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...Innovative liquid vaporizing and gas mixing solutions

Direct Fired

LP-Gas Vaporizer: 160H through 800H

Operations & Maintenance Manual

151 South Michigan Street, Seattle, Washington, USA 98108
Tel: 206-789-5410 Fax: 206-789-5414 Web: www.algas-sdi.com

This manual covers units built after August 2009 After S/N: 09160185

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A handwritten signature in dark ink, appearing to be "DW", is written over the file information.

ECLIPSE
Innovative Thermal Solutions

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. Literature contained in the Operation Manual has been supplied by vendors. Please check to be sure supplied data matches your configuration. Contact Algas-SDI if any questions exist.
- 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.
- 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 UL listed equipment, the UL listing becomes void for that unit.

Warranty, Copyrights and Approvals

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.

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.

Algas-SDI International, LLC makes NO other warranty of any kind, whatsoever expressed or implied; and all warranties of merchantability and fitness for a particular purpose are hereby disclaimed by Algas-SDI International, LLC and excluded from these terms of sale. No person has any authority to bind Algas-SDI International, LLC to any representation or warranty other than this warranty.

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APPROVALS



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IMPORTANT WARRANTY NOTICE:

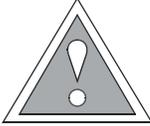
The Algas-SDI warranty period for equipment is 18 months after shipment from our facility or 12 months after installation. See our warranty statement at the beginning of this manual for the complete text. A warranty registration card has been provided with this manual so that you may register the date of installation for warranty purposes. If you do not return the warranty registration card, the warranty term will be 12 months after the equipment has been shipped to you, the end user. If you do not install it immediately, your warranty may expire earlier than necessary. The warranty registration also gives us information to contact you if we need to send you important information about the equipment later on.

Please register your equipment.

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.

PARTS AND PRICES

For parts and prices contact your Algas-SDI distributor.

ASDI CONTACT NUMBERS

If you have questions, need help with your equipment, or want information on other products, contact your distributor or 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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Options

Auto Re-igniter

160H, Auto Re-igniter System 115/230 VAC 50/60Hz, Use P/N: 3-8683, Quantity 1 per unit

See Page 3-14 for Details

Contaminant Separator / Filtaire

160H, Filtaire Model F6 - ASME, Use P/N: 20540 or 20540-ASME, Quantity 1 per unit

See Page 2-9 for Details

Economy Kit

160H, Economy Option Kit P/N: 80793, Quantity 1 per unit,

See Page 2-8 and 3-14 for Details

Inlet and Outlet Hand Valves

160H Inlet, 3/4" Gas Cock, Use P/N: 33803, Quantity 1 per unit

160H Outlet, 1" Gas Cock, Use P/N: 33804, Quantity 1 per unit

Pipeaway Adapter

160H, Pipeaway Adapter 3/4", Use P/N: 1501-5016, Quantity 1 per unit

1st Stage Regulator

160H, 1" 5-20 PSIG, Use P/N 33725, Quantity 1 per unit

For 320, 480H, 640H and 800H 1st stage regulators please consult factory

Introduction

1

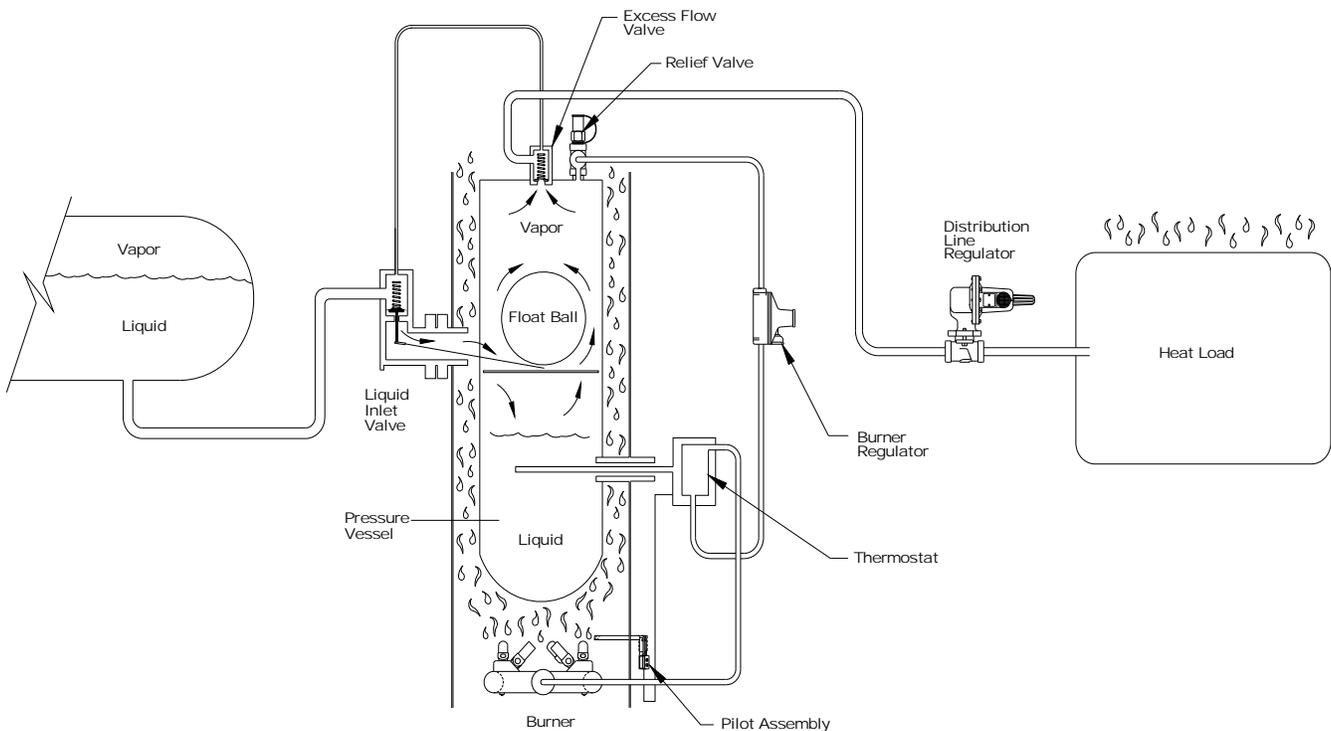
Description/Overview

Congratulations on your purchase of an Algas-SDI Direct Fired vaporizer. Algas-SDI is an ISO 9001 registered company and your new vaporizer was manufactured under strict accordance with ASME and UL requirements and carries the associated marks and the ASME "U" stamp.

A Direct Fired vaporizer, as the name implies, is one in which heat is furnished by an open flame directly applied to the heat exchange surface, which in turn contacts the LP Gas liquid that is to be vaporized. The Algas-SDI Direct Fired vaporizers consist of seven (7) main components:

- Liquid inlet valve & float assembly
- Liquid reservoir or heat exchanger
- Thermostat supply regulator
- Thermostat
- Burners
- Capacity control valve
- Relief valve

Figure 1 – Direct Fired Vaporizer System - Basic Features



HOW THE VAPORIZER WORKS

When the shut-off valve in the liquid supply line is opened, liquid is forced into the heat exchanger by the pressure in the storage tank. As the liquid level rises, some of the liquid boils off until it matches the pressure coming from the tank.

The flow of liquid into the heat exchanger will stop when the rising liquid forces the float upward, closing the liquid inlet valve, or when the pressure in the heat exchanger is the same as the pressure coming from the storage tank.

When the burner(s) is lit, the heat will boil off the liquid in the heat exchanger. During periods of low or no demand, the pressure will build up to the storage tank pressure. Whenever pressure in the heat exchanger starts to increase above the tank pressure, the pressure differential will cause the LP gas to flow back through the inlet valve to the tank.

Due to the boiling action and the flow back to the tank, the liquid level in the exchanger will drop. When the liquid level drops, the temperature sensor will sense the warmer vapor and cycle off the main burner(s).

As the demand increases, the pressure in the heat exchanger will drop. As a result, liquid will flow into the exchanger, and the temperature sensor will sense the cool liquid, and cycle the main burner(s) on.

During continuous operation, the burner(s) will cycle on and off to maintain the required supply of vapor. As long as the rate of vaporization exceeds the demand, the exchanger will contain a very small amount of liquid. The only time the exchanger will contain a large amount of liquid is when the demand is equal to or above the capacity of the vaporizer.

Whenever the demand exceeds the capacity of the vaporizer, the capacity control valve is engaged, which limits the withdraw rate from the exchanger to the maximum capacity of the vaporizer.

The capacity control valve is a spring loaded valve mounted on the outlet of the exchanger. Liquid LP gas is supplied to the top of the valve and vapor from the exchanger to the bottom of the valve. During normal operation, the valve is held open by the force of the spring.

When the liquid/vapor pressure differential exceeds the spring force, the liquid pressure will begin to close the valve. This restricts the flow out of the vaporizer. Any increase in demand will create greater pressure drop. In turn, the valve will further restrict the flow of vapor from the unit. This throttling action will cause the gas outlet pressure to drop, allowing the pressure in the heat exchanger to build back up and maintain proper gas supply to the vaporizer's burner(s) and keep the vaporizer in operation.

Direct Fired Vaporizer specifications:

BURNER INPUT: 160H	176,900 BTU's/Hr per burner
GAS CONSUMPTION: vaporized	1000 BTU's per gallon of propane
THERMOSTAT SUPPLY REGULATOR PRESSURE (BURNER ON)*:	15-18" w.c.
BURNER PRESSURE**:	9" w.c.
PILOT BURNER:	2200 BTU's/hr
NOMINAL OPERATING TEMPERATURE***:	140 to 160 °F

* Regulator Gas Pressure measured between burner regulator and thermostat at the drip leg. Regulator supply pressure may vary in order to obtain 9" w.c. at the burner. See "Adjusting the regulator" on page 4-18.

** Burner pressure measured at the burner pressure test port. See "Adjusting the regulator" on page 4-18.

*** Operating Temperature depends on ambient temperature, thermostat settings, and operating pressures.

GENERAL

- Install the system so it complies with all governing codes and regulations.
- Make up all threaded pipe connections with a sealing compound that is approved and listed for LP gas service.
- All above ground lines should be adequately supported.
- Any underground piping should be properly protected against corrosion.
- Vapor outlet lines up to the first stage regulator should be sloped toward the vaporizer to allow condensation in the vapor line to flow back to the vaporizer.
- Clean all foreign material from all pipes prior to making final connections.
- Test all joints as specified in the applicable codes for leaks before placing the piping system in service.

Unpacking and Initial Assembly

UNPACKING

Upon receiving your new vaporizer inspect package for any damage that may have occurred during shipping. Then carefully open package and inspect unit for damage. Remove all plastic shipping material from the vaporizer.

INITIAL ASSEMBLY

Install the vaporizer a minimum of 15 feet from the storage tank valves (see Table 1 below).

Secure vaporizer through the four (4) ½ inch holes (see Figure 2) on above ground level, solid, non-combustible base,

The vaporizer should be adequately protected against damage by moving vehicles.

If the vaporizer is to be installed in any building or enclosure, a relief valve pipeaway and a regulator relief pipeaway must be installed. The relief valve and regulator relief must be able to relieve outside of any enclosure or building.

Table 1 – Distance from Vaporizer

Exposure	Minimum Distance From Vaporizer Required
Storage Tank	10 feet
Storage tank shutoff valves	15 feet
Point of transfer	15 feet
Nearest important building or group of buildings or line of adjoining property which maybe built upon (except buildings in which vaporizer is installed).	25 feet

Reference NFPA58

Figure 2 – Vaporizer Dimensions

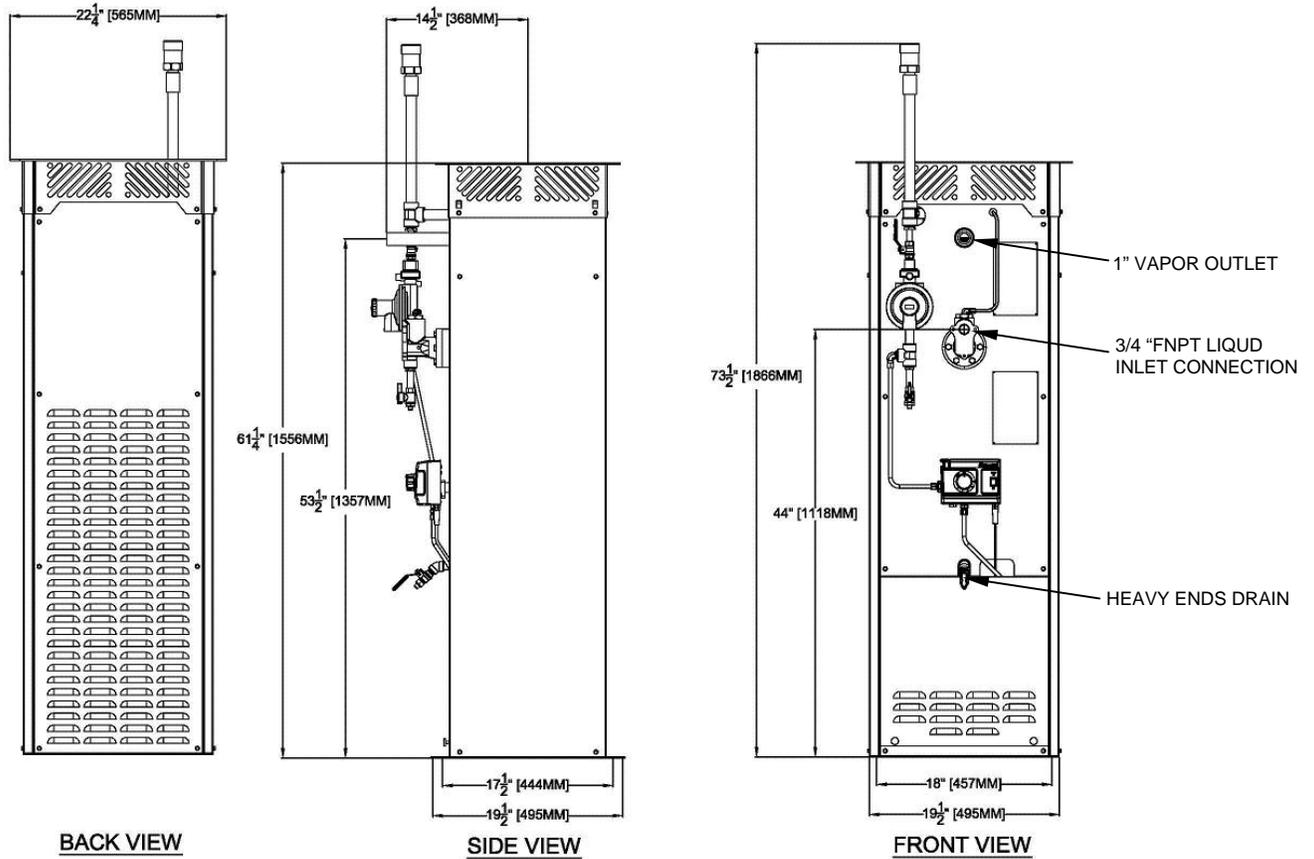
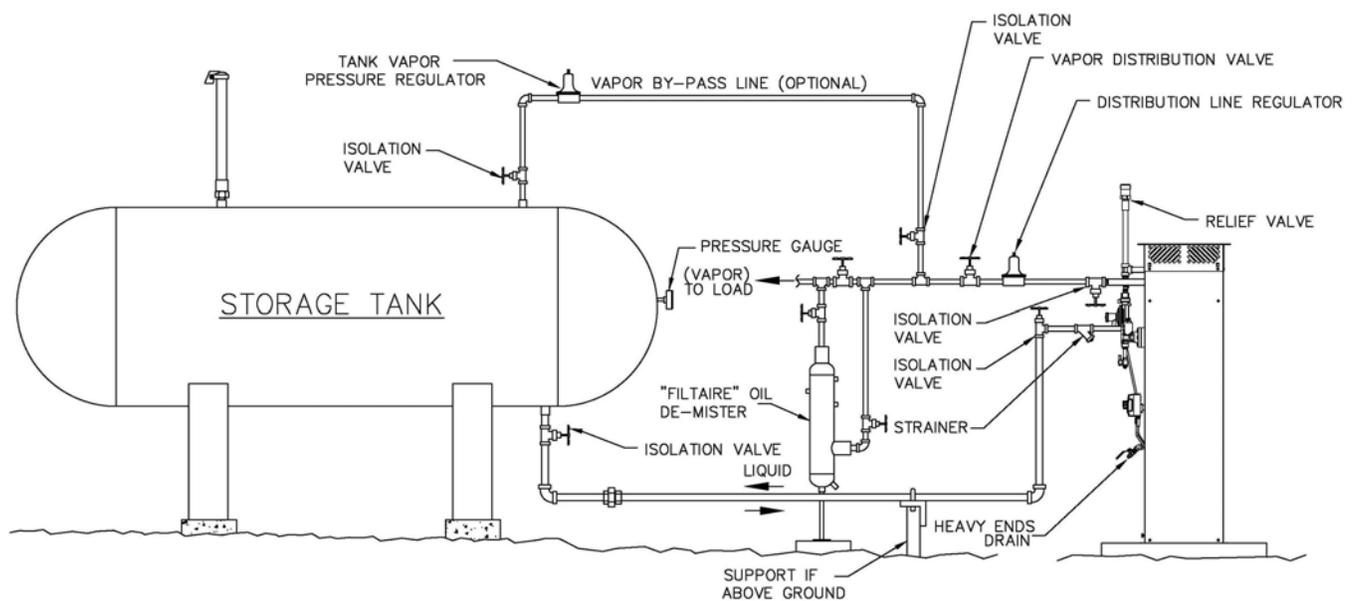


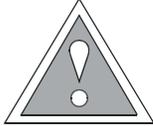
Figure 3 – Installation – 160H vaporizers





CAUTION

The entire installation must be leak tested prior to operating the system.



NOTE

Do not connect this vaporizer to a storage tank that has been used in vapor withdrawal service until the tank has been emptied and all sediment and heavy ends have been cleaned from it.

VAPOR DISTRIBUTION LINE (see Figure 3)

The vapor distribution line should be adequately sized for the service.

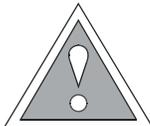
Table 2 – Recommended Vapor Distribution Line Size

Gas Line Length Ft.	Up to 50	50-150	150-250
160H Vaporizers	1-1/2"	2-1/2"	3"
320H Vaporizers	1-1/4"	1-1/2"	2"
480H Vaporizers	1-1/4"	1-1/2"	2"
640H Vaporizers	1-1/2"	2"	2-1/2"
800H Vaporizers	1-1/2"	2"	2-1/2"

* Nominal Pipe Size

1. Install a UL listed shut-off valve with a Minimum 250psi gas pressure rating.
2. Install a thermometer after the vaporizer shut-off valve.
3. Install the first stage regulator as close to the vaporizer as possible, but not further than 24" from the outlet of the vaporizer. The outlet pressure of the regulator should be set at 4 to 6 PSI lower than tank saturated vapor pressure at lowest expected temperature; this may require periodic adjustment.
4. The second stage (or low pressure) regulator should be installed as close to the consuming equipment as practical.
5. A line relief valve may be installed (optional) to protect the regulators from excessively high pressure. If a line relief valve is used, set the blow pressure at approximately 10 PSI above the first stage regulator delivery pressure.

LIQUID INLET



NOTE

Do not install a check valve in the supply line between the tank and the vaporizer. Liquid must be able to flow both ways in that line.

1. Install the 60-mesh 3/4" strainer that is supplied with the unit on the liquid inlet to the vaporizer.
2. Install a UL listed shut-off valve with a Minimum 250psi gas pressure rating

3. The liquid line from the storage tank to the vaporizer should be of sufficient size to supply the vaporizer at full capacity with a maximum pressure drop of less than the hydrostatic head pressure (see *NFPA 54*).
4. Connect the vaporizer to the storage tank.

VAPOR BYPASS LINE (OPTIONAL) - see *Figure 3*

1. Install a primary (first stage) regulator at the vapor outlet on top of the storage tank. Set this regulator to deliver gas at a pressure of 2 to 4 psi below the setting of the vaporizer regulator. Then if the vaporizer is overloaded or its output pressure drops off, the regulator on top of the storage tank will automatically take over.
2. Run a line from the regulator and tie it into the vapor service line downstream from the vaporizer first stage regulator.

BURNER SUPPLY LINE (OPTIONAL)

The vaporizer burners are supplied with vapor from the outlet of the vaporizer where the least possibility of condensation will take place. In regions where there is a problem with a high content of heavy ends in the LP gas, a separate vapor supply line to the burner control on the vaporizer may be installed. If a separate burner supply line is used, the following is recommended:

1. Disconnect the ¼" line at the burner regulator inlet.
2. Disconnect the ¼" line at the tee on top of the heat exchanger and plug it with ¼-NPT plug.
3. Install a first stage regulator as close to the tank vapor outlet as possible. A manual shut-off valve should be installed ahead of the regulator.
4. Connect the supply line from the first stage regulator to the burner regulator at the vaporizer. Make sure that the supply is sized properly to handle maximum input rating of the vaporizer burner(s). See *Figure 1*.
5. For the vaporizer Thermostat Supply Regulator pressure adjustments please refer to page 1-3.

LIQUID PUMP (OPTIONAL)

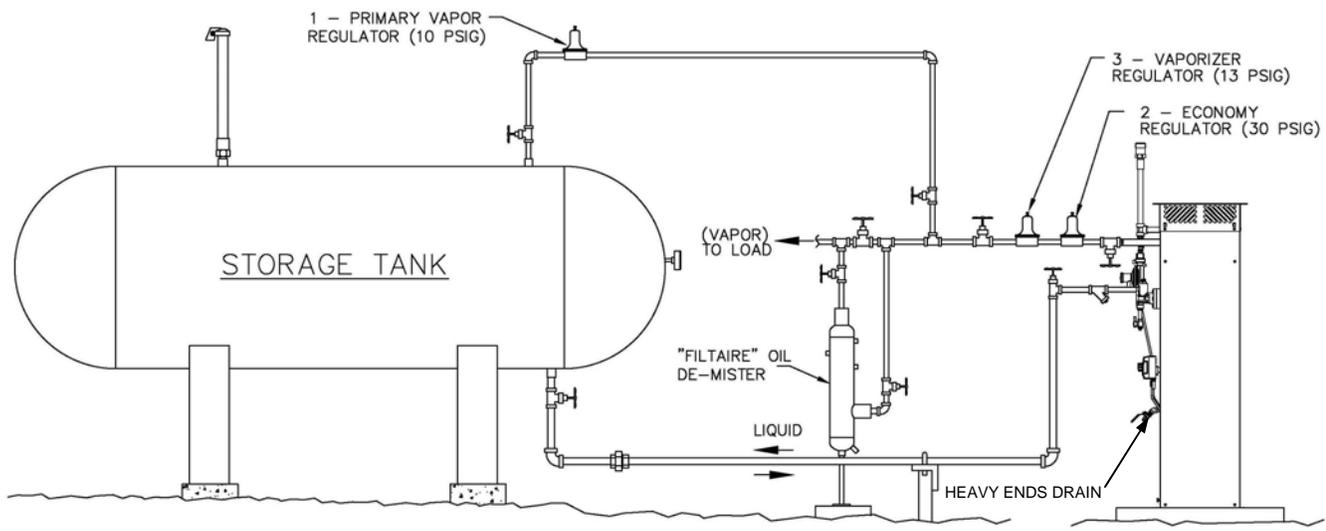
The liquid pressure to the inlet of the vaporizer must be a minimum of 6PSI higher than desired discharge pressure. If tank pressure cannot meet this requirement, install a pump in the liquid line under the storage tank to maintain the minimum pressure.

ECONOMY INSTALLATION (OPTIONAL)

A vaporizer with economy operation draws vapor from tank as primary source and utilizes the vaporizer only when needed. The intent is to allow the most economical operation and eliminate energy waste. To accomplish this, install an Algas-SDI 160H through 800H vaporizer, operating on demand, combined with a primary vapor bypass. To do this you will need an economy kit that consists of several valves and regulators.

Operation

Figure 4 – Economy Option



After installing the vaporizer, install and set the regulators from the economy kit as follows:

1. Install the (1) Primary Vapor Regulator in the vapor line at the tank and set at 10 psig. The regulator must be installed so that any gas condensing between the regulator and the tank can run back into the tank.
2. Install the (3) Vaporizer Regulator at the outlet of the vaporizer and set at 13 psig or approximately 3 psig higher than the (1) Primary Vapor Regulator.
3. Between the (3) Vaporizer Regulator and the vaporizer outlet install the (2) Economy Regulator in reverse direction such that the outlet side of the regulator faces the vaporizer. This regulator should be set at 30 psig or just high enough to allow enough pressure in the tank to supply the full flow through the (3) Vaporizer Regulator when needed.

CONTAMINANT SEPARATOR – FILTAIRE (OPTIONAL)

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.

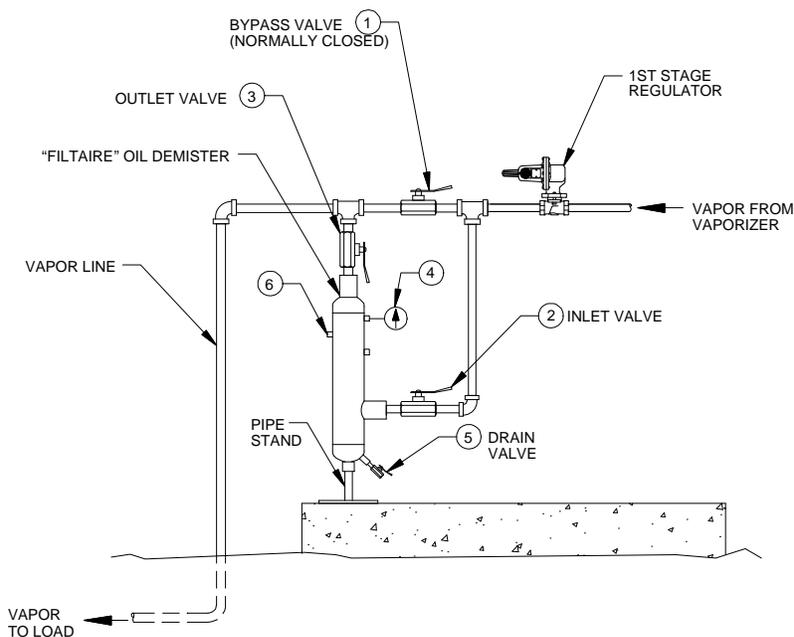
A complete **FILTAIRE** system consists of inlet and outlet connections, a blow-down drain (5), a pressure gauge (4), a vent which is normally plugged (6), and a bypass valve system for cleaning (1, 2, and 3). The bypass valves enable the system to continue operating when the **FILTAIRE** is removed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

Figure 5).

At 20 psig recommend using Algas-SDI **FILTAIRE** Model F6 ASDI PN: 20540 or 20540-ASME for Direct Fired Model 160H.

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

Figure 5 – Filtaire Operation



LEAK TEST



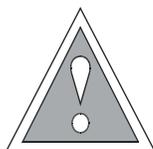
CAUTION

The entire installation must be leak tested prior to operating the system.

1. Close outlet valve.
2. Slowly open inlet valve and allow pressure to equalize in the vaporizer.
3. Apply a liberal amount of soap/water solution to ALL internal and external flanged, threaded and tubing connections. **For proper leak test procedure around the thermowell please see Appendix A.**
4. Check for any leaks by observing new bubble formation in the soap/water solution.
5. **Repair any leaks before continuing. Leak test until system has no leak present.**

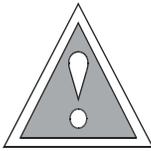
NOTE

If using direct fired vaporizers in mobile or temporary applications, leak test must be performed each time vaporizer has been moved or re-located.



CHECK REGULATOR PRESSURES

See Adjusting the Regulator page 4-18.



NOTE

For installations or locations in Canada it may be required to vent the integral pressure relief of the burner supply regulator. Venting must be installed in accordance with all requirements defined by CSA B149.1 Natural Gas and Propane Installation code latest revision.

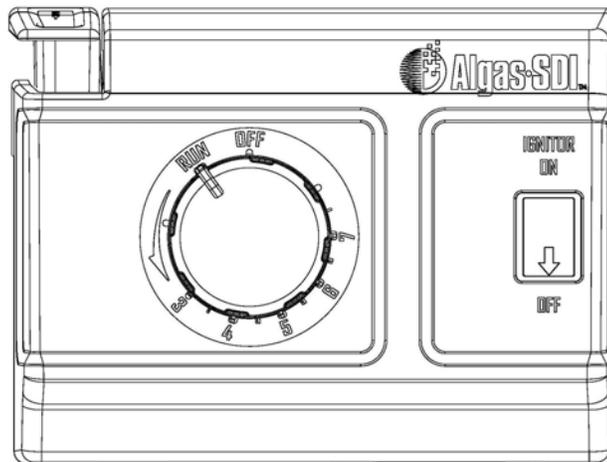
Operation

3

Direct Fired Vaporizer start up procedure

1. Before starting the vaporizer, close the outlet valve in the vapor service line.
2. Fill the vaporizer with LP gas liquid by slowly opening the liquid supply line valve between the storage tank and the vaporizer. If this valve is opened too quickly, the excess flow valve in the tank may close. If this occurs, close the liquid supply line valve and allow the excess flow valve to equalize and re-open.
3. If the vaporizer is installed with a separate burner supply line not connected to the vaporizer (see page. 2-7), open the valve supplying gas to the Thermostat Supply Regulator.
4. Turn the temperature control dial on the thermostatic gas control valve counter-clockwise to the "RUN" position ("PILOT" on first version). "RUN" position ("PILOT" on first version) indicates that the pilot and main burner can start operating.

Figure 6 – Temperature control dial in "RUN" position

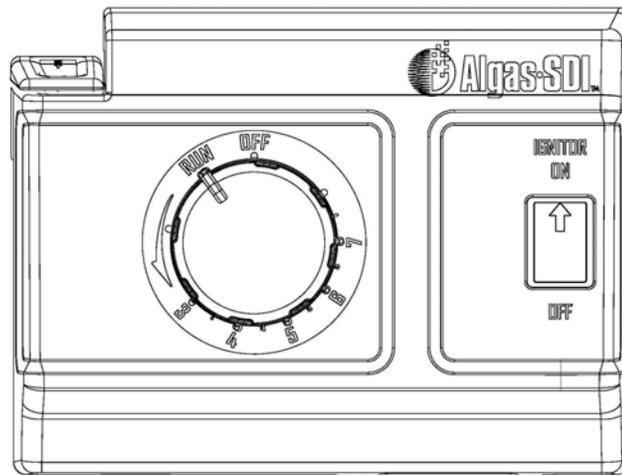


5. Turn the igniter switch to "ON". Press the pilot button. Continue to hold the pilot button for 30 to 60 seconds and release. Pilot should remain lit.

NOTE: If the ambient temperature is below 10°F (-12°C) when the pilot button is released it is likely that the main burner will immediately cycle on. As soon as the LP gas inside the heat exchanger heats up above this temperature the main burner will cycle off. This is normal operation for the new Algas-SDI thermostatic gas valves and is different than previous gas valves used.

Operation

Figure 7 – Pilot button pressed down and ignitor switch ON



WARNING

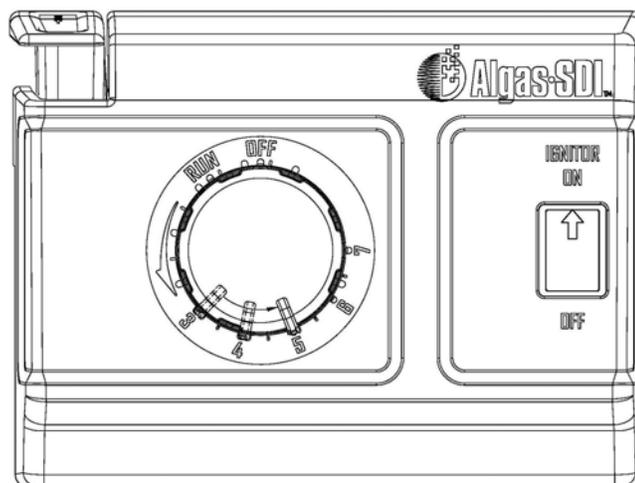
If pilot light goes off after releasing dial, turn control dial to "OFF", wait 5 minutes and repeat step 4.

6. Turn temperature control dial counter clockwise until burner(s) cycle on.
7. Allow burner(s) to heat the vaporizer until they cycle off.
8. Make sure all the valves on consuming equipment are closed and slowly open the valve in the vapor distribution line. Open all consuming equipment valves.

Direct Fired Vaporizer setpoint adjustment

Set the temperature control dial so the outlet temperature is 15 °F over the highest ambient temperature during full capacity operation. If a pump is used, set the Temperature control dial so the outlet temperature is 15 °F over the saturation temperature of the LPG during full capacity operation.

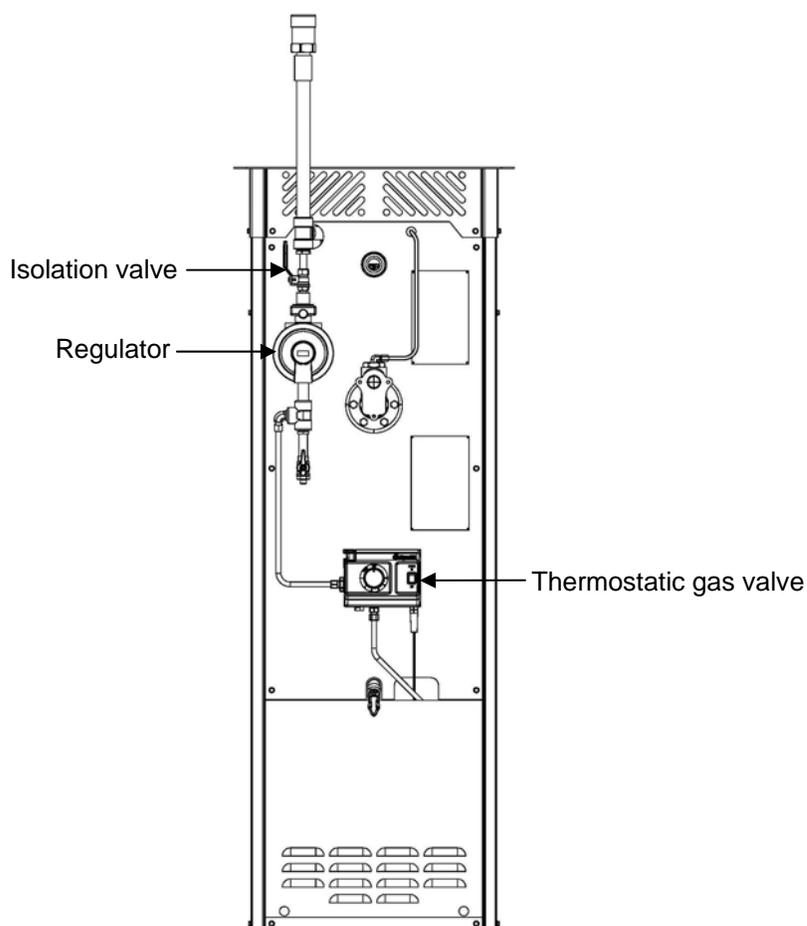
Figure 8 – Rotating temperature control dial counter-clockwise to the desired setpoint



Direct Fired Vaporizer shut down procedure

1. Turn temperature control dial to "OFF" position. Pilot flame should immediately extinguish.
2. Once the pilot flame has extinguished turn the ignitor switch to "OFF".
3. If the vaporizer is below -10°F (-12°C) the main burner may continue to operate for an additional 30-40 seconds until thermocouple cools down.
4. Close the isolation valve ahead of the burner regulator on the side of the vaporizer. This will prevent any fuel from going downstream to the thermostat, pilot and main burner.
5. If required, it is not safe to disconnect the vaporizer or service the thermostat and the burner.

Figure 9 – Vaporizer shut down procedure



Direct Fired Vaporizer purge procedure

If the vaporizer is not going to be used for a long period of time, it should be purged. The information contained below is a step by step procedure on how to purge Algas-SDI direct fired vaporizer. This procedure should be followed anytime a vaporizer needs to be maintained, serviced, relocated or shut down for any other reason.



WARNING

Prior to purging the vaporizer, ensure that there are no closed ball valves or back check valves restricting the flow of liquid to the tank.

1. Close outlet valve at exit of the vaporizer.
2. If the vaporizer is not operating, start the vaporizer per "Starting the Vaporizer" procedure.
3. After the burner cycles off, shut down the vaporizer per "Direct Fired vaporizer shut down procedure".
4. Before proceeding validate that the burner flame, pilot flame, ignitor spark and any other sources of ignition are completely extinguished.
5. Close the tank liquid outlet valve.
6. Open the vaporizer outlet valve and flare or allow attached equipment to consume remaining gas in the line.

AUTOMATIC RE-IGNITION OPERATION

Lighting or re-lighting of the pilot flame is accomplished by a spark across a gap of approximately 5/32" from the electrode tip to the grounded surface of the pilot burner or to the thermocouple tip. When the flame is established, the pilot flame conducts a current to the grounded pilot burner and a solid state switch in the unit turns off the spark. If the pilot flame is extinguished, current to ground is interrupted and the solid state switch turns on the spark, which sparks at a nominal timing of 100 times per minute, re-lighting the pilot flame well before the thermocouple cools enough to drop out the thermostat safety system.

ECONOMY OPERATION

During normal operation and while the tank pressure is above 30 psig the primary vapor regulator supplies vapor to the load. During this time the economy regulator on the discharge side of the vaporizer remains closed, until the tank pressure drops below 30 psig. Low ambient temperatures may cause this low pressure in the fall or winter or by excessive demand such that the natural vaporization cannot maintain the tank pressure. When the tank pressure drops below 30 psig, the economy regulator opens allowing flow through the vaporizer and subsequently the higher discharge pressure from the vaporizer regulator (3) overcomes the lower setting of the primary vapor regulator. This allows flow only through the vaporizer thus preventing the tank pressure from being drawn down.

Maintenance Recommendations

Vaporizers, just like any other LP gas equipment, should be maintained periodically. The following maintenance schedule may be used as a guideline. This maintenance schedule includes items that must be inspected and the type and frequency of maintenance to be performed. Although the following schedule is the minimum recommended type and frequency of maintenance, the conditions in your area and quality of the LP gas liquid may dictate a more stringent maintenance program. It is important to remember that maintenance is of paramount importance for trouble free and safe operation of the vaporizer. See *Appendix A* for a list of the most common spare parts and repair kits for proper maintenance.

CAUTION



The equipment described in this manual is designed to operate with LP gas, a flammable fuel under pressure. The nature of the application involves inherent hazards that could result in injury. ONLY a trained and fully qualified person should service this equipment.

Table 3 – Recommended periodic maintenance and inspections

Periodic maintenance inspections	
Strainer	After initial installation inspect strainer 30-60 days for debris and contaminants. Remove the plug and clean the screen. Replace screen if necessary. If oils or contaminants are present, it may be necessary to use a cleaner to remove all of the contaminants.
Pilot Burner Assembly	Inspect pilot flame to ensure flame is enveloping 3/8" to 1/2" of the thermocouple tip. If flame is yellow or too small to envelope the thermocouple tip properly, clean pilot orifice.
Flame Spreader Bar Models 80/40H & 120/60H	Upon initial installation and during periodic maintenance inspections, check flame spreader bar position to ensure both burners light simultaneously and smoothly. Straighten spreader bar if it is positioned at an angle or not positioned on top of the pilot properly.
Main Burner Assembly	Inspect burner tips to ensure each tip has proper flame. Check orifices and air supply openings for debris, insects and/or dirt. If needed, clean any plugged or obstructed orifices. For easy access to clean the burner tips, disconnect burner supply line and remove the burner from the unit.
Relief Valves	Inspect all relief valves on the vaporizer, liquid and vapor lines for signs of corrosion and rain caps. Replace rain cap if it is damaged or missing.
Drip Leg	In new installations check and drain the drip leg approximately 30 days after installation to establish if there are LPG quality issues. If poor quality LPG is present, establish a frequency schedule to drain the drip leg to prevent it from filling with contaminants and passing them into the thermostat.
Vaporizer Cabinet	Inspect the door, inside enclosure, inlet louvers and vent caps for debris and/or combustible material. If needed, clean areas so they are free of all debris.

Maintenance

Table 4 – Recommended annual maintenance and inspections

Annual Maintenance Items	
Strainer	Remove the plug and clean the screen. Replace screen if tears or holes are present. If oils or contaminants are present, it may be necessary to use a cleaner to remove all of the contaminants.
Thermostat	Check thermostat for proper operation per the <i>Start-up procedure</i> . Establish pilot and turn the thermostat dial counter-clockwise to high, burners should cycle on. Turn the dial clockwise to the “off” position, main burner and pilot should both extinguish in a short period of time. Replace the thermostat if not operating properly (thermostat cannot be serviced). NOTE: Before replacing the thermostat, be sure the thermocouple is delivering the proper voltage to the thermostat (see below).
Thermocouple	Check electrical output of the thermocouple with a millivolt meter. The thermocouple output (when hot) should be 13 - 30 mV. Lower than 13 mV reading indicates the thermocouple should be replaced. NOTE: Be careful not to over tighten the thermocouple! First hand tighten and then turn 1/8 th turn with wrench.
Pilot Assembly	Inspect pilot flame to ensure flame is enveloping 3/8” to 1/2” of the thermocouple tip. Clean pilot orifice. If pilot assembly is corroded or significantly deteriorated, replace complete pilot assembly.
Main Burner Assembly	Inspect burner tips to ensure each tip has proper flame. Check orifices and air supply openings for debris, insects and/or dirt. If needed, clean any plugged or obstructed orifices. For easy access to clean the burner tips, disconnect burner supply line and remove the burner from the unit.
Flame Spreader Bar Models 80/40H & 120/60H	Upon initial installation and during periodic maintenance inspections, check flame spreader bar position to ensure both burners light simultaneously and smoothly. Straighten spreader bar if it is positioned at an angle or not positioned on top of the pilot properly.
Liquid Inlet Valve	Use repair kit p/n: 3-0016 to replace internal components of the liquid inlet valve. See detailed <i>Liquid Inlet Valve Maintenance Instructions</i> for further information.
Capacity Control Valve	Use repair kit p/n: 3-0017 to replace internal components of the capacity control valve. See detailed <i>Capacity Control Valve Maintenance Instructions</i> for further information.
Vaporizer Tubing	Inspect all tubing for pitting or flaking - run hands along the underside of each of the tubes to check for signs of corrosion. Replace tubes is corroded. Check and tighten all fittings.
Relief Valves	Inspect all relief valves on the vaporizer, liquid and vapor lines for signs of corrosion and rain caps. Replace rain cap if it is damaged or missing. Replace relief valves per manufacturer’s recommended replacement period. Also replace relief valve if it shows significant corrosion on the outlet or has relieved.
Burner Regulator	Check regulator delivery pressure at the drip leg to ensure proper pressure is delivered to the thermostat and burners.
Heat Exchanger	<ol style="list-style-type: none"> 1. Check heat exchanger flue for holes or excessive scale. 2. Remove debris, soot build-up and any obstructions from the outside surface of the heat exchanger between the fins and in the area between the heat exchanger and flue. High pressure air or a wire brush may be used for removal. A large amount of build-up on the outside of the heat exchanger can lead to a reduced capacity from your vaporizer. 3. Check bottom head of the heat exchanger for pitting and/or scaling. Should heat exchanger head thickness be less than 0.240” the heat exchanger should be removed from service.

	<p>Nominal wall thickness 0.375". An Ultrasonic thickness tester can be used to determine wall thickness.</p> <p>4. Check heat exchanger for heavy ends accumulation inside the vessel. Remove the liquid inlet valve and tilt the vaporizer on its side to drain the heavy ends. Re-install liquid inlet valve and uniformly torque bolts to 30-35 ft.-lbs using a star/cross pattern.</p> <p>NOTE: In areas where LPG quality is poor it may be necessary for heat exchangers to be checked for heavy ends more frequently (monthly or bi-monthly depending on quality of LPG). Once it is verified that no significant quantity of heavy ends are accumulating during vaporizer operation, this maintenance can be performed on an annual basis.</p>
Drip Leg	Remove plug below the "T" on the drip leg and drain the drip leg to prevent it from filling with contaminants and passing them into the thermostat.
Vaporizer Cabinet	Inspect the door, inside enclosure, inlet louvers and vent caps for debris and/or combustible material. If needed, clean areas so they are free of all debris.

CAUTION



1. ***When servicing a component in the liquid or vapor line, BE SURE that the LP-gas supply is shut off to that component before it is removed or disassembled. The vaporizer must be completely purged before performing service. Be sure that ALL sources of ignition are extinguished within 25 feet of the work area.***
2. ***When flaring the contents of the vaporizer, be sure that the burners are on to prevent freezing during the flaring operation.***

Maintenance

Use the Direct Fired Vaporizer Inspection & Maintenance Checklist included in this manual to record and keep track of your annual maintenance and inspections.

DIRECT FIRED VAPORIZER INSPECTION CHECKLIST

Model: _____ Serial Number: _____

Maintenance Checklist Items	Inspected Yes/No	Replaced or Kit Installed?
1. Thermostat Operation: - Did burner(s) cycle on? - Did the burner(s) & pilot extinguish after a short period of time when turned off?		
2. Thermocouple: Was the millivolt output between 13 -30 mV.?		
3. Pilot Assembly: - Pilot assembly inspected for corrosion? - Pilot orifice cleaned?		
4. Burner Assembly: Burner tips and orifices cleaned?		
5. Pilot flame: Is it pilot flame uniform and strong?		
6. Liquid Inlet Valve: - Repair Kit 3-0016 Installed? - Inlet orifice cleaned? - Did valve pass "water test" to ensure seat is sealing properly?		
7. Capacity Control Valve: - Repair Kit 3-0017 Installed? - Piston cleaned?		
8. Strainer: Screen inspected for tears or holes and/or cleaned?		
9. Relief Valve: - Inspected for corrosion? - Is rain cap present? - Manufacture date checked for replacement?		
10. Drip Leg: Drained of all contaminants and oils?		
11. Burner Regulator: Pressure setting verified?		
12. Vaporizer Tubing: - All tubing checked for pitting or flaking? - All Fittings tightened?		
13. Heat Exchanger: - Flue inspected? - Debris removed from and around heat exchanger? - Heat exchanger head thickness tested? - Heat exchanger drained of heavy ends?		
14. Vaporizer Cabinet: Are door, enclosure, inlet louvers and wind shrouds cleared of debris and combustible materials?		

Once the above items have been maintained and/or inspected, leak test all fittings and connections inside and outside the cabinet, including the inlet valve flange and bolts, to ensure there are no leaks. Connect LPG Supply and light the pilot and engage main burners. Ensure pilot is strong and main burners are igniting and burning properly.

INSPECTED BY: _____ INSPECTION DATE: _____

Replacing reignitor battery

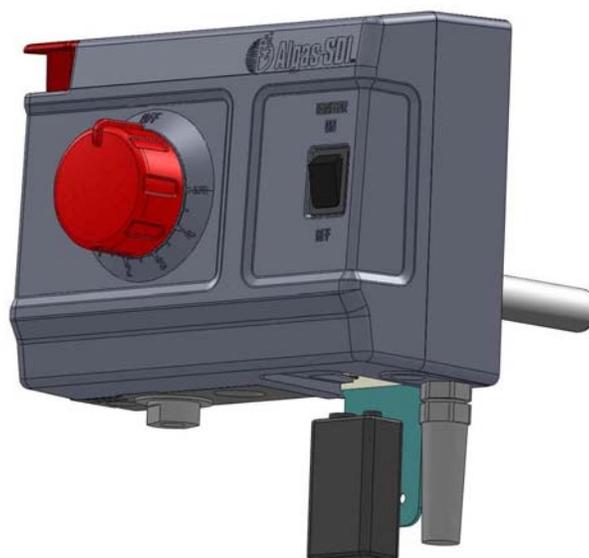
1. Turn the reignitor switch OFF. Use Phillips screwdriver to open the battery access door on the bottom right corner of the thermostatic gas control valve housing.

Figure 10 – Opening the battery access door



2. Pull out the battery, disconnect it and replace with new 9VDC battery. Push the battery back in the thermostatic gas valve housing and close the battery access door prior to turning the reignitor switch ON.

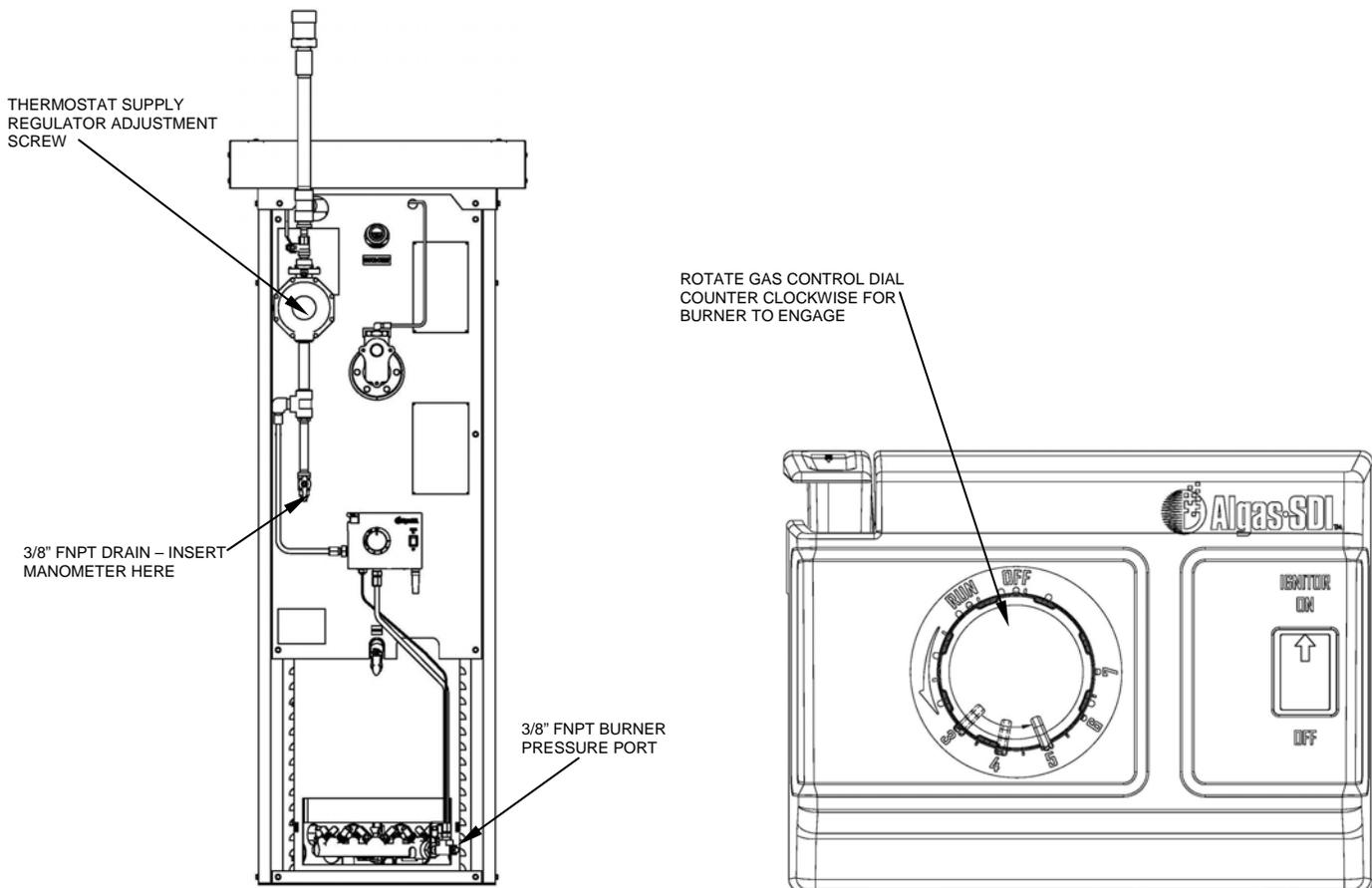
Figure 11 – Replacing the battery



ADJUSTING THE REGULATOR

1. Close the supply valve to the Thermostat Supply Regulator and vent lines.
2. Using a 3/8" FNPT barb fitting and hose, connect a 0-30" manometers (or similar pressure indicating device) to the pressure tap port at the bottom of the drip leg and at the pressure port at the inlet to the burner. You will have to remove the 3/8" plugs and drain the drip leg first.
3. Open the supply valve to the Thermostat Supply Regulator.
4. Turn the reignitor switch "ON". Establish pilot by turning temperature control dial to "RUN" ("PILOT" on previous version) position. Push down the "PILOT" button while igniting pilot (hold button down for 30 - 60 seconds). After pilot flame is established, rotate the temperature control dial counter-clockwise (See Figure 12). The main burner(s) should now engage.
5. With the main burner operating, adjust the Thermostat Supply Regulator to obtain burner pressure (at the burner pressure port) as indicated on page 1-3. To adjust the Thermostat Supply Regulator pressure, remove the cap (See Figure 12) and turn the adjustment screw with a standard screwdriver clockwise to increase and counter-clockwise to decrease the pressure. Return Thermostat Supply Regulator cap when complete.
6. Close the supply valve to the Thermostat Supply Regulator and **wait until the pilot and main burner have extinguished.** Turn the gas control dial to "OFF" position. Remove the manometer and fittings. **Replace all plugs before proceeding.**

Figure 12 – Regulator adjustment



Liquid inlet valve maintenance procedure

Use Repair Kit P/n: 3-0016 (see repair kit section for kit details)

NOTE: Vaporizer must be purged and empty of all liquid and vapor prior to performing maintenance on the liquid inlet valve.

1. Loosen the four bolts to remove liquid inlet valve cover on the outside of the vaporizer cabinet.
2. Using a 7/16" end wrench or tubing wrench, loosen and remove the capacity control valve sensing line fitting on the top of the inlet valve.
3. With a 1-1/2" box end wrench (suggest using 6 point), loosen the large nut on the top of the inlet valve (inlet valve cap)
4. Loosen the 6 inlet valve flange bolts and remove the inlet valve from the vaporizer through the hole in the cabinet.
5. Once the valve is removed from the vaporizer, remove the inlet valve cap (large nut on top) and remove the spring from the valve.
6. Remove the valve seat and stem from the valve body and orifice.
7. After the seat and stem have been removed, using a socket, remove the inlet valve orifice and wipe the top of the inlet valve orifice with a rag/cloth (one that does not leave lint on surface) or lightly with a scotch-brite type material to remove any debris and/or oils from the orifice surface.
8. Replace the O-ring under the orifice (use smallest O-ring from kit). Lightly grease new O-ring before replacing it.
9. Once the inlet valve orifice O-ring has been replaced, return the orifice to the valve and tighten accordingly.
10. Compare the length of the new stem from the repair kit to the only one that was removed from the vaporizer to make sure they are the same. It is important to make sure the new valve stem isn't longer than the original stem because it might prevent the valve from sealing properly. If needed, use a metal file to shorten the stem to match the original stem length. New vaporizers are fitted correctly and tested at the factory to make sure the seat and stem assemblies have the proper length. If the seat and stem assemblies have been changed in the field without checking the length against the original stem or the valve was not tested in the shop to ensure it is sealing (see "Water test" procedure below) there is a chance the stem could be too long and not allow the inlet valve to close properly. If you are uncertain about the prior replacement history of the valve stem you should ensure the valve is tested in water to make sure the new stem and seat assembly close fully before returning the inlet valve to the vaporizer.
11. Insert the new valve seat and stem assembly into the valve body lining up the stem with the hole in the inlet orifice.
12. Replace the spring making sure it is centered on the top of the inlet valve seat.

13. Lightly grease and replace the O-ring around the inlet valve cap (large flange nut).
14. Install inlet valve cap (large flange nut) and tighten into valve body. You may apply NEVER-SEEZ compound to the flange nut to allow for easy removal of the flange nut in the future.
15. Once the internal components of the valve are replaced perform a “water test” to ensure your inlet valve is sealing properly. To perform this test: apply a 1/8” plug in the top of the inlet valve cap using Teflon tape to ensure it is leak-proof. Using an air hose, apply 80-100 psi of air pressure at the inlet of the valve and completely submerge the valve in a bucket or sink full of water. Wait approximately 5-10 seconds and observe for air bubbles exiting the valve around valve stem that protrudes from the middle of the inlet valve. If not bubbles are present, the valve is sealing properly.
16. Remove any remnants of the old inlet valve flange gasket from the surface of the flange on the inlet valve itself and on the flange at the heat exchanger.
17. Lightly spray new inlet valve flange gasket with a dry lubricant (graphite) before installing it on the unit.
18. When re-installing the inlet valve on the vaporizer, place flange gasket on the gasket surface and slide the stem under the float ball inside the heat exchanger. Slightly tighten the bottom two flange bolts allowing the flange gasket to be supported by the two bottom bolts. Working your way around the valve, hand tighten the remainder of the bolts inspecting as you tighten them to ensure the position of the inlet valve flange gasket is correct.
19. To tighten the inlet valve bolts, torque the 6 bolts to 30-35 ft.-lbs. in a cross/star pattern.
20. Leak test inlet valve flange bolts prior to re-starting the vaporizer.

Capacity control valve maintenance procedure

Use Repair Kit p/n: 3-0017 (see repair kit section for kit details)

1. Using a 7/16" end wrench or tubing wrench, loosen and remove the capacity control valve sensing line fitting on the top of the capacity control valve and carefully slide tube out of the way in order to remove the large flange nut (capacity control valve cap). Note: you may need to loosen the tube on the other end at the top of the inlet valve to remove the tube completely.
2. With a 1-1/2" box end wrench (suggest using 6 point), loosen the large flange nut on the top of the capacity control valve (capacity control valve cap).
3. Remove the piston from the valve and wipe the piston with a rag/cloth (one that does not leave lint on surface) or lightly with a scotch-brite type material to remove any debris and/or oils from the piston surface.
4. If the piston is stuck in the valve, insert a screw into the screw tap at the top center of the piston. This will allow you to be able to grasp the screw with a pair of pliers to be able to pull the piston from the valve.
5. Remove the old O-ring from the piston and replace it with the smallest O-ring from the kit. Lightly grease new O-ring before installing it on the piston.
6. Remove spring from the capacity control valve.
7. Thoroughly wipe the inside of the valve body with a rag/cloth (again, one that does not leave lint on surface) to remove any debris or oils from the valve body.
8. Insert new spring into the Capacity Control Valve.
9. Lightly spray the surface of the capacity control valve piston with a dry lubricant (graphite) and insert piston into the valve moving it up and down thereby lubricating the body of the valve and ensuring the piston is moving up and down freely.
10. Lightly grease and replace the O-ring around the capacity control valve cap (large flange nut).
11. Install the capacity control valve cap (large flange nut) and tighten into valve body. You may apply NEVER-SEEZ compound to the flange nut to allow for easy removal of the flange nut in the future.
12. Re-install capacity control valve sensing line and tighten fittings.

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1. PILOT - TROUBLESHOOTING TREES #1 & #2

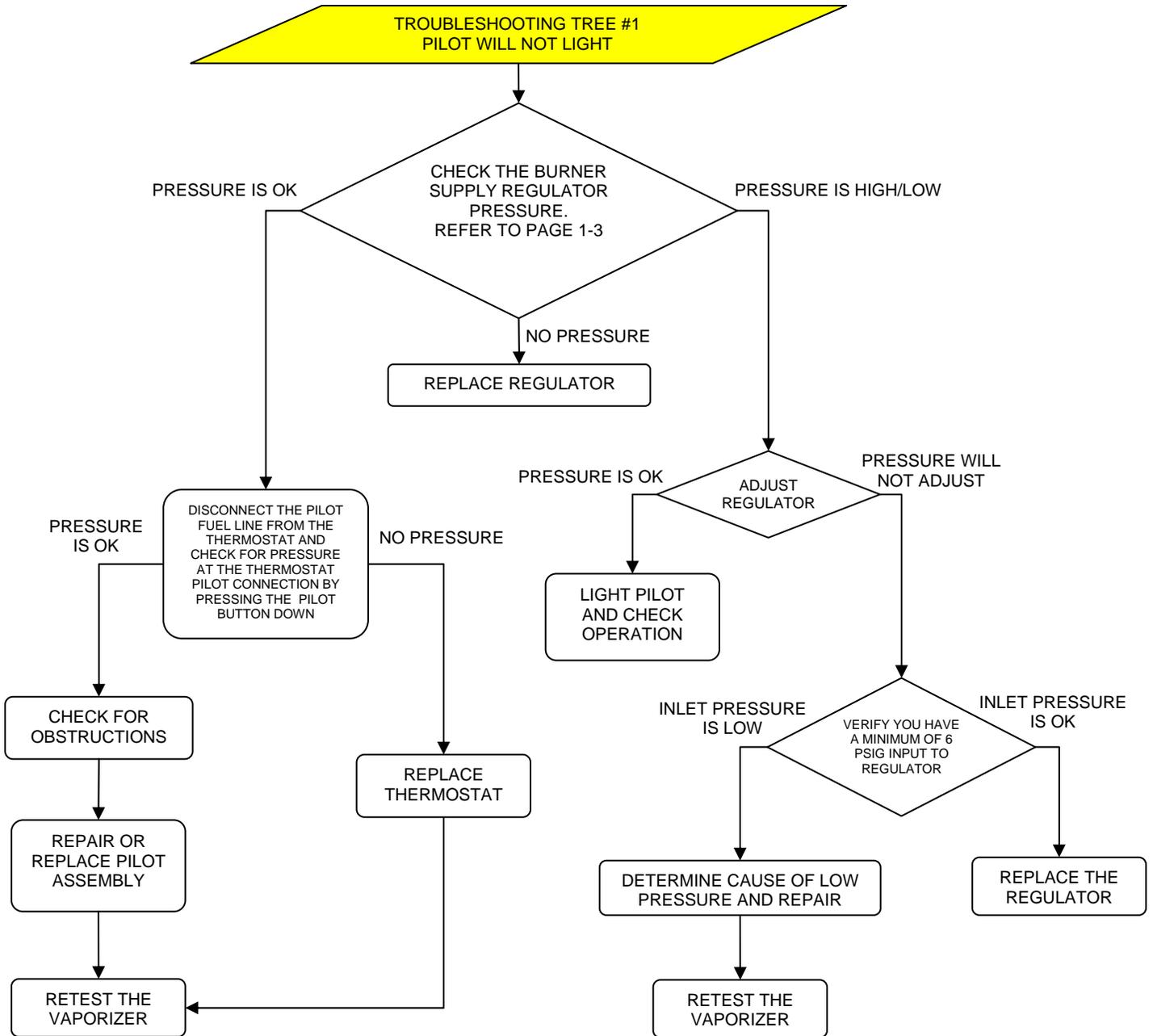
- The pilot flame is adjusted at the factory to provide a non-blowing blue flame. If the flame is not adequate or the pilot does not stay lit, check the pilot burner to see if it is clear of any obstructions.
- Flame should envelope 3/8" to 1/2" of the thermocouple tip. If the pilot flame is too low, the thermocouple will not generate sufficient voltage to hold the main burner's valve open. If the pilot flame is too small, clean the pilot burner orifice, or replace the pilot. Each 160H pilot uses #23 pilot orifices

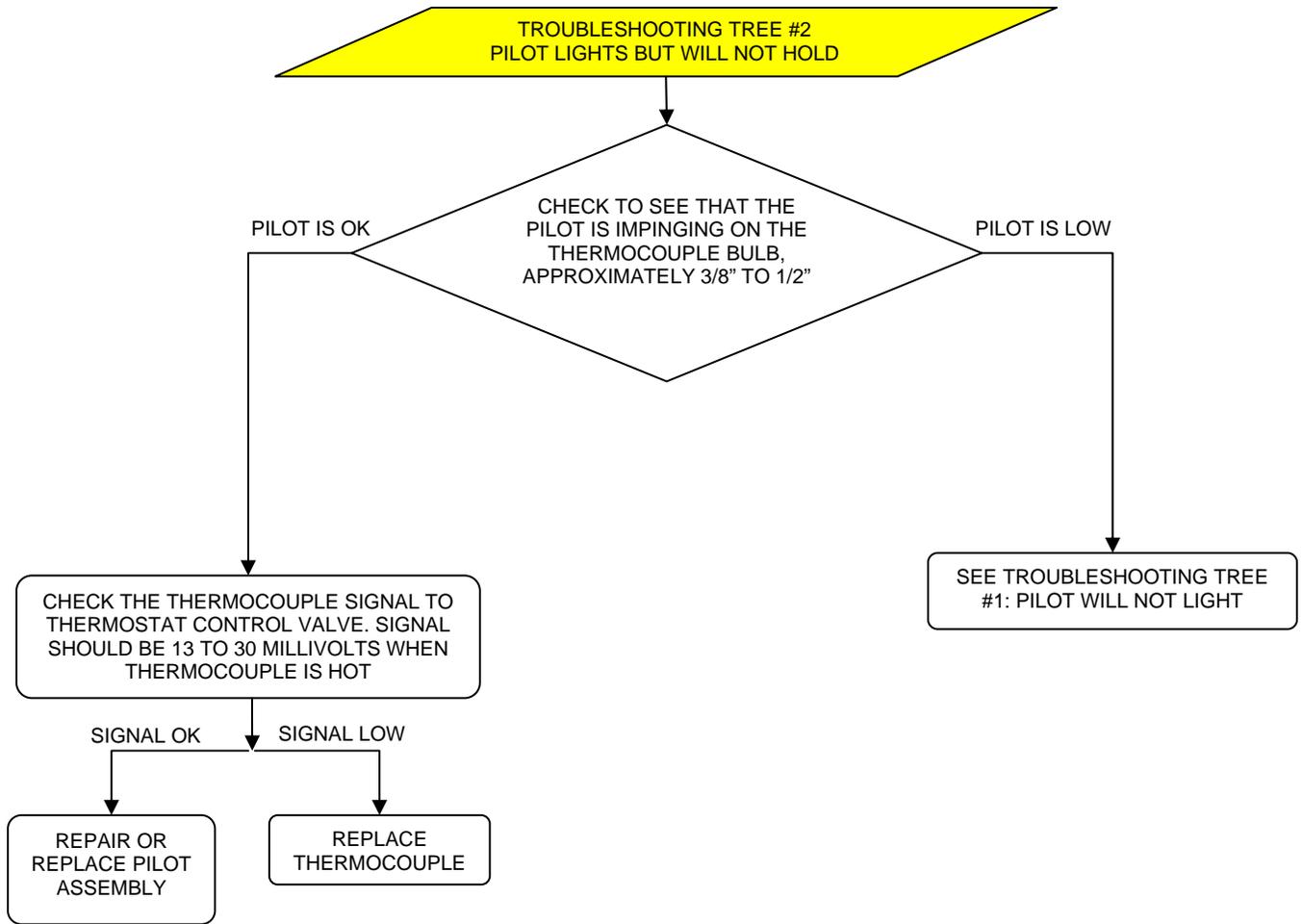
2. MAIN BURNER WILL NOT IGNITE - TROUBLESHOOTING TREE #3

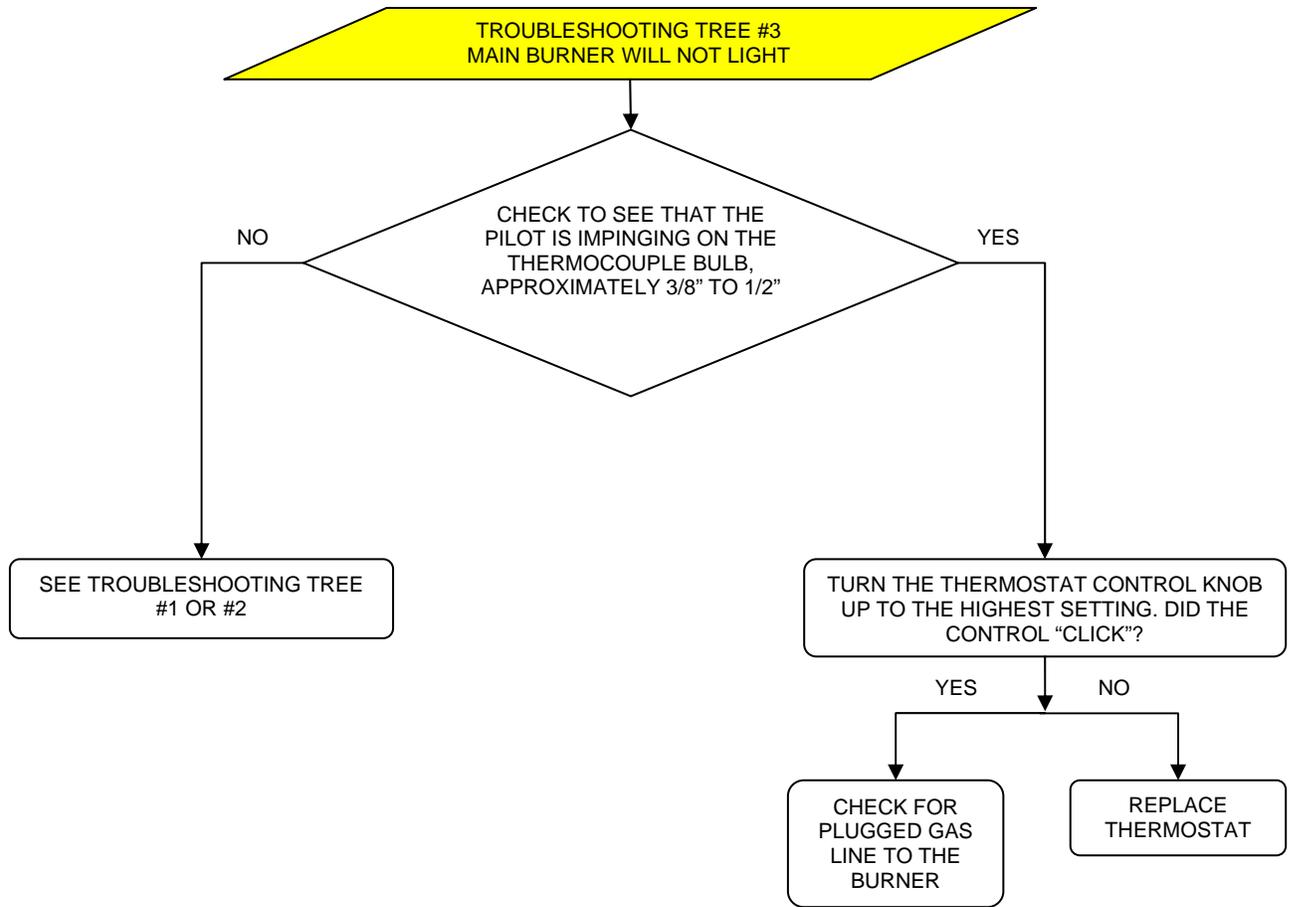
- Check the pilot burner as per 1. above.
- Check burner regulator. Disconnect tube from outlet side of regulator and check output pressure.
- If pilot burner and burner regulator check out OK, the problem is in the thermostat. Replace thermostat (the main burner will not come on unless the temperature in the heat exchanger drops).

3. IF VAPOR PRESSURE DROPS - TROUBLESHOOTING TREE #4

- Check burner; check pilot as per 1. and 2. above.
- If vapor pressure drops, but main burner(s) is working, vapor demand exceeds vaporizer capacity.
- Check liquid excess flow valve and shut off valve; make sure they are open.
- Close liquid inlet valve upstream of strainer. Bleed down system and clean strainer filter.

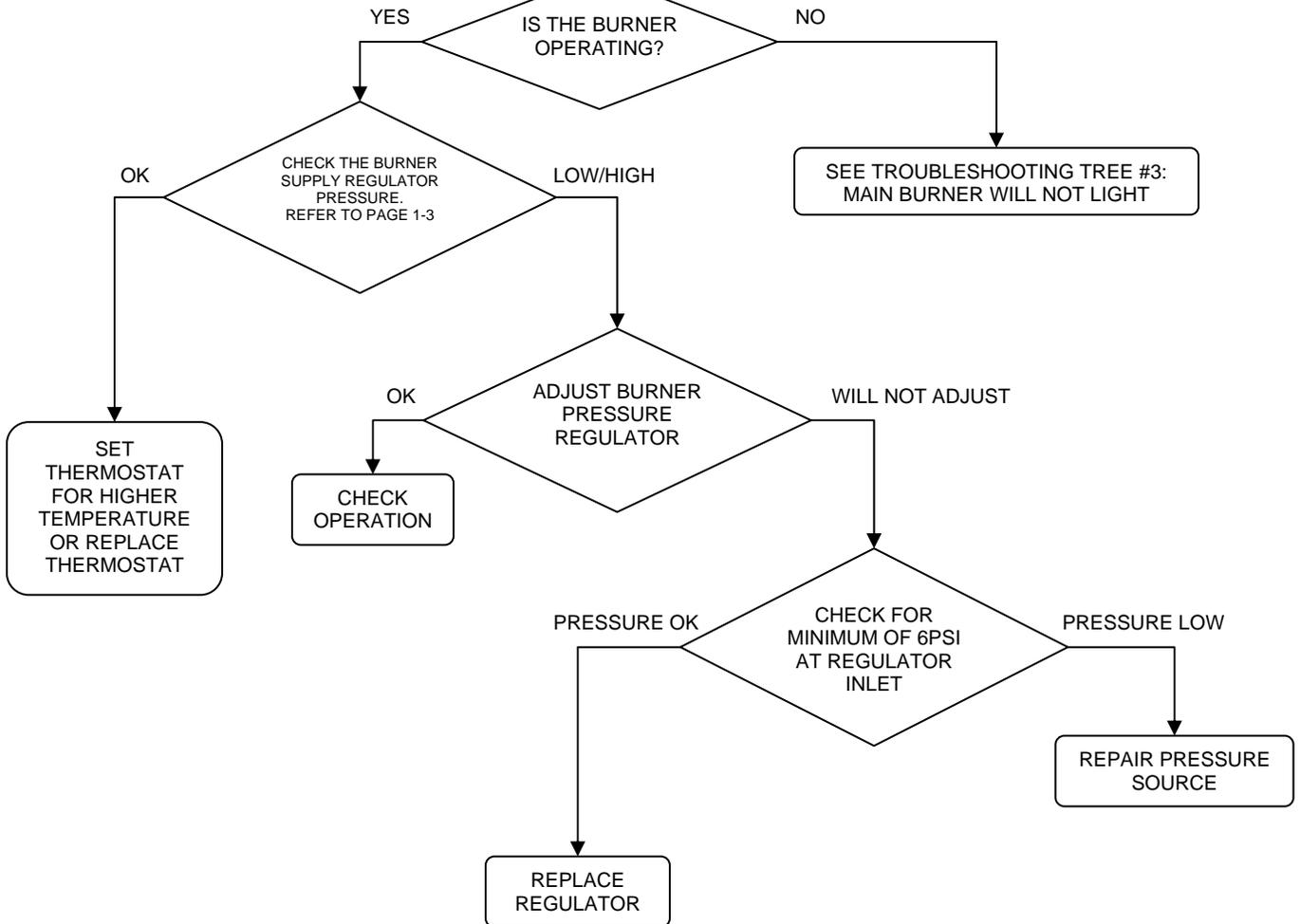






**TROUBLESHOOTING TREE #4
VAPOR SERVICE PRESSURE DROPS**

NOTE: SERVICE PRESSURE WILL DROP IF THE DEMAND EXCEEDS VAPORIZER'S CAPACITY: 160H - 14.6 MBTU/hr. THE FOLLOWING TROUBLESHOOTING TREE ASSUMES THAT THE LOAD ON THE VAPORIZER IS LESS THAN ITS MAXIMUM CAPACITY.



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APPENDIX A

TECHNICAL INFORMATION

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Appendix A

Table 6 – Repair Kits and Other Available Replacement Parts 160H trough 800H

160H trough 800H		
3-0016: Liquid Inlet Valve Repair Kit		
Components	Description	Qty.
3-4165	Valve seat assembly	1
3-4172	Spring	1
40C37	Gasket, liquid inlet valve	1
8135-101	Gasket, pins	2
1501-5002	O-ring	1
9000-25	O-ring	1
3-4156	O-ring	1
3-0017: Capacity Control Valve Repair Kit		
Components	Description	Qty.
40C69	Spring	1
9000-19	O-ring	1
9000-25	O-ring	1
1501-5002	O-ring	1
40449: 160H Pilot Assembly kit		
Components	Description	Qty.
35304	Pilot burner with ¼" spade terminal	1
51846	Reigniter wire with ¼" spade connector, 38" LG.	1
60068	1/4" Lock washer – zinc plated	2
BRA0002-04-2	Bracket, pilot	1
FAS13001-00-3	Hex screw ¼"-20 ½ " LG. , GR 5 – zinc plated	2
FAS28858-00-3	Mach. Screw pan head 8-32 ¼" LG. – zinc plated	2
TER0011-00-3	TRL lug wire 22-18GA – nylon	1
40450: Drip Leg Kit		
Components	Description	Qty.
1508-5020	Thermostat supply tube	1
30040-Z	Nipple SCH 80 ½" NPT 5" LG.	1
30103-Z	Bushing FS #2000 ½" x 3/8" NPT – zinc plated	1
30321-Z	Tee FS 2000# ½" NPT – zinc plated	1
34664-Z	Nipple schedule 80 3/8" NPT 5" LG – zinc plated	1
7405x6x8	90° elbow fitting 3/8" T x ½" MNPT – zinc plated	1
8127-111	Ball valve 3/8"	1
PAR0065-00-3	Straight connector 3/8" T x ½" MNPT – zinc plated	1
PLU0002-00-5	Plug 3/8" FS – zinc plated	1
40466: Master Tubing Kit		
Components	Description	Qty.
40467	160H Capacity Control Valve loading tube kit	1
40468	160H Thermostat supply tube kit	1
40469	160H Pilot supply tube kit	1

Appendix A

40480: Master repair kit		
Components	Description	Qty.
3-0016	Liquid inlet valve repair kit	1
3-0017	Capacity control valve repair kit	1
40449	160H Pilot assembly kit	1
41082	RS to ASDI Thermostat/Thermowell field kit	1
THE0001-00-3	Thermocouple 48" LG.	1
41091: Burner assembly kit without thermocouple and pilot		
Components	Description	Qty.
3-1035	3/8" Brass tee	1
30022-Z	Nipple SCH 80 3/8" NPT 1 1/2" LG – zinc plated	1
30130-Z	Bushing FS 2000# 3/4" x 3/8" NPT – zinc plated	1
30221-Z	Plug 3/8" FS – zinc plated	1
37600	Burner	1
PAR0041-00-3	Connector 3/8" T x 3/8" MNPT – zinc plated	1
34812: Pilot burner orifice		
Components	Description	Qty.
34812	Pilot burner orifice 0.016" LP	1
40475	160H Burner supply tube kit	1
41092: Burner tip kit #69 orifice		
Components	Description	Qty.
JET0001-00-3	Burner jet #69 orifice	32

Liquid inlet valve pin gasket installation procedure

1. Clean pivot screw hole opening from any residue.



2. Apply blue (medium strength) Locktite 243 or Permatex to threads on the liquid inlet valve body or pivot screw.



Appendix A

- Slide pin gasket (P/N 8135-101) over the pivot screw (P/N 3-4169) threads as shown in the picture.



- Screw in pivot screw to the inlet valve body and apply 8 in-lbs of torque (approximately 1/8" full turn).

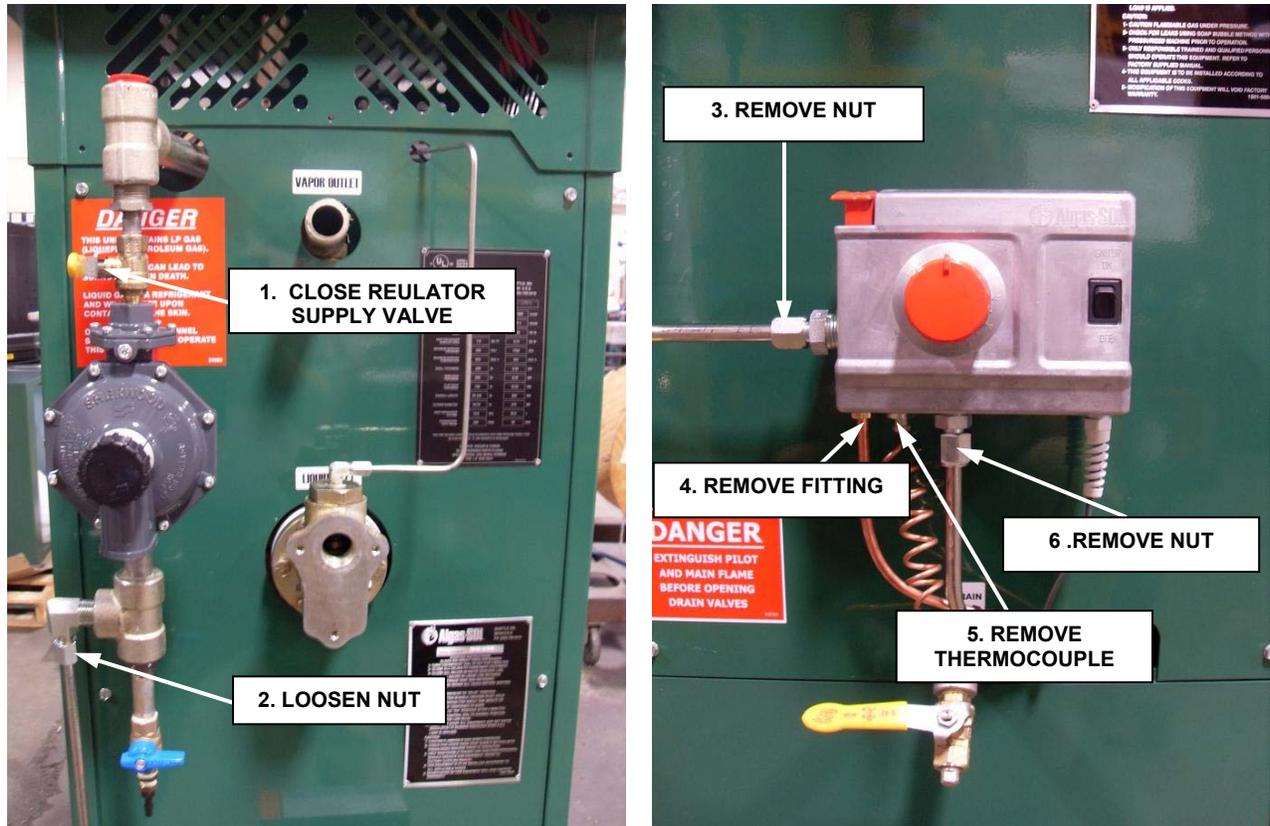


Appendix A



5. Align valve stem with pivot screw and repeat the same step with the pin gasket and pivot screw on the opposite side of the liquid inlet valve.
6. Verify there is no damage to the pin gasket. Set inlet valve assembly aside for an hour to allow locktite to properly dry before reinstalling valve assembly back on the vaporizer.
7. Re-install valve in vaporizer with new flange gasket and uniformly torque bolts to 30-35 ft-lbs.
8. Re-connect sensing line to capacity control valve.
9. After assembly pressurize with 125-150 psig compressed air and apply soap solution or leak detection fluid to both pin gasket areas and to the valve flange area to make sure there are no leaks.

Thermowell leak test procedure



Thermowell leak test procedure:

1. Close regulator supply valve.
2. Allow for burner and pilot to consume any remaining gas in the tubing.
3. Make sure that all the sources of ignition within 50ft are extinguished and that reignitor switch is OFF.
4. Loosen elbow fitting nut to ensure stainless tubing will rotate.
5. Remove nut at fitting on the inlet to the thermostat and rotate stainless steel inlet tubing away from the thermostat.
6. Remove pilot tube fitting at the thermostat and allow for space to rotate thermostat.
7. Remove thermocouple at the thermostat and allow for space to rotate thermostat.
8. Loosen burner supply tube fitting nut, pull out the tubing and allow for space to rotate thermostat.
9. Rotate thermostat counter clockwise while ensuring that thermowell stays attached to the heat exchanger.
10. Remove thermostat from thermowell.
11. Ensure that there is at least 125-150 psig of pressure available within the vaporizer during leak testing.
12. Spray soap and water solution to the inside of the front vaporizer panel opening around thermowell and heat exchanger connection.
13. Use flashlight if necessary to observe for leaks.
14. Repair any leaks before continuing.
15. Repeat leak test to ensure no leaks are present.
16. Reassemble removed parts, open regulator supply valve and leak test tubing connections.
17. It is now safe to start your vaporizer.



Innovative Liquid Vaporizing and Gas Mixing Solutions

WARRANTY REGISTRATION

Type of Equipment: _____ Serial Number: _____
ASDI Sales Order #: _____ Order Date: _____
Purchased By: _____

To help us give you better service, please fill out this warranty registration form and return it to ASDI to register your purchase and for follow up on the performance of ASDI equipment. We are dedicated to producing a quality product and if a problem occurs, ASDI wants to know about it.

Please help us with a small amount of information about your company and how the equipment will be used. When contacting ASDI, please have the type of equipment and the serial number handy so we can give you accurate information. If you have had any kind of problem with this equipment, or you have any comments, please attach a separate sheet to this form. Keep a copy for your records.

End Customer/Company Name: _____
Address: _____ Tel: _____
City: _____ Fax: _____
State: _____ Zip: _____

Name of individual to contact for follow up information: _____
Title: _____

Usage - Circle one: Base Load Standby System Peak Shaving
Other: _____

In what application is the equipment being used? _____
When was the equipment put in service? / / /

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

Appendix A

Algas-SDI International, LLC

151 South Michigan Street

Seattle, Washington, 98108

Ph: 1.206.789.5410

Fax: 1.206.789.5414

www.algas-sdi.com

