



# Service Manual

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## MD5050 Hydraulic Track Drill

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426688 Rev. 02

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# Potential Hazards

## Potential Hazard



Safety Alert Symbol. Used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.



**Entanglement Hazard.** Death or serious injury can result from contact with rotating drill steel and drivelines.



**Entanglement Hazard.** Rotating parts can cause personal injury.



**Explosion / Burn Hazard.** Will cause death, burns or blindness due to ignition of explosive gases or contact with corrosive acid.



**Explosion Hazard.** Death or serious injury can result from the use of ether or other high energy starting aids.



**Explosion Hazard.** Death or serious injury can result from the use of ether or other high energy starting aids.



**Burn Hazard.** Death or serious injury can result from release of hot pressurized liquids.

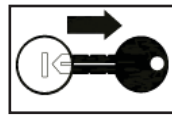
## Prevention



See Operator's Manual for instructions. If you do not understand the information the manuals, consult your supervisor, the owner, or the manufacturer.



Keep clear of rotating drill steel and drivelines. Switch off engine before performing service.



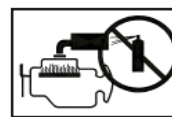
Keep away from fan and belt when engine is running. Stop engine before servicing.



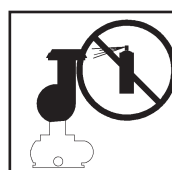
Keep all open flames and sparks away. Wear personal protective equipment, including face shield, gloves and long sleeve shirt.

### READ MANUALS

Read all manuals prior to operation.



Do not use ether or other high energy starting aids. Engine equipped with grid heating system.



Do not use ether or other high energy starting aids in compressor.






Keep away from flames.

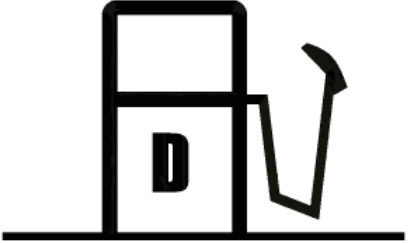
Relieve all pressure.

Allow to cool before performing service on compressor.



# Safety Signs

<b>⚠ DANGER</b>	
	<b>Explosion / Burn Hazard</b> Will cause death, burns or blindness due to ignition of explosive gases or contact with corrosive acid.
	Keep all open flames and sparks away. Wear personal protective equipment, including face shield, gloves and long sleeve shirt.
	<b>READ MANUALS</b> Read all manuals prior to operation. <b>DO NOT OPERATE</b> equipment if you do not understand the information in the manuals. Consult your supervisor, the owner or the manufacturer.
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<h1>NOTICE</h1>

USE NO.2-D DIESEL FUEL OIL WITH MINIMUM CETANE NUMBER OF 45 AND SULPHUR CONTENT NOT GREATER THAN 0.5%
SHUT OFF ENGINE BEFORE REFUELING.
CLEAN UP ANY FUEL SPILLS IMMEDIATELY. FAILURE TO OBSERVE THIS NOTICE MAY RESULT IN FIRE.
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<b>⚠ WARNING</b>	
	
<b>Burn Hazard</b> Hot fluid under pressure can scald.	Allow to cool before opening.
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<b>⚠ WARNING</b>	
	<b>BURN HAZARD</b> Death or serious injury can result from release of hot pressurized liquids.
	Keep away from flames.
	Relieve all pressure.
	Allow to cool before performing service on compressor.
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<b>⚠ WARNING</b>	
	<b>Injection Hazard</b> Escaping fluid under pressure can penetrate skin, causing serious injury.
	Relieve pressure before disconnecting hydraulic lines. Keep away from leaks and pin holes. Use a piece of cardboard or paper to search for leaks. Do not use hand. Fluid injected into skin must be surgically removed within a few hours by a doctor familiar with this type of injury or gangrene will result.
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# Track Link Repair

1. After track chain is separated, remove track shoe from damaged link (fig. 2-6).

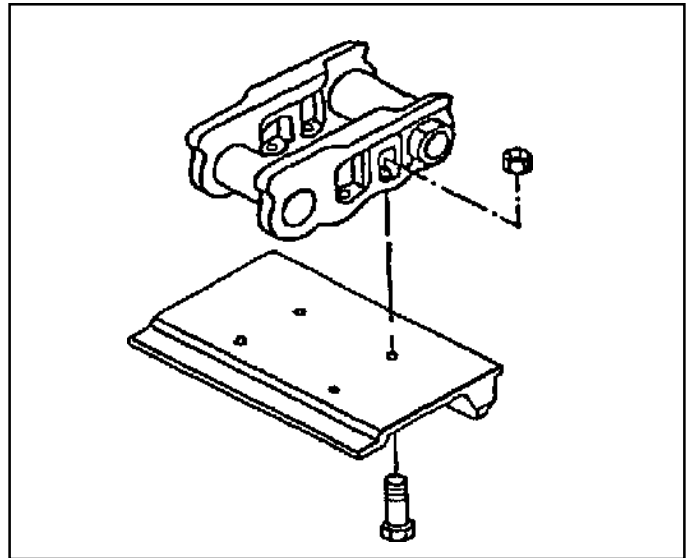


Fig. 2-6 Track Shoe Removal

2. To replace a damaged link, gas cut at the broken location (arrow, fig. 2-7). Cut the chain completely through at the damaged area and lay chain on ground.

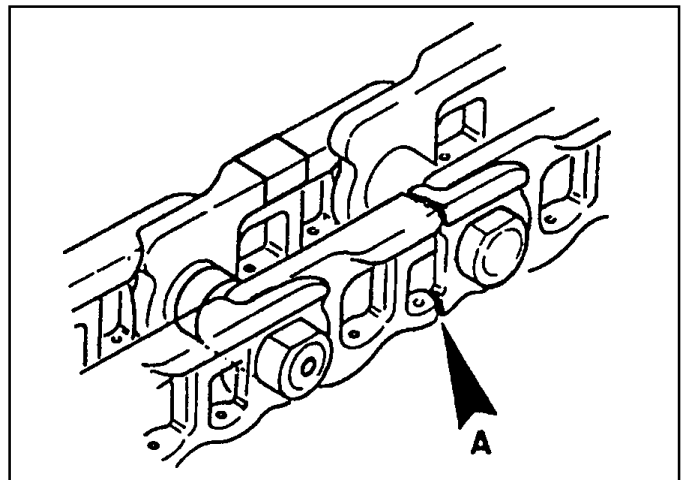


Fig. 2-7 Cut out damaged link

3. Cut the links, bushings and pins of the damaged link as shown in fig. 2-8. Remove the cut up parts.

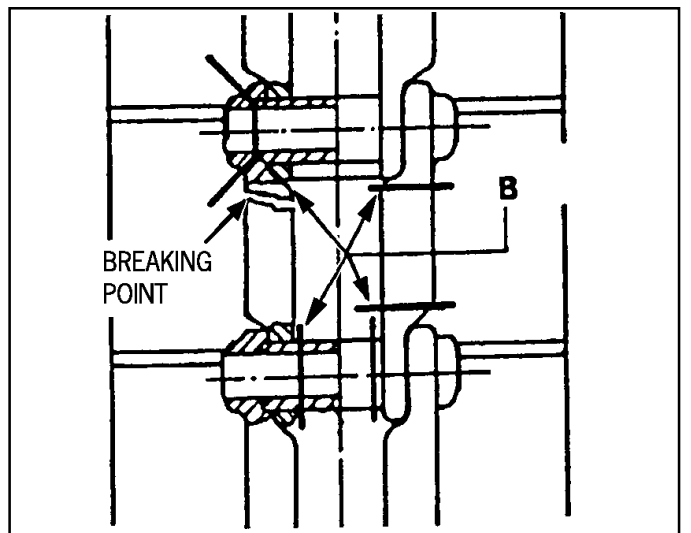


Fig. 2-8 Cut out links, bushings & pins as shown

# Idler and Tensioner Assembly

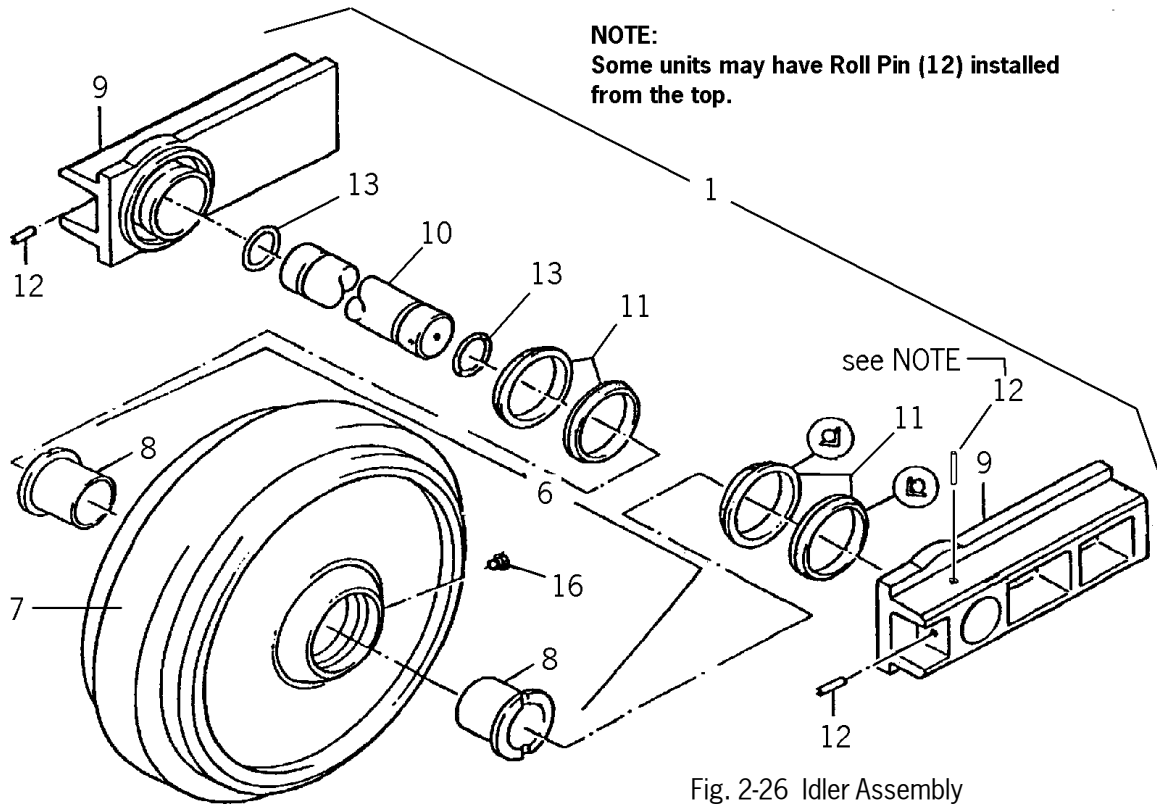


Fig. 2-26 Idler Assembly

- |                          |                  |
|--------------------------|------------------|
| 1. Idler Unit - Complete | 10. Shaft        |
| 6. Idler with Bushings   | 11. Seal (2)     |
| 7. Idler                 | 12. Roll Pin (2) |
| 8. Bushing (2)           | 13. O-Ring (2)   |
| 9. Sliding Rail (2)      | 16. Plug         |

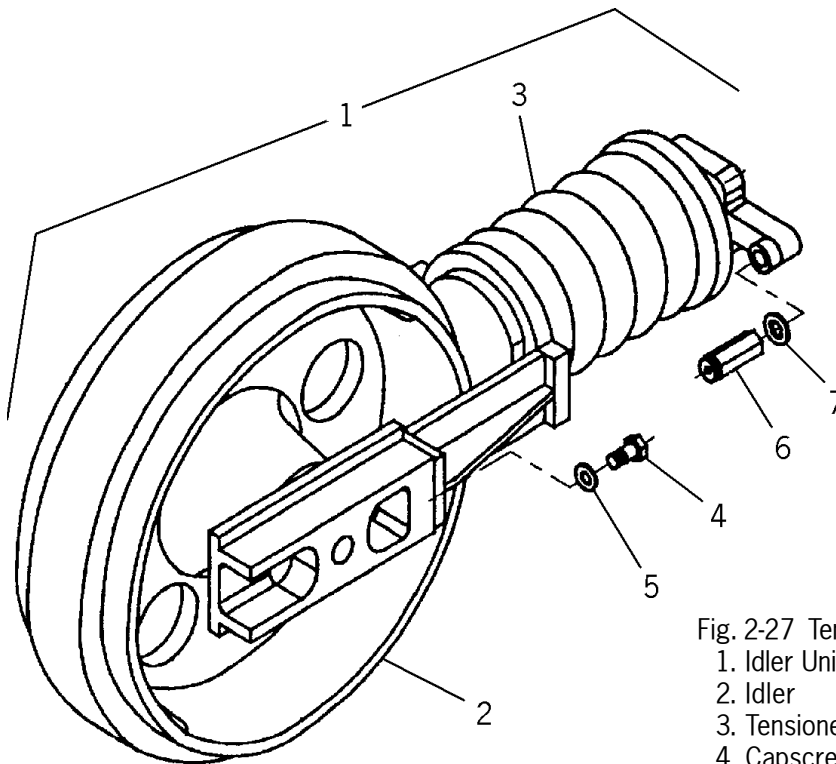


Fig. 2-27 Tensioner Assembly

- |                          |                      |
|--------------------------|----------------------|
| 1. Idler Unit - Complete | 5. Spring Washer (2) |
| 2. Idler                 | 6. Grease Fitting    |
| 3. Tensioner - Complete  | 7. Sealing Ring      |
| 4. Capscrew, M12x35 (2)  |                      |

# Track Rollers

## Track Roller - Test & Install

7. Check the end play. Check for air tightness by inserting air pressure through the oil fill hole. Test pressure should be not more than 87 PSI (6 bar). Fig. 2-50.

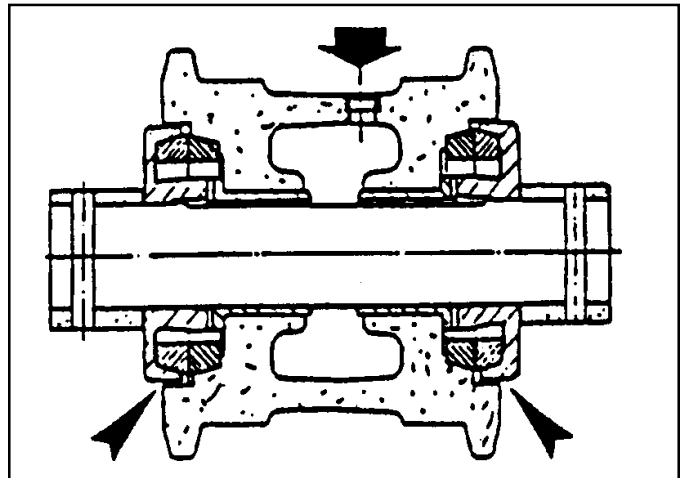


Fig. 2-50 Track Roller - pressure test.

8. If the air test is satisfactory, with no air leakage around the seals, fill roller with SAE 90 oil through the oil fill hole (fig. 2-51).

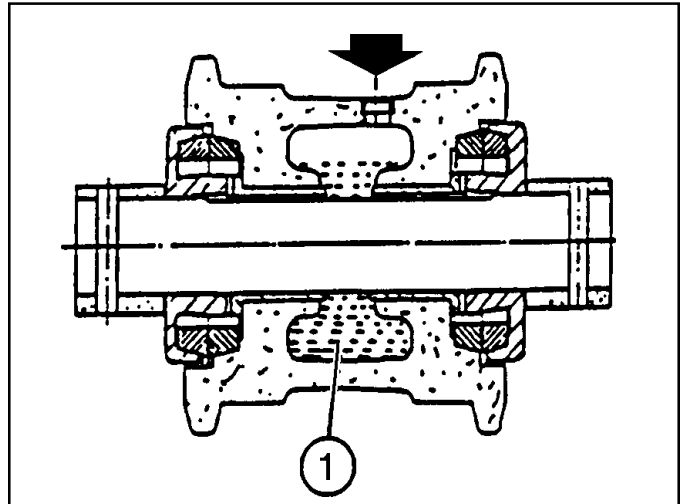


Fig. 2-51 Track Roller - fill with oil.

9. Hold the roller in such a way so the oil groove is at the bottom (remember the oil groove is aligned with the mounting surface of the bracket) and the oil fill hole is at the top. Now inset air pressure into the roller as in step 7 so the oil is pressed into the seal retaining spaces (9). Fig. 2-52.

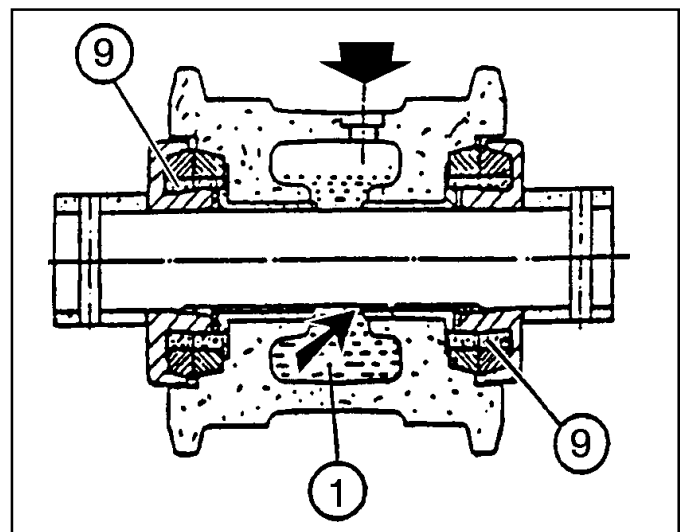
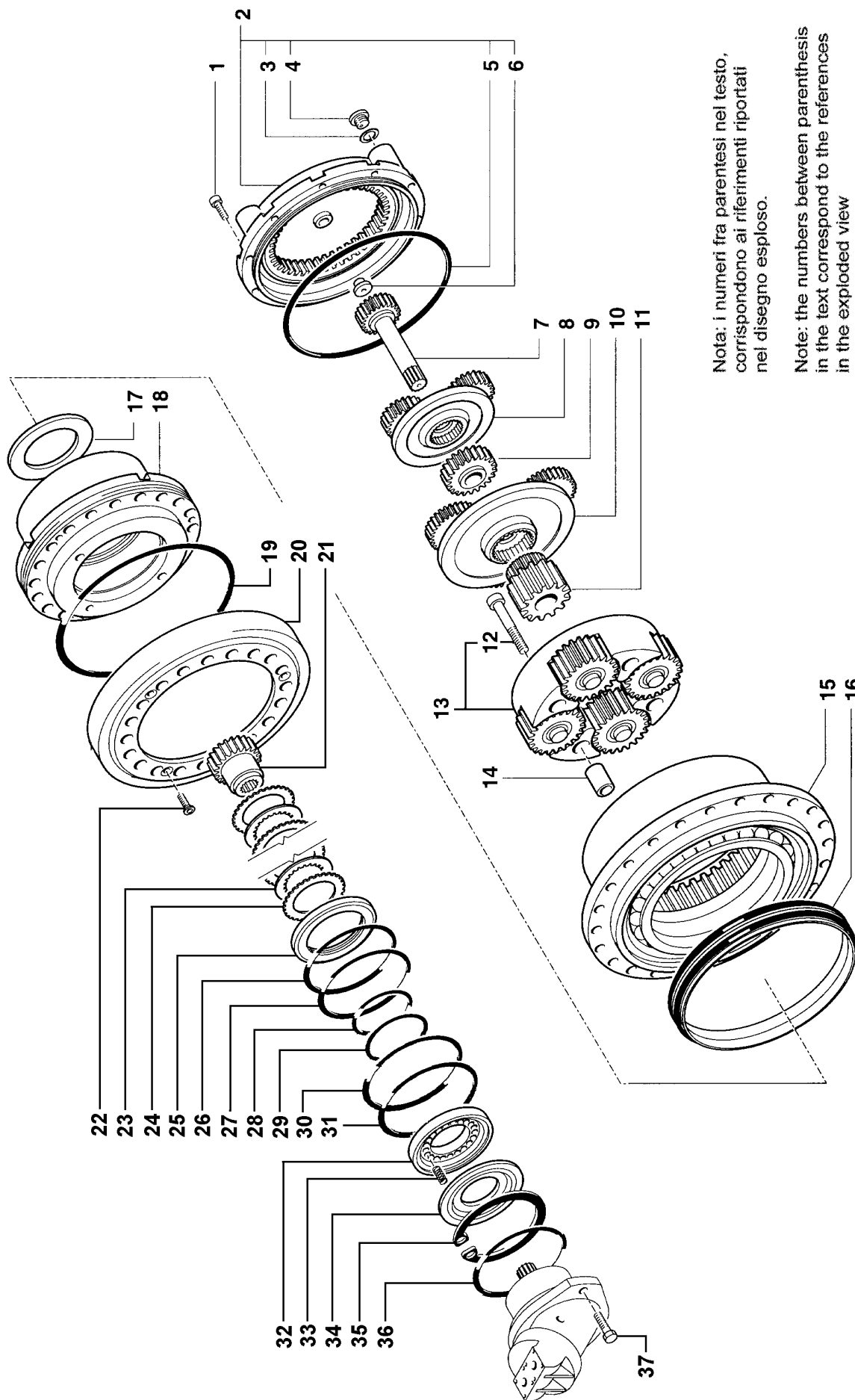


Fig. 2-52 Track Roller - air pressure on oil.



Nota: i numeri fra parentesi nel testo, corrispondono ai riferimenti riportati nel disegno esploso.

Note: the numbers between parenthesis in the text correspond to the references in the exploded view

Disegno esploso riduttore - Gearbox exploded view

## 7.0 MANUTENZIONE

In caso di normale funzionamento il motoriduttore non necessita di alcuna manutenzione ad eccezione del controllo e cambio olio. Sono necessari interventi di assistenza solo in seguito ad anomalie di funzionamento.

Eseguire i controlli ed attività secondo la tabella seguente:

<b>Controllo / Inspection</b>	<b>Frequenza / Frequency</b>	<b>Azione / Action</b>
Serraggio viti <i>Tightening screws</i>	Dopo le prime 50 ore di lavoro del riduttore <i>After the first 50 operating hours of the gearbox</i>	Verificare serraggio viti <i>Screws tightening torque check</i>
Livello olio <i>Oil level</i>	Ogni 100 ore di lavoro del riduttore <i>Every 100 operating hours of the gearbox</i>	Aggiungere olio <i>Refill oil</i>
Primo cambio olio <i>1<sup>st</sup> oil change</i>	A 150 ore di lavoro del riduttore <i>At 150 operating hours of the gearbox</i>	Sostituire olio <i>Oil replacement</i>
Cambi olio successivi <i>Next oil change</i>	Ogni 1000 ore di lavoro del riduttore o 1 volta l'anno <i>Every 1000 operating hours or at least one a year</i>	Sostituire olio <i>Oil replacement</i>

**i Informazioni** In caso di manutenzioni importanti e complesse, fare riferimento ai Disegni Esplosi e Liste Ricambi fornibili su richiesta ed alle prescrizioni contenute nel presente manuale tecnico.

Se sono necessarie istruzioni supplementari o se dovessero nascere problemi particolari, non esitate a contattare il distributore o direttamente il nostro servizio tecnico.

## 7.0 MAINTENANCE

*Under normal operating circumstances, no routine maintenance is required, except routine oil checks and oil changes. As recommended in this manual, unusual operating characteristics, such as noise or overheat, should indicate further investigation.*

*For a proper maintenance of the gearbox, the following checks and operations have to be done.*

**i Information** *In case of important and complex maintenance operations, make reference to The Spare Part Lists Exploded View which can be supplied under request or the suggestions of this manual.*

*Do not hesitate to contact the gearbox distributor or manufacturer if further instructions are necessary or in case of particular problems.*

## 9.0 RIMONTAGGIO

### 9.1 NOTE IMPORTANTI PRIMA DEL RIMONTAGGIO

Quando si procede al rimontaggio del riduttore occorre attenersi ad alcune regole fondamentali:

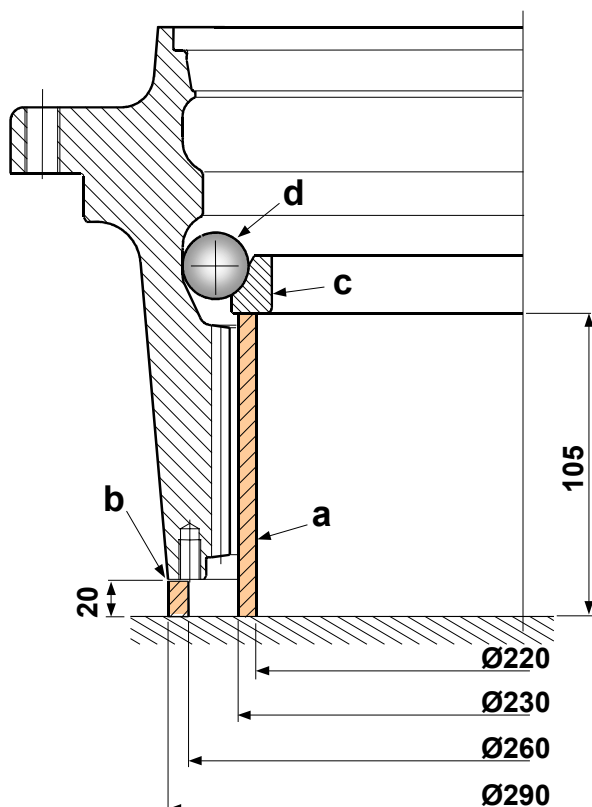
1. Nel caso di ingranaggi danneggiati, esempio un planetario, non sostituire il singolo ingranaggio ma tutta la riduzione.
2. **Sostituire sempre le guarnizioni O-ring ed gli anelli di tenuta interessati alla parte da rimontare** dopo aver pulito con attenzione le sedi di montaggio ed aver aggiunto un film di grasso sulle sedi stesse e sulle guarnizioni per facilitarne il montaggio.
3. **sostituire sempre le parti che risultano danneggiate o usurate, con ricambi originali.**

## 9.0 REASSEMBLY

### 9.1 IMPORTANT NOTES BEFORE REASSEMBLY

When proceeding with the gearbox reassembly, it is necessary to follow the rules listed below:

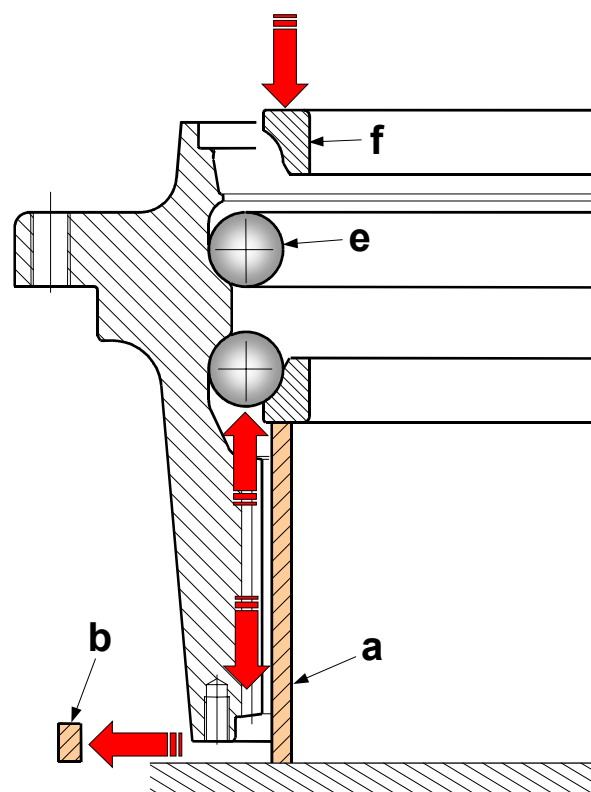
1. In case of damaged gears, for example a planet, do not replace the single gear, but the whole reduction stage.
2. **Replace always the O-rings and seal rings of the part to be reassembled** after having carefully cleaned the seats and having buttered some grease on the seats themselves and on the O-rings to make easier the reassembly.
3. **always replace all the components that seems to be damaged or with excessive wear, with original spare parts.**



30.

Montare sul corpo riduttore (15) il giro di sfere inferiore (d), sostenendo l'anello interno (c) tramite i distanziali (a-b).

*Fit the lower ball row (d), into the gearbox housing (15) holding the inner raceway (c) with spacers (a-b).*



31.

Sfilare il distanziale (b).  
Montare il giro di sfere superiore (e).  
Inserire l'anello interno del cuscinetto (f).

*Remove the spacer (b).  
Drop the upper ball row (e)  
Assemble the inner raceway (f).*

## 9.0 RIMONTAGGIO

## 9.0 REASSEMBLY



**63.**

Montare l'anello di ritegno (20) sul mozzo flangiato (18).

*Assemble the cover (20) on the flanged hub (18).*



**64.**

Fissare l'anello ritegno (20) al mozzo flangiato (18) con n°3 viti TSPEI M10x25 (22), classe di resistenza 10.9, serrate con chiave dinamometrica esagonale maschio alla coppia di 50 Nm.

*Fix the cover (20) to the flanged hub (18) by using nos.3 flathead screws M10x25 (22) grade 10.9, tightened by a male hex head torque wrench at 50 Nm torque.*



# Fuel System - Isuzu Engine

## How to minimize fuel system contamination:

### During storage and transfer

Proper storage and handling procedures are essential to keep contaminants out of your fuel system. Here are a few steps you can take to help keep your fuel clean:

1. Periodically drain and flush all fuel storage containers, including tanker trucks and stationary tanks. This will remove sediments that can easily enter your fuel system.
2. Keep all fuel nozzles, hoses and other equipment clean. Clean around fuel fill cap before removing it.
3. Maintain all hoses, gaskets and seals in your fuel storage and transfer equipment.
4. Use and maintain line filters on all fuel transfer equipment.
5. Never transfer fuel with buckets, funnels or other open containers.
6. Only purchase fuel from a reliable, reputable source. Demand periodic testing to assure you are getting a consistently high quality product.

### During service and maintenance

Many fuel system failures occur immediately after the engine has been serviced. Planning and preparation are the keys to keeping contaminants out of your engine when it is "open" for service.

Below are steps you can take to help minimize contamination entering the fuel system:

1. Clean dirt, dust and other debris from the engine compartment before performing service. Use high pressure wash to blast away mud, dust, dirt and other built-up grime off the engine before "opening" the engine for repairs.
2. Tightly cap or plug all openings during repairs, even if it is only for a few minutes.
3. Clean reusable parts with solvents, using proper cleaning and drying methods.
4. Never place components directly on the ground.

5. Keep new parts in their original package until ready to use.
6. Do not reuse seals, always replace them.
7. Perform routine inspection of fuel line and connections and make repairs immediately.
8. Maintain a regular schedule for draining and cleaning machine fuel tank. Do this weekly for severely dusty conditions, every 3 months for normal conditions.

### During operation

It is the responsibility of everyone from the machine operator to the maintenance technician to keep fuel contamination to a minimum.

### Daily Checklist:

1. Repair any fuel line leaks immediately. If fuel is leaking out, contaminants can get in.
2. Never operate machine without the properly installed fuel cap. Replace any defective gaskets or replace damaged cap.
3. Make sure fuel tank vent tube is open and breather is clean and installed properly.
4. Do not run machine out of fuel; this can draw sediment from the bottom of the tank into the fuel system.
5. Be aware of any unexplained power loss, excessive smoke or hard starting, especially when the engine is warm. Have engine checked out by qualified service personnel immediately.

### When changing filters

1. Maximize filtration by using only OEM (Original Equipment Manufacturer) High Efficiency Fuel Filters.
2. Follow the recommended change interval. If premature filter plugging occurs, consider your fuel quality or other contamination sources.
3. Remove filters carefully, making sure not to knock dirt and debris from the engine compartment into openings.
4. Keep filters packed in their original box until they are installed.

## PREPARATION AND INSTALLATION

### MOUNTING

**Pump Without Reservoir** - The pump can be mounted in any position. But, the recommended mounting position is with the drive shaft on a horizontal plane and the case drain port 1 on the top side. Secure the pump to a rigid mounting surface. Refer to the referenced Oilgear Piping Information Bulletin 90011.

**Pump With Reservoir** - These pumps are usually fully piped and equipped. It may be necessary to connect to a super-charge circuit when used. Mount reservoir on level foundation with the reservoir bottom at least six inches above floor level to facilitate fluid changes.

### PIPING AND FITTINGS

Refer to the referenced Oilgear Piping Information Bulletin 90011 and individual circuit diagram before connecting the pump to the system. Inlet velocity must not exceed 5 fps (1,5 mps). Inlet should be unrestricted and have a minimum of fittings.

#### NOTE

*DO NOT use an inlet strainer.*

Arrange line from "case drain" so the case remains full of fluid (non-siphoning). Case pressure must be less than 25 psi (1,7 bar). For higher case pressures and the special shaft seals required, contact our Customer Service. Each drain line must be a separate line, unrestricted, full sized and connected directly to the reservoir below the lowest fluid level. Make provisions for opening this line without draining (siphoning) reservoir.

### WARNING

Running the pump in NEUTRAL position (zero delivery) for extended periods without a supercharge circuit can damage the pump. The system and pump must be protected against overloads by separate high pressure relief valves. Install bleed valve(s) at the highest point(s) in system.

### POWER

Power is required in proportion to volume and pressure used. Motor size recommendations for specific applications can be obtained from The Oilgear Company. Standard low starting torque motors are suitable for most applications.

### CAUTION

**DO NOT** start or stop unit under load unless system is approved by Oilgear. It may be necessary to provide delivery bypass in some circuits.

### DRIVE

Verify rotation direction plate on the pump's housing. Clockwise pumps must be driven clockwise and counterclockwise pumps must be driven counterclockwise. Use direct drive coupling. Size and install coupling per manufacturer's instructions.

### CAUTION

**DO NOT** drive the coupling onto the pump drive shaft. If it is too tight, it may be necessary to heat coupling for installation. Refer to manufacturer's instructions.

Misalignment of pump shaft to driver's shaft should not exceed 0.005 inches (0,13 mm) Total Indicator Readout (TIR) in any plane.

## DRIVE SHAFT GROUP

Check:

- the shaft seal (007) for deterioration or cracks. Replace if necessary (press-out).
- the shaft bearing (306) for galling, pitting, binding or roughness.
- the rear shaft bushing in valve plate.
- the shaft and its splines for wear. Replace any parts necessary.

## ASSEMBLY

See Figures 8, 9 and 10. Follow the disassembly procedures in reverse for re-assembling the pump.

During assembly, install new gaskets, seals and O-rings. Apply a thin film of CLEAN grease or hydraulic fluid to sealing components to ease assembly. If a new rotating group is used, lubricate thoroughly with CLEAN hydraulic fluid. Apply fluid generously to all wear surfaces.

## SWASHBLOCK GROUP

If removed,

1. Press shaft seal (007) into front of pump housing.
2. Place housing on a bench with the mounting flange side down.
3. Press the two roll pins (207) (if they are replaced or removed) into the pump housing so the pins extend 0.050 to 0.065 inches (1,3 to 1,6 mm) from the case.
4. Grease the back side of each saddle bearing (204) and place on the pin to locate the bearings in the pump case. Make sure the pins do not protrude.
5. PVG 100 and 130, the swashblock is inserted from the valve plate end. PVG 048, 065 and 075, the swashblock is inserted through the control mounting face. Insert swashblock (201) into the pump housing. Once in place, be sure the swashblock swivels in the saddle bearings. With new bearings, swiveling may be stiff and not always smooth. PVG 110, 130; assemble (203) and (206).

6. Make sure the roll pin (205) is inserted into the cylinder bearing (202). Position the cylinder bearing so the pin is located nearest the control facing the outboard end of the drive shaft (301). The bearing should be positioned with "scarf" cuts (PVG 130 only) positioned top and bottom and with the pin (205) located on top of internal cast boss. The bearing should fit into place with a little difficulty and be square to the axis of the pump.
7. Tap bearing into place if necessary using extreme care not to damage the bearing.
8. Insert retaining ring (208) to hold bearing in place.

## DRIVE SHAFT GROUP

1. Place the housing on its side with the axis horizontal.
2. Install the seal retainer (302).
3. Lubricate the shaft seal (007) and shaft.
4. Insert the drive shaft (301) and bearing assembly into the housing.
5. Lock in place with the drive shaft bearing retainer ring (305).

## ROTATING GROUP

See Figure 6.

1. Place the cylinder barrel (101), wear surface down, on a clean cloth.
2. Place the shoe retainer spring (105) in the center of the barrel with the fulcrum ball (103) on top of it.
3. Insert the identified pistons (102) into their corresponding identified holes of the shoe retainer (104). As a unit, fit the pistons into their corresponding, identified bores in the cylinder barrel. **DO NOT FORCE**. If everything is aligned properly, the pistons will fit smoothly.

# Pump Drive

## Pump Drive Removal and Installation

1. Remove canopy from machine. See procedure in this section.
2. Remove compressor drive belt guard (1) and remove drive belt.
3. Remove compressor filter mounting bracket (2) and filter, tag and disconnect hoses as need be.
4. Drain oil from pump drive unit into a suitable container. Oil capacity is 4.5 quarts (4.3 L).

### NOTE

**If pumps do not require service, they can be removed from the pump drive without disconnecting the hydraulic hoses, and then set aside.**

5. If pump(s) are being overhauled, drain hydraulic oil from hydraulic oil reservoir. Oil capacity is 100 gallons (379 L). If hydraulic oil does not need changing, remove breather and apply a slight vacuum to tank so oil will not run out of lines to hydraulic pump(s).
6. Tag and remove hydraulic oil lines to pumps. Cap or plug all open lines and ports.
7. Support hydraulic pumps with a suitable lifting device and remove pumps.
8. Support engine air filter and bracket (3) with a suitable lifting device. Disconnect air inlet hose from air filter. Remove mounting bracket (3) for engine air filter and regulator on right side of pump drive and set aside.
9. Support the pump drive with suitable lifting device. Remove the four mounting bolts (7) from the left side. Remove the twelve mounting bolts that secure pump drive to engine flywheel housing.
10. Slide pump drive back away from engine until input shaft clears, then lift out.
11. Installation is reverse of removal. Refer to pump installation when installing pump. Refer to Section 5 for compressor belt tensioning procedure.

Fig. 3-11b Pump Drive Removal & Installation  
 5. Rear Engine & Pump Drive Mount  
 6. Mounting Bracket (Engine Air Filter)  
 7. Mounting Bolts (8) - 4 per side

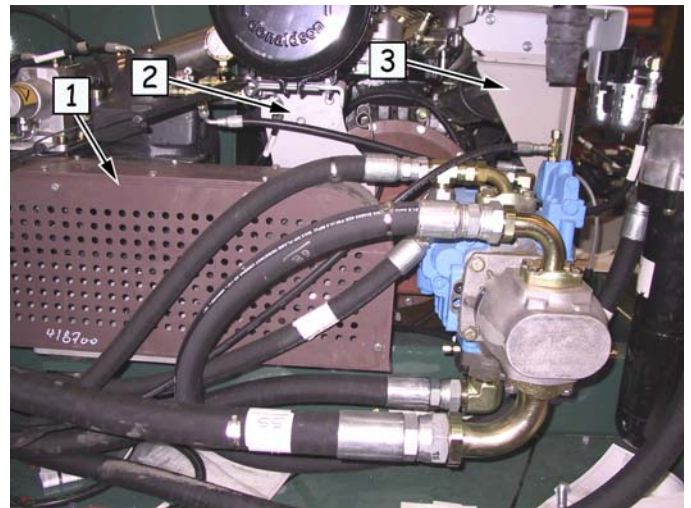


Fig. 3-11 Pump Drive Removal & Installation

1. Fan Guard
2. Mounting Bracket (Compressor Air Filter)
3. Mounting Bracket (Engine Air Filter)

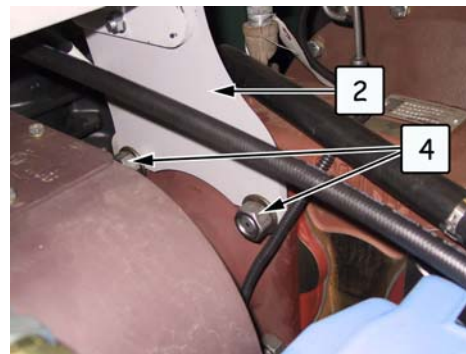
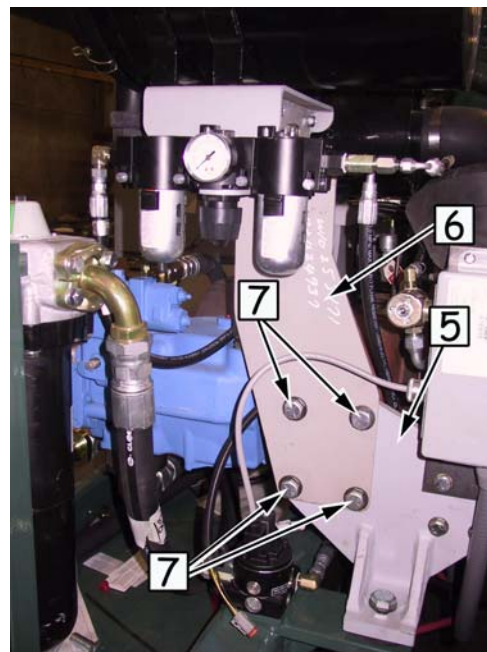
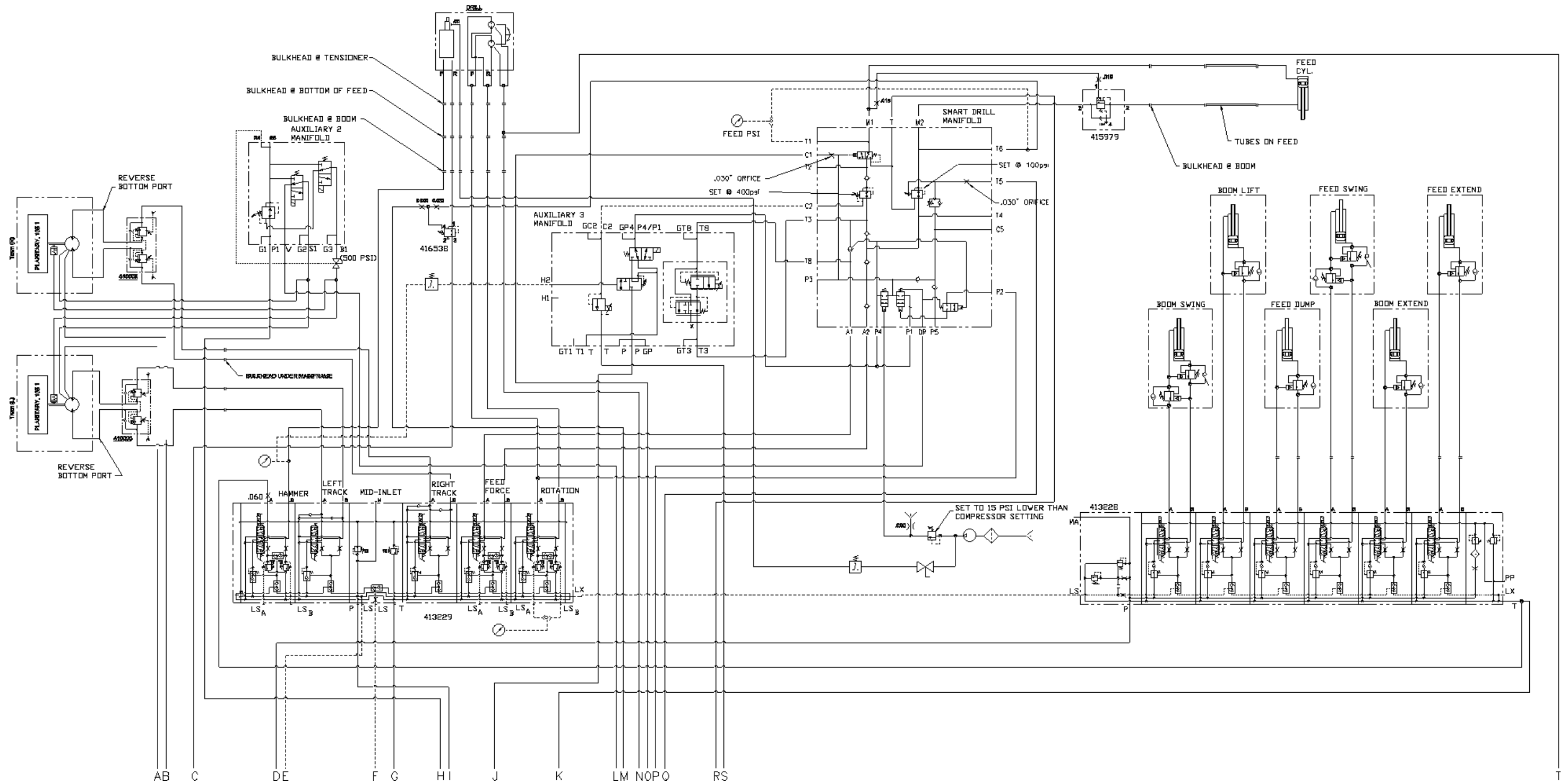


Fig. 3-11a Mounting Bracket Detail

2. Mounting Bracket (Compressor Air Filter)
4. Hex Nuts (2)



# Hydraulic Schematic



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(ref. 417151 rev E)

# Feed Force & Feed Flow Adjustments

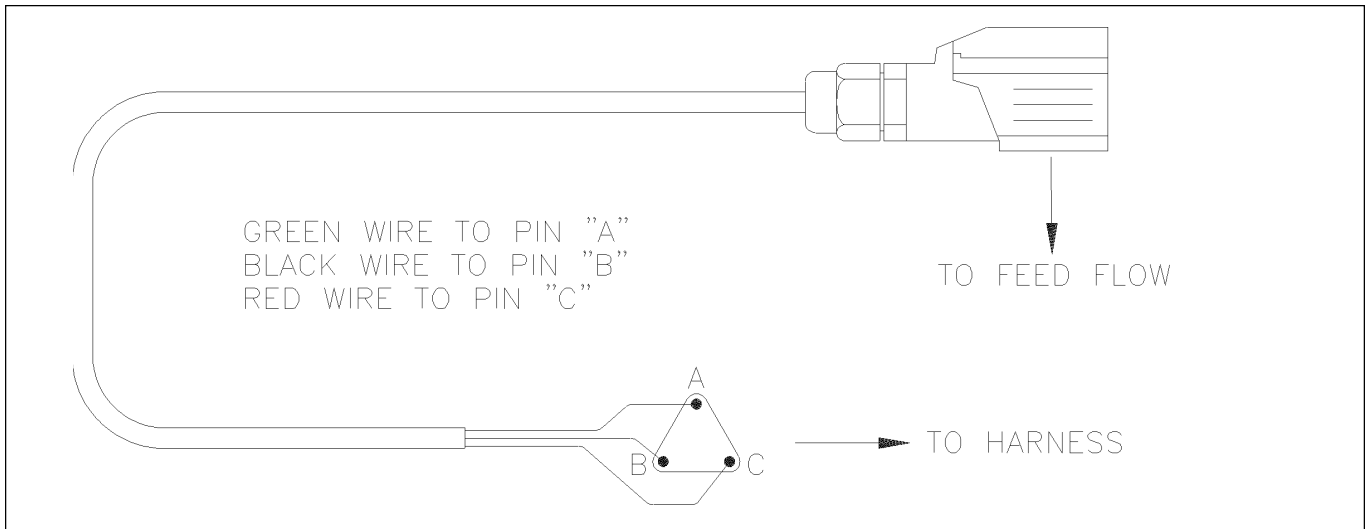


Fig. 4-19 Feed Flow Amplifier Cord (ref. 416935)

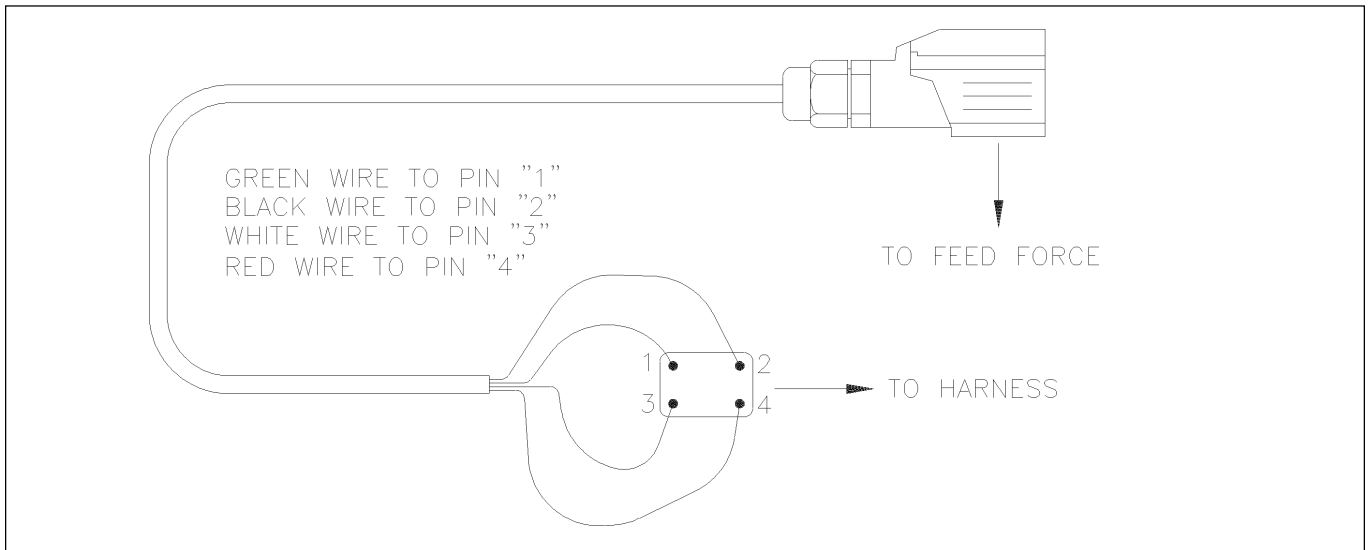


Fig. 4-20 Feed Force Amplifier Cord (ref. 416936)

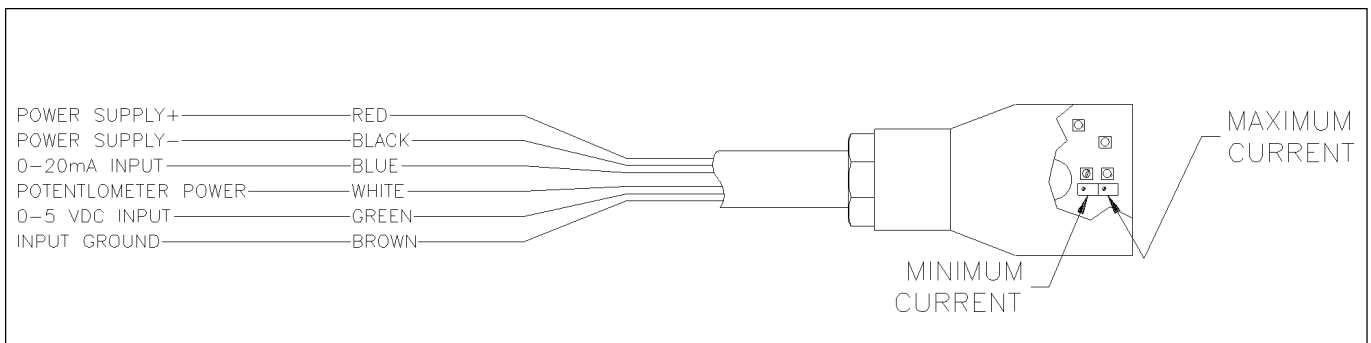
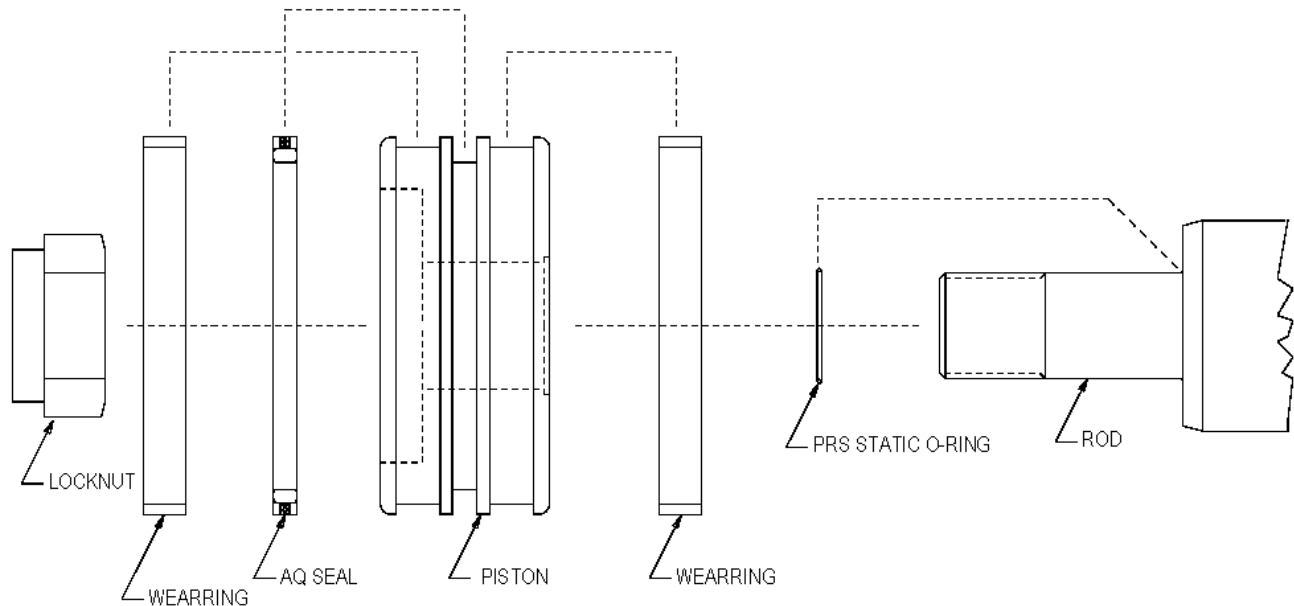


Fig. 4-21 Amplifier (ref. 415257 rev. A)

# Z Piston

## General

The Z series piston uses ductile iron material and glass-filled nylon wearings (bearing rings). It is available in two basic design styles. The first uses a groove sized for a specially designed teflon seal called the AQ seal. The teflon sealing ring has a small groove on its outside diameter that houses a quad ring seal. The entire ring is energized by a square section rubber loader. The second series uses an interference fit split nylon sealing ring with an oval section rubber loader and is called a Chemcast seal. A small static o-ring seal is fitted to a groove in the piston and is held in place by the shoulder of the rod. General procedures for teardown, inspection, and rebuild are contained in the General Procedures Maintenance Manual. See your Texas Hydraulics Sales Engineer if you have any questions.



## Teardown

After removing the piston, remove and discard the PRS static o-ring from the rod shoulder. Remove the AQ seal by means of blunt instruments of bronze or aluminum. Be sure there are no sharp edges on these tools. Be particularly careful of scratching the groove surface finish.

## Rebuild

Separate the three components of the seal assembly. For easiest installation, warm the teflon outer ring in 150 to 200°F hydraulic fluid or water. Lubricate the piston and all components with hydraulic fluid. Stretch the inner rubber expander into the seal groove. Do not use sharp edged tools and verify that it has not twisted. Likewise, stretch the teflon outer ring into the groove. Be extremely careful to avoid damaging the seal grooves during installation. Scratching the groove may cause by-pass leakage. The teflon ring will have a memory and may take as long as 24 hours to return to the correct size. This can be accelerated by pushing the piston/seal assembly through a honed or polished tube with an ID equal to the nominal cylinder bore to plus .010 inches. Clean the groove in the teflon ring and install the rubber quad ring. Verify that it has not twisted. Install the wearings into the wearing groove. If possible, allow the piston/seal assembly to sit at least one hour to allow the seals to elastically restore.

See the next page for information on the alternative style.

# Air Compressor Oil and Filter



## WARNING

**BEFORE attempting to operate or service this machine, read and understand the warnings and cautions listed in section 1.**

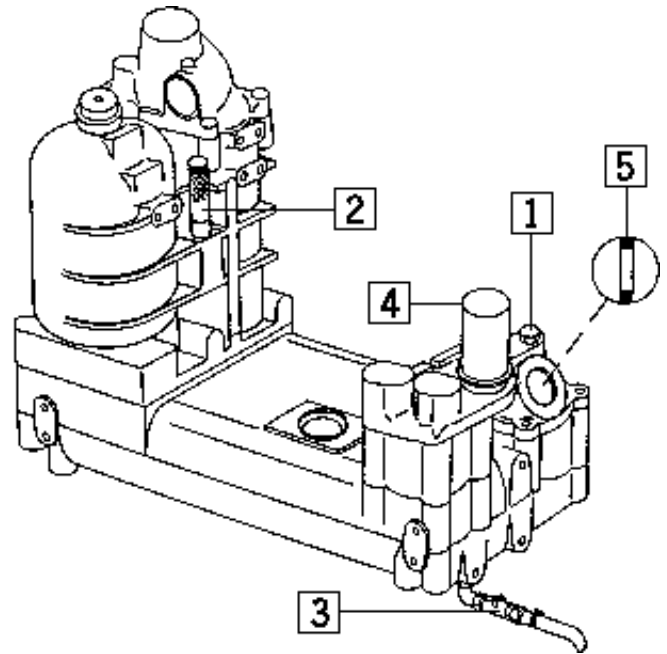
**SHUTDOWN machine and relieve pressure before attempting lubrication or service.**

**Allow compressor to cool down before starting any work.**



## CAUTION

**Use recommended oil type only; do not mix different oils. Dispose of waste oil according to local regulations regarding handling of waste oil.**



### Changing Oil Filter

1. Remove filter element with filter wrench. Have a cloth handy to catch any oil that may drain from filter. Clean mounting base and be sure old filter gasket is not stuck to base.
2. Lubricate sealing ring on new filter element with clean oil.
3. Screw on new filter element and tighten by hand only.

### Adding Oil

1. Shut down machine and relieve pressure. Unscrew the oil fill plug and open the safety valve by unscrewing the top portion (fig. 5-3). Add oil up to the top mark on the oil measuring rod. Factory fill is Chevron Tegra Synthetic Compressor Oil, ISO 68.
2. Replace oil fill plug and tighten.
3. Close the safety valve.

Fig. 5-3 Air Compressor (air end removed for clarity).

- |                  |                       |
|------------------|-----------------------|
| 1. Oil Fill Plug | 3. Oil Drain Valve    |
| 2. Safety Valve  | 4. Oil Filter Element |

### Changing Oil

1. Run the compressor until the oil temperature is 104°F to 122°F (40°C to 50°C).
2. Shutdown machine and relieve pressure. Unscrew the oil fill plug and open the safety valve by unscrewing the top portion. Open the drain valve or plug and let oil drain into a suitable container.

### NOTE

**Compressor sump oil capacity is 9.5 quarts (9 liters). This does not include oil required to fill the lines and oil cooler.**

3. Close drain valve or replace plug and add oil up to the top of the oil sump.
4. Replace oil fill plug and tighten.
5. Close the safety valve.

# Compressor Assembly

## Compressor Repair

Once the compressor assembly is removed from the machine, disassembly is a straightforward procedure. Use common sense and refer to the exploded view in fig. 5-9. The sub-assemblies of the air inlet valve and discharge valve are also simple procedures. Follow written instructions regarding repair and replacement of separator element and discharge valve.

Repair of the air end itself does require special tools. The tool kit is available from the manufacturer. Follow detailed repair instructions given for the air end. If the air end is worn out it, may be more economical to exchange the unit for a new or rebuilt air end.

## Air Inlet Valve Assembly

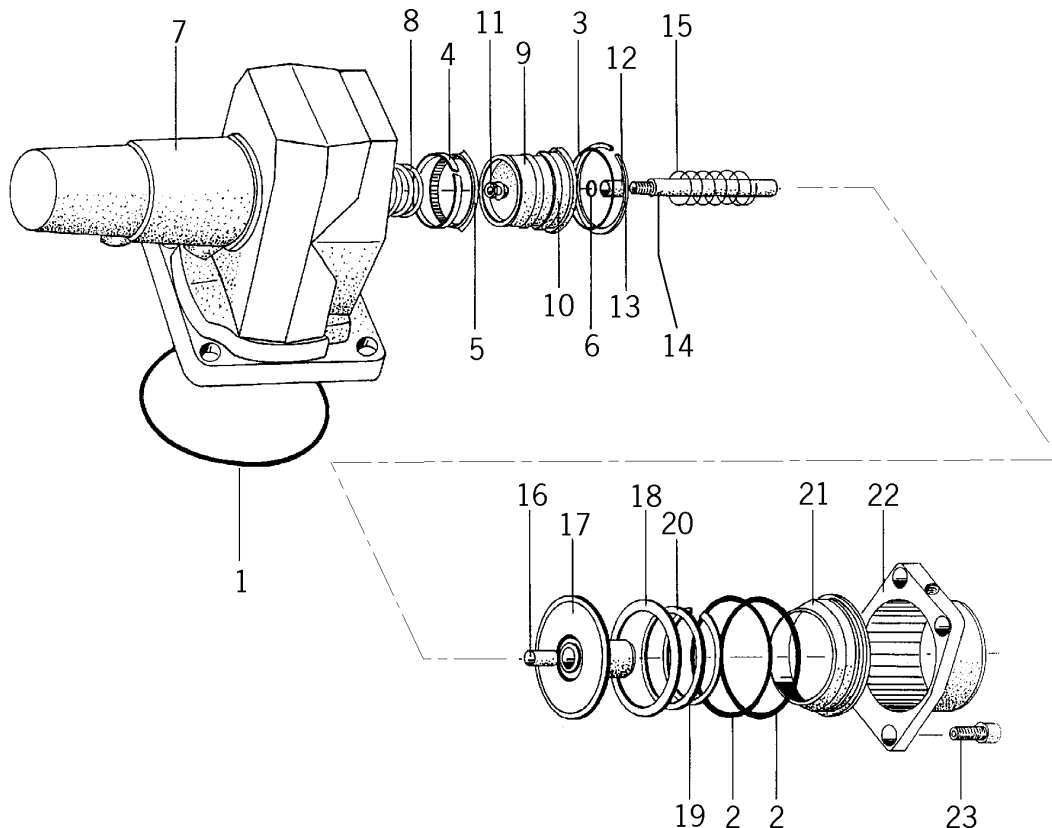


Fig. 5-10 Air Inlet Valve Assembly

- |                  |                     |                      |
|------------------|---------------------|----------------------|
| 1. O Ring        | 9. Piston           | 17. Plate            |
| 2. O Ring (2)    | 10. Cover           | 18. Gasket           |
| 3. O Ring        | 11. Nut             | 19. Stop Ring        |
| 4. Ring          | 12. Bearing Bushing | 20. Ring             |
| 5. Piston Gasket | 13. Lock Ring       | 21. Bushing          |
| 6. O Ring        | 14. Piston Rod      | 22. Flange           |
| 7. Frame         | 15. Spring          | 23. Hex Socket Screw |
| 8. Spring        | 16. Bearing Bushing |                      |

**Seal Kit No. V007941** includes items 1-6, 18,19.

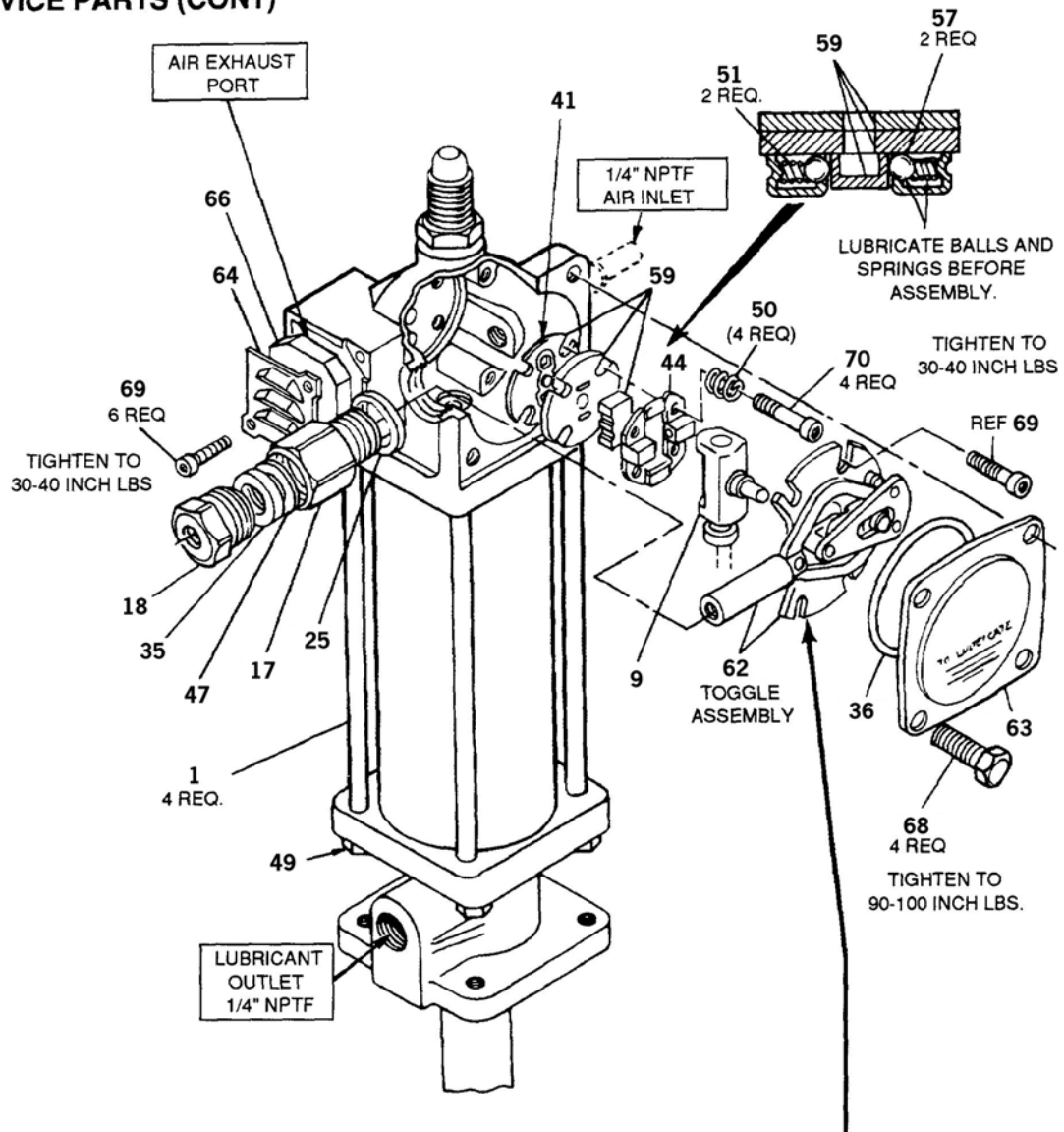
**Repair Kit No. V007942** includes items 1-6, 8, 10, 12, 15, 16, 18, 19.

## REPAIR KITS AND REPLACEMENT PARTS

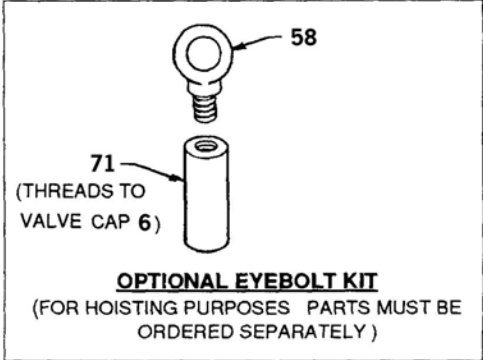
REFER TO PARTS MANUAL FOR SPECIFIC MACHINE.

- O-Ring Repair Kit (bowl, fill plug, adjusting screw and sight dome o-rings).....
- O-Ring Kit for Adjusting Screw (10 per kit) .....
- Bowl O-Ring Kit.....
- Bowl Guard (includes plastic ring) .....
- Siphon Tube Assembly Kit .....
- Sight Dome Kit.....
- Fill plug kit.....
- Flow-Guide® (1/4" models) .....
- Flow-Guide® (3/8" models) .....
- Plastic Bowl-no drain .....
- Transparent Plastic Bowl Kits:
  - with plastic petcock .....
  - with bowl guard, plastic petcock .....
- Plastic Petcock Kit .....
- Metal Bowl Kit with Petcock and Sight Gauge .....
- Check Ball and O-ring Kit .....

**SERVICE PARTS (CONT)**



**IMPORTANT**  
START FASTENERS BY HAND TO AVOID STRIPPING THREADS WHEN REASSEMBLING



- TO LUBRICATE AIR VALVE MECHANISM**
- DISCONNECT AIR TO PUMP
  - PERFORM PRESSURE RELIEF PROCEDURE.
  - REMOVE FOUR COVER SCREWS, COVER PLATE AND COVER PLATE GASKET.
  - REMOVE AIR VALVE CASTING FROM THE PUMP AND DISASSEMBLE
  - CLEAN OR FLUSH THE AIR VALVE CASTING TO REMOVE ANY CHIPS OR OTHER FOREIGN PARTICLES.
  - BEFORE REPLACING TOGGLE ASSEMBLY, PACK CAVITY WITH GREASE USING APPROXIMATELY 1-1/2 OUNCES OF N L G 1 NO 1 (LIGHT GRADE) WATER REPELLENT GREASE
  - REPLACE COVER PLATE GASKET, COVER PLATE AND COVER SCREWS TIGHTEN TO PREVENT AIR LEAKS.
  - PERIODIC INSPECTION OF PARTS AT LEAST ONCE A YEAR IS ADVISED

# Boom Swing Cylinder

## Boom Swing Cylinder - Replace

1. Clean and inspect all pins and bushings for wear or damage, replace if necessary. Apply a thin coat of grease to pins and bushings before installing.

### NOTE

When inspecting, pay close attention to cylinder eyes, pins and clevises for cracks or damage caused by accidents or overloading.

2. Raise the boom swing cylinder into place. Be sure grease fitting at rod end faces out. Align base end of cylinder with rear mounting bracket. Install the pin and pin retainer.
3. Clean and install the hose adapters on the cylinder. Be sure bleed screws marked "TE" and "TR" are tightened.
4. Uncap the hose ends and connect the hoses to the cylinder.



### WARNING

**DO NOT engage any other control levers, except for the cylinder you are working on. Serious injury or equipment damage could result.**

## Cylinder Bleeding Procedure and Final Installation

1. With the engine and hydraulic system operating, use the boom swing control lever to extend the cylinder to its fully extended position.
2. Remove the hose at the "R" (retract) port to bleed air, place hose end in a container to catch oil. Actuate the boom swing lever *as if* to retract the cylinder. When clear oil (no air bubbles) is observed coming out of the hose, return valve to neutral position, connect hose to cylinder and tighten fitting.
3. Retract cylinder to its fully retracted position.
4. Remove the hose at the "E" (extend) port to bleed air, place hose end in a container to catch oil. Actuate the boom swing lever *as if* to extend the cylinder. When clear oil (no air bubbles) is observed coming out of hose, return valve to neutral position, connect hose to cylinder and tighten fitting.
5. Extend cylinder to line up rod end with clevis on boom and install pin and retainer.
6. Lubricate the pivot points with grease.

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# Boom Shim/Wear Pad Replacement

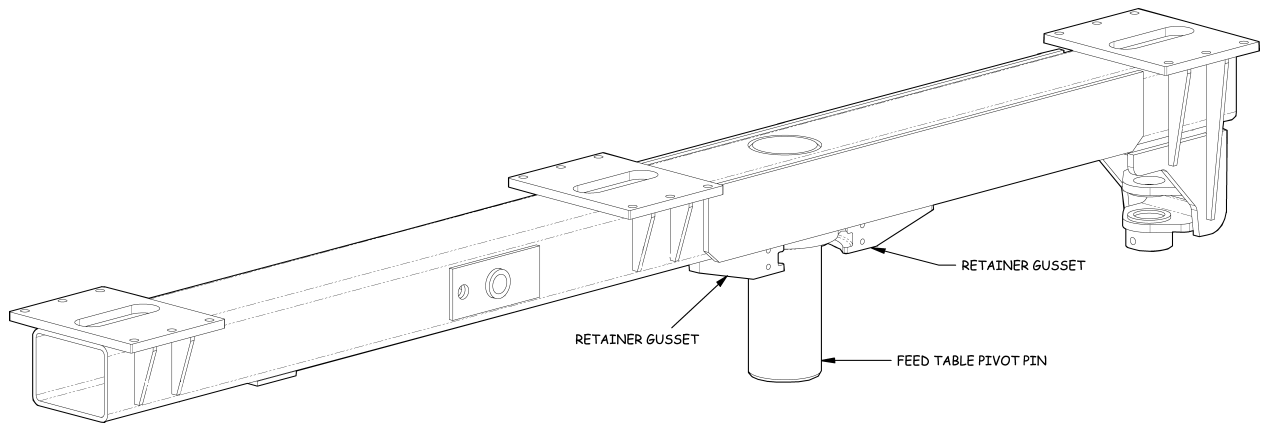


Fig. 6-8a Feed Table with Retainer Gusset (inline style shown, offset similar)

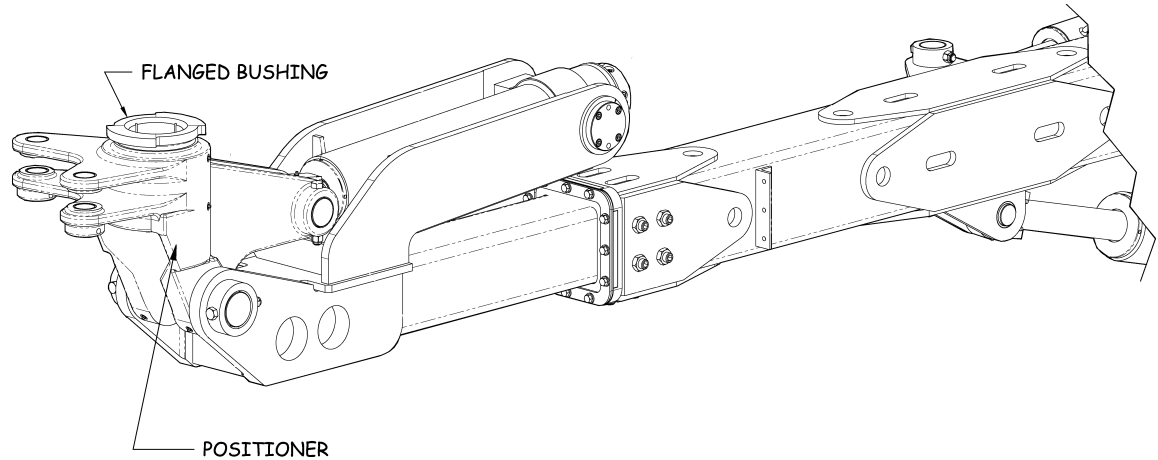


Fig. 6-8b Positioner with Flanged Bushing

## Feed and Inner Boom Tube - Removal (continued)

### NOTE

The feed table is designed with a gusset in front and in back of the feed table pin (fig. 6-8a). The positioner has a flanged bushing (fig. 6-8b). The feed table **MUST BE** turned perpendicular to the boom for the gussets to fit into the notches of the flanged bushing. When it is turned 90 degrees or parallel to the boom, it is locked into position.

7. Carefully rotate the feed until it is perpendicular with the boom and then lift up until feed pin is clear of positioner bushing. Check to make sure no hoses are being stretched. Lay feed on ground.

# HPR3818 (HPR1H-ATW) Drill/Mounting Slide

## Drill - Removal

1. Remove drill steel and place the feed in a horizontal position.
2. Shutdown the engine.
3. Tag and remove hoses connected to the drill (see fig. 6-19).
4. Attach two lifting straps to drill and using a 1/2 ton hoist, put a slight amount of tension on the drill. Remove the drill mounting bolts (fig. 6-20) and lift the drill free of the mounting slide.

### NOTE

If drill is being removed for repair, loosen the side rod nuts while it is still bolted to the mounting slide. This is much easier than trying to loosen them on the work bench.

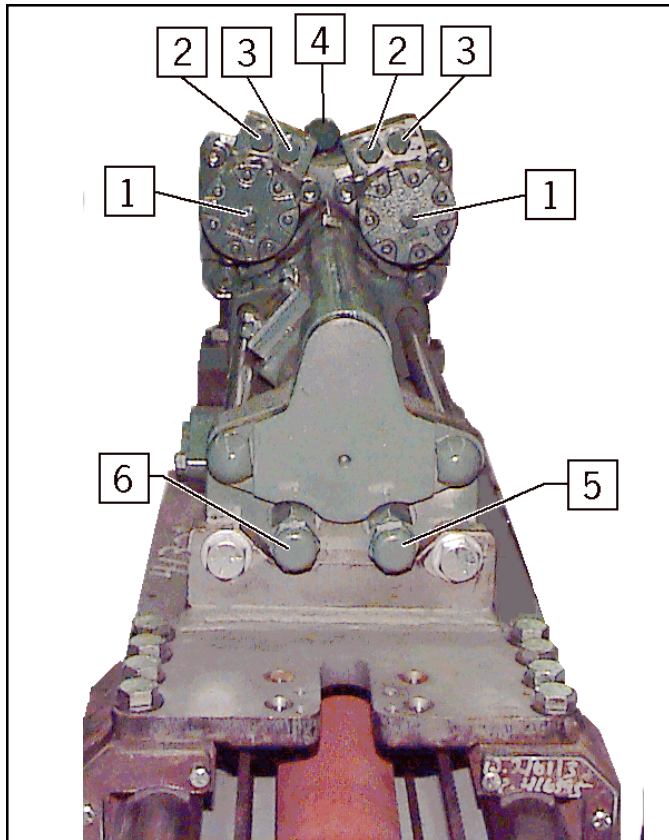


Fig. 6-19 HPR3818 (HPR1H-ATW) Drill Hose Connections

1. Rotation Motor Case Drain
2. Forward Rotation (counterclockwise, viewed from rear)
3. Reverse Rotation (clockwise, viewed from rear)
4. Air/Water Connection at water swivel
5. Drill Return (out)
6. Drill Pressure (in)

## Drill - Installation

1. Raise the drill into position using a 1/2 ton hoist and two lifting straps.
2. Install the four mounting bolts and two swivel bolts, hand tight only (fig. 6-20). Keep some tension on the drill with the lifting straps until mounting bolts are tightened.
3. Tighten the two horizontal mounting bolts at rear of the drill first. Torque to 220 ft. lbs. (300 Nm).
4. Tighten the two horizontal swivel bolts at the front of the drill.
5. Tighten the two vertical mounting bolts at front of drill. Torque to 320 ft. lbs. (435 Nm).
6. Clean and install the hoses to the drill.
7. Charge the accumulators (if necessary). Refer to drill service manual.

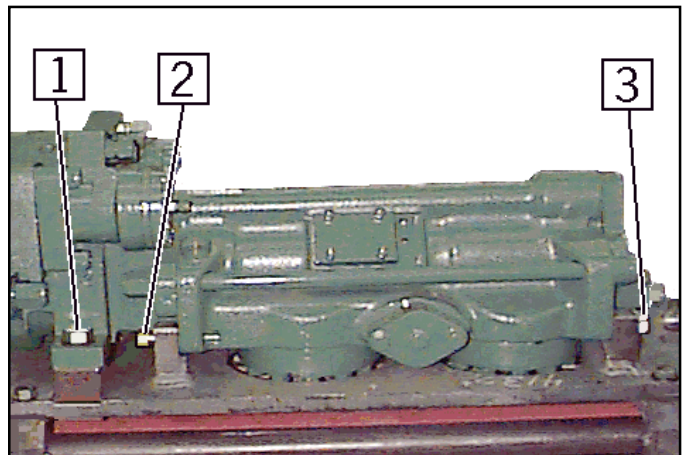


Fig. 6-20 HPR3818 (HPR1H-ATW) Drill Mounting Bolts

1. Vertical Mounting Bolts (2), torque to 320 ft. lbs. (435 Nm)
2. Horizontal Swivel Bolts (2)
3. Horizontal Mounting Bolts (2), torque to 220 ft. lbs. (300 Nm)

## To Pivot Drill

If work needs to be done on the accumulators, the drill can be pivoted to one side to access the accumulators. **DISCHARGE NITROGEN from accumulators before performing any work on them.**

1. Remove the two vertical mounting bolts (1).
2. Remove one horizontal mounting bolt (3) and loosen the other one.
3. Remove one swivel bolt (2).
4. Pivot drill 90 degrees and tighten bolts.

# Feed Swing Cylinder

## Feed Swing Cylinder - Replace

1. Clean and inspect clevis pins and bushings, replace any worn or damaged parts. Apply a light coat of grease to bushings and pins.

### NOTE

When inspecting, pay close attention to cylinder eyes, pins and clevises for cracks or damage caused by accidents or overloading.

2. Raise the feed swing cylinder into place (rod end toward feed pivot). Align the base end of the cylinder with the mounting bracket. Install pin and retainer. Be sure bleed screws marked "TE" and "TR" are tightened.
3. Clean and install the hose adapters on the cylinder.
4. Uncap the hose ends and connect the hoses to the cylinder.



### WARNING

**DO NOT engage any other control levers, except for the cylinder you are working on. Serious injury or equipment damage could result.**

## Cylinder Bleeding Procedure and Final Installation:

1. With the engine and hydraulic system operating, use the feed swing control lever to extend the cylinder to its fully extended position.
2. Remove the hose at the "R" (retract) port to bleed air, place hose end in a container to catch oil. Actuate the feed swing lever as if to retract the cylinder. When clear oil (no air bubbles) is observed coming out of the hose, return valve to neutral position, connect hose to cylinder and tighten fitting.
3. Retract cylinder to its fully retracted position.
4. Remove the hose at the "E" (extend) port to bleed air, place hose end in a container to catch oil. Actuate the feed swing lever as if to extend the cylinder. When clear oil (no air bubbles) is observed coming out of the hose, return valve to neutral position, connect hose to cylinder and tighten fitting.
5. Extend cylinder to line up rod end with clevis on positioner and install pin and retainer.
6. Lubricate the pivot points with grease.

# Boom Shim/Wear Pad Replacement

## Feed Table Installation

1. Clean the surfaces of the feed mounting pin and the bushing in the positioner and apply a coating of grease to the cleaned surfaces.
2. Position the feed over the positioner with an overhead crane. Feed must be perpendicular to boom so the retainer gussets on the feed table align with the slots in the flanged bushing in the positioner (fig's 6-8a & 6-8b). Carefully guide the feed mounting pin into the positioner. When the feed table gussets are below the flange on the bushing, turn the feed table so it is parallel with the boom.



### WARNING

**DO NOT remove lifting straps from feed until feed swing cylinder is attached to the positioner. If feed swing cylinder is not attached, the feed is free to pivot which could cause equipment damage, injury or death.**

**DO NOT raise feed to vertical position until feed mounting pin retaining cap and capscrews have been installed and tightened.**

3. Connect the feed swing cylinder rod end to the positioner and install the pin (33), capscrew (22), and lock nut (2).
4. Install the feed mounting pin retainer cap (11) along with the same amount of shims (41) that were removed. Install the six capscrews (13) and spring washers (12). Torque capscrews to 282 ft. lbs. (384 Nm). Check gap between cap (11) and positioner casting. There should be a clearance of 0.005 to 0.015 in. (0.13mm to 0.38mm). Refer to fig. 6-13. If not add or subtract shims until the correct gap is obtained.
5. Start machine and check for leaks and that all functions operate correctly.

Fig. 6-12b Feed Table - Inline shown (ref. 425956)

- |                         |                             |
|-------------------------|-----------------------------|
| 1. Weldment, Feed Table | 22. Capscrew, Hex           |
| 2. Nut, Flexloc (8)     | 28. Pad, Wear, Inner (4)    |
| 6. Nut, Flexloc (12)    | 29. Shim, 24 ga. (4)        |
| 7. Washer, Flat (6)     | 30. Shim, 16 ga. (4)        |
| 8. Cylinder, Swing      | 31. Shim, 10 ga. (8)        |
| 11. Cap, Retaining      | 32. Pad, Wear (4)           |
| 12. Washer, Spring (6)  | 33. Pin                     |
| 13. Capscrew, Hex (6)   | 41. Shim Set, .015" & .024" |
| 21. Capscrew, Hex (12)  | 42. Spacer (12)             |

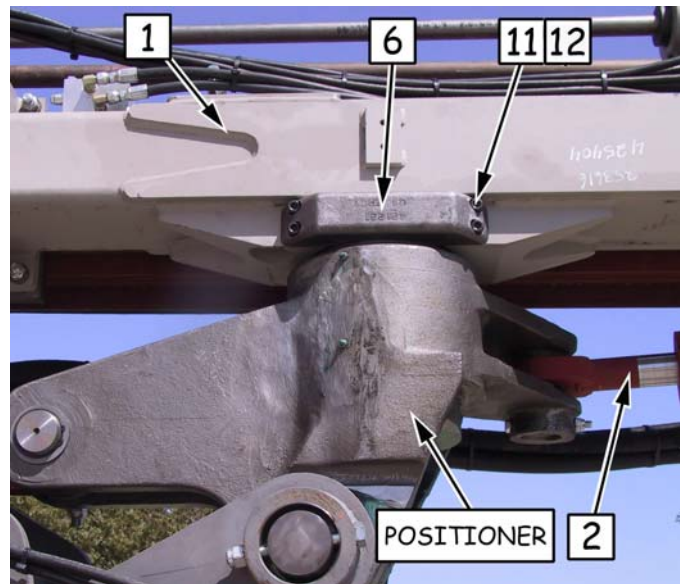
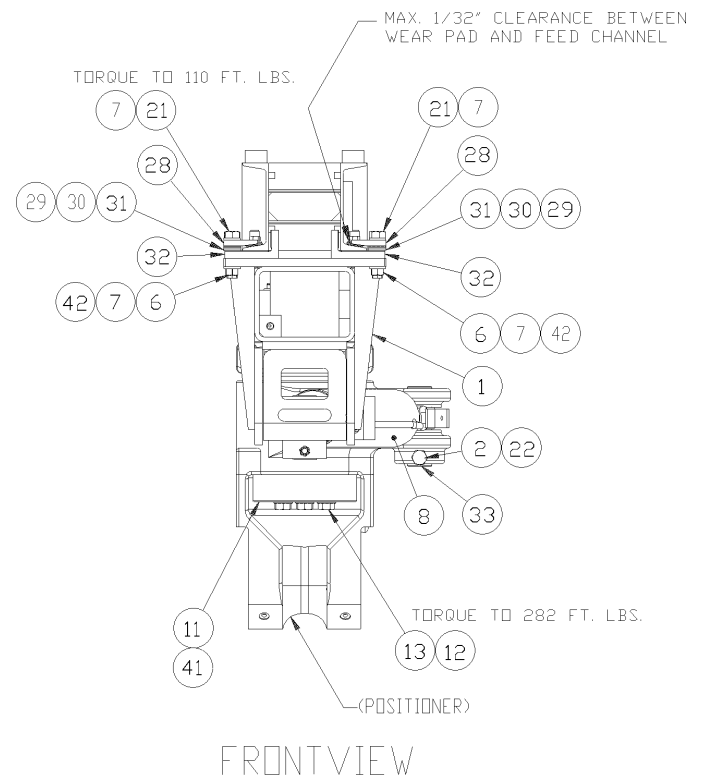


Fig. 6-12a Feed Table with Offset Feed

- |                        |                            |
|------------------------|----------------------------|
| 1. Feed Table          | 11. Lock Washer (8)        |
| 2. Feed Swing Cylinder | 12. Capscrew, soc. hd. (8) |
| 6. Retaining Cap (2)   |                            |



# Feed Chain Adjustment

The feed chain requires periodic adjustment. It is better if the chain is too loose than too tight. If the chain is too tight it will place added stress on the chain rollers and sprocket bearings as well as hindering feed force.

## Feed Chain Tension - Offset Feed

With feed in horizontal position and drill raised to top of feed, measure chain sag at lowest point (fig 6-18). Measure distance from lower edge of chain to inside edge of feed channel (distance "A") and upper edge of chain to inside edge of feed channel (distance "B"). The difference should be in the range of 3/8 to 1/2 in. (9.5 to 12.7 mm), if not, you will need to adjust the chain using the procedure listed under "adjustment".

## Feed Chain Tension - Inline Feed

With feed in horizontal position and drill raised to top of feed, measure chain sag at lowest point. Sag should be in the range of 3/8 to 1/2 in. (9.5 to 12.7 mm) below the bottom of the feed channel (fig 6-18), if not, you will need to adjust the chain using the procedure listed under "adjustment".

## Adjustment

With feed in the horizontal position and drill raised to top of feed. Loosen jam nuts and turn adjusting nut in (clockwise) to tighten or out (counterclockwise) to loosen chain tension. When correct chain tension is achieved, tighten the jam nuts (fig. 6-19).

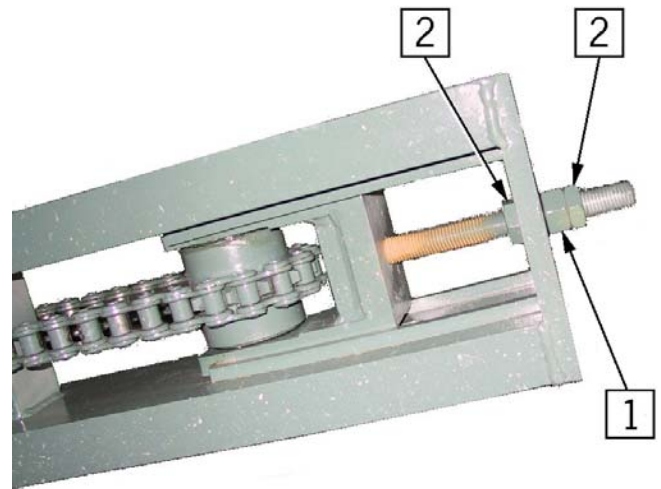
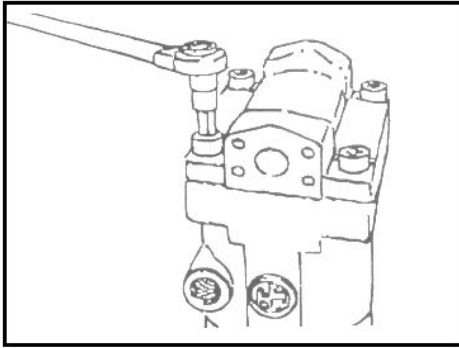
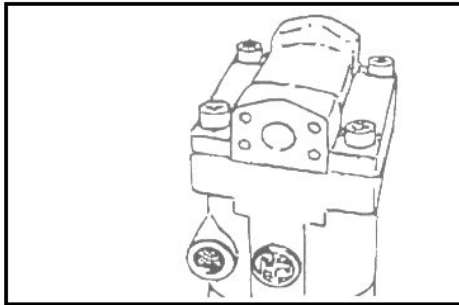


Fig. 6-19 Feed adjustment  
1.Adjusting Nut  
2.Jam Nuts

# Feed Drive Motor

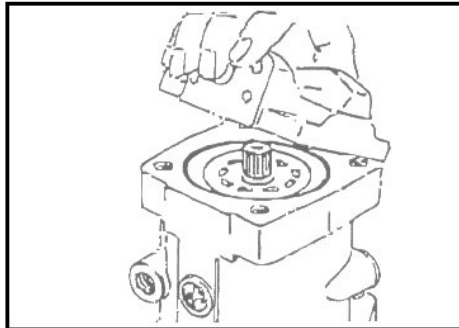


11. Grease new o-ring and set into groove. Assemble in reverse order. See torque chart at end of manual.

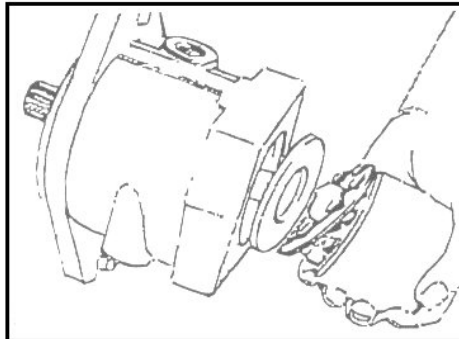


## Rotary Group - Removal

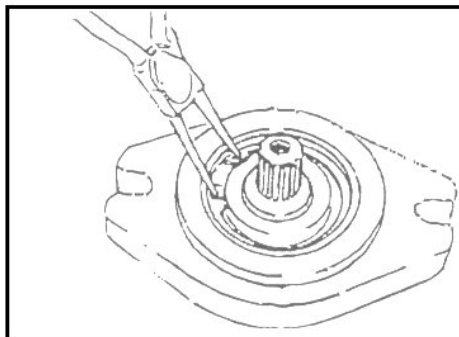
12. Disassembly and assembly position.



13. Remove connection plate.

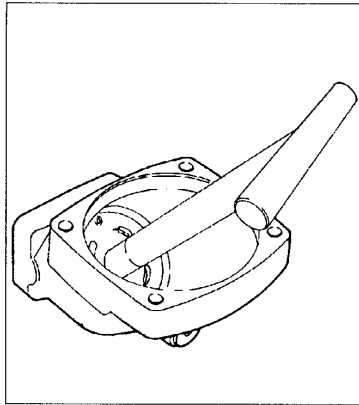


14. Turn housing over. Remove the cylinder block, retaining device and bearing plate.



15. Remove retaining ring.

# Feed Drive Motor

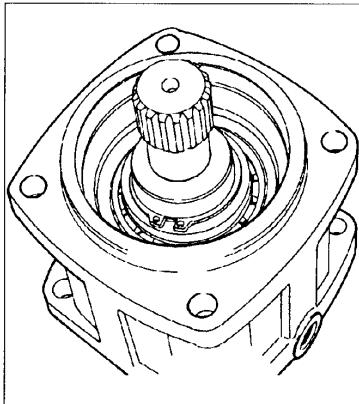


## Disassembly

For easier disassembly, the valve plate has a thread in the center. Use the special tool to pull it out.

F12	Thread	Tool
30	M24x1.5	3793077
40	M24x1.5	3793077
60	M24x1.5	3793077
80	M30x1.5	3793078

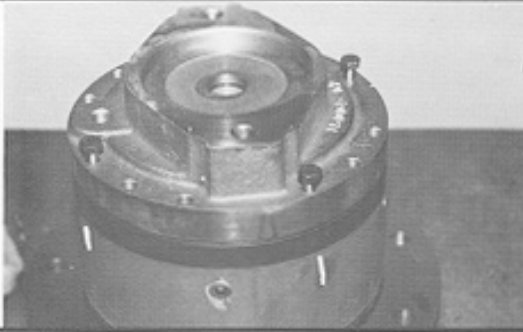
Thread specifications



## Assembly

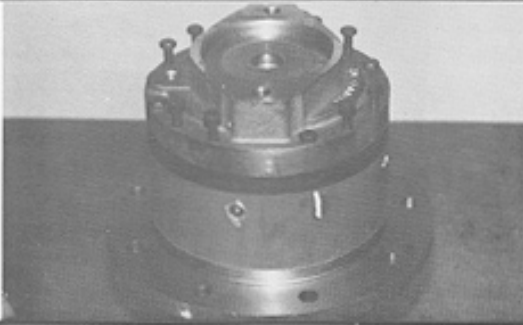
Push the shaft into the bearings in the housing. Use as many washers as needed to ensure that there is no play between the retaining ring and the bearings when the retaining ring sits in its groove on the shaft.

# Gear Reducer



12. The Cover (6) is now installed on this assembly. Taking care to correctly align Pipe Plug hole (20) with those in the Hub (1J), usually 90° to one another.

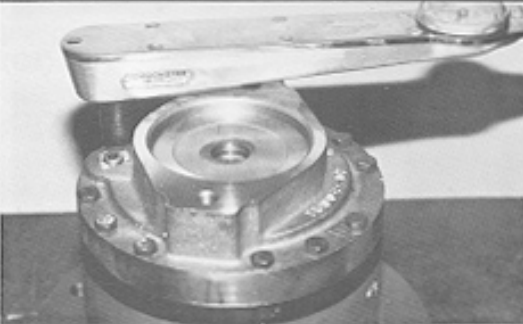
Locate the 4 counterbore holes in Hub (1G) [marked in Step 3] and install 4 Shoulder Bolts (13). A slight tap with a hammer may be necessary to align Shoulder Bolt with Hub (1G) counterbore.



13. Install regular Grade 8 Bolts (12) into remaining holes.



14. Pipe Plugs (20) are to be installed into Cover (6) using a lubricant seal of some sort.



15. Torque Shoulder Bolts (13) to 23-27 ft.-lbs. and regular Grade 8 Bolts (12) to 23-27 ft.-lbs.

This completes the assembly. The unit must be filled one-half full of EP 90 lubricant before operation if the unit is mounted horizontally, and completely filled if mounted vertically. In vertical mounting application case oil circulation is recommended.

# Main Hydraulic Pump



## WARNING

**RELIEVE all pressure before attempting service or maintenance procedures to this machine.**

**RELIEVE pressure in both hydraulic and pneumatic systems before loosening any connections or parts.**

## Standby Pressure

1. Install a 5000 PSI (345 bar) hydraulic pressure gauge in the construction port of the main pump (item 3, fig. 7-1).
2. Start machine and let it warm up for a few minutes until fluid temperatures have stabilized.
3. Place drill/tram switch in TRAM position and set standby pressure to 350 PSI (24 bar) using the upper adjustment screw (item 5, fig. 7-2).

## Main System Pressure

1. Place drill/tram switch in DRILL position and set main pressure to 3000 PSI (207 bar) using the lower adjustment screw (item 6, fig. 7-2).
2. Shut down machine, remove gauge from pump and install plug.
3. Be sure lock nuts on compensator adjustment screws are tight.

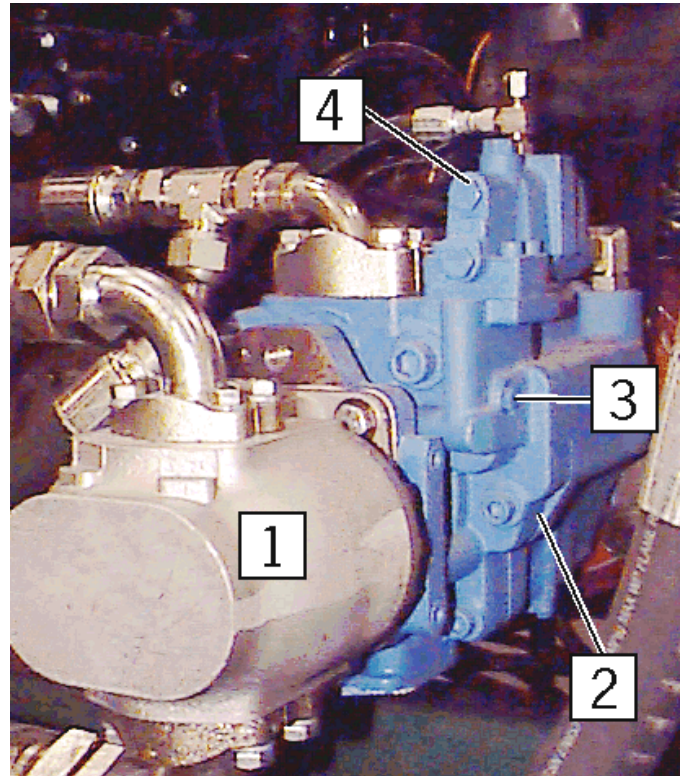


Fig. 7-1 Main Hydraulic Pump

- |                        |                              |
|------------------------|------------------------------|
| 1. Charge Pump         | 3. Construction Port (gauge) |
| 2. Main Hydraulic Pump | 4. Pump Compensator          |

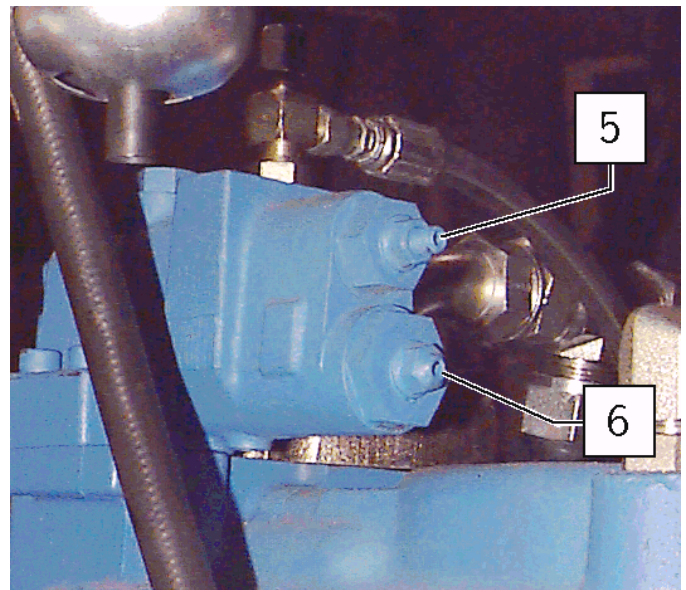


Fig. 7-2 Pump Compensator

- |                                    |
|------------------------------------|
| 5. Standby Pressure Adjustment     |
| 6. Main System Pressure Adjustment |

# Dust Collector Assembly

## Installation:

1. Make sure both ends of tubing are open to atmosphere. Connect one end of manometer ("X") to lower test port (fig. 7-13) on dust collector, leave other end ("Y") free for reading fan speed. Connect both ends of manometer to upper and lower test ports to read pressure drop across filters.
2. Mount manometer to dust collector as shown in fig. 7-13.
3. Slide scale so zero mark of scale is in line with water level (fig. 7-12).

## Reading:

1. With manometer installed per instructions and dust collector running with dust collector hose connected to precleaner and pickup pot (pickup pot must be at least 6" above the ground) you are observing the vacuum produced by the air flow in inches of water.
2. One column will travel up and the other column will go down a like amount.
3. To measure the vacuum in inches, measure the distance "A" between column "X" and column "Y" (fig. 7-12). Set dust collector fan speed so manometer reading is 17 - 18 in. (43-46 cm) of water. See "Setting Fan Speed" on following pages.
4. After reading is taken, close the connectors, which seals the tube and no fluid will lost.
5. Connect jumper tube to test ports on dust collector to seal out dirt.

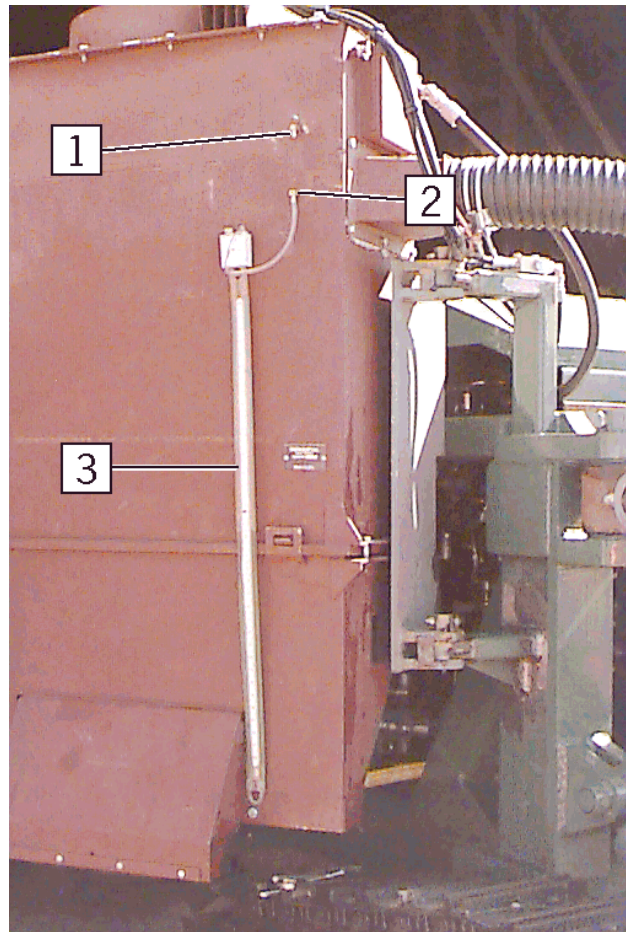


Fig. 7-13 Manometer Installation - for fan speed test

1. Upper Port
2. Lower Port
3. Manometer

## Checking Filter Condition

1. Connect manometer to upper and lower test ports and begin drilling in normal manner.
2. The reading you get will be the pressure drop across the filters. If the reading is more than 4 in. (10 cm) of water, the filters are contaminated to the extent that air flow is being restricted.
3. To correct this, shorten the time interval between air pulses by adjusting the STEP control on the timer. You should see the manometer reading go down. If the reading is below 2-1/2 in. (6 cm) of water, the filters are not restricting air flow.

# Air Regulator/Lubricator (drill lubrication)

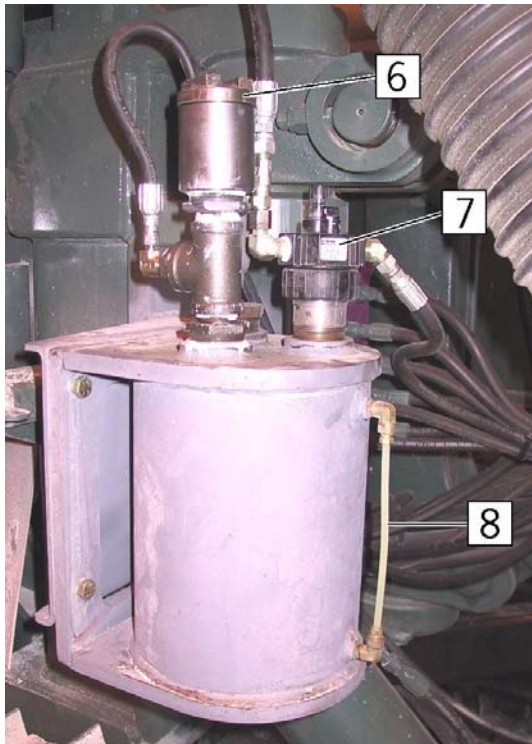


Fig. 7-21 Drill Lubricator Assembly  
 6. Oil Fill Cap  
 7. Oil Mist Lubricator (see fig. 7-22)  
 8. Oil Sight Gauge

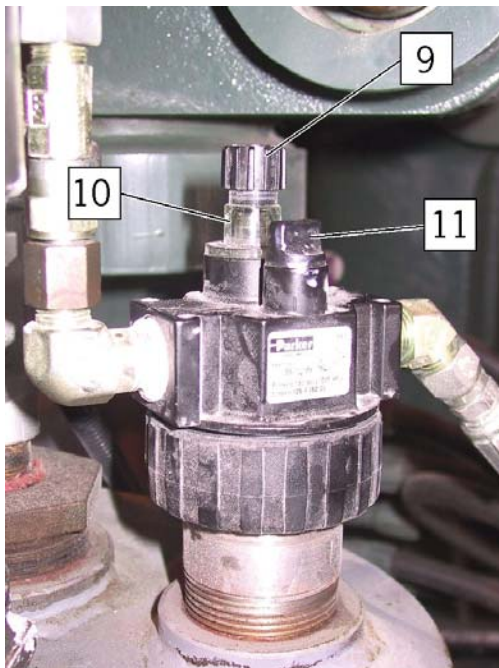


Fig. 7-22 Oil Mist Lubricator  
 9. Oil Flow Adjustment  
 10. Sight Dome  
 11. Fill Plug (do not use)

## WARNING

**RELIEVE all pressure before attempting service or maintenance procedures to this machine.**

**RELIEVE pressure in both hydraulic and pneumatic systems before loosening any connections or parts.**

## Operation

1. Be sure all settings are correct and lubricator is full of oil. See Daily Checklist.
2. Oiler operation is automatic. When the TRAM/DRILL control switch is moved to DRILL, the green lubricator light will come ON (item 12, fig. 7-23). Light is located at upper right hand corner of drill control panel.

## CAUTION:

**STOP DRILLING if green light goes OFF. Oil level is low. Refill reservoir before continuing to drill.**

3. When green light is ON, drill is receiving oil. If green light goes OFF, oil level is low. Stop drilling, shut down machine and relieve air pressure. Fill oiler before continuing to drill.



Fig. 7-23 Drill Control Panel  
 12. Drill Lubricator Light

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# Section 2

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## General Maintenance

# Troubleshooting

TROUBLESHOOTING			
PROBLEM	CAUSE	REMEDY	
4.	Rotation becomes erratic or slows down.	Feed pressure too high (overfeeding). Drill rod coupling will get hot and start to smoke if you are overfeeding.	Adjust feed pressure according to ground conditions. In very bad ground it may be desirable to drill in the "collaring mode" (reduced feed and hammer pressure). Check function of feed override valve to assure that the feed is not operating in override range.
		Rotation binding or locking up.	Check drifter for adequate lubrication.
		Rotation pump badly worn.	Check pump case flow. Replace pump as indicated.
		Rotation valve compensator malfunctioning (single pump unit only).	Check compensator for sticking spool, bad relief poppet and seal or broken springs.
5.	Rotation stops suddenly.	Broken shank.	Check for broken shank in front of splines or in flushing swivel area.
		Splines in chuck worn out.	Replace chuck and shank bearing.
		Rotation motor failure.	Repair or replace motor.
		Rotation pump failure.	Check pump for pressure and flow. Replace as required.

# Special Tools

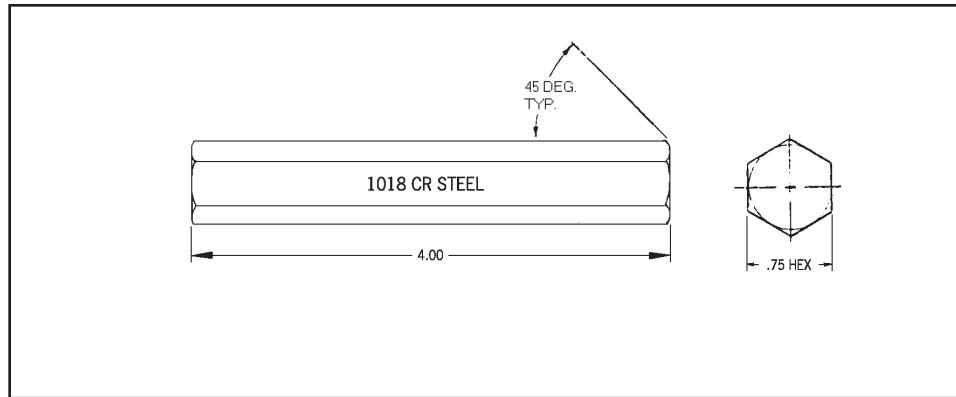


Fig. 4-4 Hex Bar (1416210)–Used to remove and install accumulator bolts.

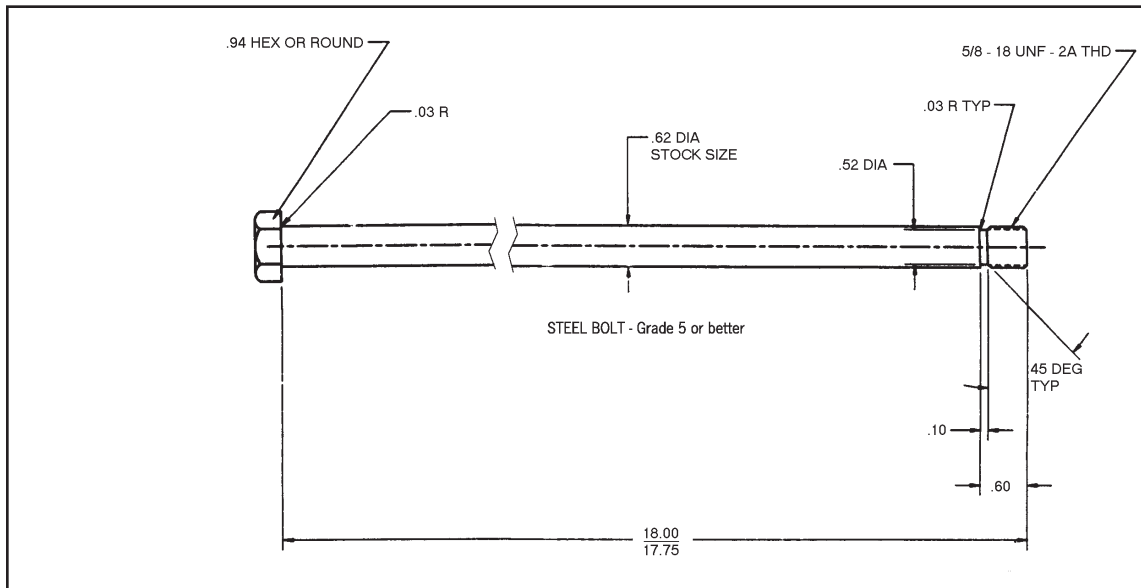


Fig. 4-5 Puller (1421459)–Used with hammer 1421460.

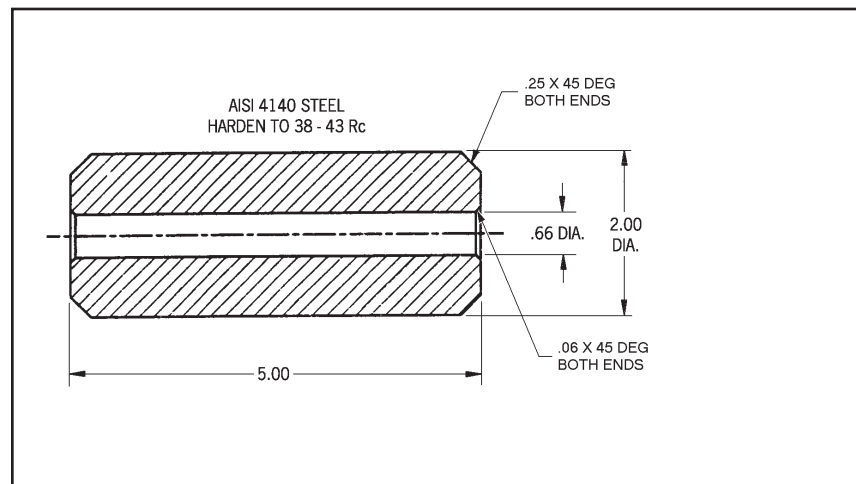


Fig. 4-6 Hammer (1421460)–Used with puller 1421459.

# Drill Disassembly

## General Information

The drill is made up of three basic sections (fig. 4-9). From front to back they are:

- **The Water Swivel**

The swivel contains a bushing to guide the front of the shank as well as seals to direct the water into the shank and to the bit.

- **The Rotation Housing**

The rotation mechanism is made up of the chuck driver assembly, rotation motor and the bearings and bushings to support the drive components.

- **The Cylinder/Backhead Area**

The cylinder/backhead area contains the hammer and hammer bearings, the automatic valve components and the high and low pressure accumulators. The cylinder is closed at the back by the backhead.

**NOTE** For complete disassembly of the drill, discharge the accumulators first. See Section 6 for procedure.

## Water Swivel Assembly–Removal

1. Using a 1 7/16 and 1 1/2 wrench, remove the four locknuts (32), spring washers (33) and capscrews (31) that retain the water swivel.
2. Remove the swivel assembly (1).
3. Remove the shank and thrust plate (8).

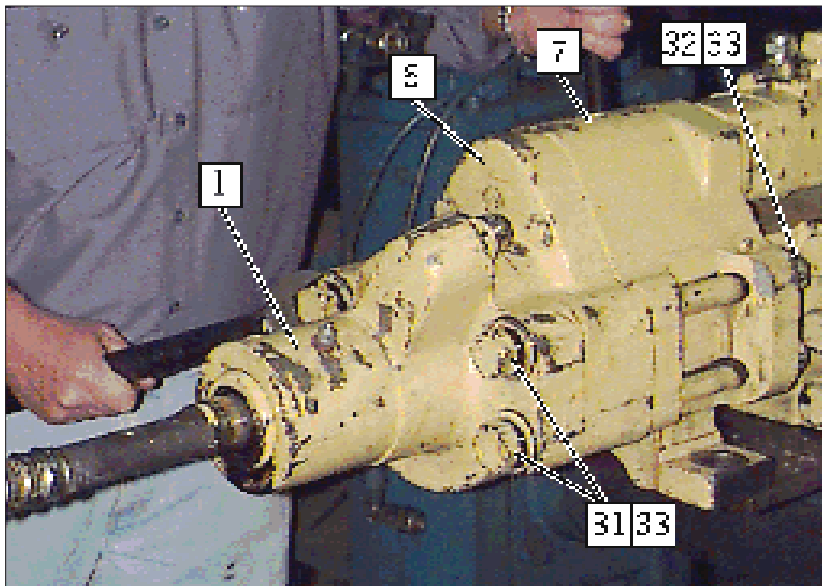


Fig. 4-10 Water Swivel Housing

- |                         |                       |
|-------------------------|-----------------------|
| 1. Water Swivel Housing | 31. Capscrew (4)      |
| 6. Chuck End Cover      | 32. Locknut (4)       |
| 7. Rotation Housing     | 33. Spring Washer (8) |

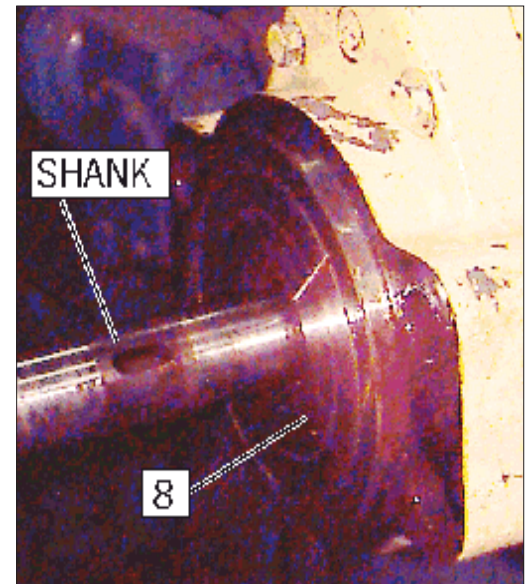


Fig. 4-10a Chuck End Cover  
8. Thrust Plate

# Drill Disassembly



**ALWAYS** discharge pressure in accumulators **BEFORE** any work is performed on the accumulators.

## Drill Cylinder Components

The main components of the drill cylinder are shown in fig. 4-27. It is possible to perform service work on the hammer, shuttle valve or backhead without discharging the accumulators.

**DO NOT** remove the accumulator covers without discharging the nitrogen gas first. Do this by opening the high pressure valve (68) with an 11/16 wrench. The accumulator covers are held in place with four allen head capscrews at the outside corners. Use a 3/4 allen wrench to remove.

The complete accumulator assembly may be removed from the drill cylinder without discharging the accumulators. This is done by removing the eight hexhead capscrews, using a 1 1/8 socket wrench.

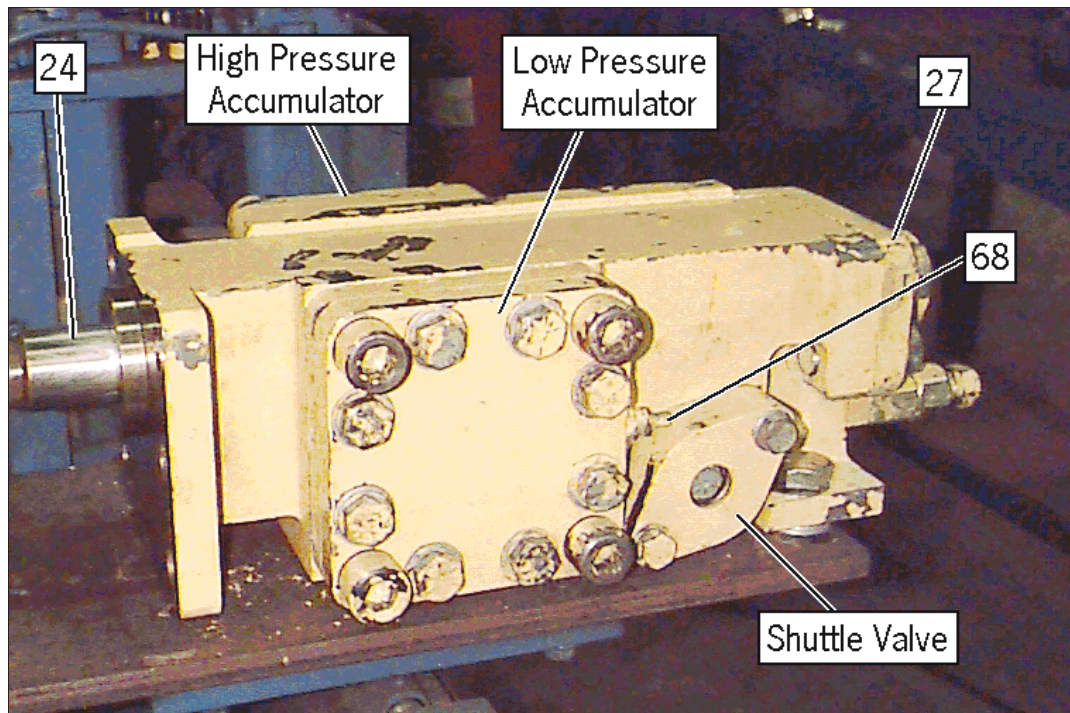


Fig. 4-27 Drill Cylinder Assembly

- 24. Hammer
- 27. Backhead
- 68. High Pressure Valve

# Drill Disassembly

## Accumulators—Disassembly and Inspection

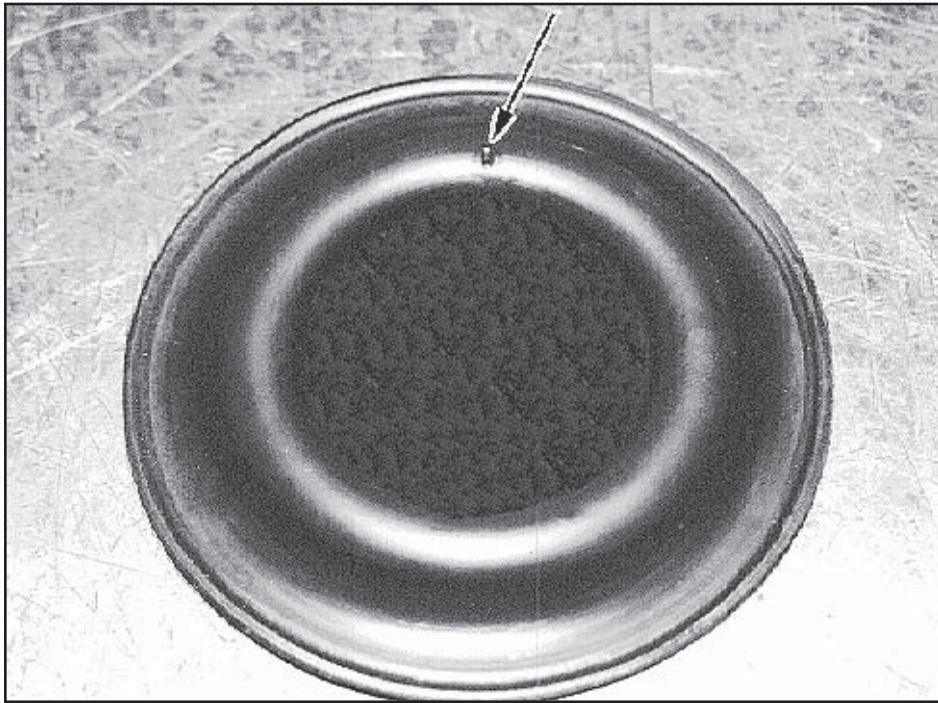


Fig. 4-39 Accumulator Diaphragm—note small hole at 12 o'clock position caused by undercharging or loss of charge pressure.

**NOTE**

Older model drills may have a metal plate in the center of the diaphragm.

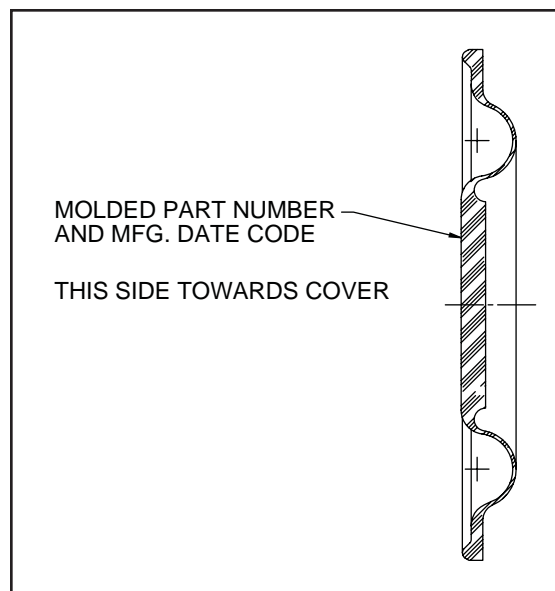


Fig. 4-40 Accumulator Diaphragm—Part Number and Manufacturing Date Code Towards the Cover Side

# Drill Assembly

2. Install o-ring (28) on front cylinder bushing (25). Lubricate o-ring and cylinder bore with hydraulic oil before installing bushing.
3. Lubricate inside of front cylinder bushing with hydraulic oil. Carefully install over hammer and into cylinder as far as it will go by hand, then drive in until shoulder is flush with cylinder, using a dead blow hammer.

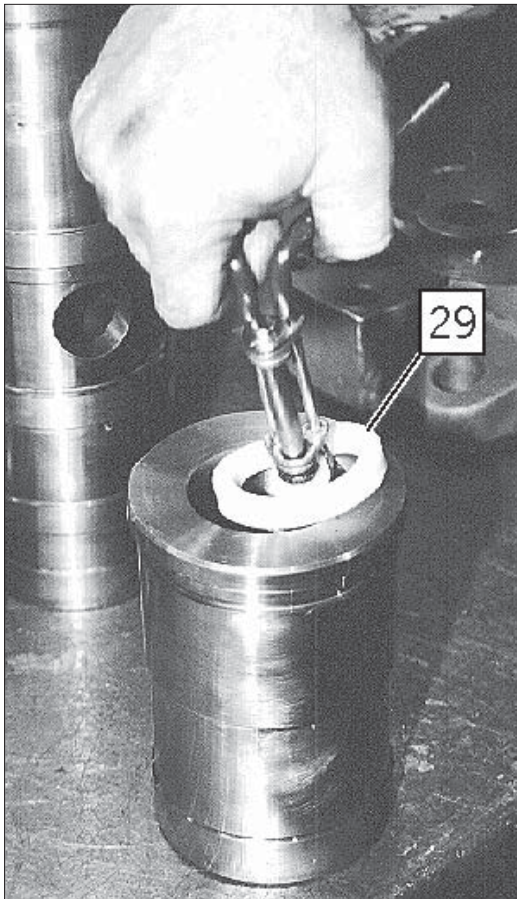


Fig. 5-7 Front Cylinder Bushing Seal installation  
29. U Cup Seal

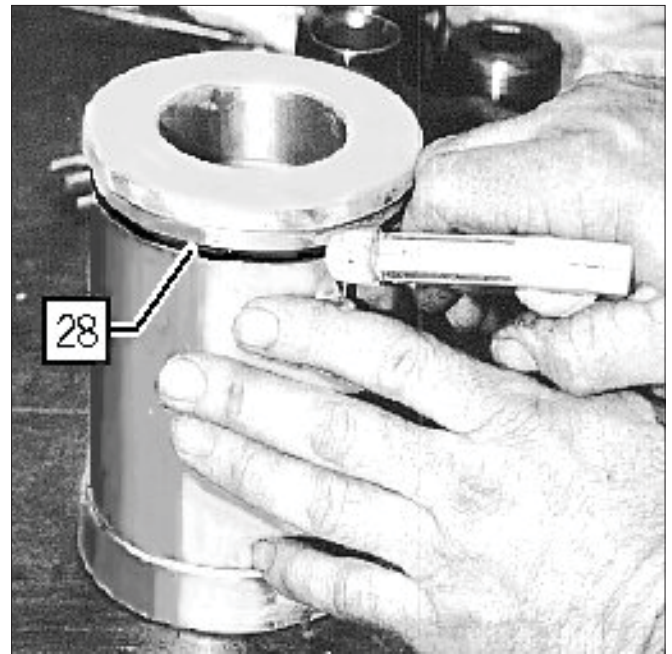


Fig. 5-8 Front Cylinder Bushing–O-Ring Installation  
28. O-Ring



Fig. 5-9 Front Cylinder Bushing–Installation

# Drill Assembly

## Rotation Housing–Assembly (cont.)

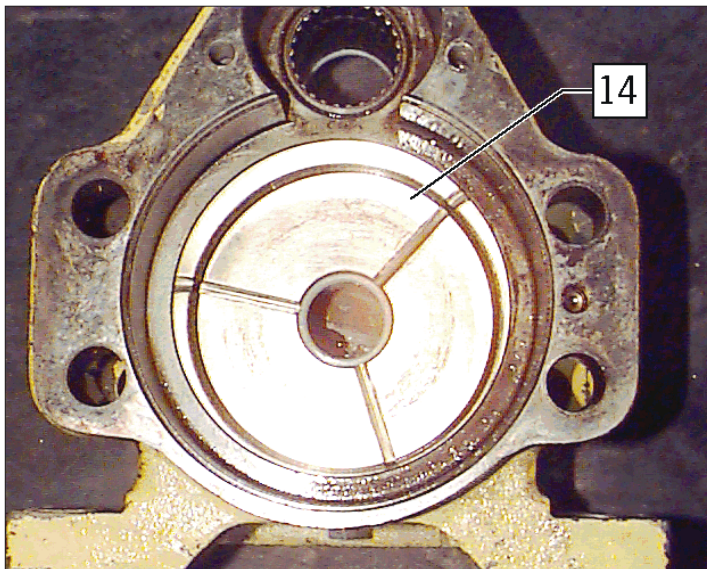


Fig. 5-28 Rotation Housing with Bearing Plate Installed  
14. Bearing Plate

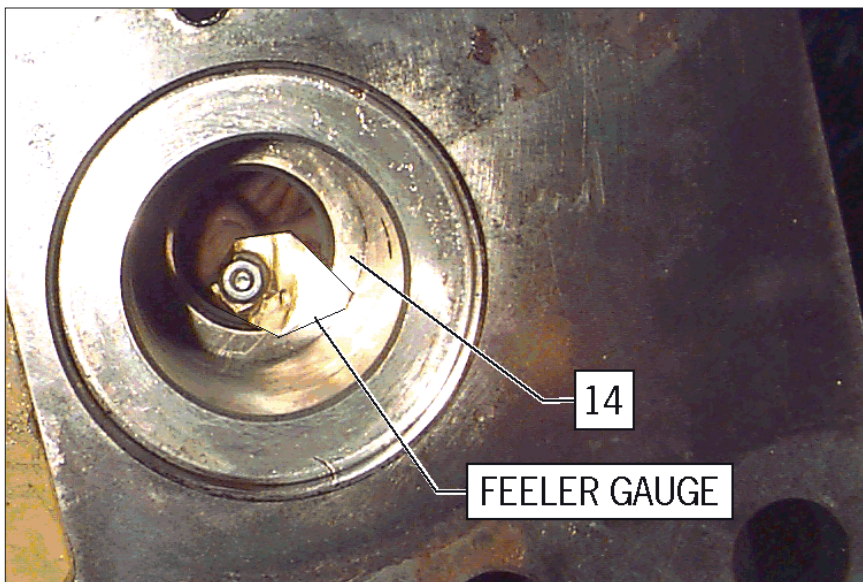
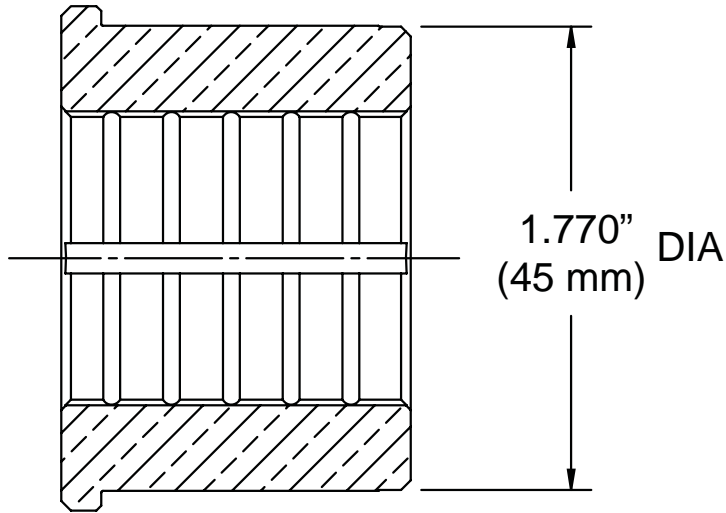


Fig. 5-28a Checking Bearing Plate Installation—viewed from back of rotation housing.  
14. Bearing Plate

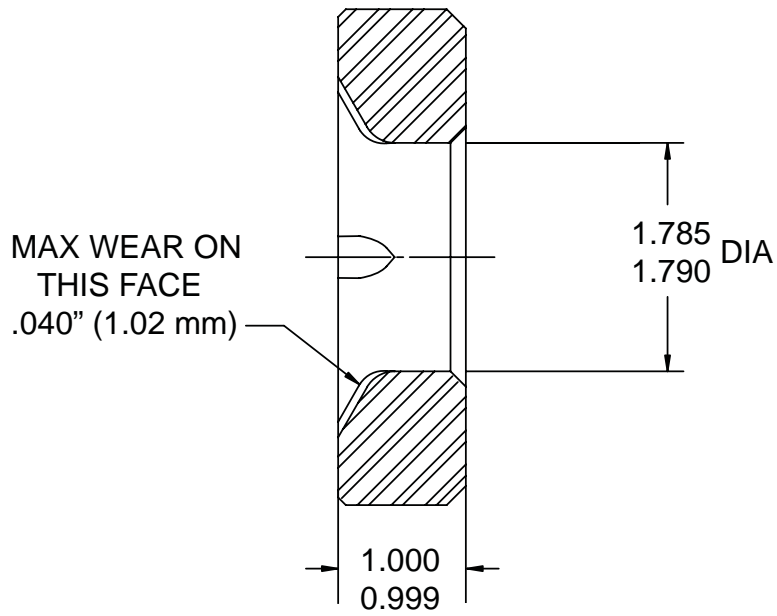
8. When satisfied that the bearing plate is installed correctly, press in the chuck driver bushing (item 13, fig. 5-23) until it is flush with the bearing plate. You are now ready to assemble the chuck driver components.

## Charging the Accumulators

# HPR4519 Wear Tolerances



SHANK BUSHING-406755



THRUST WASHER-406759



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