

COMPACT EVAPORATOR PRESSURE REGULATORS

Type (S)PORT, PORT

Port Size: 9mm (3/8") to 66mm (2 5/8") Nom.

FEATURES

- Pilot operated for close control at desired set-point
- Excellent regulation at light loads
- Interchangeable capacity cartridges
- Low pressure drop
- Few moving parts
- Long-life stainless steel diaphragms (no bellows to fail)
- Variations available for pilot electric shut-off and shut-off with electric wide-opening (bypass)
- Manual opening feature (except (S)PORT - B version)
- All service from the top
- Sweat-in-place without disassembly
- Furnished with access fitting
- UL listed (except 50 Hertz versions)

SPECIFICATIONS

- Design pressure (M.R.P.): 31.0 bar (450 psig)
- Range: 250mm hg to 8.3 bar (10" hg to 120 psig)

DESCRIPTION

These ductile iron-bodied regulators, with brazed copper couplings, will modulate the flow of refrigerant vapor to maintain a constant pressure at a control point regardless of fluctuations in load. Models are available in combinations of connection sizes, port sizes and features as designated by the model code, for application in low side (evaporator pressure) control. Unlike competitive makes of low side regulators that utilize high pressure discharge gas as a pilot source, the (S)PORT Evaporator Pressure Regulator is piloted with upstream

BULLETIN 26-01E Type (S)PORT REGULATOR



August 2004
Installation, Service and Parts Information

pressure. This eliminates the requirement for hot gas headers, isolation devices, piping, and the labor associated with the installation of other valves. Flare connections from high pressure pilot lines are also eliminated, minimizing sources for prospective leaks.

The valves are an integrated assembly of (4) modules: 1) A body, which contains no moving parts; 2) A capacity cartridge, which contains both piston and modulating plug, and defines the Port Size; 3) A pilot adapter, which defines the valve function and onto which the Pilot Solenoids providing the "S" (Shut-Off) or "B" (Bypass) features are added as required; 4) The bonnet, containing the Range Spring and adjustment screw, which is set for the value of pressure which the valve is to maintain.

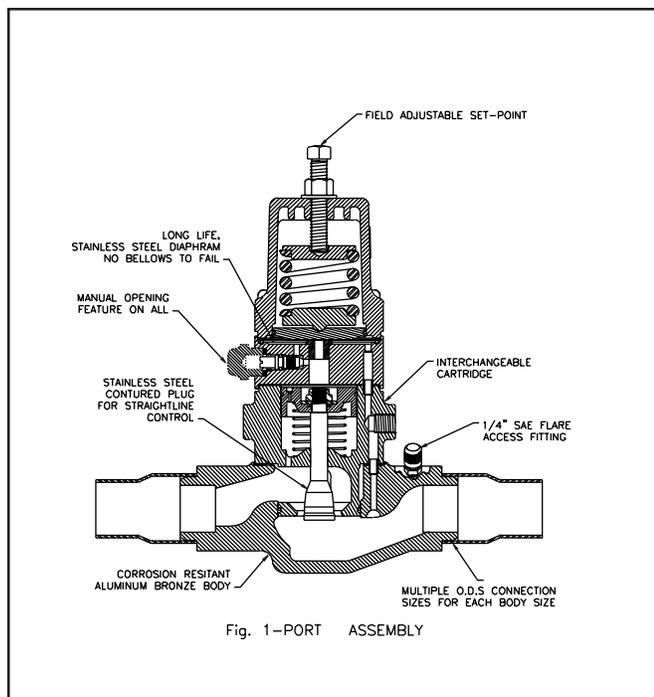


Fig. 1—PORT ASSEMBLY

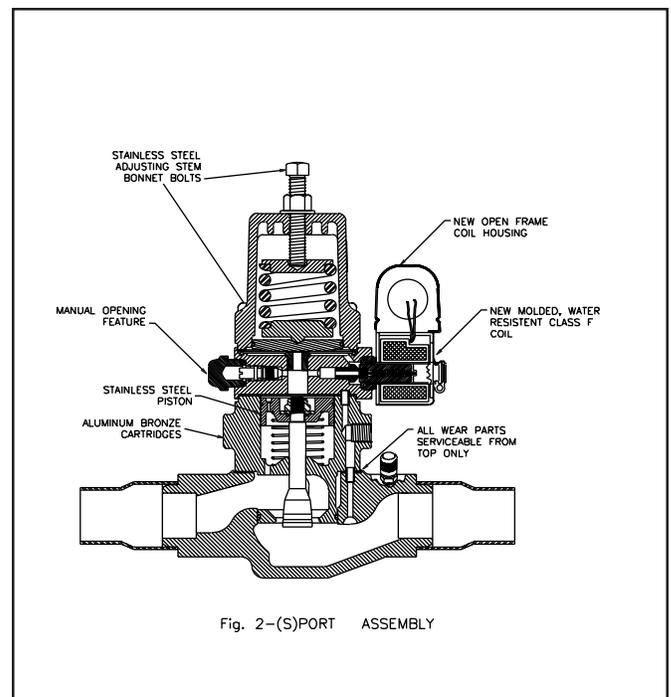


Fig. 2—(S)PORT ASSEMBLY

This unique modular design allows the regulator to be soldered into the line without disassembly, yet provides full access for disassembly, cleaning and servicing from the top only. Interchangeable capacity cartridges facilitate flow revisions should an undersized or oversized condition be created, while pilot adaptors can be changed out to add features or even change functions. Thus, retrofitting for additional evaporator capacity is simple and requires no pipe line revisions under most circumstances.

These valves will modulate to maintain a pressure as set for in the field, in spite of fluctuations in load. Correctly sized, they will modulate the flow of vapor in a wide variety of system arrangements used in commercial installations. Each port size will have a specific maximum capacity at full opening corresponding to the available pressure difference under which it will operate. The piston and plug assembly has been designed to handle reduced flow conditions, and is capable of controlling down to about 15% of the valve's maximum capacity in most cases.

For the (S)PORT pressure regulator, as the valve's inlet pressure increases even marginally above the set-point the valve tends to open, increasing flow and reducing inlet pressure. As operating conditions change and the inlet pressure tends to drop, the valve's port closes and the inlet pressure will tend to rise. In this fashion the valve continually adjusts its available flow area in response to flow conditions to maintain a practically constant inlet pressure.

A complete specification for a regulator includes:

The Port Size: Selected according to the state and density of the refrigerant along with the available pressure difference under which the valve will operate;

The Connection Size: Usually selected to match the line size as found in the field.

The Control Features: A pilot electric shut off feature [(S)PORT], or a shut-off with bypass feature [(S)PORT-B] are available options, along with the standard inlet pressure regulator (PORT).

The Control Circuit Voltage: As required by the installation, consists of Voltage and, for A.C. circuits, Frequency. This is not required for the Port Version regulator.

On the (S)PORT Series Regulators, the proper direction of flow is designated by an arrow cast into the side of the valve body, pointing from inlet to outlet.

The regulator can be mounted in a horizontal or vertical pipe line with direction of flow as described above. As with all pressure regulators, these compact regulators can control flow in this normal direction only. If a change in system operating conditions causes the outlet pressure to rise sufficiently above the inlet pressure, the Main Valve Assembly may be blown down from its seat and reverse flow can occur. This is often accompanied by a clicking noise.

Protect the inside of the regulator from moisture, dirt, chips and solder beads during installation. These compact regulators may be soldered into the line without disassembly if reasonable precautions are taken. The flame from the soldering torch should be directed away from the valve body to avoid excessive heat buildup which could possibly damage some of the internal parts. As an additional precaution, a wet cloth should be

wrapped around the regulator body to dissipate some of the heat during the soldering operation.

PRINCIPLES OF OPERATION

(Referring to Valves as shown in Fig. 3-5)

In all cases, a throttling point serves to increase or reduce the rate of delivery of the pilot stream from the upstream side of the valve to the space on top of the piston, from which it is bled to the downstream via both a bleed hole through the piston and the clearance between piston and bore. An increased pilot stream flow increases the pressure on top of the piston which pushes the modulating plug down. Conversely, a decreased pilot stream flow reduces the pressure on top of the piston and permits the closing spring to push the modulating plug up, reducing the flow area available at the port. The pilot portion of the valve is devoted to administering this pilot stream flow, thus effectively controlling the main valve opening.

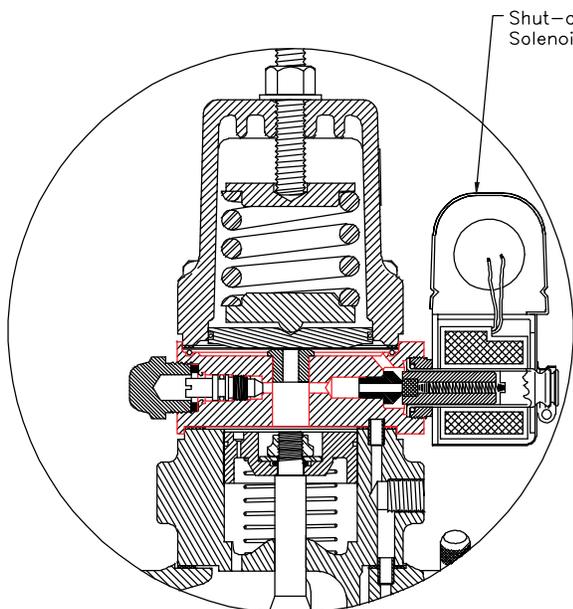
Referring to figure 5, the inlet pressure is applied via Passage N to the underside of the #10 Diaphragm at Chamber P. Considering a valve that is initially closed, as the inlet pressure rises, the Diaphragm exerts a force upward against the #5 Range Spring. When that force developed by the inlet pressure is high enough, it will equal the spring force at that point of adjustment and the diaphragm will rise off its seat and permit flow from the upstream to Chamber G, thus raising the pressure on top of the piston, causing the Modulating Plug to move down, and opening the port. Should the system conditions cause the upstream pressure to decrease, the Diaphragm will return to a position closer to the Pilot Seat, reducing the pilot stream flow, and allowing the pressure in Chamber G to bleed to the downstream side of the valve, which permits the closing spring to move the modulating plug up, thus closing the port.

THE SOLENOID FEATURES:

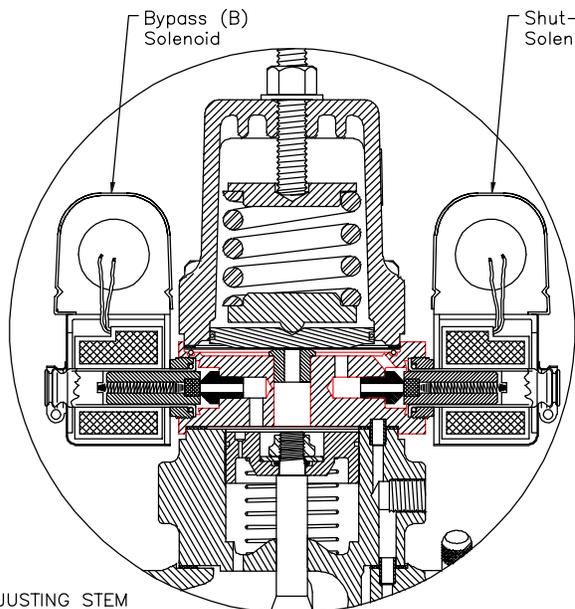
"S" for Shut-off, "B" for Bypass. To effect either of the Features, a Solenoid is employed to modify the Pilot Stream, at the Pilot Adapter. The Actuator is Normally Closed for both features, and can accept a variety of different coil voltages.

A valve with the "S" feature will act to regulate upstream pressure in its normal fashion when its solenoid coil is energized, and shut tightly when the solenoid coil is de-energized. The pilot solenoid is arranged such that, when closed, it will intercept the pilot stream before it reaches the throttling device, thus ensuring that the pressure on top of the Piston is the same as downstream pressure and permitting the closing spring to close the main valve. When the Solenoid is energized, it permits the full upstream pressure to be delivered to the top of the piston.

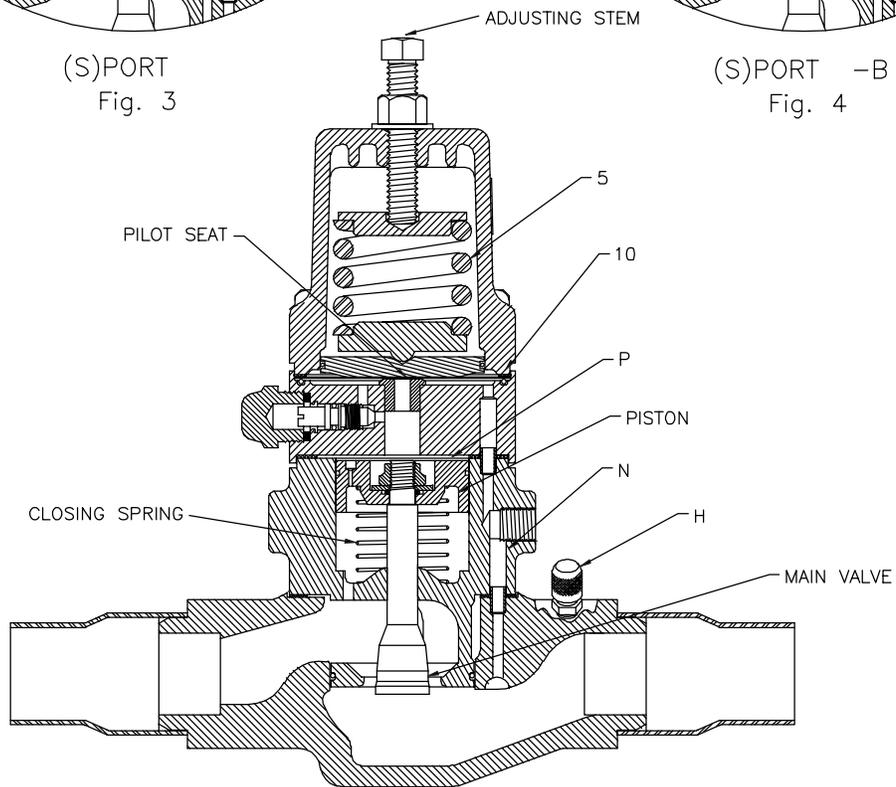
A (S)PORT valve with the "B" [(S)PORT-B] feature will act to regulate upstream pressure in its normal fashion when its bypass solenoid coil is de-energized, and its shut-off solenoid energized. To operate the regulator in a wide open position, **both** solenoids need to be energized. With both pilot solenoids energized, full upstream pressure is delivered to the top of the valve's piston, causing both the piston and modulating plug to move all the way down and the main valve to open wide. When the shut-off solenoid is de-energized on the (S)PORT-B regulator, the valve will stop flow through the regulator, regardless of whether the bypass pilot solenoid is energized or de-energized.



(S)PORT
Fig. 3



(S)PORT - B
Fig. 4

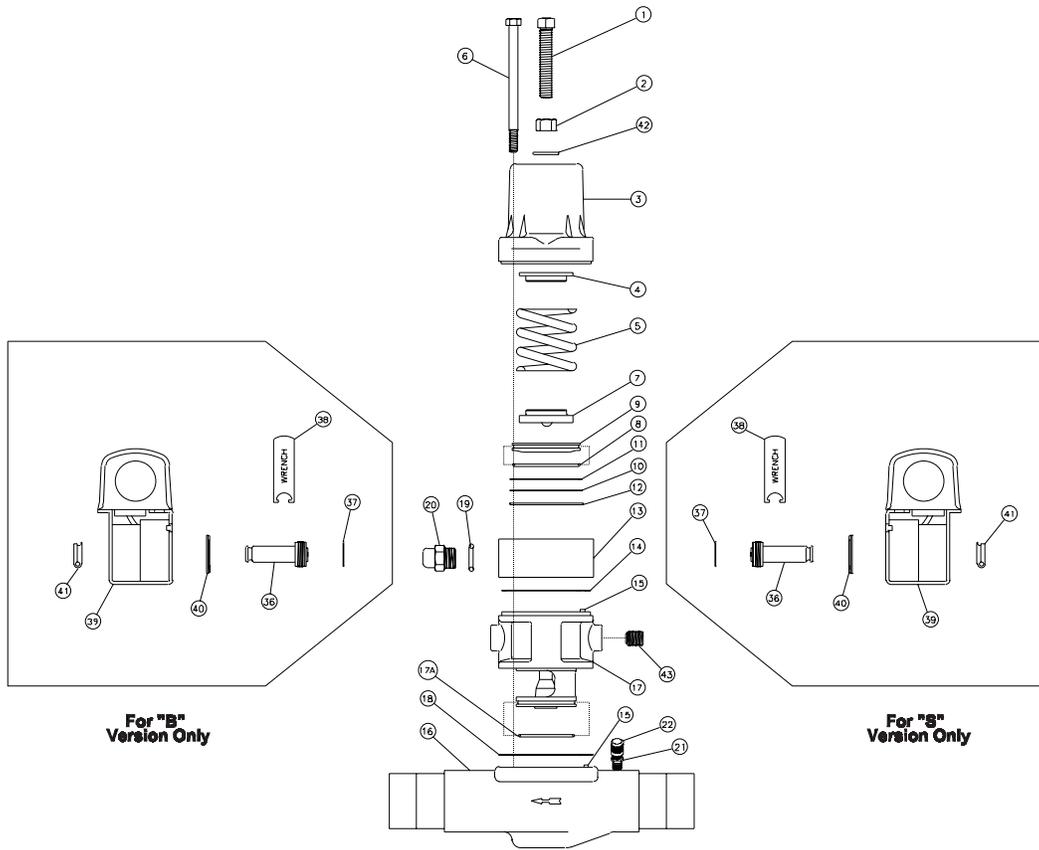


PORT
Fig. 5

REPAIR KITS FOR (S)PORT REGULATING VALVES

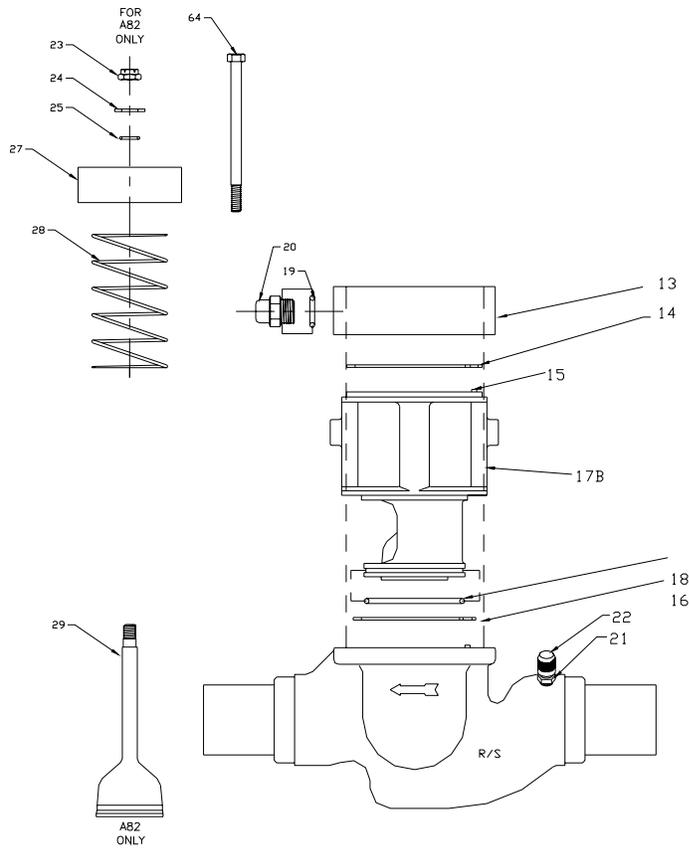
ITEM	DESCRIPTION	QTY	(S)PORT 3 TO 9	(S)PORT 9 TO 11	(S)PORT 13 TO 21
17	Cartridge Assembly	1	Only with kit	Only with kit	Only with kit
14, 17, 17A, 18	Cartridge Assembly (Red 5/8") 03	1 ea	204452	204452	—
14, 17, 17A, 18	Cartridge Assembly (Full 5/8") 05	1 ea	204453	204453	—
14, 17, 17A, 18	Cartridge Assembly (7/8") 07	1 ea	204454	204454	—
14, 17, 17A, 18	Cartridge Assembly (1-1/8") 09	1 ea	—	204455	—
14, 17, 17A, 18	Cartridge Assembly (1-3/8") 11	1 ea	—	204456	—
17B	Capacity Cartridge Housing, A82	1	—	—	Only with kit
14, 17A, 17B, 18, 26, 30	Complete Capacity Cartridge, 1-5/8 P. 13	1 ea	—	—	204597
14, 17A, 17B, 18, 26, 30	Complete Capacity Cartridge, 2-1/8 P. 17	1 ea	—	—	204598
14, 17A, 17B, 18, 26, 30	Complete Capacity Cartridge, 2-5/8 P. 21	1 ea	—	—	204599

ITEM	DESCRIPTION	QTY	(S)ORT 3 THRU 11 KIT NUMBER	(S)PORT 13 THRU 21 KIT NUMBER
1	Adjusting Stem (All except "L")	1	301888	301888
2	Adjusting Stem Seal Nut	1	301836	301836
3, 11, 8	Bonnet Kit (All except "L")	1 ea	200910	200910
4	Upper Spring Rest	1	Only with kit	Only with kit
5	Range Spring	1	Only with kit	Only with kit
7	Lower Spring Rest	1	Only with kit	Only with kit
8	"O"Ring Diaphragm Follower (All except "L")	1	Only with kit	Only with kit
4, 5, 5A, 7, 8, 11	Spring Kit (All except "L")	1 ea	202205	202205
6	Bolt Package	4	202717	203820
6	Bolt Package (S)PORT B	4	—	203821
8, 11, 12, 14, 17A, 18, 19, 37	Gasket/O-Ring Kit, All Types except "L"	8	202701	203818
9	Diaphragm Follower	1	Only with kit	Only with kit
8, 9, 11	Diaphragm Follower Kit	1 ea	200911	200911
10	Diaphragm	1	Only with kit	Only with kit
10, 11, 12	Diaphragm Kit	1 ea	200873	200873
13	Adapter Assembly	1	Only with kit	Only with kit
20	Seal Cap	1	Only with kit	Only with kit
11, 12, 13, 14, 19, 20	Adapter Assembly PORT	1 ea	202721	203803
11, 12, 13, 14, 19, 20, 36, 37	Adapter Assembly (S)PORT	1 ea	202722	203804
11, 12, 13, 14, 19, 20, 36, 37	Adapter Assembly (S)PORT B	1 ea	204363	204592
15	Pin, Locating	2	N/A Separately	N/A Separately
16	Body Assembly	1	N/A Separately	N/A Separately
21, 22	Access Fitting and Cap	1 ea	N/A Separately	N/A Separately
23	Self-Lock Nut	1	—	Only with kit
24	Washer	1	—	Only with kit
25	O-Ring	1	—	Only with kit
26	Above 3 Items	—	—	—
14, 17A, 18, 26	Service Kit, Piston/Plug	1 ea	—	203823
27	Piston	1	—	Only with kit
28	Closing Spring	1	—	Only with kit
14, 17A, 18, 26, 27, 28	Piston Kit	1 ea	—	203824
29	Modulating Plug	1	—	Only with kit
30	Items: 27, 28, 29	-	—	Only with kit
36	Solenoid Operator Assembly	1	Only with kit	Only with kit
36, 37, 38	Solenoid Operator Repair Kit	1 ea	202700	202700
39	Coil	1	Only with kit	Only with kit
40	Sleeve, Coil Insert	2	Only with kit	Only with kit
41	Clip, Coil Cover	1	Only with kit	Only with kit
39, 40, 41	Coil and Housing Kit 120V/60	1	206004	206004
39, 40, 41	Coil and Housing Kit 208-240V/60	1	206005	206005
39, 40, 41	Coil and Housing Kit 408V/60	1	206006	206006



For "B" Version Only

For "S" Version Only



A82 ONLY

ADJUSTMENT

Adjustment of a regulator's set point requires that the pressure being controlled be monitored by an accurate pressure gauge. Before making any adjustments, the SEAL NUT #2 must be loosened. In all cases where the regulator is controlling upstream pressure and a solenoid feature is not overriding that function, turning the ADJUSTING SCREW #1 in (i.e. clockwise) will raise the set point, and turning it out (i.e. counterclockwise) will lower the set point. Depending on system responses, the gauge may reflect some delay before a change in set point actually results in a change in the pressure being maintained. This can also sometimes be observed following the energization or de-energization of the Solenoid Features.

For any (S)PORT version Regulator, the Pressure Gauge can be connected to the Access Fitting H on the Inlet side of the regulator Cartridge Assembly #17.

For the entire range of the regulator, one complete turn of the Adjusting Screw will change the set point approximately 1.4 Bar (20 psi).

CAUTION: Regulators having both "S" and "B" features can only be adjusted with the "B" pilot solenoid de-energized and the "S" pilot solenoid energized. Also, regulators with only the S feature need to be adjusted with the solenoid energized.

Always retighten the Seal Nut once adjustment is completed.

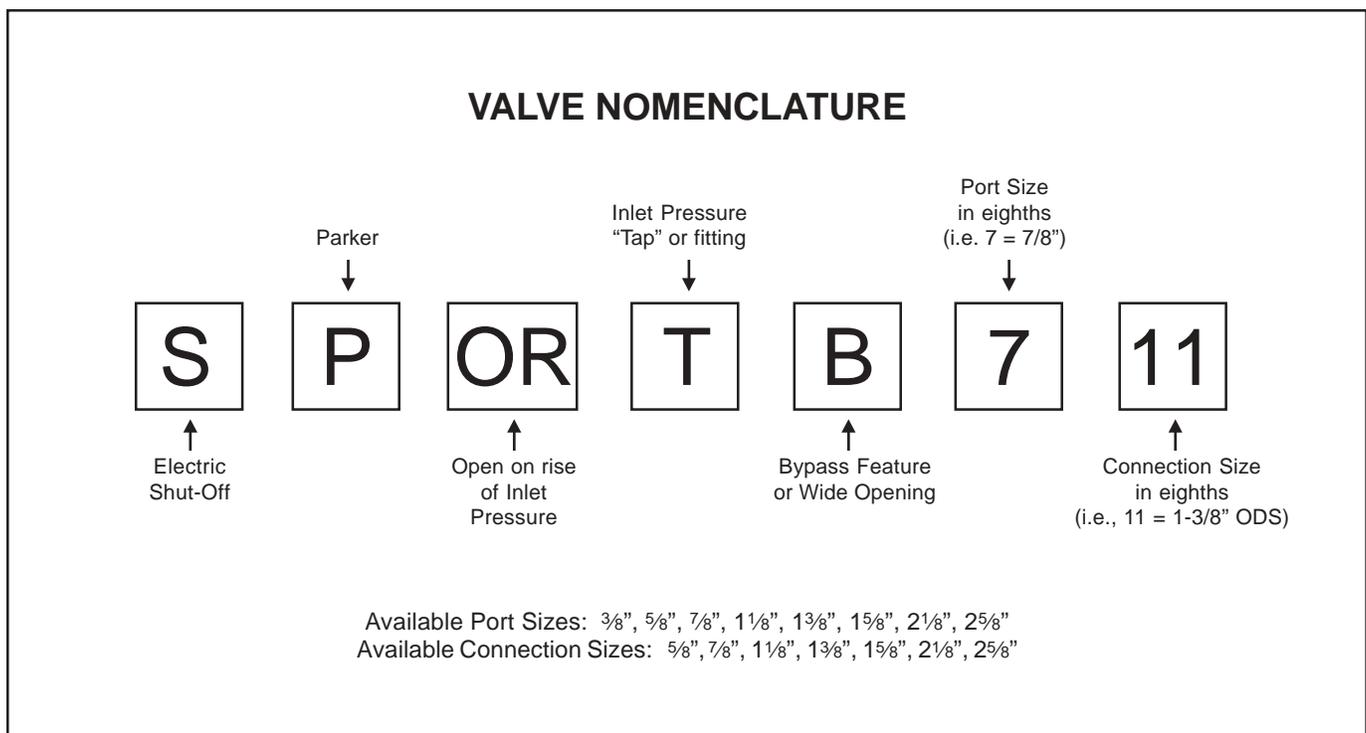
DISASSEMBLY (See also Bulletin RSB-FC)

All (S)PORT series regulators can be disassembled and all serviceable and moving parts replaced without disturbing the piping, but of course, disassembly will cause exposure of some section of piping to atmosphere, which should be addressed before disassembly by evacuation and reclaim of the refrigerant.

For all regulators, the Seal Nut should be loosened and the Adjustment Screw backed out until no further spring compression is felt. If a Solenoid Feature is incorporated, the Solenoid Coil #39 should now be removed by removing the Coil Cover Retaining Clamp. Never energize a Solenoid Coil that is not mounted and secured on its Solenoid Actuator #36.

Once the adjustment screw is backed out, the 4 bolts retaining the Valve Assembly can be removed. The bonnet can be easily lifted off, and will usually leave the Diaphragm #10 resting on top of the O-Ring #12. The wear aspects of the Adapter Assembly #13 are the Diaphragm #10 and the Pilot Seat, which is pressed into the top of the Adapter #13, and which may cause replacement of that Adapter. Remove the diaphragms and inspect carefully for cracks, or scarring around the pilot seat area. Inspect the Pilot Seat area of regulators for erosion or other damage; it should be dead smooth to maintain a good metal-to-metal seat. Removal of the Adapter Assembly #13 and the Cartridge Assembly #17 may require a sharp tap on their sides to unseat the parts from their sealed position, for which a rubber or rawhide hammer is recommended so as to avoid damage to the sealing surfaces.

Removal of the Adapter #13 will expose the top of the piston. The top of piston space should be inspected now, and the piston pressed down by hand and permitted to return to ensure it is free. The return stroke is damped and is fairly slow, though there should be no dragging or hesitation. The Cartridge Assembly #17 is a sealed sub-assembly which must be replaced intact, but it is of very rugged construction so, with the exception of a change to a different port size with changes in flow requirements, it should not require servicing beyond basic cleaning. With the Capacity Cartridge removed from the body, depress the piston and inspect the Seating Surfaces at the Modulating Plug for any foreign material, extraordinary wear, misalignment, etc.



Before reassembly, all parts must be cleaned with a suitable solvent, permitted to dry, and lubricated with a light film of refrigerant oil, simply wiped on with the fingers. Use new gaskets and O-Rings whenever possible. Insertion and sealing will be facilitated if a similar film of oil is applied to them as well.

Reassembly is exactly the reverse of disassembly, with the precaution that the reliefs cut into each module of the valve assembly and the corresponding gaskets be aligned with the appropriate Locating Pin #15. Adjust all torques to the values indicated by Table 1.

Tighten all bolts equally to draw the assembly together evenly, to ensure proper sealing of all joints. Replace all Seal Caps as applicable. When readjusting following servicing, prevent excessive pressures by starting with the adjustment stems at low spring compression until the system approaches the desired operating pressures, then reset as per "ADJUSTMENT", above.

ELECTRICAL

The Refrigerating Specialties Division molded water resistant Class "F" solenoid coil is designed for long life and powerful opening force. The standard coil housing meets NEMA 3R and 4 requirements. This sealed construction can withstand direct contact with moisture and ice.

The Class "F" solenoid coil and the splice box housing should be used on Refrigerating Specialties (S)PORT and (S)PORT-B evaporator pressure regulators only. Due to the lower temperature rating of the Class "F" coil, it should not be used with regulators applied for high side duty. For those applications, the Class "H" coil and the general purpose housing should be used, which is standard on all A8 and A9 Refrigerating Specialties regulator versions.

A solenoid coil should never be energized except when mounted on its corresponding solenoid tube.

The molded Class "F" coil is available from stock with most standard voltages. However, coils are available for other voltages and frequencies.

The solenoid coil must be connected to electrical lines with volts and Hertz same as stamped on coil. The supply circuits must be properly sized to give adequate voltage at the coil leads even when other electrical equipment is operating. The coil is designed to operate with line voltage from 85% to 110% of rated coil voltage. Operating with a coil voltage above or below these limits may result in coil burnout. Also, operating with a coil voltage below the limit will definitely result in lowering the valve's maximum opening pressure differential. Power consumption during normal operation will be 10.2 watts or less.

The coil housing washer (part #40 on page 5) should be installed on the solenoid operator (#36), before the coil housing (#39) and the coil cover clip (#41), are installed. This "stack-up" maintains the coil firmly in place and prevents excessive vibration of the entire coil housing assembly when the coil is energized.

SAFE OPERATION (See Bulletin RSBCV)

People doing any work on a refrigeration system must be qualified and completely familiar with the system and the valves involved, or all other precautions will be meaningless. This includes reading and understanding pertinent product bulletins and the current Bulletin RSB prior to installation or servicing work.

WARRANTY

All products are warranted against defects in workmanship and materials for a period of one year from date of shipment from originating factory. This warranty is in force only when products are properly installed, field assembled, maintained and operated in use and service as specifically stated in catalogs or bulletins for normal refrigeration applications, unless otherwise approved in writing. Defective products or parts thereof, returned to the factory with transportation charges prepaid and found to be defective by factory inspection, will be replaced or repaired at the company's option, free of charge, F.O.B. factory. Warranty does not cover products which have been altered or repaired in the field, damaged in transit, accidents, misuse or abuse. Products disabled by dirt or other foreign substances will not be considered defective.

The express warranty above constitutes the only warranty of the company's products and is in lieu of all other warranties expressed or implied, written or oral, including any warranty of merchantability or warranty of fitness for a particular purpose, and in no event is the company responsible for any consequential damages of any nature, whatsoever. No employee, agent, dealer or other person is authorized to give any warranties on behalf of the company, nor to assume, for the company, any other liability in connection with any of its products.

**TABLE 1 – TORQUES FOR REASSEMBLY
(Presume Use of New Gaskets and O-Rings)**

Bolt Diameter	Valve Size	Torque
1/4" (6mm)	03-21	8 ft lb (1.1 mkg)
5/16" (8mm)	13-21	12 ft lb (1.7 mkg)
Jam Nut	13-21	8 ft lb (1.1 mkg)
Solenoid Operator	all	6 ft. lb (0.9 mkg)

TABLE 2 – SERVICE POINTERS

Symptom	Probable Cause	Correction
Failure to open, close or regulate	Piston jammed due to excessive dirt.	Flush clearance space between piston and cartridge bore with refrigeration oil solvent.
	Valve manually open.	Close manual bypass stem by turning clockwise.
	Adjusting stem improperly positioned: a. Turned in too far - Does not open. b. Not turned in far enough - Does not close.	Position adjusting stem properly.
	Passage "N" clogged.	Clean passage "N"
	Pilot seat dirty or eroded.	Clean and smooth pilot seat. If diaphragm is removed, replace with new gasket and O-Ring.
	Regulator installed backwards.	Re-install regulator in proper position.
System control cannot be maintained - unstable valve operation.	Improper Regulator selection: a. Actual load is much lower than regulator capacity. b. Actual pressure drop across valve higher than originally intended. c. Combinations of a. and b.	Replace cartridge with one of suitable size.

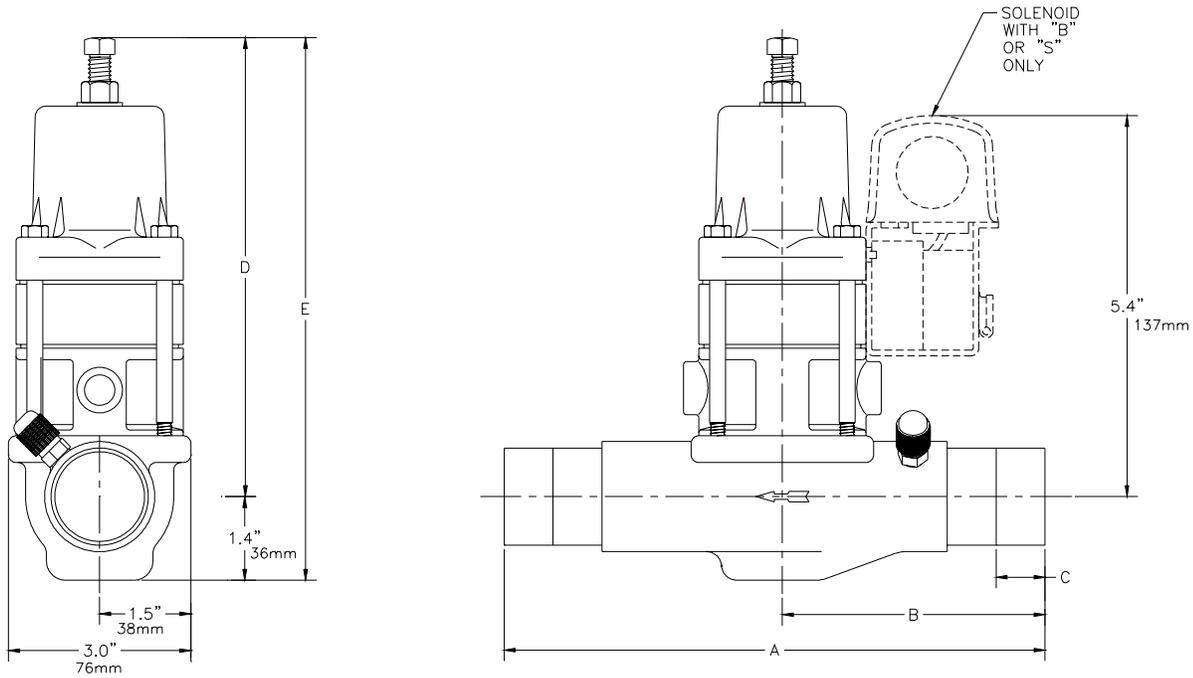


TABLE OF DIMENSIONS

Type		(S)PORT 03 thru 11			(S)PORT 13 to 21	
Connection Size		7/8" 22mm	1-1/8" 28mm	1-3/8" 35mm	1-5/8" 42mm	2-1/8" 54mm
A	inch	9.6	9.6	9.4	9.9	11.1
	m m	244	244	239	251	282
B	inch	4.8	4.8	4.7	5.0	5.6
	m m	122	122	119	127	142
C	inch	0.8	0.8	1.0	1.1	1.2
	m m	20	20	25	28	30
D	inch	8.0	8.0	8.0	8.0	8.0
	m m	203	203	203	203	203
E	inch	9.4	9.4	9.4	9.4	9.4
	m m	239	239	239	239	239