ENERPAC
Hydraulic Technology Worldwide

Repair Parts Sheet

VS-4 and VSR-4 VALVES

L1308 Rev. H 11/01 **For Date Codes Beginning with the Letter "D"**

INSTALL ALL KIT COMPONENTS TO INSURE OPTIMUM PERFORMANCE OF THE REPAIRED PUMP.

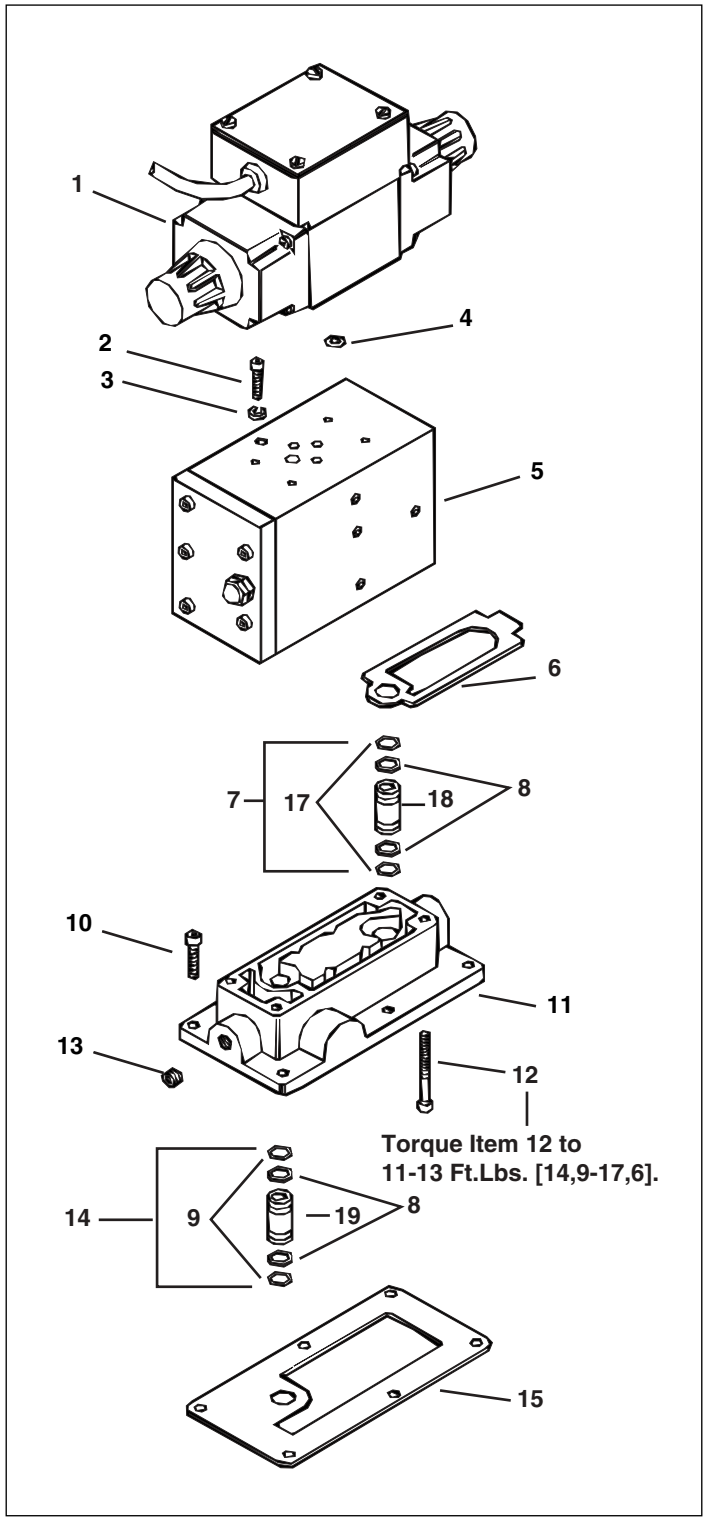


Figure 1, Valve Assembly

NOTE: Item 1 is supplied with 115 VAC power cord with a standard wall plug. This is intended for use with the VSR-4. When repairing the VS-4, you will need to cut the cord to an appropriate length to wire to the pump.

Repair Parts List for Figure 1

Item	Part Number	Qty.	Description
1	CU380900SR	1	Solenoid Ass'y.
2	B1332028	4	Cap Screw
3	M231108	4	Lock Washer
4	★B1904203	4	O-Ring
5	CL99950W	1	Valve Block Ass'y.
6	★CM56167	1	Gasket
7	DA973950SR	1	Connector Ass'y. (Valve to Adaptor)
8	★B1012564	4	Back-up Washer (VS4 only)
9	★B1007503	2	O-Ring (VS4 only)
10	B1351028	6	Cap Screw (VS4 only)
11	F132038	1	Manifold (Pump-mounted)
11	F130038	1	Manifold (Remote-mounted)
12	B1017028	4	Cap Screw
13	DA6192245	1	Plug (VS4 only)
14	CN529950K	1	Connector Ass'y. (Pump to Valve)
15	★F786167	1	Gasket
16	IC-400	1	Remote Pendant (See page 2)
17	★B1012203	2	O-Ring
18	C162096	1	Connector
19	CN528096	1	Connector

★ Indicates item included in and available only as part of Repair Kit VS4-24K1.

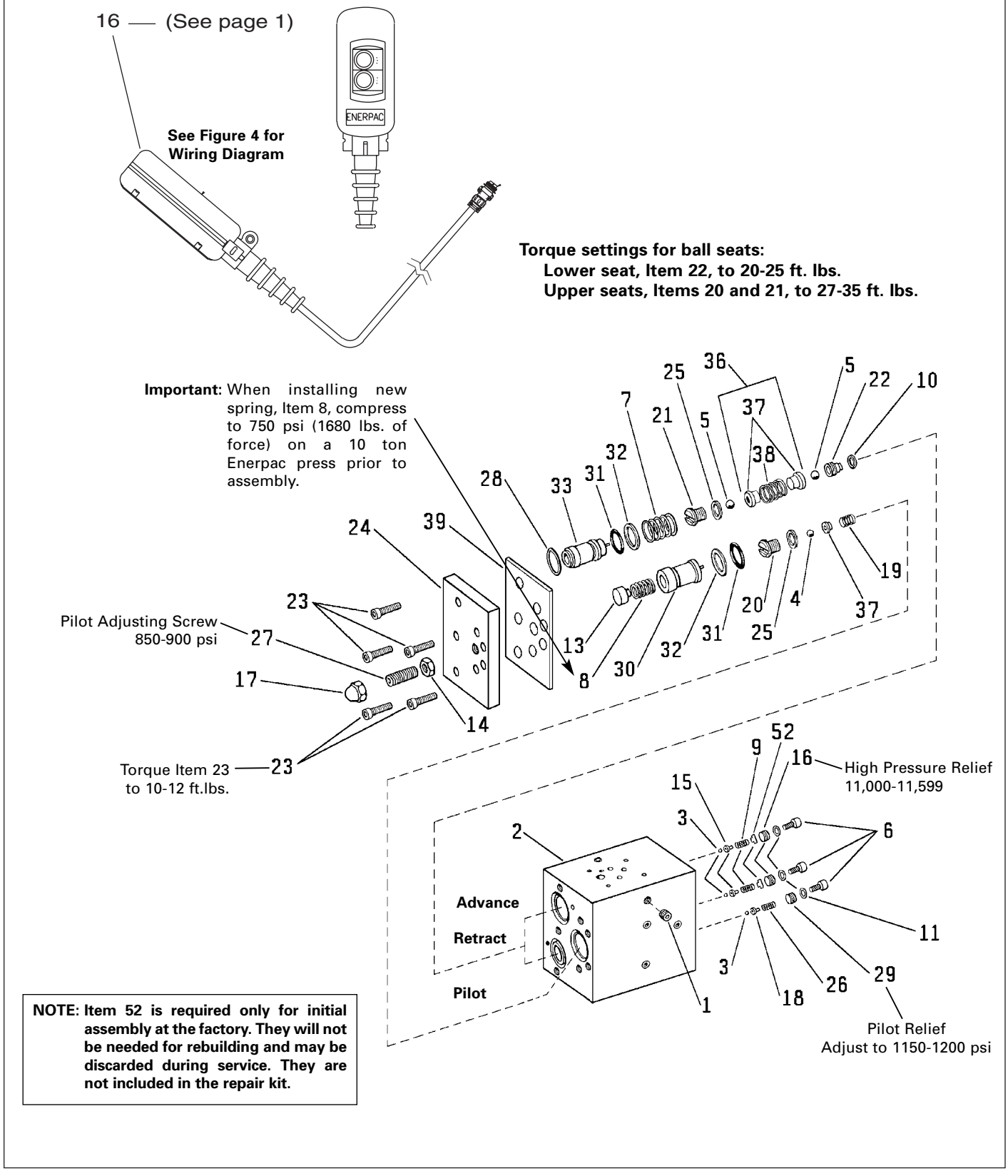


Figure 2, Valve Block Assembly

Repair Parts List for Figure 2							
Item	**Part Number**	**Qty.**	**Description**	**Item**	**Part Number**	**Qty.**	**Description**
1	★A1006245	5	Plug 1/16" - 27 NPTF	21	★CW181290	2	Seat, Top
2	CL938950W	1	Valve Block Ass'y.	22	★CW182290	2	Seat, Bottom
3	★B1003016	3	1/8" Ball	23	B1009028	7	Cap Screw
4	★B1007016	1	1/4" Ball	24	M502098	1	Cover
5	★B1010016	4	11/32" Ball	25	★P182167	3	Gasket
6	B1342028	3	Screw	26	★Y75110	1	Spring
7	★BL10952	2	Spring	27	Y158028	1	Adjusting Screw
8	★BL10967	1	Spring	28	★B1216518	2	Square Ring
9	★ BL10968	2	Spring	29	Y948028	1	Set Screw
10	★ BL30156	2	Gasket	30	DA983950SR	1	Piston Ass'y.
11	★ C846037	3	Gasket	31	★B1214203	3	O-Ring
13	CH43950W	1	Spacer	32	★B1214564	3	Back-up Washer
14	F378123	1	Nut	33	DA982950SR	2	Piston Ass'y.
15	★K1013	2	Ball Guide	36	CL104950W	2	Spring & Spacer Ass'y.
16	K877028	2	Hollow Set Screw	37	L843186	5	Spacer
17	L342055	1	Acorn Nut	38	★CW98110	2	Spring
18	★L429013	1	Ball Guide	39	★CM172167	1	Gasket
19	★L848110	1	Spring	40	IC400	1	Remote Pendant
20	★M31290	1	Seat, Pilot	52	CF634006	2	Slug

★ Indicates item included in and available only as part of Repair Kit VS4-24K1.

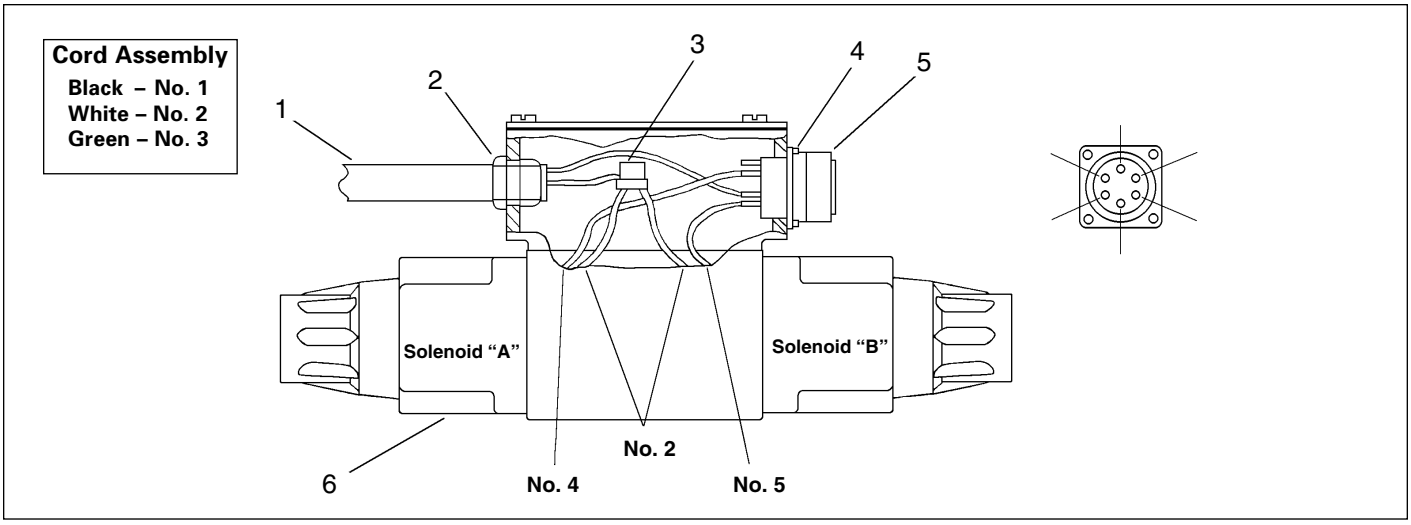
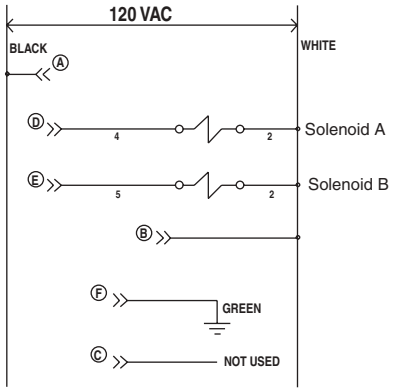


Figure 3, Solenoid Assembly

Repair Parts List for Figure 3							
Item	**Part Number**	**Qty.**	**Description**	**Item**	**Part Number**	**Qty.**	**Description**
1	Y393450	1	Cord Assembly	4	CH990028	4	Screw
2	CR759291	1	Cord Grip	5	M507900W	1	Socket Connector
3	BL20187	1	Connector	6	CU380900SR	1	Spool Valve with Coils



» PIN POSITION ON CONNECTOR
VS4

Socket & Solenoid Wire Connections (115 Volt Version)

1 - Wire from "A" - Connect to wire No. 1, black
2 - Wire from "B" - Connect to No. 2 of Solenoid "A", No. 2 of Solenoid "B" and No. 2 white wire
3 - Wire from "C" - Not Used
4 - Wire from "D" - Connect to No. 4 of Solenoid "A"
5 - Wire from "E" - Connect to No. 5 of Solenoid "B"
6 - Wire from "F" - Connect to No. 3, green ground wire

Figure 4, Socket & Solenoid Wire Connections

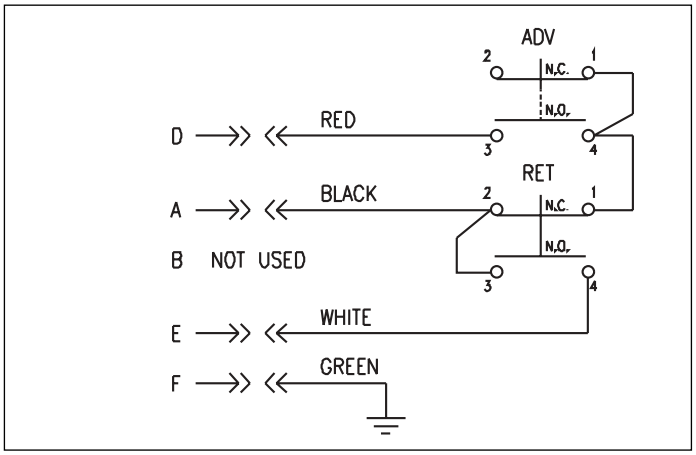


Figure 5, Wiring Schematic of Terminal Connectors

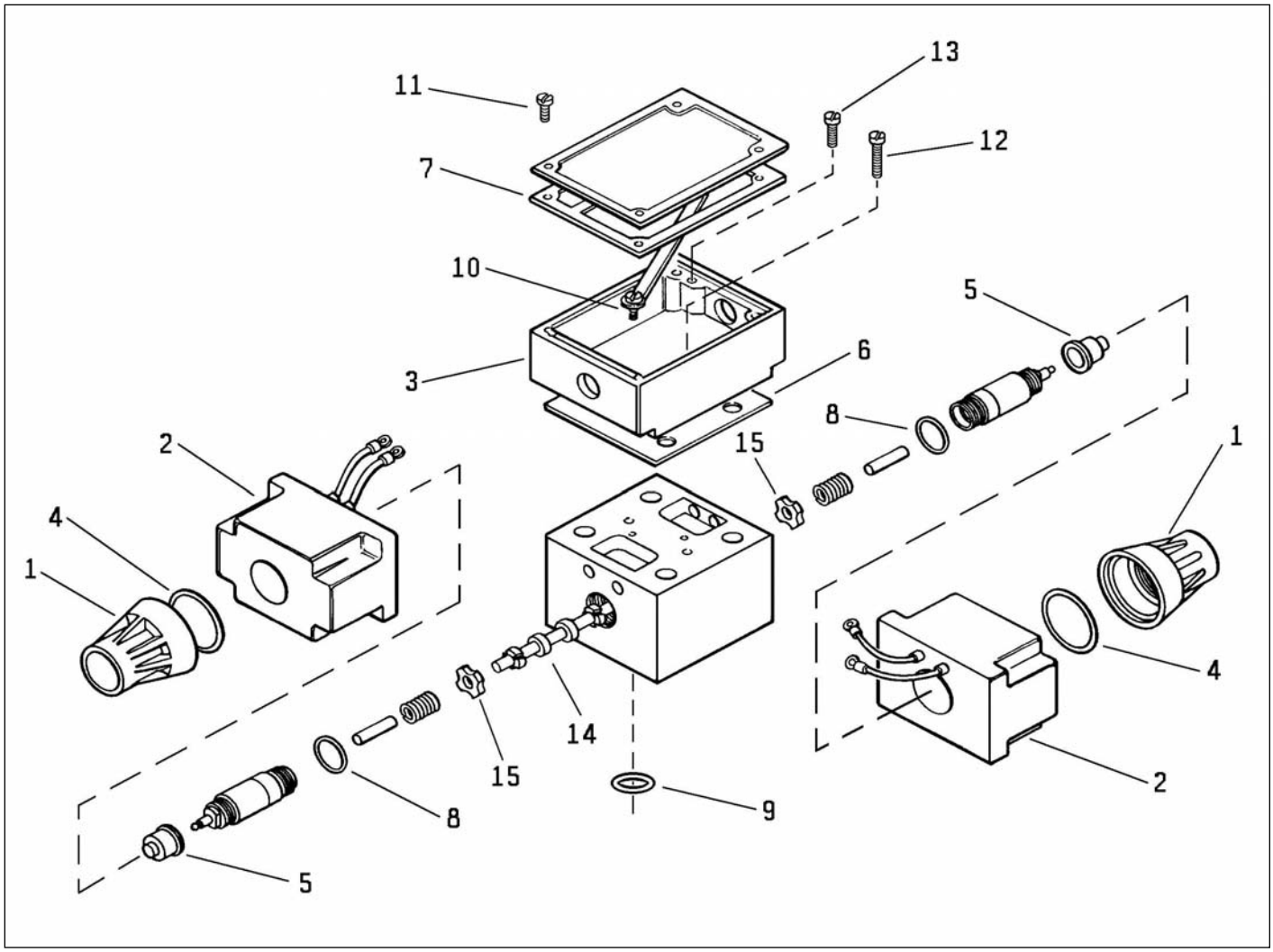


Figure 6, CU349190 Solenoid Assembly

Repair Parts List for Figure 6			
Item	**Part Number**	**Qty.**	**Description**
1	CU352020SR	2	Cap
2	DA10613190	2	Coil - 120 Volt
3	CU340950	1	Terminal Box Assembly

VSS4K1 Seal Kit			VSF4K1 Fastener Kit			VSV4K1 Spool Kit		
Item	**Qty.**	**Description**	**Item**	**Qty.**	**Description**	**Item**	**Qty.**	**Description**
4	2	O-Ring	10	1	Screw	4	2	O-Ring
5	2	Boot	11	4	Screw	5	2	Boot
6	1	Gasket	12	2	Screw	6	1	Gasket
7	1	Gasket	13	1	Screw	7	1	Gasket
8	2	O-Ring				8	2	O-Ring
9	4	O-Ring				9	4	O-Ring
						14	1	Spool
						15	2	Washer
These items available only as kits								

TROUBLESHOOTING AND REPAIR OF VS-4 & VSR-4 ELECTRIC VALVES

In diagnosing malfunctioning valves, certain symptoms may be common not only to valves, but often to hydraulic equipment in general. Before repairing the valve, mount a VM-2 on the pump and verify that the problem is not with the pump.

TROUBLESHOOTING

1. Check electrical operation of valve. Make certain pushbutton control station is in correct working order. Check spool valve for "clicking" sound which indicates operating solenoids.
2. Make certain that pilot pressure has been correctly set, or can be adjusted, and that the valve has been checked for external oil leakage.
3. Inability to obtain any pressure may be the result of blown connector seals, jammed relief components, or sticking solenoids.
4. Pressure leaks which are consistent and increase proportionately with increasing pressure ranges are usually the result of leaking gaskets or threaded surfaces.
5. Ball seat leakage is often erratic and intermittent.
6. Become familiar with and use valve schematics.
7. Valve should operate identically in both directions. If valve fails to operate in one direction, check directional circuit involved.
8. If valve malfunction is identical in both directions, check pilot circuit.
9. If valve operates to 1,200-1,500 PSI in both directions, it usually indicates excessive pilot pressure, with valve bypassing through pilot relief.
10. If pilot setting cannot be adjusted down, it indicates a severe leak in the pilot ball seat.
11. If the valve fails to build to maximum pressure in both directions, pilot pressure may be too low. Low pilot pressure may be caused by leakage through the spool valve or by a leaking pilot relief ball seat in the valve block.
12. If valve builds pressure simultaneously in both directions, this may be the result of a broken pin in the directional piston.
13. If valve fails to change direction immediately, this may be due to worn spacers or bad spring between balls of directional circuits.

DISASSEMBLY

1. Remove solenoid assembly (see Figure 3) by removing cover and four screws that hold solenoid assembly to valve block. **NOTE: Do not disassemble solenoid assembly.**
2. Remove the manifold block (Figure 1, item 11) by removing the four screws (item 12), the connector assembly (item 7) and gasket (item 6) from the valve block.
3. Disassemble valve block (see Figure 2) by removing the acorn nut (item 17), lock nut (item 14), adjusting screw (item 27), seven screws (item 23), cover (item 24) and gasket (item 39). Remove the spacer (item 13), spring (item 8), piston assembly (item 30), seat (item 20), gasket (item 25), ball (item 4), spacer (item 37) and spring (item 19). The pilot piston section of valve is now disassembled.
4. Disassemble the advance and retract piston sections by removing the square rings (item 28), 2 pistons (item 33), the springs (item 7), upper seats (item 21), gaskets (item 25), balls (item 5), spring and spacer assemblies (item 36), balls (item 5), lower seats* (item 22) and gaskets (item 10). NOTE: Discard used copper gaskets and replace with new items supplied with repair kit.
5. Disassemble the pilot relief section by removing the screw (item 6), gasket (item 11), adjusting/set screw (item 29), spring (item 26), ball guide (item 18) and ball (item 3).
6. Disassemble the high pressure relief sections for both advance and retract by removing the (2) screws (item 6), gaskets (item 11), adjusting screws (item 16), slugs (Item 52, discard), springs (item 9), ball guides (item 15) and balls (item 3).
7. It is not necessary to remove the pipe plugs (item 1) from the valve body.
8. Body is now ready to be cleaned, inspected for damage and reassembled.

* Requires special tool - TXK 400

REASSEMBLY

When assembling, use new parts supplied in repair kit.

1. Clean valve block and inspect all components. Check for worn or damaged ball seats, broken or weak springs. Inspect relief ball seats in valve block.
2. Carefully reseat small balls in reliefs. Replace guides, springs, and adjusting screws. Use care when turning adjusting screws so as not to distort or displace springs. Pilot relief spring can be forced into cross hole by bottoming screw. Do not install gaskets (item 11) or screws (item 6) at this time as adjustments to reliefs will be made during testing of the valve. NOTE: New seats must be seated by placing the ball on the seat and pressing to 200 PSI on a 10 ton press.
3. Assemble advance and retract piston sections by installing gaskets (item 10) and lower seats (item 22). Torque lower seats to 20-25 ft. lbs. Install balls (item 5), spring and spacer assemblies (item 36), balls (item 5), gaskets (item 25) and upper seats (item 21). Torque upper seats to 35-40 ft. lbs. A. Attach couplers to both ports. Connect each port to hand pump and 15,000 PSI gauge. Adjust each high pressure relief to 11,500-12,000 PSI. Valve should hold pressure at 10,000 PSI without leakage. Both seats in directional circuits will be checked in this operation.
4. Install new O-Rings and back-up washers on all three pistons.
5. Install springs (item 7) and piston assemblies (item 33) into advance and retract sections of valve body. Install square rings (item 28) between piston and cover plate.
6. Assemble pilot piston section by installing spring (item 19), spacer (item 37), ball (item 4), gasket (item 25) and seat (item 20). Torque seat to 35-40 ft. lbs. Install pilot piston assembly (item 30), spring (item 8) and spacer (item 13).
7. Use seven cap screws (item 23) to bolt cover (item 24) and gasket (item 39). Insert adjusting screw (item 27) and locknut (item 14). Do not install acorn nut (item 17) at this time as adjustments will be made during testing.
8. Install solenoid assembly (see Figure 3) using four cap screws and cover to valve body.
9. Valve is now ready to be adjusted and tested.

ADJUSTMENTS

1. Mount valve on a remote block and connect to a 700 cu. in./min. output test pump. Insert 2,000 PSI gauge in 1/16" NPT port on block nearest cover plate (may be on either side of block). Note: The return-to-tank line must be unrestricted. Quick disconnect fittings should not be used, as they will cause excessive restriction. Excessive return flow restriction will result in the inability to obtain accurate pilot pressure settings.
2. Connect pushbutton station to the valve.
3. With adjusting screw turned in, adjust pilot relief setting from port end of block to 1,150-1,200 PSI.
4. Adjust pilot setting to 850-900 PSI. (Adjustment screw located under acorn nut.)
5. Connect the ADV port to advance port on a double acting cylinder and a 15,000 PSI gauge.
6. Connect the RET port to retract port on a double acting cylinder and a 15,000 PSI gauge.
7. Run the cylinder back and forth under no pressure to eliminate air.
8. Valve should build to maximum pressure in both advance and retract directions.
9. Valve should hold pressure in both advance and retract directions. At 10,000 PSI there should be less than a 300 PSI drop in 15 seconds. When the valve is in hold, there should be no cylinder creep.
10. Remove remote block and reassemble to original block and onto pump.

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