

SERVICE INSTRUCTIONS

OILGEAR TYPE "VSA" THREE-WAY CYLINDER PREFILL AND EXHAUST VALVES

PURPOSE OF INSTRUCTIONS

These instructions are written to simplify your work when installing, operating and maintaining Oilgear Type "VSA" cylinder prefill valves. Your acquaintance with the construction, principle of operation and characteristics of these valves will help you attain satisfactory performance, reduce shut-down time and increase the unit's life. Some units have been modified from those described in this bulletin and other changes may be made without notice.



Figure 1. Typical "VSA" Prefill. Unit on left (94018) w/o "shroud", unit on right (94019) shown with "shroud".

REFERENCE MATERIAL

Piping Information Bulletin 90011
 Prefill and Control Specifications Bulletin 86000
 HSNC Check Valve (Resistance Control Only) Section 5, A3.1

I. PREPARATION AND INSTALLATION

NOTE: Parts drawings and lists are located on pages 8 thru 11. To aid in location of parts, numerals in parentheses (###) used in text correspond to Parts List item numbers.

A. MOUNTING

If unit is equipped with optional shroud (39), it may be necessary to remove the control assembly (320, 330 or 350), and optional Port 5 assembly (64) first. Remove screws (58), and remove retainer ring (56) before lifting shroud up and off of the prefill valve assembly. It may be necessary to use screw (58) holes and "jack" shroud from body.

Thoroughly clean all external surfaces and remove all thread protectors. Mount the unit on a flat 32 RMS minimum finish surface being sure Port 1 seal and spacer assembly (41 thru 45) as well as o-ring (54) are in place. Secure prefill valve to your cylinder with cap screws meeting Table 1 specifications.

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Table 1. Prefill Mounting Torques

Prefill Size	Socket Head Cap Screw			
	Quantity	Size	Torque Requirements	
			Ft. Lbs.	Nm.
100	16	5/8 - 11 x 3 1/2	120-135	162-182
150	16	1-8 x 4 1/2	400-450	540-608
200	16	1-1/4 - 7 x 5 1/2	1100-1180	1485-1593
250	20	1-1/4 - 7 x 7	1100-1180	1485-1593

Reinstall shroud, optional Port 5 and control assembly if removed. The shroud can be rotated through 360° to simplify piping alignment.

B. PIPING AND FITTINGS

See reference "Piping Information" bulletin and individual circuit diagram before connecting prefill valve to system.

Remove flanges if pipes are being welded or brazed to them. Use piping compounds or Teflon tape sparingly on tubes being threaded into flanges. Secure tubes and flange bolts tightly to prevent air being drawn into the system.

NOTE: When shroud is used with water glycol fluids, the shroud must be the optional type "K" (anodized aluminum) assembly.

CAUTION!

Provisions must be made to decompress cylinder pressure (Port 3 may be used) to 250 psi (17.2 bar) or less before opening the prefill valve.

C. ELECTRICAL

If a solenoid operator and/or limit switch option are used, refer to electrical circuit diagram and "IV. SPECIFICATIONS" for requirements.

CAUTION!

Inductive loads require a different type of switch than noninductive loads. Connecting an inductive load to a switch rated for noninductive loads will damage the switch. Oilgear supplies both the Type "M" (inductive) and Type "L" (non-inductive). See referenced Specification Bulletin and type designation to identify which switches your unit is equipped with.

II. CONSTRUCTION

Refer to Figure 11. The "VSA" Prefill Valve basic assemblies are the prefill body (37), an operator head (3), an operator ram (17) and a control assembly (320, 330 or 350). An optional low pressure shroud (39) may also be used.

The prefill body has radially placed rectangular "gating" windows to allow flow between tank (Port 2) and cylinder (Port 1). With low pressure in the valve (during opening and closing), the plunger seals (36 and 44) are in a relaxed state and clearance between them and the hollow precision ground prefill plunger (12) is at maximum for smooth opening and closing. When pressure is built up in the valve, pressure acts on the outside diameter of the seals and compresses them to zero clearance.

The operator head (3) contains the operator ram and provides a mounting for the integral control assemblies (320, 330 and 350) as well as internal passages to the operator ram (17).

The operator ram is equipped with an automotive type operator piston ring (18). An integral damper ring (16) dashpots (cushions) prefill valve closing. Optional ram position telltales (20) with integral magnetic reed switches (21) or a "test kit" telltale may also be used.

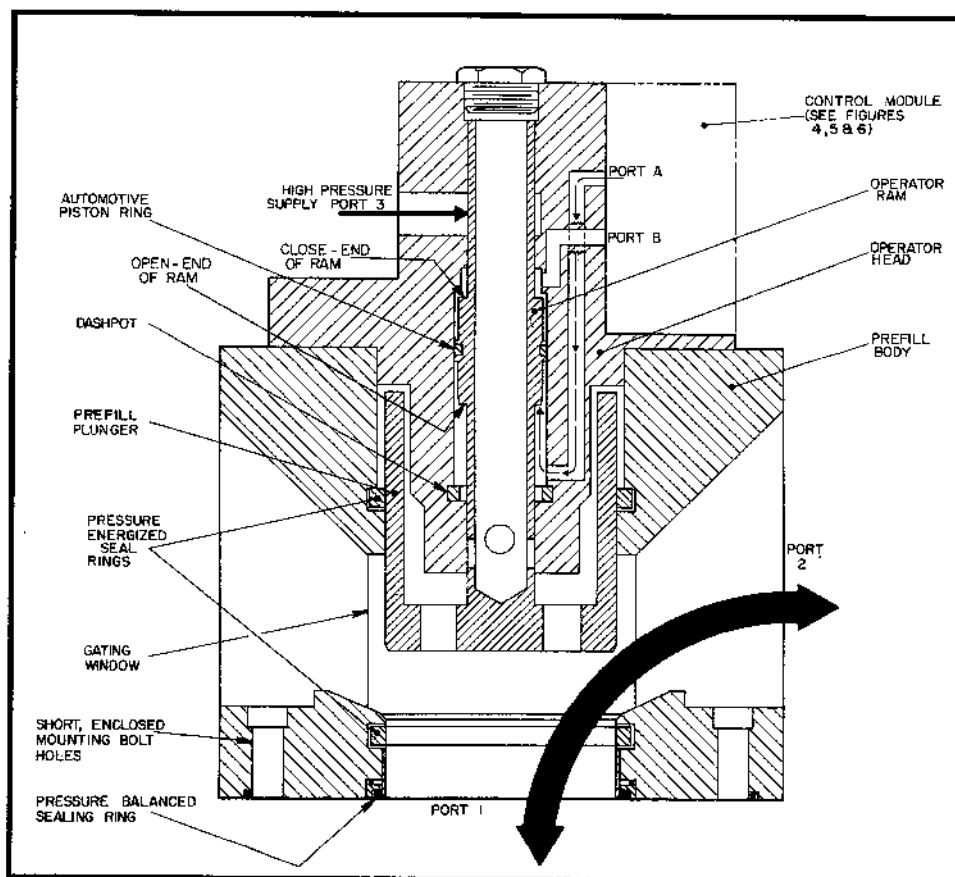


Figure 2. Diagram of Oilgear "VSA" Cylinder Prefill Unit in OPEN position (508737D).

III. PRINCIPLE OF OPERATION

A. CYLINDER PREFILL

1. Cylinder Traverse Advance. See Figure 2. Pressure at control Port "A" retracts the operator ram with the prefill plunger. Port 3 is blocked by the hollow operator ram. Tank Port 2 is connected (without restriction) to cylinder Port 1 allowing gravity prefilling to the connected cylinder.

2. Cylinder Pressing. See Figure 3. Pressure at control Port "B" extends the operator ram (with the prefill plunger) into the dashpot. The prefill plunger blocks Tank Port 2. High Pressure Supply Port 3 is connected through the hollow operator ram to Cylinder Port 1 and provides for high pressure advance and full tonnage pressing.

3. Cylinder Traverse Return. See Figure 2. Following decompression to 250 psi (17,2 bar) or less [Port 3 can be used], pressure at Control Port "A" will retract the operator ram, block High Pressure Port 3 and allow unrestricted exhaust from Cylinder Port 1 to Tank Port 2.

NOTE: Some units may be equipped with an optional Port 5. When so equipped, Port 5 is always connected (through the hollow operator ram) to Port 1.

B. CYLINDER PREFILL VALVE CONTROL

1. Plain Control. Refer to figures 4, 2 and 3. Pressure at Port 6 (Port 4 to drain) closes main prefill plunger and pressure at Port 4 (Port 6 to drain) opens it.

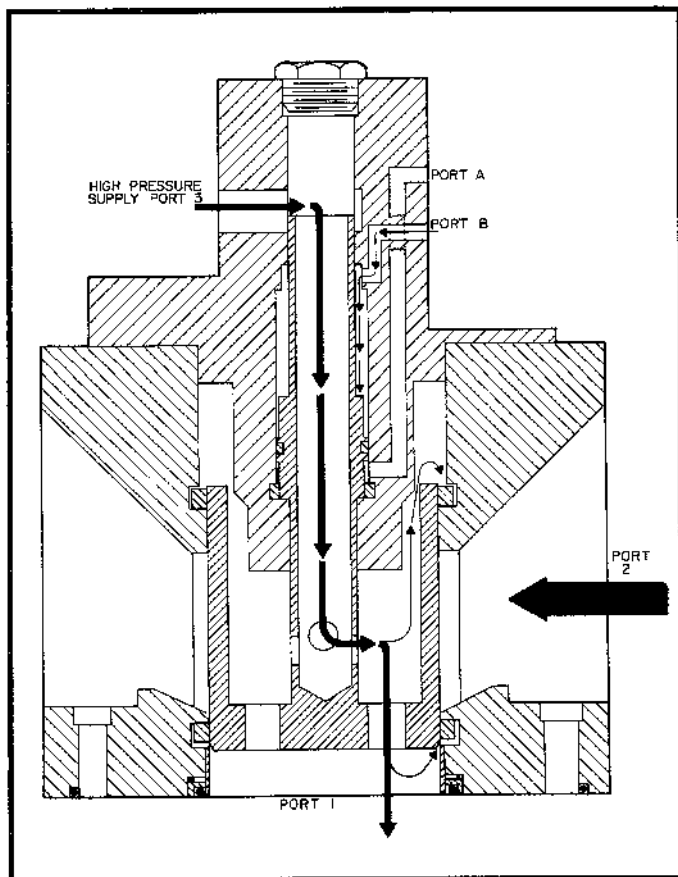


Figure 3. Diagram of Oilgear "VSA" Cylinder Prefill Unit in CLOSED position (508737D).

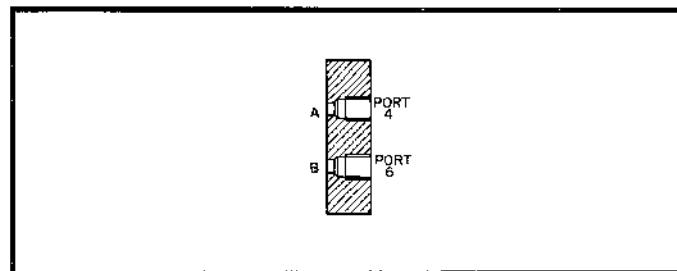


Figure 4. Type "P" Plain Control (508737D).

2. Solenoid Control. Refer to figures 5, 2 and 3. A solenoid operated four-way valve directs pilot fluid and pressure (up to 5000 psi 345 bar) to open or close the prefill as commanded by an electrical signal. Some valves may be equipped to meter flow to Port "A" or "B" and thus control prefill valve operation speed.

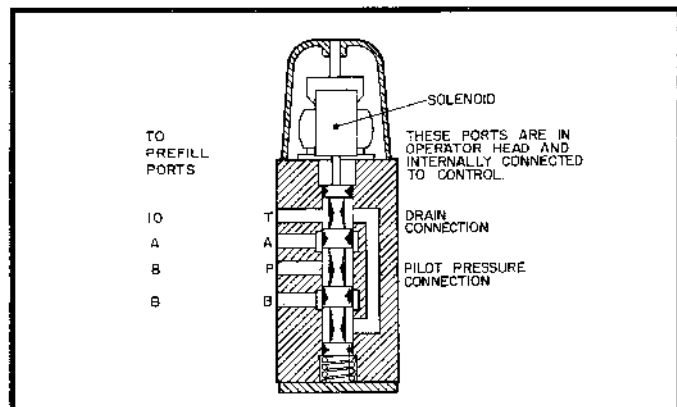


Figure 5. Type "C" Solenoid Control (508737D).

3. Resistance Control. Refer to figures 6, 2 and 3. An integral sequence type relief valve assembly is connected to Port 6. When system pressure (such as in "kicker cylinders") builds up at Port 6 to an adjustable preset value (300 to 1500 psi - 20 to 103 bar), the sequence valve opens (and remains open) porting fluid through Port "B" to the operating ram and closes the prefill plunger. When pressure at Port 6 is reduced, pilot pressure applied through Port 4 to Port "A" will open the prefill valve. Opening rate can be adjusted by the integral check/choke assembly which meters fluid flowing back through Port "B" to Port 6. **NOTE:** To open the prefill valve, pressure generated at Port "B" (when pressure is applied to Port 4) must be greater than the pressure remaining at Port 6.

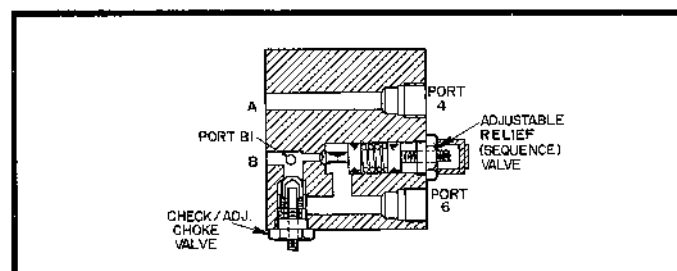


Figure 6. Type "R" Resistance Control (508737D).

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C. ACCESSORIES

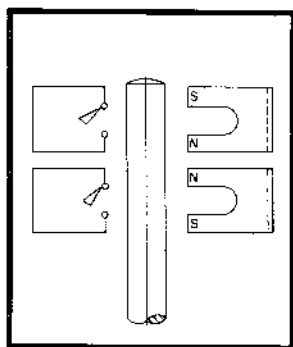


Figure 7. Prefill open, extended telltale rod interrupt magnetic field and opens switches (508280C).

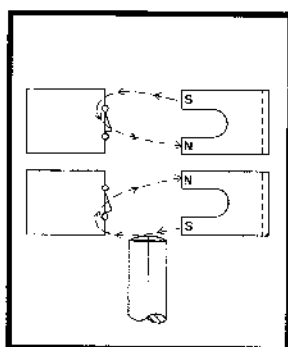


Figure 8. Prefill closed, retracted telltale rod no longer interrupts magnetic field and switches close (508280C).

1. Limit Switches. Refer to Figures 7 and 8. When the prefill plunger is in the **Open** position, the telltale rod (20) is positioned as shown in Figure 7, the rod interrupts the magnetic field and the switches are open. When the prefill plunger is in the **Closed** position, the telltale rod is retracted and the magnetic field closes the normally open switches.

IV. SPECIFICATIONS

See referenced bulletin on "Prefill and Control Specifications" for "Pressure Drop vs. Flow" curves and other specifications. See individual application circuit and/or installation drawings for exceptions.

A. OPERATING PRESSURE

1. Valve. Maximum operating pressure is 5000 psi (345 bar) at Ports 1 and 3. Maximum shroud pressure is 20 psi (1.4 bar) at Port 2.

2. Control. Pressure range is 100 to 5000 psi. When used with the plain or solenoid control, a shifting speed control orifice (83) is installed in operator head (3) underneath the control assembly (320, 330 or 350) for pilot pressure of 2500-3500 psi. Install alternate orifice (83A) for pilot pressure of 3500 to 5000 psi. Remove orifices for pilot pressure below 2500 psi. **No orifice is used when equipped with resistance control.**

CAUTION!

System must be decompressed to 250 psi (17,7 bar) or less before opening prefill valve.

3. Ram (Prefill Plunger) Stroke.

Table 2. Prefill Valve Plunger Stroke.

Prefill Size	Stroke	
	inches	mm.
100	1.810	46,00
150	2.560	65,02
200	3.250	82,60
250	3.875	98,43

V. MALFUNCTIONS AND CAUSES

A. PLUNGER DOES NOT SHIFT PROPERLY

1. Inoperative or damaged control (see "B").
2. Insufficient pilot and/or operator pressure.
3. Dirt or foreign material causing operator ram (17) and/or prefill plunger (12) to stick.
4. Worn or broken operator piston ring (18) and/or plunger seals (36 or 44).
5. Excessive slip due to worn prefill plunger (12) or operator piston ring (18).

B. RESISTANCE CONTROL (see reference material).

1. Relief (sequence) valve not seating.
2. Worn relief (sequence) valve plunger.
3. Check/choke valve assembly leaking.
4. Broken relief (sequence) or check valve spring.

C. SOLENOID CONTROL (see manufactures material).

1. Defective solenoid or coil.
2. Sticking four-way valve plunger.

VI. TESTING AND ADJUSTING

To measure prefill valve stroke or observe movement, use the telltale rod (20) if unit is so equipped. If limit switch is used, remove enclosure cover (203) to observe rod movement. If not equipped, a **Telltale Test Kit is available through your Oilgear representative. The kit should be installed and used only for test purposes. The kit must be removed before the prefill valve is put back into normal service.**

A. CONTROLS

1. Plain Control. Refer to Figure 13. Install pressure gages, rated higher than actual system pressure, into lines connected to control Port 4 and 6. Observe gages during normal operating cycle. Determine if pressure required by your system is present in each line at proper times during cycle under the following conditions.

(a) With zero pressure at Port 3 and minimum pressure at Port 4 (Port 6 connected to drain), the plunger should be **OPEN**, or (b) with minimum pilot pressure at Port 6, (Port 4 connected to drain) the plunger should be **CLOSED**.

If pilot pressure, ranging from minimum to maximum, is present and plunger does not shift, something is physically restricting the plunger movement and prefill must be disassembled and repaired.

2. Solenoid Control. Refer to Figure 13. Energize solenoid and listen for spool movement. If spool doesn't move, press on the (brass) override pin to determine if spool is stuck or if solenoid is defective. If spool movement is not restricted, disassemble solenoid and replace coil. If spool movement is restricted, replace or disassemble valve. If solenoid and spool are working properly, install a pressure gage (rated above system pressure) into the line connected to Ports 8 and 10. Gage connected to Port 8 should read the pilot pressure and gage connected to Port 10 should read zero. Observe gage during normal operating cycle. If sufficient pilot pressure (Port 8) is present and directional valve spool is shifting, something is physically restricting plunger movement, and prefill must be disassembled and repaired.

3. **Resistance Control.** Refer to Figure 13. Install pressure gages (rated above system pressure) into lines connected to Ports 4, 6 and B1. Observe gages during normal operating cycle. Determine if pressure required by your system is present in each line at proper times during cycle. Pilot pressure should be constant at Port 4. When pressure in the system (such as the "kicker cylinder") builds up to the adjustable preset setting of sequence valve, the sequence valve will remain open, the Port 6 gage should then read the same as the high pressure system (pump or relief valve). During the "pressing" portion of cycle, the gages in Port 6 and "B1" should read alike, if gages in Port 6 and "B1" do not read alike, the sequence valve is faulty (stuck in the closed position). If the gages are alike and the plunger does not shift, something is physically restricting plunger movement and prefill must be disassembled and repaired.

B. ACCESSORIES

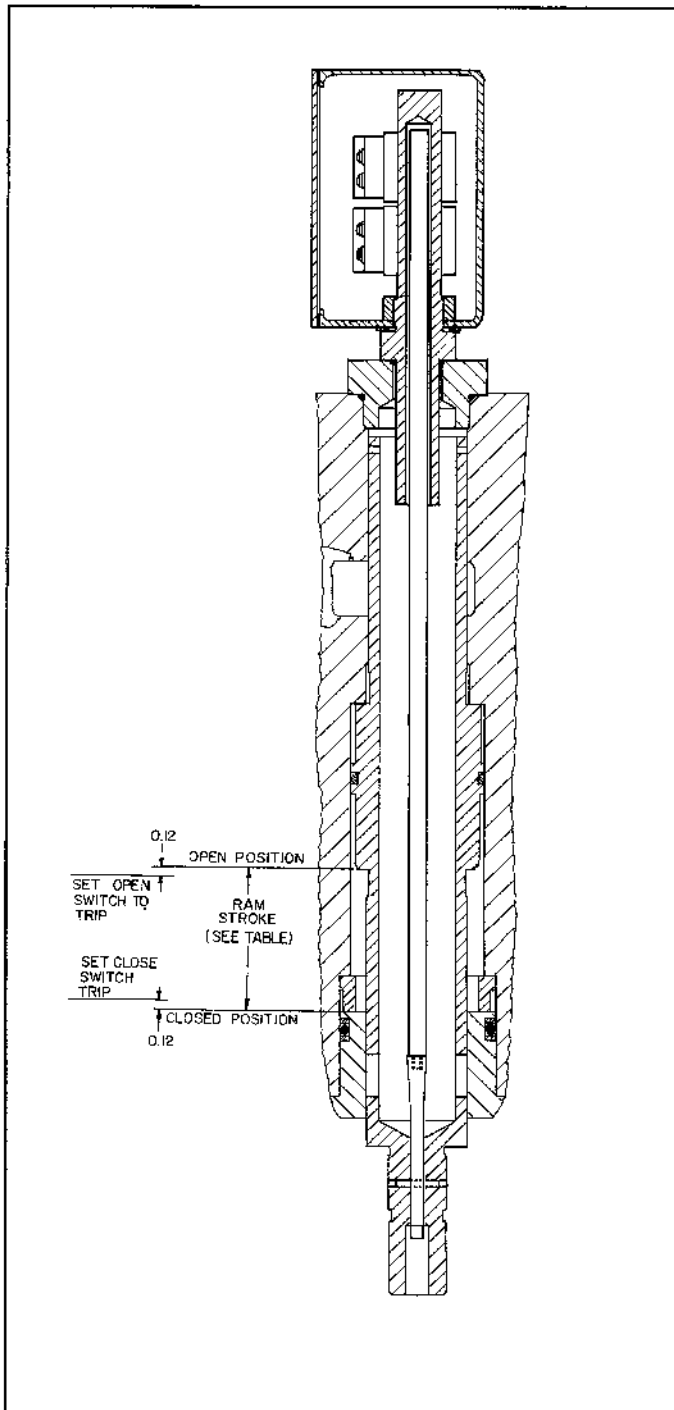


Figure 10. Open and Close limit switch positioning (508280C).

1. **Limit Switches.** Determine the current requirements for limit switches and conduct a routine test of switches. If necessary, replace with switches of the same type and current rating. To adjust (reposition) limit switches, refer to Figure 10 and 14. With prefill in the OPEN position, mark the fully extended telltale rod (20) position in the adapter (207). Move telltale back 0.12 inches (3.05mm) and move "open switch" (211E) until it "trips" at that point. The "close" switch (211R) should be set to trip when it's center line is "ram stroke (Table 2) minus 0.24 inches (6.1mm) from the center line of the open switch - or, move the prefill to the CLOSE position, mark the fully retracted telltale (20) position in the adapter. Move the telltale outward 0.12 inches (3.05mm) and position the "Close Switch" (211R) until it trips at that position.

VII. DISASSEMBLY

A. GENERAL (Parts drawings on Pages 9, 10 and 11).

Refer to Figures 11, 12, 13, and 14. It will be advantageous to tag similar parts (particularly screws, plugs and o-rings), with item numbers during disassembly to be certain they don't become confused with similar parts and to ensure they will be returned to original location. Do not remove (locator) roll pins unless they are deformed or otherwise in need of replacement.

WARNING: NEVER attempt to remove or install any component or assembly while system is running. Always shut-off power and release pressure from system before servicing or testing.

B. PREPARATION

While disassembling or assembling unit, we recommend choosing an area where no traces of dust, sand or other abrasive particles, which can damage the valve and system, are in the air. We also recommend not working near welding, sand blasting, grinding benches and the likes. Place all parts on a CLEAN surface. To clean parts which have been disassembled, it is important to use CLEAN solvents. All tools and gages should be CLEAN prior to working with these units and CLEAN threadless rags used to handle and dry parts.

Refer to figures 11, 12, 13, and 14. Depending upon what part or parts are to be inspected, it may not be necessary to completely take apart all assemblies or disconnect piping.

WARNING:- To remove electrical connector, first remove screw (354A) and then unplug connector (354) from solenoid by pulling straight up.

C. DISCONNECTING & DISMOUNTING

IF THE UNIT IS EQUIPPED WITH OPTIONAL SHROUD (39), it will be necessary to remove the piping, electrical connections, control assembly (320, 330 or 350), first. See following sections "D" and "E". Remove screws (58) and remove retainer ring (56) before lifting shroud up and off the prefill valve. It may be necessary to use screw (58) holes and "jack" shroud from body. After removal of screws (53A), Port 2 flange (53) can be removed for inspection of o-ring (38).

IF THE UNIT IS WITHOUT SHROUD, remove all piping and electrical connections.

IF THE UNIT CAN BE REMOVED FROM THE PRESS CYLINDER, make a "locating" scribe mark on mounting (cylinder) surface and a corresponding mark on prefill body before removing. Remove valve body mounting bolts and lift prefill assembly from cylinder.

D. CONTROL ASSEMBLIES

1. Plain Control. Refer to Figure 13. Remove socket head cap screws (321A). Control body (321) can be withdrawn from prefill operator head and o-rings (322) removed.

2. Solenoid Control. Refer to Figure 13. Remove socket head cap screws (351A). Control valve (351) can be withdrawn from prefill operator head and o-rings (352) removed. Knurled end cap can be turned off, and removed, so solenoid and cover assembly (353) can be removed for inspection or replacement.

3. Resistance Control. Refer to Figure 13. Remove socket head cap screws (331A). Control body (331) can be withdrawn from prefill operator head and o-rings (336) removed. If necessary, sequence valve assembly (332) and/or check/choke assembly (335) can be turned out from the body. O-rings (336) can be removed from control body.

E. ACCESSORIES

1. Limit Switch Assembly. Refer to Figure 14. Remove screws (203B), switch enclosure cover (203) and cover gasket (203A). Scribe a "locating" pencil mark on telltale rod (20) above and below switches so they can be reinstalled at the same position. Loosen clamp screws on terminal block then locknut (204). Pull switch housing (208), locknut and magnetic reed switches (211E and 211R) from adapter (207). Remove seal (209), adapter, (207) o-ring (201), adapter plug (205) and o-ring (202).

F. OPERATOR HEAD ASSEMBLY

If unit is equipped with Port 5 option (see Figure 12). Remove screws (64A), Port 5 adapter flange (64) and o-ring (66, size 200 and larger).

See Figure 11. Remove socket head cap screws (1A) and Port 3 flange (1) will be free of operator head. Pull o-ring (2) from groove in operator head. Before disassembling, scribe a "locating" mark on the operator head (3) and a corresponding mark on the prefill body (37) so they can be returned to their original position upon reassembly. Remove socket head cap screws (3A). Install appropriate hook bolts into holes on top surface of operator head (3).

CAUTION!

It is extremely important to avoid tilting the operator head assembly (3) during removal as the prefill plunger (12) may become lodged in the prefill body (37).

Using a suitable crane, lift head (3) assembly from prefill body (37).

On size 200 and 250 prefills with Port 5 option, see figure 12. Remove Port 5 spacer (65) with o-ring (5) and back-up ring (4) from operator head (or prefill body) and then remove o-ring (81) and back-up ring (80) if necessary.

On size 200 and 250 prefills, remove four socket head cap screws (27A) and remove operator flange (27) from operator head. Remove o-rings (28) and (30) from operator head.

Block operator head in a vertical position with prefill plunger (12) pointed up. Remove back-up ring (4) and o-ring (5) if necessary. Pull cotter pin (6) from slotted nut (7). Remove nut and washer (8). Lift lower plunger retainer (9), dowel pin (10), prefill plunger (12) and upper plunger retainer (11) from ram. Remove socket head cap screws (13A) and pull operator ram bushing (13) from operator head. Remove back-up rings (14) and o-ring

(13) from operator head. Remove back-up rings (14) and o-ring (15) from bushing if necessary. Pull operator ram assembly (17, 17A and 17B) from operator head. Note position of damper ring (16) in relation to operator head and mark it with a pencil prior to removal to assure that when reinstalled it is placed in same position. Remove damper ring. Remove operator piston ring (18) if necessary.

If size 200 and larger units are equipped with Port 5 option, remove Port 5 spacer (65) and back-up ring (80) and o-ring (81) if necessary.

G. PREFILL BODY

Reach in and remove seal spacer (35) and upper plunger seal (36) from prefill body (37). If necessary, remove o-rings (52 and 40) from outer body grooves. If valve has not been removed from (cylinder) mounting, remove mounting bolts (or nuts). Using appropriate hook bolts, lift prefill body from mounting. Turn prefill body so Port 1 is facing upward.

Remove machine screw (82). Remove spacer ring (45), o-ring (41) seal retainer (42), o-ring (43) and lower plunger seal (44). Also, remove o-rings (54, 40 and 52) if necessary.

VIII. INSPECTION

WARNING:- Always wear safety goggles when using solvents or compressed air. Failure to wear safety goggles could result in personal injury.

Clean all parts thoroughly, inspect and replace any part showing signs of undue wear. Be sure o-rings are free from nicks, cuts, hardening, cracking or deterioration.

A. CONTROL ASSEMBLIES

1. Plain Control. Check for foreign material and obstructions in ports and passages. Inspect o-rings.

2. Solenoid Control. Inspect all o-rings. Using manual override pin, check for smooth plunger movement. Check for foreign material and obstructions in ports and passages.

3. Resistance Control. Inspect all o-rings. Check for foreign material and obstruction in ports and passages. Inspect the sequence valve assembly and check/choke assemblies to be sure plungers etc. move freely and that all seats and matching surfaces are free from nicks and burrs.

B. ACCESSORIES

1. Limit Switch Assembly. Inspect magnets for visible damage and replace if necessary. Inspect all o-rings and seals.

NOTE:- Magnets lose their magnetic properties. Because of the relative low cost and difficulty to determine acceptability, it is recommended that magnets be replaced at the same time a defective switch is replaced.

C. PREFILL OPERATOR AND BODY

Check upper and lower plunger seals (36 and 44) for signs of scoring, cracking or excessive wear- replace if necessary. Check prefill plunger (12) for scoring or excessive wear. Inspect all o-rings for nicks, cuts, hardening, cracking or deterioration. Check operator ram (17) operator piston ring (18) and damper ring (16) for scoring and/or excessive wear. Check ram bore in operator head and operator ram bushing bore for scoring and/or excessive wear.

IX. ASSEMBLY (refer to Figures 11 thru 14).

A. PREFILL BODY

Install lower plunger seal (44) and spacer ring (45) into bottom bore of prefill body (37). Insert o-ring (43), seal retainer (42) and o-ring (41) into prefill body (grease heavily) and secure with machine screws (82). Apply grease to o-ring (54) and insert into groove on bottom of prefill body. Place prefill body in upright position (Port 1 facing down). Install upper plunger seal (36) and seal spacer (35). If used, install outer o-rings (40 and 52) for shroud as well as retainer ring (56) [size 150 only].

B. RAM AND PLUNGER

When used, turn telltale rod (20) into the operator ram (17) adapter stem (17A). Install operator piston ring (18) into groove on operator ram, then slide operator ram into operator head (3). Install damper ring (16) into bore against shoulder. **USE CAUTION TO INSTALL CORRECTLY** (relief turn on O.D. faces gland 13). Location marks made during disassembly must match up upon reassembly. Install o-ring (15) with back-up rings (14) on both sides into bushing groove. Install operator ram bushing (13) over operator ram against the operator head. Apply Loctite No. 242 to threads of screws (13A) and secure bushing to operator head tighten to following torques:-

Table 3. Operator Bushing Torques.

Prefill Size	Torque Requirements	
	ft. lbs.	Nm.
100	6.7-7.3	9.0- 9.8
150	25-28	33.8-37.8
200	25-28	33.8-37.8
250	61-68	83.0-91.8

Place upper plunger retainer (11) onto operator ram, prefill plunger (12) onto upper plunger retainer, insert dowel pin (10), place lower plunger retainer (9) over dowel pin and onto operator ram. Place washer (8) onto operator ram, apply Loctite No. 242 to threads of slotted nut (7). **Hand tighten nut until snug. Wrench tighten until next slot lines up with hole drilled in operator ram (17). Then, back-off nut one slot and install cotter pin thru nut and operator ram. Spread cotter pin ends to lock in place.** Install cotter pin (6) thru nut to lock in place.

C. OPERATOR HEAD

If Port 5 option is used for size 200 and larger, place back-up ring (80) and o-ring (81) on operator head and then slip Port 5 spacer (65) onto operator head.

All valves, install back-up ring (4) and o-ring (5) into groove on operator head (37). Apply ample amount of grease to o-ring. Using appropriate hook bolts, lift operator head using suitable crane. Carefully align scribe marks, on operator head and prefill body made during disassembly and carefully lower assembly into prefill body (37) so Port 3 will be aligned with piping. Secure operator head to prefill body using screws (3A) and tighten torque listed in Table 4. Put o-ring (2) in place and secure Port 3 flange (1) to operator head with screws (1A).

Table 4. Operator Head Torques.

Prefill Size	Torque Requirements	
	ft. lbs.	Nm.
100	220-224	297-302
150	608-640	821-862
200	608-640	821-862
250	1121-1180	1513-1593

D. PREFILL ASSEMBLY

Return assembly to mounting surface taking care to align scribe marks (made during disassembly) on prefill body and cylinder mounting surface. See Table 1. (I. PREPARATION AND INSTALLATION) for mounting bolt torque requirements.

E. SHROUD ASSEMBLY

Be sure o-rings (40 and 52) are installed. For size 150 units, be sure lower retainer ring (56) is in place. If Port 2 flange (53) is used, install o-ring (38) into shroud and fasten flange with screws (53A).

Table 5. Shroud Flange Torques.

Prefill Size	Torque Requirements	
	ft. lbs.	Nm.
100	28-33	38.1-44.9
150	90-100	122.4-136.0
200	90-100	122.4-136.0
250	90-100	122.4-136.0

Lift shroud (39) over prefill assembly and lower evenly (squarely) onto prefill body while aligning Port 2 connection with piping.

NOTE:- Shroud is sealed to prefill body by o-ring compression. It may be necessary to use a rubber mallet or jacking system to position shroud on prefill body.

Install retaining ring (56) into upper groove of prefill body to retain shroud and then install screws (58) to "lock" in place.

F. CONTROLS

1. Plain Control. See Figure 13. Insert o-rings (322) into grooves of control body (321), position on operator head and secure with screws (321A) tightened to 40-44 ft. lbs. (54-59 Nm).

2. Solenoid Control. See Figure 13. Insert o-rings (352) and secure solenoid control assembly (351) to operator head with screws (351A) tightened to 40-44 ft. lbs. (54-59 Nm).

3. Resistance Control. See Figure 13. Insert sequence valve assembly (332) and check/choke valve assembly (335) into resistance control body (331), insert o-ring (336) and secure resistance control assembly to operator head switch screws (331A) tighten to 40-44 ft. lbs. (54-59 Nm).

G. PORT 5 FLANGE (when used)

Replace o'ring (66) on size 200 and larger units or (22) on smaller units. Secure Port 5 flange adapter (64) to operator head with screws (64A). Insert o'ring (67) in flange and secure Port 5 flange (68) with screws (68A).

H. PLUG OR LIMIT SWITCH ACCESSORY

For size 200 and larger. See Figure 11. Place o'rings (28 and 30) in place and then secure operator flange (27) to operator head with screws (27A).

Table 6. Operator Flange Torques.

Prefill Size	Torque Requirements	
	ft. lbs.	Nm.
200	352-382	475-515
250	608-640	821-862

1. **For units without limit switches**, place o'ring (22) in counterbore and screw down plug (26).

2. **For units with limit switches**, see Figure 14. Apply Loctite "AA" green to adapter plug (205). Install o'ring (202) and adapter plug. Apply Loctite "AA" green to adapter (207). Install o'ring (201) and adapter. Install seal (209) against shoulder of the adapter.

If magnets and/or switches were removed, position magnets so "V" slots will be parallel to telltale rod. The poles of the magnets should repel each other. Secure reel switch with mounting screws. Place switch housing (208) and locknut (204) partially over adapter (207). Place switches (211E and 211R) at marks that were scribed on adapter prior to disassembly and secure switches in place by tightening clamp screws, but **DO NOT OVER TIGHTEN**. If you neglected to mark switch positions upon disassembly - see "VI. TESTING AND ADJUSTING, C, 1" for setting limit switch positions. Set cover gasket (203A) on housing, place switch enclosure cover (203) on gasket and secure with screws (203B).

I. MOUNTING AND CONNECTING

See Section "I. PREPARATION and INSTALLATION".

X. PARTS LIST

Parts used in this assembly are per Oilgear specifications. Use Oilgear parts to ensure compatibility with assembly requirements. When ordering replacement parts, be sure to include prefill type designation, serial number, bulletin number and item number. To ensure seal and packing compatibility, specify type of hydraulic fluid used.

ITEM NO.	DESCRIPTION	ITEM NO.	DESCRIPTION	ITEM NO.	DESCRIPTION
1	Flange, Port 3	27A	Screw, S.H.C.	53	Flange, Port 2
1A	Screw, S.H.C.	28**	Seal, O'ring	53A	Screw, S.H.C.
1B	Plug, Pipe	30**	Seal, O'ring	54**	Seal, O'ring
2**	Seal, O'ring	31	Plug, SAE (Port 8 & 10)	56	Ring, Retainer
3	Head, Operator	32**	Seal, O'ring	58	Screw, S.H.C.
3A	Screw, S.H.C.	35	Spacer, Seal	59	Plug, SAE
4**	Ring, Back-up	36**	Seal, Upper Plunger	60**	Seal, O'ring
5**	Seal, O'ring	37	Body, Prefill	64	Flange, Port 5 Adapter
6	Pin, Cotter	38**	Seal, O'ring	64A	Screw, S.H.C.
7	Nut, Slotted	39	Shroud, Optional	65	Spacer, Port 5
8	Washer	40**	Seal, O'ring	66**	Seal, O'ring
9	Retainer, Lower Plunger	41**	Seal, O'ring	67**	Seal, O'ring
10	Pin, Dowel	42	Retainer, Seal	68	Flange, Port 5
11	Retainer, Upper Plunger	43**	Seal, O'ring	68A	Screw, S.H.C.
12	Plunger, Prefill	44**	Seal, Lower Plunger		
13	Bushing, Operator Ram	45	Ring, Spacer	70	Label
13A	Screw, S.H.C.	46	Plate, Name	71	Washer, Back-up
14**	Ring, Back-up	47	Screw, Rd. Hd.	72	Plug, SAE
15**	Seal, O'ring	48**	Seal, O'ring	73**	Seal, O'ring
16	Ring, Damper	49	Plug, SAE	80**	Ring, Back-up
17*	Ram, Operator	50	Plug, Pipe	81**	Seal, O'ring
17A*	Stem, Adapter	51	Plug, SAE	82	Screw, Mach.
17B*	Pin	52**	Seal, O'ring	83	Orifice, Shifting Speed
18	Ring, Operator Piston			83A	Orifice, Alternate
20	Rod, Telltale				
21	Guard, Telltale				
22**	Seal, O'ring				
23	Bushing, Telltale				
24**	Packing, Block-vee				
25**	Ring, Retainer				
26	Plug, SAE				
27	Flange, Operator				

* Parts 17, 17A and 17B furnished as an assembly only.

** Parts are included in Oilgear "Type A" Seal Kit.

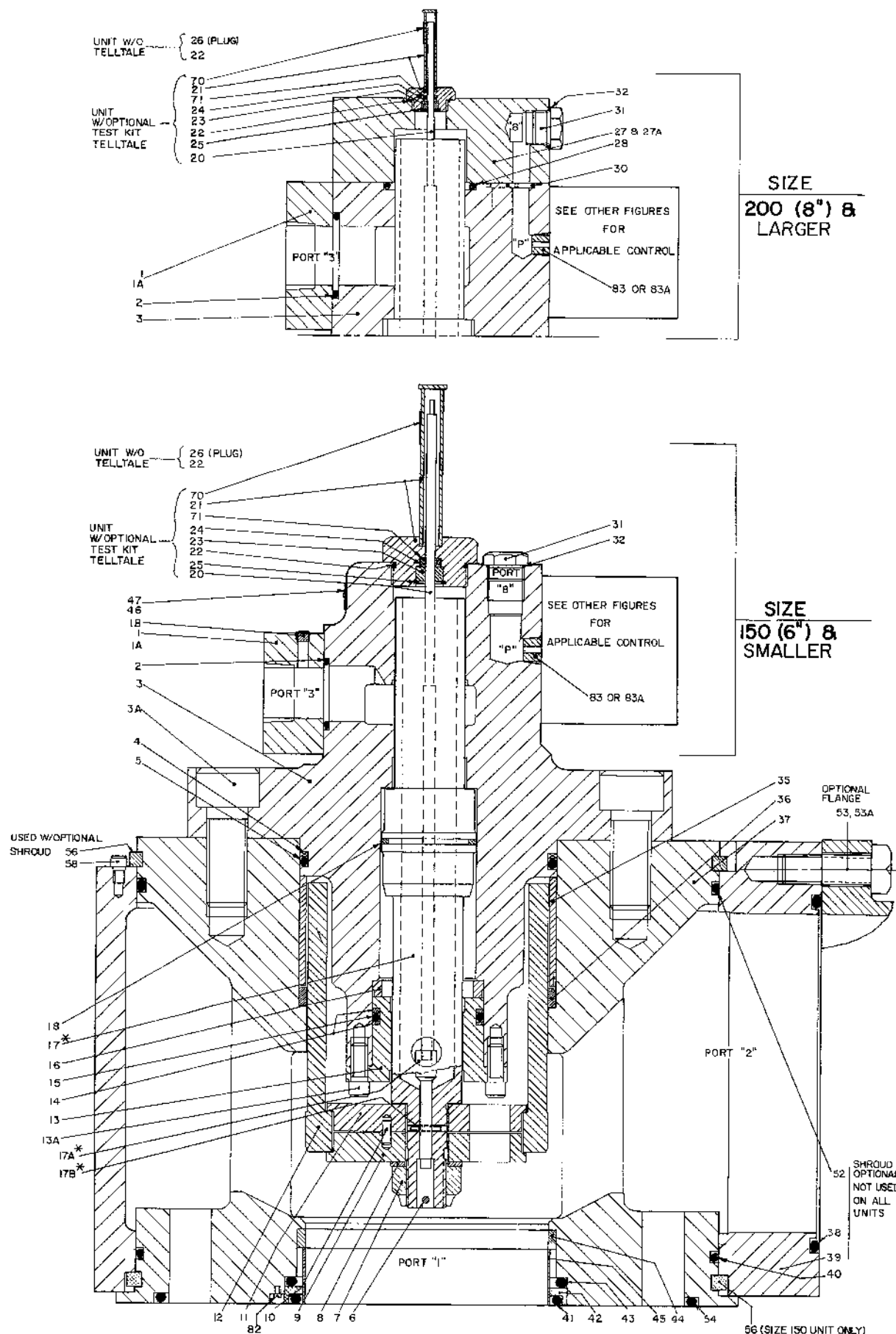


Figure 11. Parts Drawing, Type "VSA" 3-way Prefill valves (508280C sht. 1).

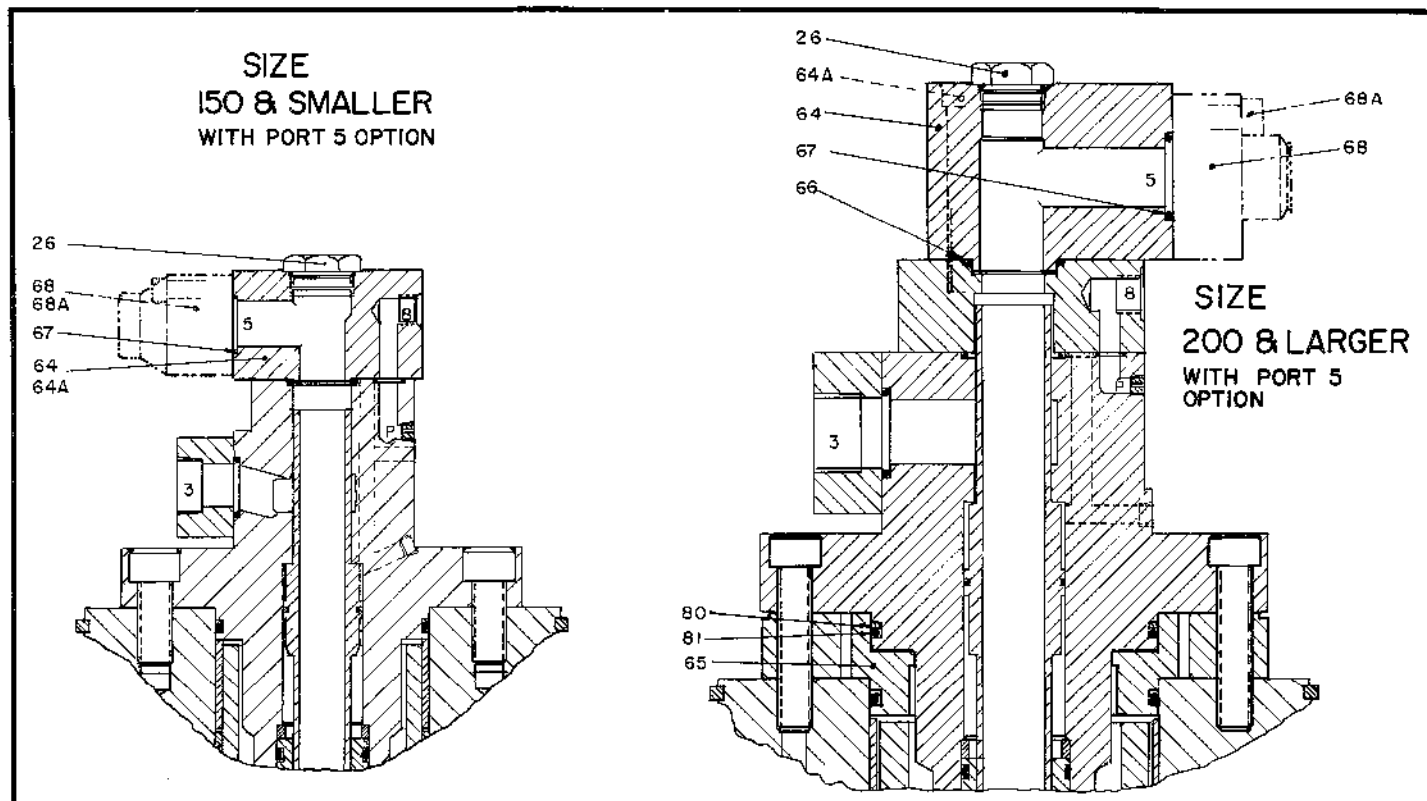


Figure 12. Parts Drawing, Showing Modifications for Port 5 Option (508280C sht. 2).

ARP 568 UNIFORM SIZE NUMBERS

ITEM NO.	DESCRIPTION
200	Assembly, Open/Close Switch
201	Seal, O'ring
202	Seal, O'ring
203	Cover, Switch Enclosure
203A	Gasket, Cover
203B	Screws, Rd. Hd.
204	Nut, Lock
205	Plug, Adapter
207	Adapter
208	Housing, Switch
209	Seal, "Strato"
211E	Switch, Open Magnetic Reed
211R	Switch, Close Magnetic Reed
320	Assembly, Plain Control
321	Body, Plain Control
321A	Screw, S.H.C.
322	Seal, O'ring
330	Assembly, Resistance Control
331	Body, Resistance Control
331A	Screw, S.H.C.
332	Assembly, Sequence Valve
333	Assembly, HSNV Check Valve
350	Assembly, Solenoid Control
351	Valve, CETOP 5 Control
351A	Screw, S.H.C.
352	Seal, O'ring
353	Solenoid, Assembly
354	Connector, Electrical
354A	Screw,

FOR O'rings (w/durometer) and Back-up Rings

ITEM NO.	PREFILL VALVE SIZE			
	100	150	200	250
2	218-90	222-90	332-90	338-90
4	345	436	445	449
5	345-90	436-90	445-90	449-90
14	326	332	336	348
15	329-90	332-90	336-90	348-90
22	920	924	924	924
28	— —	225-90	334-90	346-90
30	— —	017-90	114-90	210-90
32	908-90	— —	— —	— —
38	433-70	446-70	450-70	454-70
40	448-70	457-70	463-70	469-70
41	348-90	438-90	446-90	450-90
43	349-90	439-90	447-90	451-90
48	906-90	— —	906-90	— —
52	448-70	456-70	463-70	468-70
54	373-70	455-70	463-70	469-70
60	— —	906-90	— —	— —
66	— —	— —	334-90	337-90
67	— —	222-90	331-90	331-90
73	— —	— —	— —	906-90
81	— —	— —	445-90	449-90
202	920-90	924-90	924-90	924-90

Item No.	All Sizes
201	910-90
322	111-90
336	111-90
352	111-90

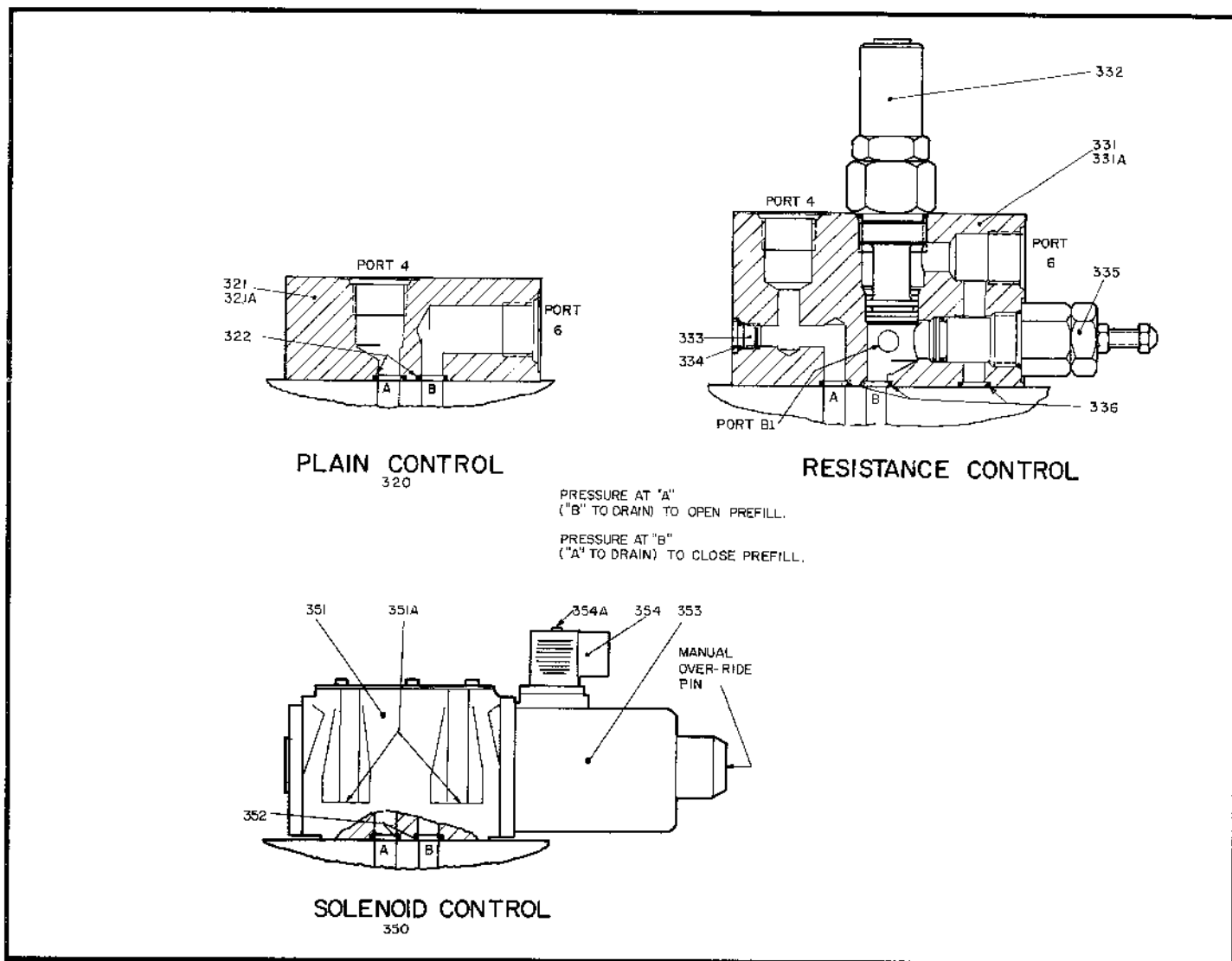


Figure 13. Parts Drawing, Type "P", "R" and "C" Controls for "VSA" Prefills (508280C sht. 6).

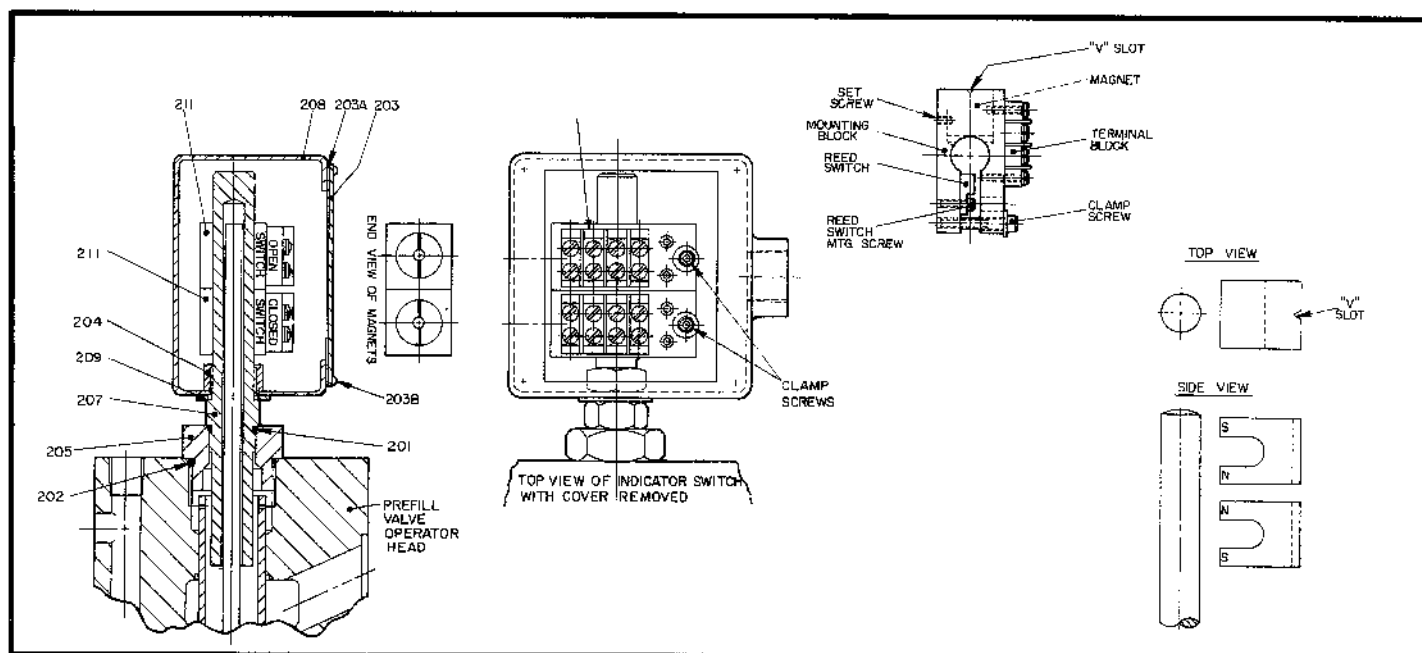


Figure 14. Parts Drawing, Type "M" or "L" Indicator Switch Assembly (508280C sht. 6).

XI. AFTER SALES SERVICES

Oilgear builds products that last. However, it is the nature of this type of machinery to require proper maintenance regardless of the care that goes into its manufacture. Oilgear has several service programs to help you.

"STAY-ON-STREAM" SERVICE:

By signing up for Oilgear's "Stay-On-Stream" program you can prepare for problems before they happen. Certain field tests such as fluid testing, slip testing and electronic profile recording comparisons can be performed by our field service people or your own trained personnel. These tests can indicate problems before they become "down-time" difficulties.

SERVICE SCHOOLS:

Oilgear holds schools to train your maintenance personal. A "general" hydraulic or electronic school is conducted in our Milwaukee plant on a regular basis. "Custom" schools, specifically addressing your particular hydraulic and electrohydraulic equipment can be conducted in your plant.

SPARE PARTS AVAILABILITY:

Prepare for future needs by stocking Oilgear original factory parts. Having the correct parts and necessary skills "in-plant" enables you to minimize down-time. Oilgear has developed parts kits to cover likely future needs. Oilgear field service technicians also stand ready to assist your maintenance people in trouble-shooting and repairing equipment.

OILGEAR EXCHANGE SERVICE

Standard replacement pumps and motors are available to users of Oilgear equipment where comparable units will be returned in exchange. When standard replacements must be modified to replace units which are special, shipment will depend on availability of parts, assembly and test time necessary.

To obtain this service, place an order for an exchange unit and provide the serial number and type designation. The replacement unit will be shipped F.O.B. our factory. Milwaukee, Wisconsin. User retains the replacement and returns the worn unit prepaid to The Oilgear Company for reconditioning and test. When the unit is reconditioned and stocked, the user is billed the cost of reconditioning or a flat rate exchange price if one has been applied to that particular type of unit.



THE OILGEAR COMPANY

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