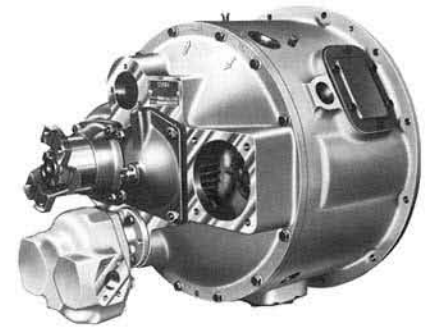
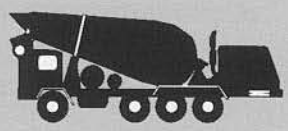
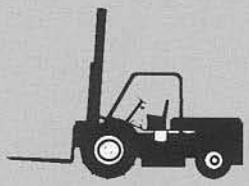
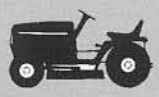
# 53R-300 Wheel End Service Manual w/Brake Supplements 0187

Allied Systems Form #80-790









## *SPICER OFF-HIGHWAY COMPONENTS*

DANA

# FOREWORD

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

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

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

Whenever repair or replacement of component parts is required, only Spicer Off Highway Products approved parts as listed in the applicable parts manual should be used. Use of "will fit" or non-approved parts may endanger proper operation and performance of the equipment. Spicer Off Highway products does not warrant repair or replacement parts, nor failures resulting from the use of parts which are not supplied or approved by Spicer Off Highway Products. **Important:** Always furnish the distributor with the serial and model number when ordering parts.

# CAUTION

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

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

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

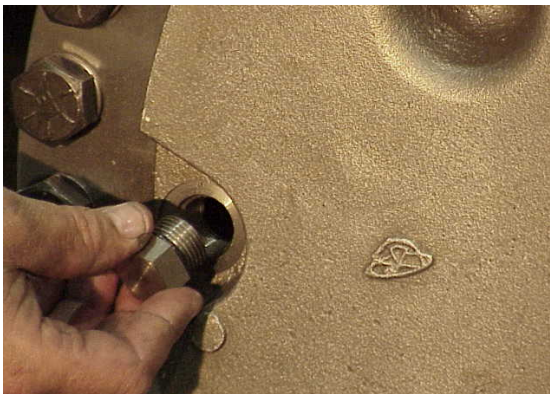
Accordingly, anyone who intends to use a replacement parts service procedure or tool, which is not recommended by SOHPD, must first determine that neither his safety nor the safe operation of the machine will be jeopardized by the replacement part, service procedure or tool selected.

It is important to note that this manual contains various 'Cautions' and 'Notices' that must be carefully observed in order to reduce the risk of personal injury during service or repair, or the possibility that improper service or repair may damage the unit or render it unsafe. It is also important that these 'Cautions' and 'Notices' are not exhaustive, because it is impossible to warn of all the possible hazardous consequences that might result from failure to following these instructions.

# Table of Contents

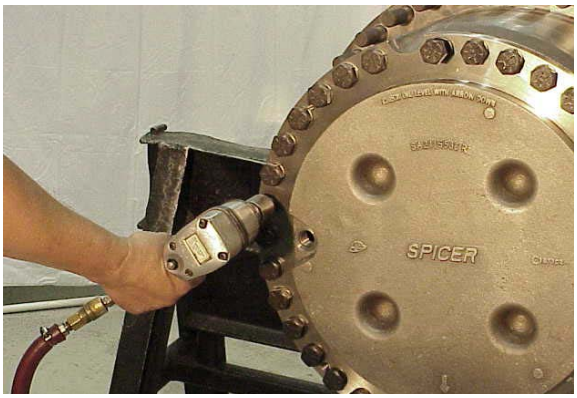
# CHAPTER 1
# HUB DISASSEMBLY

**1**



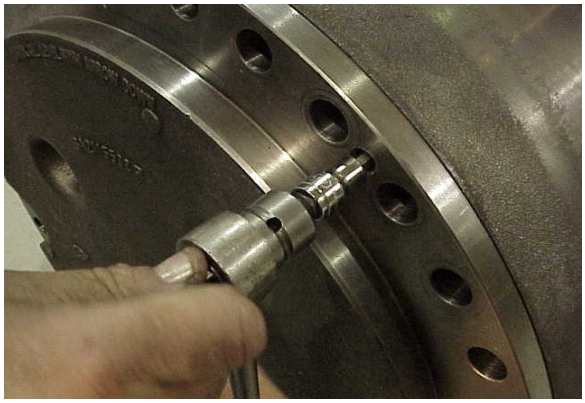
Remove drain/fill plug, drain fluid as required.

**2**



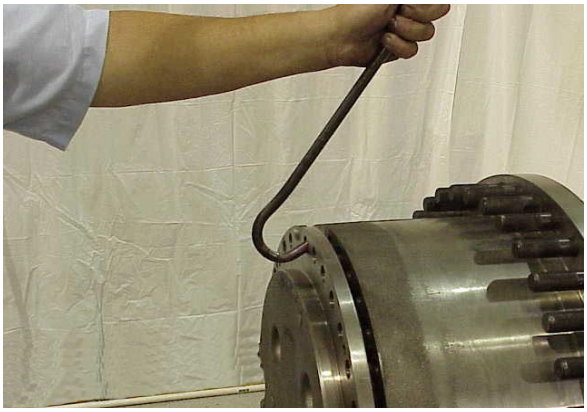

Remove capscrews.

**3**



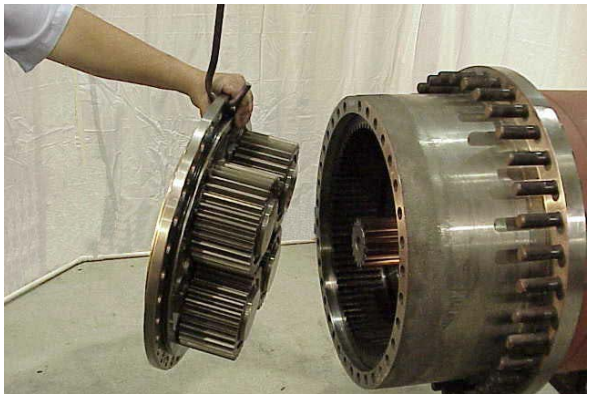
Tighten pusher screws to separate flange from housing.

**4**



Insert hook or other secure lifting device into planet flange.

**5**

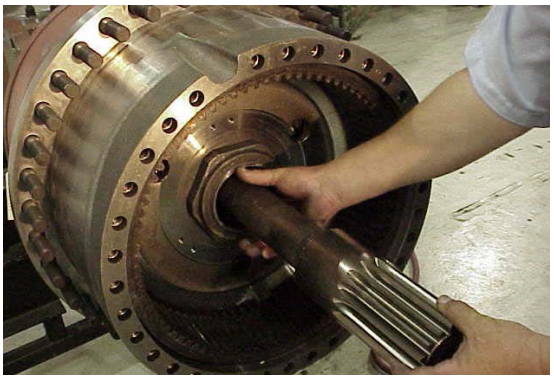


Carefully remove planet assembly.

**6**

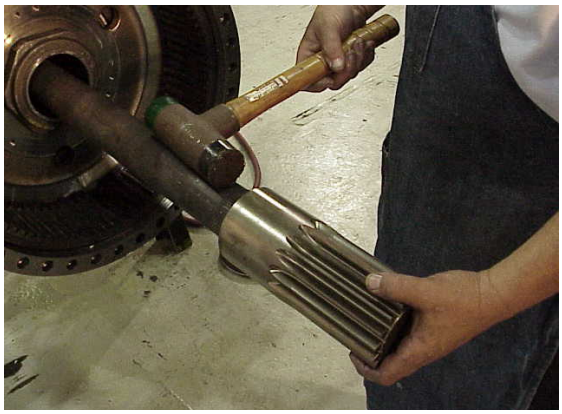
Remove 0-ring from planet.

7



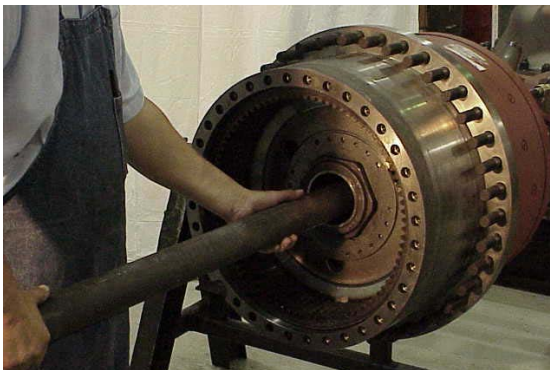
Pull axle shaft out until sun gear extends past housing.

8



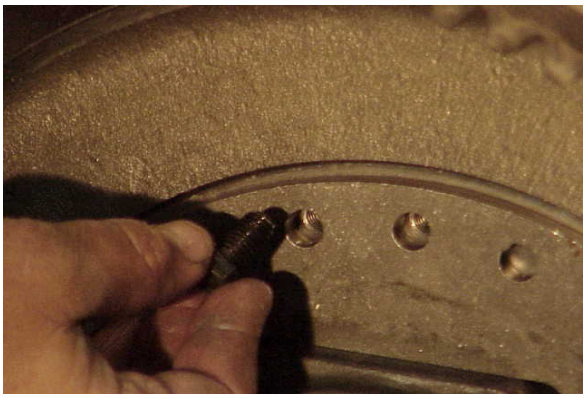
Remove sun gear.

9



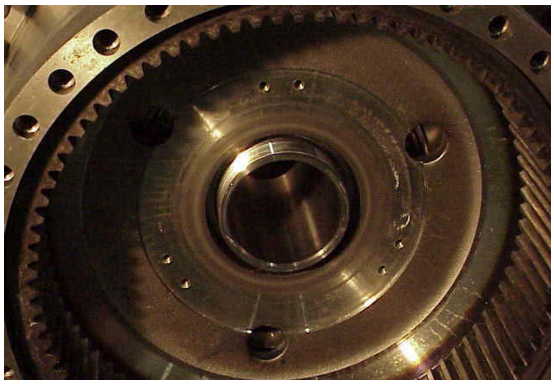
Remove axle shaft.

10



Remove lock plate bolts. Remove lock plate.

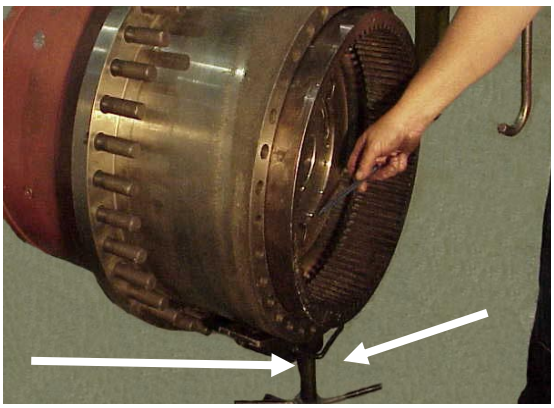
11



Remove spindle nut.

12

Support wheel end with adjustable stand. Carefully slide internal gear out of hub as shown.



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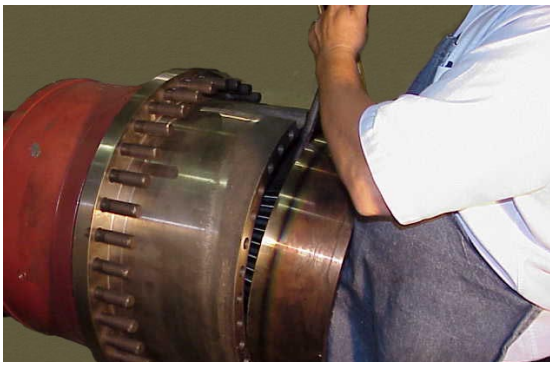
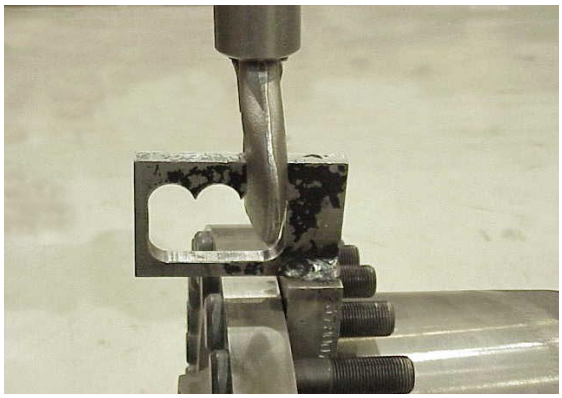


Carefully insert hook into one of the internal gear hub holes as shown. Insure hook is secure in hub.

**14**

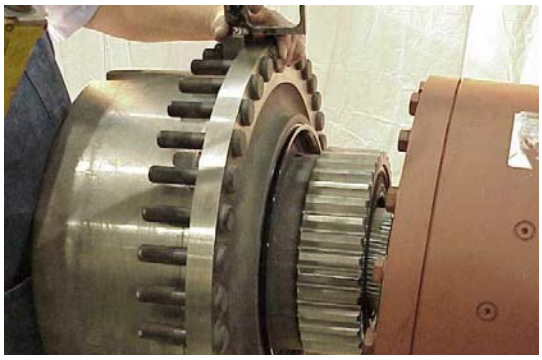
Inspect the internal hub bearings. Replace as required. See bearing heating and freezing page for installation tips.

**15**



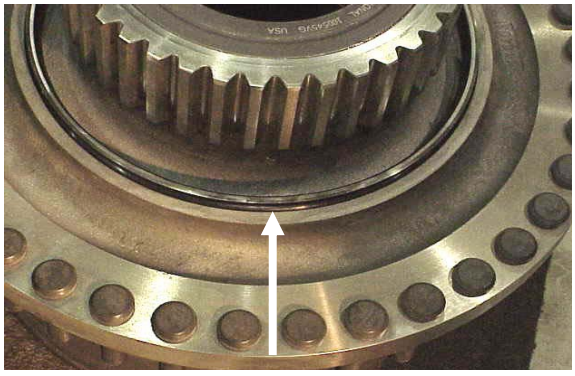
Install a secure lifting device on the wheel.

**16**



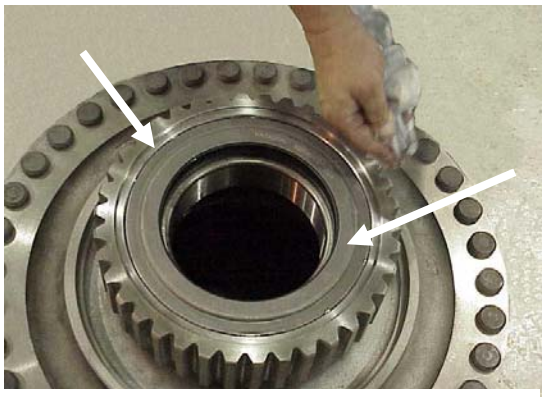
Remove wheel assembly using hoist and lifting device or safe equivalent.

**17**



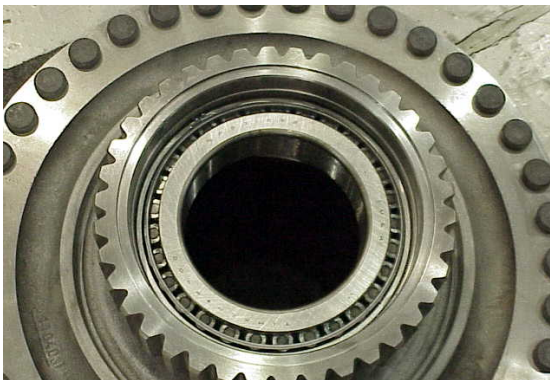
Remove face seal from hub.

**18**



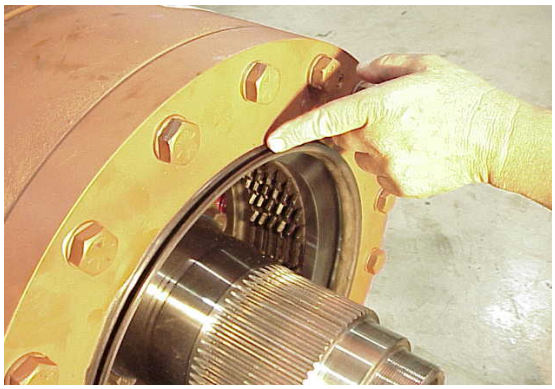
Remove hub seal.

19



Remove hub seal and bearing. Inspect bearing cone and cup. Replace as required.

20



Remove face seal from brake housing.

21

See sub-assembly section for plantary disassembly and reassembly.

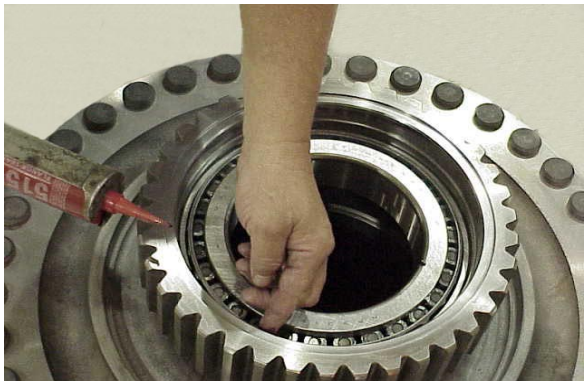
Clean, inspect and replace components as required.

22

## Hub Reaasembly

Lubricate hub bearing and cup. Install bearing.

23

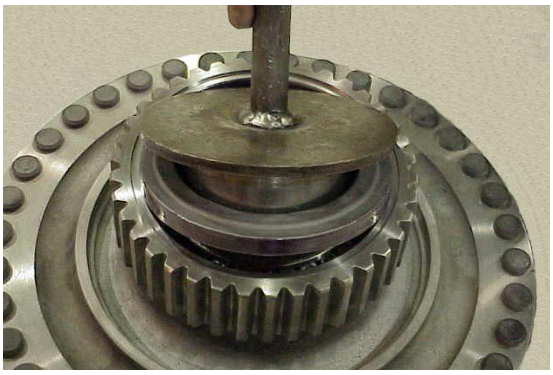


Apply sealer to seal bore.

24


Apply sealer to seal case, spread evenly around case o.d.

25

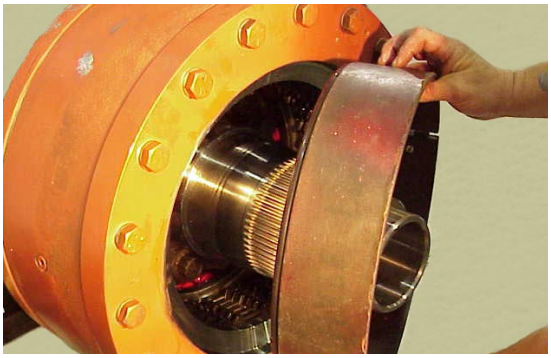


Install hub seal using proper driver.

26

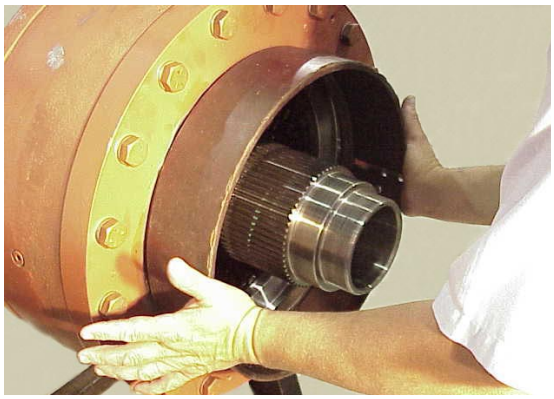
Install face seal on installation tool.

27



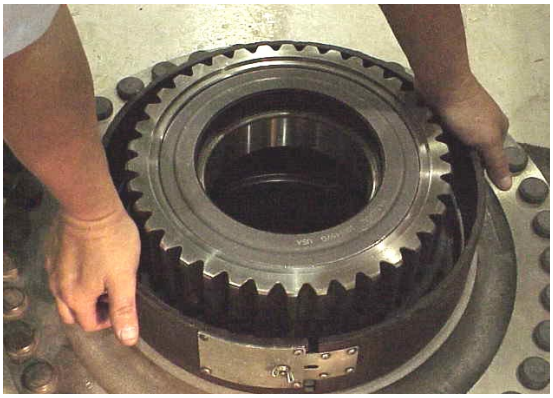
Position seal for installation. Lubricate seal and seal bore with denatured alcohol or soapy water before installation. **DO NOT USE OIL!!**

28



Carefully install install face seal.

29



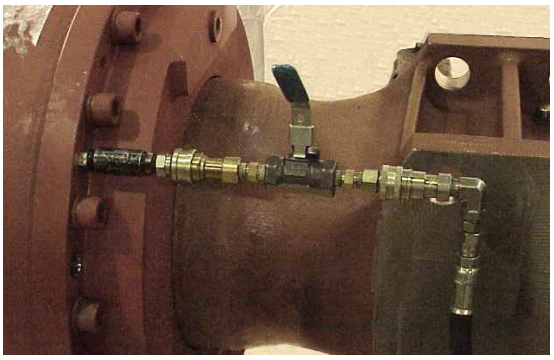
Repeat process for hub.

30

**NOTE!**
It will be necessary to release the brake apply springs before installing the wheel assembly or setting bearing preload.

**See figure 31**

31



Apply 1500 psi [103 bar] hydraulic pressure using equipment with the proper pressure rating for the task.

32

Align brake plate teeth.

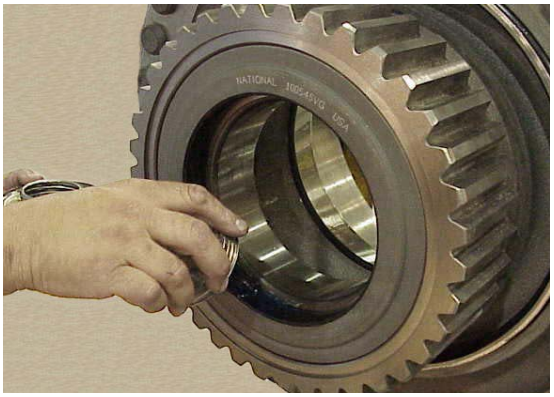
33

Remove any dirt or contaminants from seal faces.

34

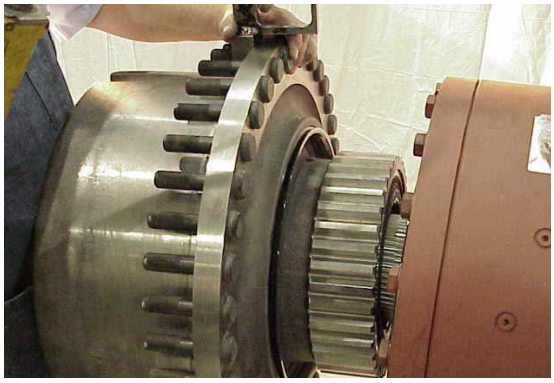
Lubricate the seal faces with clean oil.
NOTE: Excessive amounts of oil may give the impression of a seal leak after unit is put into service.

35



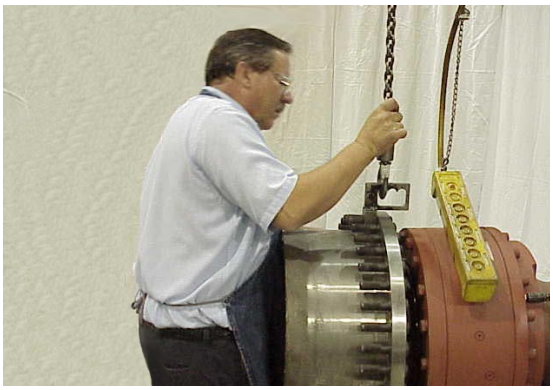
Lubricate the hub seal.

36 **Hub Installation**



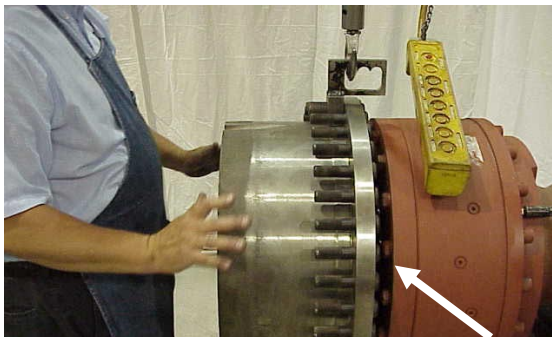
Using hoist, install hub assembly on spindle.

**37**



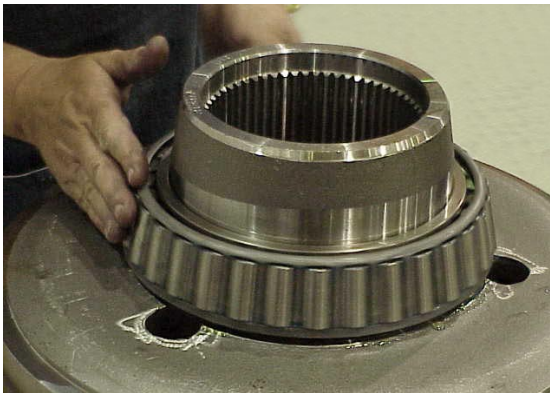
Carefully work hub splines into brake plate teeth.

**38**



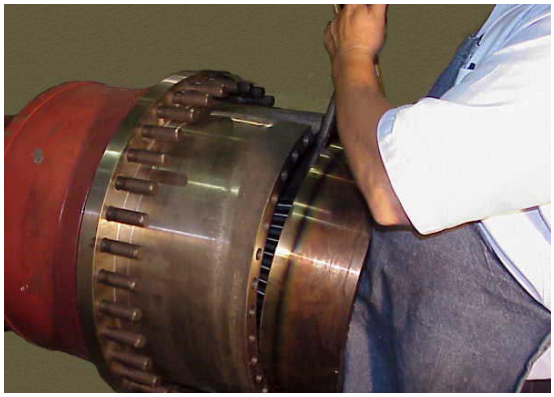
Work hub fully onto spindle and through brake plates. See arrow for reference.
NOTE: Support hub with stand while installing internal gear hub.

**39**



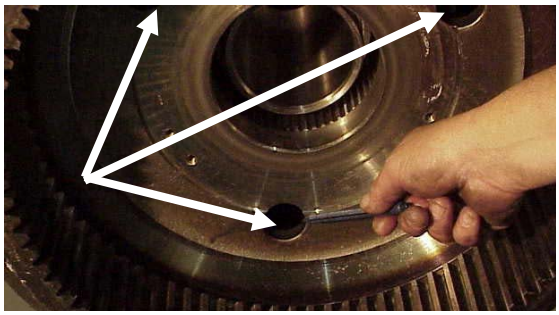
Lubricate internal hub bearing with oil and rotate several times. Lubricate hub and spindle splines.

**40**



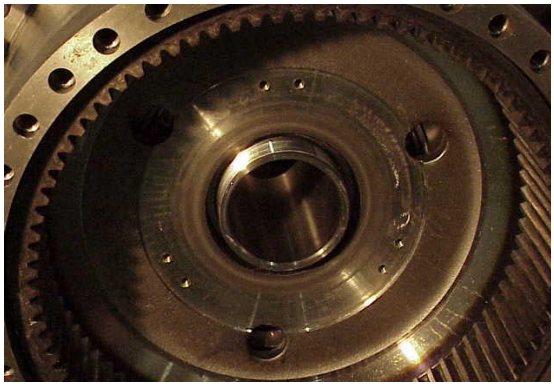
Install internal gear hub in wheel assembly.

**41**



Carefully align internal hub splines on spindle. Align oil holes as shown, see arrows. Use adjustable stand to help with hub alignment.

**42**

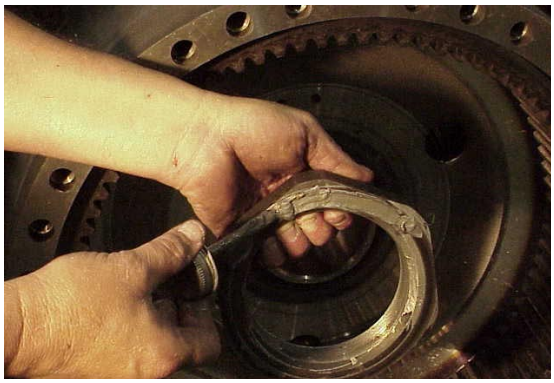


Slide internal hub onto spindle.

43

Lubricate spindle threads with anti-seize.

44

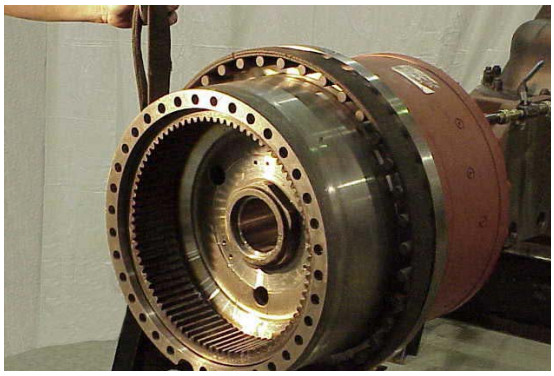


Apply anti-seize to the spindle nut contact face and install.

45

**Note:** It is imperative that the hubs be rotated during the bearing tightening and pre-loading process to insure the bearings are not damaged and accurate readings are obtained.

46 **Bearing Preload**

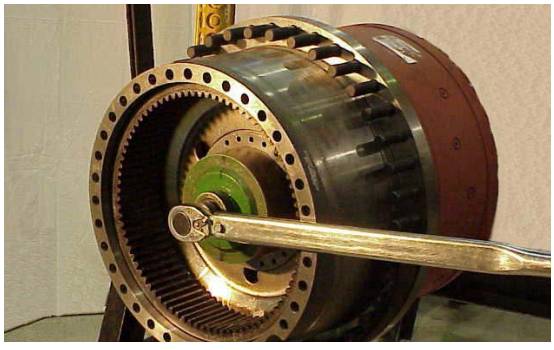


Hook a strap onto a wheel stud as shown and wrap around hub.

47

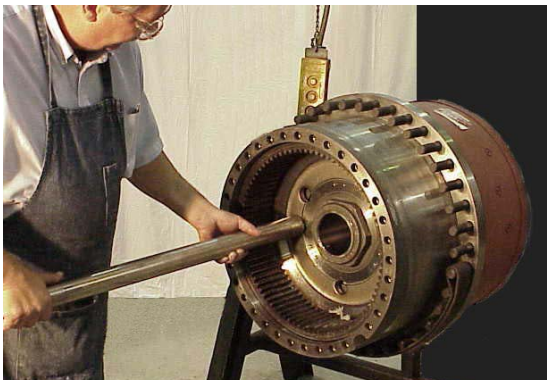
Using a hoist connected to strap rotate the hub while while running spindle nut down with impact gun. Do not exceed 1200 lbf/ft [1627 Nm].

48



Torque, rotate and shock the hub assembly as described on the Bearing Preload page 69.

49

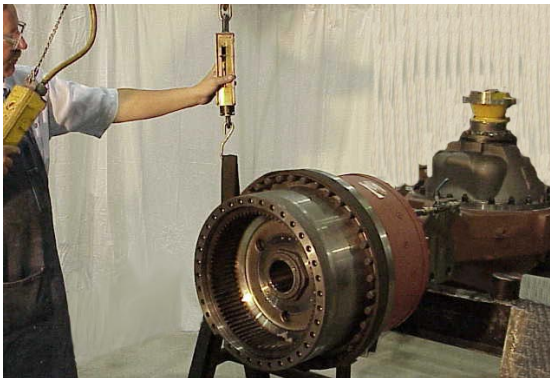


Shock hub as described in preload procedure.

50

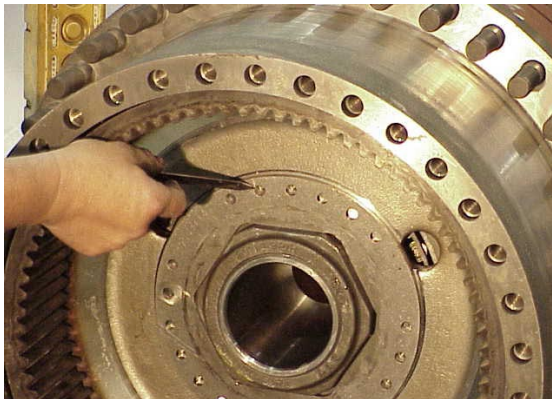
Rolling torque can be measured using a strap and scale as shown or by using a torque wrench and adapter bar which spans the diameter of the hub, attaching to the planetary bolt holes.

51



Attach scale and measure rolling torque as described in preload procedure.

52



Install lock plate and align holes as described.

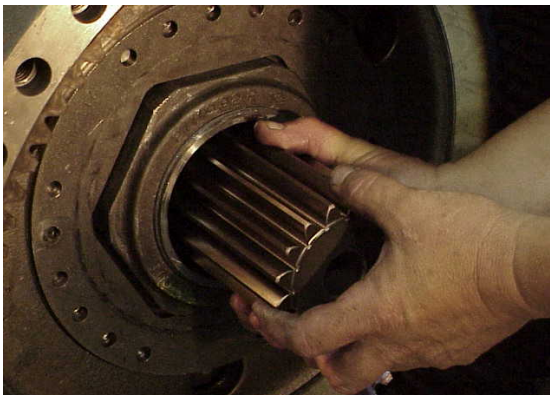
53


Apply Loctite 262 or equivelant to lock plate screws. Tighten to 25-28 lbf/ft [34-38 Nm].

54 **Planetary Installation**

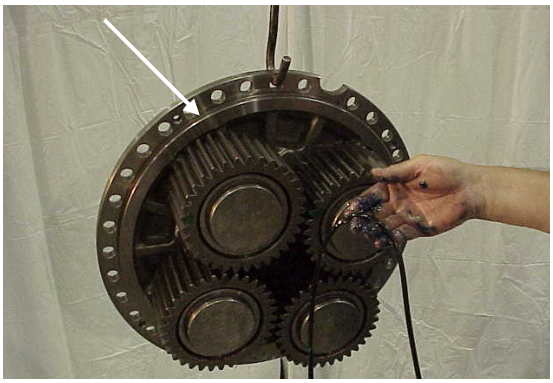
Install axle shaft and sun gear.

**55**



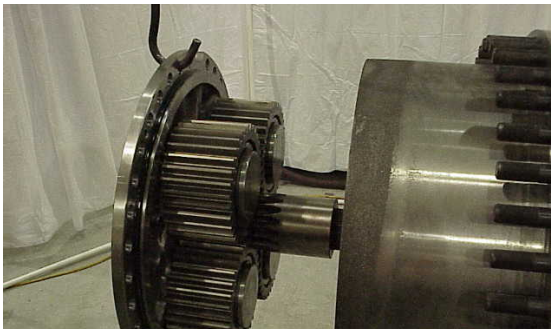
Slide assembly into differential splines.

**56**



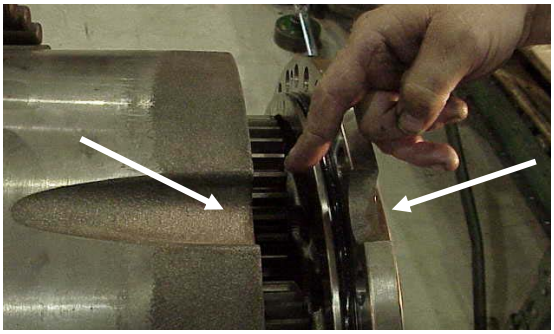
Lubricate o-ring with grease, install in planet housing o-ring groove

**57**



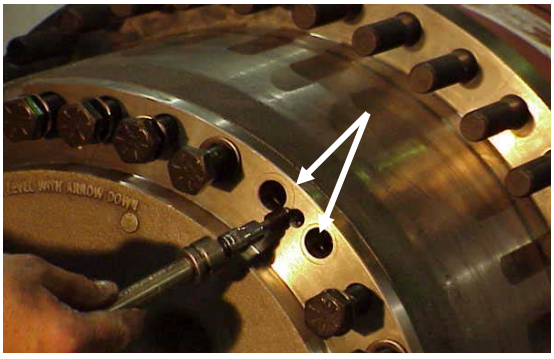
Install planetary assembly on sun gear. Do not allow axle shaft to support weight of planetary assembly.

**58**



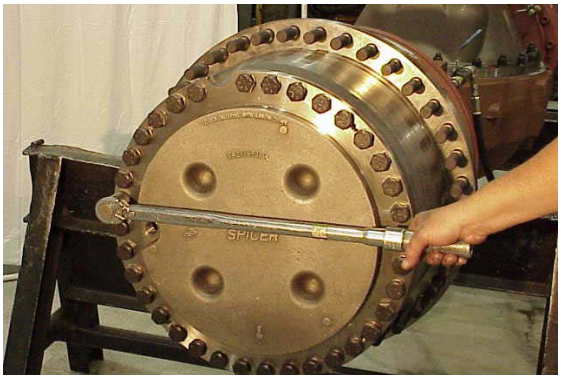
Align scallops in planetary assembly and hub as shown by arrows, mate the two components.

**59**



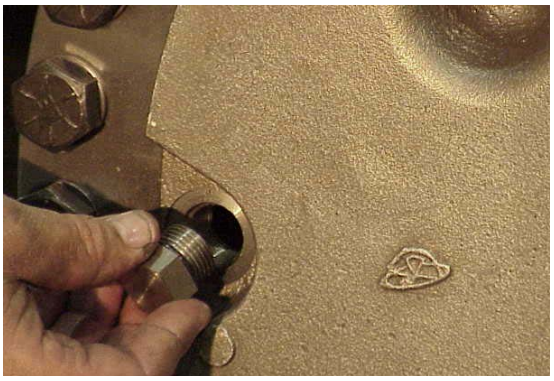
Apply Loctite 262 or equivelant to planetary capscrews. Be sure to install pusher screws before installing capscrews and washers.

**60**



Tighten capscrews to 300-330 lbf/ft [407-447 Nm]

**61**



Install fill/drain plug. Tighten to
30-35 lbf/ft [41-47 Nm]

# Chapter 2
## 13150 / 16150 LCB

### POSI-STOP
### (LCB LIQUID COOLED BRAKES)

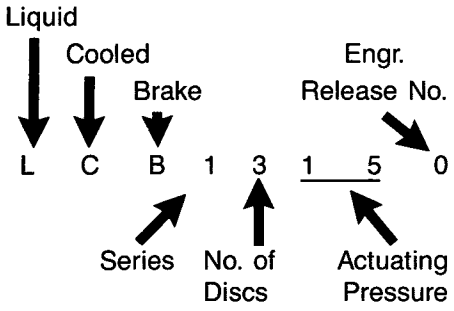
The liquid cooled brake is ideal for use in contaminated or temperature sensitive environments and in machines where extra long maintenance intervals are required. Braking action of the Posi-Stop liquid cooled brake is achieved through the release of pressure on the hydraulic piston with the rotating 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.

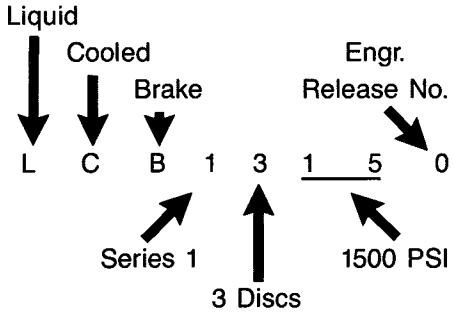
Wheel bearings can be serviced as in any normal bearing procedure.

**MODEL DESIGNATION**

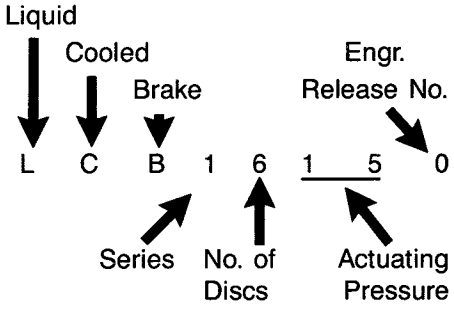



**MODEL**
**LC.B. 13150**

**EXAMPLE**

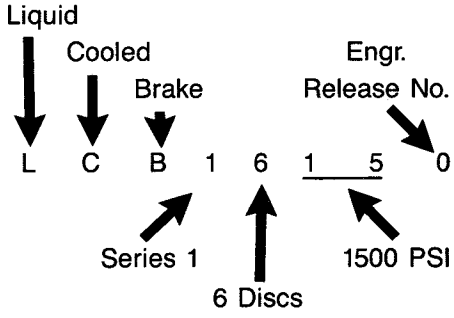


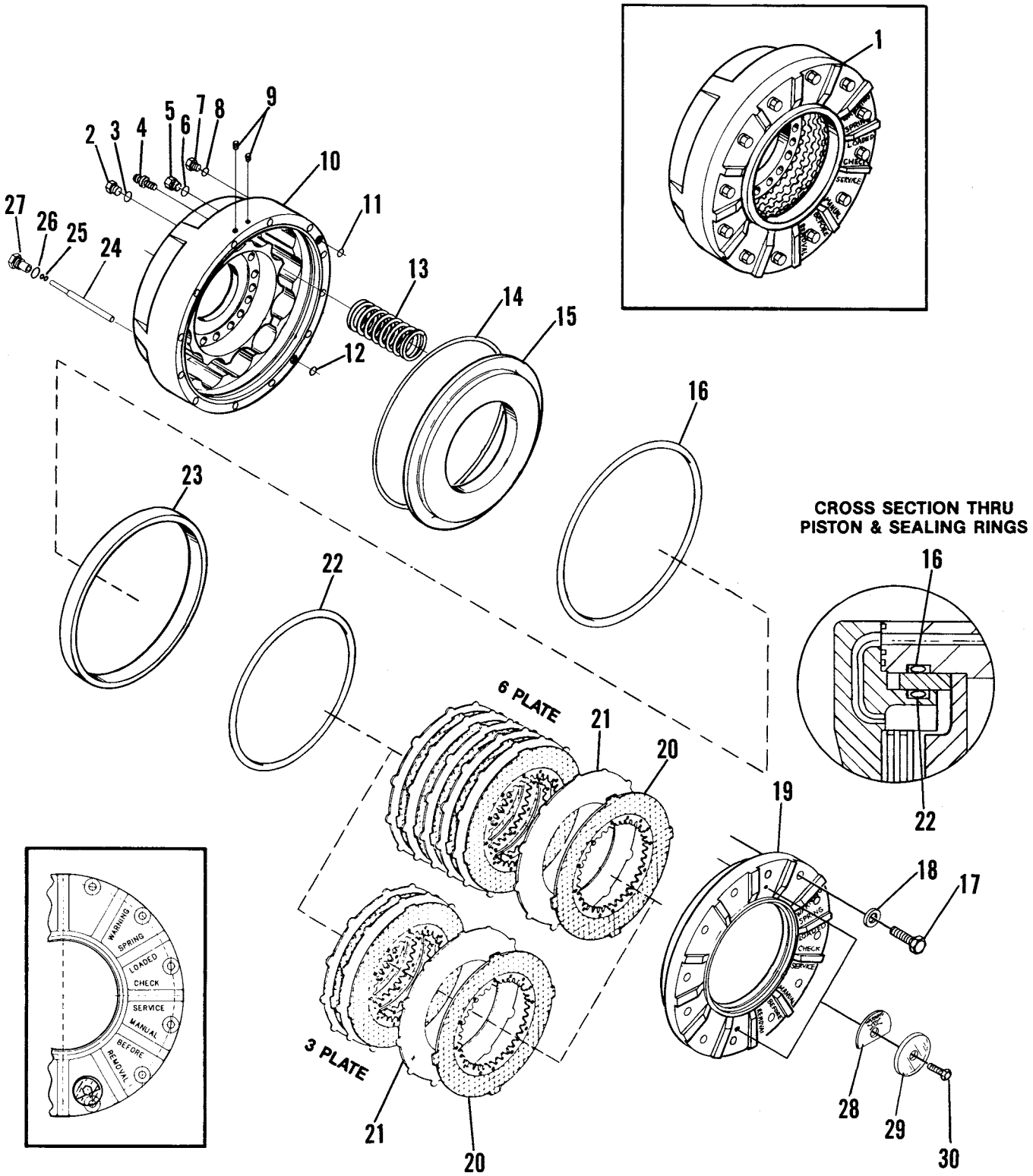

**MODEL DESIGNATION**




**MODEL**
**LC.B. 26100**

**EXAMPLE**

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25
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27
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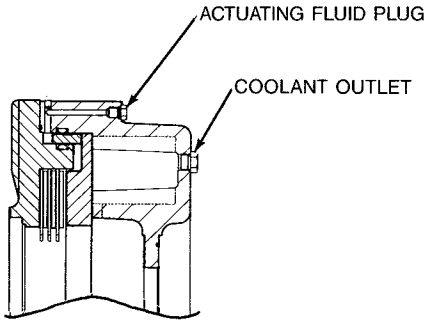
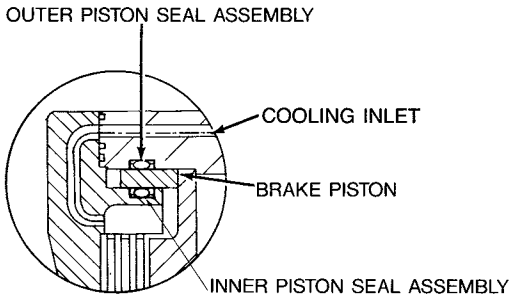
29
30
6 PLATE
3 PLATE
CROSS SECTION THRU
PISTON & SEALING RINGS
WARNING
SPRING
LOADED
CHECK
SERVICE
MANUAL
BEFORE
REMOVAL

## POSI-STOP
## BRAKE ASSEMBLY
## (3 OR 6 PLATE)

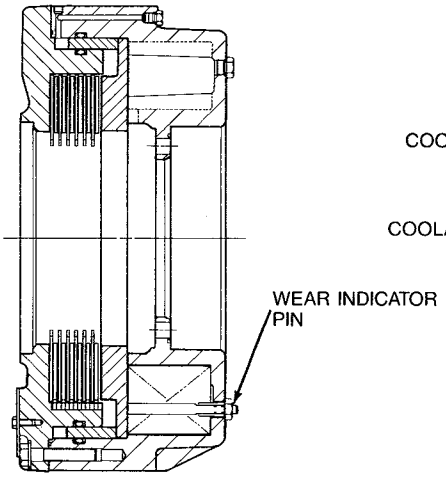
| ITEM | DESCRIPTION | QTY. |
|---|---|---|
| 1 | Multi Disc Brake Assembly [Qty. Indicated for (1) Wheel End] | 1 |
| 2 | Cooling Outlet Plug | 1 |
| 3 | Cooling Outlet Plug "O" Ring | 1 |
| 4 | Bleeder Screw | 1 |
| 5 | Cooling Inlet Plug | 2 |
| 6 | "O" Ring | 2 |
| 7 | Actuating Fluid Plug | 1 |
| 8 | Actuating Plug "O" Ring | 1 |
| 9 | Plug | 2 |
| 10 | Brake Housing | 1 |
| 11 | Inlet "O" Ring | 1 |
| 12 | Outlet "O" Ring | 1 |
| 13 | Brake Apply Spring | 15 |
| 14 | Outer Cover "O" Ring Seal | 1 |
| 15 | Piston Pressure Ring | 1 |
| 16 | Outer Piston Seal Assembly | 1 |
| 17 | Outer Cover Attaching Capscrew | 12 |
| 18 | Outer Cover Attaching Washer | 12 |
| 19 | Brake Outer Cover | 1 |
| 20 | Friction Disc & Lining Assembly | 3 or 6 |
| 21 | Reaction Plate | 3 or 6 |
| 22 | Inner Piston Seal Assembly | 1 |
| 23 | Brake Piston | 1 |
| 24 | Wear Indicator Pin | 1 |
| 25 | Indicator Pin "O" Ring | 2 |
| 26 | Indicator Guide "O" Ring | 1 |
| 27 | Indicator Pin Guide | 1 |
| 28 | Warning Sticker | 2 |
| 29 | Sticker Cover | 2 |
| 30 | Sticker Cover Capscrew | 2 |




**3 PLATE**

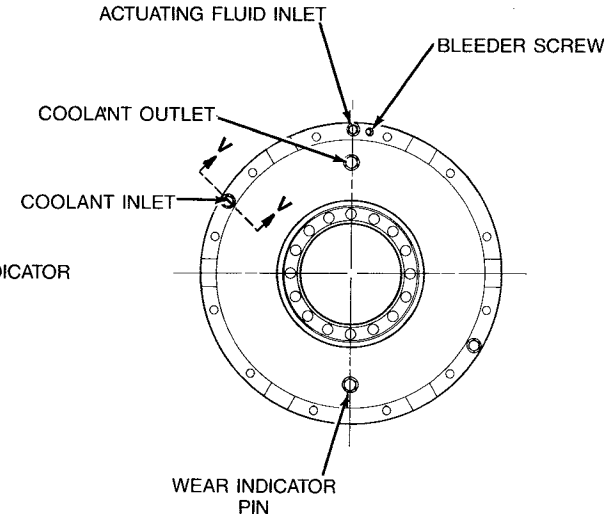



**V-V**
**CROSS SECTION THRU PISTON SEALING RINGS**



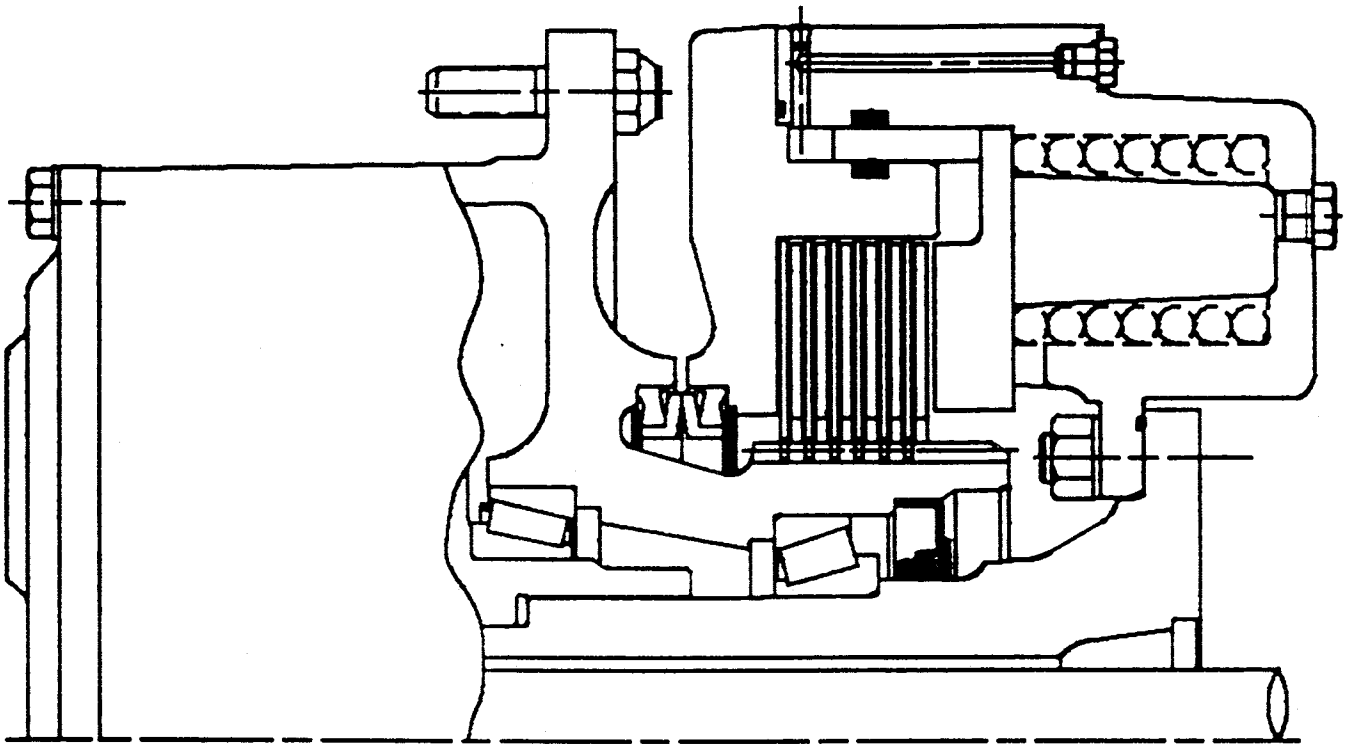

TIGHTEN 175 TO 190 LBS. FT.
[240-260 N.m.]

**6 PLATE**




**WARNING: SPRING LOADED. CHECK SERVICE MANUAL BEFORE REMOVAL.**

## CLARK **POSI-STOP**
## LCB 16150 VEHICLE BRAKE



**(6 Plate Shown)**

### FEATURES:

- Brake force is applied by large multiple coil springs directly to the wheel hub friction discs, for positive stopping action under condition of decreasing hydraulic hold off pressure. Similiarly brake is released when hold off pressure increases to 90% of the brake release pressure rating.
- Brakes are immediately applied with any loss of hydraulic pressure.
- Hydraulic actuation system is greatly simplified.
- Secondary braking systems are not required.
- Brake is totally enclosed for long life under adverse conditions.
- For extra safety, brake is designed to generate substantial torque even in the unlikely condition of total loss of friction lining material.
- Fits 24'' rims or larger.

### BRAKE RATING:

- Torque rating is 143,000 lb. in. for 13150 LCB and 250,000 lb. in. for 16150 LCB per wheel at zero line pressure and full brake release at 1500 psi line pressure.

### AXLE APPLICATION:

- CLARK 15D1841, 16D2149, 19D2748 Series.

## POSI-STOP
## LIQUID-COOLED BRAKE — DRAINING

To drain the brake housing, remove the bottom drain plug or friction disc wear indicator from the brake housing. Remove the inlet plug below the bleeder screw. Allow enough time for housing to drain completely.

**NOTE: For friction disc wear information see page 15.**

On axles equipped with posi-stop liquid cooled brakes, the brakes must be released hydraulically before wheel end removal or installation. Apply 1500 PSI [10342 kPa] hydraulic pressure using mineral oil to the brake fluid actuation port prior to wheel end removal. Pressure must be applied and retained until wheel hub is removed from spring applied liquid cooled brakes.

## 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.

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

**WARNING:** **Outer Brake Housing Cover is under 40,000 lbs. compressed spring pressure and extreme caution must be taken in removing this cover. Brake cover bolts must be removed cautiously and evenly. *Do not remove bolts one (1) at a time.***

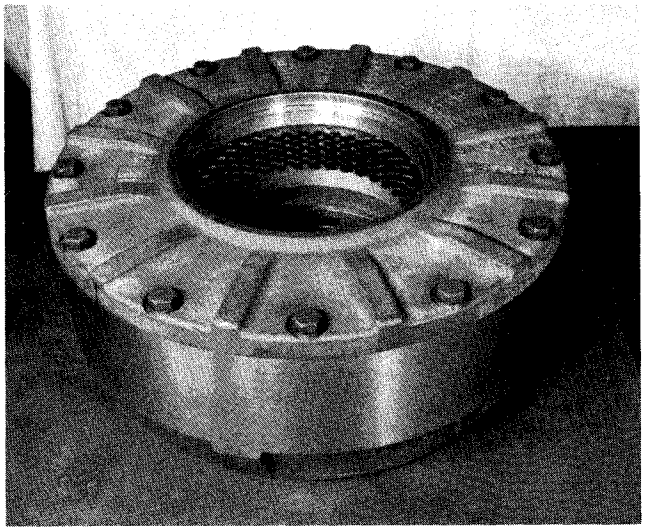


**Figure 1**

Multi disc brake removed from axle as an assembly. Brake face seal removed.

**NOTE:** Face seal in one axle end must not be mixed with face seal on the opposite axle end.

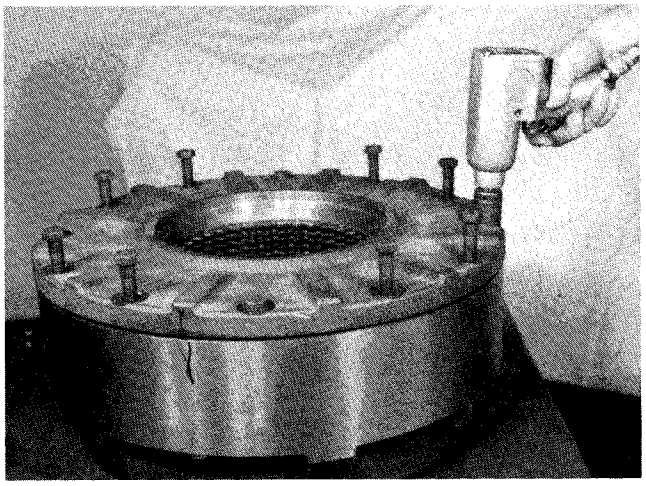


**Figure 2**

Figure 2 shows bolts being removed from brake cover. Eight bolts were run out from the cover, but not free of threaded holes. Never take the bolts out of threaded holes all the way until spring pressure is completely relieved. Four (4) bolts were then carefully removed simultaneously a thread or two at a time. An added precaution would be to leave six (6) bolts in place and removed evenly and carefully.

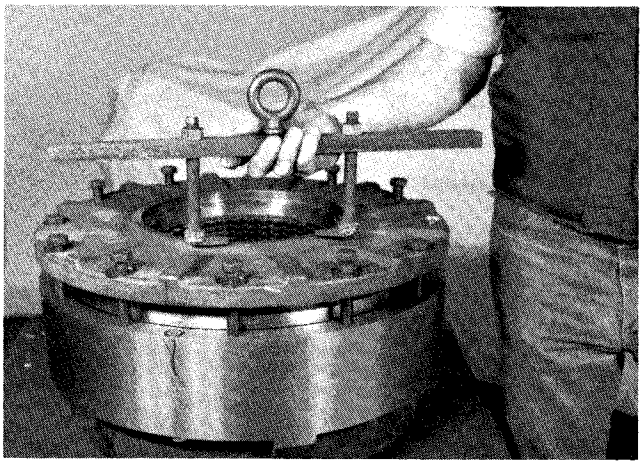


**Figure 3**
A lifting tool was fabricated to remove brake cover and also hold friction disc and reaction disc in place. A sketch of this tool is shown on page 16.

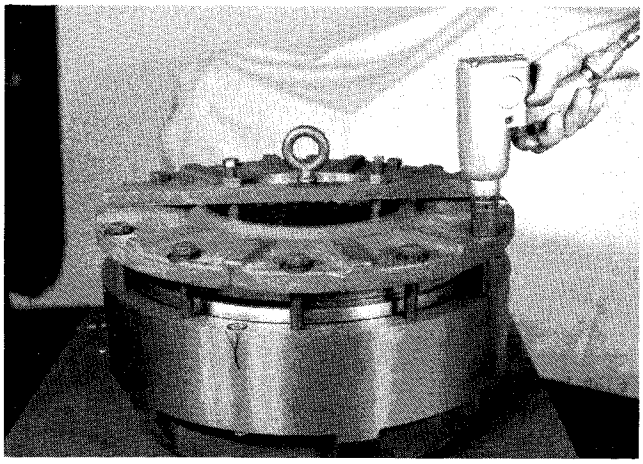


**Figure 4**
Install lifting tool and clamp inner teeth of friction disc to hold in place. Remove cover bolts.

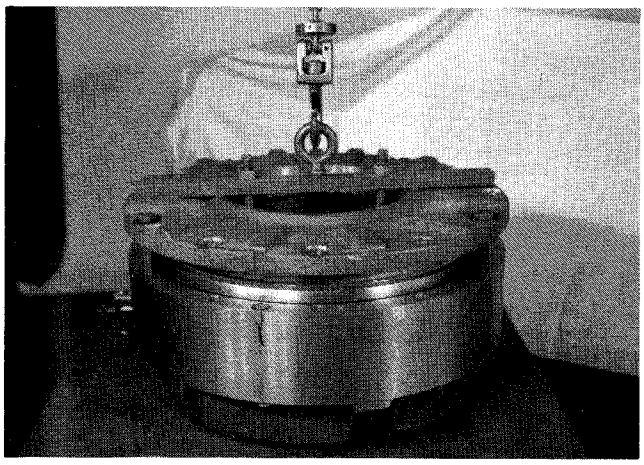


**Figure 5**
Lift cover off of brake housing.

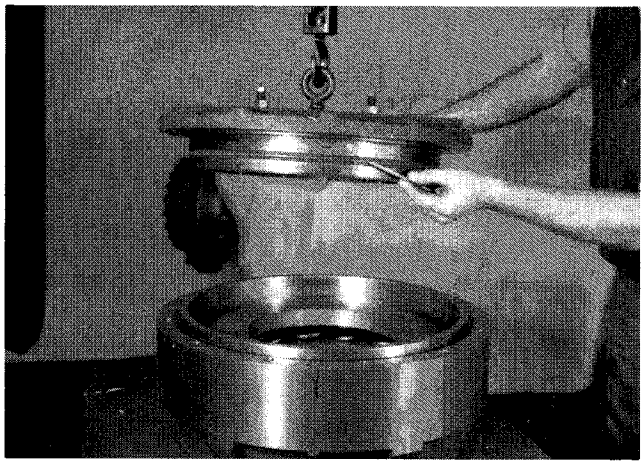


**Figure 6**
Cover removed. Remove inner piston seal assembly. **NOTE:** Some units will have sealing ring and back-up rings. Remove sealing rings.

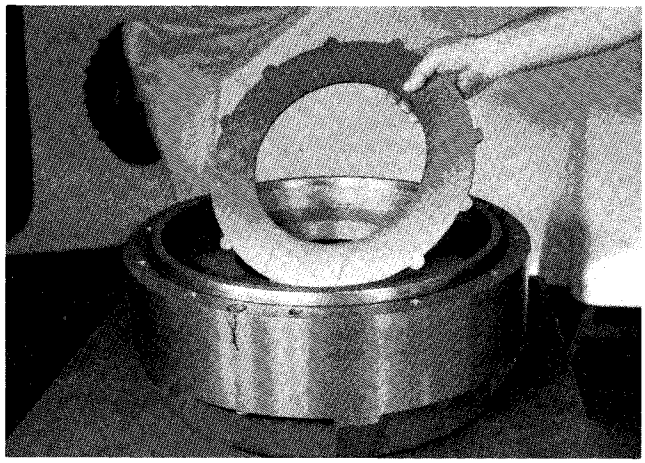


**Figure 7**
Remove reaction plate. This remained in housing when cover was removed.

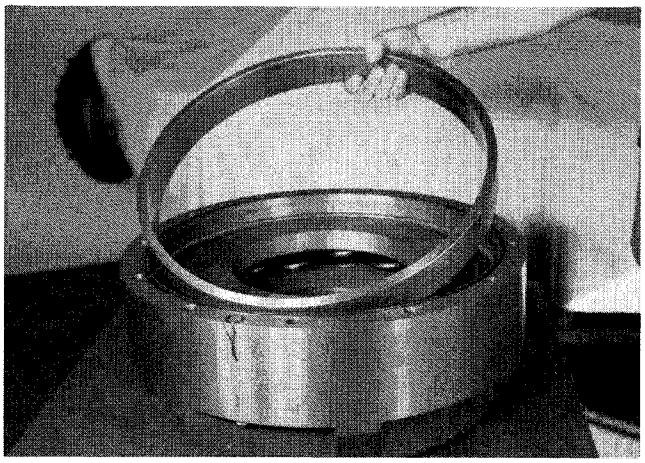


**Figure 8**
Remove brake piston.

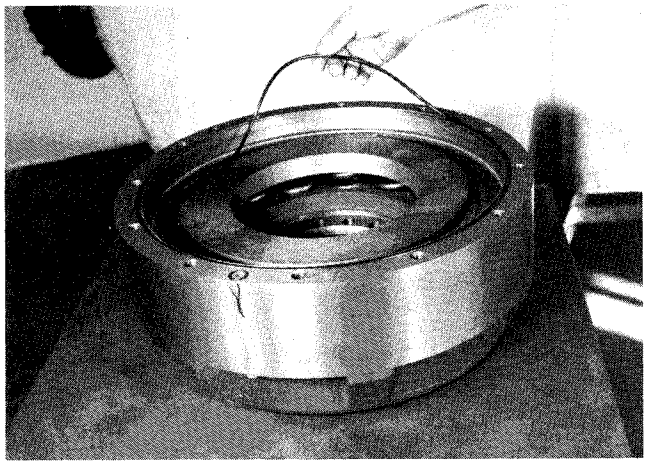


**Figure 9**
Remove outer cover "O" ring seal.

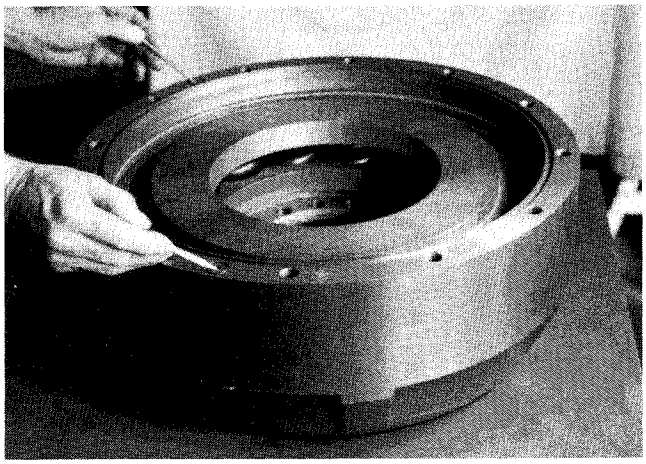


**Figure 10**

Remove brake cover inlet and outlet "O" rings two (2) places.

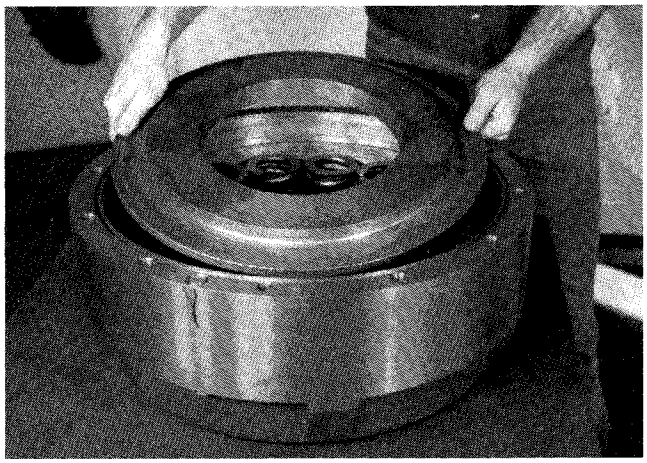


**Figure 11**
Remove piston pressure ring.

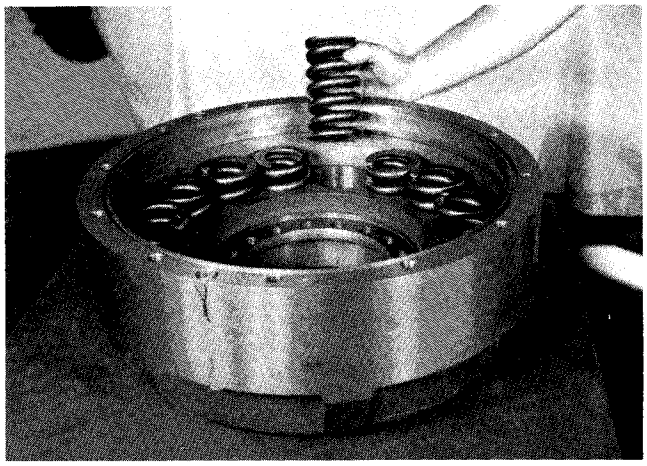


**Figure 12**
Remove brake apply springs. Remove friction and reaction disc from brake cover.

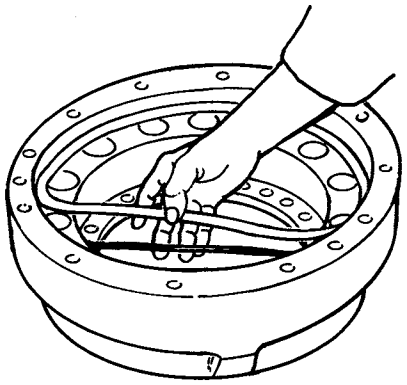


**Figure 13**
Remove outer piston seal assembly.
**NOTE:** Some units will have sealing ring and back-up rings. Remove sealing rings.

## 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.

Apply a film of lubricant to the brake piston and all sealing rings to facilitate reassembly.

## REASSEMBLY

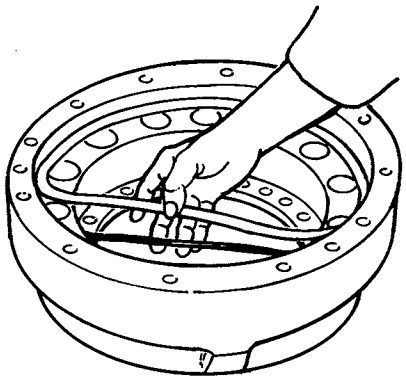


**Figure 14**
Install outer piston seal assembly.

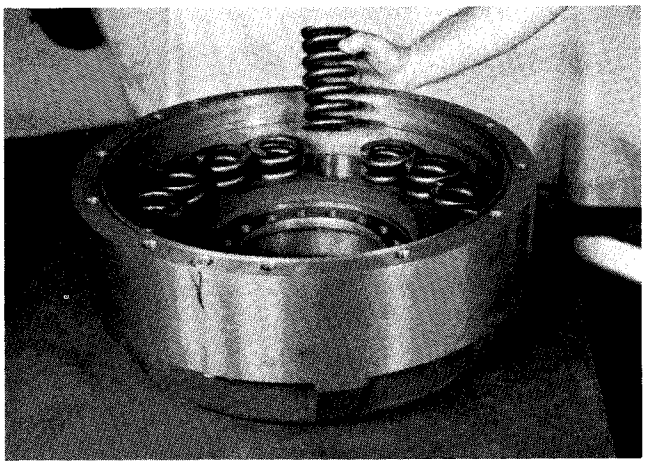


**Figure 15**
Install brake apply springs.

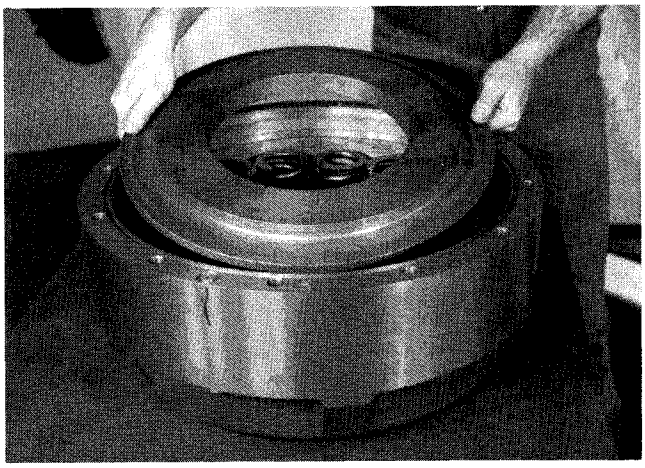


**Figure 16**
Install piston pressure ring.

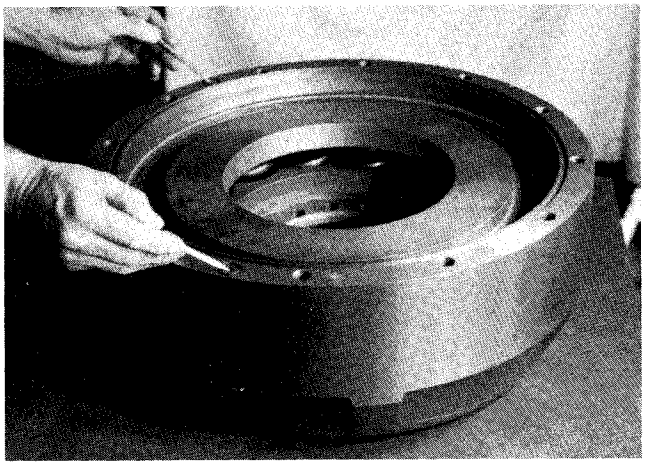


**Figure 17**
Install inlet and outlet "O" rings in two (2) places.

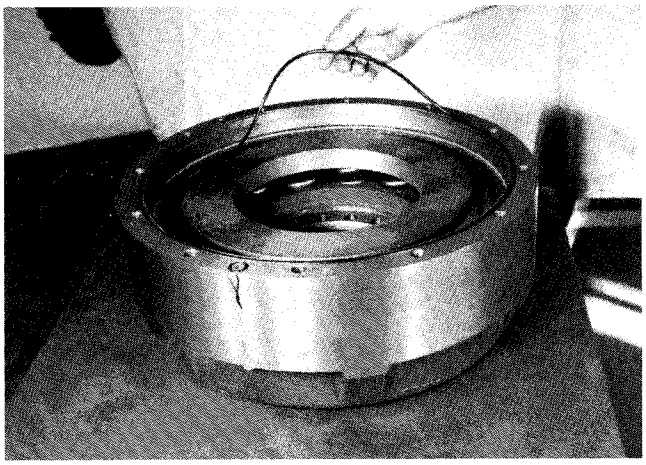


**Figure 18**
Install outer cover "O" ring seal.

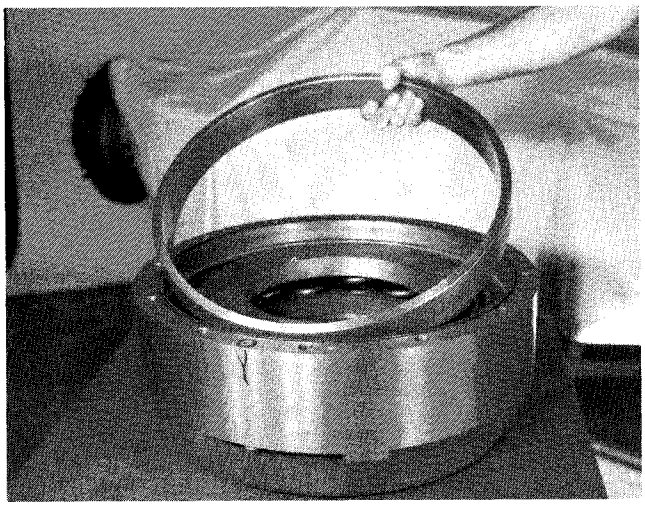


**Figure 19**
Install brake piston.
See page 14 for proper piston installation.

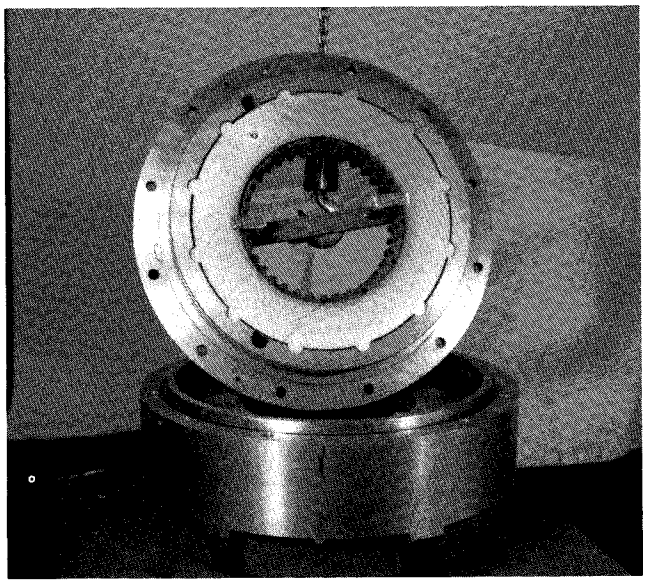


**Figure 20**
Position first friction plate (teeth on inner diameter) in brake cover. Install first reaction plate (teeth on outer diameter) in brake cover. Alternate friction and reaction discs until three (3) or six (6) each has been installed. You will start with a friction disc and end with a reaction disc. Install lifting eye and clamping tool to hold discs in position. (3 or 6 plate to be determined by model number.)

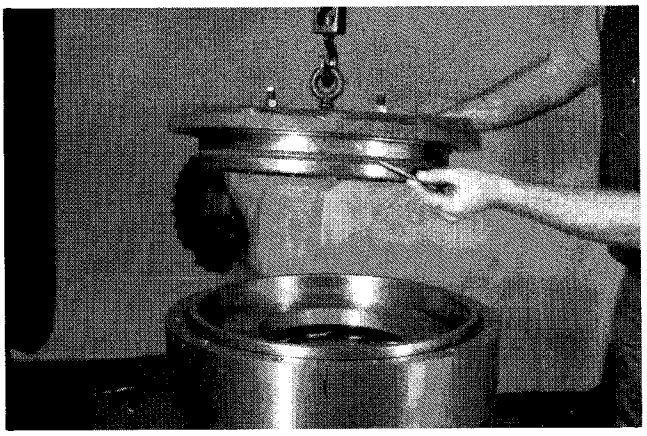


**Figure 21**
Install inner piston seal assembly.

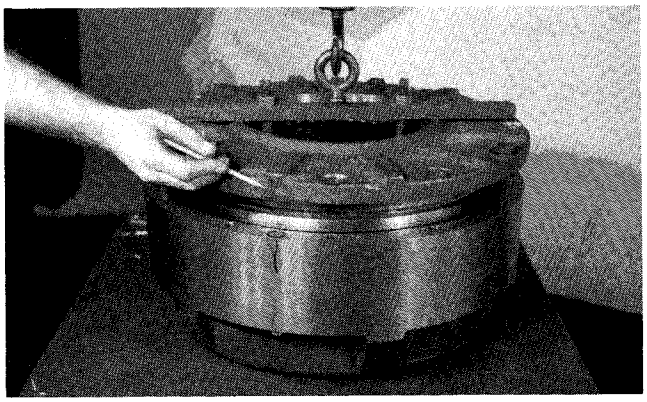


**Figure 22**
Install cover and disc assembly on brake housing.
**NOTE:** Align inlet and outlet holes in cover with holes in brake housing.

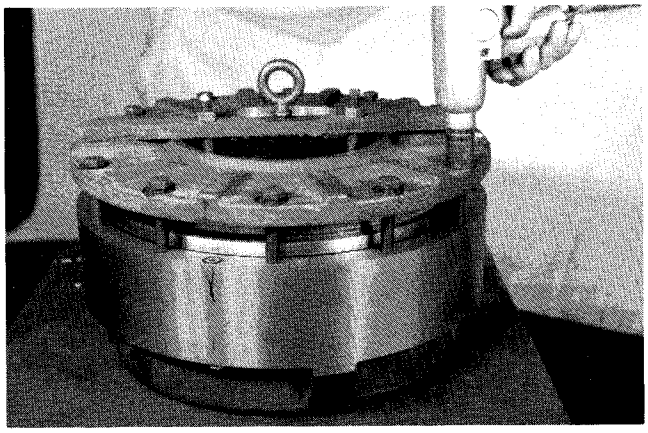


**Figure 23**
Install Loctite #262 to threaded holes in brake housing. Install brake cover to brake housing bolts. Run bolts down evenly until bottom of clamp hits on pressure plate. Remove clamp and lifting eye. Continue installing bolts evenly until cover is tight against housing.

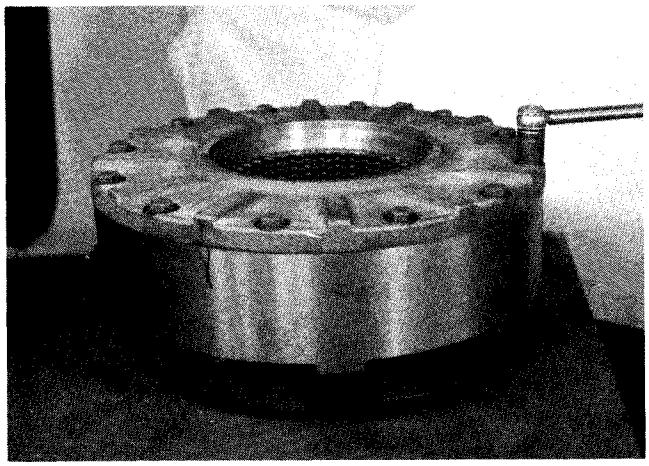


**Figure 24**
Tighten bolts 175-190 ft. lbs. torque [240-260 N.m.].

## LIQUID COOLED BRAKE — LUBRICATION

The self contained liquid cooled brake system uses the same lube as the axle center section and wheel ends. There are no seals between the spindles and wheel hubs. Oil that lubricates the differential and planetary wheel ends also lubricates and cools the brake assembly. The oil level is the same height as the planet and axle center and the brake may be filled and oil level checked at the planet carrier assembly or planet carrier cover.

Brake oil changes would be accomplished at the same time the axle lube is changed. Contaminates resulting from braking will not affect axle within normal oil change periods.

**CAUTION:** On all axles with liquid cooled brakes check brake drain plug for presence of axle lube for axles without forced cooling, or cooling fluid for axles with forced cooling.

## RECOMMENDED LIQUID COOLED BRAKE COOLING OILS

IT IS RECOMMENDED THAT AXLES WITH EXTERNAL COOLED LIQUID COOLED BRAKES (LCB) USE "TRACTOR HYDRAULIC FLUIDS" MEETING ALLISON C4 DESIGNATION FOR COOLING OIL. THIS FLUID HAS E.P. ADDITIVE FOR IMPROVED FACE SEAL LIFE AND FRICTION MODIFIERS FOR HIGH TORQUE AND QUIET BRAKE OPERATION.

## FACE SEAL BREAK-IN PERIOD

WHEN MACHINE IS IMMEDIATELY DRIVEN FROM PRODUCTION FLOOR OR AFTER FACE SEAL HAS BEEN REBUILT OR REPLACED, IT IS IMPERATIVE THAT A 15 MINUTE BREAK-IN PERIOD BE CONDUCTED AT NOT MORE THAN 25 RPM WHEEL SPEED, WHICH IS 5 MPH MAX. AND IN 1ST GEAR OPERATION ONLY. THIS IS TO ALLOW THE SEAL RUBBERS AND METAL RINGS TO PROPERLY SEAT.

## 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.

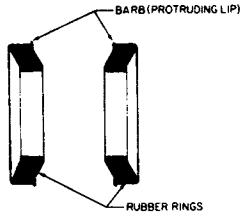



**Figure 1**

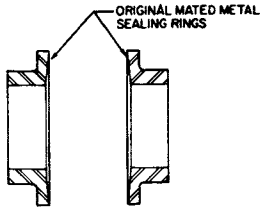



**Figure 2**

**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 (2) 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.

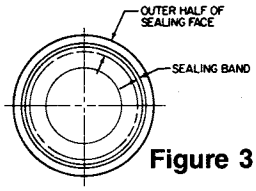



**Figure 3**

**Seal acceptable for rebuilding.**

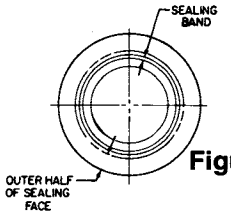



**Figure 4**

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.

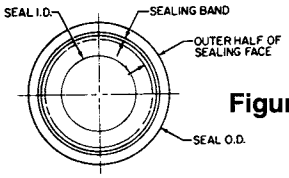



**Figure 5**

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

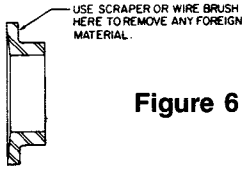



**Figure 6**

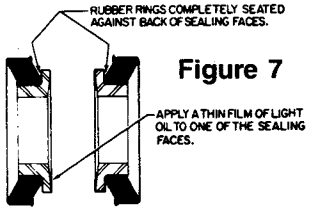



**Figure 7**

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).

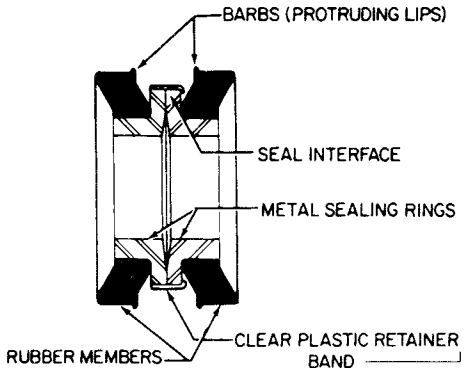
   **(b)** Clean the metal sealing rings with a clean degreasing solvent then wipe with the lint free wiping cloths furnished in the rebuilding kit (see Figure 6).

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 13 for face seal installation instructions.

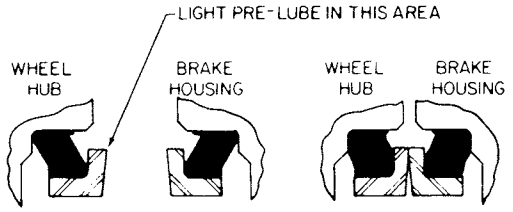
## FACE SEAL INSTALLATION INSTRUCTIONS




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




**STEP 1** **STEP 2**

2. The seal is intended to be held in its operating position by two counterbores.

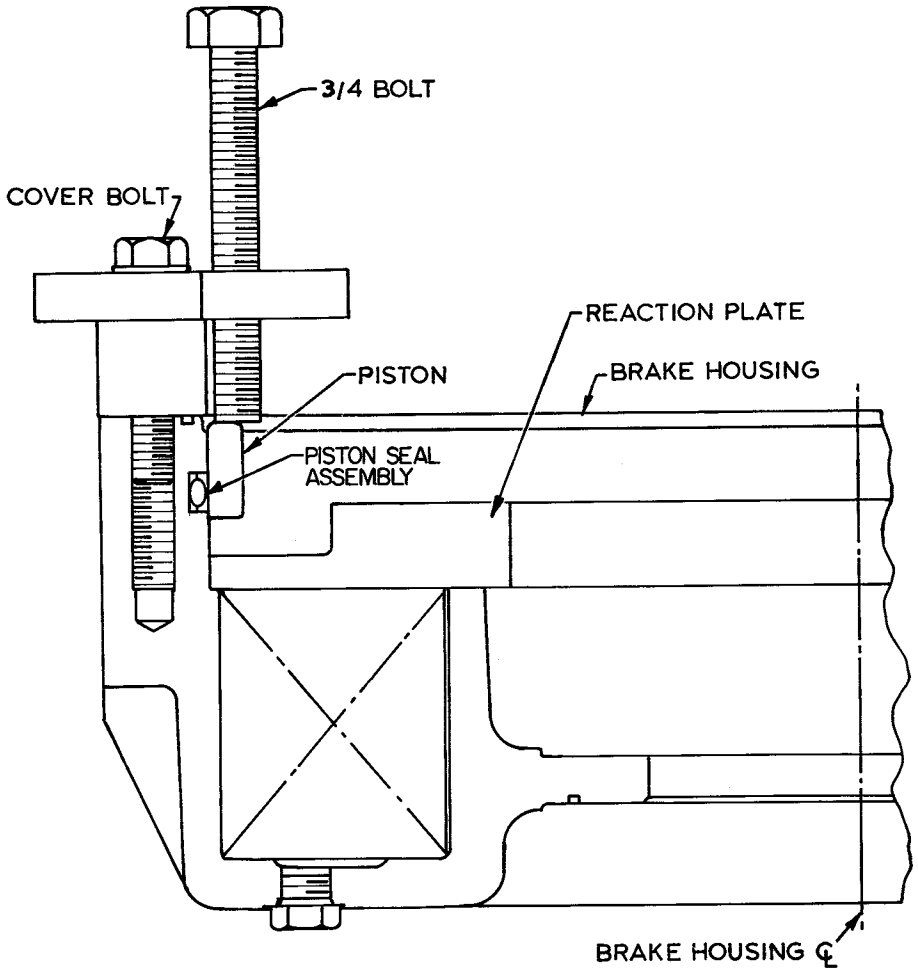
   One (1) of these bores will be in the wheel hub (a rotating member) and the other bore will be stationary (in the liquid cooled brake housing).

   The function of this seal is to prevent dirt from entering the axle end or axle lube from leaking.

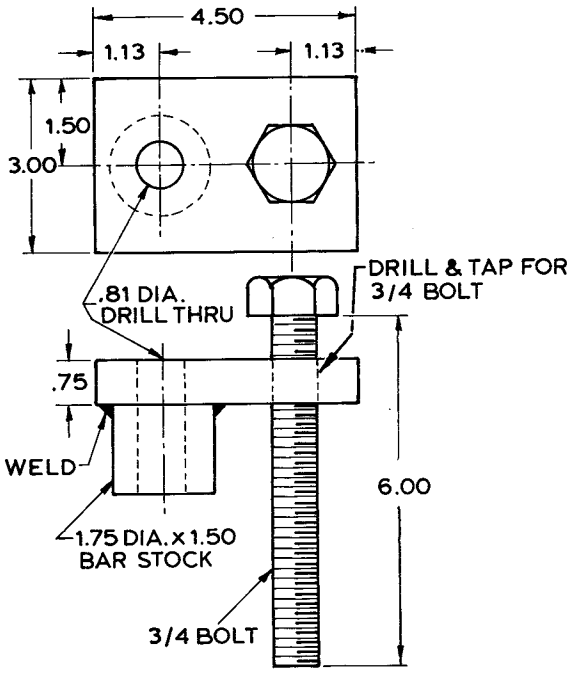
3. An important point to note is that there must be no oil or dirt on the bores, rubber members, or any area of the casting except the lapped face as explained below. Any oil or dirt in these areas must be removed with a clean degreasing solvent. (A new seal is packaged and shipped clean of oil and dirt, 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 three (3) complete revolutions to seat the seal faces.




**PISTON INSTALLATION DRAWING**




**PISTON ASSEMBLY TOOL**

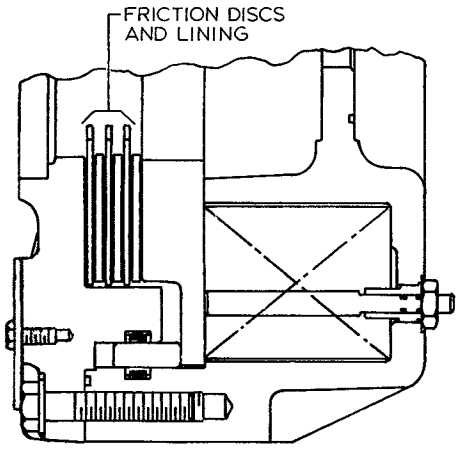
**[Three (3) Required]**

To facilitate the brake piston installation into the brake housing an installing tool can be fabricated. Three (3) identical pushing tools are needed (see tool drawing).

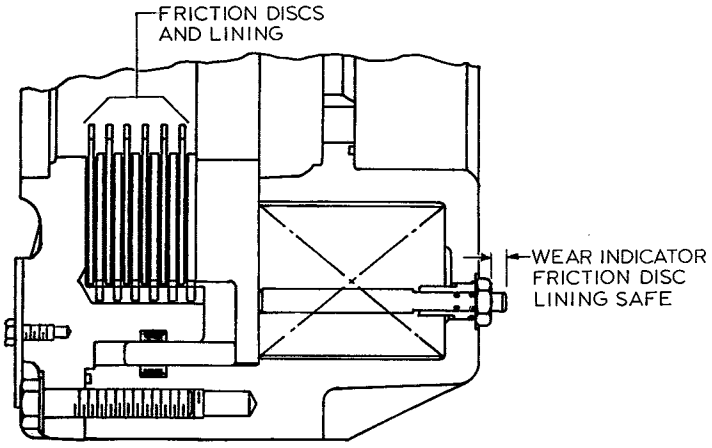
With the piston outer piston seal assembly in brake housing as shown on page 4, position piston in housing as shown in Figure 19.

Install the three (3) pushing tools on brake housing 120 degrees apart. Use three (3) of the cover bolts to hold tool on brake housing.

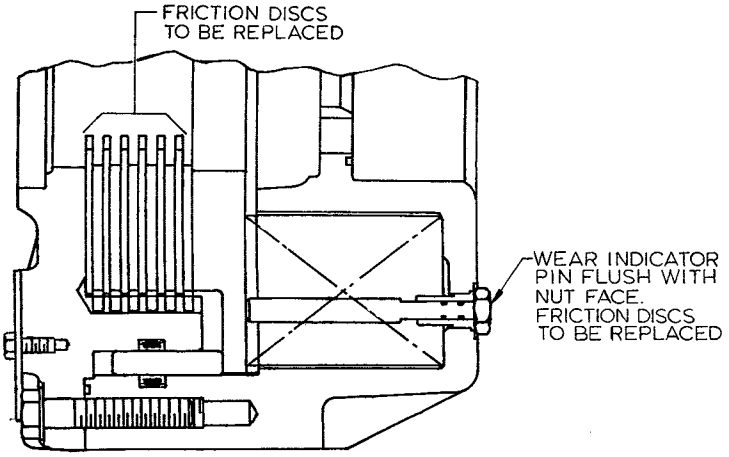
Position the threaded bolts over the piston to just clear the brake housing and tighten the cover bolts. Turn the threaded bolts a thread at a time on all three pushing tools to evenly install piston until it bottoms on reaction plate.




3 PLATE BRAKE




6 PLATE BRAKE

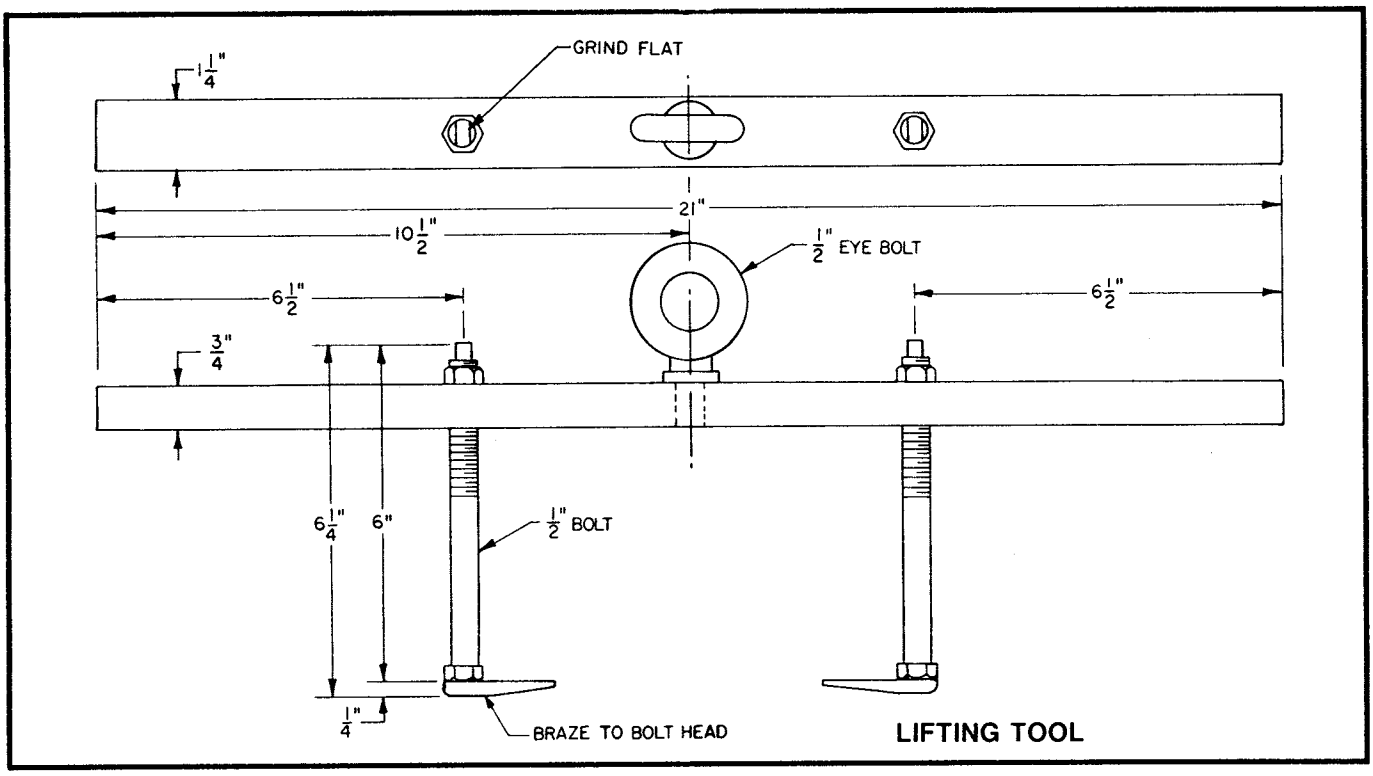



**Spring applied, hydraulically released, liquid cooled brake friction disc lining wear check procedure.**

**NOTE:** The machine (vehicle) must be shut down and all power off before lining wear can be checked.

The brake must be applied to make the wear indicator check. This means all hydraulic pressure to the brake must be off as the brakes are applied with spring pressure.

1. Clean thoroughly the area around the wear indicator.
2. Push wear indicator pin against the reaction plate.
3. When wear indicator pin is flush with indicator nut face, the friction and lining disc must be replaced (see illustration).




**LIFTING TOOL**

## NOTES

## LIQUID COOLED BRAKE — PRESSURE CHECKS

1. If brake assembly is disassembled or partially disassembled to allow mounting to the axle, the pressure apply fluid actuation test must be redone per instructions below.
2. If brake assembly is not disassembled or partially disassembled before mounting to axle, no pressure apply fluid check is required.
3. If brakes are posi-stop, apply 1500 PSI [10342 kPa] hydraulic pressure using mineral oil to the brake fluid actuation port just prior to assembling wheel hub and wheel bearing adjustment and maintain the pressure until the wheel bearing adjustment is complete.
4. If brakes are sealed off from main axle with seals between the hub and spindle (for purposes of either forced oil cooling or separate brake sump) proceed as follows:

   A) Remove drain plugs from both brakes.

   B) Apply 12 PSI [83 kPa] air pressure to complete axle (normally thru axle housing breather hole) and shut air off at inlet to lock pressure on axle.

   C) Axle must hold 12 PSI [83 kPa] for 15 seconds with no drop in pressure.

   D) If leaks occur, determine cause. Rebuild and retest (see (1) above also).

   E) If no leaks occur, make sure cooling ports are plugged. Apply 12 PSI [83 kPa] air pressure to drain port of **EACH** brake. Shut off air at inlet to lock pressure on brake cavity.

   F) Each brake cavity must hold 12 PSI [83 kPa] for 15 seconds with no drop in pressure.

   G) If leaks occur, determine cause. Rebuild and retest starting at (4) (see (1) above also).
5. If brakes are **NOT** sealed off from main axle cavity (common brake and axle oil sump) then make sure cooling and drain ports are plugged and apply 12 PSI [83 kPa] air pressure to axle (normally thru axle housing breather hole) shut off air at inlet to lock pressure on axle.

   Axle must hold 12 PSI [83 kPa] for 15 seconds with no drop in pressure.

   If leaks occur, determine cause. Rebuild and retest (see (1) above also).

## INSTRUCTION FOR POSI-STOP LIQUID COOLED BRAKE PRESSURE CHECKS

1. After completing assembly and with bleeder plugged, apply 12 PSI [83 kPa] air pressure to the brake fluid actuation port. Shut off air at inlet to hold pressure on brake.
2. Let pressure stabilize for 30 seconds. This is to compensate for temperature change, piston movement and seating of seal lips.
3. Repressure to 12 PSI [83 kPa] if required and hold for 15 seconds with no pressure drop.
4. Repeat repressuring until 12 PSI [83 kPa] holds for 15 seconds minimum, but not over 3 repressurings.
5. If after 3 repressurings brake will still not hold pressure, tear down and determine cause of leak. Rebuild and retest.
6. Apply $1500\ ^{+50}_{-00}$ PSI [$10342\ ^{+344}_{-000}$ kPa] hydraulic pressure using mineral oil to brake fluid actuation port and shut off pressure at inlet to hold pressure on brake. Inspect to insure that pressure plate has moved against housing stop and that friction plates are released and free. Maintain pressure for 30 seconds minimum without drop. Repeat twice. If brake will not maintain pressure, tear down and determine cause of leak. Rebuild and retest.

# Chapter 3
## 24100 / 26100 LCB

## (LCB) LIQUID COOLED BRAKES

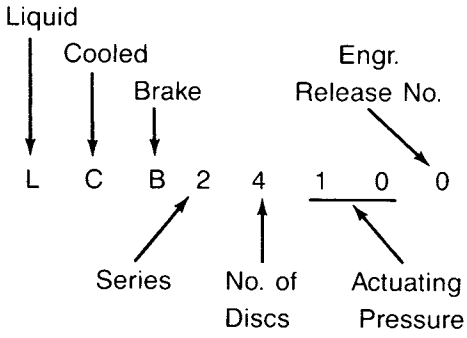
The liquid cooled brake is ideal for use in contaminated or temperature sensitive environments and in machines where extra long maintenance intervals are required. Braking action of the liquid cooled brake is achieved through the application of the hydraulic piston with the rotating graphitic friction 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.

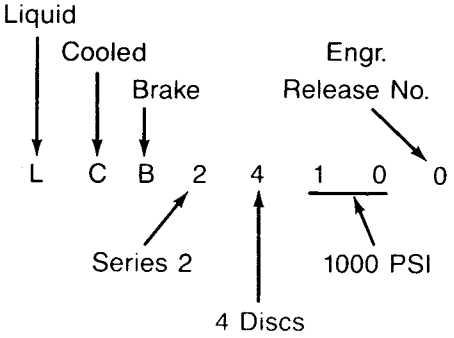
Wheel bearings can be serviced as in any normal bearing procedure.

**MODEL DESIGNATION**

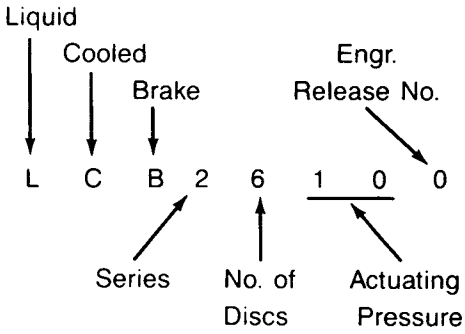



**MODEL LC.B. 24100**

**EXAMPLE**

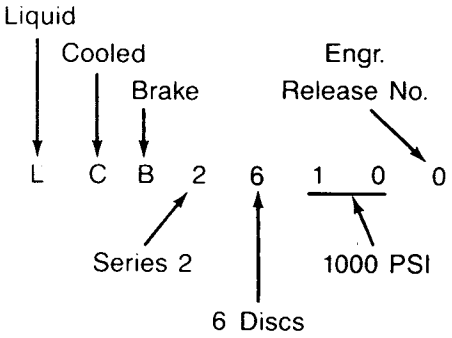


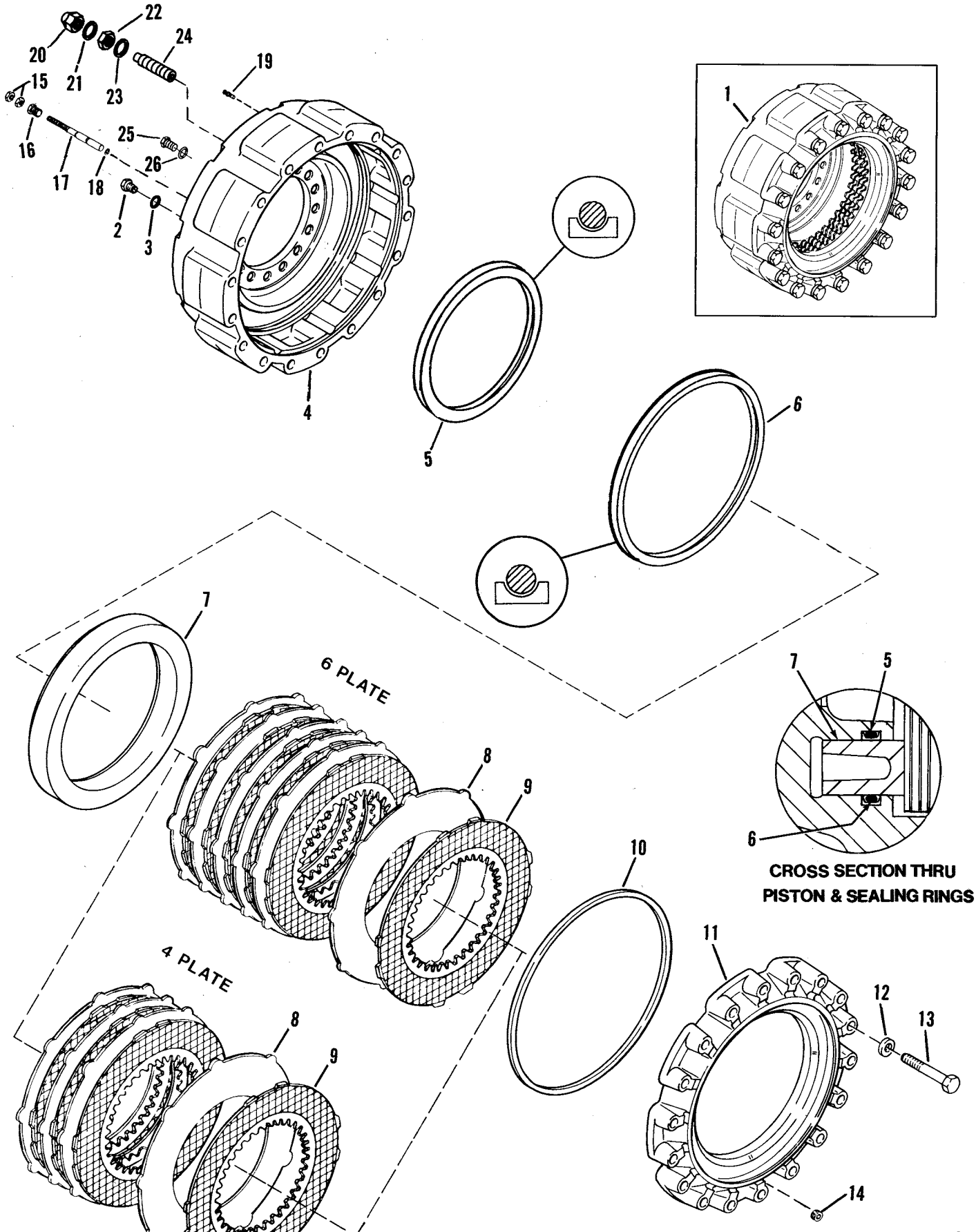

**MODEL DESIGNATION**




**MODEL LC.B. 26100**

**EXAMPLE**

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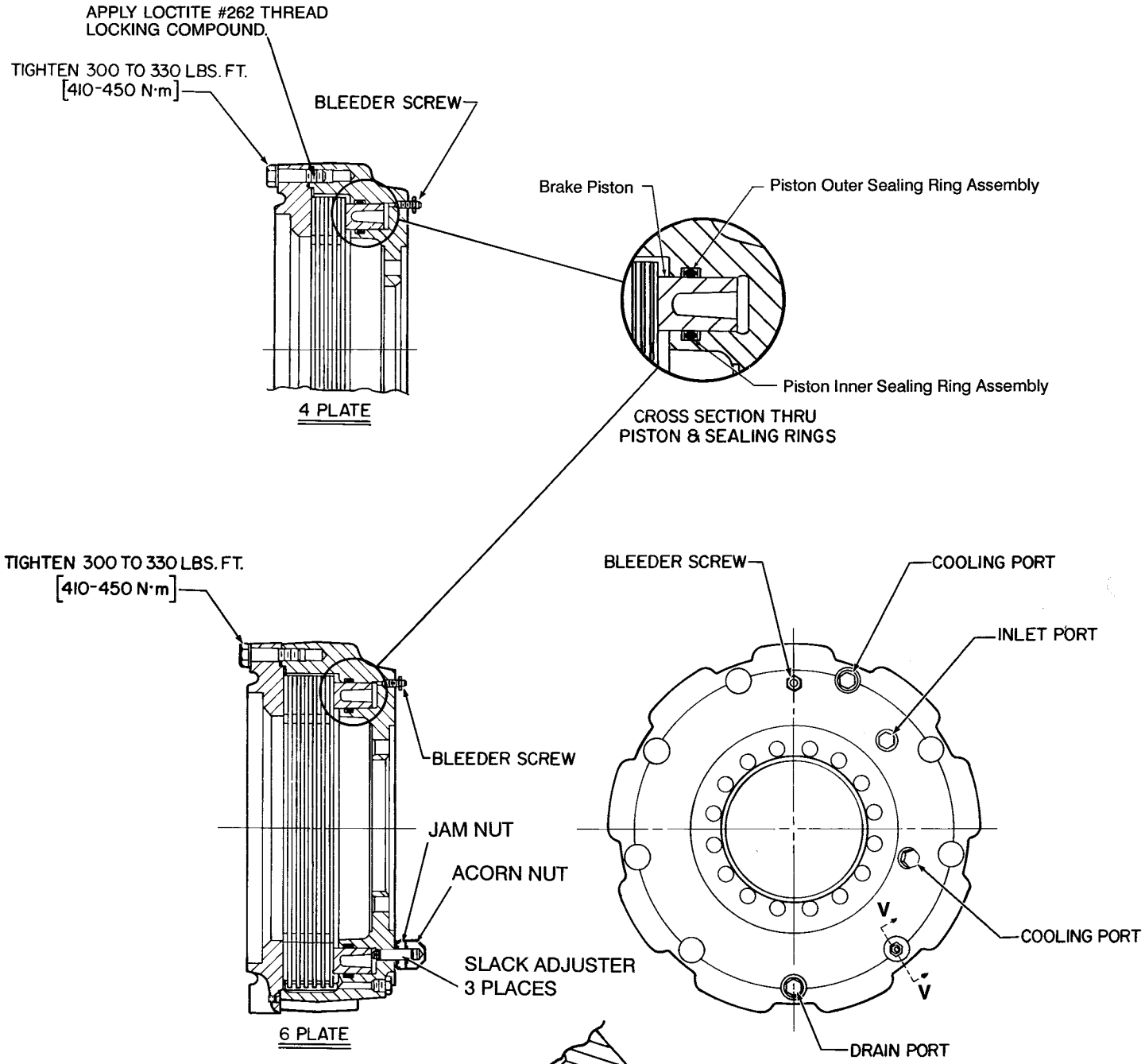
23
24
25
26
6 PLATE
4 PLATE
CROSS SECTION THRU
PISTON & SEALING RINGS

## MULTI-DISC LIQUID-COOLED BRAKE ASSEMBLY

| Item | Description | Quantity |
|---|---|---|
| 1 | Multi-Disc Brake Assembly—Quantity Indicated for One (1) Wheel End | 1 |
| 2 | Cooling Inlet Plug | 5 |
| 3 | Cooling Inlet Plug "O" Ring | 5 |
| 4 | Brake Housing | 1 |
| 5 | Piston Sealing Inner Ring Assembly | 1 |
| 6 | Piston Sealing Outer Ring Assembly | 1 |
| 7 | Brake Piston | 1 |
| 8 | Reaction Disc | 4 or 6 |
| 9 | Friction Disc Assembly | 4 or 6 |
| 10 | Cover and Housing Seal | 1 |
| 11 | Brake Outer Cover | 1 |
| 12 | Brake Cover Washer | 18 |
| 13 | Brake Cover Cover Capscrew | 18 |
| 14 | Puller Hole Screw | 2 |
| 15 | Locknut | 2 |
| 16 | Fitting | 1 |
| 17 | Wear Indicator Pin | 1 |
| 18 | Pin "O" Ring | 1 |
| 19 | Bleeder Screw | 1 |
| 20 | Slack Adjuster Acorn Nut | 3 |
| 21 | Slack Adjuster Seal | 3 |
| 22 | Slack Adjuster Jam Nut | 3 |
| 23 | Slack Adjuster Seal | 3 |
| 24 | Slack Adjuster Screw | 3 |
| 25 | Cooling Outlet Plug | 1 |
| 26 | Cooling Outlet Plug "O" Ring | 1 |




## Slack Adjuster Setting Procedure

1) Apply 100psi 689 kPg air pressure to piston port and hold for 5 seconds. Then release.
2) With acorn nut removed and jam nut backed off, turn adjusting screw clockwise inward until it contacts piston and then tighten screw to 10 lbf·ft [13.6 N·m] to seat piston.
3) Back adjusting screw off 1.5 turns and then tighten jam nut to 50-75 lbf·ft [68.7-101.7 N·m] while maintaining position of adjusting screw.
4) Assemble and tighten acorn nut to 50-75 lbf·ft [67.8 101.7 N·m].

## LIQUID COOLED BRAKE — DRAINING

To drain the brake housing, remove the bottom drain plug from the brake housing. Remove the inlet plug below the bleeder screw. Allow enough time for housing to drain completely.

## 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 extrene 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.

**Refer to appropriate axle maintenance and service manual for disassembly of axle wheel end up to removing the liquid cooled brake.**

## LIQUID COOLED MULTI-DISC BRAKE (4 OR 6)

### DISASSEMBLY

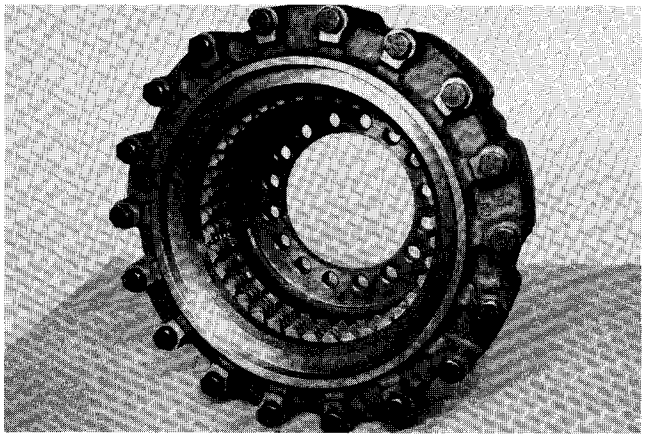


**Figure 1**

Multi disc brake removed from axle as an assembly. Brake face seal removed. **NOTE:** Face seal in one axle end must not be mixed with face seal on the opposite axle end.

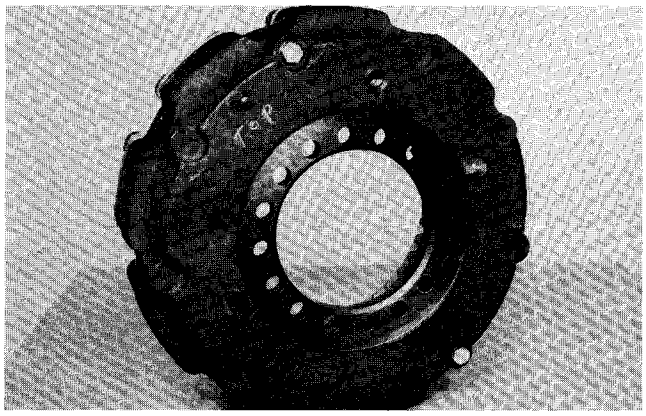


**Figure 2**

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

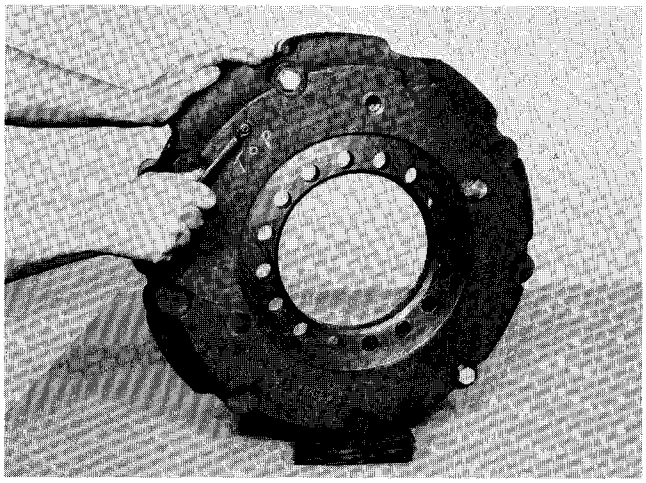


**Figure 3**

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

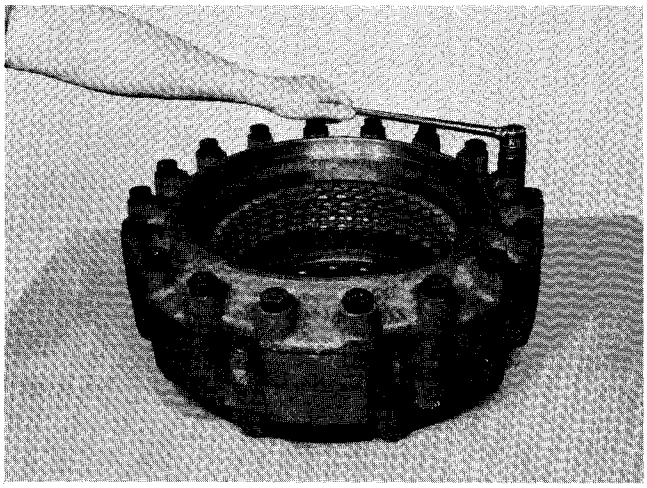


**Figure 4**

Lay assembly over on bench and remove bolts and washers.

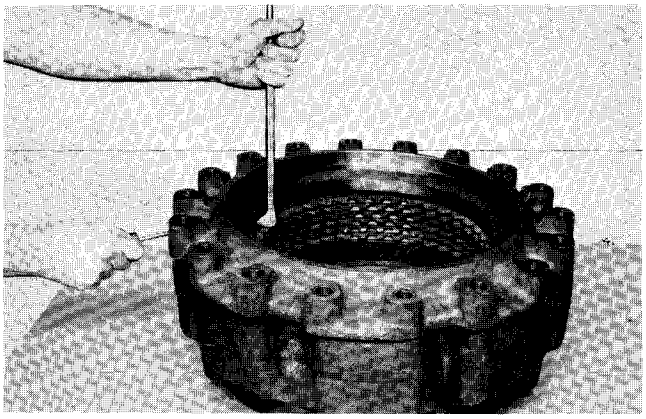


**Figure 5**

Pry carefully to separate brake housing. **NOTE: Some end caps have puller screw holes. Remove hole plugs and install bolt in threaded holes. Remove end cap.**

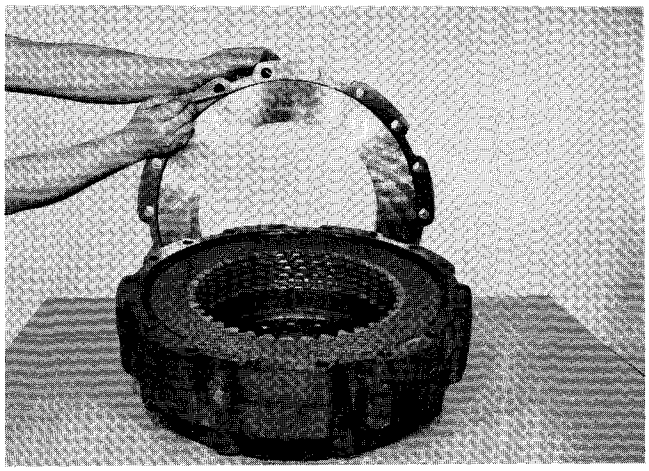


**Figure 6**

Remove brake end cap and "O" ring.

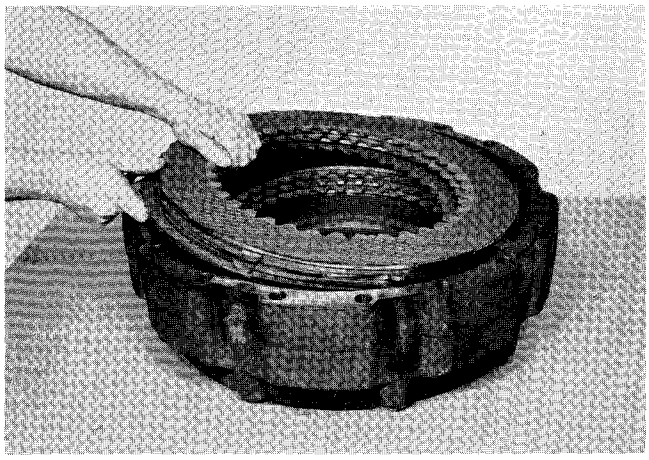


**Figure 7**

Remove friction and reaction plates. (4 or 6 plate, depending on model).

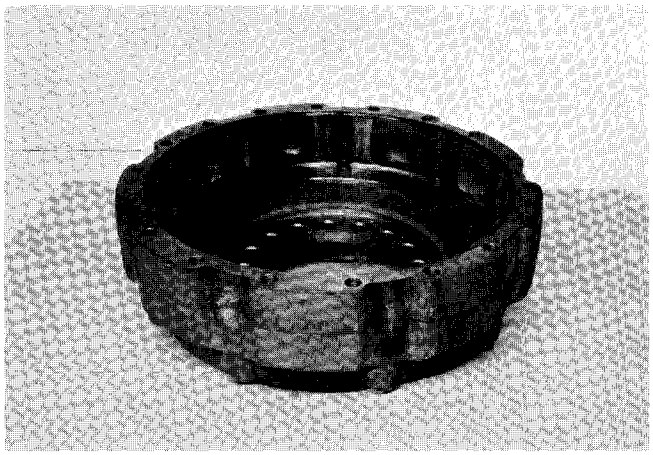


**Figure 8**

Friction and reaction plates removed.

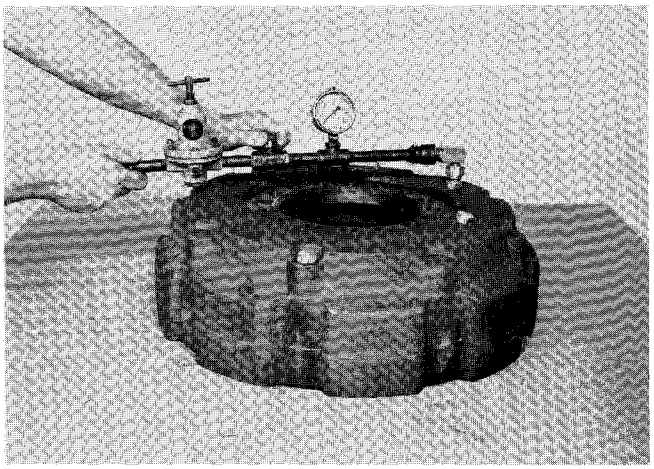


**Figure 9**

Turn housing over, install bleeder screw. Install a air regulator and shut off valve in the brake inlet port. Apply air pressure slowly and tap on housing to remove brake piston.

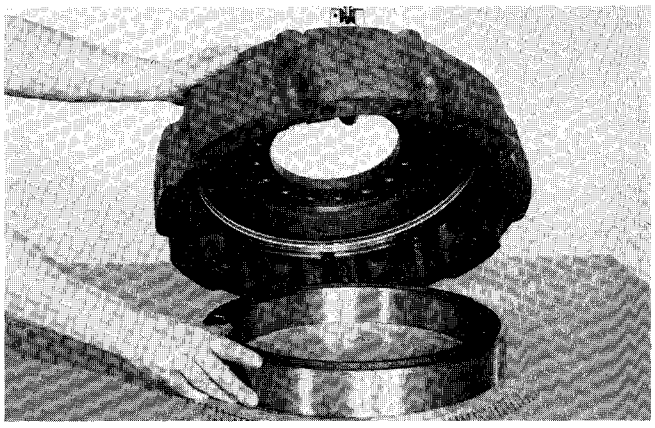


**Figure 10**

Piston removed. Remove bleeder screw to prevent damage of screw. Turn housing over.

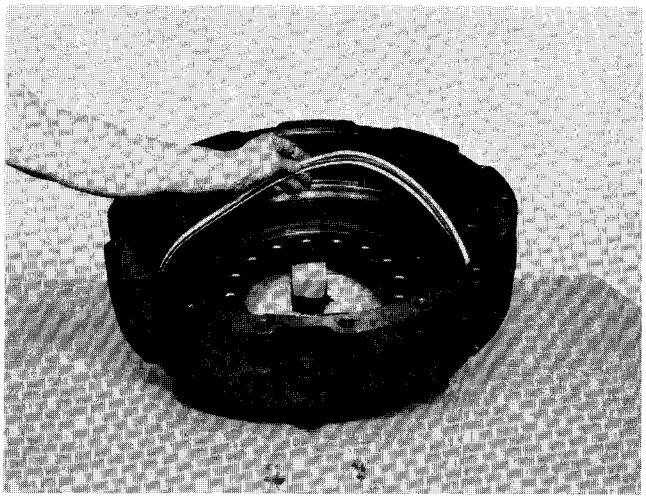


**Figure 11**
Remove piston outer sealing ring and back up rings.

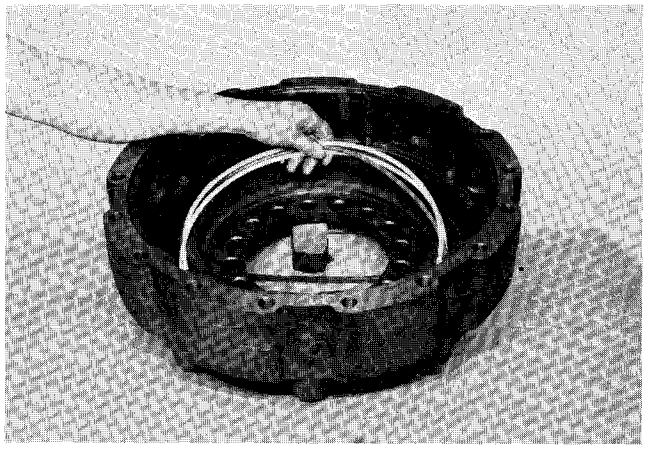


**Figure 12**
Remove piston inner sealing ring and back up rings.

## 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.

**Apply a film of lubricant to the brake piston and all sealing rings to facilitate reassembly.**

## REASSEMBLY

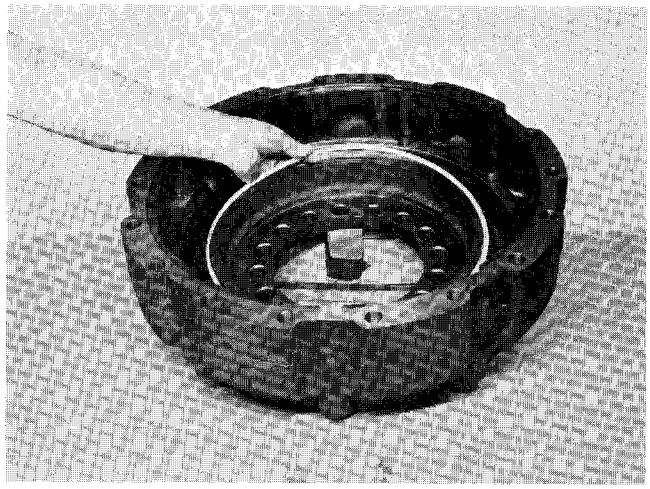


**Figure 13**
Install brake piston inner back up ring.

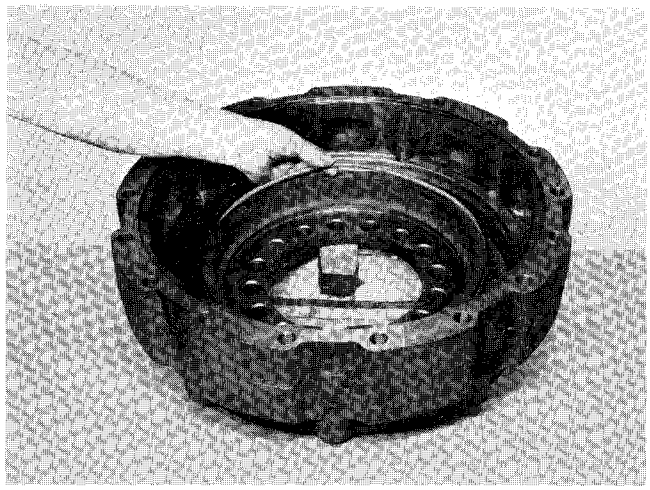


**Figure 14**
Install piston inner sealing ring.

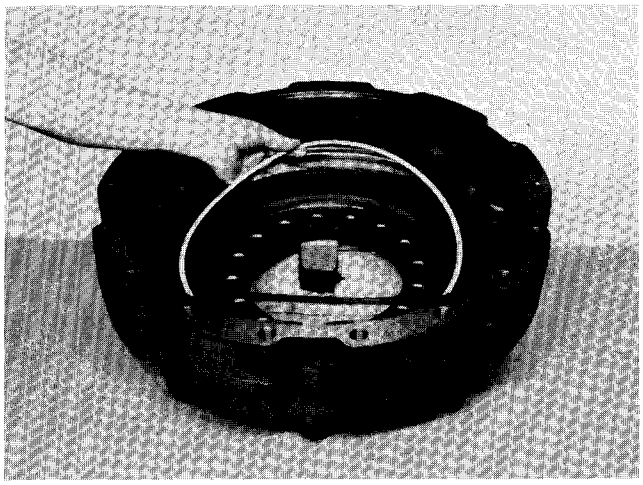


**Figure 15**
Install piston inner backup ring.

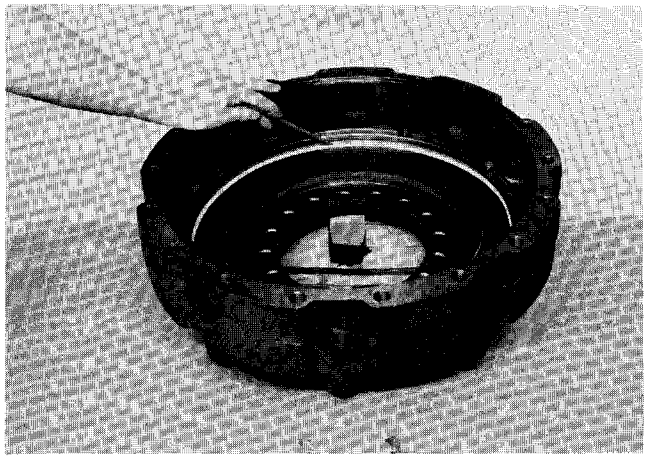


**Figure 16**
Install brake piston outer backup ring.

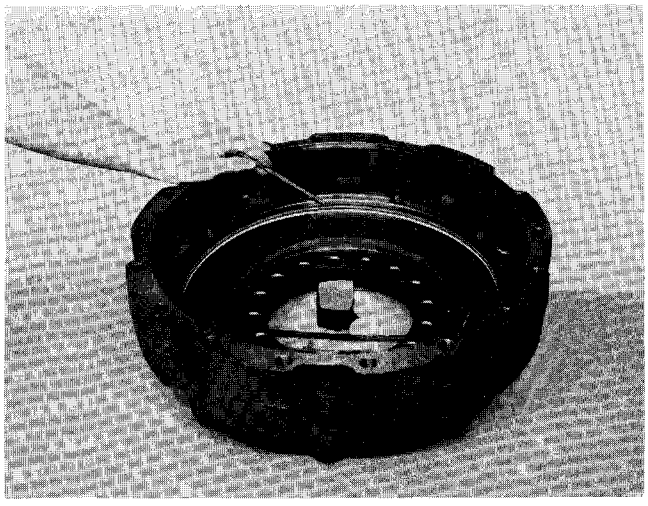


**Figure 17**
Install piston outer sealing ring.

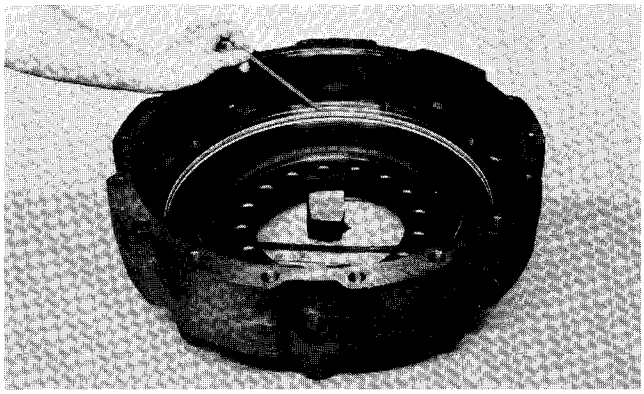


**Figure 18**
Install piston outer back up ring.

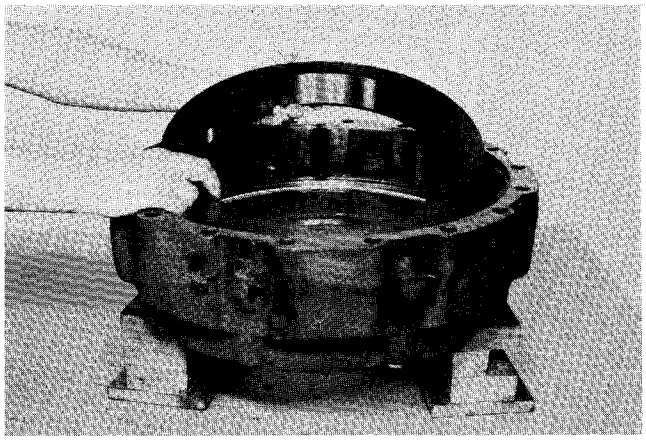


**Figure 19**
Position brake piston in housing with groove in piston in. Use caution as not to damage inner and outer sealing rings.

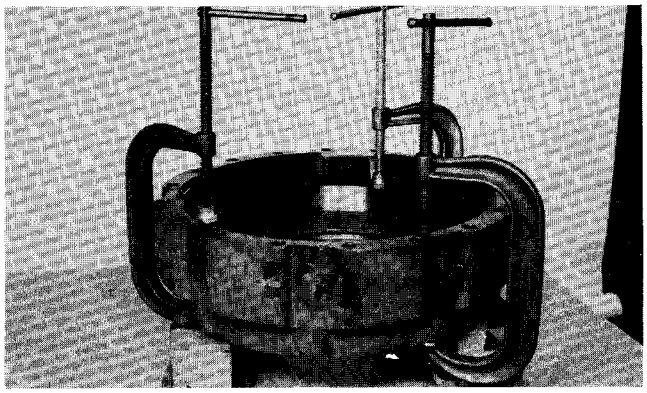


**Figure 20**
Three "C" clamps evenly spaced on the outer surface of the piston was used to facilitate piston assembly. **NOTE:** Be sure brake inlet port is open or piston will not go in. Turn "C" clamp evenly until piston is in full position in housing. Remove clamps.

**See page 2 "cross section thru piston and sealing rings" for proper stack up of parts.**

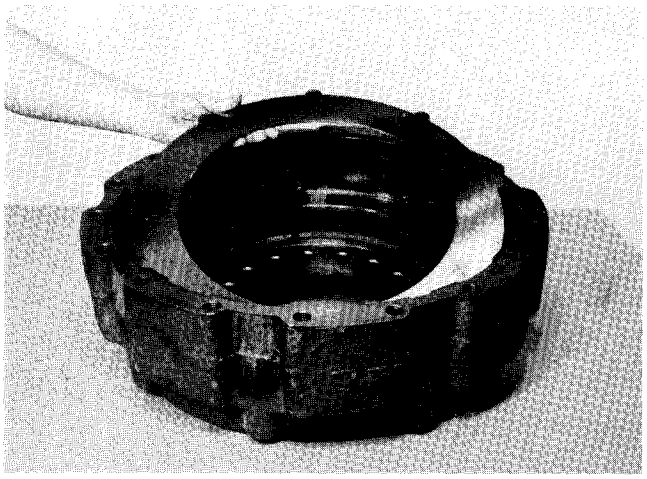


**Figure 21**
Install first steel reaction plate.

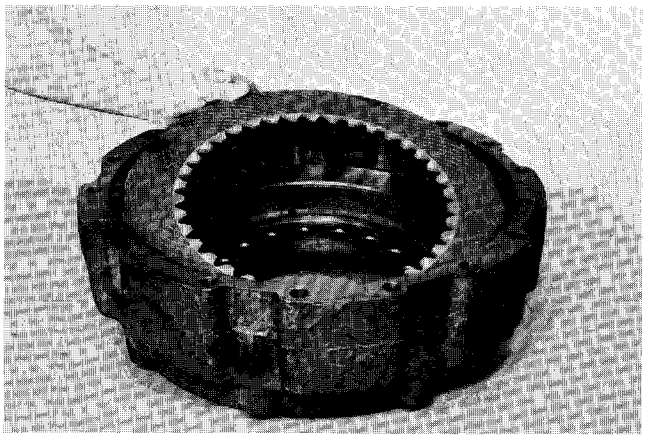


**Figure 22**
Install first friction plate. Alternate steel and friction plates until 4 or 6 steel and 4 or 6 friction plates have been installed. (4 or 6 plate determined by Model No.) Start with a steel and end with a friction plate.

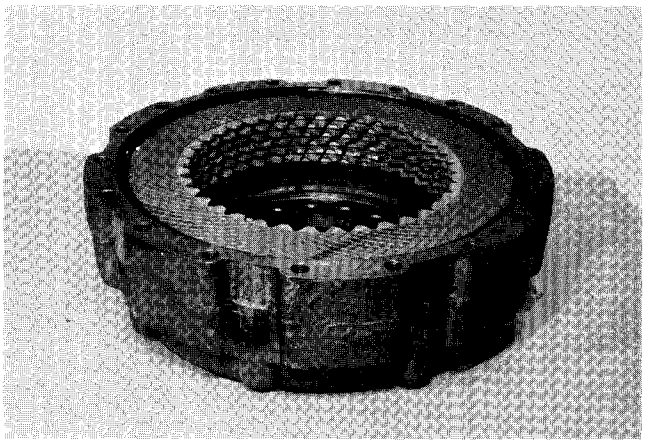


**Figure 23**
Friction and steel plates installed.

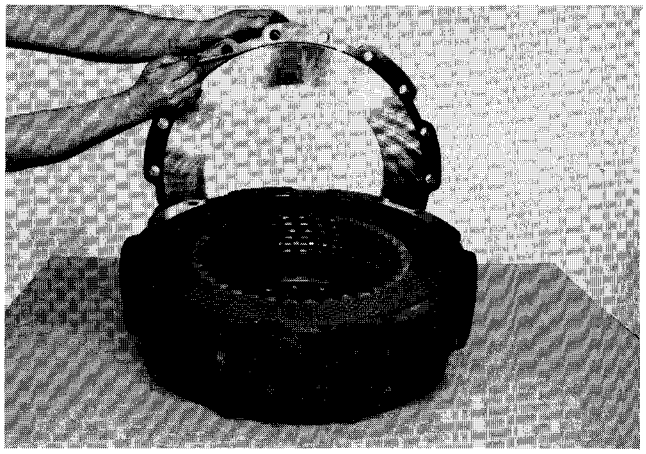


**Figure 24**
Position a new sealing ring on brake end cover.

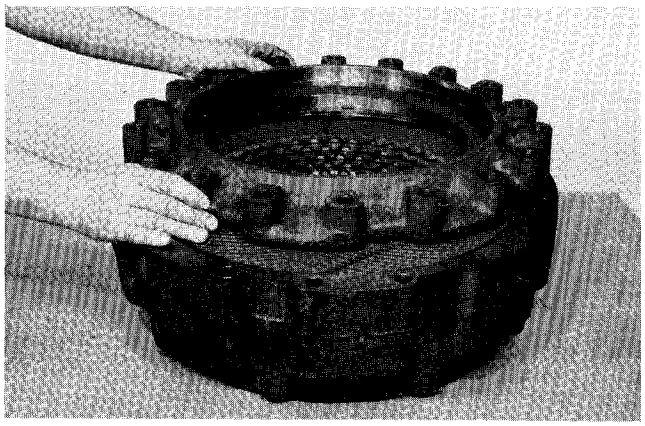


**Figure 25**
Align holes in end cover with holes in housing. Install bolts and washers.

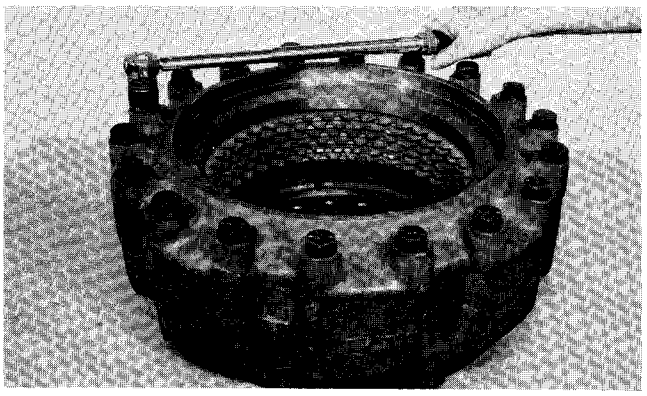


**Figure 26**
Tighten bolts securely. **NOTE:** Bolts can be torqued 300 to 330 ft. lbs. [410-447 N.m] after brake is installed on axle, as long as brake is sealed tight enough to be tested. See page 10 for testing procedure.

**See page 12 and 13 for face seal rebuilding and installation procedure.**

## LIQUID COOLED BRAKE – LUBRICATION

The self contained liquid cooled brake system uses the same lube as the axle center section and wheel ends. There are no seals between the spindles and wheel hubs. Oil that lubricates the differential and planetary wheel ends also lubricates and cools the brake assembly. The oil level is the same height as the planet and axle center and the brake may be filled and oil level checked at the planet carrier assembly or planet carrier cover.

Brake oil changes would be accomplished at the same time the axle lube is changed. Contaminates resulting from braking will not affect axle within normal oil change periods.

**CAUTION:** On all axles with liquid cooled brakes check brake drain plug for presence of axle lube for axles without forced cooling, or cooling fluid for axles with forced cooling.

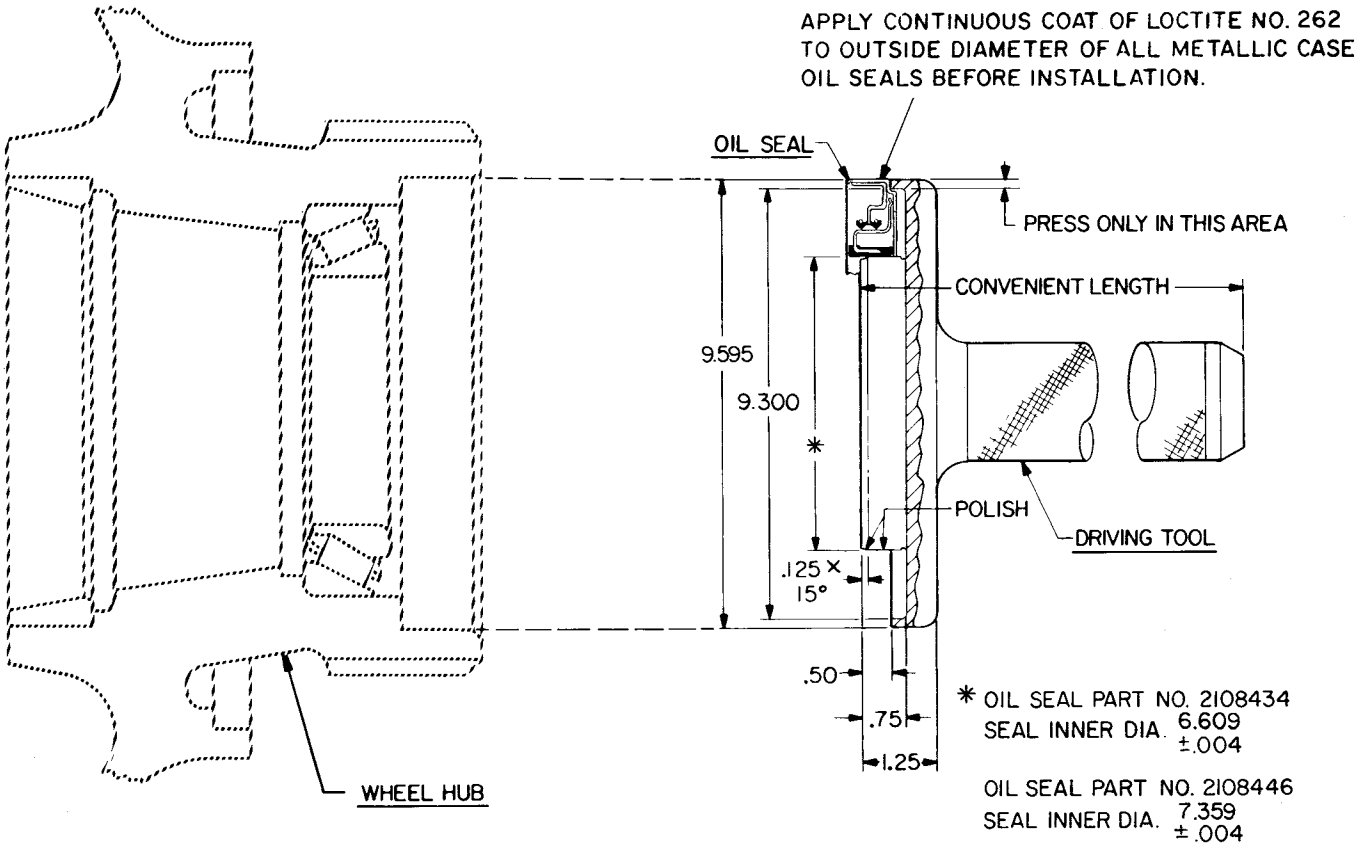
**NOTE:** IT IS RECOMMEMDED THAT AXLES WITH EXTERNAL COOLED LIQUID COOLED BRAKES (LCB) USE "TRACTOR HYDRAULIC FLUIDS" MEETING ALLISON C4 DESIGNATION FOR COOLING OIL. THIS FLUID HAS E.P. ADDITIVE FOR IMPROVED FACE SEAL LIFE AND FRICTION MODIFIERS FOR HIGH TORQUE AND QUIET BRAKE OPERATION.

## LIQUID COOLED BRAKE TESTING PROCEDURE

1. Connect a porto-power unit to brake line inlet.
2. Pump porto-power up to about 500 psi, (3447, 4 kPa) and bleed brake. After all air is out of brake, pump porto-power up to 1000 psi (6894,8 kPa) and lock off. The gauge will show about 100 psi (689,5 kPa) drop. At this point the gauge should hold. After 3 to 5 minutes unlock gauge, let pressure bleed off so the gauge shows zero, then pump porto-power up to about 100 psi [689,5 kPa]. Lock off porto-power. Gauge should hold at 100 psi [689,5 kPa]. Let stand for about five minutes. If pressure holds, the brake does not leak. If there is a drop in pressure on the gauge 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)**




## N O T E S

## FACE SEAL BREAK-IN PERIOD

WHEN MACHINE IS IMMEDIATELY DRIVEN FROM PRODUCTION FLOOR OR AFTER FACE SEAL HAS BEEN REBUILT OR REPLACED, IT IS IMPERATIVE THAT A 15 MINUTE BREAK-IN PERIOD BE CONDUCTED AT NOT MORE THAN 25 RPM WHEEL SPEED, WHICH IS 5 MPH MAX. AND IN 1ST GEAR OPERATION ONLY. THIS IS TO ALLOW THE SEAL RUBBERS AND METAL RINGS TO PROPERLY SEAT.

# 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.

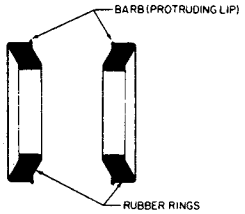



**Figure 1**

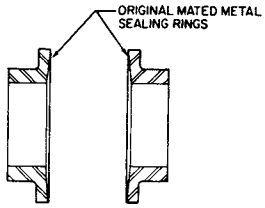



**Figure 2**

**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.

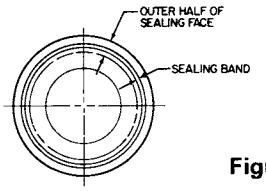



**Figure 3**

**Seal acceptable for rebuidling.**

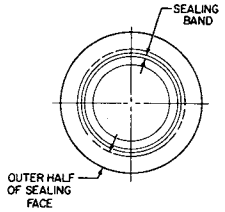



**Figure 4**

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.

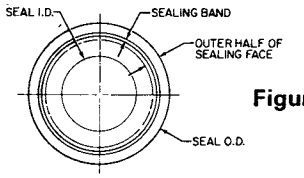



**Figure 5**

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

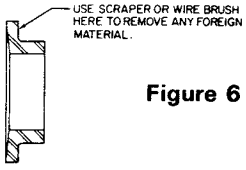



**Figure 6**

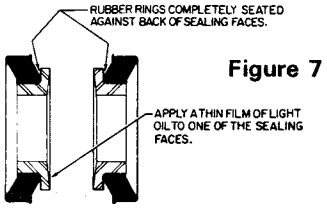



**Figure 7**

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).

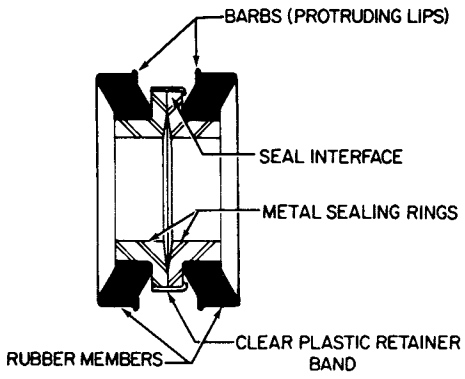
   **(b)** Clean the metal sealing rings with a clean degreasing solvent then wipe with the lint free wiping cloths furnished in the rebuilding kit (see Figure 6).

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 13 for face seal installation instructions.

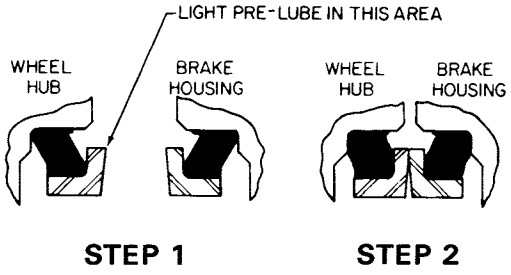
# FACE SEAL INSTALLATION INSTRUCTIONS




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.

# Recommended Actuation and Cooling Fluids

Only the following generic types of fluids are recommended by Spicer Off-Highway Products Division for use in Series I, II, and III Liquid Cooled brakes. Specific brand names will vary in formulation and may affect brake performance.

**Actuation Fluids:**

THF & UTTO (Tractor Hydraulic Fluids)
Hydraulic Oils meeting V-104C and 35VQ25
Dexron III
Motor Oil API CH4/SJ
Oil meeting MIL-PRF-2104G
Water/Oil Invert Emulsion (FRF)
Water/Glycol (FRF)
Organic Esters (FRF)

***Automotive brake fluids are not approved*

**Cooling Fluids:**

The preferred forced cooling oil in Spicer Off-Highway products Liquid Cooled Brakes is a Tractor Hydraulic Fluid (THF, UTTO) with a viscosity of SAE 10W or 15W20. TO-4 oils are not recommended for use in brakes.

THF & UTTO (Tractor Hydraulic Fluids)
ATF meeting ATD C-4
Dexron III
Hydraulic Oils meeting V-104C and 35VQ25
Oil meeting MIL-PRF-2104G
Water/Oil Invert Emulsion for brake temperatures less than 160° F. (FRF)
Polyolesters (FRF)

** Phoshate esters (FRF) and water/glycols (FRF) are not approved.*
*** Use of high viscosity oils may damage brake friction material.*

## DISASSEMBLY

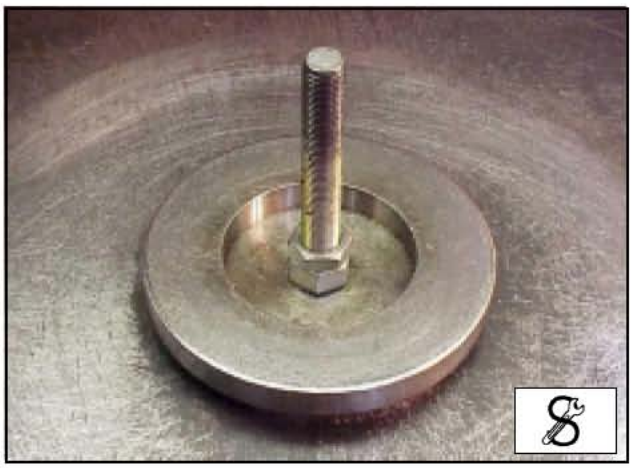


**Figure 1**
It is recommended that a retaining fixture similar to this be used for disassembly and assembly of the brake.

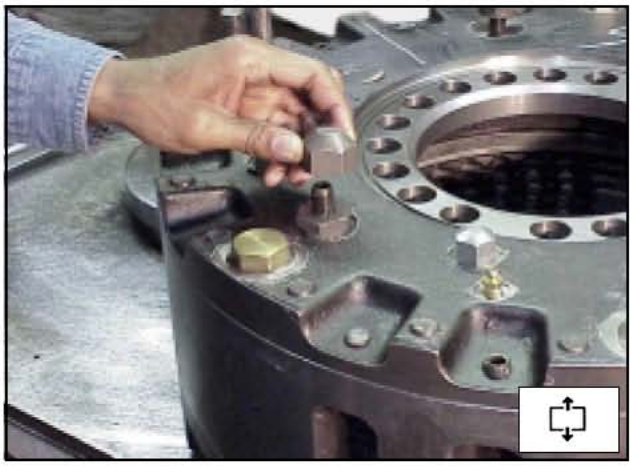


**Figure 2**
Remove the caps from the adjusting screws.

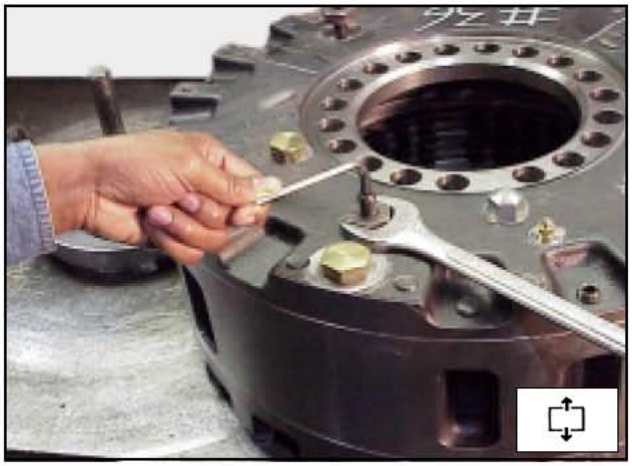


**Figure 3**
Loosen the jam nuts and remove the adjusters.

**Figure 4**
Remove the jam nuts from the adjusting screws.

**Figure 5**
Remove the O-ring from the jam and acorn caps.

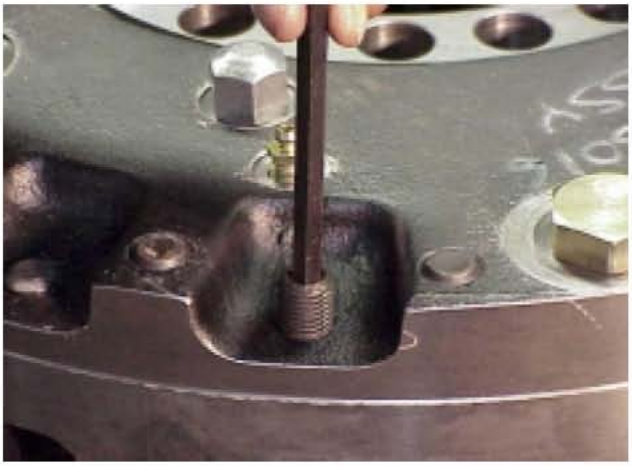


**Figure 6**
Remove the puller screw plugs.

**Figure 7**
Remove the bleeder screw.

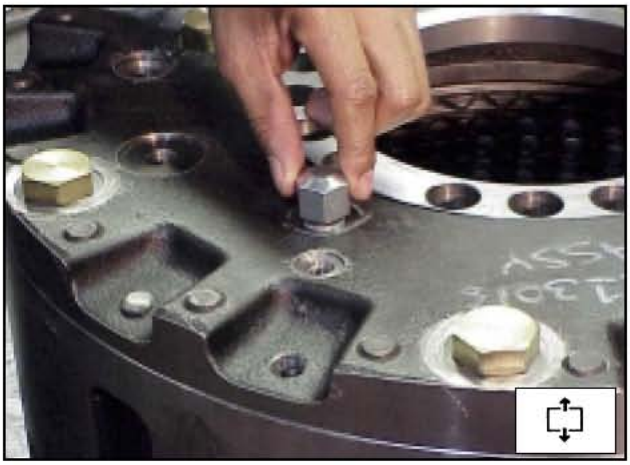


**Figure 8**
Remove the cap from the wear indicator.

**Figure 9**
Wear indicator pin.

**Figure 10**
Remove the piston inlet port fittings or plugs.

**Figure 11**
Remove the cooling port plugs or fittings.

**Figure 12**
Remove the cover capscrews.

**Figure 13**
Remover the brake cover.

**Figure 14**
Remove the retractor springs.

**Figure 15**
Remove the cover O-ring.

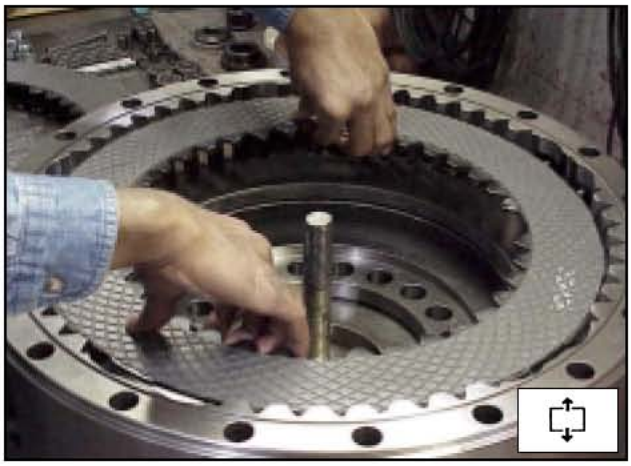


**Figure 16**
Remove the friction plates.

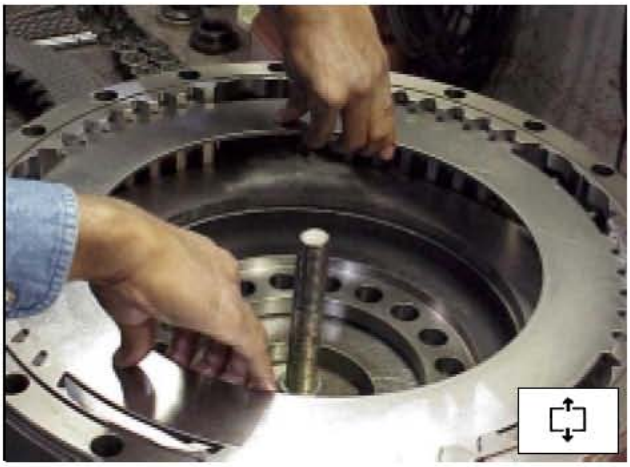


**Figure 17**
And the reaction plates.

**Figure 18**
Remove the pressure plate.

**Figure 19**
Remove the spring guide pins from the pressure plate.

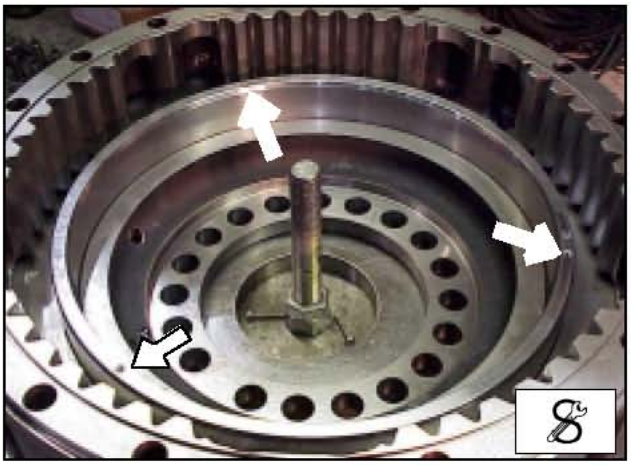


**Figure 20**
To remove the brake piston you may have to use the (3) puller holes in the piston.

**Figure 21**
Remove the brake piston.

**Figure 22**
Before separating the brake housing and spicer (rearcover) be sure that the serial numbers are stamped in the spider and housing. If no numbers are found, stamp or etch some type of reference marks for reassembly.

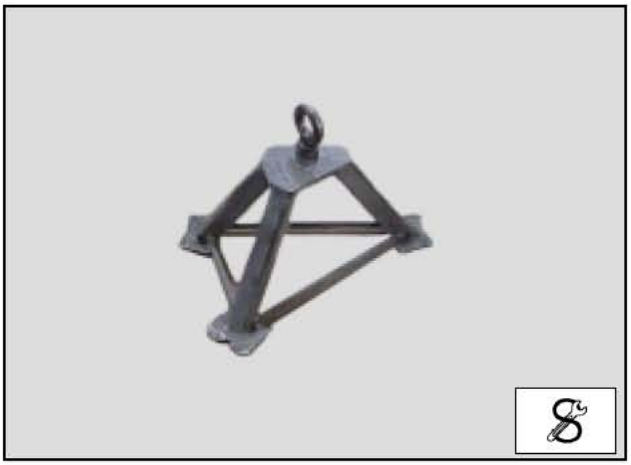


**Figure 23**
It is advised that some type of lifting fixture be used to remove the brake housing.

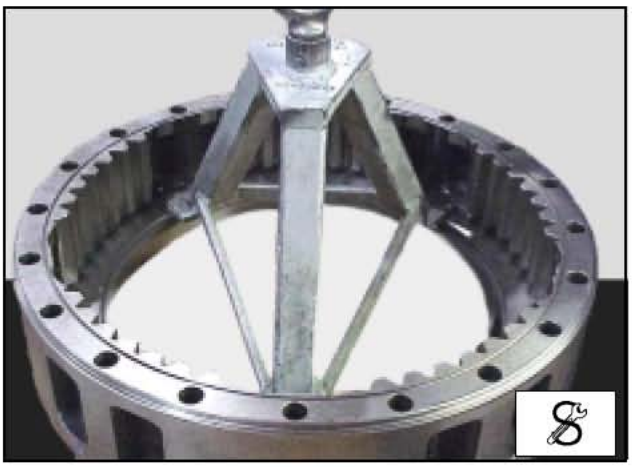


**Figure 24**
Lifting fixture installed in housing.

**Figure 25**
Remove brake housing.

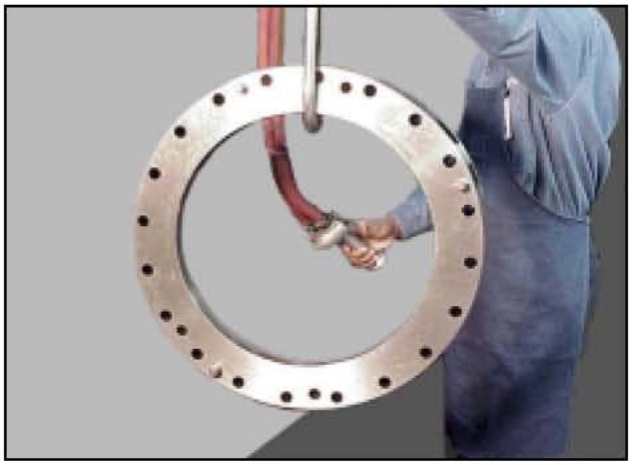


**Figure 26**
Flip housing 180°.

**Figure 27**
Remove outer piston seal and O-ring.

**Figure 28**
Carefully remove inner piston seal.

**Figure 29**
Remove the inner piston seal O-ring and cooling and drain port O-rings (3).

**Figure 30**
Remove the wear indicator pin and remove O-ring.

## REASSEMBLY

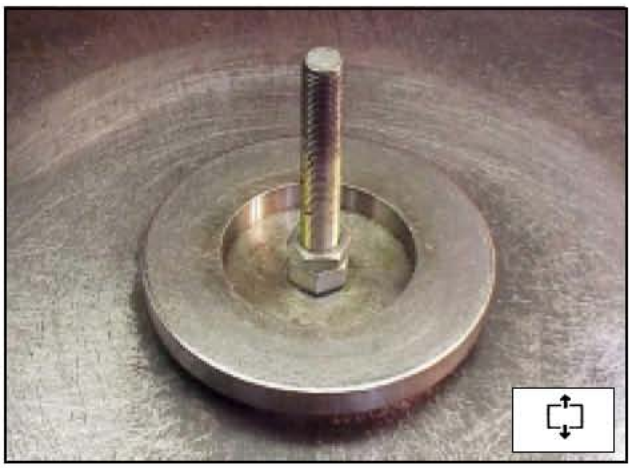


**Figure 1**
It is recommended that a locating device such as this be used when servicing the brake.

**Figure 2**
Brake cover mounted on bench.

**Figure 3**
Install O-ring on wear indicator pin & lubricate.

**Figure 4**
Insert indicator pin in brake cover bore as shown.

**Figure 5**
Gently tap pin into bore.

**Figure 6**
Pin at proper depth.

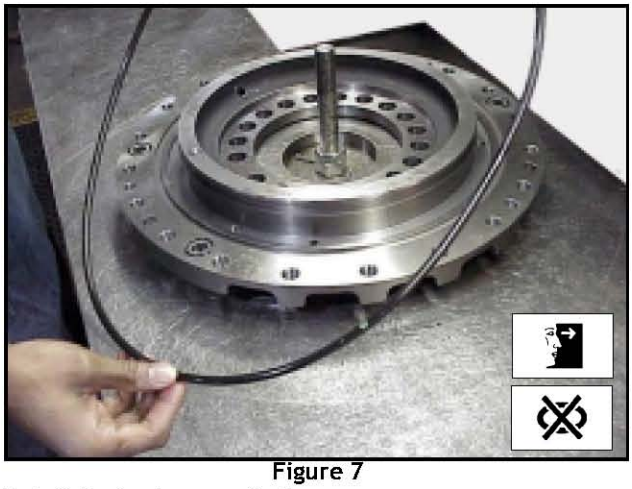


**Figure 7**

Install the brake cover O-ring.

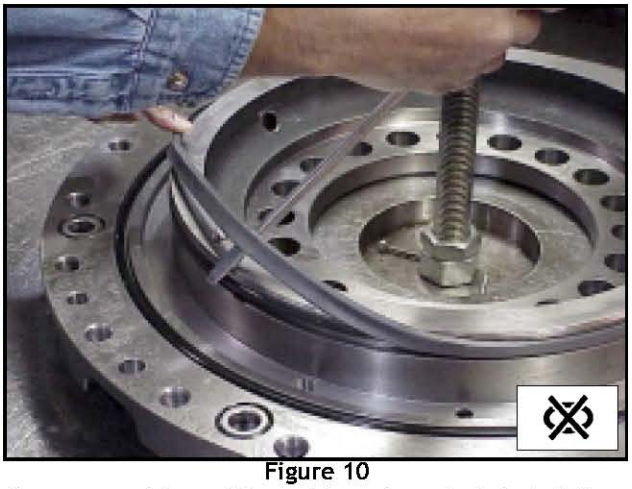


**Figure 10**

Use a screw driver with no nicks or burrs to help install the seal. Be careful not to overstretch the seal.

**Figure 8**

Install the three (3) O-rings on the brake cover, then install the inner piston seal O-ring.

**Figure 11**

Lubricate the piston seal with mineral oil or approved hydraulic fluid.

**Figure 9**

Install the inner piston seal over the inner seal O-ring.

**Figure 12**

If installing a new brake housing or if pins have been removed install three new dowel pins in brake housing.

**Figure 13**
Install the outer piston O-ring and seal in the brake housing.

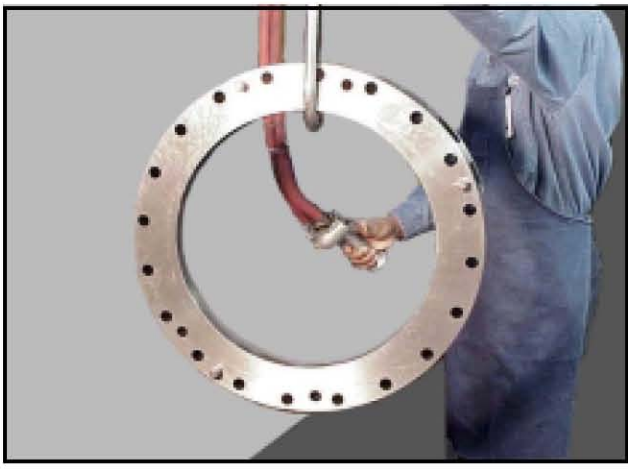


**Figure 14**
Using an appropriate holding device flip the brake housing over.

**Figure 15**
Using an appropriate device lift the brake housing.

**Figure 16**
Place brake housing on spider being sure that ID numbers are aligned.

**Figure 17**
Serial number.

**Figure 18**
Place non marring spacers on capscrews.

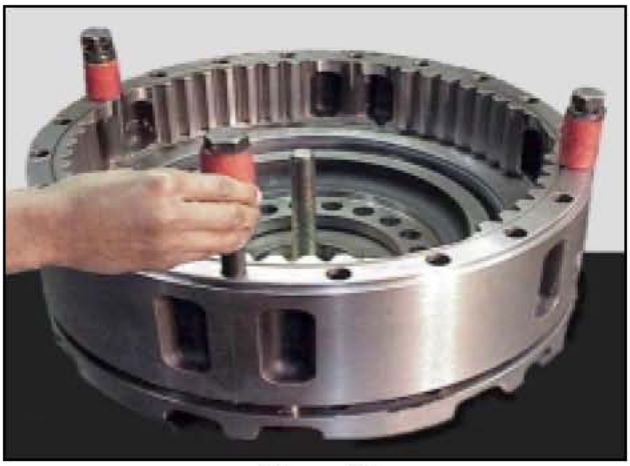


**Figure 19**
Insert three (3) capscrews with spacers in brake housing.

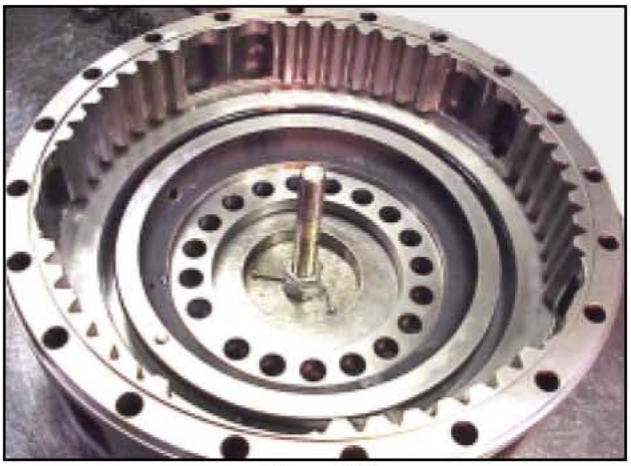


**Figure 22**
Brake housing installed on rear cover.

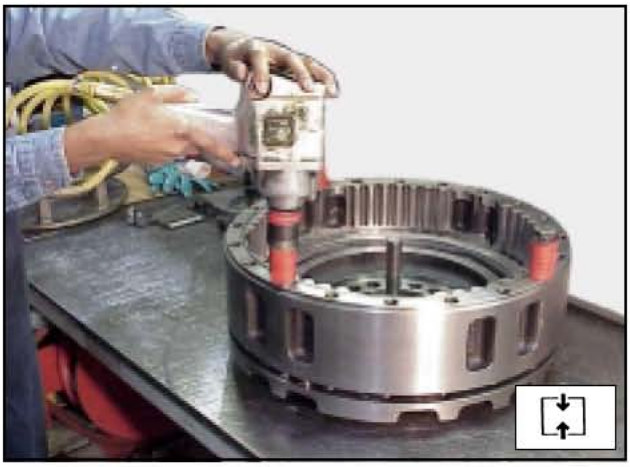


**Figure 20**
Alternately run capscrews down until housing is seated against brake cover.

**Figure 23**
Lubricate piston seals.

**Figure 21**
Top side of brake piston.

**Figure 24**
Gently place piston in housing with holes facing up.

**Figure 25**
Piston in place.

**Figure 26**
Install pressing device in housing.

**Figure 27**
Carefully press piston into receiver groove.

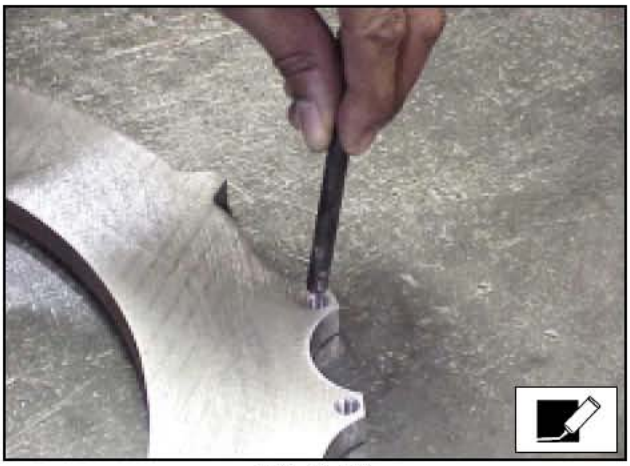


**Figure 28**
Place Loctite 262 on threads of spring guide pins and installing pressure plate.

**Figure 29**
Tighten pins in pressure plate.

**Figure 30**
Place pressure plate in brake housing.

**Figure 31**
Install reaction plate over pressure plate.

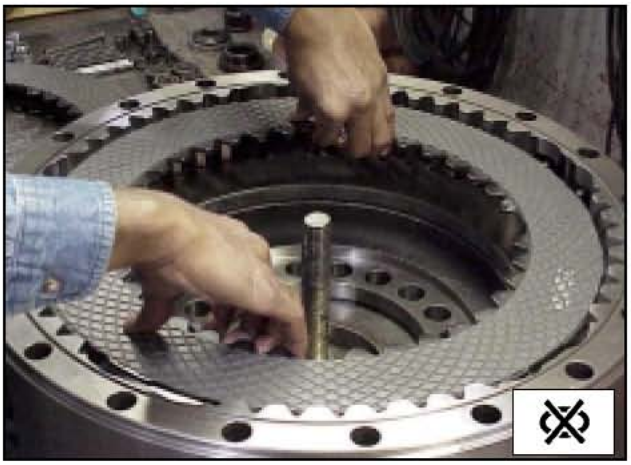


**Figure 32**
Install friction disc in housing.

**Figure 33**
Alternately install reaction plates and friction disc until proper number of each has been installed. Keep teeth aligned.

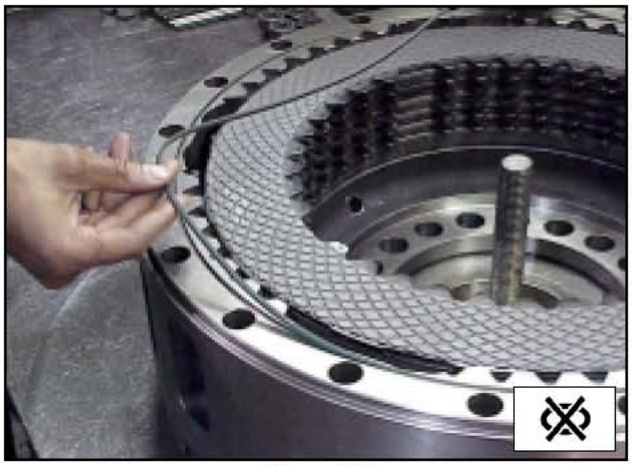


**Figure 34**
Install cover seal O-ring in groove.

**Figure 35**
Install retractor springs over guide pins.

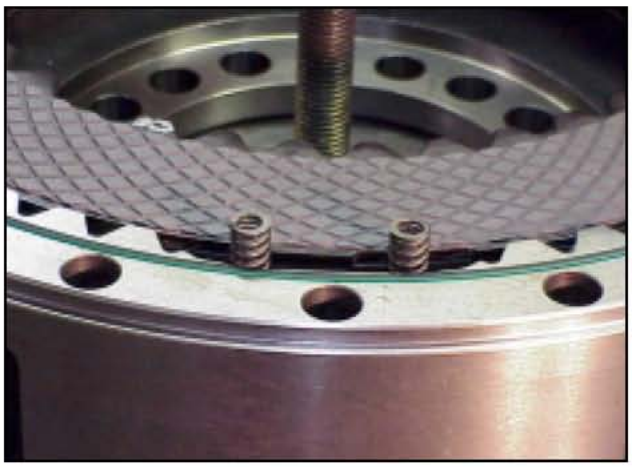


**Figure 36**
Springs installed.

**Figure 37**
Place brake cover on housing.

**Figure 38**
Install washers on cover.

**Figure 39**
Apply Loctite 262 to capscrew threads.

**Figure 40**
Install capscrew in cover.

**Figure 41**
In a crossing pattern run capscrews down.

**Figure 42**
Using torque wrench or automatic torquing device, tighten capscrews to 300-350 lbf-Ft. (410-450 Nm).

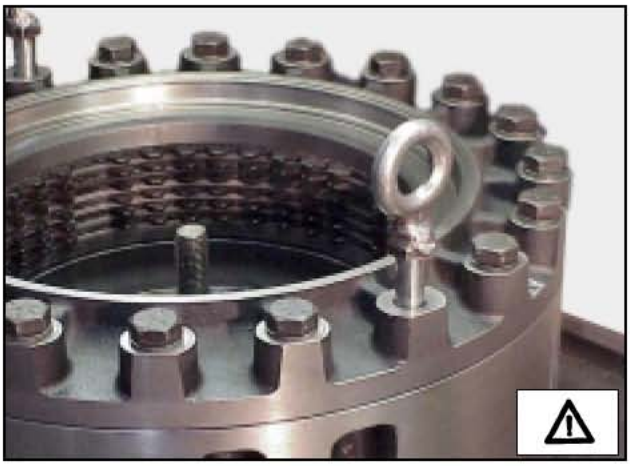


**Figure 43**
Using appropriate device flip brake assembly over. **Be careful, assembly is heavy and awkward.**

**Figure 46**
Install (2) inlet port plugs or fittings.

**Figure 44**
Install cooling port plugs or fittings (4) places and drain port plugs or fittings (1) place.

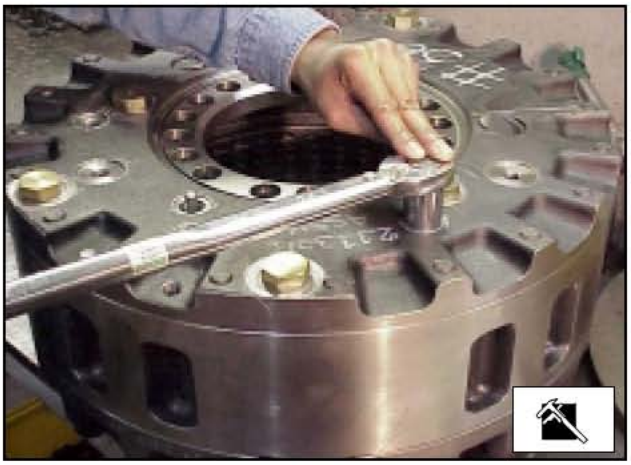


**Figure 47**
Tighten to 20-25 lbf-Ft (27-34 Nm).

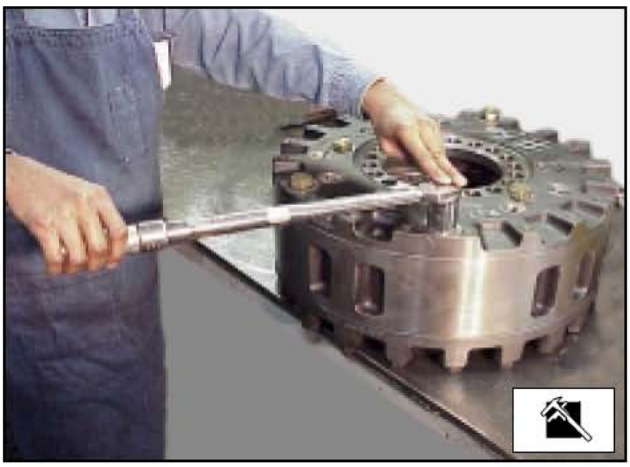


**Figure 45**
Tighten 5 plugs or fittings to 45-50 lbf-Ft (61-68 Nm).

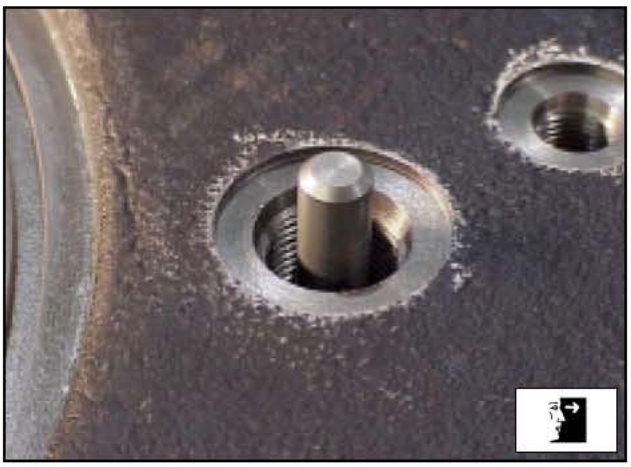


**Figure 48**
Wear pin protruding through rear cover.

**Figure 49**
Install wear indicator cap and tighten to 20-25 lbf-Ft (27-34 Nm).

**Figure 50**
Install bleeder screw, tighten to 10-12 lbf-Ft (14-16 Nm).

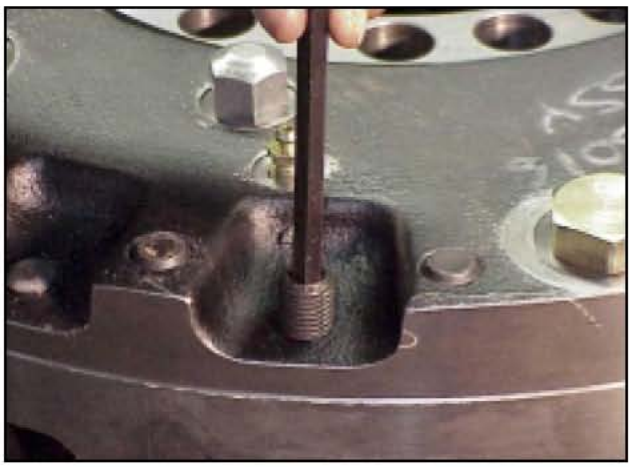


**Figure 51**
Install puller plugs (3).

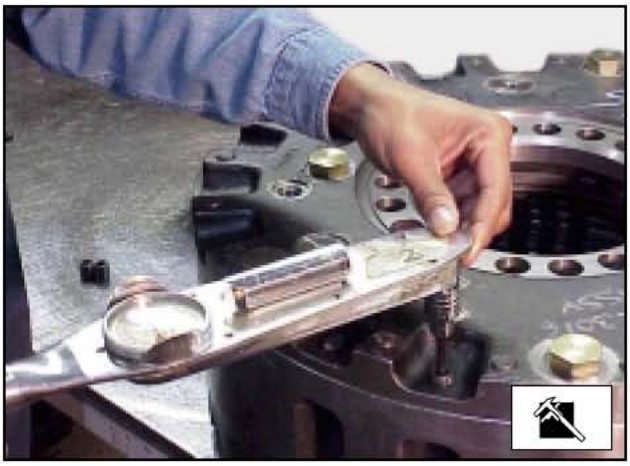


**Figure 52**
Tighten to 20-25 lbf-Ft (27-34 Nm).

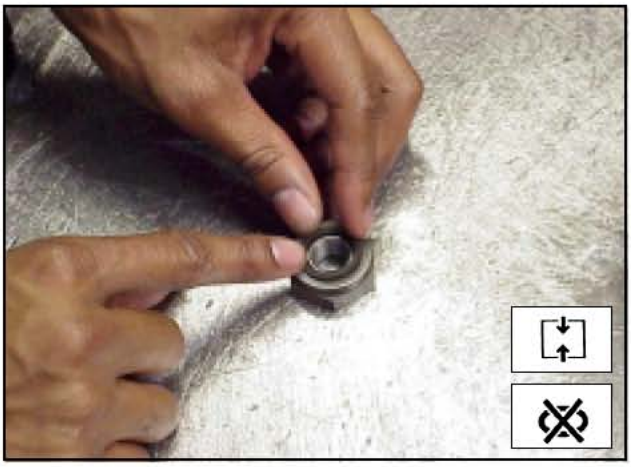


**Figure 53**
Insert O-rings in slack adjuster jam nuts and acorn nuts.

**Figure 54**
Lubricate O-ring.

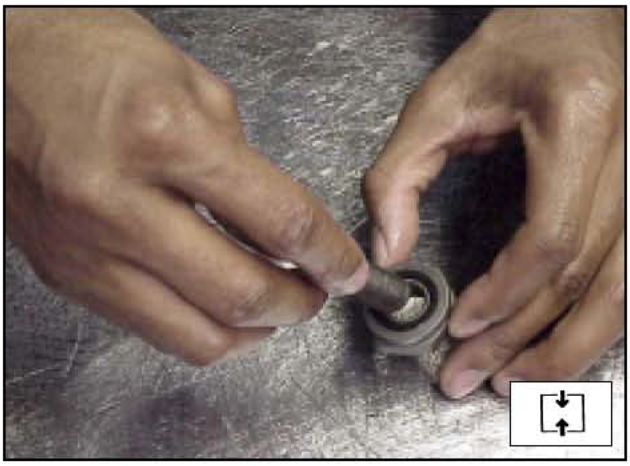


**Figure 55**
Install lubricated slack adjuster screws in jam nuts.

**Figure 56**
Assembled screw and nut.

**Figure 57**
Install slack adjuster assembly in brake housing.

**Figure 58**
Remove piston actuation port plug.

**Figure 59**
Install pressure gauge assembly. **Note:** Be sure threads are sealed properly and all gauge assembly components can safely handle 2000 psi of pressure.

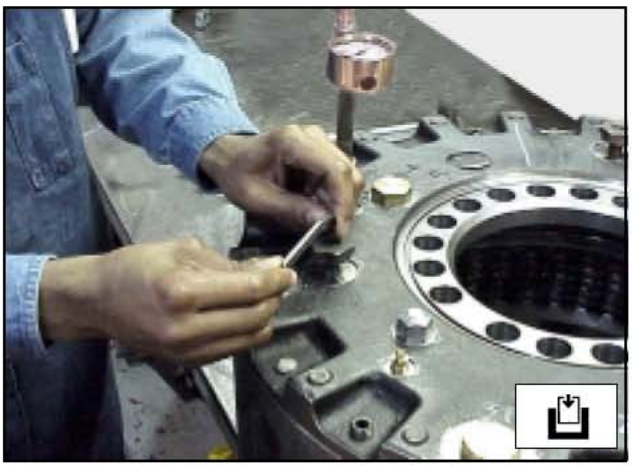


**Figure 60**
Apply 100 psi (689 kPa) air pressure to gauge, shut off assembly with jam nuts backed off. Turn adjuster clockwise until they contact piston.

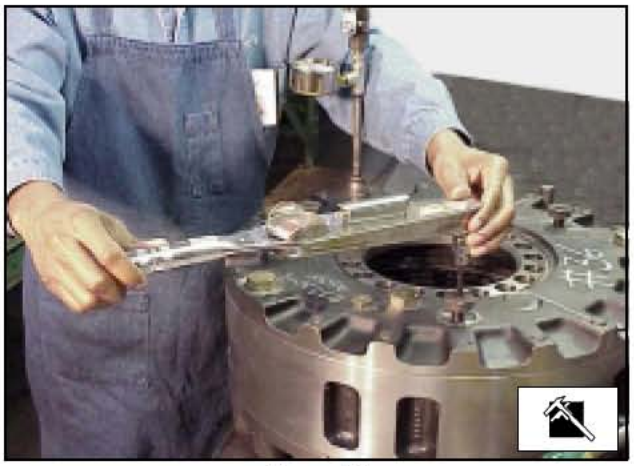


**Figure 61**
Tighten adjusting screws to 10 lbf-Ft. Back off screws 1.75 turns.

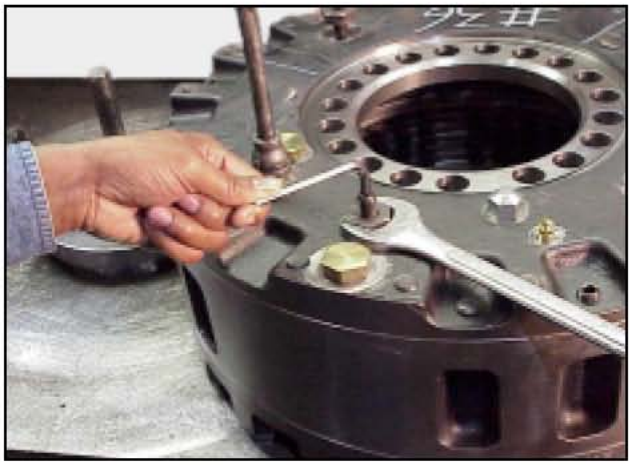


**Figure 62**
Tighten jam nuts holding adjusting screws.

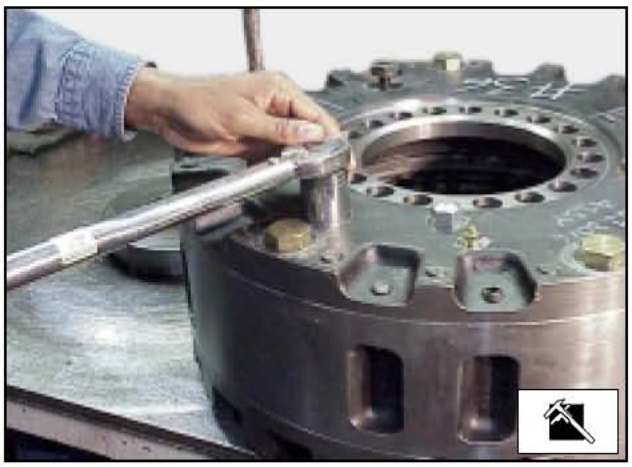


**Figure 63**
Tighten jam nuts to 50-75 lbf-Ft (67.8-101.7 Nm).

**Figure 64**
Install acorn nuts.

**Figure 65**
Tighten acorn nuts to 50-75 lbf-Ft (68-102 Nm). Carefully release air pressure.

# Hydraulic Pressure Test

1. Apply 2000 psi (13780 kPa) hydraulic pressure using mineral oil to gauge assembly previously used.

2. Shut off pressure at gauge.

3. After stabilizing 30 seconds, pressure should remain constant for 30 seconds minimum.

4. Repeat test twice. Carefully release pressure.

5. If brake will not maintain pressure, tear down and determine cause.

# Chapter 5
## 25150 Posi-Stop Brakes

Disassembly and reassembly of the Series II liquid cooled, spring applied hydraulic released brake assembly.

**Warning: Do not make any attempt any repairs he brake until this text is completely read, understood and all safety precautions complied to.**

1. Drain axle wheel end thoroughly.

2. Disassemble wheel end from spindle including the removal of the wheel hub from the brake discs. **Note:** If spindle or axle housing is to be replaced, remove brake as an assembly by removing the brake to spindle nuts and washers. Remove brake assembly from the spindle.

**NOTE:** *It is imperative a special disassembly and reassembly spring compression tool be fabricated before disassembling any part of this brake. A drawing of this tool is included in this text (Fig. A).*

3. Install spring compression tool cylinder portion axle spindle, through brake discs and against the piston pressure ring.

4. Install the round portion with the bolts over the spindle. Back the bolts out far enough they do not contact the cylinder face.

5. Install spindle nut and tighten securely against compression tool.

6. Tighten the four (4) compression tool bolts against the compression tool cylinder. This will hold the springs in position while removing the brake cover and brake discs.

**WARNING: Outer brake housing cover is under 72,000 lbs of compressed spring pressure. EXTREME caution must be taken in removing this cover. Brake cover bolts must be removed cautiously and evenly.**
**DO NOT REMOVE BRAKE COVER BOLTS ONE (1) AT A TIME!!**

7. With the spring compression tool securely in place, remove the brake cover bolts evenly. **Do not remove bolts one at a time**.

8. Remove brake cover and piston from brake housing.

9. Remove friction and reaction discs.

10. Cautiously and evenly turn the compression tool bolts out one (1) thread at a time. The compression springs will push the piston pressure ring out of the brake housing.

**WARNING:** ***Before removing compression tool from spindle, make sure all spring force is off pressure ring and ring moves freely in brake housing.***

11. Remove spindle nut and two (2) piece compression tool.

12. Remove piston pressure ring. **See note in Fig. 13.**

**Note:** Inner and outer springs are matched and must remain together as a set. As each spring set is removed, wire the inner and outer springs together so they do not get mixed up with the other springs while cleaning and inspecting.

13. Remove the brake to spindle stud nuts and washers. Remove brake housing from studs.

Piston and Piston Seal Removal from Brake Cover:

A. A recommended procedure for removing the piston is to fabricate three simple piston removal tools from channel iron. A drawing of this tool is included in this chapter. (Fig. B)

   There are three (3) threaded holes approximately 120 degrees apart in the outer face of the piston. Using the proper size bolts, thread a nut on the bolt and add a washer under the nut. Position bolt, nut and washer through the top of the channel and thread into the hole in the piston in all three (3) locations. Turn nuts a thread or two (2) at a time and piston will come out of the cover.

B. Remove the inner and outer two (2) piece piston sealing ring.

## See Cleaning and Inspection

14. Position a new brake housing to spindle O-ring on brake housing. Install brake housing on axle spindle studs with brake bleeder hole located at the top. Use caution as not to damage O-ring. Position washers on studs and install nuts. Tighten nuts to specified torque. (See Torque Chart).

15. Remove wire from one compound spring set (inner and outer) at a time and install in housing spring pocket. Springs must remain as a matched set as they are weighed and matched at the factory.

16. Install remainder of springs following same procedure.

17. Position piston pressure ring in brake housing and against compound springs.

18. Install spring compression tool cylinder portion over axle spindle and center in pressure ring.

19. Install the round portion with the bolts over the spindle. Back the bolts out enough to prevent them from contacting the cylinder face.

20. Install spindle nut and tighten securely against round compression tool.

21. Turn the four (4) compression tool bolts in against compression tool cylinder.

22. Cautiously and evenly in a criss-cross pattern tighten the compression tool bolts a thread or two at a time. To compress the spring sets and push the pressure ring into brake housing. Springs are compressed far enough when

the tangs on the pressure ring are approximately 1/8" (.125 in)/[3mm] from being flush with the face of the brake housing.

23. Install first steel reaction plate in pressure ring.

24. Install first friction disc in pressure plate.

25. Install second reaction disc.

26. Install second friction disc, aligning the four (4) oil grooves in the second friction disc with the oil grooves in the first friction disc.

27. Alternate steel reaction plates and friction discs until five (5) plates and five (5) discs are installed. The installation sequence begins with a reaction plate and ends with a friction disc.

**Note:** Always align friction disc oil grooves with previously installed friction disc oil grooves. Careful alignment of friction disc teeth at this time will facilitate installation of the wheel hub.

28. Install new square cut sealing ring in brake housing o-ring groove.

**Piston and Brake Cover Assembly:**

A. Install new piston outer o-ring and seal ring in brake cover outer ring groove.
B. Install new piston inner o-ring and seal ring in inner ring groove. Use caution not to overstretch inner o-ring and seal ring.
C. Make sure inner and outer seal rings are in fully seated position in ring grooves. Lightly lubricate both inner and outer seals.
D. To facilitate installing the piston in the brake cover, a simple installation tool can be made. A drawing of the tool is on page ( ). Three (3) of these tools are needed.
E. The three (3) steel blocks with a hole in them are used with three (3) brake cover bolts, washers and three (3) 5/8-11 NC nuts. The bolts come through the cover approximately 120° apart. The piston is positioned in the piston groove with the chamfer edges down and the three threaded holes up. Position an installing steel block on each of the cover bolts. Install a washer and a nut on each bolt. Locate long portion of block over piston. Tighten nuts evenly on all three blocks to compress piston into piston groove. Use caution as not to damage piston inner and outer sealing rings. Push piston in groove until it is flush with face of cover. Remove nuts, washers, installation blocks and cover bolts.
F. Position two new square cut sealing rings in cover ring grooves. A light coat of oil will hold rings in position during cover installation. Mark the fluid hole locations on the edge of the cover for alignment with the holes in the brake housing.

**Brake Cover Installation on Housing**

29. Mark edge of brake housing at the two fluid hole locations.

30. Position brake cover on brake housing, aligning fluid hole marks on cover with marks on brake housing. Install cover on housing using caution not to disrupt sealing rings at fluid openings.

**Note:** If brake bleeder screw is in brake housing, open brake bleeder screw to allow air to escape from behind piston during cover installation.

31. Install cover to housing bolts and washers. If there is a slight gap between cover and housing, carefully and evenly tighten bolts to specified torque. **(See torque chart)**

32. When all cover bolts are tightened to specified torque, install the two (2) warning tags and capscrews. Tighten capscrews to specified torque. **(See torque chart)**

33. Carefully and evenly loosen bolts in compression tool. When bolts are away from compression cylinder, remove spindle nut. Remove compression tool and cylinder from spindle and brake.

Install and adjust wheel end assembly.

**Note:** Brake release pressure must be applied to turn wheel hub and adjust wheel bearings.

# Cleaning and Inspection

## Cleaning

Clean all parts thoroughly using solvent type cleaning fluid. Blow parts dry with compressed air to insure solvent residue and any foreign materials are removed.

## 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.

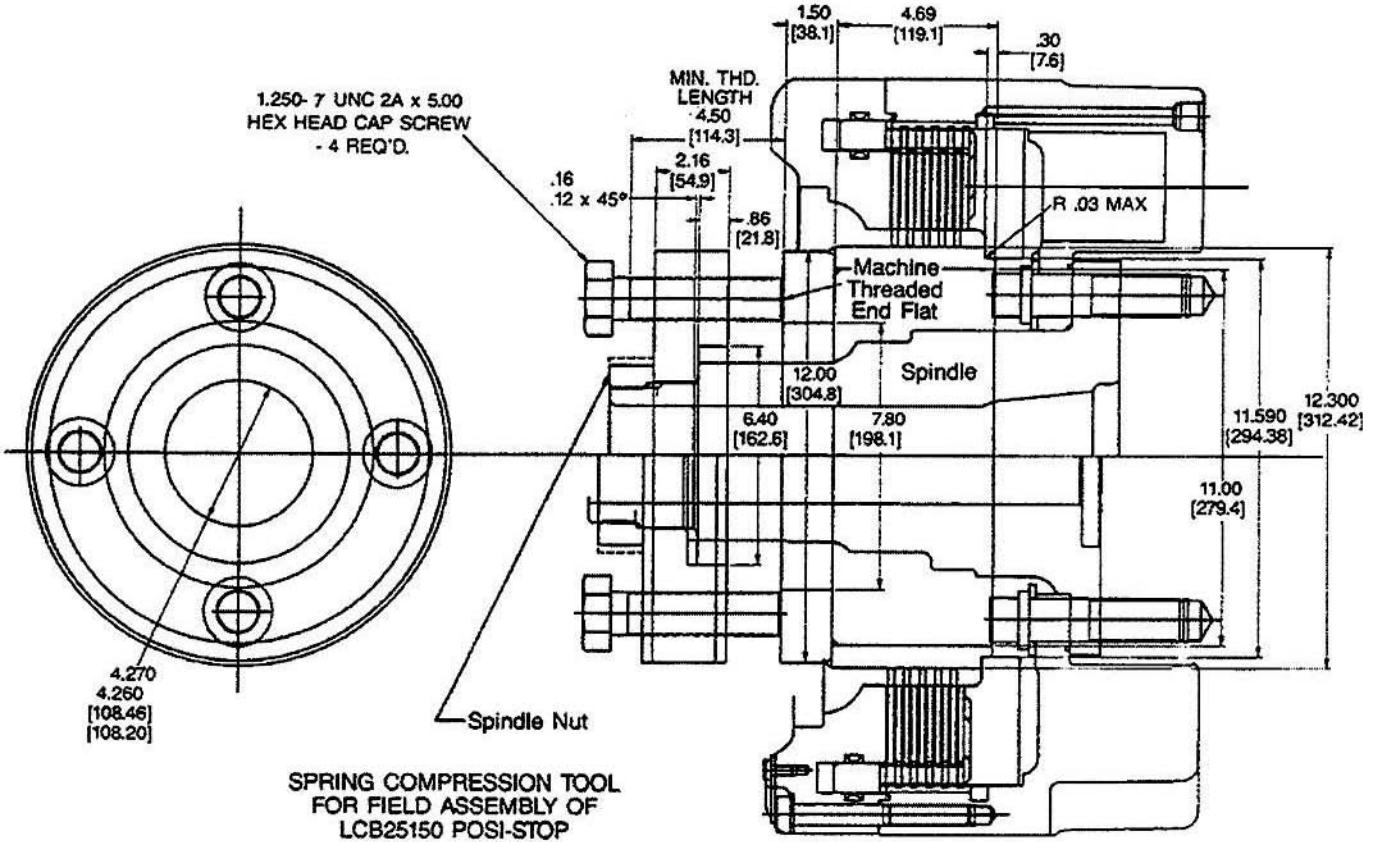
## Housing, Covers, etc.

Inspect housings and covers to be certain they are thoroughly cleaned and mating surfaces are free from nicks, burrs and other damage. Check all parts carefully for evidence of cracks or conditions which could cause leaks or failures.

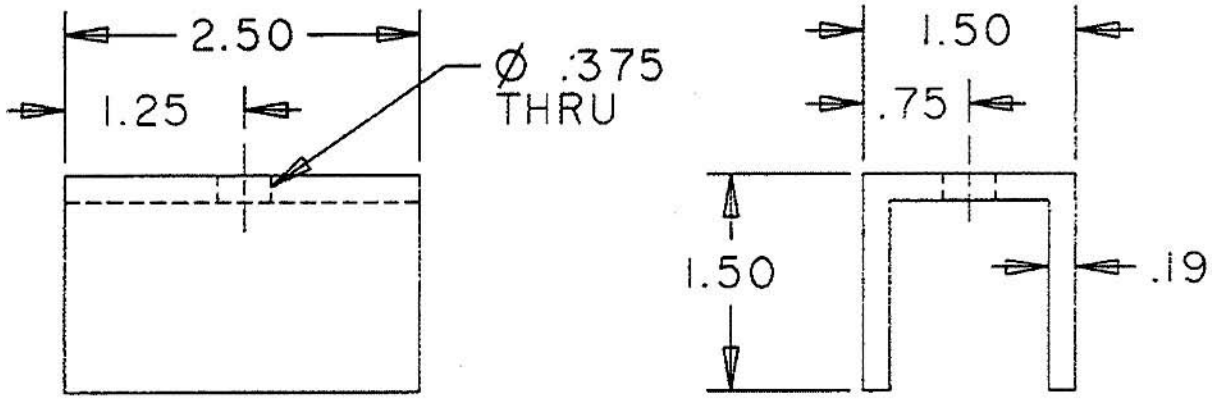
## Piston and Housing Seals

Replacing seals is more economical if done when unit is disassembled rather than performing a premature overhaul to replace these parts at a later date. Further loss of lubricant through a worn seal may result in failure of other more expensive parts. Sealing members should be handled carefully, particularly when being installed. Cut or scratches can seriously impair the seals efficiency.

Apply a film of lubricant to the brake piston and all sealing rings to facilitate reassembly.

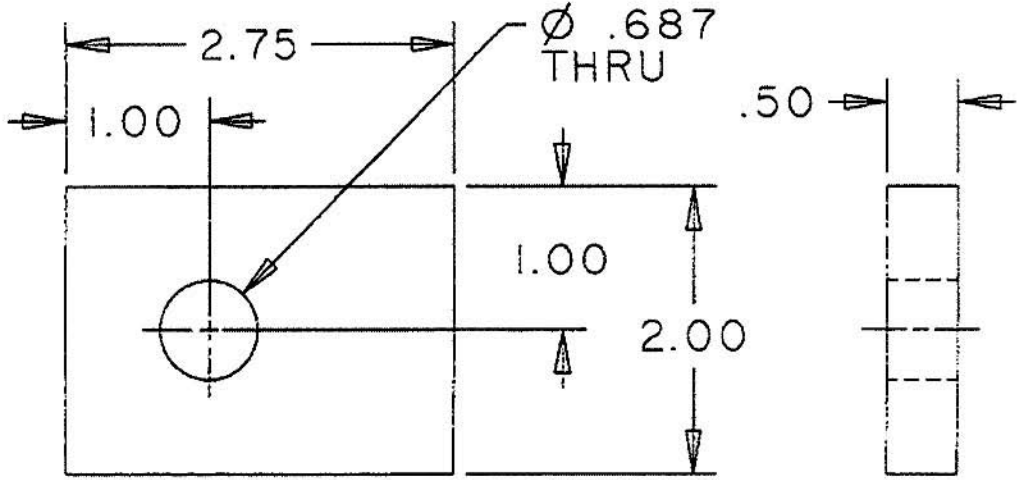



SPRING COMPRESSION TOOL
FOR FIELD ASSEMBLY OF
LCB25150 POSI-STOP




PISTON REMOVAL TOOL 3-REQD

Fig. B




PISTON INSTALLATION TOOL 3 REQD

# Wheel Bearing Adjusting Procedure

1. Before wheel bearing adjustment is made it is imperative all tapered bearing cones and cups be pressed to fully seated position. Do not attempt to seat cups and cones by tightening spindle nut against internal gear hub as this is not an effective method of seating the components and damage may occur.

2. Coat face of spindle nut, spindle threads and spindle splines with Anti-Seize or Never-Seez.

3. Install spindle nut and tighten to 1200 lbf/ft [1627 Nm]. Shock internal gear hub with heavy bar while rotating wheel hub a minimum of 2 revolutions. Recheck nut torque, if nut moves retorque to 1200 lbf/ft [1627 Nm] and repeat shocking and rotating. Repeat process until the spindle nut does not advance when when torqued.

4. Loosen the the spindle nut ¼ to ½ turn and shock the wheel hub until a slight amount of bearing end play is achieved and the wheel hub can rotate freely.

5. Using a strap, hoist and scale or torque wrench and adapter bar, determine the rolling torque of the wheel end with the bearings in a no load condition. Due to the imbalance of the hub assembly there will be a variation in rolling torque as the wheel hub is rotated. Record the maximum rolling torque figure observed while the hub is being rotated. This figure will be the "No-Load" rolling torque.

6. The acceptable value for axles using LCB (liquid cooled brakes) is up to 200 lbf/ft [27 Nm], other brake types 25-100 [34-136 Nm].

   **NOTE:**
   *The specifications given are for axles using new parts. For service on axles with used parts the procedure is the same except the minimum allowable rolling torque can be as low as 5 lbf/ft [7 Nm].*

7. Tighten spindle nut to 600 lbf/ft [813 Nm]. Advance the nut until 3 holes in the lock plate line up with the holes in the internal gear hub.

8. Check wheel hub rolling torque, it must be within the specified range as listed below. If rolling torque is higher than specified reduce the nut torque to obtain an acceptable reading, but not less than 400 lbf/ft [542 Nm]. If spindle nut torque must be reduced below 400 lbf/ft [542 Nm] the is likely a concentricity or alignment issue in the hub assembly and it should be disassembled and inspected and reassembled as required.

9. If rolling torque is lower than specified increase spindle nut torque until preload is in specified range with lock plate holes aligned. Do not torque to more than 1400 lbf/ft [1898 Nm]. Recheck rolling torque after rotating the wheel hub at least 5 times.

10. Install lock plate and screws as specified in the service procedure.

**Note:** Posi-Stop brake release pressure must be the pressure specified for the particular brake being used or inaccurate rolling torque readings can result.

| Adjustment Chart | |
|---|---|
| **Brake Type** | **Bearing Preload** |
| **LCB / Posi-Stop** | 30-80 lbf/ft [41-108 Nm] Over No Load |
| **None - Drum Dry Disc** | 20-40 lbf/ft [27-54 Nm] Over No Load |

SPICER OFF-HIGHWAY
PRODUCTS DIVISION

# TECHNICAL SERVICE BULLETIN

| No. 279 | Mo – Yr 10/01 |
|---|---|

# RECOMMENDED LUBRICANTS FOR SPICER DRIVE AXLES

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

**Mineral Based:** Acceptable lubricants must meet **API GL-5/MT-1** or **MIL-PRF2105E** qualifications. The highest viscosity grade must be used given the prevailing ambient temperatures from the chart below.

**Synthetics:** Synthetic lubricants are recommended providing they meet API GL-5/MT-1 qualifications. The highest viscosity grade must be used given the prevailing ambient temperatures from the chart below.

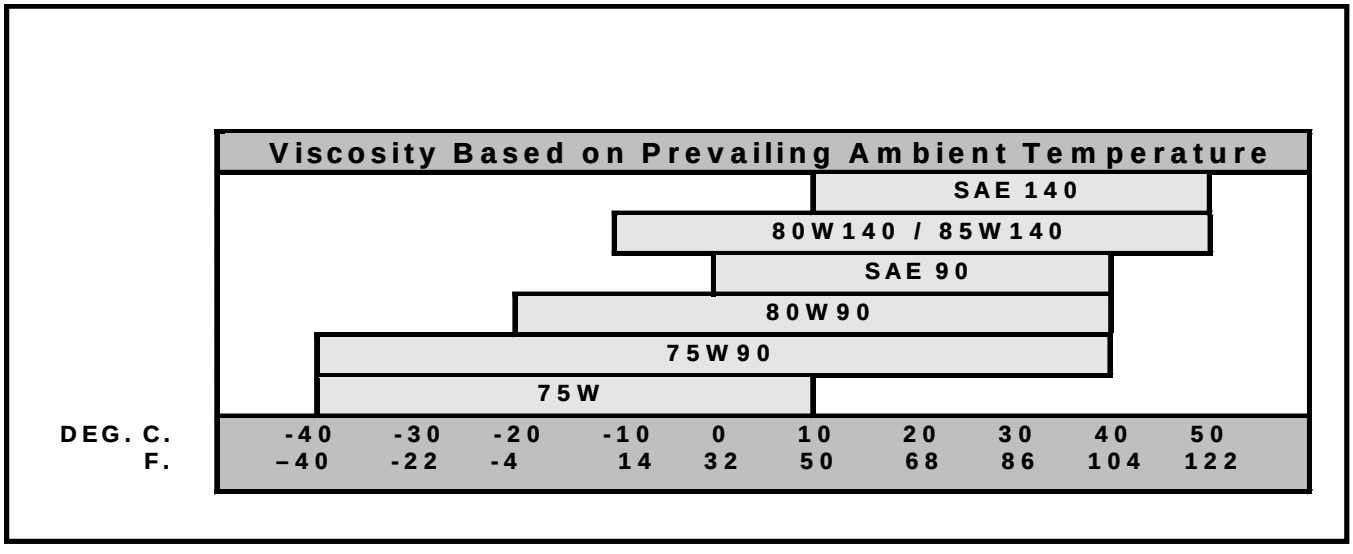
*In general synthetic oils have a lower pressure viscosity response than mineral oil lubricants. As the contact pressure between the gears increases, this produces a thickening of the mineral oil at the contact point. This increase in viscosity helps to maintain lubricant film thickness reducing the possibility of surface and spalling fatigue. Synthetic lubricants do not thicken as much under pressure unless specifically formulated to do so. Before using a synthetic lubricant in heavy applications, the customer must check with the lubricant supplier on the issue of high-pressure lubricant applications.*

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

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

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

**The use of aftermarket lubricant additives other than those specified is not recommended and may reduce the life of the axle and void the warranty!**



OFF-HIGHWAY PRODUCTS

# TECHNICAL SERVICE BULLETIN

NO. TSB-340 Mo/Yr – 08/08

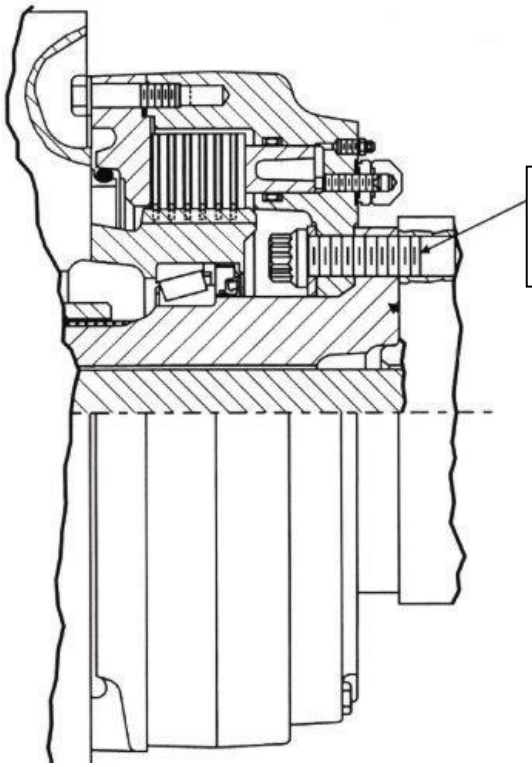
## 241394, 240594, & 241103 SPINDLE BOLTS

**REASON FOR BULLETIN:** Update 1.250" spindle bolt installation procedure.

**MODELS EFFECTED:** 19D3847, 19D4354, 21D3847, 21D4354, 48T300, 53R300, 53R312, 58R397, 25D8860.

**WHAT TO DO:** Use only the following instructions when servicing spindle bolt part numbers 241394, 240594 & 241103. This TSB supersedes all previously released instructions and Product Service Manuals.

**IMPORTANT:** NEW BOLTS ARE HIGHLY RECOMMENDED FOR EACH REPAIR/REBUILD
DO NOT LUBRICATE THREADS
DO NOT USE LOCTITE
DO NOT CLEAN/CHASE THREADS WITH A TAP - Use only solvent and compressed air



Tighten new bolts in a circular pattern to 2508-2712 Nm [1850-2000 LBF/FT].
NOTE: Threads must be clean and dry.

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## APPLICATION POLICY

Capability ratings, features and specifications vary depending upon the model and type of service. Applications approvals must be obtained from Spicer Off-Highway Products Division. We reserve the right to change or modify our product specifications, configurations, or dimensions at any time without notice.


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