Algas-SDI™

ISO 9001 Certified

...Innovative liquid vaporizing and gas mixing solutions

Direct Fired

LP-Gas Vaporizer: 160H trough 800H

Operations & Maintenance Manual

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

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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LISTED

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IMPORTANT WARRANTY NOTICE:

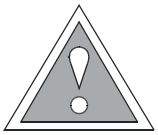
The Algas-SDI warranty period for equipment is 18 months after shipment from our facility or 12 months after installation. See our warranty statement at the beginning of this manual for the complete text. A warranty registration card has been provided with this manual so that you may register the date 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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Appendix A: Technical Information

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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, 2" 5-80 PSIG, Use P/N: 37098, Quantity 1 per unit

Introduction 1

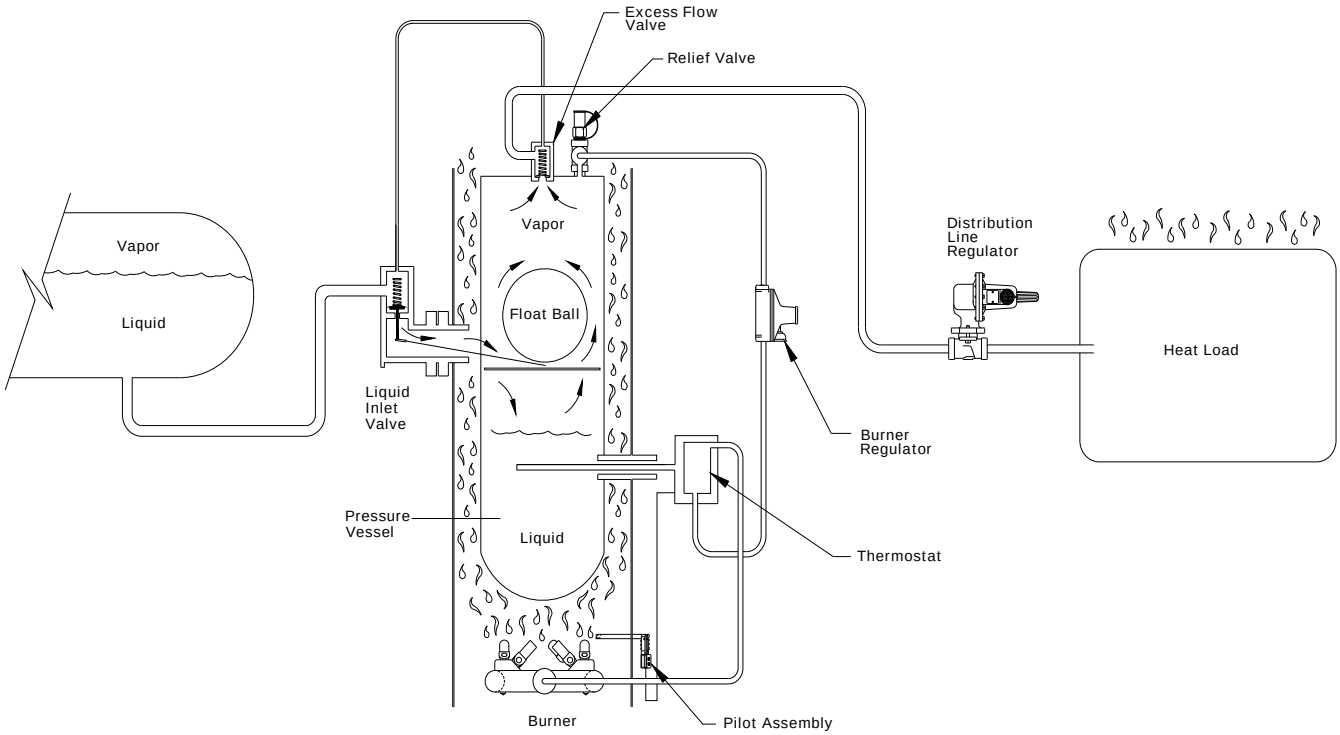
Description/Overview

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:	1000 BTU's per gallon of propane vaporized
THERMOSTAT SUPPLY REGULATOR PRESSURE (BURNER ON):	17.9
THERMOSTAT SUPPLY REGULATOR PRESSURE (BURNER OFF):	19.5
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
** Operating Temperature depends on ambient temperature, thermostat settings, and operating pressures.

Installation 2

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 Flue cap(s) on the top of the unit with the supplied hardware.

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*

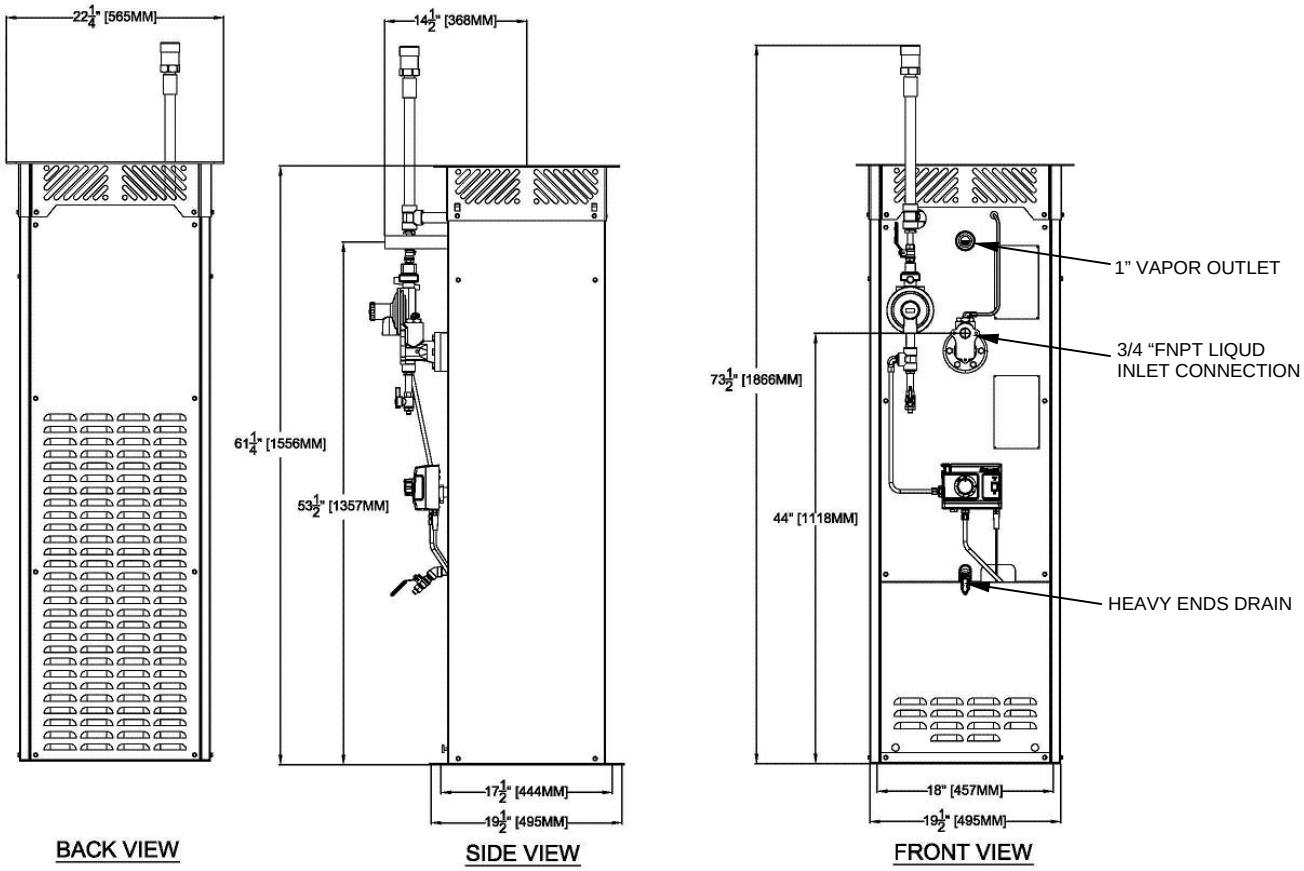
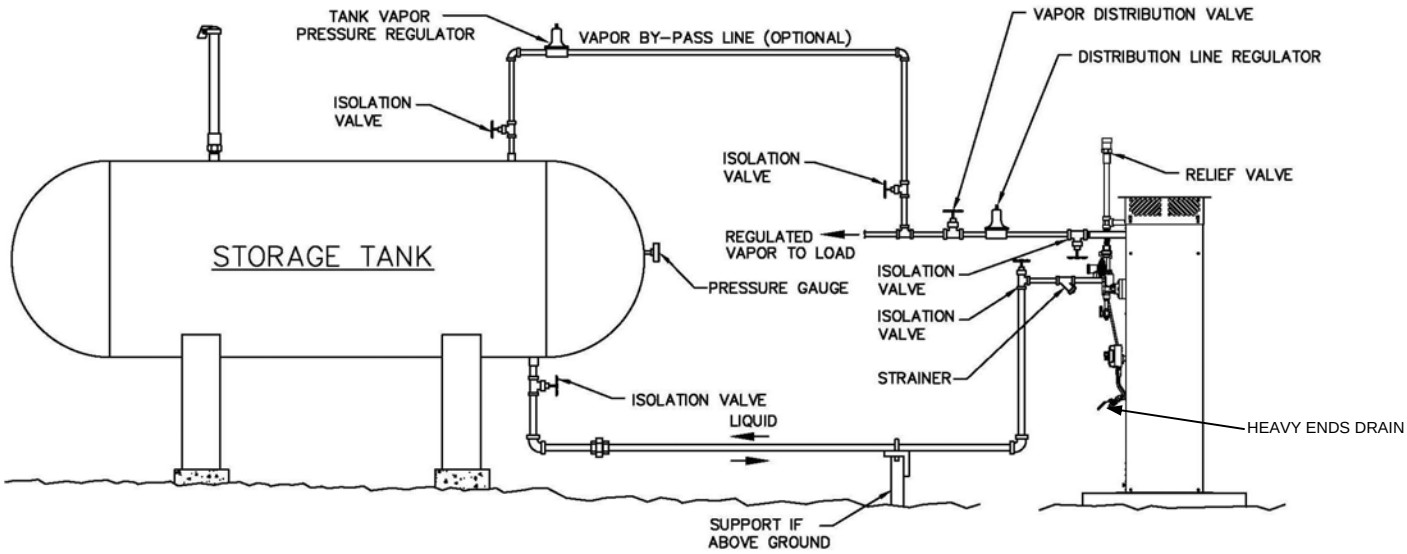


Figure 3 – *Installation – 160H vaporizers*



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.

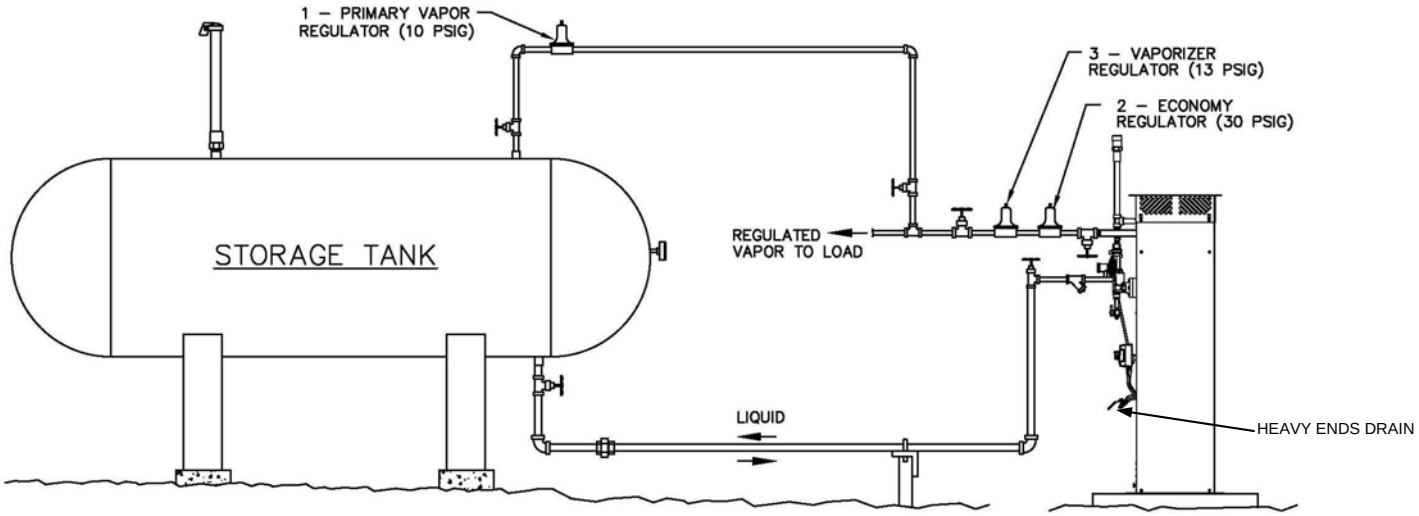
LIQUID PUMP (OPTIONAL)

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.

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.

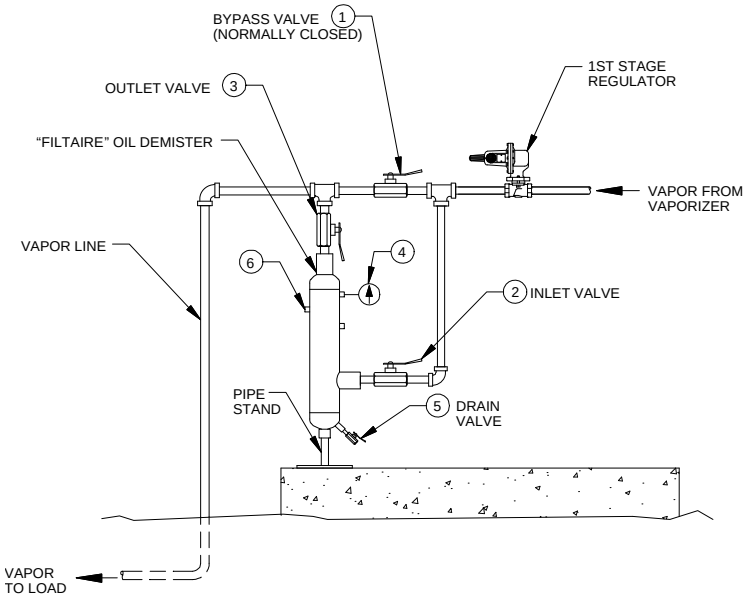
A complete **FILTAIRE** system consists of inlet and outlet connections, a blow-down drain (5), a pressure gauge (4), a vent which is normally plugged (6), and a bypass valve system for cleaning (1, 2, and 3). The bypass valves enable the system to continue operating when the **FILTAIRE** is removed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

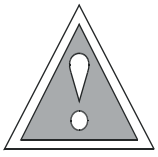


LEAK TEST

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 4-21.

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Operation 3

Starting the Vaporizer

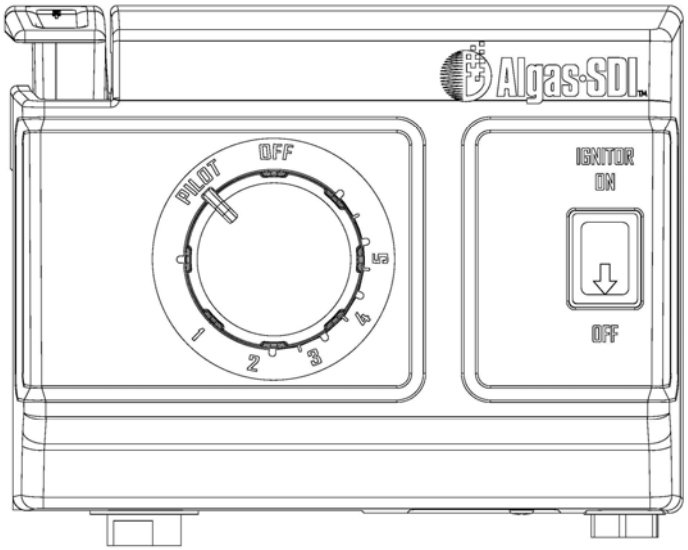
1. Before starting the vaporizer, close the outlet valve in the vapor service line.

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.

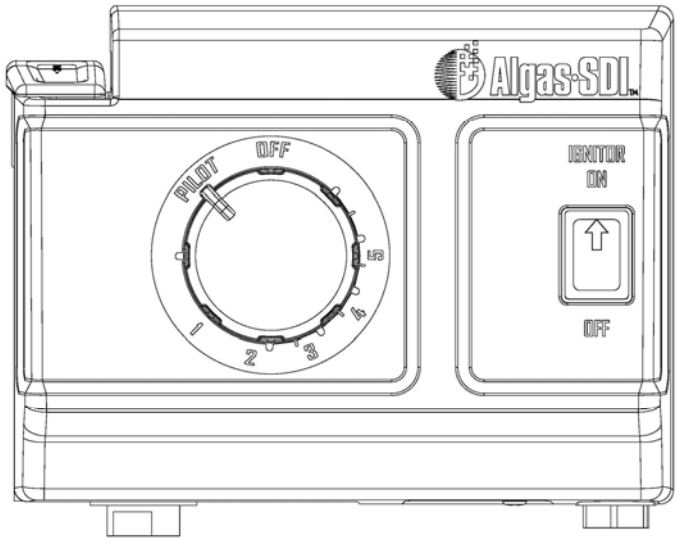
4. Turn the gas control dial on the gas thermostat counter-clockwise to the "PILOT" position.

Figure 6 – *Thermostat gas control dial in "PILOT" position*



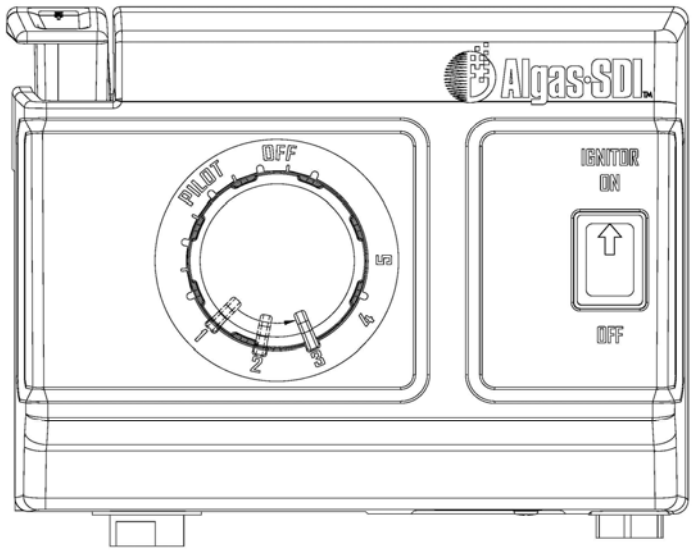
5. Press the pilot button. Turn the igniter switch to "ON". Continue to hold the pilot button for 30 to 60 seconds and release. Pilot should remain lit.

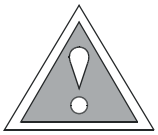
Figure 7 – *Thermostat pilot button pressed down and ignitor switch ON*



6. Turn the gas control dial on the gas thermostat counter-clockwise until the burner comes on. Depending on the ambient temperature, burner will come on while gas control dial is between settings 1 and 5.

Figure 8 – *Rotating gas control dial counter-clockwise to turn the main burner on*





WARNING

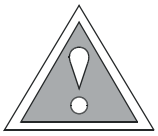
If pilot light goes off after releasing dial, turn control dial to "OFF", wait 5 minutes and repeat step 4.

7. 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.

8. Allow the burner(s) to heat the vaporizer until the main burner cycles off.

9. Make sure all valves on consuming equipment are closed and open the valve in the vapor distribution line. Open all consuming equipment valves.

10. 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 and shut down 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.

Direct Fired Vaporizer shut down & purge procedure

1. Close outlet valve at exit of the vaporizer.

2. Ensure all storage tank valves are open with no restrictions of flow back to the storage tank. A check valve restricting flow back to the storage tank must never be used in a vaporizer installation.

3. Start burner per the instructions in the Operations & Maintenance Manual and turn the thermostat temperature dial to the “5”.

4. After the burner cycles off; turn thermostat knob to the “OFF” position, shut off igniter (if installed) and check the pilot flame is extinguished.

5. After pilot flame is extinguished close tank outlet valve.

6. Now open vaporizer outlet valve and flare or allow attached equipment to consume remaining gas in the line.

7. After verifying the pressure in the lines is zero and no sources of ignition are present in the area, vaporizer can now be disconnected.

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 4

Service and Maintenance

The 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 serviced, the type of service to perform, and the frequency of service. However, this is only a suggested schedule. The conditions in your area and quality of the LP gas liquid may dictate a more stringent maintenance, but whatever your schedule, remember that maintenance is of paramount importance for trouble free operation of the vaporizer. *See Appendix A* for recommended 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 – *Items to be Serviced Monthly*

Items to be Serviced Monthly	Service to Perform:
Strainer	Remove and clean screen. Replace as necessary. In some cases it may be necessary to use some type of cleaner to remove all contaminants.
Pilot Burner Assembly	Inspect pilot assembly. The flame should envelope 3/8" to ½" of the thermocouple tip.
Main Burner Assembly	Inspect for proper flame. Check that air supply openings are clear of debris, dirt or trash. If needed, clean each burner orifice.
Relief Valves	Check all relief valves on vaporizer, liquid and vapor lines for signs of corrosion in outlet. Check all rain caps. Replace if damaged or missing.
Enclosure	Check access door and inside enclosure for debris and combustible material. Check and, if needed, clean the inlet louvers and vent cap(s).
Heavy ends drain	Check heat exchanger for possible heavy ends accumulation. Turn the thermostat to off position, switch off the reigniter and ensure there are no sources of ignition within 25ft. Remove plug from the drain valve and open the valve slowly. After draining heavy ends, close the valve off and re-install the plug. It is now safe to put your vaporizer back in service. NOTE: *In areas with poor gas quality this maintenance procedure might need to be repeated every other week.*

NOTE

Before replacing thermostat, be sure the thermocouple (read while hot) is delivering the proper voltage to the thermostat (13 to 30 millivolts).

Table 4 – *Items to be Serviced Annually*

Items to be Serviced Annually	Service to Perform:
Thermostat	Check thermostat for proper operation *(see Start-up Procedure*). If t thermostat is not operating properly, it should be replaced (thermostat cannot be serviced).
Thermocouple	The electrical output of the thermocouple should be checked with a millivolt meter. The thermocouple (when hot) output should be between 13 and 30 millivolts. A lower than 13 millivolt reading indicates the thermocouple should be replaced.
Liquid Inlet Valve	Remove plug from inlet valve and wipe away debris. Use kit P/N: 3-0016 to replace valve seat, spring and O-ring on plug, o-ring on valve orifice, flange gasket and pin gasket. For proper pin gasket installation procedure and valve installation and test procedure please see Appendix A.
Capacity Control Valve	Disassemble and clean the valve assembly inside of the body. Use kit P/N: 3-0017 to replace the spring and the O-rings on the piston and plug. Use powdered graphite as lubricant around top of the piston. Use grease as lubricant for the O-ring on the valve plug.
Heat Exchanger(s)	Check heat exchanger flue for holes or excessive scale. Remove obstructions and debris if needed. Check heat exchanger bottom head for pitting. Should pitting be in excess of 0.125" (nominal wall thickness 0.375"), remove heat exchanger from service. Ultrasonic thickness tester can be used to determine wall thickness.
Main Burner Assembly	Inspect for proper flame. Check that air supply openings are clear of debris, dirt or trash. If needed, clean each burner orifice. All Direct Fired vaporizers built after October 2002 use #66 orifice burner tips.

CAUTION

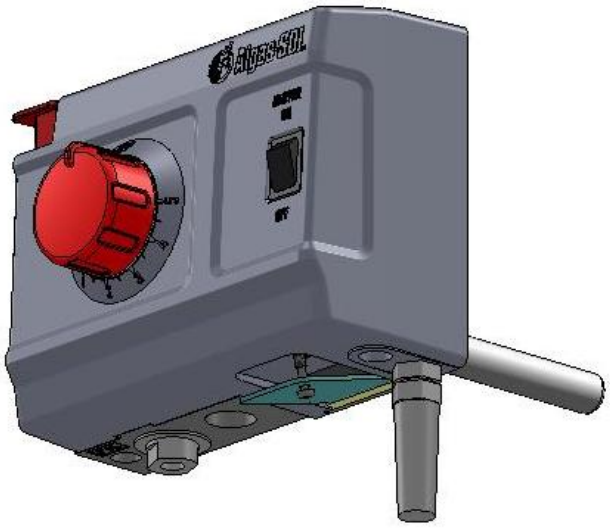
1. ***When servicing a component in the liquid or vapor line, BE SURE that the LP-gas supply is shut off to that component before it is removed or disassembled. The vaporizer must be completely blown down before performing service. Be sure that ALL sources of ignition are extinguished within 25 feet 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.***

Replacing reignitor battery

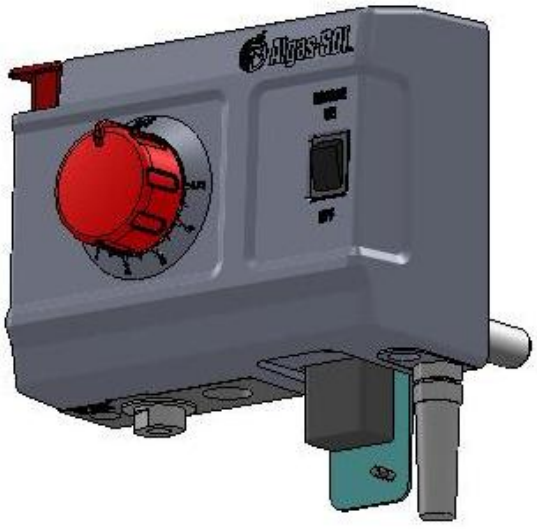
1. Turn the reignitor switch OFF. Use Phillips screwdriver to open the door on the bottom right corner of the thermostat housing.

Figure 9 – *Opening the battery access door*



2. Pull out the battery, disconnect and replace. Push the battery back in the thermostat housing and close the door prior to turning the reignitor switch ON.

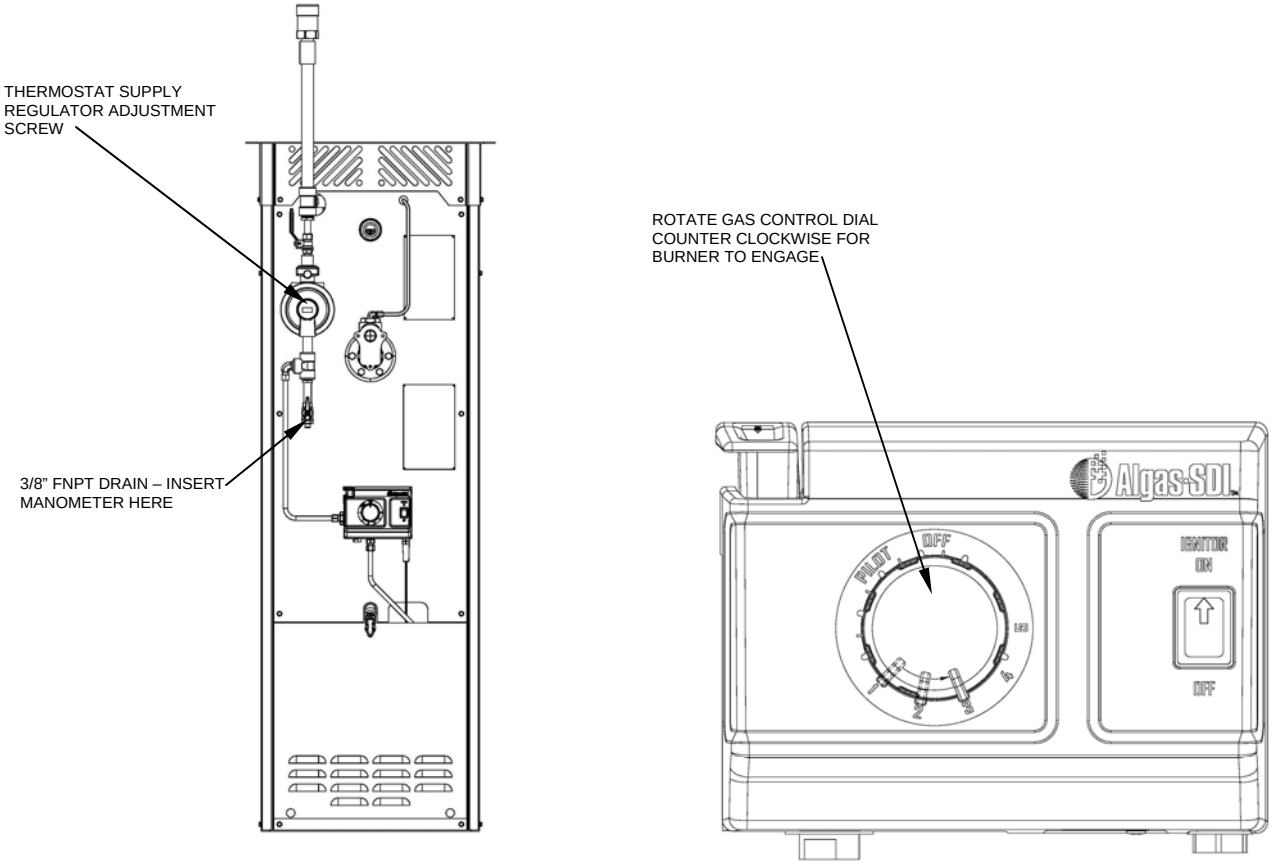
Figure 10 – *Replacing the battery*



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” manometer (or similar pressure indicating device) to the pressure tap port at the bottom of the drip leg. You will have to remove the 3/8” plug and drain the drip leg first.
3. Open the supply valve to the Thermostat Supply Regulator.
4. Establish pilot by turning gas control dial to "PILOT". Push down the "PILOT" button while igniting pilot (hold button down for 30 - 60 seconds). After pilot is established, rotate the gas control dial counter clockwise towards "5" mark position (See Figure 8). The main burner(s) should now engage.
5. With the main burner operating, check the Thermostat Supply Regulator and burner gas pressure using the manometer. For the desired Thermostat Supply Regulator pressure please refer to page 1-3. To adjust the Thermostat Supply Regulator pressure, remove the cap (See Figure 13) and turn the adjustment screw clockwise with a standard screwdriver to increase 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 11 – *Regulator adjustment*



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Troubleshooting 5

1. PILOT - TROUBLESHOOTING TREES #1 & #2

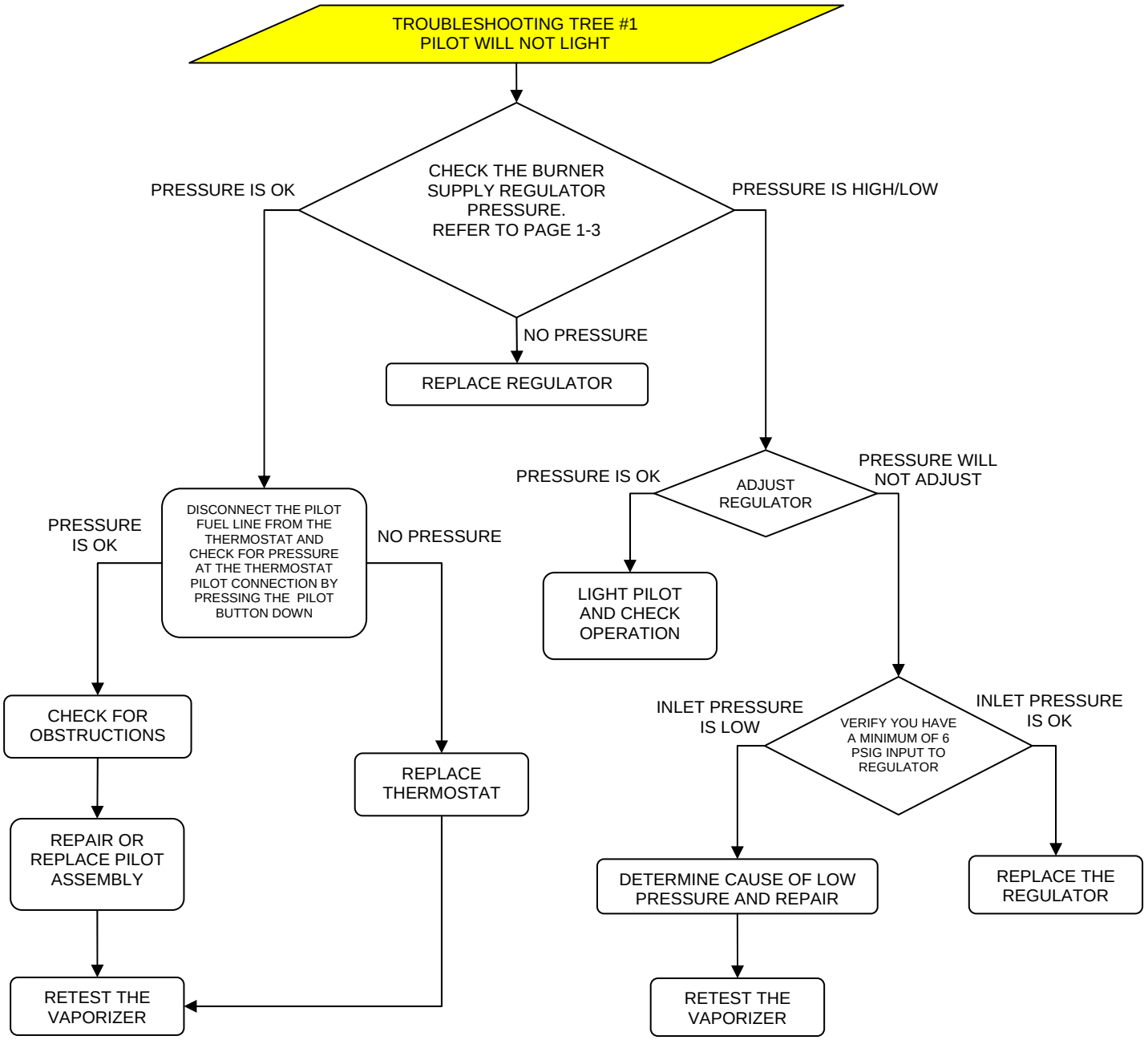
- The pilot flame is adjusted at the factory to provide a non-blowing blue flame. If the flame is not adequate or the pilot does not stay lit, check the pilot burner to see if it is clear of any obstructions.
- Flame should envelope 3/8” to 1/2" of the thermocouple tip. If the pilot flame is too low, 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

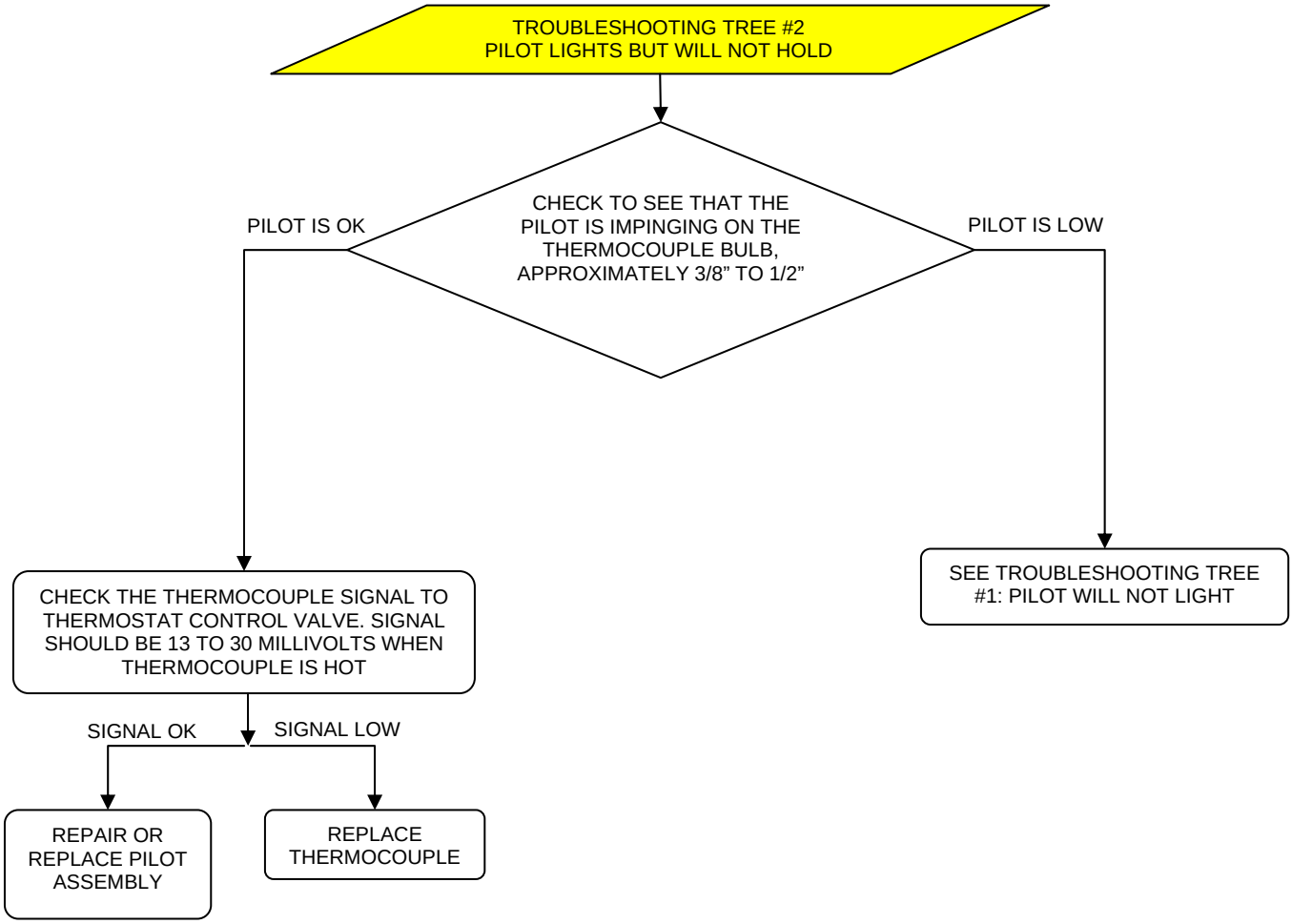
2. MAIN BURNER WILL NOT IGNITE - TROUBLESHOOTING TREE #3

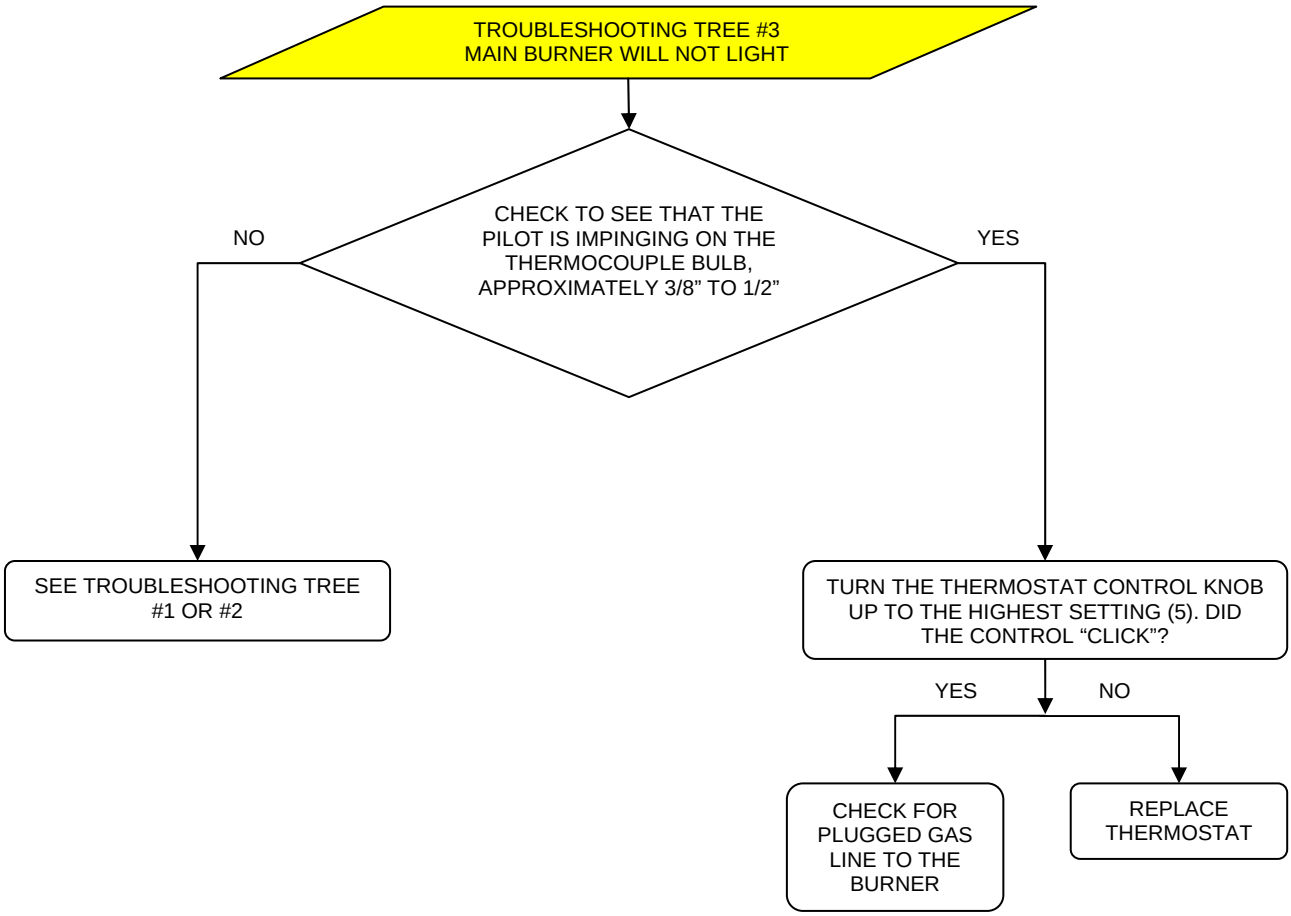
- Check the pilot burner as per 1. above.
- Check burner regulator. Disconnect tube from outlet side of regulator and check output pressure.
- If pilot burner and burner regulator check out OK, the problem is in the thermostat. Replace thermostat (the main burner will not come on unless the temperature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

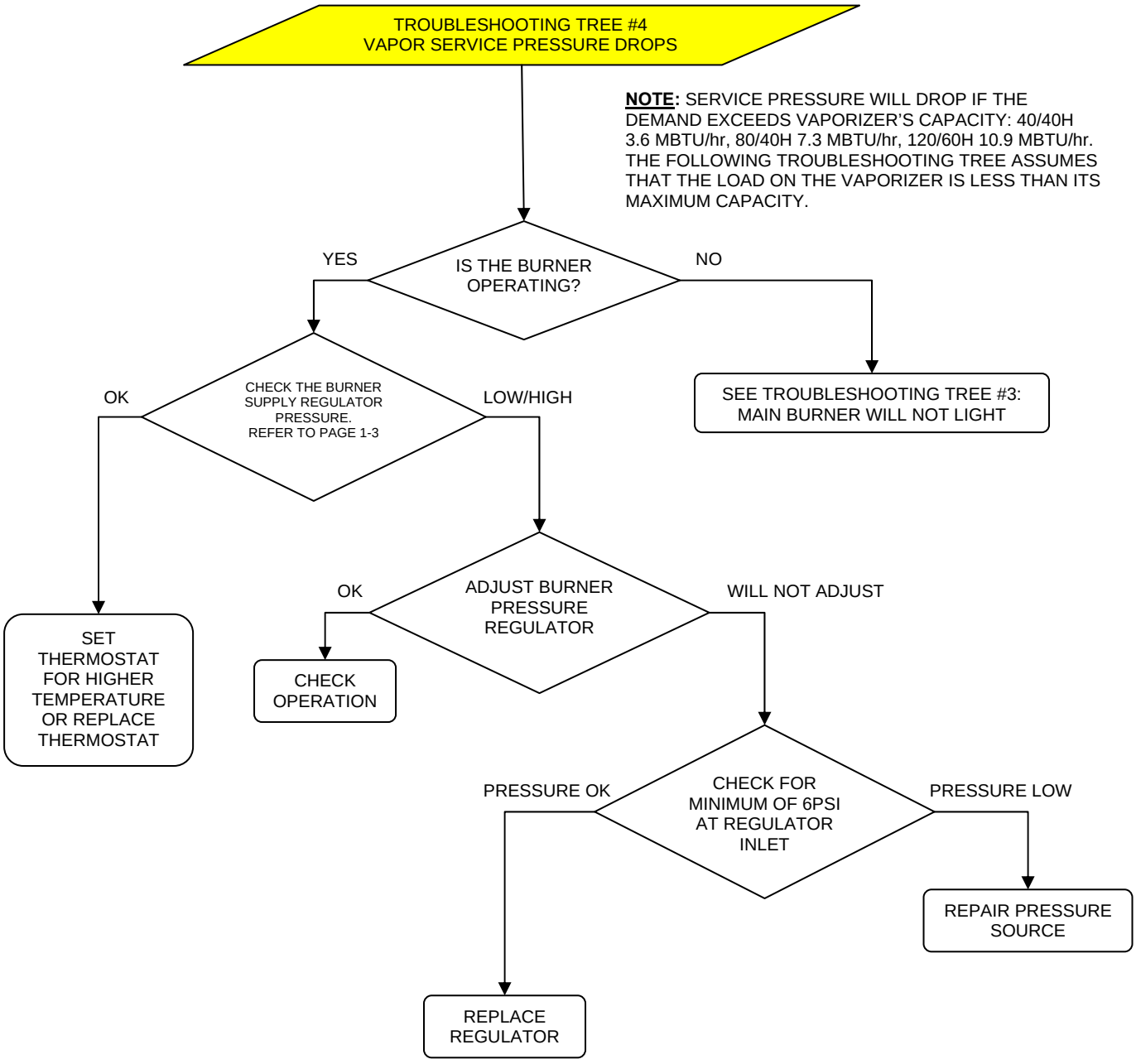
3. IF VAPOR PRESSURE DROPS - TROUBLESHOOTING TREE #4

- 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 #1
PILOT WILL NOT LIGHT
CHECK THE BURNER SUPPLY REGULATOR PRESSURE. REFER TO PAGE 1-3
PRESSURE IS OK
PRESSURE IS HIGH/LOW
NO PRESSURE
REPLACE REGULATOR
DISCONNECT THE PILOT FUEL LINE FROM THE THERMOSTAT AND CHECK FOR PRESSURE AT THE THERMOSTAT PILOT CONNECTION BY PRESSING THE PILOT BUTTON DOWN
PRESSURE IS OK
NO PRESSURE
CHECK FOR OBSTRUCTIONS
REPAIR OR REPLACE PILOT ASSEMBLY
RETEST THE VAPORIZER
REPLACE THERMOSTAT
ADJUST REGULATOR
PRESSURE IS OK
PRESSURE WILL NOT ADJUST
LIGHT PILOT AND CHECK OPERATION
VERIFY YOU HAVE A MINIMUM OF 6 PSIG INPUT TO REGULATOR
INLET PRESSURE IS LOW
INLET PRESSURE IS OK
DETERMINE CAUSE OF LOW PRESSURE AND REPAIR
RETEST THE VAPORIZER
REPLACE THE REGULATOR


TROUBLESHOOTING TREE #2
PILOT LIGHTS BUT WILL NOT HOLD
CHECK TO SEE THAT THE PILOT IS IMPINGING ON THE THERMOCOUPLE BULB, APPROXIMATELY 3/8" TO 1/2"
PILOT IS OK
PILOT IS LOW
CHECK THE THERMOCOUPLE SIGNAL TO THERMOSTAT CONTROL VALVE. SIGNAL SHOULD BE 13 TO 30 MILLIVOLTS WHEN THERMOCOUPLE IS HOT
SEE TROUBLESHOOTING TREE #1: PILOT WILL NOT LIGHT
SIGNAL OK
SIGNAL LOW
REPAIR OR REPLACE PILOT ASSEMBLY
REPLACE THERMOCOUPLE


TROUBLESHOOTING TREE #3
MAIN BURNER WILL NOT LIGHT
CHECK TO SEE THAT THE PILOT IS IMPINGING ON THE THERMOCOUPLE BULB, APPROXIMATELY 3/8" TO 1/2"
NO
YES
SEE TROUBLESHOOTING TREE #1 OR #2
TURN THE THERMOSTAT CONTROL KNOB UP TO THE HIGHEST SETTING (5). DID THE CONTROL "CLICK"?
YES
NO
CHECK FOR PLUGGED GAS LINE TO THE BURNER
REPLACE THERMOSTAT


TROUBLESHOOTING TREE #4
VAPOR SERVICE PRESSURE DROPS
NOTE: SERVICE PRESSURE WILL DROP IF THE DEMAND EXCEEDS VAPORIZER'S CAPACITY: 40/40H 3.6 MBTU/hr, 80/40H 7.3 MBTU/hr, 120/60H 10.9 MBTU/hr. THE FOLLOWING TROUBLESHOOTING TREE ASSUMES THAT THE LOAD ON THE VAPORIZER IS LESS THAN ITS MAXIMUM CAPACITY.
IS THE BURNER OPERATING?
YES
NO
SEE TROUBLESHOOTING TREE #3: MAIN BURNER WILL NOT LIGHT
CHECK THE BURNER SUPPLY REGULATOR PRESSURE. REFER TO PAGE 1-3
OK
LOW/HIGH
SET THERMOSTAT FOR HIGHER TEMPERATURE OR REPLACE THERMOSTAT
ADJUST BURNER PRESSURE REGULATOR
OK
WILL NOT ADJUST
CHECK OPERATION
CHECK FOR MINIMUM OF 6PSI AT REGULATOR INLET
PRESSURE OK
PRESSURE LOW
REPAIR PRESSURE SOURCE
REPLACE REGULATOR

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APPENDIX A

TECHNICAL INFORMATION

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

160H

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

3-0017: Capacity Control Valve Repair Kit

Components	Description	Qty.
40C69	Spring	1
9000-19	O-ring	2
1501-5002	O-ring	1

40405: Pilot Assembly Kit

Components	Description	Qty.
3-0641	Pilot burner	1
8034-103	Nut, Keps, #10-32	2
60031	Screw, pan head, Phillips, 10-32 X 1" LG.	2
60777	Washer, Flat, #10-32	2

40406: Drip Leg Kit

Components	Description	Qty.
30321	3/8” brass tee	1
37062	Connector, male 3/8"T x 1/2" MNPT brass, elbow	3
3-1042	Connector, male 3/8"T x 1/2" MNPT brass, straight	1
30024	Nipple, 3/8" NPT x 2-1/2" long	1
8008-203	Plug, 3/8” 300#	1
8127-111	Valve, ball 3/8”	1
30046	Nipple, 1/2" NPT x 2 1/2” long	1

40407: Tubing Kit

Components	Description	Qty.
40408	Burner Regulator Supply Tube Kit 160H	1
40409	Pilot Supply Tube Kit 160H	1
40414	Capacity Control Valve Tube Kit 160H	1
40406	Drip Leg Kit 160H	1
40413	Burner Supply Tube Kit 160H	1

40419: Repair Kit		
Components	**Description**	**Qty.**
40415	Repair kit, pilot & thermocouple 160H	1
3-0016	Repair kit, liquid inlet valve	1
40420	Repair kit, capacity control valve	1
40405	Pilot assembly kit 160H	1
40416	Thermostat/Thermowell kit	1

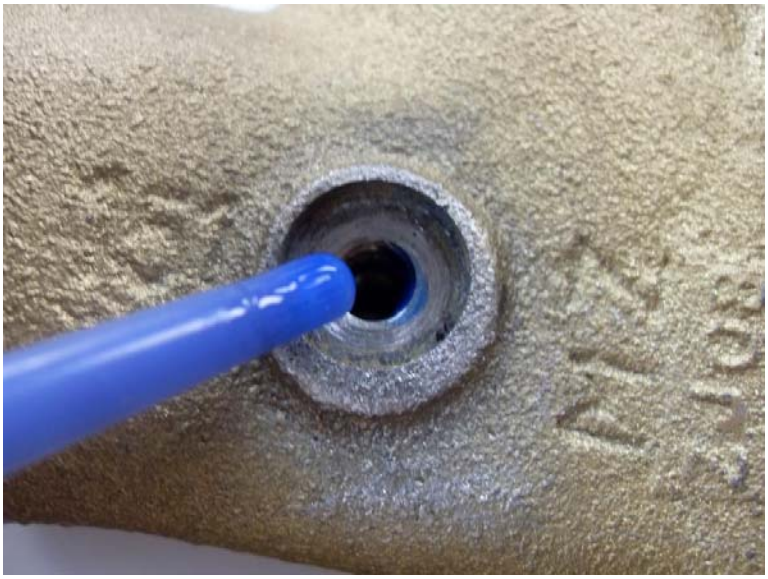
40415: Thermocouple and Pilot Orifice Kit		
Components	**Description**	**Qty.**
37510	Orifice pilot burner 160H	1
37058	Thermocouple for 160H	1

40418: Master Rebuild Kit		
Components	**Description**	**Qty.**
40419	Repair kit 160H	1
33581	Burner tips	10
8151-102A	Regulator, w/brass piston 14-18” WC	1

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.



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

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

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.

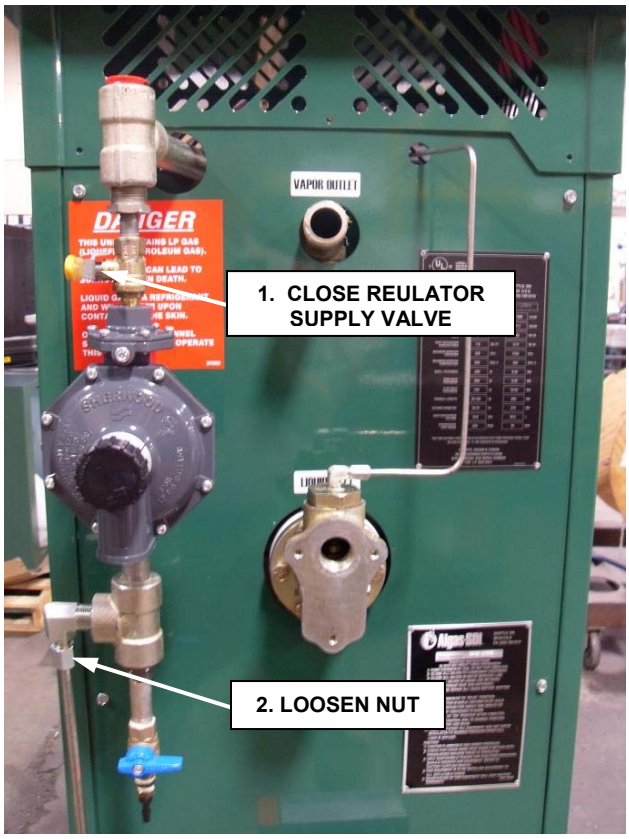
6. Verify there is no damage to the pin gasket. Set inlet valve assembly aside for an hour to allow locktite to properly dry before reinstalling valve assembly back on the vaporizer.

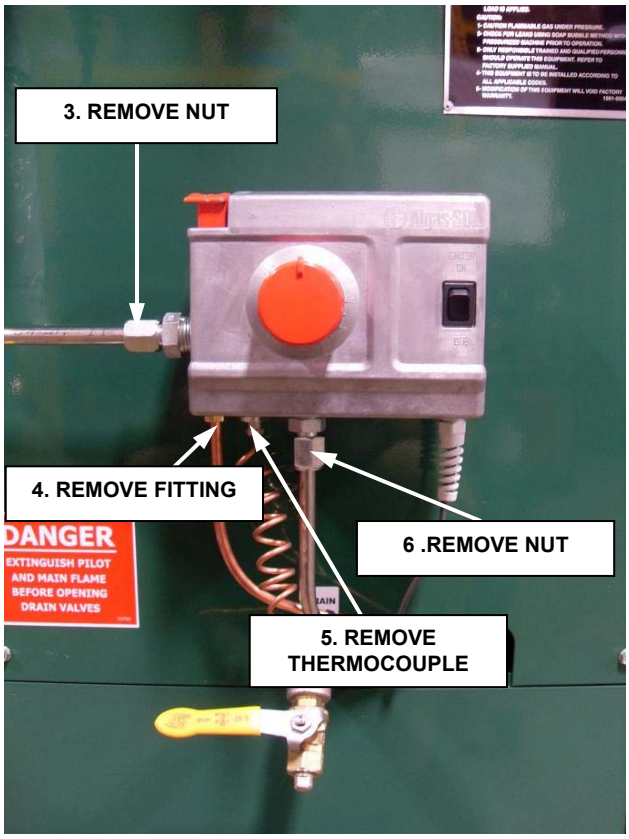
7. Re-install valve in vaporizer with new flange gasket and uniformly torque bolts to 30-35 ft-lbs.

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.

Appendix A

Appendix A

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