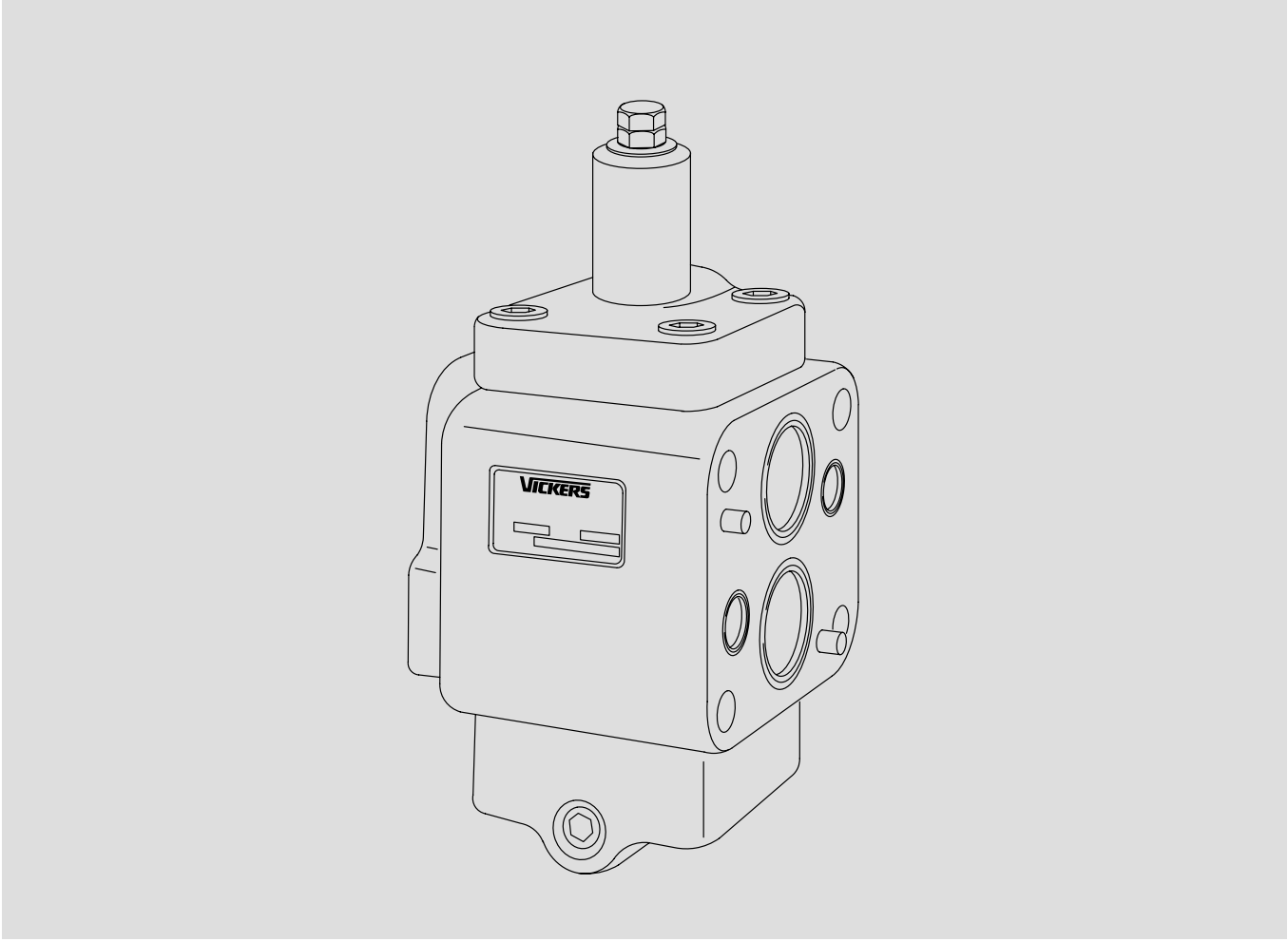
Overhaul Manual

Vickers®

Pressure Relief

Pressure Control Valves Hydro-Cushion Type

RF, RG and RT Series
RCF, RCG and RCT Series



VICKERS

Revised 9/1/87

I-3332-S

Table of Contents

Section I – Operating Characteristics

Type . . . . . Hydro-cushion pressure control valves
Operating Fluid . . . . . High quality lubricating oil
Recommend Viscosity . . . . . 100-250 SSU @ 100° F.

Operating Pressure . . . . . Maximum 2000 PSI
Port Connections . . . . . Flange, gasket or threaded
Mounting Position . . . . . Optional

Model	Port Size	Capacity GPM	Parts Drawing	Installation Drawing	
				"RC" Series	"RC" Series
RT/RCT-03-**-1*	3/8 inch	8	I-3325-S	I-132395	I-132396
RG/RCG-03-**-1*			I-3329-S	I-133101	I-133103
RT/RCT-06-**-1*	3/4 inch	20	I-3326-S	I-132395	I-132396
RG/RCG-06-**-1*			I-3330-S	I-133101	I-133103
RT/RCT-10-**-1*	1 1/4 inch	50	I-3327-S	I-13395	I-13296
RG/RCG-10-**-1*			I-3331-S	I-133101	I-133103
RT/RCT-12-**-1*	1 1/2 inch	65	I-3327-S	I-132395	I-132396
RF/RCF-16-**-1*	2 inch	125	I-3328-S	I-133671	I-133672

Table 1. 2.

R (C) T O - 06 - D P 2 - 10

1 2 3 4 5 6 7 8 9

1 Valve Type 3.
Pressure control

2 Valve Design
C - with integral check valve
(Reverse free flow)
Omitted - Without check valve
(no reverse flow)

3 Installation
F - Flange connected
G - Gasket mounted
T - Threaded connections

4 Special Feature
O - Normally open spool
(decompression circuits)
Omitted - Normally closed spool
(standard)

5 Port Connections
Nominal Pipe Size
03 - 3/8" female pipe thread
06 - 3/4" female pipe thread
10 - 1 1/4" female pipe thread
12 - 1 1/2" female pipe thread
16 - 2" flange female pipe thread

6 Pressure Rating
A - 75-250 PSI (with pilot piston)
B - 125-500 PSI (with pilot piston)
D - 250-1000 PSI (with pilot piston)
F- 500-2000 PSI (with pilot piston)
Z - 25-125 PSI (without pilot piston)

7 Special Application
P - Auxiliary external pilot
pressure control
Omitted standard control

8 Circuit Application
1 - "R" Series, relief valve
(internal drain directly operated)
"RC" Series, counter balance valve
(internal drain directly operated)
2 - Sequence Valve
(external drain remotely operated)
3 - Sequence Valve
(external drain remotely operated)
4 - "R" series, unloading valve
(internal drain remotely operated)
"RC" series, counter-balance valve
(internal drain remotely operated)

9 Design Number

9 Design Modification

Table 1. Model Code Breakdown
4.

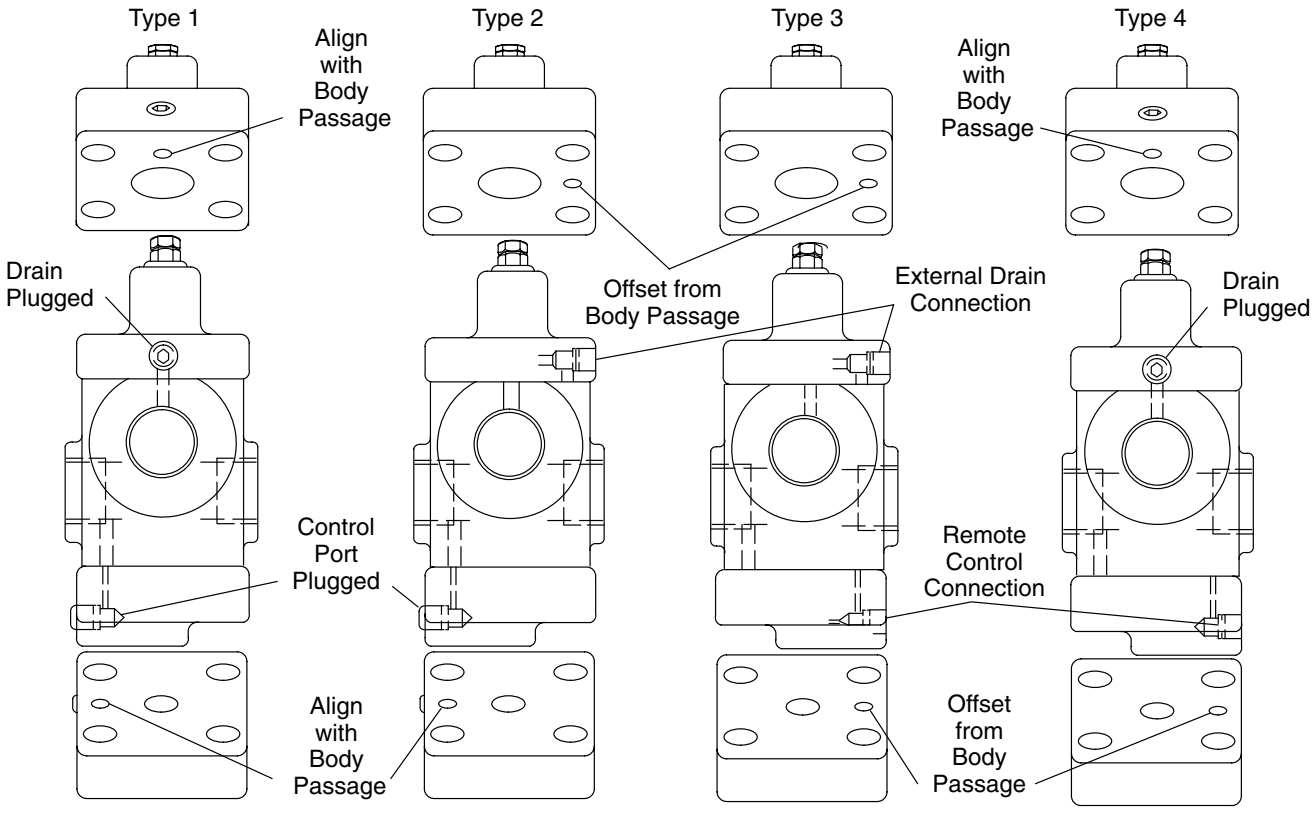
For satisfactory service life of these components, use full flow filtration to provide fluid which meets ISO cleanliness code 20/18/15 or cleaner. Selections from pressure, return, and in-line filter series are recommended.

Section II – Description

This manual contains operation, service and overhaul information for Vickers hydro-cushion type pressure control valves.

The “R” and the “RC” series valves are identical in operation except the “R” series limits flow to one direction - from the primary port to the secondary port. The “RC” series, provided with an integral check valve, permits reverse free flow from the secondary port to the primary port when the valve is closed.

Since these valves can be internally or externally drained, directly or remotely operated, they are adaptable to a wide range of applications depending on the position of the covers in relation to the body.



NOTE:
Cover positions illustrating threaded style valves apply to gasket mounted valves also, except the cover ports remain plugged. External connecitons are made directly to the mounting surface or subplate fo the RG, RCG Series.

Figure 1. 6.

The four standard combinations are designated as Types 1, 2, 3, and 4. Each type is available with or without the integral check valve, permitting reverse free flow.

TYPE 1 - is internally drained and directly operated. It is used as a relief valve for overload protection when the system pressure does not exceed 500 PSI. In this application the secondary port is connected directly to tank. Or, if provided with the integral check valve, it can be used as a counterbalance or brake valve.

TYPE 2 - is externally drained and directly operated. It is used as a sequence valve permitting pressure buildup for the second phase of a two phase cycle, while maintaining a minimum pressure at the primary port for a holding operation, i.e., a clamp and work stroke cycle.

TYPE 3 - is externally drained and remotely operated. It is used as a sequence valve in the same manner as **Type 2** except, being remotely operated, the valve can be used to sequence independently of the primary pressure when provided with a separate pressure source.

TYPE 4 - is internally drained and remotely operated. It is used primarily as an unloading valve where the secondary port must be connected directly to tank. Application of external pressure permits the valve to open fully independent of the primary pressure. Type 4 valves can also be used as remotely operated counterbalance or brake valves when provided with the integral check valve.

Section III – Installation

The RT, RCT series with threaded connections and the RF, RCF series valves with flange connections are usually installed directly in the supply line. Fluid flow is through the primary pressure ports on opposite side of the valve body. The single, secondary port, on the side of the valve adjacent to the primary port, is connected to tank or to the secondary circuit depending on the application and type of valve used.

The RG, RCG series gasket mounted valves are teed into the supply line. The tee connection is piped to the bottom, or pressure port in the subplate, or to the back surface of the mounting area. The top, or secondary, port is piped to tank or to the secondary circuit with the covers arranged for internal or external drain and direct or remote control depending on the valve action required.

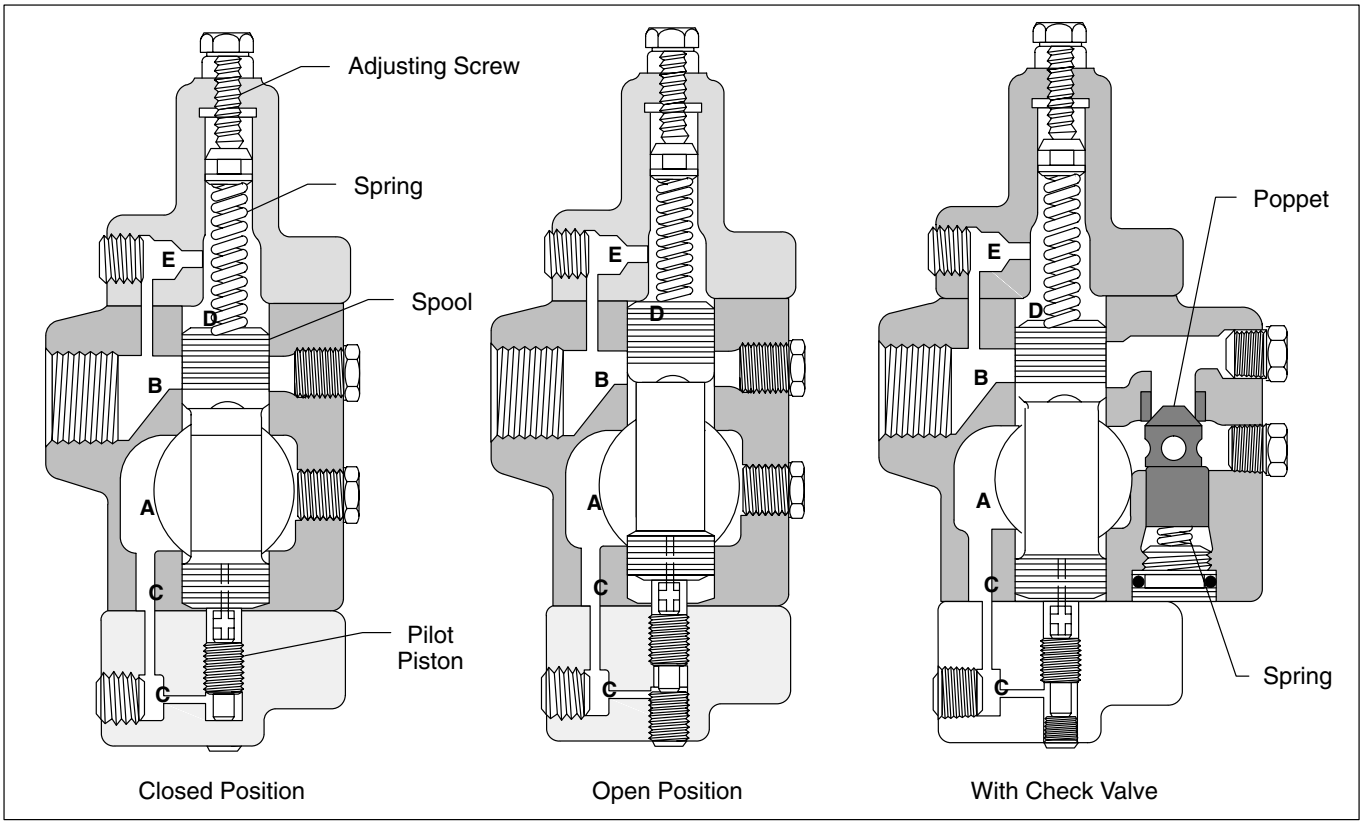


Figure 2. 8.

Section IV – Operation

Figure 2 illustrates the basic operation of the various types of valves. The point at which the valve begins to function is determined by the position of the adjusting screw (which varies the force exerted by the spring on the spool) referred to as the pressure setting of the valve. Clockwise rotation of the screw increases pressure. Counterclockwise rotation decreases pressure.

The effective areas of the spool exposed to hydraulic pressure in primary chamber A being equal, the spool is hydraulically balanced and held in a normally closed position by the force of the spring. When pressure is primary chamber A - which is effective on the piston through passages C - exceeds the adjusted pressure setting, the piston is forced upward moving the spool accordingly.

The spool moving upward opens secondary chamber B permitting pump delivery to flow into the secondary circuit, while maintaining a minimum pressure in primary chamber A equal to the pressure setting of the valve.

When the primary pressure decreases, compression of the spring overcomes the hydraulic force effective on the piston and spool closes blocking flow to chamber B.

Fluid leakage trapped between the piston and the spool escapes through the center hole of the spool, into spring chamber D, through drain passage E to chamber B and tank, or externally to tank depending on the position of the top cover.

Valves with pressure ratings identified as A, B, D or F, require the pilot piston in the bottom cover.

Valves of the Z (or low pressure rating) do not use the pilot piston, but use a spool without the center drain hole, in order to prevent the pilot fluid from escaping through the drain passage.

In addition to the basic units, some models may include special features for specific applications.

Model code breakdown on page 4, describes in detail the valve types, pressure ranges and special applications available.

Figure 3 schematically illustrates two special feature valves. The normally open spool is identified by the letter O in the model number and the auxiliary remote control feature is identified by the letter P in the model number.

Section V – Special Features

The normally open spool type, used with a special counter-balance or decompression control requires a needle valve or orifice installed between the primary port and the secondary port to accomplish the decompression feature.

Operation of this valve when used with a gravity returned single acting ram is such that pump fluid passes free flow into secondary chamber B, then through the check valve and chamber A into the ram. Pressure buildup in the ram closes the spool.

When the work stroke is completed, fluid flow is diverted from the secondary port by directing the pump delivery to tank.

On the return stroke, trapped fluid under pressure in the primary port holds the valve spool and check valve closed until a small amount of fluid bleeding off through the needle valve or orifice reduces the trapped pressure.

When pressure drops below the valve setting, the spring forces the valve spool to open directing the discharge flow through the secondary port to tank.

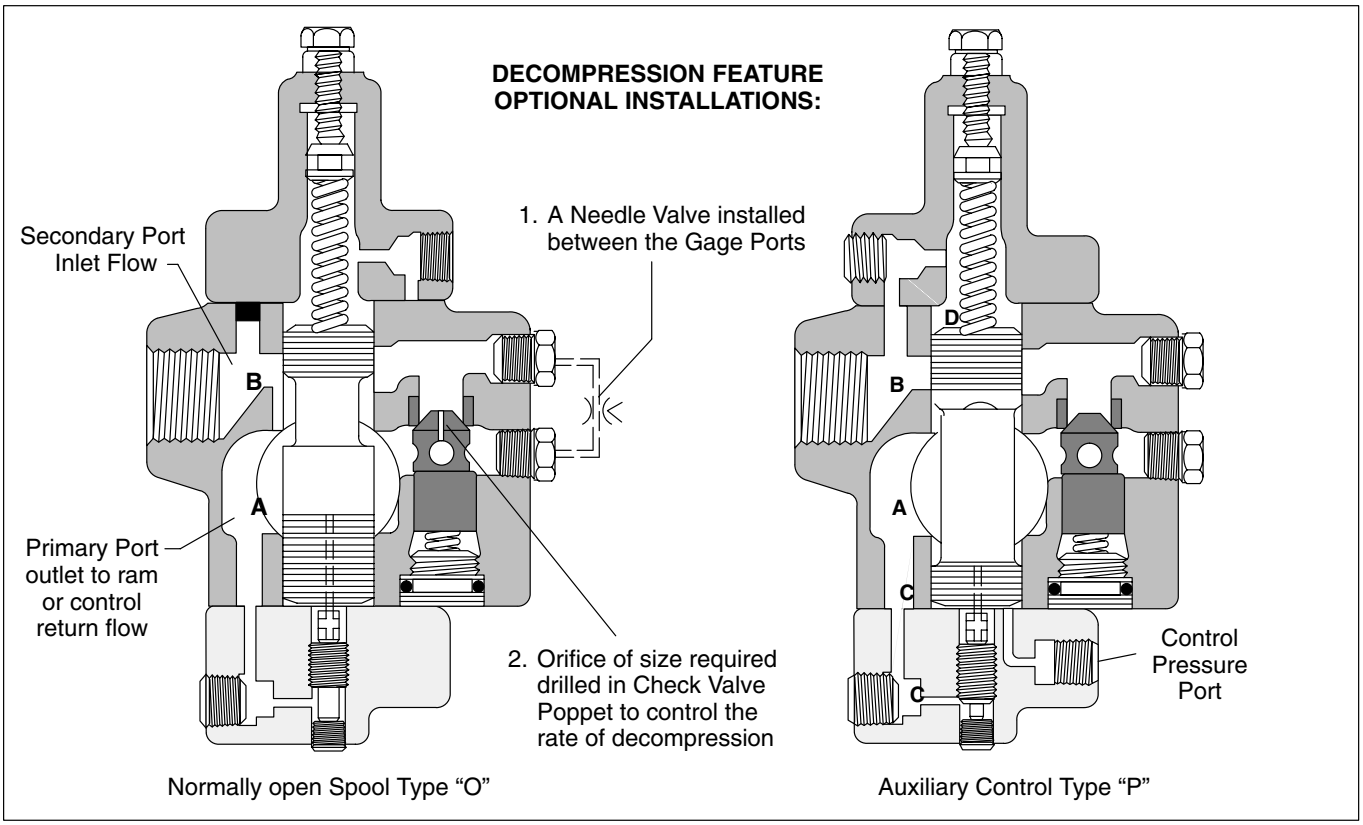


Figure 3. 11.

Valves with the "P" feature, auxiliary remote control are available in both the R* and the RC* series.

These valves may be used to stop the movement of a hydraulic cylinder or motor by providing hydraulic braking when the driving force is removed.

Because of the difference in effective areas between the bottom of the spool and the bottom of the pilot piston, the external pilot pressure needed to open the valve to resume movement is only one-eighth of the internal pilot pressure required for the A, B or D rated valves and one-sixteenth of the internal pressure required by the F rated valves.

Operation is such that the cylinder or motor is maintained in a fixed position when force is removed until pilot pressure applied to the large area of the spool, overcomes the spring force. This permits the discharge fluid to pass through the primary port into the secondary port and back to tank.

The integral check valve permits free flow from the secondary port to the primary for reversing action of the cylinder or motor.

Section VI – Overhaul

CAUTION

Before breaking any circuit connections, be certain the electrical power is off and all branches of the circuit are relieved of trapped pressure. Lower all vertical cylinders. Discharge or isolate accumulators. Block any load whose movement could cause injury to personnel or damage to the equipment.

A. Disassembly 13.

If a valve fails to function properly, the trouble can often be corrected without removing the valve from the installation. This can be accomplished in the following manner.

1. Back off the adjusting screw full length to relieve all compression on the spring.

2. Remove top cover screws, cover and spring.

3. Check the valve spool for binding or excessive clearance in the body bore. Be sure the pilot pistons remains in the bottom cover during the process.

4. If the spool checks out satisfactorily, remove the bottom cover. Check the pilot piston for burrs or excessive clearance in the cover bore.

5. Check the bottom cover for clogged control passages. See Trouble Shooting Table 3.

For complete disassembly (See Figure 4), remove the valve from the installation. Dismantle in the same order as the key index numbers assigned to the exploded view.

B. Reassembly 14.

Reassemble in reverse order of disassembly. Follow key index numbers in Figure 4 in reverse order.

NOTE

In reassembling the valves, the position of the drain passage in the top cover in relation to the drain passage in the body, and the position of the control fluid passage in the bottom cover in relation to the body passage, determines the type or function of the valve. See Figure 1 for cover positions.

1. Adjusting Screw
2. Locknut
3. Cover Screw
4. Cover - Top
5. Plug - Drain Port
6. Seals or Gasket
7. Plug
8. O-Ring
9. Spring
10. Spool
11. Cover Screw
12. Cover - Bottom
13. Seals or Gasket
14. Piston
15. Plug
16. Plug
17. Body - RT Series
18. Body - RCT Series
19. Body - RG Series
20. Body - RCG Series
21. Body - RF Series
22. Body - RCF Series
23. Screw - Mtg.
24. Plate - Mtg.
25. Seal
26. Seal
27. Plug
28. Plug
29. Seal
30. Spring
31. Poppet
32. Seat

33. Neoprene Plug - Used on external drain models only.
34. Neoprene Plug - Used on remote control models only.

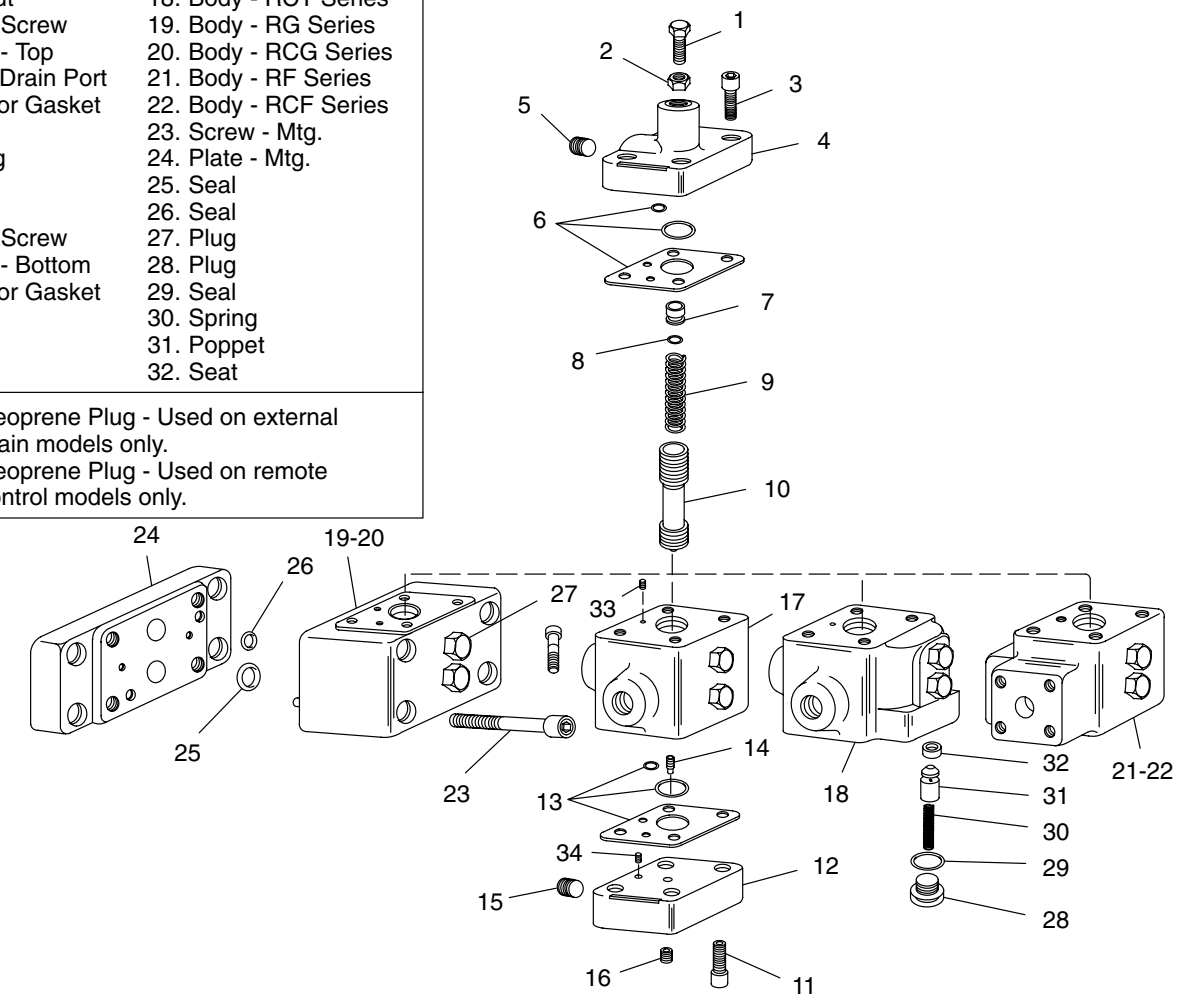


Figure 3. 15.

E. Troubleshooting Chart

Trouble	Possible Cause	Remedy
Erratic Pressure	1. Foreign matter in the system. Spool binding in the body bore.	Drain, flush and refill system with clean fluid. Check spool for excessive wear or burrs. Remove burrs with India Stone. Check body bore for wear or out-of-round. RT and RCT series, check the connecting piping for excessive tightness distorting body.
Premature Valve Action (Low Pressure)	1. Valve improperly adjusted. 2. Drain hole through main spool plugged. 3. Main spool stuck in open position. 4. Control piston binding in up position.	Readjust valve to proper setting. Remove spool. Blow out hole with filtered compressed air. Remove spool. Check for burrs, foreign matter, excessive wear, out-of-round body bore. RG and RCG series, inspect valve mounting surfaces for flatness. Remove bottom cover. Check piston for burrs.
Delayed Valve Action (High Pressure)	1. Control piston binding in bottom position. 2. Control fluid passage in bottom cover plugged.	Check for burrs, foreign matter or excessive wear. Remove cover. Clear obstruction from control passage and blow clean with compressed air.

Table 3. Trouble Shooting Chart

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