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Definition of Terms

Some of the terms used in this manual are defined below:

Conservation Vent: A device which is connected to a storage tank and regulates the pressure therein. Conservation vents may provide pressure relief, vacuum relief, or both. Pallets move in direct response to tank pressure allowing flow out of or into the tank. Pallet movement may be controlled by weight-loading, spring-loading, or a pilot valve.

Deadband: The total pressure difference between the blanketing valve opening pressure (or set point) and resealing pressure. This applies to the main valve; some leakage through the pilot will occur above the main valve resealing pressure

Diaphragm Chamber: The portion of the pilot valve which contains the sense diaphragm.

Dome Pressure: The pressure in the dome volume.

Dome Volume: The chamber between the poppet in the pilot valve and the piston in the main valve.

Emergency Vent: A conservation vent which provides additional pressure relief to accommodate extraordinary conditions such as fire exposure to a tank or full-open failure of a blanketing valve.

Flow Plug: A small cylinder which may be connected to the end of the piston to partially block flow past the inlet seat of the main valve. This is used to reduce the blanketing valve's flow capacity.

Inlet Port: The connection to the blanketing valve coming from the gas supply line.

Main Valve: The portion of the blanketing valve through which the supply gas flows into the storage tank.

Orifice: A small diameter passage in the line between the inlet port and the dome volume.

Outlet Port: The connection to the blanketing valve leading to the storage tank.

Pilot Valve: The portion of the blanketing valve which senses the tank pressure and controls the dome pressure.

Piston: The component in the main valve which moves open from a normally seated position to allow flow of blanketing gas through the valve.

Piston Spring: The spring which biases the piston towards the seated position.

Poppet: The component in the pilot valve which can move open from a normally seated position to allow flow through the valve.

Poppet Spring: The spring which biases the poppet towards the seated position.

Purge: A very low flow of supply gas directed past the sense line and/or the outlet in order to keep corrosive vapors away from the blanketing valve.

Sense Chamber: The space below the diaphragm chamber to which the pressure from the sense line is directed. The pressure in the sense chamber controls the opening and closing of the pilot and blanketing valve.

Sense Diaphragm: A thin, non-metallic disc in the diaphragm chamber which flexes in response to changes in tank pressure acting upon it.

Sense Line: A line running from the storage tank to the sense port of the blanketing valve. It feeds tank pressure to the underside of the sense diaphragm.

Sense Port: The connection to the blanketing valve coming from the sense line.

Set Point: The tank pressure (positive or negative) at which the blanketing valve opens.

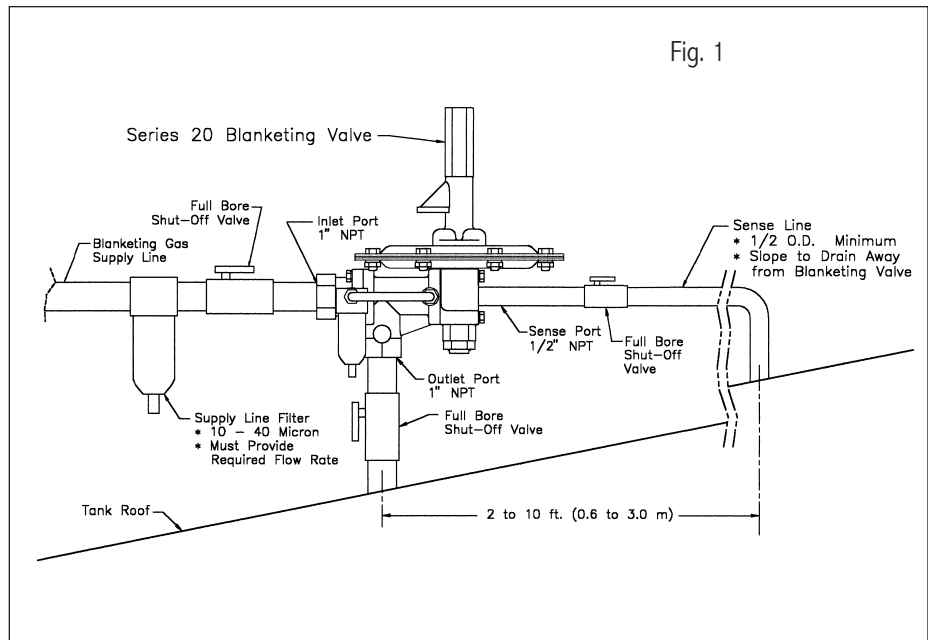
Soft Goods: The elastomeric components of the blanketing valve including the o-rings, gaskets and diaphragm.

Stop: A bolt connected to the sense diaphragm which contacts the poppet to move it in response to movement of the sense diaphragm.

INSTALLATION

Placement

The blanketing valve should be placed on top of the storage tank with its outlet connected via a short run of pipe to the top of the tank. A second, usually smaller, line runs from the sense port of the valve to a separate connection on the tank. A line coming from the blanketing gas supply source connects to the valve inlet. The blanketing valve must be positioned so that the inlet line is horizontal and the outlet line points downward. Installation requires connecting the blanketing valve to three lines as shown below in Fig. 1.



All three lines connecting to the valve should have full bore shut-off valves so that the unit can be isolated and depressurized for maintenance. The use of pipe unions at each connection will facilitate installation and removal of the blanketing valve. FEP tape should be applied to all pipe thread connections. However, be careful in applying it so that the tape cannot get loose inside and potentially clog the blanketing valve. Further details regarding the three lines follow:

■ **SUPPLY LINE:** The piping leading to the blanketing valve inlet should be the same pipe size as the inlet connection. This line should incorporate a full bore shut-off valve to enable isolation of the valve from the pressure supply during maintenance. The line should also include an in-line filter. A 10 to 40 micron filter element is recommended. The filter flow capacity must be higher than the required flow through the blanketing valve.

■ **OUTLET LINE:** The piping from the valve outlet should be the same size as the outlet connection. This line should also incorporate a full bore-shut-off valve to enable isolation of the blanketing valve from the tank during maintenance. A short, straight pipe run from the valve outlet to the top of the storage tank is recommended. An extended length of pipe from the blanketing valve to the tank could lead to delayed closing of the valve and thus overpressurization of the tank.

■ **SENSE LINE:** The sense line should also include a full bore valve to enable isolation of the blanketing valve from the tank during maintenance. The horizontal run from the sense port should be angled slightly down away from the valve to ensure that any

condensate could not drain into the valve. $\frac{1}{2}$ " O.D. tubing or larger should be used to ensure that there is not a pressure drop from the tank to the valve. This size line is also needed so that the high pressure supply gas which leaks into the sense chamber while the valve is open is able to dissipate into the tank so as not to affect closing of the blanketing valve.

The sense line connection to the tank should be far enough from the outlet line connection to ensure that a static pressure is sensed. On the other hand, the line should not be so long as to lead to a pressure drop in the line. A range of 2 to 10 feet from the outlet line connection is recommended. If a longer sense line is necessary, then the size of the tubing or pipe should be increased according to offset pressure drop effects, see Fig. 2.

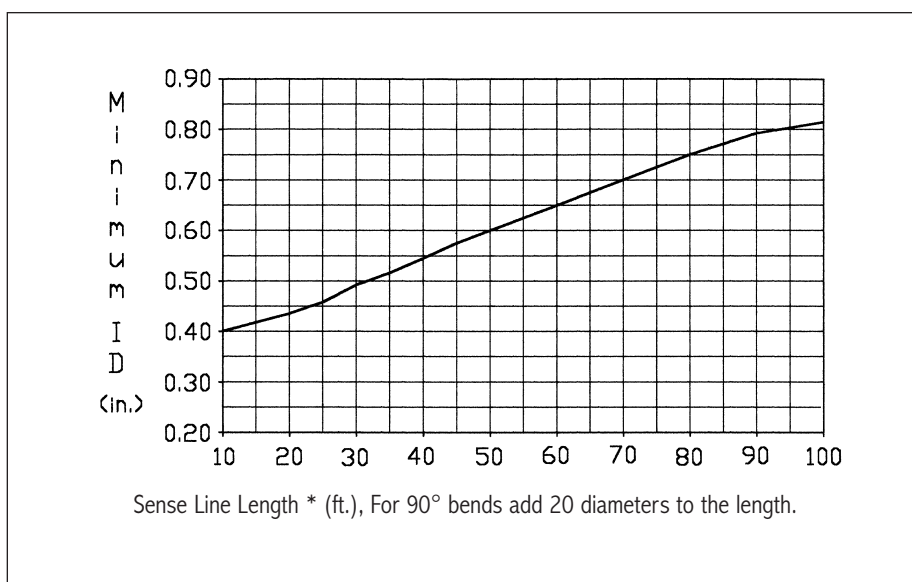


Fig. 2
Recommended Minimum Sense Line I.D. Based on Length

Start-Up

The blanketing valve is tested and set to the customer specified set point (as listed on the label) prior to shipment. Further adjustment in the field should not be required. After installation is complete, follow the steps below in order to put the blanketing valve into service:

1. Open the shut-off valve in the sense line between the blanketing valve and the tank.
2. Open the shut-off valve in the outlet line between the blanketing valve and the tank.
3. Check the blanketing gas supply line pressure to see that it corresponds to the pressure or pressure range listed on the label of the blanketing valve. If not, the supply pressure regulator should be adjusted accordingly. The maximum range in which the valve will operate is 20 to 200 PSIG.
4. Slowly open the shut-off valve in the blanketing gas supply line. Pressurizing the blanketing valve slowly pre-loads the valve so that it will not initially pop open.

If the tank pressure is above the blanketing valve set point, then the blanketing valve should seal immediately. Otherwise the valve will open and flow until the tank pressure rises above the set point. If the blanketing valve does not reseal at all, consult "Troubleshooting" on page 27.

Shut-Down

The blanketing valve must be depressurized when removing it from operation. Follow the steps below for system shut-down:

1. Close the shut-off valve in the blanketing gas supply line.
2. Close the shut-off valve in the sense line.
3. Pressure between the supply line shut-off and the seals inside the blanketing valve must be bled off. If the set point pressure is above atmospheric pressure, then the safest way to do this is to break the seal at the sense port of the blanketing valve. This will allow the pressure in the sense chamber to drop which will open the blanketing valve and bleed off the internal pressure into the tank. If the blanketing valve has a setting below atmospheric pressure, then a different method must be used. In addition to cracking the sense line, a connection between the supply line shut-off valve and the blanketing valve inlet port must be cracked to allow the high pressure gas to bleed out. The connection should be cracked slowly so that the high pressure gas bleeds, not bursts, out.
4. Close the shut-off valve in the outlet line.
5. Remove the supply line to the blanketing valve carefully in case there is still trapped pressure in the line.

MAINTENANCE

Purpose & Frequency

Periodic maintenance checks are recommended to ensure that the blanketing valve is in good operating condition. Debris in the valve or damaged seals are the most likely causes of operating problems. The frequency of routine maintenance necessary for the blanketing valve will depend on the severity of the operating conditions. The valve should be checked within a month of installation and then as determined appropriate after that. At minimum, the valve should be checked annually.

Leakage Check

Before performing any disassembly, it is a good idea to check for external leakage. This can be done by spraying or brushing soap around mating connections and bolts. If no leakage is detected around the #12 gasket or the #15 gasket (See Fig. 4), then it should not be necessary to disassemble the diaphragm case while performing routine maintenance.

Disassembly & Inspection

The following instructions are for maintenance of the standard components of the blanketing valve. Refer to the section entitled "Accessory Equipment" for instructions regarding optional accessories. Also, the diagrams in this section show a unit with standard 1" FNPT inlet and outlet connections. Except where noted, these instructions apply also to units with other inlet and outlet connections.

Protectoseal O-rings and gaskets are available from Protectoseal. See Table 6 on page 13 for soft goods kits which can be ordered.

CAUTION: The blanketing valve must be completely depressurized before any disassembly is performed. See the "shut-down" instructions above.

■ **DIAPHRAGM CASE** (See Fig. 4)

Remove the eight (8), #11 bolts, #13 nuts, and #4 lock washers. Carefully pull up the upper case assembly. Reach under the case to hold the #6 set spring in position while pulling the case up so that the spring and the #5 upper anchor do not fall over. The #9 diaphragm assembly and the #12 gasket can now be removed and checked. If there is any corrosion or damage to the gasket, it must be replaced.

Looking at the diaphragm assembly, the two (2), #22 plates should be clamped flat against the #23 diaphragm, and the diaphragm should be free of cracks, cuts or holes. See Fig. 5 for disassembly of the diaphragm assembly. Unthread the #25 stop (machined hex screw) from the #20 lower anchor. Note: This connection may be very tight due to thread adhesive being applied during assembly. The diaphragm and the #24 gasket should be free of cracks, cuts or holes. To remove the #14 lower case, remove the four (4), #7 hex screws. This exposes the #15 gasket which can then be inspected for corrosion or damage.

■ **PILOT VALVE** (See Figs. 6 & 7)

Position the blanketing valve so that the inlet points downward. Remove the four (4), #17 hex screws. Slowly lift up and remove the pilot body. Set aside the #18 main valve including (Fig. 7) the #39 piston spring, #36 O-ring and #37 O-ring.

Refer to Fig. 6. Before removing the #35 lower plug assembly, identify the marks on the nut of the lower plug assembly and the bottom of the pilot body. These marks, which should be lined up with each other, identify the proper position of the lower plug. This position is set at the factory for optimal performance of the blanketing valve. If the marks are not easy to see, then additional marks to identify the position during reassembly (with felt tip pen or otherwise) should be made on the nut and the pilot body before unscrewing the lower plug. Unscrew and remove the #35 lower plug assembly. When this is removed, the #31 poppet and attached parts will come out with it. Be careful not to damage the fine thread on the lower plug after removal.

Grasping the lower plug assembly in one hand and the poppet in the other, firmly tug on the poppet to pull it out of the lower plug assembly. Be certain to do this in a slow, controlled manner so that the #32 poppet spring does not fly out and get lost. If the #14 lower case has been removed, then the #27 upper plug can also be removed. The best way to do this is to slowly insert a phillips-head screwdriver up into the bottom of the small hole in the upper plug and tap on it to push the plug out. Be very careful not to damage the inside bottom of the upper plug where the #29 O-ring seats. The O-rings can now be inspected for wear or corrosion.

■ **MAIN VALVE** (See Figs 7 & 8)

The #36 and #37 O-rings which were between the main body and the pilot body may be inspected for corrosion or damage. Slide the #40 piston out of the #38 main body. Inspect the #46 and #47 O-rings for wear or corrosion. Remove the #49 or #52 hex screw to disassemble the piston assembly. A thin open end wrench must be slid across the flats on the piston to secure it while removing the screw. Be careful not to damage the outside of the piston or create any burrs along side the wrench flats.

It may be possible to inspect the #42 screen assembly while it is in the #41 inlet cap. Alternately, or if it needs to be cleaned, it can be removed by sliding a special tool into the slots in the collar of the screen assembly and unscrewing it. Contact your Sales Representative and request Part No. 20-T1A for the necessary tool. For a unit with a 1/2" FNPT or 3/4" FNPT inlet, the thread adapter must be unscrewed and removed in order to take out the screen assembly. Note: If the unit as a 1/2" or 3/4" inlet flange, a different tool along with special instructions will be required.

If no leakage between the main body and the inlet cap was detected during the leakage test, then it will not be necessary to remove the inlet cap. If it is desired to remove the inlet cap, first remove the #44 tube by loosening the nuts on each end. Then (See Fig. 4) remove the four (4), #19 hex screws and pull the inlet cap out from the main body. The second #37 O-ring may then be inspected for corrosion or damage. If leakage was detected at any connections in the external filter line (going through the #43 filter), then these components should be removed for inspection and reapplication of FEP tape on the tapered threads. Refer to page 15 for instructions on cleaning the filter.

Reassembly

When reassembling the blanketing valve, be sure to replace any worn or damaged O-rings and gaskets.

■ MAIN VALVE (See Fig. 4, 7 & 8)

Reinsert the #42 screen assembly into the #41 inlet cap if it was removed. If the inlet cap has been removed, then replace the #37 O-ring, insert the inlet cap into the #18 main body, and secure it with the four (4), #19 hex screws and lock washers. Tighten the screws to 96 in-lbs.

Reassemble any connections which were loosened in the external filter line. Apply FEP tape to any tapered thread connection. Reconnect the #44 tube by attaching and tightening the two (2) nuts.

Before reassembling the #40 piston assembly (see Fig. 8), the #46 and #47 O-rings should be lubricated. Recommended lubricants are DuPont Krytox GPL206 or Dow Corning 111 Valve Lubricant, but any seal lubricant which is compatible with both the stored chemical and the O-ring material may be appropriate. When reinserting the O-rings, be certain that the larger of the two goes in the groove on the outside center of the piston (see Table 7 on page 13 to check O-ring sizes). Reassemble the #48 retainer and, if included, the #51 flow plug. Insert the #49 or #52 hex screw with lock washer and tighten to 60 in-lbs. Push the piston assembly back into the main body. It should move freely in and out of the bore but should not drop through freely. If it does drop through, the wrong size (too small) O-ring must have been put into the outside center groove.

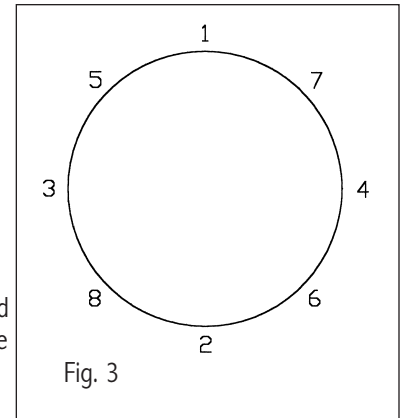
■ PILOT VALVE (See Fig. 6)

Before reassembling the pilot valve, the #29 and #30 O-rings should be lubricated. Reinsert all six (6) O-rings. It is also recommended that a conservative amount of anti-seize compound be applied to the threads of the lower plug before threading it back into the pilot body. Hold the poppet upside down, insert the #32 poppet spring in the groove in the end, and insert the #33 spring pin into the spring. Slide the #35 lower plug assembly over the spring pin, spring, and poppet, and pop it into place. The poppet should move easily up and down inside the lower plug, being pushed up by the poppet spring. Push the #27 upper plug back into the #34 pilot body if it has been removed. The orientation of the cross holes in the upper plug is not important. Slowly, being careful not to damage the end of the stem on the poppet or the seat at the end of the piston, insert the #36 and #37 O-rings into the grooves in the main body. Carefully position the pilot body over the main body so that the piston spring fits into the groove in the pilot body. Slowly push the pilot body toward the main body so that the hub of the pilot body slides inside the #36 O-ring. BE VERY CAREFUL NOT TO CUT OR DAMAGE THE O-RING! While holding the pilot body in place, insert the four (4), #17 hex screws with lock washers and tighten to 96 in-lbs.

■ DIAPHRAGM CASE (See Fig. 4)

With the assembly of bodies upright, place the #15 gasket on top of the pilot body. Place the #14 lower case over the gasket and secure it with four (4), #7 hex screws and lock washers, tightening to 96 in-lbs. If the #9 diaphragm assembly has been disassembled, then reassemble it as shown in Fig. 5. Apply thread adhesive to the thread connection and tighten until lock washer and plates are compressed.

Place the diaphragm assembly over the lower case, then place the #12 gasket over the diaphragm and line up the bolt holes. Place the #6 set spring over the #20 lower anchor of the diaphragm assembly and insert the #5 upper anchor in the top of the spring. While holding the spring upright with one hand, slide the #10 upper case assembly until it rests on top of the diaphragm. Line up the bolt holes, insert the eight (8), hex screws, lock washers, and nuts and tighten to 96 in-lbs. Tighten the hex screws in the order as shown in Fig. 3.



Reinstallation & System Check

Follow the installation and start-up instructions on page 2 to reinstall the blanketing valve after maintenance. After reinstalling the blanketing valve, a soap test should be performed again. If leakage is detected, then the point of leakage should be noted, and the valve should be disassembled as appropriate to identify the gasket or O-ring past which the leak is occurring.

If the blanketing valve flows continuously and does not seal after start-up, then the system should be shut down so that the problem can be identified. See the section “troubleshooting” on page 27 for possible problem sources. Any time that a blanketing valve is disassembled and reassembled, its operation should be monitored for a period afterward.

Set Point Adjustment w/o a Field Test Kit

Protectoseal Series 20 blanketing valves may be provided with a field test kit which facilitates checking and, if necessary, adjusting the set point. See “Field Test Accessories” on page 20 for more information. Instructions below provide a method of checking the set point for a blanketing valve which is not equipped with a field test kit. To add field test accessories to your unit contact the factory.

■ REQUIRED EQUIPMENT

1. High pressure / high flow air (or nitrogen) supply source with pressure gauge
2. Low pressure air supply source with manometer or pressure gauge
3. Collector tank (optional)
4. Clamping device to hold the blanketing valve
5. Wrenches
6. Screwdriver
7. Ear protection

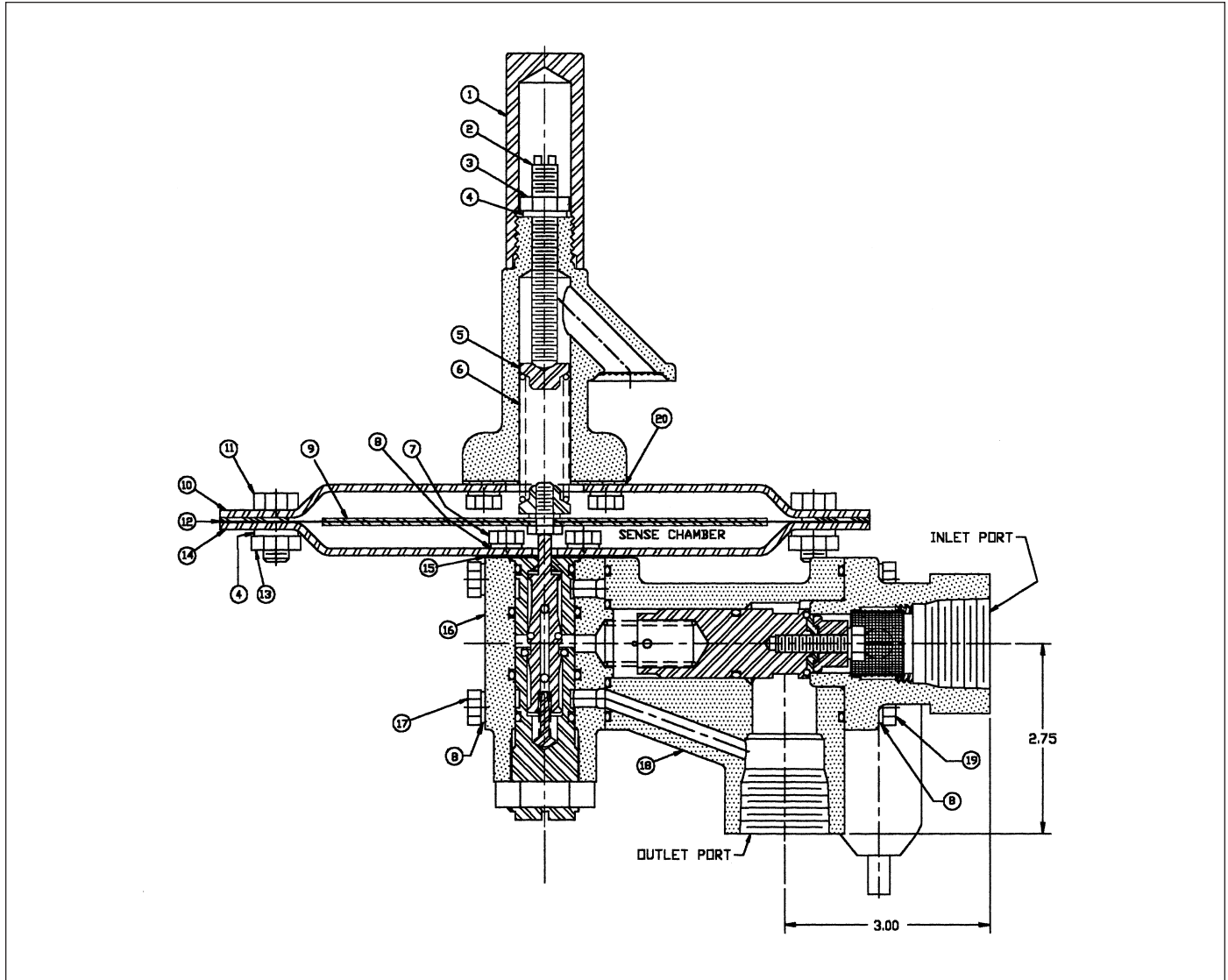
■ TEST PROCEDURE (See Fig. 9)

1. Clamp the blanketing valve securely so that the outlet is open to blow into an area where it will not cause any harm. WARNING: A high pressure surge of air will exit the outlet port of the blanketing valve when the valve opens. It is advisable to connect a piece of pipe to the outlet to direct the flow away from the person doing the testing.
2. Connect a line from a high pressure / high flow air supply source to the blanketing gas supply source, if possible. The workable inlet supply pressure range of the blanketing valve is 20 PSIG minimum / 200 PSIG maximum.
3. Connect a low pressure supply line to the 1/2" NPT sense port. This line must be connected to a manometer or pressure gauge for pressure monitoring. Ideally, to obtain a more static pressure supply, this line should come from a collector tank and the pressure reading should be taken from the collector tank.
4. Unscrew and remove the #1 cap from the blanketing valve.
5. Check that the manometer or gauge is zeroed.
6. Set the low pressure supply as follows:

Set Point Range (inches W.C.)	Low Pressure Supply (inches W.C.)
-0.5 to 30.0	6 above set point
Above 30.0	2 above set point

7. Pressurize the low pressure supply line connected to the sense port.
8. CAUTION: Put on ear protection, the flow out of the valve can be extremely loud.
9. Pressurize the high pressure supply line connected to the inlet port.
10. If the blanketing valve does not seal initially, loosen the #3 jam nut and unscrew the #2 set screw until it seals completely.
11. Opening pressure adjustment: Cycle the pressure to the sense port up and down to determine the opening point of the blanketing valve. The tank pressure should be lowered slowly (at approximately 0.1" W.C. per second for low settings). Adjust the set screw so that the main valve opens at the desired set point. Please note the following:
 - a) The set point of the Series 20 Blanketing Valve is specified as the pressure at which the main valve opens.
 - b) The opening of the blanketing valve can be heard, and the opening of the main valve should be distinguished from the opening of the pilot valve. The pilot valve will begin to leak at a pressure just above that at which the main valve will open abruptly. The quick opening of the main valve is usually very loud, although the degree of loudness will depend upon the inlet pressure and the flow capacity (as determined by the size of the flow plug, if any).
 - c) The main valve reseals above the pressure at which it opens, and the pilot reseals above where the main valve reseals.
12. After the desired opening pressure has been attained, secure the position of the set screw by tightening the jam nut until the lockwasher is flat.
13. If the opening pressure has been adjusted to a pressure different than that of the set point specified on the blanketing valve label, then the blanketing valve should be marked permanently to identify the new set point.
14. Shut off the inlet pressure, then relieve test tank pressure. Wait for the main valve to pop open and relieve pressure.
15. Disconnect all the test lines.
16. Screw the cap onto the spring guide and tighten it securely. Be careful not to move the spring guide.
17. Follow the blanketing valve installation and start-up instructions to install the blanketing valve into the system.

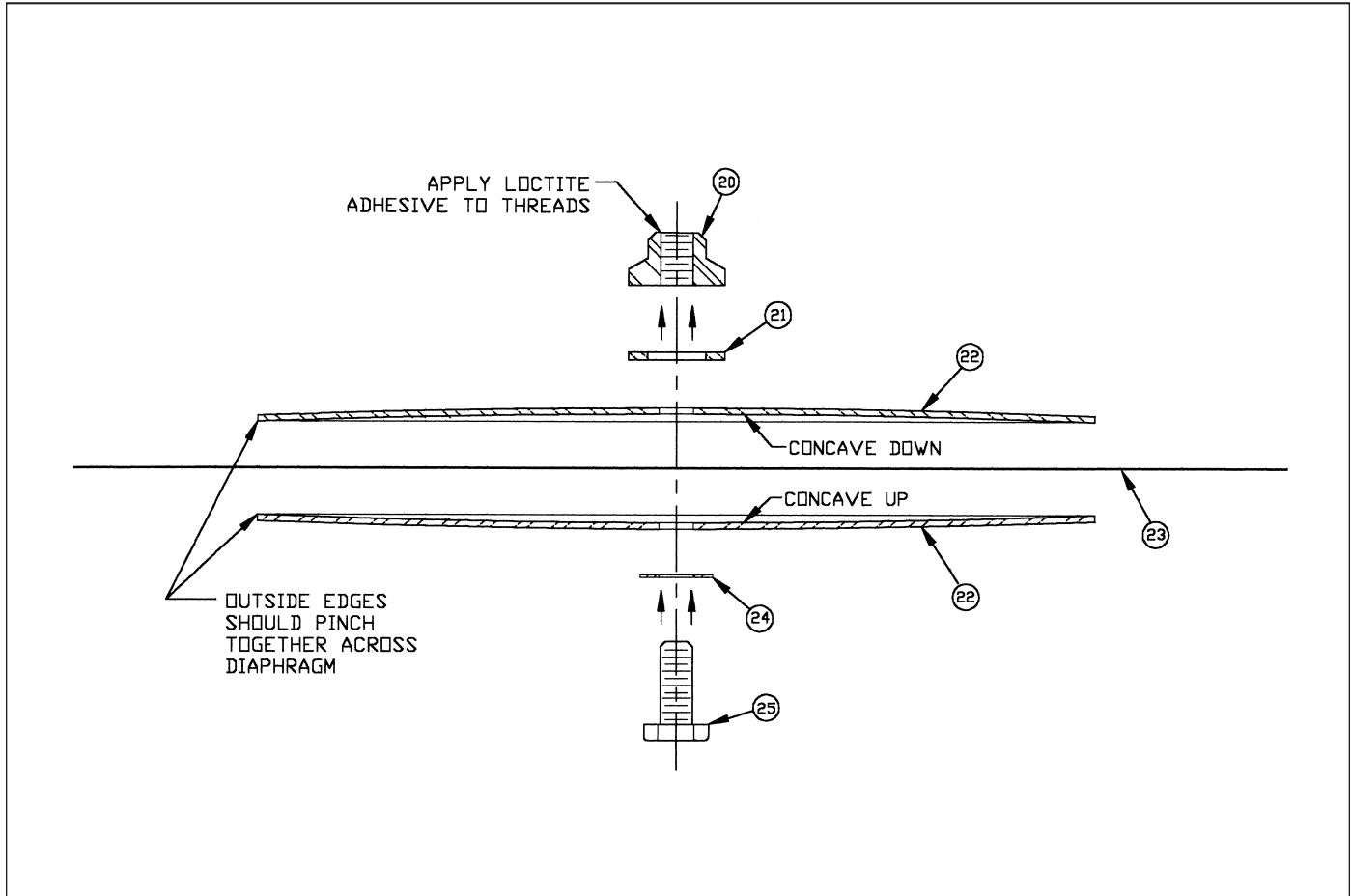
Fig. 4
Blanketing Valve



#	Qty.	Description	#	Qty.	Description	Part No.
1	1	Cap	11	8	Hex Screw, 3/8 - 16 UNC x 3/4	-
2	1	Set Screw	12	1	Gasket	20-18C-*
3	1	Jam Nut, 3/8 - 24 UNF	13	8	Jam Nut, 3/8 - 16 UNC	-
4	9	Lock Washer, 3/8"	14	1	Lower Case	-
5	1	Upper Anchor	15	1	Gasket	20-18D-*
6	1	Set Spring	16	1	Pilot Valve (Fig. 6)	-
7	4	Hex Screw, 1/4 - 20 UNC x 1/2	17	4	Hex Screw, 1/4 - 20 UNC x 2 1/4	-
8	12	Lock Washer, 1/4"	18	1	Main Valve (Fig. 7)	-
9	1	Diaphragm Assembly (Fig. 5)	19	4	Hex Screw, 1/4 - 20 UNC x 1	-
10	1	Upper Case Assembly	20	1	Gasket	20-18E-*

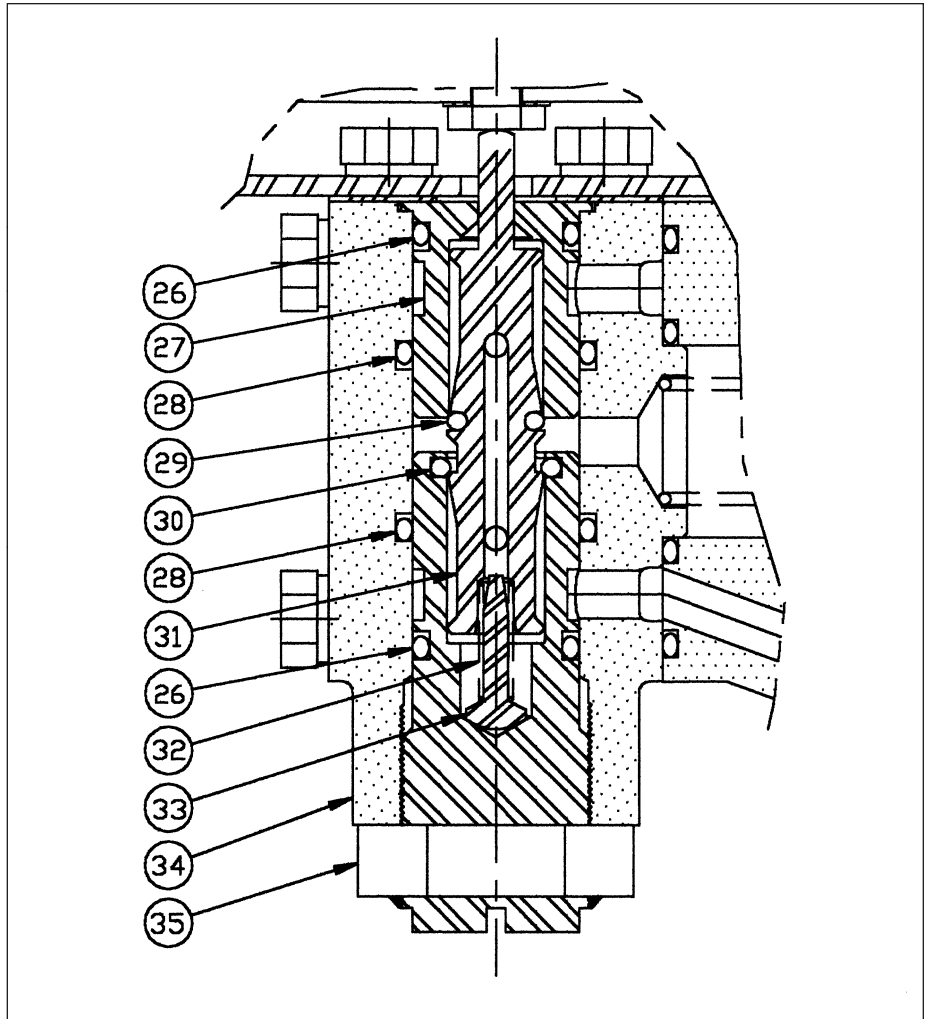
* Suffix for the material code, see Table 5 on page 13.

Fig. 5
Diaphragm Assembly
(Item #9)



#	Qty.	Description	Part No.
20	1	Lower Anchor	-
21	1	Lock Washer 1/4"	-
22	2	Plate	-
23	1	Diaphragm	20-18A-107
24	1	Gasket	20-18B-107
25	1	Stop	-

**Fig. 6
Pilot Valve Assembly
(Item #16)**

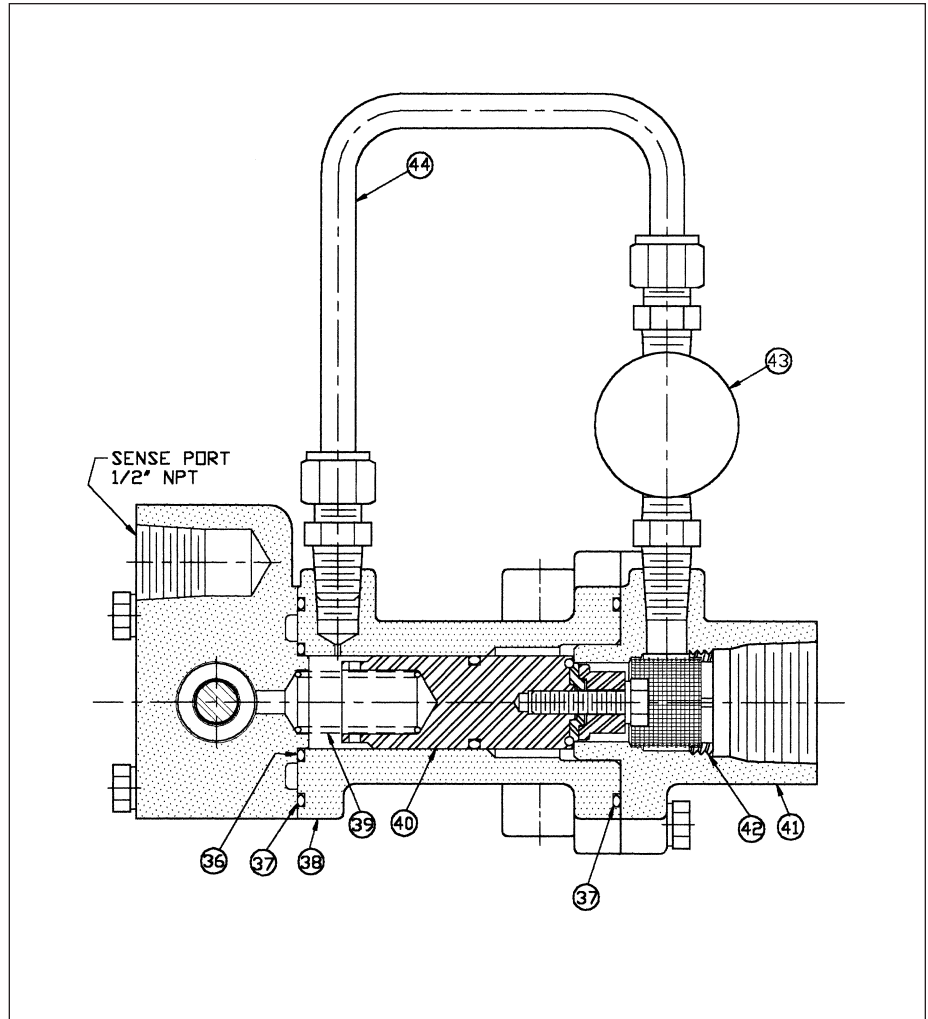


#	Qty.	Description	Part No.
26	2	O-Ring	20-R115-*
27	1	Upper Plug	✚
28	2	O-Ring	20-R118-*
29	1	O-Ring	20--R109-*
30	1	O-Ring	20-R112-*
31	1	Poppet	✚
32	1	Poppet Spring	-
33	1	Spring Pin	-
34	1	Pilot Body	✚
35	1	Lower Plug Assembly	✚

* Suffix for the material code, see Table 5 on page 13.

✚ These parts must be replaced as a set.

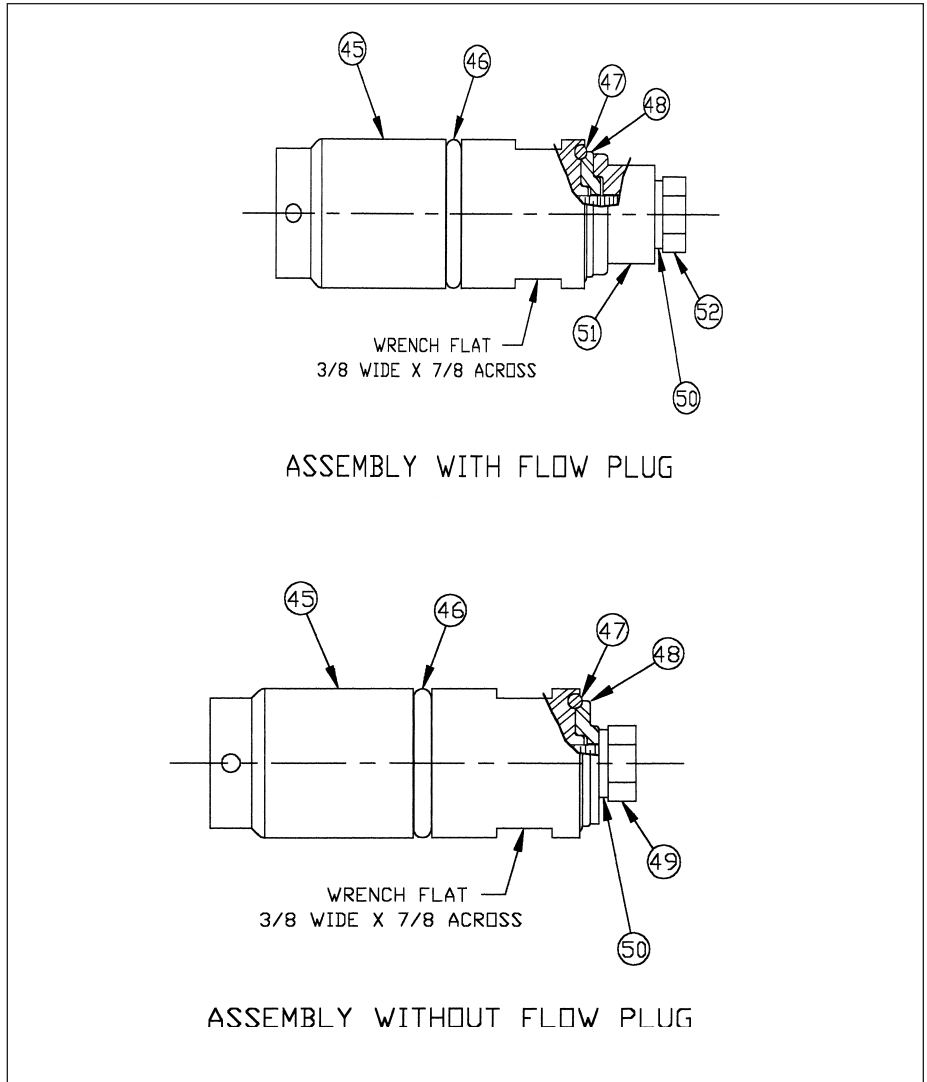
Fig. 7
Main Valve Assembly
(Item #18)



#	Qty.	Description	Part No.
36	1	O-Ring	20-R-121-*
37	2	O-Ring	20-R137-*
38	1	Main Body	-
39	1	Piston Spring	-
40	1	Piston Assembly (Fig. 8)	-
41	1	Inlet Cap	-
42	1	Screen Assembly	-
43	1	Pilot Filter	-
44	1	Tube	-

* Suffix for the material code, see Table 5 on page 13.

**Fig 8
Piston Assembly
(Item #40)**



#	Qty.	Description	Part No.
45	1	Piston	-
46	1	O-Ring (larger)	20-R117-*
47	1	O-Ring (smaller)	20-R116-*
48	1	Retainer	-
49	1	Hex Screw, 1/4 - 20 UNC x 1/2	-
50	1	Lock Washer, 1/4"	-
51	1	Flow Plug	-
52	1	Hex Screw, 1/4 - 20 UNC x 7/8	-

* Suffix for the material code, see Table 5 on page 13.

Table 5
O-Ring & Gasket Codes & Suffixes

Model No. Code*	Material	Part No. Suffix (†)
A	Buna-N	-101
B	Neoprene	-100
C	Viton®	-118
D	EPDM	-136
E	Kalrez®**	-138
F	Chemraz®**	-140

* Digit #7 of part number.

** On units with Kalrez or Chemrez seals & gaskets, the diaphragm case gasket will be Buna-N.

Table 6
Soft Goods Kits

Kit Part No.	Contents
20-SGK1-†	All O-rings, Gaskets, & Diaphragms
20-SGK2-†	All O-rings

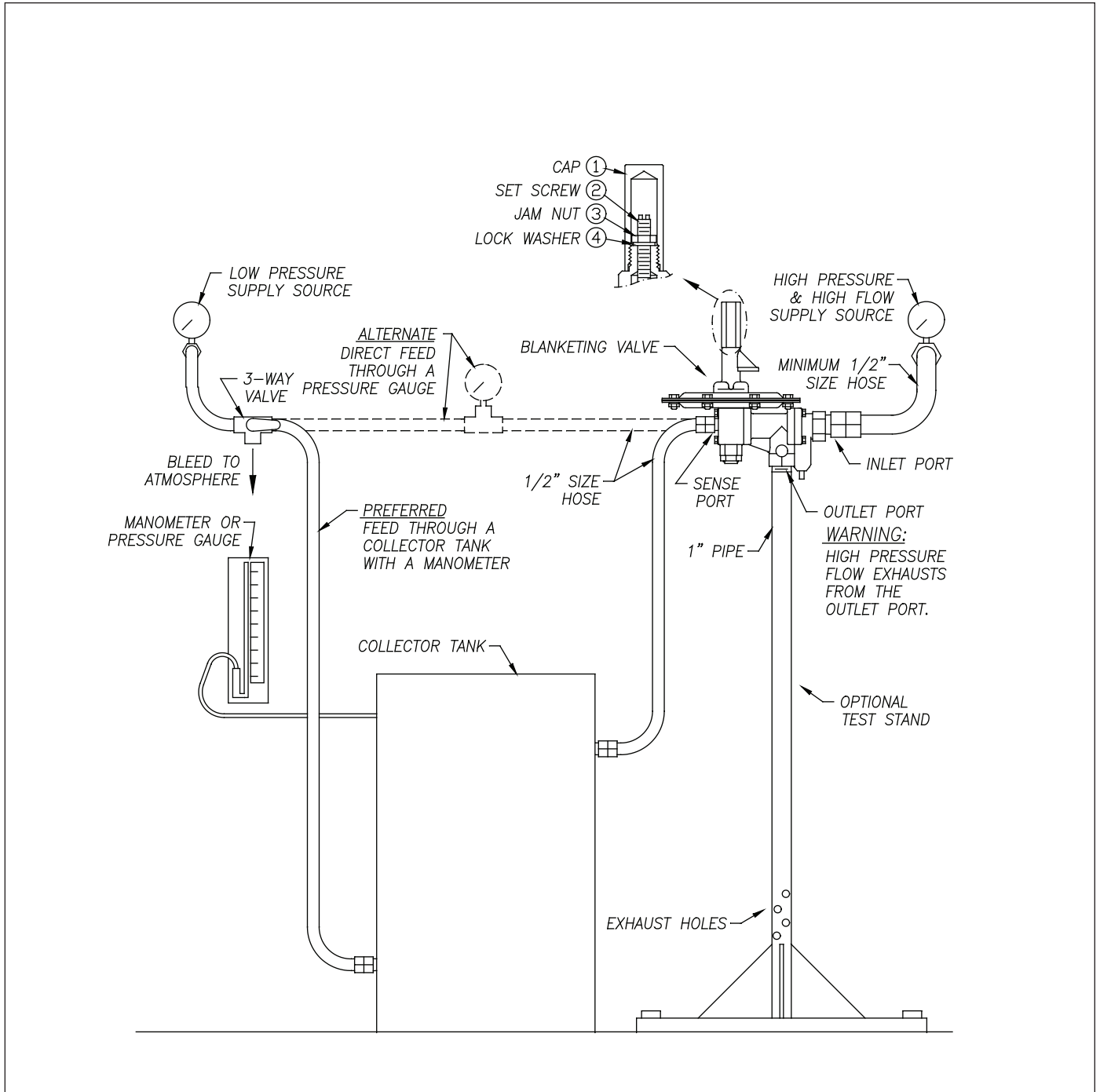
† Suffix for the material code, see Table 5.

Table 7
O-Ring Sizes

Part No.	Cross Section Dia.	I.D.
20-R109-†	.103	.299
20-R112-†	.103	.487
20-R115-†	.103	.674
20-R116-†	.103	.737
20-R117-†	.103	.799
20-R118-†	.103	.862
20-R121-†	.103	1.049
20-R137-†	.103	2.050

† Suffix for the material code, see Table 5.

**Fig. 9
Recommended Test
Set-Up**



ACCESSORIES

Filter

■ FUNCTION

The inlet line filter, with a 20 micron element, serves to keep any unwanted particles out of the pilot valve and dome volume. This filter along with the inlet screen serves as back up in case contamination enters the supply line through or after the supply line filter. This filter is not a substitute for a supply line filter.

■ MAINTENANCE

Condensate may be drained from the bowl of the in-line filter (see Fig. 10) by turning the draincock (serrated knob on the bottom of the bowl) clockwise from bottom. Note: The serrated knob may be covered by a protective rubber cap which slips off. Draining can be done while the system is pressurized, however caution must be taken to catch the fluid which may shoot out due to the high pressure inside of the filter (the pressure inside the filter will equal the blanketing gas supply pressure). **CAUTION: DO NOT** unscrew the bowl of the filter while system is pressurized. After the system has been depressurized, the filter can be cleaned as follows:

1. Unscrew the bowl of the filter and clean the bowl (use household soap only).
2. Unscrew the filter element. Check the element for excessive blockage or visible holes. Replacement filter elements are available if needed.
3. Reassemble the element and the bowl. Make sure that the bowl is screwed all the way so that the top presses against the rubber seal in the body. Also make sure that the drain at the bottom of the bowl is closed (screwed all the way counter-clockwise from the bottom).

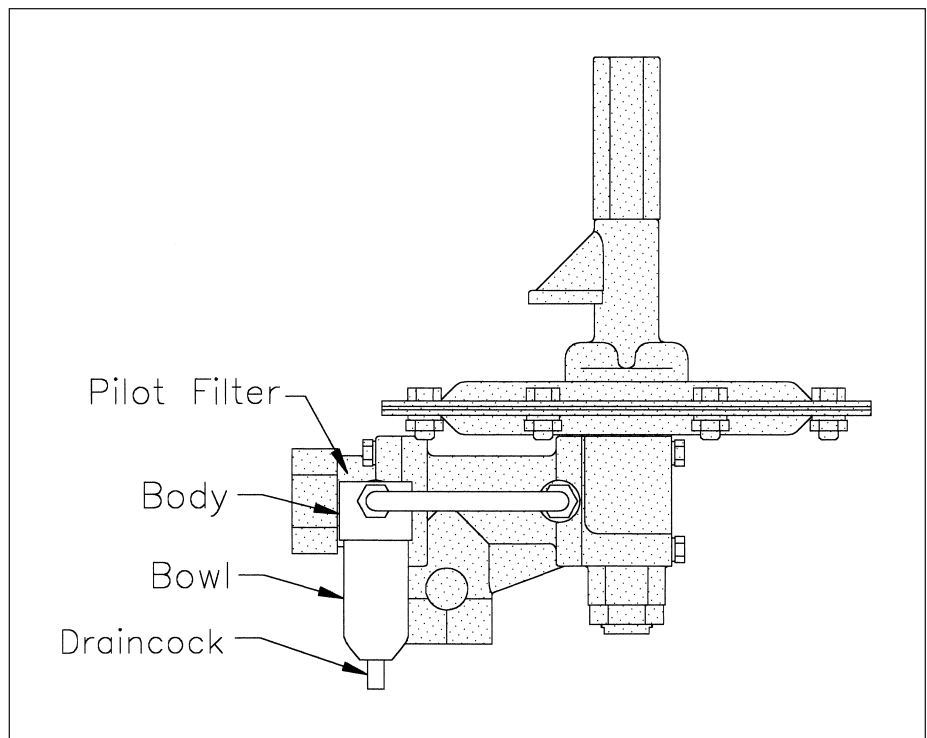


Fig. 10
Pilot Filter

Check Valve

■ FUNCTION

The check valve, which goes in the external filter line between the inlet gas supply and the pilot valve, prevents tank pressure from being drawn out of the tank through the blanketing valve in the event that pressure in the blanketing gas supply line should drop to zero or vacuum. It is in between the inlet cap and the pilot filter and allows flow in only one direction - from the inlet to the filter (and on to the pilot). See Fig. 11.

■ MAINTENANCE

The check valve should not normally require maintenance. When the blanketing valve has been depressurized, the check valve may be removed and checked. A small arrow on the body of the check valve shows the direction in which flow is allowed. If pressure is supplied to the inlet, flow should come through the outlet. If pressure is supplied at the outlet, no flow should pass through the check valve. If the check valve is found to be defective, it must be replaced.

When installing the check valve, be certain that it is positioned with the arrow pointing away from the inlet (in the direction of flow shown in Fig. 11).

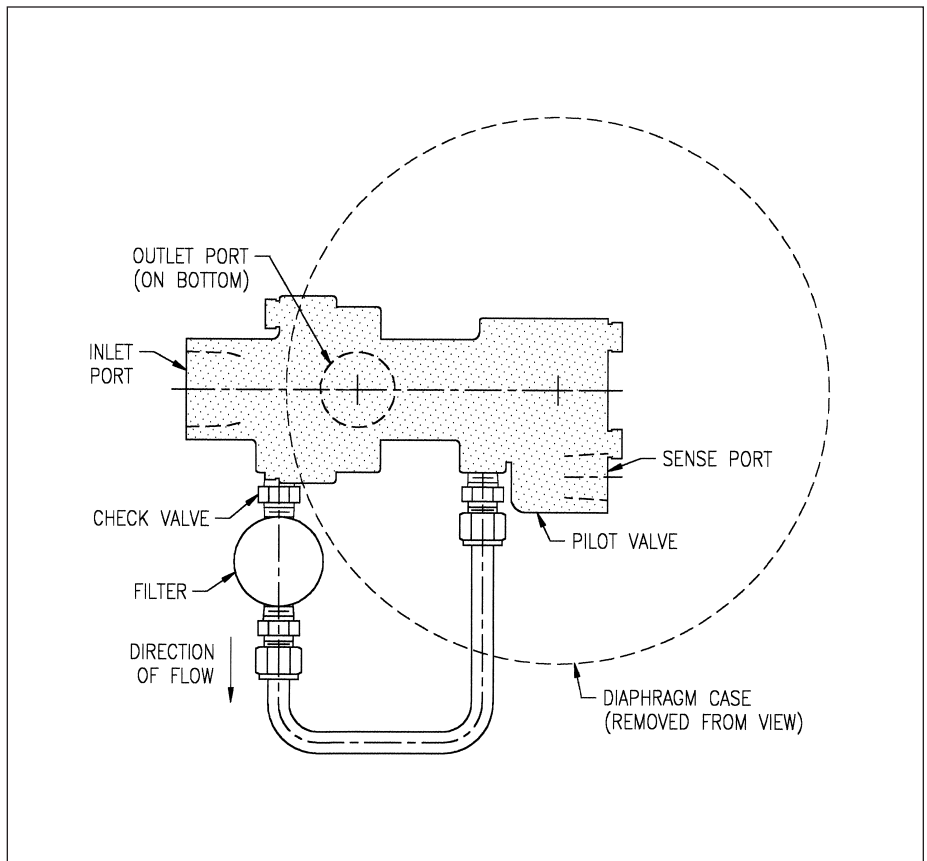


Fig. 11
Check Valve Location

Pressure Gauges

■ FUNCTION

Optional pressure gauges may be included which enable system pressure monitoring. The supply line pressure gauge will show the blanketing gas supply pressure at the inlet to and inside of the blanketing valve. The sense line pressure gauge will show the tank pressure being sensed by the blanketing valve through the sense line.

■ MAINTENANCE

When the blanketing valve has been completely depressurized, gauges may be removed for calibration checks. Replacement gauges can be ordered if necessary. The sense line gauge supplied by Protectoseal has a working pressure of up to 15 psig and so should not be damaged by fluctuations in tank pressure. Damage to the supply pressure gauge may indicate that the blanketing gas supply system was overpressurized at some point. Excessive supply pressure can cause blanketing valve failure and should be immediately investigated.

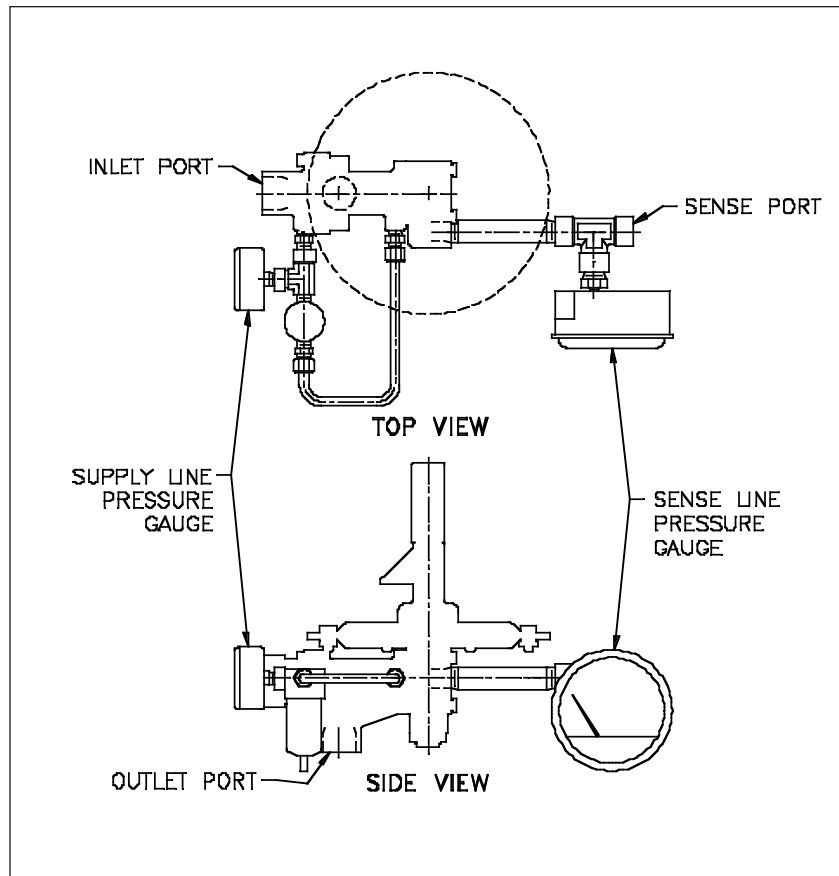


Fig. 12
Pressure Gauges

Integral Purge Accessories

■ FUNCTION

The integral purge is used to create a small flow of blanketing gas at the blanketing valve outlet and/or the sense line connection in order to keep vapors from the material stored in the tank from corroding the blanketing valve. Due to the blanketing valve's stainless steel 316 construction, the availability of chemically resistant soft goods, and the high concentration of blanketing gas present in the blanketing valve, the integral purge should not be necessary except in very severe service conditions. Both the blanketing valve

outlet, and to a much lesser extent, the sense line will be purged with blanketing gas any time that the blanketing valve opens. The integral purge, however, flows continuously and so also lessens the existence of standing vapors from the stored material when the blanketing valve is closed.

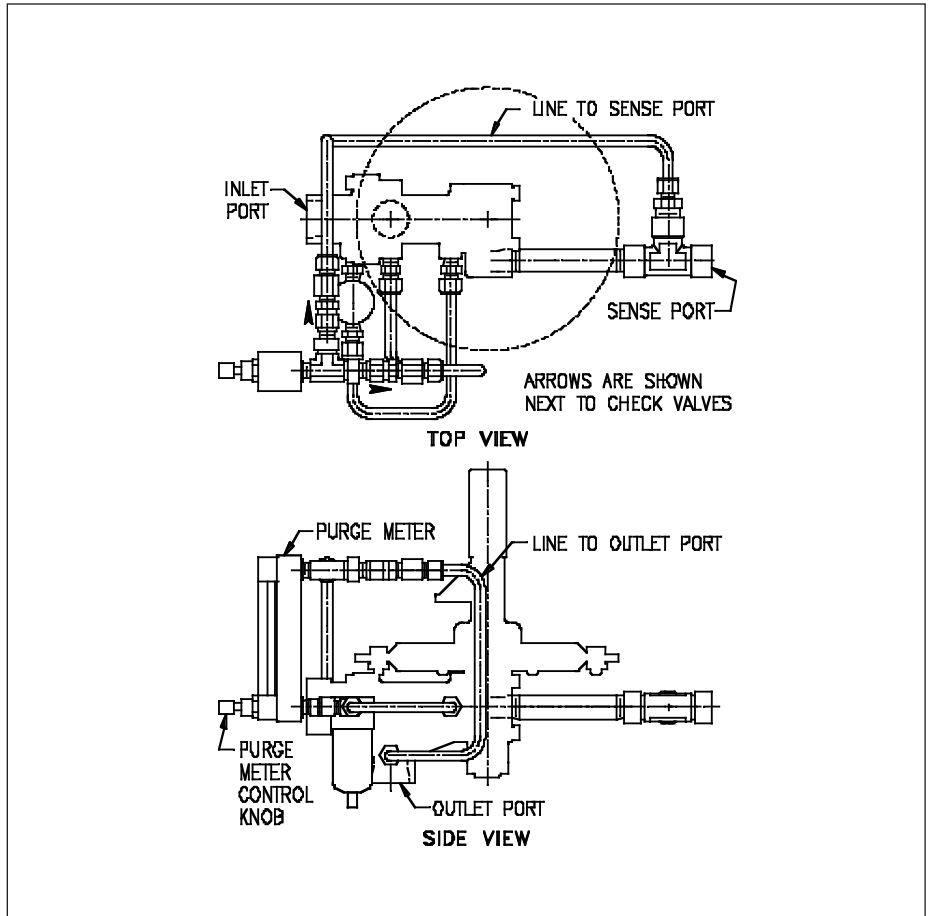


Fig. 13
Integral Purge System with Outlet & Sense Line Purges

■ OPERATION

The integral purge system uses the blanketing gas supply to create a trickle of flow at the outlet port and/or sense port. The purge meter (See Fig. 13) is used to control the flow going to either of these locations. A recommended flow through the meter is 0.5 SCFH. Flows higher than about 1.0 SCFH past the sense port are not recommended because they can create an artificially high pressure at the sense port leading to the valve opening at a tank pressure lower than the set point. If the purge is only to the outlet line, then higher flows create only the problem of high supply gas usage.

The purge meter has a percent scale. The flow indicated will depend upon the blanketing gas supply pressure, the molecular weight of the blanketing gas, and (to a lesser degree) the operating temperature. See the below tables to determine the flows through the purge meter as follows:

Scale Reading for a Desired Flow:

$$\text{Scale Reading \%} = (\text{Desired Flow \{SCFH\}} \times 125 \times F1 \times F2 \times F3)$$

Flow Indicated at a Scale Reading:

$$\text{Flow \{SCFH\}} = (\text{Scale Reading \%}) / (125 \times F1 \times F2 \times F3)$$

Supply Pressure (PSIG)	F1
20	0.651
30	0.573
40	0.518
50	0.477
60	0.444
70	0.417
80	0.394
90	0.375
100	0.358
110	0.343
120	0.330
130	0.319
140	0.308
150	0.299
160	0.290
170	0.282
180	0.275
190	0.268
200	0.262

Table 8
Supply Pressure Factor (F1)

Gas	F2
Air	1.00
Carbon Dioxide	1.238
Helium	0.372
Natural Gas	0.775
Nitrogen	0.982

Table 9
Molecular Weight Factor (F2)

Temp. (°F)	Temp. (°C)	F3
0	-18	0.932
20	-7	0.952
40	4	0.971
60	16	0.991
70	21	1.000
80	27	1.009
100	38	1.028
120	49	1.046

Table 10
Temperature Factor (F3)

■ MAINTENANCE

The integral purge accessories should not normally require maintenance. When the blanketing valve has been removed for maintenance, the purge meter or purge system can be checked for blockage by hooking up a pressure line to the inlet of the purge meter (the bottom connection) and checking for flow at the outlet(s).

Since the blanketing gas should be clean, the purge meter should not usually require cleaning. However, if it is desired to do so, follow these steps:

1. Squeeze the clear plastic shield to unsnap it from the retainer.
2. Remove the glass tube by pushing it up (against the compression spring) and pulling it out.

3. Use tweezers to pull the float stop out from the top of the tube and then carefully tilt the tube to remove the float. Handle the float with care to avoid nicking or scratching it.
4. Clean the tube and float with mild detergent and water or with a suitable solvent. Use a soft cloth or tube brush to clean the meter tube. Do not expose the tube or float to extreme temperature changes.
5. The shield may be cleaned with detergent and water or with kerosine. If kerosine is used, follow up cleaning with detergent and water.
6. Reassemble in the reverse order of disassembly.

Units which have an outlet line purge will include one or more check valves which prevent back flow from the outlet when the blanketing valve opens. The blanketing valve will not function without these check valves. If it is desired to inspect these check valves, refer to the paragraph on check valve maintenance. Be certain to note the direction of the arrows on the check valves before removing them so that they will be reinstalled properly (the arrows should point away from the purge meter as shown in Fig. 13.).

Field Test Accessories

■ FUNCTION

The field test accessories make it possible to check the opening pressure of the valve in the field. Through a series of valves and a regulator, the blanketing gas supply is regulated down and directed into the sense chamber of the blanketing valve. A vacuum pump is also used in the low pressure / vacuum set point version in order to lower the pressure sufficiently. By lowering and raising this regulated pressure, the opening and closing point of the blanketing valve can be determined. Both the supply pressure gauge and the sense pressure gauge are included with the field test accessories.

Optional additional accessories are a 3-way valve for the outlet line and/or shut-off valve for the sense line. The 3-way valve makes it possible to divert outlet flow away from the tank if the blanketing valve is field tested while connected to the system. The auxiliary outlet port of the 3-way valve can either be connected to a collector or open directly to atmosphere. The sense line shut-off valve is used to isolate the sense chamber while conducting a field test. It provides easy accessibility if the valve is field tested while connected to the tank. It also provides a quick means of sealing off the sense port if the valve is removed from the tank for testing.

■ SET-UP

If the unit has been removed from the system:

1. Seal off the sense port by closing the sense line shut-off valve or inserting a pipe plug.
2. Position the outlet of the valve so that the high pressure flow can exhaust safely. The blanketing valve should be held securely by clamping or other means.
3. Connect a line from a pressure source to the valve inlet. The minimum restriction in this line should be a $\frac{1}{2}$ " pipe size diameter. The pressure source must be of sufficient capacity to open the blanketing valve fully, otherwise the valve will not operate consistently. Where possible, the inlet supply pressure should be equivalent to the blanketing gas supply pressure.

If the unit is still connected in the system:

1. Shut-off the blanketing gas supply to the inlet port.
2. Isolate the sense port from the tank by closing the sense line shut-off valve.

3. If the unit has a 3-way valve, turn the handle on the valve approximately 180° to close off the path to the tank and open up the blanketing valve outlet to the auxiliary port.
4. If the unit does not have a 3-way valve, you must leave the outlet line open and exhaust the blanketing valve into the tank. **CAUTION:** Exhausting into the tank while running a field test may cause the tank's pressure relief vents to open.

Notes regarding the set point and valve operation:

1. The set point of the Protectoseal Series 20 Blanketing Valve is specified as the pressure at which the main valve opens.
 2. The opening of the main valve should be audibly distinguished from the opening of the pilot valve. The pilot valve will begin to leak at a pressure just above that at which the main valve will open abruptly. The quick opening of the main valve is usually very loud, although the degree of loudness will depend upon the inlet pressure and the flow capacity.
 3. The main valve reseals above the pressure at which it opens, and the pilot reseals above where the main valve reseals.
-

■ TESTING - HIGHER PRESSURE SET POINT KIT

If the unit has set point range B, C, D or E (as indicated by digit 6 of the model number) (2.1 to 69.2 inches W.C.) then this section applies. If the unit has a set point range of A or F, then proceed to the next section entitled "Testing - Low Pressure or Vacuum Set Point".

Follow these steps to determine the opening and resealing points (See Fig. 14):

1. Connect the test kit as shown at connection #1 and connection #2 (if it is not already attached). If the blanketing valve includes the integral purge option, the purge meter should be shut before using the field test unit.
2. Pull up the handle on the regulator to unlock it and turn the handle all the way counter-clockwise. This minimizes the outlet pressure of the regulator so that the regulator pressure gauge will not be damaged when inlet pressure is applied.
3. Turn the knobs on the needle valve and the bleed valve clockwise to close them.
4. Open shut-off valve #2 (at the hose end of the test kit).
5. **CAUTION:** Put on ear protection. The flow out of the valve can be extremely loud.
6. Pressurize the inlet to the blanketing valve.
7. Slowly open shut-off valve #1 (at the inlet of the test kit).
8. Turn the handle on the regulator clockwise to increase the outlet pressure until the regulator gauge reads approximately 10 PSIG.
9. Slowly open the needle valve to pressurize the sense line. Bring the pressure up above the set point (as indicated by the sense line pressure gauge).
10. Lower the sensed pressure by adjusting the knobs on the bleed valve, the needle valve and the regulator.
11. Note: If the blanketing valve has been removed from the system, then pressure in the sense chamber will bleed to atmosphere through the outlet port. Thus, there will not be a tight system and some gas must be continually bled in through the test kit in order to maintain the pressure at the sense port.
12. Cycle the sensed pressure up and down to determine the opening pressures. If the blanketing valve is not opening at the set point, see the section entitled "Set Point Adjustment" on page 6.
13. If other problems are experienced, refer to the troubleshooting guide. Double check your set-up and test procedures before attempting to adjust the set point or fix any other problems.

■ TESTING - LOW PRESSURE OR VACUUM SET POINT TEST KIT

If the unit has set point range A or F (-0.5 to 2.0 inches W.C.), then this section applies. Follow these steps to determine the blanketing valve's opening and resealing points (See Fig. 15).

1. Pull up the handle on the regulator to unlock it and turn the handle all the way counter-clockwise. This minimizes the outlet pressure of the regulator so that the regulator pressure gauge or the sense line gauge will not be damaged when inlet pressure is applied.
2. Turn the knob on the stem valve clockwise to close it.
3. Open shut-off valve #2 (at the hose end of the test kit).
4. CAUTION: Put on ear protection. The flow out of the valve can be extremely loud.
5. Pressurize the inlet to the blanketing valve.
6. Slowly open shut-off valve #1 (at the inlet of the test kit).
7. Turn the handle on the regulator clockwise to increase the outlet pressure until the regulator gauge reads 13 to 14 PSIG. (NOTE: Do not pressurize above 15 PSIG. Doing so could damage the sense line pressure gauge which is rated at 15 PSIG maximum.)
8. Lower the sensed pressure by turning the knob to open the stem valve. NOTE: Due to the small volume of the field test kit which controls the sense pressure, the blanketing valve may chatter near the set point.
9. Cycle the sensed pressure up and down to determine the opening pressures.
10. If the blanketing valve is not opening at the set point, refer to the section entitled "Set Point Adjustment" on page 6.

If other problems are experienced, refer to the troubleshooting section. Double check your set-up and test procedure before attempting to adjust the set point or fix any other problems.

■ ADJUSTING THE SET POINT (See Fig. 4)

1. Remove the #1 cap.
2. While securing the #2 set screw with a screwdriver, loosen the #3 jam nut.
3. Screw the set screw clockwise to make the unit open at a higher (or less negative) pressure or screw it counter-clockwise to make it open at a lower (or more negative) pressure.
4. Check the opening point using the field test kit as instructed above.
5. Iterate until the desired opening point is achieved.
6. Secure the position of the set screw with the jam nut and lock washer.
7. Thread on and tighten the cap.

■ AFTER TESTING

To depressurize the blanketing valve and test kit, shut off the inlet supply while the valve is flowing. Check that the pressure indicated on the sense line gauge is zero. Close shut-off valve #1 and shut-off valve #2. Disconnect the test kit at connection #1 and connection #2, if desired.

If the unit has been removed from the system:

1. Open the sense line shut-off valve or remove the pipe plug from the sense port.
2. Disconnect the line from the pressure source.
3. Follow the installation and start-up instructions on page 2 to reinstall the blanketing valve.

If the unit is connected to the system:

1. Open the sense line shut-off valve.
2. Turn the handle on the 3-way valve back to its original position to open the path from the blanketing valve outlet to the tank and shut-off the auxiliary port.
3. Open the inlet supply shut-off valve.

Open and reset the purge meter if that option is included with the blanketing valve.

■ MAINTENANCE

If any of the components of the field test kit do not function properly, consult the factory for assistance in ordering replacement parts.

The following Figs. will appear on the next pages:

Fig. 14
Higher Pressure Set Point (2.1 to 69.2 inches W.C.) Field Test Kit
With Outlet Line 3-Way Valve & Sense Line Shut-Off Valve

Fig. 15
Low Pressure or Vacuum Set Point (-0.5 to 2.0 inches W.C.) Field Test Kit
Without Outlet Line 3-Way Valve or Sense Line Shut-Off Valve

Fig. 16
Combination of all Available Accessories

**Fig. 14
Higher Pressure Set Point
Field Test Kit**

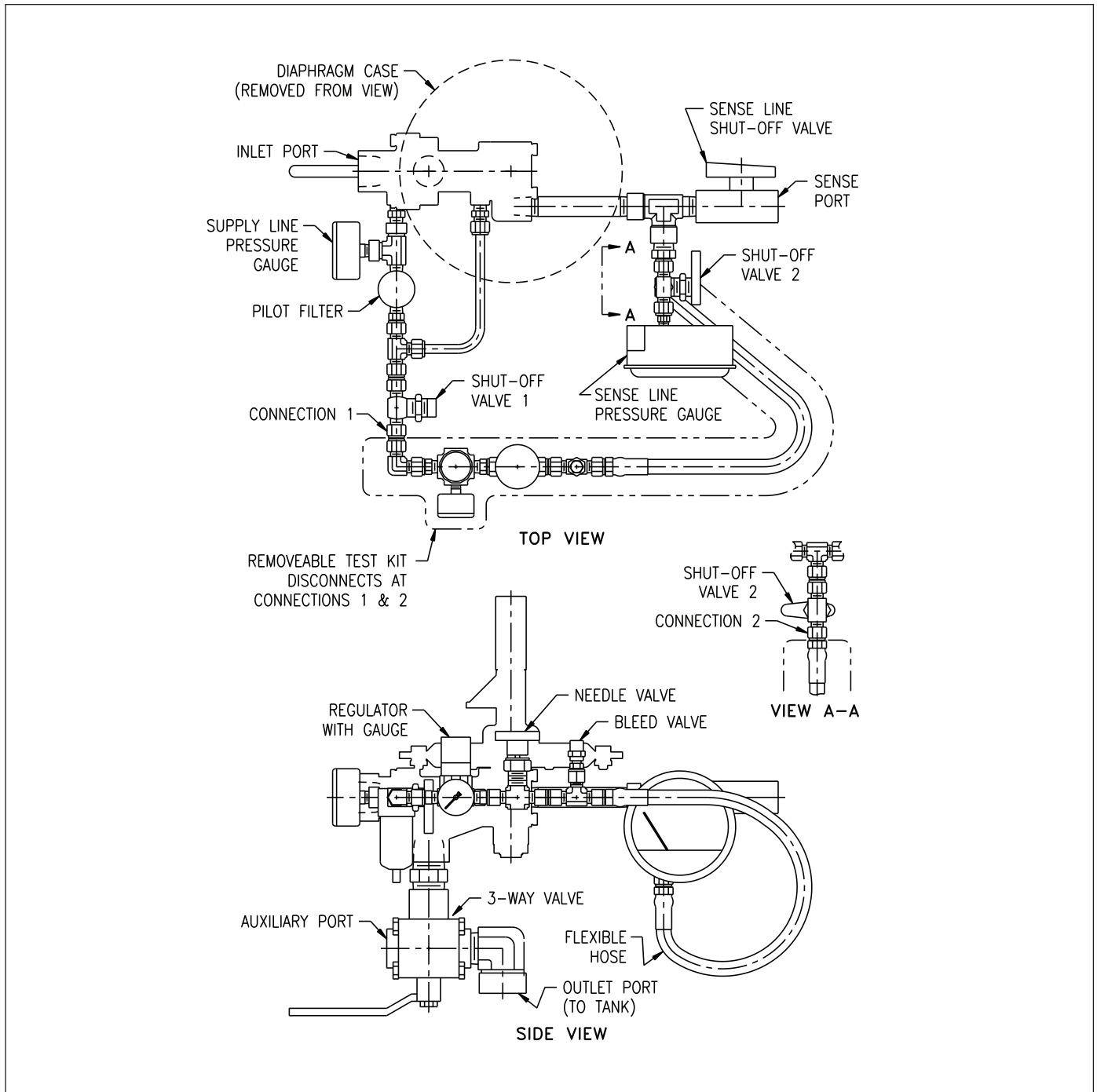


Fig. 14
Higher Pressure Set Point (2.1 to 69.2 inches W.C.) Field Test Kit
With Outlet Line 3-Way Valve & Sense Line Shut-off Valve

Fig. 15
Low Pressure Field
Test Kit

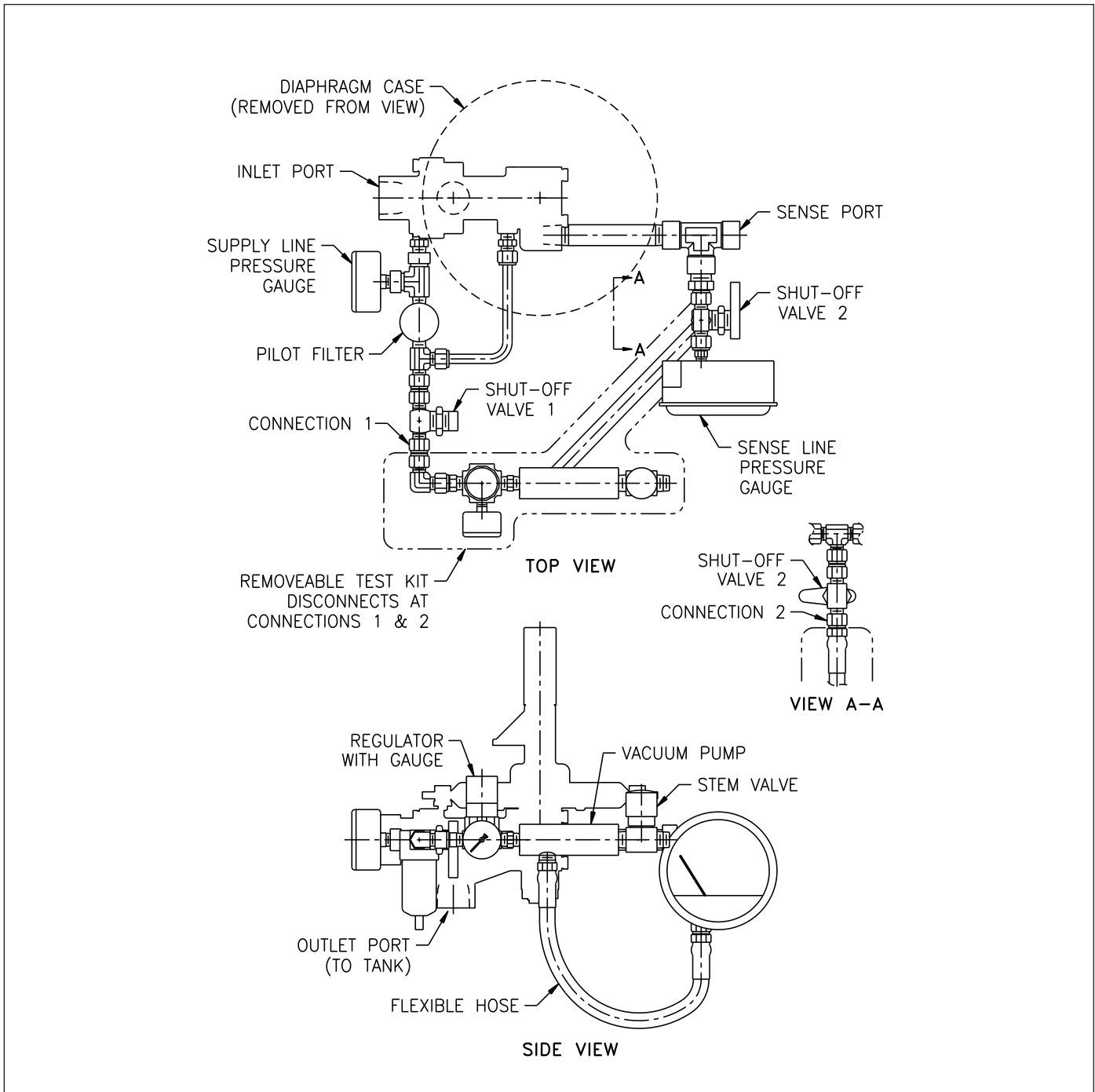
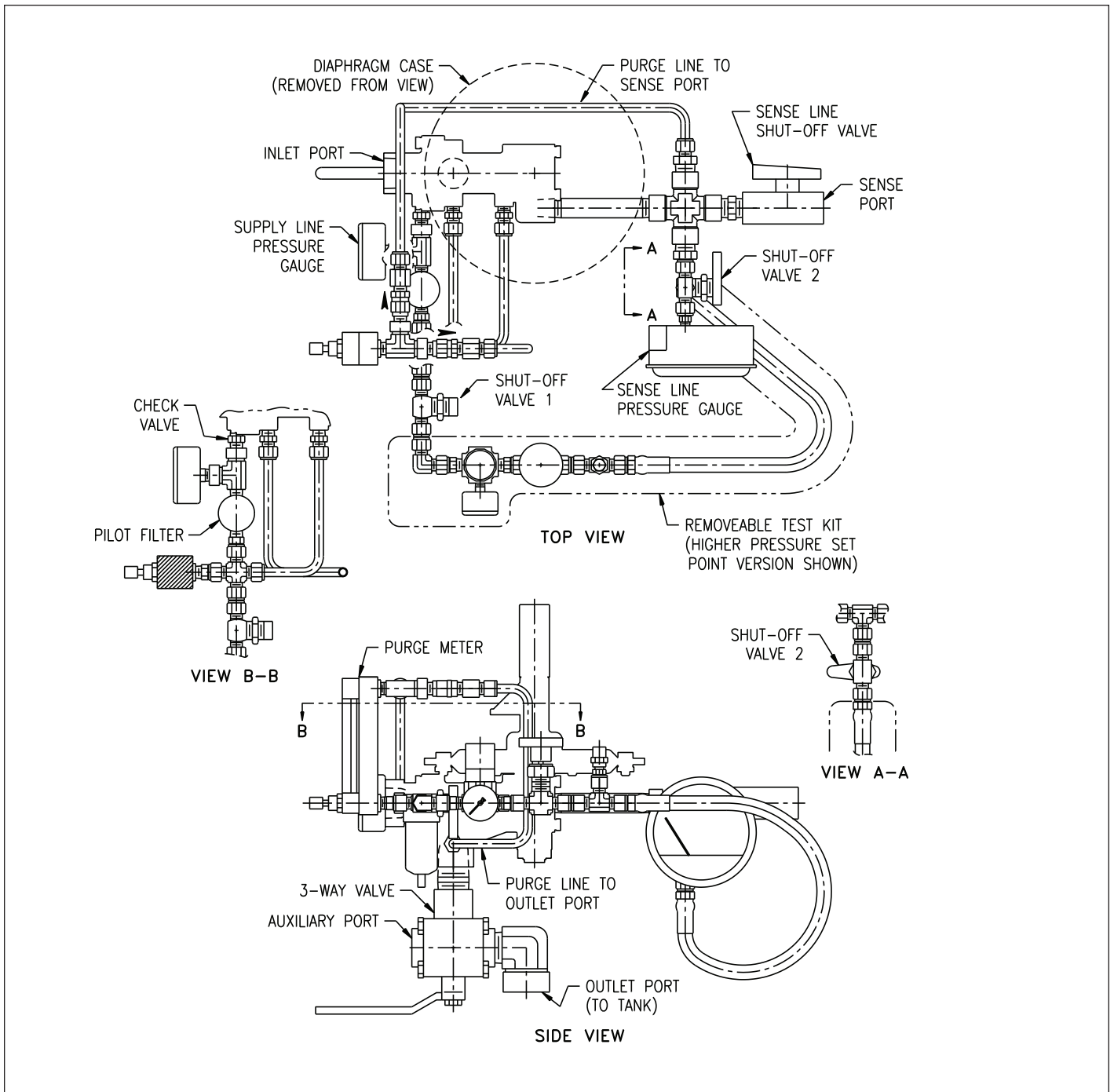


Fig. 15
Low Pressure or Vacuum Set Point (-0.5 to 2.0 inches W.C.) Field Test Kit
Without Outlet Line 3-Way Valve or Sense Line Shut-off Valve

**Fig. 16
Combination of All
Available Accessories**



Troubleshooting

Possible problems which could be encountered with a blanketing valve are listed below. Possible sources of the problems along with suggestions for investigating the problems are also included. Refer to the maintenance instructions for directions on disassembly and reassembly of the blanketing valve and accessories. Refer to Figure 2 through 8 as necessary. NOTE: ** Refers to optional equipment which may not be included with your unit

WARNING: Always depressurize the blanketing valve before disassembling.

■ **PROBLEM 1 :** The blanketing valve does not open at all.

- 1.1. The blanketing gas supply is empty or shut down or the shut-off valve in the supply line is closed.
 - ✓ Inspect the blanketing gas supply source and supply line.
- 1.2. The shut-off valve in the outlet line is closed.
 - ✓ Open the shut-off valve.
- 1.3. The sense line shut-off valve is closed or the sense line is blocked.
 - ✓ Inspect the sense line.
- 1.4. The set point is too low.
 - ✓ Has the #2 set screw been adjusted? If the set screw has been backed out then the opening pressure will have been lowered, possibly below atmospheric pressure.
 - ✓ The set point may be checked. See either the sections regarding "Set Point Adjustment" on page 6 or consult the factory for assistance.
- 1.5. The diaphragm assembly or the poppet is stuck. Take off the #10 upper case assembly and inspect.
 - ✓ Is the #9 diaphragm assembly intact?
 - ✓ Was the #6 set spring jammed when you took off the case?
 - ✓ Does the #31 poppet move down and spring back up when you press down on the stem protruding into the lower case? If not, disassemble the pilot valve and check the O-rings, the pin and the spring pin.
- 1.6. The piston is jammed shut. Remove the pilot body and inspect the main body.
 - ✓ Does the #40 piston assembly move freely through the bore.
 - ✓ Check for debris in the bore.
 - ✓ Inspect the #46 and #47 O-rings.
 - ✓ Was the #39 piston spring jammed when you removed the pilot body?
 - ✓ Check for marks or raised surfaces on the piston or in the bore. If found, the main valve and/or piston may require replacement.

■ **PROBLEM 2:** The blanketing valve flows full open without resealing.

- 2.1. There is a leak in the sense line or in the tank.
 - ✓ Isolate the blanketing valve from the tank, pressurize the tank, and check to see if it holds pressure.
2. There is a leak from the sense chamber.
 - ✓ Leak test the diaphragm case around the perimeter and around the bolts.
 - ✓ Leak test around the #15 gasket between the lower case and the pilot body.
 - ✓ Check for a hole in the sense diaphragm.
 - ✓ Check the #24 gasket in the diaphragm assembly.
- 2.3. There is a leak in the external filter line.
 - ✓ Leak test all fittings.
- 2.4. The set point is too high. If the set point of the blanketing valve is above that of the pressure relief devices, then neither the blanketing valve or the pressure relief devices will close.
 - ✓ Compare the specified set points for the blanketing valve and the pressure relief devices. The blanketing valve set point should be at least 2.0 inches W.C. below that of the pressure relief devices.

- ✓ The set point may be checked. See either the section regarding “Set Point Adjustment” on page 6 or consult the factory for assistance.
- 2.5. The piston is stuck open.
 - ✓ See #6 in preceding problem.
 - ✓ Check for debris at the piston seat (where the #47 O-rings seats).
- 2.6. The diaphragm assembly or the poppet is stuck.
 - ✓ See 1.5.
- 2.7. An O-ring has been blown out or damaged.
 - ✓ Disassemble and inspect.
- 2.8. The blanketing valve was not reassembled properly after maintenance.
 - ✓ Check to see if an O-ring is missing or if the wrong size O-ring was used for the #46 O-ring. Use Table 7 on page 13 to check O-ring sizes.
 - ✓ Take apart the pilot valve and check to see that the #32 poppet spring and the 33 spring pin are in place.
 - ✓ ** Verify that the check valve installed in the proper direction. See the section regarding “Integral Purge Accessories”.
 - ✓ ** Verify that the shut-off valves for the field test kit are closed. See the section regarding “Field Test Accessories”.

■ **PROBLEM 3:** The blanketing valve leaks continuously.

- 3.1. Debris is holding the poppet or piston open.
 - ✓ Take the unit apart, check for debris, clean and reassemble.
- 3.2. An O-ring has been blown out or damaged.
 - ✓ Disassemble and inspect.
- 3.3. The piston is not properly reseated.
 - ✓ Check for debris at the piston seat (where the #47 O-ring seats).
 - ✓ See 1.6
- 3.4. There is a leak in the external filter line.
 - ✓ Leak test all fittings.
- 3.5. There is a leak from the sense chamber.
 - ✓ See 2.2
- 3.6. The diaphragm assembly is stuck or prevented from moving all the way back up.
 - ✓ See 1.5

■ **PROBLEM 4:** The blanketing valve opens above or below the set point.

- 4.1. There is a leak in the sense line.
 - ✓ Leak test connections in the sense line.
- 4.2. There is a leak from the sense chamber.
 - ✓ See 2.2.
- 4.3. The set point is incorrect.
 - ✓ The set point may be checked. Refer to sections regarding “Set Point Adjustment” on page 6 or consult the factory for assistance.

■ **PROBLEM 5:** The pressure vent or other pressure relief device opens before the blanketing valve closes.

- 5.1. The set point of the two devices are too close to each other
 - ✓ See 2.4.
- 5.2. The blanketing valve is opening above its set specified set point.
 - ✓ Has the #2 set screw been adjusted? If the set screw has been screwed in then the opening pressure will have been raised.
 - ✓ The set point may be checked. Refer to sections regarding “Set Point Adjustment” on page 6 or consult the factory for assistance.

- 5.3. The pressure relief device is opening below its specified set point.
 - ✓ Check the opening pressure of the pressure relief device.
 - 5.4. The blanketing valve is closing too far above its set point. This would indicate that the pilot valve is not functioning properly.
 - ✓ Check that the #35 lower plug assembly is screwed in all the way with the mark on the nut lining up with the mark on the pilot body.
 - ✓ Check for debris in the pilot valve.
 - ✓ Inspect the O-rings in the pilot valve.
 - ✓ Possibly the pilot valve was not reassembled properly after maintenance.
 - 5.5. The blanketing valve flow capacity is too high for the system.
 - ✓ Refer to the "User Guide" for assistance in determining flow capacity sizing.
-

■ **PROBLEM 6:** The vacuum vent or other vacuum relief device opens.

- 6.1. The blanketing valve set point is below (more negative than) the vacuum vent set point.
 - ✓ Check the labels of the blanketing valve and the vacuum relief device to identify the set points. The set point of one of the units may have to be changed.
 - 6.2. The blanketing valve is opening below its set point.
 - ✓ See 1.4.
 - 6.3. The vacuum vent is opening above its set point.
 - ✓ Check the opening pressure of the vacuum relief device.
 - 6.4. The blanketing valve flow capacity is not high enough for the system.
 - ✓ Refer to the "User Guide" for assistance in determining flow capacity sizing.
-

■ **PROBLEM 7:** The blanketing valve cycles, repeatedly opening and closing.

- 7.1. The blanketing valve flow capacity is too high for the system.
 - ✓ Refer to the User's Guide for assistance in determining flow capacity sizing.
- 7.2. **The check valve in the line between the outlet and the purge meter is not sealing.
 - ✓ Refer to the section on "Integral Purge Accessories" on page 17 for procedures on investigating the operation of the check valve. Replace the check valve if it is found defective.

NOTE: ** Refers to optional equipment which may not be included with your unit.



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