



**Algas-SDI**<sup>TM</sup>

*...Innovative vaporizing and pressure building solutions*

**ISO 9001**  
Certified

# **Second Sun**<sup>TM</sup>

## **Flameless Tank Heater**

### *Installation, Operation & Maintenance Manual*

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**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, will void your warranty and may lead to dire consequences. When components are replaced with components not approved for use in our FM/UL listed equipment, the FM/CSA listing becomes void for that unit.

## **WARRANTY REGISTRATION**

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

OR

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

## **WARRANTY, COPYRIGHTS AND APPROVALS**

### **WARRANTY**

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

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

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.

### **COPYRIGHT**

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### **APPROVALS**

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## **SYMBOLS AND CONVENTIONS**

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

### **GENERAL WARNING OR CAUTION**



*This symbol 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**



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

### **ASDI CONTACT NUMBERS**

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

**Telephone: 206.789.5410**

**Facsimile: 206.789.5414**

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

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

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## DESCRIPTION

The **SECOND SUN™** flameless catalytic tank heater is a new product that Algas-SDI has been developing and testing for several years. The concept is a result of research that began in 1998. The intent of the heater is to augment natural vaporization or to build pressure from the environment at times when the environment is not able to supply the needed energy through the “wetted” surface of the propane tank.

When used with propane, applications can range from boosting pressure in a tank to vaporizing small loads. Use the heater during cold weather in lieu of a pump to boost pressure on a tank that is used with a vaporizer for larger loads. The heater can both boost pressure and serve as a vaporizer for smaller loads up to 1MM Btu/hr. In either case the containers can be stationary or portable since the heater does not need a permanent electrical service. On a temporary basis, the **SECOND SUN™** may be used to boost the pressure in a container that has been over drawn and refrigerated.

The **SECOND SUN™** tank heater is rated at 27-30,000 Btu/hr and should only be placed on 1000 gallon and larger vessels up to 12000 gallons. Catalytic heaters, properly maintained and serviced, will not ignite a mixture of fuel and air or sustain open flame combustion. A stainless steel grill is installed to protect the catalytic material from damage such as incidental impact, insects or rodents but it is important to inspect the heater face for holes before starting the heater.

Each **SECOND SUN™** operates and is controlled by tank pressure. The safety system includes three (3) elements: an over-pressure safety switch that monitors pressure in the tank to which the tank heater is attached, a high temperature switch that monitors the tank surface temperature should the liquid level fall below the heater, and a pilot heater monitor that prevents an unwanted release of gas in the event the pilot heater temperature drops below the point necessary to continue catalyzing the fuel. When any of the safeties are triggered, manual intervention is required to restart the unit.



A solid state thermo-electric generator provides power to operate the tank heater controls. Electrical power is generated by the temperature differential between the heater and the ambient air. The small finned aluminum heat exchanger cools one side of the EMF generating device, and the heater provides heat to opposite side. The heat exchanger must remain exposed and unobstructed. A common “flame type” thermocouple does not function in this application because there is no pilot flame.

The **SECOND SUN™** is a “staged” heater consisting of a smaller portion called the “pilot” heater and a larger section called the “main” heater. These two sections are both contained within the overall heater and cannot be seen without removing the catalyst material. The pilot heater is used to start the catalyzing process with a limited energy source such as a 12V car battery, and to allow the heater to ramp down when main heat is not necessary. In cold environments our testing has shown that the **SECOND SUN™** performs best when the pressure setting corresponds to a saturation temperature above 32 F (55 psi for propane) is preferred. When set below this point ice formation may impede the heater performance when the main heater cycles off for long periods.

When not needed during the summer, we recommend the unit be shut off. Before restarting the unit in the fall, the catalyst material should be visually inspected to make sure rodents have not entered and degraded the material. At the same time, the tank surface covered by the heater should be inspected for corrosion, using the same method used for inspecting all other exposed surfaces.

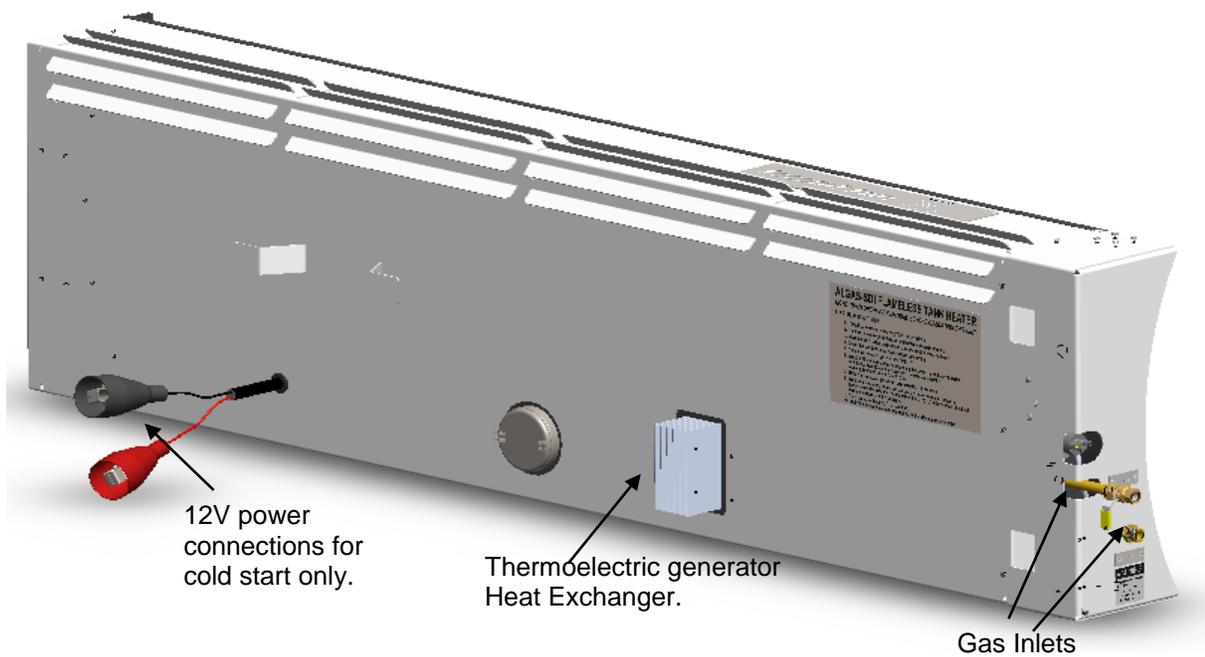
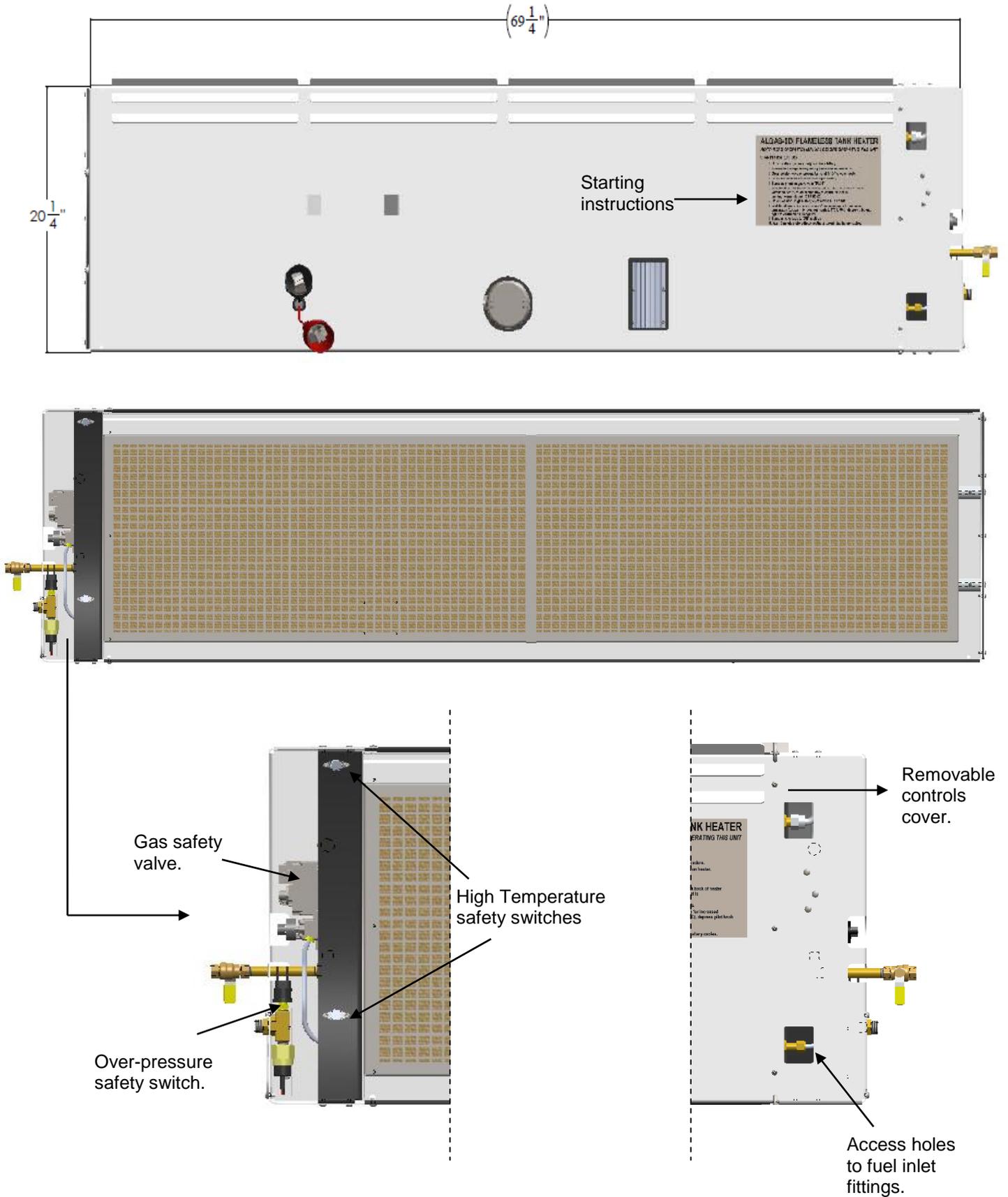


Figure 1 — SECOND SUN



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## GENERAL REQUIREMENTS

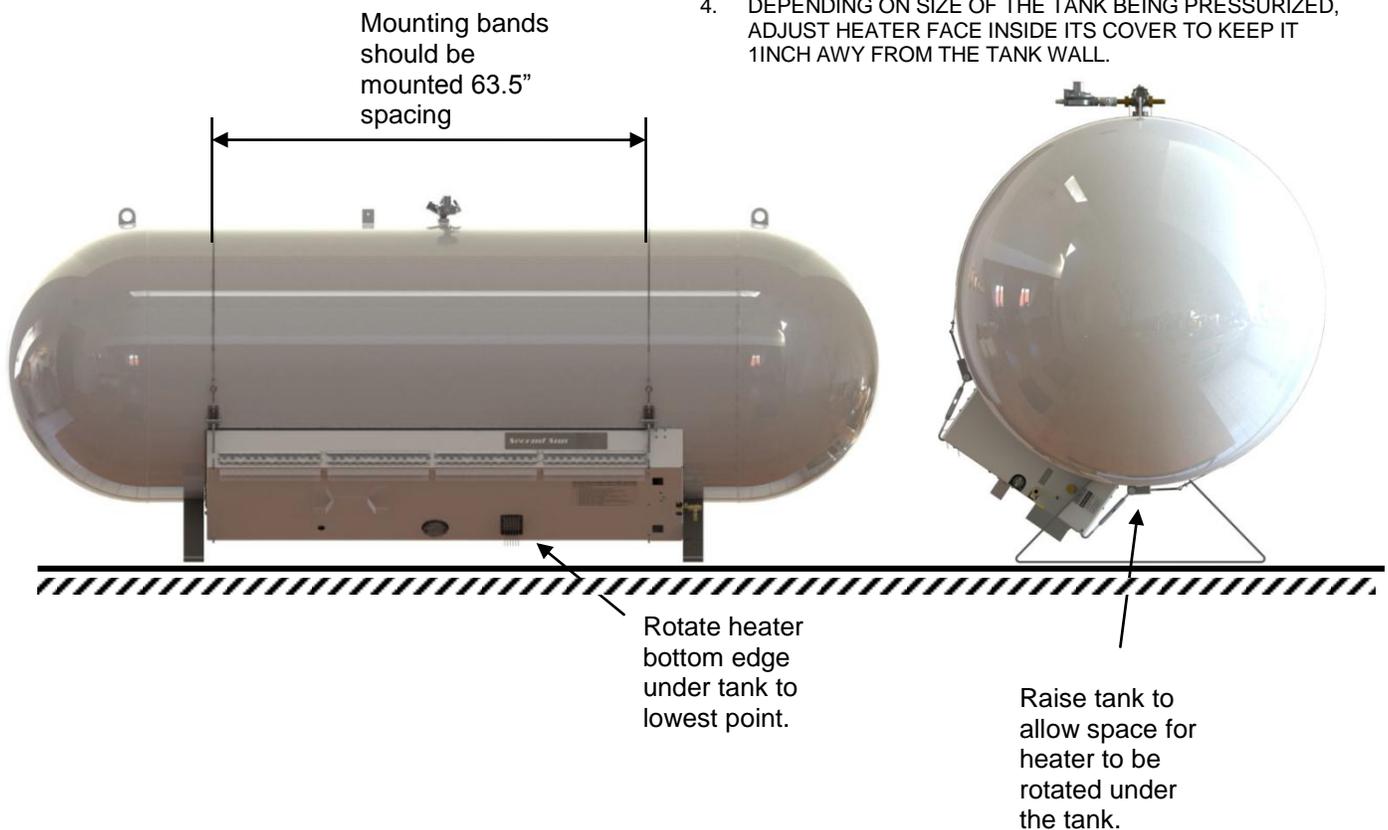
Install the Second Sun™ on a “raised” tank to allow space for the heater to be rotated under the tank. Inspect the heater face visually for any damage to the catalyst material. At the same time, the tank surface, covered by the heater, should be inspected for corrosion, using the same method for inspecting all other exposed surfaces. Clean all foreign materials from all pipelines prior to making any connections to Second Sun™. Use pipe sealant approved for LPG use where required. Check all connections for leaks using leak detection solution or device. Eliminate all leaks prior to operation.

Install in accordance with NFPA 58 and local applicable codes and regulations as required.

**Figure 2 – Typical Second Sun™ Installation**

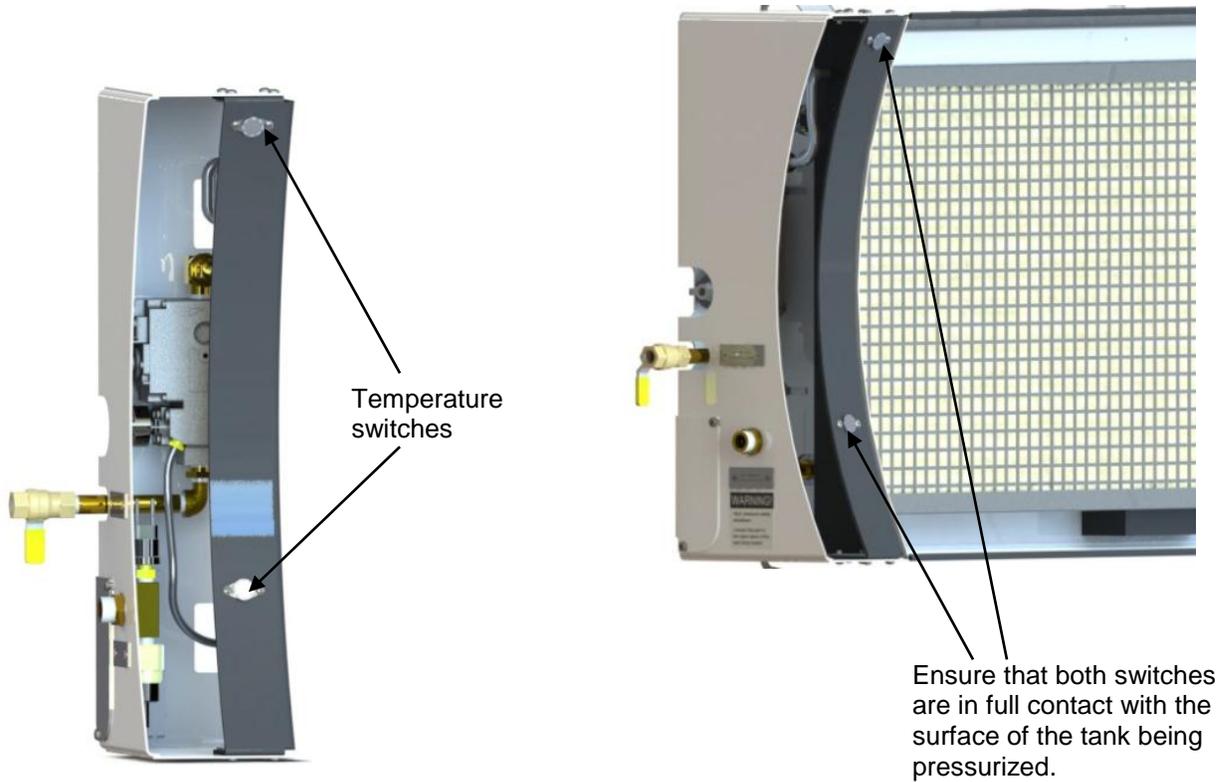
### NOTES

1. INSTALL THE TANK STRAPS WITH DIRECTIONS GIVEN BELOW BEFORE ATTEMPTING TO MOUNT THE HEATER.
2. INSTALL THE PROVIDED GAS REGULATOR ASSEMBLY TO YOUR TANKS MULTI-VALVE WITH NECESSARY FITTINGS.
3. DO NOT PLACE HEATER ON ITS BACK AT ANY TIME TO AVOID DAMAGE TO CRITICAL COMPONENTS OF SECOND SUN™.
4. DEPENDING ON SIZE OF THE TANK BEING PRESSURIZED, ADJUST HEATER FACE INSIDE ITS COVER TO KEEP IT 1INCH AWAY FROM THE TANK WALL.



1. Attach the provided tank heater mounting bands on to the tank at **63.5** inch centers as shown in Figure 2.
2. Level tank straps such that lower turnbuckle assemblies are as low on the tank as possible while still allowing heater to clear the ground. Do not allow the heater lower edge to cover the tank invert (lowest line of the tank bottom).
3. Ensure that the neoprene band holding the temperature switches is folded upward against the side of heater and not under the edge of the heater since it will prevent the temperature switches from contacting the tank surface properly.
4. Hook the bottom edge of the heater cover in to J-hooks and tighten the turnbuckles only enough so they stay hooked into the cover. Insert the top J-hooks into the mounting holes on the upper side of the cover.
5. Make certain the heater side skirt extends outwards from the heater to seal against the outside of the tank. Do not allow it to fold under the heater since it will prevent the heater from making full contact with the tank.
6. Tighten the top turn buckles while supporting the heater until there is about 1.5 inch space remaining between the top edge of heater and the turnbuckle assembly on the mounting band.
7. Connect the regulator assembly to the multi-valve (on top of the tank) that is connected to the vapor space of the tank being heated.
8. Connect the high pressure line to the lower fitting on the heater marked "**High Pressure Tank Connection**".
9. Connect the output of the regulator to the upper fitting on the side of the heater cover marked "**Low Pressure Regulator Connection**".
10. Close the on-off valve, located outside the control cover, marked as "Low Pressure Regulator Connection".
11. Open the isolation valve on the propane tank and check the installed plumbing for leaks.
12. Open the heater on-off valve and check for leaks in the remaining gas train.
13. Repair any leaks before proceeding with the installation.
14. Check both temperature switches for proper contact with the tank surface by looking from the side of the controls cover.
15. The temperature switches should be in close contact over the full surface of the switch. Loosen the turnbuckle on the control cover side for an easier inspection of the switches.

**Figure 3 – Temperature switches**



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**CAUTION**

***Once full contact is made with the tank surface it can take up to 15 minutes for the switch to automatically reset. Once the switch has closed, the control circuit will allow gas to flow to the main heater.***

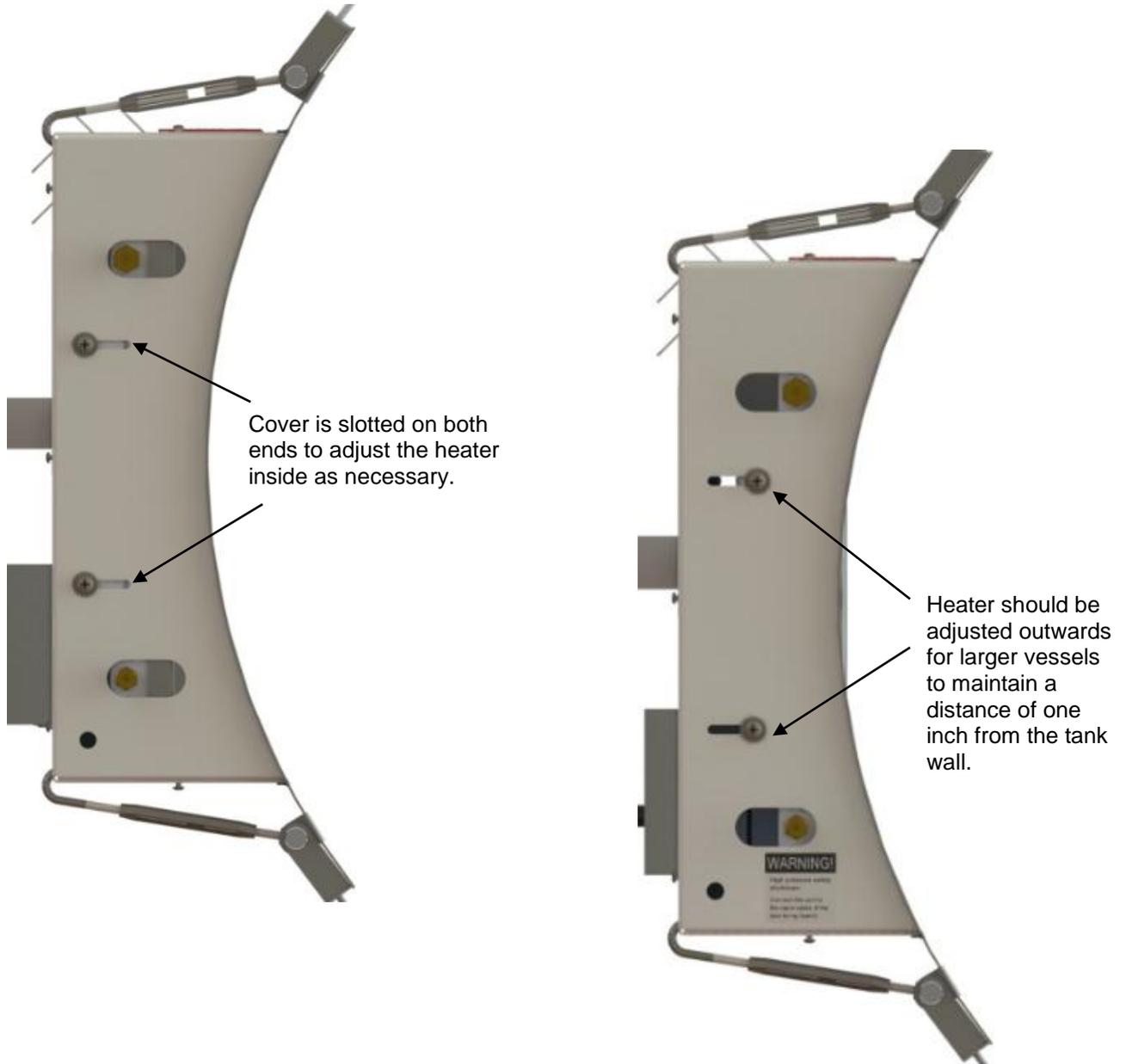


***The lower switch will activate when the tank is empty and will shut off gas flow to both the pilot and main heater. This will require a cold restart procedure once the tank has been refilled. Activating (opening) the upper temperature switch will shut-off gas flow to only the main heater and will allow the pilot heater to continue to operate. Once the tank has been filled, the main heater will come on automatically.***

***Heater should be turned OFF while refueling the tank.***

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**Figure 4 – Adjustable Heater**

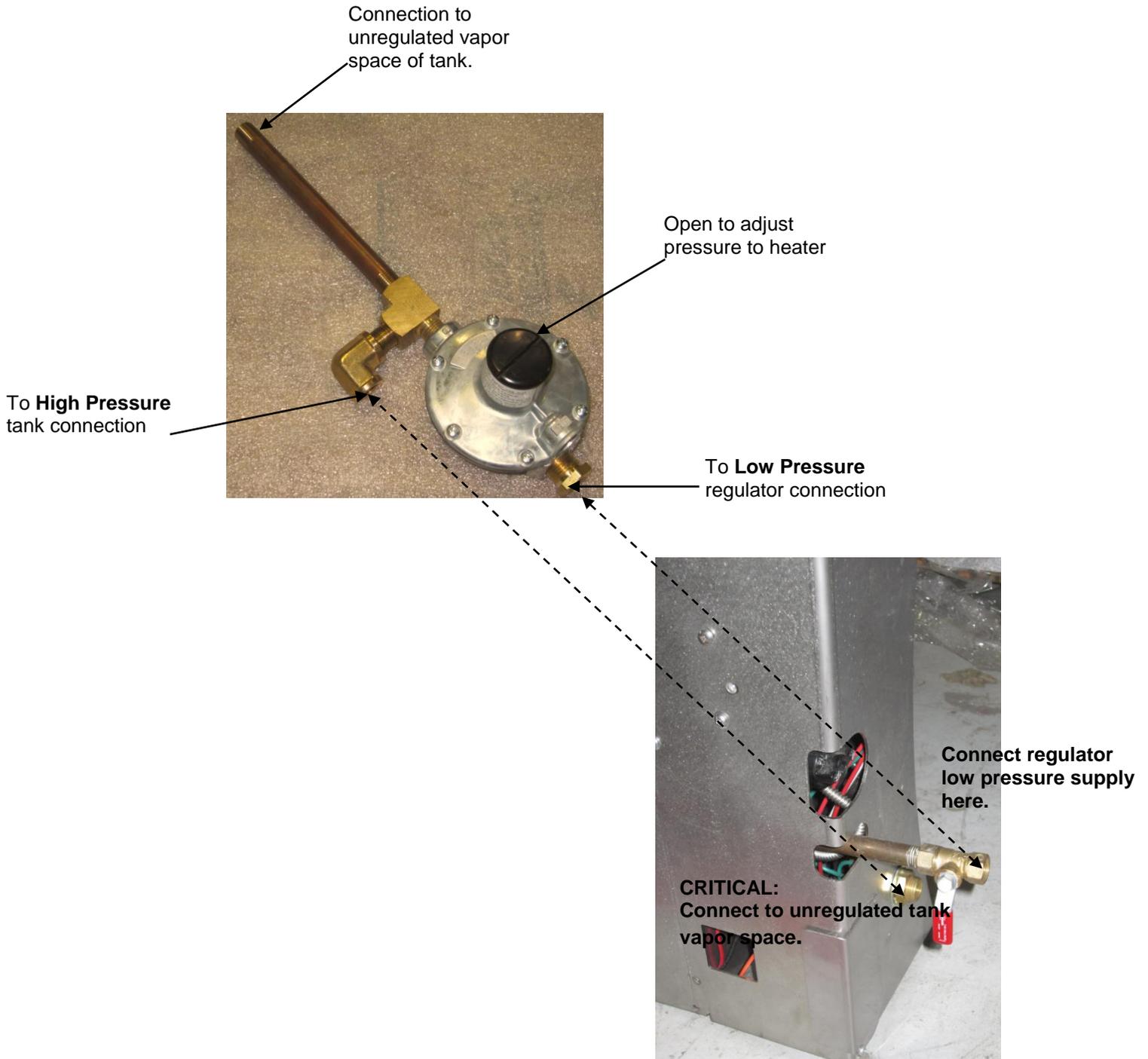


**NOTES**

1. HEATER SHOULD BE ADJUSTED OUTWARD IN ITS ENCLOSURE DEPENDING UPON THE SIZE OF TANK ITS PRESSURIZING. A 1INCH SPACE SHOULD BE MAINTAINED BETWEEN THE HEATER FACE AND TANK SURFACE FOR PROPER VAPORIZATION.

**Figure 5 – Gas Regulator Assembly**

1. Connect either copper lines or hose from the valve assembly to multivalve on the tank.
2. Ensure that the lines do not contain any low spots where liquid can accumulate without draining, via gravity, to the heater.



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## GENERAL

Second Sun™ is controlled by tank pressure. The tank heater utilizes an adjustable operating pressure switch with a range of 55 psi – 100 psi. When the pressure in the storage tank falls below the operating switch set point the heater will cycle on providing heat (energy) into the liquid stored in the tank. When the pressure requirement is met, the tank heater reverts to standby mode.

## OPERATING INSTRUCTIONS

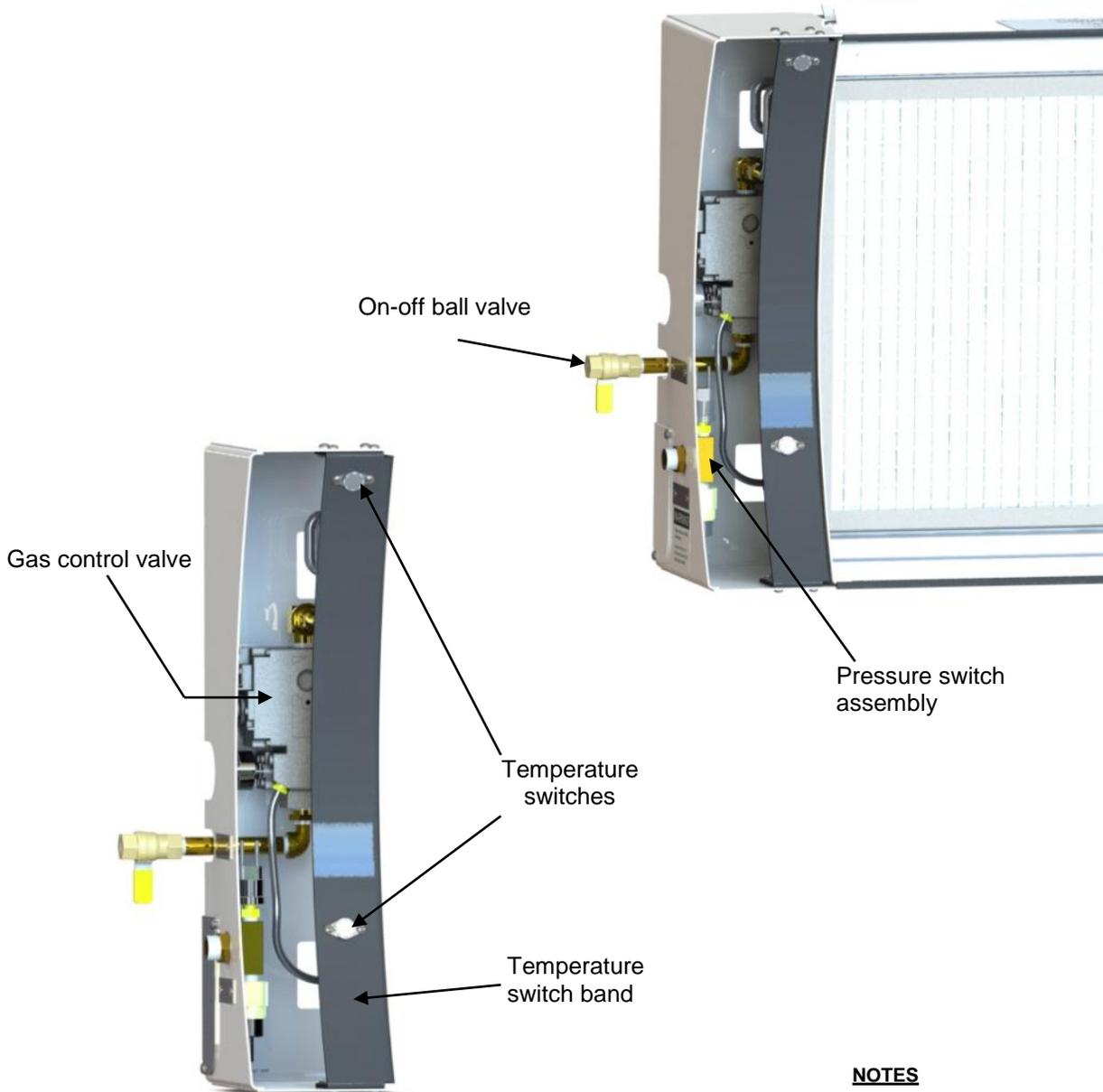
1. The heater operates automatically, turning on when pressure drops below 55 psi and into stand-by mode as pressure rises above 57 psi. Heater will automatically switch from stand-by to full heat mode when the pressure drops below 55 psi.
2. If the propane level, in the tank, drops below the top of the heater and the tank wall temperature rises above 125° F the heater will shift to stand-by mode. If the propane level, in the tank, falls to the lower section of the heater and the tank wall temperature rises above 125° F the tank heater and pilot will shut down requiring manual restart.
3. If the tank pressure rises to 160 psi the tank heater and pilot will shut down requiring manual restart.

## STARTING THE SECOND SUN

1. Attach cables to a heavy-duty 12 volt truck battery.
2. Start the truck to charge the battery during the heater start-up procedure.
3. Open the isolation valve on the propane tank and on/off valve on the heater.
4. Check for gas leaks and repair before proceeding.
5. Turn the black knob on the gas valve to “Pilot”.
6. Wait 20-30 minutes before depressing the pilot valve. Check the back of the heater, near the 12 v. electrical connection box, to ensure pre-heat is working (warm to touch - 125° F, 52° C).
7. Depress and hold the pilot knob, on the gas valve, for at least 60 seconds.
8. Wait 30 minutes and check the back of the heater again for increased temperature (too warm for continual contact – 175° F, 79° C), depress the pilot knob again to ensure that it is engaged.
9. Turn the gas valve knob to “On” position.
10. Wait 10 minutes before disconnecting and rewinding the battery cables.

## STOPPING THE HEATER

1. If the heater is on and you wish to manually switch the operation to stand-by mode, turn the black knob on the gas control valve to "Pilot" setting.
2. To shut the heater down, completely, close the manual on-off ball-valve, on the outside of the heater cover. The heater can also be turned off by closing the isolation valve on the propane tank.



### NOTES

1. WHEN INSTALLING THE TANK HEATER MAKE SURE THE TEMPERATURE SWITCHES ARE MAKING FULL CONTACT WITH THE TANK SURFACE. FAILING TO DO SO WILL TRIGGER THE TEMPERATURE SWITCHES AND KEEP THE HEATER FROM MONITORING TANK SURFACE TEMPERATURES PROPERLY.

## GENERAL REQUIREMENTS

Second Sun™ is designed for long term trouble free operation. Because of the nature of its use, and the low maintenance requirements, it is important to provide scheduled maintenance. Below is a check off list for annual inspections.

- I. Check the heater face and tank surface (under the heater) yearly. Release the heater top latches and allow the heater to tilt back on the latches. This will allow adequate space to inspect both the heater surface and the tank surface. The tank surface should be clean and the paint should be intact without scratches and with no exposed metal. The heater face should be clean and free of debris, ice, snow and insect nests.
- II. Inspect the catalytic material for holes rips or tears. If holes are present, discontinue use immediately and ship the heater back to Algas-SDI for repair. Gas can escape from holes in cat material and support open flame combustion.
- III. Clean obstructions from the cover inlet and exhaust louvers. If the exhaust and/or inlet louvers are plugged, the heater will not operate correctly and may not reach optimum temperature.
- IV. Do not use high pressure air or water to clean the cat surface. If the heater surface does not reach full temperature after an hour of operation (850° F/454° C) and tank pressure is less than 55 psi, contact the factory for instructions.
- V. The temperature of heater face should be 750-1050° F.
- VI. Voltage of the peltier device, measured between terminal 3A and 5A should be 90 mv or higher when the heater is running. This should measure 300-500 mv when the main valve is actuated. When the heater is running and only the pilot is actuated it will read 600-1000 mv.
- VII. Inspect the neoprene band holding the temperature switches along its edges for any major cracks that would affect proper temperature switch contact.

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### CAUTION

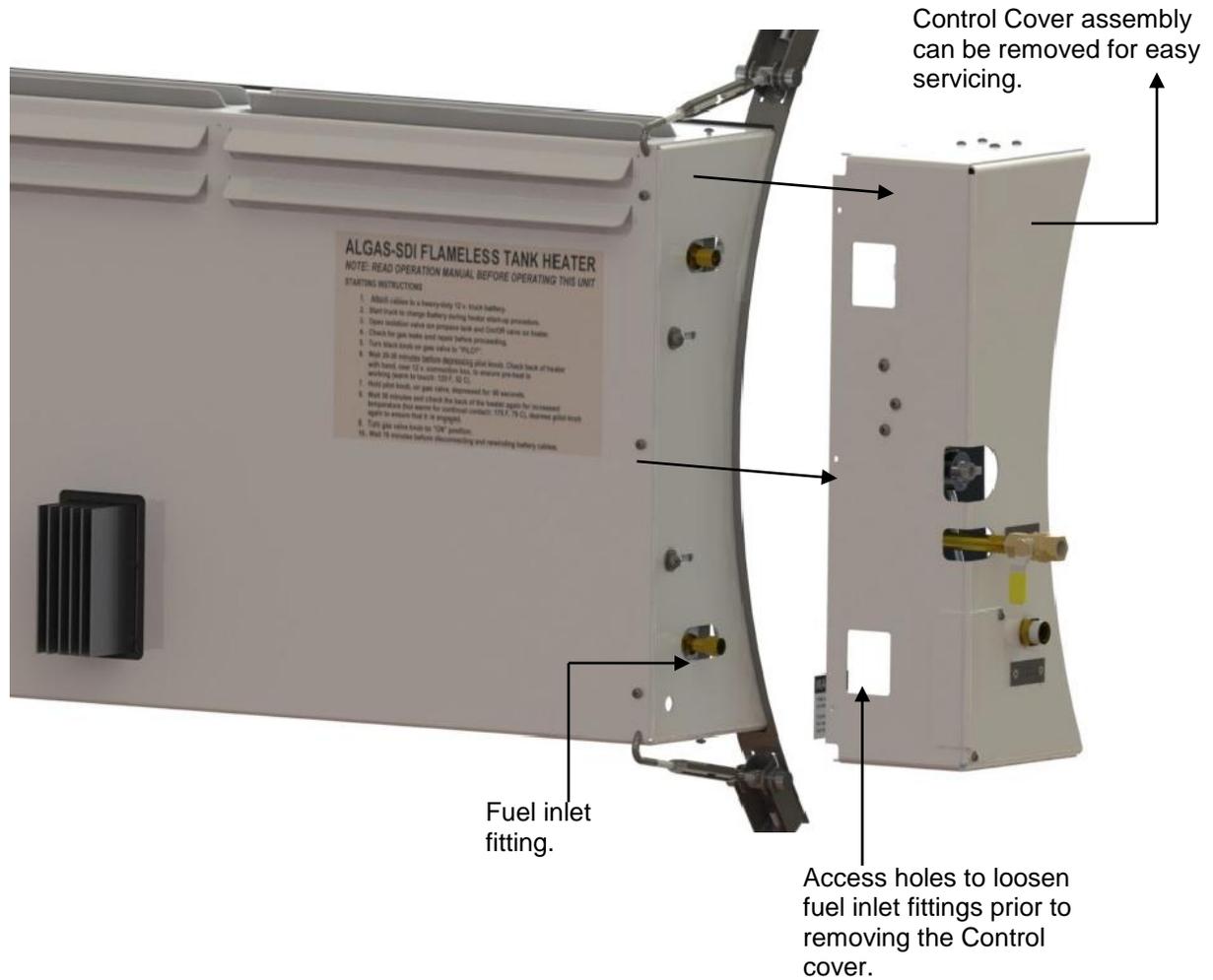


***Voltage readings will change depending upon ambient conditions. In colder environments a higher voltage reading can be expected. In a warmer climate a much lower voltage reading will be obtained.***

***The gas valve will work properly as long as a minimum of 300 mv can be registered when only the pilot is actuated and running.***

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Figure 6 – Control Cover



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**CAUTION**



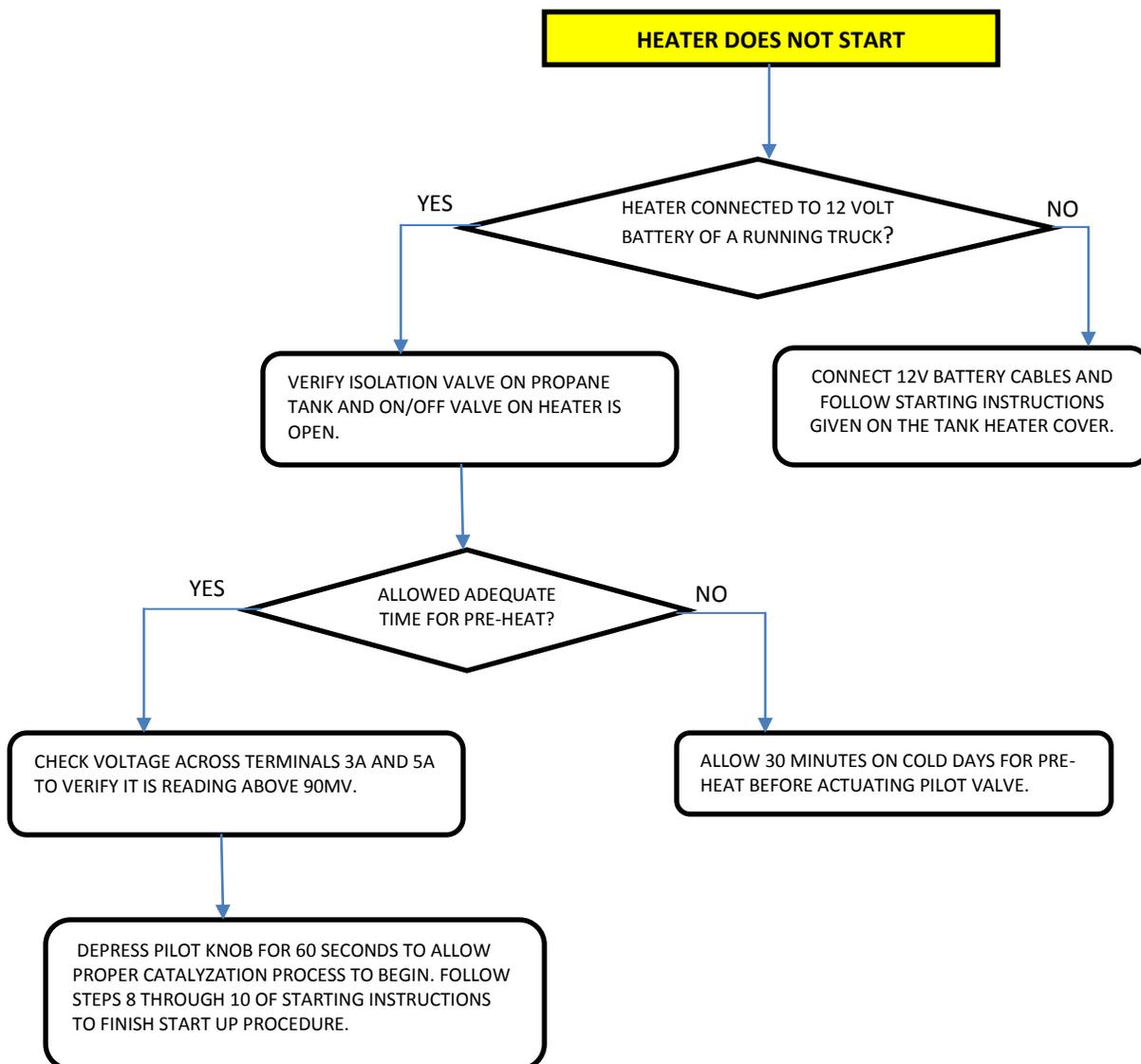
***Before removing the control cover for servicing, empty any fuel lines by shutting gas off from the fuel source. After fuel lines have been emptied, loosen gas fittings from the access holes on the back before attempting to remove the cover.***

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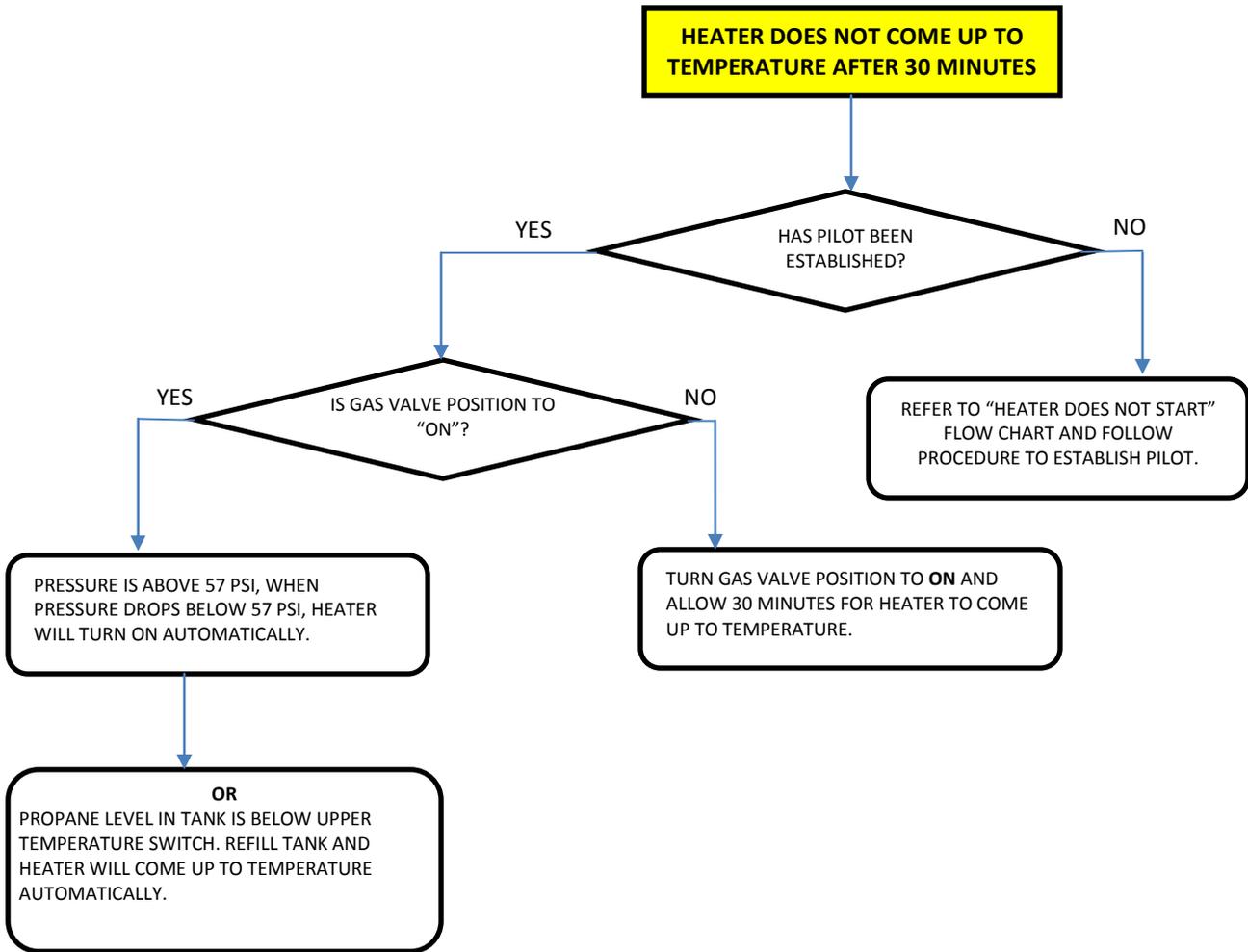
## General Requirements

FOLLOW TROUBLESHOOTING GUIDE BELOW TO IDENTIFY THE PROBLEM:

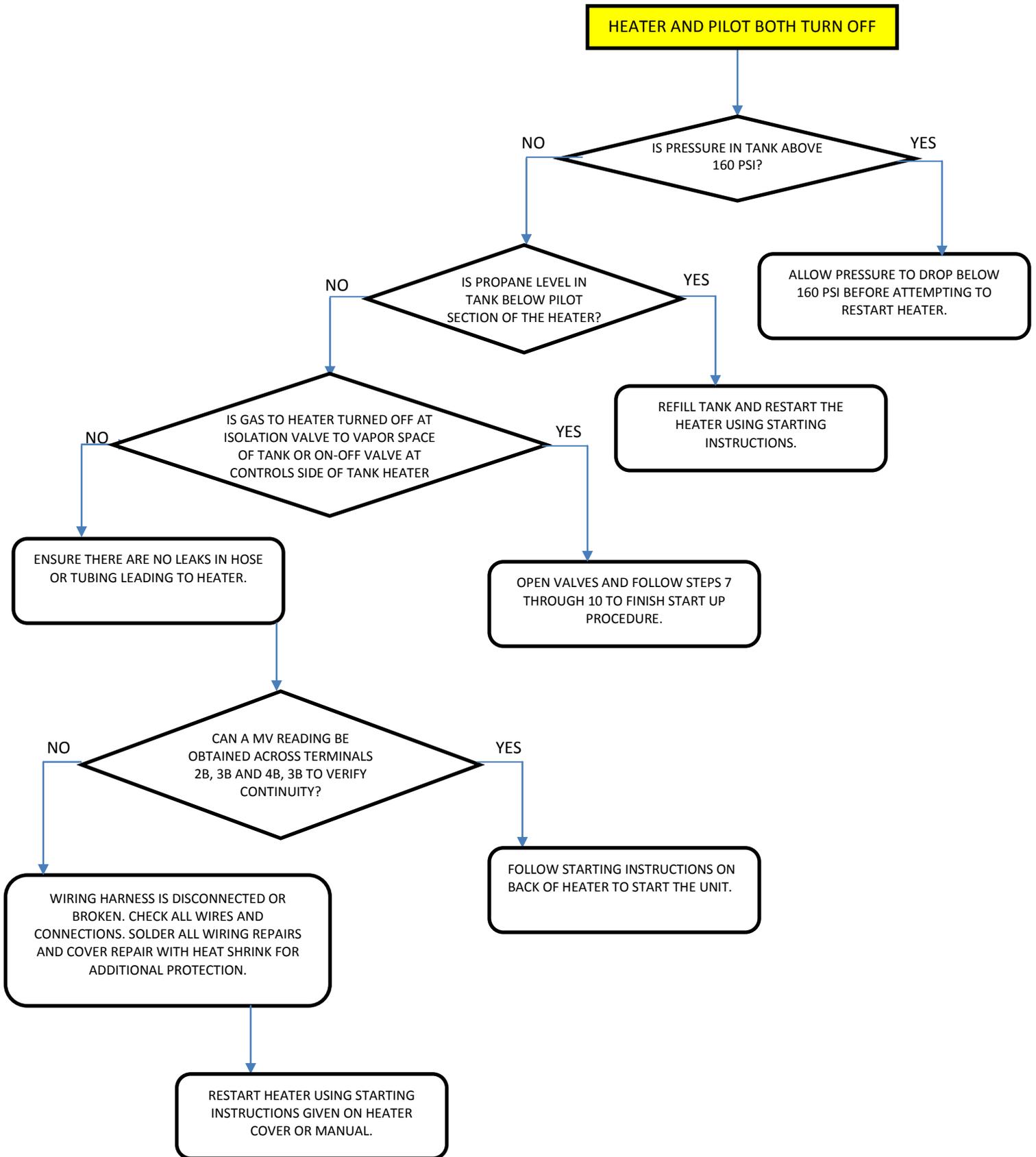
Figure 7: Heater does not start



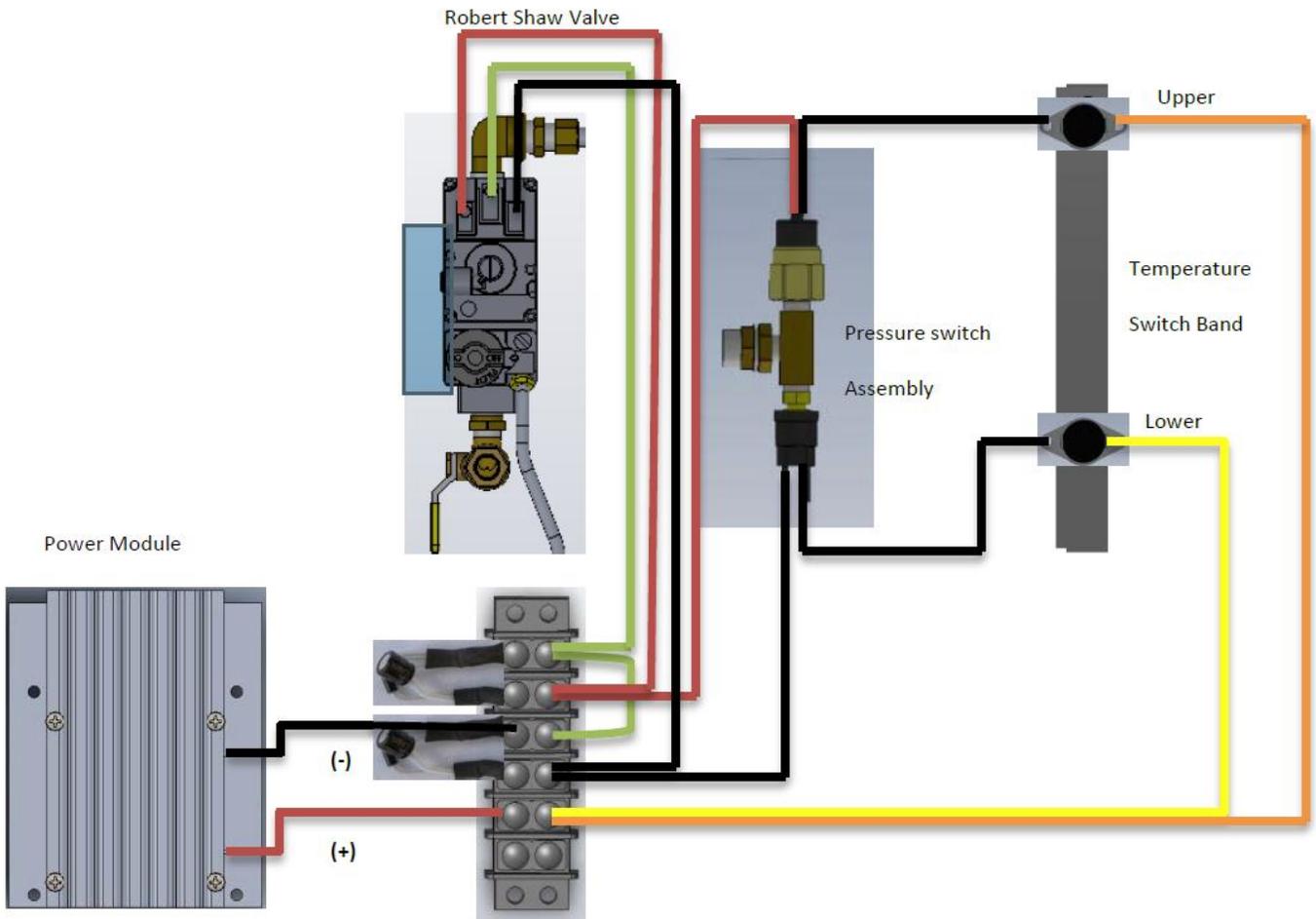
**Figure 8: Heater does not come up to temperature after 30 minutes**



**Figure 9: Heater and Pilot both turn off**

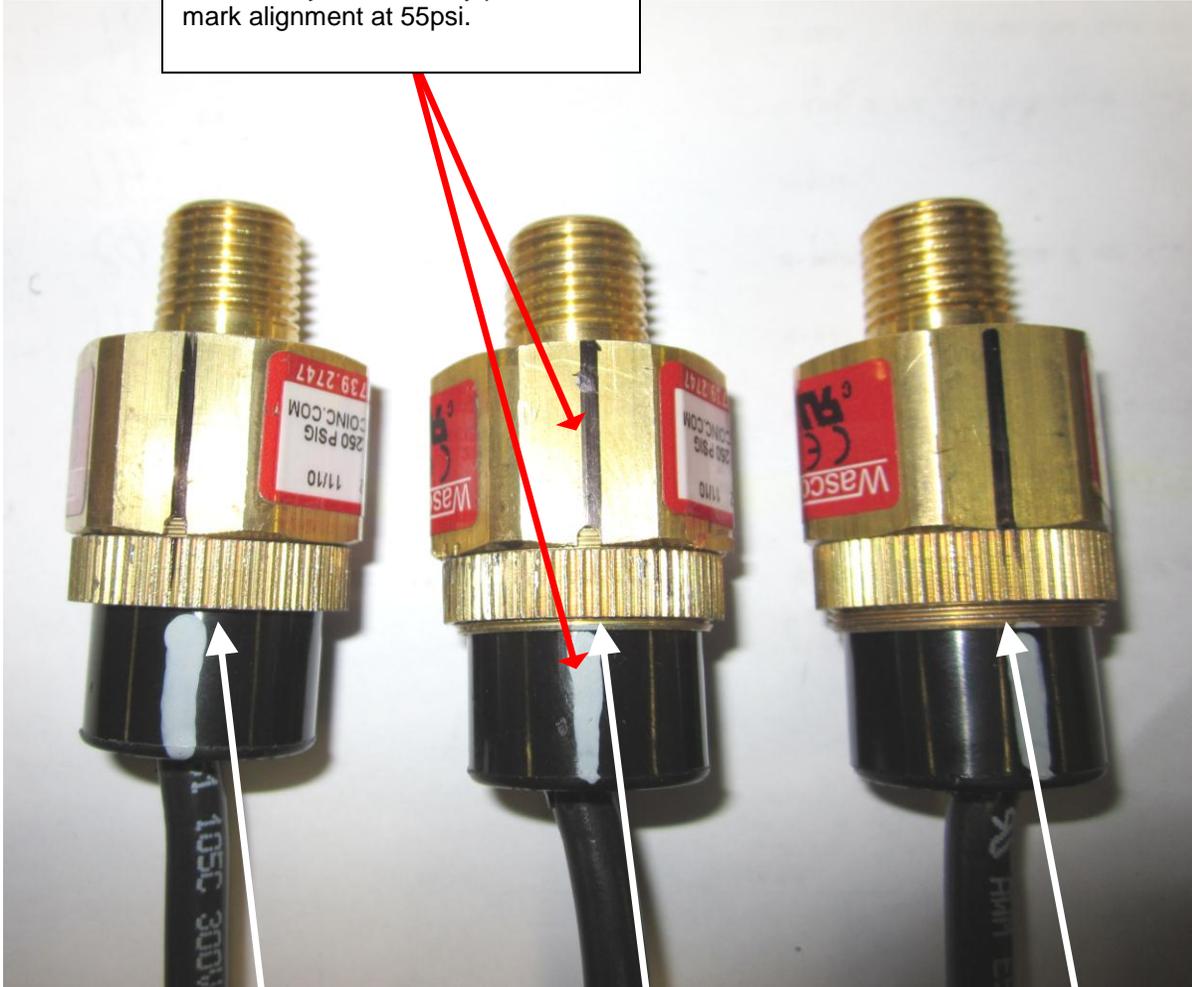


**Figure 10: Wiring Diagram**



**Figure 11: Adjustable pressure switch settings**

Indicator marks on wrench flat and switch body show factory pre-set mark alignment at 55psi.



**OUT OF ADJUSTMENT**

No threads exposed:  
Rotate switch body  
counterclockwise until one  
thread is visible outside the  
lock ring.

**PROPER ADJUSTMENT**

One exposed thread:  
Pressure setting is factory pre-  
set at 55 psi.

**OUT OF ADJUSTMENT**

Multiple threads exposed:  
Rotate the switch body  
clockwise until only one thread  
is visible outside the lock ring  
and marks are aligned.

- The adjustable pressure switch is pre-set to 55 psi, unless specified by the customer to a different setting.
- Every 60 degrees of counter-clockwise rotation (one wrench flat) will **increase** the pressure setting by 30 psi.
- Every 60 degrees of clockwise rotation (one wrench flat) will **decrease** the pressure setting by 30 psi.

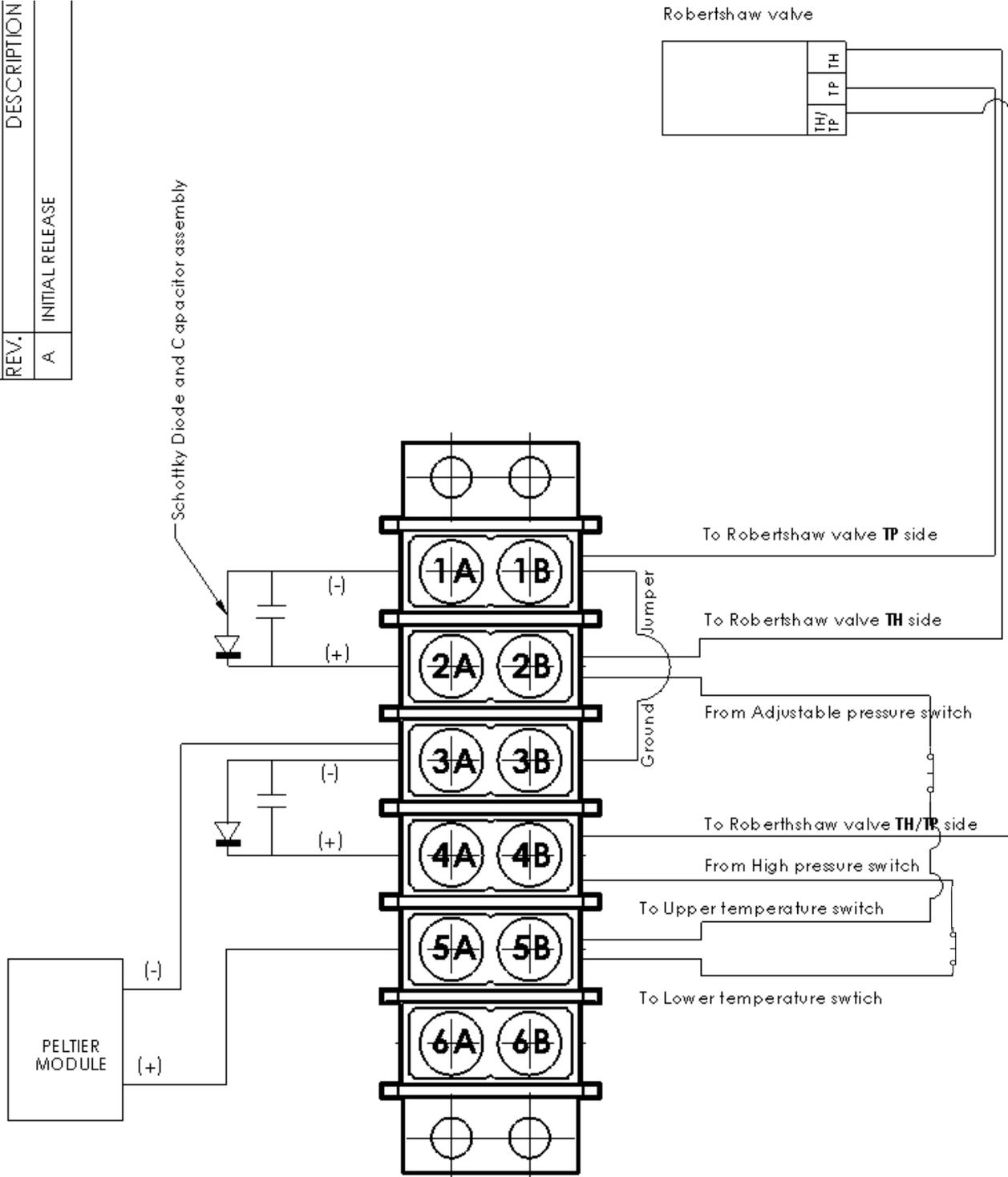
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# ***APPENDIX A***

## ***TECHNICAL INFORMATION***

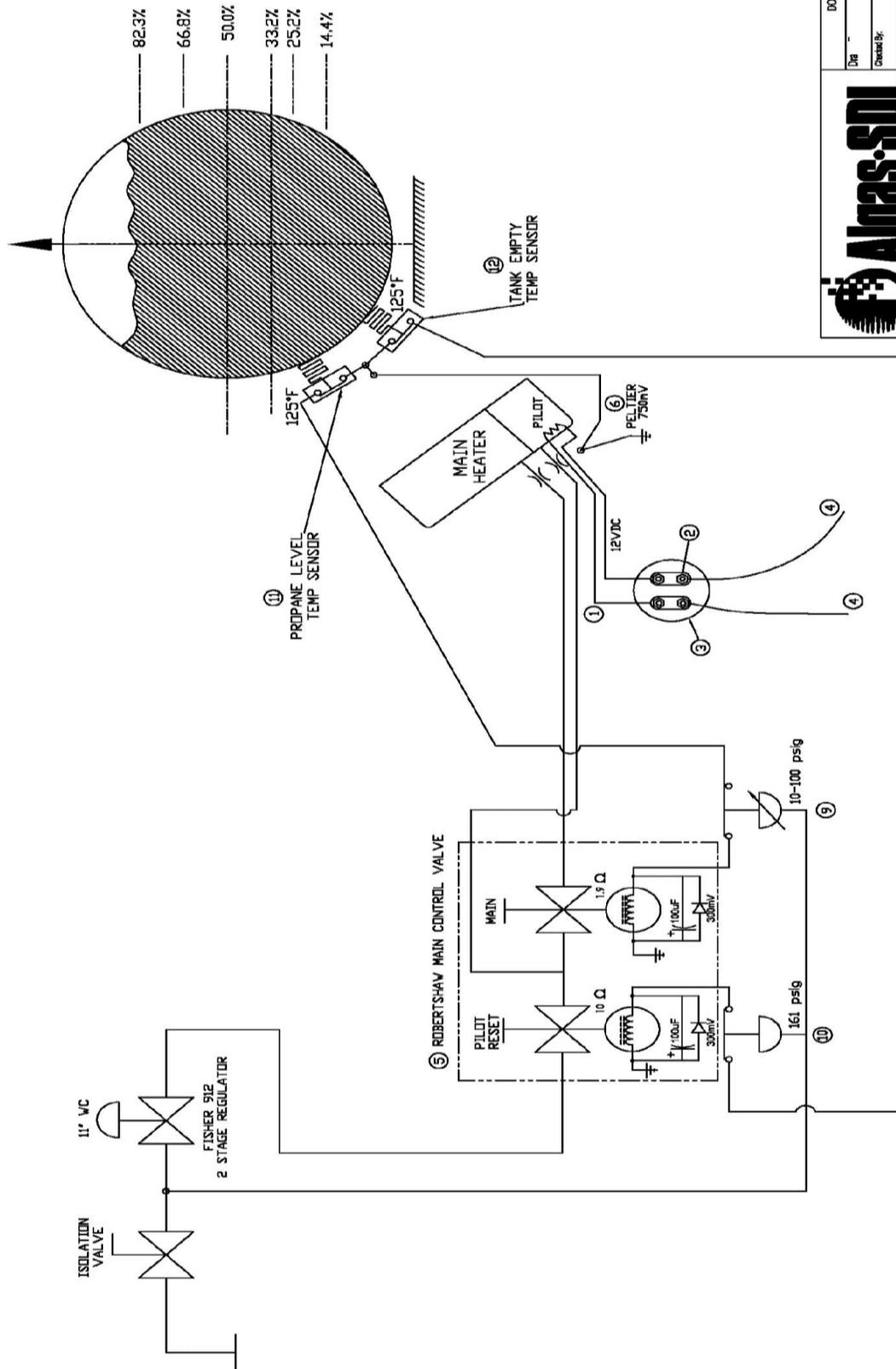
# TERMINAL STRIP DRAWING FOR SECOND SUN

REV.	DESCRIPTION
A	INITIAL RELEASE



## SECOND SUN Spare Parts

SPARE PARTS	PART NUMBERS
1. Gas valve	60431
2. Peltier assembly	2201-4006
3. High pressure switch	60422
4. Adjustable pressure switch	60423
5. Temperature switch	60510
6. Neoprene Temperature switch band	2201-5017
7. Fisher regulator	30737
8. Heater engine	2201-5020
9. Heater engine cover	2201-4001
10. Control cover	2201-4002
11. Tank heater mounting band	2201-5012
12. Mounting clevis	2201-5013
13. Clevis pin	2201-5014
14. Cable shackle	2201-5015
15. Schottky diode and capacitor assembly	2201-4009



DO NOT SCALE DRAWING

Drawn By:	Date:
Checked By:	Scale:
Approved By:	Job #:

**Algas-SDI**  
2100 E. Main Street, Suite 100, Meriden, CT 06450

A.S.D.I. STD.



Innovative Liquid Vaporizing and Gas Mixing Solutions

## WARRANTY REGISTRATION

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

To help us give you better service, please fill out this warranty registration form and return it to ASDI to register your purchase and for follow up on the performance of ASDI equipment. We are dedicated to producing a quality product and if a problem occurs, ASDI wants to know about it. Please help us with a small amount of information about your company and how the equipment will be used. When contacting ASDI, please have the type of equipment and the serial number handy so we can give you accurate information. If you have had any kind of problem with this equipment, or you have any comments, please attach a separate sheet to this form. Keep a copy for your records.

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

Name of individual to contact for follow up information: \_\_\_\_\_  
 Title: \_\_\_\_\_

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

In what application is the equipment being used? \_\_\_\_\_  
 When was the equipment put in service? \_\_\_\_\_

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

151 South Michigan Street,                      Tel: 206.789.5410    E-mail: sales@algas-sdi.com  
 Seattle, Washington, 98108, USA              Fax: 206.789.5414    Internet: www.algas-sdi.com