



INSTRUCTIONS

BULLETIN 946077

OILGEAR TYPE "PFL" ONE-WAY FIXED DELIVERY PUMPS

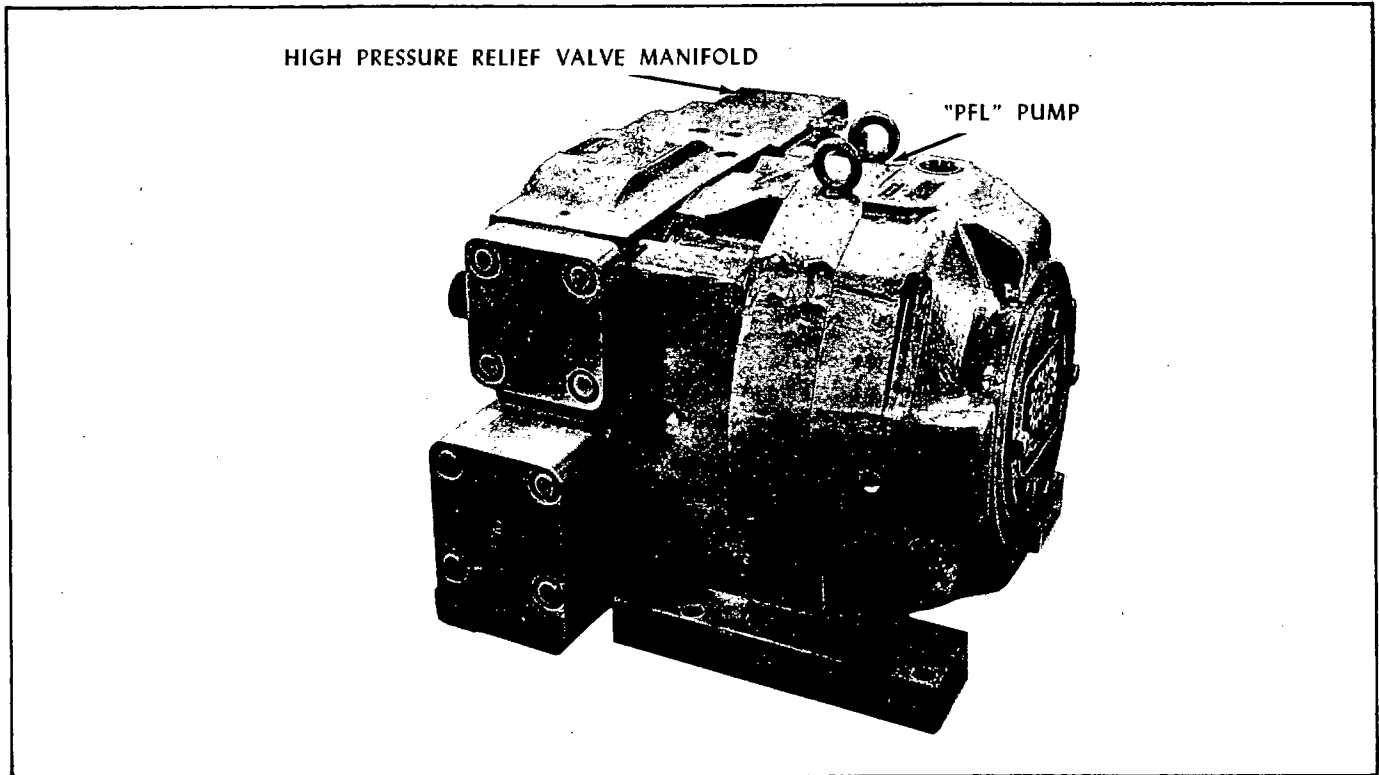


Figure 1. Unit(s) with high pressure relief valve manifold. (55157)

REFERENCE BULLETINS

Full Flow Pilot Pump Filters _____	DS-89907
Coolers _____	DS-89920
Fluid Recommendations _____	Bulletin 90000
Contamination Evaluation Guide _____	Bulletin 90004
Filtration Recommendations _____	Bulletin 90007
Piping Information _____	Bulletin 90011

TO THE USER AND OPERATOR OF OILGEAR "PFL" PUMPS:

These instructions will help you install, operate and maintain "PFL" units. Some Oilgear units have been modified from those described in this bulletin and other changes may be made without notice.

I. PREPARATION AND INSTALLATION

A. MOUNTING

1. PUMP WITHOUT RESERVOIR - Secure unit to a rigid mounting surface. Remove all pipe tap protectors (not pipe plugs). See bulletin on "Piping Information". Prefill pump case through port 1 with hydraulic fluid. Connect drain line from port 1 (with loop above highest point of case) to reservoir above the high fluid level, so case remains full of fluid. Suction and relief valve discharge tubes should reach one and a half to two times their diameter below low fluid level and within one or two times their diameter from bottom of reser-

voir - do not bottom tubes on reservoir. If unit is equipped with optional pilot pump, connect suction tube to port 3. The unit may also be equipped with an (optional) high pressure relief valve manifold. Connect valve discharge (port 6) to reservoir below-fluid level. Seal openings around all tubes to keep foreign material out of reservoir.

2. PUMP WITH RESERVOIR - These units are usually fully equipped. Mount reservoir on level foundation with bottom at least six inches from floor level to facilitate fluid changes. Remove case drain line, prefill pump case with hydraulic fluid and replace drain line.

B. PIPING AND FITTINGS

See Oilgear bulletin on "Piping Information" before connecting system per individual application circuit diagram. CAUTION: If unit is not equipped with optional Oilgear high pressure relief valve manifold, be sure system and pump are protected against overloads by relief valves. Be sure all connections are tight to prevent air from being drawn into the system or fluid from leaking out of the system.

LITHO IN USA

Issued: Sept., 1980

THE **Oilgear** COMPANY

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BULLETIN 946077

CLOCKWISE rotated pumps (delivery from port "A") with rear head in standard position:

High pressure relief valve must connect with port "A" (see cutaway diagram).

Port "B", opposite high pressure relief valve manifold, must connect to reservoir, supercharge line, or appropriate suction/supercharge module. Port "A", opposite H.P.R.V., must be blocked. With rear head in alternate position, H.P.R.V. and suction connections are reversed with respect to ports "A" and "B".

COUNTERCLOCKWISE rotated pumps (delivery from port "B") with rear head in standard position:

H.P.R.V. must connect with port "B" (see cutaway diagram). Port "A", opposite H.P.R.V. manifold, must connect to reservoir, supercharge line or appropriate suction/supercharge module. Port "B", opposite H.P.R.V., must be blocked. With rear head in alternate position, H.P.R.V. and suction connections are reversed with respect to ports "A" and "B".

C. POWER

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

D. DRIVE

See rotation direction plate on unit's housing. Clockwise units should not be driven counter-clockwise and vice versa. Use direct drive, provide an easy slip fit for coupling and fasten set screw. Do not use a press fit.

E. FLUID AND FILLING RECOMMENDATIONS

Refer to instruction plate on unit, reservoir, machine and/or Oilgear bulletins on Fluid Recommendations. Pump all fluid into reservoir through a clean 10 micron filter. Fill reservoir to, but not above, high level on sight gage. Be sure pump case is filled with fluid. Turn driveshaft a few times by hand with a spanner wrench to be sure parts are "free".

Approximate Torque to turn Pump Shaft	075	170	250
Ft. Lbs.	17	25	63
Nm.	23	34	85

With pump under "no load", turn the drive unit on and off several times before allowing pump to attain full speed. The system is usually filled by running the pump. Watch fluid level and stop pump if level becomes low. With differential (cylinder) systems, be sure level is not above "high level" when ram is retracted, or below "low level" when extended. Bleed air from system by loosening connections or opening petcocks at the highest point in system. Close connections or petcocks when steady stream of fluid appears.

F. FLUID FILTER

Keep hydraulic fluid clean at all times. Oilgear recommends the use of a filter between the pilot pump and connections to auxiliary devices. See reference material for information on filters. Replace filter element when condition indicator reaches change area at normal fluid temperature. Drain and thoroughly clean filter case. Use replacement elements of the same micron rating (normally three microns).

G. AIR BREATHER

An air breather is mounted on fluid reservoir for most installations. It is important the breather is kept clean and of adequate size to allow air flow in and out of reservoir as fluid level changes. About every six months, remove breather cover, wash screen in solvent, clean and refill case to level mark and install dry screen.

H. FLUID COOLING

When pump is operated continuously at rated pressure or frequent peak loads, auxiliary cooling of fluid may be necessary. Fluid temperature should not exceed the limits specified in Oilgear bulletins on "Fluid Recommendations".

II. CONSTRUCTION

A. HIGH PRESSURE PUMP (Refer to fig. 4)

A driveshaft (48) runs through the centerline of the pump cases (14 and 51). One half of the floating cylinder (34) is splined to it. A roller bearing (35) supports the cylinder and driveshaft inboard end and a ball bearing (50) supports the outboard end. The port plate (41) has crescent shaped ports, one crescent connects all the pumping pistons (32) making the upper half revolution and the other crescent connects the other pistons making the lower half revolution. Pumping pistons in the cylinder are held against the cam plate (25) by a harness plate (31). The cam plate has a fixed angle, which limits the stroke of the pistons.

B. OPTIONAL PILOT PUMP

Often a generated rotor type pilot pump assembly (9) is spline coupled to the rear end of the driveshaft.

C. OPTIONAL HIGH PRESSURE RELIEF VALVE (H.P.R.V.) (See Figure 5)

Manifold contains a large balanced type relief valve (438 or 435). The relief valve is operated by a smaller pilot relief valve (408 or 468). The size 250 manifold differs in configuration, but contains the same basic parts. Manifold is mounted on pumps high pressure delivery port.

D. OPTIONAL SUCTION/SUPERCHARGE MANIFOLD (Refer to fig. 6)

The manifold contains a spring supported disc type check valve (204) and a back pressure relief valve (220). It is mounted on pump port "B" for pumps delivering from port "A", but can be mounted on port "A" for pumps delivering from port "B".

III. SPECIFICATIONS

A. HIGH PRESSURE PUMP

Rated Drive Speed (all sizes).

60 hz -	1200 rpm
	1800 rpm (except 250)
50 hz -	1000 rpm
	1500 rpm

B. PILOT PUMPS (All Sizes) are available with a number of element widths that determine delivery volume. Check the second part of the model code (on pilot pump nameplate) to determine what you have. (Example: P3D-515-F20B). It will be necessary to ratio from the listed data for speeds and pressures other than listed.

CODE NO.	gpm at 1200 rpm		lpm at 1500 rpm	
	0 psi	2000 psi	0 bar	140 bar
260	20.1	18.9	63,6	58,8
390	30.2	29.0	95,3	91,0
515	40.2	39.0	127,1	123,2
645	50.3	46.7	158,9	146,7
775	60.4	58.6	190,7	183,4
900	70.1	65.7	221,5	205,8

MAXIMUM DELIVERY							
		075		170		250	
		gpm	lpm	gpm	lpm	gpm	lpm
5000 psi [345 bar]	60 hz 1200 rpm	36.6	139	82.0	310	122.0	462
	1800 rpm	55.0	209	126.0	477	---	---
	50 hz 1000 rpm	30.0	115	68.0	258	101.0	383
	1500 rpm	95.6	173	102.0	387	152.0	576

C. PILOT PUMP RELIEF VALVE (P.P.R.V.)

P.P.R.V. is often located on top of the pilot pump on PFL 170 and 250 sizes, and in the pilot pressure line on PFL-075.

PUMP SIZE	RPM	ADJUSTABLE RANGE		STANDARD PRESSURE	
		PSI	BAR	PSI	BAR
075	1200	25-1000	1,7-69	450	31
170	1200	25-1000	1,7-69	450	31
250	1200	25-1000	1,7-69	600	41

D. HIGH PRESSURE RELIEF VALVE (HPRV) MANIFOLD

The high pressure relief valve is adjustable on all sizes. Maximum setting should not exceed 5000 psi (345 bar). For higher pressure applications, consult The Oilgear Company.

IV. PRINCIPLE OF OPERATION (See page 4)

V. MALFUNCTIONS AND CAUSES

A. INSUFFICIENT HIGH PRESSURE PUMP VOLUME

1. Insufficient drive motor speed.
2. Worn axial piston pump.
3. Worn or grooved cradle wear plate (40) and/or port plate (41).
4. Obstructed suction circuit.
5. Main or pilot high pressure relief valve (HPRV) poppets (438 or 408), (485 or 468) stuck open - worn or dirty seats - broken springs.

B. IRREGULAR OR UNSTEADY OPERATION

1. Worn axial piston pump.
2. Air entering hydraulic system.
3. Reservoir fluid too low.
4. Faulty output circuit or components.

C. LOSS OF PRESSURE

1. Worn piston pump.
2. Piston shoe (32) not seated on cradle wear plate (16).
3. Worn or grooved port plate (41) or wear plate (40) - port and wear plate separation.
4. Main or pilot high pressure relief valve poppets (438 or 408), (485 or 468) stuck open - worn or dirty seats - broken springs.

D. EXCESSIVE OR HIGH PEAK PRESSURES

1. High pressure relief valves set too high.
2. Binding HPRV poppets (438 or 408), (485 or 468).
3. Clogged orifice slots in HPRV main poppet (438 or 485).
4. Back pressure in HPRV pilot valve discharge circuit.

E. EXCESSIVE NOISE

1. Worn or pitted bearings (35 or 50).
2. Worn or pitted cradle wear plate (16).
3. Worn or loose driveshaft/cylinder spline.
4. Faulty pilot pump coupling.
5. Starting or stopping pump under load.
6. Air entering hydraulic system.
7. Fluid too cold or viscosity too high.
8. HPRVs not seating properly or dampers (432) not operable.

F. EXCESSIVE HEATING

1. Worn pilot (9) or piston pump.
2. Worn or grooved port plate (41) or wear plate (40).
3. Air entering hydraulic system.
4. Low fluid reservoir.
5. Excessive relief valve discharge or leakage.
6. Operating pump above rated or peak pressure.
7. Insufficient cooling provision or clogged coolers.

IV. PRINCIPLE OF OPERATION (See Figure 2)

A. HIGH PRESSURE PUMP

Turning the driveshaft rotates the cylinder containing pumping pistons. A harness plate holds piston shoes against the cam plate, which has a fixed angle. Therefore, as the pistons revolve around the face of the cam plate, a reciprocating motion is produced. As each piston moves through the lower half revolution of the cylinder, it's bore is open to the lower crescent of the port plate. With pump driven clockwise and rear head in standard position (Figure A), each piston moves outward during the lower half revolution, drawing fluid into it's bore (from port "B") until it reaches it's outmost stroke where it's bore is blocked, having passed the lower crescent port opening. Moving through the upper half revolution of the cylinder, each piston bore opens to the upper crescent port of the port plate. Each piston strokes inward during the upper half revolution and displaces fluid through the upper crescent port to port "A" until it reaches it's inmost position where, having passed the upper crescent port, it is blocked once more before beginning the lower half revolution again.

With pump driven clockwise and rear head in alternate position, (Figure B), which reverses the angle of the cam plate, the piston will stroke outward during the upper half revolution and draw fluid from port "A". During the lower half revolution, the pistons will stroke inward and displace fluid to port "B". Therefore, reversal of cam plate angle reverses pump delivery.

NOTE: If pump is driven counter-clockwise, the delivery functions will be reverse of those described above.

B. OPTIONAL PILOT PUMP

The inner element of the gerotor pump has one "tooth" less than the outer element, forming a series of "pockets". As the inner element is rotated, the outer element, driven by it, also rotates. During the lower half revolution, the size of the "pockets" of fluid are squeezed through the upper half revolution and fluid is delivered from port 4 through a (recommended) filter to auxiliary devices.

VI. TESTING AND ADJUSTING

CAUTION: Shut down the pump before installing or removing gages, or when adding or removing shims.

A. HIGH PRESSURE RELIEF VALVE (H.P.R.V.)

Check pressure by installing a 6000 psi (415 bar) gage in auxiliary pressure port of the pump and operating machine. Keep periods of relief valve discharge short or excessive heating and damage may result. Be sure H.P.R.V. is not being vented through ports 13 and 13B and on dual pressure heads, pilot pressure is applied to head. Stall ram or output shaft of driven components. Gage will read H.P.R.V. setting. Compare reading with section III D, "Specifications" or your individual application circuit. Make adjustments when fluid is warm.

For units with adjustable pilot pressure head (405), turn pressure adjusting screw (411) clockwise to increase setting and counter-clockwise to decrease. For units with dual pressure pilot heads (415), add shims (417A, B, C) to increase setting or remove to decrease. Do not adjust for pressures higher than those in specifications.

C. OPTIONAL HIGH PRESSURE RELIEF VALVE MANIFOLD (H.P.R.V.)

As fluid is delivered by the high pressure pump, it passes around the H.P.R.V. poppet stem and through the axial slots in the H.P.R.V. poppet. Because there is equal pressure on both the stem end and the spring end of the poppet, the valve is in a balanced state and the spring holds the valve closed against the seat. When pressure generated in the line reaches the relief valve setting, the small pilot relief valve opens and pressure in the spring end of the H.P.R.V. poppet drops. Now the H.P.R.V. is in an unbalanced state. The greater pressure on the stem end forces poppet against spring, lifting H.P.R.V. off seat and fluid is exhausted through port 6. When excess pressure is relieved, the pilot relief valve poppet closes, the H.P.R.V. is again balanced and spring closes valve on seat to maintain pressure. Construction provisions are made to dampen the opening to prevent chattering (too rapid alternation of open/close).

D. OPTIONAL SUCTION/SUPERCHARGE MANIFOLD

The suction/supercharge manifold is connected on inlet port of pump (as an example - if port "A" is high pressure, port "B" is inlet). When optional pilot pump is used, the exhaust flow from it's relief valve is ported to port "B" flange opposite suction/supercharge manifold and is used to partially supercharge the axial piston pump. The balance of inlet volume is drawn through port 5 and check valve (204).

If full volume supercharge is used, it connects to inlet port, opposite suction/supercharge manifold. Any excess volume, not absorbed by the axial piston pump, builds pressure that opens the back pressure relief valve (B.P.R.V.) (224) and is returned to reservoir via port 5. If supercharge volume is insufficient, the axial piston pump can draw fluid from port 5 through check valve (204).

B. PILOT PUMP AND PILOT PUMP RELIEF VALVE (P.P.R.V.)

- To check pressure, fluid should be warm. Check circuit to be sure fluid is not bypassed or leaking somewhere in the circuit. Install a piping tee fitting in port 4 of the pilot pump, a closed needle valve in another leg of the fitting and a 2000 psi (140 bar) gage in the remaining leg. Place a suitable container at the needle valve outlet to catch pilot pump fluid. Start pump, with delivery bypassed.

PILOT PUMP - Open needle valve until gage reads 100 psi (6,9 bar) and then measure pilot pump volume. See section III B, "Specifications".

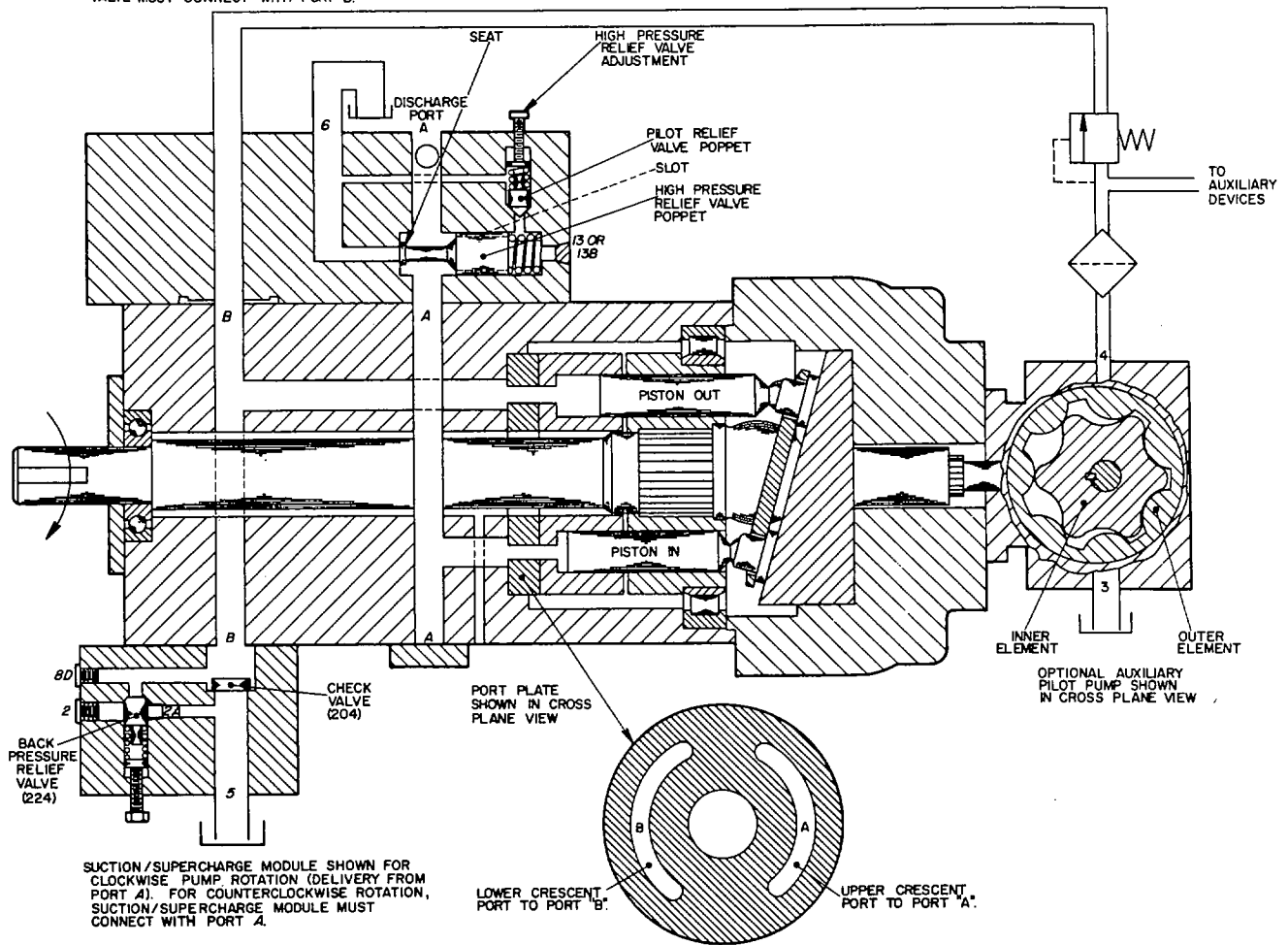
P.P.R.V. - Check pressure reading when relief valve opens and compare with section III C, "Specifications", or your individual application circuit drawing.

Limit discharge to prevent dropping reservoir fluid below low fluid level.

CAUTION: Dirty filter elements in the pilot pump circuit may cause a pressure drop and restrict available pilot pump pressure.

FIGURE "A" - PISTON PUMP SHOWN WITH REAR HEAD IN STANDARD POSITION.

TYPE "C" & "D" RELIEF VALVE MODULE SHOWN FOR CLOCKWISE PUMP ROTATION (DELIVERY FROM PORT A). FOR COUNTERCLOCKWISE ROTATION, RELIEF VALVE MUST CONNECT WITH PORT B.



SUCTION/SUPERCHARGE MODULE SHOWN FOR CLOCKWISE PUMP ROTATION (DELIVERY FROM PORT A). FOR COUNTERCLOCKWISE ROTATION, SUCTION/SUPERCHARGE MODULE MUST CONNECT WITH PORT A.

FOR CLOCKWISE ROTATED PUMPS, PORT B MUST CONNECT TO RESERVOIR, SUPERCHARGE LINE, OR APPROPRIATE SUCTION/SUPERCHARGE MODULE, AND PORT A OPPOSITE H.P.R.V. MODULE (IF USED) MUST BE BLOCKED.
 FOR COUNTERCLOCKWISE ROTATED PUMPS, BLOCK PORT B OPPOSITE H.P.R.V. MODULE (IF USED), AND PORT A TO RESERVOIR, SUPERCHARGE LINE, OR APPROPRIATE SUCTION/SUPERCHARGE MODULE.

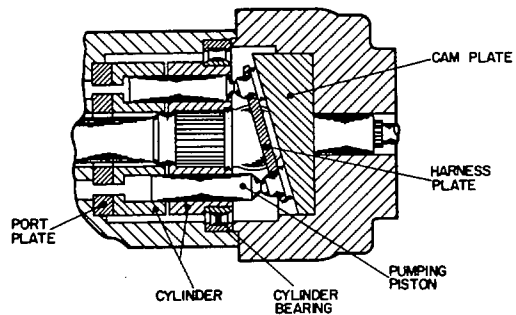


FIGURE "B" - PISTON PUMP SHOWN WITH REAR HEAD IN ALTERNATE POSITION.

NOTES FOR HIGH PRESSURE RELIEF VALVE & SUCTION CONNECTIONS ARE REVERSED (FROM FIGURE "A") IN RESPECT TO PORTS A & B.

C. AXIAL PISTON PUMP – To check for worn piston unit, measurement of the leakage, while under pressure, can be made from the case drain. After the unit is warm, either install a flow meter in the drain line, or have the flow from the drain line exposed to reservoir or a large container. The case must remain full of fluid during this test. With an accurate high pressure gage in the pressure line, start the pump and raise the maximum system pressure with the system relief valve. Read the flow meter or time the case drain flow to fill a known size container and calculate the flow rate. This leakage should be around 2% of the pump rated delivery for each 1000 psi (69 bar). Additional leakage indicates wear, but does not become critical until it impairs performance.

VII. DISASSEMBLY

Depending on what part or parts are to be inspected or replaced, it may not be necessary to completely disassemble unit. It may even be unnecessary to remove drive motor coupling, piping and/or pump from mounting.

Disconnect case drain line from port 1 and drain pump case through plug on bottom of case. (Case drain ports are usually prefixed by number "1".)

A. PILOT PUMP (Refer to fig. 4)

Remove screws (8) and slide pilot pump assembly (9) away from case. Remove O'ring (10). Spline coupling (11) with roll pin (12) can be pulled off of shaft end. Pilot pump case can be separated so the inner and outer elements can be inspected, if necessary. Refer to manufacturer's literature.

B. REAR HOUSING (Refer to fig. 4)

Place sling around rear housing (14), or use eyebolts. Remove screws (13). Partially pull rear housing straight back from front housing, being careful not to tilt or tip it. Note position of pin (27) in relation to rear head position (either "S-S" for standard position or "R-R" for alternate position, see figure 4). Separate piston harness plate (31) and piston assemblies (32) from cam wear plate (16) so they remain with the cylinder assembly. Withdraw rear housing completely and remove housing gasket (15). With large counterbore facing up, remove cam wear plate (16). Remove screws (21), rear case cover (22) and O'ring (10) – or see previous paragraph for pilot pump removal. Before removing cam plate (25), be sure to take note of whether the narrow width of the plate is on the right or left side of the pump. It must be returned to the same position when reassembling. Remove cam plate (25). Do not remove dowel pins (26) or (27) from front housing unless damaged.

C. PISTON PUMP AND PORT PLATE (Refer to fig. 4)

After rear housing has been removed so pump piston and harness plate assembly remains with cylinder assembly, mark each piston, its cylinder bore and location in harness plate to facilitate inspection and assembly. Pull harness plate (31) with piston assemblies (32) from cylinder assembly. Pull out cylinder half (34) with a sling. Inner race of cylinder bearing (35), piston harness fulcrum (33) and roll pin (36) should come out with cylinder half. Do not press out bearing (35) or remove pin (36) unless replacement is necessary. Remove cylinder spring (37), cylinder wear plate (40) and dowel pins (39) with second cylinder half (38). Do not remove dowel pins (39) unless they need to be replaced. Remove port plate assembly (41). Dowel pin (42) may come out with the plate or remain in case.

D. OPTIONAL HIGH PRESSURE RELIEF VALVE MANIFOLD (Refer to fig. 5)

1. SIZES 075 and 170 – Disconnect any piping to manifold. Either place a sling around manifold or use eyebolts and remove mounting screws (400) and high pressure relief valve (HPRV) manifold (401) from pump. Take out O'rings (402). Remove screws (406) and lift off pilot head (405 or 415) as an assembly with roll pins (404). Remove O'rings (407) and (430) from head and manifold. Lift out pilot relief valve poppet (408) and spring (409).

For adjustable pressure pilot heads, remove adjusting screw (411) and jam nut (410). Slide out pilot valve spring cap (412) and remove O'ring (413).

On units equipped with dual pressure pilot heads, insert a rod through pilot pressure/drain connection and push out dual pressure piston (416) and shims (417 A, B, C). Remove HPRV spring (431). High pressure relief damper plug (432) is removed with HPRV poppet assembly. From poppet, pull damper plug (432), damper chamber spring (433), O'ring (434) and damper chamber spacer (435). To remove HPRV balance piston (436), pull out HPRV poppet (438) and push HPRV support rod (437) through poppet.

2. SIZE 250 – Disconnect piping to manifold. With a sling around the manifold, or using eyebolts, remove mounting screws (450A) and HPRV manifold (450) from pump. Lift off O'ring (451). Remove screws (452) and relief valve pilot head (453). Turn out adjusting knob cap (455) and O'ring (456) with dowel pin (457) and O'ring (458). If pilot relief valve spring guide (465) and O'ring (466) do not come out with adjusting knob assembly, remove them. Remove machine screw (460) and lift off adjusting knob (454). Remove jam nut (459) and adjusting screw (463). Take out pilot relief valve spring (467) and pilot relief valve poppet (468). To inspect seat, remove pilot relief valve cap (469) and, using a 0.25-20NC-2 threaded bolt, pull out pilot relief valve seat (470) with O'rings (471).

Remove O'rings (480) and (481) from manifold. HPRV spacer (482) and HPRV spacer plug (482A) can be pulled off roll pin (483). Remove HPRV spring (484) and pull out HPRV poppet (485). To inspect seat, remove screws (487) and relief valve exhaust flange (488). After removing O'rings (489), pull out HPRV seat spacer (490) and HPRV seat (491) can be pressed off roll pins (492).

E. OPTIONAL SUCTION/SUPERCHARGE MANIFOLD (Refer to fig. 6)

Disconnect any piping to manifold. Place a sling around manifold and remove screws (200) and manifold body (201) from pump. Pull spring retainer (202) from body and remove O'ring (203). Slip out check valve disc (204) with check valve spring (205). Check valve seat (206) is pressed into body and should not be removed unless replacement is necessary. Remove plug (220) with O'ring (221). On sizes 170 and 250, lift out back pressure relief valve spring (222) and washer (223). Slide out plunger (224). On size 075, unscrew B.P.R.V. cartridge as an assembly. If necessary, remove screws (214A) and flange (214). Remove O'ring (215).

F. DRIVESHAFT AND SEAL (Refer to fig. 4)

Disconnect coupling from drive motor and remove pump from mounting. Remove driveshaft coupling key (43). Remove screws (44) and slide driveshaft seal gland (45) with driveshaft seal (47) carefully off of driveshaft. If replacement is necessary, seal can be removed from gland. Remove O'ring (46). Pull driveshaft assembly (48) from front housing (51). Remove

retaining ring (49) and front shaft bearing (50) can be pressed off of shaft if replacement is necessary.

VIII. INSPECTION

Clean all parts thoroughly. Inspect all seals and O'rings for hardening or deterioration and replace if necessary. Check all locating pins (dowel or roll) for damage. Check all springs for cracks or signs of fatigue.

A. PILOT PUMP

Inspect inner and outer elements for nicks, burrs, or signs of wear. Check face plates for scratches and grooves. Check bearings for smooth rotation. If necessary, replace pilot pump as an assembly or contact pilot pump manufacturer for current parts information.

B. REAR HOUSING

Inspect cam wear plate (16) for scratches, grooves or uneven surface. If defects are minor, they can be lightly stoned from surface.

C. PISTON PUMP AND PORT PLATE

Check all pump piston assemblies (32) for smooth action in their cylinder bores. Check walls of pistons and bores for scratches and other signs of excessive wear. Be sure each piston shoe pivots smoothly and end play does not exceed 0.003 inches (0,076 mm). Inspect each shoe face for nicks or scratches. Scratches are due to dirt in the fluid. Measure shoe thickness, the part between harness plate and cradle wear plate. All shoes must be equal to within 0.0005 inch (0,013 mm). If one or more piston assembly needs to be replaced, it is recommended that all of them be replaced. Inspect cylinder bearing (35) for galling, pitting, binding or roughness and replace if necessary. Closely inspect mating faces of cylinder wear plate (40) and port plate (41) for flatness, scratches or grooves. If faces are not flat and smooth, the wear plate will "lift-off" of port plate, causing loss of delivery. Some plates can be refinished by light grinding or lapping, if damage is not deep. If damage is deep, replacement is necessary.

D. OPTIONAL H.P.R.V. MANIFOLD

1. SIZES 075 and 170

Inspect relief valve poppet (408) and seat in manifold for scratches or grooves. Replace poppet if damaged. Check HPRV poppet (438) to be sure it is clean and axial grooves are open. Check poppet's face and seat for scratches or grooves and lap if necessary. Check for smooth motion of balance piston (436) in bore of poppet and poppet in body. To prevent HPRV chatter, make sure drilling through damper chamber spacer (435) and damper plug (432) is clear.

2. SIZE 250

Inspect pilot relief valve poppet (468) for scratches or grooves and replace if damaged. Check HPRV poppet (485) to be sure it is clean and lateral grooves are open. Check poppet shoulder and seat (491) for scratches, grooves or cracks and lap if necessary.

E. OPTIONAL SUCTION/SUPERCHARGE MANIFOLD

Check for dirt on check valve seat (206) and disc (204) and examine surfaces for scratches, grooves, or cracks. Inspect back pressure relief valve plunger (224), on sizes 170 and 250, for scoring or foreign matter. Polish or lap sticky plunger. Clearance between plunger and body should be 0.0011 to 0.0014 inch (0,028 to 0,036 mm). Be sure hole in plunger is not

blocked. On size 175, check action of B.P.R.V. poppet for smoothness. If judged faulty, replace as an assembly.

F. DRIVESHAFT AND SEAL

Check driveshaft seal for cracks and replace if necessary. Check shaft bearing (50) for galling, pitting, binding, or roughness and replace if necessary.

IX. ASSEMBLY

Clean and lubricate parts with a film of hydraulic fluid just prior to assembly. A light coat of grease on O'rings and other parts can be used to hold them in place during assembly. If bearing races are heated in oil to ease assembly, exercise extreme caution to prevent heating over 250°F (120°C).

A. DRIVESHAFT AND SEAL

Press on inner race of shaft bearing (50) to force it down on the shoulder of the driveshaft (48). Lock it in place with retaining ring (49). Slide shaft assembly into front housing (51) until bearing fits into it's bore. If necessary, tap outer race of bearing to seat it in the bore. Insert O'ring (46) in housing. Press driveshaft seal (47) evenly into shaft gland (45). Carefully, slide gland assembly over driveshaft, secure with screws (44) and add shaft key (43).

B. OPTIONAL H.P.R.V. MANIFOLD - 1. SIZES 075 and 170

Place HPRV support rod (437) in bore of HPRV balance piston (436) and insert in HPRV poppet (438). Place O'ring (434) on HPRV damper plug (432) and insert damper chamber spring (433) in plug. Insert end of damper chamber spacer (435) with radially cross drilled holes inside chamber spring. Insert damper plug assembly into bore of HPRV poppet (438). When placing the HPRV poppet assembly into manifold, make sure the support rod bottoms in the drilled hole and poppet seals on counterbore in manifold.

For dual pressure pilot heads, tamp down shims (417 A, B,C,) in dual pressure piston (416) to be sure they are flat. Insert this assembly into dual pressure head (415). For adjustable pressure pilot heads, screw pressure adjusting screw (411) and jam nut (410) into adjustable pressure pilot head (405), place O'ring (413) on pilot valve spring cap (412) and insert in bore on adjusting screw.

Insert pilot relief valve spring (409) in bore of pilot head. Place pilot relief valve poppet (408) in spring. Put O'rings (407) and (430) in their respective bores. Place HPRV spring (431) on damper plug (432) and guide pilot head assembly on roll pins (404) being sure pilot poppet seats in drilled manifold passage. Secure pilot head with screws (406). With O'rings (402) in place, secure manifold (401) to pump with screws (400).

2. SIZE 250

Guide HPRV seat (491) on roll pins (492) and press until it seats on shoulder inside HPRV manifold (450). Insert HPRV seat spacer (490) and O'ring (489) in bore. Fasten relief valve exhaust flange (488) to HPRV manifold with screws (487). Place HPRV spring (484) in HPRV poppet (485). Insert orifice plug (486) into poppet, slide poppet into bore until it seats. Locate HPRV spacer (482) on roll pin (483), push into place until shoulder seats. Add spacer plug (482A). Insert O'rings (480) and (481) in bores. Be sure orifice plug (472) is in drilled passage under port 14. Place O'ring (471) on pilot relief valve seat (470) and insert in pilot head bore. Screwing in pilot relief valve cap (469) will press in seat. Place pilot relief valve poppet (468) on one end of pilot relief valve spring (467) and

pilot relief valve spring guide (465) with O'ring (466) on other end. Insert dowel pin (457) into spring guide to be held by O'ring (466) and place complete assembly in pilot head bore so poppet seats. Be sure O'ring (458) is inside adjusting screw cap (455). Slide O'ring (456) over cap and insert cap assembly in bore so it slides over dowel pin (457). Screw in cap assembly. Replace adjusting screw (463) and jam nut (459). Add adjusting knob (454) and machine screw (460). Fasten assembled pilot head (453) to manifold with screws (452) Torque screws (452) to 230-250 ft. lbs. (310-338 Nm). Insert O'ring (451) in it's bore. Make sure plug (450B) is installed. Secure HPRV manifold (450) to pump with screws (450A). Torque to 380-390 ft. lbs. (513-526 Nm).

C. OPTIONAL SUCTION/SUPERCHARGE MANIFOLD

Be sure external plugs (217) and (225) with O'rings (218) and (226) are in place. For sizes 170 and 250, replace BPRV plunger (224) in body (201). Insert back pressure relief valve spring (222) and washer (223) in piston. Replace O'ring (221) and plug (220). For size 075, reinstall BPRV cartridge as an assembly. If check valve seat (206) was removed, press in place. Place check valve spring (205) on check valve disc (204) with large spring circumference on disc. Place disc with spring in bore on the seat. Note position of spring retainer (202) fins and align with slots in manifold before pressing into place. Insert O'ring (203) in bore and secure manifold (201) to pump with screws (200). If removed, replace O'ring (215) and flange (214). Secure with screws (214A).

D. PISTON PUMP AND PORT PLATE

Slide port plate (41) into housing and position on dowel pin (42). For pressure at port A, use the locating hole stamped "A" for dowel pin placement in the port plate. For pressure at port B, use the locating hole stamped "B". Dowel pins (39) should be pressed 0.38 inches (9.7 mm) into rear cylinder half (38). Use grease and locate cylinder wear plate (40) on the pin. Place on bench with wear plate down. Place cylinder springs (37) in their bores. Press on inner race or shrink fit pump cylinder bearing (35) on splined cylinder half (34). Roll pin (36) should be pressed into this cylinder half 0.50 (12,7 mm). Position cylinder half (34) on half (38) so roll pin locates in hole in front half (38). It is recommended that each piston assembly (32) be placed in the pump piston harness plate (31) hole and bore in cylinder that it came from (they should have been identified when disassembling). Place harness plate on fulcrum (33) accordingly and insert one piston at a time through the harness plate and into the cylinder bore. Slip an approximately one inch wide web sling around the entire assembly, on it's side, as close to the bearing as possible. Using the sling and a hoist, guide the assembly onto the driveshaft as far as possible. With the assembly supported by the shaft, remove the sling. Lift the assembly up slightly and, while pushing inward, turn it slightly to engage the splines. The face of the cylinder should be parallel to the face of the housing. It might be necessary to wiggle and push on face to align splines. Place sling around shaft and lift it slightly until bearing is aligned with it's bore. Push in until bearing seats in bore and wear plate contacts the port plate.

E. REAR HOUSING

Locate cam plate (25) on dowel pins (26). Be sure the narrow width of the cam plate is returned to the original position. Place rear housing (14) with large bore upward. Grease contact side of cam wear plate (16) and place in cam plate bore. Place housing gasket (15) on rear pump housing. Using a sling or eyebolts, slide this entire assembly along driveshaft until case halves meet, centered on roll pin (27). Oil threads of screws (13) and fasten two halves together, torquing to:

SIZE	FT. LBS.	Nm
075	55-60	75-81
170	135-140	183-189
250	193-198	261-268

Remove plug (82) opposite cylinder gap "A" and measure gap. It should be:

SIZE	INCHES	MM
075	0.090 ± 0.017	2,29 ± 0,43
170	0.100 ± 0.050	2,54 ± 1,27
250	0.100 ± 0.051	2,54 ± 1,30

If gap does not measure accordingly, it is an indication of wrong assembly.

If unit is not equipped with a pilot pump, insert O'ring (10) in rear cover bore and fasten rear case cover (22) with screws (21).

F. PILOT PUMP

Insert O'ring (10) in bore. Slide pilot pump spline coupling (11) with roll pin (12) onto pilot pump (9) shaft and insert assembly in rear housing bore until spline coupling engages spline on rear driveshaft. Fasten with screws (8).

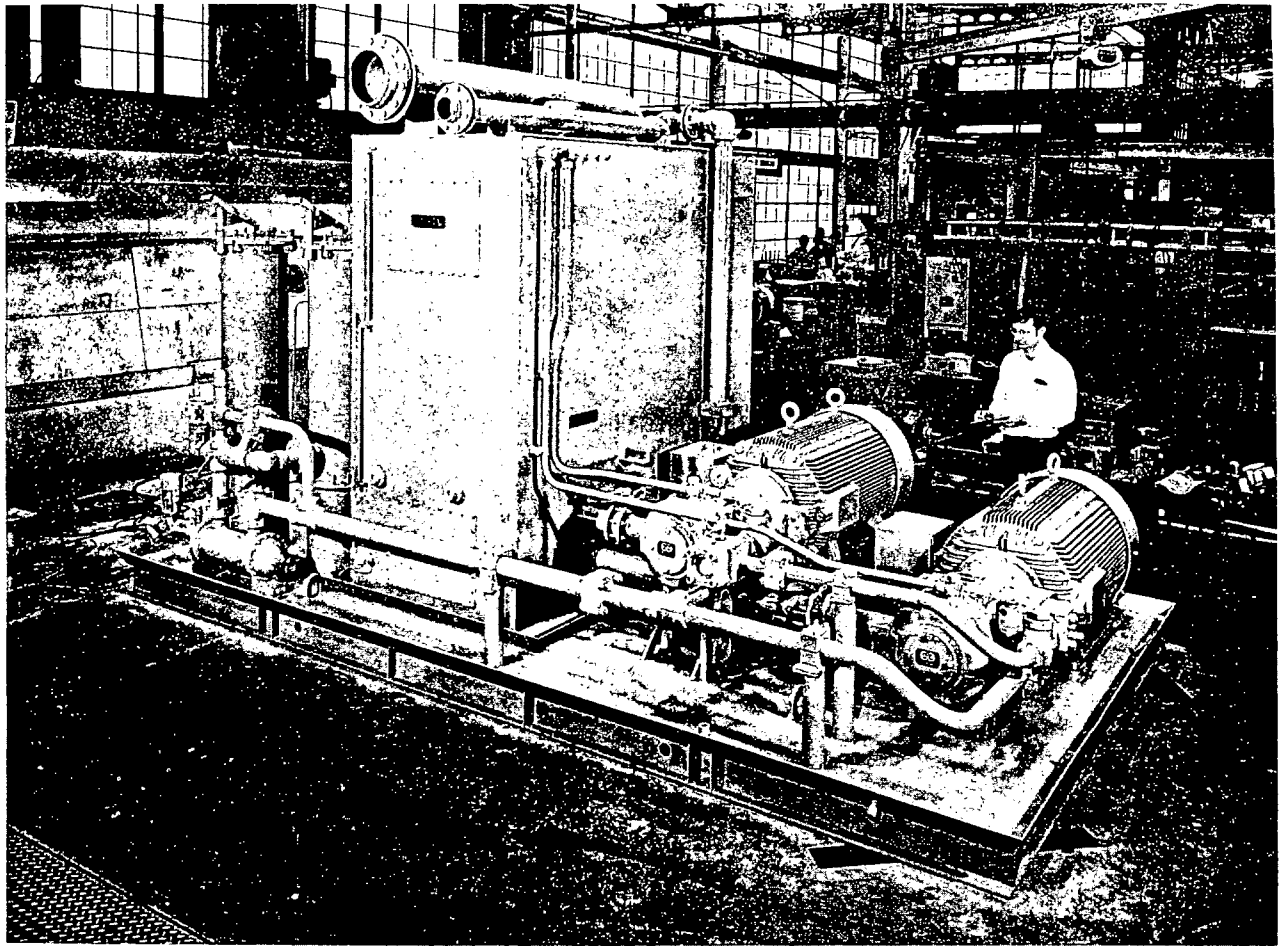


Figure 3. Photo of PFL-250 Pump on base (55299).

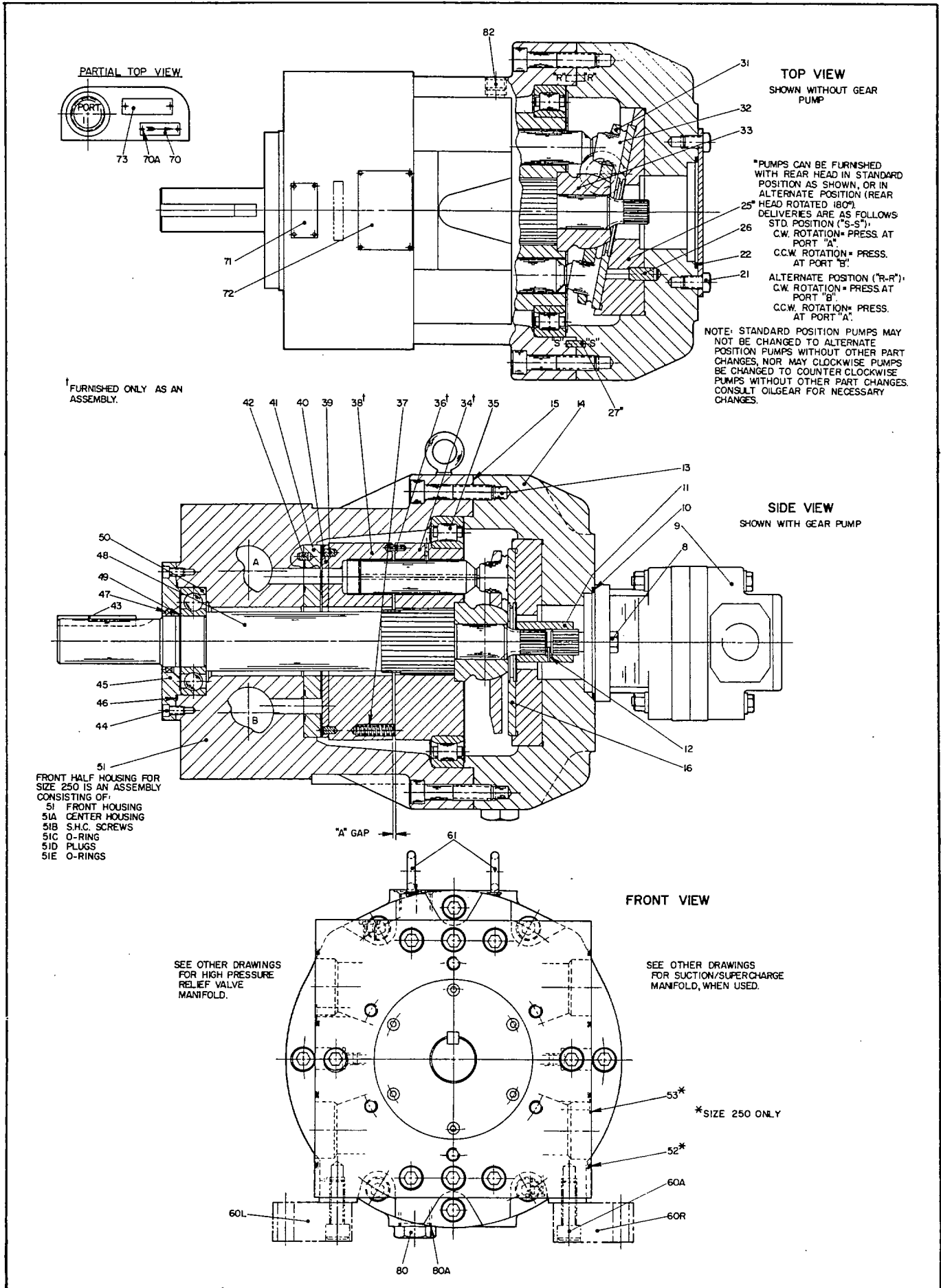


Figure 4. Parts Drawing, "PFL" Pumps. DS-946077-B (509876-B)

X. PARTS LIST, PFL PUMPS

ITEM NO.	DESCRIPTION
8	Screw, Hex. Head
9	Pilot Pump Assembly
10	Seal, O'Ring
11	Coupling, Gear Pump Spline
12	Pin, Roll
13	Screw, Cap
14	Housing, Rear Pump
15	Gasket, Housing
16	Wear Plate, Cam
21	Screw Cap
22	Cover, Rear Case
25	Plate, Cam
26	Pin, Dowel
27	Pin, Roll
31	Plate, Piston Harness
32	Pump Piston Assembly
33	Fulcrum, Piston Harness
34†	Pump, Cylinder Half
35	Bearing, Cylinder
36†	Pin, Roll
37	Spring, Cylinder
38†	Pump, Cylinder Half
39	Pin, Dowel
40	Wear Plate, Cylinder
41	Plate, Port
42	Pin, Dowel
43	Key, Driveshaft Coupling
44	Screw, Cap
45	Gland, Driveshaft Seal
46	Seal, O'Ring
47	Seal, Driveshaft
48	Driveshaft, Assembly
49	Ring, Retaining
50	Bearing, Front Shaft

ITEM NO.	DESCRIPTION
51	Housing, Front
51A*	Housing, Center
51B*	Screw, Cap
51C*	Seal, O'Ring
51D*	Plug, Cross Drilling
51E*	Seal, O'Ring
52*	Seal, O'Ring
53*	Seal, O'Ring
60A	Screw, Cap
60L	Mounting Foot, Left
60R	Mounting, Foot, Right
61	Bolt, Eye
70	Plate, Rotation
70A	Screw, Drive
71	Plate, Name
72	Plate, Fluid Recommendations
73	Plate, Caution
80	Plug, Parker
80A	Seal, O'Ring
82	Plug, Pipe

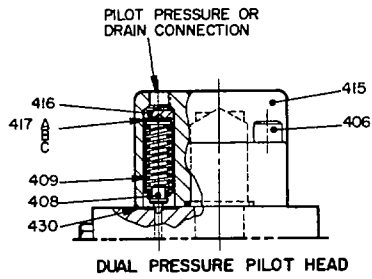
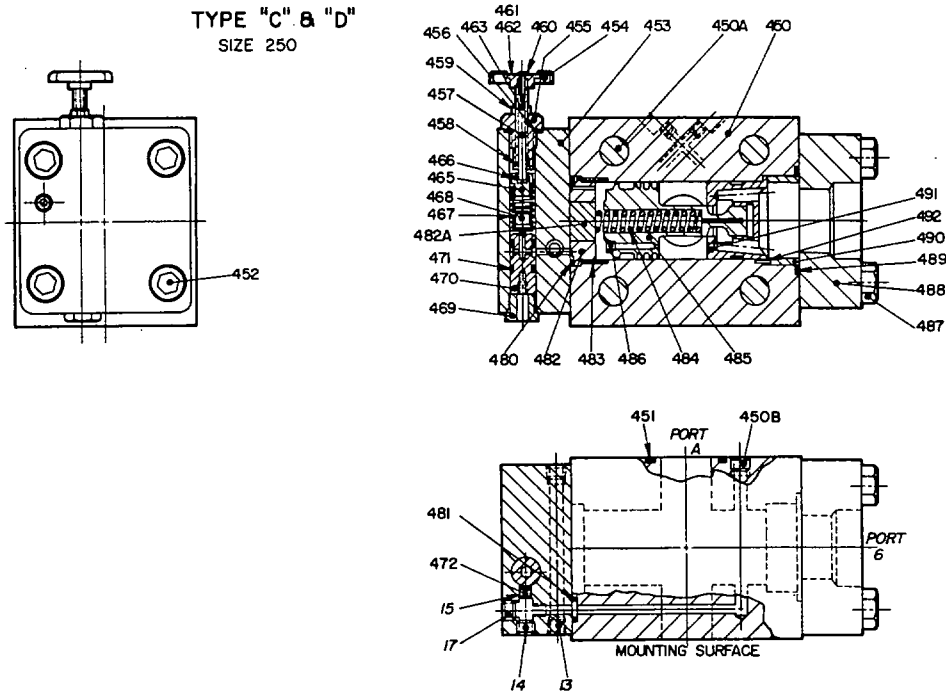
† Furnished only as an assembly

* Size 250 only

O'RING SIZES
(Cross Section x O.D. - Duro + 5)

ITEM NO.	PFL-075	PFL-170	PFL-250
10	3/16 x 4-5/8 70	3/16 x 5-5/8 70	3/16 x 5-5/8 70
46	1/8 x 4 70	1/8 x 5-3/8 70	1/8 x 6 70
51C	-----	-----	3/16 x 10-7/8 70
51E	-----	-----	906 ARP 70
52	-----	-----	3/16 x 3-7/8 70
53	-----	-----	3/16 x 3/4 70
80A	916 ARP 70	916 ARP 70	920 ARP 70

Parts used in this assembly are per Oilgear specifications. Use Oilgear parts for compatibility with assembly requirements. When ordering parts, be sure to specify type designation, serial number stamped on nameplate, bulletin number and item number. Specify type of hydraulic fluid for packings and seals.



TYPE "C" & "D"
SIZES 170 & 075

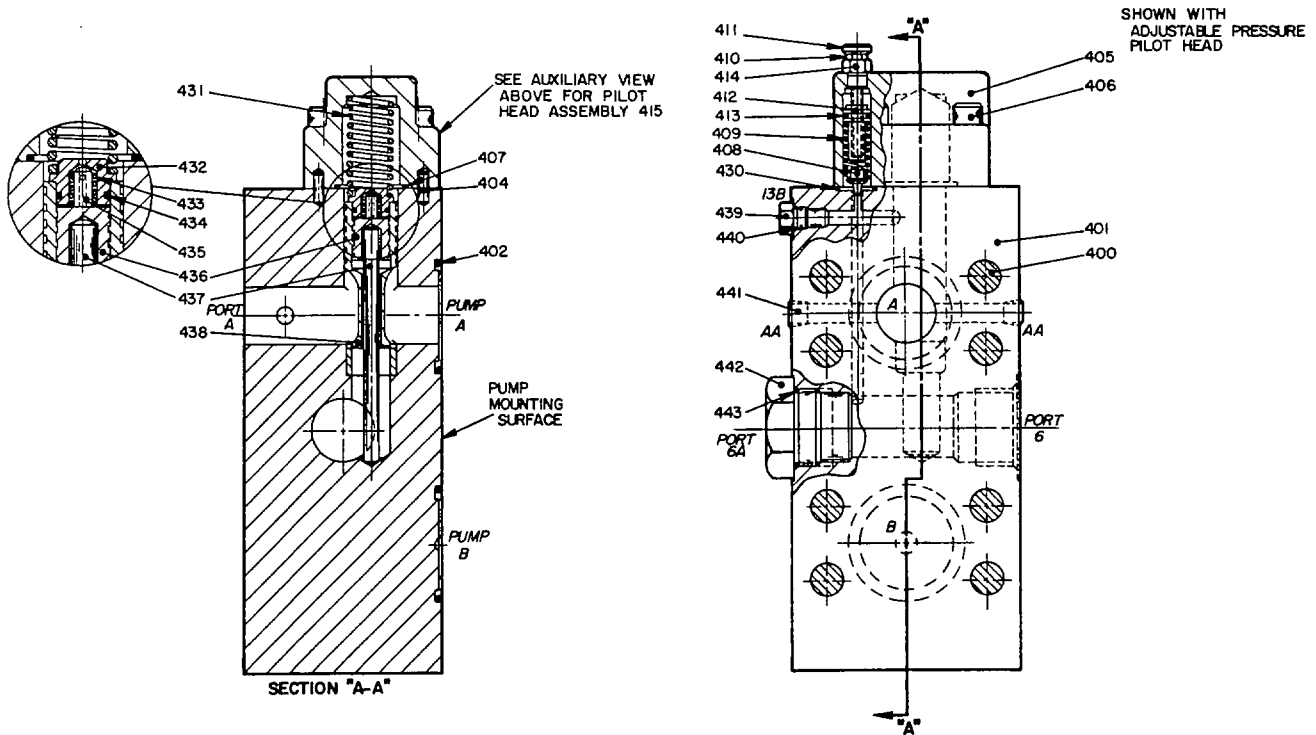


Figure 5. Parts Drawing "PFL" OPTIONAL H.P.R.V. Modules. DS-946077-B (509876-B).

XI PARTS LIST

OPTIONAL HIGH PRESSURE RELIEF VALVE MANIFOLD
FOR "PFL" PUMPS SIZES 075 and 170

ITEM NO.	DESCRIPTION
400	Screw, Mounting
401	Manifold HPRV
402	Seal, O'Ring
404	Pin, Roll
405	Head, Adjusting Pressure Pilot
406	Screw, Cap
407	Seal, O'Ring
408	Poppet, Pilot Relief Valve
409	Spring, Pilot Relief Valve
410	Nut, Jam
411	Screw, Pressure Adjusting
412	Cap, Pilot Valve Spring
413	Seal, O'Ring
415	Head, Dual Pressure Pilot
416	Piston, Dual Pressure
417A	Shim, 0.003
417B	Shim, 0.005
417C	Shim, 0.010
430	Seal, O'Ring
431	Spring, HPRV
432	Plug, HPRV Damper
433	Spring, Damper Chamber
434	Seal, O'Ring
435	Spacer, Damper
436	Piston, HPRV Balance
437	Rod, HPRV Support
438	Poppet, HPRV
439	Plug, Hex. Head
440	Seal, O'Ring
441	Plug, Pressure
442	Plug, Hex. Head
443	Seal, O'Ring

OPTIONAL HIGH PRESSURE RELIEF VALVE MANIFOLD
FOR "PFL" PUMP SIZE 250

ITEM NO.	DESCRIPTION
450	Manifold, HPRV
450A	Screw, Cap
450B	Plug, Pipe
451	Seal, O'Ring
452	Screw, Cap
453	Head, Pilot Relief Valve
454	Knob, Adjusting
455	Cap, Adjustng Knob
456	Seal, O'Ring
457	Seal, O'Ring
459	Nut, Jam
460	Screw, Machine
461	Washer, Lock
462	Plate, Adjusting Direction
463	Screw, Adjusting
465	Guide, Pilot Relief Valve Spring
466	Seal, O'Ring
467	Spring, Pilot Relief Valve
468	Poppet, Pilot Relief Valve
469	Cap, Pilot Relief Valve
470	Seat, Pilot Relief Valve
471	Seal, O'Ring
472	Plug, Orifice
480	Seal, O'Ring
481	Seal, O'Ring
482	Spacer, HPRV
482A	Plug, Spacer
483	Pin, Roll
484	Spring, HPRV
485	Poppet, HPRV
486	Plug, Pipe
487	Screw, Hex. Hd. Cap
488	Flange, Relief Valve Exhaust
489	Seal, O'Ring
490	Spacer, HPRV Seat
491	Seat, HPRV
492	Pin, Roll

O-RING SIZES
(Cross Section x O.D. - Duro ± 5)

ITEM NO.	PFL-075		PFL-170	
402	1/8 x 2-1/8	90	3/16 x 2-3/4	90
407	1/8 x 1-3/4	90	1/8 x 1-3/4	90
413	3/32 x 5/8	70	3/32 x 5/8	70
430	3/32 x 1	70	3/32 x 1	70
434	3/32 x 7/8	90	3/32 x 7/8	90
440	ARP 906	70	ARP 906	70
443	ARP 920	70	ARP 920	70

ITEM NO.	PFL-250	
451	3/16 x 2-1/2	90
456	1/8 x 1-1/8	70
458	1/16 x 7/16	70
466	1/16 x 7/16	70
471	3/32 x 3/4	90
480	1/8 x 3-1/8	90
481	3/32 x 3/4	90
489	3/16 x 3-3/8	70

Parts used in these assemblies are per Oilgear specifications. Use Oilgear parts for compatibility with assembly requirements. When ordering parts, be sure to specify type designation, serial number stamped on nameplate, bulletin number and item number. Specify type of hydraulic fluid for packings and seals.

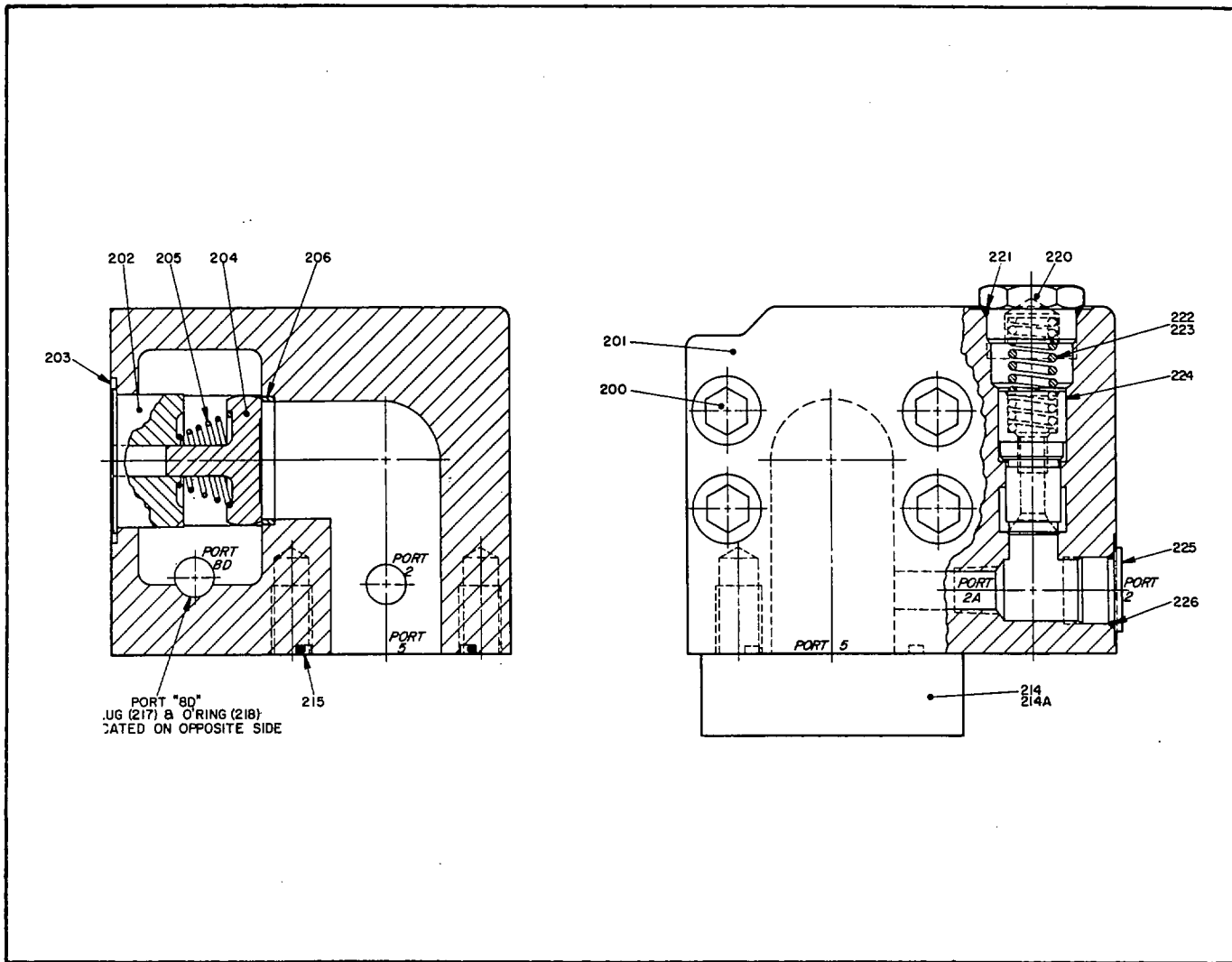


Figure 6. Parts Drawing "PFL" optional suction/supercharge manifold. DS-946077-B (509876-B).

XII. PARTS LIST

OPTIONAL SUCTION/SUPERCHARGE MANIFOLD FOR "PFL" PUMPS

<u>ITEM NO.</u>	<u>DESCRIPTION</u>	<u>ITEM NO.</u>	<u>DESCRIPTION</u>
200	Screw, Cap	215	Seal, O'Ring
201	Body, Manifold	217	Plug, S.A.E.
202	Retainer, Spring	218	Seal, O'Ring
203	Seal, O'Ring	220	Plug, S.A.E.
204	Disc, Check Valve	221	Seal, O'Ring
205	Spring, Check Valve	222	Spring, B.P.R.V.
206	Seat, Check Valve	223	Washer
214	Flange, Socket Weld or Pipe	224	Plunger, B.P.R.V.
214A	Screw, Cap	225	Plug, S.A.E.
		226	Seal, O'Ring

O-RING SIZES
(Cross Section x O.D. - Duro + 5)

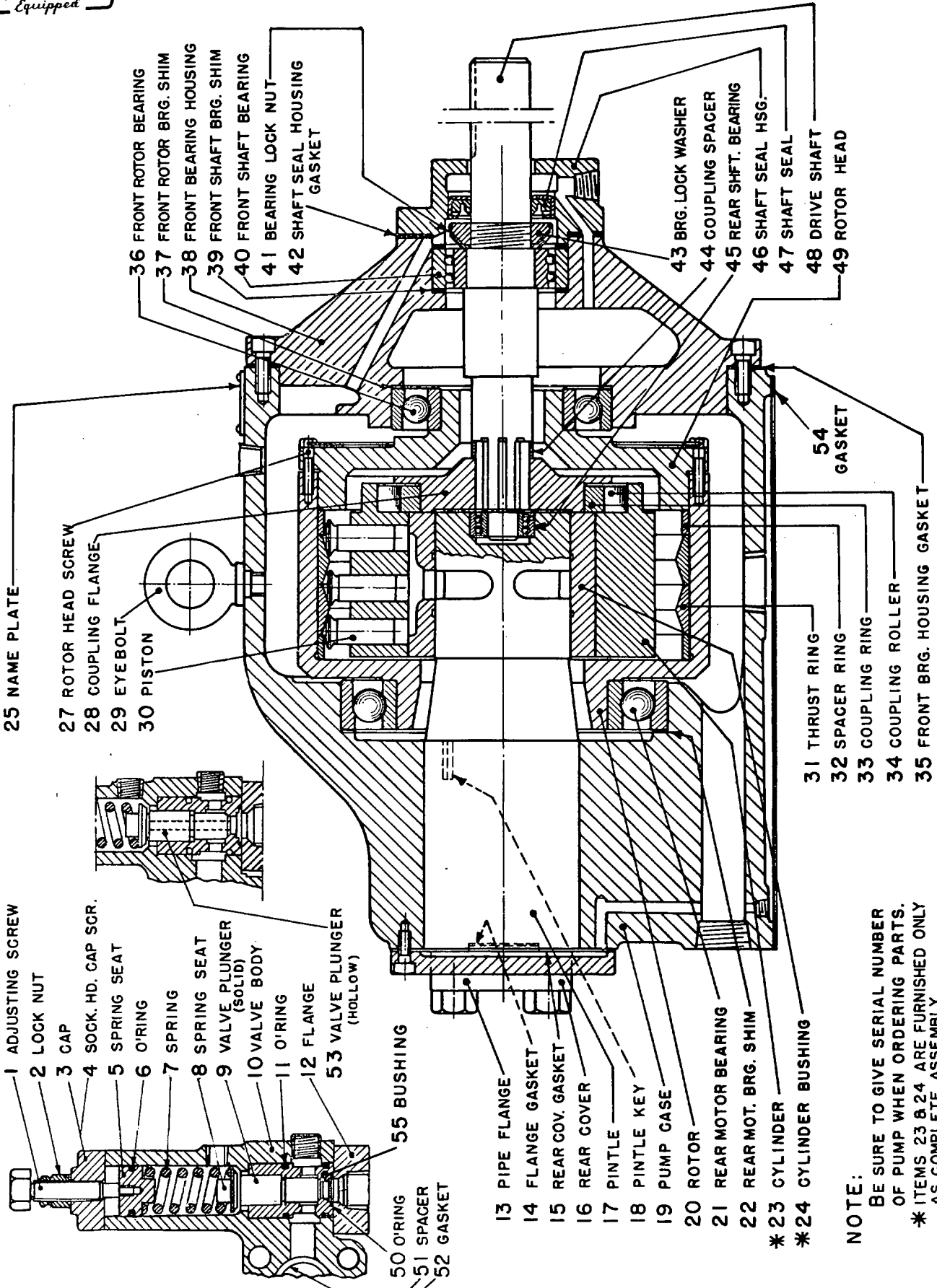
ITEM NO.	PFL-075		PFL-170		PFL-250	
203	3/16 x 2-1/4	90	1/8 x 3	90	-----	
215	3/16 x 3	90	3/16 x 3-3/4	90	3/16 x 3-3/4	70
218	ARP 908	70	ARP 910	70	ARP 908	70
221	-----	-----	ARP 920	70	ARP 920	70
226	ARP 912	70	ARP 916	70	ARP 916	70

Parts used in this assembly are per Oilgear specifications. Use Oilgear parts for compatibility with assembly requirements. When ordering parts, be sure to specify type designation, serial number stamped on nameplate, bulletin number and item number. Specify type of hydraulic fluid for packings and seals.



OILGEAR TYPE C PUMPS

REPAIR PARTS DRAWING
TYPE "C" PUMPS



- 1 ADJUSTING SCREW
- 2 LOCK NUT
- 3 CAP
- 4 SOCK. HD. CAP SCR.
- 5 SPRING SEAT
- 6 O'RING
- 7 SPRING
- 8 SPRING SEAT
- 9 VALVE PLUNGER (SOLID)
- 10 VALVE BODY
- 11 O'RING
- 12 FLANGE
- 53 VALVE PLUNGER (HOLLOW)
- 50 O'RING
- 51 SPACER
- 52 GASKET
- 55 BUSHING

- 13 PIPE FLANGE
- 14 FLANGE GASKET
- 15 REAR COV. GASKET
- 16 REAR COVER
- 17 PINTLE
- 18 PINTLE KEY
- 19 PUMP CASE
- 20 ROTOR
- 21 REAR MOTOR BEARING
- 22 REAR MOT. BRG. SHIM
- * 23 CYLINDER
- * 24 CYLINDER BUSHING
- 25 NAME PLATE
- 27 ROTOR HEAD SCREW
- 28 COUPLING FLANGE
- 29 EYEBOLT
- 30 PISTON
- 31 THRUST RING
- 32 SPACER RING
- 33 COUPLING RING
- 34 COUPLING ROLLER
- 35 FRONT BRG. HOUSING GASKET
- 36 FRONT ROTOR BEARING
- 37 FRONT ROTOR BRG. SHIM
- 38 FRONT BEARING HOUSING
- 39 FRONT SHAFT BRG. SHIM
- 40 FRONT SHAFT BEARING
- 41 BEARING LOCK NUT
- 42 SHAFT SEAL HOUSING GASKET
- 43 BRG. LOCK WASHER
- 44 COUPLING SPACER
- 45 REAR SHFT. BEARING
- 46 SHAFT SEAL HSG.
- 47 SHAFT SEAL
- 48 DRIVE SHAFT
- 49 ROTOR HEAD
- 54 GASKET

NOTE:
 BE SURE TO GIVE SERIAL NUMBER OF PUMP WHEN ORDERING PARTS.
 * ITEMS 23 & 24 ARE FURNISHED ONLY AS COMPLETE ASSEMBLY.
 INSTALLATION DRAWING DS-46100-G

45575-C

