Algas-SDI™

ISO 9001 Certified

...Innovative liquid vaporizing and gas mixing solutions

XPM & XPV

Packaged Vaporizing/Mixing System

Models: XPM2.5 through XPM14.0
Models: XPV2.5 through XPV28.0

Operations & Maintenance Manual

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FILE: MANUAL PN 52569 REV 2-29-04 XPV-XPM.doc

ECLIPSE Innovative Thermal Solutions

WARNING

Read the OPERATION MANUAL before operating this equipment.

This equipment uses LPG-a flammable fuel handled under pressure. Inherent hazards exist and a thorough understanding of the equipment is required to allow safe operation and maintenance.

equipment.

,

etc. DO NOT SUBSTITUTE! The consequence from such actions are unpredictable and may lead to dire consequences. When components are replaced with components not approved for use in our FM/CSA listed equipment, the FM/CSA listing becomes void for that unit.

Disclaimer and Warning

Read this Operation and Maintenance Manual before operating the XPV / XPM system.

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To Register your new equipment: Visit Algas-SDI's web site at: algas-sdi.com, then click on the "Tech Support" button. Select online Registration or print out the Acrobat Warranty Registion.

OR

Fill out the Warranty Registration information on the last page of this manual. Then make a photo copy and mail to the address shown at the bottom.

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WARRANTY

Algas-SDI International, LLC (ASDI) warrants that the equipment is free of defects in materials and workmanship under normal use and service. ASDI agrees to repair or replace, at our option, without charge f.o.b. factory, any part which has proven defective to the satisfaction of Algas-SDI International, LLC within one (1) year from the date of the original installation or within 18 months from the date of shipment, whichever is earlier. Equipment, which in the opinion of ASDI, has been damaged by improper installation or operation, or has been abused or tampered with in any way, will not be accepted for return under warranty.

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APPROVALS

FM
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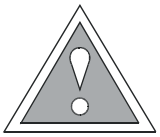
Symbols and Conventions

Special symbols are used to denote hazardous or important information. You should familiarize yourself with their meaning and take special notice of the indicated information.

Please read the following explanations thoroughly.

GENERAL WARNING OR CAUTION



Indicates hazards or unsafe practices which can result in damage to the equipment or cause personal injury. Use care and follow the instructions given.

FLAMMABLE GAS HAZARD

Indicates a potential hazard which can result in severe personal injury or death. Use extreme care and follow the instructions given.

ELECTRICAL DISCONNECT REQUIRED

Indicates a potentially dangerous situation which can result in severe personal injury or death or damage to equipment. Use great care and follow the instruction given.

ASDI CONTACT NUMBERS

If you have questions, need help with your equipment, or want information on other products, contact Algas-SDI at:

Telephone: 206.789.5410

Facsimile: 206.789.5414

Email: sales@algas-sdi.com

Internet: http://www.algas-sdi.com

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Appendix B: Vaporizer Technical Information

Recommended Spare Parts List

Introduction 1

OVERVIEW

The XPV / XPM Liquefied Petroleum Gas (LPG) vaporizing/mixing systems from Algas-SDI are self-contained units providing a mixture of LPG gas and air which can replace natural gas. The XPM and XPV are similar except the XPV is packaged with an accumulator tank. The customer provides the accumulator tank for the XPM.

XPV DESCRIPTION

The XPV compact LPG vaporizer/mixer systems are available in various models providing a gas/air mix from 2.5 to 28 million BTU/hr at pressures from 5 to 12 PSIG depending on the model selected. The XPM systems are available in various models providing a gas/air mix from 2.5 to 14 million BTU's/hr at pressure from 5 to 12 psig. Other models are available for butane and butane/propane mixtures. The gas/air mix provided is compatible with natural gas and may be used as a direct replacement without adjustments to your burner systems.

These combination systems use our proven XP electric vaporizer to vaporize the LPG and the same atmospheric venturi system used on our reliable Vaporaire mixing machines. The gas is mixed and stored in the accumulator tank to provide uninterrupted flow of mixed gas from full flow to no flow, automatically.

All models are explosion-proof and meet the requirements of Class I, Division 1, Group D as defined by NFPA Pamphlets 58 and 70. That classification allows you to install them almost anywhere with minimum clearances for convenient installation.

Operation is automatic. To start the system, simply open the liquid inlet hand valve and press the **START** switch. A solid state control system controls vaporizer operations and continually monitors the safety of the system If the system is off, it takes less than one minute after the start switch is pressed to be ready to provide gas at full flow.

A liquid pump, such as the Algas-SDI Stabilaire pump system, may be required to provide sufficient gas pressure for the mixing process. The required pressure for your system is indicated on the data sheet provided with the unit. If your supply tank will not provide the required pressure under all expected temperature conditions, a pump will be needed.

VAPORIZER OPERATION

The vaporizer is composed of multiple resistance heating elements imbedded in a finned aluminum heat exchanger core. An RTD temperature sensor (7) and a solid state control system (8) maintain the heater core temperature at 200° to (93.3°C to 98.9°C). Liquid LPG enters the vaporizer through the inlet solenoid valve (9) and comes in contact with the heater core. The LPG extracts heat from the core and vaporizers. When the core cools to the set temperature the control system turns the heater contactor on heating the core as needed to maintain temperature. The control board provides the logic to shut off the system if an unsafe condition exists.

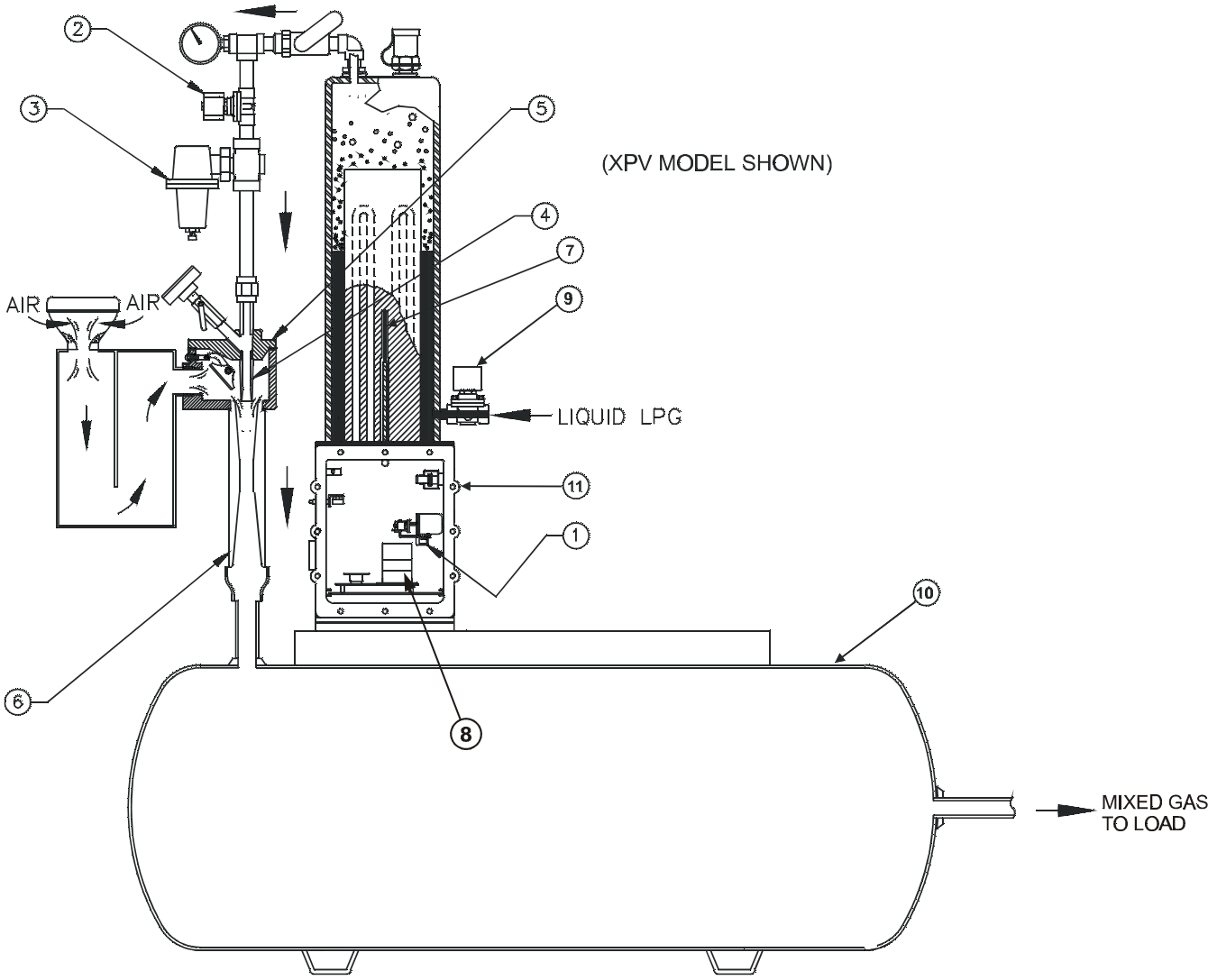
MIXER OPERATION

The vaporized LPG rises into the vapor header and exits through the vapor outlet. ***See Figure 1***. The vapor pressure will close the low vapor pressure switch (11) and activate the venturi control switch (1) after an initial time delay.

The venturi solenoid (2) opens, feeding LPG vapor through a pressure regulator (3) and then through the venturi nozzle (4). The LPG creates a pressure lower than atmospheric pressure in the venturi housing (5) as it exits the venturi nozzle.

The natural atmospheric pressure will force the air into the housing. Both air and LPG streams are mixed and compressed in the diffuser section (6). The discharged gas is then stored in the accumulator tank (10). When the pressure in the accumulator reaches a preset level the venturi solenoid valve will close. As the mixed gas is drawn off and used the tank pressure will decrease allowing the venturi solenoid valve to reopen. This process continues until the unit is switched off or shut down by a safety condition.

Figure 1 *– XPV/XPM Vaporizer / Mixer System Typical Operation*



XPM-XPV Vaporizer-Mixer.wmf

1. **Venturi pressure control switch.**
2. **Venturi vapor solenoid valve.**
3. **Venturi vapor pressure regulator.**
4. **Venturi nozzle.**
5. **Venturi housing assembly.**
6. **Diffuser.**
7. **RTD temperature sensor.**
8. **Solid state control system.**
9. **Inlet solenoid valve.**
10. **Accumulator tank.**
11. **Low vapor switch & high tank pressure switch**

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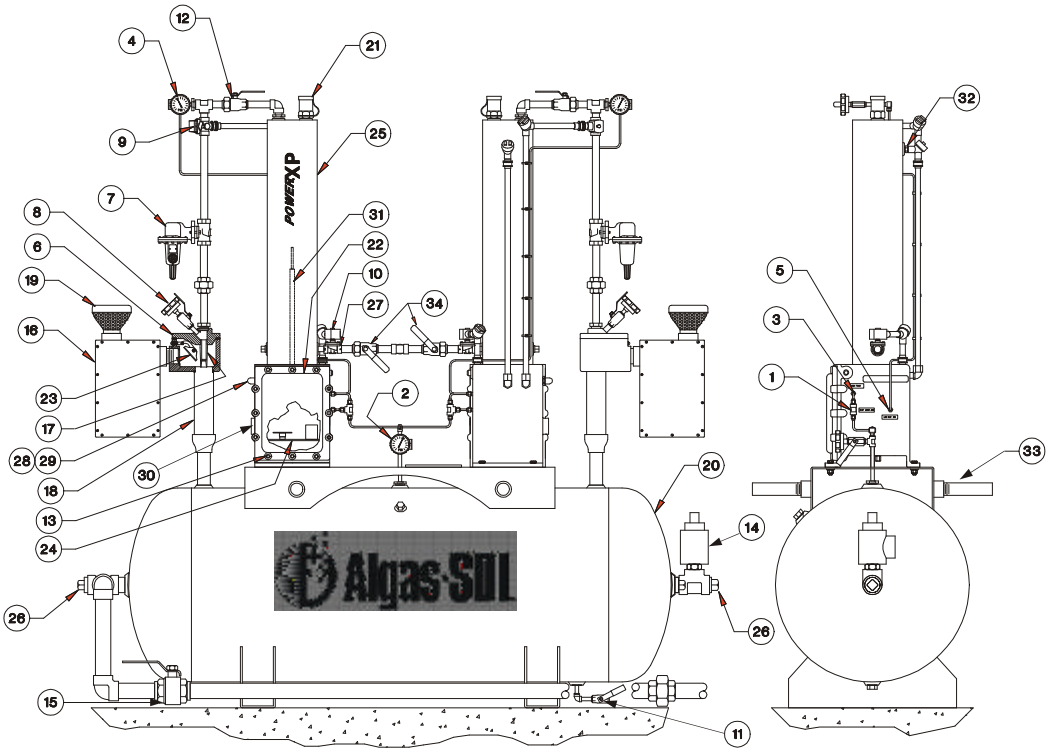
Major Component Drawings

2

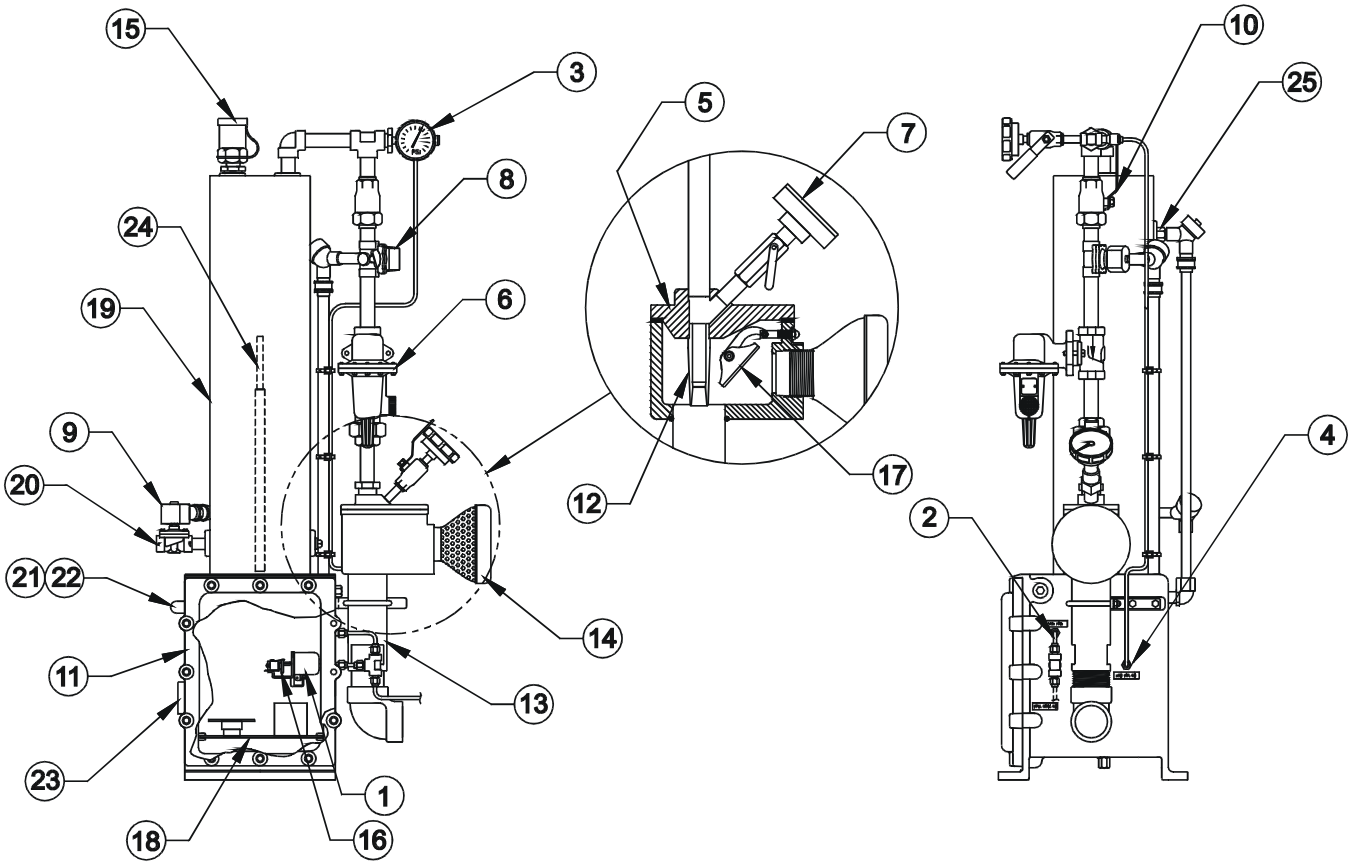
Figure 2 *–XPV Model, 2.5-5# & 8#, Models, 5.0 through 10.5 - 5#, 8#, 12#, Model, 9.0 -12#*



XPV Major Components.wmf

1. **Venturi pressure control switch.**
2. **Mixed gas pressure gauge.**
3. **High tank pressure switch.**
4. **Inlet vapor pressure gauge.**
5. **Low vapor pressure switch.**
6. **Venturi housing assembly.**
7. **Venturi vapor pressure regulator.**
8. **Venturi motive pressure gauge.**
9. **Venturi vapor solenoid valve.**
10. **Inlet safety solenoid valve.**
11. **Accumulator tank drain valve.**
12. **Venturi, isolation valve.**
13. **Control box.**
14. **Accumulator tank relief valve.**
15. **Mixed gas discharge valve (by others).**
16. **Air intake silencer.**
17. **Nozzle.**
18. **Diffuser.**
19. **Air inlet screen.**
20. **Accumulator tank.**
21. **Vaporizer relief valve.**
22.
23. **Air intake check valve assembly.**
24. **Control board assembly.**
25. **Vaporizer.**
26. **Inspection opening.**
27. **LPG inlet.**
28. **Start button.**
29. **Stop button.**
30. **Electric supply connection point.**
31. **Vaporizer temperature sensor.**
32. **Vaporizer liquid level switch.**
33. **2” Pipe nipples installed for transportation only.**
34. **Liquid inlet isolation valve.**

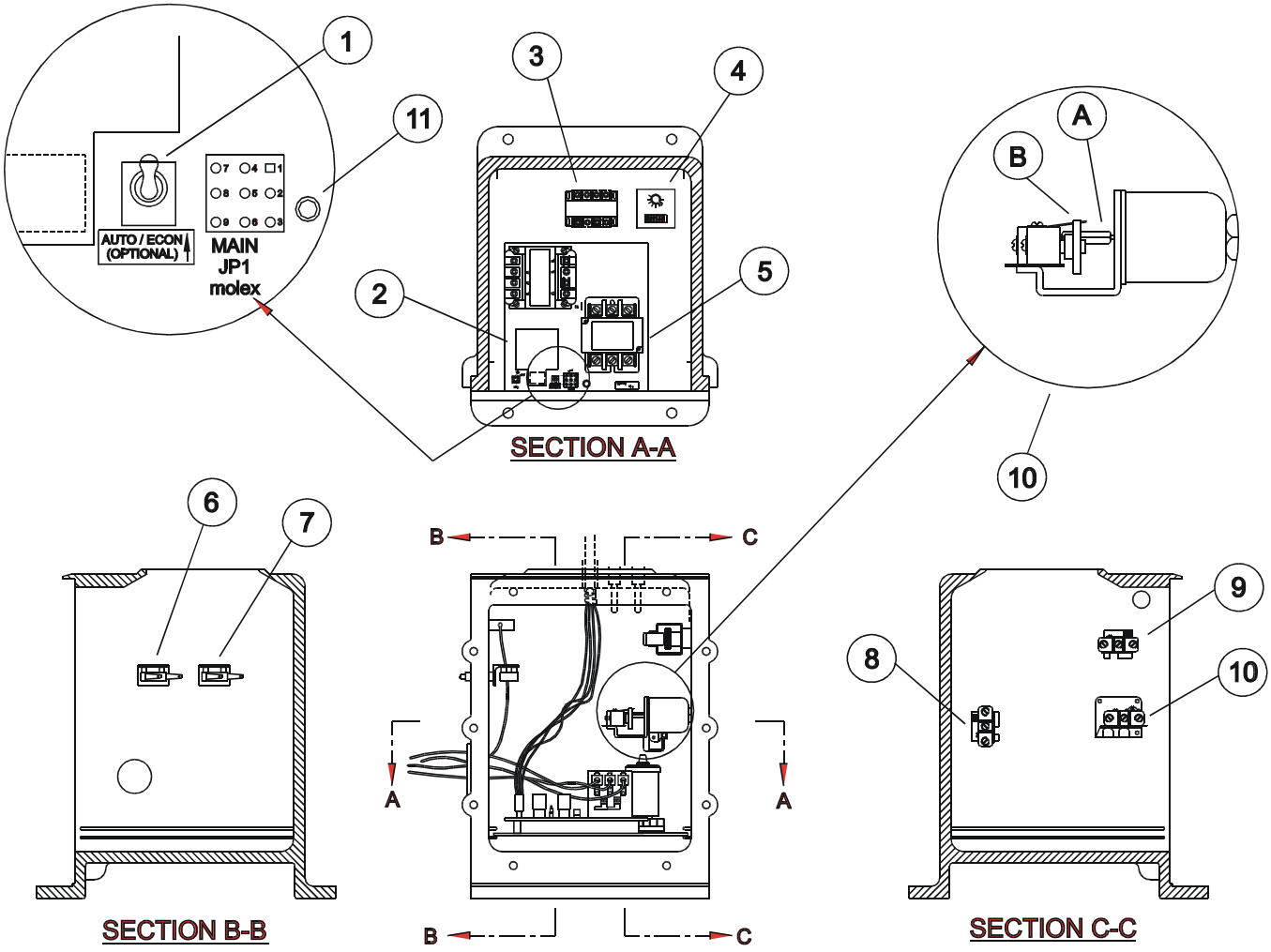
Figure 3 – *XPM Model*



XPM Major Components.wmf

1. **Venturi pressure control switch.**
2. **High tank pressure switch.**
3. **Inlet vapor pressure gauge.**
4. **Low vapor pressure switch.**
5. **Venturi housing assembly.**
6. **Venturi vapor pressure regulator.**
7. **Venturi motive pressure gauge.**
8. **Venturi vapor solenoid valve.**
9. **Inlet safety solenoid valve.**
10. **Venturi, isolation valve.**
11. **Control box.**
12. **Nozzle.**
13. **Diffuser.**
14. **Air inlet screen.**
15. **Vaporizer relief valve.**
16. **Accumulator tank mixed gas pressure adjusting screw.**
17. **Air intake check valve assembly.**
18. **Control board assembly.**
19. **Vaporizer.**
20. **LPG inlet.**
21. **Start button.**
22. **Stop button.**
23. **Electric supply connection point.**
24. **Vaporizer temperature sensor.**
25. **Vaporizer liquid level switch.**

Figure 4 – *Control Box, Models, 2.5 through 28.0*



Control Box 2.5-28.0.wmf

1. **Auto/Economy switch**
2. **Auto restart module (optional)**
3. **Venturi control circuit transformer.**
4. **Time delay relay.**
5. **Control board assembly.**
6. **Start button.**
7. **Stop button.**
8. **Low vapor pressure switch.**
9. **High tank pressure switch.**
10. **Mixed gas pressure switch.**
    - **A. Mixed gas pressure adjustment screw.**
    - **B. Mixed gas differential pressure adjustment wheel.**
11. **Contactor fuse.**

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Installation 3

XPV /XPM SYSTEM INSTALLATION PROCEDURE

The **XPV** and **XPM** systems are normally installed outside of plant buildings on a concrete pad. Consult state, provincial, insurance carriers, and local authorities for installation requirements.

For the **XPV**, install the system on a level base and secure it through the four mounting holes. Use 1/2“, grade 5 “J” bolts embedded in a concrete pad at least 6’ x 10’ x 8” thick. Install a drain valve in the plugged opening at the bottom of the surge tank. Install a manual valve after the mixed gas outlet. ***See Figure 6*** for suggested installation.

- Remove the four 2" pipe nipples that are provided for transportation purposes. ***See Figure 2, Item 33***.

ELECTRICAL

Electrical service must be provided to the control box mounted on the surge tank. See data sheet or the information tag on the unit for proper voltage and current requirements.

LIQUID LINE

Size the liquid line from the storage tank to the vaporizer to supply the vaporizer at full capacity with a minimal pressure drop. A liquid line sizing chart is provided on Table 5. Install a liquid line strainer with a magnetic plug at the vaporizer inlet.

- Connect the **LIQUID LPG LINE TO THE VAPORIZER INLET**. Back flow of liquid from the vaporizer toward the tank is part of the normal operation of the vaporizer. Do not install check valves in that line. Install an Algas-SDI Stabilaire pump system if conditions require. Also install a strainer, with magnet for iron particle pick-up, before the inlet of the vaporizer with a size 40 or smaller wire mesh screen. Install an isolation valve with hydrostatic relief on the inlet liquid line before the strainer.

XPM INSTALLATION

- For the **XPM**, install the system on a 3' x 3' x 4" thick pad. ***See Figure 7*** for suggested installation. *See Accumulator Sizing* for information on accumulator.
- Connect the sensing line from the venturi pressure control switch and high mixed gas pressure switch to an opening in the mixed gas accumulator.
- Install a pressure gauge on the mixed gas accumulator for indication. Refer to the typical installation drawing for general layout (***see Figure 7***).
- Connect the **MIXED GAS OUTLET** to the **PLANT PIPING** as required. A shut-off valve and a back check valve should be installed between the connection point and the outlet of the accumulator tank.
- Clean all foreign materials from all pipe lines prior to making final connections. All joints require a pipe sealant approved for LPG. Test for leaks using an inert gas, such as compressed carbon dioxide or nitrogen, at approximately 100 psig (7 kg/cm^2). Check all connections using an appropriate leak detection solution or device.
  EVEN VERY SMALL LEAKS ARE UNACCEPTABLE!
  ELIMINATE ALL LEAKS PRIOR TO OPERATION.

ACCUMULATOR SIZING GUIDELINES

ACCUMULATOR VOLUME (FT^3) = 3.0 x Venturi capacity (MMBtu/Hr.)

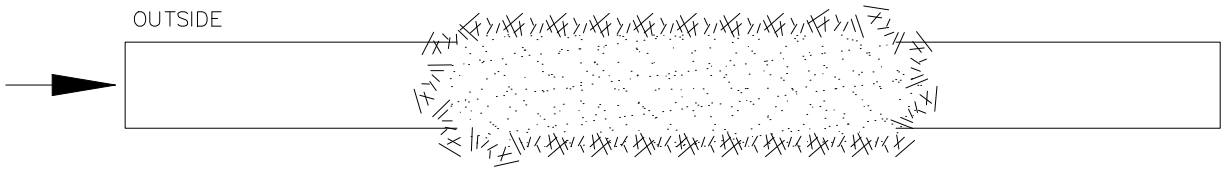
EXAMPLE:

- XPM 14.0-8
  Minimum cycle time = 1 second.
  Operating pressure band = 1 PSIG.
- **ACCUMULATOR VOLUME** (FT^3) = 3.0 x 14.0 =42 FT^3

NOTE

The minimum recommended cycle time is 1 second. The longer the cycle time the better. In this example, if the cycle time is increased to 2 seconds, the accumulator size would be 84 FT^3.

Figure 5 *– Frost on the Liquid Line*



FROST ON INLET LINE - EXCESSIVE PRESSURE DROP.

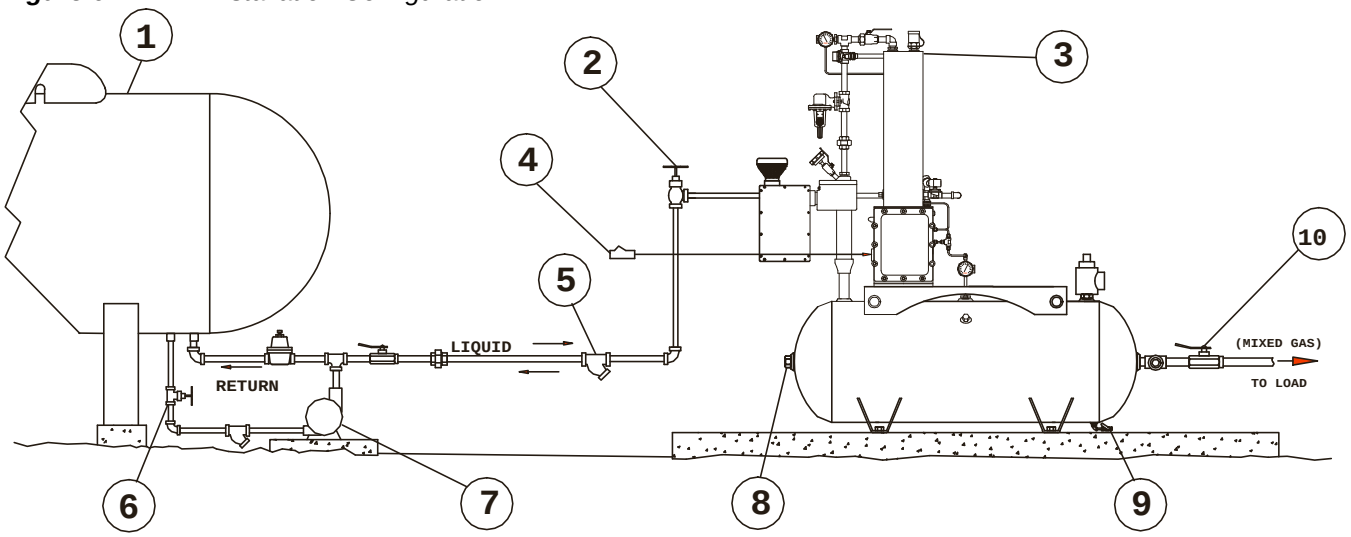
Frost.wmf

NOTE

Frost on the liquid line indicates propane is vaporizing due to a restriction that causes a pressure drop. If the inlet pipe is too small, the LPG vaporizes before it enters the vaporizer causing a drastic drop in efficiency. Wrong size inlet pipes can reduce output as much as 50%. When referring to the line sizing chart, note that the pipe sizes recommended are minimum size. Restrictive valves or other devices may also cause a pressure drop in the liquid line resulting in a frosting of the line.

If pressure drop is excessive a liquid pump may be required.

Figure 6 — *XPV Installation Configuration.*



XPV Installation.dxf

***1. LPG storage tank.**

***2. Isolation valve with hydrostatic relief.**

3. XPV packaged vaporizing/mixing system.

***4. Electrical supply, seal-off required.**

***5. Strainer with magnet plug for iron particle pick up.**

***6. Isolation valve.**

7. Pump (optional), Algas-SDI Stabilaire.

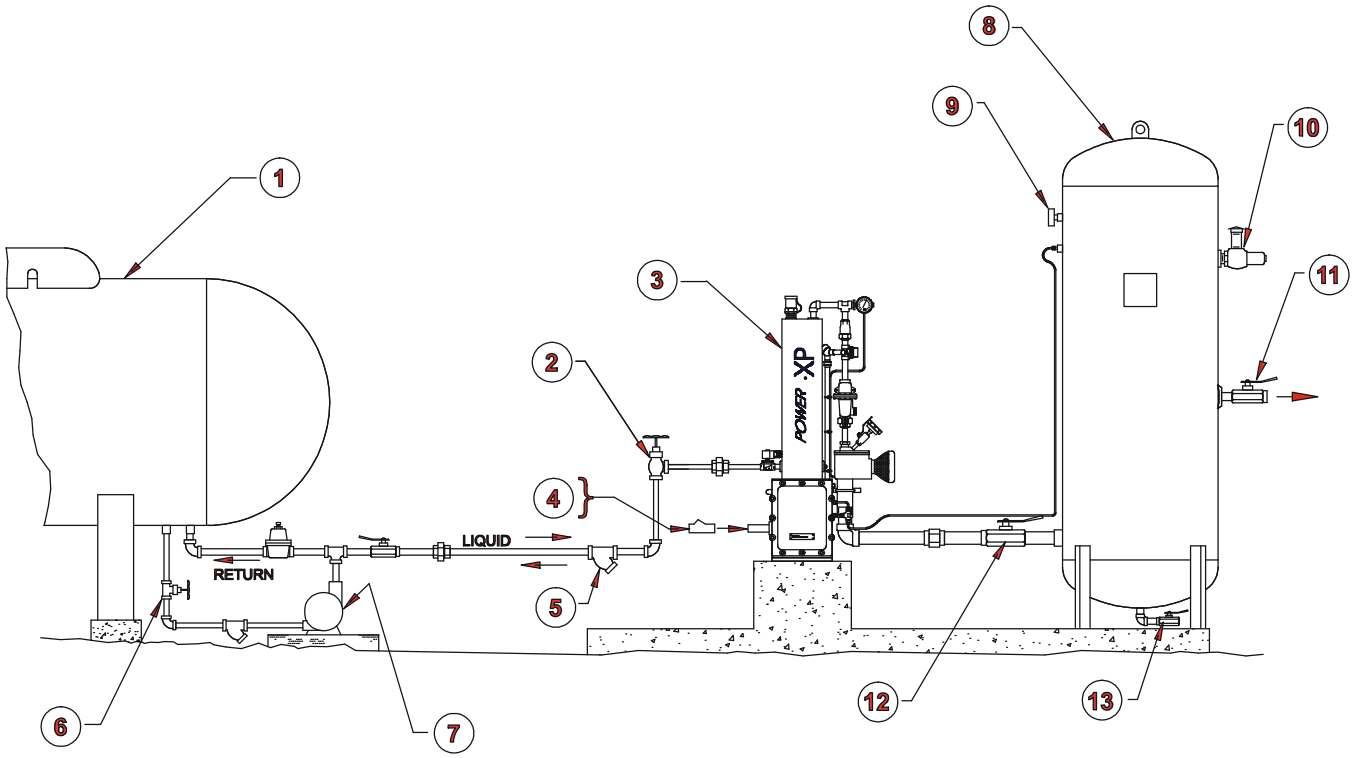
8. Inspection opening.

***9. Drain valve.**

***10. Outlet shut-off valve.**

**Customer supplied.*

Figure 7 *— XPM Installation Configuration.*



XPM Installtion.wmf

***1. LPG storage tank.**

***2. Isolation valve with hydrostatic relief.**

3. XPM packaged vaporizing/mixing system.

***4. Electrical supply, seal-off required.**

***5. Strainer with magnetic plug for iron particle pick up.**

***6. Isolation valve.**

7. Pump (optional), Algas-SDI Stabilaire.

***8. Surge tank.**

***9. Pressure gauge.**

***10. Relief valve.**

***11. Accumulator tank outlet valve.**

***12. Mixer outlet shut-off valve.**

***13. Drain valve.**

**Customer supplied.*

LIQUID PUMP

Pressure in the LPG storage tank depends on ambient temperature. Install an Algas-SDI **Stabilaire** liquid pump beneath the storage tank if the lowest ambient temperature will not provide enough pressure from the tank to supply your specific system. Refer to the data sheet provided with the unit to determine the pressure required for your specific system. The pump should be set up to supply LPG at a constant pressure, regardless of the flow rate.

SAFETY RELIEF VALVE

Always install the raincap or similar device (if removed) to prevent water and other debris from entering the relief valve discharge port. If water enters, it may freeze and prevent the relief valve from proper discharge, creating a potentially hazardous situation.

ELECTRICAL SERVICE

The data sheet provides proper electrical power requirements, wiring diagrams and schematics. This unit meets Class I,
Division 1, Group D requirements. Wiring to the unit must meet the applicable codes for the area in which it is being installed. Provide a fused disconnect outside of the classified area. If it is not within sight of the system, it must have a locking device. Run wire within rigid conduit (***see Tables 1 - 4*** for recommended wire sizing charts), and install an adequately sized seal-off at the connection of the field conduit to the vaporizer.

DETERMINING WIRE LENGTH AND SIZE

When selecting the type and size of wire used to install the XPV & XPM vaporizer/mixers, please take into account the following environmental information.

- Maximum enclosure surface temperature: 65° C (150° F)
- Maximum enclosure ambient temperature: 65° C (150° F)
- Maximum temperature allowed at contactor terminals: 90° C (195° F)
- Current draw of vaporizer: Indicated on individual rating plate
- Contactor terminal lug wire size range: #2 - 10

As the length of the wire run affects the overall wire size requirements, always refer to NFPA 70 (NEC) for proper wire selection. Several wire sizing charts have been provided for determining the size of wire required due to load and length of wire.

When installing the wire it is important to have a good connection at the terminal lugs. Loose terminations may cause an excessive temperature rise at the terminal lugs which can lead to premature contactor failure, transformer failure, and/or overheating and possible destruction of the transformer. For this reason it is strongly recommended that the wire terminations be checked and re-tightened periodically to prevent excessive overheating at the terminals due to loose connections.

Table 1 *– Wire Length Chart [#4 AWG]*

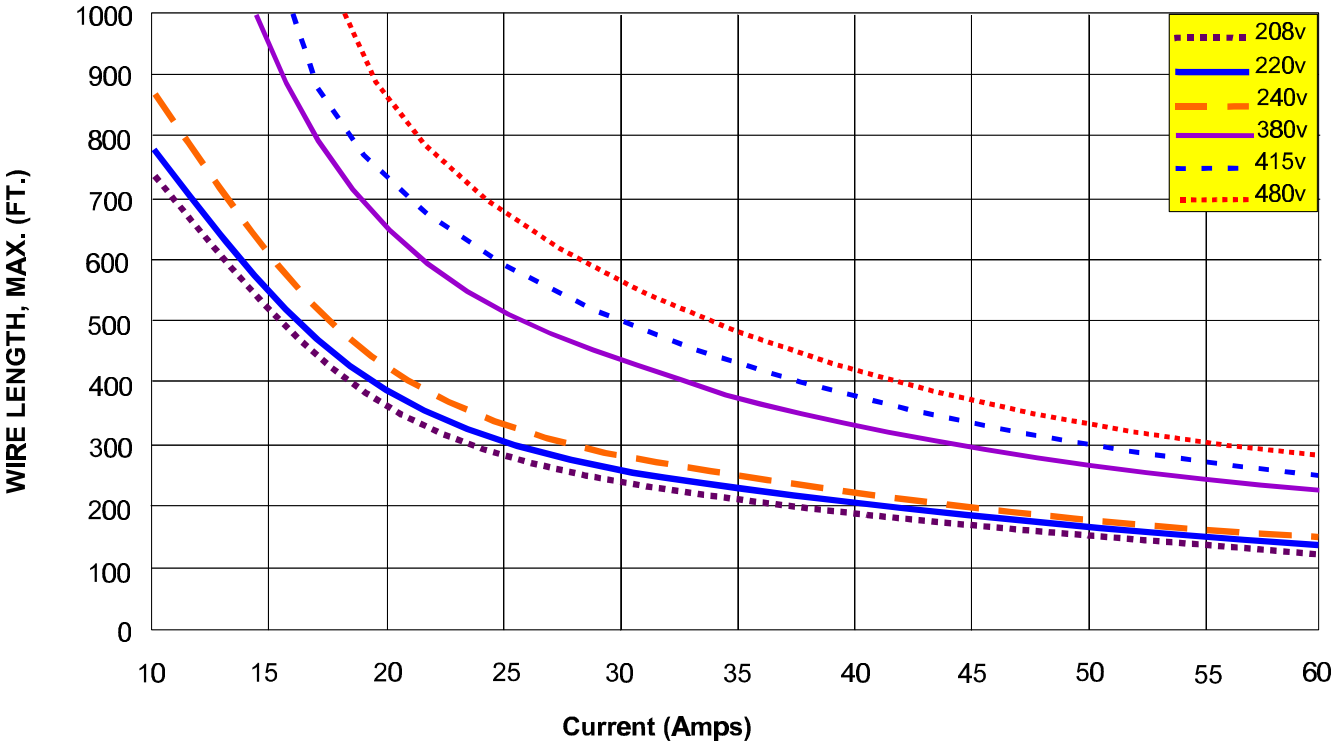


Table 2 *– Wire Length Chart [#6 AWG]*

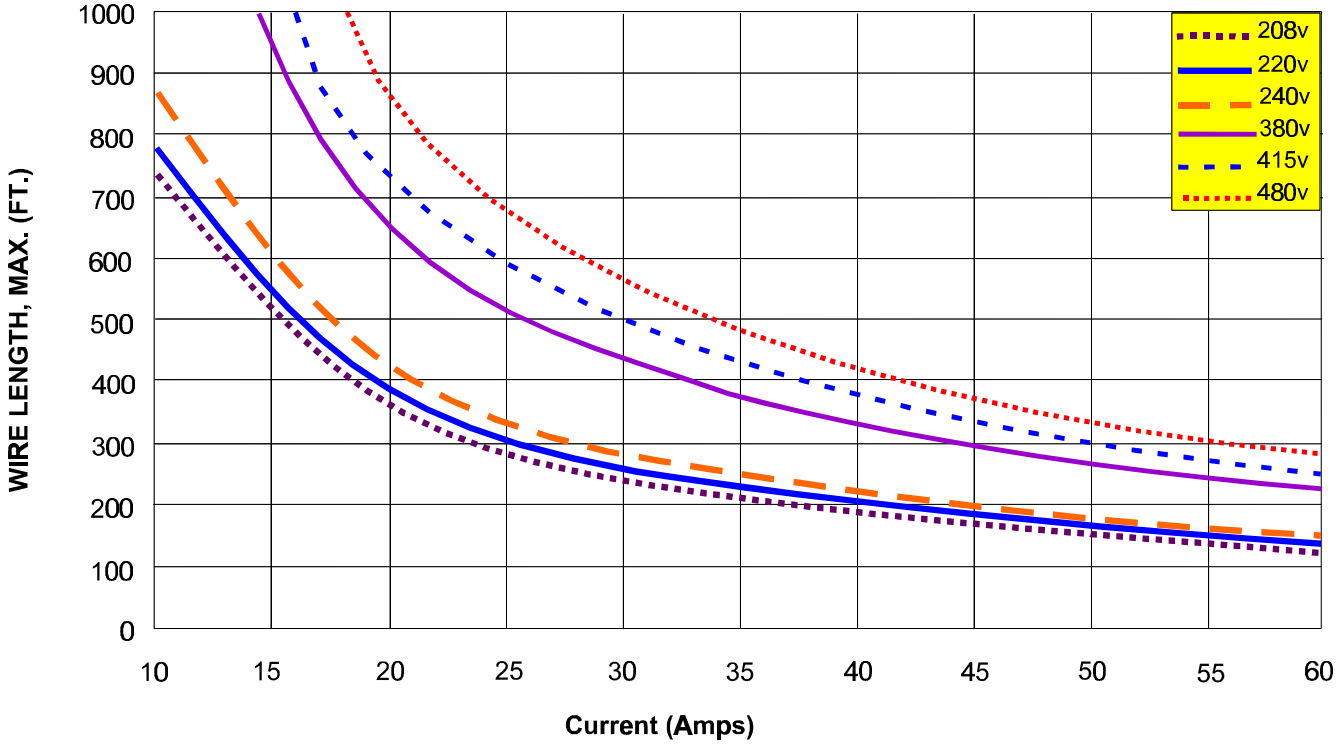


Table 3 *– Wire Length Chart [#8 AWG]*

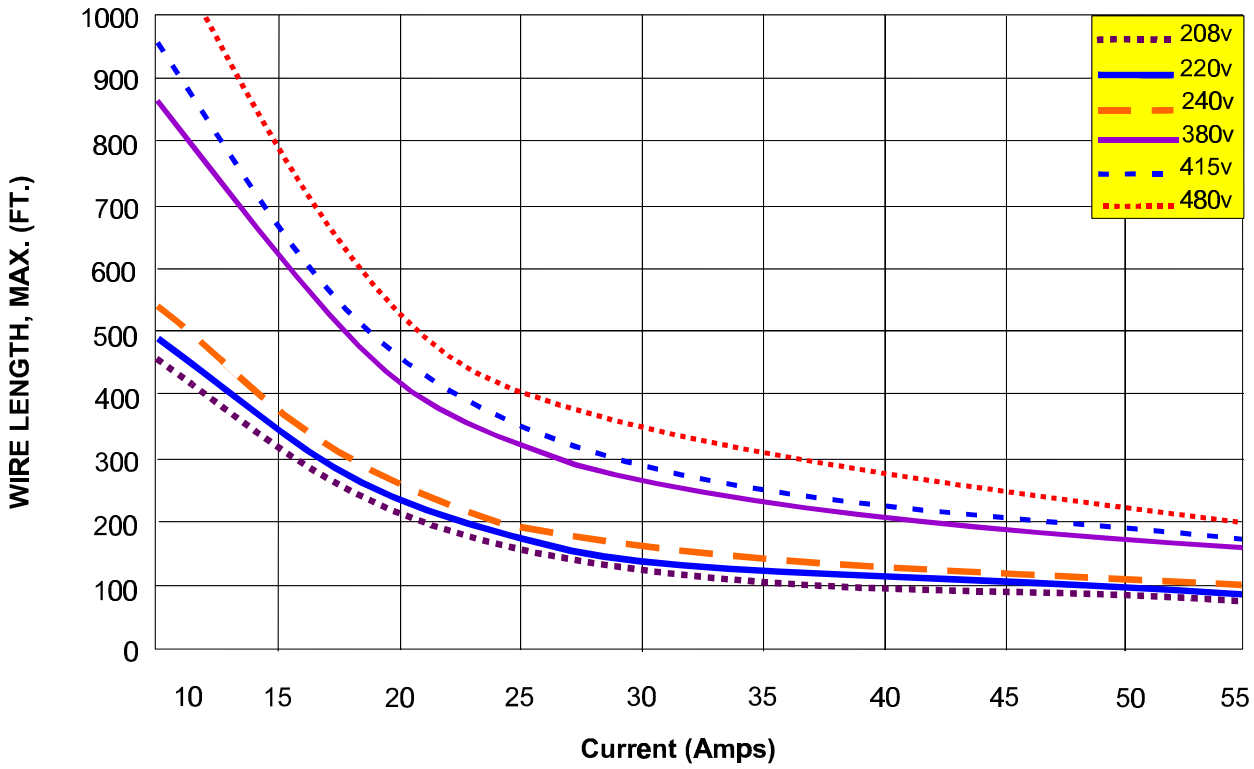
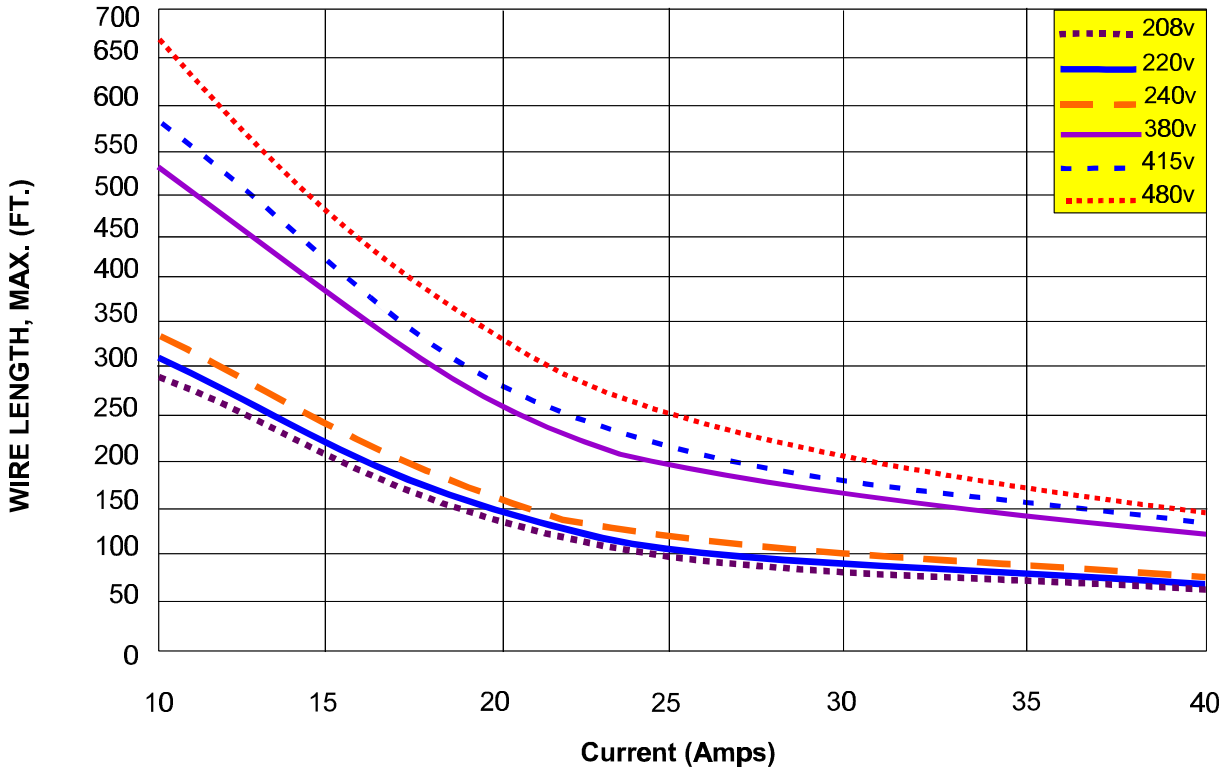


Table 4 *– Wire Length Chart (#10 Awg)*



NOTE

**** Recommended minimum AWG wire size, based on one conductor per phase, three line conductors maximum per conduit, 75 °C rated wire, and a maximum wire length of 150 ft. Wire sizing must be based on 125% of rated load and 3% maximum voltage drop. Use class B or class C stranded wire with untinned ends.***

***** Dual vaporizer/mixer units must have two power feeds.***

Table 5 *– LPG Liquid Line Sizing Chart (minimum pipe size)*

System Size	Distance in feet from storage to vaporizer							
	25	**50**	**75**	**100**	**150**	**200**	**300**	**400**
XPV/XPM 2.5 Through XPV/XPM 10.5	¾"	¾"	1"	1"	1"	1¼"	1¼"	1¼"
XPV/XPM 10.5	1"	1"	1¼"	1¼"	1¼"	1½"	1½"	1½"
XPV/XPM 14.0	1"	1¼"	1¼"	1¼"	1¼"	1½"	1½"	1½"
XPV 21.0	1"	1¼"	1¼"	1¼"	1½"	1½"	1½"	1½"
XPV 28.0	1¼ "	1¼ "	1¼ "	1½ "	1½ "	1½ "	1½ "	1½ "

* Add equivalent length of all values and fittings to the length of pipe.

Use this value from these tables to determine minimum pipe use.

Table 6 *– Equivalent Pipe Length of Various Valves and Fittings (length in feet)*

Size/Description	½"	¾"	1"	1 ¼"	1 ½"
Globe Valve	15.5	21	27	36	43
Gate Valve	0.6	0.8	1	1.4	1.6
Angle Valve	8	11	14	18	21
Elbow, 90	1.4	1.9	2.4	3.2	3.8
Elbow, 45	0.7	1	1.2	1.6	2
Elbow, 90 STR	2.3	3.1	4	5.3	6.3
Tee	2.7	3.7	4.8	6.4	7.5

Table 7 *– Liquid Temperature vs. Tank Pressure Chart*

Liquid		Propane		Butane	
Temperature		Tank Gauge Pressure		Tank Gauge Pressure	
°F	°C	PSI	KPa	PSI	KPa
-43.73	-41.65	0	0		
-40	-39.6	1.3952	9.6196		
-30	-36.85	3.421	23.5871		
-30	-34.1	5.639	38.877		
-25	-31.35	8.06	55.57		
-20	-28.6	10.697	73.751		
-15	-25.85	13.561	93.503		
-10	-23.1	16.666	114.91		
-5	-20.35	20.024	136.06		
0	-17.6	23.648	163.05		
5	-14.85	27.551	189.96		
10	-12.1	31.747	218.88		
15	-9.35	36.248	249.92		
20	-6.6	41.068	283.15		
25	-3.85	46.222	318.69		
30	-1.1	51.723	356.67		
35	1.65	57.586	397.04	1.25	8.6185
40	4.4	63.825	440.06	2.92	20.133
45	7.15	70.455	485.77	4.82	33.233
50	9.9	77.49	534.27	6.85	47.229
55	12.65	84.945	585.68	9	62.053
60	15.4	92.836	640.08	11.32	78.049
65	18.15	101.179	697.6	13.82	95.286
70	20.9	109.988	758.34	16.5	113.76
75	23.65	119.28	822.4	19.3	133.07
80	26.4	129.0715	889.91	22.44	154.72
85	29.15	139.737	963.45	25.81	177.95
90	31.9	150.215	1035.7	29.21	201.4
95	34.65	161.603	1114.21	32.67	225.25
100	37.4	173.558	1196.64	36.67	252.83
105	40.15	186.098	1283.1	41.02	282.82
110	42.9	199.241	1373.72	46.57	321.09
115	45.65	213.007	1468.63	50.28	346.67
120	48.4	227.414	1567.96	55.28	381.14
125	51.15	242.483	1671.86	60.53	417.34
130	53.9	258.235	1780.47	66.13	455.95
135	56.65	274.691	1893.93	72.13	

NOTE:

Below 30° F or –10 C, Butane is a liquid at normal atmospheric pressure

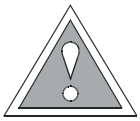
WARNING

The contactor that powers the heaters produces sparks which may ignite any propane vapors in the area when the control box cover is removed. If the cover must be removed, first shut off the power, remove the cover and check very carefully for LPG fumes, leaks or any indication of LPG in the atmosphere.

Do not re-apply power if LPG fumes are present.
They may ignite!

Keep a fire extinguisher available in the immediate vicinity before re-applying power when the control cover is removed.

CAUTION



Piping may be hot!

XPV / XPM normal operating temperature is about 195°F [90°C]. LPG vapor piping may approach this temperature under some conditions.

FOR YOUR SAFETY — IF YOU SMELL GAS:

- DO NOT TOUCH ANY ELECTRICAL SWITCHES.
- EXTINGUISH ANY OPEN FLAME.
- SHUT OFF GAS SUPPLY IMMEDIATELY.
- SHUT OFF POWER THROUGH A REMOTE DISCONNECT.

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Operations and Start-Up Instructions

VAPORIZER/MIXER OPERATION AND START-UP

- Complete installation and leak test.
- Turn on the customer provided **DISCONNECT** for the equipment.
- Check for correct **VOLTAGE** to the system.
- Manually close the **MIXED GAS OUTLET VALVE** which is located at the outlet of the accumulator tank. ***See Figure 2, Item 15***.
- Manually close **VENTURI ISOLATION VALVE**, which is located after the outlet of the vaporizer before the **VENTURI VAPOR PRESSURE REGULATOR**. ***See Figure 2, Item 12***.

NOTE

This unit will not be damaged by operating the unit in a "dry" condition. It is not necessary to have LPG in the unit for testing or evaluation.

- Drain the **ACCUMULATOR TANK**, check that no moisture or oils are present, re-close the valve. ***See Figure 2, Item 11***.
- Open all valves between the LPG storage tank and the vaporizer to allow liquid flow to the vaporizer. If a pump is required to achieve the necessary vapor pressure, start the pump and check the outlet pressure. Refer to the data sheet provided for required vapor pressure.
- Push the **START** button on the vaporizer. The vaporizer heater elements will then be energized, heating the body. When the core temperature attains 130°F. (54°C), the inlet solenoid valve will automatically energize and the valve will open allowing liquid to enter the vaporizer body. It should take about 60 seconds to reach a ready condition.
- Check the **VAPOR PRESSURE GAUGE** to verify the proper LPG vapor pressure. ***See Figure 2, Item 4***.
- Open the **VENTURI ISOLATION VALVE.** ***See Figure 2, Item 12***.
- The venturi will cycle, raising the pressure in the mixed gas accumulator to the preset level. The unit is now ready to supply mixed gas and opening the outlet shutoff valve will allow mixed gas to flow. The heaters and venturi(s) will cycle automatically to match flow conditions while the accumulator tank will insure continuous mixed gas supply.
- Refer to BTU adjustment procedure in Chapter 5 - Maintenance, for proper method for setting the venturi trains. The pressure has been set initially at the factory; however, slight adjustments may be required due to altitude or vibrations from shipping.
- The system is now ready for operation.
- Refer to Chapter 6 - Troubleshooting, for any problems.

Stopping the System

- For Temporary Shutdown (1 – 2 hours)
  1. Close the mixed gas outlet valve (***see Figure 2, Item 15***).
  2. Shut off the liquid propane pump (if you are using one).
  3. Press the **STOP** button on the control enclosure(s).
- For Extended Shutdown (do these steps in sequence)
  1. Close the mixed gas outlet valve (***see Figure 2, Item 15***).
  2. Close the venturi isolation valve(s) on the mixer gas train (***see Figure 2, Item 12***).
  3. Shut off the liquid propane pump (if you are using one).
  4. Close the liquid inlet isolation valve (***see Figure 6, Item 2***).
  5. Press the **STOP** button on the control enclosure(s).

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Maintenance 5

The XPV / XPM packaged vaporizing/mixing system is designed for long term trouble-free operation. Considering the nature of system use, with heavy prolonged workloads, it is very important to provide scheduled maintenance. ASDI provides a **RECOMMENDED SPARE PARTS** list located at the back of this manual for ordering ease when replacing components.

Table 8–*Maintenance Schedule*

Item	1 Month	3 Months	6 Months	Annual
*Liquid LPG inlet strainer	Clean		Check as conditions require	Check as conditions require
Safety relief valve(s)				Visually check. Replace if any leakage is observed.
Inlet solenoid				Change the diaphragm and operating parts if the unit is being used regularly or if the valve makes unusual noises (i.e. buzzing, etc.) during operation See the enclosed maintenance and operation sheet for ASCO 2-way valves replacement procedure. (Appendix A)
Electric wiring and connections			Check primary terminal lug tension	Visually inspect for corrosion, loose wires, heat buildup and charring
Low vapor pressure switch setpoints				Verify against the values on the data sheet
High tank pressure switch setpoints				Verify against the values on the data sheet
Venturi check valve assembly	Check for leaks			Inspect clevis assy., clevis bolt, valve arm & valve surface. Replace if worn.
Motive pressure (pressure at the venturi) set point		Check setting		

Adjustment Procedures for System Operating and Safety Controls

All of the controls (except for the venturi regulator) are preset at the factory. However, vibration in transportation may alter the settings or it may be desirable to change the system delivery pressure (within the range of the installed venturi). Thus the control settings may need to be checked or readjusted. Any replaced controls will also require adjustment.

WARNING

The pressure control switch (1) is mounted in an explosion-proof control box (13). The box also contains electronic devices capable of producing electrical sparks when they are activated. Power to the control box must be turned off at a remote disconnect before the cover is removed. Check for propane leaks before applying power.

WARNING

DO NOT APPLY POWER IF LPG FUMES ARE PRESENT. THEY MAY IGNITE!

WARNING

DO NOT attempt to adjust the pressure switches with the power turned on.

WARNING

Always have a fire extinguisher handy when operating with the control enclosure open.

MOTIVE PRESSURE (Pressure at the Venturi)

SET PRESSURE OF THE VENTURI REGULATOR

The initial motive pressure for the venturi is stamped on the base of the venturi housing. This pressure is adjusted using the vapor pressure regulator on the LPG vapor train. The adjustments should be made with the system in operation, using a BTU METER while adjusting the motive pressure and monitoring BTU meter to attain a 1450 BTU/cu. ft. mix.

Table 9 *– Pressure Requirements & Settings*

Propane Pressure Requirement Data		
Mixed air/propane delivery Pressure psig (kg/cm2)	**Inlet vapor pressure psig (kg/cm2)**	***Nozzle motive pressure psig (kg/cm2)**
5.0 (.35)	31.0-55.0 (2.18-3.87)	28.0-43.0 (1.97-3.02)
8.0 (.56)	74.0-85.0 (5.20-5.98)	70.0-74.0 (4.92-5.20)
10.0 (.70)	99.0-123.0 (6.96-8.65)	95.0-117.0 (6.68-8.23)
12.0 (.84)	117.0-136.0 (8.23-9.56)	114.0-135.0(8.01-9.49)
For butane models refer to equipment data sheet provided.		

**Refer to data sheet for specific settings. Contact factory for additional information and data about butane/propane LPG mixtures.*

SYSTEM DELIVERY PRESSURE: VENTURI PRESSURE CONTROL SWITCH

The Venturi Pressure Control Switch (Mixed Gas) is wired normally closed and is set to open according to ***Table 10***. The system delivery pressure is adjustable within the range of the installed venturi. The on/off and differential pressures are set by means of the mixed gas pressure adjustment screw and mixed gas differential pressure adjustment wheel. ***See Figure 4 Item 10, Chapter 2 - Major Component Drawings***. To adjust the switch, use a 1/4“ open end wrench. Turn the main adjustment screw counterclockwise to lower the setpoint or clockwise to raise the setpoint. Turn the adjusting screw until the “on” setpoint is reached, then set the differential adjustment wheel for a deadband (off) of .75 to 1 PSI. A typical deadband setting is between E and F. ***See Chapter 6 - Troubleshooting***, for replacing the mixed gas pressure control switch.

Table 10 *– System Delivery Pressure Setpoints*

System Delivery Pressure Setpoints						
XPV 2.5 - XPV 14.0						
Delivery Pressure	**Venturi “ON” (psig)**		**Venturi “OFF” (psig)**		**Deadband**	**Deadband Position**
#5	5		5 ¾ - 6		.75 - 1	E - F
#8	8		8 ¾ - 9		.75 - 1	E - F
#10	10		10 ¾ - 11		.75 - 1	E - F
#12	12		12 ¾ - 13		.75 - 1	E - F
XPV 21.0 - XPV 28						
Delivery Pressure	**#1 ON (psig)**	**#1 OFF (psig)**	**#2 ON (psig)**	**#2 OFF (psig)**	**Deadband**	**Deadband Position**
#5	5	5 ¾	5 ¼	6	0.75	E - F
#8	8	8 ¾	8 ¼	9	0.75	E - F
#10	10	10 ¾	10 ¼	11	0.75	E - F
#12	12	12	12 ¼	13	0.75	E - F

HIGH TANK PRESSURE SWITCH

The High Tank Pressure Switch is wired normally closed and is set to open at a set safety pressure, ***See Figure 4, Item 9.*** The pressure switch is located in the control box. To set, turn the adjusting wheel to approximate the setting shown on the indicator scale on the switch. The setpoints for the high tank pressure switch in the control box are as follows.

Table 11 *– High Tank Pressure Switch Setpoints*

High Tank Pressure Switch Setpoints	
Mixed air/propane delivery pressure	**High tank pressure switch**
5 psig	8 psig
8 psig	11 psig
10 psig	13 psig
12 psig	15 psig

LOW VAPOR PRESSURE SWITCH

The Low Vapor Pressure Switch is wired normally open and is set to close when there is adequate vapor pressure to operate the venturi, ***See Figure 4, Item 8***.
With the system operating, slowly throttle the vaporizer LPG vapor outlet valve. This reduces the LPG vapor pressure being sent to the mixer. Observe the LPG vapor pressure gauge and note the pressure at which the low vapor pressure switch opens and disables the venturi solenoid valve.
To set the low vapor pressure switch, turn the adjusting wheel to the approximate setting shown on the indicator scale on the switch body. Refer to the data sheet for set point information. Repeat the process to verify the setpoint. Note the low vapor pressure switch only disables the venturi solenoid valve and does not shut off the XPV/XPM.

Venturi Check Valve Replacement Instruction

If the venturi check valve leaks or the pivot mechanism operates poorly, the venturi check valve assembly must be replaced. Follow the procedure below to replace the venturi check valve and pivot arm.

NOTE

If replacement venturi check valve is not assembled, follow below instructions:

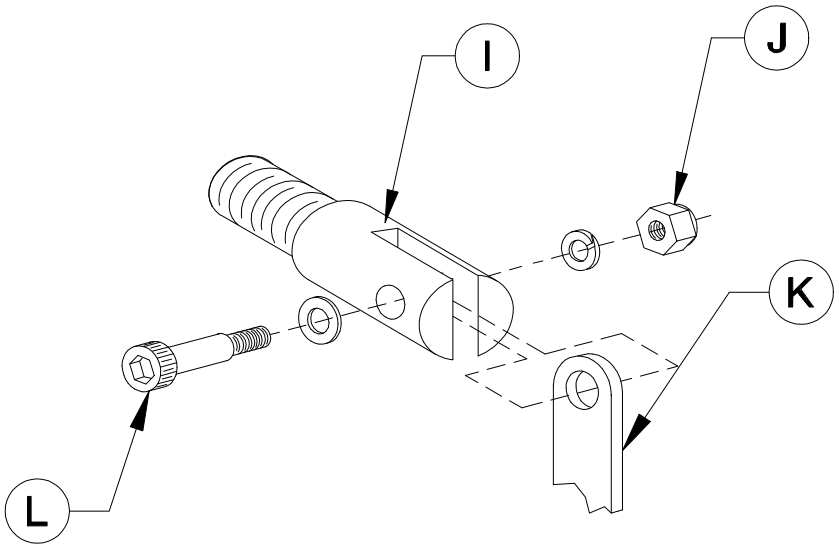


Figure 8 *- Venturi Check Valve Detail*

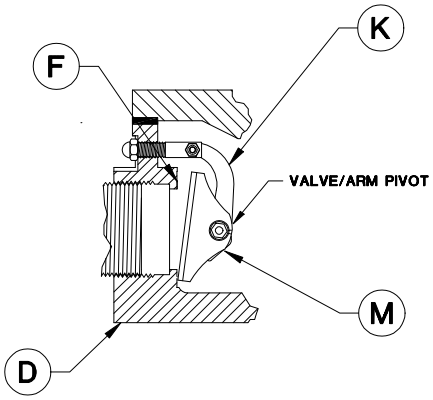
1. After the existing check valve (A) has been removed, examine the machined seating surface (F) on the venturi housing (D) to be sure the surface is clean and without flaws.

2. Screw the clevis (I) into the housing, using Permatex No. 2 or equivalent on the threads, until 3 –3 ½ threads are exposed outside of the housing (D). Do not use a screwdriver or other prying device to install the clevis. Clean any excess Permatex from clevis slot.

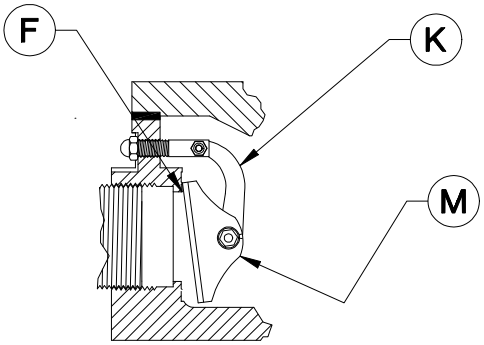
3. Insert the check valve arm (K) into the slot of the clevis and connect the two pieces with the clevis/arm pivot screw (L) through the aligned holes. Be sure that the lock washer and a flat washer are inserted on the lock nut end (with the flat washers are inserted on either side of the clevis. Tighten the lock nut (J), allowing for free swing of the arm .

4. Check for proper clevis installation as follows:

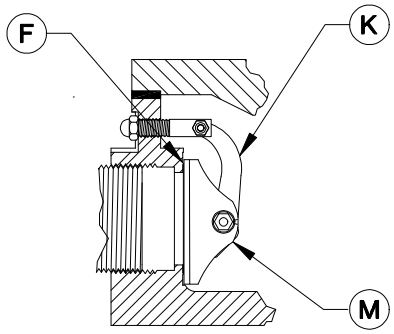
- With the arm (K) raised, rotate the valve (M) around the valve/arm pivot so that the edge of the valve nearest the clevis is lowered without allowing the valve (M) to turn around the valve/arm pivot, only the lower part of the valve should contact the seating surface (F).



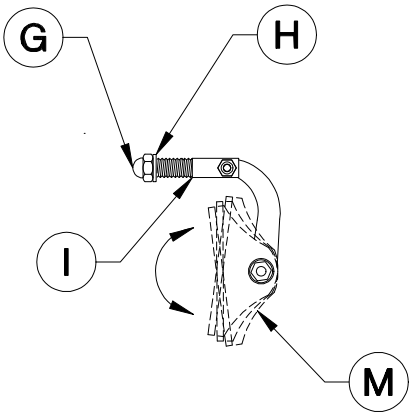
- With the valve (M) rotated to the other extreme position around the valve/arm pivot, lowering the arm (K) should cause only the upper part of the valve (M) to contact the seating surface (F).



Lower the arm (K) a third time, allowing free rotation of the valve (A). The valve (M) should be able to contact the seating surface (F) uniformly all around.



- If the valve does not contact the seat as described above, reposition the clevis (I) in the housing (D). At least three threads must be exposed for proper installation of the acorn nut (G).



5. Place sealing washer (H) onto clevis (I) then tighten the acorn nut (G) onto the clevis (I) outside the housing (D), making sure that when the nut is tight, the valve is centered. Do not use any tools on the clevis inside the housing, or on the or valve. It may be helpful to start with valve offset to the side and allow it to rotate to its centered position while tightening the acorn nut (G).

6. Tighten the lock nut (J) on the clevis/arm pivot screw until the arm is tight in the clevis. Then slowly loosen the lock nut just until the arm can swing freely. Check that the valve is centered and clears the housing on both sides.

7. Install the venturi housing lid (B)), using a new gasket (C). Apply white Lithium grease to gasket & threads.

8. Apply pressure to the unit and check for leaks around the lid and around the check valve. Initially a small leak may occur around the check valve, but after a few cycles the leak should correct itself. If it persists, remove the lid and re-check the seating surfaces and the alignment.

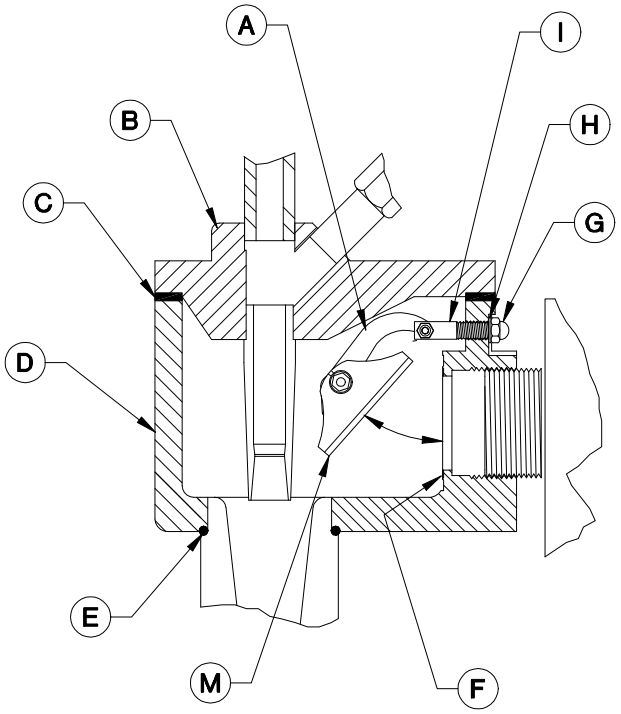


Figure 9 *–Venturi Check Valve Assembly*

Venturi Check Valve.dxf

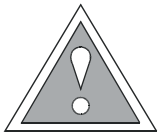
A. Venturi check valve assembly.
B. Venturi housing cover
C. Gasket.
D. Venturi housing.
E. Diffuser O-ring.
F. Seating Surface
G. Acorn Nut
H. Sealing Washer
I. Sealing washer
J. Lock Nut
K. Flapper Arm
L. Pivot Screw
M. Flapper

NOTE

As with all components containing materials subject to deterioration, the venturi check valves should routinely be checked and replaced as necessary. A minimum annual inspection should be conducted.

LEAK CHECK PROCEDURE FOR VENTURI CHECK VALVES

- Remove silencer from venturi.
- Build up pressure in the surge tank to the system operating pressure, shut off the system, close the inlet valve, and disconnect all power.
- Use either a gas detector or a soapy solution applied to the check valve and seat to determine if there is a leak.
- If there is a slight leak from the venturi check valve, tapping the valve open quickly with a screwdriver or suitable tool may dislodge a small particle on the lip of the valve. Otherwise the venturi must be disassembled to adjust the check valve pivot arm as outlined in the previous procedure.
- When assembling the silencer into the venturi housing, use an anti-seize compound on the threads.



WARNING

LPG is heavier than air and LPG vapor either mixed with or without air will "pool" in low areas without ventilation or wind. Check potential pooling areas with a gas detector if gas is suspected.

BTU ADJUSTMENT PROCEDURE XPV/XPM

The BTU adjustment procedure must be done on initial start-up to assure proper mixed gas BTU value.

Connect your BTU analyzer to the surge tank test port.

If your system has two venturis, shut one of them off using the venturi inlet hand valve (***see Figure 2 Item 12***), and adjust each one separately.

With your system running, establish a load such that the venturi is on 50% of the time and off 50% of the time. Adjust the venturi regulator until the venturi motive pressure is at the pressure stamped on the venturi housing or the pressure called out on your data sheet. This is a starting point for adjusting the BTU value of your mixed gas.

Monitor your BTU instrument and set the venturi regulator until you have the appropriate mix of propane/air (in most cases 1450 BTU's per cubic foot, or 1.30 specific gravity).

If you have a second unit, turn it on and shut this one off. Adjust the second one the same as above.

Due to the physical properties of the venturis, as the motive pressure increases, the LPG flow increases accordingly. If the motive pressure is set too high, it may overdraw the vaporizer. A general rule is, do not exceed the motive pressure stamped on the venturi housing by more than 5 PSIG.

Increase the system load and verify the mixed gas BTU value.

Disconnect your test equipment and return the system to operation.

Troubleshooting Guide

6

The troubleshooting guide for the Algas-SDI **XPV/XPM VAPORIZER/MIXING SYSTEM** is presented in seven trees:

- TREE #1 – System Does Not Start.
- TREE #2 – No Reaction When Start Switch is Pressed.
- TREE #3 – Contactor Closes When the Start Button is Pressed, But Drops Out When the Button is Released.
- TREE #4 – Vaporizer Starts But Venturi/Mixer Does Not Operate.
- TREE #5 – XPV Starts, Cycles Once, and Shuts Down.
- TREE #6 – LPG Liquid Solenoid Valve Does Not Open.
- TREE #7 – Unit Operates But Shuts Off Intermittently.

Additional information on replacing and adjusting components can be found in the vendor parts information in Appendix A.

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WARNING

High voltage is present throughout the control enclosure even if the unit is turned off! You must shut off the power at the disconnect before you can safely reach into the enclosure to do anything!

WARNING

The contactor that powers the heaters produces sparks which may ignite any propane vapors in the area when the control box cover is removed. If the cover must be removed, shut off the power, remove the cover and check very carefully for LPG fumes or any indication of LPG in the atmosphere.

WARNING

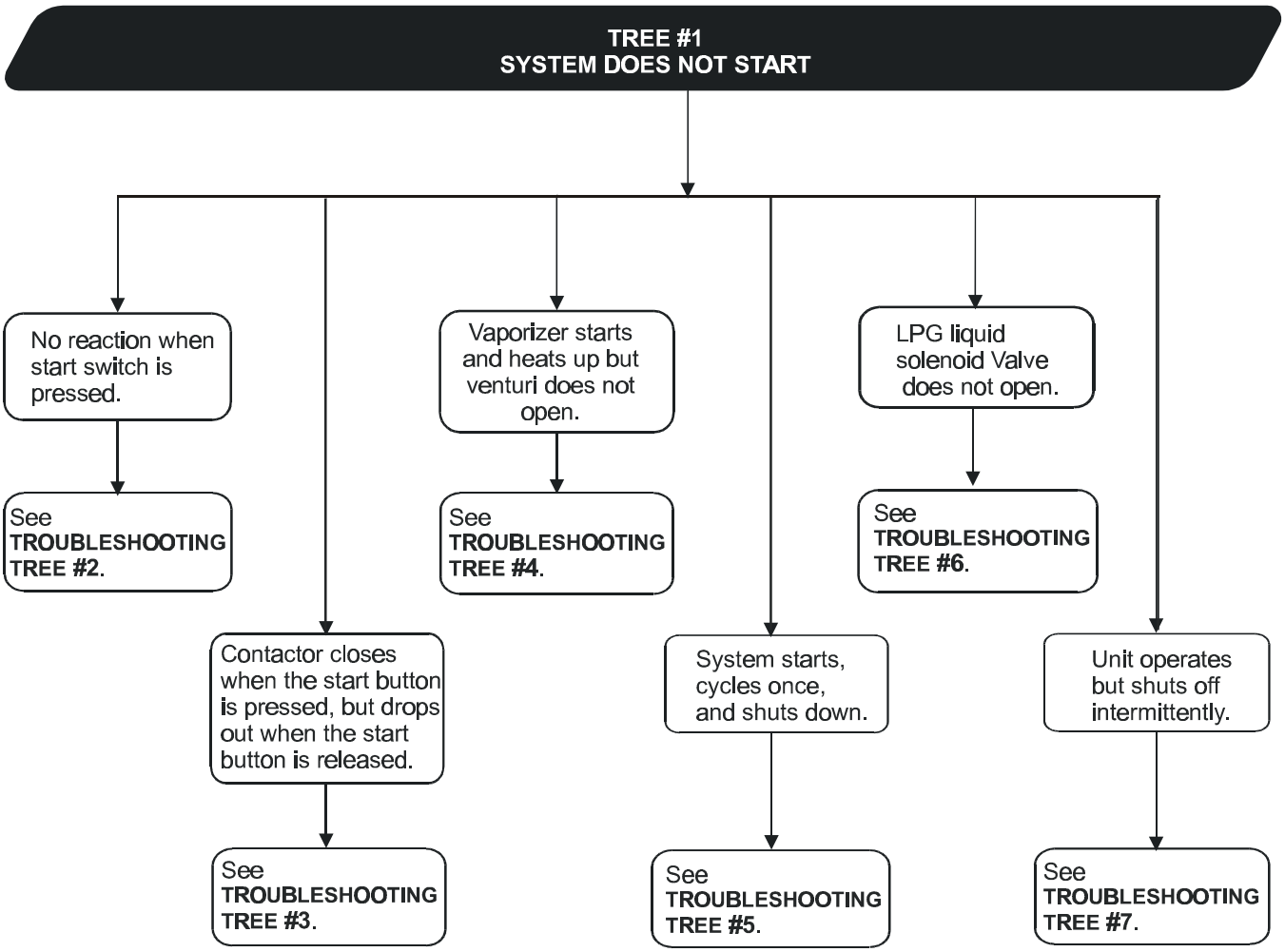
Do not re-apply power if LPG fumes are present. They may ignite!

WARNING

Keep a fire extinguisher available in the immediate vicinity before re-applying power when the control cover is removed.

NOTE

Do not test AC power by going from the ground to the power lead. This could produce an erroneous reading. Check from one power lead to another.


TREE #1
SYSTEM DOES NOT START
No reaction when start switch is pressed.
See TROUBLESHOOTING TREE #2.
Vaporizer starts and heats up but venturi does not open.
See TROUBLESHOOTING TREE #4.
LPG liquid solenoid Valve does not open.
See TROUBLESHOOTING TREE #6.
Contactor closes when the start button is pressed, but drops out when the start button is released.
See TROUBLESHOOTING TREE #3.
System starts, cycles once, and shuts down.
See TROUBLESHOOTING TREE #5.
Unit operates but shuts off intermittently.
See TROUBLESHOOTING TREE #7.

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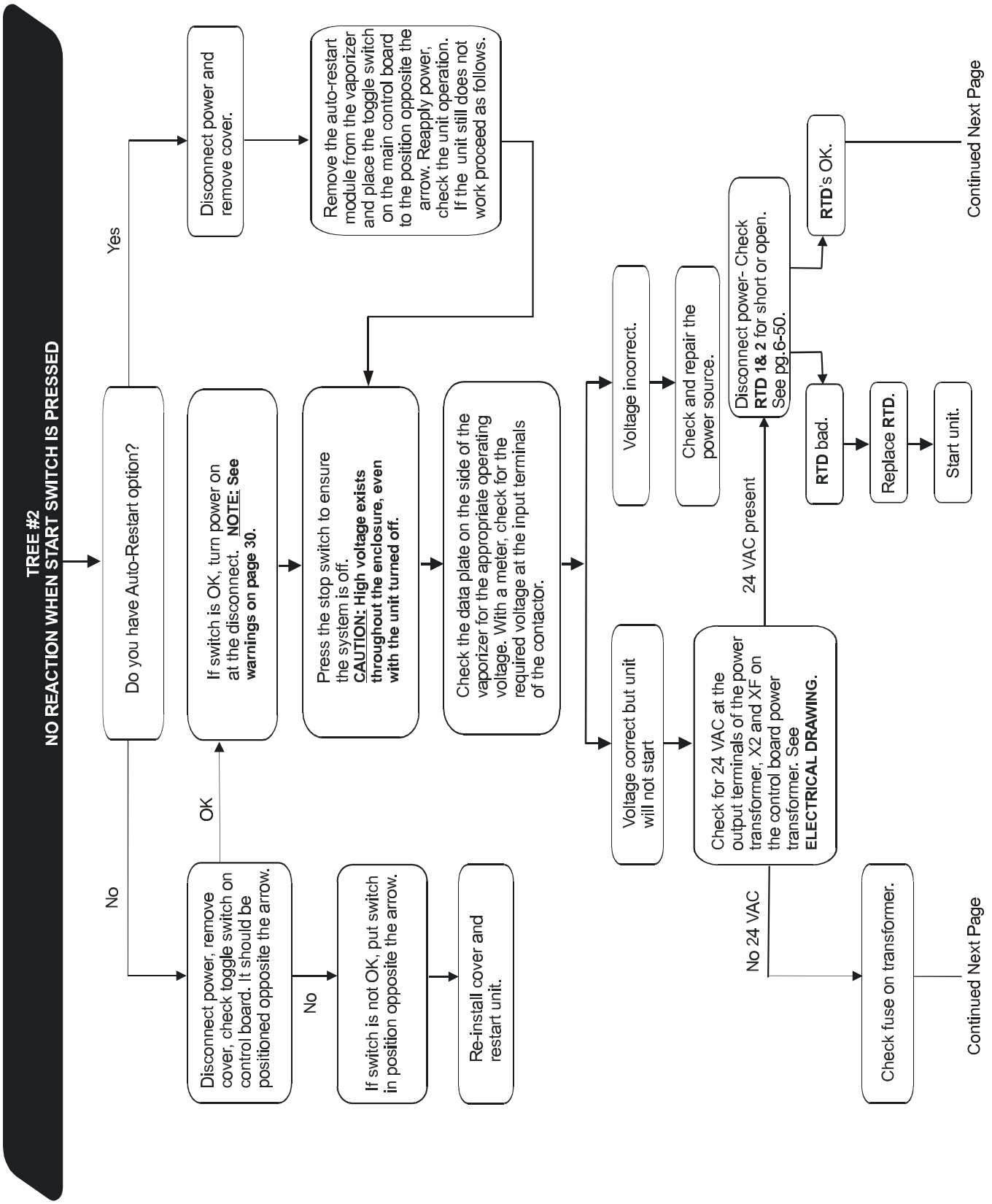
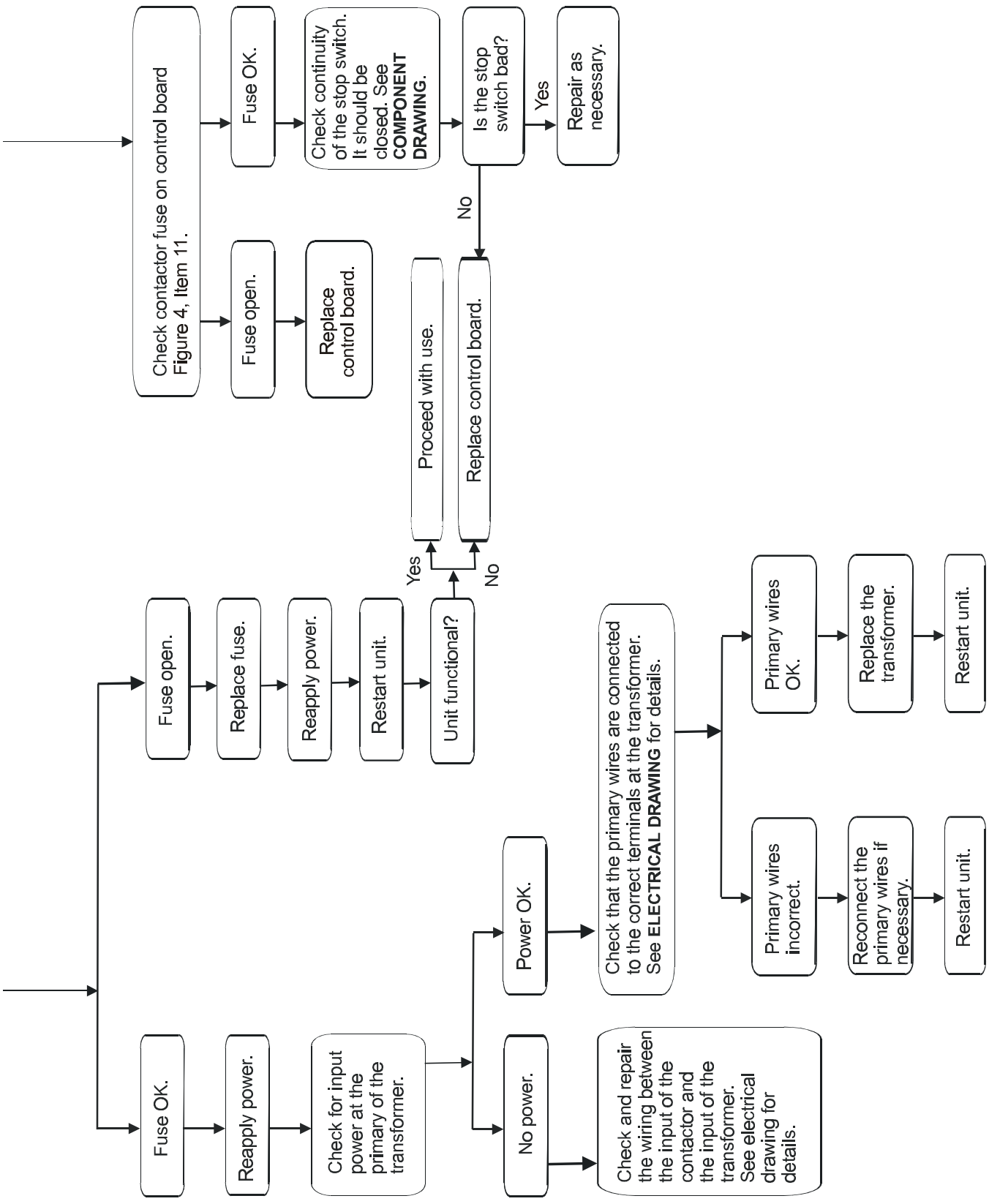
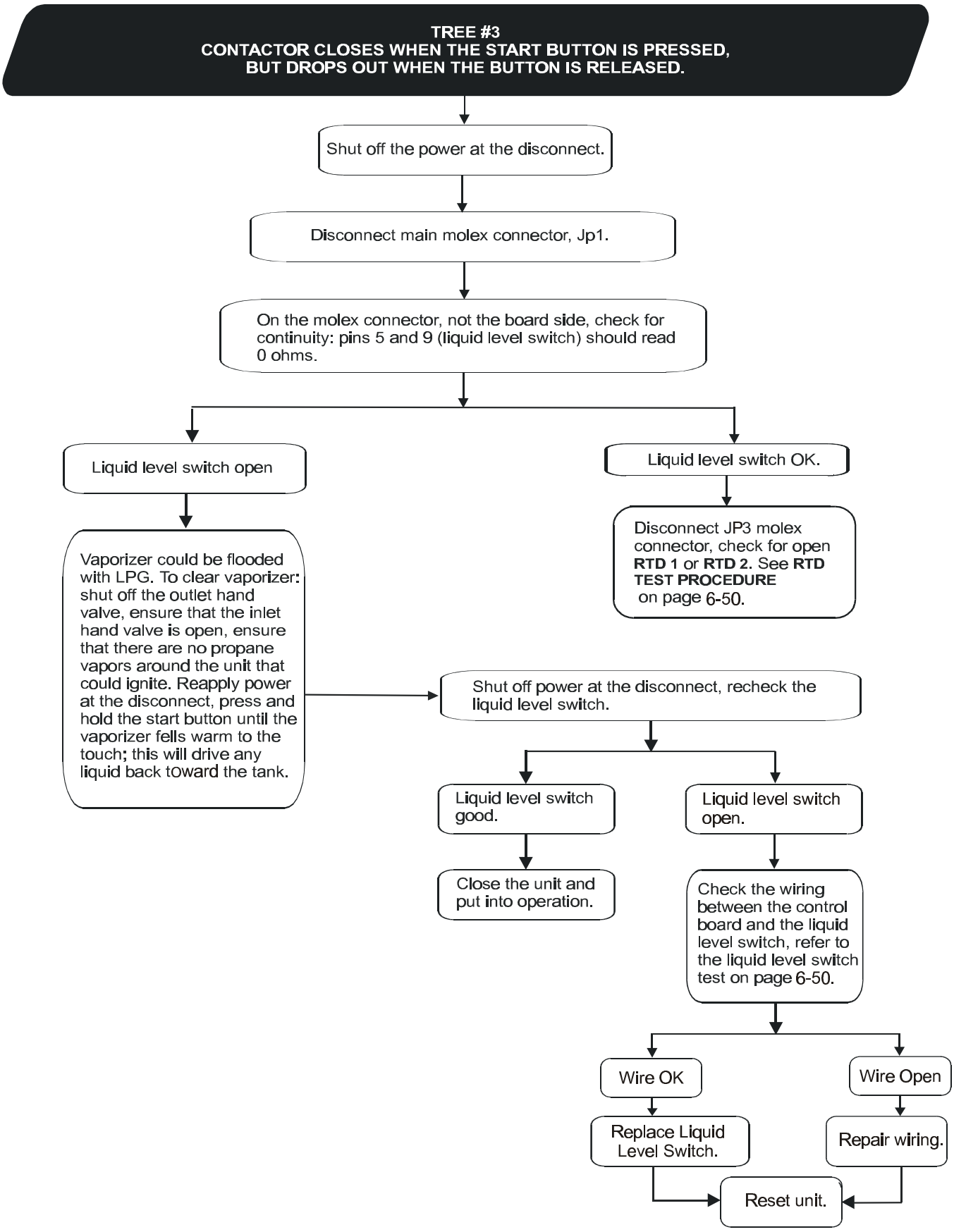

TREE #2
NO REACTION WHEN START SWITCH IS PRESSED
Do you have Auto-Restart option?
Yes
No
Disconnect power and remove cover.
Remove the auto-restart module from the vaporizer and place the toggle switch on the main control board to the position opposite the arrow. Reapply power, check the unit operation. If the unit still does not work proceed as follows.
Disconnect power, remove cover, check toggle switch on control board. It should be positioned opposite the arrow.
OK
No
If switch is not OK, put switch in position opposite the arrow.
Re-install cover and restart unit.
If switch is OK, turn power on at the disconnect. **NOTE: See warnings on page 30.**
Press the stop switch to ensure the system is off. **CAUTION: High voltage exists throughout the enclosure, even with the unit turned off.**
Check the data plate on the side of the vaporizer for the appropriate operating voltage. With a meter, check for the required voltage at the input terminals of the contactor.
Voltage incorrect.
Check and repair the power source.
Voltage correct but unit will not start
Check for 24 VAC at the output terminals of the power transformer, X2 and XF on the control board power transformer. See **ELECTRICAL DRAWING.**
24 VAC present
Disconnect power- Check **RTD 1& 2** for short or open. See pg.6-50.
RTD's OK.
Continued Next Page
RTD bad.
Replace **RTD**.
Start unit.
No 24 VAC
Check fuse on transformer.
Continued Next Page


Check contactor fuse on control board Figure 4, Item 11.
Fuse OK.
Check continuity of the stop switch. It should be closed. See COMPONENT DRAWING.
Is the stop switch bad?
Yes
Repair as necessary.
No
Fuse open.
Replace control board.
Proceed with use.
Replace control board.
Yes
No
Fuse open.
Replace fuse.
Reapply power.
Restart unit.
Unit functional?
Fuse OK.
Reapply power.
Check for input power at the primary of the transformer.
Power OK.
No power.
Check and repair the wiring between the input of the contactor and the input of the transformer. See electrical drawing for details.
Check that the primary wires are connected to the correct terminals at the transformer. See ELECTRICAL DRAWING for details.
Primary wires OK.
Replace the transformer.
Restart unit.
Primary wires incorrect.
Reconnect the primary wires if necessary.
Restart unit.


TREE #3
CONTACTOR CLOSES WHEN THE START BUTTON IS PRESSED, BUT DROPS OUT WHEN THE BUTTON IS RELEASED.
Shut off the power at the disconnect.
Disconnect main molex connector, Jp1.
On the molex connector, not the board side, check for continuity: pins 5 and 9 (liquid level switch) should read 0 ohms.
Liquid level switch open
Liquid level switch OK.
Disconnect JP3 molex connector, check for open RTD 1 or RTD 2. See RTD TEST PROCEDURE on page 6-50.
Vaporizer could be flooded with LPG. To clear vaporizer: shut off the outlet hand valve, ensure that the inlet hand valve is open, ensure that there are no propane vapors around the unit that could ignite. Reapply power at the disconnect, press and hold the start button until the vaporizer fells warm to the touch; this will drive any liquid back toward the tank.
Shut off power at the disconnect, recheck the liquid level switch.
Liquid level switch good.
Liquid level switch open.
Close the unit and put into operation.
Check the wiring between the control board and the liquid level switch, refer to the liquid level switch test on page 6-50.
Wire OK
Wire Open
Replace Liquid Level Switch.
Repair wiring.
Reset unit.

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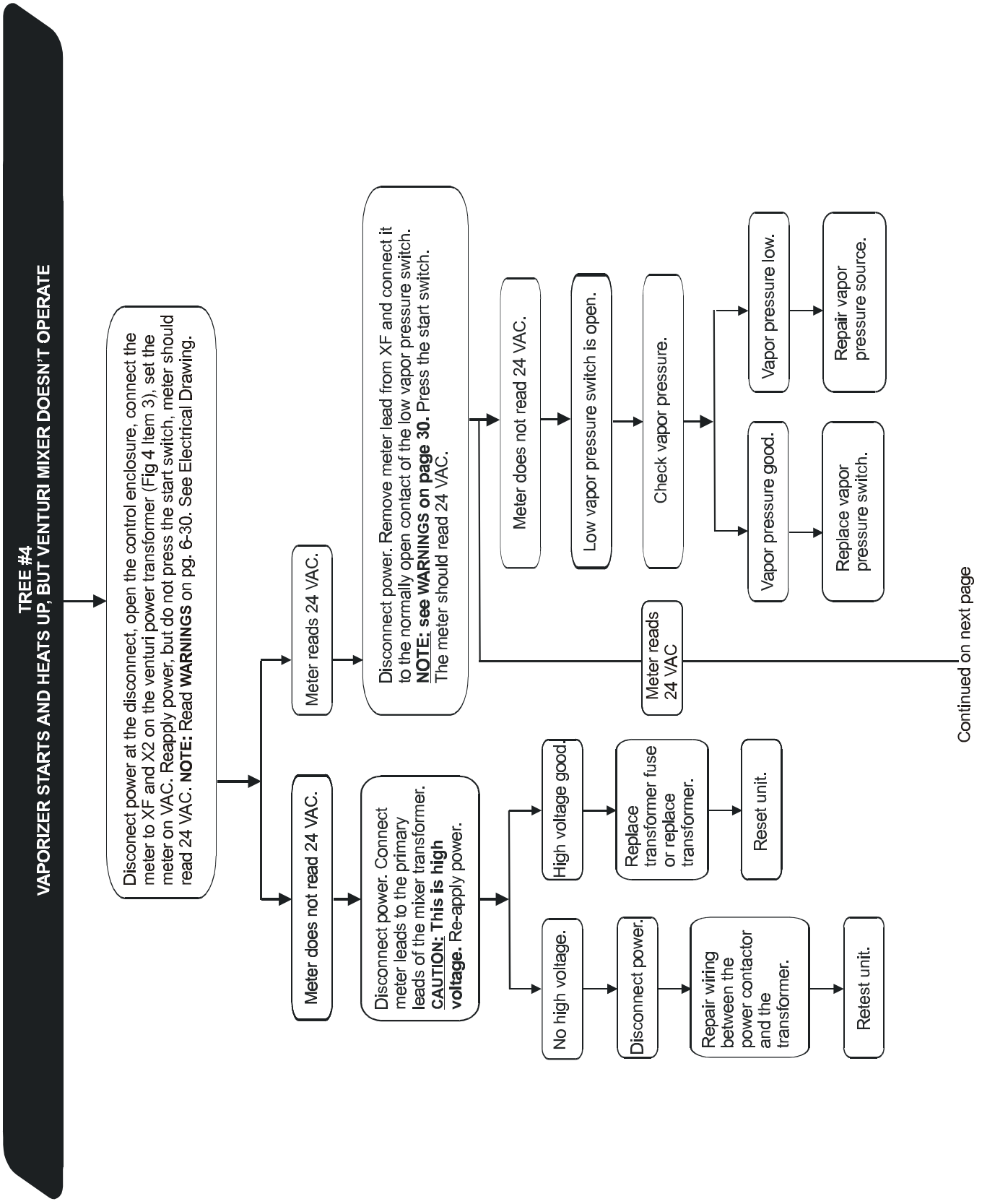
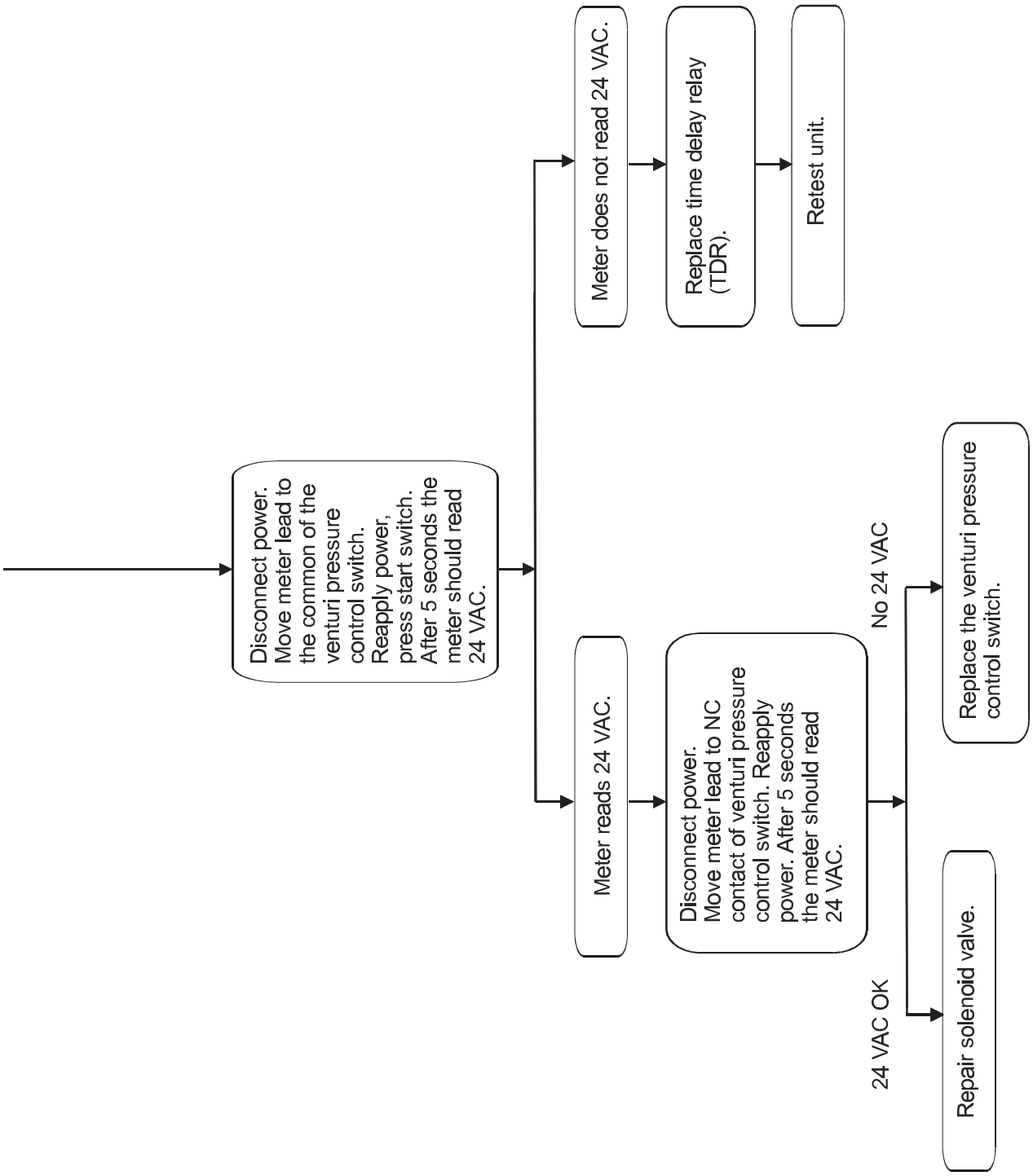
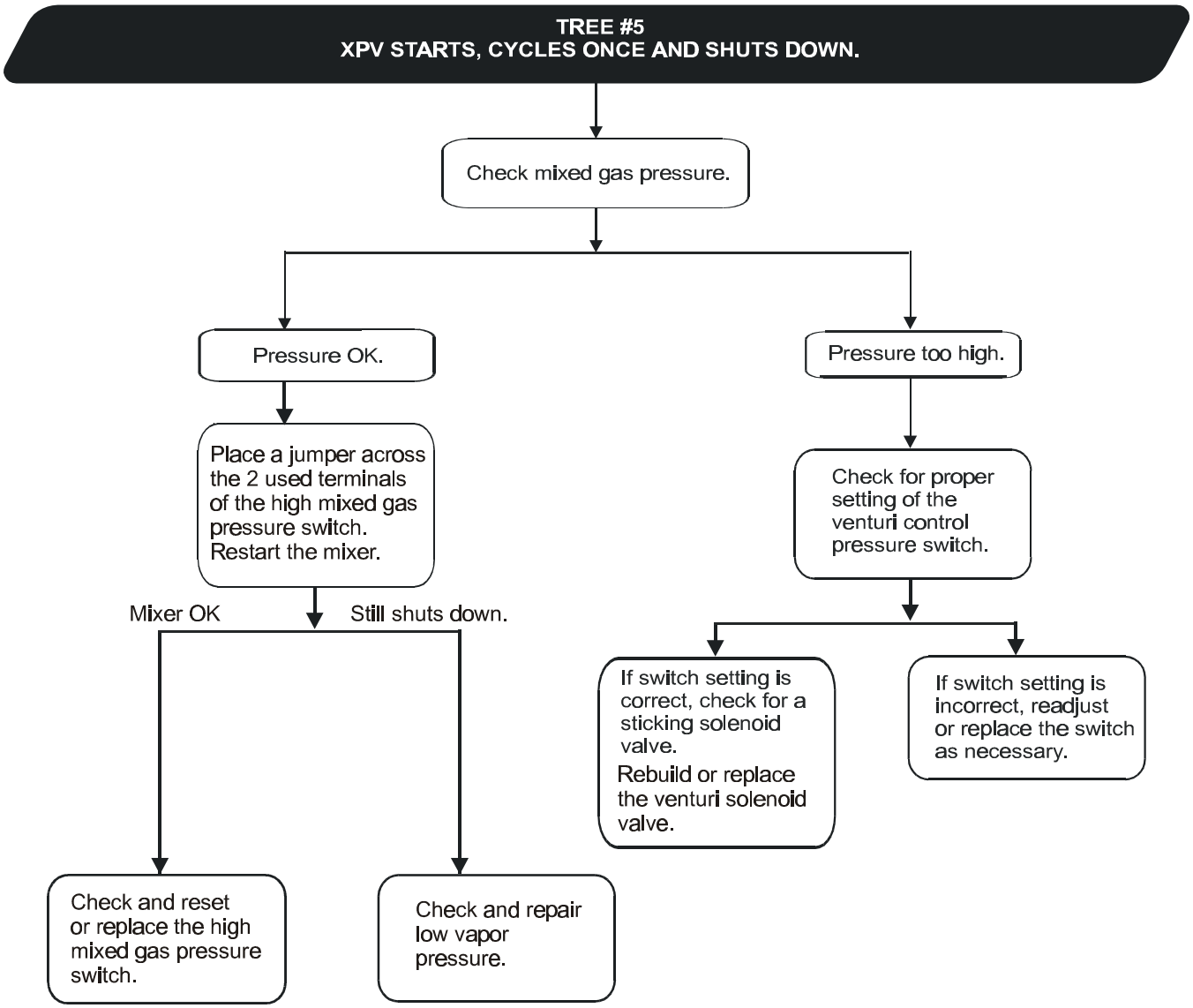
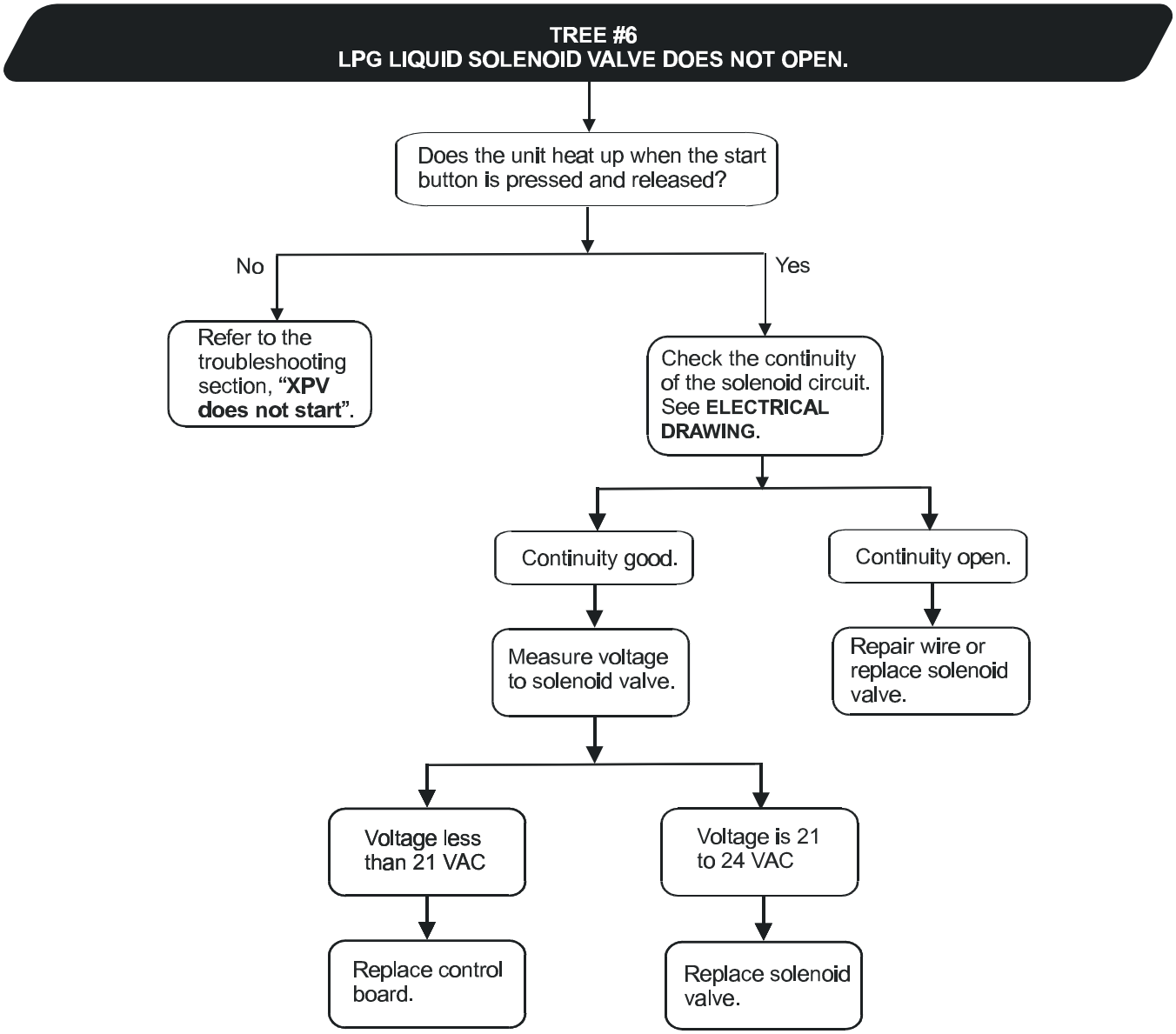
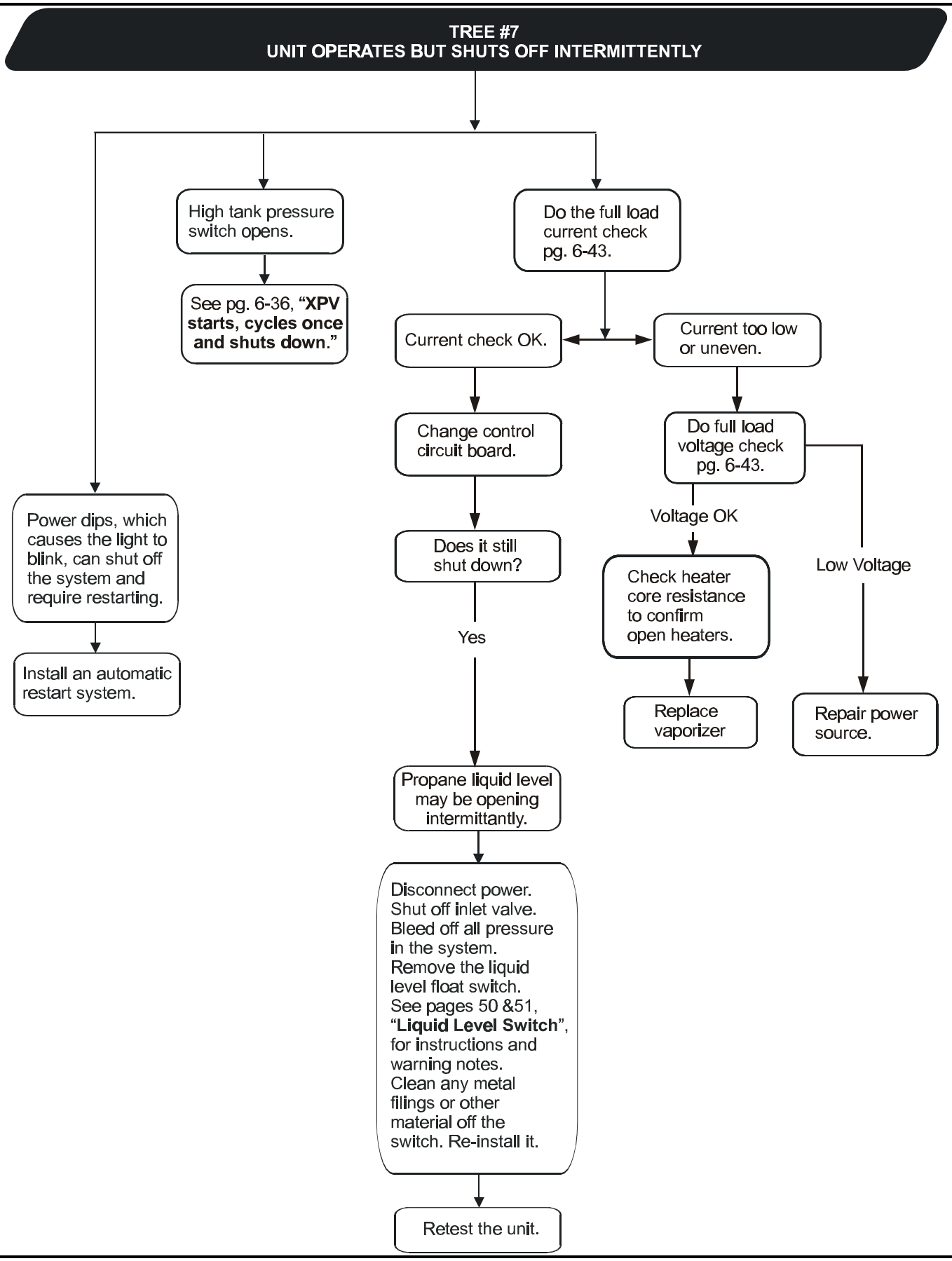

TREE #4
VAPORIZER STARTS AND HEATS UP, BUT VENTURI MIXER DOESN'T OPERATE
Disconect power at the disconnect, open the control enclosure, connect the meter to XF and X2 on the venturi power transformer (Fig 4 Item 3), set the meter on VAC. Reapply power, but do not press the start switch, meter should read 24 VAC. NOTE: Read WARNINGS on pg. 6-30. See Electrical Drawing.
Meter does not read 24 VAC.
Disconnect power. Connect meter leads to the primary leads of the mixer transformer. CAUTION: This is high voltage. Re-apply power.
No high voltage.
Disconnect power.
Repair wiring between the power contactor and the transformer.
Retest unit.
High voltage good.
Replace transformer fuse or replace transformer.
Reset unit.
Meter reads 24 VAC.
Disconnect power. Remove meter lead from XF and connect it to the normally open contact of the low vapor pressure switch. NOTE: see WARNINGS on page 30. Press the start switch. The meter should read 24 VAC.
Meter does not read 24 VAC.
Low vapor pressure switch is open.
Check vapor pressure.
Vapor pressure good.
Replace vapor pressure switch.
Vapor pressure low.
Repair vapor pressure source.
Meter reads 24 VAC
Continued on next page


Disconnect power. Move meter lead to the common of the venturi pressure control switch. Reapply power, press start switch. After 5 seconds the meter should read 24 VAC.
Meter does not read 24 VAC.
Replace time delay relay (TDR).
Retest unit.
Meter reads 24 VAC.
Disconnect power. Move meter lead to NC contact of venturi pressure control switch. Reapply power. After 5 seconds the meter should read 24 VAC.
No 24 VAC
Replace the venturi pressure control switch.
24 VAC OK
Repair solenoid valve.


TREE #5
XPV STARTS, CYCLES ONCE AND SHUTS DOWN.
Check mixed gas pressure.
Pressure OK.
Pressure too high.
Place a jumper across the 2 used terminals of the high mixed gas pressure switch. Restart the mixer.
Check for proper setting of the venturi control pressure switch.
Mixer OK
Still shuts down.
If switch setting is correct, check for a sticking solenoid valve.
Rebuild or replace the venturi solenoid valve.
If switch setting is incorrect, readjust or replace the switch as necessary.
Check and reset or replace the high mixed gas pressure switch.
Check and repair low vapor pressure.


TREE #6
LPG LIQUID SOLENOID VALVE DOES NOT OPEN.
Does the unit heat up when the start button is pressed and released?
No
Yes
Refer to the troubleshooting section, "XPV does not start".
Check the continuity of the solenoid circuit. See ELECTRICAL DRAWING.
Continuity good.
Continuity open.
Measure voltage to solenoid valve.
Repair wire or replace solenoid valve.
Voltage less than 21 VAC
Voltage is 21 to 24 VAC
Replace control board.
Replace solenoid valve.


TREE #7
UNIT OPERATES BUT SHUTS OFF INTERMITTENTLY
High tank pressure switch opens.
See pg. 6-36, "XPV starts, cycles once and shuts down."
Power dips, which causes the light to blink, can shut off the system and require restarting.
Install an automatic restart system.
Do the full load current check pg. 6-43.
Current check OK.
Current too low or uneven.
Change control circuit board.
Does it still shut down?
Yes
Propane liquid level may be opening intermittantly.
Disconnect power. Shut off inlet valve. Bleed off all pressure in the system. Remove the liquid level float switch. See pages 50 &51, "Liquid Level Switch", for instructions and warning notes. Clean any metal filings or other material off the switch. Re-install it.
Retest the unit.
Do full load voltage check pg. 6-43.
Voltage OK
Check heater core resistance to confirm open heaters.
Replace vaporizer
Low Voltage
Repair power source.

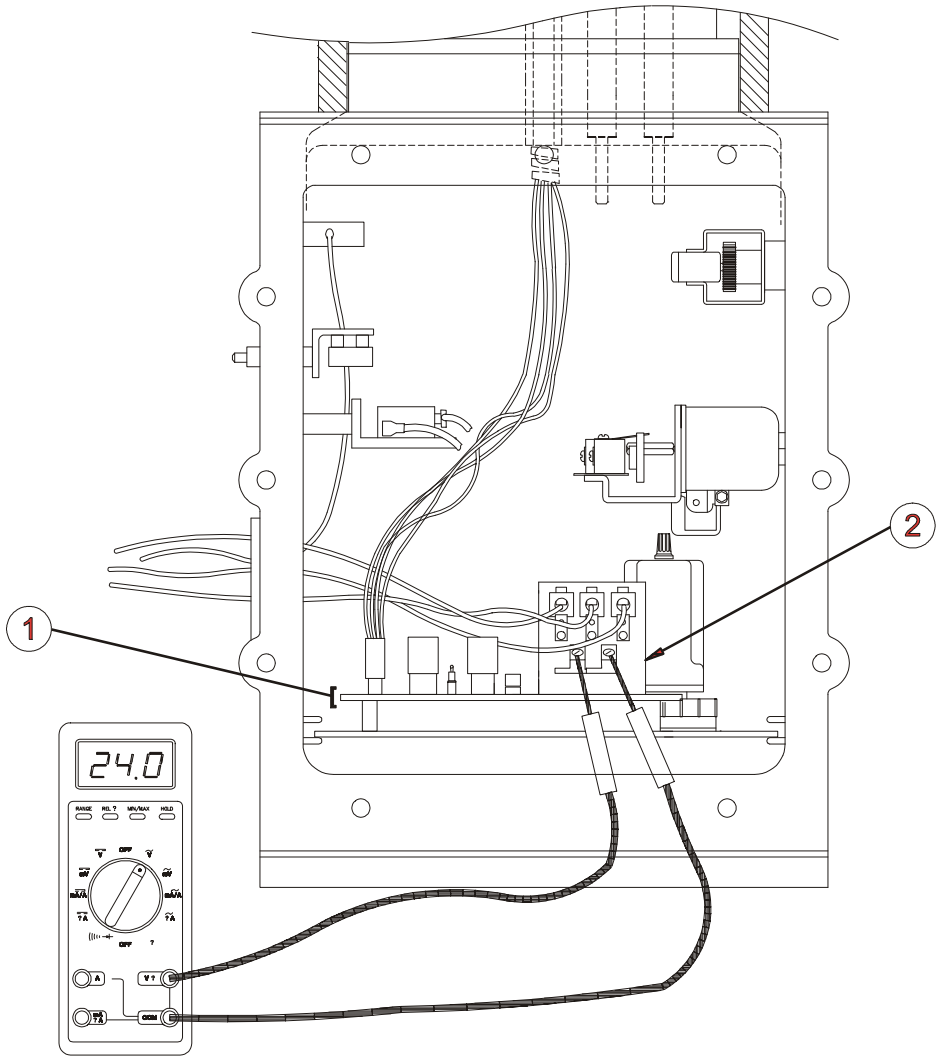
Testing Individual Components

CHECKING THE CONTACTOR

If the contactor is not closing:

Check the voltage across the contactor coil. The voltage should be 24 VAC. If the voltage is 24 VAC and the contactor is not closing, and therefore energizing the heaters, replace the contactor. If the voltage is 0 VAC, check the wiring from the contactor coil to the control board connections, E3 and E4. If the wiring is OK and the voltage across the coil and E3/E4 is 0 VAC, replace the control board.

Figure 10 *- Contactor Voltage Checks*



Contactor Voltage Checks.wmf

1. **Control board.**
2. **Heater contactor.**

REPLACING THE CONTACTOR

- Turn off the power at the disconnect.
- Remove the front cover.
- Remove the RTD and Main Molex connectors from the control board.
- Slide out the control board for access to the main power input wiring.
- Remove the top four or six power wires from the contactor line terminals.
- Remove both quick disconnect coil wires.
- Slide the control board out.
- Remove the bolts that connect the contactor metal base to the circuit board.
- Install the new contactor.
- Re-connect the coil wires and power wires.
- Slide the control board back into the housing.
- Reconnect the RTD and Main Molex connectors.
- Replace the front cover.
- Turn on power at the disconnect.
- Restart the system.
- Check operation.

HIGH TANK PRESSURE SAFETY SWITCH

Shuts off the unit when the **MIXED GAS** pressure is too high due to a malfunction in the control system. *See the data sheet* for pressure setting. The pressure is adjusted by turning the adjustment dial on the switch.

Accuracy of the **MIXED GAS** pressure safety switch can be checked with an external regulator and calibrated pressure.

REPLACING THE HIGH TANK PRESSURE SAFETY SWITCH

- Turn power off at the disconnect, bleed the system to 0 pressure.
- Remove the wires to the switch.
- Remove the switch with an open end wrench.
- Install a new switch.
- Turn power on, open isolation valve, and bring system up to operating pressure.
- Check carefully for leaks at all connections.
- Refer to the adjustment procedure in Chapter 5 - Maintenance, for setting the switch.

LOW VAPOR SAFETY SWITCH

Shuts off the unit if the vapor pressure is too low.

Accuracy of the low vapor safety switch can be checked with an external regulator and calibrated pressure gauge or by removing the switch and testing it with a known pressure.

REPLACING THE LOW VAPOR SAFETY SWITCH

- Turn off the power at the disconnect, bleed the system to 0 pressure.
- To replace the low vapor safety switch, the **MIXED GAS OPERATING PRESSURE CONTROL SWITCH** and the **HIGH TANK PRESSURE SWITCH** must be removed.
- Remove the wires to the switch.
- Remove the switch with an open end wrench.
- Install a new switch.
- Replace the **MIXED GAS OPERATING PRESSURE CONTROL SWITCH** and the **HIGH TANK PRESSURE SWITCH**.
- Turn power on, open isolation valve and bring system up to operating pressure.
- Refer to the adjustment procedures in Chapter 5 - Maintenance, for setting the switch

TIME DELAY RELAY

The time delay relay is used to allow the vaporizer sufficient time for the vapor pressure switch to be satisfied before opening the venturi. It should be set for five seconds. The correct dip switch settings are shown on the electrical schematic in this manual.

The time delay relay simply plugs in a multi-pin socket. To remove it, rock back and forth gently to loosen it and pull it up. The plastic aligning pin is notched for correct alignment.

REPLACING THE MIXED GAS PRESSURE VENTURI CONTROL SWITCH

NOTE

See ADJUSTMENT PROCEDURES FOR SYSTEM OPERATING AND SAFETY CONTROLS section in Chapter 5. Mixed gas pressure control switch, earlier in this manual for additional information.

- Turn off the power at the disconnect, close the inlet hand valve and bleed the system to 0 pressure.
- Remove the switch with an open end wrench.
- Install a new switch.
- Turn power on, open isolation valve and bring system up to operating pressure.
- Verify operation with external pressure gauges.
- Refer to the adjustment procedures in Chapter 5 - Maintenance, for setting the switch.

FULL LOAD VOLTAGE CHECK

Current flow depends on the applied voltage. Voltage lower than the specified voltage causes low current. Make all measurements with the heater **ON** (contactor closed).

WARNING

These test include high voltage. Exercise great caution in making these following tests. Carelessness could result in severe injury or death.

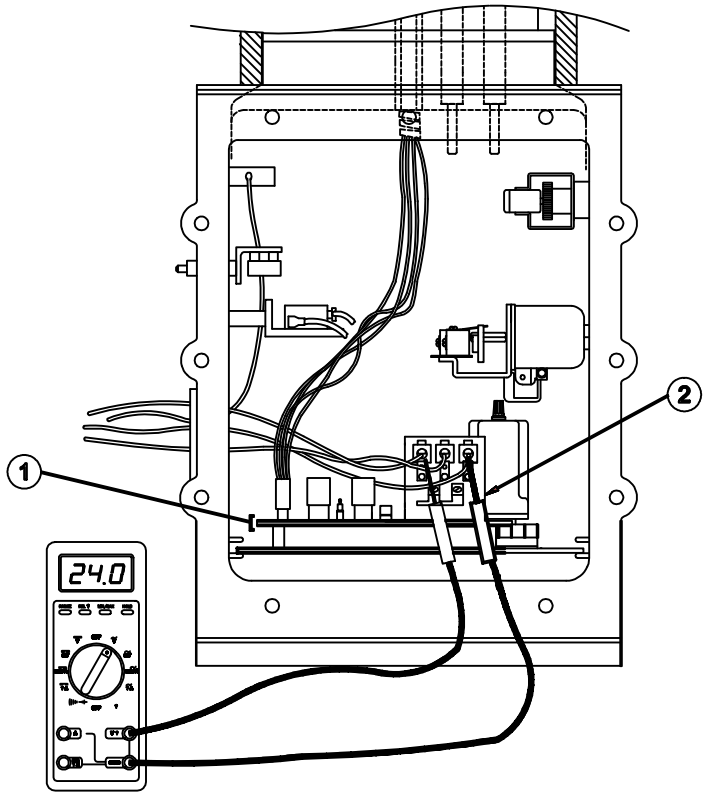
VOLTAGE CHECK PROCEDURE

Check heater voltage by measuring voltage at the contactor terminals. Check the data sheet or the data tag on the vaporizer to determined the correct voltage reading for your vaporizer. Measure voltage between all connected poles of the relay. The readings should be equal to +/-3%.

NOTE

Low voltage reduces the vaporization capacity to your vaporizer.

Figure 11 *- Measuring Voltage at Contactor Terminals.*



Measuring Voltage.wmf

1. **Control board.**
2. **Heater contactor.**

FULL LOAD CURRENT CHECK

NOTE

You will have less than 60 seconds to measure the current before the vaporizer is up to temperature and the current flow stops.

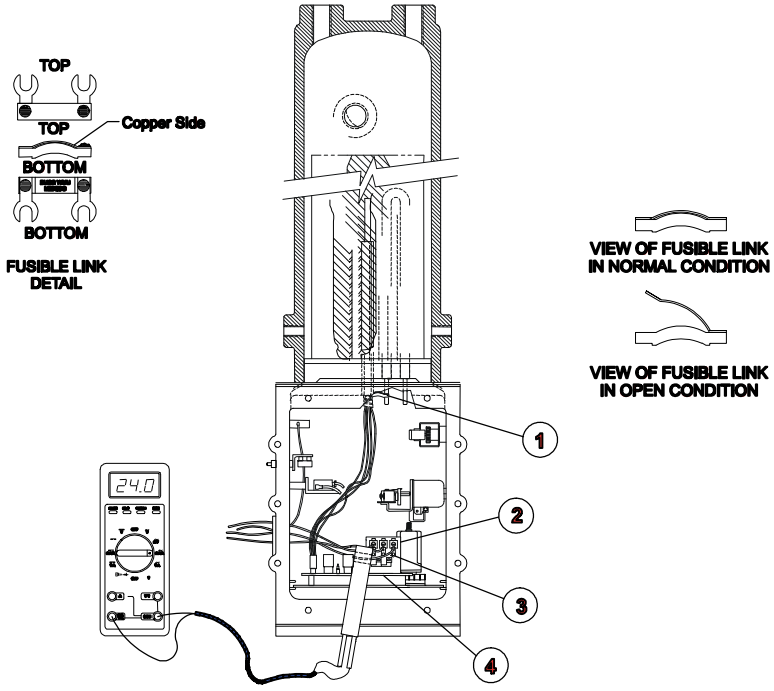
Measure the current on each of the heater AC power input wires. Check the data sheet or the nameplate to determine line current for your vaporizer. All wires should have equal readings of +/-3%

Low current on all wires indicates low input voltage. Drastically different current readings indicate a defective heater, defective wiring, or an open fusible link due to over heating. If a fusible link is open, contact the factory. Do not attempt repair. *See Heater Resistance* check for more information.

WARNING

These tests include high voltage. Exercise great caution in making the following tests. Carelessness could result in severe injury or death. (See additional warning at the beginning of this manual.)

Figure 12 *- Full Load Current Check.*



Full Load Current Check.wmf

1. **Fusible links.**
2. **Contactor.**
3. **Power input wiring.**
4. **Control board.**

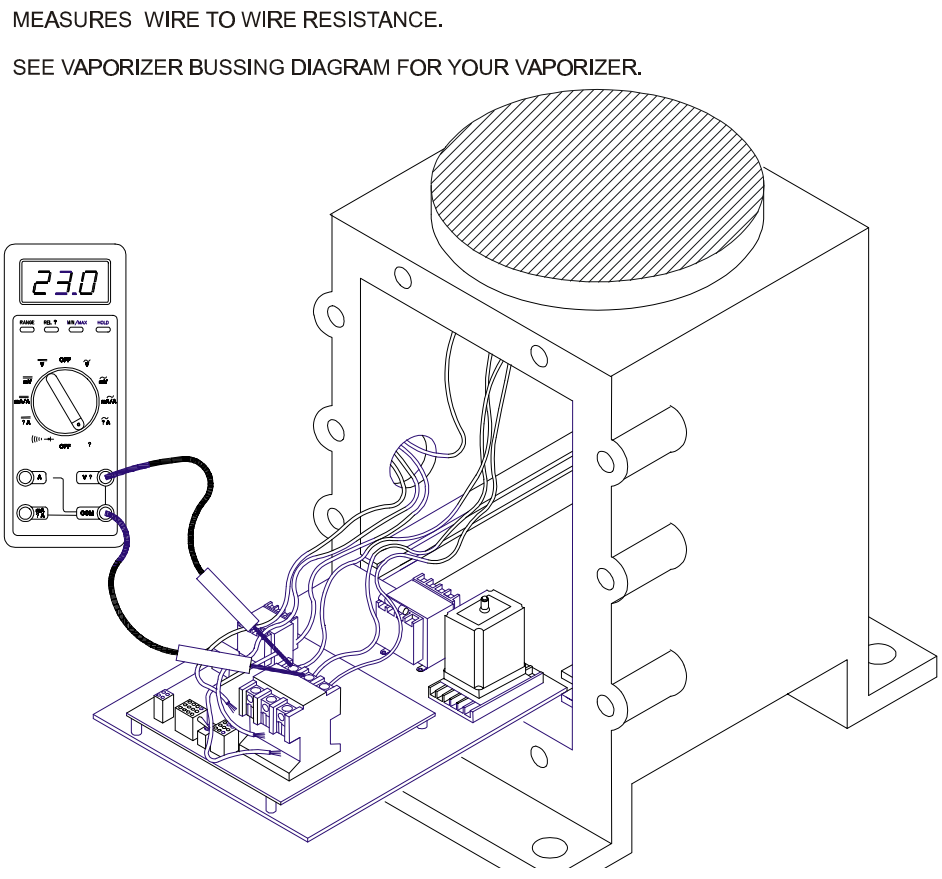
CAUTION

Turn off electrical power at the disconnect before proceeding.

HEATER CORE RESISTANCE

Remove the two **MOLEX PLUGS** (main and RTD) from the control board. Slide out the control board to obtain access to the incoming power wiring connections. Disconnect them and slide the board out more to obtain access to the heater wire connections on the contactor. Measure the resistance across each pair of wires. Refer to the wiring diagram for resistance data. An incorrect resistance reading indicates either a faulty heater element, a wiring problem, or an open fusible link.

Figure 13 *- Heater Core Resistance Wiring Connections*

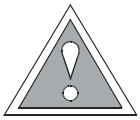


Heater Core.wmf

LIQUID LEVEL SAFETY SWITCH

Open the control box housing and disconnect the “main” connector on the front of the control board. Check for continuity between pins 5 & 9 as shown below. If your meter reads 0 ohms, the float switch is good. Close the control box. Turn power on at the disconnect. Start vaporizer again.

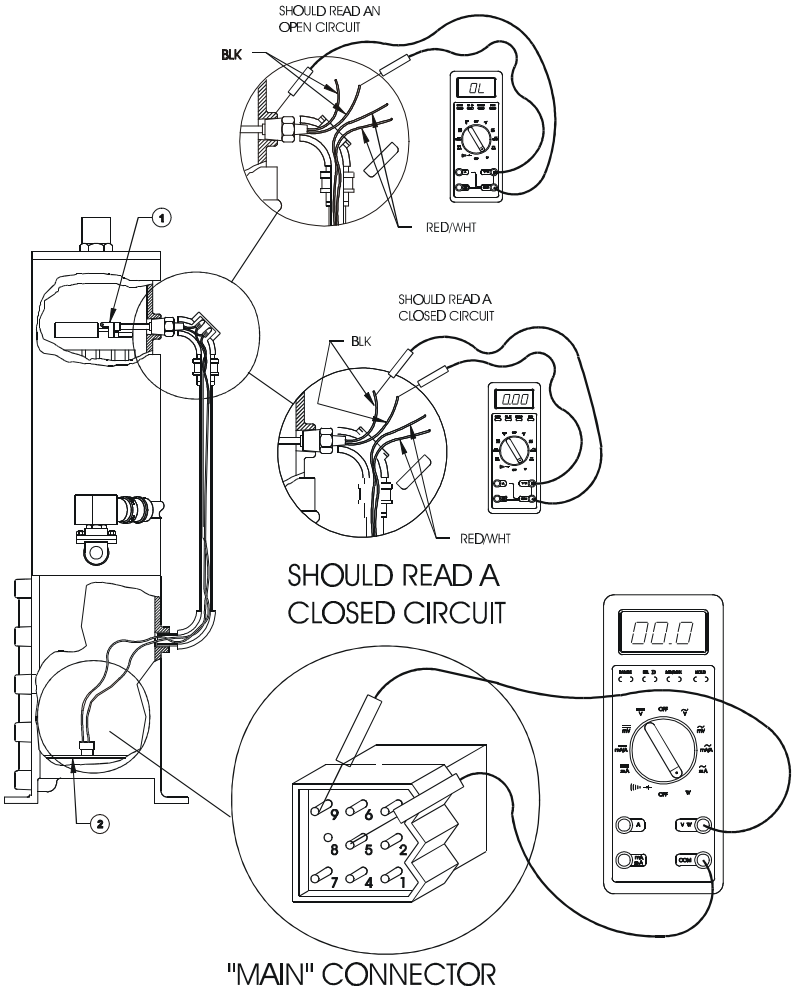
If the switch reads open (OL open on the meter), do the following tests: Remove the conduit elbow cover at the liquid level switch. Disconnect and separate the four wires and test as shown below. A reading other than what is indicated shows a bad liquid level switch. Replace it. If the liquid level switch is good, repair the wiring between the liquid level switch and the control board.



CAUTION

Turn off power at the disconnect.

Figure 14 *- Liquid Level Safety Switch Testing Sites.*



Liquid Level Switch Testing Sites.wmf

1. Liquid level switch. **2. Control board.**

REPLACING THE LIQUID LEVEL SWITCH

CAUTION

Turn power off at the disconnect.

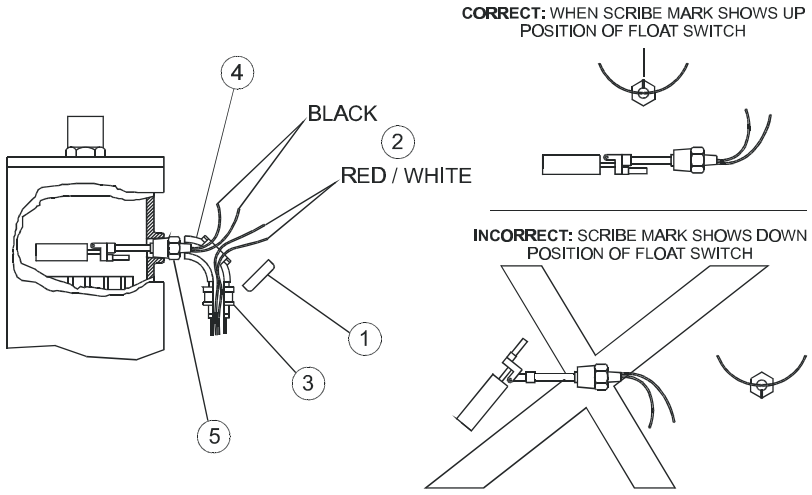
Close the liquid LPG inlet hand valve; bleed off all of the pressure in the vaporizer before proceeding.

NOTE

Use a teflon base thread compound to seal for leaks when re-installing the float switch.

- **STEP 1**: **REMOVE** the conduit elbow cover (1).
- **STEP 2**: **PULL OUT** and separate the wires (2).
- **STEP 3**: **DISCONNECT** the conduit union (3).
- **STEP 4**: **UNSCREW** the conduit elbow (4) from the liquid level safety switch.
- **STEP 5**: **REMOVE** the liquid level safety switch (5). The arrow scribe on the float switch must be up in order to pull the float back through the mounting hole. *See below*.

Figure 15 *- Replacing the Liquid Level Switch.*



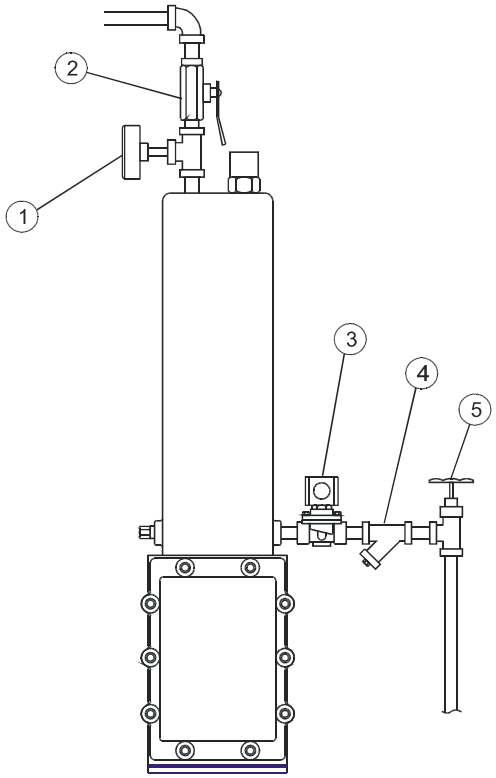
Replacing Liquid Level Switch.wmf

1. **Conduit elbow cover.**
2. **Wires.**
3. **Conduit union.**
4. **Conduit elbow**
5. **Liquid level safety switch.**

SOLENOID VALVE LEAK TEST

- Shut off the outlet hand valve. The inlet hand valve should be open. Start the vaporizer and allow it to heat up until the heater shut off. This allows any accumulated liquid in the vaporizer to be forced back toward the supply tank.
- Turn off the vaporizer. Shut off the power at the disconnect. Shut off the inlet hand valve. Close ball valve on vaporizer pressure gauge and remove the pressure gauge. Cautiously bleed off any LPG pressure in the vaporizer and outlet supply piping. When the pressure reaches 0 pressure in the vaporizer, reinstall the pressure gauge and verify 0 pressure.
- Turn on the inlet hand valve. The solenoid valve is closed and you should not have any pressure build up in the vaporizer. If pressure increases, the solenoid valve is leaking and needs to be repaired or replaced. If it is not leaking in this condition, turn the power back on at the disconnect. Do not press the start switch.
- Check again for a leaking solenoid valve. The pressure should remain at zero. If the pressure does not remain at zero, replace the control board.

Figure 16 *- Solenoid Valve Leak Test Components*



Solenoid Valve Leak Test Components.wmf

1. **Vapor pressure gauge.**
2. **Vapor discharge outlet hand valve.**
3. **Solenoid valve.**
4. **Strainer.**
5. **Liquid inlet hand valve.**

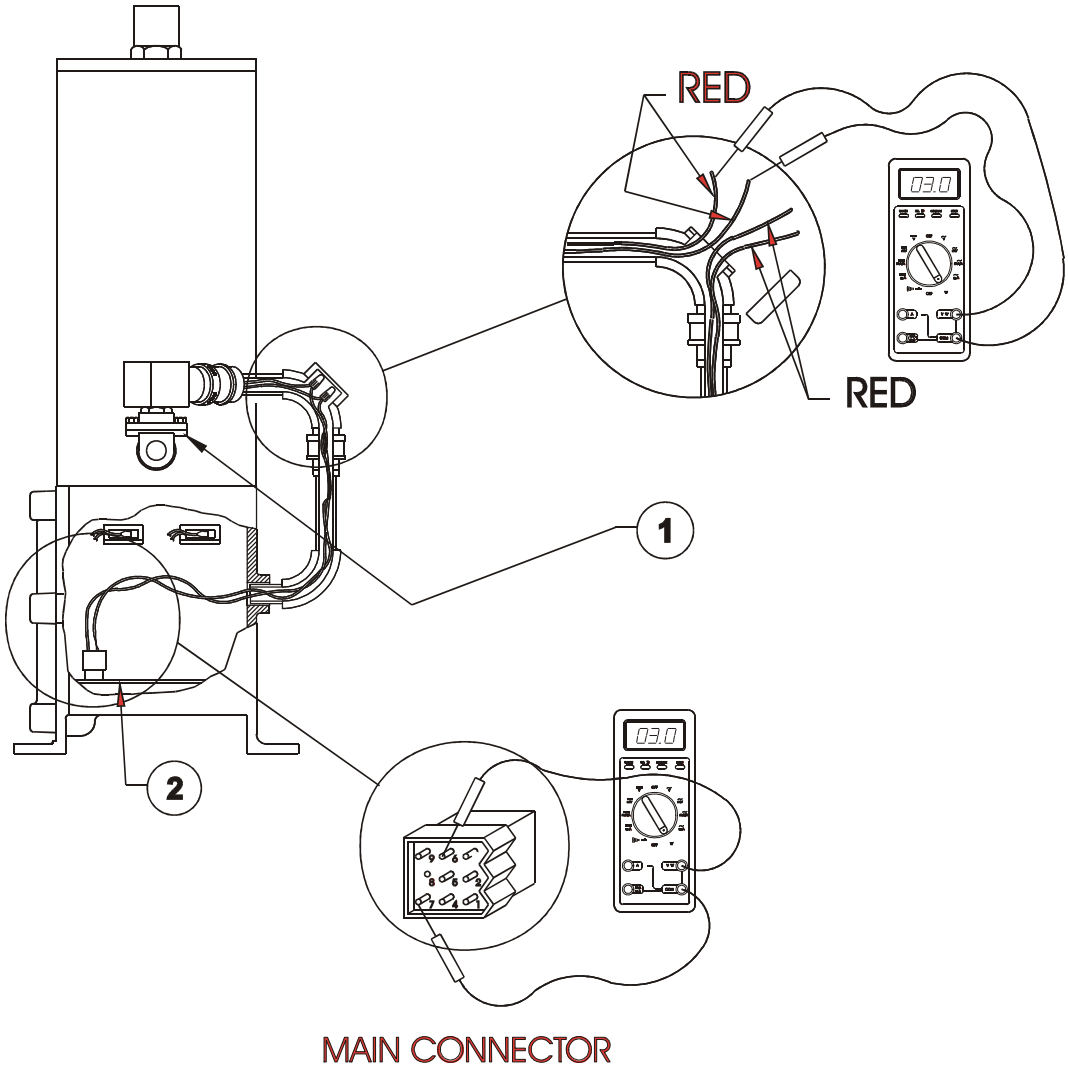
SOLENOID VALVE ELECTRICAL TEST

WARNING

Shut off power at the electrical disconnect before proceeding.

Open the electrical housing at the vaporizer base. Disconnect the "**MAIN**" (JP1) connector and measure resistance between pins 6 & 7 on the Molex Plug connector. You should measure approximately 3 ohms. If not, remove the cover at the conduit elbow, disconnect the wires and measure the solenoid leads again. If the measured resistance is still incorrect, change the solenoid coil. If it is good, check and if necessary, repair the wiring between the elbow and the "**MAIN**" (JP1) connection.

Figure 17 - *Solenoid Valve Electrical Test.*



Solenoid Valve Electrical Test.wmf

1. **Inlet solenoid valve.**
2. **Control board.**

RTD TEMPERATURE SENSOR

NOTE

RTD #1 is pins 1 and 2, controlling HIGH TEMPERATURE LIMIT and SOLENOID CIRCUIT.

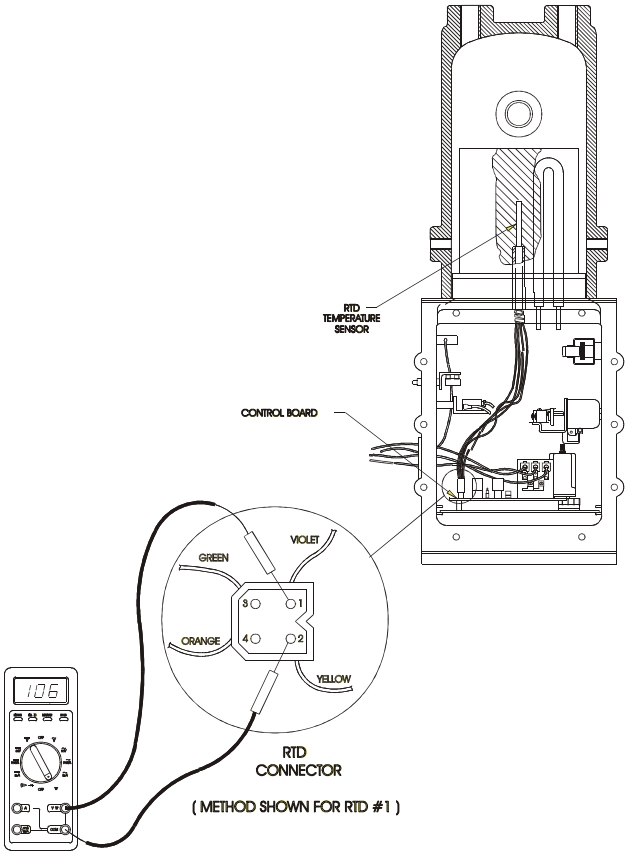
RTD #2 is pins 3 and 4, controlling HIGH TEMPERATURE LIMIT and HEATER CONTACTOR.

CAUTION

Shut off power at the disconnect before proceeding.

Remove the RTD Molex Plug from the board. Check the resistance across pins 1 & 2 and 3 & 4 as shown in ***Figure 18***. Reference RTD resistance ***Tables 12 & 13***. If the resistance differs from the table or from each other by more than 2 ohms, replace the RTD.

Figure 18 - *RTD Temperature Sensor.*



RTD Temperature Sensor.wmf

Table 12 *- RTD Temperature vs. Resistance Table – Centigrade*

Platinum			100 at 0°C		0.00385 / /°C.		
T (°C)	**R( )**	**T (°C)**	**R( )**	**T (°C)**	**R( )**	**T (°C)**	**R( )**
0	100	50	119.395	100	138.5	150	157.315
1	100.391	51	119.78	101	138.879	151	157.688
2	100.781	52	120.165	102	139.258	152	158.061
3	101.172	53	120.54	103	139.637	153	158.434
4	101.562	54	120.934	104	140.016	154	158.807
5	101.953	55	121.318	105	140.394	155	159.19
6	102.343	56	121.703	106	141.773	156	159.553
7	102.733	57	122.087	107	141.151	157	159.925
8	103.123	58	122.471	108	141.53	158	160.298
9	103.513	59	122.855	109	141.908	159	160.67
10	103.902	60	123.239	110	142.289	160	161.043
11	104.292	61	123.623	111	142.664	161	161.415
12	104.681	62	124.007	112	143.042	162	161.787
13	105.071	63	124.39	113	143.42	163	162.159
14	105.46	64	124.774	114	143.797	164	162.521
15	105.849	65	125.157	115	144.175	165	162.902
16	106.238	66	103.513	116	144.552	166	163.274
17	106.627	67	103.513	117	144.929	167	163.646
18	107.016	68	103.513	118	145.307	168	164.017
19	107.404	69	103.513	119	145.684	169	164.388
20	107.793	70	127.072	120	146.061	170	164.759
21	108.181	71	127.454	121	146.437	171	165.13
22	108.57	72	127.837	122	146.814	172	165.501
23	108.958	73	128.219	123	147.191	173	165.872
24	109.346	74	128.601	124	147.567	174	166.243
25	109.734	75	128.984	125	147.943	175	166.613
26	110.122	76	129.366	126	148.32	176	166.984
27	110.509	77	129.748	127	148.696	177	167.354
28	110.897	78	130.129	128	149.072	178	167.724
29	111.284	79	130.511	129	149.448	179	168.064
30	111.672	80	130.893	130	149.823	180	168.464
31	112.059	81	131.274	131	150.199	181	168.834
32	112.446	82	131.655	132	150.575	182	169.204
33	112.833	83	132.037	133	150.95	183	169.573
34	113.22	84	132.418	134	151.325	184	169.943
35	113.607	85	132.799	135	151.701	185	170.312
36	113.994	86	133.18	136	152.076	186	170.683
37	114.38	87	133.56	137	152.451	187	171.051
38	114.767	88	133.941	138	152.825	188	171.42
39	114.153	89	134.322	139	153.2	189	171.789
40	115.539	90	134.702	140	153.575	190	172.158
41	115.925	91	135.082	141	153.949	191	172.526
42	116.311	92	135.463	142	154.324	192	172.895
43	116.697	93	135.843	143	154.698	193	173.312
44	117.083	94	136.223	144	155.072	194	173.632
45	117.469	95	136.602	145	155.446	195	174
46	117.854	96	136.982	146	155.82	196	174.368
47	118.239	97	137.362	147	156.194	197	174.736

Table 13 *- RTD Temperature vs. Resistance Table - Fahrenheit*

Platinum			100 at 32°F		0.00385 / /°F		
T (°F)	R( )	T (°F)	R( )	T (°F)	R( )	T (°F)	R( )
0	93.034	50	103.902	100	114.681	150	125.37
1	93.252	51	104.119	101	114.895	151	125.583
2	93.47	52	104.335	102	115.11	152	125.795
3	93.689	53	104.551	103	115.325	153	126.008
4	93.907	54	104.768	104	115.539	154	126.221
5	94.125	55	104.984	105	115.754	155	126.434
6	94.343	56	105.2	106	115.968	156	126.656
7	94.561	57	105.417	107	116.183	157	126.859
8	94.779	58	105.633	108	116.397	158	127.072
9	94.997	59	105.849	109	116.611	159	127.284
10	95.215	60	106.065	110	116.826	160	127.497
11	95.433	61	106.281	111	117.04	161	127.709
12	95.651	62	106.497	112	117.254	162	127.922
13	95.868	63	106.713	113	117.469	163	128.134
14	96.086	64	106.929	114	117.683	164	128.347
15	96.304	65	107.145	115	117.897	165	128.559
16	96.522	66	107.361	116	118.111	166	128.771
17	96.739	67	107.577	117	118.325	167	128.984
18	96.957	68	107.793	118	118.539	168	129.196
19	97.175	69	108.009	119	118.753	169	129.408
20	97.392	70	108.224	120	118.967	170	129.62
21	97.61	71	108.44	121	119.181	171	129.832
22	97.827	72	108.656	122	119.395	172	130.045
23	98.045	73	108.871	123	119.609	173	130.257
24	98.262	74	109.087	124	119.823	174	130.469
25	98.479	75	109.303	125	120.036	175	130.681
26	98.697	76	109.518	126	120.25	176	130.893
27	98.914	77	109.734	127	120.464	177	131.105
28	99.131	78	109.949	128	120.678	178	131.317
29	99.349	79	110.165	129	120.891	179	131.528
30	99.566	80	110.38	130	121.105	180	131.74
31	99.783	81	110.595	131	121.318	181	131.952
32	100	82	110.811	132	121.532	182	132.164
33	100.217	83	111.026	133	121.746	183	132.375
34	100.434	84	111.241	134	121.959	184	132.587
35	100.651	85	111.457	135	122.172	185	132.799
36	100.868	86	111.672	136	122.386	186	133.01
37	101.085	87	111.887	137	122.599	187	133.222
38	101.302	88	112.102	138	122.813	188	133.434
39	101.519	89	112.317	139	123.026	189	133.645
40	101.736	90	112.532	140	123.239	190	133.857
41	101.953	91	112.747	141	123.452	191	134.068
42	102.169	92	112.962	142	123.666	192	134.279
43	102.386	93	113.177	143	123.879	193	134.491
44	102.603	94	113.392	144	124.092	194	134.702
45	102.819	95	113.607	145	124.305	195	134.913
46	103.036	96	113.822	146	124.518	196	135.125
47	103.253	97	114.037	147	124.731	197	135.336
48	103.469	98	114.251	148	124.944	198	135.547

RTD TEMPERATURE SENSOR REPLACEMENT

NOTE

A flat bladed screwdriver and an open end wrench, approximately ½", may be required depending on the type of locking collar on the sensor.

CAUTION

Always disconnect power to vaporizer before servicing.

Stop vaporizer and shut off power at the disconnect.

MAIN and **RTD** Molex connectors.

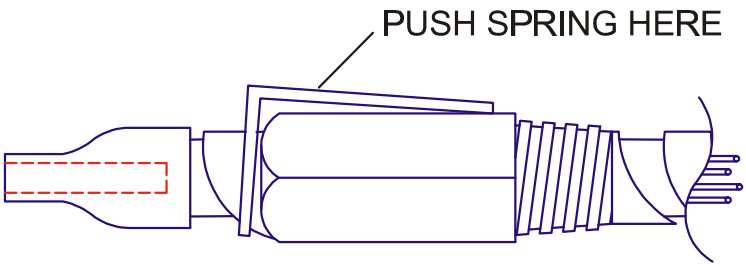
Disconnect the main power wires attached to the contactor and the wires going to the heaters.

The RTD temperature sensor can now be removed from the center of the vaporizer core.

Two types of locking collars have been used on the sensors.

SPRING TAB RETAINER (1 PIECE)

Figure 19 *- RTD Sensor with Spring Tab Retainer*

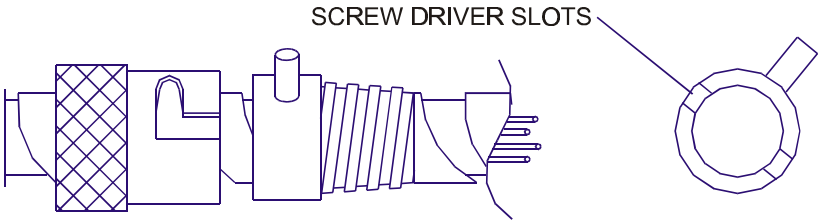


RTD Sensor with Spring Tab Retainer.wmf

To remove a sensor fitted with the spring tab style retainer, squeeze firmly on the tab and pull gently on the sensor. Remove and install the new retainer if required. Install the new sensor by applying a small amount of heat transfer and insert the sensor. Push firmly until the sensor is fully engaged. There should be approximately ½" of sheath remaining.

BAYONET WITH ADAPTER (2 PIECE)

Figure 20 *- RTD Sensor with Bayonet Style Retainer*



RTD Sensor with Bayonet Style Retainer.wmf

- To remove a sensor fitted with the bayonet style retainer, push gently on the retainer while turning to the left. When the retainer is disengaged, pull out the old temperature sensor.
- Use a short, flat-blade screwdriver to remove the adapter.
- Install the new spring tab retainer using an appropriately sized open end wrench (½" or 13mm)
- Install the new sensor by applying a small amount of heat transfer grease to the sensor tube and re-inserting in the unit. Squeeze the spring tab while inserting the sensor. Push firmly until the sensor is fully engaged. When the RTD has been pushed in as far as it will go, there should be at least ½" of sheath remaining.
- Reinstall control board, connect all wires, and reinstall the enclosure cover. Torque cover bolts to 19.5 ft. Lbs. Check vaporizer operation.

INSTALLATION OF THE AUTO RESTART MODULE

This procedure is for field installation of the **AUTO RESTART MODULE** (ASDI P/N 52142 or 52175 kit). Any references to the Economy function does apply nor available on the XPV/XPM units.

MODULE INSTALLATION FOR AUTO RESTART OPERATION ONLY

1. SHUT OFF POWER AT THE DISCONNECT BEFORE REMOVING THE EXPLOSION PROOF COVER.
2. Remove the explosion proof cover to access the control board.
3. On the existing circuit board, place the toggle switch in the **AUTO/ECON** position (towards you). It is located between the AUX and **MAIN** Molex wire connectors. ***See Figure 21***.
4. Move the switch on the Auto Restart/Economy Module to **AUTO RESTART ONLY**. ***See Figure 21***.
5. Plug the Auto Restart/Economy Module into the AUX Molex connector on the original circuit board.
6. Replace the explosion proof cover.
7. Turn on power at the disconnect.
8. Go to Operation of Auto-Restart.

AUTO RESTART/ ECONOMY OPERATION

1. Two position switch on the option module: **AUTO-RESTART/ECONOMY MODE** and **AUTO RESTART ONLY**.

AUTO RESTART ONLY	Disables **ECONOMY MODE**; the vaporizer will operate regardless of the system pressure. The **AUTO RESTART** function will operate.

2. Operation of **AUTO RESTART**:

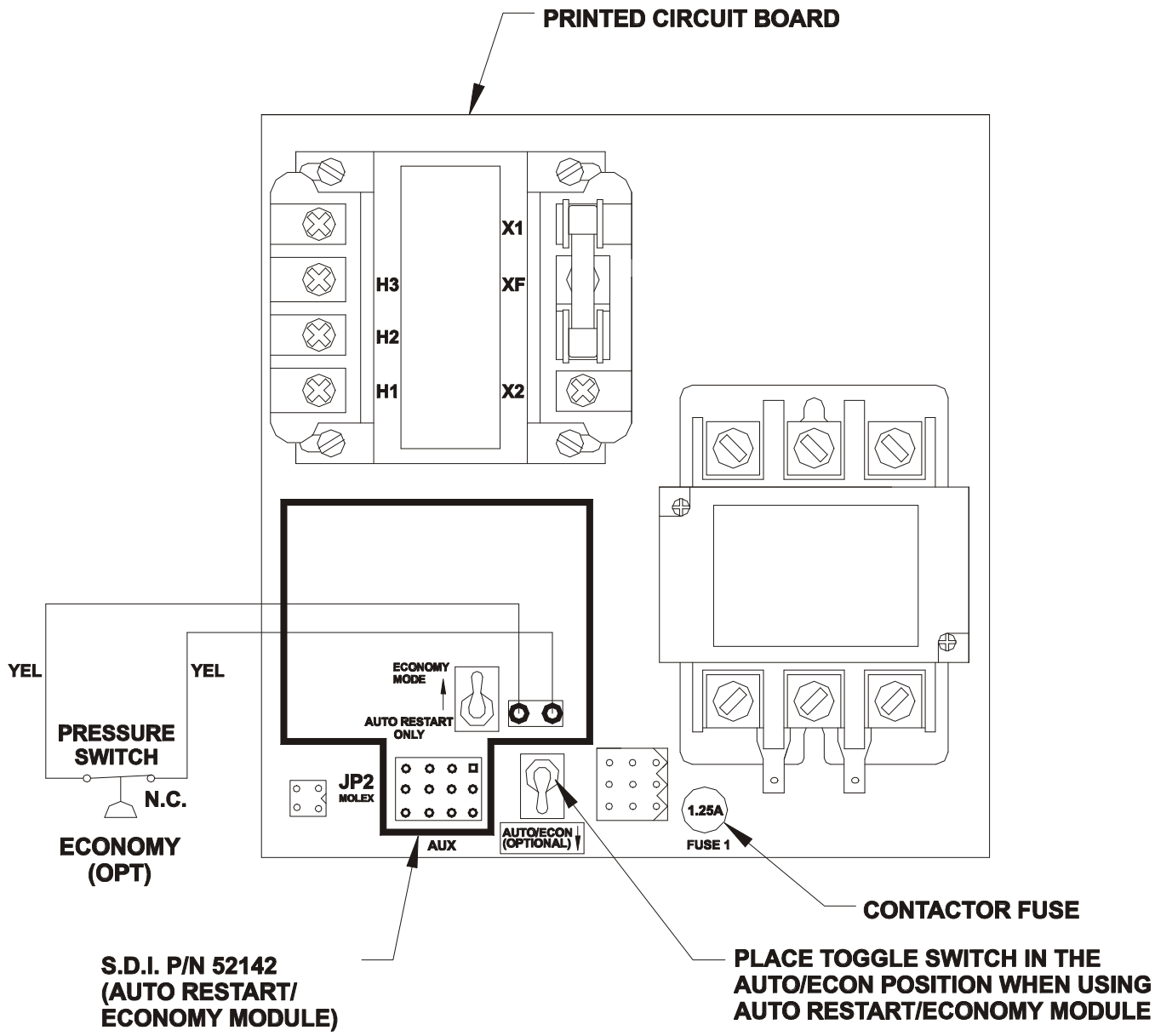
   A. When the power is first turned on, the vaporizer will not start automatically. To start the vaporizer and also initiate the **AUTO RESTART** function, the **START** button must be pushed at the vaporizer.

   B. Power may now be cycled on and off, and the vaporizer will resume operation due to the **AUTO RESTART** function.

C. To discontinue the **AUTO RESTART** function and stop the vaporizer, push the **STOP** switch at the vaporizer when the power is on. Once this has been done, the vaporizer will not start automatically again until the **START** switch is pushed with the power on, as described above.

D. The vaporizer will not restart automatically if the unit has shut down on a safety (i.e. high liquid level, high temperature, etc.). The unit must be manually restarted.

Figure 21 *- Auto Restart Installation Diagram*



Printed Circuit Board.WMF

XP REMOTE CONTROL BOX

The POWER XP **REMOTE CONTROL BOX** provides a means of controlling a POWER XP vaporizer from a remote location. In addition, the box indicates the vaporizer operating status and also annunciates alarm conditions. The remote control box is intended for indoor use. With installer provided wire, the box can be located up to 425 feet from the vaporizer using 14 AWG wire, and 275 feet from the vaporizer using 16 AWG wire.

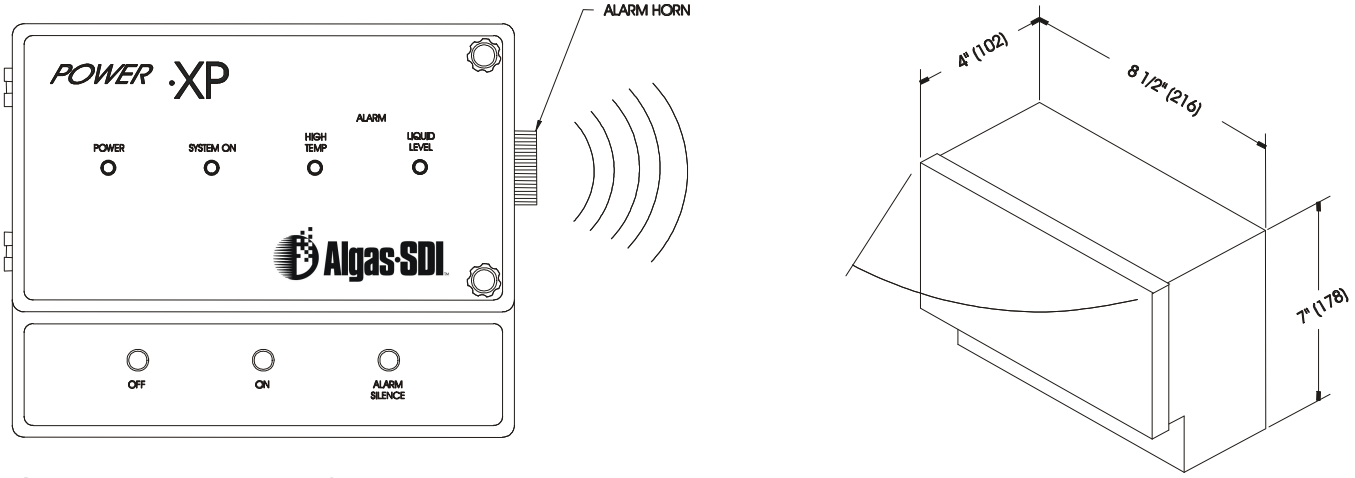


Figure 22 *- Remote Control Box*

Remote Control Box.wmf

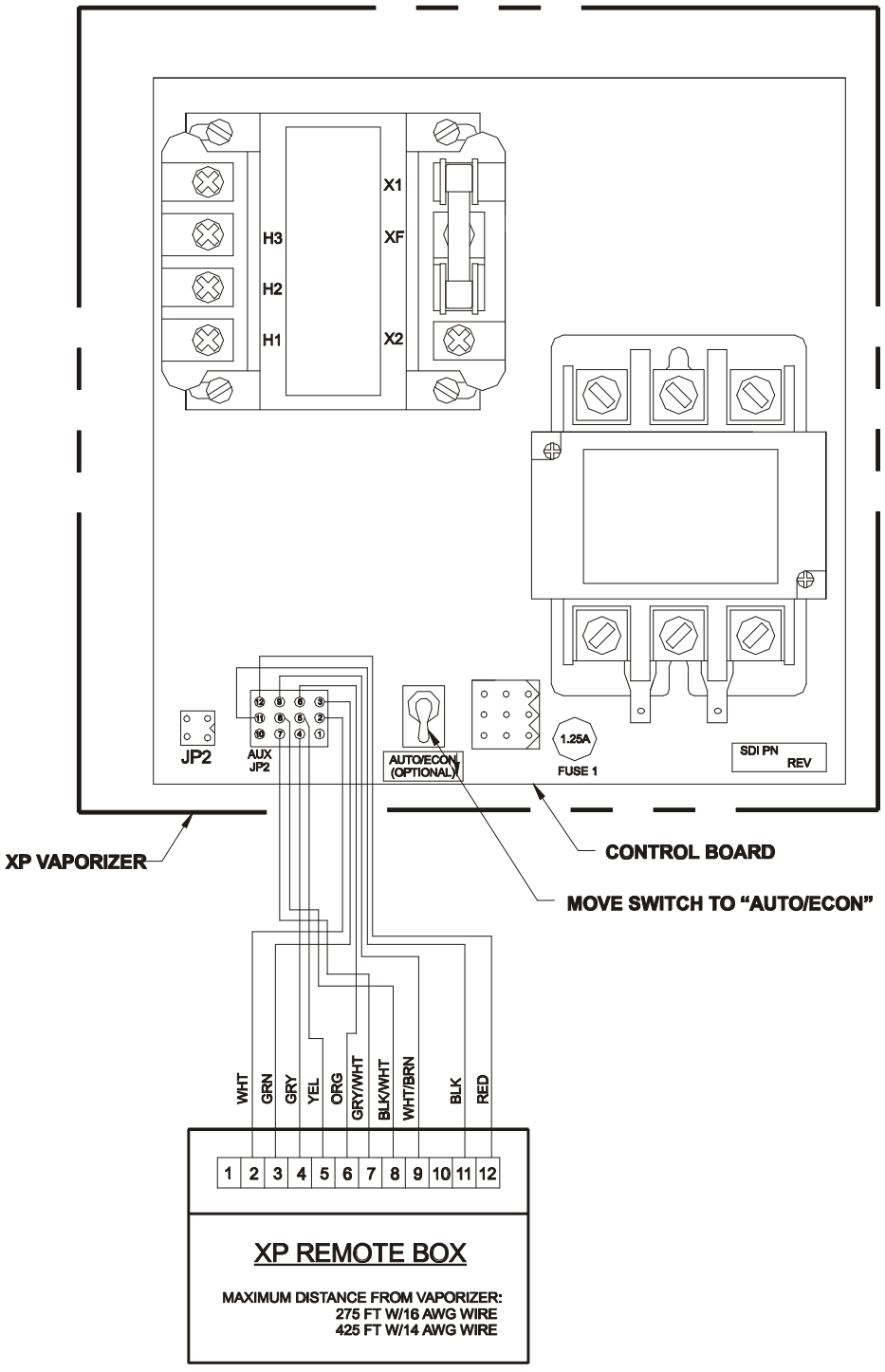
INDICATING LIGHTS

- **POWER:** Illuminates when power from the vaporizer is applied to the box.
- **SYSTEM ON:** Illuminates when the vaporizer has been started and is in operation.
- **HIGH TEMP:** Illuminates when the vaporizer exceeds its high temperature limit. The alarm horn will sound until it is silenced.
- **LIQUID LEVEL:** Illuminates when liquid in the vaporizer exceeds its high limit. The alarm horn will sound until it is silenced.

PUSH BUTTONS

- **OFF:** Turns off the vaporizer.
- **ON:** Turns on the vaporizer.
- **ALARM SILENCE:** Silences the horn in the event of an alarm, however, the appropriate alarm light will remain illuminated until the alarm condition is cleared.

Figure 23 *- Interconnect Wiring Diagram (POWER XP Vaporizer with Remote Control Box)*



Interconnect Wiring Diag.jpg

CONTAMINANT SEPARATOR - FILTAIRE

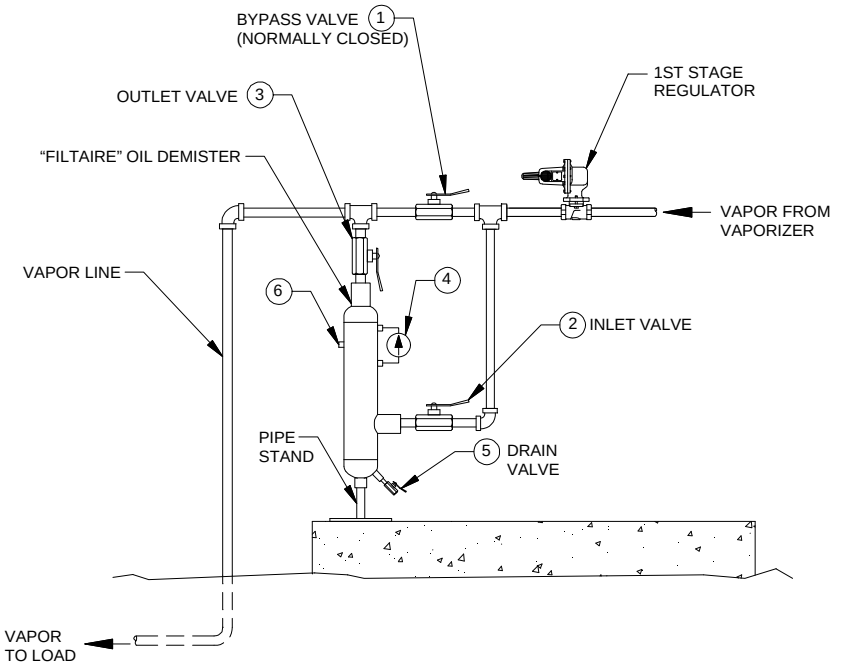
The **FILTAIRE** is a filtering device designed to trap heavy hydrocarbons commonly present in LPG gas vapor. It also traps other materials which may be in the gas due to storage conditions and internal condition of the equipment.

Impurities are collected in the system and periodically removed through the system blow down drain. Residual heavy end hydrocarbons with boiling points higher than pure LPG are trapped by the filter and fall to the bottom for removal.

A complete **FILTAIRE** system consists of inlet and outlet connections, a blow-down drain (5), a differential pressure gauge (4), a vent which is normally plugged (6), and a bypass valve system for cleaning (1, 2, and 3). The bypass valves enable the system to continue operating when the **FILTAIRE** is removed for cleaning (***see Figure 24***).

Note: Items 4,5 and 6 are included with **FILTAIRE** assemblies.

Figure 24 - ***Description of Operation***,



Filtaire.wmf

APPENDIX A

COMPONENT INFORMATION

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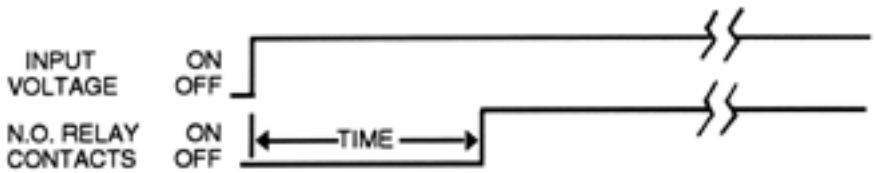
AMPERITE *Solving Your Timing Requirements Since 1922*

DC10 Series TDR

… Solid state CMOS digital circuitry
… Triggered delay on release timing mode
… DPDT (2 form C) isolated 10 ampere relay contacts
… Timing selection: Knob adjustable or Fixed
… Numerous models timing from 0.1 secs. to 1000 hours
… UL File #E96739 (M)
… CSA File #LR62586

Timing Mode:
Delay on operate timing cycle begins upon application of input power. The relay contacts transfer at the end of the delay period and will remain transferred until input voltage is removed. Reset occurs when input voltage is removed.

Timing diagram:



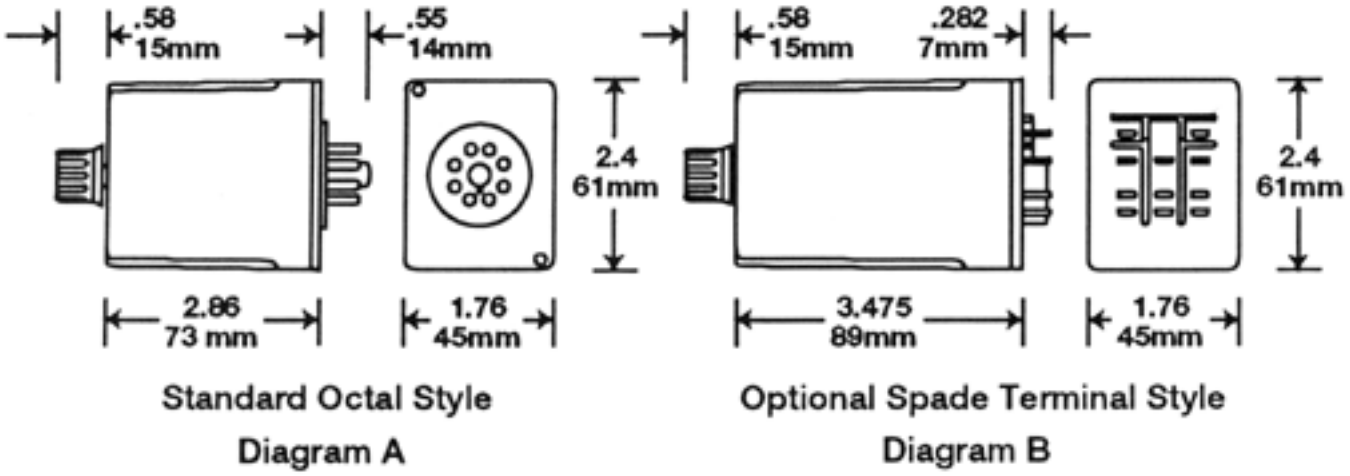
Contact Information:
Arrangement: 2 form C (DPDT) - Diagram C
Contact Material: Silver - Cadmium Oxide
Rating (Resistive):
10A @ 240V AC Resistive
15A @ 30V DC Resistive
15A @ 120V AC Resistive
1/3 HP @ 120V AC
1/2 HP @ 250V AC
Expected Life @ 25°C : 10 Million operations, Mechanical; 100,000 operations minimum at rated loads.

Environmental Information:
Temperature Range:
Storage: -60°C to +105°C (-76°F to +221°F)

Operating: -45°C to +70°C (-49°F to +158°F)

Mechanical Information:
Termination: 8 pin Octal Style Plug or 11 pin spade terminals (Diagram C & D)
Enclosure: White plastic case. Knob adjustable models have a dial scale for reference only.
Weight: 4 oz (114g) approx.

Outline Dimensions (Octal Style):
Please contact us for information on 11-pin spade terminal style (LDC10).



Standard Octal Style
Diagram A

Optional Spade Terminal Style
Diagram B

Timing Specification:
Timing - Fixed: 0.1 sec. through 1000 hours.
Timing Ranges: Standard timing ranges are as follows:
.1 to 10 secs., 1 to 30 secs., 1.8 to 180 secs., 5 to 300 secs., 1 to 60 mins., 1 to 60 hours. **Custom timing is available.**
Timing Adjustment: Knob adjustable potentiometer.
Timing Tolerance: Fixed Units: ±5%; 1% units are available at extra cost.
Adjustable Units: -0 to +10% of maximum specified delay time.
Minimum specified value or less at low end.
Repeatability: ±1%
Release Time: 60 ms typical, 100 ms maximum
Timing Cycle Interrupt Transfer: None
Reset: Upon interruption of power

Initial Dielectric Strength:
Between open contacts: 1000V RMS, Between adjacent contacts: 1500V RMS,
Between contacts & coil: 1500V RMS

Input Information:
Voltage: AC units- 12V, 24V, and 120V; DC units: 12V, 24V, 48V, and 110V. Other voltages are available.
Power Requirement: AC units: 3 VA or less, DC units: 3 Watts or less
Transient Protection: 1 Joule MOV
Polarity Protection: On DC units - Yes

Input Voltages & Limits:

Nominal	Minimum	Maximum
12V AC	10V	14V
24V AC	20V	28V
120V AC	105V	130V
12V DC	11V	14V
24V DC	20V	32V
48V DC	41V	55V
110V DC	95V	125V

Wiring Diagrams:

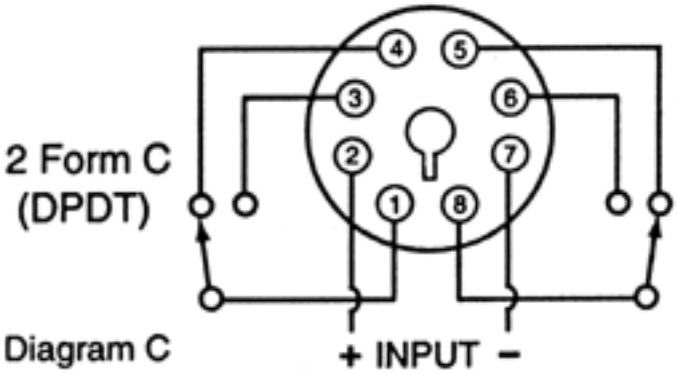


Diagram C

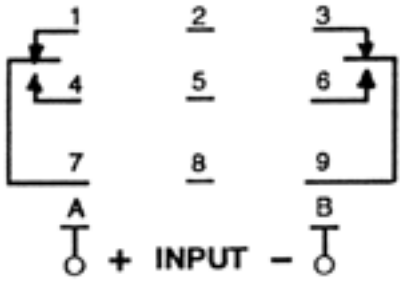
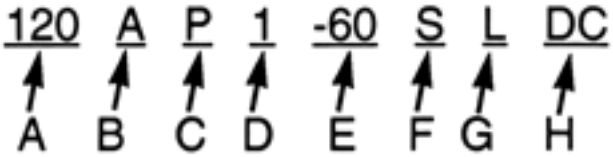


Diagram D

Ordering Information:

Definition of a part number for the Amperite DC10 Series Time Delay Relay.
Example:



A: Denotes nominal input voltage. Voltages available: 12, 24 & 120V AC; 12, 14, 48, & 110V DC, Custom voltages are available.

B: Denotes type of input current required for operation:

A = AC - Alternating Current, D = DC - Direct Current

C: Denotes contact form: P= DPDT - 2 form C.

D & E: Denotes range of knob adjustability for timing (in seconds, minutes or hours) where:
D= Minimum time delay. E= Maximum time delay for adjustable TDR'S.
Note:
1.) Ranges available: See standard timing ranges above. Custom timing is available.
2.) Both values (D & E) can be replaced by a single value for a factory preset time delay in seconds, minutes or hours from 0.1 secs. through 1000 hours.

F: Denotes use of seconds, minutes or hours in timing value(s), S = seconds, M = minutes, H = hours.

G: Enter "L" if optional 11-pin spade terminals are required (Diagram D). Contact us for dimensional differences.

H: Denotes use of solid state digital circuitry of DC10 Series.

Product Selection Table - Main Menu
Overview of Amperite product line

Solving Your Timing Requirements Since 1922

Installation & Maintenance Instructions

ASCO® TRIVPOINT® Pressure Switches

Miniature–Size, Fixed Deadband Pressure Switches With Field Adjustable Set Points

H–SERIES

Form No. P7079R4

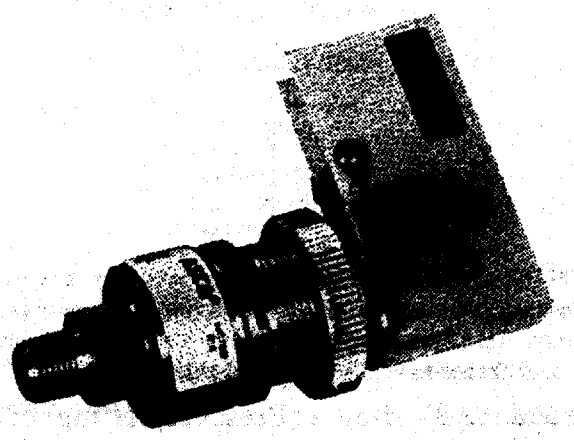
DESCRIPTION

The H–Series are miniature size pressure switches having field adjustable set points, fixed deadbands, and diaphragm/piston sensors. These pressure switches are designed to provide long life and maintain set point accuracy. Materials wetted by the fluid include brass or stainless steel pressure connections. Internal elastomers are made of Buna N, ethylene propylene, fluorosilicone, or VITON* depending upon service requirements.

H–Series pressure switches are available with:

- Open–Frame construction
- Type 1 –General Purpose Enclosure
- Types 3, 3S, and 4–Raintight/Watertight Enclosure

NOTE: H–Series, Suffix *L* pressure switches are limited to Open–Frame Construction.



H–Series, Suffix *L* Pressure Switch

OPERATION

The pressure switch controls electrical circuits in response to changes in pressure. The set and reset points are adjustable over the full range of the switch. As the deadband (on–off differential) is adjusted, both set point on increasing pressure and set point on decreasing pressure are changed. The difference between these points is fixed and is not adjustable. Pressure setting adjustments are made by turning the adjustment wheel at the center of the switch.
On H–Series, Suffix S pressure switches, the snap switch has an adjustment knob to vary the deadband range. To increase deadband range, turn knob counterclockwise; to decrease range, turn knob clockwise.

NOTE: The maximum proof pressure for H–Series pressure switches is 250 psig. Proof pressure is the pressure which a device can be subjected to for extended periods of time without changes in its operating characteristics.

*DuPont's Registered Trademark

INSTALLATION

Check the nameplate for correct catalog number, electrical rating, and pressure range. Never apply incompatible fluids or exceed pressure rating of the switch.

IMPORTANT: All internal adjustments have been made at the factory. Any adjustment, alteration, or repair to the parts of the switch other than stated herein voids all warranties.

Temperature Limitations

Ambient Temperature

- Standard & Suffix *L* Switch: – 4° F to +140° F
- Suffix *U* Switch: – 4° F to +122° F

Check catalog number on nameplate to determine fluid temperature limitations. The seventh (7th) digit in the catalog indicates diaphragm material and fluid temperature limitations. See chart provided.

Seventh (7th) Digit in Catalog Number	Diaphragm Material	Fluid Temperature Limitations
1	Buna N	–4° F to +180° F
2	VITON*	–4° F to +250° F
6	Ethylene Propylene	–4° F to +250° F
7	Fluorosilicone	–40° F to +250° F

EXAMPLE: For Catalog Number HB46A278, the seventh digit of the catalog number is 7. This indicates that the diaphragm material is Fluorosilicone and the fluid temperature limitations are – 40° F to +250° F.

Positioning

The pressure switch may be mounted in any position.

Mounting

For mounting bracket (optional feature) or mounting dimensions of general purpose enclosure see Figures 1, 2, and 3.

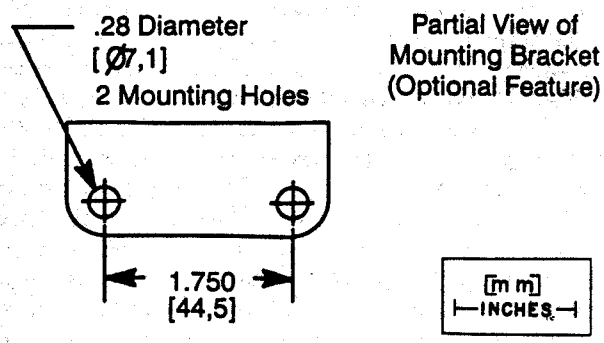


Figure 1. Optional mounting bracket.

Printed in U.S.A.

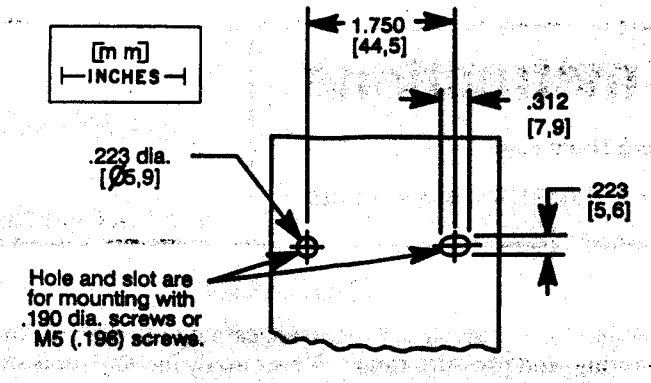


Figure 2. General purpose enclosure.

Piping/Tubing

Adequate support of piping and proper mounting of pressure switch should be made to avoid excessive shock or vibration. To minimize the effect of vibration on a switch, mount perpendicular to vibration. Connect piping or tubing at base of pressure switch.

⚠ CAUTION: Do not use 1/2" pipe thread on pressure switch body as a pressure connection. This thread is provided for mounting the pressure switch in a panel enclosure or mounting bracket through a 7/8" diameter hole.

⚠ CAUTION: Pressure switches with the seventh (7th) digit in the catalog number being a six (6) are provided with ethylene propylene diaphragm material which can be attacked by oils and greases. Wipe the pipe threads clean of cutting oils.

Apply pipe compound sparingly to male pipe threads only. If applied to internal threads, the compound may enter the sensor and cause operational difficulty. Avoid pipe strain on pressure switch by properly supporting and aligning piping. When tightening pipe, do not use the pressure switch as a lever. Locate wrenches applied to pressure switch body on wrenching flats only.

⚠ CAUTION: For steam service, install a condensate loop, (pigtail or steam siphon tube) between the steam line and the pressure switch.

Wiring

Wiring must comply with local codes and the National Electric Code. Use No. 14 AWG copper wire rated for 60° C minimum. Switch is marked *NO* for normally open, *NC* for normally closed, and *C* for common. H–Series, Suffix *L* switches are provided with 1/4" spade terminal connections. The general purpose switch enclosure is provided with two 7/8" diameter knockouts to accommodate 1/2" electrical hub or connector. For extra support, leave switch housing assembled when driving out 7/8" diameter knockout. It is recommended that flexible conduit be used. If rigid conduit is used, do not consider it or use it as a means of supporting (mounting) the pressure switch. The raintight/watertight enclosure has a 1/2" conduit hub. When replacing housing cover, torque screws in a crisscross manner to 10 in–lbs [1,1 Nm] to ensure even gasket compression.

⚠ CAUTION: Electrical load must be within range stated on nameplate. Failure to stay within the electrical range of the switch rating may result in damage or premature failure of the electrical switch.

⚠ CAUTION: Do not overtighten screw type terminal connections. When connections are made, be sure there is no stress on the wire leads. Excess of either condition may cause malfunction of switch.

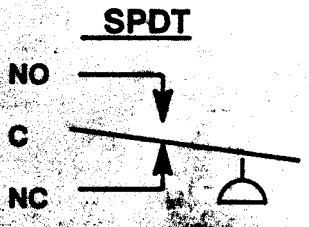
Electrical Ratings

Standard & Suffix *L* Switches

15 amps resistive, 125 volts AC
10 amps resistive, 250 volts AC
1/8 HP, 125 volts AC
1/4 HP, 250 volts AC
1/2 amp resistive, 125 volts DC
1/4 amp resistive, 250 volts DC

Suffix *U* Switch

5 amps resistive, 125 and 250 volts AC
1/8 HP, 125 volts AC
1/4 HP, 250 volts AC
1/2 amp resistive, 125 volts DC
1/4 amp resistive, 250 volts DC



IMPORTANT: H–Series pressure switches are available with optional snap switches which have different electrical ratings than listed above. Check nameplate on housing cover or frame to verify electrical ratings.

Set Point Adjustment (Pressure Setting) of Fixed Deadband Pressure Switch

When making adjustment (pressure setting) a pressure gauge within suitable range is required. If electrical hookup (to line of final application) to the switch is not desirable, a battery powered test lamp or Ohmmeter may be used. The markings on the pressure switch calibration scale (in PSIG or BAR) are for an approximate pressure setting. The adjustment wheel in center of the pressure switch is turned clockwise or counterclockwise to change pressure setting. For an exact pressure setting proceed as follows:

To Adjust Set Point On *Increasing Pressure*

1. If the pressure switch is in the line of final application when set point adjustment is made, be sure switch can be test operated without affecting other equipment.
2. Turn adjustment wheel clockwise until indicator is full down (toward pressure connection) or well beyond desired pressure setting (set point).
3. Follow the steps in the chart below to make the pressure setting.

ASCO Valves Automatic Switch Co. 50–60 Hanover Road, Florham Park, New Jersey 07932

Adjustment Procedure	Normally Closed		Normally Open	
	Switch Terminal	Status of Test Lamp	Switch Terminal	Status of Test Lamp
1. Starting with zero pressure, connect test lamp to common	NC	On (Closed Circuit)	NO	Off (Open Circuit)
2. Apply desired set point pressure. Then turn adjustment wheel counterclockwise until switch operates.	NC	Off (Open Circuit)	NO	On (Closed Circuit)
3. Lower pressure until switch returns on decreasing pressure	NC	On (Closed Circuit)	NO	Off (Open Circuit)

4. For exact pressure setting, cycle pressure switch and make fine adjustments with wheel.
5. After setting has been made, make permanent electrical connections.

⚠ WARNING: To prevent the possibility of personal injury or property damage, be sure electrical power is off when making permanent electrical connections.

To Adjust Set Point On *Decreasing Pressure*

1. If the pressure switch is in the line of final application when set point adjustment is made, be sure switch can be test operated without affecting other equipment.
2. Turn adjustment wheel counterclockwise until indicator is full up (toward snap switch).
3. Follow the steps in the chart below to make the pressure settings.

Adjustment Procedure	Normally Closed		Normally Open	
	Switch Terminal	Status of Test Lamp	Switch Terminal	Status of Test Lamp
1. Starting with initial pressure above desired pressure (set point), connect test lamp to common.	NC	Off (Open Circuit)	NO	On (Closed Circuit)
2. Decrease pressure to desired set point pressure. Then turn adjustment wheel clockwise until switch operates.	NC	On (Closed Circuit)	NO	Off (Closed Circuit)
3. Raise pressure until switch returns on increasing pressure.	NC	Off (Open Circuit)	NO	On (Closed Circuit)

4. For exact pressure setting, cycle pressure switch and make fine adjustments with wheel.
5. After setting has been made make permanent electrical connections.

⚠ WARNING: To prevent the possibility of personal injury or property damage, be sure electrical power is off when making permanent electrical connections.

Testing of Installation

If the adjustment of the switch has been made outside of the line of final application, the switch should be re-tested when installed in the line of final application. Follow adjustment instructions. Be sure switch can be test operated without affecting other equipment.

MAINTENANCE

⚠ WARNING: To prevent the possibility of personal injury or property damage, turn off electrical power, depressurize switch and vent fluid to a safe area before removal or inspection.

IMPORTANT: Pressure switch is not field repairable. In case of damage, replace the entire pressure switch. Address all service inquiries to Automatic Switch Company, 50–60 Hanover Road, Florham Park, New Jersey 07932, Valve Service Department.

Preventive Maintenance

- While in service, operate the fixed deadband pressure switch periodically (cycle between two set points) to ensure proper operation. If necessary, electrical wiring and pipe connections should be made so that switch can be test operated without affecting other equipment.
- Periodic inspection of the pressure switch, external surfaces only, should be carried out. Switch should be kept clean and free from paint, foreign matter, corrosion, icing, or freeing conditions.
- Keep the medium entering the pressure switch as free from dirt and foreign material as possible.

Causes of Improper Operation

- **Incorrect Electrical Connection:** Check leads to switch. Be sure they are properly connected. Switch is marked *NO* for normally open, *NC* for normally closed, and *C* for common.
- **Faulty Control Circuit:** Check the electrical power supply to switch. Check for loose or blown fuses, open-circuited or grounded wires, loose connections at switch. See nameplate for electrical rating and range.
- **Incorrect Pressure:** Check pressure in system with suitable pressure gauge. Pressure must be within range specified on nameplate.
- **Incorrect Adjustment:** Check pressure scale to see approximate setting. Refer to section on "Set Point Adjustment of Fixed Deadband Pressure Switch".
- **External Leakage or Snap Switch Failure:** Replace pressure switch, see *ORDERING INFORMATION*.
- **Excessive Vibration or Surges Causing Switch to Operate Undesirably:** Check for pressure fluctuations in system and install pressure surge suppressor. Check switch mounting and be sure there is no excessive vibration.

If the operation of the pressure switch cannot be corrected by the above means, it should be replaced.

FOR SERVICE, REPLACEMENT OR INFORMATION

Consult Factory or Authorized Factory Representative or Distributors

ORDERING INFORMATION

When Ordering, Specify Catalog Number, Fluid, and Pressure Range.

Torque Chart

Part Name	Torque Value Inch–Pounds	Torque Value Newton–Meters
Cover screws	10	1,1

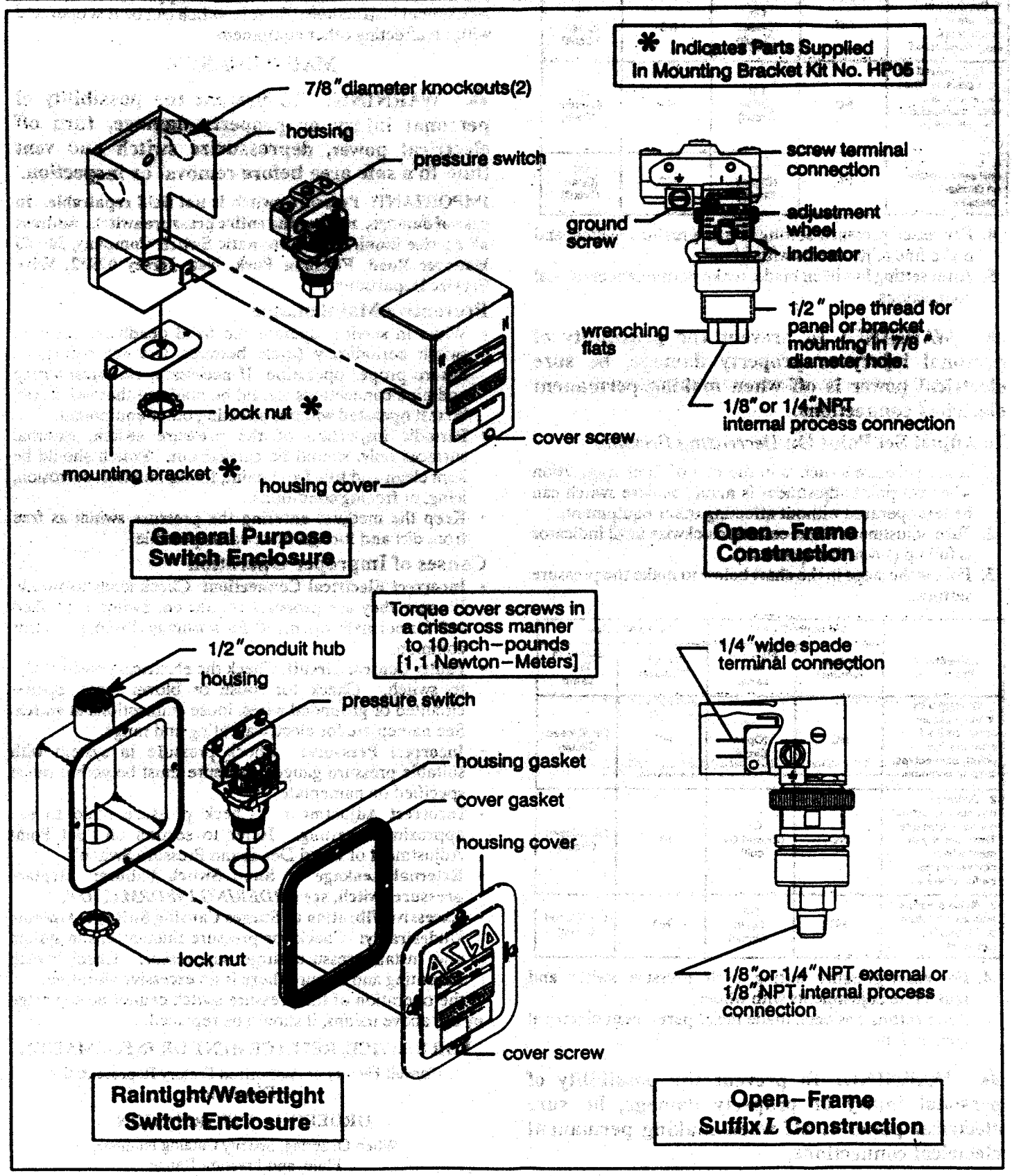


Figure 3. H–Series pressure switches.

INSTALLATION AND MAINTENANCE INSTRUCTIONS

2-WAY INTERNAL PILOT OPERATED SOLENOID VALVES HUNG DIAPHRAGM – 3/8, 1/2 AND 3/4 N.P.T. NORMALLY CLOSED OPERATION

BULLETINS
8210
8211

ASCO

Form No. V-5825

DESCRIPTION

Bulletin 8210's are 2-way, normally closed, internal pilot operated solenoid valves. Valve body and bonnet are of brass construction. Standard valves have a General Purpose, NEMA Type 1 Solenoid Enclosure.

Bulletin 8211's are the same as Bulletin 8210's except the solenoids are equipped with an enclosure which is designed to meet NEMA Type 4 Watertight, NEMA Type 7 (C or D) Hazardous Locations - Class I, Group C or D, and NEMA Type 9 (E, F or G) Hazardous Locations - Class II, Group E, F or G. The explosion-proof/watertight solenoid enclosure is shown on a separate sheet of Installation and Maintenance Instructions, Form No. V-5380.

Bulletin 8210 and 8211 valves with suffix 'HW' in the catalog number are specifically designed for hot water service.

OPERATION

Normally Closed: Valve is closed when solenoid is de-energized and opens when solenoid is energized.

MANUAL OPERATOR (Optional)

Valves with suffix 'MO' in catalog number are provided with a manual operator which allows manual operation when desired or during an interruption of electrical power. To operate valve manually, push in knurled cap and rotate clockwise 180°. Disengage manual operator by rotating knurled cap counterclockwise 180° before operating electrically.

MANUAL OPERATOR LOCATION (Refer to Figure 3)

Manual operator (when shipped from factory) will be located over the valve outlet. Manual operator may be relocated at 90° increments by rotating valve bonnet. Remove bonnet screws (4) and rotate valve bonnet with solenoid to desired position. Replace bonnet screws (4) and torque in a crisscross manner to 110 ± 10 inch pounds.

If valve is installed in system and is operational, proceed in the following manner:

WARNING: Depressurize valve and turn off electrical power supply.

1. Remove retaining cap or clip and slip the entire solenoid enclosure off the solenoid base sub-assembly. CAUTION: When metal retaining clip disengages, it will spring upwards.
2. Remove bonnet screws (4) and rotate valve bonnet to desired position.
3. Replace bonnet screws (4) and torque in a crisscross manner to 110 ± 10 inch pounds.
4. Replace solenoid enclosure and retaining clip or cap.

INSTALLATION

Check nameplate for correct catalog number, pressure, voltage and service.

TEMPERATURE LIMITATIONS

For maximum valve ambient and fluid temperatures refer to chart. The temperature limitations listed are for UL applications. For non UL applications, higher ambient and fluid temperature limitations are available. Consult factory. Check catalog number on nameplate to determine maximum temperatures.

Construction	Coil Class	Catalog Number Prefix	Maximum Ambient Temp. °F.	Maximum Fluid Temp. °F.
A-C Construction (Alternating Current)	A	None or DA	77	180
	F	DF or FT	122	180
	H	HT	140	180
D-C Construction (Direct Current)	A, F or H	None, FT or HT	77	150
Catalog Numbers Suffixed 'HW' A-C Construction (Alternating Current)	A	None or DA	77	210
	F	DF or FT	77	210
	H	HT	122	210

POSITIONING/MOUNTING

Valve may be mounted in any position. For mounting bracket (optional feature) dimensions, refer to Figure 1.

PIPING

Connect piping to valve according to markings on valve body. Apply pipe compound sparingly to male pipe threads only; if applied to valve threads, it may enter the valve and cause operational difficulty. Pipe strain should be avoided by proper support and alignment of piping. When tightening the pipe do not use valve as a lever. Wrenches applied to valve body or piping are to be located as close as possible to connection point. **IMPORTANT: Valves with suffix 'HW' in the catalog number have a special diaphragm material which is specifically compounded for hot water service. This material can be attacked by oil and grease. Wipe the pipe threads clean of cutting oils and use teflon tape to seal pipe joints.**

IMPORTANT: For the protection of the solenoid valve, install a strainer or filter suitable for the service involved in the inlet side as close to the valve as possible. Periodic cleaning is required depending on the service conditions. See Bulletins 8600, 8601 and 8602 for strainers.

WIRING

Wiring must comply with Local and National Electrical Codes. Housings for all solenoids are provided with connections for 1/2 inch conduit. The general purpose solenoid enclosure may be rotated to facilitate wiring by removing the retaining cap or clip. CAUTION: When metal retaining clip disengages it will spring upwards. Rotate to desired position. Replace retaining cap or clip before operating.

NOTE: Alternating Current (A-C) and Direct Current (D-C) Solenoids are built differently. To convert from one to the other, it is necessary to change the complete solenoid including the solenoid base sub-assembly and core assembly.

SOLENOID TEMPERATURE

Standard catalog valves are supplied with coils designed for continuous duty service. When the solenoid is energized for a long period, the solenoid enclosure becomes hot and can be touched with the hand for only an instant. This is a safe operating temperature. Any excessive heating will be indicated by the smoke and odor of burning coil insulation.

MAINTENANCE

WARNING: Turn off electrical power and depressurize valve before making repairs. It is not necessary to remove valve from pipe line for repairs.

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CLEANING

A periodic cleaning of all solenoid valves is desirable. The time between cleanings will vary, depending on media and service conditions. In general, if the voltage to the coil is correct, sluggish valve operation, excessive leakage or noise will indicate that cleaning is required.

PREVENTIVE MAINTENANCE

1. Keep the medium flowing through the valve as free from dirt and foreign material as possible.
2. While in service, operate valve at least once a month to insure proper opening and closing.
3. Periodic inspection (depending on media and service conditions) of internal valve parts for damage or excessive wear is recommended. Thoroughly clean all parts. Replace any parts that are worn or damaged.

IMPROPER OPERATION

1. **Faulty Control Circuit:** Check electrical system by energizing solenoid. A metallic click signifies the solenoid is operating. Absence of the click indicates loss of power supply. Check for loose or blown-out fuses, open circuited or grounded coil, broken lead wires or splice connections.
2. **Burned-Out Coil:** Check for open circuited coil. Replace coil if necessary.
3. **Low Voltage:** Check voltage across coil leads. Voltage must be at least 85% of nameplate rating.
4. **Incorrect Pressure:** Check valve pressure. Pressure to the valve must be within range specified on nameplate.
5. **Excessive Leakage:** Disassemble valve and clean all parts. Replace worn or damaged parts with a complete Spare Parts Kit for best results.

COIL REPLACEMENT (Refer to Figure 2)

Turn off electrical power supply and disconnect coil leads. Proceed in the following manner:

1. Remove retaining cap or clip, nameplate and cover. CAUTION: When metal retaining clip disengages, it will spring upwards.
2. Remove spring washer, insulating washer and coil. Insulating washers are omitted when a molded coil is used.
3. Reassemble in reverse order of disassembly paying careful attention to exploded view provided for identification and placement of parts.

CAUTION: Solenoid must be fully reassembled as the housing and internal parts are part of and complete the magnetic circuit. Place insulating washer at each end of coil if required.

VALVE DISASSEMBLY (Refer to Figures 2 and 3)

Depressurize valve and turn off electrical power supply. Proceed in the following manner:

1. Remove retaining cap or clip and slip the entire solenoid enclosure off the solenoid base sub-assembly. CAUTION: When metal retaining clip disengages, it will spring upwards.
2. Unscrew solenoid base sub-assembly and remove bonnet gasket.
3. Remove valve bonnet screws (4) and valve bonnet.
4. For normal maintenance, it is not necessary to disassemble the manual operator (optional feature) unless external leakage is evident. To disassemble remove stem pin, manual operator stem, stem spring and stem gasket.
5. Remove core spring, core/diaphragm sub-assembly and body gasket. CAUTION: Do not damage or distort hanger spring between core/diaphragm sub-assembly.
6. All parts are now accessible for cleaning or replacement. Replace worn or damaged parts with a complete Spare Parts Kit for best results.

VALVE REASSEMBLY

1. Reassemble in reverse order of disassembly paying careful attention to exploded views provided for identification and placement of parts.
2. Replace body gasket and core/diaphragm sub-assembly. Locate the bleed hole in core/diaphragm sub-assembly approximately 45° from the valve outlet.
3. Replace core spring with wide end in core first; closed end protrudes from top of core.
4. If removed, replace manual operator stem, stem spring, stem gasket and stem pin.
5. Replace valve bonnet and bonnet screws (4). Torque bonnet screws (4) in a crisscross manner to 110 ± 10 inch pounds.
6. Replace bonnet gasket and solenoid base sub-assembly. Put solenoid base sub-assembly to 175 ± 25 inch pounds.
7. Replace solenoid enclosure and retaining cap or clip.
8. After maintenance, operate the valve a few times to be sure of proper opening and closing.

SPARE PARTS KITS

Spare Parts Kits and Coils are available for ASCO valves.
Parts marked with an asterisk (*) are supplied in Spare Parts Kits.

ORDERING INFORMATION FOR SPARE PARTS KITS
When Ordering Spare Parts Kits or Coils Specify Valve Catalog Number, Serial Number and Voltage.

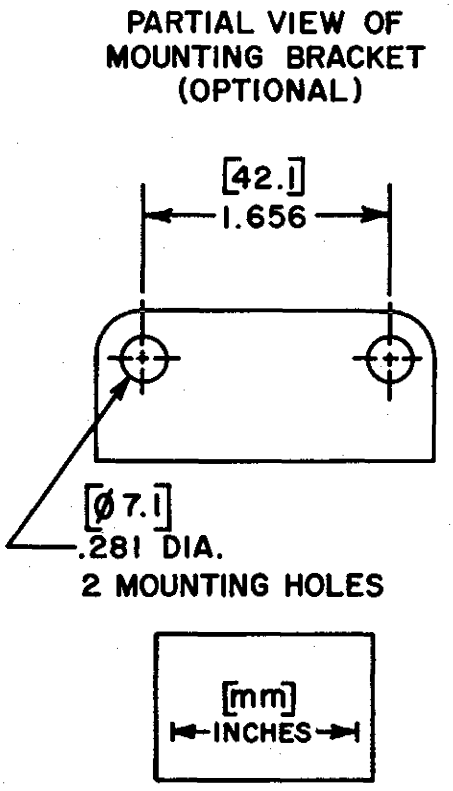

Figure 1. Dimensions For Mounting Bracket (Optional Feature)

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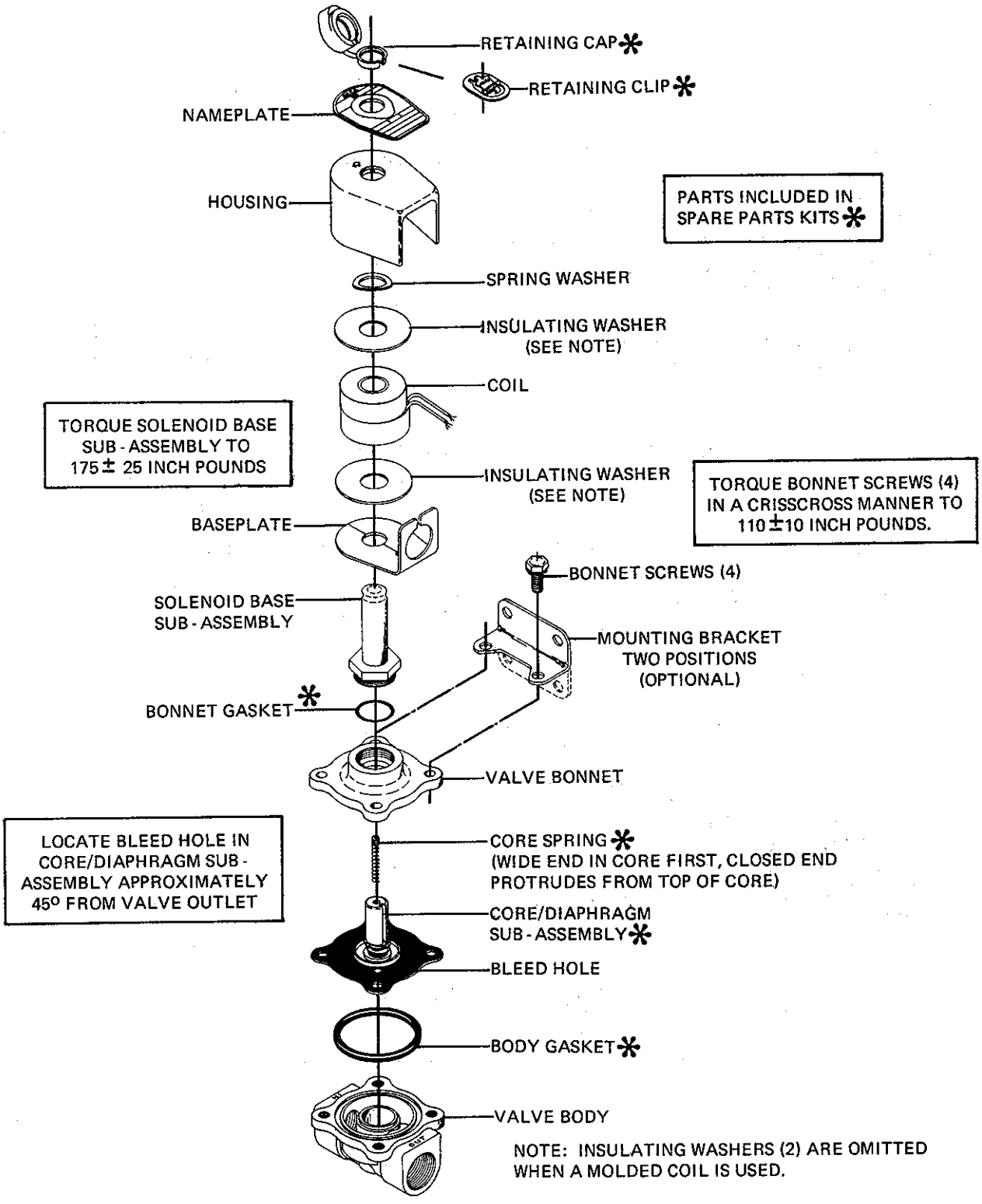

Bulletin 8210 — 3/8, 1/2 & 3/4 N.P.T. — A-C Construction
General purpose solenoid enclosure shown.
For explosion-proof/watertight solenoid enclosure used on Bulletin 8211, see Form No. V-5380.

Figure 2.

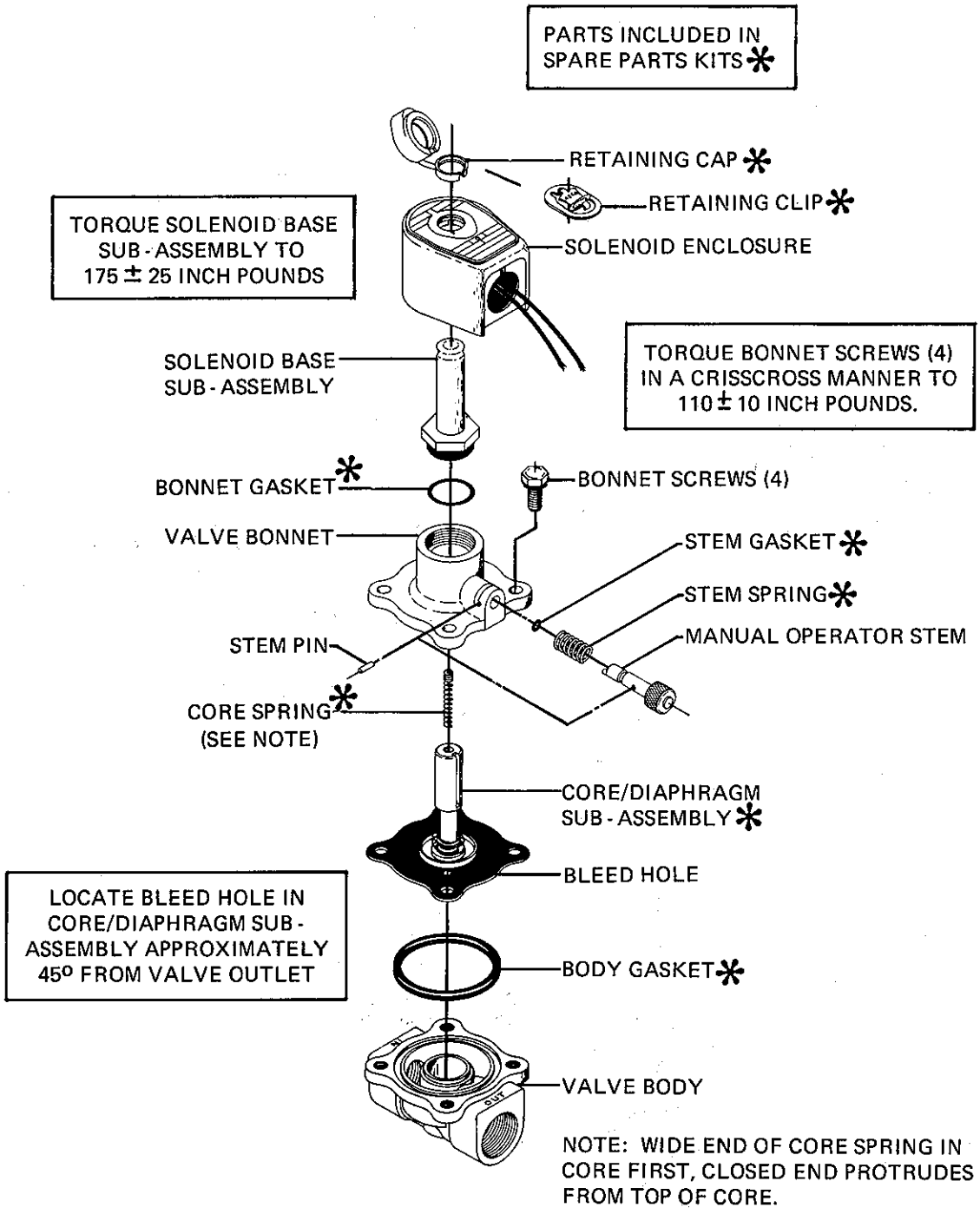

Figure 3. **Bulletin 8210 — Manual Operator**
General purpose solenoid enclosure shown.
For explosion-proof/watertight solenoid enclosure used on Bulletin 8211, see Form No. V-5380.

ASCO Valves
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Installation & Maintenance Instructions

ASCO Red-Hat II®

OPEN–FRAME, GENERAL PURPOSE, WATERTIGHT/EXPLOSIONPROOF SOLENOIDS

SERIES
8003G
8202G
Form No.V6584R8

— SERVICE NOTICE —

ASCO® solenoid valves with design change letter "G" or "H" in the catalog number (ex. 8210G 1) have an epoxy encapsulated ASCO® Red Hat II® solenoid. This solenoid replaces some of the solenoids with metal enclosures and open–frame constructions. Follow these installation and maintenance instructions if your valve or operator uses this solenoid.

See separate instructions for basic valve.

DESCRIPTION

Catalog numbers 8003G and 8202G are epoxy encapsulated pull–type solenoids. The green solenoid with lead wires and 1/2″ conduit connection is designed to meet Enclosure Type 1–General Purpose, Type 2–Dripproof, Types 3 and 3S–Raintight, and Types 4 and 4X–Watertight. The black solenoid on catalog numbers prefixed "EF" or "EV" is designed to meet Enclosure Types 3 and 3S–Raintight, Types 4 and 4X–Watertight, Types 6 and 6P–Submersible, Type 7 (A, B, C & D) Explosionproof Class I, Division 1 Groups A, B, C, & D and Type 9 (E, F, & G)–Dust–Ignitionproof Class II, Division 1 Groups E, F & G. The Class II, Groups F & G Dust Locations designation is not applicable for solenoids or solenoid valves used for steam service or when a class "H" solenoid is used. See *Temperature Limitations* section for solenoid identification and nameplate/retainer for service. When installed just as a solenoid and not attached to an ASCO valve, the core has a 0.250–28 UNF–2B tapped hole, 0.38 or 0.63 minimum full thread.

NOTE: Catalog number prefix "EV" denotes stainless steel construction.

Catalog numbers 8202G1, 8202G3, 8202G5 and 8202G7 are epoxy encapsulated push–type, reverse–acting solenoids having the same enclosure types as previously stated for Catalog numbers 8003G1 and 8003G2.

Series 8003G and 8202G solenoids are available in:

- **Open–Frame Construction:** The green solenoid may be supplied with 1/4″ spade, screw or DIN terminals. (Refer to Figure 4)
- **Panel Mounted Construction:** These solenoids are specifically designed to be panel mounted by the customer through a panel having a .062 to .093 maximum wall thickness. Refer to Figure 1 and section on *Installation of Panel Mounted Solenoid.*

Optional Features For Type 1 – General Purpose Construction Only

- **Junction Box:** This junction box construction meets Enclosure Types 2,3,3S,4, and 4X. Only solenoids with 1/4″ spade or screw terminals may have a junction box. The junction box provides a 1/2″ conduit connection, grounding and spade or screw terminal connections within the junction box (See Figure 5).
- **DIN Plug Connector Kit No.K236034:** Use this kit only for solenoids with DIN terminals. The DIN plug connector kit provides a two pole with grounding contact DIN Type 43650 construction (See Figure 6).

OPERATION

Series 8003G – When the solenoid is energized, the core is drawn into the solenoid base sub–assembly. **IMPORTANT: When the solenoid is de–energized, the initial return force for the core, whether developed by spring, pressure, or weight, must exert a minimum force to overcome residual magnetism created by the solenoid. Minimum return force for AC construction is 11 ounces, and 5 ounces for DC construction.**

Series 8202G – When the solenoid is energized, the disc holder assembly seats against the orifice. When the solenoid is de–energized , the disc holder assembly returns. **IMPORTANT: Initial return force for the disc or disc holder assembly, whether developed by spring, pressure, or weight, must exert a minimum force to overcome residual magnetism created by the solenoid. Minimum return force is 1 pound, 5 ounces.**

INSTALLATION

Check nameplate for correct catalog number, service, and wattage. Check front of solenoid for voltage and frequency.

⚠ WARNING: Electrical hazard from the accessibility of live parts. To prevent the possibility of death, serious injury or property damage, install the open – frame solenoid in an enclosure.

FOR BLACK ENCLOSURE TYPES 7 AND 9 ONLY

⚠ CAUTION: To prevent fire or explosion, do not install solenoid and/or valve where ignition temperature of hazardous atmosphere is less than 165° C. On valves used for steam service or when a class "H" solenoid is used, do not install in hazardous atmosphere where ignition temperature is less than 180°C. See nameplate/retainer for service.

NOTE: These solenoids have an internal non–resetable thermal fuse to limit solenoid temperature in the event that extraordinary conditions occur which could cause excessive temperatures. These conditions include high input voltage, a jammed core, excessive ambient temperature or a shorted solenoid, etc. This unique feature is a standard feature only in solenoids with black explosionproof/dust–ignitionproof enclosures (Types 7 & 9).

⚠ CAUTION: To protect the solenoid valve or operator, install a strainer or filter, suitable for the service involved in the inlet side as close to the valve or operator as possible. Clean periodically depending on service conditions. See ASCO Series 8600, 8601, and 8602 for strainers.

Temperature Limitations

For maximum valve ambient temperatures, refer to chart. The temperature limitations listed, only indicate maximum application temperatures for field wiring rated at 90°C. Check catalog number prefix and watt rating on nameplate to determine maximum ambient temperature. See valve installation and maintenance instructions for maximum fluid temperature. NOTE: For steam service, refer to *Wiring* section, *Junction Box* for temperature rating of supply wires.

Temperature Limitations For Series 8003G or 8202G Solenoids for use on Valves Rated at 10.1, 11.6, 17.1, or 22.6 Watts

Watt Rating	Catalog Number Coil Prefix	Class of Insulation	Maximum † Ambient Temp.
10.1 & 17.1	None, FB, KF, KP SC, SD, SF, & SP,	F	125°F (51.7°C)
10.1 & 17.1	HB, HT, KB, KH, SS, ST, SU,	H	140°F (60°C)
11.6 & 22.6	None, FB,KF, KP, SC, SD, SF, & SP.	F	104°F (40°C)
11.6 & 22.6	HP, HT, KB, KH, SS, ST, SU, & SV	H	104°F (40°C)

† Minimum ambient temperature –40° F (–40° C).

Positioning

This solenoid is designed to perform properly when mounted in any position. However, for optimum life and performance, the solenoid should be mounted vertically and upright to reduce the possibility of foreign matter accumulating in the solenoid base sub–assembly area.

Wiring

Wiring must comply with local codes and the National Electrical Code. All solenoids supplied with lead wires are provided with a grounding wire which is green or green with yellow stripes and a 1/2″ conduit connection. To

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facilitate wiring, the solenoid may be rotated 360°. For the watertight and explosionproof solenoid, electrical fittings must be approved for use in the approved hazardous locations.

⚠ CAUTION: Cryogenic Applications — Solenoid lead wire insulation should not be subjected to cryogenic temperatures. Adequate lead wire protection and routing must be provided.

Additional Wiring Instructions For Optional Features:

- **Open−Frame solenoid with 1/4″ spade terminals.**

For solenoids supplied with screw terminal connections use #12−18 AWG stranded copper wire rated at 90°C or greater. Torque terminal block screws to 10 ± 2 in−lbs [1,0 ± 1,2 Nm]. A tapped hole is provided in the solenoid for grounding, use a #10−32 machine screw. Torque grounding screw to 15 − 20 in−lbs [1,7 − 2,3 Nm]. On solenoids with screw terminals, the socket head screw holding the terminal block to the solenoid is the grounding screw. Torque the screw to 15 − 20 in−lbs [1,7 − 2,3 Nm] with a 5/32″ hex key wrench.

- **Junction Box**

The junction box is used with spade or screw terminal solenoids only and is provided with a grounding screw and a 1/2″ conduit connection. Connect #12−18 AWG standard copper wire only to the screw terminals. Within the junction box use field wire that is rated 90°C or greater for connections. For steam service use 105°C rated wire up to 50 psi or use 125°C rated wire above 50 psi. After electrical hookup, replace cover gasket, cover, and screws. Tighten screws evenly in a crisscross manner.

- **DIN Plug Connector Kit No.K236034**

1. The open−frame solenoid is provided with DIN terminals to accommodate the plug connector kit.
2. Remove center screw from plug connector. Using a small screwdriver, pry terminal block from connector cover.
3. Use #12−18 AWG stranded copper wire rated at 90°C or greater for connections. Strip wire leads back approximately 1/4″ for installation in socket terminals. The use of wire−end sleeves is also recommended for these socket terminals. Maximum length of wire−end sleeves to be approximately 1/4″. Tinning of the ends of the lead wires is not recommended.
4. Thread wire through gland nut, gland gasket, washer and connector cover.

NOTE: Connector housing may be rotated in 90° increments from position shown for alternate positioning of cable entry.

5. Check DIN connector terminal block for electrical markings. Then make electrical hookup to terminal block according to markings on it. Snap terminal block into connector cover and install center screw.
6. Position connector gasket on solenoid and install plug connector. Torque center screw to 5 ± 1 in−lbs [0,6 ± 1,1 Nm].

NOTE: Alternating current (AC) and direct current (DC) solenoids are built differently. To convert from one to the other, it may be necessary to change the complete solenoid including the core and solenoid base sub−assembly, not just the solenoid. Consult ASCO.

Installation of Solenoid

Solenoids may be assembled as a complete unit. Tightening is accomplished by means of a hex flange at the base of the solenoid.

Installation of Panel Mounted Solenoid (See Figure 1)

1. Disassemble solenoid following instruction under *Solenoid Replacement* then proceed.
2. Install solenoid base sub−assembly through customer panel.
3. Position spring washer on opposite side of panel over solenoid base sub−assembly.
4. Replace solenoid, nameplate/retainer and red cap.
5. Make electrical hookup, see *Wiring* section.

Solenoid Temperature

Standard solenoids are designed for continuous duty service. When the solenoid is energized for a long period, the solenoid becomes hot and can be touched by hand only for an instant. This is a safe operating temperature.

MAINTENANCE

⚠ WARNING: To prevent the possibility of death, serious injury or property damage, turn off electrical power, depressurize solenoid operator and/or valve, and vent fluid to a safe area before servicing.

Cleaning

All solenoid operators and valves should be cleaned periodically. The time between cleaning will vary depending on medium and service conditions. In general, if the voltage to the solenoid is correct, sluggish valve operation, excessive noise or leakage will indicate that cleaning is required. Clean strainer or filter when cleaning the valve.

Preventive Maintenance

- Keep the medium flowing through the solenoid operator or valve as free from dirt and foreign material as possible.
- While in service, the solenoid operator or valve should be operated at least once a month to insure proper opening and closing.
- Depending on the medium and service conditions, periodic inspection of internal valve parts for damage or excessive wear is recommended. Thoroughly clean all parts. Replace any worn or damaged parts.

Causes of Improper Operation

- **Faulty Control Circuit:** Check the electrical system by energizing the solenoid. A metallic *click* signifies that the solenoid is operating. Absence of the *click* indicates loss of power supply. Check for loose or blown fuses, open−circuited or grounded solenoid, broken lead wires or splice connections.
- **Burned−Out Solenoid:** Check for open−circuited solenoid. Replace if necessary. Check supply voltage; it must be the same as specified on nameplate/retainer and marked on the solenoid. Check ambient temperature and check that the core is not jammed.
- **Low Voltage:** Check voltage across the solenoid leads. Voltage must be at least 85% of rated voltage.

Solenoid Replacement

1. Disconnect conduit, coil leads, and grounding wire.

NOTE: Any optional parts attached to the old solenoid must be reinstalled on the new solenoid. For 3−way construction, piping or tubing must be removed from pipe adapter.

2. Disassemble solenoids with optional features as follows:

- **Spade or Screw Terminals**

Remove terminal connections, grounding screw, grounding wire, and terminal block (screw terminal type only).

NOTE: For screw terminals, the socket head screw holding the terminal block serves as a grounding screw.

- **Junction Box**

Remove conduit and socket head screw (use 5/32″ hex key wrench) from center of junction box. Disconnect junction box from solenoid.

- **DIN Plug Connector**

Remove center screw from DIN plug connector. Disconnect DIN plug connector from adapter. Remove socket head screw (use 5/32″ hex key wrench), DIN terminal adapter, and gasket from solenoid.

3. Snap off red cap from top of solenoid base sub−assembly. For 3−way construction with pipe adapter (Figure 3), remove pipe adapter, nameplate and solenoid. Omit steps 4 and 5.
4. Push down on solenoid. Then using a suitable screwdriver, insert blade between solenoid and nameplate/retainer. Pry up slightly and push to remove.

NOTE: Series 8202G solenoids have a spacer between the nameplate/retainer and solenoid.

5. Remove solenoid from solenoid base sub−assembly.
6. Reassemble in reverse order of disassembly. Use exploded views for identification and placement of parts.
7. Torque pipe adapter to 90 inch−pounds maximum [10,2 Nm maximum]. Then make up piping or tubing to pipe adapter on solenoid.

Disassembly and Reassembly of Solenoids

1. Remove solenoid, see *Solenoid Replacement*.
2. Remove spring washer from solenoid base sub−assembly. For 3−way construction, remove plugnut gasket.
3. Unscrew solenoid base sub−assembly from valve body.
4. Remove internal solenoid parts for cleaning or replacement. Use exploded views for identification and placement of parts.
5. If the solenoid is part of a valve, refer to basic valve installation and maintenance instructions for further disassembly.
6. Torque solenoid base sub−assembly and adapter to 175±25 in−lbs [19,8±2,8 Nm].

ORDERING INFORMATION FOR ASCO SOLENOIDS

When Ordering Solenoids for ASCO Solenoid Operators or Valves, order the number stamped on the solenoid. Also specify voltage and frequency.

Torque Chart

Part Name	Torque Value Inch—Pounds	Torque Value Newton—Meters
solenoid base sub—assembly & adapter	175 ± 25	19,8 ± 2,8
pipe adapter	90 maximum	10,2 maximum

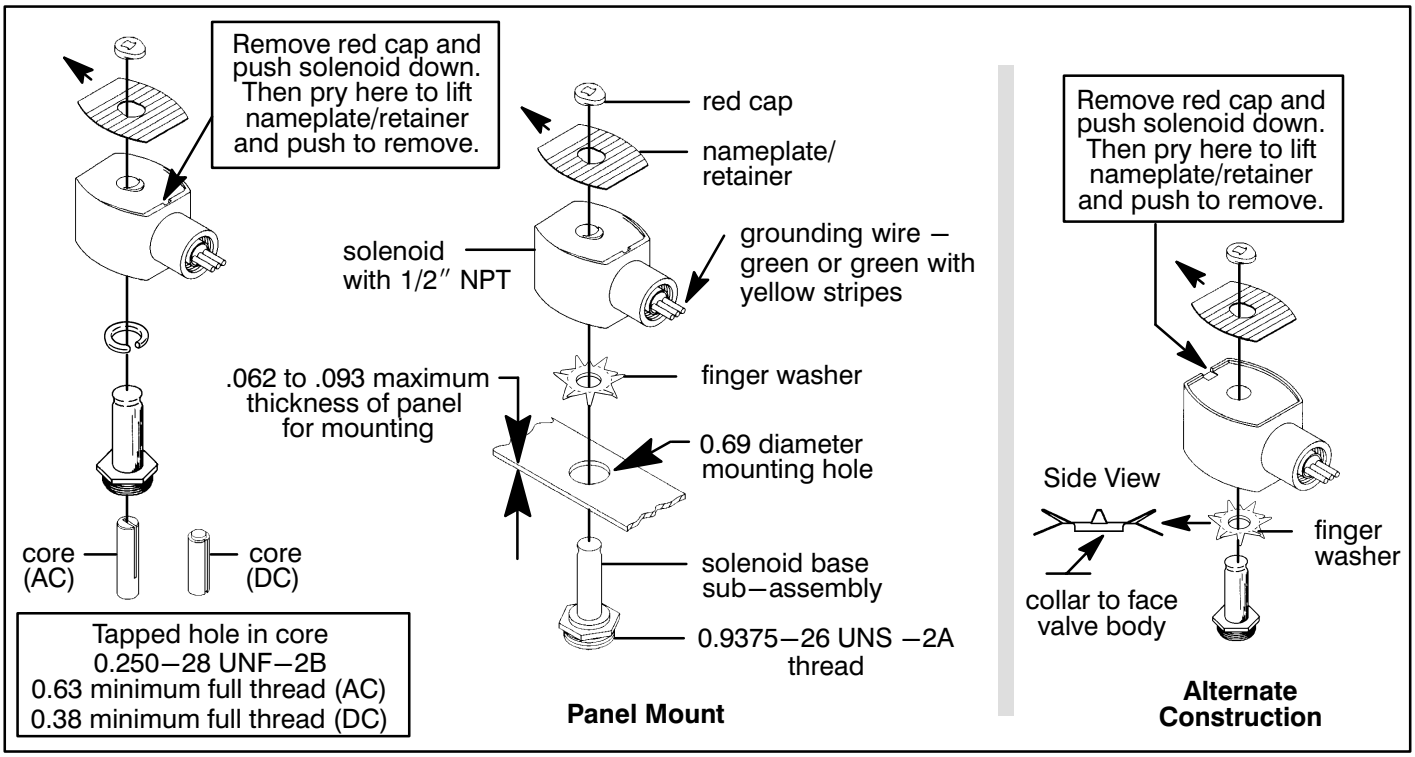

Figure 1. Series 8003G solenoids

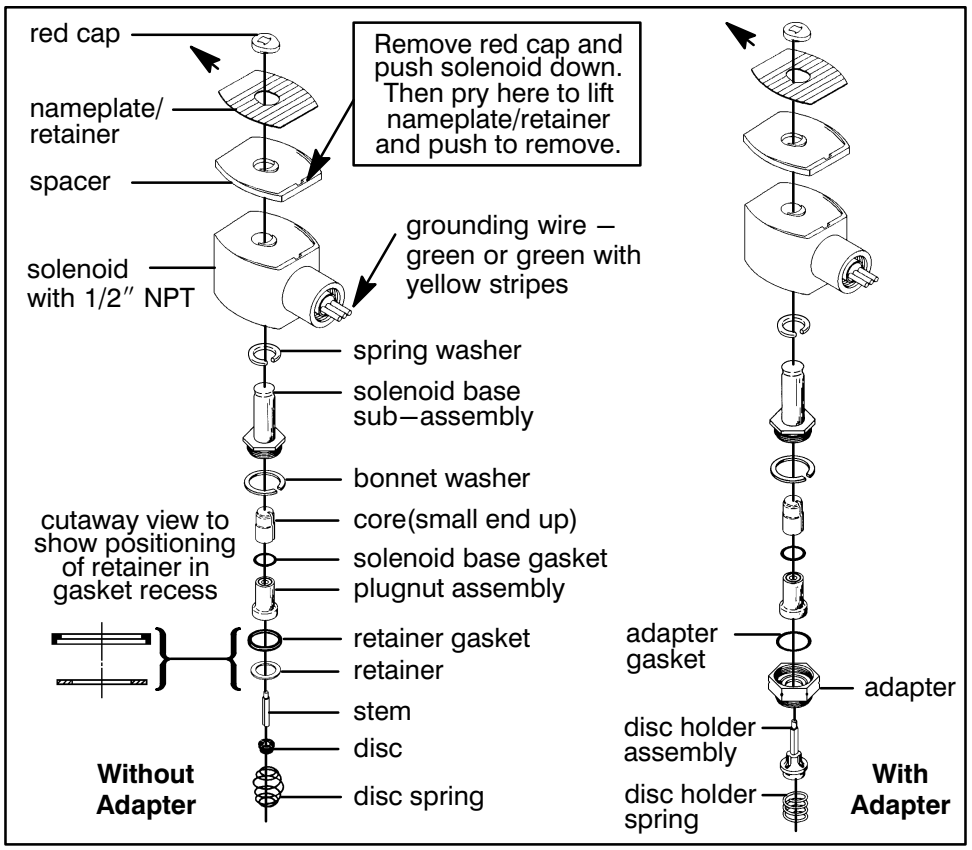

Figure 2. Series 8202G solenoids

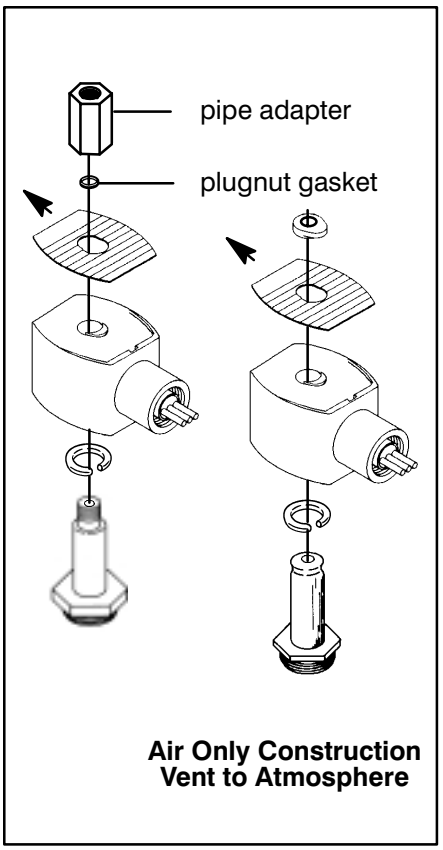

Figure 3. 3—Way Construction

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Torque Chart

Part Name	Torque Value in Inch—Pounds	Torque Value in Newton—Meters
terminal block screws	10 ± 2	1,1 ± 0,2
socket head screw	15 — 20	1,7 — 2,3
center screw	5 ± 1	0,6 ± 0,1

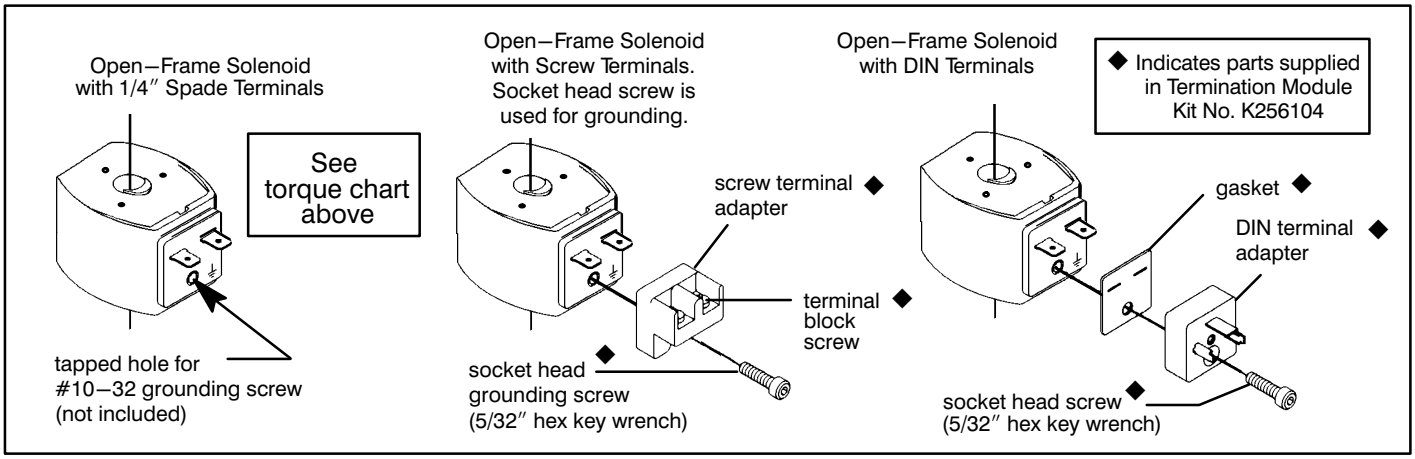

Figure 4. Open—frame solenoids

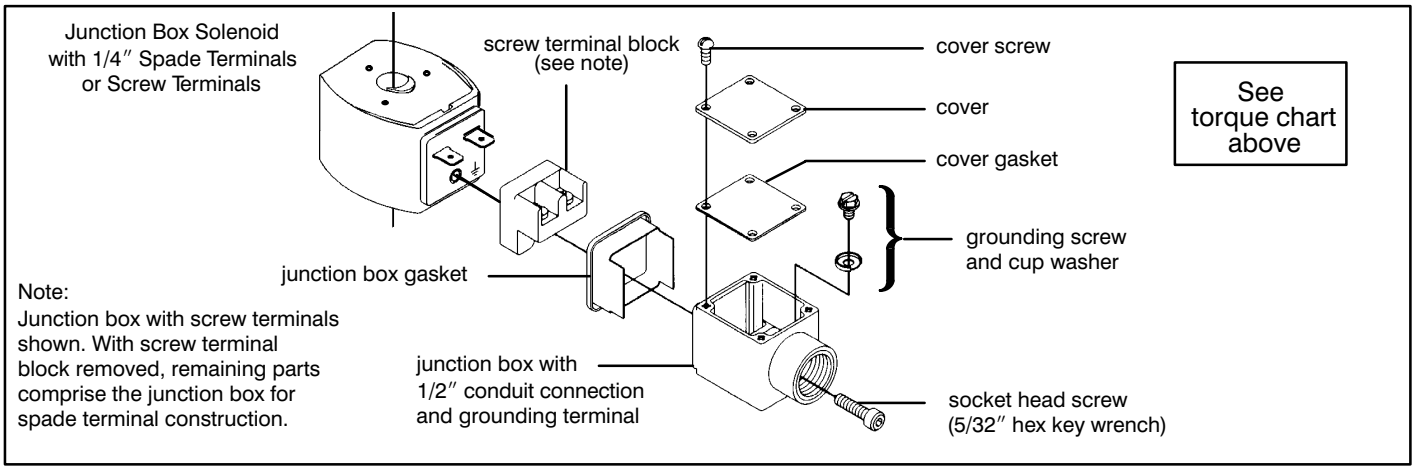

Figure 5. Junction box (optional feature)

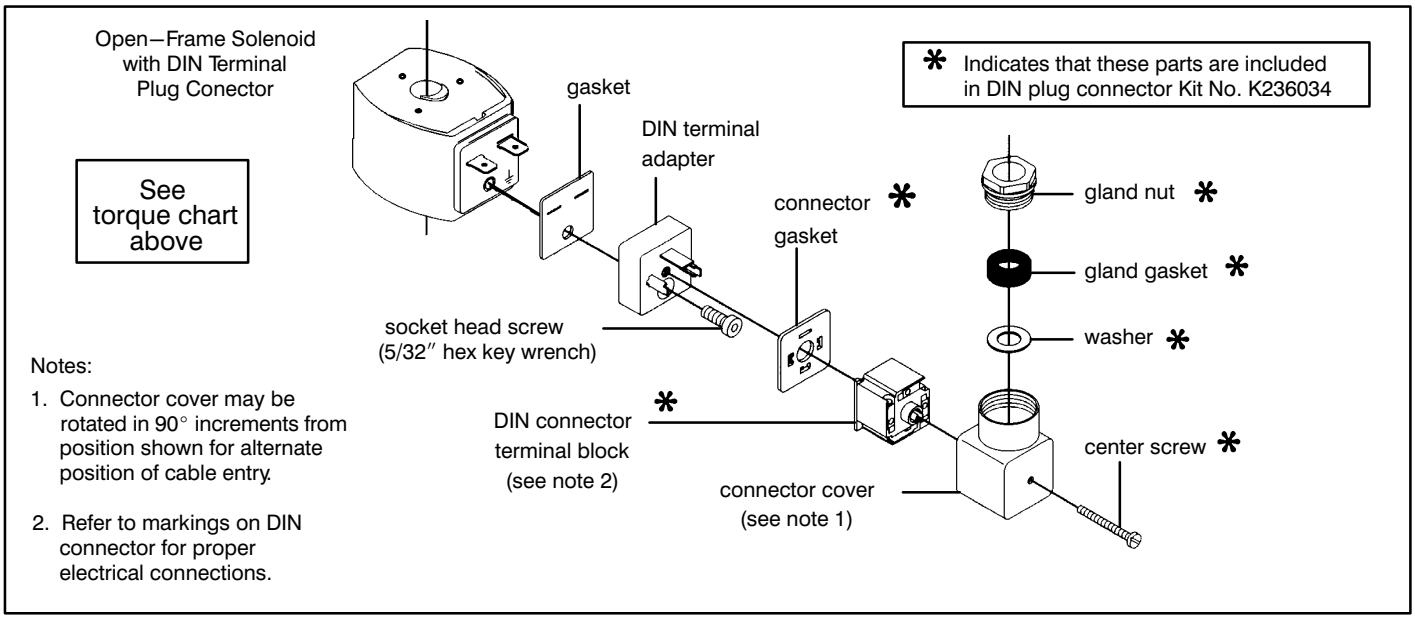

Figure 6. DIN plug connector kit No. K236034 (optional feature)

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627 Series Pressure Reducing Regulators

Introduction

Scope of Manual

This manual provides instructions for the installation, adjustment, maintenance, and parts ordering for the 627 Series regulators. These regulators usually are shipped separate for line installation, although sometimes they are shipped installed on other equipment. Refer to the instruction manual for the other equipment for installation and operating instructions.

Figure 1. Typical 627 Series Self-Operated Pressure Reducing Regulator

Description

The 627 Series self-operated pressure reducing regulators (figure 1) are for high and low pressure systems. These regulators can be used with natural gas, air, or a variety of other gases. Performance characteristics vary according to construction (see the AVAILABLE CONFIGURATIONS specification in table 1).

Specifications

Table 1 gives some general specifications for the 627 Series regulators. The nameplates (figure 2) gives detailed information for a particular regulator as it comes from the factory.

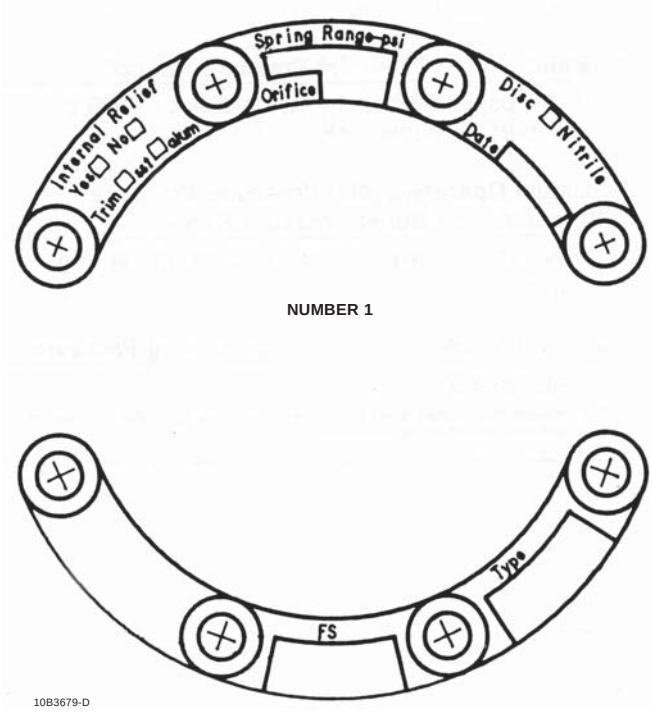


Figure 2. Nameplates

D101328X012

Table 1. Specifications

Available Constructions

Type 627: Self-operated pressure reducing regulator equipped with a pitot tube for greater regulated capacities (figure 7)

Type 627R: Type 627 with internal relief and with an open throat (figure 8)

Type 627M: Type 627 with a stem seal between the body outlet pressure and diaphragm case. Pressure is measured under the diaphragm through the 1/4-inch NPT downstream control line connection (figure 9)

Type 627MR: Type 627M with internal relief (figure 10)

Type 627H: Type 627 with a diaphragm limiter to deliver a higher outlet pressure (figure 11)

Type 627HM: Type 627H with a stem seal between the body outlet pressure and diaphragm case. Pressure is measured under the diaphragm through two 1/4-inch NPT downstream control line connections (figure 12)

Body Sizes

3/4, 1, or 2-inch

End Connection Styles

3/4, 1, or 2-inch body sizes: NPT

1 or 2-inch body sizes: ANSI Class 300 or 600 RF flanged

Maximum Inlet Pressure(1) (Body Rating)

2000 psig (138 bar) for NPT steel, 1480 psig (102 bar) for RF flanged steel, or 1000 psig (69 bar) for ductile iron

Maximum Valve Disk Inlet Pressure Rating(1)

2000 psig (138 bar) for nylon disk or 1000 psig (69 bar) for nitrile disk

Maximum Operating Inlet Pressure, Pressure Differential, and Outlet Pressure Ranges(1)

See table 2 for pressures by port and spring range

Maximum Spring and Diaphragm Casing Pressure(1)

See table 3

Maximum Body Outlet Pressure(1) (Type 627M, 627MR, and 627HM Only)

2000 psig (138 bar) for screwed steel, 1480 psig (102 bar) for RF flanged steel, or 1000 psig (69 bar) for ductile iron. (Type 627 and 627R are limited by maximum diaphragm casing pressure)

Port Diameters

See table 2

Internal Relief Performance

Type 627R: See table 4

Type 627MR: Limited by field-installed control line piping

Temperature Capabilities(1)

-20 to 180°F (-29 to 82°C)

Pressure Registration

Type 627, 627H or 627R: Internal

Type 627M, 627HM or 627MR: External through 1/4-inch NPT control line connection in the diaphragm casing

De-Icer System

See figure 3 and Type 627M Regulator De-Icer System Application section

Relief Indicator

For 627R and 627MR (see figures 8 and 9)

Spring Case Vent Connection

3/4-inch NPT female with removable screened vent assembly

Control Line Connection (Type 627M, 627HM or 627MR Only)

1/4-inch NPT female

Approximate Weight

Ductile Iron or Steel Casings: 10 pounds (4,5 kg)

Aluminum Casings: 6.3 pounds (2.8 kg)

1. The pressure/temperature limits in this instruction manual or any applicable standard limitation should not be exceeded.

Table 2. Maximum Inlet Pressures, Differential Pressures, and Outlet Pressure Ranges

TYPE NUMBER	OUTLET PRESSURE RANGE, SPRING PART NUMBER, AND COLOR	ORIFICE SIZE, INCHES (mm)	MAXIMUM INLET PRESSURE, PSIG (bar)	MAXIMUM DIFFERENTIAL PRESSURE, PSID (bar)
627 and 627M[3]	5[2] to 20 psig (0,34 to 1,4 bar) 10B3076X012 Yellow	3/32 (2,4) 1/8 (3,2) 3/16 (4,8) 1/4 (6,4) 3/8 (9,5) 1/2 (12,7)	2000 (138)[1] 1000 (69)[1] 750 (51,7) 500 (34,5) 300 (20,7) 250 (17,2)	2000 (138)[1] 1000 (69)[1] 750 (51,7) 500 (34,5) 300 (20,7) 250 (17,2)
	15 to 40 psig (1,0 to 2,8 bar) 10B3077X012 Green	3/32 (2,4) 1/8 (3,2) 3/16 (4,8) 1/4 (6,4) 3/8 (9,5) 1/2 (12,7)	2000 (138)[1] 1500 (103)[1] 1000 (69)[1] 750 (51,7) 500 (34,5) 300 (20,7)	2000 (138)[1] 1500 (103)[1] 1000 (69)[1] 750 (51,7) 500 (34,5) 300 (20,7)
	35 to 80 psig (2,4 to 5,5 bar) 10B3078X012 Blue	3/32 (2,4) 1/8 (3,2) 3/16 (4,8) 1/4 (6,4) 3/8 (9,5) 1/2 (12,7)	2000 (138)[1] 2000 (138)[1] 1750 (121)[1] 1500 (103)[1] 1000 (69)[1] 750 (51,7)	2000 (138)[1] 2000 (138)[1] 1750 (121)[1] 1500 (103)[1] 1000 (69)[1] 750 (51,7)
	70 to 150 psig (4,8 to 10,3 bar) 10B3079X012 Red	3/32 (2,4) 1/8 (3,2) 3/16 (4,8) 1/4 (6,4) 3/8 (9,5) 1/2 (12,7)	2000 (138)[1] 2000 (138)[1] 2000 (138)[1] 1750 (121)[1] 1250 (86,2)[1] 750 (51,7)	2000 (138)[1] 2000 (138)[1] 2000 (138)[1] 1750 (121)[1] 1250 (86,2)[1] 750 (51,7)
627R and 627MR	5[2] to 20 psig (0,34 to 1,4 bar) 10B3076X012 Yellow	3/32 (2,4) 1/8 (3,2) 3/16 (4,8) 1/4 (6,4) 3/8 (9,5) 1/2 (12,7)	2000 (138)[1] 1000 (69)[1] 750 (51,7) 500 (34,5) 300 (20,7) 200 (13,8)	2000 (138)[1] 1000 (69)[1] 750 (51,7) 500 (34,5) 300 (20,7) 200 (13,8)
	15 to 40 psig (1,0 to 2,8 bar) 10B3077X012 Green	3/32 (2,4) 1/8 (3,2) 3/16 (4,8) 1/4 (6,4) 3/8 (9,5) 1/2 (12,7)	2000 (138)[1] 1500 (103)[1] 1000 (69)[1] 750 (51,7) 300 (20,7) 200 (13,8)	2000 (138)[1] 1500 (103)[1] 1000 (69)[1] 750 (51,7) 300 (20,7) 200 (13,8)
	35 to 80 psig (2,4 to 5,5 bar) 10B3078X012 Blue	3/32 (2,4) 1/8 (3,2) 3/16 (4,8) 1/4 (6,4) 3/8 (9,5) 1/2 (12,7)	2000 (138)[1] 1750 (121)[1] 1000 (69)[1] 750 (51,7) 300 (20,7) 200 (13,8)	2000 (138)[1] 1750 (121)[1] 1000 (69)[1] 750 (51,7) 300 (20,7) 200 (13,8)
	70 to 150 psig (4,8 to 10,3 bar) 10B3079X012 Red	3/32 (2,4) 1/8 (3,2) 3/16 (4,8) 1/4 (6,4) 3/8 (9,5) 1/2 (12,7)	2000 (138)[1] 1000 (69)[1] 500 (34,5) 300 (20,7) 200 (13,8) 200 (13,8)	2000 (138)[1] 1000 (69)[1] 500 (34,5) 300 (20,7) 200 (13,8) 200 (13,8)
627H and 627MH[3]	140 to 250 psig (9,7 to 17,2 bar) 10B3078X012 Blue	3/32 (2,4) 1/8 (3,2) 3/16 (4,8) 1/4 (6,4) 3/8 (9,5) 1/2 (12,7)	2000 (138)[1] 2000 (138)[1] 1750 (121)[1] 1500 (103)[1] 1000 (69)[1] 750 (51,7)	2000 (138)[1] 2000 (138)[1] 1750 (121)[1] 1000 (69)[1] 500 (34,5) 250 (17,2)
	240 to 500 psig (16,5 to 34,5 bar) 10B3079X012 Red	3/32 (2,4) 1/8 (3,2) 3/16 (4,8) 1/4 (6,4) 3/8 (9,5) 1/2 (12,7)	2000 (138)[1] 2000 (138)[1] 1750 (121)[1] 1500 (103)[1] 1000 (69)[1] 750 (51,7)	2000 (138)[1] 2000 (138)[1] 1750 (121)[1] 1000 (69)[1] 500 (34,5) 250 (17,2)

1. For inlet pressure in excess of 1000 psig (69 bar), refer to the maximum body and disk pressure ratings in the specification table.
2. For pressure settings under 10 psig (0,69 bar), inlet pressure should be limited to approximately 100 psig (6,9 bar) so the setpoint adjustment can be obtained.
3. The unbalance forces change from the wide-open monitor mode to an active regulator mode such that the Type 627M or 627MH should have a 3/8-inch (9,5 mm) or larger orifice when used as a wide-open monitor.

Table 3. Maximum Spring and Diaphragm Casing Pressure(1)

MAXIMUM PRESSURE DESCRIPTION	SPRING AND DIAPHRAGM CASING STYLE	TYPE 627, PSIG (bar)	TYPE 627R, PSIG (bar)	TYPE 627M, PSIG (bar)	TYPE 627MR, PSIG (bar)	TYPE 627H AND 627HM, PSIG (bar)
Maximum pressure to spring and diaphragm casings to prevent leak to atmosphere other than relief action (internal parts damage may occur)	Die cast aluminum	250 (17,2)	250 (17,2)	Not Available	Not Available	Not Available
	Die cast aluminum	250 (17,2)	250 (17,2)	250 (17,2)	Not Available	Not Available
	Steel	250 (17,2)	250 (17,2)	250 (17,2)	250 (17,2)	800 (55,2)
Maximum pressure to spring and diaphragm casings to prevent burst of casings during abnormal operation (leak to atmosphere and internal parts damage may occur)	Die cast aluminum	375 (25,9)	375 (25,9)	Not Available	Not Available	Not Available
	Ductile iron	465 (32)	465 (32)	465 (32)	465 (32)	Not Available
	Steel	1500 (103)	1500 (103)	1500 (103)	1500 (103)	1500 (103)
Maximum diaphragm casing overpressure (above setpoint) to prevent damage to internal parts	All styles	60 (4,1)	120 (8,3)	60 (4,1)	120 (8,3)	120 (8,3)

1. If the spring case is pressurized, a metal adjusting screw cap is required. Contact your Fisher Sales Representative.

WARNING

Personal injury, property damage, equipment damage, or leakage due to escaping gas or bursting of pressure-containing parts may result if this regulator is overpressured or is installed where service conditions could exceed the limits given in tables 1, 2, 3, and 4, or where conditions exceed any ratings of the adjacent piping or piping connections.

To avoid such injury or damage, provide pressure-relieving or pressure-limiting devices (as required by the appropriate code, regulation, or standard) to prevent service conditions from exceeding those limits. The Type 627R or 627MR regulator with internal relief will provide downstream overpressure protection within the limits given in tables 1, 2, 3 and 4. If these limits are exceeded additional downstream overpressure protection must be provided by the user.

Additionally, physical damage to the regulator could cause personal injury or property damage due to escaping gas. To avoid such injury or damage, install the regulator in a safe location.

Installation

Regulator operation within ratings does not preclude the possibility of damage from debris in the lines or from external sources. A regulator should be inspected for damage periodically and after any overpressure condition. Key numbers referenced in this section are shown in figures 7 through 12. Ensure that the operating temperature capabilities listed in table 1 are not exceeded.

Like most regulators, 627 Series regulators have outlet pressure ratings that are lower than their inlet pressure ratings. A pressure relieving or pressure limiting device must be provided by the user for the Type 627, 627H, 627M, and 627HM regulators if the inlet pressure can exceed the outlet pressure rating, since these regulators do not have internal relief.

Type 627R regulators provide internal relief which limits the total outlet pressure buildup over setpoint. Use table 4 to determine the total outlet pressure. This internal relief may be adequate for the application, if not, provide additional pressure relief or a pressure limiting device downstream.

Note

If the regulator is shipped mounted on another unit, install that unit according to the appropriate instruction manual.

Perform steps 1 through 6 for all types of regulators:

1. Only personnel qualified through training and experience should install, operate, or maintain this regulator.

2. For a regulator that is shipped separately, make sure that there is no damage to, or foreign material in, the regulator.

3. Ensure that all tubing and piping have been blown free of foreign debris.

4. The regulator may be installed in any position as long as the flow through the body is in the direction indicated by the arrow cast on the body.

5. If continuous operation is required during inspection or maintenance, install a three-valve bypass around the regulator.

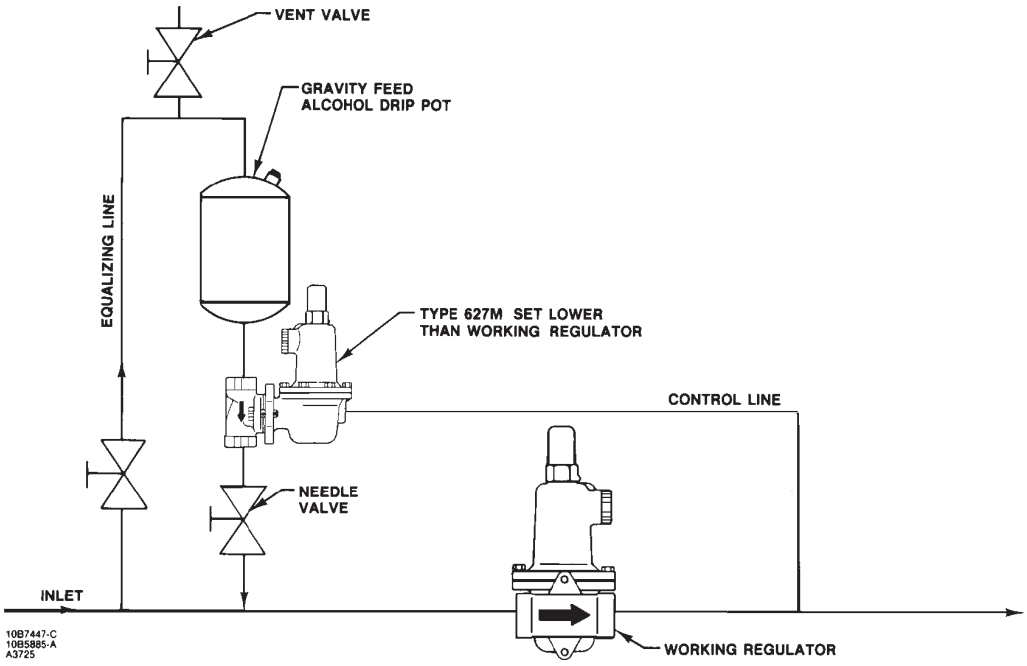


Figure 3. Schematic of De-Icer System

WARNING

A regulator may vent some gas to the atmosphere. In hazardous or flammable gas service, vented gasmay accumulate and cause personal injury, death, or property damage due to fire or explosion. Vent a regulator in hazardousgas service toa remote, safe location away from air intakes or any hazardous area. The vent line or stack opening must be protected against condensation or clogging.

6. Position the body (key 1) and/or diaphragmspring case (key 29) so it will not collectmoisture or debris into the screened vent. If the regulator requires repositioning, refer to the body area maintenance procedures and/or the diaphragm case area maintenance procedures in the Maintenance section to reposition the screened vent for the application.

Perform steps 7 through 9 for Types 627M, 627HM, and 627MR regulators only:

7. A Type 627M, 627HM, or 627MR regulator requires a downstream control line. Install the control line before putting the regulator into operation.

8. Ensure that the downstream control line piping is at least 3/8-inch or larger outside diameter tubing and connected to a straight section of outlet piping 10 diameters downstream of the regulator.

9. A hand valve should be installed in the control line. This hand valve can be used to throttle down and dampen outlet pulsations in control pressure which may cause unstability or cycling of the regulator.

Remote Vent Line Installation

All 627 series regulators have a vent assembly installed in the 3/4-inch NPT spring case vent opening. The vent assembly can be removed to install a remote vent line if necessary. Remote vent lines must have the largest practical diameter. The vent line should be as short as possible with a minimum number of bends or elbows.

Protect the remote vent opening against entrance of rain, snow, or any other foreign material that may plug the vent or vent line and prevent proper operation of the regulator. Periodically check the vent opening to be sure it is not plugged with foreign debris.

Type 627M or 627HM Regulator De-Icer System Application

For the Type 627M or 627HM regulator de-icer system, refer to the application shown in figure 3. With a large pressure drop across the working regulator, ice can

Table 4. Type 627R Internal Relief Performance[1]

OUTLET PRESSURE RANGE, SPRING PART NUMBER, AND COLOR	OUTLET PRESSURE SETTING, PSIG (bar)	MAXIMUM ALLOWABLE DOWNSTREAM SYSTEM PRESSURE, PSIG (bar)	MAXIMUM INLET PRESSURE TO KEEP MAXIMUM ALLOWABLE DOWNSTREAM SYSTEM PRESSURE FROM BEING EXCEEDED, PSIG (bar)[2]					
			Orifice Size, Inches (mm)					
			3/32 (2,4)	1/8 (3,2)	3/16 (4,8)	1/4 (6,4)	3/8 (9,5)	1/2 (12,7)
5[3] to 20 psig (0,34 to 1,4 bar) 10B3076X012 Yellow	10 (0,69)	60 (4,1)	1250 (86,2)	740 (51,1)	320 (22,1)	190 (13,1)	95 (6,56)	75 (5,18)
		100 (6,9)	2000 (138)	1500 (103)	620 (42,7)	390 (26,9)	180 (12,4)	130 (8,97)
		125 (8,6)	2000 (138)	1900 (131)	830 (57,2)	480 (33,1)	220 (15,2)	160 (11,0)
		175 (12,1)	2000 (138)	2000 (138)	1100 (75,8)	670 (46,2)	320 (22,1)	220 (15,2)
		200 (13,8)	2000 (138)	2000 (138)	1300 (89,6)	770 (53,1)	360 (24,8)	260 (17,9)
		250 (17,2)	2000 (138)	2000 (138)	1600 (110)	960 (66,2)	450 (31,0)	320 (22,1)
	15 (1,0)	60 (4,1)	1000 (69,0)	620 (42,7)	260 (17,9)	170 (11,7)	90 (6,2)	70 (4,8)
		100 (6,9)	2000 (138)	1400 (96,5)	610 (42,1)	370 (25,5)	170 (11,7)	130 (8,97)
		125 (8,6)	2000 (138)	1900 (131)	810 (55,8)	480 (33,1)	220 (15,2)	160 (11,0)
		175 (12,1)	2000 (138)	2000 (138)	1100 (75,8)	670 (46,2)	320 (22,1)	220 (15,2)
		200 (13,8)	2000 (138)	2000 (138)	1300 (89,6)	770 (53,1)	360 (24,8)	260 (17,9)
		250 (17,2)	2000 (138)	2000 (138)	1600 (110)	960 (66,2)	450 (31,0)	320 (22,1)
	20 (1,4)	60 (4,1)	850 (58,6)	490 (33,8)	210 (14,5)	130 (9,0)	80 (5,52)	65 (4,49)
		100 (6,9)	2000 (138)	1300 (89,6)	600 (41,4)	360 (24,8)	170 (11,7)	120 (8,28)
		125 (8,6)	2000 (138)	1800 (124)	800 (55,2)	480 (33,1)	220 (15,2)	160 (11,0)
		175 (12,1)	2000 (138)	2000 (138)	1100 (75,8)	670 (46,2)	320 (22,1)	220 (15,2)
		200 (13,8)	2000 (138)	2000 (138)	1300 (89,6)	770 (53,1)	360 (24,8)	260 (17,9)
		250 (17,2)	2000 (138)	2000 (138)	1600 (110)	960 (66,2)	450 (31,0)	320 (22,1)
15 to 40 psig (1,0 to 2,8 bar) 10B3077X012 Green	15 (1,0)	60 (4,1)	1000 (69,0)	380 (26,2)	210 (14,5)	130 (8,97)	80 (5,5)	65 (4,49)
		100 (6,9)	2000 (138)	1300 (89,6)	590 (40,7)	350 (24,1)	170 (11,7)	120 (8,28)
		125 (8,6)	2000 (138)	1800 (124)	800 (55,2)	470 (32,4)	220 (15,2)	160 (11,0)
		175 (12,1)	2000 (138)	2000 (138)	1100 (75,8)	640 (44,1)	320 (22,1)	220 (15,2)
		200 (13,8)	2000 (138)	2000 (138)	1300 (89,6)	780 (53,8)	370 (25,5)	260 (17,9)
		250 (17,2)	2000 (138)	2000 (138)	1600 (66,2)	960 (66,2)	450 (31,0)	320 (22,1)
	20 (1,4)	60 (4,1)	630 (43,4)	200 (13,8)	150 (10,3)	100 (6,9)	70 (4,83)	65 (4,49)
		100 (6,9)	2000 (138)	1200 (82,7)	550 (37,9)	330 (22,8)	160 (11,0)	120 (8,28)
		125 (8,6)	2000 (138)	1700 (117)	760 (52,4)	450 (31,1)	210 (14,5)	160 (11,0)
		175 (12,1)	2000 (138)	2000 (138)	1100 (75,8)	630 (43,4)	320 (22,1)	220 (15,2)
		200 (13,8)	2000 (138)	2000 (138)	1300 (89,6)	770 (53,1)	360 (24,8)	260 (17,9)
		250 (17,2)	2000 (138)	2000 (138)	1600 (66,2)	960 (66,2)	460 (31,7)	320 (22,1)
	30 (2,1)	100 (6,9)	2000 (138)	950 (65,5)	450 (31,1)	260 (17,9)	140 (9,66)	110 (7,59)
		125 (8,6)	2000 (138)	1500 (103)	670 (46,2)	400 (27,6)	190 (13,1)	150 (10,3)
		175 (12,1)	2000 (138)	2000 (138)	1000 (69,0)	610 (42,1)	300 (20,7)	220 (15,2)
		200 (13,8)	2000 (138)	2000 (138)	1200 (82,7)	760 (52,4)	360 (24,8)	260 (17,9)
		250 (17,2)	2000 (138)	2000 (138)	1600 (110)	970 (66,9)	460 (31,7)	320 (22,1)
	40 (2,8)	100 (6,9)	1500 (103)	700 (48,3)	330 (22,8)	200 (13,8)	120 (8,28)	108 (7,45)
		125 (8,6)	2000 (138)	1300 (89,6)	560 (38,6)	340 (23,4)	180 (12,4)	140 (9,66)
		175 (12,1)	2000 (138)	1800 (124)	1000 (69,0)	550 (37,9)	290 (20,0)	220 (15,2)
		200 (13,8)	2000 (138)	2000 (138)	1200 (82,7)	730 (50,3)	350 (24,1)	250 (17,2)
		250 (17,2)	2000 (138)	2000 (138)	1600 (110)	970 (66,9)	460 (31,7)	320 (22,1)

form with in this regulator. The formation of ice decreases the size of the port opening, so the regulator is unable to supply enough flow to satisfy the downstream demand. When the downstream pressure falls below the outlet pressure setting of the Type 627M or 627HM regulator, the disk assembly of the Type 627Mor 627HMregulator moves off its seat ring, permitting alcohol to flow into the main gas line. The alcohol carried to the main regulator by the flow stream prevents additional ice from forming on the seat ring. When normal flow resumes, and as pressure in the downstream system is restored, the Type 627M or 627HM regulator shuts off.

Startup and Adjustment

Startup

WARNING

To avoid personal injury or property damage due to explosion or damage to regulator or downstream components during startup, release downstream pressure to prevent an overpressure condition on the diaphragm of the regulator.

Table 4. Type 627R Internal Relief Performance[1] (continued)

OUTLET PRESSURE RANGE, SPRING PART NUMBER, AND COLOR	OUTLET PRESSURE SETTING, PSIG (bar)	MAXIMUM ALLOWABLE DOWNSTREAM SYSTEM PRESSURE, PSIG (bar)	MAXIMUM INLET PRESSURE TO KEEP MAXIMUM ALLOWABLE DOWNSTREAM SYSTEM PRESSURE FROM BEING EXCEEDED, PSIG (bar)[2]					
			Orifice Size, Inches (mm)					
			3/32 (2,4)	1/8 (3,2)	3/16 (4,8)	1/4 (6,4)	3/8 (9,5)	1/2 (12,7)
35 to 80 psig (2,4 to 5,5 bar) 10B3078X012 Blue	40 (2,8)	125 (8,6)	2000 (138)	1100 (75,8)	500 (34,5)	300 (20,7)	170 (11,7)	140 (9,66)
		150 (10,3)	2000 (138)	1600 (110)	750 (51,7)	440 (30,3)	230 (15,9)	180 (12,4)
		175 (12,1)	2000 (138)	2000 (138)	980 (67,6)	580 (40,0)	290 (20,0)	220 (15,2)
		200 (13,8)	2000 (138)	2000 (138)	1200 (82,7)	720 (49,6)	340 (23,4)	250 (17,2)
		250 (17,2)	2000 (138)	2000 (138)	1600 (110)	940 (64,8)	450 (31,0)	320 (22,1)
	50 (3,4)	125 (8,6)	1400 (96,5)	820 (56,5)	400 (27,6)	230 (15,9)	150 (10,3)	140 (9,66)
		150 (10,3)	2000 (138)	1400 (96,5)	650 (44,8)	370 (25,5)	210 (14,5)	170 (11,7)
		175 (12,1)	2000 (138)	1900 (131)	700 (48,3)	530 (36,5)	270 (18,6)	210 (14,5)
		200 (13,8)	2000 (138)	2000 (138)	1100 (75,8)	670 (46,2)	330 (22,8)	240 (16,5)
		250 (17,2)	2000 (138)	2000 (138)	1500 (103)	920 (63,4)	430 (29,6)	320 (22,1)
	60 (4,1)	125 (8,6)	900 (62,1)	450 (31,1)	270 (18,6)	190 (13,1)	140 (9,66)	130 (8,97)
		150 (10,3)	1700 (117)	1100 (75,8)	540 (37,2)	300 (20,7)	190 (13,1)	160 (11,0)
		175 (12,1)	2000 (138)	1700 (117)	780 (53,8)	470 (32,4)	250 (17,2)	200 (13,8)
		200 (13,8)	2000 (138)	2000 (138)	1000 (69,0)	610 (42,1)	310 (21,4)	230 (15,9)
		250 (17,2)	2000 (138)	2000 (138)	1400 (96,5)	880 (60,7)	420 (29,0)	310 (21,4)
	70 (4,8)	150 (10,3)	1200 (82,7)	850 (58,6)	430 (29,6)	250 (17,2)	170 (11,7)	160 (11,0)
		175 (12,1)	2000 (138)	1400 (96,5)	670 (46,2)	400 (27,6)	230 (15,9)	190 (13,1)
		200 (13,8)	2000 (138)	2000 (138)	920 (63,4)	550 (37,9)	280 (19,3)	230 (15,9)
		250 (17,2)	2000 (138)	2000 (138)	1300 (89,6)	830 (57,2)	400 (27,6)	310 (21,4)
	80 (5,5)	150 (10,3)	800 (55,2)	500 (34,5)	300 (20,7)	200 (13,8)	160 (11,0)	150 (10,3)
		175 (12,1)	1500 (103)	1200 (82,7)	550 (37,9)	330 (22,8)	210 (14,5)	190 (13,1)
		200 (13,8)	2000 (138)	1700 (117)	800 (55,2)	480 (33,1)	270 (18,6)	220 (15,2)
		250 (17,2)	2000 (138)	2000 (138)	1200 (82,7)	770 (53,1)	390 (26,9)	300 (20,7)
70 to 150 psig (4,8 to 10,3 bar) 10B3079X012 Red	70 (4,8)	175 (12,1)	1900 (131)	600 (41,4)	400 (27,6)	260 (17,9)	200 (13,8)	175 (12,1)
		200 (13,8)	2000 (138)	1200 (82,7)	630 (43,4)	380 (26,2)	250 (17,2)	210 (14,5)
		250 (17,2)	2000 (138)	2000 (138)	1100 (75,8)	680 (46,9)	360 (24,8)	290 (20,0)
	80 (5,5)	175 (12,1)	1400 (96,5)	250 (17,2)	240 (16,5)	200 (13,8)	190 (13,1)	175 (12,1)
		200 (13,8)	2000 (138)	960 (66,2)	520 (35,9)	330 (22,8)	240 (16,5)	210 (14,5)
		250 (17,2)	2000 (138)	2000 (138)	1000 (69,0)	620 (42,7)	350 (24,1)	280 (19,3)
	100 (6,9)	200 (13,8)	1500 (103)	250 (17,2)	240 (16,5)	230 (15,9)	210 (14,5)	210 (14,5)
		250 (17,2)	2000 (138)	1600 (110)	770 (53,1)	520 (35,9)	320 (22,1)	270 (18,6)
	125 (8,6)	250 (17,2)	2000 (138)	1000 (69,0)	500 (34,5)	390 (26,9)	290 (20,0)	260 (17,9)
	150 (10,3)	250 (17,2)	1200 (82,7)	260 (17,9)	260 (17,9)	260 (17,9)	260 (17,9)	260 (17,9)

1. The internal relief performance values are obtained by removing the disk assembly.
2. For inlet pressures in excess of 1000 psig (69 bar), refer to the maximum body and disk pressure ratings in the specifications table.
3. For pressure settings under 10 psig (0,69 bar), inlet pressure should be limited to approximately 100 psig (6,9 bar) so the setpoint adjustment can be obtained.

▭ - Shaded areas indicate maximum inlet pressures allowed during system malfunction only. Table 6 gives the maximum inlet pressure for normal regulator operation.

In order to avoid an overpressure condition and possible equipment damage, pressure gauges should always be used to monitor pressures during startup.

1. Slowly open the upstream shutoff valve.
2. Slowly open the downstream shutoff valve.
3. Check all connections for leaks.
4. Make final control spring adjustments according to the adjustment procedures.

Adjustment

The range of allowable pressure settings is marked on the nameplate (figure 2). If a pressure setting beyond this range is necessary, substitute the appropriate regulator control spring. Change the nameplate to indicate the new pressure range.

Before increasing the setting, refer to tables 2, 3, or 4. Review the pressure limits for the control spring range being used and be certain that the new pressure setting will not result in an overpressure condition.

Table 5. Maximum Torque Values

KEY NUMBER(1)	DESCRIPTION	MAXIMUM TORQUE, FOOT-POUNDS (N•m)
2	Seat ring	25 (34)
3	Cap screw (w/ aluminum diaphragm casing)	16 (22)
	Cap screw (w/ ductile iron or steel diaphragm casing)	25 (34)
18	Lever cap screw	7 (9)
22	Diaphragm connector nut	17 (23)
26	Guide retainer (for Type 627R and 627MR only)	3 (4)
37	Spring case cap screw (w/ aluminum or ductile iron diaphragm casing)	7 (9)
	Spring case cap screw (w/ steel diaphragm casing)	35 (47)
46	Diaphragm cap screw (w/Type 627 or 627M)	7 (9)
	Diaphragm cap screw (w/Type 627H or 627MH)	14 (19)

1. Refer to figures 7 through 10 for key number locations.

Note

Always use a pressure gauge to monitor pressure when making adjustments.

Refer to figures 7 through 12 for key number locations.

1. Remove the adjusting screw cap (key 36).

2. Loosen the locknut (key 34).

3. Increase the outlet pressure setting by turning the adjusting screw (key 35) clockwise. Decrease the outlet pressure setting by turning the adjusting screw counterclockwise.

4. When the desired pressure is obtained, hold the adjusting screw (key 35) in place and tighten the locknut (key 34).

Shutdown

WARNING

To avoid personal injury or property damage due to explosion or damage to regulator or downstream components during shutdown, release downstream pressure to prevent an overpressure condition on the diaphragm of the regulator.

1. Close the nearest upstream shutoff valve.

2. Close the nearest downstream shutoff valve.

3. Open the vent valve between the regulator and the downstream shutoff valve nearest to it.

4. For a Type 627, 627H, or 627R regulator, the regulator will open to release pressure between the upstream shutoff valve and the regulator.

5. A Type 627M, 627HM, or 627MR regulator requires venting the control line and downstream pressure from the regulator before maintenance. The pressure between these shutoff valves is released through the open regulator because the disk assembly remains open in response to the decrease in control line pressure.

Maintenance

Unless otherwise specified, the following maintenance procedures apply to all types of regulators. For a summary of maximum torque values required for all types of regulators, refer to table 5.

Due to normal wear, damage from external sources, or debris in the air or gas line, regulator parts such as the disk assembly, seat ring, and diaphragm must be inspected periodically and replaced as necessary to ensure correct performance. The frequency of inspection and replacement depends upon the severity of conditions and the requirements of state and federal laws. Normal wear of the seat ring and disk assembly is accelerated with high pressure drops and with large amounts of impurities in the flow stream. Instructions are given below for replacing the disk assembly, seat ring, diaphragm, and O-rings. These procedures may also be used for disassembly required for inspection and replacement of other parts.

Problem Indication for Type 627R and 627MR Regulators

WARNING

Isolate the regulator from all pressure to avoid personal injury and equipment damage due to explosion or sudden release of process pressure. Cautiously release pressure from the regulator before attempting disassembly.

The vent assembly is equipped with a relief indicator (key 49, figure 4). The cap for the relief indicator snaps over the vent assembly opening. If the relief valve opens wide, exhaust gas pops the cap off the screen vent assembly opening indicating a problem with the regulator. If the cap pops off, refer to the shutdown and to the body area maintenance procedures to inspect the disk assembly and seat ring.

If the disk assembly and seat ring are not damaged, refer to the diaphragm and spring case area maintenance procedures in this section.

The disk assembly and seat ring can be inspected, removed, and replaced without removing the regulator body from the line connections. Refer to the body area maintenance procedures.

Body Area Maintenance Procedures

These procedures are for gaining access to the disk assembly, seat ring, diaphragm casing O-ring and stem assembly. All pressure must be released from the diaphragm casing before the performing these steps.

While using the following procedures, refer to figures 7 through 12 for key number locations.

Replacing the Disk Assembly or Seat Ring

1. To inspect and replace the disk assembly (key 9) or seat ring (key 2), remove the cap screws (key 3, figure 5), and separate the diaphragm casing (key 5) from the body (key 1).

2. Inspect and, if necessary, remove the seat ring (key 2). If removed, coat the threads of the replacement seat ring with lubricant (key 38) and torque to 25 foot-pounds (34 N•m).

3. Inspect the disk assembly and, if necessary, remove the hair pin clip (key 13) that holds the disk assembly (key 9) in place. If replacing the disk assembly is the only maintenance required, skip to step 16.

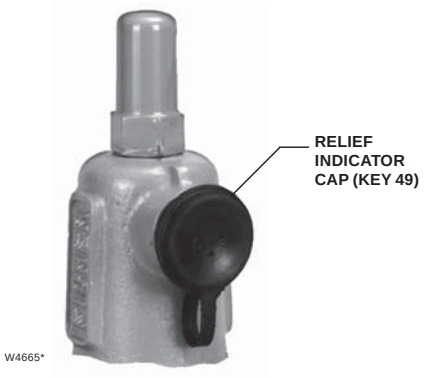


Figure 4. Relief Indicator

Replacing the Stem Assembly

If it is necessary to perform maintenance on the stem assembly, continue with steps 4 through 8 and 15 through 19 for Type 627, 627H, and 627R regulators, or steps 9 through 19 for Type 627M, 627HM, and 627MR regulators.

Perform steps 4 through 8 for Type 627, 627H, and 627R Regulators only:

4. ForType 627, 627H, and627R regulators (figure 5), use steps 5 through 8 to remove and replace the stem assembly.

5. Remove the boost body (key 6), stabilizer (key 7), and stem guide (key 8) from the diaphragm casing (key 5). Unhook and remove the stem (key 10) from the diaphragm casing (key 5).

6. Remove and inspect the diaphragm casing O-ring (key 4, figure 7, 8, or 11) and replace it if necessary.

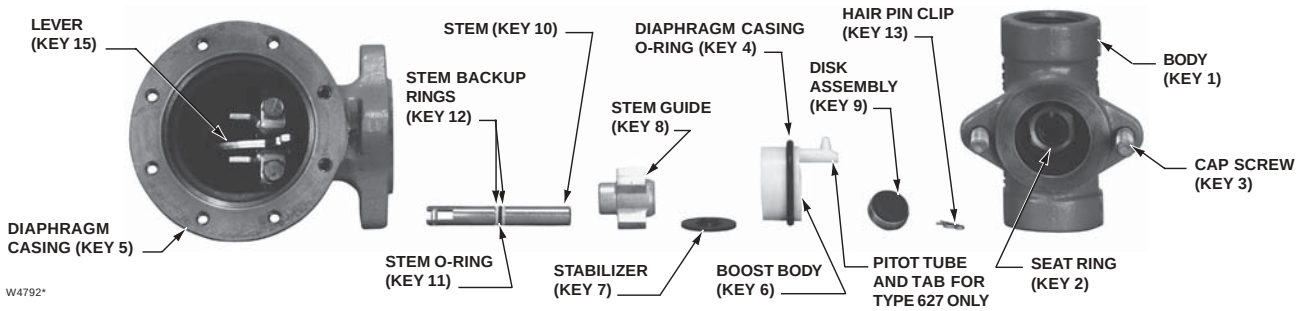
7. Apply lubricant (key 42) to a replacement diaphragm casing O-ring (key 4, figure 7, 8, or 11) and install it onto the boost body (key 6). Skip to step 14.

8. For the Type 627 or 627H regulators, be sure to insert the pitot tube (tab) into the outlet side of the body (see figure 7 or 11). Skip to step 14.

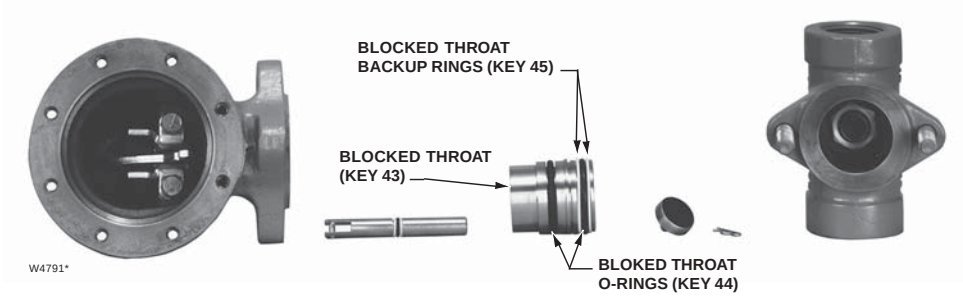
Perform steps 9 through 19 for Type 627M, 627HM, and 627MR Regulators only:

9. For Type 627M, 627HM, and 627MR regulators (figure 5), use steps 10 through 14 to remove and replace the stem assembly.

10. To remove the blocked throat (key 43), insert a screw driver blade into the groove provided in the throat and pry it out of the diaphragm casing (key 5). Inspect and replace parts as necessary.



Type 627 and 627R



Type 627M amd 627MR

Figure 5. Stem Assemblies

11. Inspect and, if necessary, replace the blocked throat O-rings (key 44, figure 5) and backup rings (key 45, figure 5).

12. Apply lubricant (key 42) to replacement blocked throat O-rings (key 44) and backup rings (key 45).

13. Apply lubricant (key 42) to the replacement stem O-ring (key 11) and stem backup rings (key 12) and install them on the stem (key 10).

14. For assembly, insert the stem (key 10) into the diaphragm casing (key 5) and hook it on the lever (key 15).

15. Insert parts into the diaphragm casing (key 5) that were removed in steps 5 and 6 or step 10 (see figure 5).

16. Install the the disk assembly (key 9), line up the hole in the disk assembly and stem (key 10) and insert the hair pin clip (key 13).

17. Position the diaphragm casing plus attached parts in relation to the body (key 1) so that they are correct for the application.

18. Secure the diaphragm casing to the body with the cap screws (key 3, figure 5). For an aluminum diaphragm casing (key 5), torque the cap screws (key 3) to 16 foot-pounds (22 N•m). For ductile iron or steel diaphragm casings, torque the cap screws (key 3) to 25 foot-pounds (34 N•m).

19. It may be necessary to reposition the diaphragm spring case to prevent rain, ice, and foreign debris from entering the spring case. Refer to the diaphragm and spring case area maintenance procedures, steps 1, 2, and 21 through 25.

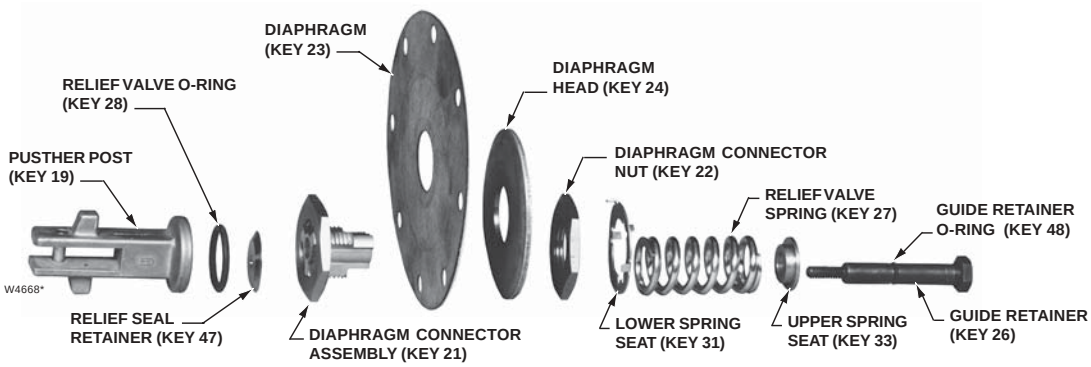
Diaphragm and Spring Case Area Maintenance Procedures

These procedures are for gaining access to the control spring, diaphragm assembly, and lever assembly. All spring pressure must be released from the diaphragm casing before these steps can be performed.

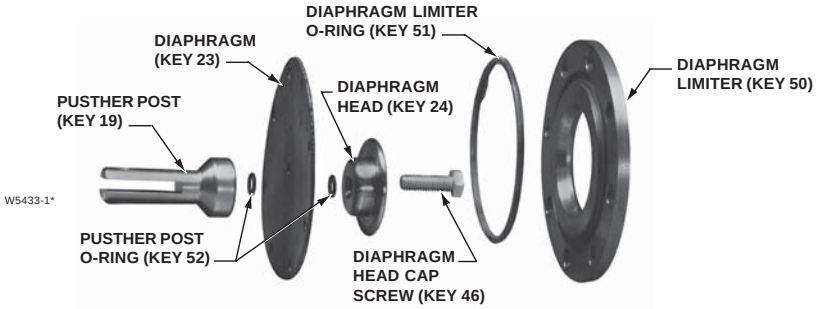
While using the following procedures, refer to figures 7 through 12 for key number locations.

1. Remove the adjusting screw cap (key 36), loosen the lock nut, and turn the adjusting screw (key 35) counterclockwise until all compression is removed from the control spring (key 32).

2. Remove the spring case cap screws (key 37), the nameplates, and lift off the spring case (key 29). If changing the control spring (key 32) or repositioning the spring case (key 29) is the only maintenance required, install the replacement control spring or rotate the spring case so it is correct for the application. Skip to step 21. For diaphragm area maintenance, continue with step 3.



Type 627, 627R, 627M, or 627MR



Type 627H amd 627HM

Figure 6. Diaphragm Assemblies

3. Remove the diaphragm limiter and O-ring (keys 50 and 51, on the Type 627H or 627HM only). Remove the diaphragm assembly by tilting it so that the pusher post (key 19) slips off the lever (key 15).

4. If it is necessary to replace the lever assembly, remove the lever cap screws (key 18).

5. Install the replacement lever (key 15) into the lever retainer (key 16) by inserting the lever pin (key 17). Secure the lever assembly into the diaphragm casing with the cap screws (key 18) and torque the cap screws to 7 foot-pounds (9 N•m).

If it is necessary to perform maintenance on the diaphragm assembly, continue with steps 6 through 11 and step 20 for Type 627, 627H, 627M, and 627HM regulators, or steps 12 through 19 for Type 627R and 627MR regulators.

Perform steps 6 through 11 for Type 627, 627H, 627M, and 627HM Regulators only:

6. For Type 627, 627H, 627M, and 627HM regulators (figures 5 & 6), use steps 7 through 11 to disassemble and reassemble the diaphragm assembly.

7. Remove the diaphragm head cap screw (key 46), lower spring seat (key 31,Type 627 or 627Monly), and diaphragm head (key 24). On the Type 627H or 627HM, remove the diaphragm cap screw O-rings (key 52). Separate the diaphragm (key 23) from the pusher post (key 19).

8. Install the diaphragm (key 23), in reverse order in step 7, on the pusher post (key 19), insert and finger tighten the diaphragm head cap screw (key 46).

9. Hook the pusher post on the lever (key 15), then turn the diaphragm (key 23) to match the holes in the diaphragm with the holes in the spring casing.

10. Unhook the pusher post from the lever and torque the diaphragm head cap screw (key 46) to 7 foot-pounds (9 N•m) for the Type 627 or 627M. On the Type 627H or 627HM torque the diaphragm head cap screw to 14 foot-pounds (18 N•m).

11. Hook the pusher post on the lever (key 15) and check the hole alignment. If necessary, loosen the cap screw (key 46) and reposition the diaphragm (key 23) on the pusher post (key 19). Retorque the screw (see step 10). Skip to step 20.

Perform steps 12 through 19 for Type 627R and 627MR Regulators only:

12. For Type 627R and 627MR regulators (figure 6), use steps 13 through 19 to disassemble and reassemble the diaphragm assembly:

13. Remove the guide retainer (key 26) and separate the diaphragm parts. Refer to figure 6 for the sequence of parts.

14. To remove the diaphragm (key 23), remove the diaphragm connector nut (key 22) and lift off the diaphragm head (key 24) and diaphragm (key 23) from the connector assembly (key 21). Do not attempt to disassemble the connector assembly (key 21).

15. Position the replacement diaphragm (key 23) on the connector assembly (key 21), install the diaphragm head (key 24) and connector nut (key 22), then torque to 17 foot-pounds (32 N•m).

16. If necessary, replace the guide retainer O-ring (key 48) and, set the guide retainer (key 26) aside, ready for assembly.

17. On the pusher post (key 19) install the relief seal O-ring (key 28) and lubricate (key 42). Also, install the relief seal retainer (key 47), diaphragm connector assembly (key 21, with attached parts) relief spring (key 27), upper relief spring seat (key 33), and guide retainer (key 26). Torque the guide retainer (key 26) to 3 foot-pounds (4 N•m).

18. Hook the pusher post (with attached parts) on the lever (key 15) to check the alignment of the holes in the diaphragm with the holes in the spring casing. If the holes do not line up, unhook the pusher post from the lever, hold the pusher post, and rotate the diaphragm to the correct position.

19. Install the lower spring seat (key 31) over the relief spring so it rests flat on the connector nut (key 22).

20. Insert the diaphragm assembly into the diaphragm casing (key 5) and hook the pusher post on the lever (key 15).

21. Install the control spring (key 32) and upper spring seat (key 33), and apply lubricant (key 38) to the upper spring seat (key 33).

22. Install the spring case (key 29) so that the screened vent assembly (key 30) is in the correct position for the application. Place the nameplates (key 39) over the screw holes, insert the spring case cap screws (key 37), and finger tighten.

23. Screw in the adjustment screw to put slack into the diaphragm (key 23).

24. Using a crisscross pattern, finish tightening the spring case cap screws (key 37) to 7 foot-pounds (9 N•m) of torque.

25. If necessary, refer to the installation and/or the startup and adjustment procedures.

26. Install the adjusting screw cap (key 34) after regulator adjustment.

Parts Ordering

When corresponding with your Fisher sales office or sales representative about this regulator, always reference the type number which is found on the nameplate (key 39, figures 7 through 12).

When ordering replacement parts, reference the key number of each needed part as found in the following parts list.

Parts List

Key	Description	Part Number
	Type 627 Parts Kit with aluminum/nitrile trim (includes keys 4, 9, 11, 12, and 23)	R627X000A12
	Type 627 Parts Kit with stainless steel/nitrile trim (includes keys 4, 9, 11, 12, and 23)	R627X000S12
	Type 627R Parts Kit with aluminum/nitrile trim (includes keys 4, 9, 11, 12, 23, 28, and 48)	R627RX00A12
	Type 627R Parts Kit with stainless steel/nitrile trim (includes keys 4, 9, 11, 12, 23, 28, and 48)	R627RX00S12
1	Body	
	Ductile iron	
	1000 psig (69 bar) max inlet pressure	
	3/4-inch NPT size	30B3046X012
	1-inch NPT size	30B3048X012
	2-inch NPT size	30B3096X012
	Steel	
	2000 psig (138 bar) max inlet pressure	
	3/4-inch NPT size	30B3050X012
	1-inch NPT size	30B3051X012
	2-inch NPT size	30B7452X012
	Steel, ANSI Class 600 RF flanged	
	1480 psig (102 bar) max inlet pressure	
	1-inch size	40B6754X012
	2-inch size	40B6756X012
2*	Seat ring	
	Aluminum	
	3/32-inch (2.4 mm) port diameter	0R044109022
	1/8-inch (3.2 mm) port diameter	1A936709012
	3/16-inch (4.8 mm) port diameter	00991209012
	1/4-inch (6.4 mm) port diameter	0B042009012
	3/8-inch (9.5 mm) port diameter	0B042209012
	1/2-inch (12.7 mm) port diameter	1A928809012
	303 Stainless steel	
	3/32-inch (2.4 mm) port diameter	0R044135032
	1/8-inch (3.2 mm) port diameter	1A936735032
	3/16-inch (4.8 mm) port diameter	00991235032
	1/4-inch (6.4 mm) port diameter	0B042035032
	3/8-inch (9.5 mm) port diameter	0B042235032
	1/2-inch (12.7 mm) port diameter	1A928835032

*Recommended spare part.

Key	Description	Part Number
2*	Seat ring (continued)	
	316 Stainless steel, NACE(1) construction only	
	3/32-inch (2.4 mm) port diameter	0R0441X0012
	1/8-inch (3.2 mm) port diameter	1A9367X0022
	3/16-inch (4.8 mm) port diameter	009912X0012
	1/4-inch (6.4 mm) port diameter	0B0420X0012
	3/8-inch (9.5 mm) port diameter	0B0422X0012
	1/2-inch (12.7 mm) port diameter	1A9288X0012
3	Cap Screw (not shown), (2 req'd)	
	Type 627 and 627R w/aluminum diaphragm case, pl steel	18A1087X012
	All Types w/ductile iron diaphragm case, pl steel	1C403824052
	or steel diaphragm case, pl steel	1C403024052
4*	Diaphragm Case O-Ring (Type 627, 627H, or 627R only), nitrile	17A2325X022
5	Diaphragm Case	
	For Type 627 or 627R	
	Aluminum w/o 1/8-inch gauge tap	40B3084X012
	Aluminum with 1/8-inch gauge tap for Type 627 only	11B5380X012
	Ductile iron w/o 1/8-inch gauge tap	30B3053X012
	Ductile iron with 1/8-inch gauge tap for Type 627 only	31B0641X012
	Steel	30B3104X012
	For Type 627M or 627MR	
	Ductile iron	39A5987X012
	Steel	30B8734X012
	For Type 627H, steel	30B3104X012
	For Type 627HM, steel	30B8734X012
6	Boost Body (not for Type 627M, 627HM, or 627MR), Delrin(2)	
	For Type 627 or 627H	30B3056X012
	For Type 627R	30B3057X012
7	Stabilizer (for Type 627, 627H, and 627R only), nitrile	10B3060X012
8	Stem Guide (for Type 627, 627H, and 627R only), powdered metal	20B3061X012
9*	Disk Assembly (for all port diameters)	
	Aluminum holder and nitrile disk	1C4248X0212
	303 Stainless steel holder and nitrile disk	1C4248X0202
	Aluminum holder and nylon disk	1C4248X00A2
	303 Stainless steel holder and nylon disk	1C4248X0062
	NACE construction only	
	Aluminum holder and nitrile disk	1C4248X0212
	316 Stainless steel holder and nitrile disk	1C4248X0252
	Aluminum holder and nylon disk	1C4248X00A2
	316 Stainless steel holder and nylon disk	1C4248X0262
10	Stem	
	303 stainless steel	10B3059X012
	316 stainless steel (NACE)	10B3059X022
11*	Stem O-Ring, nitrile	1D687506992
12	Stem Backup Ring, TFE (2 required)	1K786806992
13	Hair Pin Clip, stainless steel	10B3058X012
14	Drive Pin, plated steel	1A953228982
15	Lever, plated steel	20B3063X012
16	Lever Retainer, plated steel	30B3097X012
17	Lever Pin	
	Stainless steel	10B3083X012
	316 stainless steel (NACE)	10B3083X022
18	Lever Cap Screw (2 required)	
	Plated steel	10B7454X012
	316 stainless steel (NACE)	10B7454X022
19	Pusher Post, aluminum	
	For Type 627 or 627M	10B3098 X012
	For Type 627R or 627MR	10B3098 X022
	For Type 627H or 627HM, 416 stainless steel	10B3098 X032
21	Diaphragm Connector (for Type 627R or 627MR only), stainless steel	10B6758X012
22	Diaphragm Connector Nut (for Type 627R or 627MR only), stainless steel	10B7449X012
23*	Diaphragm, nitrile	
	For Type 627 or 627M w/aluminum or ductile iron diaphragm case	10B3069X012

Key	Description	Part Number
23*	Diaphragm, nitrile (continued)	
	For Type 627 or 627M w/steel diaphragm case	10B8735X012
	For Type 627R or 627MR w/aluminum or ductile iron diaphragm case	10B3068X012
	For Type 627R or 627MR w/steel diaphragm case	10B8736X012
	For Type 627H or 627HM w/steel diaphragm case (diaphragm is neoprene with nylon fabric)	12B0178X012
24	Diaphragm Head, plated steel	
	For Type 627 or 627M, plated steel	1D666428982
	For Type 627R or 627MR, plated steel	10B3071X012
	For Type 627H or 627HM, 416 stainless steel	12B0175X012
25	Relief Spring Seat (for Type 627R or 627MR only), steel	10B7446X012
26	Guide Retainer (for Type 627R or 627MR only), stainless steel	10B7450X012
27	Relief Spring (for Type 627R or 627MR only), plated steel	10B6757X012
28*	Relief Seal O-Ring (for Type 627R or 627MR only), nitrile	1J108506992
29	Spring Case	
	For Type 627 or 627R	
	Aluminum	40B3086X012
	Ductile iron	30B3055X012
	Steel	30B3102X012
	For Type 627M or 627MR	
	Ductile iron	30B3055X012
	Steel	30B3102X012
	For Type 627H or 627HM	
	Steel	30B3102X012
30	Screened Vent Assembly, plastic	10B3093X012
31	Lower Spring Seat, plated steel	
	For Type 627 or 627M	1D666625072
	For Type 627R or 627MR	20B3073X012
32	Control Spring, pl steel	
	5 to 20 psig (0.34 to 1.4 bar), yellow	10B3076X012
	15 to 40 psig (1.0 to 2.8 bar), green	10B3077X012
	35 to 80 psig (2.4 to 5.5 bar), blue	10B3078X012
	70 to 150 psig (4.8 to 10.3 bar), red	10B3079X012
	140 to 250 psig range (9.6 to 17.2 bar), blue, used in a Type 627H or 627HM	10B3078X012
	240 to 500 psig range (16.5 to 34.5 bar), red, used in a Type 627H or 627HM	10B3079X012
33	Upper Spring Seat, plated steel	1D667125072
34	Locknut, plated steel	1D667728982
35	Adjusting Screw, pl steel	
	For Type 627 or 627M	10B3081X012
	For Type 627H or 627HM	10B3081X012
	For Type 627R or 627MR	10B3080X012
36	Adjusting Screw Cap, plastic	20B3082X012
37	Spring Case Cap Screw, pl steel (8 required)	
	For aluminum or ductile iron diaphragm case	1A391724052
	For steel diaphragm case	10B8737X012
	For Type 627H/HM, steel diaphragm case	1A346424052
39	Nameplate	----------
43	Blocked Throat (for Type 627M, 627HM or 627MR only), stainless steel	10B3085X012
44	Blocked Throat O-Ring (for Type 627M, 627HM, or 627MR only), nitrile (2 required)	1E264306992
45	Blocked Throat Backup Ring (for Type 627M, 627HM, or 627MR only), TFE (2 required)	10B3106X012
46	Diaphragm Head Cap Screw, steel	
	For Type 627 or 627M	1K920724052
	For Type 627H or 627HM	1C379124052
47	Relief Seal Retainer (for Type 627R or 627MR only), stainless steel	10B7445X012
48*	Guide Retainer O-Ring (for Type 627R or 627MR only), nitrile	1D682506992
49	Relief Indicator (for Type 627R or 627MR only), rubber (not shown)	30B3100X012
50	Diaphragm Limiter	22B0176X012
51*	Diaphragm Limiter O-Ring	1K877606992
52*	Pusher Post O-Ring (2 required)	1C853806992

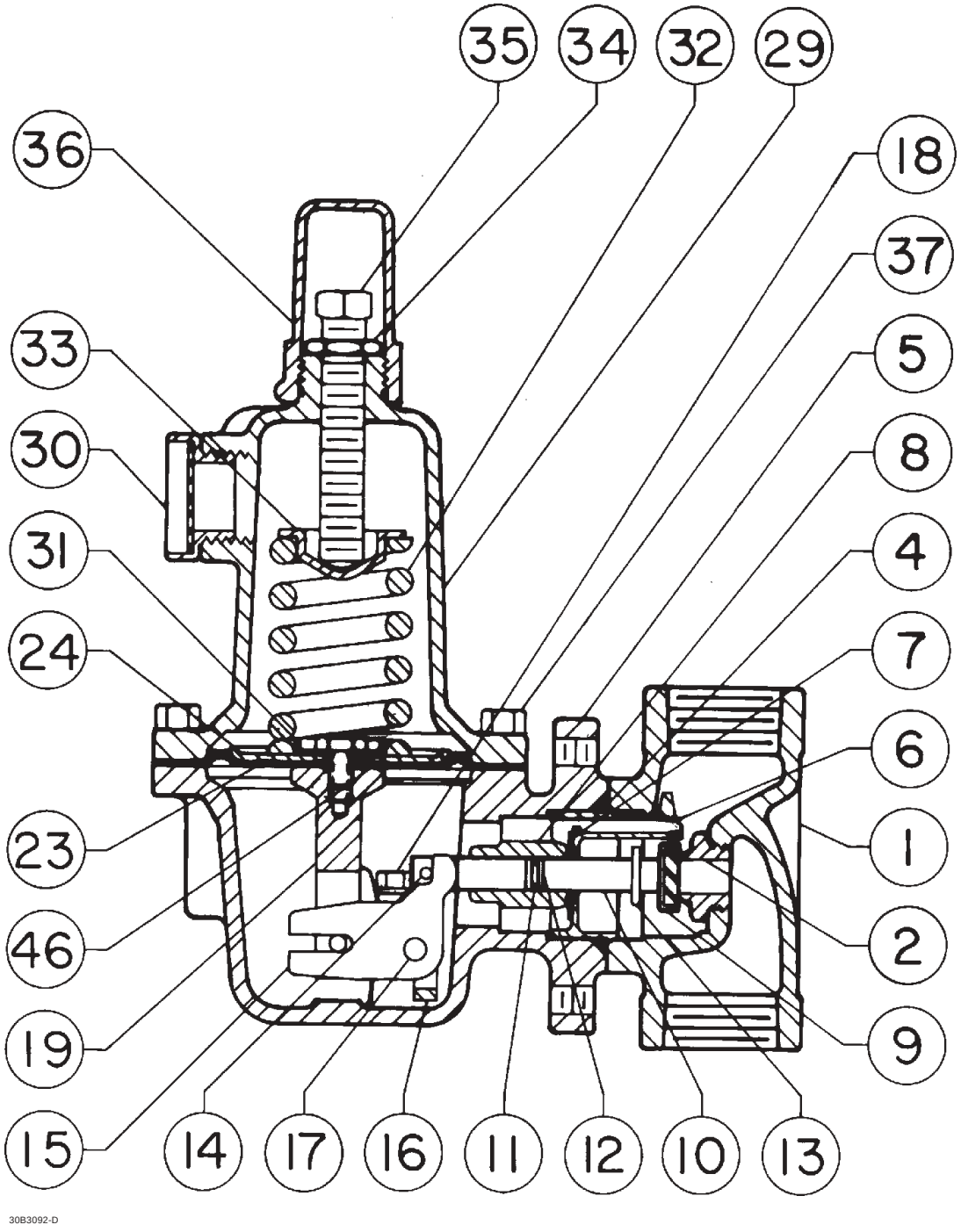


Figure 7. Type 627 Regulator Components

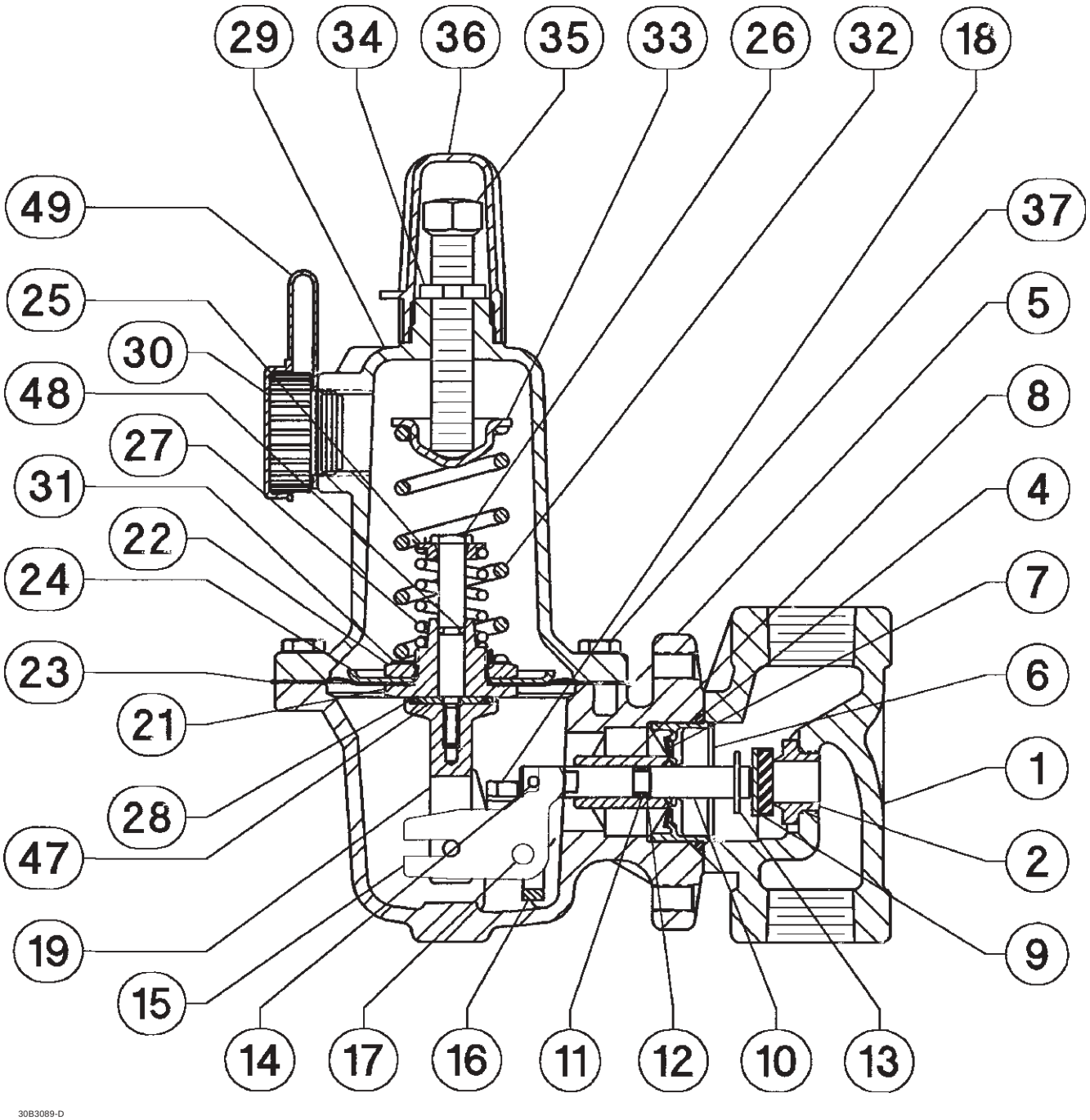


Figure 8. Type 627R Regulator Components

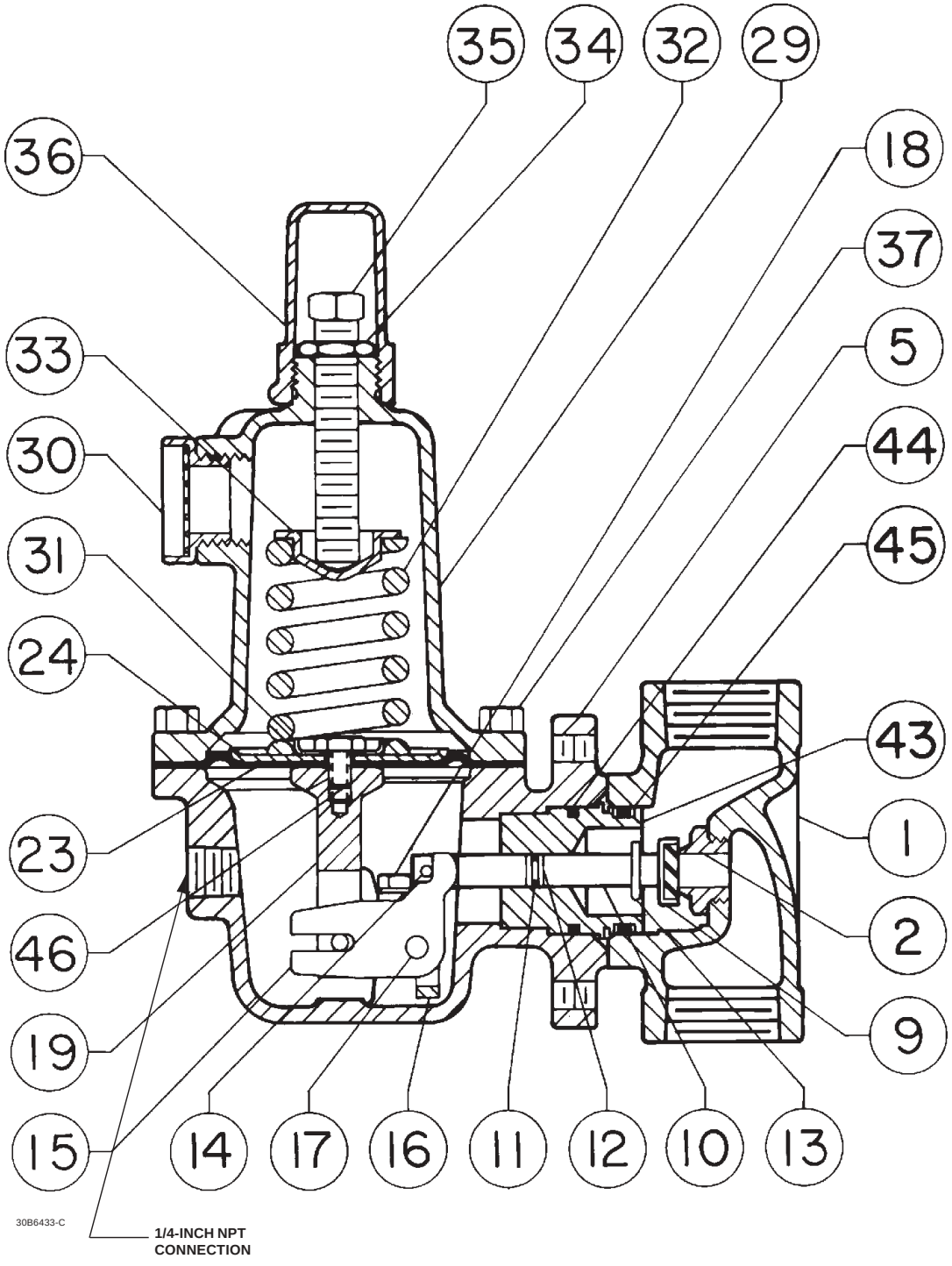


Figure 9. Type 627M Regulator Components

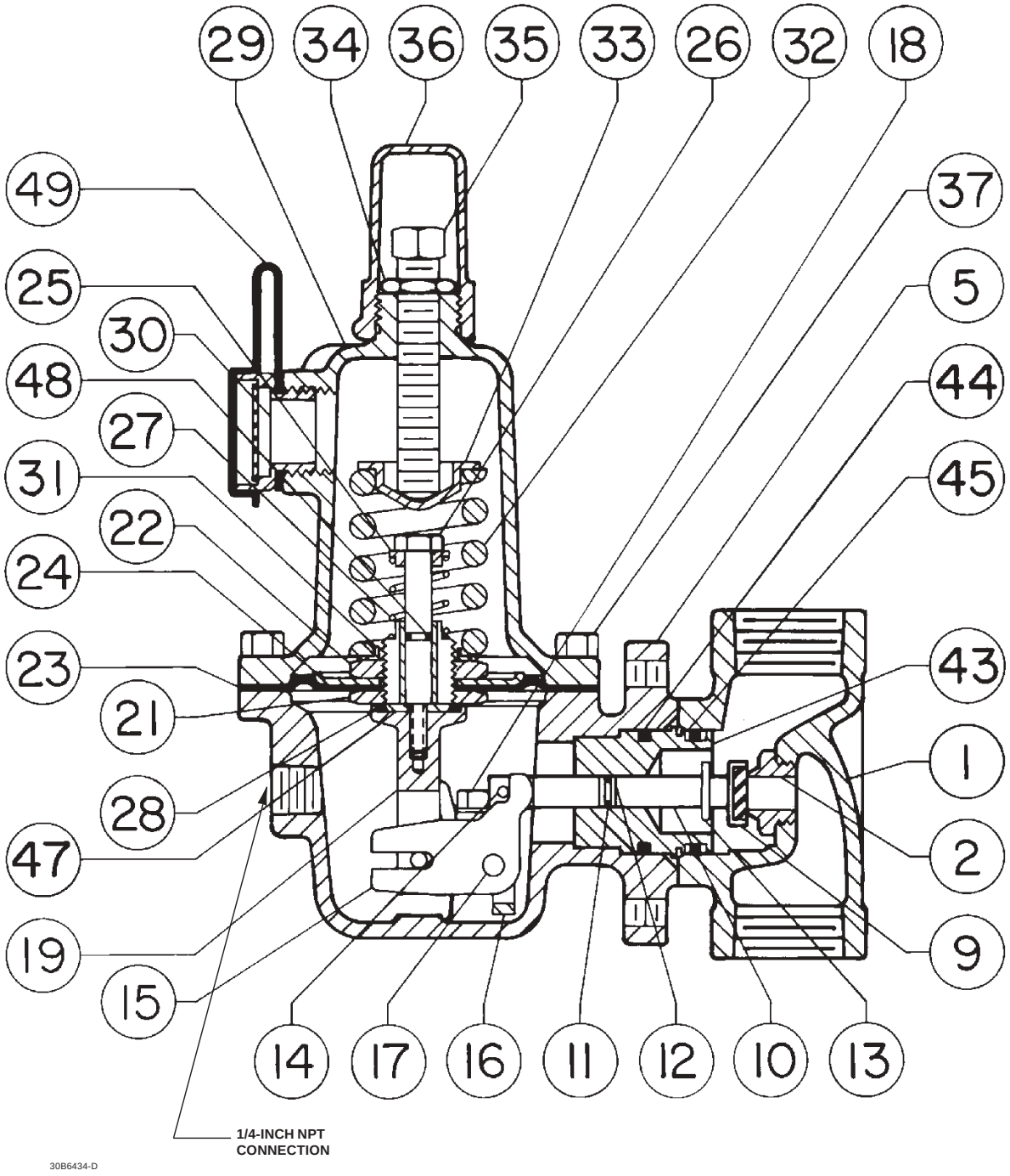


Figure 10. Type 627MR Regulator Components

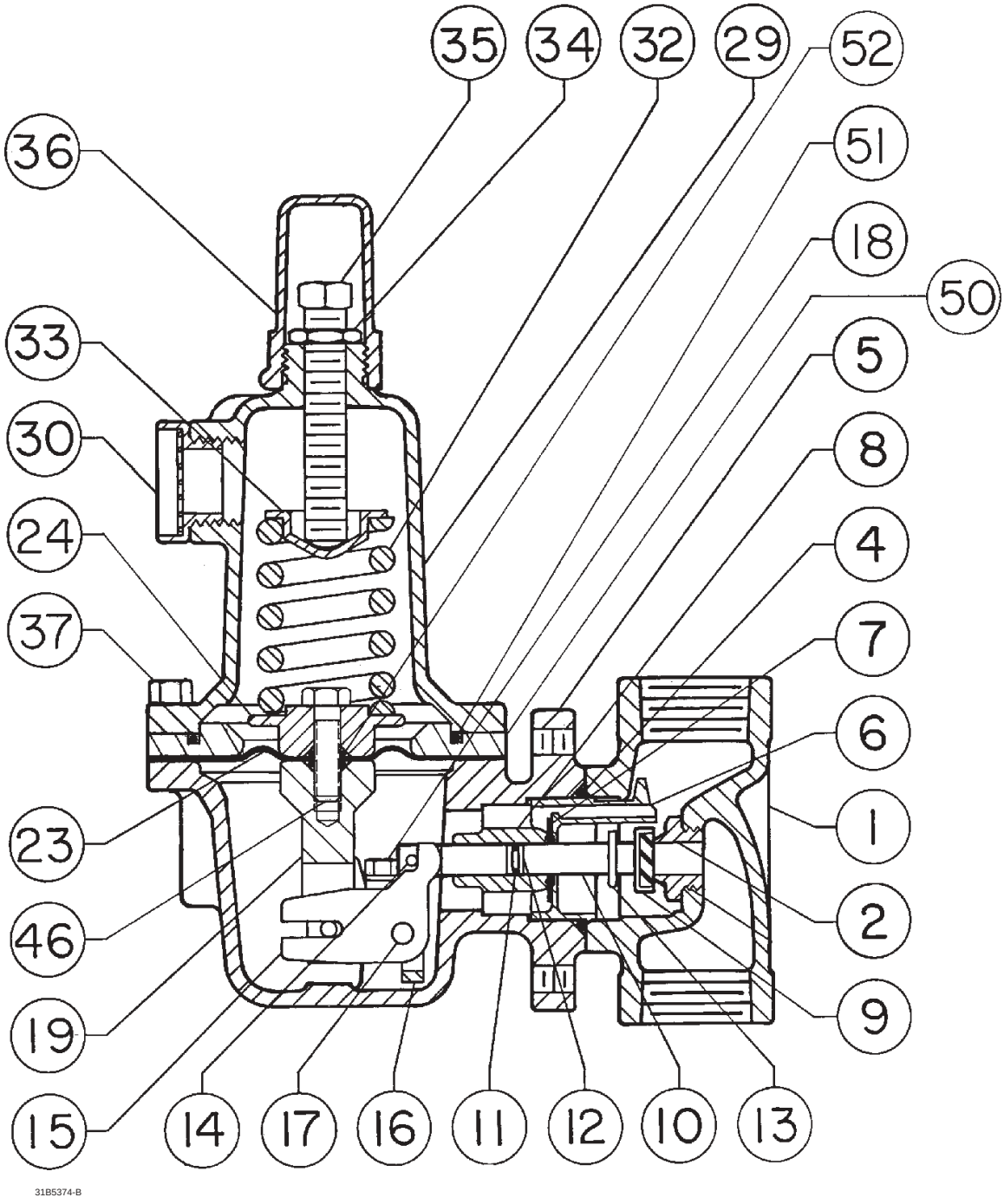


Figure 11. Type 627H Regulator Components

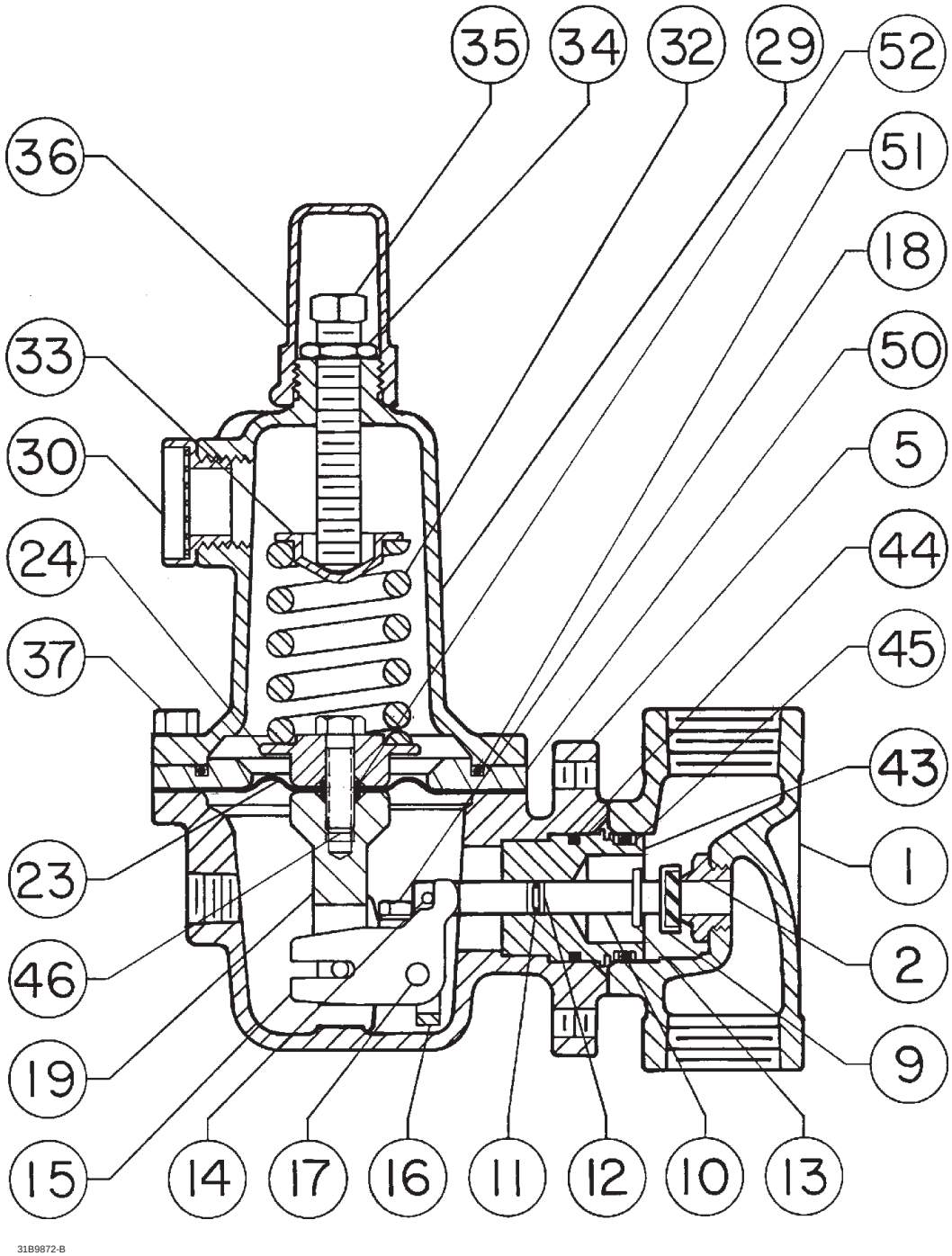


Figure 12. Type 627HM Regulator Components

January 2001

Errata Sheet
for

627 Series
Form 5252, July 1989

This errata sheet includes information covering the Type 627LB extended body regulator. This new body style is available on all 627 Series configurations and will be an addition to key 1 in the Parts List. The pressure ratings on the Type 627LB bodies will be identical to the existing specifications stated in the current 627 Series Instruction Manual. Each bullet on this errata sheet refers to a section of the 627 Series Instruction Manual (form 5252) where this infornation needs to be added.

• Add the following to the Available Constructions section of Table 1. Specifications on page 2.

Type 627LB: A 627 Series construction with an extended NPT screwed body. Note: The pressure ratings and capacities for a Type 627LB depend on the 627 Series construction. See the above listed constructions for ratings and specifications.

• Add the following to the Parts List on page 12.

Key	Description	Part Number
1	Body	
	Type 627LB - Ductile iron	
	1000 psig (69 bar) max inlet pressure	
	3/4-inch NPT screwed body	39B2450X012
	1-inch NPT screwed body	39B2451X012
	2-inch NPT screwed body	39B0414X012
	Type 627LB - Steel	
	2000 psig (138 bar) max inlet pressure	
	3/4-inch NPT screwed body	39B0411X012
	1-inch NPT screwed body	39B0412X012
	2-inch NPT screwed body	39B0415X012

• Add the following figure to the end of page 18.

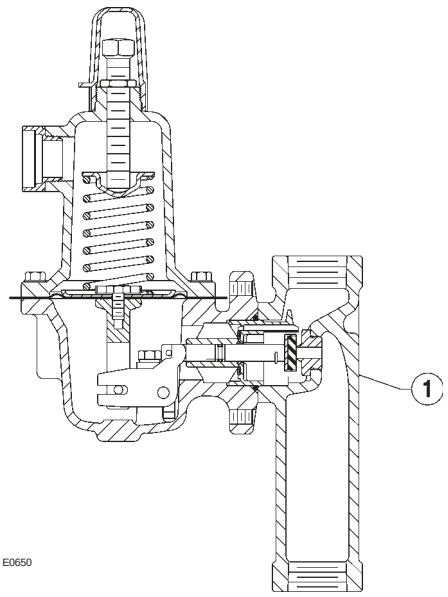


Figure 13. Type 627LB Regulator Body

For information, contact Fisher Controls:
Marshalltown, Iowa 50158 USA
28320 Gallardon, France
Sao Paulo 05424 Brazil
Singapore 128461

Printed in U.S.A.

Safety Warning — LP-Gas Pressure Relief Valves

Purpose

In its continuing quest for safety, Engineered Controls International, Inc. is publishing safety warning bulletins explaining the hazards associated with the use, misuse and aging of *ECII®/ RegO® Products*. LP-Gas dealer managers and service personnel must realize that the failure to exercise the utmost care and attention in the installation, inspection and maintenance of these products can result in personal injury and property damage.

The National Fire Protection Association Pamphlet #58 "Storage and Handling of Liquefied Petroleum Gases" states: "In the interests of safety, all persons employed in handling LP-Gases shall be trained in proper handling and operating procedures." *ECII®* Warning Bulletins are useful in training new employees and reminding older employees of potential hazards.

This Warning Bulletin should be provided to all purchasers of ECII® / RegO® Products and all personnel using or servicing these products. Additional copies are available from Engineered Controls International, Inc. and your Authorized *ECII®/ RegO® Products* Distributor.

⚠WARNING

What You Must Do:

- Read This Entire Warning
- Install Properly
- Inspect Regularly
- Replace In 10 Years or Less

Scope

This bulletin applies to pressure relief valves installed on stationary, portable and cargo containers and piping systems utilized with these containers. This bulletin is not intended to be an exhaustive treatment of this subject and does not cover all safety practices that should be followed in the installation and maintenance of LP-Gas systems. Each LP-Gas employee should be provided with a copy of NPGA Safety Pamphlet 306 "LP-Gas Regulator and Valve Inspection and Maintenance" as well as the NPGA "LP-Gas Training Guidebooks" relating to this subject.

Warnings should be as brief as possible. If there is a simple warning, it is:

Inspect pressure relief valves regularly. Replace unsafe or suspect valves immediately. Use common sense.

Install Properly

Consult NFPA Pamphlet #58 and/or any applicable regulations governing the application and use of pressure relief valves. Make sure you are thoroughly trained before you attempt any valve installation, inspection or maintenance.

Proper installation is essential to the safe operation of pressure relief valves. When installing *ECII®/ RegO®* pressure relief valves, consult warning # 8545-500 which accompanies each valve. Check for damage and proper operation after valve installation. Check that the valve is clean and free of foreign material.

Pipeaways and deflectors may be required by local codes, laws and regulations depending on the installation. Use only *ECII®/ RegO®* adapters on *ECII®/ RegO®* relief valves. Adapters not designed specifically for piping away *ECII®/ RegO®* relief valves, such as those with 90° turns or reduced internal diameters, will decrease flow dramatically. These should never be used as they can cause the relief valve to chatter and eventually destroy itself.

The addition of deflectors, pipeaway adapters and piping will restrict the flow. To properly protect any container, the total system flow must be sufficient to relieve pressure at the pressure setting of the relief valve in accordance with all applicable codes.

Inspect Regularly

A pressure relief valve discharges when some extraordinary circumstance causes an over pressure condition in the container. If a pressure relief valve is known to have discharged, the relief valve, as well as the entire system, should be immediately and thoroughly inspected to determine the reason for the discharge. In the case of discharge due to fire, the valve should be removed from service and replaced.

Relief valves should be inspected each time the container is filled but no less than once a year. If there is any doubt about the condition of the valve, it must be replaced.

Eye protection must be worn when performing inspection on relief valves under pressure. Never look directly into a relief valve under pressure or place any part of your body where the relief valve discharge could impact it. In some cases a flashlight and a small mirror are suggested to assist when making visual inspections.

To Properly Inspect A Pressure Relief Valve, Check For:

1. A rain cap. Check protective cap located in valve or at end of pipeaway for a secure fit. Protective caps help protect the relief valve against possible malfunction caused by rain, sleet, snow, ice, sand, dirt , pebbles, insects, other debris and contamination. REPLACE DAMAGED OR MISSING CAPS AT ONCE AND KEEP A CAP IN PLACE AT ALL TIMES.
2. Open weep holes. Dirt, ice, paint and other foreign particles can prevent proper drainage from the valve body. IF THE WEEP HOLES CANNOT BE CLEARED, REPLACE THE VALVE.
3. Deterioration and corrosion on relief valve spring. Exposure to high concentrations of water, salt, industrial pollutants, chemicals and roadway contaminants could cause metal parts to fail. IF THE COATING ON THE RELIEF VALVE SPRING IS CRACKED OR CHIPPED, REPLACE THE VALVE.
4. Physical damage. Ice accumulations and improper installation could cause mechanical damage. IF THERE ARE ANY INDICATIONS OF DAMAGE, REPLACE THE VALVE.
5. Tampering or readjustment. Pressure relief valves are factory set to discharge at specified pressures. IF THERE ARE ANY INDICATIONS OF TAMPERING OR READJUSTMENT, REPLACE THE VALVE.
6. Seat leakage. Check for leaks in the seating area using a non-corrosive leak detection solution. REPLACE THE VALVE IF THERE IS ANY INDICATION OF LEAKAGE. Never force a relief valve closed and continue to leave it in service. This could result in damage to the valve and possible rupture of the container or piping on which the valve is installed.
7. Corrosion and contamination. REPLACE THE VALVE IF THERE ARE ANY SIGNS OF CORROSION OR CONTAMINATION ON THE VALVE.
8. Moisture, foreign particles or contaminants in the valve. Foreign material such as paint, tar or ice in relief valve parts can impair the proper functioning of the valves. Grease placed in the valve body may harden over time or collect contaminants, thereby impairing the proper operation of the relief valve. DO NOT PLACE GREASE IN THE VALVE BODY, REPLACE THE VALVE IF THERE ARE ANY INDICATIONS OF MOISTURE OR FOREIGN MATTER IN THE VALVE.
9. Corrosion or leakage at container connection. Check container to valve connection with a non-corrosive leak detection solution. REPLACE THE VALVE IF THERE IS ANY INDICATION OF CORROSION OR LEAKAGE AT THE CONNECTION BETWEEN THE VALVE AND CONTAINER.

CAUTION: Never plug the outlet of a pressure relief valve. Any device used to stop the flow of a properly operating pressure relief valve that is venting an overfilled or overpressurized container - raises serious safety concerns!

Replace Pressure Relief Valves In 10 Years Or Less

The safe useful life of pressure relief valves can vary greatly depending on the environment in which they live.

Relief valves are required to function under widely varying conditions. Corrosion, aging of the resilient seat disc and friction all proceed at different rates depending upon the nature of the specific environment and application. Gas impurities, product misuse and improper installations can shorten the safe life of a relief valve.

Predicting the safe useful life of a relief valve obviously is not an exact science. The conditions to which the valve is subjected will vary widely and will determine its useful life. In matters of this kind, only basic guidelines can be suggested. For example, the Compressed Gas Association Pamphlet S-1.1 Pressure Relief Device Standards — Cylinders, section 9.1.1 requires all cylinders used in industrial motor fuel service to have the cylinder's pressure relief valves replaced by new or unused relief valves within twelve years of the date of manufacture of cylinder and within each ten years thereafter. *The LP-Gas dealer must observe and determine the safe useful life of relief valves in his territory.* The valve manufacturer can only make recommendations for the continuing safety of the industry.

WARNING: Under normal conditions, the useful safe service life of a pressure relief valve is 10 years from the original date of manufacture. However, the safe useful life of the valve may be shortened and replacement required in less than 10 years depending on the environment in which the valve lives. Inspection and maintenance of pressure relief valves is very important. Failure to properly inspect and maintain pressure relief valves could result in personal injuries or property damage.

For Additional Information Read:

1. CGA Pamphlet S-1.1 Pressure Relief Standards — Cylinders, Section 9.1.1.
2. *ECII*® Catalog L-500.
3. *ECII*® Warning # 8545-500.
4. NPGA Safety Pamphlet 306 "LP-Gas Regulator and Valve Inspection and Maintenance" and "LP-Gas Training Guidebooks".
5. NFPA # 58, "Storage and Handling of Liquefied Petroleum Gases".
6. NFPA # 59, "LP-Gases at Utility Gas Plants".
7. ANSI K61.1 Safety Requirements for Storage and Handling of Anhydrous Ammonia.

Requirements for Pressure Relief Valves

Every container used for storing or hauling LP-Gas and anhydrous ammonia must be protected by a pressure relief valve. These valves must guard against the development of hazardous conditions which might be created by any of the following:

- Hydrostatic pressures due to overfilling or the trapping of liquid between two points.
- High pressures resulting from exposure of the container to excessive external heat.
- High pressures due to the use of incorrect fuel.
- High pressures due to improper purging of the container.

Consult NFPA Pamphlet #58 for LP-Gas and ANSI #K61.1 for anhydrous ammonia, and/or any applicable regulations governing the application and use of pressure relief valves.

Operation of Pressure Relief Valves

Pressure relief valves are set and sealed by the manufacturer to function at a specific "start-to-discharge" pressure in accordance with regulations. This set pressure, marked on the relief valve, depends on the design requirement of the container to be protected by the relief valve. If the container pressure reaches the start-to-discharge pressure, the relief valve will open a slight amount as the seat disc begins to move slightly away from the seat. If the pressure continues to rise despite the initial discharge through the relief valve, the seat disc will move to a full open position with a sudden "pop". This sharp popping sound is from which the term "pop-action" is derived.

Whether the relief valve opens a slight amount or pops wide open, it will start to close if the pressure in the container diminishes. After the pressure has decreased sufficiently, the relief valve spring will force the seat disc against the seat tightly enough to prevent any further escape of product. The pressure at which the valve closes tightly is referred to as the "re-seal" or "blow-down" pressure. Generally, the re-seal pressure will be lower than the start-to-discharge pressure.The re-seal pressure can be, and in most cases is, adversely affected by the presence of dirt, rust, scale or other foreign particles lodging between the seat and disc. They interfere with the proper mating of the seat and disc and the pressure in the container will usually have to decrease to a lower pressure before the spring force embeds foreign particles into the resilient seat disc material and seals leak-tight. The degree by which the presence of dirt decreases the re-seal pressure, is, of course, dependent on the size of the interfering particles.

Once particles have been trapped between the disc and seat, the start-to-discharge pressure is also affected. For example, the pressure relief valve will start-to-discharge at some pressure lower than its original start-to-discharge pressure. Again, the pressure at which the valve will start to discharge is dependent on the size of the foreign particles.

In the case of a pressure relief valve that has opened very slightly due to a pressure beyond its start-to-discharge setting, the chances of foreign material lodging between the seat and disc is negligible although the possibility is always present. If the relief valve continues to leak at pressures below its start-to-discharge setting it must be replaced.

Relief valves which have "popped" wide open must also be checked for foreign material lodged between the seat and disc, as well as for proper reseating of the seat and disc. Continued leakage at pressures below the start-to-discharge setting indicate the relief valve must be replaced.

The pressure at which a pressure relief valve will start to discharge should never be judged by the reading of the pressure gauge normally furnished on the container.

The reasons for this are two-fold:

- If the relief valve is called upon to open, the resulting discharge produces an increased vaporization of the product in the container with the result that the liquid cools to a certain extent and the vapor pressure drops. A reading taken at this time would obviously not indicate what the pressure was when the relief valve opened.
- The pressure gauges usually on most containers provide somewhat approximate readings and are not intended to provide an indication of pressure sufficiently accurate to judge the setting of the relief valve.

Repair and Testing

RegO® Pressure Relief Valves are tested and listed by Underwriters Laboratories, Inc., in accordance with NFPA Pamphlet #58. Construction and performance of RegO® Pressure Relief Valves are constantly checked at the factory by U.L. inspectors. Therefore, testing of RegO® Pressure Relief Valves in the field is not necessary.

Never attempt to repair or change the setting of RegO® Pressure Relief Valves. Any changes in settings or repairs in the field will void the UL® listing and may create a serious hazard.

While the functioning of a pressure relief valve appears to be relatively simple, the assembly and test procedure used to manufacture these RegO® products is rather complex. Highly specialized test fixtures and specially trained personnel are necessary to attain proper relief valve settings. These fixtures and personnel are available only at the factory.

Any pressure relief valve which shows evidence of leakage, other improper operation or is suspect as to its performance must be replaced immediately using approved procedures.

Pipe-Away Adapters

Pipe-away adapters are available for most RegO® Pressure Relief Valves, where it is required or desirable to pipe the discharge above or away from the container. Each adapter is designed to sever if excessive stress is applied to the vent piping – thus leaving the relief valve fully operative.

Weep hole deflectors are available on larger relief valves. These deflectors provide protection against flame impinging on adjacent containers which could occur from ignition of LP-Gas escaping through the relief valve drain hole when the valve is discharging.

Selection of RegO® Pressure Relief Valves For ASME Containers

The rate of discharge required for a given container is determined by the calculation of the surface area of the container as shown in "Chart A" for LP-Gas and "Chart B" for anhydrous ammonia. See page D9.

Setting - The set pressure of a pressure relief valve depends upon the design pressure of the container. Refer to NFPA Pamphlet #58 for more information.

Selection of RegO® Pressure Relief Valves for DOT Containers

To determine the proper relief valve required for a given DOT container, refer to the information shown with each pressure relief valve

in the catalog. This information will give the maximum size (pounds water capacity) DOT container for which the relief valve has been approved.

Setting - The standard relief valve setting for use on DOT cylinders is 375 PSIG.

Ordering RegO® Pressure Relief Valves

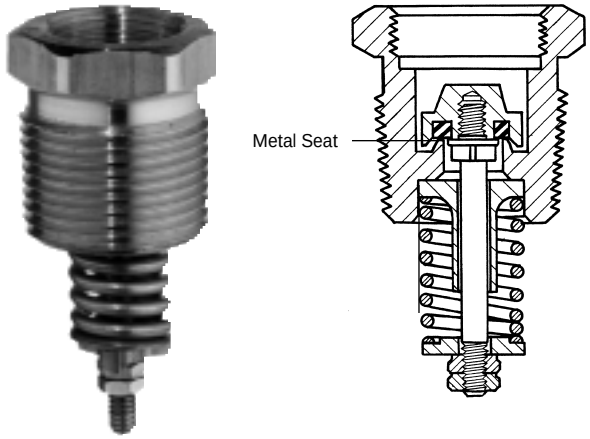
When ordering RegO® Pressure Relief Valves, be sure you are certain that it will sufficiently protect the container as specified in the forewording information, NFPA Pamphlet #58 and any other applicable standards or specifications.

All adapters, protective caps and deflectors must be ordered separately, unless specified otherwise.

Part Number Explanation

Products carrying an “A” or “AA” prefix contain no brass parts and are suitable for NH_3. Hydrostatic relief valves carrying an “SS” prefix are of stainless steel construction and are suitable for use with NH_3. The products are also suitable for use with LP-Gas service except relief valves carrying an “AA” prefix. These are of partial aluminum construction and are listed by U.L. for NH_3 service only.

Safety Information — Relief Valves Don’t Last Forever



RegO® Relief Valve for lift truck containers

The internal spring is protected from external contamination but the other external parts must be protected with a cap. Circular rubber seat disc ring seats on brass shoulder approximately 3⁄64" wide.

This article was prepared by the engineers of RegO® products, after technical consultation with valve manufacturers and other industry sources. Its purpose is to alert and remind the LP-Gas industry of the importance of proper maintenance of pressure relief valves. It applies most particularly to separate relief valves with emphasis on lift truck and motor fuel containers where the hazards of contamination are greatest.

Since the beginning of our industry, manufacturers of equipment and distributors of LP-Gas have worked diligently to provide a safe environment for employees and consumers. The history of the industry testifies to the success of their efforts.

But the industry is now entering its sixth decade and equipment installed years ago is failing because of age. Every year, additional equipment will fail unless it is replaced. Pressure relief valves are no exception. The valve manufacturers and LP-Gas dealers are naturally concerned about this situation.

Causes of Relief Valve Failure

A relief valve is designed to have a safe useful life of many years, but that life will vary greatly depending on the environment in which it “lives.” To attempt to estimate the safe useful life of a relief valve and the effect of environment on its performance, a brief discussion of the materials used and the nature of its performance should be helpful.

Relief valve bodies are generally made of brass or steel. Springs are made from various spring wires which are plated or painted, or made of stainless steel. Valve seat discs are made of synthetic rubber compounds which will remain serviceable in an atmosphere of LP-Gas. Relief valve stems, guides, etc. are generally made from brass or stainless steel.

Relief valves, over the years, may not function properly in several ways:

- They may leak at pressures below the set pressure.
- They may open and fail to properly reseat.
- They may open at higher than the set pressure.

These failures to function properly are due primarily to four “environmental” conditions:

1. Corrosion of metal parts (particularly springs) which result in the component parts failing to perform.
2. Deterioration of the synthetic rubber seat disc material.
3. Clogging or “cementing” of the movable relief valve components so that their movement is restricted.
4. Debris on the valve seat after the relief valve opens, effectively preventing the valve from reseating.

Corrosion is caused by water, corrosive atmospheres of salt and industrial pollutants, chemicals, and roadway contaminants. High concentrations can attack the metal parts vigorously. No suitable metals are totally resistant to such corrosion.

Synthetic rubber and seat disc materials can also be attacked by impurities in the gas and corrosive atmospheres, particularly those with sulphur dioxide. There are no suitable rubber materials which resist all contaminants.

“Cementing” of relief valve parts has been caused by normal industrial atmospheres containing particles of dirt, iron oxide, metal chips, etc. combined with water, oil, or grease. Ice collecting in recessed valves could cause relief valves to fail to open. Paint and tar in relief valves also cause failure to function properly.

Debris on valve seats which prevents reseating can occur whenever the valve collects material in the relief valve opening which is not blown out when the relief valve opens.

Inspection of Relief Valves

Unfortunately many of the above problems may not be easily observed because of the compact nature of some relief valve designs.

A casual visual inspection of a relief valve may not necessarily disclose a potential hazard. On the other hand, a visual inspection will often disclose leakage, corrosion, damage, plugging and contamination.

If additional light is required, a flashlight should be used.

If there is any doubt about the condition of the valve, or if there is a suspicion that the valve has not been protected by a cap for some time, it should be replaced before refilling the container.

Eye protection must be used when examining relief valves under pressure.

Smaller Relief Valves

The industry's requirement for a small full-flow safety relief valve challenged design engineers some years ago:

- The valve must be leakproof before operating and must reseat leakproof each time after each operation. The only known satisfactory seat disc materials to accomplish this have been special synthetic rubber compounds.
- Valve discharge settings are relatively high and require high spring loads to keep the valve closed.
- Because of the small interior diameter of the valve, the round metal seating area is small.

All of these parameters may result in the development of a significant indentation in the rubber seat disc after some years. The seat disc may have a tendency to cling to the metal seat. This may result in the relief valve not opening at the set pressure as the seat disc ages.

Test have been conducted on small LP-Gas relief valves of all the U.S. valve manufacturers. Valves over 10 years old were removed from service and tested to determine at what pressure the valves discharged. In many of the valves, the pressure required to open the valve exceeded the set pressure.

Because of the critical importance of proper functioning of relief valves, common sense and basic safety practice dictate that small relief valves should be replaced in about 10 years.

Some larger relief valves on bulk storage tanks can be replaced with rebuilt valves obtained from the manufacturers. Small relief valves cannot be rebuilt economically, thus, new valves are required. Most LP-Gas dealers find it impractical and costly to test relief valves and field repairing of relief valves is not sanctioned by the manufacturers, Underwriter's Laboratories, or ASME.

Use of Protective Caps

Many of the problems that cause inoperative relief valves could be prevented if proper protective caps were kept in place *at all times.*

Collection of debris would be prevented. Contamination caused by corrosive atmospheres would be reduced. Water collection in the valves would be eliminated. Relief valves protected with caps from the time of installation in the container would obviously have a much longer safe useful life, but they still should be replaced at some time because of the gradual deterioration of the rubber seat disc due to age alone.

NFPA 58 requires that protective caps must be kept in place as a protective cover on some relief valves. This is a mandatory requirement on several types of relief valves. The fact that use of caps may make inspection more time consuming should not be viewed as a reason for either not using the caps, or not making required periodic inspections.

In the event a relief valve has been used without the required cap, the relief valve should be thoroughly inspected and the required cap placed on the relief valve. If damage is noted to the relief valve, it should be replaced and the replacement valve should be capped.

Relief valves with pipe-away adapters or deflectors used on lift truck containers have been found choked with debris. Inspection of relief valves with deflectors can only be accomplished by removing the deflector.

Similarly, larger relief valves with vent stacks have been found choked with debris and water. Valves have failed because springs rusted through. The weep hole was plugged. It was obvious that the relief valves had not been inspected in many years. These conditions must be alleviated by periodic inspections and replacement of relief valves as needed.

Summary Recommendations

Predicting the safe useful life of a relief valve is obviously not an exact science. The conditions to which the valve is subjected will vary widely and will largely control its life. In matters of this kind, only basic guidelines can be suggested. The LP-Gas dealer must observe and determine the safe useful life of relief valves in his territory. The valve manufacturers can only make recommendations for the continuing safety of the industry:

1. Make sure proper protective caps are in place at all times. Do not release a container for service or fill a container unless it has a protective cap in place.
2. Replace relief valves periodically, at least every 10 years. Every relief valve has the month and year of manufacture stamped on the valve. This is most particularly true of small *separate* relief valves.
3. Carefully inspect valves each time before the container is filled. Replace valves showing any signs of contamination, corrosion, damage, plugging, leakage, or any other problem. Eye protection must be used when examining relief valves under pressure.

Chart A — Minimum Required Rate of Discharge for LP-Gas Pressure Relief Valves Used on ASME Containers

From NFPA Pamphlet #58, Appendix D (1986).

Minimum required rate of discharge in cubic feet per minute of air at 120% of the maximum permitted start-to-discharge pressure for pressure relief valves to be used on containers other than those constructed in accordance with Interstate Commerce Commission specification.

Surface Area Sq. Ft.	Flow Rate CFM Air	Surface Area Sq. Ft.	Flow Rate CFM Air	Surface Area Sq. Ft.	Flow Rate CFM Air	Surface Area Sq. Ft.	Flow Rate CFM Air	Surface Area Sq. Ft.	Flow Rate CFM Air	Surface Area Sq. Ft.	Flow Rate CFM Air	Surface Area Sq. Ft.	Flow Rate CFM Air
20 or less	626	85	2050	150	3260	230	4630	360	6690	850	13540	1500	21570
25	751	90	2150	155	3350	240	4800	370	6840	900	14190	1550	22160
30	872	95	2240	160	3440	250	4960	380	7000	950	14830	1600	22740
35	990	100	2340	165	3530	260	5130	390	7150	1000	15470	1650	23320
40	1100	105	2440	170	3620	270	5290	400	7300	1050	16100	1700	23900
45	1220	110	2530	175	3700	280	5450	450	8040	1100	16720	1750	24470
50	1330	115	2630	180	3790	290	5610	500	8760	1150	17350	1800	25050
55	1430	120	2720	185	3880	300	5760	550	9470	1200	17960	1850	25620
60	1540	125	2810	190	3960	310	5920	600	10170	1250	18570	1900	26180
65	1640	130	2900	195	4050	320	6080	650	10860	1300	19180	1950	26750
70	1750	135	2990	200	4130	330	6230	700	11550	1350	19780	2000	27310
75	1850	140	3080	210	4300	340	6390	750	12220	1400	20380		
80	1950	145	3170	220	4470	350	6540	800	12880	1450	20980		

Surface area =Total outside surface area of container in square feet.

When the surface area is not stamped on the name plate or when the marking is not legible, the area can be calculated by using one of the following formulas:

1. Cylindrical container with hemispherical heads. Area (in sq. ft.) = overall length (ft.) x outside diameter (ft.) x 3.1416.
2. Cylindrical container with semi-ellipsoidal heads. Area (in sq. ft.) = [overall length (ft.) + .3 outside diameter (ft.)] x outside diameter (ft.) x 3.1416.
3. Spherical container. Area (in sq. ft.) = outside diameter (ft.) squared x 3.1416.

Flow Rate CFM Air = Required flow capacity in cubic feet per minute of air at standard conditions, 60ºF. and atmospheric pressure (14.7 psia).

The rate of discharge may be interpolated for intermediate values of surface area. For containers with total outside surface area greater than 2000 square feet, the required flow rate can be calculated using the formula, Flow Rate in CFM Air = 53.632 $A^{0.82}$. Where A = total outside surface area of the container in square feet.

Valves not marked "Air" have flow rate marking in cubic feet per minute of liquefied petroleum gas. These can be converted to ratings in cubic feet per minute of air by multiplying the liquefied petroleum gas ratings by the factors listed below. Air flow ratings can be converted to ratings in cubic feet per minute of liquefied petroleum gas by dividing the air ratings by the factors listed below.

Air Conversion Factors

Container Type	100	125	150	175	200
Air Conversion Factor	1.162	1.142	1.113	1.078	1.010

Chart B — Minimum Required Rate of Discharge for Anhydrous Ammonia Pressure Relief Valves Used on ASME Containers

From ANSI K61.1-1981, Appendix A (1981).

Minimum required rate of discharge in cubic feet per minute of air at 120% of the maximum permitted start-to-discharge pressure for pressure relief valves to be used on containers other than those constructed in accordance with United States Department of Transportation cylinder specifications.

Surface Area Sq. Ft.	Flow Rate CFM Air	Surface Area Sq. Ft.	Flow Rate CFM Air	Surface Area Sq. Ft.	Flow Rate CFM Air	Surface Area Sq. Ft.	Flow Rate CFM Air	Surface Area Sq. Ft.	Flow Rate CFM Air	Surface Area Sq. Ft.	Flow Rate CFM Air	Surface Area Sq. Ft.	Flow Rate CFM Air
20	258	95	925	170	1500	290	2320	600	4200	1350	8160	2100	11720
25	310	100	965	175	1530	300	2380	650	4480	1400	8410	2150	11950
30	360	105	1010	180	1570	310	2450	700	4760	1450	8650	2200	12180
35	408	110	1050	185	1600	320	2510	750	5040	1500	8900	2250	12400
40	455	115	1090	190	1640	330	2570	800	5300	1550	9140	2300	12630
45	501	120	1120	195	1670	340	2640	850	5590	1600	9380	2350	12850
50	547	125	1160	200	1710	350	2700	900	5850	1650	9620	2400	13080
55	591	130	1200	210	1780	360	2760	950	6120	1700	9860	2450	13300
60	635	135	1240	220	1850	370	2830	1000	6380	1750	10090	2500	13520
65	678	140	1280	230	1920	380	2890	1050	6640	1800	10330		
70	720	145	1310	240	1980	390	2950	1100	6900	1850	10560		
75	762	150	1350	250	2050	400	3010	1150	7160	1900	10800		
80	804	155	1390	260	2120	450	3320	1200	7410	1950	11030		
85	845	160	1420	270	2180	500	3620	1250	7660	2000	11260		
90	885	165	1460	280	2250	550	3910	1300	7910	2050	11490		

Surface area = Total outside surface area of container in square feet.

When the surface area is not stamped on the name plate or when the marking is not legible, the area can be calculated by using one of the following formulas:

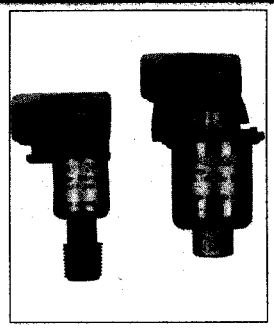
1. Cylindrical container with hemispherical heads. Area (in sq. ft.) = overall length (ft.) x outside diameter (ft.) x 3.146.
2. Cylindrical container with other than hemispherical heads. Area (in sq. ft.) = [overall length (ft.) + .3 outside diameter (ft.)] x outside diameter (ft.) x 3.1416.
3. Spherical container. Area (in sq. ft.) = outside diameter (ft.) squared x 3.1416.

Flow Rate CFM Air = Required flow capacity in cubic feet per minute of air at standard conditions, 60°F. and atmospheric pressure (14.7 psia).

The rate of discharge may be interpolated for intermediate values of surface area. For containers with total outside surface area greater than 2,500 square feet, the required flow rate can be calculated using the formula, Flow Rate in CFM Air = 22.11 $A^{0.82}$ where A = outside surface area of the container in square feet.

Conversion Factor

ft^2 x 0.092 903 = m^2
CFM x 0.028 317 = m^3/min
ft x 0.304 8 = m



54 Series Pressure Switches

Types

Enclosed: J54, J54A, H54,
Skeleton: J54S, J54AS, H54S,

UNITED ELECTRIC CONTROLS

Installation and Maintenance Instructions

Please read all instructional literature carefully and thoroughly before starting. Refer to the final page for the listing of Recommended Practices, Liabilities and Warrantees.

GENERAL

As the pressure changes, a diaphragm, bellows or piston sensor actuates one or two snap acting switches. The 54 Series offers two types of adjustments: internal hex adjustment on the "J" types or a calibrated adjustment dial on "H" types.

Part I - Installation

Tools Needed
Flatblade screwdriver
Adjustable wrench to 1 1/8"

LOCATE SWITCH WHERE VIBRATION, SHOCK, AND AMBIENT TEMPERATURE FLUCTUATIONS ARE MINIMAL. TO AVOID DAMAGE TO CONTROL, ALWAYS HOLD THE WRENCH ON THE WRENCH FLATS OR HEX PORTION OF THE PRESSURE CONNECTION WHEN TIGHTENING.

The control can be mounted in any position.

Enclosed Versions J54, J54A and H54

Remove cover first by removing the one captive screw located on the front of the cover.

Pipe Mounting
Mount the control directly to the line via the NPT pressure connection.

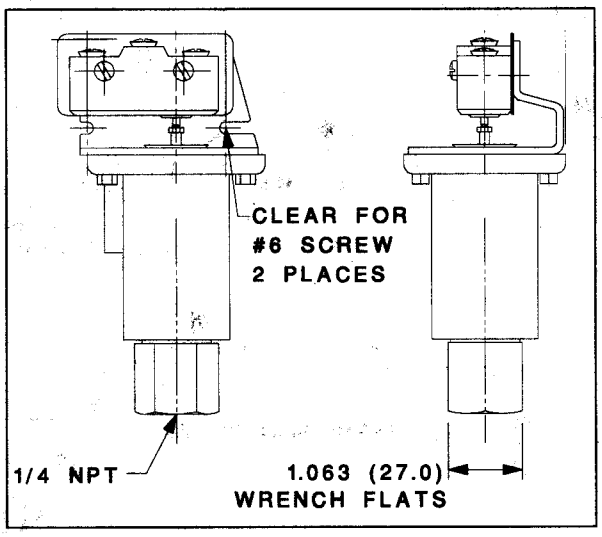
Vertical Surface Mount
Two holes for #10 screws are provided in the bracket plate.

Conduit Connection
A 7/8" diameter hole has been provided in the bracket plate for mounting a 1/2" NPT conduit fitting.

Skeleton Versions J54S, J54AS H54S

Pipe Mounting
Mount the control directly to the line via the NPT pressure connection.

Vertical Surface Mount
Two openings for #6 screws are provided in the rear of the bracket plate.



Mounting for skeleton versions (J54S shown)

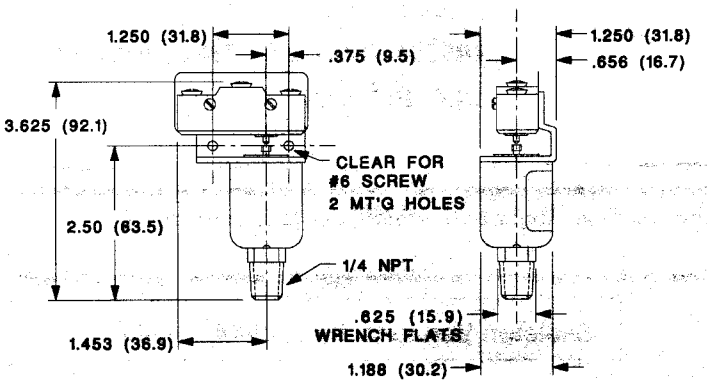
ALL LIVE SUPPLY CIRCUITS MUST BE DISCONNECTED BEFORE WIRING THE CONTROL. WIRE IN ACCORDANCE WITH NATIONAL AND LOCAL WIRING CODES. MAXIMUM RECOMMENDED WIRE SIZE IS #14AWG.

Bring wires up to the terminals from the rear, so that wires lay along insulator.

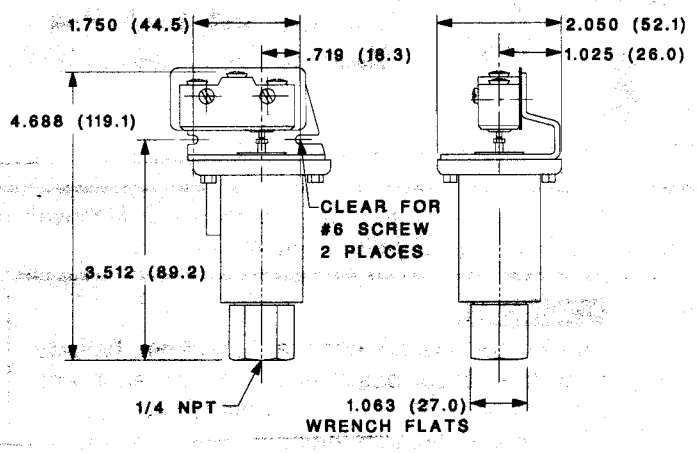
Part II - Adjustments

Tools Needed
1/4" open end wrench
Flatblade screwdriver

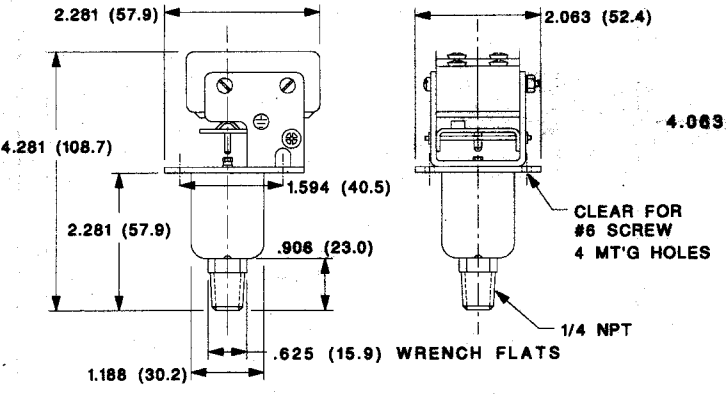
Dimensions



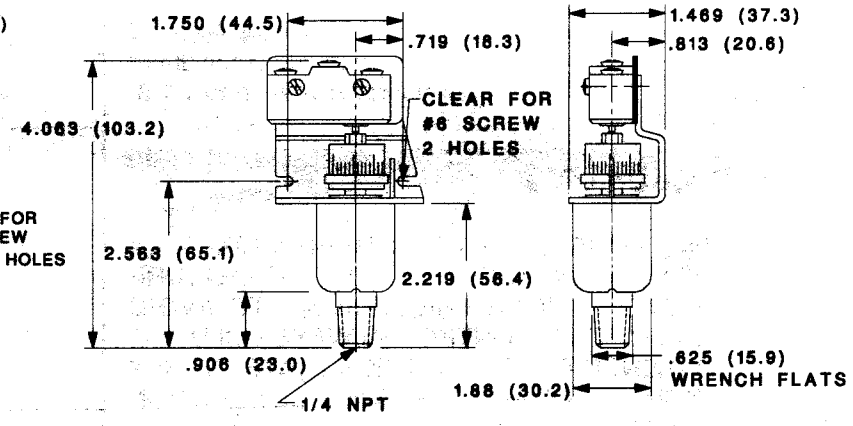
Type J54S models 22 - 28



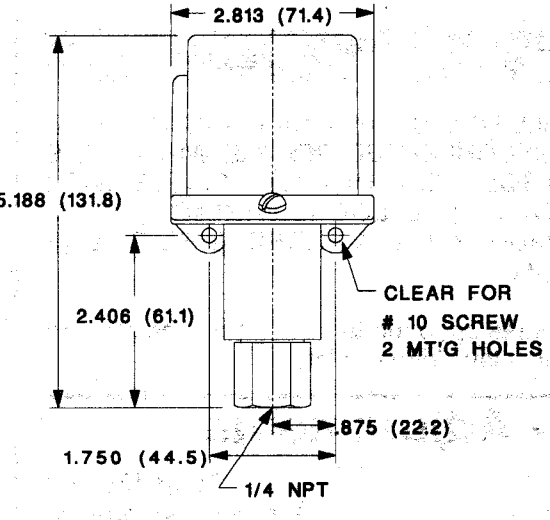
Type J54S models 610 - 614



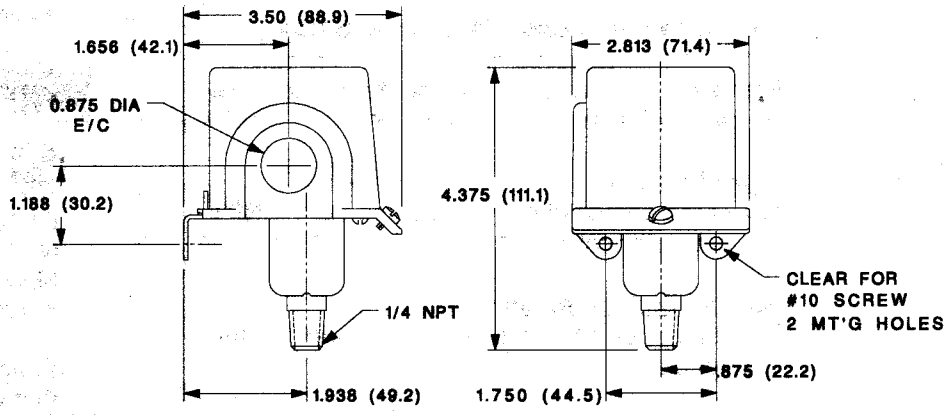
Type J54AS models 22 - 28



Type H54S models 22 - 28



Type J54 models 610 - 614



Type H54, J54 and J54A models 22 - 28

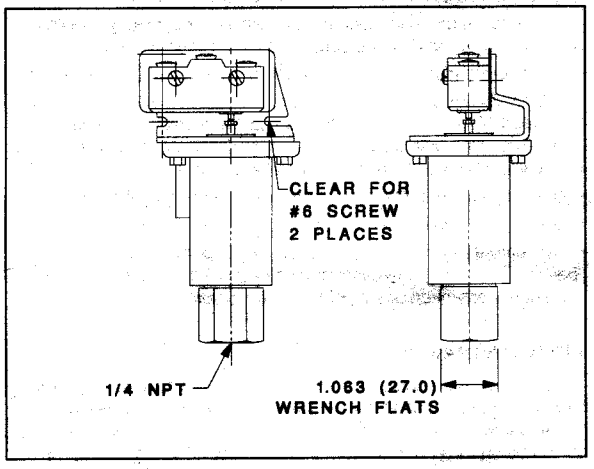
Uncalibrated Single Switch Versions J54, J54S

Mount control onto a calibrated pressure source (vacuum source for model 22). Secure. Use pipe sealant or teflon tape to ensure tight vacuum seal.

USING THE SENSOR HOUSING OR BRACKET TO TIGHTEN THE FITTING TO THE SOURCE WILL RESULT IN DAMAGE TO THE CONTROL.

Using a 1/4" open end wrench, turn main adjustment screw counterclockwise (out of sensor plunger) to lower set point or clockwise (into sensor plunger) to raise set point.

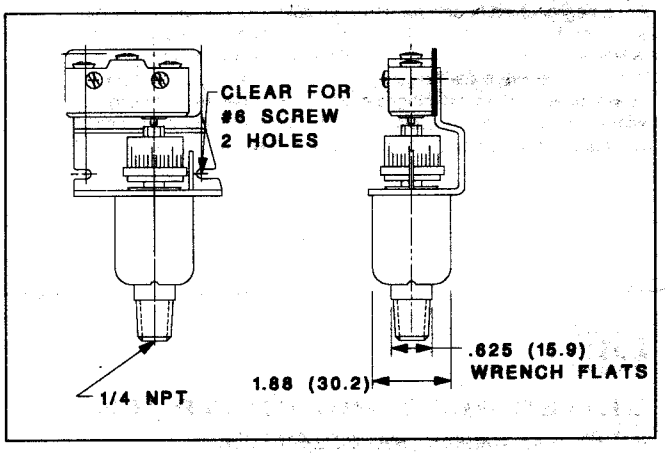
ALWAYS RECHECK SET POINTS AFTER ANY ADJUSTMENTS ARE MADE.



Type J54S, models 610-614

Calibrating Single Switch Versions H54, H54S

Turn the calibrated reference dial to desired set point by aligning setting on dial with dowel pin.



Type H54S, models 22-28

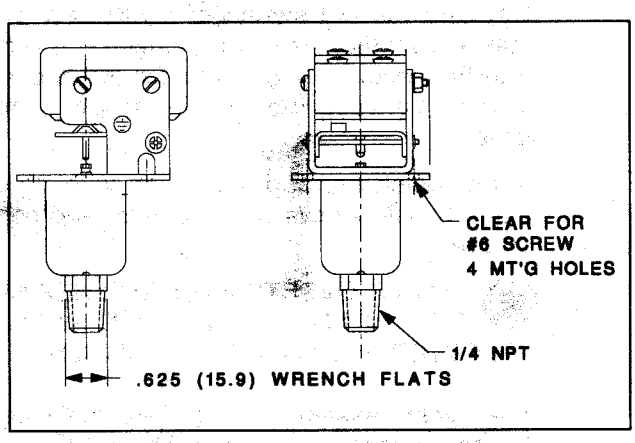
Calibrating All Dual Switch Versions J54A, J54AS

Mount control via an NPT pressure connection onto a calibrated pressure source (vacuum source for model 22). Secure fitting to source tight enough to prevent leaks. Use teflon tape to secure firmly. Apply tightening torque to the fitting only.

USING THE SENSOR HOUSING OR BRACKET TO TIGHTEN THE FITTING TO THE SOURCE WILL RESULT IN DAMAGE TO THE CONTROL.

High Set of Range

Using a 1/4" open end wrench, turn main adjustment screw counterclockwise (out of sensor plunger) to lower set point or clockwise (into sensor plunger) to raise set point. Turning the 1/4" hex screw clockwise until "high set" switch transfers at the target pressure point provides a pressure rise set point.



Type J54AS, models 22-28

Low Set of Range

Using a 1/4" open end wrench, turn "low set" microswitch screw counterclockwise (out of sensor plunger) to lower set point or clockwise (into sensor plunger) to raise set point. Turn screw until both "high set" and "low set" switches transfer together on or near the target pressure on rise.

Turn the "low set" switch adjustment screw clockwise (into sensor plunger) until the "low set" switch transfers at the desired pressure on fall (unless required otherwise).

Raise the pressure source to the "high set" pressure valve to check the set point pressure. Adjust the 1/4" hex screw accordingly if further fine adjustments are needed. Lower pressure to check the set point of the "low set". Fine adjust if necessary.

ALWAYS RECHECK SET POINTS AFTER ANY ADJUSTMENTS ARE MADE.

Manual Reset, Option 1530 or suffix "G"
A snap-acting switch with this option will remain tripped until pressure changes and the reset button is manually depressed, which resets the switch.

Part III - Replacements

Tools Needed

Flatblade screwdriver

DISCONNECT ALL LIVE ELECTRICAL SUPPLY TO THE CONTROL BEFORE PERFORMING ANY DISASSEMBLY.

Remove the cover if an enclosed type. Disconnect wires from switch terminals. Label each wire to ensure proper reconnections. Remove the two hex nuts and pull out the long screws. Remove the switch(es) and insulators. Note the position of switch plunger relative to sensor plunger or lever of dual switch.

Replace the old switch(es) with new ones, making sure that the switch plunger(s) is aligned with the sensor plunger, and the insulators are located between the switch(es) and bracket plate.

Align switch(es) and insulators with bracket plate. Install screws with hex nuts and tighten securely.

DO NOT OVERTIGHTEN THE HEX NUTS OR SWITCH ACTUATION WILL BE AFFECTED. RECONNECT THE WIRES.

The sensor assembly is not field replaceable. Do not attempt any disassembly of these parts. If any questions, consult the UE factory.

RECOMMENDED PRACTICES

United Electric Controls Company recommends careful consideration of the following factors when specifying and installing UE pressure and temperature units. Before installing a unit, the Installation and Maintenance instructions provided with unit must be read and understood.

- To avoid damaging unit, proof pressure and max temperature limits stated in literature and on nameplates must never be exceeded, even by surges in the system. Operation of the unit up to proof pressure or max temperature is acceptable on a limited basis (i.e.start-up, testing) but continuous operation must be restricted to the designated adjustable range. Excessive cycling at proof pressure or maximum temperature limits could reduce sensor life.
- A back-up unit is necessary for applications where damage to the primary unit could endanger life, limb or property. A high or low limit switch is necessary for applications where dangerous runaway condition could result.
- The adjustable range must be selected so that incorrect, inadvertent or malicious setting at any range point can not result in an unsafe system condition.
- Install unit where shock, vibration and ambient temperature fluctuations will not damage unit or affect operation. Orient unit so that moisture does not enter the enclosure via the electrical connection.
- Unit must not be altered or modified after shipment. Consult UE if modification is necessary.
- Monitor operation to observe warning signs of possible damage to unit, such as drift in set point. Check unit immediately.
- Preventative maintenance/periodic testing is necessary for critical applications where damage could endanger property/ personnel.
- For all applications, a factory set unit should be tested before use.

Electrical ratings stated in literature and on nameplate must not be exceeded. Overload on a switch can cause possible damage on the first cycle. Wire unit according to local and national electrical codes, using wire size recommended in installation sheet.

- Use only factory authorized replacement parts and procedures.
- Do not mount unit in ambient temp. exceeding published limits.
- For remote mounted temperature units, capillary lengths beyond 10 feet can increase chance of error, and may require re-calibration of set point and indication.

LIMIT WARRANTY

UE warrants that the product thereby purchased is, upon delivery, free from defects in material and workmanship and that any such product which is found to be defective in such workmanship or material will be repaired or replaced by UE (F.O.B. UE); provided, however, that this warranty applies only to equipment found to be so defective within a period of 12 months after installation by buyer but not to exceed 18 months after delivery by the seller. Except for the limited warranty of repair and replacement stated above, UE disclaims all warranties whatsoever with respect to the product, including all implied warranties of merchantability or fitness for any particular purpose.

LIABILITY LIMITATION

The sole and exclusive remedy of buyer for any liability or seller for any claim, including incurred in connection with (I) breach of any warranty whatsoever expressed or implied, (II) a breach of contract, (III) a negligent act or acts (or negligent failure to act) committed by seller, or (IV) an act for which strict liability will be imputed to seller, is limited to the limited warranty or repair and replacement stated herein. In no event shall the seller be liable for any special, indirect, consequential or other damages or like general nature, including, without limitation, loss of profits or production, or loss or expenses of any nature, incurred by the buyer or any third party.

UE
UNITED ELECTRIC CONTROLS
P.O. Box 9143, Watertown, MA 02272-9143 USA
617 926-1000 Fax 617 926-2568

APPENDIX B

TECHNICAL INFORMATION

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Table 14 - *XPV Packaged Vaporizing/Mixing System Recommended Spare Parts and Accessories*

REPLACEMENT PARTS		MODEL TYPE AND SIZE													
		5#							8#						
ITEM	**DESCRIPTION**	**2.5**	**5.0**	**7.0**	**10.5**	**14.0**	**21.0**	**28.0**	**2.5**	**5.0**	**7.0**	**10.5**	**14.0**	**21.0**	**28.0**
1	Valve, Inlet Solenoid	36111													
***1A**	Repair Kit, Inlet Solenoid Valve	40287													
2	Switch, Start/Stop, Exp.	30887													
***3**	Switch, Liquid Level	30897													
4	Valve, Pressure Relief (250 PSIG)	35009 / (OLD 30747)													
5	Rain Cap	35379													
***6**	RTD Temperature Sensor	See variable parts section on page B-3													
7	Control Circuit Board 208V/240V	52712													
	Control Circuit Board 380V/415V	52713													
	Control Circuit Board 440V/480V	52714													
7A	Relay, Heater Control	52604 / (OLD 52603)													
8	Relay, Time Delay (Prog)	52625													
9	Pipe Away Adapter (for item 4)	30752													
***11**	Switch, Pressure, Venturi Control	35539													
12	Switch, Pressure, High Mixed Gas	36081													
13	Switch, Pressure, Low Vapor	36106													
14	Gauge, Pressure, 0-15 PSI †	30688													
15	Transformer, Venturi Circuit, 208V/240V	52229													
	Transformer, Venturi Circuit, 380V/415V	52151													
	Transformer, Venturi Circuit, 440V/480V	52526													
16	Rain Cap (Surge Tank Relief) †	32044													
17	Silencer †	36080													

Table 14 - *XPV Packaged Vaporizing/Mixing System Recommended Spare Parts and Accessories*

REPLACEMENT PARTS		MODEL TYPE AND SIZE													
		5#							8#						
ITEM	**DESCRIPTION**	**2.5**	**5.0**	**7.0**	**10.5**	**14.0**	**21.0**	**28.0**	**2.5**	**5.0**	**7.0**	**10.5**	**14.0**	**21.0**	**28.0**
18	Valve, Relief (Surge Tank)	31304													
20	Gauge, Pressure, 0-300 PSI	30641													
21	Valve, Union Ball, 3/4" (Outlet)	33813 & 30365 / (OLD 30705)													
22	Valve, Solenoid, 3/4" (Venturi Control)	36111													
***22A**	Repair Kit, Solenoid Valve (Venturi)	40287													
23	Regulator, 627	32851	32712			35668	32712	35668	30782			30741			
***23A**	Repair Kit, Regulator - 627	40022													
24	Gasket, Venturi Housing	20122													
25	O-Ring (Diffuser)	31051													
***26[1]**	Venturi Check Valve Rebuild Kit	40490													
27	Gauge, Pressure, 0-100 PSI	30638													
28	Air Inlet Screen	31016													
ACCESSORIES															
	Remote Control Panel	52141 - PER VAPORIZER													
	Strainer with Magnetic Plug	30655 & 32892													
	Auto Restart	52175 - PER VAPORIZER													

VARIABLE PARTS		VAPORIZER MODEL		
ITEM	**DESCRIPTION**	**XP80S**	**XP120S**	**XP160S**
***6**	Gauge, Pressure, 0-15 PSI †	35682	36020	36024

[1] *Venturi check valve rebuilt kit includes: Clevis, Acorn nut, Check valve, Pivot arm, Pivot bolts and hardware, and Venturi HSG gasket*

* *Algas-SDI recommends that these spare parts be kept on hand by the customer*

† *XPV only*XPV Packaged Vaporizing/Mixing System

***Table 14 -** XPV Packaged Vaporizing/Mixing System Recommended Spare Parts and Accessories*

REPLACEMENT PARTS		MODEL TYPE AND SIZE										
		10#				12#						
ITEM	**DESCRIPTION**	**9.0**	**13.0**	**18.0**	**26.0**	**5.0**	**7.0**	**9.0**	**10.5**	**14.0**	**18.0**	**21.0**
1	Valve, Inlet Solenoid	36111										
***1A**	Repair Kit, Inlet Solenoid Valve	40287										
2	Switch, Start/Stop, Exp.	30887										
***3**	Switch, Liquid Level	30897										
4	Valve, Pressure Relief (250 PSIG)	35009 / (OLD 30747)										
5	Rain Cap	35379										
6	RTD Temperature Sensor	See variable parts section on page B-5										
7	Control Circuit Board 208V/240V	52712										
	Control Circuit Board 380V/415V	52713										
	Control Circuit Board 440V/480V	52714										
7A	Relay, Heater Control	52604 / (OLD 52603)										
8	Relay, Time Delay (Prog)	52625										
9	Pipe Away Adapter (for item 4)	30752										
***11**	Switch, Pressure, Venturi Control	35539										
12	Switch, Pressure, High Mixed Gas 8-25	36082										
13	Switch, Pressure, Low Vapor	36106										
14	Gauge, Pressure, 0-30 PSI †	30688										
15	Transformer, Venturi Circuit, 208V/240V	52229										
	Transformer, Venturi Circuit, 380V/415V	52151										
	Transformer, Venturi Circuit, 440V/480V	52526										
16	Rain Cap (Surge Tank Relief) †	32044										
17	Silencer †	36080										

***Table 14 -** XPV Packaged Vaporizing/Mixing System Recommended Spare Parts and Accessories*

REPLACEMENT PARTS		MODEL TYPE AND SIZE										
		10#				12#						
ITEM	**DESCRIPTION**	**9.0**	**13.0**	**18.0**	**26.0**	**5.0**	**7.0**	**9.0**	**10.5**	**14.0**	**18.0**	**21.0**
18	Valve, Relief (Surge Tank)	31304										
20	Gauge, Pressure, 0-300 PSI	30641										
21	Valve, Union Ball, 3/4" (Outlet)	33813 & 30365 / (OLD 30705)										
22	Valve, Solenoid, 3/4" (Venturi Control)	36111										
***22A**	Repair Kit, Solenoid Valve (Venturi)	40287										
23	Regulator, 627	30741				36063			30741	36063	30741	
***23A**	Repair Kit, Regulator – 627	40022										
24	Gasket, Venturi Housing	20122										
25	O-Ring (Diffuser)	31051										
***26**[1]	Venturi Check Valve Rebuild Kit	40490										
27	Gauge, Pressure, 0-100 PSI	30638										
28	Air Inlet Screen	31016										
ACCESSORIES												
	Remote Control Panel	52141 - PER VAPORIZER										
	Strainer with Magnetic Plug	30655 & 32892										
	Auto Restart	52175 - PER VAPORIZER										

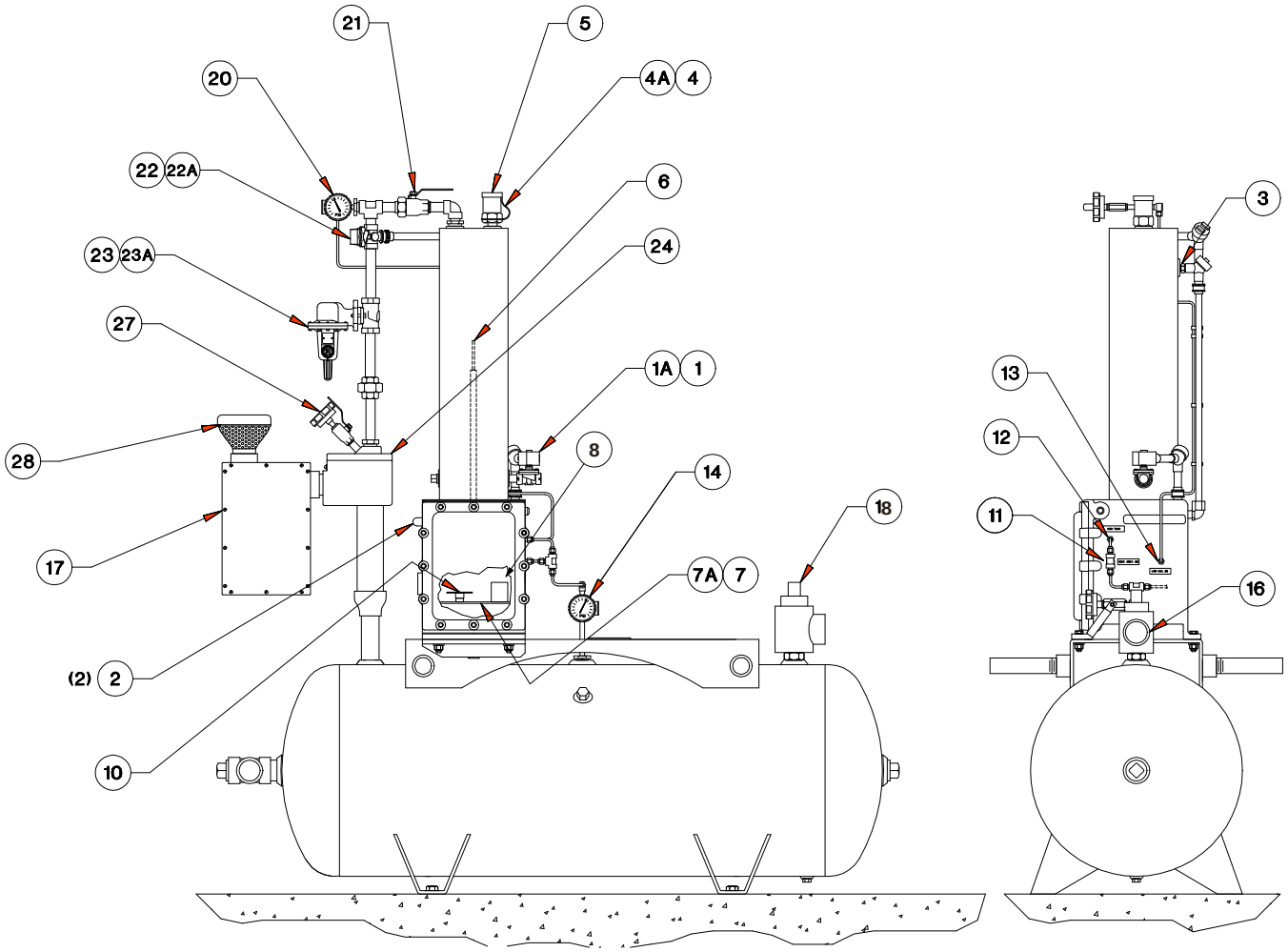
VARIABLE PARTS		VAPORIZER MODEL		
ITEM	**DESCRIPTION**	**XP80S**	**XP120S**	**XP160S**
***6**	RTD Temperature Sensor	35682	36020	36024

[1] *Venturi check valve rebuilt kit includes: Clevis, Acorn nut, Check valve, Pivot arm, Pivot bolts and hardware, and Venturi HSG gasket*

** Algas-SDI recommends that these spare parts be kept on hand by the customer*

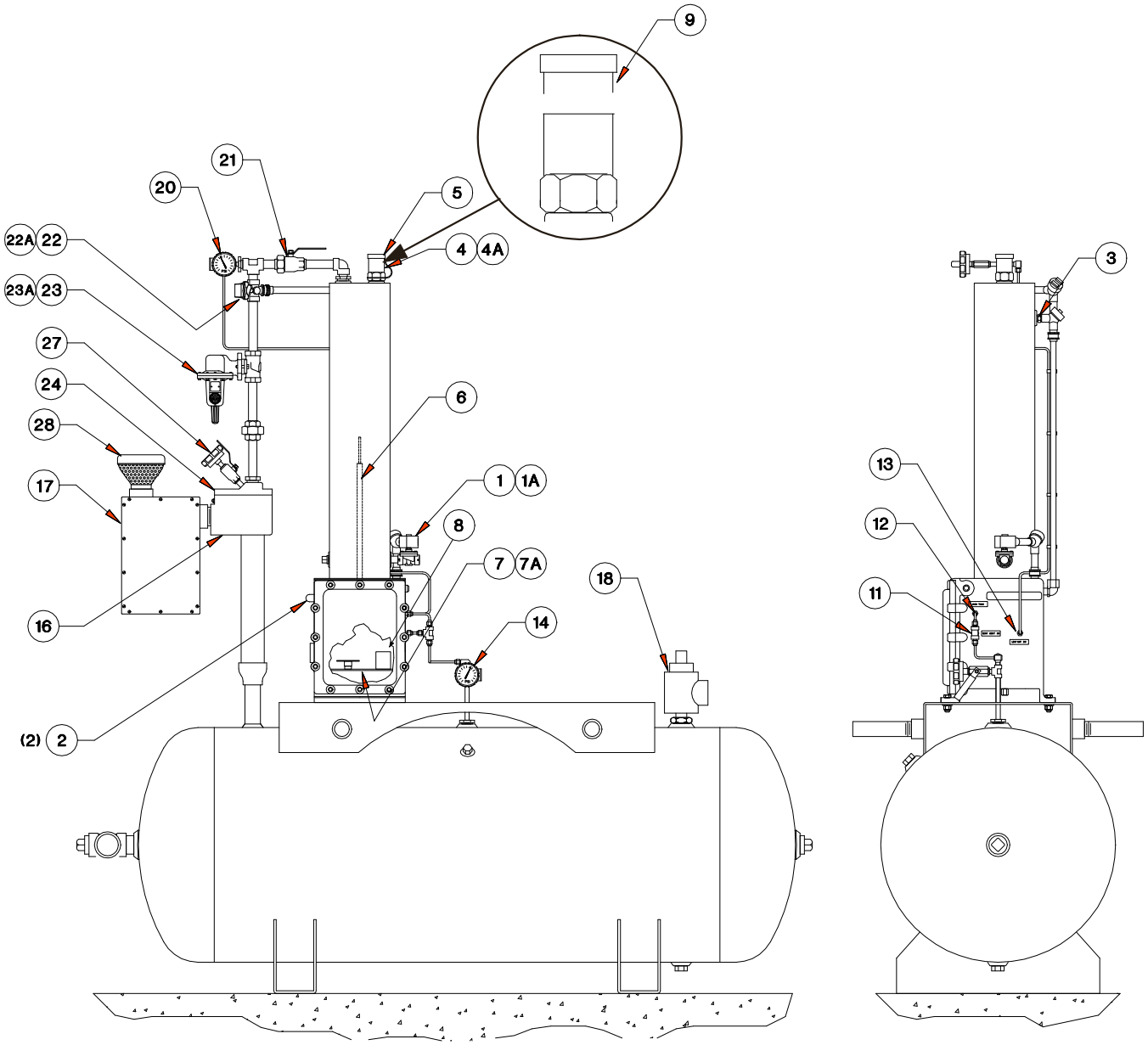
† *XPV only*XPV Packaged Vaporizing/Mixing System

Figure 25 - Recommended Spares Diagram
Model: 2.5 – 5# & 8#; Model 5.0, 7.0,V10.5 – 5#, 8#, 12#; Model: 9.0 – 12#



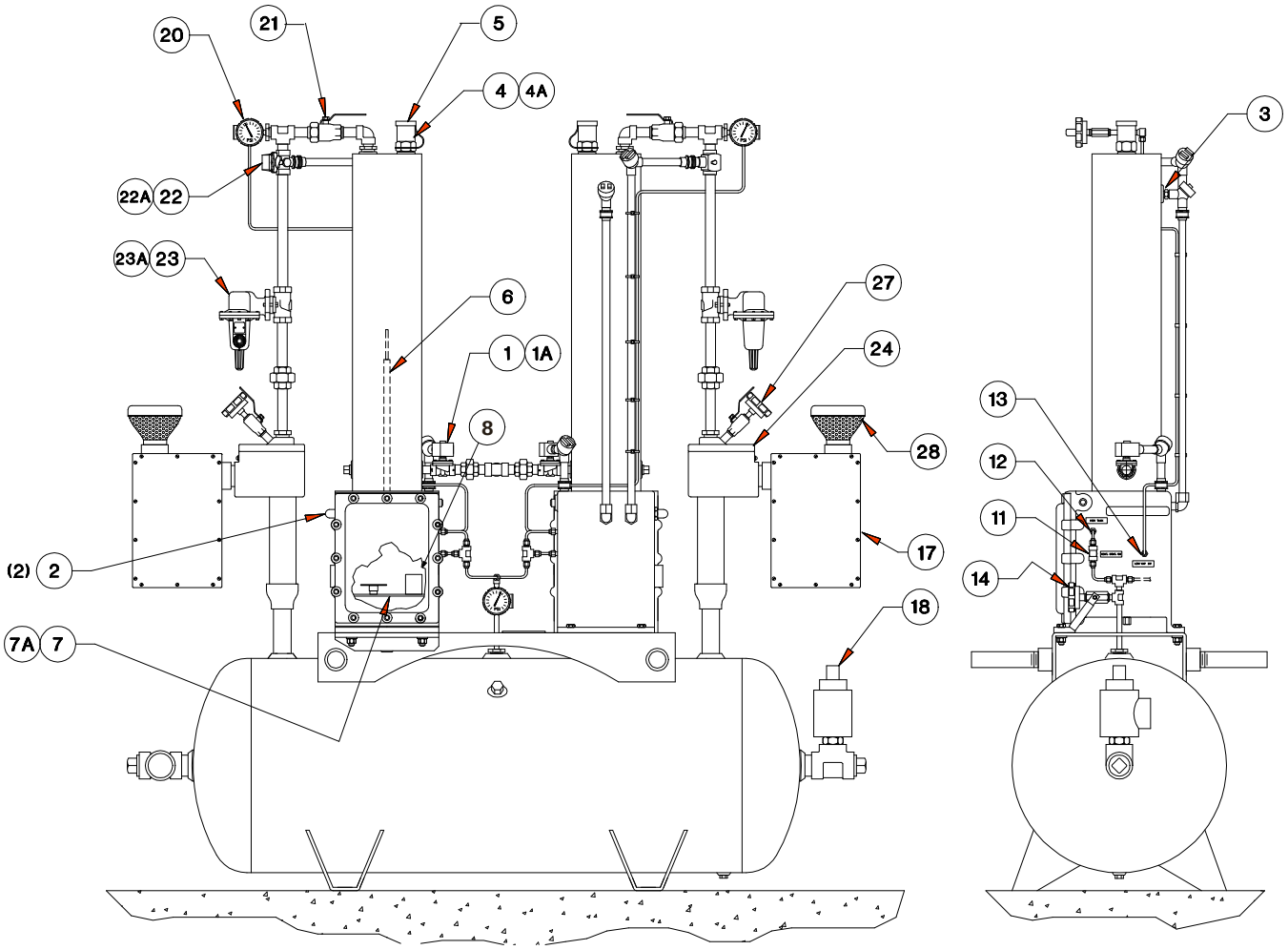
Recommended Spares Diagram(1).dxf

Figure 26 - *Recommended Spares Diagram*
Model: 13 – 10#; Models: 14.0 – 5# & 8#



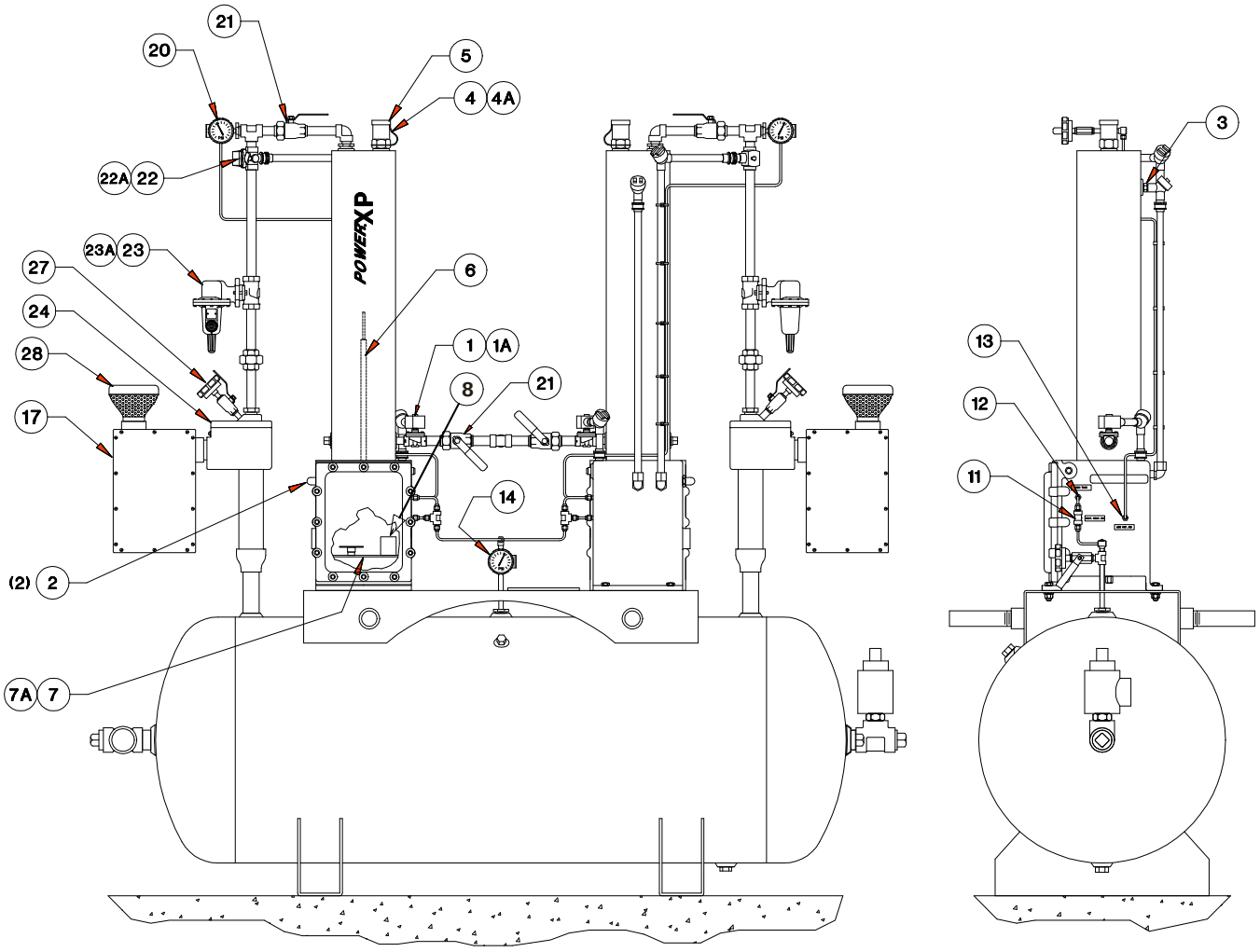
Recommended Spares(2).dxf

Figure 27 - *Recommended Spares Diagram*
Models: 14.0 – 12# & 18.0 – 12#; Model: 21.0 – 5#, 8#, 12#



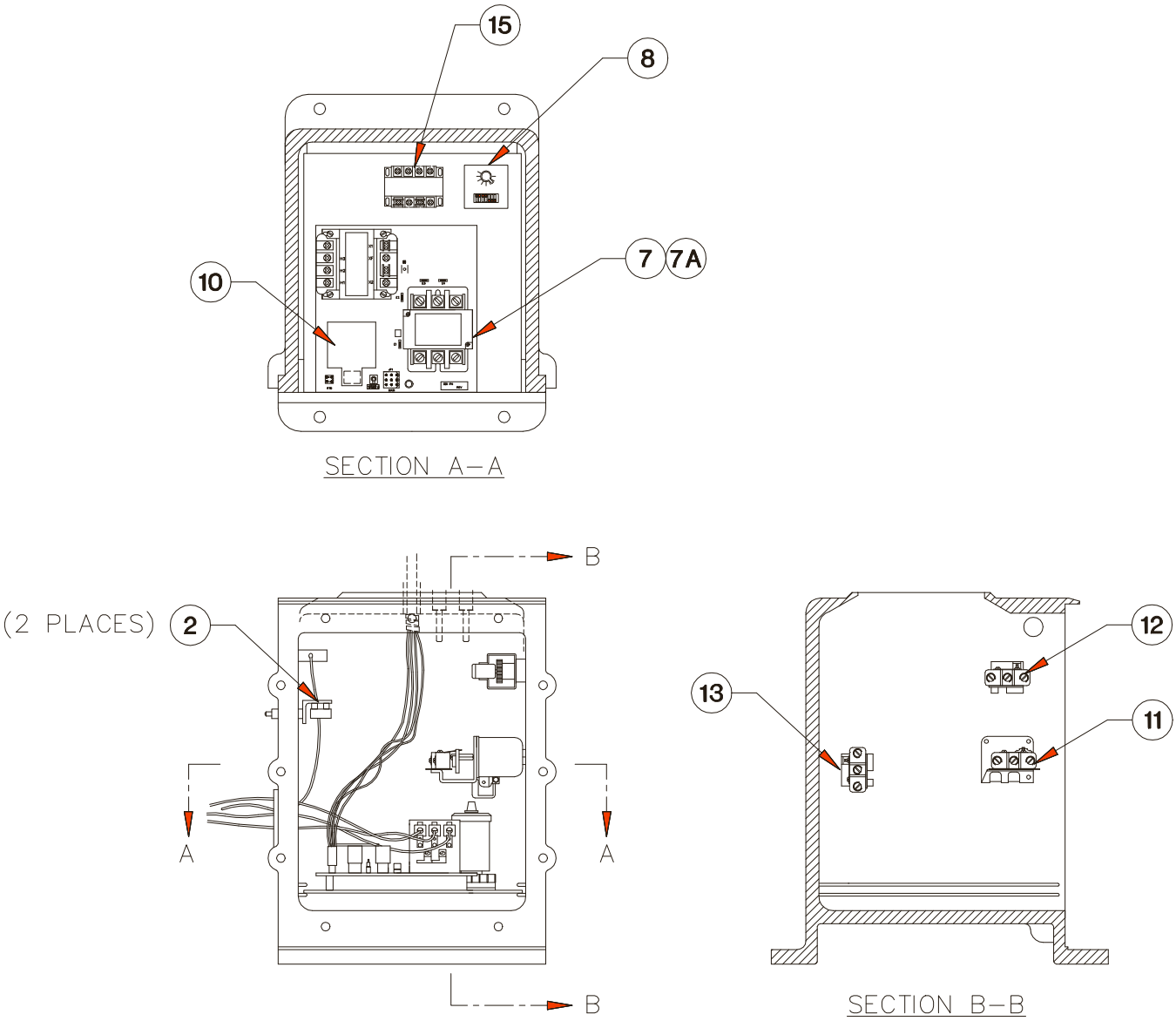
Recommended Spares (3).dxf

Figure 28 - *Recommended Spares Diagram*
Model: 26.0 – 10#; Model: 28.0 – 5# & 8#



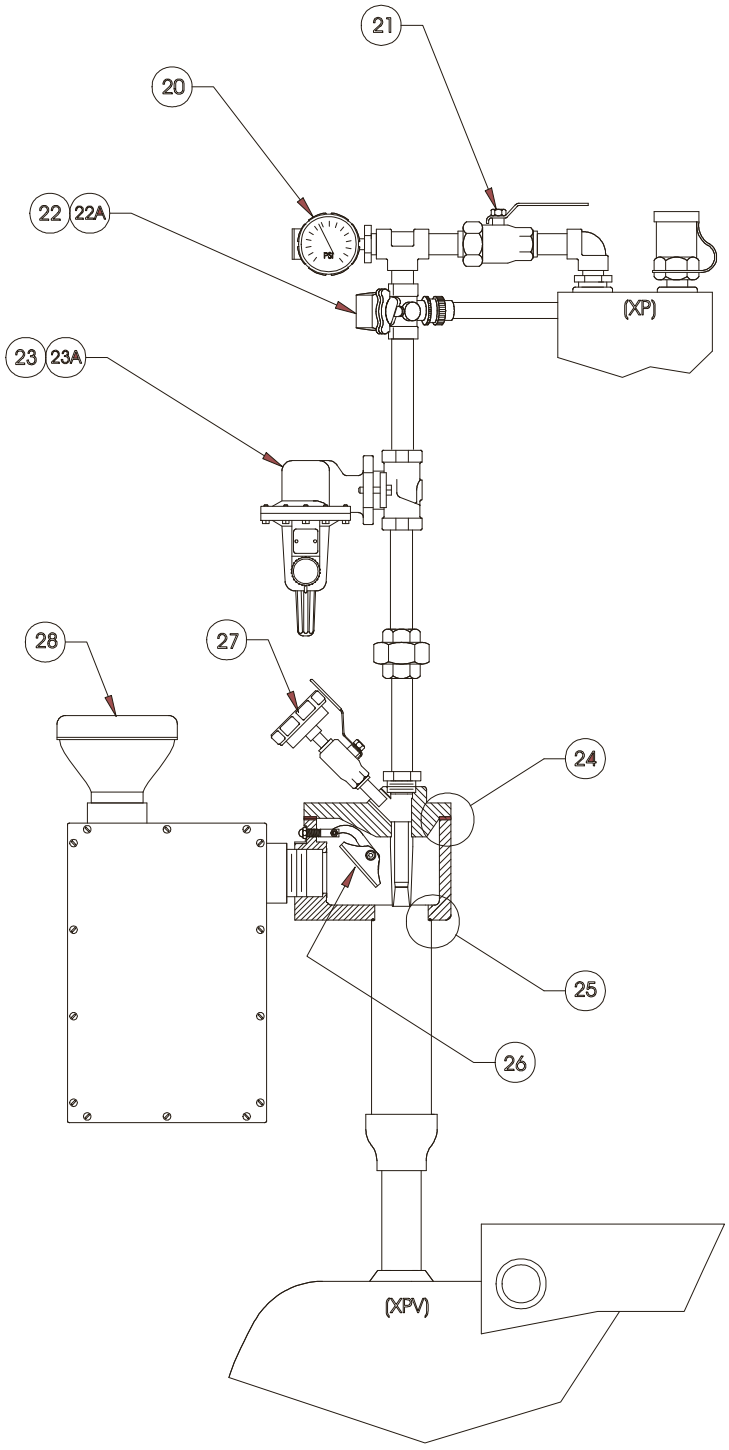
Recommended Spares (4).dxf

Figure 29 - *Recommended Spares Diagram*
Control Box



Recommended Spares (5).dxf

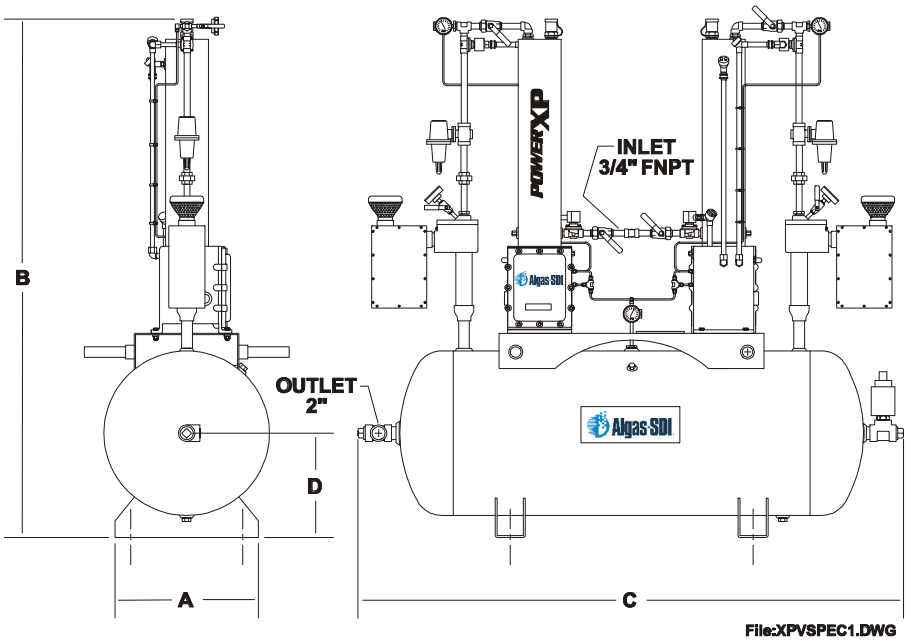
Figure 30 - *Recommended Spares Diagram*



Recommended Spares (6).dxf

Figure 31 - *XPV Dimensional Diagram.*

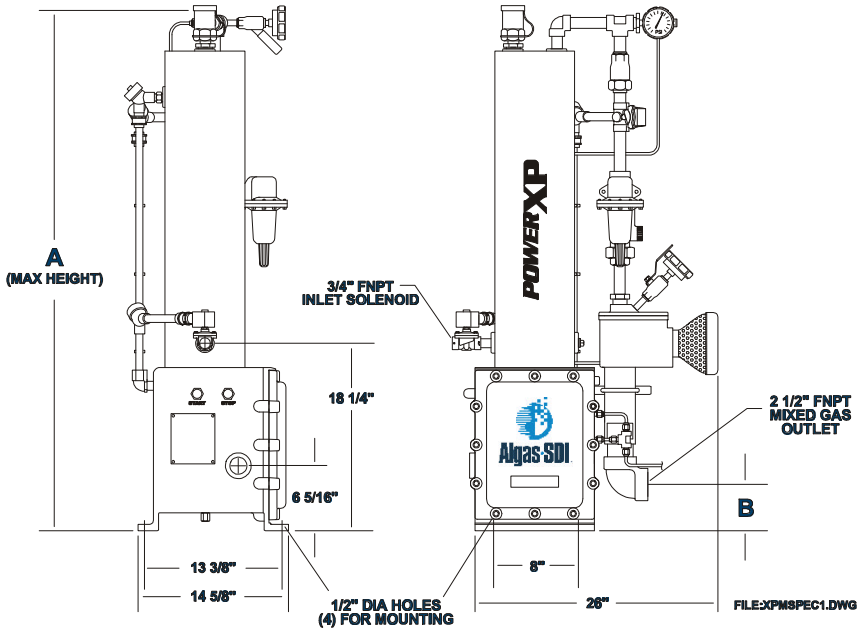
MODEL	A	B	C	D
XPV2.5-5	24"	76 ½"	75"	14"
XPV2.5-8	24"	76 ½"	75"	14"
XPV5-5	24"	76 ½"	75"	14"
XPV5-8	24"	76 ½"	75"	14"
XPV5-12	24"	76 ½"	75"	14"
XPV7-5	24"	76 ½"	75"	14"
XPV7-8	24"	76 ½"	75"	14"
XPV7-12	24"	82"	75"	14"
XPV9-10	24"	82"	75"	14"
XPV9-12	24"	82"	75"	14"
XPV10.5-5	24"	82"	75"	14"
XPV10.5-8	24"	82"	75"	14"
XPV10.5-12	24"	89"	75"	14"
XPV13-10	30"	95"	93"	18"
XPV14-5	30"	95"	93"	18"
XPV14-8	30"	95"	93"	18"
XPV14-12	24"	83"	80"	14"
XPV18-10	24"	83"	80"	14"
XPV18-12	24"	83"	80"	14"
XPV21-5	24"	83"	80"	14"
XPV21-8	24"	83"	80"	14"
XPV21-12	24"	90"	80"	14"
XPV26-10	30"	95"	97"	18"
XPV28-5	30"	95"	97"	18"
XPV28-8	30"	95"	97"	18"



Xpvspec1.wmf

Figure 32 – *XPM Dimensional Diagram.*

MODEL	A	B
XPM2.5-5	50"	6 1/2"
XPM2.5-8	50"	6 1/2"
XPM5-5	50"	6 1/2"
XPM5-8	50"	6 1/2"
XPM5-12	50"	6 1/2"
XPM7-5	50"	4 1/2"
XPM7-8	50"	3 1/2"
XPM7-12	52"	6 1/2"
XPM9-10	52"	3 1/2"
XPM9-12	52"	3 1/2"
XPM10.5-5	52"	4 1/2"
XPM10.5-8	52"	3 1/2"
XPM10.5-12	59"	3 1/2"
XPM13-10	59"	6 1/2"
XPM14-5	59"	3 1/2"
XPM14-8	59"	3 1/2"



Xpmspec1.wmf

Algas-SDI™

ISO 9001 Certified

...Innovative liquid vaporizing and gas mixing solutions

WARRANTY REGISTRATION

Please copy the information from the data sheet supplied with your manual.

Type of Equipment: _____ Serial Number: _____

ASDI Sales Order #: _____ Order Date: _____

Purchased By: _____

_____

_____

To help us provide better service to you, please fill out this warranty registration form and retur n it to us. Keep a copy for your records.

This will register your recent purchase and aide us in tracking the performance of your equipment. Please help us with a small amount of information about your company and about how you are using the equipment. Contact us via phone, fax, or email if you have a question, problem, or concern about your equipment. Please have the type of equipment and serial number available so we can give you accurate information.

End Customer/Company Name: _____

Address: _____ Tel: _____

City: _____ State: _____ Zip: _____ Fax: _____

Name of individual to contact for follow up information: _____

When was the equipment put in service?_____/_____/_____

Usage - Circle one:	Base Load	Standby System		
	Peak Shaving	Other please specify: _____		
Application - Circle one:	**Agriculture:**	Poultry	Livestock	Grain drying
	Commercial:	Restaurant	Hospital	School
	Industrial :	Construction	Automotive	Glass/ceramics
	Other:	Please specify: _____		

Note: If you have more than one piece of our equipment, fill out one warranty sheet and staple the others to it, we'll do the rest.

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