



ISO 9001
Certified

...Innovative liquid vaporizing and gas mixing solutions

Direct Fired

LP-Gas Vaporizer: 160H - 800H

Operations & Maintenance Manual

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

FILE: MANUAL PN 54000 rev 11-17-22

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.

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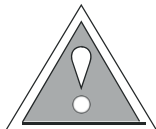
APPROVALS



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.

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Direct Fired Vaporizer Options

Electronic Auto Re-igniter

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

See Page 3-15 for Details

FILTAIRE™ Contaminant Separator

A contaminant separator is recommended for all Direct Fired Vaporizer installations. To properly size the FILTAIRE™ contact Algas-SDI with total connected load and high pressure (first stage) regulator setting.

See Page 2-8 for Details

Economy Valve Kit

Economy Valve Kit P/N: 41051, Quantity 1 per unit

See Page 2-9 for Details

Inlet and Outlet Isolation Valves

3/4" inlet valve use P/N: 33803, Quantity 1 per unit

1" outlet valve use P/N: 33804, Quantity 1 per unit

Pipeaway Adapter

Pipeaway Adapter 3/4", P/N: 34877, Quantity 1 per unit

1st Stage Regulator

1" 5-20 PSIG (0.35-1.4 bar), Use P/N 33725, Quantity 1 per unit

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

Introduction

1

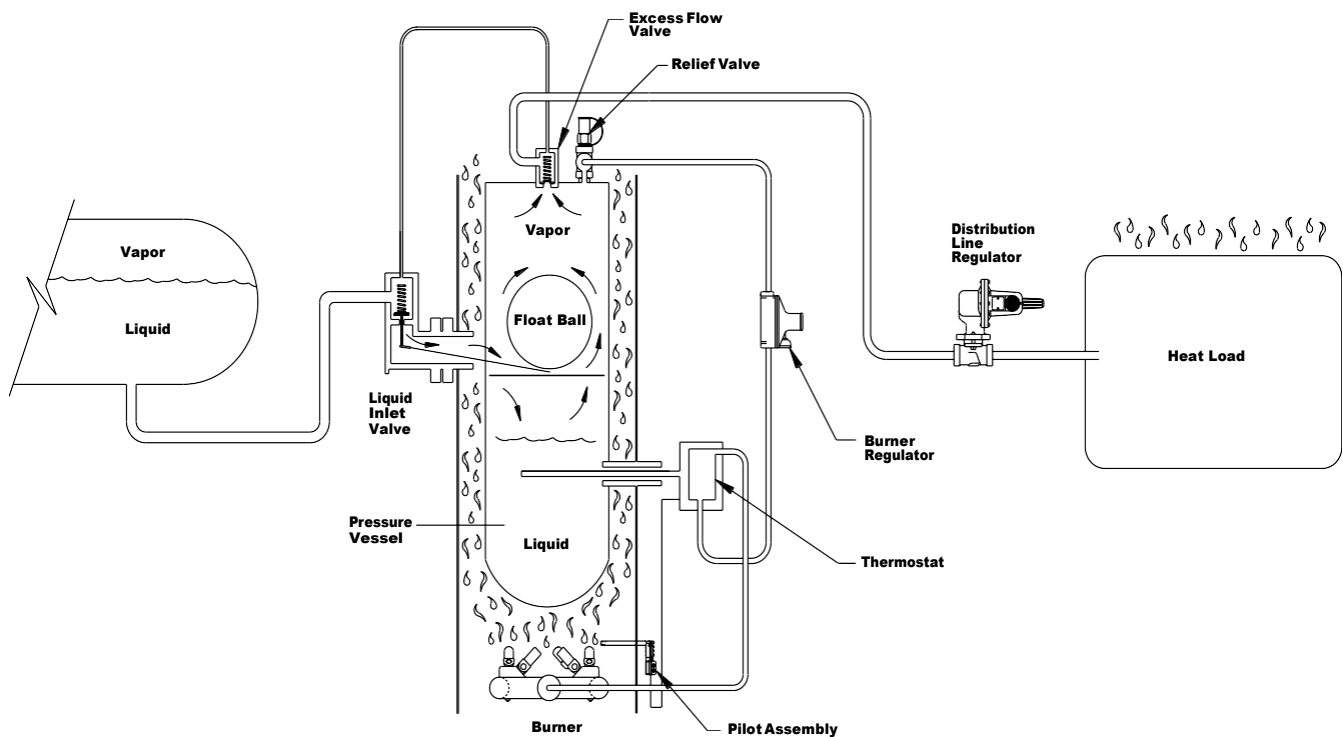
Description/Overview

Algas-SDI is an ISO 9001 registered company. Direct Fire Vaporizers are manufactured under strict accordance with ASME, UL and PED requirements and carry 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
- Burner 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 heat 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 heat 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 heat exchanger will contain a very small amount of liquid. The only time the heat 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 heat exchanger to the maximum capacity of the vaporizer.

The capacity control valve is a spring-loaded valve mounted on the outlet of the heat exchanger. Liquid LP gas is supplied to the top of the valve and vapor from the heat 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

176,900 BTU/hr (51.8 kW) per burner

GAS CONSUMPTION: Approximately 1,000 BTU/hr (0.3 kW) per gallon (3.79 liters) of propane vaporized

TOTAL BURNER INPUT

160H: 176,900 BTU/hr (51.8 kW)

320H: 353,800 BTU/hr (103.6 kW)

480H: 530,700 BTU/hr (155.4 kW)

640H: 707,600 BTU/hr (207.2 kW)

800H: 884,500 BTU/hr (259.0 kW)

THERMOSTAT SUPPLY REGULATOR PRESSURE*: 15-18" W.C. (37.3 – 44.8 mbar)

BURNER PRESSURE:** 9" W.C. (22.4 mbar)

PILOT BURNER: 2,200 BTU/hr (0.64 kW)

NOMINAL OPERATING TEMPERATURE*:** 140 to 160 °F (60 to 71°C)

* 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. (22.4 mbar) at the burner. See "Adjusting burner input pressure" on page 4-21.

** Burner pressure measured at the burner pressure test port. See "Adjusting burner input pressure" on page 4-21.

*** 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 piping should be installed such that the first stage regulator is placed higher than the vaporizer outlet. This allows 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 the vaporizer inspect package for any damage that may have occurred during shipping. Carefully open package, inspect unit for damage, and remove all plastic shipping material and wood shipping base 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 pipe away and regulator relief pipe away 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

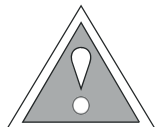
Exposure	Minimum Distance From Vaporizer Required
Storage Tank	10 feet (3 m)
Storage tank shutoff valves	15 feet (4.6 m)
Point of transfer	15 feet (4.6 m)
Nearest important building or group of buildings or line of adjoining property which may be built upon (except buildings in which vaporizer is installed).	25 feet (7.6 m)

Reference NFPA58



CAUTION

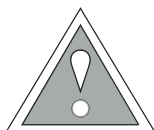
The entire installation must be leak tested prior to operating the system.



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.

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. Ahead of the vaporizer inlet, install a 60-mesh strainer of equivalent size to that of the vaporizer inlet connection.
2. Install a UL listed shut-off valve with a Minimum 250psi (17.24 bar) 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.

LIQUID SUPPLY LINE (see Figure 3)

The liquid supply line should be adequately sized for the service.

Table 2 – Recommended Liquid Supply Line Size (Nominal Pipe Size)

Liquid Line Length Ft. (m)	Up to 50 (15)	50-150 (15-36)	150-250 (36-76)
160H Vaporizers	1" (DN25)	1-1/4" (DN 32)	1-1/2" (DN40)
320H Vaporizers	1-1/4" (DN 32)	1-1/2" (DN40)	2" (DN50)
480H Vaporizers	1-1/4" (DN 32)	1-1/2" (DN40)	2" (DN50)
640H Vaporizers	2" (DN50)	2" (DN50)	2" (DN50)
800H Vaporizers	2" (DN50)	2" (DN50)	2" (DN50)

VAPOR DISTRIBUTION LINE (see Figure 3)

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

Table 3 – Recommended Vapor Distribution Line Size (Nominal Pipe Size)

Gas Line Length Ft. (m)	Up to 50 (15)	50-150 (15-36)	150-250 (36-76)
160H Vaporizers	1-1/4" (DN 32)	1-1/2" (DN40)	2" (DN50)
320H Vaporizers	1-1/4" (DN 32)	1-1/2" (DN40)	2" (DN50)
480H Vaporizers	1-1/4" (DN 32)	1-1/2" (DN40)	2" (DN50)
640H Vaporizers	1-1/2" (DN40)	2" (DN50)	3" (DN80)
800H Vaporizers	1-1/2" (DN40)	2" (DN50)	3" (DN80)

1. Install a UL listed shut-off valve with a Minimum 250 PSIG (17.24 bar) gas pressure rating.
2. Install a 0-300 PSIG (0-20.7 bar) pressure gauge (or provisions for one) ahead of the 1st stage regulator.
3. Install the first stage regulator as close to the vaporizer as possible, but not further than 24" (0.6 m) from the outlet of the vaporizer. The outlet pressure of the regulator should be set at 4 to 6 PSIG (0.3 to 0.4 bar) 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 PSIG (0.7 bar) above the first stage regulator delivery pressure.

VAPOR BYPASS LINE (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 (0.14 to 0.3 bar) 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.
3. Although vapor bypass line is not required for proper operation, it is recommended for all installations.

BURNER REGULATOR SUPPLY LINE (OPTIONAL)

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 1/4" line at the burner regulator inlet.
2. Disconnect the 1/4" line at the tee on top of the heat exchanger and plug it with 1/4 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).

LIQUID PUMP (OPTIONAL)

The liquid pressure to the inlet of the vaporizer must be a minimum of 6 PSIG (0.4 bar) 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. For the Economy Valve field installation kit, use P/N 41051. The valve modulates open and closed as the tank pressure rises and falls. The Economy Valve is a mechanical device and requires no electricity to operate. Make sure the Economy Valve is correctly installed. Verify the flow direction on the rating plate during installation. Contact Algas-SDI for set-point information.

CONTAMINANT SEPARATOR – FILTAIRE (OPTIONAL)

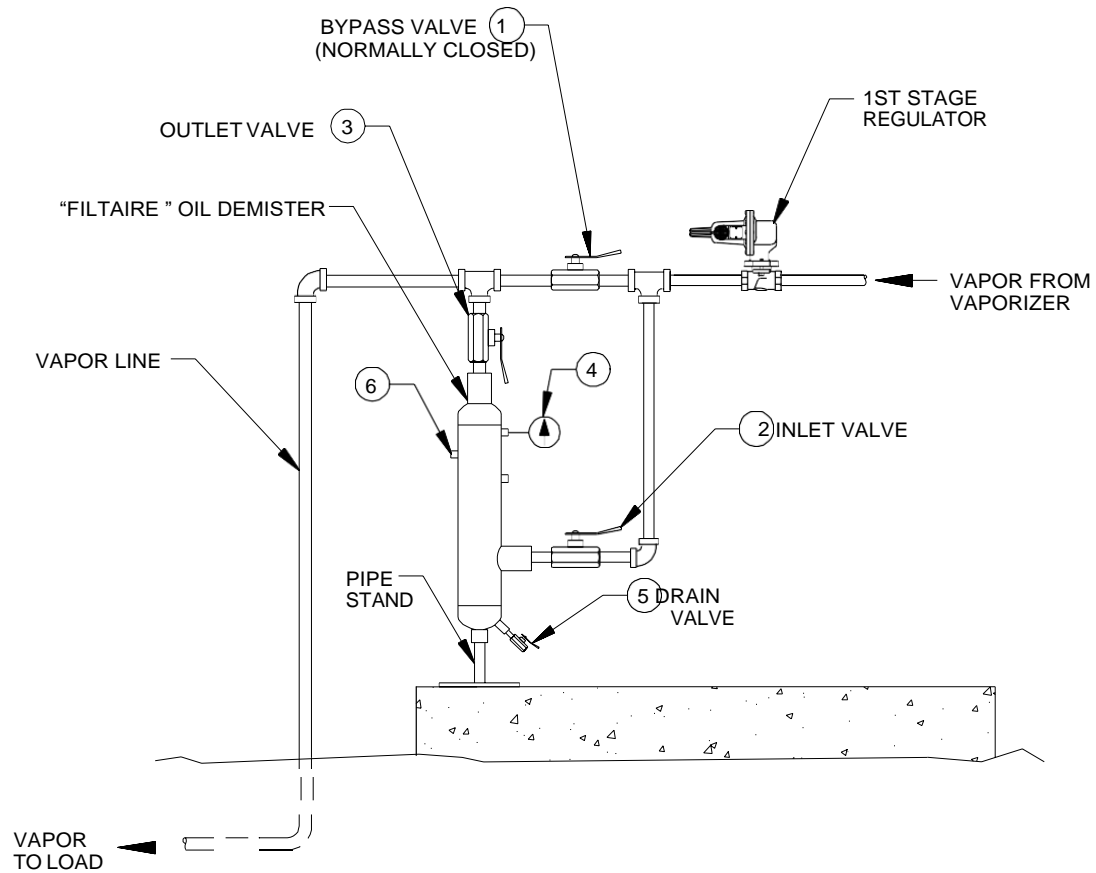
FILTAIRE™ is a filtering device designed to trap heavy hydrocarbons commonly present in LPG gas vapor. It also traps other materials, which may be in the gas due to storage conditions and internal condition of the equipment.

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 4).

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

Figure 4 – Filtaire Operation



To properly size the **FILTAIRE™** contact Algas-SDI with total connected load and high pressure (first stage) regulator setting.

ENCLOSURE AIR REQUIREMENTS

If vaporizer must be housed inside an enclosure or other enclosed area, the following requirements for fresh air intake and exhaust outlet must be met. Failure to do so will result in improper operation and damage to the equipment.

Table 4 – Cross-Sectional Inlet/Outlet Air Requirements

Vaporizer	Inlet Air, Louver Area in ² (cm ²)	Outlet Exhaust, Flue Annular Area in ² (cm ²)
160H	89 (574)	27 (174)
320H	177 (1142)	54 (348)
480H	265 (1710)	82 (529)
640H	354 (2284)	109 (703)
800H	442 (2852)	136 (877)

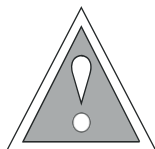
LEAK TEST



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 BURNER INPUT PRESSURES

See “Adjusting burner input pressure” page 4-21.

Installation Safety Requirements



NOTE

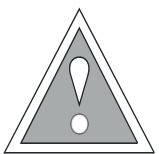
Burner supply regulator 1st and 2nd stage vents shall be piped away from vaporizer if required by local codes and regulations, or when installed in a building, enclosure, or other situation with potential to accumulate flammable gases.

Ensure that vent piping is adequately supported to prevent damage to regulator. Reference equipment drawing for vent location and thread size. Always pipe away regulator vents to a safe location with no source of ignition. Ensure vents are not blocked with debris.



NOTE

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



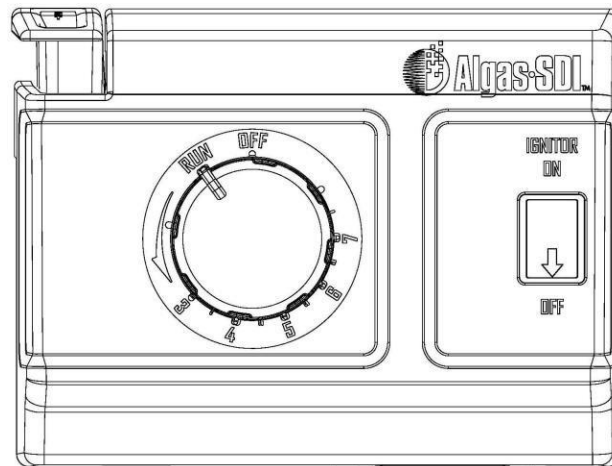
NOTE

Pressure relief valve discharge on direct fired vaporizers shall be piped to a point outside the structure or a building and shall point vertically upwards and be unobstructed.

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 burner supply regulator.
4. Turn the temperature control dial on the thermostatic gas control valve counterclockwise to the "RUN" position. "RUN" position indicates that the pilot and main burner can start operating.

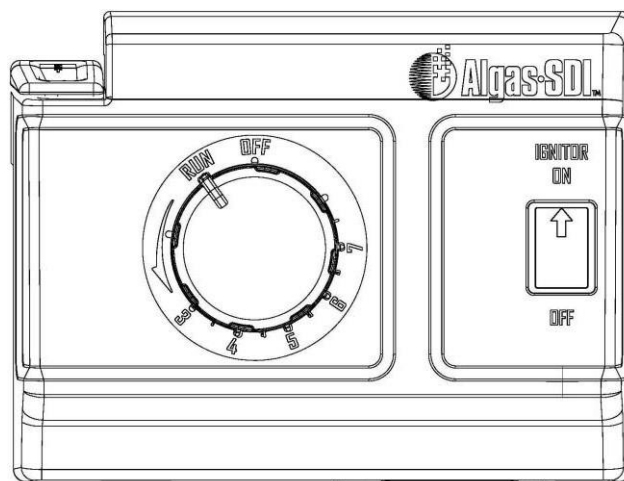
Figure 5 – Temperature control dial in "RUN" position



5. Turn the reigniter switch to "ON" and press the pilot button down (see Figure 6). 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 thermostatic gas valve.

Figure 6 – Pilot button pressed down and ignitor switch ON



WARNING

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

6. Set temperature control dial to 7. This will cause burner(s) to 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.

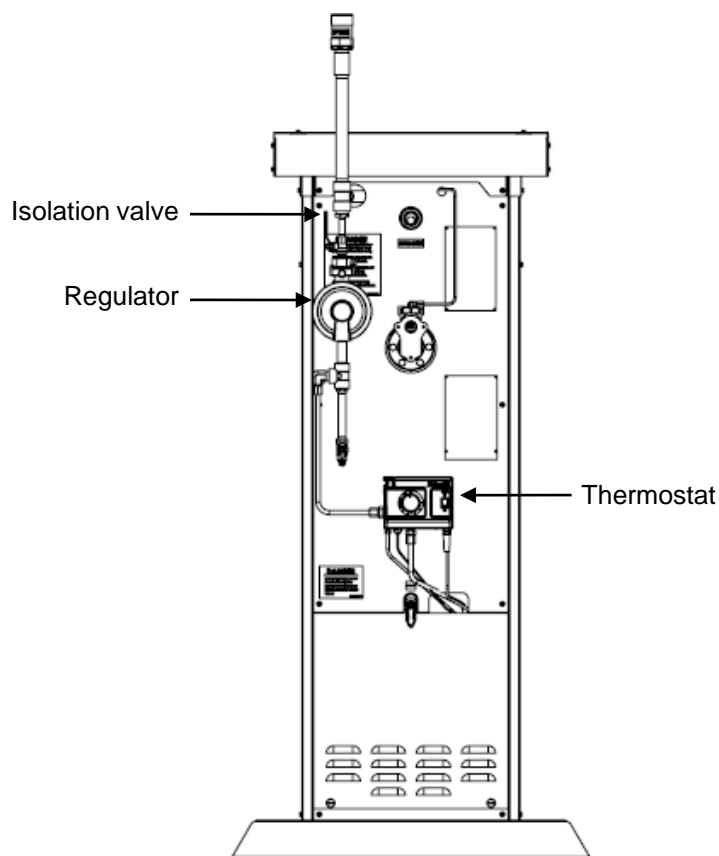
Direct Fired Vaporizer setpoint adjustment

Set the temperature control dial to setpoint 7. If a lower setpoint is desired, contact Algas-SDI for evaluation of suitability for the given installation.

Direct Fired Vaporizer shut down procedure (See Figure 7)

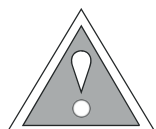
1. Turn temperature control dial to “OFF” position. Pilot flame should immediately extinguish.
2. Once the pilot flame has extinguished turn the igniter switch to “OFF”.
3. Close the isolation valve ahead of the burner regulator on the side of the vaporizer. This will prevent any fuel from going downstream to the thermostat, pilot and main burner.

Figure 7 – 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. Ensure all 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.**
2. Close outlet shut-off valve at the exit of the vaporizer.
3. Start burner per Direct Fired Vaporizer startup procedure and turn the thermostat temperature control dial to the highest setpoint (7).
4. After the burner cycles off, turn thermostat temperature control dial to OFF position, shut off reigniter (if installed) and check that the pilot flame is extinguished.
5. After the pilot flame is extinguished, close shut off valve prior to the vaporizer in the liquid line.
6. Now open vaporizer outlet valve and flare or allow attached equipment to consume the 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, the 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 1/8" (3 mm) from the electrode tip to the grounded surface of the pilot. 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.

Maintenance Recommendations

Direct Fired Vaporizers are designed for trouble free and safe operation. Because of the nature of their use, and the severe duty they receive, it is important to provide scheduled maintenance. The maintenance schedule, type and frequency, provided in this manual is the minimum maintenance required for proper and safe operation of your vaporizer. Ambient conditions surrounding the vaporizer installation and LPG quality may require a more frequent maintenance schedule. A list of spare parts and repair kits for proper maintenance is located in the Appendix section of this manual.

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.

CAUTION



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 (7.6 m) of the work area.

When flaring the contents of the vaporizer, be sure that the burners are on to prevent freezing during the flaring operation.

Table 5 – Initial Installation & Operation Inspections

Required 30-60 days after initial installation	
Component	Action Required
Inlet Strainer	Inspect strainer and remove accumulated debris. NOTE: if debris accumulation is heavy check every 3-6 months or more frequent as required.
Main Burner Assembly	Check orifices and air supply openings on the burner tips for debris or foreign objects. If needed clean any plugged or obstructed orifices before restarting the vaporizer. NOTE: In some applications the vaporizer may be installed in an environment where excessive amounts of dust or debris are present. When the vaporizer is located in this type of an environment, it may be necessary to check the burner tips on a frequent basis to ensure proper operation and capacity of the vaporizer.
Drip Leg	Check the vaporizer drip leg, and any others present in the installation, for heavy ends and oil build-up. If present, first ensure there are no sources of ignition within 25 feet (7.6 m), and then drain heavy ends. NOTE: In areas where LPG quality is poor it may be necessary for drip legs 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 is accumulating during vaporizer operation, this maintenance can be performed on an annual basis.

Table 6 – Annual Maintenance Requirements

Annual Maintenance Items	
Strainer	Remove the plug and clean the screen. Replace screen if tears or holes are present (40 – 80 Mesh). 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 counterclockwise 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 multimeter. The thermocouple output (when hot) should be 13 - 30 mV DC. Lower than 13 mV DC 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" (9-13 mm) 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. For easy access to clean the burner tips, disconnect burner supply line and remove the burner from the unit. With compressed air (if possible), blow out main burner ring prior to cleaning the burner tips. Check orifices and air supply openings for debris, insects and/or dirt. Clean any plugged or obstructed orifices.
Liquid Inlet Valve	Use repair kit 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 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 if corroded. Disconnect all tubing and blow tubes free of debris. Re-install tubing to the vaporizer and check and tighten all fittings.
Relief Valves	Inspect all relief valves on the vaporizer, liquid and vapor lines for signs of corrosion and damaged or missing 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 and at the burner pressure port to ensure proper pressure is delivered to the thermostat and burners. See page 1-3 for burner pressure specifications.
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 0.265" (6.7 mm) the heat exchanger should be removed from

	<p>service. Nominal wall thickness 0.375" (9.5 mm). 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 (40.7-47.5 Nm) 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. 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	<p>Remove plug below the tee on the drip leg and drain the drip leg to prevent it from filling with contaminants and passing them into the thermostat. NOTE: In areas where LPG quality is poor it may be necessary for drip legs to be checked for heavy ends more frequently. 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>
Vaporizer Cabinet	<p>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.</p>

CAUTION

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 (7.6 m) of the work area.

When flaring the contents of the vaporizer, be sure that the burners are on to prevent freezing during the flaring operation.

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 DC?		
3. Pilot Assembly: - Pilot assembly inspected for corrosion? - Pilot orifice cleaned or replaced?		
4. Burner Assembly: Burner tips and orifices cleaned?		
5. Flame Spreader Bar: Is it present and positioned properly, or does it have signs of damage/corrosion?		
6. Liquid Inlet Valve: - Repair Kit Installed? - Inlet orifice cleaned? - Did valve pass "water test" to ensure seat is sealing properly?		
7. Capacity Control Valve: - Repair Kit Installed? - Piston and valve body 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? Record pressure setting here.		
12. Vaporizer Tubing: - All tubing checked for pitting or flaking and blown free of debris? - 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 rain caps cleared of debris and combustible materials?		

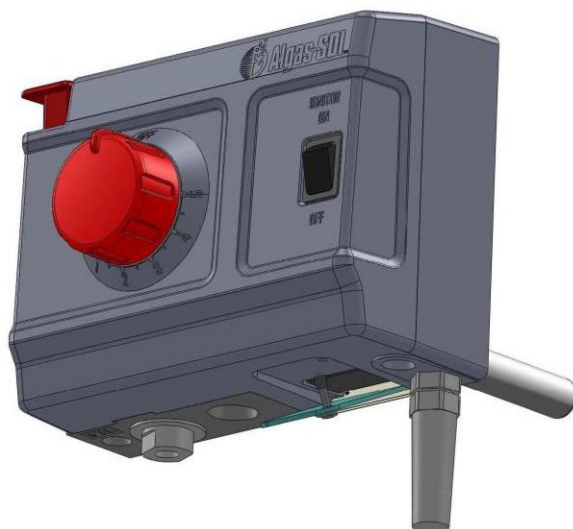
Once the above items have been maintained and/or inspected, leak test all fittings and connections inside and outside the cabinet, including the inlet valve flange and bolts, to ensure there are no leaks. Connect LPG Supply and light the pilot and engage main burners. Ensure pilot is strong and main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

INSPECTED BY: _____ INSPECTION DATE: _____

Replacing reignitor battery

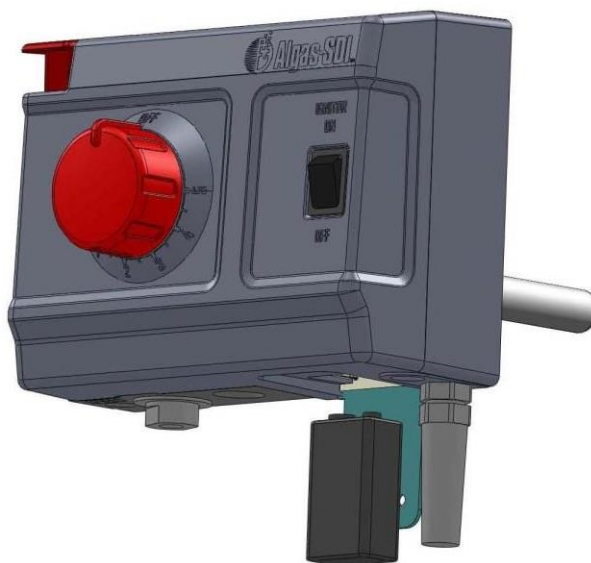
1. Turn the reignitor switch “OFF”. Open the battery access door on the bottom right corner of the thermostat housing.

Figure 8 – Opening the battery access door



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

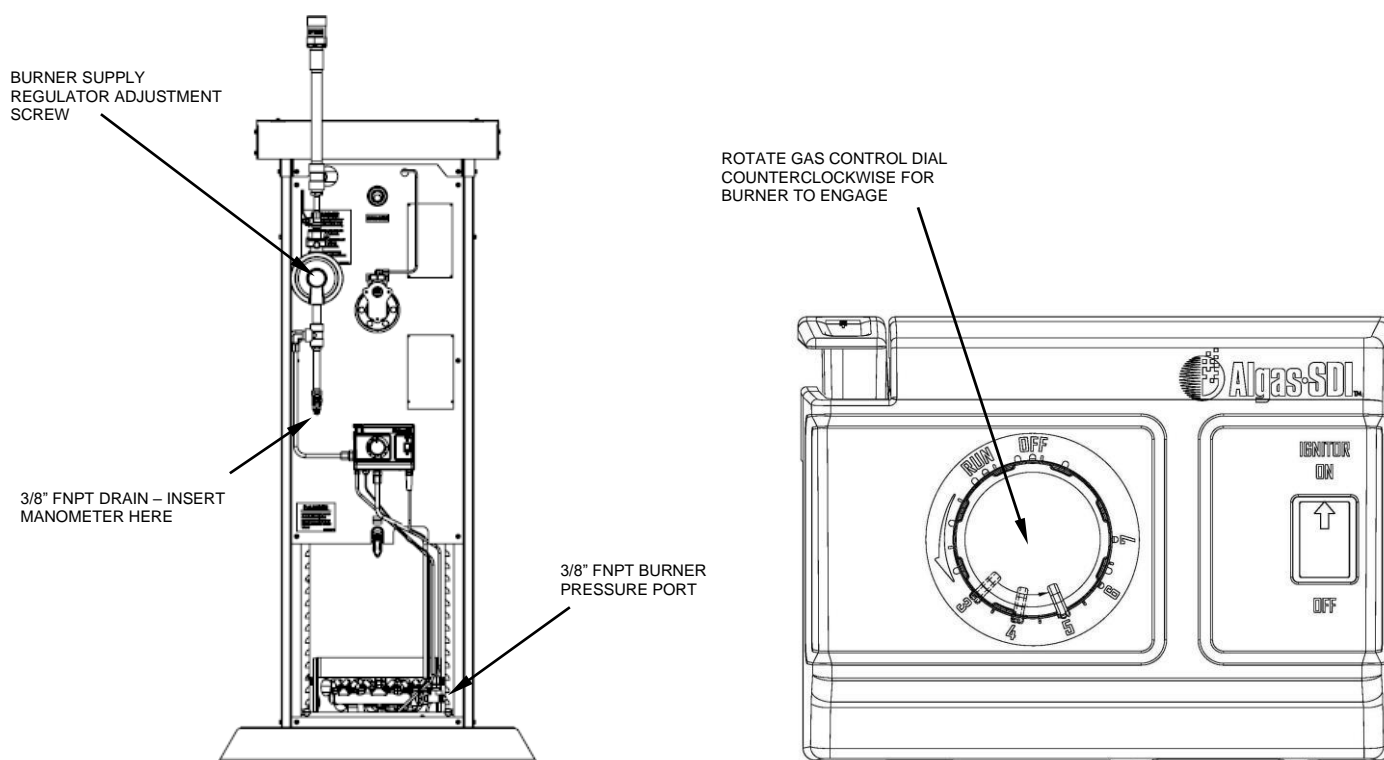
Figure 9 – Replacing the battery



Adjusting burner input pressure

1. Close the supply valve to the Burner 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 port at the inlet to the burner. You will have to remove the 3/8" plug.
3. Open the supply valve to the burner supply regulator.
4. Turn the reigniter switch "ON". Establish pilot by turning temperature control dial to "RUN" 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 counterclockwise. The main burner(s) should now engage.
5. With the main burner operating, check the gas pressure at the burner pressure port using a manometer (see No. 2 above). For the required burner input pressure for each model refer to page 1-3. To adjust the pressure, remove the cap on the burner supply regulator (See Figure 10) and turn the adjustment screw clockwise with a standard screwdriver to increase the pressure. Return burner supply regulator cap when complete.
6. Close the supply valve to the Burner Supply Regulator and **wait until the pilot and main burner have extinguished**. Turn the temperature control dial to "OFF" position. Remove the manometer and fittings. **Replace all plugs and perform a leak test before proceeding.**

Figure 10 – Adjusting burner input pressure



Liquid inlet valve maintenance procedure

Use Repair Kit P/N: 40764 (see Appendix A for kit details)

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



CAUTION

Follow the below instructions carefully to prevent hazardous conditions. Leak test the entire installation prior to operating the system.

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. With a 9/16" box end or socket wrench, 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 torque to 35 ft-lbs.
10. Compare the length of the new stem from the repair kit to the old one that was removed from the vaporizer to make sure they are the same. It is important to make sure the new valve stem is not 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 psig (6-7 bar) 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 no 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. Inspect surfaces for marks or other damage and clean of any other debris.
17. Inspect new inlet valve flange gasket for damage – primarily any tears, bends, or significant scratches.
18. Lightly spray flange gasket with a dry lubricant (graphite) before installing it on the unit.
19. Check flange bolts for a thin layer of NEVER-SEEZ. Re-apply as needed.
20. 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.
21. To tighten the inlet valve bolts, torque the 6 bolts to 30-35 ft.-lbs (40.7-47.5 Nm) in a cross/star pattern.
22. Leak test inlet valve flange bolts prior to re-starting the vaporizer.

Capacity control valve maintenance procedure

Use Repair Kit p/n: 40764 (see Appendix A 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. If the piston is stuck in the valve or difficult to remove, thread an 8-32 bolt or screw into the screw tap at the top center of the piston. This will allow you to have leverage and grasp the screw with a pair of pliers to remove the piston from the valve.
4. 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.
5. Remove spring from the capacity control valve.
6. 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.
7. Insert new spring into the Capacity Control Valve.
8. 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.
9. Lightly grease and replace the O-ring around the capacity control valve cap (large flange nut).
10. 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.
11. Re-install capacity control valve sensing line and tighten fittings.
12. Leak test prior to restarting the vaporizer.

Soot Cleaning maintenance procedure

In markets where LPG quality may affect vaporizer operation, additional maintenance is required to prevent component failure and maintain full output capacity.

This is only to be performed on models with S/Ns starting with A09/A11/A13/A15 and A17.

Required Tools

- 11/16" wrench
- 7/16" wrench
- 3/8" wrench
- 5/16" socket
- Compressed air source
- Air tool extender
- Clean rags

Cleaning Procedure

1. Purge the vaporizer and shut down per standard procedure in the O&M manual.
2. Remove the burner access door and flue cover from the vaporizer.
3. Disconnect the burner supply tubing, pilot tubing, and thermocouple line from the thermostat.
4. Remove the burner assembly with attached lines from the vaporizer.
5. Disconnect the reigniter wire from the burner pilot and set aside the burner assembly for reuse.
 - a. Inspect the burner for cracks in the manifold or loose jets. If either are present, report to Algas-SDI Customer Service for troubleshooting.
6. Remove the top plate/wind shroud from the vaporizer and set aside for reuse.
7. Using a compressed air source connected to the provided air tool extender, blow air from the top of the vaporizer between the heat exchanger and flue down towards the base of the cabinet. Utilize the extender to reach lower into the flue, ensuring all soot is removed from around the fins.
 - a. **Warning:** do not blow air on the insulation area or it can damage the insulation.
8. Wipe the heat exchanger bottom head clean with a rag until all soot is removed.
9. Blow off the soot that has accumulated at the base of the cabinet.
10. Wipe clean any surfaces where soot remains. **It is essential to remove ALL soot from the heat exchanger and the flue.**
11. Reinstall the removed components.
12. Leak test all connections.
13. The vaporizer is now ready to resume standard operation per O&M manual.

Maintenance Schedule

The Direct Fired vaporizer is required to be maintained free of an excessive amount of soot to ensure full output capacity is met and to prevent component failure. Some cleaning may be necessary based on how much soot is present. The rate of soot accumulation will depend on fuel quality, operating capacity, and frequency of use.

After initial vaporizer installation, monitor the level of soot buildup on the bottom head of the heat exchanger and inside of the flue, and observe if flame is rolling back or pointing straight up (see following image for example). Also check for an even blue flame with some yellow tips and presence of leaks on the burner. Inspect the equipment initially one month after beginning operation. Continue to do so based on these results, and clean accordingly using the procedure detailed above.



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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" (9 to 13 mm) 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. IGNITER WILL NOT SPARK – TROUBLESHOOTING TREE #3

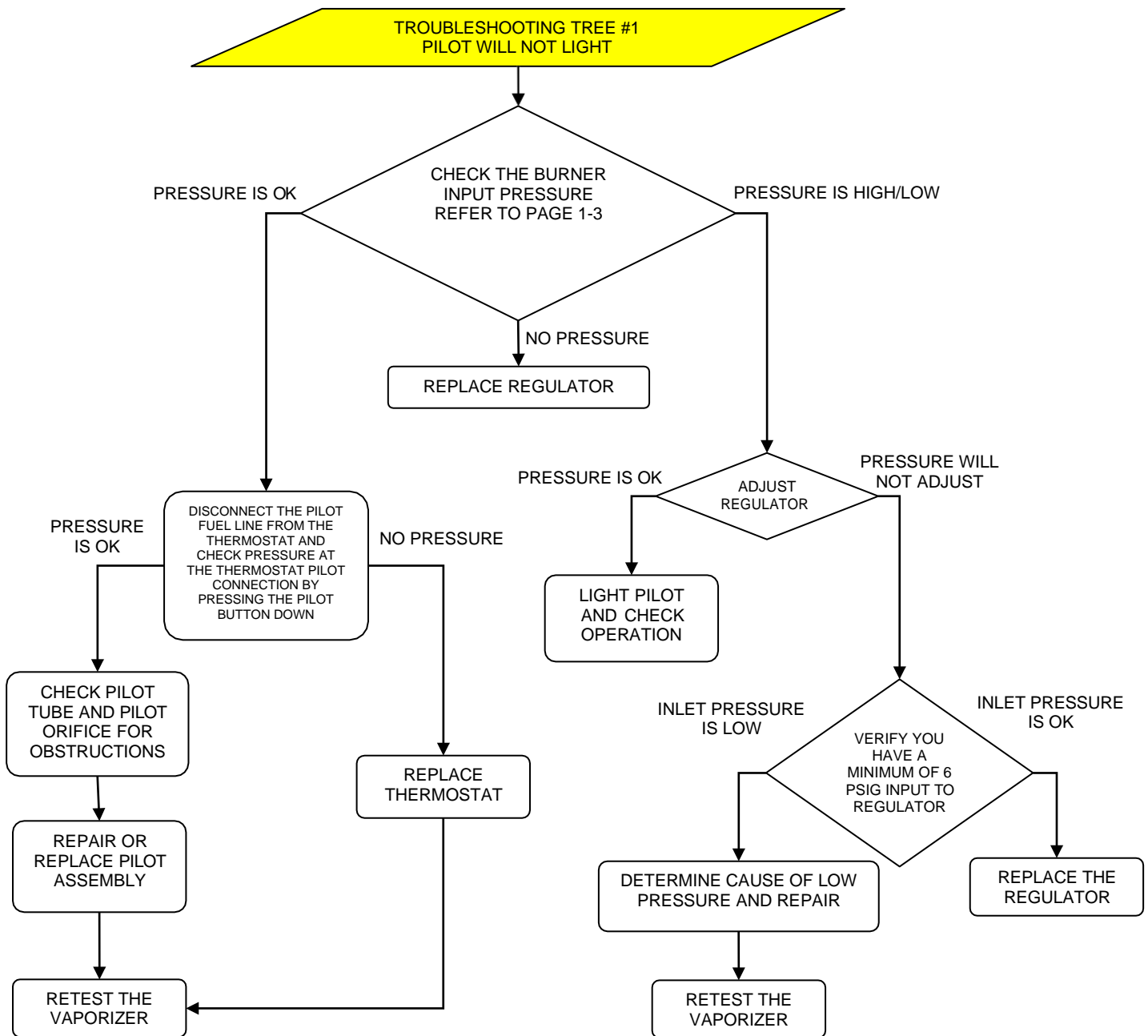
- Check the reigniter battery and replace if necessary.
- Verify that the spark electrode is not in contact with the pilot hood and that spacing from the hood is not greater than 1/8" (3 mm).
- Check if the spark electrode is saturated with moisture/water. Wipe any moisture/water or light the vaporizer manually with a torch to dry it.
- Check the rocker switch by removing the leads and touching them together. If the reigniter spark is established, then the rocker switch is faulty.

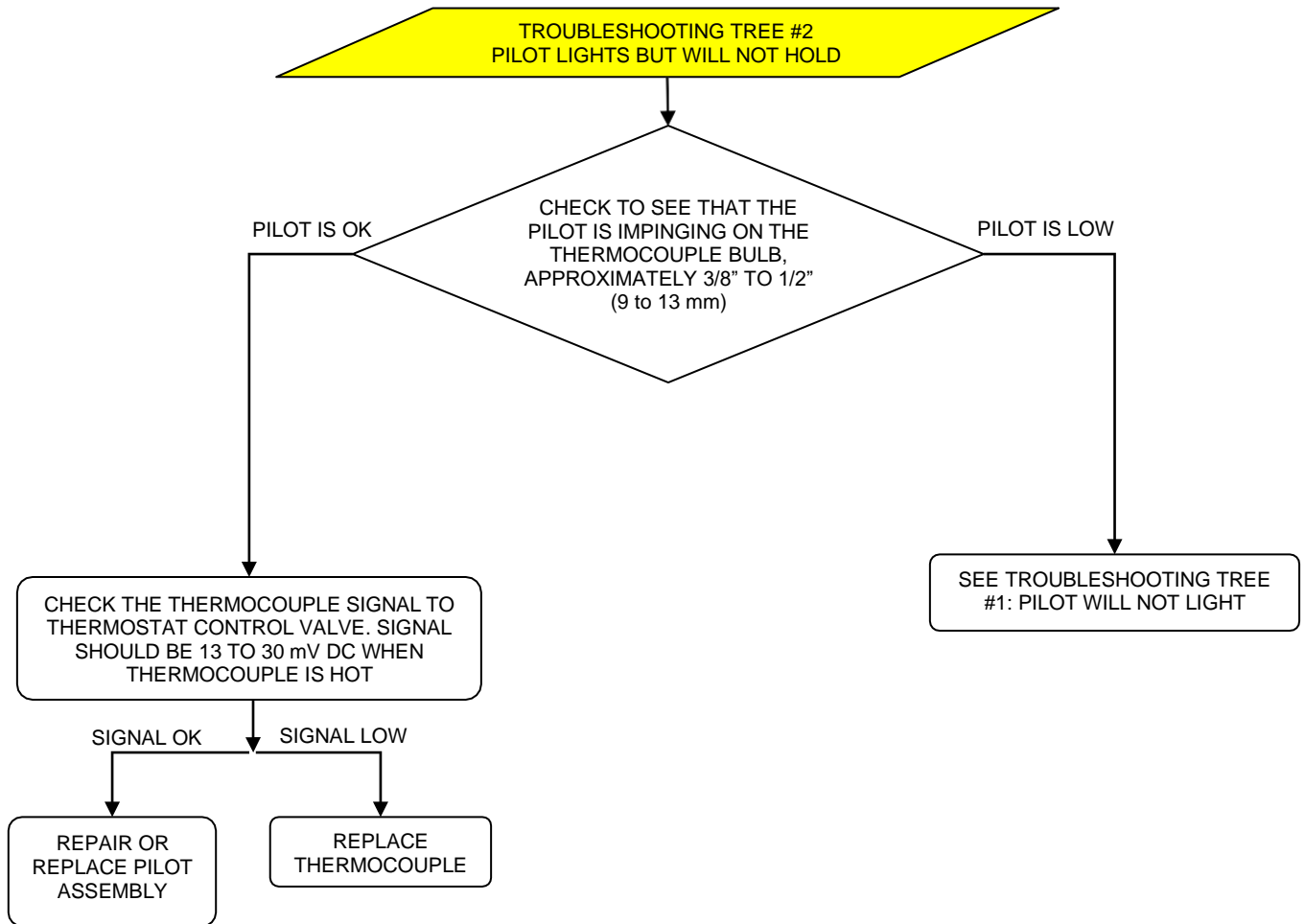
3. MAIN BURNER WILL NOT IGNITE - TROUBLESHOOTING TREE #4

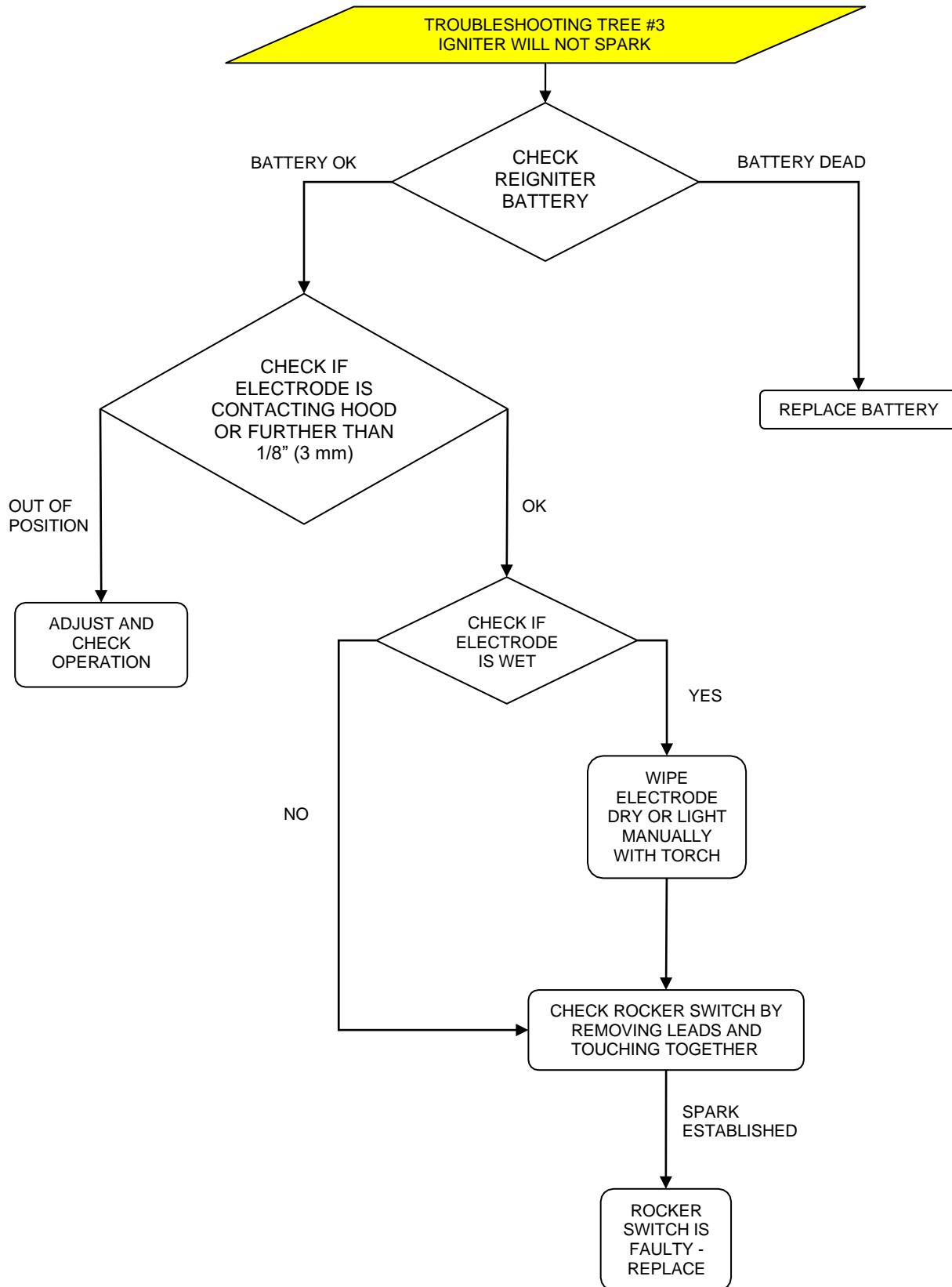
- Check the pilot burner as per 1. above.
- Check burner regulator. Disconnect tube from outlet side of regulator and check output pressure.
- If pilot burner and burner regulator check out OK, the problem is in the thermostat. Replace thermostat (the main burner will not come on unless the temperature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

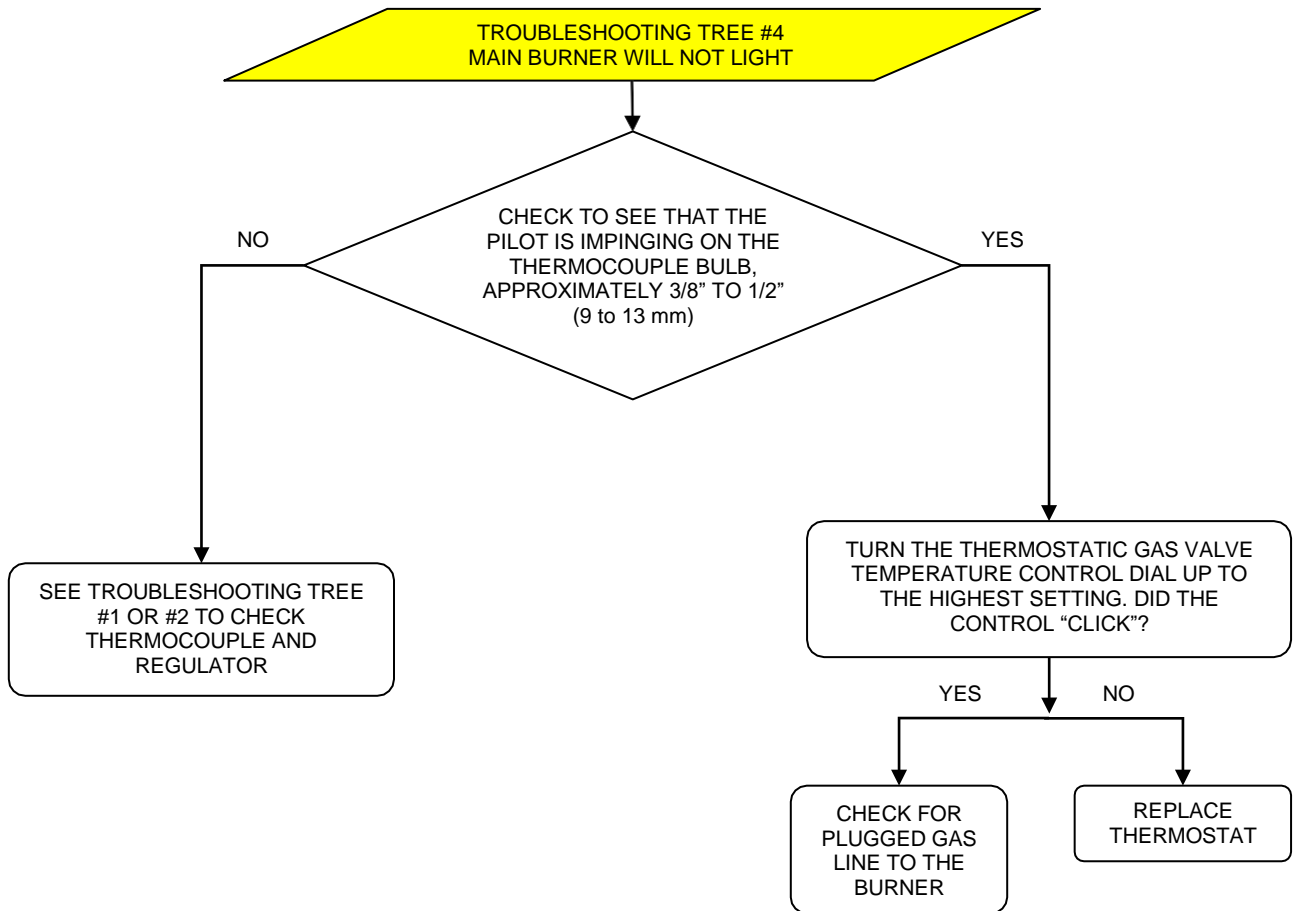
4. IF VAPOR PRESSURE DROPS - TROUBLESHOOTING TREE #5

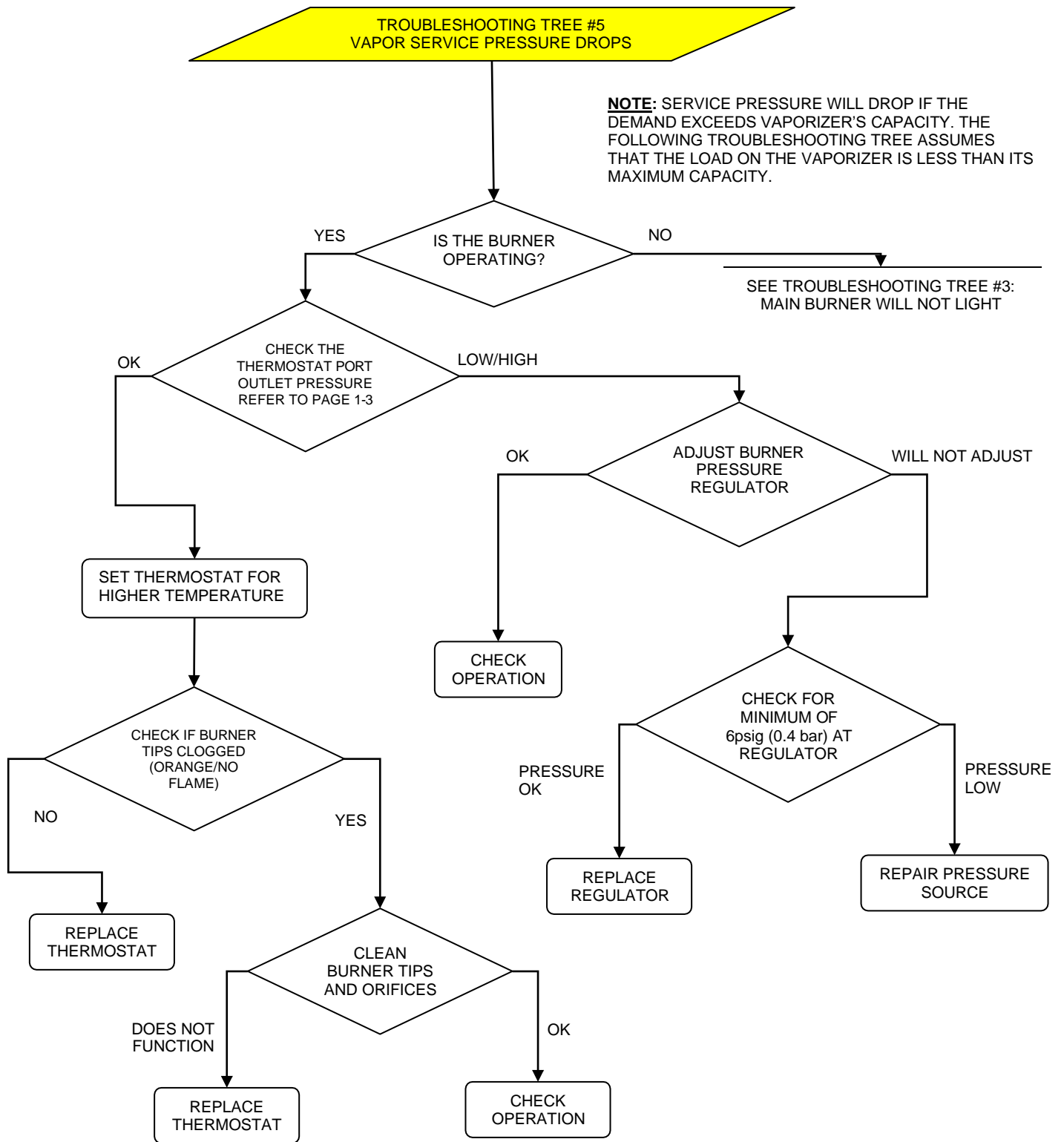
- Check burner; check pilot as per 1. and 2. above.
- If vapor pressure drops, but main burner(s) is working, vapor demand exceeds vaporizer capacity.
- Check liquid excess flow valve and shut off valve; make sure they are open.
- Close liquid inlet valve upstream of strainer. Bleed down system and clean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











APPENDIX A

TECHNICAL INFORMATION

Figure 11 – 160H Vaporizer Replacement Parts

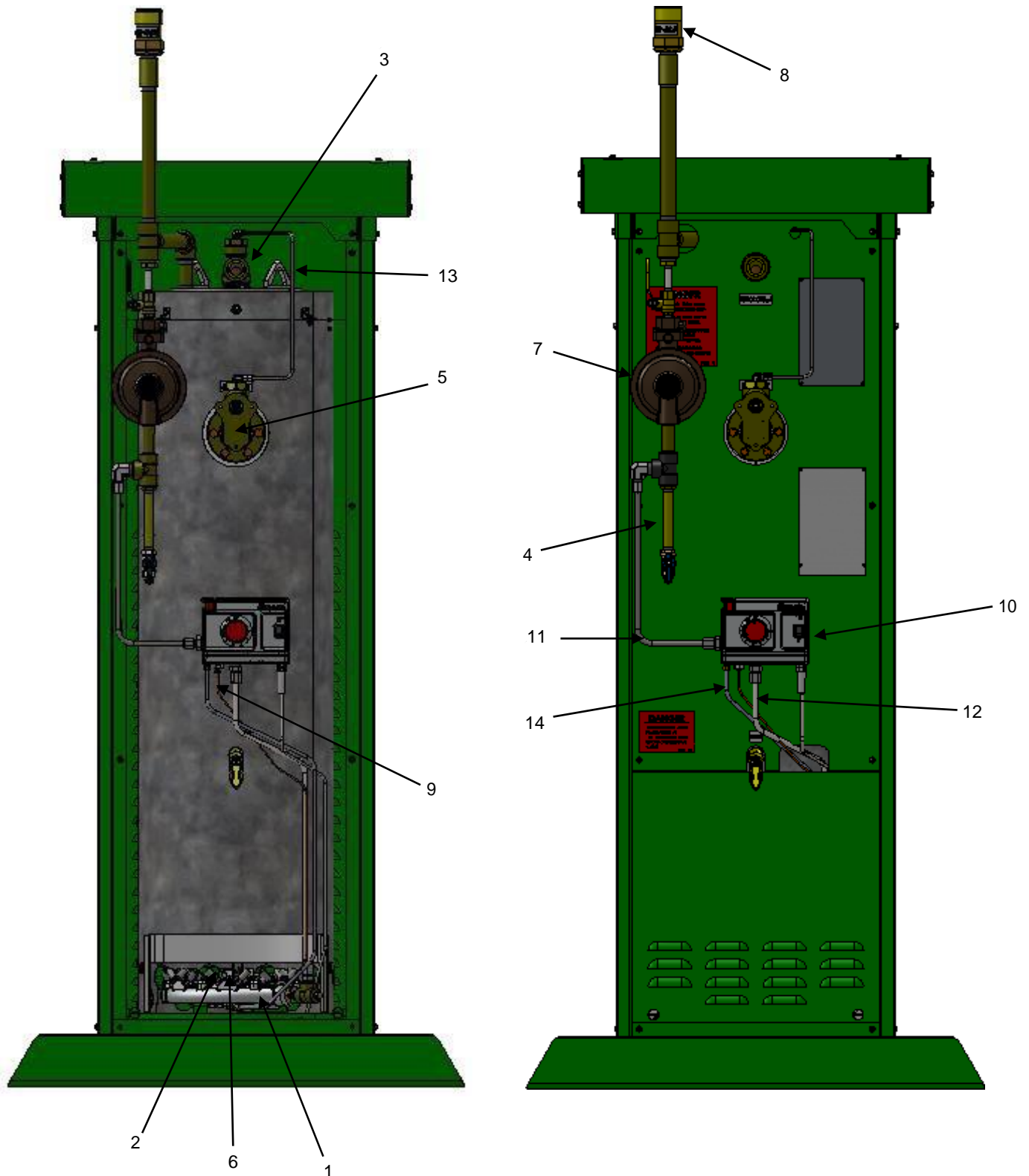
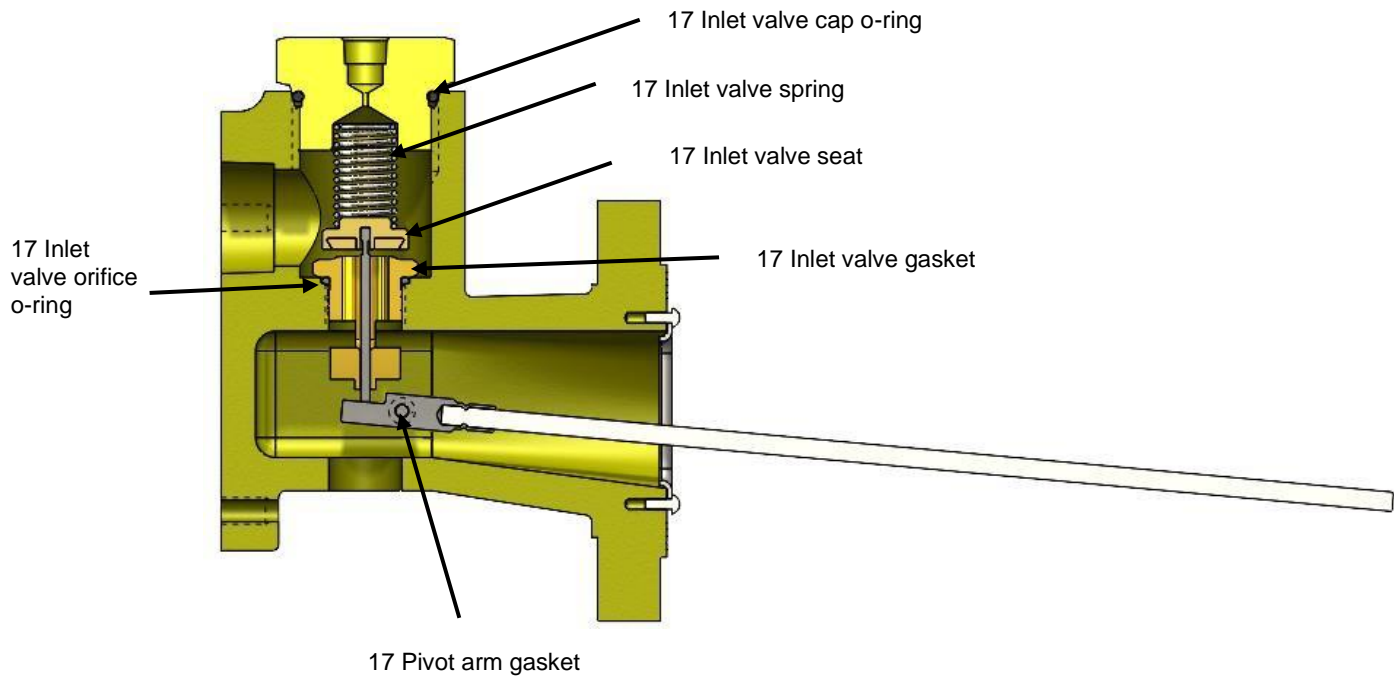


Figure 12 – Liquid Inlet Valve and Capacity Control Valve

LIQUID INLET VALVE



CAPACITY CONTROL VALVE

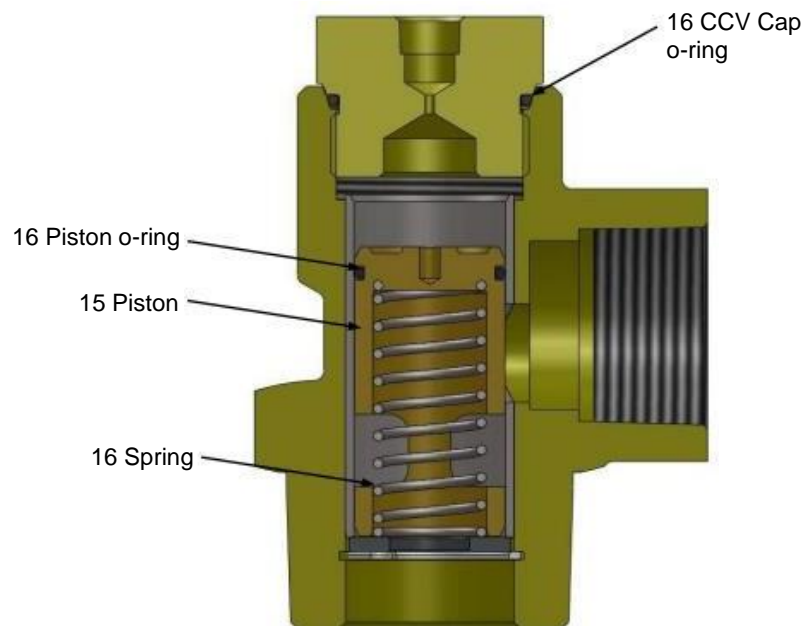


Figure 11 and 12 Descriptions

1. Burner Manifold assembly	P/N: 41091
2. Burner tip #69 burner jet orifice (qty 32)	P/N: 41092
3. Capacity control valve 1"	P/N: 1508-4001
4. Drip leg kit	P/N: 40450
5. Liquid Inlet Valve	P/N: 1501-4001
6. Pilot assembly	P/N: 40449
7. Regulator, Burner Supply	P/N: 34800
8. Relief valve, 3/4" NPT UL/CE/ASME	P/N: 34876
9. Thermocouple	P/N: THE0001-00-3
10. Thermostat/Thermowell w/ 9VDC igniter	P/N: 41082
11. Tube kit, thermostat supply	P/N: 40408
12. Tube kit, burner supply	P/N: 40475
13. Tube kit, capacity control	P/N: 40467
14. Tube kit, pilot supply	P/N: 40469
15. Piston, Capacity Control Valve	P/N: 1508-5005
16. Repair kit, Capacity Control Valve	P/N: 40764
*See Capacity Control Valve in Figure 12	
17. Repair kit, Liquid Inlet Valve	P/N: 40764
*See Liquid Inlet Valve in Figure 12	

Table 7 – Repair Kits and Other Available Replacement Parts 160H through 800H

160H through 800H		
40764: Repair kit, Liquid Inlet/Capacity Control Valve		
Components	Description	Qty.
3-0016	Liquid Inlet Valve repair kit	1
3-0017	Capacity Control Valve repair kit	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
40475	160H Burner supply tube kit	1

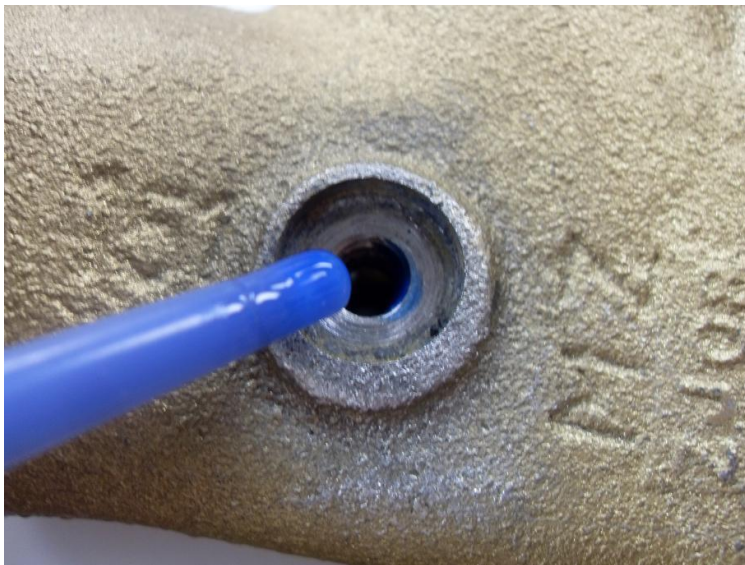
40480: Master repair kit		
Components	Description	Qty.
40764	Repair kit, Liquid Inlet/Capacity Control Valve	1
40449	160H Pilot assembly kit	1
41082	RS to ASDI Thermostat/Thermowell field kit	1
THE0001-00-3	Thermocouple 48" LG.	1
41091: Burner assembly kit without thermocouple and pilot		
Components	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
1508-4042	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
41092: Burner tip kit #69 orifice		
Components	Description	Qty.
300046	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.



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



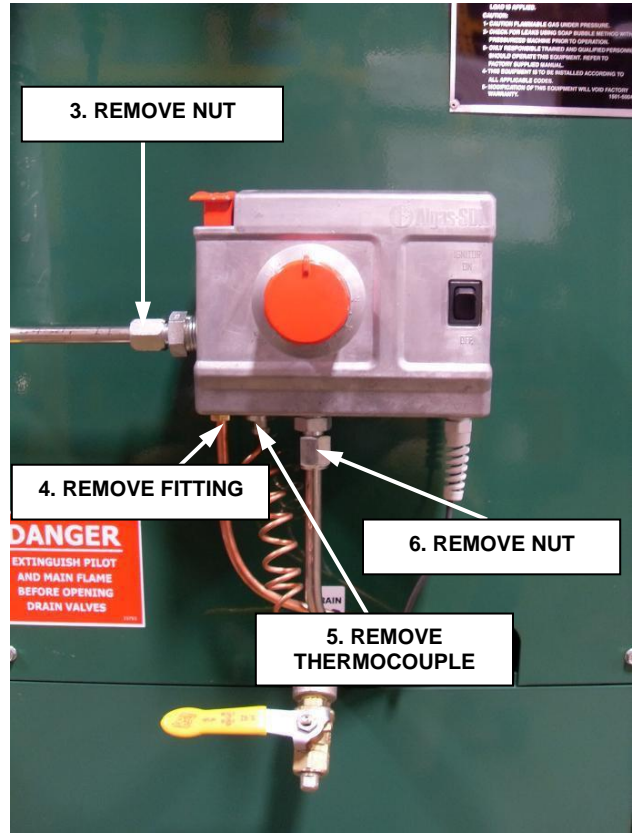
4. Screw in pivot screw to the inlet valve body and apply 8 in-lbs of torque (approximately 1/8 full turn).





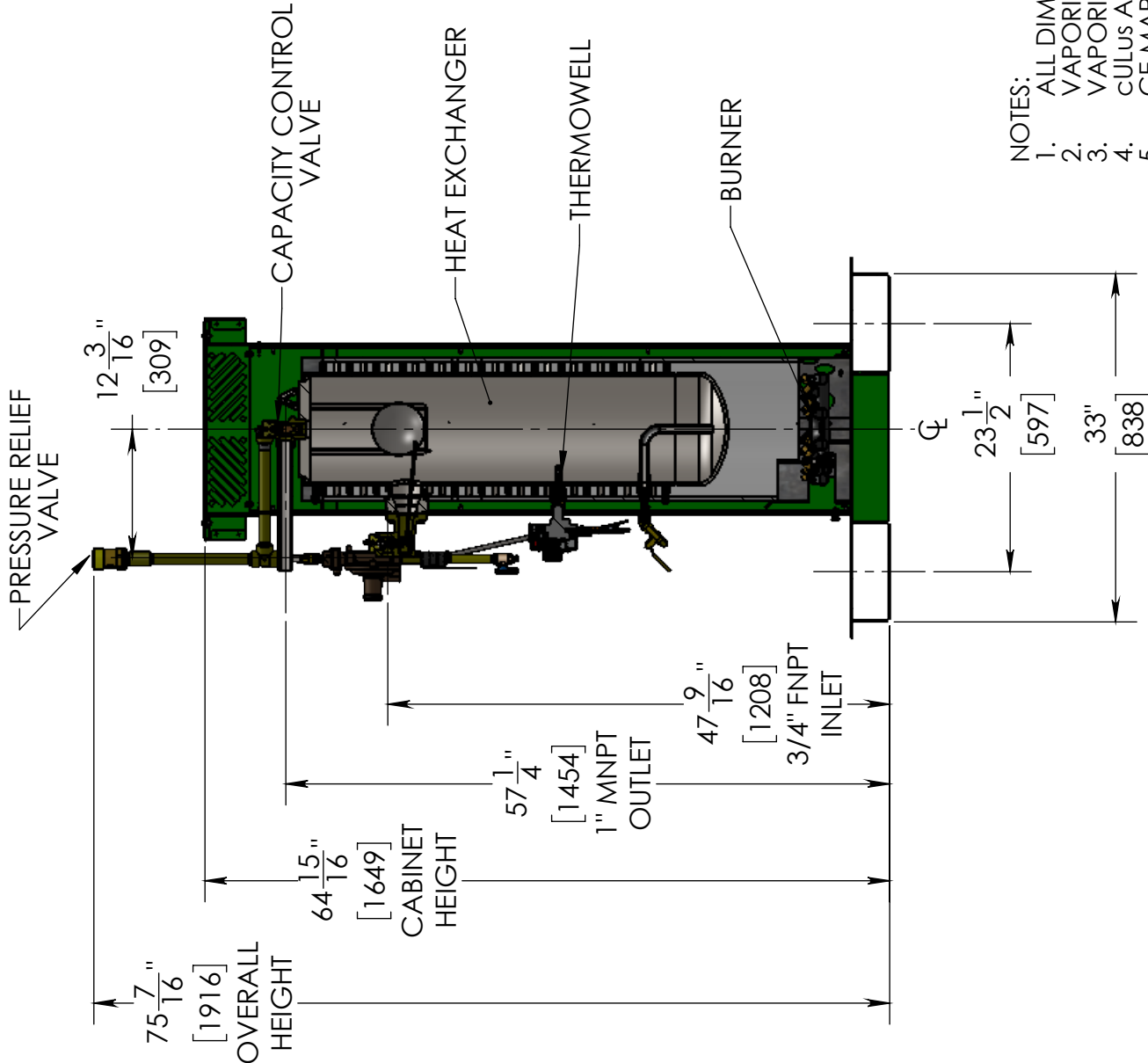
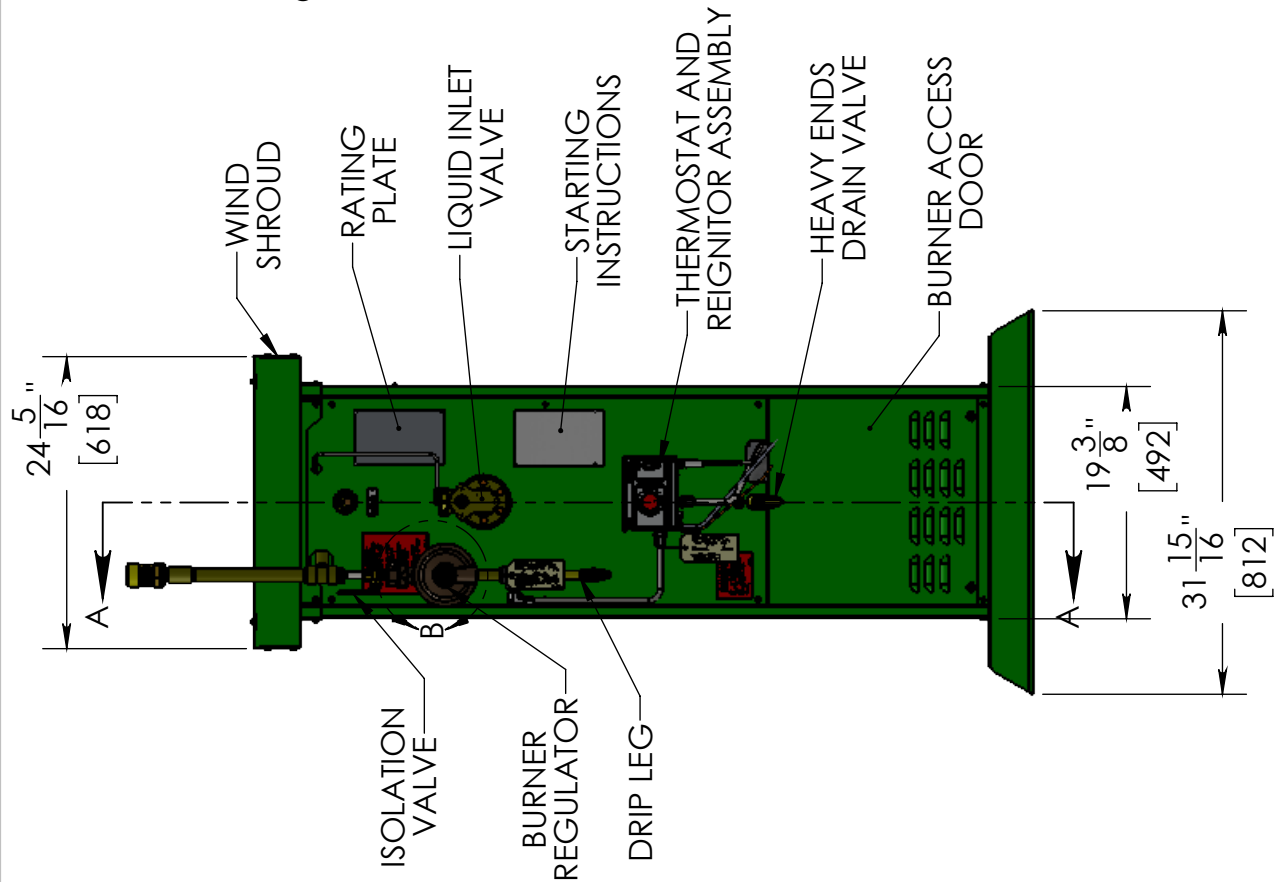
5. Align valve stem with pivot screw and repeat the same step with the pin gasket and pivot screw on the opposite side of the liquid inlet valve.
6. Verify there is no damage to the pin gasket. Set inlet valve assembly aside for an hour to allow Loctite to properly dry before reinstalling valve assembly back on the vaporizer.
7. Re-install valve in vaporizer with new flange gasket and uniformly torque bolts to 30-35 ft-lbs (40.7-47.5 Nm).
8. Re-connect sensing line to capacity control valve.
9. After assembly pressurize with 125-150 PSIG (8.6-10.3 bar) 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

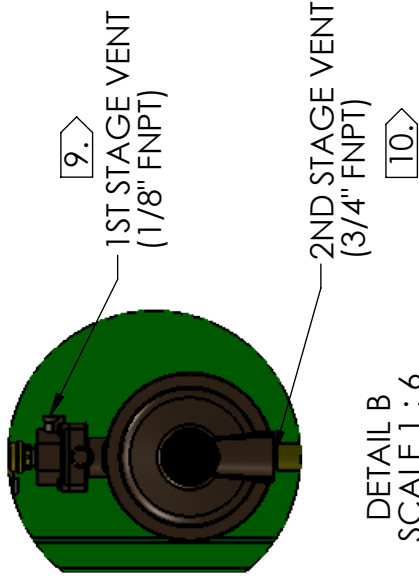
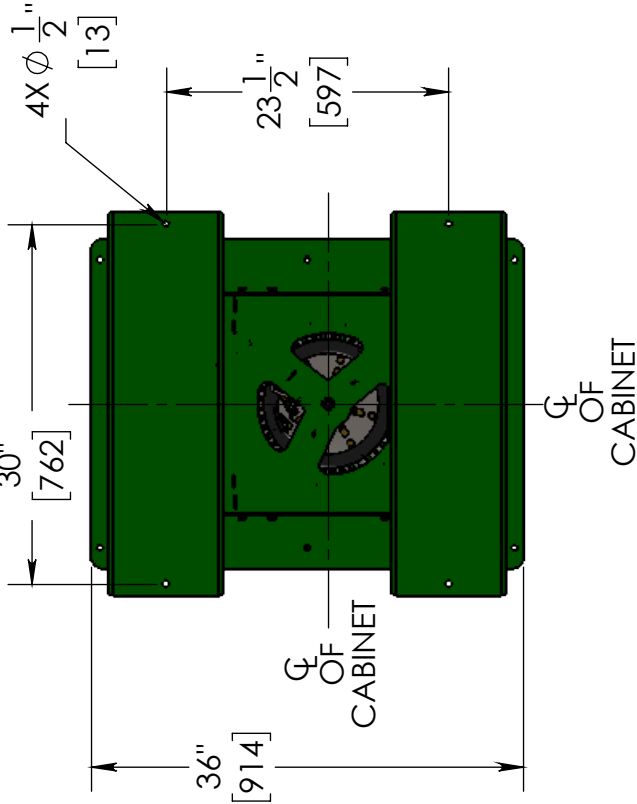


Thermowell leak test procedure:

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 counterclockwise 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.



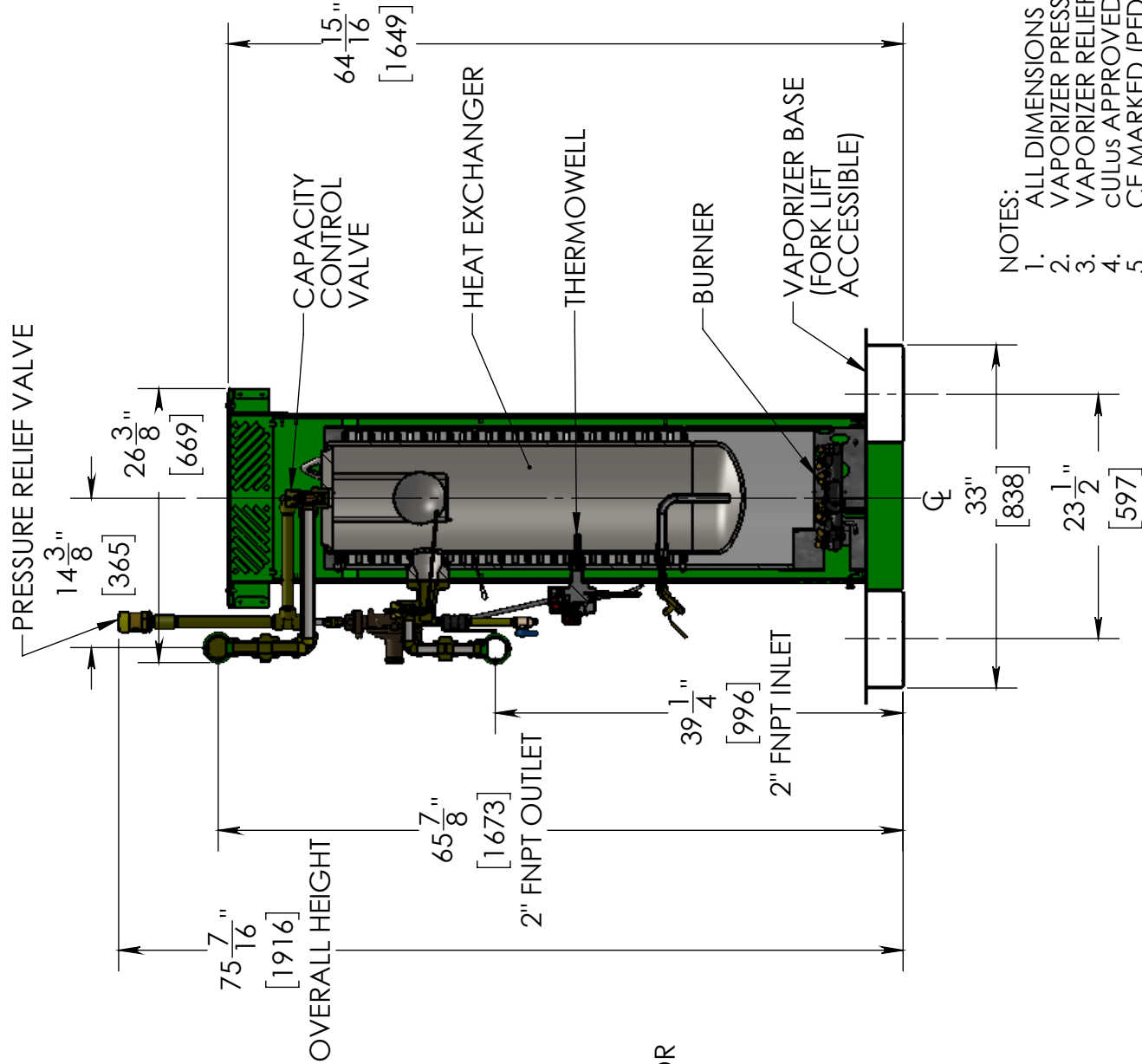
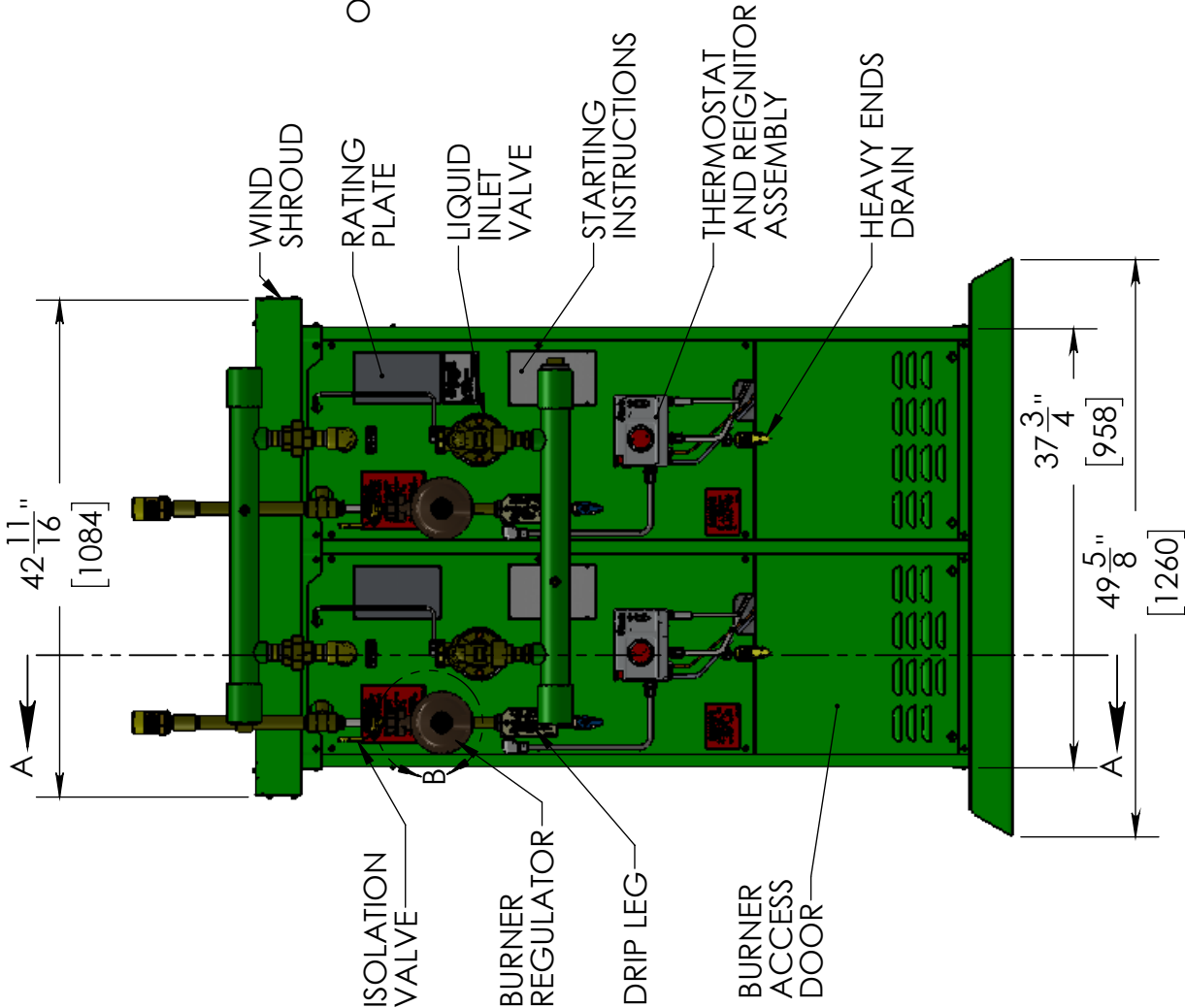
SECTION A-A
SCALE 1 : 16



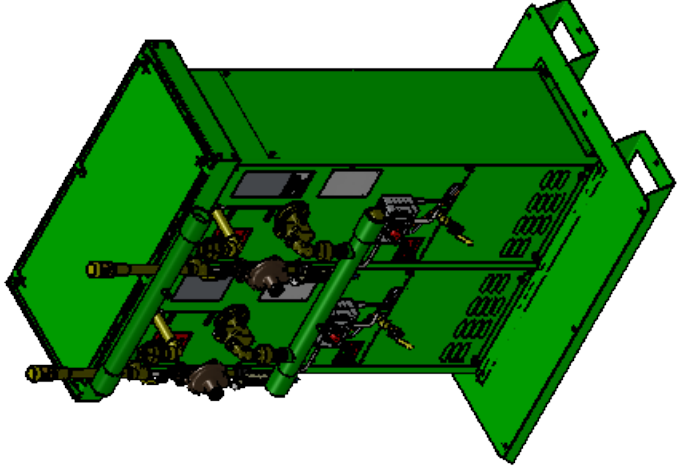
NOTES:

- ALL DIMENSIONS ARE IN INCHES [mm].
- VAPORIZER PRESSURE VESSEL RATED AT 290 PSIG [20 BAR] MAWP.
- VAPORIZER RELIEF VALVE SETTING 250 PSIG [17.2 BAR].
- cULus APPROVED.
- CE MARKED (PED).
- VAPORIZER CAPACITY AT 0°F AND 100 PSIG PROPANE INLET CONDITION 160 GPH [320 KG/HR].
- VAPORIZER TO BE SECURED THROUGH THE FOUR MOUNTING HOLES ON ABOVE GROUND, LEVEL, SOLID, NON-COMBUSTIBLE BASE.
- HEAT INPUT 180,000 BTU/HR [189,910 KJ/HR].
- USE THE 1/8" FNPT PORT TO PIPE AWAY 1ST STAGE VENT IF REQUIRED.
- USE THE 3/4" FNPT PORT TO PIPE AWAY 2ND STAGE VENT IF REQUIRED.
- APPROXIMATE SHIPPING WEIGHT 455 LBS [206 KG].

THIRD ANGLE PROJECTION		TOLERANCES UNLESS OTHERWISE SPECIFIED X ± .XX ± .XXX ± ANGLE ±0°30' FRACTIONS ± 1/4"	 Algas·SDI TM 151 S. Michigan St., Seattle, Washington, USA 98108 Tel: (206) 789-5410 Fax: (206) 789-5414	Drawn By: SCO			
				Checked By: DN			
				Approved By:			
				Date: 3/31/10			
				Scale: 1" = 16" AND NOTED			
DO NOT SCALE DRAWING		INTERPRET THIS DRAWING IN ACCORDANCE WITH ANSI/ASME Y14.5-2009	Part #	Job #			
				A.S.D.I. STD.			
				LARGE DF 160H VAPORIZER EQUIPMENT DRAWING			
				Size: B	Dwg. # 1508-6001	Sht. No.: 1 of 1	Rev.: E
				THIS DRAWING SHALL NOT BE REPRODUCED OR USED IN ANY MANNER DETRIMENTAL TO ITS INTERESTS. ALL RIGHTS RESERVED. © COPYRIGHT ALGAS·SDI			



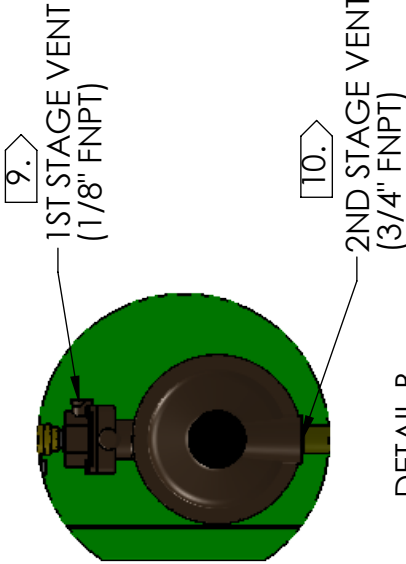
ISOMETRIC VIEW
NO SCALE




NOTES:

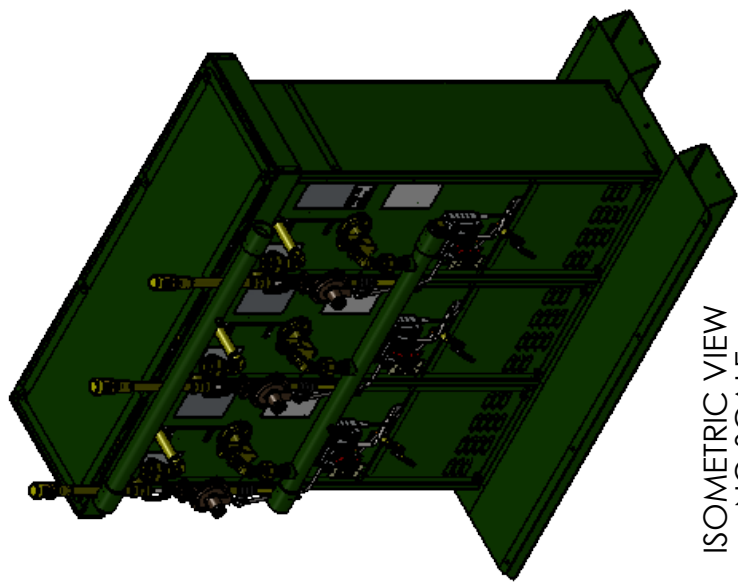
1. ALL DIMENSIONS ARE IN INCHES [mm].
2. VAPORIZER PRESSURE VESSEL RATED AT 290 PSIG [20 BAR] MAWP.
3. VAPORIZER RELIEF VALVE SETTING 250 PSIG [17.2 BAR].
4. CULUS APPROVED.
5. CE MARKED (PED).
6. VAPORIZER CAPACITY AT 0°F AND 100 PSIG PROPANE INLET CONDITION 320 GPH [640 KG/HR].
7. VAPORIZER TO BE SECURED THROUGH THE FOUR MOUNTING HOLES ON ABOVE GROUND, LEVEL, SOLID, NON-COMBUSTIBLE BASE.
8. HEAT INPUT 360,000 BTU/HR [379,820 KJ/HR].
9. USE THE 1/8" FNPT PORT TO PIPE AWAY 1ST STAGE VENT IF REQUIRED.
10. USE THE 3/4" FNPT PORT TO PIPE AWAY 2ND STAGE VENT IF REQUIRED.
11. APPROXIMATE SHIPPING WEIGHT 855 LBS [387 KG].

SECTION A-A



DETAIL B
SCALE 1 : 6

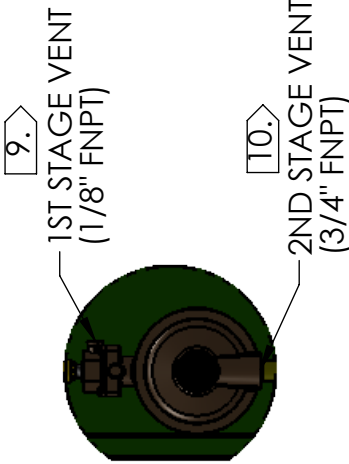
<div>THIRD ANGLE PROJECTION</div> <div></div>	<div>TOLERANCES</div> <div>UNLESS OTHERWISE SPECIFIED</div> <div><div>.X ±</div><div>.XX ±</div><div>.XXX ±</div></div> <div>ANGLE ±0°30'</div> <div>FRACTIONS ± 1/4"</div>	<div> Algas-SDI™</div> <div>151 S. Michigan St., Seattle, Washington, USA 98108</div> <div>Tel: (206) 789-5410 Fax: (206) 789-5414</div>	Drawn By: SCO	
			Checked By: DN	
			Approved By:	
			Date: 4/1/10	
			Scale: 1:16 AND NOTED	
<div>DO NOT SCALE DRAWING</div> <div>INTERPRET THIS DRAWING IN ACCORDANCE WITH ANSI/ASME Y14.5-2009</div> <div>THIS DRAWING SHALL NOT BE REPRODUCED OR USED IN ANY MANNER DETRIMENTAL TO ITS INTERESTS. ALL RIGHTS RESERVED.</div> <div>© COPYRIGHT ALGAS-SDI</div>	<div>Part #</div>	Job # A.S.D.I. STD.		
		Title:		
		LARGE DF 320H VAPORIZER EQUIPMENT DRAWING		
		Size: B		
		Dwg. # 1510-6001		
Sheet No.: 1 of 1				
Rev.: D				



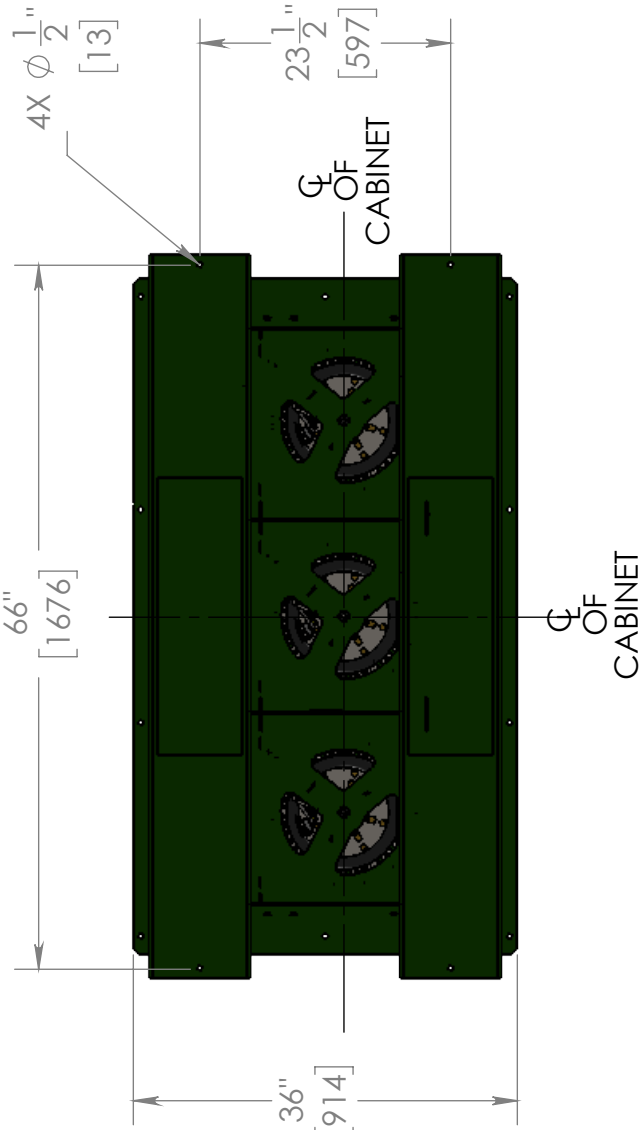
ISOMETRIC VIEW
NO SCALE

NOTES:

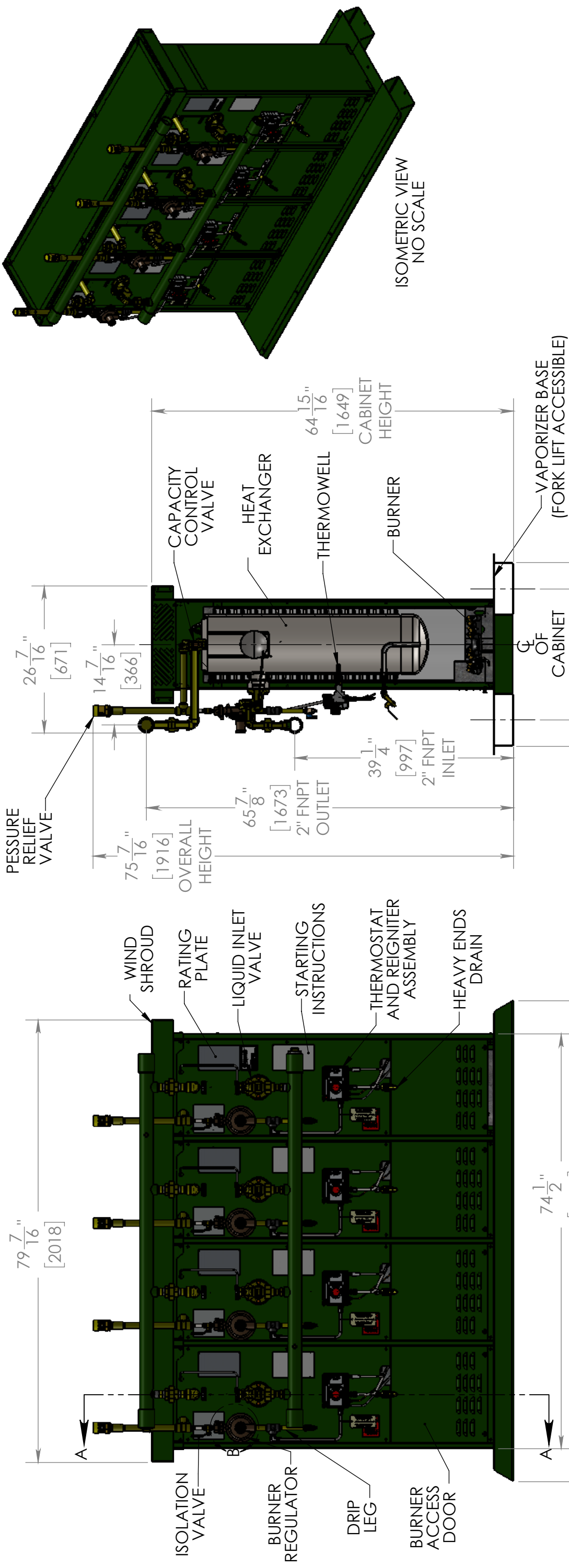
1. ALL DIMENSIONS ARE IN INCHES [mm].
2. VAPORIZER PRESSURE VESSEL RATED AT 290 PSIG [20 BAR] MAWP.
3. VAPORIZER RELIEF VALVE SETTING 250 PSIG [17.2 BAR].
4. CULUS APPROVED.
5. CE MARKED (PED).
6. VAPORIZER CAPACITY AT 0°F AND 100 PSIG PROPANE INLET
CONDITION 480 GPH [960 KG/HR].
7. VAPORIZER TO BE SECURED THROUGH THE FOUR MOUNTING HOLES
ON ABOVE GROUND, LEVEL, SOLID, NON-COMBUSTIBLE BASE.
HEAT INPUT 540,000 BTU/HR [569,730 KJ/HR].
8. USE THE 1/8" FNPT PORT TO PIPE AWAY 1ST STAGE VENT IF REQUIRED.
9. USE THE 3/4" FNPT PORT TO PIPE AWAY 2ND STAGE VENT IF REQUIRED.
10. APPROXIMATE SHIPPING WEIGHT 1242 LBS [563 KG].
- 11.



DETAIL B
SCALE 1 : 8

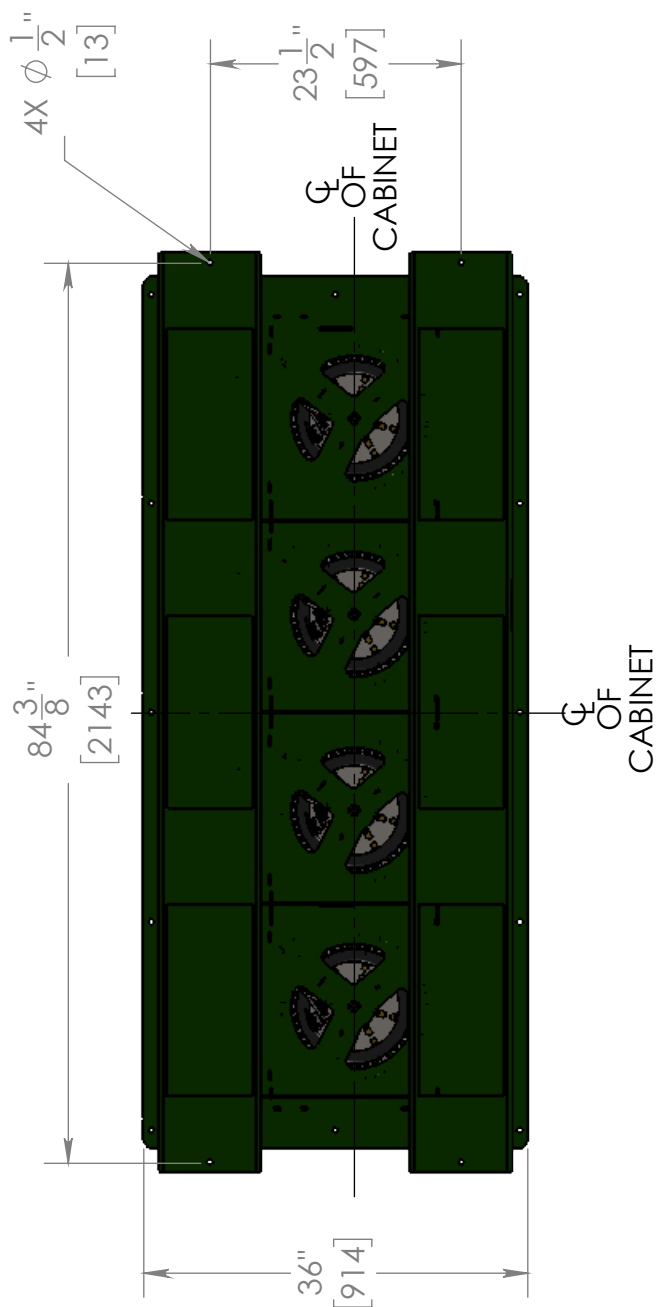
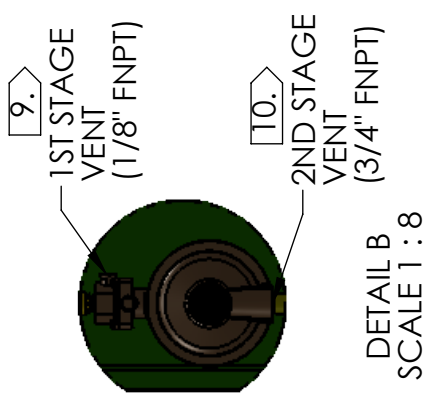




<p>THIRD ANGLE PROJECTION</p> 	<p>TOLERANCES UNLESS OTHERWISE SPECIFIED</p> <p>.X ± .XX ± .XXX ±</p>		<p></p>		<p>Drawn By: A. FIGLIOLI</p> <p>Checked By: DN</p> <p>Approved By:</p> <p>Date: 4/1/10</p>	
	<p>DO NOT SCALE DRAWING</p> <p>INTERPRET THIS DRAWING IN ACCORDANCE WITH ANSI/ASME Y14.5-2009</p>		<p>151 S. Michigan St., Seattle, Washington, USA 98108 Tel: (206) 789-5410 Fax: (206) 789-5414</p>		<p>Scale: 1:24 AND NOTED</p> <p>Job # A.S.D.I. STD.</p>	
<p>ANGLE ±0°30' FRACTIONS ± 1/4"</p>			<p>Part #</p>		<p>1 of 1</p>	
<p>Title: LARGE DF VAPORIZER 480H EQUIPMENT DRAWING</p>			<p>Size: B</p>		<p>Sht. No.: 1 of 1</p>	
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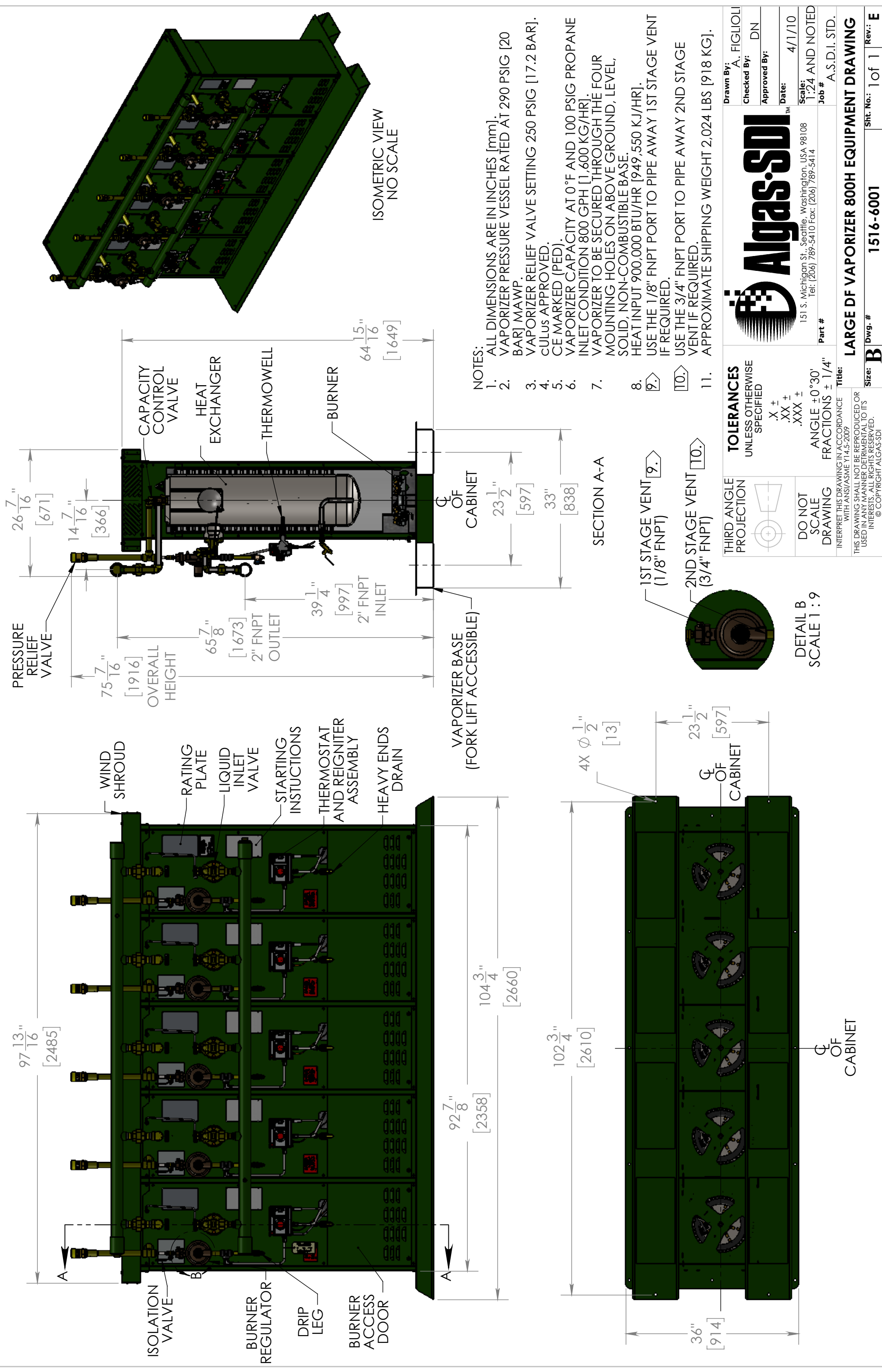


NOTES:

1. ALL DIMENSIONS ARE IN INCHES [mm].
2. VAPORIZER PRESSURE VESSEL RATED AT 290 PSIG [20 BAR] MAWP.
3. VAPORIZER RELIEF VALVE SETTING 250 PSIG [17.2 BAR].
4. CULUS APPROVED.
5. CE MARKED (PED).
6. VAPORIZER CAPACITY AT 0°F AND 100 PSIG PROPANE INLET CONDITION 640 GPH [1,280 KG/HR].
7. VAPORIZER TO BE SECURED THROUGH THE FOUR MOUNTING HOLES ON ABOVE GROUND, LEVEL, SOLID, NON-COMBUSTIBLE BASE.
8. HEAT INPUT 720,000 BTU/HR [759,640 KJ/HR].
9. USE THE 1/8" FNPT PORT TO PIPE AWAY 1ST STAGE VENT IF REQUIRED.
10. USE THE 3/4" FNPT PORT TO PIPE AWAY 2ND STAGE VENT IF REQUIRED.
11. APPROXIMATE SHIPPING WEIGHT 1,627 LBS [738 KG].



THIRD ANGLE PROJECTION 	TOLERANCES UNLESS OTHERWISE SPECIFIED .X ± .XX ± .XXX ± ANGLE ±0°30' FRACTIONS ±1/4"	 Algas-SDI™ 151 S. Michigan St., Seattle, Washington, USA 98108 Tel: (206) 789-5410 Fax: (206) 789-5414	Drawn By: A. FIGLIOLI
	DO NOT SCALE DRAWING INTERPRET THIS DRAWING IN ACCORDANCE WITH ANSI/ASME Y14.5-2009 THIS DRAWING SHALL NOT BE REPRODUCED OR USED IN ANY MANNER DETRIMENTAL TO IT'S INTERESTS. ALL RIGHTS RESERVED. © COPYRIGHT ALGAS-SDI		Checked By: DN
		Part #	Approved By:
			Date: 4/1/10
			Scale: 1"=24 AND NOTED
			Job # A.S.D.I. STD.
LARGE DF VAPORIZER 640H EQUIPMENT DRAWING			
Size: B		Dwg. # 1514-6001	Sht. No.: 1 of 1
			Rev.: E



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