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INSTRUCTIONS FOR THE INSTALLATION, OPERATION AND MAINTENANCE OF FAIRCHILD MODEL 22 COMPUTING RELAY

GENERAL INFORMATION

The Model 22 Computing Relay provides an output pressure modulated by several input signals.

Specifications Model 22 Relay

Input and output pressure ranges 3-15 psig
[2-1.0 BAR] (20-100 kPa)

Normal supply pressure 20 psig [1.5 BAR] (150 kPa)

Maximum operating pressures
Signal and output pressure 50 psig [3.5 BAR]
(350 kPa)

Supply Pressure 150 psig [10.0 BAR] (1000 kPa)

Maximum overpressure 100 psig [7.0 BAR] (700 kPa)
any connection 250 psig [17.0 BAR] (1700 kPa)
supply connection only

Input to output ratios 2:1, 1:1, 1:2
all within 2%

Ambient Temperature Limits -40° F to 200° F
(-40° C to 93.3° C)

Linearity of output pressure within 0.4%
of full range

Repeatability for unbalances within the normal
pressure range, the output pressure
will repeat its previous value
within 0.5% at full range

Air Consumption 0.06 SCFM (0.1 m³/HR) max.
at 15 psig [1.0 BAR] (100 kPa) output
[In balance, on dead end service]

Output flow capacity A forward flow of 2 SCFM
(Mid-scale output, (3.4 m³/HR) will not
20 psig [1.5 BAR] cause a drop in output of
[150 kPa] supply) more than 3% of full range

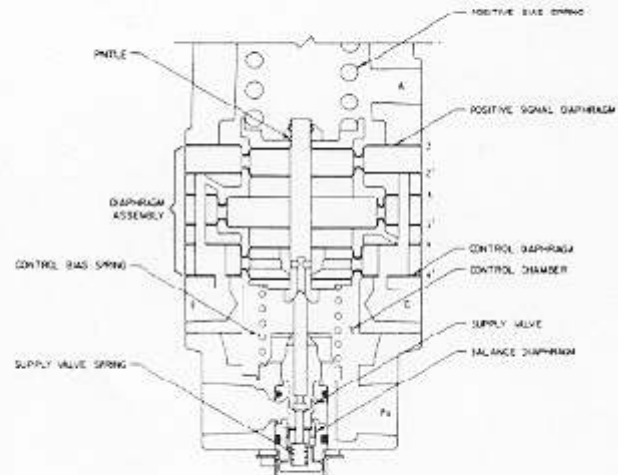
Minimum output pressure 0 psig (0 kPa)
at any supply pressure

Supply pressure effect A supply pressure
change of 5 psig [.35 BAR] (35kPa) will not
change the output pressure more
than 0.1% of full range

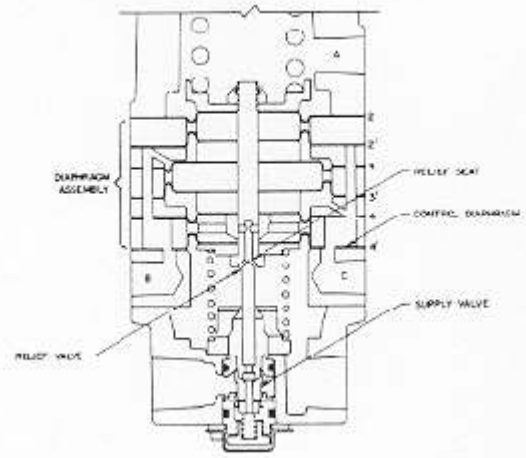
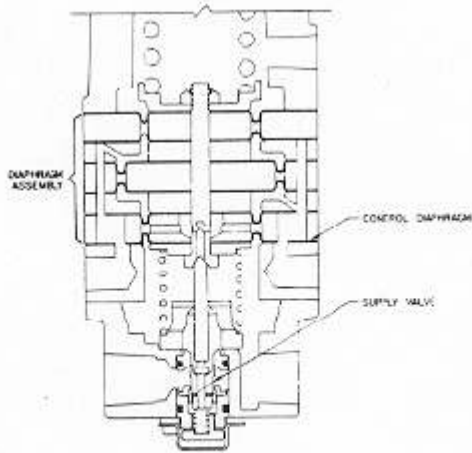
PRINCIPLES OF OPERATION

When the adjusting screw of the Model 22 is turned for a specific set point, the positive bias spring exerts a force against the top of the diaphragm assembly. Signal A exerts pressure against the top of diaphragm 2.

With no other signals introduced, the combined force is the result of positive bias spring force and signal A acting in the downward direction on the top of diaphragm 2, so that $P_o = A + K$ where P_o = output pressure, A = pressure at port A, and K = spring constant. This condition is achieved only when output pressure reaches the desired set point. Until then the diaphragm assembly moves downward, causing the supply valve to open and allowing supply air to be transmitted to the outlet port. Downstream pressure is transmitted to the control chamber, and is sensed in the underside of control diaphragm 4. The increase in pressure on the control diaphragm, aided by the force of the control bias spring and the force of the supply valve spring, causes the diaphragm assembly to move upward against the force of the signal pressure at A acting on the positive signal diaphragm and the positive bias spring force. This force, acting through the pintle, allows the supply valve to throttle, maintaining the output pressure. Downstream pressure acts on the top of the supply valve, and is communicated through the channel in the supply valve to the bottom of the balance diaphragm.



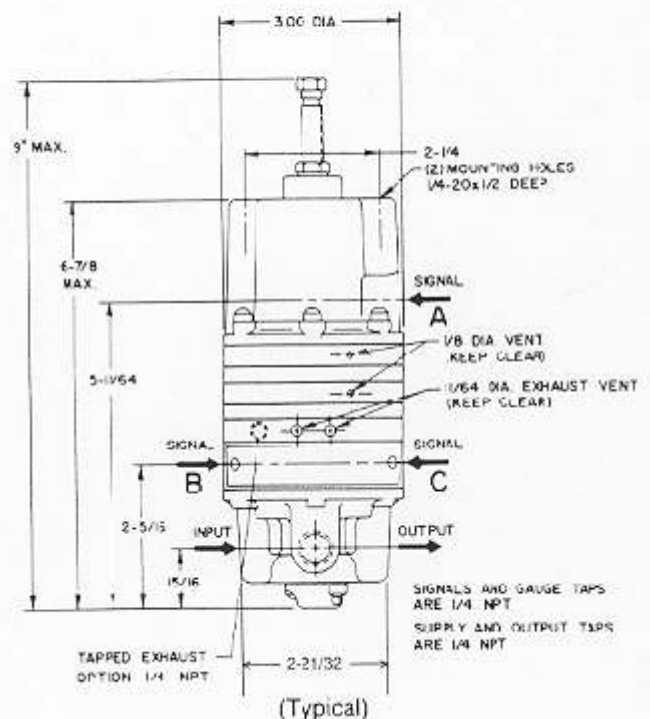
When set point is reached, the supply valve throttles to keep the forces acting on the bottom of the control diaphragm in balance with the forces acting on the top of the diaphragm assembly. As downstream pressure increases above set point, the force on the bottom of the control diaphragm 4' moves the diaphragm assembly upward, allowing the supply valve to be seated. As the diaphragm assembly continues to move upward, the relief seat moves away from the relief valve, venting exhaust air through the holes in the ring spacer.

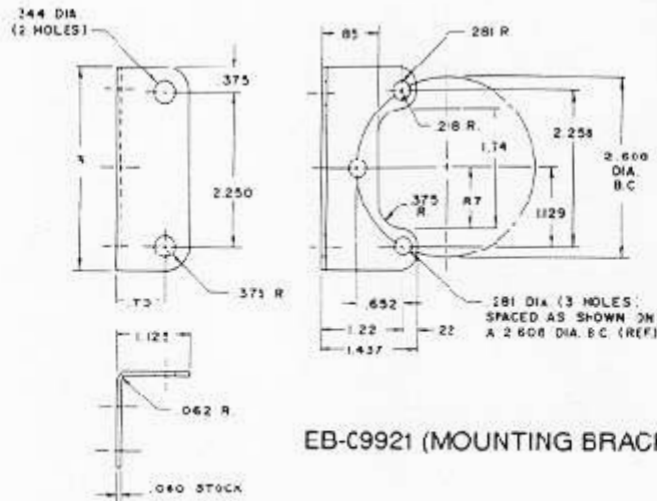


When downstream pressure falls below set point, the decrease is communicated to the bottom of the control diaphragm. A decrease in pressure on the control diaphragm causes the diaphragm assembly to move downward, lowering the relief seat against the relief valve. As downward movement of the diaphragm assembly continues the supply valve opens, increasing downstream pressure until set point is reached. Diaphragms 3 and 3' have two times the surface area of diaphragm 2', 4, and 4'. Signal pressure introduced at port B exerts a downward force on the top of diaphragm 3, and an upward force on the bottom of diaphragm 2'. However, because the area of diaphragm 3 is twice the area of diaphragm 2', a net downward force is produced so that the output pressure is $P_o = A + B + K$.

INSTALLATION

Clean all pipe lines to remove dirt and scale before installation is made. Apply minimum amount of pipe compound to male threads of the air line only. Start with the third thread back and work away from the end of the line to avoid the possibility of getting compound into the relay. Install unit in system; body is fitted with 1/2" or 3/8" NPT inlet and outlet connections. The Model 22 can be mounted in any position without affecting its operation. The inlet, outlet, and all signal ports are labeled (look for arrows denoting direction of flow on underside of unit) and should be tightened securely. The use of a filter to remove dirt and entrained liquid in the air line ahead of the unit is recommended for best performance. If an air line lubricator is used, it should be located downstream beyond the unit in order to avoid interference with the relay performance. The optional bracket is available for mounting the relay.





ADJUSTMENTS

No field adjustments are required.

OPERATION

Relieve pressure on range spring before putting relay into service for the first time. If a (K) constant is required for operation, turn the adjusting screw slowly in a clockwise direction until required negative or positive bias setting is obtained. Set Dias (K) with no signal

inputs by adjusting the screw. For negative bias setting a known signal (higher than required negative bias) must be inserted at Port A or B. Turn the adjusting screw slowly in a clockwise direction until the required negative bias is obtained.

MAINTENANCE

The relay is easily disassembled for the occasional cleaning or removal of foreign matter. Before this is done, however, shut off valve upstream of the relay to prevent escape of air when relay is disassembled. There is no need to remove the relay from the pipe line. Remove the two 10-32 screws on the bottom of the unit and pull out the inner valve assembly. Wash inner valve

assembly with solvent exercising care to avoid damaging diaphragm and valve facings. Replace assembly carefully.

The vent hole in the power stage ring (located just above the body) of the relay should be kept clean.

TROUBLE SHOOTING

PROBLEM	CHECK
Leakage	Body screw tightness Diaphragm
High Bleed	Relief pintle and relief seat for damage or contamination
Difficult to Adjust	Adjusting screw

REPAIR PARTS LIST

A Service Kit is available for maintenance of the Model 22

	EA-12133-1	EA-12133-2	EA-12133-3	EA-12133-4	EA-12133-5
Used on Catalog	22112	22312	22412	22512	22612
	22113	22313	22413	22513	22613
	22212		22422		
	22213		22423		
	22222		22432		
	22223		22433		

SERVICE KIT INSTALLATION

1. Check components in service kit EA 12133 () against items marked with an asterisk in the exploded view and the associated table.

CAUTION: There are six individual diaphragms in the Kit. Note that they are stamped with an identifying number and a statement "Piston Side". This is the side that must be placed against the spacer as reassembly takes place.

2. Mark bonnet (2), the spacer rings (9, 12, 15, 18), actuating ring assembly (21), spacer Ring (25) and body (29) so that the relay can be reassembled properly. Also mark the diaphragms for reference when replacing them with diaphragms from the kit.

CAUTION: Be certain, when reassembling the unit that all ports in the spacer rings and the diaphragms are aligned so that the unit will operate properly. During disassembly, the relationship between ports in the spacer rings and the diaphragms should be noted.

The stack should be taken apart as new diaphragms are installed one by one.

3. Turn adjusting screw (1) counterclockwise to release pressure on range spring (5).
4. Loosen and remove six Screws (3) holding Bonnet (2), Spacer Rings (9, 12, 15, 18, 25) and Ring Assembly (21) to Body (29). Do this very slowly to release upward pressure on Spring (27) which will force Bonnet (2) and all the Spacer Rings to rise away from Body (29).
5. Remove Bonnet (2) and set aside.
6. Remove Spring Seat (4) and Spring (5) and set aside. Lift out the stacked assembly of diaphragms and ring spacers. Place two Screws (3) into the stack opposite one another.
7. Loosen Locknut (6) and remove. Remove Spring Seat (7).
8. Pull out Relief Seat (24) and Spring Seat (23A) from the stack. Place Spring Seat (23A) on Relief Seat (24).
9. Hold the assembly of Relief Seat (24) and Spring Seat (23A) in a vertical position.

Note marks made on spacer rings, actuator ring assembly and diaphragms made in step 2.

Secure two screws (3). Turn the old stack over. As new diaphragms are assembled together with the old stack rings and spacers onto the relief seat, note the orientation of these items in the old stack. Consult Figure 4 while building up the NEW stack. Place NEW diaphragm (23) convoluted side UP, over the relief seat (24). Place spacer (22) from OLD stack over the relief seat (24) well facing up. Place actuator ring assembly (21) from OLD stack over the relief seat (24) two small holes nearest the rim facing up.

Use two screws (3) to keep parts aligned in the NEW stack. Continue stacking NEW diaphragm (20) convoluted side down and aligned so that the holes in the rim of (21) are not blocked. (Check marks made in step 2) spacer (19) from OLD stack, spacer ring (18) from OLD

stack well side up, NEW diaphragm (17) convoluted side up, spacer (16) from OLD stack spacer ring (15) from OLD stack, NEW diaphragm (14) convoluted side down, spacer (13) from OLD stack, spacer ring (12) from OLD stack (well facing down), NEW diaphragm (11) convoluted side up, spacer (10) and spacer ring (9) from OLD stack, NEW diaphragm (8) convoluted side down, spring seat (7) and fasten the stack together with locknut (6). Make sure that all parts marked in step 2 are in proper relationship to each other. Spacer (22) must be in the stack in the position as shown. DO NOT interchange the spacers.

NOTE: While putting the stack together, use markings on the old diaphragms as reference to assure that proper hole alignments are maintained in the new stack.

10. Remove the two Screws (3) from the NEW stack. Lift out spring (27) and Spring Seat (28) from Body (29) and set aside.
11. Remove Spacer Ring (25) and Gasket (26) from Body (29). Discard Gasket (26).
12. Remove two Screws (34), Retainer Cap (33) and Cartridge Retainer (32).
13. Using a soft hammer, drive out Inner Valve Assembly (31) and Screen (31A) from Body (29).
14. Using a suitable dowel, tap out Seat Assembly (30) from Body (29). Obtain a new Seat Assembly (30) from the service kit and place into the bottom well of Body (29) brass end first. Seat the Assembly (30) against the well shoulder. Obtain Screen (31A) and Inner Valve Assembly (31) from the kit and place into well of Body (29).
15. Place Retainer (32), Retainer Cap (33) over Inner Valve Assembly (31) and fasten to Body (29) with two Screws (34).
16. Place Spring Seat (28) over the Inner Valve Assembly pintle and make sure that it seats in the well.
17. Place Spring (27) over Spring Seat (28). Obtain Gasket (26) from the service kit and place on Body (29) making sure that six large holes in the Gasket (26) are aligned with six holes in Body (29).
18. Place Spacer Ring (25) over Gasket (26), making sure that holes are aligned. Use marks made in step 2 as a reference.
19. Place Spring (5) over Spring Seat (7) and make sure it is seated. Place Spring Seat (4) over Spring (5).
20. Place Bonnet (2) over assembly in step 19. Place two Screws (3) in opposite holes and fasten assembly to Body (29). Considerable downward force must be applied to overcome the force of the two springs. Do the same with the remaining four Screws (3).
21. Follow the installation instructions in the IOM, to reinstall the relay and the instructions in the operating section of the IOM to place the relay back in service.

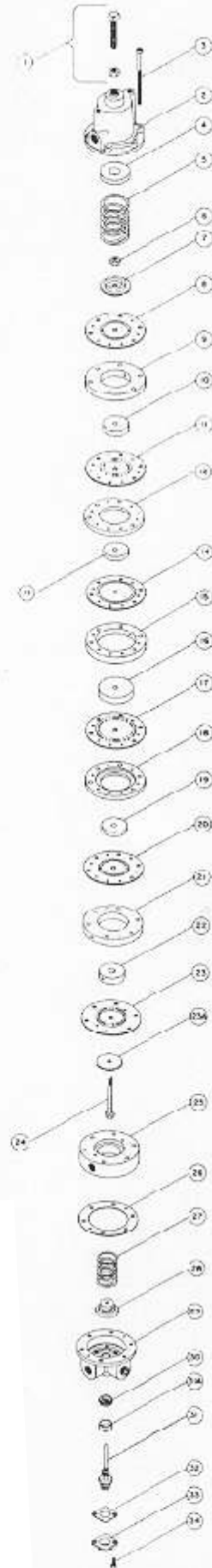
Index	Part No.	Description
1	EB-13653-1	Adjusting Screw & Nut Assembly
2	EB-1894	Bonnet
3	EB-1032-52	Screw
4	EB-6058	Spring Seat
5	EB-6060-30	Spring
6	EB-8071-3	Locknut
7	EB-8059	Spring Seat
*8, 11	EB-13761	Diaphragm
9	EB-13499	Spacer Ring
10	EB-8060	Spacer
12	EB-8055	Spacer Ring
13	EB-8062	Spacer
**4, 17	EB-13762	Diaphragm
15	EB-8057	Spacer Ring
16	EB-8061	Spacer
18	EB-8055	Spacer Ring
19	EB-8062	Spacer
*20	FR-13761	Diaphragm
21	EB-14586	Actuator Ring Assembly
22	EB-8063	Spacer
*23	EB-13729A	Diaphragm
23 A	EB-8064	Spring Seat
24	CD-8065	Relief Seat
25	EB-8052-2	Spacer Ring
*26	EB-8051	Gasket
27	EB-8067	Spring
28	EB-8068	Spring Seat
29	EB-14745-3	Body
*30	FR-6070	Seat Assembly
*31	EB-1820-2	Inner Valve Assembly
*31 A	EB-6017	Filter Screen
32	EB-6027	Cartridge Retainer
33	EB-7136	Retainer Cap
34	EB-1032-6	Screw

OPTIONS

All Model numbers ending in 2 have ¼ NPT port.
An ending in 3 indicates a ⅜ NPT port.

For example:

Model 22112 has a ¼ NPT port.



Catalog 22112
Model 22
Figure 3

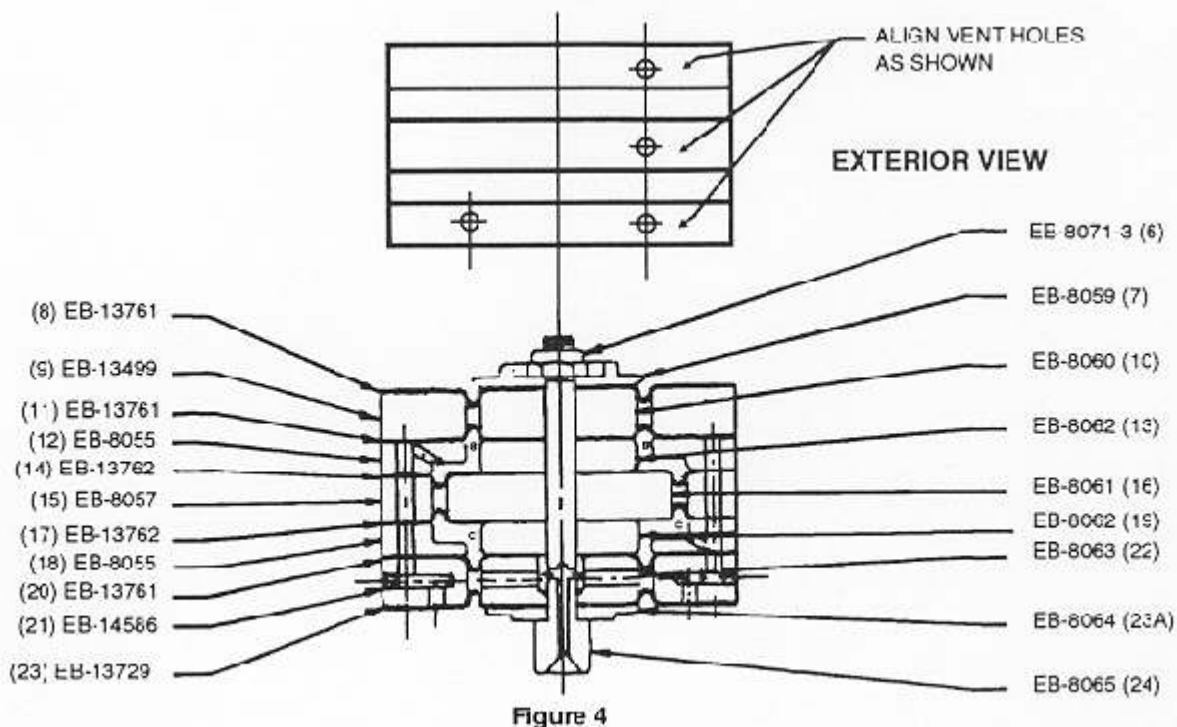


Figure 4

	OPTION		
	22112	22112U	22113
Body	EB-14745-3		EB-14745-4
Actuator Ring Assy.	EB-14586		
Diaphragm	EB-13729		
Bonnet Sub-Assy.	EB-1895-1	EB-1895-2	
Inner Valve Assy.	EB-13899-1	EB-13899-3	
Pipe Plug	EB-1174	EB-18181-1	
Spacer Ring	EB-8052-2	EB-8052-5	

	OPTION	
	22312	22313
Body & Inner Valve Assembly	EB-13392-1	EB-13892-2
Adjusting Screw & Nut	EB-13653-1	EB-13653-1
Spacer	EB-9170-1	
Bonnet Sub-Assembly	EB-1895-1	
Diaphragm Assembly	EB-13393	
Spacer Ring	EB-9170-1	

	OPTION	
	22212	22213
Body	EB-14745-3	EB-14745-4
Adjusting Screw & Nut	EB-13653-1	EB-13653-1
Bonnet Sub-Assembly	EB-1895-1	EB-1895-1
Body & Valve Assembly	EB-13899-1	EB-13899-1
Spacer Ring	EB-8052-1	EB-8052-1
Elbow	EB-9229	
Nylo Seal Tube	EB-9384-3	

	OPTION	
	22612, 22432, 22412, 22422	
Body & Inner Valve Assembly	EB-13892-1	
Adjusting Screw & Nut	EB-13653-1	
Spacer Ring	EB-9170-2	
Bonnet Sub-Assembly	EB-1895-1	
Diaphragm Assembly	EB-13895	

	OPTION		
	22512	22512U	22513
Body & Inner Valve Assy.	EB-13892-1	EB-13892-3	EB-13892-2
Adjusting Screw	EB-13653-1		
Bonnet Sub-Assy.	EB-1895-1	EB-1895-2	
Spacer Ring	EB-9170-1	CD-9170-6	

LEGAL NOTICE:

The information set forth in the foregoing Installation, Operation and Maintenance Instructions shall not be modified or amended in any respect without prior written consent of Fairchild Industrial Products Company. In addition, the information set forth herein shall be furnished with each product sold incorporating Fairchild's unit as a component thereof.

