

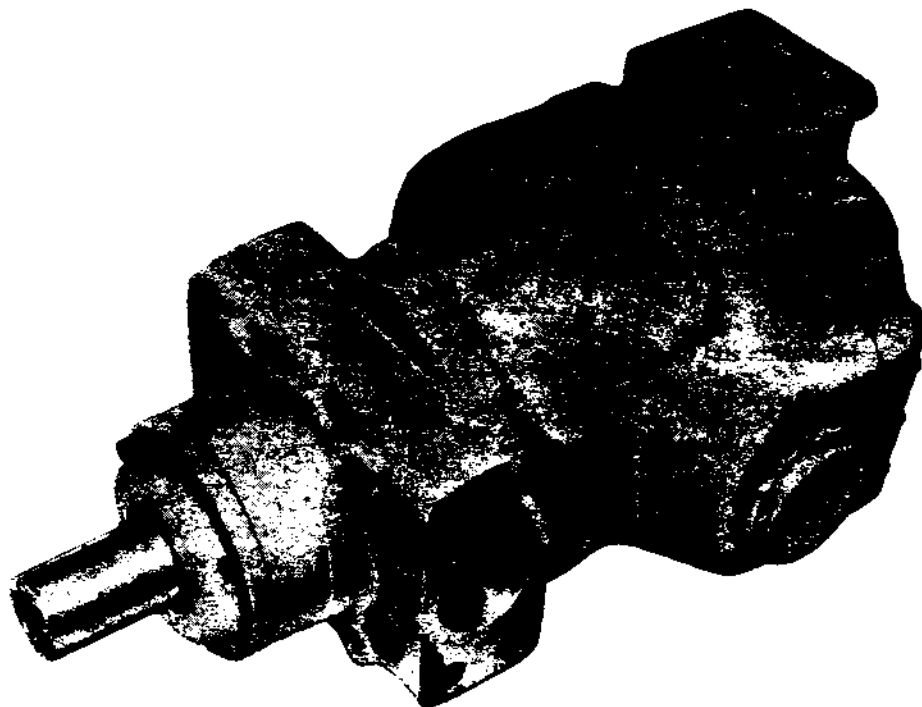
**DENISON** Hydraulics

**SERVICE LITERATURE**

**PISTON TYPE PUMP – VARIABLE VOLUME**

**MODEL P1V07 & PV09  
with Spring Hold Down**

**ASSEMBLY INSTRUCTIONS  
AND  
PARTS LISTING**



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# SECTION I

## Introduction and Description

### GENERAL

This manual contains installation, operation, maintenance, and overhaul instructions for the redesigned 700 series and the new 900 series variable volume axial piston pumps. The high pressure models are designed to operate up to 5000 psi while the low pressure models were designed for applications that do not require more than 3500 psi. See Table 1 for pump data.

### DESCRIPTION

Power applied to the pump shaft turns the rotating assembly (barrel and bearing assembly, piston and shoe assembly, and attached parts) creating the pumping action. The volume of the oil delivered is controlled by changing the length of piston strokes within the barrel and bearing assembly. The piston strokes are changed by raising the hanger above center to increase the volume. The volume is decreased by returning the hanger to center. The hanger position is changed by the various controls that are bolted to the hanger end cap. These controls are easily removed as units.

**TABLE I**  
**TYPICAL PERFORMANCE DATA\***

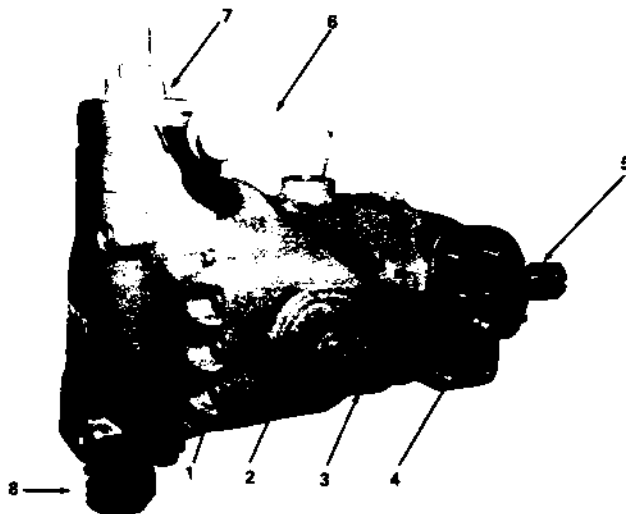
700 SERIES – VARIABLE VOLUME PUMPS										
Volume Setting		High Pressure – Low Volume – 5000 psi					Low Pressure – High Volume – 3500 psi			
		P1V07-020-51**0 4.05 in 3/rev					P1V07-027-31**0 5.27 in 3/rev			
		Delivery in GPM					Delivery in GPM			
Full	RPM	1000 psi	2000 psi	3000 psi	4000 psi	5000 psi	1000 psi	2000 psi	3000 psi	3500 p
		1200	20.70	20.65	20.40	20.15	19.60	27.50	27.40	27.15
	1800	30.50	30.35	30.15	29.85	29.40	41.20	41.00	40.70	40.20
900 SERIES – VARIABLE VOLUME PUMPS										
Full		PV09-043-51*0 8.34 in 3/rev					PV09-053-31* 10.30 in 3/rev			
		RPM	43.5	43.2	42.6	42.0	41.1	53.5	53.2	52.6

\*Above data based on 200 SSU oil @ 100° F. inlet temperature.

\*\*R or L indicates rotation

use digit 1 through 6 to indicate operating control

1. END CAP
2. VOLUME INDICATOR
3. HANGER HOUSING
4. PORT BLOCK
5. SHAFT
6. COMPENSATOR LINE
7. COMPENSATOR CONTROL CAP ASSEMBLY
8. MINIMUM VOLUME STOP ASSEMBLY



**FIGURE 1**  
**VARIABLE VOLUME PUMP W/PRESSURE COMPENSATOR**  
(Compensator cap and line shown on left hand model)

P1V07 - 027 - 3 1 R - 04	
<p>Variable volume Piston Pump P1V07 = 700 series PV09 = 900 series</p> <hr/> <p><b>GPM@ 1200 RPM</b> 020 = 20 gal. 053 = 53 gal.</p> <hr/> <p>Maximum continuous pressure 3 = 3500 psi 5 = 5000 psi</p>	<p>Controls 01 = Stem 02 = Handwheel 03 = Servo 04 = Pressure compensator 05 = Cylinder 06 = Press. comp. w/handwheel Letters = Special</p> <hr/> <p>Shaft rotation R = Right hand L = Left hand</p> <hr/> <p>Shaft 1 = Standard keyed</p>

## SECTION II Installation

### MOUNTING

The pump should be mounted on a base of sufficient strength and in such a manner as to maintain a positive alignment with the prime mover. Close shaft alignment with the prime mover is of utmost importance. A flexible type coupling must be used between the prime mover and the pump.

Refer to individual specification sheet for installation and mounting connections.

### PIPING

All piping should be of adequate size and strength to assure free flow at the pressure involved. All system piping must be clean before the pump is connected. Piping workmanship must be accurate in order to eliminate any undue strain on the pump when tightening flange bolts. **Do not use galvanized pipe.**

Check that the entire hydraulic system is free from dirt, lint, scale and other foreign material.

### FILL PUMP

Immediately upon pump installation fill pump with clean hydraulic fluid. Use fluid in accordance with specifications given in Table II. The case drain must be of adequate size to assure that the case pressure does not exceed 100 PSI.

TABLE II

FLUID RECOMMENDATIONS	
Viscosity Index . . . . .	90 min
Maximum viscosity at Starting temperature at low pressure, low flow and/or low speed . . . . .	7500 SUS
Maximum viscosity at full power . . . . .	750 SUS
Minimum viscosity at full power . . . . .	70 SUS
Optimum viscosity for maximum life . . . . .	130 SUS
Rust and oxidation inhibitors . . . . .	yes
Anti-foam additive . . . . .	yes
<p>It is recommended that the fluid be a petroleum base R &amp; O oil meeting Denison standard HF-1. These preferred fluids do not contain anti-wear additives.</p>	
<p>Fluids meeting Denison standards HF-2 are acceptable for use but may require operating conditions. These fluids are similar to HF-1 but do contain anti-wear additives.</p>	
<p><b>CAUTION:</b> For most efficient operation, inlet oil temperature should be 125° F – 135° F and should not exceed 180°F.</p>	
<p>When it becomes necessary to use petroleum base fluids which do not meet this specification or special fire resistant hydraulic fluids, a Denison representative should be consulted.</p>	
<p>* It is suggested that a fluid certification be provided to insure conformance to this specification.</p>	

To fill pump remove the drain line connection fitting. Add oil until the pump is filled to the top of the pump housing. Replace the fitting and connect the drain line.

## SECTION III Operation

### INITIAL STARTING

Check that oil used in system conforms to specifications given in Table II. Check oil level by disconnecting the drain line. Oil in pump must be to the top of the tank return outlet of the pump body. Add oil as necessary. Replace the fitting.

After the hydraulic system and pump have been properly filled, the entire system should be purged of air. Adjust the system relief valves for minimum pressure. Start the unit and allow to build up to operating speed. Increase system pressure to approximately 500 PSI. At the start, there will probably be some air trapped in the system, this is usually indicated by an erratic knock. Operate the pump at low pressures (up to 500 PSI) until it has been purged. Purge the air from the system by venting at one of the hydraulic system valves. At this point, the pressure setting of the system relief valves may be increased to system rated pressure.

### NORMAL STARTING

Always start pump with system relief valves set for minimum pressure.

Start prime mover, permit it to reach full speed.

Gradually increase pump delivery by adjusting system relief valves.

### STOPPING

Reduce pump delivery to minimum pressure, then cut off power.

### LOW TEMPERATURE STARTING

When the viscosity is greater than that recommended in Table II above, use the following starting procedure.

Set system relief valves for minimum pump delivery.

Start the prime mover and allow the pump to reach full operating speed.

Slowly increase pump delivery by means of the system relief valves, until system temperature reaches the recommended temperature range. At this point normal operation may be resumed.

It may be necessary to apply air pressure to suction system to insure oil being carried to pump.

## SECTION IV Maintenance

### GENERAL

Maintenance is limited to operations which do not require complete system or pump teardown. For example, repair of system or pump leaks or sticky valves. The first operation in the repair of any leak is to tighten the screws or fittings around the leakage area. If this does not remedy the leak, it may be necessary to open the pump and replace a gasket or "O" ring.

If the pump does not operate properly or there is evidence of damage, overhaul the equipment in accordance with Section V.

Before opening the pump, drain oil by removing the plug (44, fig. 2). Always refill the pump housing with clean oil upon completion of the repair operation. Use oil in accordance with Table II. Purge the system if necessary.

Before reassembling any parts, they must be absolutely clean and free from dirt, lint or other foreign matter. All parts must be washed in a cleaning fluid such as Stoddard solvent or equivalent. All "O" rings and gaskets must be clean and carefully examined for cuts or other damage. Replace any damaged parts.

### TROUBLE SHOOTING

Table III lists possible troubles and remedies for the complete pump assembly. Perform only those operations possible under maintenance. Refer to Section V for overhaul procedures.

**TABLE III  
TROUBLE SHOOTING CHART**

<b>Trouble</b>	<b>Possible Cause</b>	<b>Remedy</b>
No Pressure	Prime mover not operating	Check prime mover.
	Defective system relief valve.	Check system valves.
	Wrong rotation.	Reverse rotation immediately to prevent breakage of pump parts.
Insufficient Pressure	Leak in pipe joints or fittings.	Inspect thoroughly all joints. Tighten if necessary.
	Pump not delivering oil.	Check oil circulation by removing plug or line near pump.
	System relief valve set too low or valve sticking open. Parts may be dirty, worn or broken.	Check relief valve.
	Dirt in system.	Drain oil and clean system tank.
	Dirty system filters.	Replace filters.
	Leakage in system.	Inspect all pipe connections and tighten loose connections or fittings. Check oil level. Add oil as necessary. Purge system.
Chattering or Vibration in Hydraulic System	Air in system.	Cycle pressure in system.
Pump Making Noise	Coupling misalignment.	Realign couplings.
	Pump parts worn or broken, solid matter wedged between pump internal operating parts.	Overhaul pump.
	Dirty system.	Clean filters.
Insufficient Flow	Clogged filters; restriction in suction line.	Clean filters, remove and blow out lines.
	Air in suction lines due to loose union.	Tighten suction line union.
	Insufficient fluid in system.	Add hydraulic fluid.
	System relief valve sticking in open position.	Check relief valve thoroughly.
	Oil viscosity too heavy.	Start pump unit in accordance with Section III "Low Temperature Starting."
	Broken shaft or coupling failure.	Replace coupling if damaged. If shaft is damaged, overhaul pump.
	Break in piping.	Repair or replace.
Breakage of Rotor, Piston, Shoes, Shaft or Port Plate	Excessive pressure above pump rating. Seizure due to lack of oil supply. Solid matter wedged between pump operating parts.	Overhaul pump.
Excessive Wear on Port Plate, Shoes, Pistons, and All Moving Parts	Lack of oil supply. Oil viscosity too low. Abrasive matter in oil. Sustained high pressure above maximum rating. Coupling misalignment. High overload impact pressures. Pump operated dry.	Overhaul pump.

# SECTION V

## Overhaul

### GENERAL

The instructions contained in this section cover a complete teardown of the pumps. Disassemble only as far as necessary to replace or repair the worn parts. If a complete disassembly is required, follow the index numbers 1 through 59.

### DISASSEMBLY

Drain all oil from the pump by removing the hex head plug (44) at underside of pump. Remove key (58) from the pump shaft. Remove the fluid connections by removing the eight screws. Remove items 1 through 4. The index plate assembly, barrel and bearing assembly, port plate, and port block must be handled with care to avoid marring the precision finish of the parts.

### PISTON AND SHOE ASSEMBLY (25)

The hanger must be removed from the housing to check the piston and shoe assembly. Remove items 5 through 16 and lift hanger (18) with items (19) through (23) attached. The inner bushing (17) can now be removed from the hanger housing. **Do not remove screw (19) and nut (20) from the hanger unless a replacement is required. These parts were set at the factory to prevent the pump from over-stroking.**

Remove screw (23) to release the index plate (22) from the hanger. Remove items (24) through (30).

### BARREL AND BEARING ASSEMBLY (39)

Remove items (37) and (38) to release the assembly. Insert two heavy wood dowels into the bores of the barrel and with an oscillating motion pull the barrel assembly from the hanger housing. Do not allow the face of the barrel to strike the end of the shaft. **Do not remove the seven inserts from the barrel. These parts are available only as assembly.**

The port plate (40) may cling to the face of the bearing and barrel assembly. Use caution to prevent port plate from dropping. If the port plate remains on the port block (59) it may be removed by inserting two brass rods the same diameter as the porting in each port and squeezing together to free port plate. Remove pin (47).

Remove screws (41) and (42) and remove the hanger housing (43) from the port block (59) and remove "O" ring (46).

Remove six screws (48), seal retainer (49), and "O" ring (50). To remove the part of the shaft seal that is in the seal retainer, insert a piece of brass rod that is smaller than the outboard opening of the seal retainer and press the seal seat and rubber gasket out.

Wrap a piece of shim stock or thick tape around the shaft to cover the keyway before removing the remainder of the seal from the shaft. Do not bump or damage the carbon seal face.

Place a brass rod (5/8" dia. or larger) inside the splined end of the shaft and press the entire shaft assembly (52) from the port block (59).

Bend back the teeth of the lock washer (54).

Remove the lock nut (53) and lock washer. Support the inner race of bearings (55) and press the shaft (57) from the bearings. Remove spacers (56).

### CLEANING

All parts must be absolutely clean and free from dirt, lint, or other foreign material. All parts of the pump must be washed in Stoddard solvent or equivalent cleaning compound. The pump body and port block must also be washed thoroughly in case of bearing failure. After all parts are cleaned they must be protected with a light film of oil and covered until re-installed in the pump.

### INSPECTION AND REPAIR

Replace any damaged or substandard "O" rings, gaskets, or seals at reassembly. Replace all worn or damaged parts. If repair parts are not available, some moving parts may be replaced for limited service, as an emergency measure only. These parts are the port plate, bearing and barrel assembly, creep plate, shoe retainer, piston and shoe assembly.

#### A. PORT PLATE

Scratches that appear on the sealing bands around the accurate ports can be removed by hand lapping on an accurate lapping block using carborundum finishing compound Grade A280V8WS or equivalent abrasive. After lapping, the faces of the port plate must be parallel within .0002 of an inch.

## B. BARREL AND BEARING ASSEMBLY

Replace the barrel assembly if there is an indication of damage or excessive wear to the piston bores. Scratches or shallow wear grooves in the face plate may be removed by hand lapping. If the face plate is damaged, replace it.

## C. PISTON AND SHOE ASSEMBLY with RETAINER

Remove scratches from the sealing bands of the bronze shoes by hand lapping. Lap the assembly as a unit only. Use the shoe retainer as the holding fixture. Lap on an accurate lapping block with carborundum finishing compound Grade A280V8WS or equivalent. Check fit of pistons in cylinder barrel bore. Clearance should be from .0008 to .0016 inches.

## D. CREEP PLATE

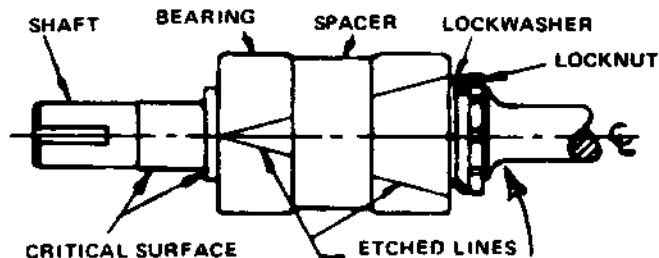
Lap working face of creep plate on an accurate lapping block using carborundum finishing compound Grade A280V8WS or equivalent.

### CAUTION

Clean all pieces after lapping. Make certain all lapping compound is removed. Coat the parts with oil.

## ASSEMBLY PROCEDURES

### SHAFT AND BEARINGS



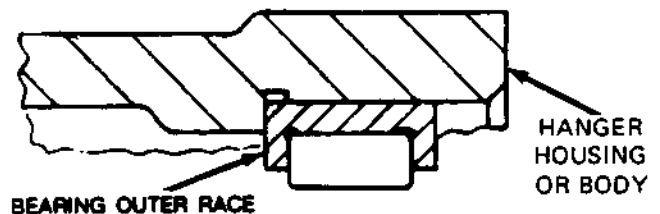
1. Before assembly of bearings (55) to shaft (57), note the etched lines across the O.D. of the bearing. Always assemble bearings to shaft so that the etched lines form a "V."
2. Install one bearing onto shaft, press it snugly against the shoulder of the shaft.
3. Insert the bearing spacers (56) over shaft and against bearing.

4. Press on second bearing, seating against bearing spacers.
5. Assemble bearing lockwasher (54) on shaft, make sure tang of lockwasher fits into groove in shaft, seat against bearing.
6. Thread bearing locknut (53) onto shaft. Put chamfered edge of locknut toward lockwasher. Tighten locknut securely.
7. Bend tang of lockwasher into aligned slot of locknut.

*NOTE: Press bearings onto shaft with a smooth, steady force. Do not "beat" into place.*

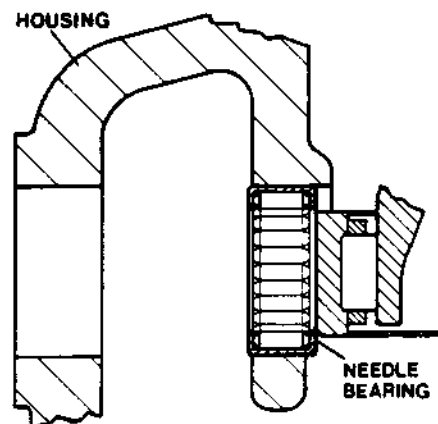
### INSTALLATION OF BEARINGS IN HANGER HOUSING

1. Press outer race of barrel bearing into I.D. of hanger housing (43) seating it against shoulder.



*NOTE: Press bearing into body with a smooth, steady force. Do not "beat" into place.*

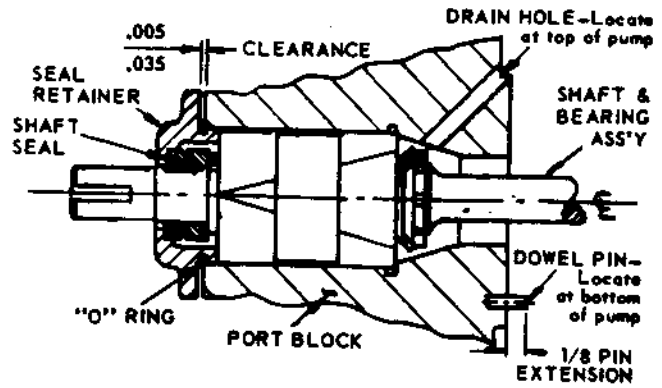
2. Insert needle bearing and bushing assembly (17) into the inner bore of the hanger housing, entering the housing through the space between the larger outer bore and the inner bore. The assembly (17) must be seated against the outer race.





### MOUNTING HANGER HOUSING ON PORT BLOCK

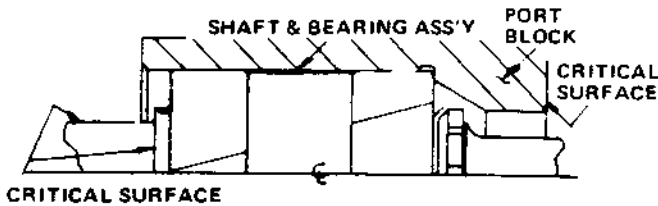
1. Position hanger housing (43) with round opening turned up.
2. Place "O" ring (46) in groove in hanger housing.
3. Position the port block on the hanger housing with the external end up. Install screws (41) and (42) through port block and thread into hanger housing. Torque these screws evenly, 130 ft. lbs.



2. Install "O" ring (45) on plug (44) and install in bottom hole in the hanger housing.

### INSTALLING SHAFT AND BEARING ASSEMBLY

1. Press shaft and bearing assembly (52) into port block, (59), seating it against shoulder in port block.



**NOTE:** Press shaft and bearing assembly into port block with a smooth, steady force. Do not "beat" into place.

### ASSEMBLE SHAFT SEAL AND SEAL RETAINER IN PORT BLOCK

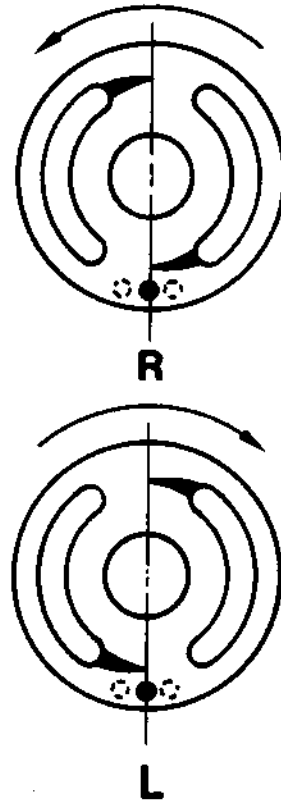
1. Insert "O" ring (50) onto seal retainer (49).
2. Insert shaft seal (45) into bore of seal retainer. Use care so as not to cut or scratch sealing surface of shaft seal.
3. Assemble pilot O.D. of seal retainer into pilot bore of port block while slipping I.D. of shaft seal over shaft. Again use care to avoid damaging the shaft seal.
4. Insert the six socket head cap screws (48) and tighten snugly. There should be clearance between seal retainer and port block. Do not torque screws excessively.

### PORT PLATE PIN

1. Press dowel pin (47) into port block. Measure pin extension to insure proper assembly. During assembly, this pin locates the bottom of the pump.

### PORT PLATE INSTALLATION

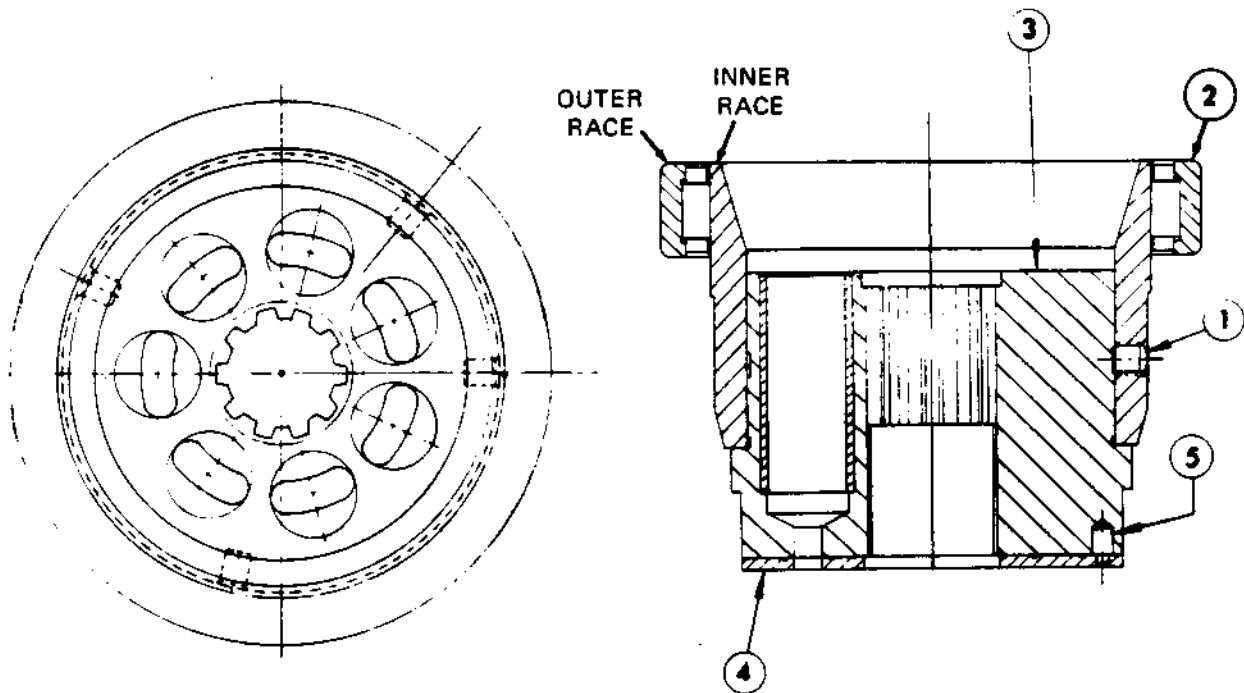
1. Position the hanger housing, port block and shaft assembly with the external end of the shaft extended down.
2. Slip port plate (40) over shaft and into pilot bore of body, making sure hole in port plate goes over dowel pin in port block. Check to insure port plate is firmly seated against port block by trying to rotate the port plate radially. If a slight movement is obtainable the port plate is properly assembled.
3. Check pump rotation to make sure that the correct port plate is being used.



# BARREL & BEARING ASSEMBLY

No.	Qty.	5.29 Cu. In. P1V07-027-3 S15-41419	4.06 Cu. In. P1V07-020-5 S15-41417	Description
1	4	312-35038	312-35038	3/8-24x3/8 Soc. set screws Cup pt. Spot Lok
2	1	035-49652	035-49652	Barrel bearing
3	1	S15-41414	S15-41415	Barrel assy. w/sleeves
4	1	035-70403	035-70402	Face plate
5	2	035-49825	035-49825	Face plate pins

## BARREL ASSY.

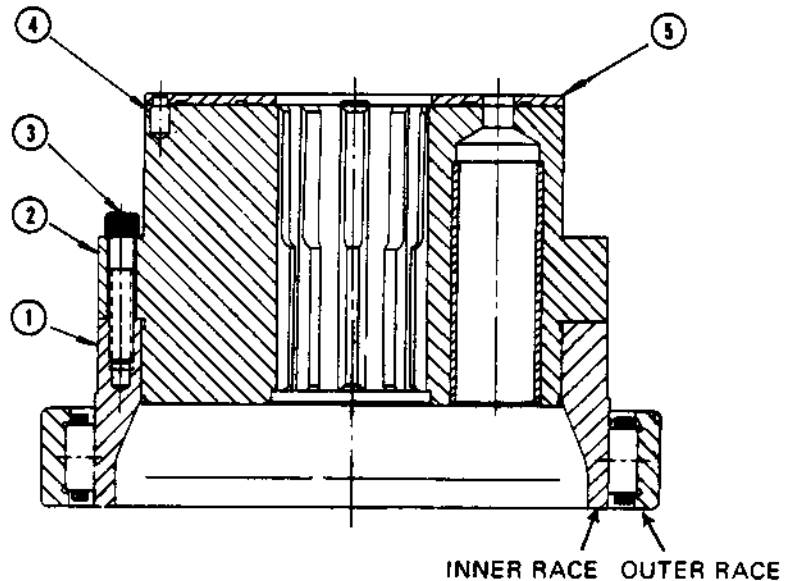
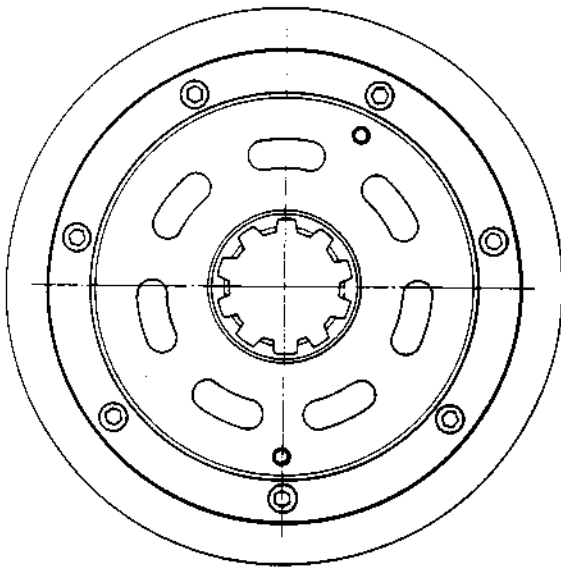


1. Position the barrel (3) with the arcuate ports turned down and align the bearing (2) with the screw holes for item (1), centered between the piston bores.
2. Press the inner race of the bearing on the barrel.
3. Insert the four screws (1) and bottom against the barrel; torque the screws an additional 120 inch pounds.
4. Invert the assembly (arcuate ports up) and push pins (5) into the holes provided in the barrel.
5. Apply a coating of oil on the face of barrel and install the face plate (4) over the pins (5) with the steel side of the plate against the barrel.

# BARREL & BEARING ASSEMBLY

No.	Qty.	10.3 Cu. In. PV09-053-3 S15-41420	8.3 Cu. In. PV09-043-5 S15-41421	Description
1	1	035-49063	035-49063	Barrel Bearing
2	1	S15-41413	S15-41412	Barrel Assy. w/sleeves
3	7	359-00003	359-00003	5/16-24x1 1/4 soc. set screws w/Spot Lok
4	2	035-49825	035-49825	Face plate pins
5	1	035-49824	035-70042	Face plate

## BARREL ASSY.

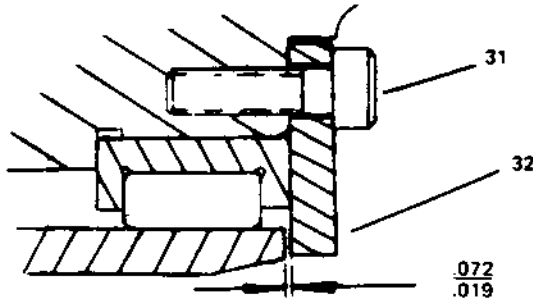


1. Place the inner race of the bearing (1) on a clean flat surface with the seven tapped holes (5/16-24) turned up.
2. Position the barrel assembly (2) on the inner race with the accurate ports turned up and the seven drilled holes in the barrel directly over the seven tapped holes. (Two 5/16-24 screws approx. 3" long should be inserted in the two parts to serve as guides.) Press the barrel assembly (2) into the bearing inner race (1). Remove the guide screws.

3. Insert the seven screws (3) through the barrel assembly and thread into the bearing (1). Torque the screws evenly to 360 in. lbs.
4. Push the two pins (4) into the holes provided in the face of the barrel.
5. Apply a coating of oil on the face of the barrel (2) and install the face plate (5) over the pins (4) with the steel side of the plate against the barrel.

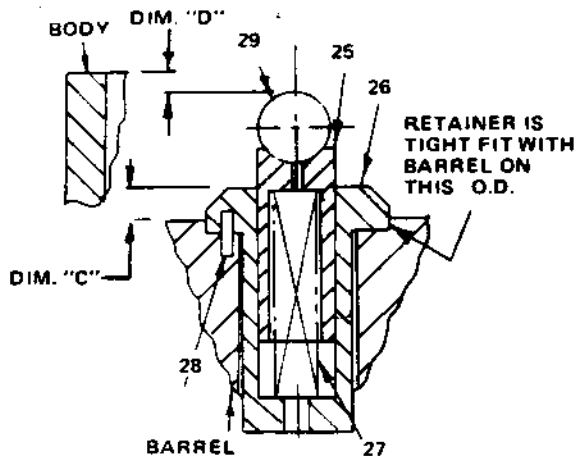
## INSTALLATION OF BARREL ASSEMBLY

1. Slip barrel onto shaft and seat gently against the port plate. Be careful not to damage the lapped surface of the barrel and port plate.



2. Place stops (38) in counterbore of the hanger housing. Insert screws (37) through the stops and thread into the housing. Tighten securely. There must be no clearance between the stop and the outer bearing race. See above sketch for clearance between the stop and inner race.
3. Insert pin (30) in the hole provided in the barrel spline.
4. Install spring retainer (29) in the counterbore in barrel and over the pin (30). The retainer may require some pressure to properly seat it in the counterbore. Check dimension "C" for proper installation.

	P1V07	PV09
Dim. "C"	$\frac{.364}{.324}$	$\frac{.401}{.351}$
Dim. "D"	$\frac{1.125}{1.078}$	$\frac{1.334}{1.314}$

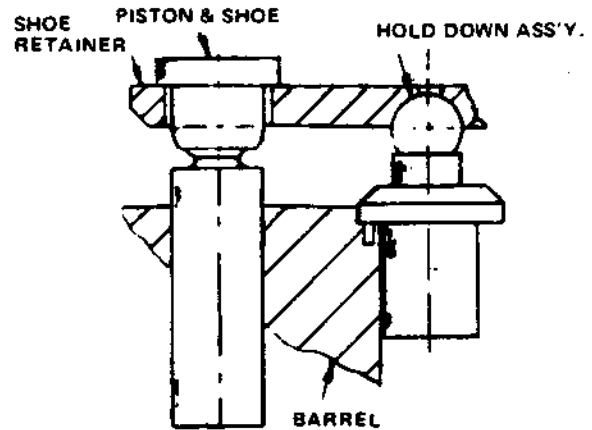


5. Insert spring (28) in spring socket (27) then insert (28) and (27) into (29).

6. Apply fluid to the ball seat of the spring socket (27) and place ball (26) in socket. Check dimension "D." If dimension "D" is greater than measurement shown, add spacer or washers on top of the spring (28) and under spring socket (27).

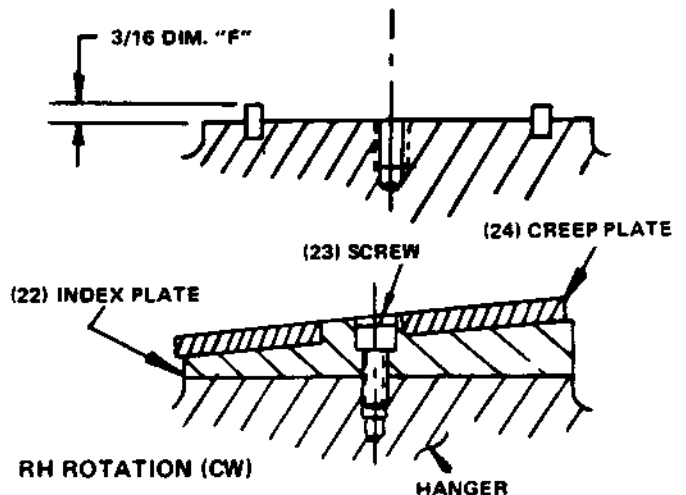
## INSTALLATION OF PISTON AND SHOE ASSEMBLY

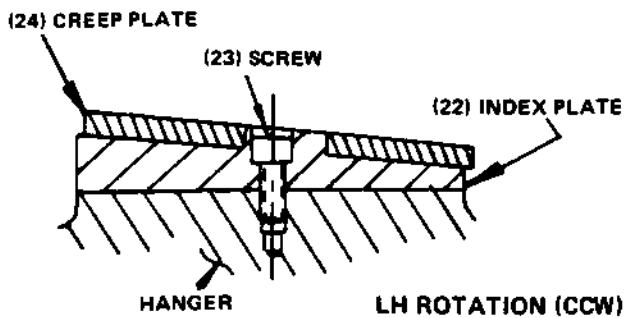
1. Insert the seven piston assemblies in the shoe retainer as shown. Lubricate the pistons and the bores of the barrel.
2. Insert the pistons in the bores of the barrel and position the shoe retainer on the steel ball (26).



## INSTALLATION OF HANGER

1. Thread hex nut (20) on hex head screw (19) and install in hanger (18). The positioning of these parts will be determined later when setting the hanger. For assembly purposes this screw will be considered to be on the top of the hanger.



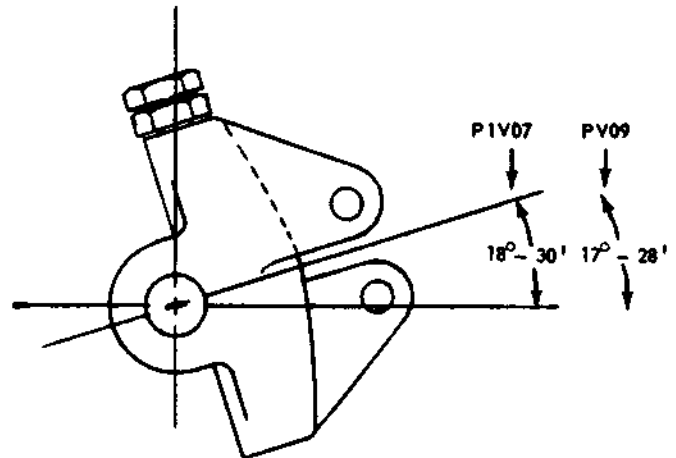


2. Insert the dowel pins (21) in the hanger (18). Check dimension "F" for proper assembly.
3. Position the hanger (18) with the flat side facing the assembler and screw (19) at the top (12 o'clock). Align index plate (22) over dowel pin (21) with the thick side of the plate at 9 o'clock.  
**The index plate must be installed in this position for right hand operation.**  
**The thick side of the index plate (22) must be positioned at 3 o'clock for left hand operation.**  
 Install screw (24) through index plate and tighten.

4. Apply fluid to both sides of the creep plate (23) and install on the index plate. The creep plate must be free to rotate.
5. Position dowel pin (41) and plug (38) at 6 o'clock (bottom of pump). Insert hanger with screw (19) at 12 o'clock (top) in the hanger housing (37).
6. Press indicator shaft (14) into one of the trunnion pins (15). Assembly keys (16) to trunnion pins.
7. Slip trunnion pins through housing, hanger, and inner bearing assembly in body, engaging key way in hanger with key in trunnion pin. Must be snug, but slide free. The trunnion pin with the indicator shaft should be on the right hand side of the pump, when facing the open end of the hanger housing.
8. Slip trunnion spacers (13) and trunnion needle bearings (12) over trunnion pins and into bores in housing until bushing assemblies are flush with body.
9. Assemble gasket (11), cap (9) and three screws (7) on left hand side of pump. Tighten screws securely.
10. Place "O" ring (10) into groove in cap (8), then slip cap and gasket (11) over indicator shaft (14), install three screws (7) and tighten securely.
11. Place indicator (6) on indicator shaft and thread on nut (5).

## SETTING HANGER "FULL VOLUME" POSITION

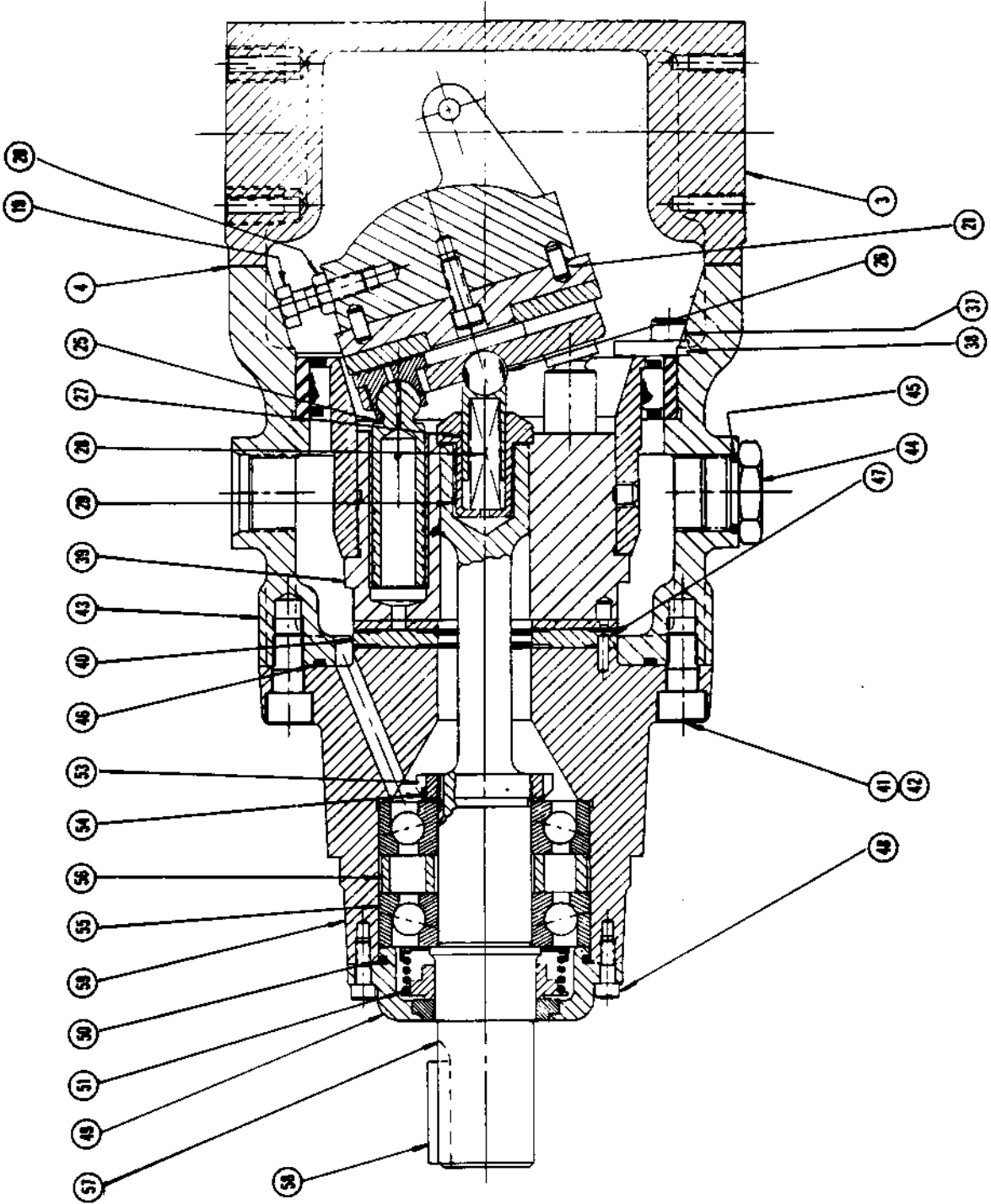
1. Using a protractor, or other equivalent tool, position the hanger, as indicated in sketch, above the horizontal centerline of the pump.

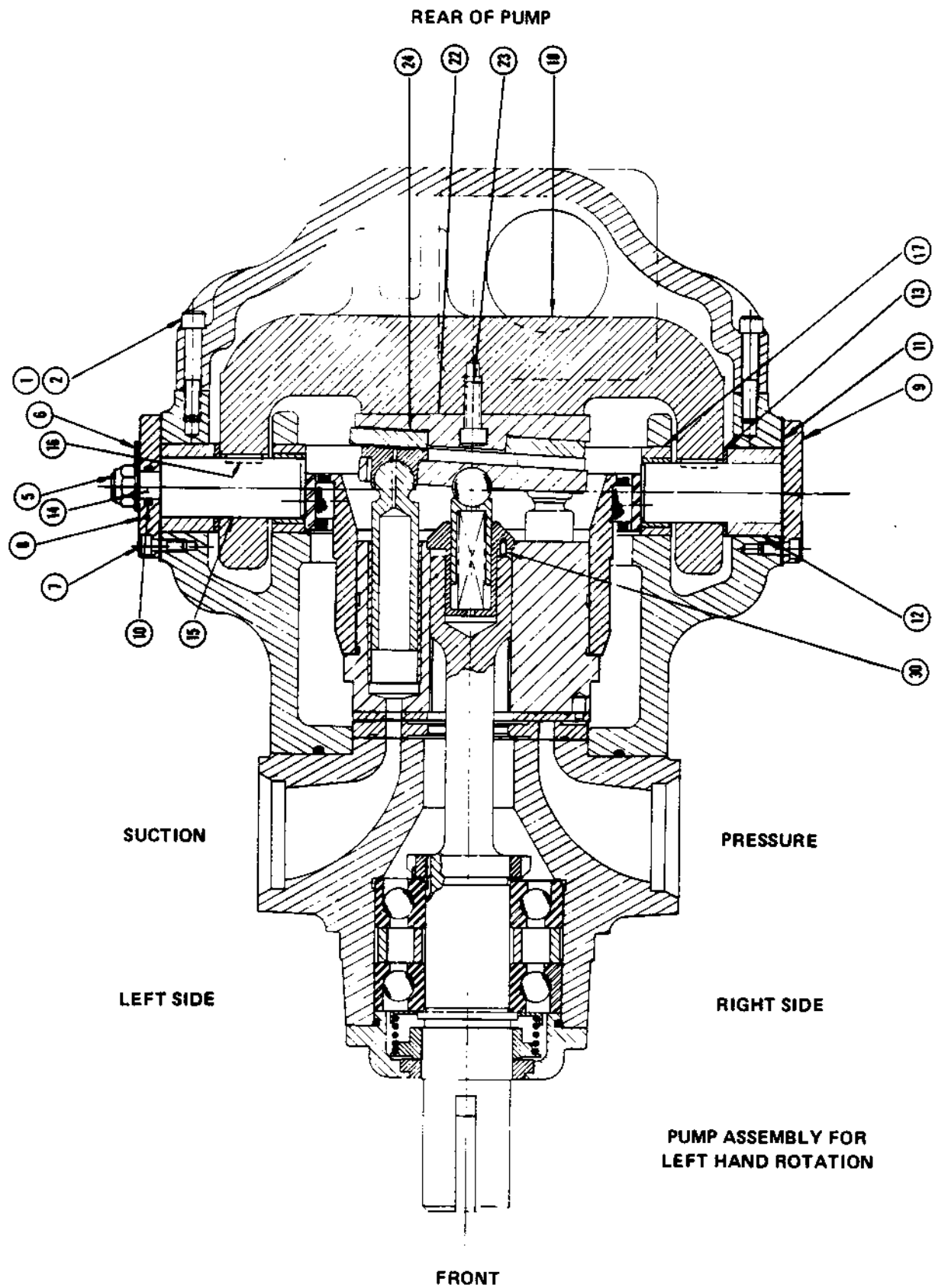


2. Hold hanger in this position and back out stop screw until it contacts stop surface of body, then lock screw in place.
3. With the hanger in this (full volume) position align indicator (6) with "full" mark on the trunnion cap and re-tighten nut (5).

## INSTALL END CAP TO PUMP

1. Assemble the top part of the controls on the end cap (3).
2. After control is installed, proceed as follows: lightly grease gasket (4) and place on housing.
3. Hold end cap (3) against housing with word "Denison" right side up and reading from left to right, and insert screws (1) and (2), tighten securely.
4. Attach the controls to the bottom of the end cap after cap (3) is mounted.





## P1V07

## PV09

No.	Qty.	Part No.	Description	Part No.	Qty.	No.
1	14	358-14200	SHC screw 5/16-18x1½	-----	16	-
-	-	-----	SHC screw 3/8-16x1¼	358-16220	16	1
2	4	358-16380	SHC screw 3/8-16x4½	-----	-	-
-	-	-----	SHC screw 3/8-16x4	358-16360	4	2
3	1	035-40726	End Cap	035-41093	1	3
4	1	035-40752	End Cap Gasket	035-41087	1	4
5	1	331-16000	Elastic Stop Nut 3/8-16	331-16000	1	5
6	1	035-40763	Indicator	035-40763	1	6
7	6	358-12080	SHC screw 1/4-20x½	358-12080	6	7
8	1	035-40749	Trunnion Cap (ind. side)	035-41080	1	8
9		035-40748	Trunnion Cap	035-41079	1	9
10	1	671-00112	O-ring 70-6227-10	671-00112	1	10
11	2	035-40753	Trunnion Gasket	035-41084		11
12	2	230-00019	Needle Bearing HJ-162416	-----	-	-
-	-	-----	Needle Bearing HJ-223016	230-10020	2	12
13	2	035-40764	Trunnion Spacer	035-41081	2	13
14	1	035-40746	Indicator Shaft	035-40746	1	14
15	2	035-40747	Trunnion Pin	035-41085	2	15
16	2	211-22016	Square Key ¼x¾	-----	-	-
-	-	-----	Square Key 5/16x7/8	035-41083	2	16
17	2	S15-16833	Inner Bearing Ass'y.	S15-28930	2	17
18	1	035-40730	Hanger	035-41091	1	18
19	1	313-16180	Sq. Hd. Set Screw 3/8-11x1¼	-----	-	-
-	-	-----	Sq. Hd. Set Screw 1/2-13x1¼	313-21082	1	19
20	1	313-16000	3/8-16 Hex Nut	-----	-	-
-	-	-----	1/2-13 Hex Nut	333-20000	1	20
21	2	324-21608	Dowel Pin 1/4x1/2	-----	-	-
-	-	-----	Dowel Pin 3/8x1/2	324-22408	2	21
22	1	035-15206	Index Plate	035-41088		22
	1	035-17091	Index Plate (flat)	035-43031	1	
23	1	358-14140	SHC screw 5/16-18x7/8	358-14140	1	23
24	1	035-14074	Wear Plate	035-41086	1	24
25	1	See Below	Piston & Shoe w/retainer	See Below	1	25
26	1	201-24001	3/4" Steel Ball	-----	-	-
-	-	-----	7/8" Steel Ball	201-28001	1	26
27	1	035-13342	Spring Socket	035-41028	1	27
28	1	035-22174	Holddown Spring	035-40961		28
29	1	035-11818	Spring Retainer	035-41029	1	29
30	1	325-04040	Roll Pin 1/16x¼	-----	-	-
-	-	-----	Dowel Pin 1/8x3/8	324-20806	1	30
37	2	359-15126	SHC screw 3/8-24x3/8	359-15126	2	37
38	2	035-40762	Barrel Stop	035-41082	2	38
39	1	See Pg. 10	Barrel & Bearing Ass'y.	See Pg. 11	1	39
40	1	See Below	Port Plate	See Below	1	40

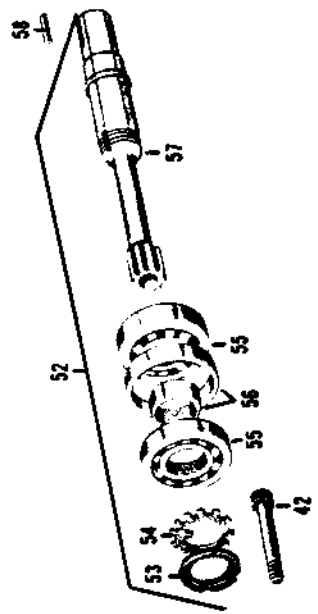
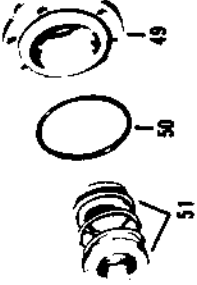
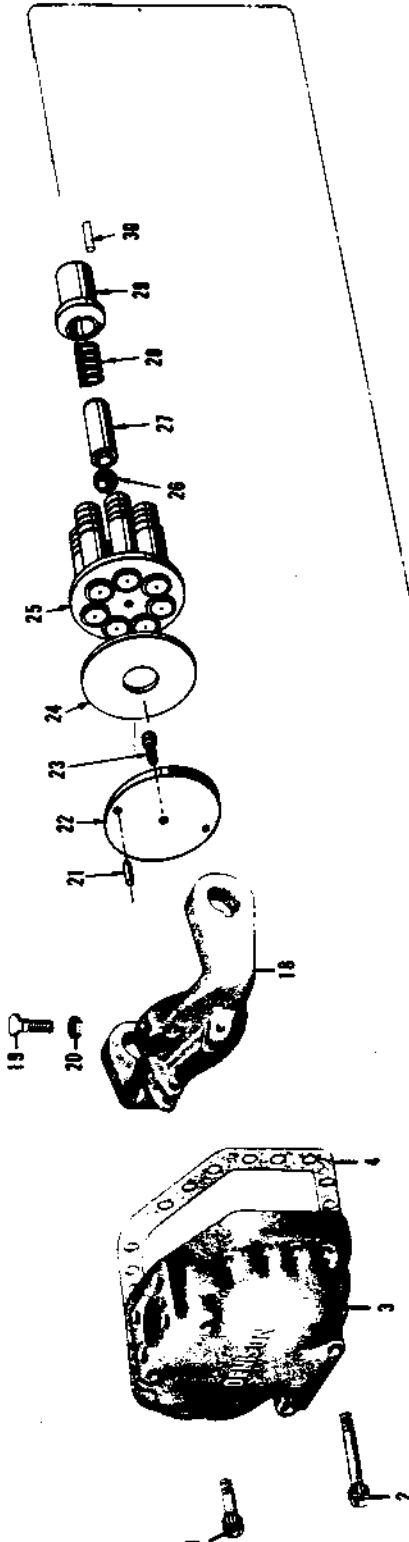


P1V07

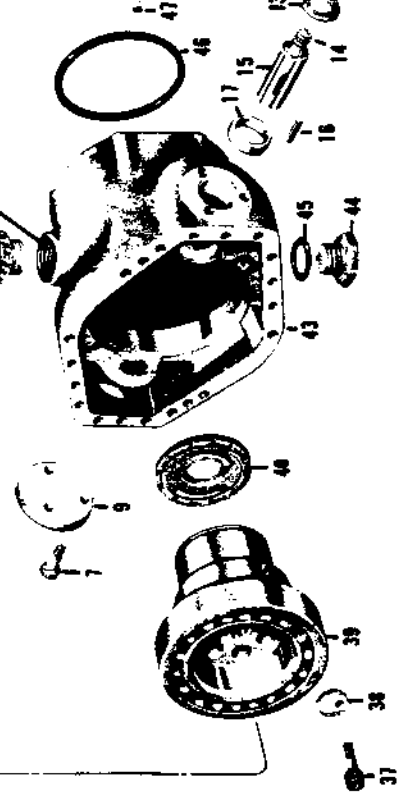
PV09

No.	Qty.	Part No.	Description	Part No.	Qty.	No.
41	2	358-20180	SHC screw 1/2-13x1½	-----	-	-
-	-	-----	SHC screw 5/8-11x1½	358-24200	2	41
42	4	358-20340	SHC screw 1/2-13x3½	-----	-	-
-	-	-----	SHC screw 5/8-11x4	358-24360	4	42
43	1	035-40728	Hanger Housing	035-41095	1	43
44	1	488-14164	Hex Plug SAE-16	488-14164	1	44
45	1	671-00916	O-ring 70-6290-16	671-00916	1	45
46	1	671-00254	O-ring 70-6230-32	-----	-	-
-	-	-----	O-ring 70-6227-68	671-00441	1	46
47	1	324-21208	Dowel Pin 3/16x1/2 (port plate)	324-21208	1	47
48	6	358-12120	SHC screw 1/4-20x3/4	-----	-	-
-	-	-----	SHC screw 1/4-20x1	358-12160	1	48
49	1	035-40718	Shaft Seal Retainer	035-40981		49
50	1	671-00236	O-ring 70-6230-14	-----	-	-
-	-	-----	O-ring 70-6230-24	671-00246	1	50
51	1	623-12260	Shaft Seal	623-12322	1	51
52	1	S15-13508	Shaft & Bearing Ass'y. (keyed)	S15-19700	1	52
53	1	341-10008	--N-08 Locknut	-----	-	-
-	-	-----	N-11 Locknut--	341-10011	1	53
54	1	350-01008	--W-08 Lockwasher	-----	-	-
-	-	-----	W-11 Lockwasher --	350-01011	1	54
55	1	230-20308	--MRC308 SDB Matched Bearings	-----	-	-
-	-	-----	MRC311 SDB Matched Bearings--	230-82045	1	55
56	1	S15-13495	--Bearing Spacers--	S15-13591	1	56
57	1	035-40737	--Pump Shaft--	035-40968	1	57
58	1	035-20101	Shaft Key	035-20102	1	58
59	1	035-40724	Port Block	035-40987	1	59
	1	035-26011	Suction Flange	035-40994	1	
	1	035-11831	Pressure Flange	035-18588	1	
	1	035-14366	Pressure Flange w/¼ NPTF	035-41110	1	
	2	671-00226	O-ring 70-6230-4	-----	-	
	-	-----	O-ring 70-6230-8	671-00230	2	
	1	S15-17789	Seal Kit	S15-17790	1	

4.05 cu. in. P1V07-027	5.29 cu. in. P1V09-020	Item 25	8.3 cu. in. PV09-043	10.3 cu. in. PV09-053
S15-00511	S15-14665	Piston & Shoe Assy. w/retainer	S15-16251	S15-14770
S15-00512	S15-14608	Piston & Shoe only (7)	S15-16252	S15-14604
035-11826	035-11826	Shoe retainer only (1)	035-40966	035-40966
<b>Item 40</b>				
035-42076	035-43513	Right hand port plate	035-43219	035-43034
035-44451	035-43369	Left hand port plate	035-43590	035-43574
035-41843	035-42355	Bi-Directional port plate	035-43612	035-42142



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