



12620 QUENTIN AVENUE SOUTH
SAVAGE, MINNESOTA 55378 U.S.A.
(612) 894-8900 TELE: 910-576-2761

INSTALLATION

PUMP MOUNTING AND DRIVE CONNECTION

The pump may be mounted in any position but horizontal mounting with the case drain port in a vertical position is recommended to maintain case fluid level. It is essential that the pump case be completely filled with operating fluid before start up and must remain full thereafter. Failure to comply with this requirement may cause pump seizure, noise, or damage to internal parts.

For any system and combination of piping, the vacuum at the pump inlet must not exceed 5 inches hg. Nor may the pump be mounted more than 3 feet above the fluid level.

An automatic air bleed valve, model AB1 is recommended for use in pump models PVA15, PVA23, and PVA30. The bleed valve should be teed into the pump outlet line and piped back to the reservoir below the oil level.

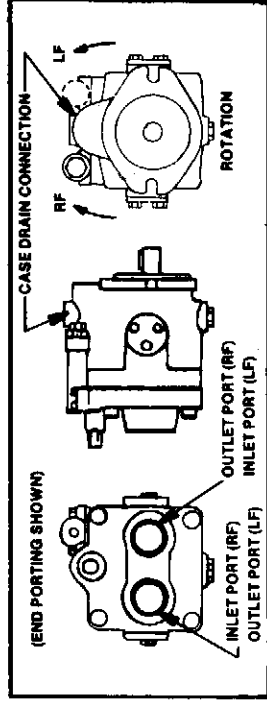
Align the pump and motor shafts to an alignment of .003 TIR inches. Pump and motor shaft ends must have a minimum end clearance of 1/4 to 1/2 inches, or as specified by coupling manufacturer.

Direct inline drive through a jaw type - flexible web coupling is recommended for all Continental pumps.

Pump and motor shafts must not be rigidly connected. Tire-type flexing elements or chain type couplings are not recommended.

Avoid indirect drives such as belts, chains, and gears that create side loads on the drive shaft.

FIGURE 1.



PIPING AND RESERVOIR

All piping should be full sized as shown in table 1. Use a minimum number of elbows, fittings, and bends.

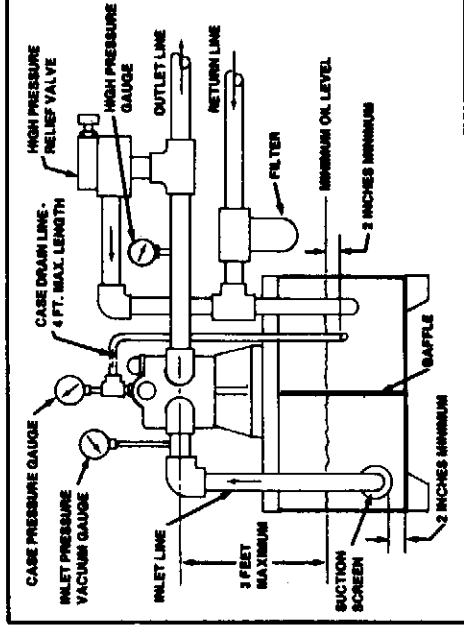
TABLE 1.

	PVA6 and PVA10	PVA15	PVA23 and PVA30
Inlet and Outlet	1" SAE st. thread tube (1-5/16-12 thread) (End ports)	1-1/4" SAE st. thread tube (1-5/8-12 thread) (End ports)	1-1/2" SAE 4-bolt flange 3000 psi (Side ports)
Case Drain	3/8 SAE st. thread tube (9/16-18 thread)	1/2 SAE st. thread tube (3/4-16 thread)	5/8 SAE st. thread tube (7/8-14 thread)

Use pickled pipe or seamless tube free from dirt and scale. Do not use galvanized or other pipe that generates contamination. Avoid using pipe threads wherever possible. Inspect and clean the reservoir, pipe, fittings, and components threaded connections before installing pump.

Service Booklet PVA-SERIES PUMPS Installation, Start-up & Operating Instructions, Parts Pages & Repair Procedures

FIGURE 2.



INLET LINE

All threaded joints in the inlet line must be vacuum tight.

It is recommended that a 150 mesh screen be installed in the inlet line for the PVA 23 and 30. Use 200 mesh screen for the PVA 6, PVA 10, and PVA 15. Screens must be below the minimum oil level but not less than 2 inches above the reservoir bottom.

WARNING

Operation of the pump at less than 160 psi outlet pressure will reduce the life of the pump. If a pump is to be "UNLOADED" vs. "DEADHEADED" during operation, 160 psi minimum backpressure MUST be provided.

NOTE

The inlet piping system must be designed and constructed in a manner to limit vacuum measured at pump inlet to 5 inches hg maximum.

CASE DRAIN LINE

The case drain line should be full sized as shown in table 1 and not longer than 4 feet. This line should return directly to the tank below the minimum fluid level and not directed at the tank bottom. The tank connections should be as far from the pump suction screen as possible. Case drain coolers, filters, or other connections to the case drain line are not recommended. When the pump is rotated 90 degrees and the case drain port is horizontal, loop the case drain line to the highest point on the pump housing and then directly to the tank.

NOTE

The case drain pressure measured at the pump drain port must not exceed 10 psig.

PRESSURE LINE

Install a pressure relief valve as close to the pump outlet as possible. This valve should be set 300 psi higher than the maximum system working pressure. The relief valve is used to prevent surge pressures which could be damaging to the system.

RETURN LINES

For all return lines a 10 micron filter is preferred, 25 micron is acceptable for mobile pumps. All return lines should discharge at least 2 inches below minimum oil level, not directed at the tank bottom, separated from the suction screen by baffles, and as far away as possible.

START UP PROCEDURE

The following instructions apply for initial start up of the hydraulic pump. **After an extended shutdown period, start over with item 4.**

1. Check the nameplate and model number for rated RPM and pressure. Direction of rotation is indicated by an arrow on the pump body.
2. Fill the reservoir with the specified hydraulic fluid which should pass through a 25 micron (nominal) filter prior to entering the reservoir.
3. Install a vacuum gauge at the pump inlet, a suitable high pressure gauge at pump outlet, and a low pressure-gauge at case drain port. (temporarily).
4. **Fill pump housing with fluid at the case drain port.**
5. Rotate the pump and motor by hand to ensure free rotation. (A high amount of drag will be present.)
6. Set the machine controls to open the circuit and allow free flow from the pump back to tank or connect the pump outlet line directly to the tank temporarily until the start up check out is complete.
Jog the motor on and off for two or three seconds in each mode until the pump is primed. Check the direction of rotation during the first jog period. Never start a new pump installation against a blocked outlet line. An airbleed valve, AB1 is recommended on PVA15, PVA23 and PVA30 pumps.

7. After the pump has been primed, provide a method of loading the pump to 200-300 psi and run at the rated speed to purge the air from the system. It may be necessary to crack a pressure line to bleed air from the circuit or install an air bleed valve for this purpose.

8. Check the inlet vacuum gauge and if the inlet pressure is greater than 5 inches hg. vacuum, shut down the system and make the necessary adjustments to the inlet piping to reduce the pressure drop.

9. Do not adjust the controls until the air has been purged from the system. Normal start-up will be accompanied by pump noises as air passes through the pump. When the pump quiets down the air has been purged.

CONTROLS ADJUSTMENT

WARNING

Setting maximum system pressure requires dead-heading the pump. Take necessary safety precautions to disable or block all machine functions which would create unsafe or hazardous situations. Refer to the machine or system specifications for specific control settings and any procedures or instruction concerning control adjustment.

DISPLACEMENT ADJUSTMENT

This pump is set at the factory for maximum displacement. If pump displacement restriction is required to stay within horsepower or flow requirements, set maximum pump displacement as follows:

The displacement adjusting screw and locknut are shown in Figure 3. Using the appropriate metric wrenches, loosen the locknut and turn the adjusting screw clockwise to reduce displacement and counter-clockwise to increase displacement. Table 2 indicates the adjustment ranges for the different pumps. Stops are built into the pump to limit the maximum position of the adjusting screw.

FIGURE 3.

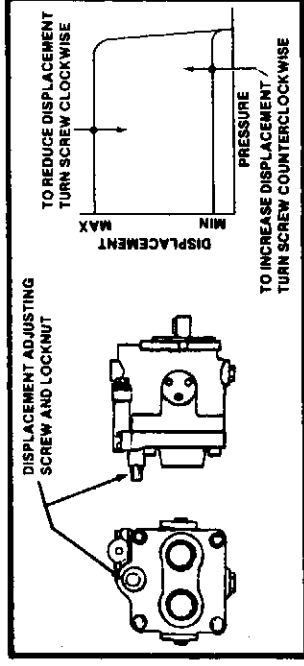


TABLE 2.

Pump size	Change in displacement per revolution of screw cubic inches/revolution	Nominal Flow change @ 1750 RPM (GPM)	Nominal Flow @ 1750 RPM	
			MIN.	MAX.
PVA-6	.09	0.7	1.0	6.9
PVA-10	.12	0.9	2.8	10.7
PVA-15	.15	1.1	9.1	17.4
PVA-23	.25	1.9	0	23.9
PVA-30	.31	2.3	3.0	32.3

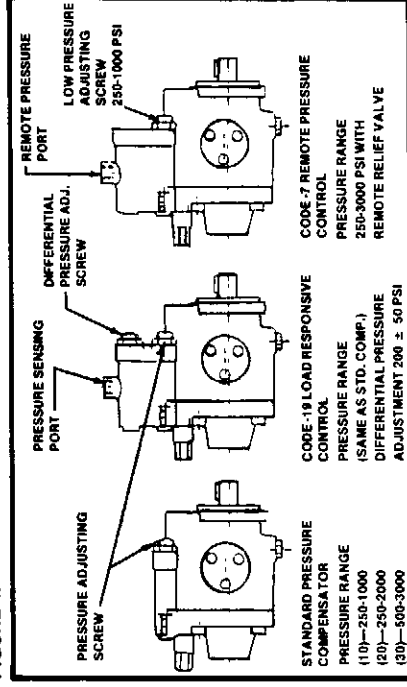
After adjustment, hold screw in place and torque locknut to 12-16 lb-ft.

PRESSURE ADJUSTMENT

The pressure compensator control automatically adjusts pump displacement to maintain volume requirements of the system at a pre-selected, adjustable operating pressure.

Your pump conforms to one of the configurations, shown in Fig. 4. Adjustment screws are identified and pressure adjustment ranges are stated.

FIGURE 4.

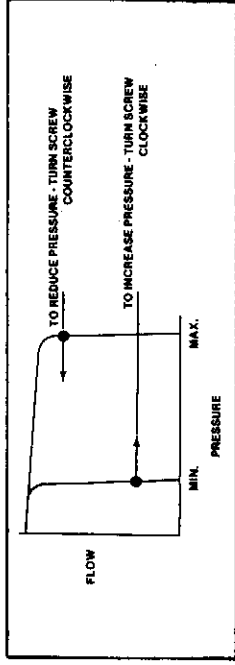


PRELIMINARY STEPS

1. The system relief valve must be set 300 psi higher than the desired dead-head pressure requirement to prevent control conflict between the compensator and relief valve. The system relief valve is to be set before setting the pump pressure.
2. The Load-Responsive function, if present, must be disabled prior to adjusting the pressure compensator using one of the following procedures:
 - a. Connect system pressure to the pressure sensing port.
 - b. Loosen the locknut on the differential pressure adjusting screw and screw clockwise until solid (5 to 10 lb-ft). Tighten locknut.
3. Start and Run pump until oil reaches at least 100 degrees F.

PRESSURE COMPENSATOR ADJUSTMENT

FIGURE 5.



1. Operate the pump against a closed or blocked circuit which will allow the compensator to regulate pump pressure at dead-head condition. The pumps are set at the factory for a low dead-head pressure. The outlet pressure gauge will indicate the compensator pressure setting.
2. Loosen the pressure adjusting screw locknut and turn the pressure adjusting screw clockwise to increase pressure, counterclockwise to reduce pressure.

PUMP SIZE	CHANGE IN PRESSURE PER TURN OF ADJUSTING SCREW		
	10	20	30
PVA6	275	475	725
PVA10	275	475	725
PVA15	275	475	725
PVA23	225	400	650
PVA30	225	400	650

3. If the pressure setting does not increase in response to turning the adjusting screw clockwise, the system relief valve may be improperly set or flow to the system is occurring.
4. Slowly raise the pump pressure to system requirements. With the pump running at rated speed and dead-head, check the case drain pressure gauge. If the case drain pressure gauge reads higher than 10 psig, shut-down the system and find way to reduce case drain pressure to 10 psig, maximum.
5. It may be necessary to cycle the pump on and off; that is dead-head to open circuit and back to dead-head to purge air from the compensator control circuit.
6. When the desired dead-head pressure setting is reached, hold the adjusting screw in place and torque the locknut to 16-20 lb-ft. Cycle the pump 2 or 3 times to ensure pressure setting is maintained.

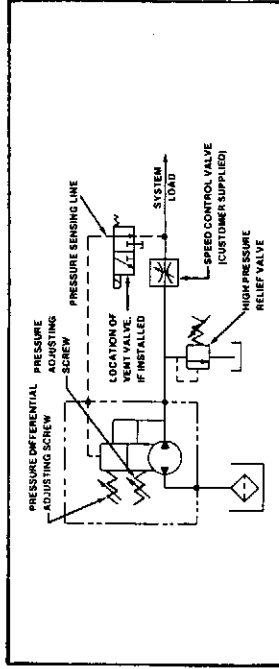
LOAD RESPONSIVE CONTROL CODE 19

The load responsive control automatically adjusts pump displacement to provide selectable constant outlet flow regardless of pump drive speed or system load.

Blocking pump outlet flow, as in a closed center valve position, and venting the pressure sensing port to tank, will cause the pump to dead-head at minimum pressure.

1. Connect the pump to a load circuit as shown in Figure 6.

FIGURE 6.



The pump has a 7/16-20 SAE straight threaded connection for 1/4" tube on the control for the pressure sensing line connection.

2. Open the speed control valve and operate the pump until all air is purged from the circuit and the fluid reaches at least 100 degrees F.
3. Set the pressure compensator adjusting screw to maximum system requirements as described in Pressure Adjustment Procedure.
4. Open and close the speed control valve several times for 2-3 seconds in each mode. The pump must cycle from dead-head to flow in response to valve position. The pressure gauge should indicate a dead-head pressure at approximately 250 psi with the speed control valve closed and pressure sensing line vented.
5. The Load Responsive Control is set at the factory to regulate constant flow with a 200 psi differential pressure across the speed control valve. The pressure differential adjusting screw will allow you to adjust this differential pressure approximately ± 50 psi. Higher differential pressures will cause a faster response time but will add to the heat load of the system. Lower differential pressures will reduce the heat load of the system but will cause slower response time.
6. To change the differential pressure, loosen the locknut and turn the screw clockwise to increase the differential pressure across the speed control valve.
7. Turning the screw counterclockwise will reduce the differential pressure across the speed control valve.
8. Tighten the pressure differential adjusting screw locknut to 16-20 lb-ft once the desired setting is achieved.

REMOTE PRESSURE CONTROL CODE 7

This control allows the pump compensating pressure to be adjusted from a remote location using a pressure relief valve. The pump control has an internal orifice which meters 1/2 to 1 gpm of fluid into the compensator spring chamber. Directing this fluid from the remote pressure port to a remote pressure relief valve will allow you to set dead-head pressure for single or dual pressure circuits. The pump has a 7/16-20 SAE straight thread connection for 1/4 inch tube at the remote pressure port.

NOTE: The control port must never be blocked.

1. The low pressure adjusting screw is used to set minimum dead-head pressure. Clockwise rotation of the adjusting screw will increase the pressure setting.
2. By adding regulated pressure at the remote pressure ports, dead-head pressure (set with the low pressure adjusting screw) will increase on a direct basis. Example: with the low pressure set at 1000 psi and regulated pressure at the remote pressure port of 1500 psi, the dead-head pressure will be 2500 psi. Combined pressure settings must not exceed 3000 psi.
3. Follow the same safety procedure for setting dead-head pressure with this control as are used with the standard compensator.

NOTE

The remote pressure relief valve must be a direct acting differential piston relief valve. Pilot operated relief valves may cause instability.

Continental Hydraulics can provide the necessary accessory components needed for remote, single or multiple, pressure settings.

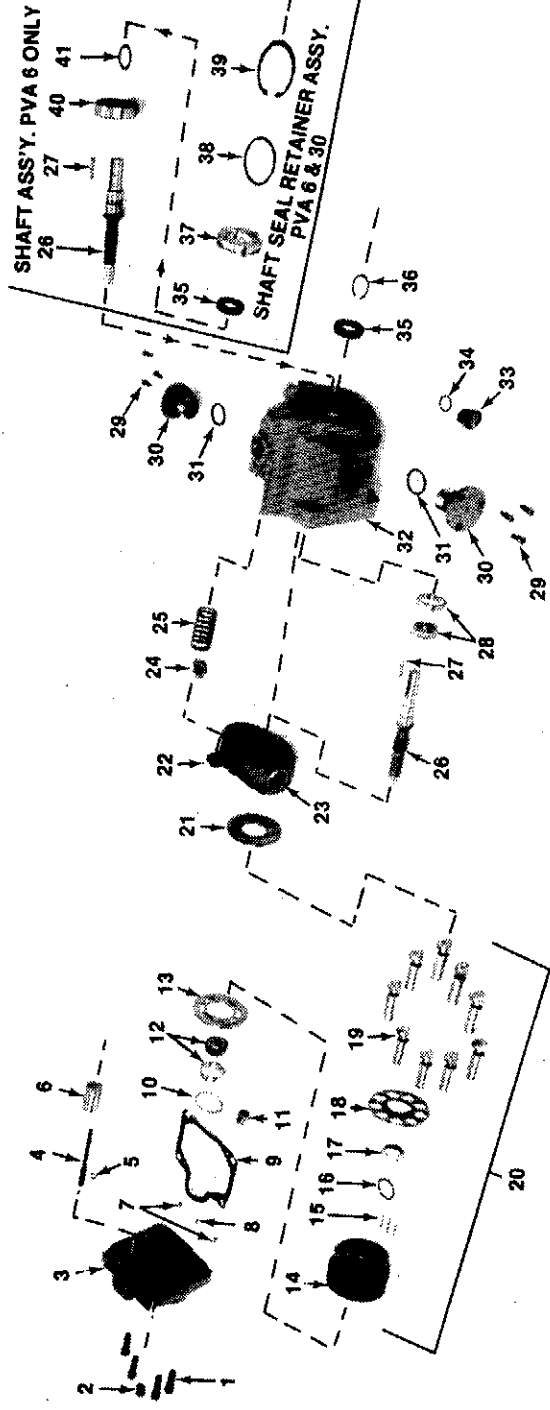
Contact your Continental Hydraulic distributor for assistance in selecting control valves and for applications with the pressure control relief valve further than 4 feet from the pump.

MODEL CODE IDENTIFICATION

PVA - - - - - - - - -

SELECT ONE: SELECT ONE: SELECT ONE: SELECT ONE: SELECT ONE: SELECT ONE: SELECT ONE: SELECT ONE: SELECT ONE: AS REQUIRED: AS REQUIRED:

SIZE - FLOW		RPM		PRESSURE		ROTATION		SEALS		PORTING		MECHANICAL OPTIONS		CONTROL OPTIONS	
CODE	GPM @ 1750	CODE	RANGE	CODE	RANGE	CODE	ROTATION	CODE	TYPE	CODE	STYLE	CODE	DESCRIPTION	CODE	DESCRIPTION
8-6	6 GPM	B	500 - 1800	10	250 - 1000	RF	CW FLANGE	O	BUNAN	1	SIDE THD.	OMIT (STD.)	STRAIGHT KEYS SHAFT	OMIT (STD.)	STANDARD PRESS. COMP.
10-10	10 GPM	M	OVER 1800	20	250 - 2000	LF	CCW FLANGE	P	VITON	5	SIDE FLG.	12	SPLINE SHAFT	7	REMOTE PRESS. COMP.
16-16	16 GPM			30	500 - 3000					1R	END THD.	21	SAE "A" REAR MOUNT	19	LOAD RESPONSIVE CONTROL
23-23	23 GPM											22	SAE "B" REAR MOUNT		
30-31	31 GPM														



CONTROL VALVE PARTS BREAKDOWN

STANDARD PRESSURE COMPENSATOR
42

REMOTE PRESSURE CONTROL
43

LOAD RESPONSIVE CONTROL
44

SEAL KITS

Includes Items: 5, 9, 31, 34, 35, 38, 50, 53, 54, and 57

MODEL NO.	KIT NO.	MODEL NO.	KIT NO.
PVA6 Buna-N	253306	PVA6 Viton	253311
PVA10 Buna-N	253307	PVA10 Viton	253312
PVA15 Buna-N	252683	PVA15 Viton	253313
PVA23 Buna-N	253308	PVA23 Viton	253314
PVA30 Buna-N	253310	PVA30 Viton	253315

ITEM NO.	CODE	PART NO.	DESCRIPTION	NO. REQ.
1			Socket Head Bolt	4
2			Locknut (Flow Adj. Screw)	1
3	253324	PVA6-RH Cover - End Porting		1
3	253330	PVA6-LH Cover - Side Porting		1
3	253327	PVA6-LH Cover - End Porting		1
3	253355	PVA6-LH Cover - Side Porting		1
3	253325	PVA10-RH Cover - End Porting		1
3	253331	PVA10-RH Cover - Side Porting		1
3	253328	PVA10-LH Cover - End Porting		1
3	253336	PVA10-LH Cover - Side Porting		1
3	C.F.	PVA10-RH Cover		1
3	C.F.	PVA10-LH Cover		1
3	253326	PVA15-RH Cover - End Porting		1
3	233332	PVA15-RH Cover - Side Porting		1
3	253329	PVA15-LH Cover - End Porting		1
3	253337	PVA15-LH Cover - Side Porting		1
3	C.F.	PVA15-RH Cover		1
3	C.F.	PVA15-LH Cover		1
3	253333	PVA23-RH Cover - Side Porting		1
3	253338	PVA23-LH Cover - Side Porting		1
3	C.F.	PVA23-RH Cover		1
3	C.F.	PVA23-LH Cover		1
3	253334	PVA30-RH Cover - Side Porting		1
3	253339	PVA30-LH Cover - Side Porting		1
3	C.F.	PVA30-RH Cover		1
3	C.F.	PVA30-LH Cover		1
3	C.F.	PVA30-LH Cover		1
3	C.F.	Flow Adj. Screw		1
4		O-Ring		1
5		Control Cylinder		1
6		Locating Pin (Cover)		2
7		Locating Pin (Valve Plate)		1
8		Gasket		1
9		Shim		A.R.
10		PVA6 Rear Bearing		1
11	253372	PVA10 Rear Bearing		1
12	253373	PVA15 Rear Bearing		1
12	253374	PVA23 Rear Bearing		1
12	253377	PVA30 Rear Bearing		1
12		PVA30 Rear Bearing		1
13		PVA6 Valve Plate R.H. Brass		1
13		PVA10 Valve Plate R.H. Brass		1
13		PVA15 Valve Plate R.H. Brass		1
13		PVA23 Valve Plate R.H. Steel		1
13		PVA30 Valve Plate R.H. Steel		1
13		PVA6 Valve Plate L.H. Brass		1
13		PVA10 Valve Plate L.H. Brass		1
13		PVA15 Valve Plate L.H. Brass		1
13		PVA23 Valve Plate L.H. Steel		1
13		PVA30 Valve Plate L.H. Steel		1
13		Valve Plate		1
13	M	Cylinder Block		1
14		Pin		3
15		Washer		1
16		Retaining Guide		1
17		Retaining Ring		1
18		Piston		9
19		PVA6 Cylinder Block Kit-Steel		1
20		PVA10 Cylinder Block Kit-Steel		1
20		PVA15 Cylinder Block Kit-Steel		1
20		PVA23 Cylinder Block Kit-Brass		1
20		PVA30 Cylinder Block Kit-Brass		1
20		Cylinder Block Kit		1
20	M	C.F.		1
21		PVA6 Thrust Plate		1
21		PVA10 Thrust Plate		1
21		PVA15 Thrust Plate		1
21		PVA23 Thrust Plate		1
21		PVA30 Thrust Plate		1
22		Swashplate		1
23		Journal Bearing (Not Shown/in Swashplate)		2
24		Spring Retainer		1
25		Spring		1
26		PVA6 Keyed Shaft		1
26		PVA10 Keyed Shaft		1
26		PVA15 Keyed Shaft		1
26		PVA23 Keyed Shaft		1
26		PVA30 Keyed Shaft		1

ITEM NO.	CODE	PART NO.	DESCRIPTION	NO. REQ.
26	253363	PVA6 Splined Shaft		1
26	253364	PVA10 Splined Shaft		1
26	C.F.	PVA15 Splined Shaft		1
26	C.F.	PVA23 Splined Shaft		1
26	C.F.	PVA30 Splined Shaft		1
27	253360	PVA6 Shaft Key		1
27	253361	PVA10 & PVA15 Shaft Key		1
27	253362	PVA23 & PVA30 Shaft Key		1
28	253371	PVA10 & PVA15 Front Bearing		1
28	253375	PVA23 Front Bearing		1
28		PVA30 Front Bearing		1
28	253376	Socket Head Bolt		3
29		PVA6 Trunnion Bearing Kit		2
30	253320	(Includes Item #23)		2
30	253321	PVA10 and PVA15 Bearing Kit		2
30	253322	(Includes Item #23)		2
30	253322	PVA23 Trunnion Bearing Kit		2
30	253323	(Includes Item #23)		2
30	253323	PVA30 Trunnion Bearing Kit		2
31		"O" Ring		2
32		Pump Body		1
33		Plug		1
34		"O" Ring		1
35	253316	PVA6, PVA10, PVA15 Shaft Seal Buna N		1
35	253317	PVA23, PVA30 Shaft Seal Buna N		1
35	253318	PVA6, PVA10, PVA15 Shaft Seal Viton		1
35	253319	PVA23, PVA30 Shaft Seal Viton		1
36		Snap Ring		1
37	6 & 30	Seal Retainer		1
38	6 & 30	"O" Ring		1
39	6 & 30	Snap Ring		1
40	6 Only	PVA6 Front Bearing		1
41		Snap Ring		1
42	STD. 253362	PVA6, PVA10, PVA15 Control Valve 1000 psi		1
42	STD. C.F.	PVA6, PVA10, PVA15 Control Valve 2000 psi		1
42	STD. 253300	PVA6, PVA10, PVA15 Control Valve 3000 psi		1
42	STD. C.F.	PVA23, PVA30 Control Valve 1000 psi		1
42	STD. C.F.	PVA23, PVA30 Control Valve 2000 psi		1
42	STD. 253301	PVA23, PVA30 Control Valve 3000 psi		1
43	7 253302	PVA6, PVA10, PVA15 Control Valve 1000 psi		1
43	7 C.F.	PVA6, PVA10, PVA15 Control Valve 2000 psi		1
43	7 C.F.	PVA6, PVA10, PVA15 Control Valve 3000 psi		1
43	7 253303	PVA23, PVA30 Control Valve 1000 psi		1
43	7 C.F.	PVA23, PVA30 Control Valve 2000 psi		1
43	7 C.F.	PVA23, PVA30 Control Valve 3000 psi		1
44	19 C.F.	PVA6, PVA10, PVA15 Control Valve 1000 psi		1
44	19 C.F.	PVA6, PVA10, PVA15 Control Valve 2000 psi		1
44	19 253304	PVA6, PVA10, PVA15 Control Valve 3000 psi		1
44	19 C.F.	PVA23, PVA30 Control Valve 1000 psi		1
44	19 C.F.	PVA23, PVA30 Control Valve 2000 psi		1
44	19 C.F.	PVA23, PVA30 Control Valve 3000 psi		1
45		Screw		A.R.
46		Compensator Spool		A.R.
47		Compensator Body		A.R.
48		Spring Retainer		A.R.
49		Spring Assembly (May be more than (1) part)		A.R.
50		"O" Ring		A.R.
51		Pressure Adj. Screw		A.R.
52		Orifice		A.R.
53	253211	PVA6, PVA10, PVA15 Gasket		1
53	253213	PVA23, PVA30 Gasket		1
54	253212	"O" Ring		1
55		Locknut		1
56		Socket Head Bolt		4
57		"O" Ring		A.R.

* See Note #9 Under Major Repair - Cylinder Block Kit
C.F. - Consult Factory

PVA PISTON PUMP REPAIR PROCEDURE

NOTE: A pump that has been disassembled for changing components or for any other reason may void warranty.

MINOR REPAIR — SHAFT SEAL REMOVAL:

Two types of shaft seals are used on the PVA series pumps. The PVA6 and PVA30 models utilize a seal retainer and o-ring. The PVA10, PVA15, and PVA23 models use a replacement seal and retaining snap ring only.

Using snap ring pliers, remove the snap ring from the shaft end of the pump.

CAUTION: The snap ring holds the shaft in the housing on the PVA6 model. Do not pull on the shaft after the snap ring has been removed. In the event the shaft is pulled from the housing, do not attempt to slide it back into the pump, but remove the end cap and cylinder block kit as outlined in the major repair section.

PVA6 and PVA30:

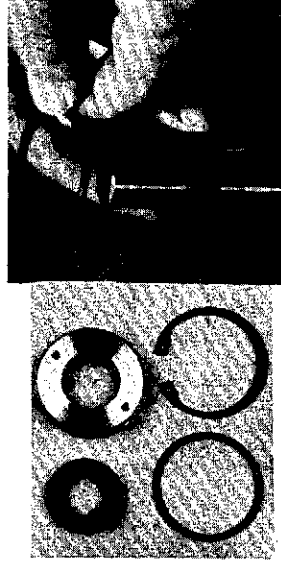
Install two screws into the seal retainer (use two of the screws from the compensator control). Pull or pry the seal retainer from the body. It will be held in place by the outer o-ring.

Remove the shaft seal (discard the shaft seal when removed) and outer o-ring.

PVA10, PVA15, and PVA30:

Using a punch, or some type of sharp instrument, puncture the shaft seal and gently pry it out.

NOTE: The PVA23 may have the same style shaft seal as the PVA6 and PVA30 on the earlier models.



MINOR REPAIR — SHAFT SEAL INSTALLATION:

PVA6 and PVA30:

Use a seal driver and press the new shaft seal into the retainer. Make sure it is bottomed out on the seal retainer. (**DO NOT USE EXCESSIVE FORCE**). Install a new outer o-ring on the retainer. Lubricate the outer o-ring and shaft seal and slide the assembly over the shaft and into the pump body until the snap ring groove is uncovered. Install the snap ring (beveled end out) into the groove.

PVA10, PVA15, and PVA23:

Lubricate the new shaft seal (I.D. and O.D.) and carefully slide it over the shaft. Press the seal into place and securely install the snap ring into the groove.

MINOR REPAIR — CONTROL VALVE:

Using an internal hex wrench, remove the (4) screws. Remove the control and gasket from the pump. Remove the o-ring from the control mounting surface. If the control is not performing properly, disassembly of the control valve may be required (See exploded view for orientation. **NOTE:** spool orientation before removal. **REASSEMBLE:** replacing all o-rings and gaskets. Place the control on the pump (make sure the gasket is on the valve properly) and re-install the (4) screws. Tighten to 61—60 In. lbs. torque.

NOTE: PVA6, PVA10, and PVA15 controls (pressure compensator, remote pressure compensator and load sensor) are interchangeable, likewise, the PVA23 and PVA30 controls are interchangeable.

MAJOR REPAIR — DISASSEMBLY:

GENERAL:

1. Remove the protective locknut from the maximum flow adjustment screw.
2. Remove the (4) bolts which hold the cover on to the pump. There is an internal loading on the cover. The cover should begin to separate from the body. Remove the cover from the body.

NOTE: The valve plate and control cylinder are loose. Be certain they do not fall and become damaged.

3. Remove the valve plate and control cylinder. Do not attempt to remove the tube to which the control cylinder is fitted. The tube is pressed into the cover and is not replaceable.



4. Remove the maximum flow adjustment by turning it clockwise through the cover. Remove the o-ring from the adjustment screw.

BEARING REMOVAL — COVER:

1a. PVA6 rear needle bearing puller to remove.

1b. PVA10, PVA15, PVA23 and PVA30 — Remove the bearing race from the cover. **NOTE:** There may be shim under the race, they are for setting the shaft end in play. **DO NOT LOOSEN.** Using a clamp type bearing puller, remove the tapered roller bearing from the shaft. **CAUTION:** Do not damage the cylinder block. A brass shim spacer may be required to protect the cylinder block from damage.



2. Remove the gasket from the pump body.
3. Set the pump horizontal, slide the cylinder block kit off the shaft as a unit. If the cylinder kit does not remain together, it may be reassembled later.
4. Remove the thrust plate from its counterbore, in the swashplate. Avoid damaging all critical surfaces.
5. PVA6 — Remove the rotorshaft through the front of the pump.

TRUNNION REMOVAL:

1. Journal bearing style - First, mark right and left trunnions.
2. Remove the (3) screws from the trunnion.
3. Remove each trunnion by using a soft, blunt punch to drive it out of the pump body from the inside.
4. If other than trunnion shown are used, replace with listed trunnions and journal bearings (located in the swashplate) if needed.
5. Remove the o-ring from the trunnion and replace it.
6. After both trunnion assemblies have been removed, lift the swashplate out of the pump body.
7. Remove the spring and spring retainer from the pump body.

BEARING REMOVAL — SHAFT:

1. PVA — Remove the snap ring from the shaft and press the bearing off using an arbor type press.
2. PVA10, PVA15, PVA23, and PVA30 shaft bearing removal — remove the shaft from the body by removing it out the cover side.
3. Remove the bearing race from the body.
4. Press the bearing off the shaft with an arbor type press.
5. Thoroughly clean and inspect all parts. Replace all damaged parts.

MAJOR REPAIR — ASSEMBLY:

1. Shaft, bearing assembly — (PVA6 will be assembled later) PVA10, PVA15, PVA23 and PVA30 — Press the new bearing race into the body. **NOTE:** If shims were used, install them first.
2. Press the bearing on to the shaft until it rests on the shoulder shaft.
3. Insert the shaft and bearing into the body.
4. Replace the o-ring on the maximum flow adjustment screw and replace the assembly back into the cover.
5. Install the control cylinder and valve plate on the cover.
6. Install the cover gasket and maximum flow screw locknut.
7. Install the spring and spring retainer.
8. Insert the swashplate and make sure the spring retainer ball is inserted into the hole in the swashplate.

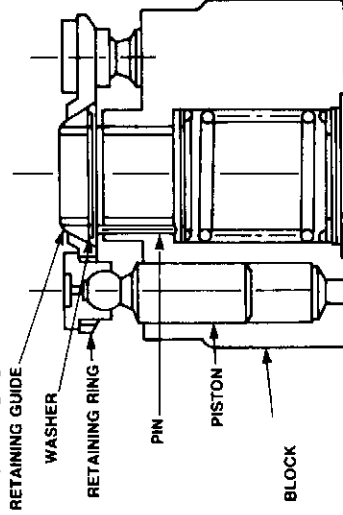
9. Install the trunnion (make sure they are on the correct side) and torque the mounting screws to: PVA6, PVA10 and PVA15 to 7—8 ft. lbs., PVA23 to 16—21 ft. lbs. and PVA30 to 27—37 ft. lbs.

SHAFT/BEARING ASSEMBLY:

1. PVA6 — Install the snap ring on the shaft ahead of the bearing, press the bearing on with an arbor type press.
2. Install the PVA6 shaft seal and retaining assembly on to the shaft as outlined in the minor repair section.
3. Install thrust plate on to the swashplate making sure the thrust plate lies flat against the swashplate.

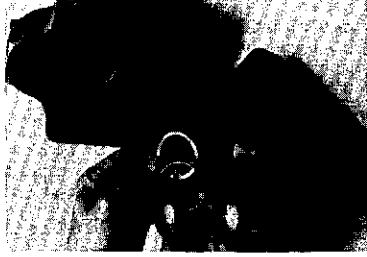
CYLINDER BLOCK:

1. Prior to the assembly of the cylinder block, inspect the pistons, retaining ring, retaining guide, washer and pins for damage and excessive wear. Replace all parts that are defective. If any pistons are defective, it is necessary to replace the complete cylinder block kit.
2. Install bearing pins in neck end of cylinder block.
3. Place the washer on the locating pins.
4. Install the retaining ring guide on the washer.
5. Place the retaining ring over the retaining ring guide. The guide should protrude through the center of the retaining ring (make certain the washer remains centered under the guide).
6. Install all pistons through the retaining ring and into the block.
7. Place the pump in a horizontal position and slide the cylinder block assembly on to the shaft and against the thrust plate **CAUTION:** Care must be taken that the washer and retaining guide do not come off the locating pins.
8. Stand the unit vertically with the shaft seal down to insure all parts remain in position. Then rotate the cylinder block two or three times to insure the piston slippers are in contact with the thrust plate. When properly installed, a spring load can be felt when pushing against the cylinder block.
9. When replacing the cylinder block kit or the valve plate, compare the **MATERIAL** of the item to be replaced against the material of the item offered in the parts list. **NOTE:** If the cylinder block kit is offered in brass the valve plate **MUST** be steel, if the cylinder block kit is offered in iron the valve plate must be brass (bi-metal). Both the cylinder block kit and valve plate will require replacement if the parts needed is the same material as its mating surface.



BEARING INSTALLATION:

1. PVA6 — Cover needle bearing can be pressed into the cover. The bearing should protrude above the cover surface .088 — .098 in. The writing on the end of the bearing should be visible after the bearing is installed.



2. Press the PVA10, PVA15, PVA23, and PVA30 tapered bearing on the pump shaft with an arbor type press until the bearing rests on the shoulder of the shaft. Also install the bearing race and shims into the cover.

3. Install the cover, while holding the valve plate so it does not drop, on to the cylinder block and pump body.

