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# ***Blendaire***

*LPG/Air Mixer*

## *Operations & Maintenance Manual*

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# **WARNING**

Read the OPERATION MANUAL before operating this equipment.

- **NOTE:** Algas-SDI reserves the right to use alternate manufacturers' components as vendor delivery applicability dictates. Vendors have supplied literature contained in the Operation Manual. Please check to be sure supplied data matches your configuration. Contact Algas-SDI if any questions exist.
- This equipment uses LPG-a flammable fuel, or NH<sub>3</sub>-a toxic gas, (depending on the model), handled under pressure. Inherent hazards exist and a thorough understanding of the equipment is required to allow safe operation and maintenance.
- Allow only a TRAINED and FULLY QUALIFIED PERSON to service this equipment.
- Any time a component must be replaced, use the same type, model, 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.

## *Warranty Registration*

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

OR

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

## *Warranty and Copyright*

### *WARRANTY*

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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.

Algas-SDI International, LLC will not accept back charges for work performed by others upon or in conjunction with ASDI equipment, unless prior authorization is given by means of an Algas-SDI International, LLC purchase order. Algas-SDI International, LLC will not be liable by reason of shutdown, non-operation or increased expense of operation of other equipment, or any other loss or damage of any nature, whether direct or consequential, arising from any cause whatsoever.

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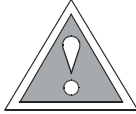
### *COPYRIGHT*

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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***

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**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***

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



### ***ELECTRICAL DISCONNECT REQUIRED***

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**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***

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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](mailto:sales@algas-sdi.com)

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

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## Appendix B: Technical Information

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    Table 2 -- Vapor pressures of Commercial Butane – Propane Mixtures (English)

Warranty Registration - Refer to the nameplate on the unit to fill out the product registration. Then Photo copies and mail to address shown. Or register on line by visiting Algas-SDI web site under "Tech Support".







# Introduction

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## DESCRIPTION

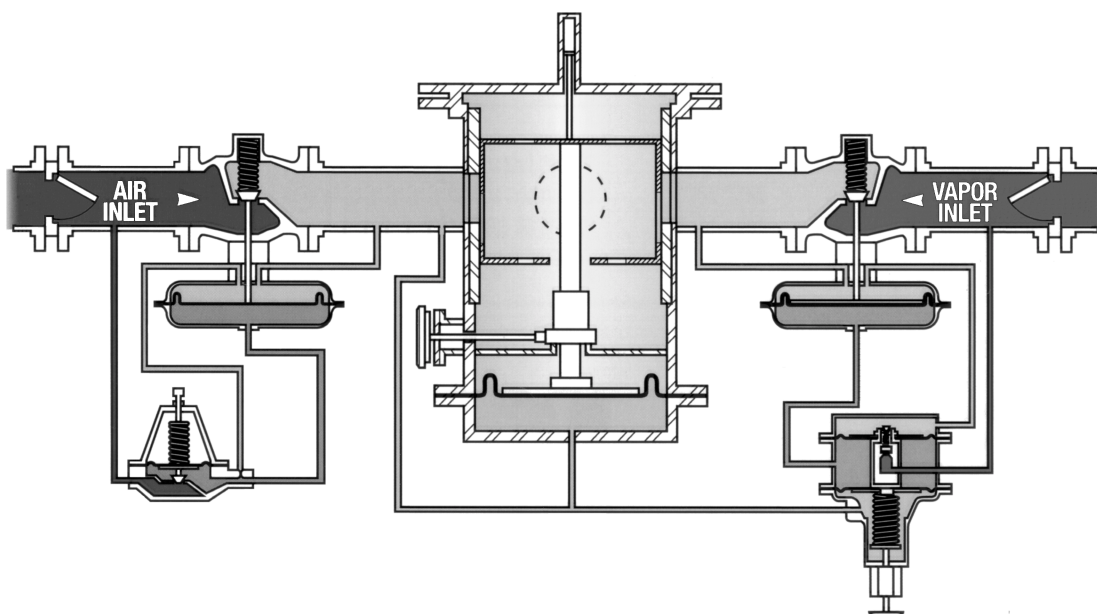
The **BLENDAlRE** is designed to mix LPG vapor with air in a wide range of ratios and deliver the mixed gas at a fixed designated pressure from 10 to 150 psi (0.70 - 10.55 kg/cm<sup>2</sup>) (See *Figure 1*).

There are two separate flow paths into the **BLENDAlRE**, one for air and one for LPG vapor. They combine at the mixing valve into a single gas line. The airline contains a check valve and an air regulator, which determines the pressure at the mixing valve inlet. The vapor line contains a check valve and vapor regulator (gas governor). The gas governor maintains the vapor pressure at the mixing valve inlet equal to the air pressure by slaving it to the air side.

The air regulator also delivers control pressure to the diaphragm-actuated piston and controls the gas governor through a common sensing line. Consequently, regulated air pressure, regulated LPG vapor pressure and mixed LPG/Air pressure remain constant.

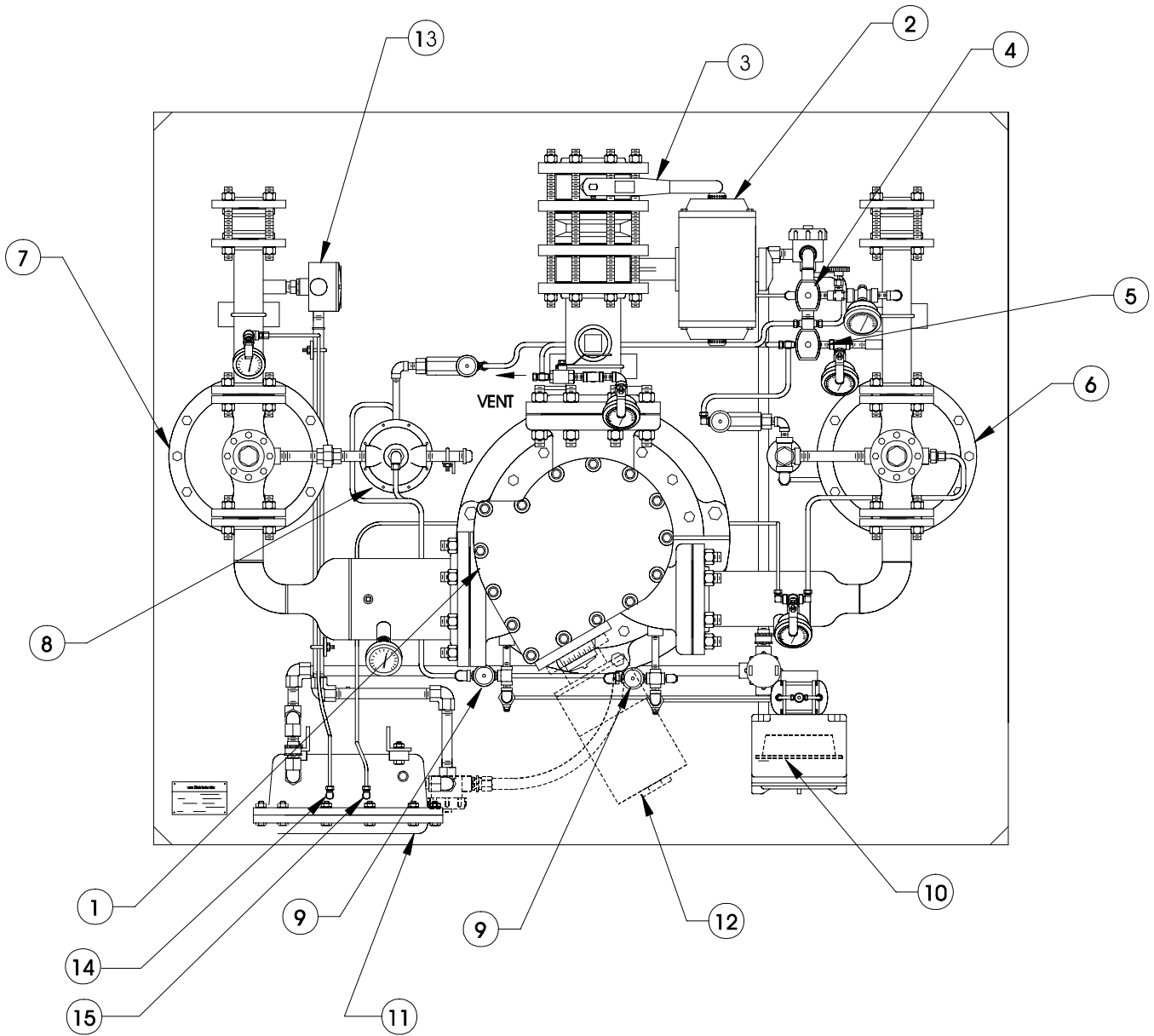
If there is a malfunction, the safety shut-off valve(s) and the two regulators will shut down the system.

*Figure 1 - General Layout (FVO valve shown)*



*Description.gif*

Figure 2 - Component Diagram (Selas Valve shown)



Blman2R1.wmf

# Major Components

# 2

## **1 - MIXING VALVE**

This valve is the heart of the system. It blends air and LPG vapor over a broad range of flow rates at a selected ratio.

## **2 - AUTOMATIC SAFETY SHUT-OFF VALVE**

This is located either at the outlet or at each inlet and will automatically close if there is an alarm condition, lack of electricity or if the air supply is low.

## **3 - MANUAL SHUT-OFF VALVE**

Allows system to be shut off manually at the outlet pipe and allows the operator to manually control the outlet flow rate when starting the system.

## **4 - AUTOMATIC SAFETY SHUT-OFF VALVE CONTROL**

Used with the automatic shut-off valve. The three-way solenoid provides on/off control of the valve. The regulator and needle valve controls the rate of opening of the automatic safety shut-off valve.

## **5 - AIR AND GAS PILOT LOADING VALVE**

The three-way solenoid provides on/off operation of air regulator and gas governor.

## **6 - AIR REGULATOR**

Controls the air pressure entering the mixing valve.

## **7 - GAS GOVERNOR**

Controls the LPG pressure entering the mixing valve (additional regulator required upstream by user).

## **8 - GAS GOVERNOR PILOT**

Controls the gas governor pressure bias relative to the air pressure.

## **9 - PRECISION ORIFICE VALVE**

Controls feedback rate to gas governor pilot. Both the gas governor pilot and the precision orifice valve allow the LPG governor to function.

## **10 - DIFFERENTIAL PRESSURE SWITCH AND GAUGES**

Indicates the pressure difference between the air and LPG before they enter the mixing valve. The differential switch will shut down the system if the established differential pressure is exceeded.

**11 - ELECTRICAL CONTROL BOX**

The electrical control box houses the process controller or a terminal strip for connection to an external process controller and houses the air and LPG pressure transducers.

**12 - AUTOMATIC AIR-GAS RATIO CONTROL SYSTEM (OPTIONAL)**

The electric motor driving the control system is connected to and controlled by the process controller.

**13 - LPG VAPOR TEMPERATURE SENSOR**

Determines if LPG gas vapor is at safe operating temperature. The system will shut down if LPG vapor temperature is close to dewpoint. The chart at the end of this section has the dewpoints for propane, N-butane and Isobutane.

**14 - VAPOR PRESSURE SENSOR**

It is used to prevent liquid LPG from entering the system and also to prevent low LPG pressure from forcing lean mixtures.

**15 - AIR PRESSURE SENSOR**

Is used to prevent high air pressure from causing lean mixtures.

The **BLENDIAIRE** mixer should be housed in a well-ventilated area suitable for its use. The mixer must be placed on a level pad with no pits or depressions so no gas will accumulate. Care must be taken in the entire operating area so that LPG is never near or below its dewpoint in the system at any time.

Heat tracing may be required depending upon location, LPG content and pressure. Mount each **BLENDIAIRE** unit on a concrete pad strong enough to support its weight (See data sheet). For ease of operation and maintenance, a 1 1/2" or larger vent line or flare stack with shut-off valve should be installed at the connection point provided on the blender between the mixing valve outlet and the safety shut-off valve.

A vent line (3/8" tube) must be provided to exhaust bleed down products (air and a small amount of LPG) when the system shuts down.

If the unit is equipped with Auto-Ratio-Control, a gas quality-measuring device suitable for the specific operating conditions is required. The total response time, including sample lag time, should be kept to a minimum.



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## ***CAUTION***

***Always consult with local codes and authorities prior to installing equipment.***

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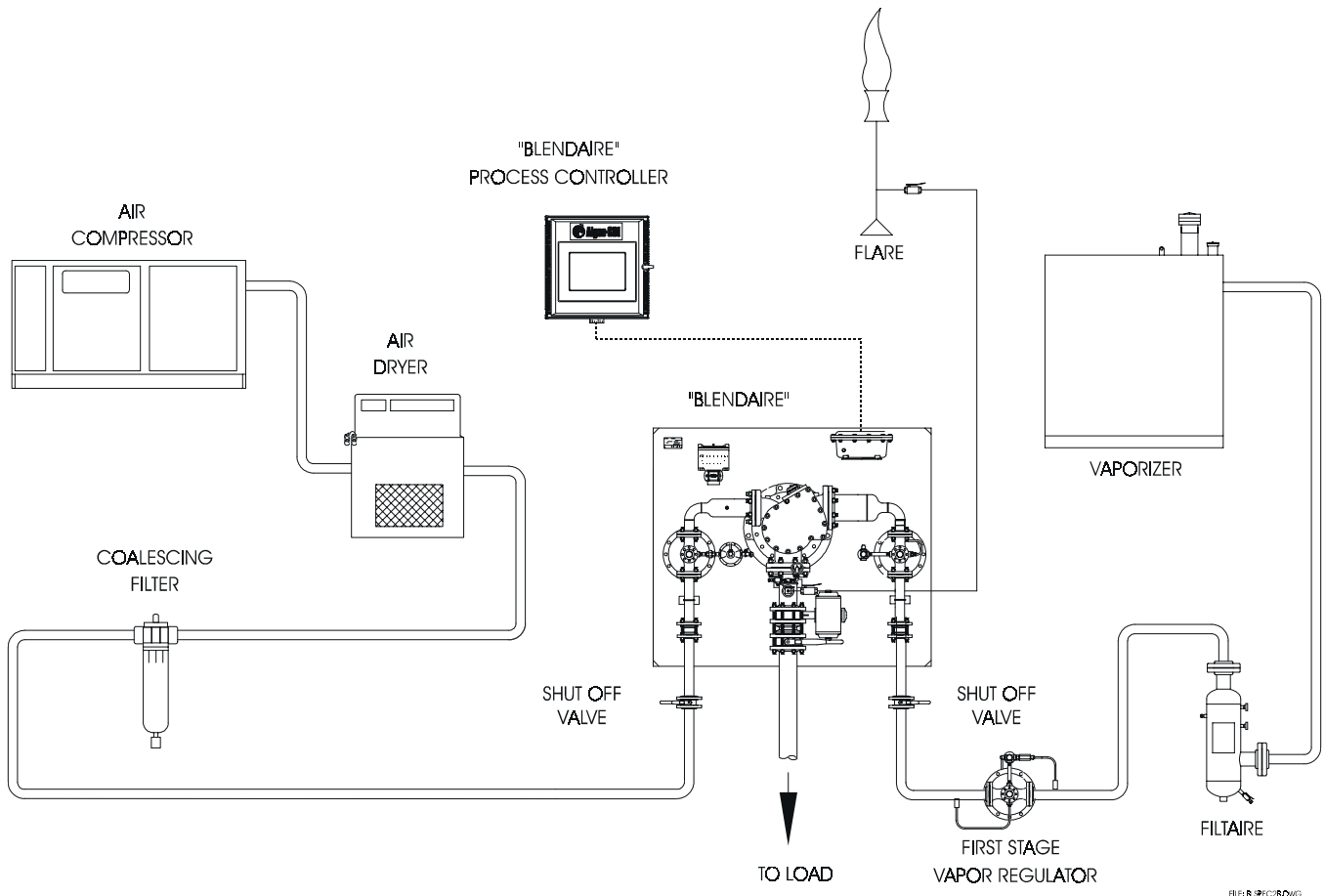
## ***NOTE***

***On Blendaires with an FVO valve the ratio adjuster indicator is a 'weight loaded' device which can turn independently from the adjuster wheel during transportation due to sudden motion. When the unit was assembled at the factory the piston and indicator were at the 50% position. If the indicator does not read 50% DO NOT TURN THE ADJUSTER WHEEL. Remove the indicator from the wheel and place the indicator at 50% by rotating it. Replace indicator in its original position and tighten setscrew. The wheel may then be turned to adjust the ratio as desired.***

---

## Installation

Figure 3 – Installation Drawing



Installation.dxf

The following equipment must be installed for proper operation of the blending systems:

1. Air supply
2. Vapor supply
3. Mixed gas outlet
4. Process controls

#### **AIR SUPPLY**

1. Air filters at the incoming air pipes. The user must determine the cleaning schedule for the filters. Dirty air will cause problems in the mixing systems. Supply air must be free of oil and all particulate matter greater than one micron in diameter.
2. An air dryer for the incoming air supply.
3. A First stage pressure regulator in the air supply pipe to reduce the air pressure to the operating pressure specified on the data sheet at the beginning of this manual. This regulator must be of good quality.
4. A vapor shut-off valve must be installed between the blender and the incoming LPG gas vapor line.

#### **VAPOR SUPPLY**

1. First stage gas supply pressure regulator reduces the operating pressure to 10 psig (0.70 kg/cm<sup>2</sup>) over desired mixed gas pressure.
2. If the LPG has a heavy end content, filters must be provided upstream of the regulator on the vapor inlet pipe to each Blendaire. The user must determine the cleaning schedule for the filters. A drip leg to drain the heavier particles should be provided immediately upstream of the first stage regulator.
3. Heat tracing must be placed over the vapor supply pipes if the ambient temperature goes within 10°F of the dewpoint of the LPG gas. Electric heat tracing is preferred with an appropriate controller. All heat tracing must be suitable for the class of hazardous location in which it is to be installed. Always consult with the appropriate authorities and all applicable codes.
4. A vapor shut-off valve must be installed between the blender and the incoming LPG gas vapor line.

#### **MIXED GAS OUTLET**

1. The temperature of the pipe must be kept above the dewpoint of the air/gas mixture. Heat tracing over the outlet pipe may be required as well.

#### ***NOTE***

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***See the LPG gas dewpoints given in the manual (Table 1).***

---

#### **PROCESS CONTROLLERS**

1. The Blendaire process controller is mounted on the unit unless an external controller is used.
2. The Blendaire uses two (2) control and sensing signal types: alternating current (AC) and direct current (DC). These signals must be transmitted in separate conduit runs. A 3/4" NPT conduit opening is provided for DC signals and a 1/2" NPT opening are provided for AC signals.
3. See wiring Diagram for wire type and required field connections.

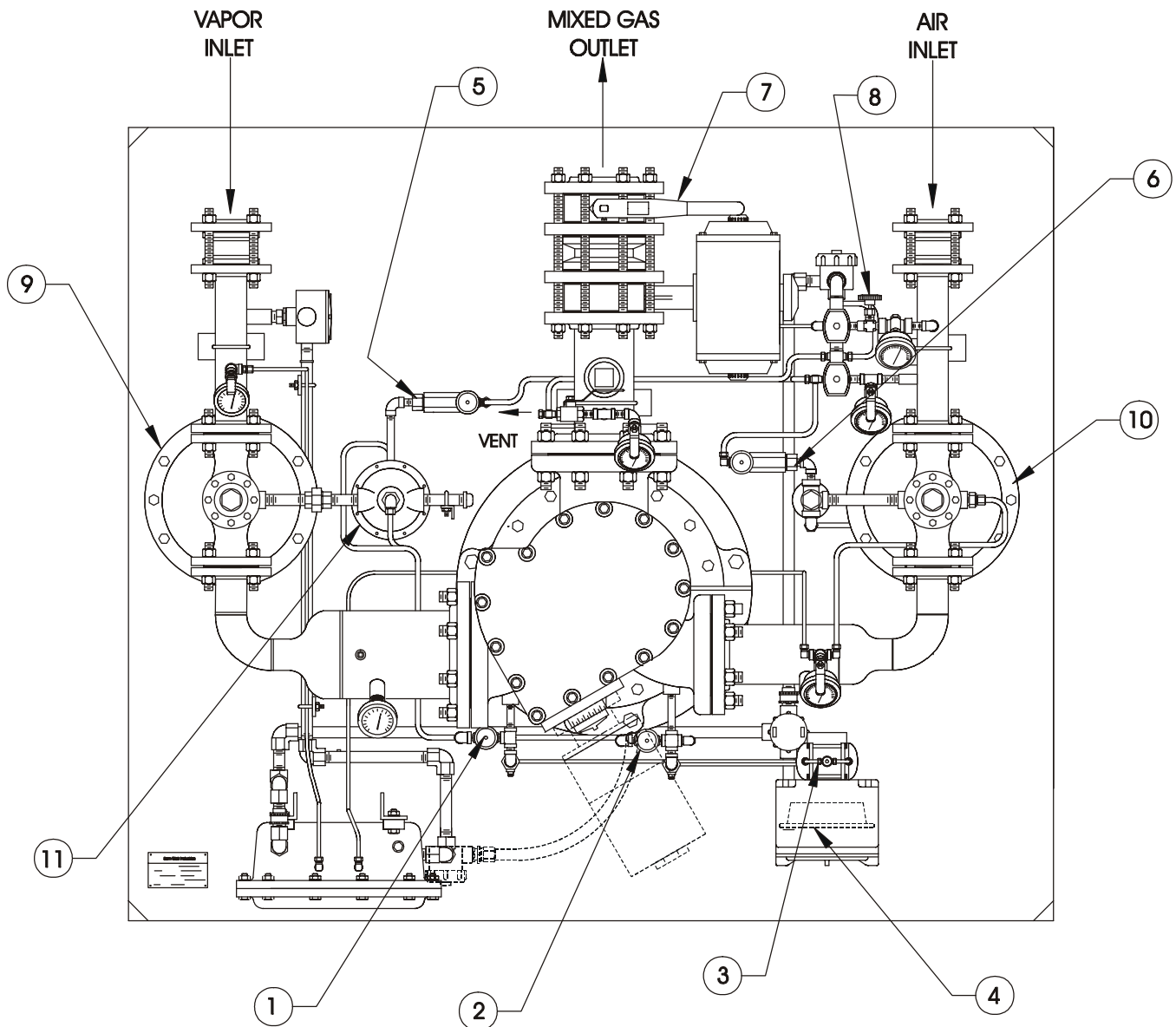
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The following procedures must be performed to each Blendaire system when they are first installed.

## STARTING THE MIXING SYSTEM (INITIAL ADJUSTMENT)

Figure 4 – Adjustment Reference Drawing



### BLENDIAIRE REGULATOR ADJUSTMENT PROCEDURE

1. Open the differential pressure bypass valve (#3).
2. Open valves (#1), (#2), (#5), (#6), and (#8).
3. Check that the air and LPG supply is sufficient.
4. Prepare a non-critical load to consume the mixed gas produced during the set-up procedure. A flare stack or other device should exhaust the non-critical load.
5. Start the mixing system.
6. Slowly open valve (#7) approximately 20°.
7. If the regulators (#9) and (#10) have travel indicators (1098-EGR's) remove the covers and observe the travel and timing. The regulators must operate so that both valves open and close simultaneously. If the regulators do not have travel indicators, the differential pressure (#4) will have to be used to indicate the operation of the regulators (#9) and (#10). To do this, slowly close the bypass valve (#3) and observe the needle movement of the differential pressure gauge. The needle will move in the direction of the higher pressure (either LPG or air). Re-open the bypass valve (#3) before the needle reaches the alarm set point ( $\pm 28''$  W.C.), other wise the Blendaire will need to be restarted.
8. If the regulators (#9) and (#10) operate with similar timing and the differential pressure is stable ( $\pm 2 - 3''$  w.c.), no adjustment is required. When the differential pressure is stable, it may be offset to one side or the other to achieve the proper mixing ratio. However, the mixing ratio should never exceed 8 – 9" w.c. offset.
9. If the regulators (#9) and (#10) oscillate, perform the following adjustment steps:

#### ***NOTE***

---

***The LPG in the system must remain in the gaseous state at all times. The regulators will not operate properly if there is ANY liquid in the system. Perform all necessary procedures to eliminate liquid in the system.***

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- a. Lower the inlet air pressure to 5 – 10 psi ( $0.35 - 0.70 \text{ kg/cm}^2$ ) over the discharge pressure. (Only units with a first stage air regulator.)
  - b. Lower the inlet LPG vapor pressure to 5 – 10 psi ( $0.35 - 0.70 \text{ kg/cm}^2$ ) over the discharge pressure.
  - c. Close valves (#1) and (#2). Slowly open valve (#2) for one turn. Now open valve (#1) for one-half turn. Monitor the performance.
  - d. Gradually adjust valve (#1) until the operation is stable. Continue to monitor the performance. Valve (#2) may also have to be adjusted to obtain stable operation.
10. Tighten the packing nuts on valves (#1) and (#2) to keep them from being unintentionally re-adjusted or moved.
  11. Close the bypass valve (#3).
  12. If necessary, adjust the mixing ratio by following the approved procedure.

---

## BLENDARE MIXING RATIO ADJUSTMENT PROCEDURE

These procedures require a mixed gas quality indicator or other gas quality measurement device. After performing the regulator adjustment procedure as outlined above, start the mixing system and establish a moderate flow rate. Perform the following adjustments:

1. Set the mixing ratio adjustment knob (manual) or the PID loop controller output (auto ratio control) to 50%.
2. Monitor the gas quality. If the mixture is close to the desired range, re-adjust the mixing ratio by using the adjustment knob or the PID loop controller output until the mixture is adequate.
3. If the desired quality of gas mixture cannot be achieved by the procedure outlined above, the differential pressure may also be adjusted.
4. If the mixture is too lean (low calorific value) the differential pressure must be increased to the LPG side. If the mixture is too rich, it must be increased to the airside.
5. To make the mixture richer, turn the differential pressure pilot (#11) adjustment knob clockwise (in). To make the mixture leaner, turn the adjustment knob counter-clockwise (out).

### ***NOTE***

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***Do not exceed 8 – 9" w.c. for the normal adjustment.***

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The blender can be started after these procedures are completed.

## STARTING THE BLENDER

With the air and the LPG systems operating, close both LPG and air inlet valves to the Blender. Close the LPG/air outlet valve at the blender.

### STARTING THE SYSTEM EQUIPPED WITH MANUAL ADJUSTMENT

1. Apply power to the control panel.
2. Depress the **START** switch.
3. The solenoid valves will be actuated and the outlet pressure should increase to operational pressure.
4. Open the manual valve.
5. Start the system on a **FLARE STACK** to dispose of the initial gas.

6. As the system reaches a steady operating condition, check the differential pressure gauge. It should show a fluctuation less than + or – 3" w.c. (Inches of water). If necessary, follow the adjustment procedures on the previous pages. Check all other pressure readings, and trim the corresponding regulators as required.

***NOTE***

---

***If the start-up is done under cold conditions, and the vapor temperature alarm comes on begin the process all over. If liquid has entered the system, do not restart until all liquid has been removed. If this condition exists, it is an indication that the system needs adequate heat tracing.***

---

7. The outlet pressure can be trimmed by adjusting the air regulator pilot if necessary. (Do not change the output pressure from the design system pressure without changing the safety set points to the corresponding values).

To restart the blender after a safety shutdown, determine and eliminate the cause of failure and begin the start procedure over.

***NOTE***

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***During initial start-up, the mixing ratio adjuster should be adjusted to the approximate setting. The scale is based on port areas, not percent gas, as different gases have different flowing characteristics.***

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## **SAFETY OPERATING GUIDELINES**

The process control panel monitors the following safety functions:

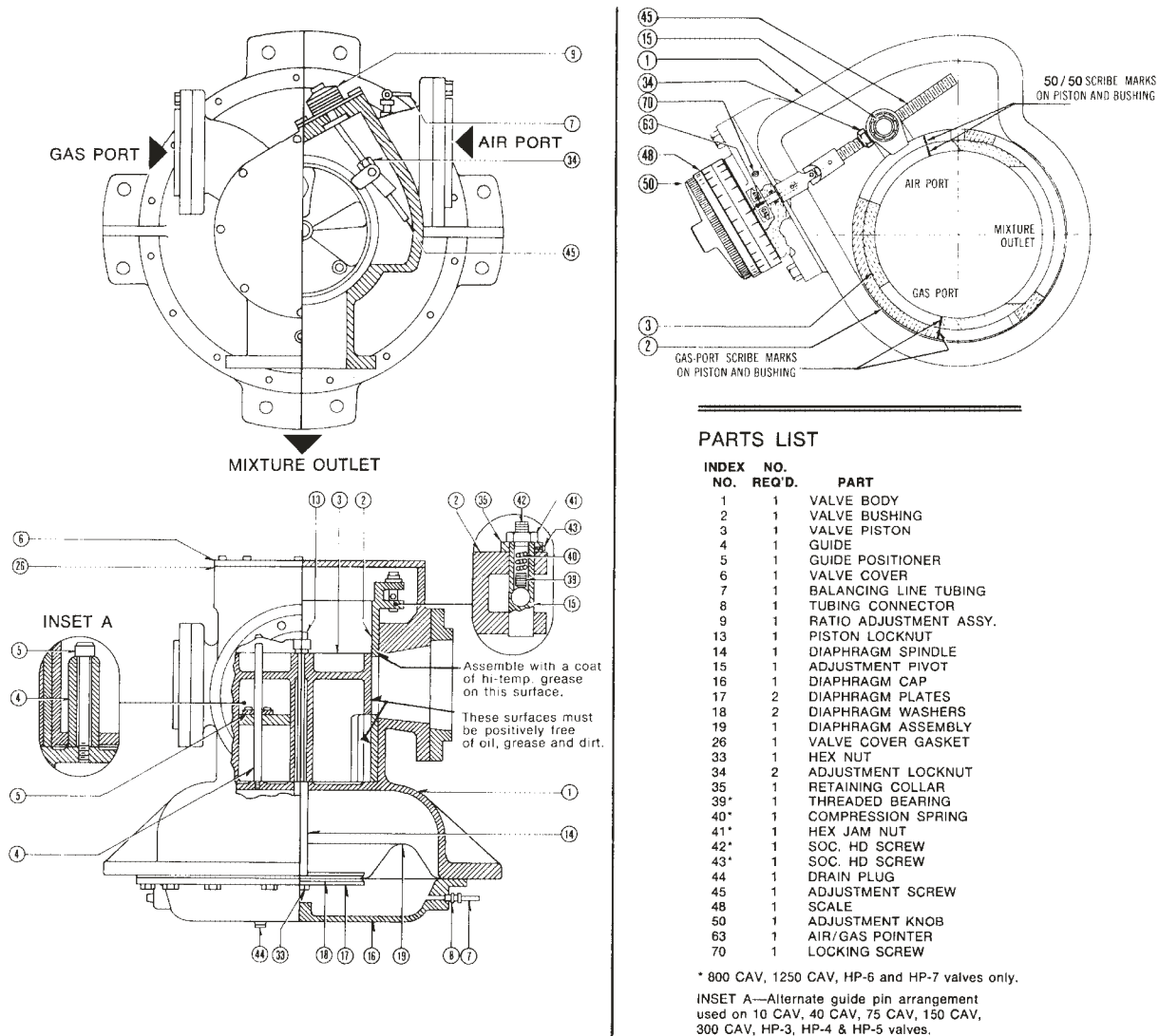
1. Regulated air pressure at the inlet of the mixing valve.
2. Regulated vapor pressure at the inlet of the gas governor.
3. Vapor temperature at the gas governor inlet.
4. Differential pressure between the air and vapor inlets of the mixing valve.
5. Calorific value from a mixed gas quality indicator.

## **SHUTTING DOWN THE BLENDER**

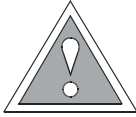
1. Put the PID loop controller in the stop mode (if equipped with automatic ratio adjustment).
2. Close the outlet valve.
3. Press the **STOP** switch.
4. If the unit is to be serviced, close the air inlet isolation valve and the vapor inlet isolation valve.
5. Do not disconnect power to the control panel. The servo motor and control panel on the Blendaire is equipped with a heating element and thermostat, which are used to prevent corrosion of the components inside the enclosures. This circuit must always remain **ON**.

# Operation

Figure 5 – Blender Valve Drawing



Blender Valve.wmf



## ***CAUTION***

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**Turn off the LPG gas inlet valve to the mixer before performing any maintenance or repairs.**



## ***CAUTION***

---

**Before performing any work on the blender, follow all safety procedures for LPG gas; make sure there are no open flames or electrical sparks, and wear appropriate clothing. Turn off all electrical power to the blender.**

---

## ***Selas Blender Valve***

(See Figure 5)

### **DISASSEMBLY**

Place the valve at 50% air / 50% gas before doing any maintenance on the valve. Scribe a mark on the sleeve and body of the valve so they will be aligned when re-assembled. Mark and note the position of the adjustment screw. All these components must be re-installed in the same position they were in when removed.

The blender sleeve and piston operate at close tolerances. For proper operation the piston must have free movement. If the LPG gas entering the system is very dirty or has heavy end products, the blender valve may have to be cleaned more frequently.

### **PROCEDURE FOR CLEANING THE BLENDER VALVE**

(See figure 5)

1. To expose the internal parts, remove the valve cover (#6). Next, unscrew the piston locknut (#13) from the diaphragm spindle (#14) and remove the piston (#3).

### ***NOTE***

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***For easier removal, coat the hex nuts of the valve cover and the gasket with a light grease or anti-seize compound.***

---

2. Remove all debris that has accumulated in the valve. Wipe clean all accessible areas, using a cloth saturated with solvent. Do not overlook the orifice opening located in the valve body – they must be free of any obstruction.
3. Remove loose grit and dirt from the piston (#3) and sleeve (#2) and carefully inspect the surfaces for corrosion and abrasions.

4. Remove hard deposits with a crocus cloth or steel wool dipped in a quick evaporating solvent such as acetone or lacquer thinner. Never use grit or emery since metal removal can alter the fit of the components. It is important during this cleaning operation not to mar or deform in any way the sharp metering edges of both the piston and sleeve ports.
5. Remove the balancing line tubing (#7) and clean by blowing high pressure air through the tube. (Make sure that both ends of the balancing lines are disconnected).
6. A drain plug (#44) is located in the diaphragm cap (#16). It should be removed to drain excessive condensation from the mixing valve.
7. If the sleeve does not rotate easily in the valve body is also needs to be cleaned. For preventive maintenance the sleeve should also be cleaned every year.

To clean the sleeve, remove the ratio adjustment assembly (#9) from the adjustment pivot (#15). Carefully lift the sleeve from the valve body, using a steady vertical lift in order to prevent binding. Clean it the same way the piston is cleaned.

### ***NOTE***

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***Never coat any part of the piston or inside of the sleeve with oil or grease, as this will attract abrasive impurities from the gas or air supply and may clog or restrict operation.***

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Before re-assembling the sleeve in the valve body, coat the outside of the sleeve and the inside of the valve body with a dry lubricant such as graphite. Carefully replace all of the parts, making sure not to force them. Wipe off all excess lubricant from the port area.

8. Re-install the clean piston and line it up with the scribe marks that were made before disassembly.

If no scribe marks were made, the indicator scale must be reset according to the scribe marks on the piston and sleeve made at the factory.

9. Replace the ratio adjustment assembly and apply lithium grease to the adjustment screw (#45).



## RESETTING OF SCALE

1. The scale assembly must be adjusted with the blender valve cover removed so scribe marks on the piston and sleeve can be observed.
2. Scribe marks are put on the piston and sleeve at the factory to show their relative alignment. When these "Gas" port scribe marks are matched, they indicate the position of 50% "Air" – "50%" Gas.
3. To correctly set the scale, the marks must match. With the marks set, screw the ratio adjuster motor into the adjustment pivot. The 50% "Air" position on the scale must be maintained for the system to be aligned.
4. When the motor assembly is flush with the valve body and the scribe marks are aligned, secure the assembly.
5. Re-install the valve cover.

## REPLACING THE DIAPHRAGMS (See figure 5)

The elastomeric diaphragm (#19) requires little maintenance and only needs to be replaced if it becomes brittle and/or is ruptured. If either occurs, the diaphragm can be replaced as follows:

1. Disconnect the tube fitting (#8), and remove the diaphragm cap.
2. Remove the valve cover (#6) and unscrew the piston lock nut (#13).
3. Unscrew the hex nut (#33), removing the diaphragm assembly (#17) and diaphragm washers (#18).
4. The assembly and diaphragm spindle will drop out.
5. Clean the diaphragm spindle.
6. Replace the diaphragm spindle and re-assemble the piston lock nut.
7. Replace the defective diaphragm with a new one.
8. Reassemble the plates and washers.
9. Check for full diaphragm travel to assure the new diaphragm travels freely.
10. Lift the diaphragm cap into position and fasten it to the valve body with cap screws.

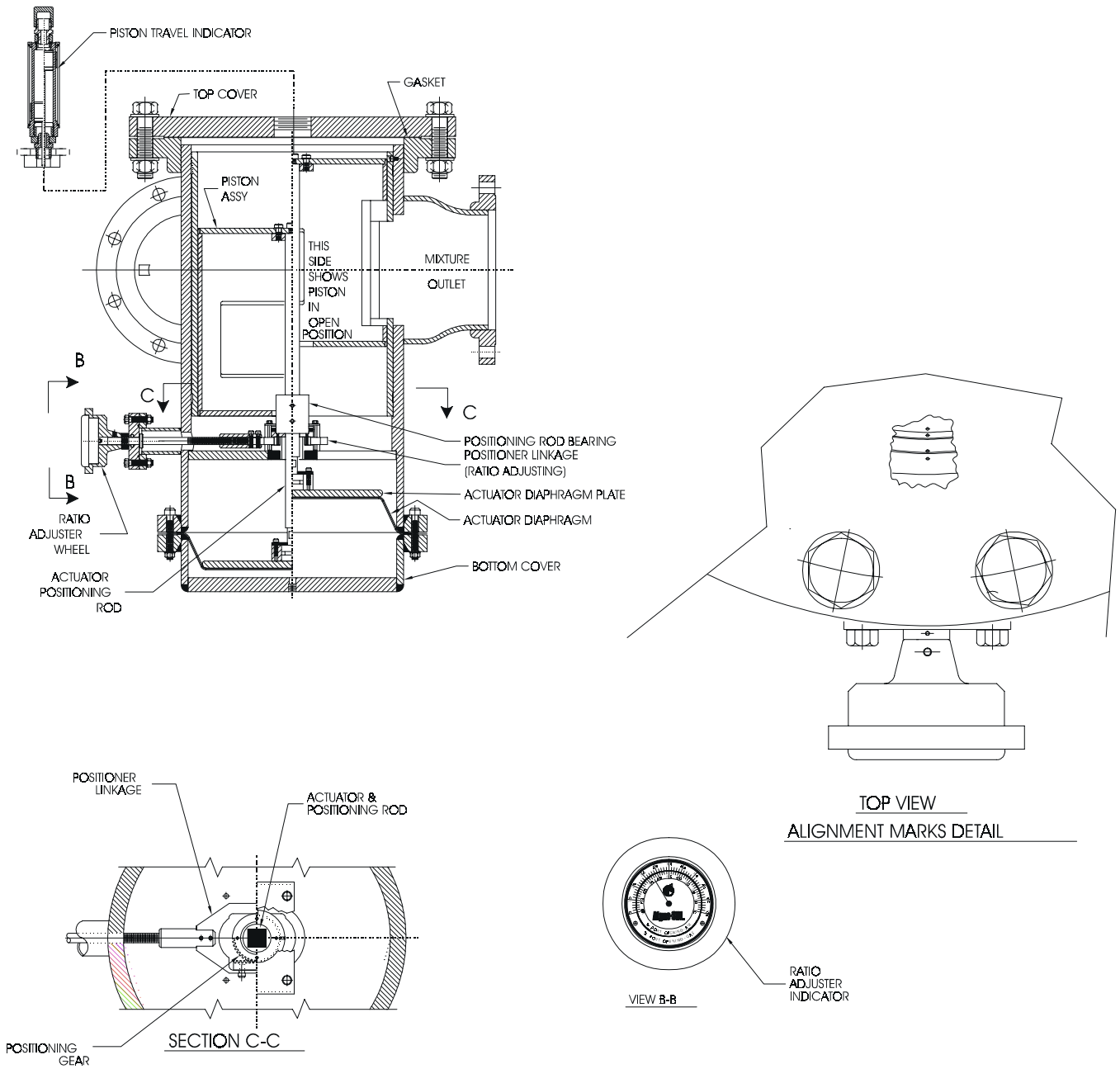
### ***NOTE***

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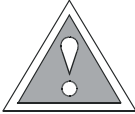
***Flat diaphragms require a pleating along the outer edge to provide the slack, which will allow vertical movement. To accomplish this, evenly space the pleats between the bolt holes allowing no more than one fold at any one point under the clamping surface.***

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Figure 6 – FVO valve drawing



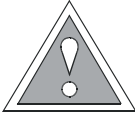
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---

**CAUTION**

**Turn off the LPG gas inlet valve and air inlet valve to the mixer before performing any maintenance or repairs.**



---

**CAUTION**

**Before performing any work on the blender, follow all safety procedures for LPG gas; make sure there are no open flames or electrical sparks, and wear appropriate clothing. Turn off all electrical power to the blender.**

---

## ***FVO Blender Valve***

(See Figure 6)

### **ASSEMBLY**

Clean the blender valve as operating experience dictates. The blender sleeve and piston operate at close tolerances. They must be clean for free movement. If the LPG gas entering the system is very dirty or has heavy end products, the blender valve may have to be cleaned more frequently. Dirty air may also require more frequent cleaning.

Place the valve back at 50% air / 50% gas before doing any maintenance on the valve. This will align all of the alignment marks in line with the discharge.

### **PROCEDURE FOR CLEANING THE BLENDER VALVE**

(See figure 6)

1. To expose the internal parts, remove the valve cover. Next, unscrew the thumbscrew with the Travel Indicator Push Rod still attached from the Piston Rod and the 4 allen head screws around the top of the piston. Remove the piston.

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**NOTE**

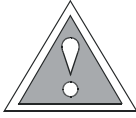
***For easier removal, coat the hex nuts of the valve cover gasket with a light grease or anti-seize compound.***

---

2. Remove all debris that has accumulated in the valve. Wipe clean all accessible areas, using a cloth saturated with solvent. Do not overlook the orifice opening located in the valve body – it must be free of any obstruction.
3. Remove loose grit and dirt from the piston and sleeve and carefully inspect the surfaces for corrosion and abrasions.
4. Remove hard deposits from the piston with a crocus cloth or steel wool dipped in a quick evaporating solvent such as acetone or lacquer thinner. Do not use any abrasives on the sleeve, it might remove the anodized surface. Never use grit or emery since metal removal can alter the fit of the components. It is important during this cleaning operation not to mar or deform in any way the sharp metering edges of both the piston and sleeve ports.

**NOTE**

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**Never coat any part of the piston or inside of the sleeve with oil or grease, as this will attract abrasive impurities from the gas or air supply and may clog or restrict operation.**

---

5. Remove the balancing line tubing and clean by blowing high pressure air through the tube. (Make sure that both ends of the balancing lines are disconnected). This will drain any excessive condensation from the mixing valve.
6. If the ratio adjustment assembly does not move easily it will also need to be cleaned. For preventive maintenance the ratio adjustment assembly may need to be cleaned every year.

To clean the ratio adjustment assembly, remove the Piston Rod Clamp from the Piston Rod. Remove the bearing hold down plate. Before removing the bearing and adjuster sector gear scribe a mark on the gear and rack so that they can be reassembled in the right orientation. Loosen the 4 setscrews in the bearing and lift the bearing and sector gear together.

When re-assembling the Adjuster Sector Gear on the Piston Rod, be careful not to damage or lose the felt wipers in the top and bottom of the bearing. Make sure to line up the scribe marks between the Adjuster Sector Gear and the Adjuster Rack Gear. Before re-tighten the set screws in the bearing apply a low strength lock-tight to the threads to prevent them from backing out. Carefully replace all of the parts, making sure not to force them. The top of the Piston rod clamp should be flush with the top of the Piston Rod. Wipe off all excess lubricant from the port area.

7. Re-install the clean piston by aligning the alignment mark with the mark on the sleeve.
8. Replace the 4 Allen head screws and the thumbscrew with the travel indicator push rod still attached. Replace the lid and tighten bolts in a star pattern.

## **RESETTING OF SCALE**

1. The scale assembly must be adjusted with the blender valve cover removed so alignment marks on the piston, sleeve, and valve body can be observed.
2. Alignment marks are put on the piston, sleeve, and valve body at the factory to show their relative alignment. When these marks are matched, they indicate the position of 50% "Air" – 50% "Gas".
3. The ratio adjuster indicator should be installed at 50% "Air" – 50% "Gas".
4. Stroke the servomotor in forced mode to 50% and re-install.
5. Re-install the valve cover and check for leaks.

## **REPLACING THE DIAPHRAGMS**

The diaphragm supplied requires little maintenance and only needs to be replaced if it becomes brittle and/or is ruptured. If either occurs, the diaphragm can be replaced as follows:

1. Remove the valve cover.
2. Support the piston from above in the full open position.
3. Disconnect the tube fitting, and remove the diaphragm cap.
4. Remove the old diaphragm.
5. Make sure the chamber that houses the diaphragm is clean and dry.
6. Apply talcum powder to both sides of the diaphragm.
7. Replace the defective diaphragm with the new one.
8. Check the spacers in the diaphragm cap (if equipped). They should be mounted firmly. If they are loose they need to be glued down.
9. Check for full diaphragm travel to assure the new diaphragm travels freely.
10. Lift the diaphragm cap into position and retighten all fasteners.
11. Replace the valve cover and check for leaks.

### **TEMPERATURE SENSOR**

The temperature sensor on the LPG side of the Blendaire must be calibrated once every year. Perform the following procedures to calibrate the sensor.

1. Turn of the electricity to the system.
2. As previously described, shut down the system and bleed it down completely so all pressures are zero.
3. Remove the wire connection and the temperature transmitter.
4. The accuracy of the temperature transmitter can be tested by measuring the resistance across the two wires it while it is immersed in water of a known temperature. For example, if the temperature transmitter is immersed in a container of ice water with the temperature 0° C, the resistance should be 100.000. If it is placed in a container of boiling water, 100° C, the resistance should be 138.500. If the resistance is off by 2%, a new temperature transmitter should be installed. See the enclosed resistance/temperature table for a reference.

## **REPLACEMENT OF THE ROTARY ACTUATOR SERVO-MOTOR**

1. Check all circuits for operation and functionality.
2. Make all necessary connections from the process control panel to the motor on the Blendaire valve.
3. Remove the aluminum cover from the motor and switch assembly.
4. Remove motor from shaft. Using the PID controller controls in manual, run the motor to 50% gas.
5. Position the blender valve inner sleeve so that it is in the 50% gas position. Re-install the motor at this time.
6. Slowly operate the motor to 70% gas using the PID controller. Adjust the outer limit switch to trip at this point. Now operate the motor to 30% gas using the PID controller. Adjust the outer limit switch to trip at this point.
7. Run the motor slowly from 100% to 0% and back to double check the range and limit switches. Set the motor to 50%.
8. Check the heater for operation. The aluminum body of the motor should be warm to the touch. (Do not touch the heating element directly because it is very hot).
9. Apply a sealer to the locknuts of the limit switches to secure them.

## BLENDIAIRE PLC CONTROLLER

The ASDI **Blendaire** PLC Controller is accessed by removing the cover.

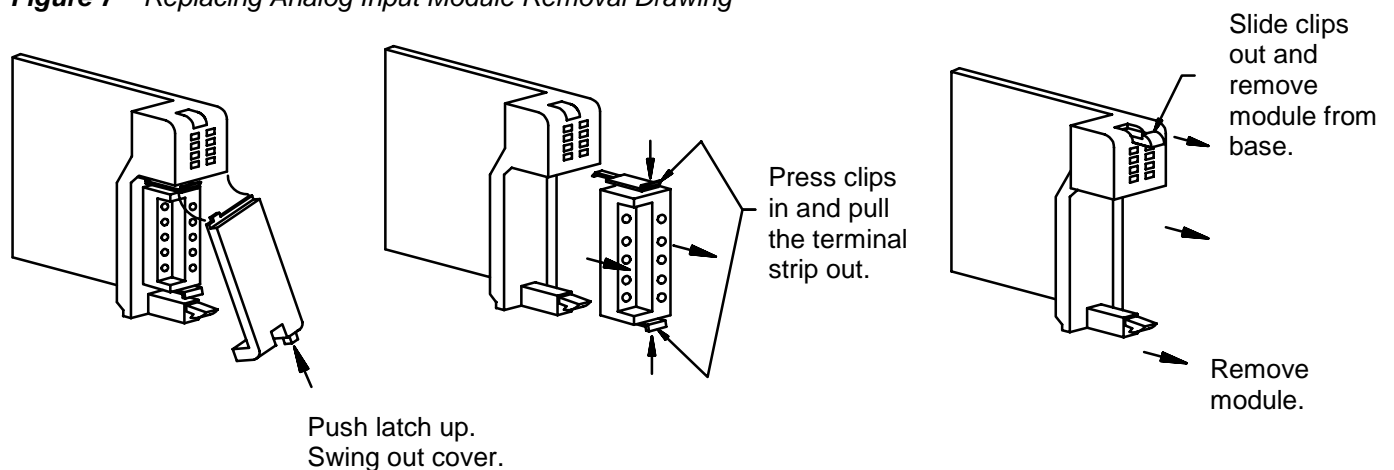
### **NOTE**

**Do not attempt to repair the PLC modules. If the module is defective, the entire module should be replaced.**

### REPLACING ANALOG INPUT MODULE (SLOT 0):

- Turn off power at the disconnect. **MODULES** must not be removed with power applied to the PLC.
- Press the small tab on the right located under the cover and pull the cover out from the bottom.
- Squeeze the tabs on the top and bottom of the terminal block and pull it out.
- Pull outward on the retaining clips, located at the top and bottom, to unlock the module.
- Remove the module by grasping the top and bottom and sliding it outward.
- Replace the module by sliding it into the slot. Align the PC board(s) on the module with the grooves on the top and bottom of the base. Push the module straight into the base until it is firmly seated in the back-plane connector.
- Once the module is inserted into the base, push the retaining clips located at the top and bottom to firmly secure the module.
- Replace the terminal block. Replace the cover by inserting the tab in the top and push in the cover.

**Figure 7 – Replacing Analog Input Module Removal Drawing**



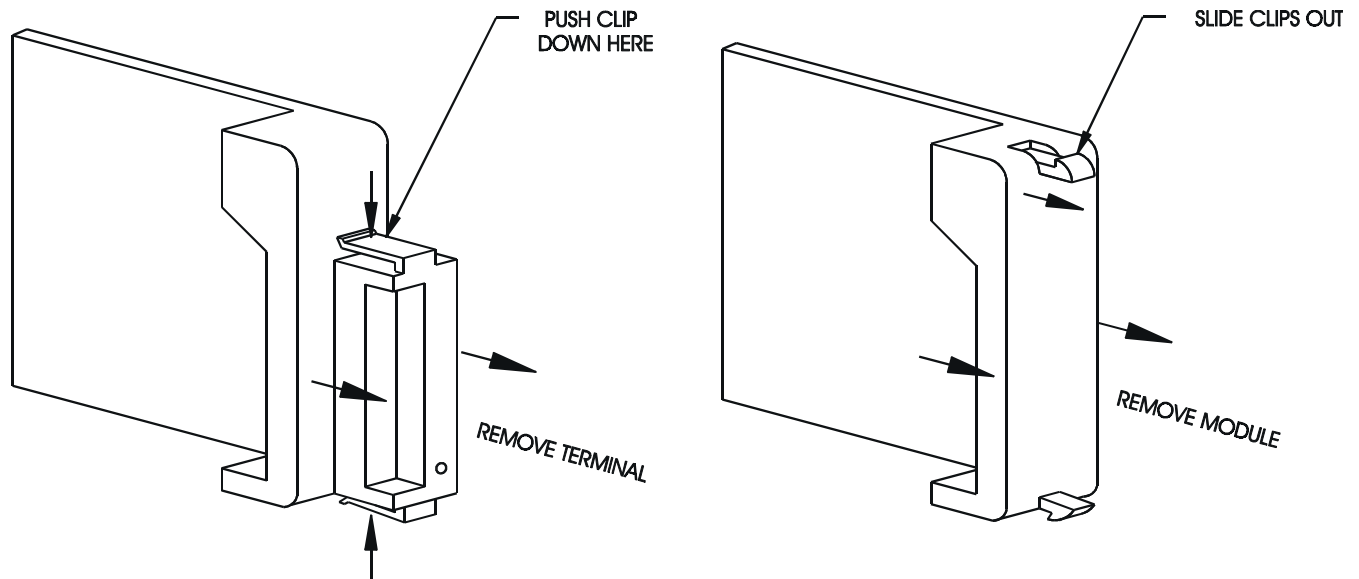
Analog Input Module Removal.wmf



## REPLACING AC INPUT AND OUTPUT MODULES (SLOT 1 AND 2):

- Turn off power at the disconnect. Modules must not be removed with power applied to the PLC.
- Squeeze the tabs on the top and bottom of the terminal block and pull it out.
- Pull outward on the retaining clips, located at the top and bottom, to unlock the module.
- Remove the module by grasping the top and bottom and sliding it outward.
- Replace the module by sliding it into the slot. Align the PC board(s) on the module with the grooves on the top and bottom of the base. Push the module straight into the base until it is firmly seated in the back-plane connector.
- Once the module is inserted into the base, push the retaining clips located at the top and bottom to firmly secure the module.
- Replace the terminal block.

**Figure 8 – Replacing AC Input and Output Modules**



INPUT OR OUTPUT MODULE TERMINAL REMOVAL

INPUT OR OUTPUT MODULE REMOVAL

*Module Removal.wmf*

### CONTROL BOX HEATER

The **CONTROL BOX** is equipped with a heater to prevent condensation and to insure that all the electrical components operate within their allowed temperature range. The heater is mounted on the back side of the control panel and is not visible. The heater is controlled by two thermostats. One thermostat (#1) (heater operating thermostat) is mounted on the STOP Switch and the second thermostat (#2) over temperature safety is mounted directly on the control panel.

### TESTING THE CONTROL BOX HEATER

If the heater is not on due to ambient temperature being higher than the thermostat settings, the heater can be checked by the following procedure:

The operating thermostat is on at 45° F and off at 60° F. The high temperature limit thermostat opens at 150° F.

- Turn off the control box power at the disconnect.
- Open the control box.
- Jumper the thermostat #1 mounted on the STOP Switch.
- Turn on the power at the disconnect.
- Monitor the control panel temperature to determine if it is heating up.



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### ***CAUTION***

***Control Panel will get hot!***

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- Turn off the control box power at the disconnect.
- Remove the thermostat jumpers.
- Put the cover on the control box .
- Turn on the power.

*Blendaire Maintenance Schedule*

DESCRIPTION	FIRST MONTH	EVERY MONTH	EVERY 6 MONTHS	EVERY YEAR	EVERY 2 YEARS
Selas Mixing Valve	Clean and dry lube*.	Clean and dry lube*. (if required)		Clean and dry lube*(if required) outer sleeve and adjustment screw.	Polish piston and sleeve.  Replace diaphragm.
FVO Mixing Valve	Clean and dry lube.	Clean and dry lube. (if required)			Polish piston and sleeve.  Replace diaphragm.
Pilot	Clean pilot filters with solvent.		Clean pilot filters with solvent.		Re-build pilot.  Replace pilot filters.
Regulator	Inspect and clean lines.		Clean upper body.		Clean and re-build.
Safety Valve			Check.		Rebuild actuator.  Replace main valve seal.
Temperature Transducers			Re-calibrate.		Re-calibrate or replace.
PLC Controller Circuits			Check.		
PLC Controller Safeties	Check.		Check.		
Solenoid Valves			Check operation.	Clean valve.	Rebuild valve.
Differential Pressure Switch Check Points			Check		
Control Lines				Clean and purge.	

\* Only use dry lubricant on the outside of the sleeve and the inside of the valve body.



# Troubleshooting

# 7

PROBLEM	CAUSE	SOLUTION
<b>Alarm and Vaporizer Limits</b> sound immediately.	Vaporizer not functioning normally.	Vaporizer must be operating correctly.
<b>Alarm and High Pressure</b> sound after 15 seconds.	Air pressure regulator is set too high or is malfunctioning.	Check air pressure regulator operation.
	High pressure gas is trapped in the blender.	Bleed the LPG gas line.
<b>Alarm and Low Vapor Pressure</b> sound after 15 seconds.	The first stage vapor regulator located near the vaporizer is malfunctioning or is misadjusted.	Check and repair the first stage regulator.
	The pump pressure to the vaporizer is low.	Check pump operation and incoming lines.
	Safety solenoid valves malfunctioning.	Repair solenoid valves.
	Vapor shut-off valve is closed.	Open vapor shut-off valves.
<b>Alarm and Differential Pressure</b> sound after 15 seconds.	Broken gas governor.	Check the gas governor for operation.
	Faulty mixing valve diaphragm.	Check the mixing valve for ruptured diaphragm.
	Improper air pressure.	Check the high pressure air supply.
	Faulty solenoid valves.	Check the safety solenoid valves.
<b>Alarm and Low Vapor Temperature</b> come on after the delay period.	System not yet warmed up.	Re-start the blender at the control panel and put a small load on the system to warm up the temperature switch.
	The vaporizer is not set warm enough.	Re-set the vaporizer.
	The system load is too high for the vaporizer.	Reduce the system load to operating parameters.



# ***APPENDIX A***

## ***Component Information***





## **NOTE**

***This manual covers all ranges of models;  
therefore, some components in the enclosed section  
will not be applicable.***

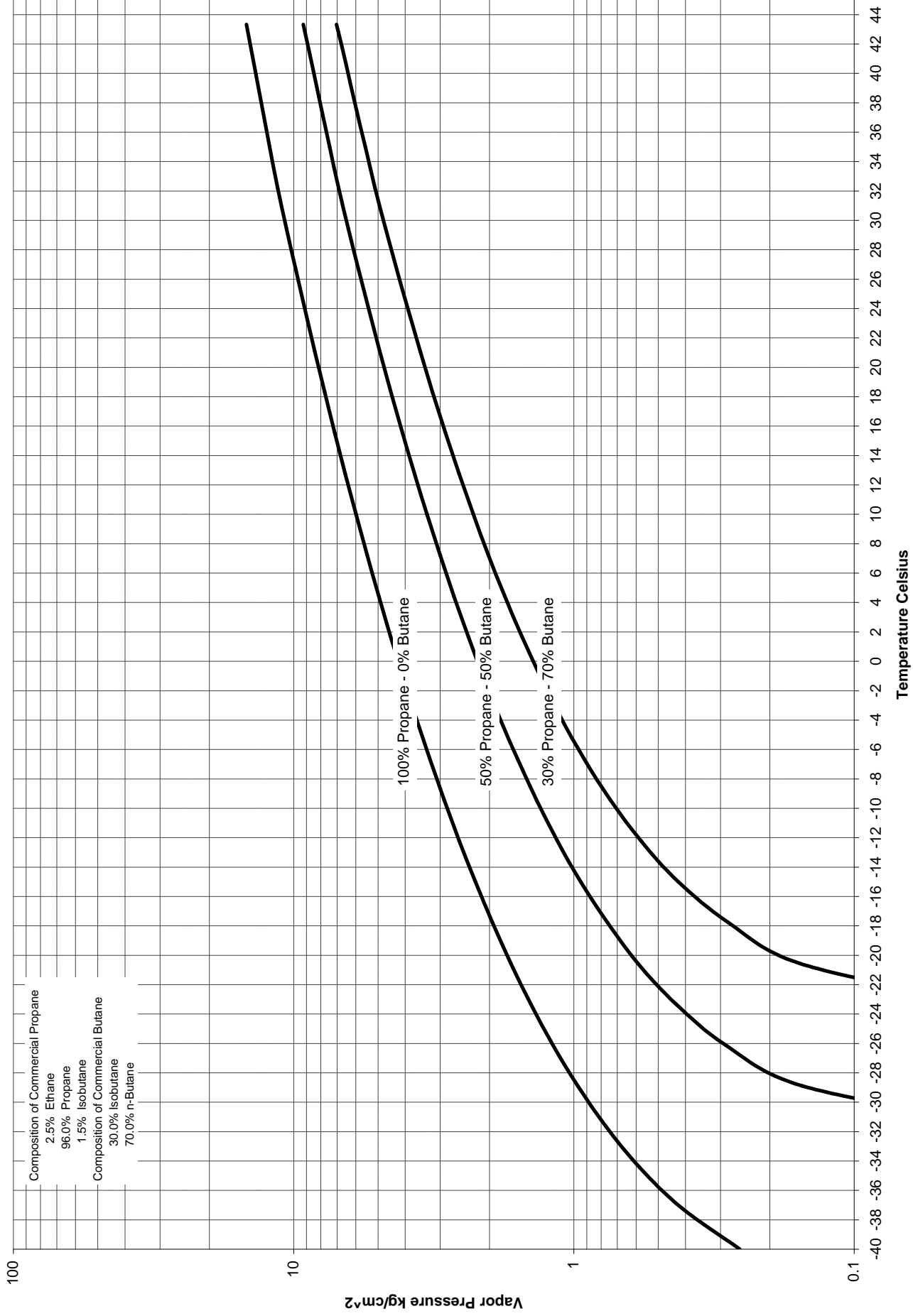
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# ***APPENDIX B***

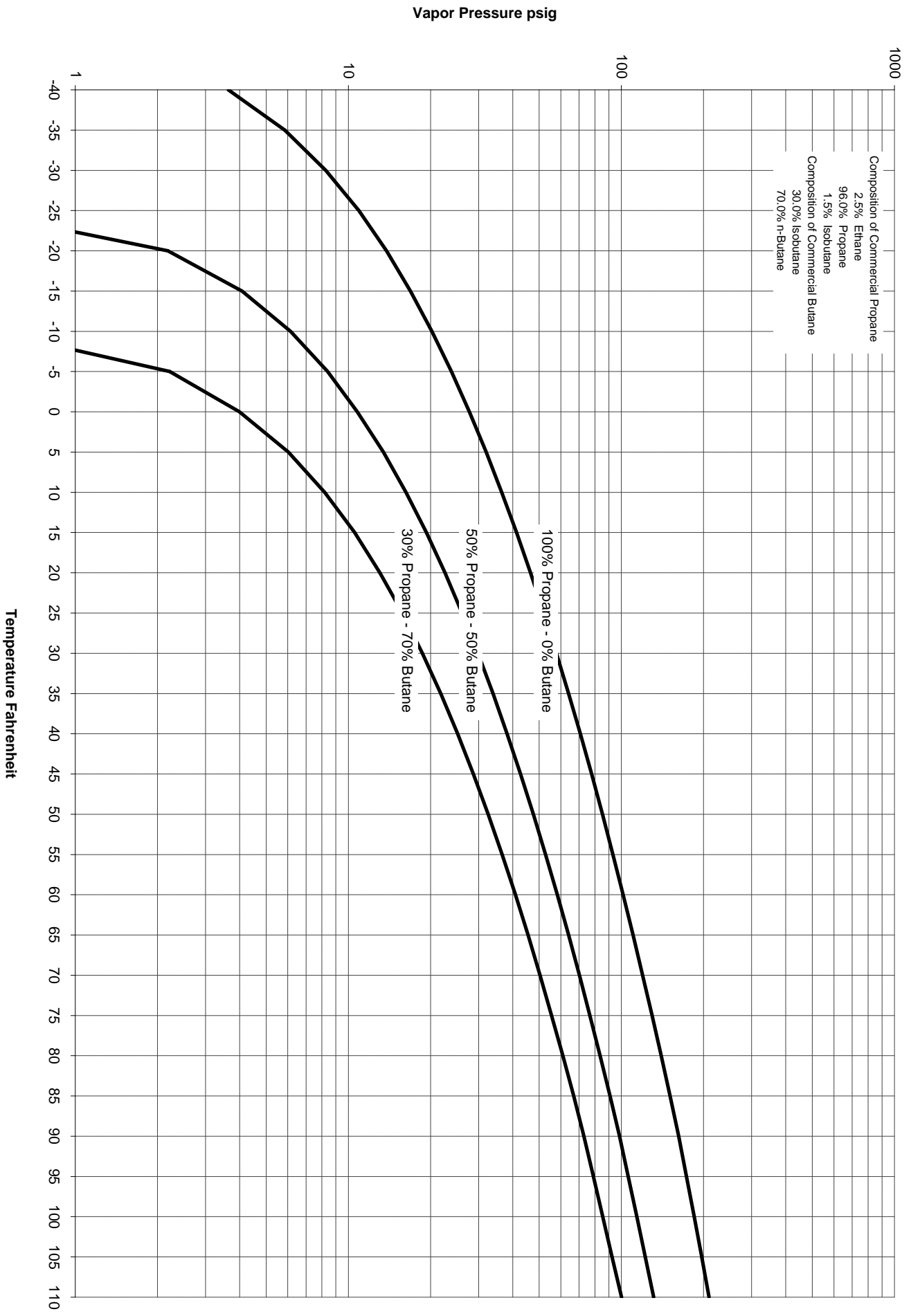
## ***Technical Information***



# Vapor Pressures of Commercial Butane - Propane Mixtures



# Vapor Pressures of Commercial Butane - Propane Mixtures





...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 return it to us. Keep a copy for your records.

This will register your recent purchase and aid 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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