

## Adjustable Differential Relay 84871-A1

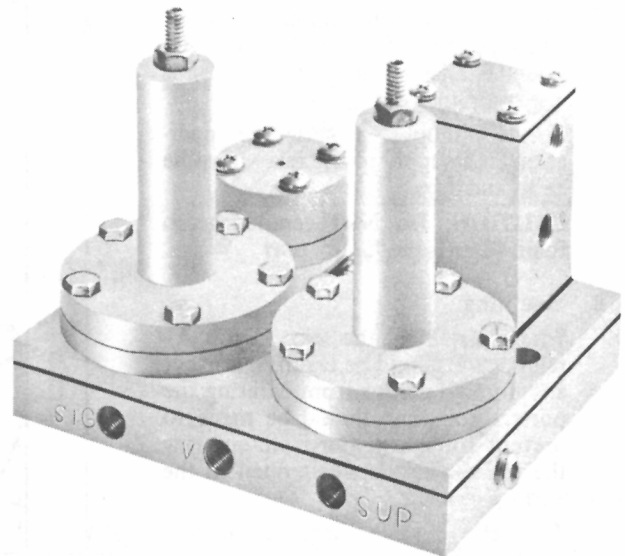
### GENERAL DESCRIPTION

The 84871-A1 Adjustable Differential Diverting Relay is a two-position, snap-acting, three-way relay. Its normal function is to receive a proportional pneumatic signal and transform this signal, at a predetermined setting, to a positive change on a final control device.

The separate high and low switching points are adjustable over the entire range normally used in pneumatic control systems and easily field adjusted.

This relay will perform various operations such as:

- Supply or exhaust a control line on command of a proportional signal.
- Divert either of two control lines on command of a proportional signal.
- Select either of two lines to supply one control line on command of a proportional signal.
- Port 1 may be used as a permissive for diverting action by connecting a device to either vent or block port 1. (Venting port 1 will prevent a diverting action.)



### SPECIFICATIONS

**Construction** ..... Anodized aluminum body, stainless steel and plated steel springs; elastomer coated fabric diaphragms and gaskets. Elastomer impregnated cork gasket; stainless steel and aluminum valve with resilient seat.

**Supply Pressure** ..... Use 20 psi (1.37 bar) to port "SUP" for 30 psi (2.068 bar) or less through the Diverting Relay. Use 25 psi (1.724 bar) to port "SUP" for pressures greater than 30 psi (2.068 bar) through the Diverting Relay. Port 2 (canceling) pressures must equal port "SUP" pressures to ensure positive canceling.

**Signal Pressure:**

**HIGH** ..... 1.3 to 30 psi (.090 to 2.068 bar)

**LOW** ..... 1.0 to 29.7 psi (.069 to 2.048 bar)

**Diverting Relay Maximum Pressure:**

40 psi (2.758 bar) to port NO.

60 psi (4.137 bar) to port NC.

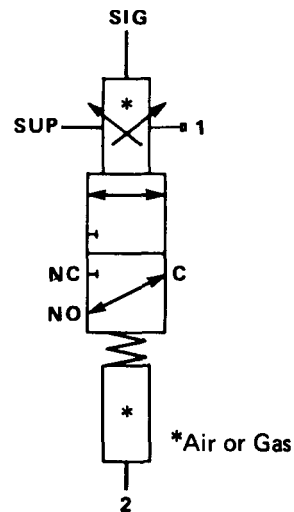
**CAUTION: DO NOT EXCEED MAXIMUM PRESSURE.**

**Mounting** ..... Surface

**Dimensions** ..... See Figure 1

**Connections** ..... 1/8" - 27 NPT

**Approximate Shipping Weight** ..... 3.5 lbs. (1.589 kg)



J.I.C. SYMBOL

### ORDERING INFORMATION

Specify No. 84871-A1

## INSTALLATION

### A. General

Tubing and fittings used to connect the relay must be free of chips, dirt, and moisture or other foreign material.

It is recommended that an "antisieze" type thread compound be applied to the second or third male thread in moderate amount. Do not allow compound to be deposited inside the relay. Thread sealing tape is not recommended.

For continuous, trouble-free operation, the supply to the relay must be clean and dry.

**CAUTION: Do NOT remove green foam filter from "SUP" port.**

### B. Mounting

When installing, the No. 84871-A1 relay, care should be taken to prevent any foreign matter from entering the ports. Provisions should be made to prevent foreign matter from entering the ports which are left open to the atmosphere.

The relay may be installed in any position. The relay should be securely mounted, using the two holes (clearance for No. 10 screws), provided in the sub-plate. (See Figure 1.)

## DIMENSIONS

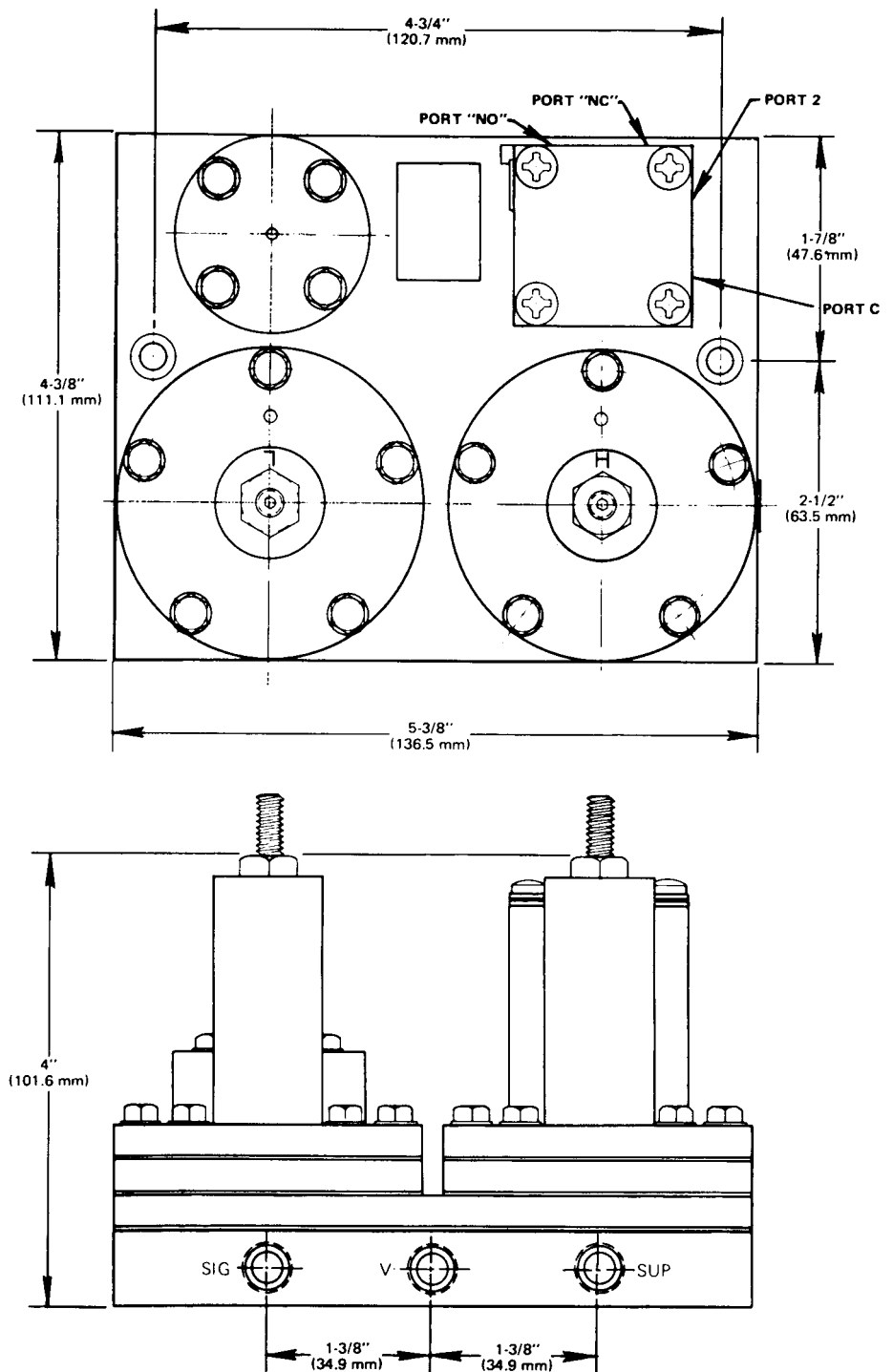


Figure 1

## OPERATION

With no signal pressure applied, valve 1 and valve 2 are open, connecting the passage ways downstream of restrictor 1 and restrictor 2 to the vent cavity.

Regulated pressure entering connection "SUP" bleeds through restrictors 1 and 2, through valves 1 and 2 and into the vent cavity.

### Increasing Signal Pressure

As the signal pressure is increased to equal the setting on the LOW adjustment spring, valve 1 closes, thus permitting the pressure downstream of restrictor 1 to increase to supply pressure. This same pressure also appears at the selector valve which is closed at this time due to the internal spring and lack of pressure on the pilot diaphragm.

Further increasing the signal pressure to equal the setting on the HIGH adjustment spring causes valve 2 to close, thus causing the pressure downstream of restrictor 2 to increase to supply pressure. This pressure is applied to the pilot diaphragm of the selector valve causing it to open.

Pressure from restrictor 1 which was previously blocked at the selector valve poppet now is permitted to pass to the pilot diaphragm of the diverting relay. The

diverting relay transfers from the "NO" to "C" to the "NC" to "C" position.

Transfer of the diverting relay may be overridden, if desired, by applying a canceling pressure to port 2.

### Decreasing Signal Pressure

Reducing the signal pressure to the setting of the HIGH spring causes the pilot pressure of the selector valve to be vented. The selector valve does not close, however, due to the secondary pilot diaphragm which is still exposed to the pressure from the LOW pilot section. The diverting relay remains connected "NC" to "C."

Further reduction of the signal pressure to the low setting causes the LOW section pressure to be vented, allowing the selector valve to close. Pilot pressure to the diverting relay will be vented through restrictor 3, causing the relay to retransfer "NO" to "C."

NOTE: The pressure which pilots the diverting relay is supplied from the LOW pilot section; therefore, if the LOW setting is set higher than the HIGH setting, the diverting relay will transfer as soon as the LOW setting is exceeded.

*Minimum reset differential is achieved in this manner.*

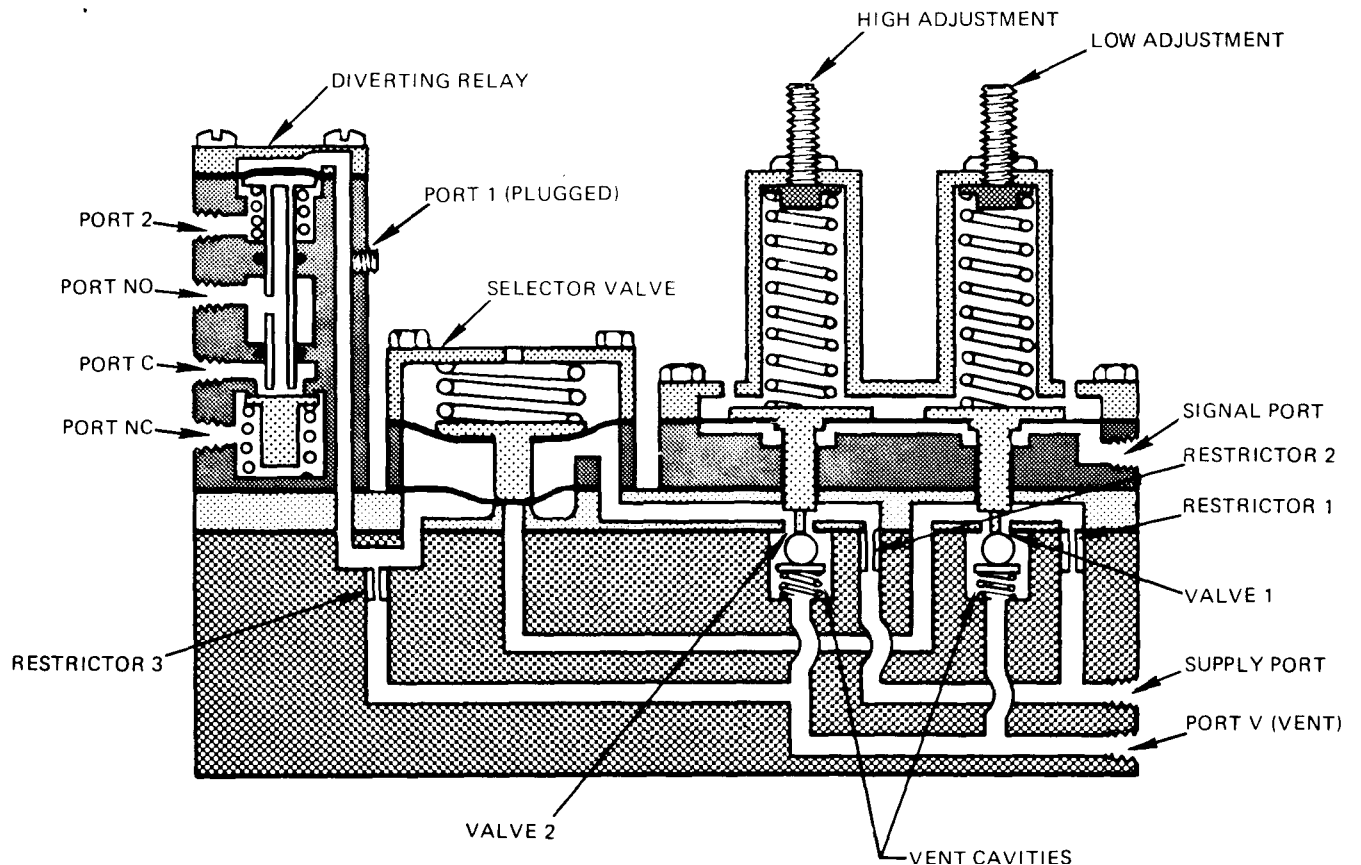


Figure 2

## SETPOINT ADJUSTMENT

Turn both adjusting screws counterclockwise until there is no spring pressure. This can be checked by turning the adjustment screws IN and OUT with the fingers to determine where the spring tension stops.

Connect a  $20 \pm 0.5$  psig ( $1.379 \pm .034$  bar) regulated air supply to the "SUP" port in the base of the relay. Apply  $25 \pm 5$  psig ( $1.72 \pm .345$  bar) to port "NC" of the diverting relay and connect a pressure gage to port "C" of the diverting relay in order to detect a transfer of the relay.

Connect a regulated supply and test gage to the signal port marked "SIG." Set the signal pressure to the desired low setpoint. Turn the LOW adjusting screw marked "L" clockwise until the relay diverts. A finer setting may be achieved by turning the adjusting screw in and out a few times in order to find the exact diverting point. Tighten the locknut on the adjusting screw and recheck the setting by increasing and decreasing the signal pressure across the desired LOW setpoint. Before continuing with the next step, decrease the signal pressure to 0 psi (0 bar).

Turn the HIGH adjusting screw clockwise approximately eight (8) full revolutions. Regulate signal pressure to the desired HIGH setting. Slowly turn the adjusting screw counterclockwise until the relay diverts. Tighten the locknut on the adjusting screw and recheck the setpoints by increasing and decreasing the signal pressure across the full range of both the HIGH and LOW setpoints. Fine adjust as required.

NOTE: The setting will change approximately 4 psi (.277 bar) per revolution of the adjusting screws.

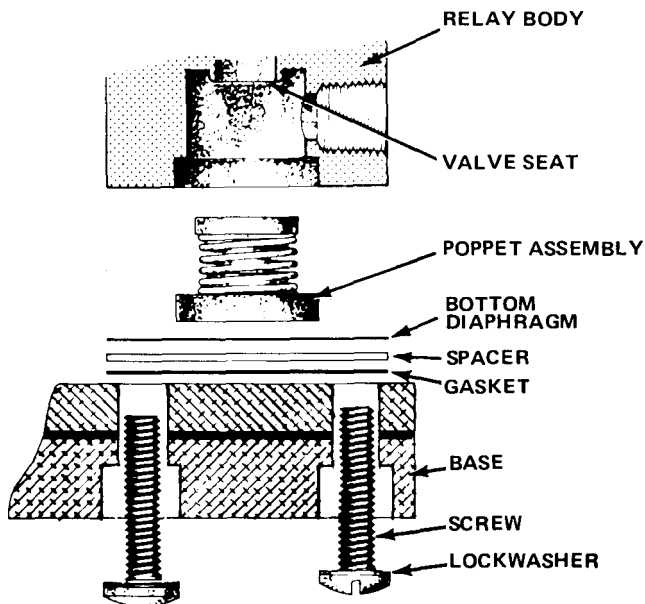


Figure 3

## MAINTENANCE

**WARNING: USE CARE WHEN DISASSEMBLING, SPRING LOAD FORCES PRESENT.**

- A. If excessive leakage occurs at valve seat, remove Diverting Relay from base. Clean poppet and seat with soft, dry cloth (See Figure 3).
- B. If Diverting Relay does not function properly, it may be due to contamination by foreign matter. Disassemble and clean all metal parts with non-flammable solvent and dry thoroughly.

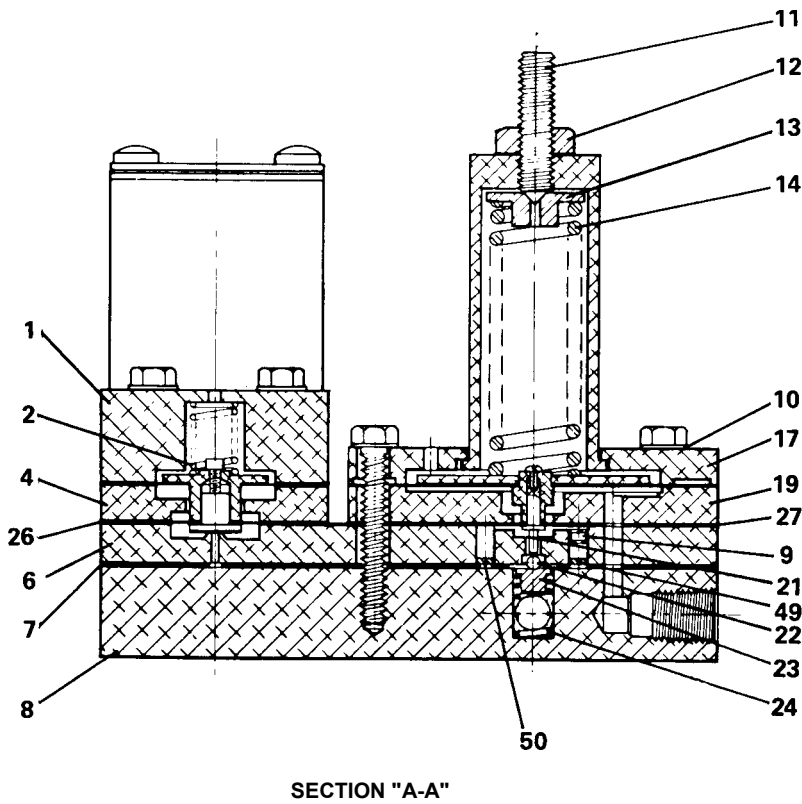
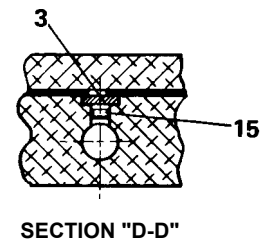
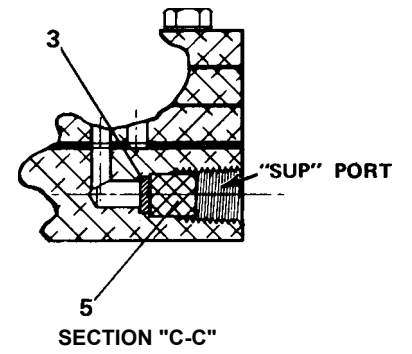
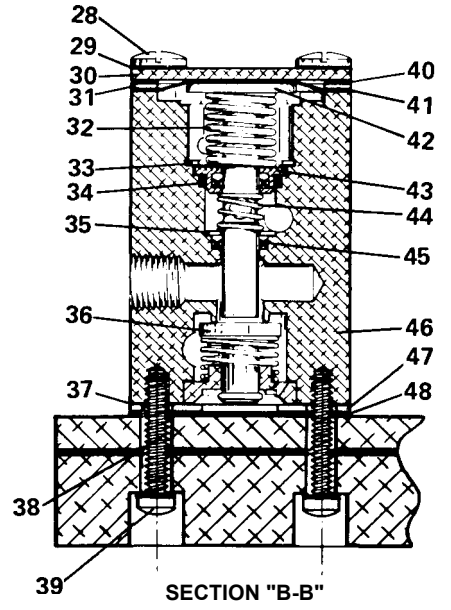
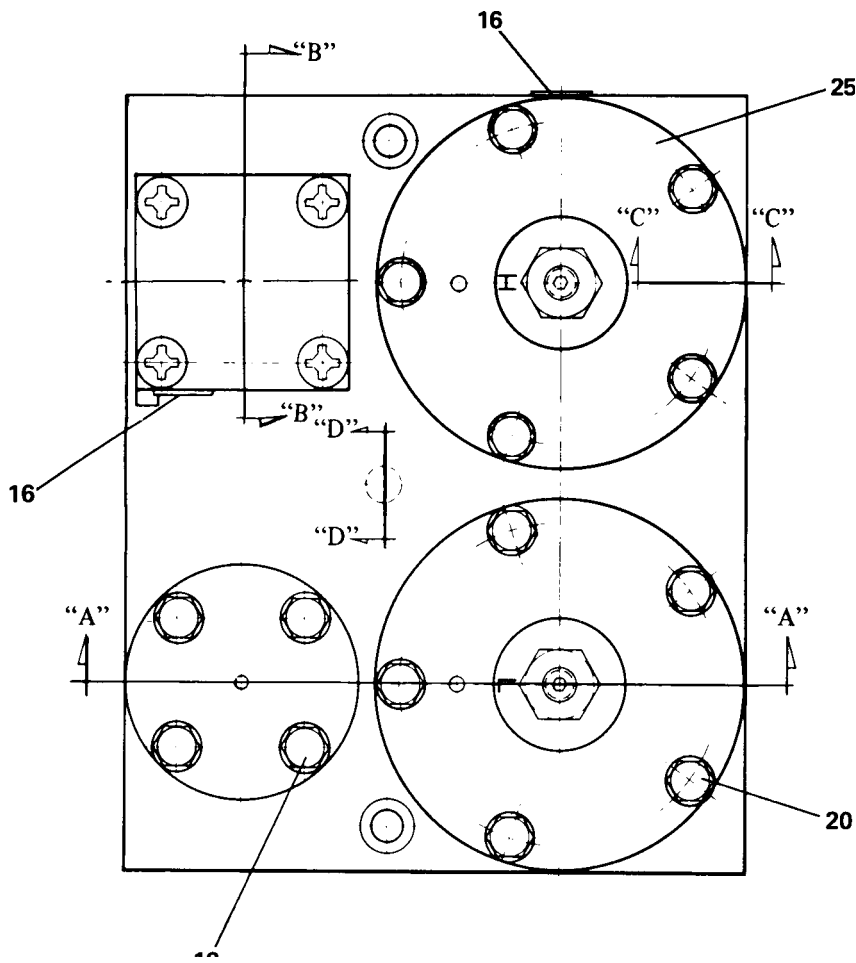
After reassembly, check for external leakage. Retighten assembly screws as necessary. Gasket cement should not be used to seal leaks due to the possibility of plugging small passages or damaging the operating characteristics of the diaphragms.

- C. If the Adjustable Differential Relay (ADR) exhibits signs of pneumatic leakage, all screws should be tightened and then the following items should be checked. The numbers in parentheses refer to the parts list on page 6.
  1. The top plate diaphragms (19) may be leaking. Replace the top plate assembly.
  2. The selector relay (4) diaphragm may be leaking. Replace the selector relay assembly.
  3. The ball and seat (22) may be contaminated. Remove, clean and replace.
- D. The ADR may exhibit improper operation, other than obvious leakage, such as: restricted flow; L side will not operate; H side will not operate; relay diverts but C port pressure does not change; the relay diverts at the wrong signal pressure. In this event, the following items should be checked:
  1. Restrictors (9) (15) may be blocked. Clean the orifice.
  2. Filters (3), (5), (47), (48) may be blocked. Clean (3), (47), (48) or replace (3).
  3. Ball and seat (22) may be contaminated. Remove, clean and replace.
  4. The vent chamber may be blocked. Clean it.
  5. Any of the diaphragms previously listed may be leaking.

### CAUTION:

If cleaning is required, do not subject "O"-rings, valve poppets, diaphragms or gaskets to cleaning fluid, acetone, or any halogenated hydrocarbons such as vapor degrease liquids, etc. Clean only with a soft, dry cloth. Upon reassembly, all "O"-rings are to be lubricated with a silicone-type lubricant. Do not permit lubricant to get on poppet or valve seats.

PARTS LIST



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DET. NO.	NO. REQ'D	PART NO.	DESCRIPTION
1	1	35829-A1	Cover
2	1	35840-A1	Spring
*3	2	35837-A1	Metal Filter
*4	1	84875-A1	Selector Relay Assembly
*5	1	25303-A1	Foam Filter
6	1	35819-C1	Plate
*7	1	35838-A1	Gasket
8	1	35819-A1	Base
9	2	31311-B2	Restrictor
10	14	29994-A1	Lockwasher
11	2	36717-J2128	Set Screw
12	2	26798-A1	Nut
13	2	35821-A1	Guide
14	2	35835-A1	Spring
15	1	33542-A1	Restrictor
16	2	25599-A1	Pipe Plug
17	1	84873-A2	Cover Assembly
18	4	33715-T2600	Screw
*19	2	84876-A1	Top Plate Assembly
20	10	33715-T2300	Screw
*21	2	35823-A1	Operating Pin
*22	2	32976-A1	Ball
23	2	35822-A1	Retainer
24	2	31262-A1	Spring
25	1	84873-A1	Cover Assembly
*26	1	35868-B1	Gasket
*27	2	35831-A1/B1	Gasket
28	4	33713-G1109	Screw
29	4	36600-L0609	Lockwasher
30	1	33666-A2	Cover
31	1	33430-A2	Spacer
32	1	27953-A1	Spring
33	1	36605-A2	Retaining Ring
*34	1	36240-N0013	"O"-Ring
35	1	33671-A2	Washer
*36	1	84895-A1	Poppet Assembly
*37	1	24498-B2	Diaphragm
38	4	36600-L0609	Lockwasher
39	4	33713-K1700	Screw
*40	1	33665-B1	Gasket
*41	1	24498-A1	Diaphragm
42	1	85013-A1	Head & Stem Assembly
43	1	33667-B1	"O"-Ring Carrier
44	1	33668-B1	Spring
*45	2	36240-C0010	"O"-Ring
46	1	31857-G1	Relay Body
47	1	33430-B2	Spacer
*48	1	35868-C1	Gasket
49	2	35090-A1	Metal Filter
50	2	32090-A1	Metal Filter

**REPAIR KITS:**

1. For a complete kit to service one unit order Repair Kit No. 82665-C1. Kit contains details marked \*.  
NOTE: Only the plug and "O"-Ring are furnished in this kit for detail 36.
2. For a complete kit to repair the Diverting Relay ONLY (See Figure 2) containing details 34, 37, 38, 39, 43 and the plug and "O"-Ring for detail 36, order Repair Kit No. 82665-B 1.

**Robertshaw**

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