

# ELSTON

## H-LC Nosemount Cargo Heater



### Owner's Manual for H-LC Cargo Heaters

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**ELSTON MANUFACTURING INC.**

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Valid for all models HLC with Serial Numbers beginning with #H6140

## 1 Safety Information

Safety precautions are necessary for the safe and reliable operation of this product. For your safety, please take the time to read the appropriate sections of this manual before installing, servicing, or operating the heater.

**⚠ WARNING** Use only propane vapor for fuel. Use this heater only with regulators and tanks that provide propane vapor at 10.5 to 11 inches of water column (10.5-11 InWC). Use of a different fuel, a liquid withdrawal cylinder, and/or propane vapor at a significantly different pressure risks fire or explosion.

**⚠ WARNING** Use a carbon monoxide detector  
A damaged heater could leak carbon monoxide into the heated area. As with a home, it is strongly recommended that a carbon monoxide detector is used whenever people are regularly in the space warmed by this heater.

**⚠ WARNING** Do Not Bypass or Remove Safety Equipment  
Although we understand temporary measures must be made to save a load, bypassing any safety device may result in fire or explosion. For your safety, do not temporarily bypass any safety equipment. If safety equipment is bypassed, fix these temporary measures as quickly as possible.

**⚠ WARNING** Use only exact parts or manufacturer approved replacements for repair  
For proper function and safety, critical parts, such as hoses, regulators, guards, and electronics, must match the existing part.

**⚠ CAUTION** Do not service heater until heater has cooled for at least 15 minutes  
Heat exchanger and attached parts remain hot enough to cause burns after unit is shut off until they have cooled for at least 15 minutes.

**⚠ CAUTION** Turn off power to the heater during service. Keep power off unless necessary for testing as heater can start unexpectedly resulting in pinched or cut fingers or damage to heater components from tools.

**NOTICE** Use only in accordance with local regulations. Current regulations in your area may require that the installer of this heater or that the person servicing the propane fuel system meet certain requirements. If it is unsure what is required, please refer to the current regulations in your area or speak with the authority having jurisdiction before beginning installation.

**⚠ WARNING** During operation, the exhaust of this heater produces carbon monoxide, a chemical known to the state of California to cause birth defects and/or other reproductive harm.

As always, apply common sense and beware the perils of ignorance. If you are not sure it is safe or do not have enough knowledge to know if it is safe, **then do not do it!**

## 2 Description of Heater

The nose-mounted cargo heater, i.e. the H-LC Heater, you have purchased is a thermostatically controlled propane heater. It is designed to be mounted on the nose of a trailer to heat cargo. However, it may be used in similar situations where heat is needed.

The HLC heater is a heavy-duty, forced air heater with electronic ignition. To maximize safety, the combustion air is completely separate from the inside air. To maximize energy efficiency, the heater heats air drawn from inside the trailer instead of heating up cold outside air. The exhaust exits out of the bottom of the heater. If you have a vented model it draws air from outside the trailer.

### 2.1 Specifications

Dimensions.....	36 in wide x 16 in tall x 9 in deep
Weight.....	80 lbs
Shipping Weight.....	82 lbs
Rating.....	35,000 BTU/hr
Cold Air Inlet Diameter.....	.6 in
Hot Air Outlet Diameter.....	.4 in
Hot Air Flow.....	150 cfm (minimum) 200 cfm (typical)
Exhaust Outlet Diameter.....	.2 in
Rated Voltage.....	12 VDC 120 VAC
Operating Voltage Range.....	11.5 – 13.5 VDC 120 VAC ± 10%
Average Current Draw.....	8 Amp DC 1 Amp AC
Fuel Requirement.....	Propane (LP gas)
Fuel Consumption.....	1.3 lbs/hr (Max)
Maximum Recommended Thermostat Setting.....	70 °F

All HLC heaters have two standard parts: the heater and the electrical control box.

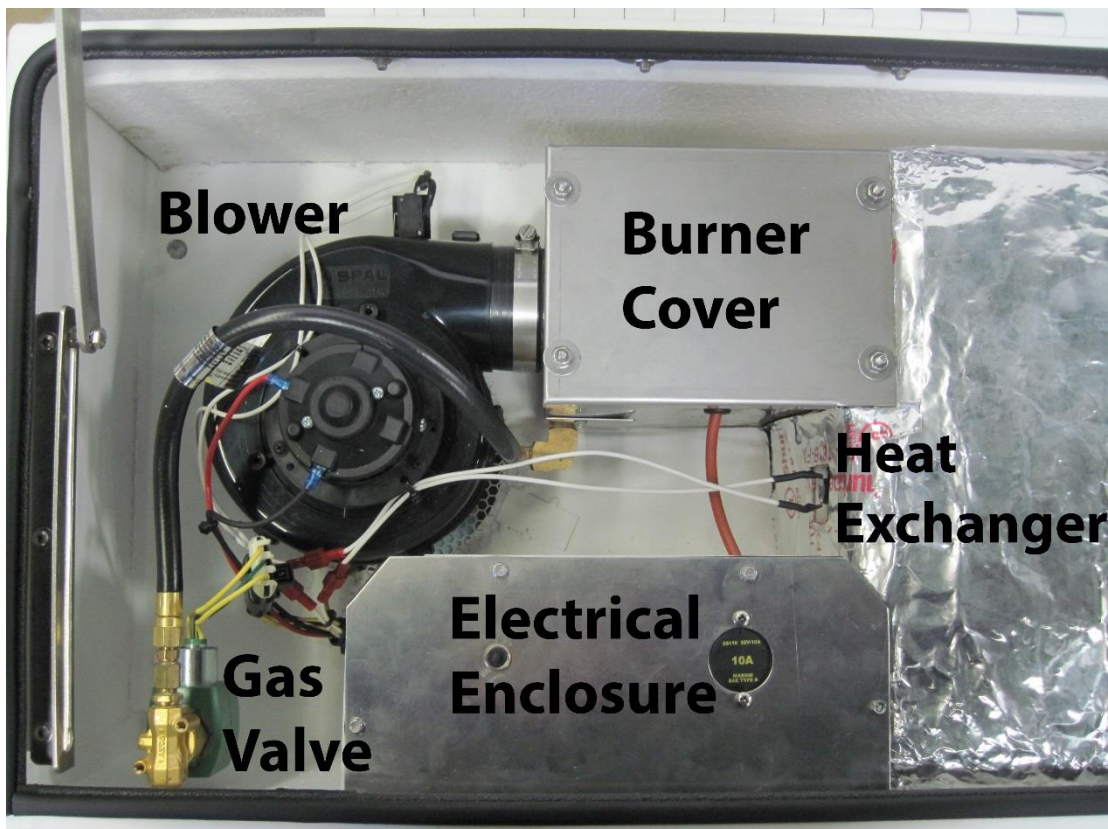
Let's begin with the heater. The heater door can be opened by grasping each handle with your thumb pointing in and turning your hands a quarter of a turn such that your thumbs point straight down. See Figure 1 for details.





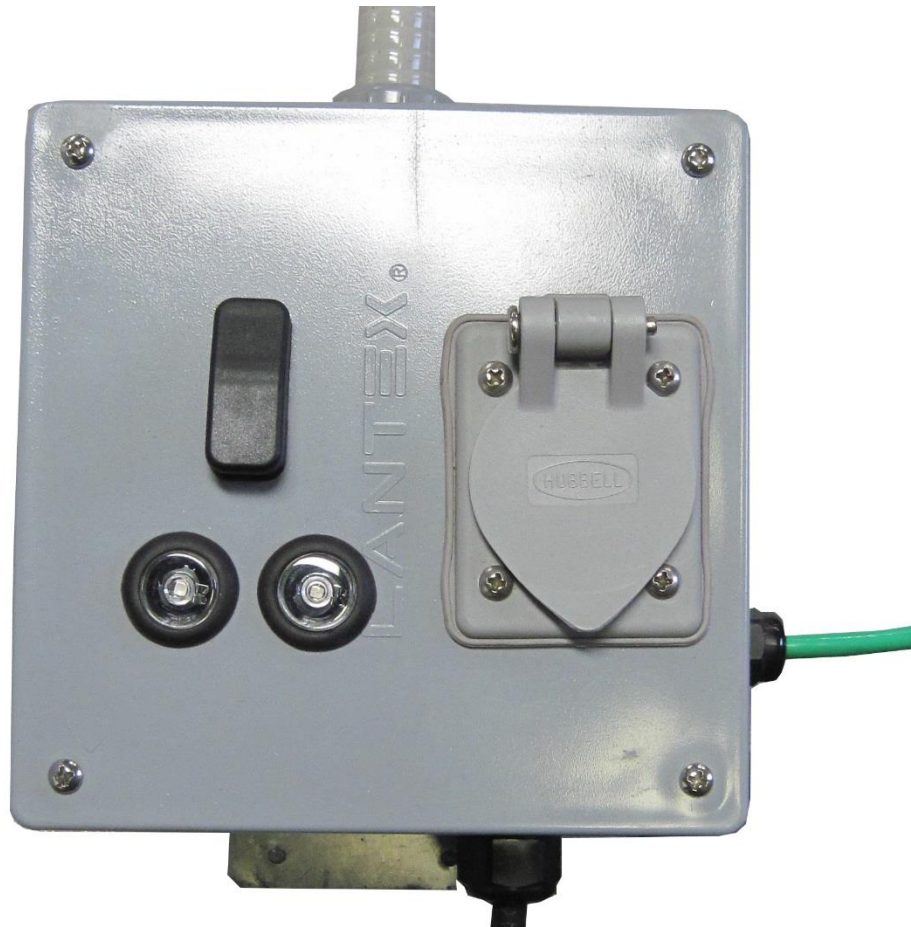
*Figure 1: Opening the Heater*

When you look inside the heater, you will see the major components shown in *Figure 2*.



*Figure 2: Inside of HLC Heater*

Mounted at eye-level on the trailer, you will see a gray control box (see *Figure 3*), with a rocker switch and two indicator lights. The rocker switch turns the heater on and off, the left (green) indicator illuminates when the heater is receiving power, and the right (red) indicator lights when the ignition control proceeds to an error code (see the Troubleshooting section, *Table 1*, for more information). The 110 VAC plug located on the control box allows you to run the heater without attaching the trailer to a semi-tractor or to run the heater through the night without running down your vehicle's battery. The circuit break, power supply, and other electronics for the 110 VAC standby are mounted inside the heater shell.



*Figure 3: Control Box*

We always welcome feedback on our products. If you have comments, suggestions, or problems with the unit please contact us at 1-800-845-1385 or email at [sales@elstonmfg.com](mailto:sales@elstonmfg.com).

### 3 Operating Instructions

Please read the safety information on page 1 if you have not already done so. These instructions assume the heater has already been installed. For installation instruction, please go to *Installation* (page 23).

#### 3.1 Operating Precautions

This heater is designed to heat and provide freeze protection of cargo in trailers and truck bodies. It should not be used for heating buildings or recreational vehicles.

**⚠ WARNING** To prevent fire or explosions and to comply with federal regulations, do not use this heater when transporting Class 1 (explosive), Division 2.1 (flammable gases), and Class 3 (flammable liquids) materials. If you wish to transport Class 1 (explosive) materials, the propane tanks must be emptied or removed and the power to the heater turned off and locked out. If you wish to transport Division 2.1 (flammable gases) or Class 3 (flammable liquids) materials, the service valve on the propane tank must be closed, the hose to the propane tanks must be disconnected, and the power to the heater turned off and locked out.

**⚠ WARNING** Carbon monoxide could be produced by a damaged heater. Symptoms of carbon monoxide exposure include headache, dizziness, burning eyes and nose, nausea, and dry mouth or sore throat. If you experience any of these symptoms, immediately seek fresh air and seek medical attention. Ventilate the area to reduce the carbon monoxide concentrations to safe levels before reentering.

**⚠ WARNING** Never enter the heated area after the heater has sat unattended for an extended period of time, with the gas on, while operating a device, such as a phone, cigarette, or forklift, which could be a source of ignition. If a propane leak developed, you may not detect the odorant in the propane soon enough to extinguish the source of ignition and prevent it from igniting the mixture.

**⚠ WARNING** Correct any leaks immediately as they are a serious fire hazard. If you smell the slightest gas odor, do not use the heater until you have found and fixed the source of the leak. If you smell propane or suspect flammable vapors may be present (from a spilled flammable liquid, etc.) when entering the enclosed area, take immediate action. Follow your company's procedure if one is established. Otherwise:

- Do not do anything that could ignite the mixture including operating an electrical switch, disconnecting an extension cord, or using your phone. Do not light matches or any other source of flame.
- Get everyone away from the area immediately.
- Call your fuel supplier and/or the fire department.
- Do not reenter the area until the heated area has been aired out and declared safe by your fuel supplier, fire department, or trained safety director.
- Have a properly trained service person repair any leaks and bring the heater back into service.

**NOTICE**

Do not disconnect power from the running heater except in an emergency. Stopping the heater before it has finished its cool down cycle will cause heater components to wear out significantly faster. Turn down the thermostat or wait to use the switch on the control box until the blower has stopped. Turn down the thermostat or turn off the propane during normal operation to force the heater to enter its cool-down cycle.

**NOTICE**

Propane has a chemical added to give it a distinctive odor. If you are not familiar with that odor, please contact your local LP supplier. They can provide you with a scratch-and-sniff brochure. Use extra caution if you smoke or strong odors are present as this can make the odor difficult to notice. Like most other odors, extended exposure can reduce your sensitivity to the smell. Since LP gas is heavier than air, please remember that the odor will be stronger at lower levels.

### 3.2 Running the Heater for the First Time or After the Unit has been Idle for a Long Time

Whenever it is needed to verify that the heater is working properly, please process through the following steps:

1) **Check the inlets, outlets, and exhaust tubing**

Check that the air inlets, outlets, and exhaust tubing are undamaged and unblocked.

2) **Check the fuel system**

Check that the propane tank(s) are securely mounted and the gas lines and fittings between the propane tank(s) and the heater are tight and undamaged. Turn on the valve on the propane tank(s).

**CAUTION**

If propane is detected, immediately discontinue operation of the heater until the source of the leak has been found and fixed.

3) **Set the thermostat to the maximum value**

If the temperature is above 80 or 90 °F, the thermostat setting cannot be adjusted high enough for the heater to start in the next step. To continue setting up the heater, chill the thermostat probe or wait for a cooler day.

4) **Turn on the heater**

The heater will start and, after a few seconds, ignite. If the heater does not ignite right away, the ignition system will try to ignite the heater again after a designed delay of 5 minutes. If the heater still does not ignite after a few minutes (the red indicator light will display error codes), please refer to the *Troubleshooting* guide to help fix the problem.

5) **Set the thermostat to the desired temperature**

The heater is now ready for use. The heater will automatically turn on and off as necessary to maintain the desired temperature in the trailer.

### 3.3 General Recommendations for Loading and Heating Cargo

This section contains some general suggestions on loading cargo and setting the thermostat on the heater. However, every application is unique so experience will be the best guide for proper loading techniques.

These recommendations assume that the thermostat probe is mounted on a non-metallic surface on the front wall of the trailer about 2 to 3 feet off the floor and the walls and ceiling have at least 1 inch of insulated foam board installed. Additional insulation will reduce fuel consumption, even out the temperature distribution from floor to ceiling within the trailer, maintain a constant trailer temperature in much lower outside temperatures, and is often required to maximize performance.

This heater operates most effectively when the following items are true:

- Cargo is loaded so that there is room for hot air to travel the length of the trailer.
- Cargo is loaded so there are areas of cold air to settle and unobstructed paths for this air to return to the front of the trailer.
- Cargo is standing away from the walls and setting on an insulating surface off the floor, such as a wooden pallet. This is especially important for the rear walls since it tends to be the coldest place in the trailer due to inadequate sealing doors.
- An extended cold air intake is installed. If the cold air intake is extended so that the air is pulled from a couple of feet off the floor, the circulation in the trailer will be better and there will exist a smaller temperature distribution throughout the trailer.
- The seals for any openings should be in good condition. Significant amounts of heat can be lost through a poorly sealed door making the cargo in the rear of the trailer much colder than the rest.
- The trailer is insulated. Many dry-van trailers come “insulated,” but do not have any insulation in the ceiling of the trailer. To maximize performance, install 1” thick foam board insulation into the ceiling of the trailer as well as the sides, front, and rear doors of the trailer.

If the heater has everything it needs to operate effectively, start by setting the thermostat 8 – 10 degrees above the desired minimum temperature. This assumes the temperature of the cargo is within 10 -20 degrees of the minimum temperature. If the cargo is considerably warmer than the minimum temperature, such as cargo in a 70 °F warehouse that needs to be kept above freezing, set the thermostat higher since some areas of the trailer can cool considerably faster than others. To get started, try setting the thermostat an addition 3 °F warmer (for a total of 11 – 13 °F).

If the cargo is not loaded to allow good air circulation, the trailer is uninsulated, or the trailer is loaded to haul bulk cargo, setting the thermostat will be more difficult. The trailer will have large cold pockets near the floor of the trailer because of limited ways for the heat to circulate. There are no definitive recommendations, since every situation is unique, but try starting with a setting 20 °F above the desired minimum temperature.

If cargo is loaded in areas of the trailer that are naturally warmer, such as the nose of the trailer, the thermostat temperature can be set a few degrees cooler than what is recommended above. The warmest area of the trailer is the front 30 feet of the trailer and more than 2 ½ feet off the floor.



### 3.4 Normal Operation

#### 1) Check Propane Supply

Check that the propane tank(s) are securely mounted and contains fuel. Check that the fitting connecting the tank to the gas system is tight. Turn the propane tank service valve on.

#### **CAUTION**

If propane is detected, immediately discontinue operation of the heater until the source of the leak has been found and fixed.

#### 2) Set the Thermostat

Set the thermostat to the desired temperature. Please refer to the General Recommendations for Loading and Heating Cargo section for recommendations on setting the temperature. If the temperature in the area attempting to be heated is above 80 or 90 °F, the thermostat may not be able to be set high enough for the heater to start in the next step. To continue setting up the heater, chill the thermostat probe or wait for a cooler day.

#### 3) Turn on the Heater

Use the rocker switch on the control box to turn the heater on. Check and verify that the heater starts and runs for 10 – 15 minutes before leaving the heater unattended for normal operation. The heater is now ready for use and will automatically run as necessary to maintain the desired temperature within the trailer (just like a home furnace). Under normal operation, the heater will periodically ignite, sometimes with a noticeable, but not loud, pop.

#### 4) Turn the Heater Off

If possible, do not turn off the heater while it is running. If it is necessary to turn off the heater while it is running, it is recommended that propane system be turned off, resulting in the evacuation of the fuel supply line. This will force the unit to attempt the ignition process to bring the heater back into service. After the 3 unsuccessful ignition trials, the heater will go through a 3 – 5 minute cool down process. Once the blower motor turns off, deactivate the rocker switch on the control box to cut power to the heater.

#### **NOTICE**

Turning off the heater with the power switch while the heater is running will significantly reduce the life of several of the heater components. This method of turning off the heater is not inherently dangerous, **but we advise you to avoid this method.**

## 4 Service Instruction

### 4.1 Every Time you Walk by the Heater (and at Least Once a Week)

- Check the exterior of the heater and the exterior propane gas lines for damage.
- Check that the handles are in the fully closed position.
- Check that the heater is not smoking or producing soot (if it is, refer to the *Troubleshooting* section).

### 4.2 Every Time the Trailer is Loaded and Unloaded

- Check the return air inlet, hot air outlet, and exhaust for damage and obstruction.
- Check the thermostat probe for damage or the wire leading to the thermostat probe for damage.
- Check that the propane gas and electrical lines are secured to the trailer and undamaged.

### 4.3 Annually before the Start of the Winter Season

- Carefully inspect the propane tank, regulator, and propane fuel lines for leaks or damage. Replace any damaged components, fix any leaks, and tighten any loose fittings.
- Check the return air inlet, hot air outlet, and exhaust outlet for damage and obstructions. Remove any obstructions and repair any damage.
- Check the thermostat probe for damage or the wire leading to the thermostat probe for damage.
- Check that all mounting bolts and screws are tight.
- Check that all electrical wiring is securely attached and undamaged.
- Verify all electrical fittings going into the heater and out of the control box are tight.
- Remove the burner cover and inspect the burner and inside of the combustion chamber. Verify that all the screws for the electrode assembly are tight and the high voltage cable to the electrode assembly are securely attached and insulated.
- Clean any dust or dirt from around the blower and the air inlets and outlets.
- Check the exhaust outlet for carbon deposits and clean the heat exchanger if significant deposits (more than a film) are present.
- Start up and run the heater for a couple of minutes to check that everything is in working order.

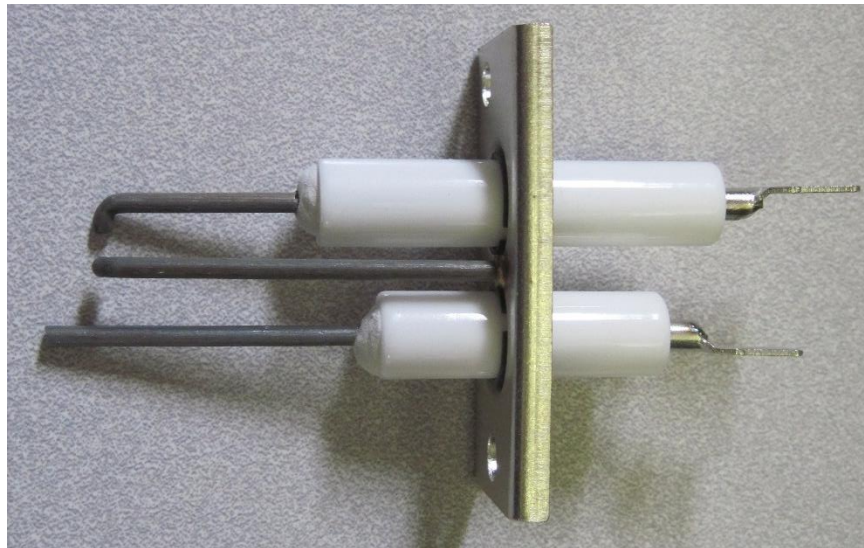
### 4.4 Every Three Years:

In addition to the annual maintenance in 4.3 Annually before the Start of the Winter Season section:

- Remove the electrode assembly and check it for damage and deposits, as shown in Figure 4. Electrode probes should not be darker than a light gray or have an excessively rounded tip. Inspect the porcelain portion of the electrode assembly for cracks or damage. If the electrode assembly probes are damaged or excessively round, the electrode assembly should be replaced. If the electrode assembly has deposits on it, carefully remove them with a damp rag or an abrasive pad such as an Emery cloth.

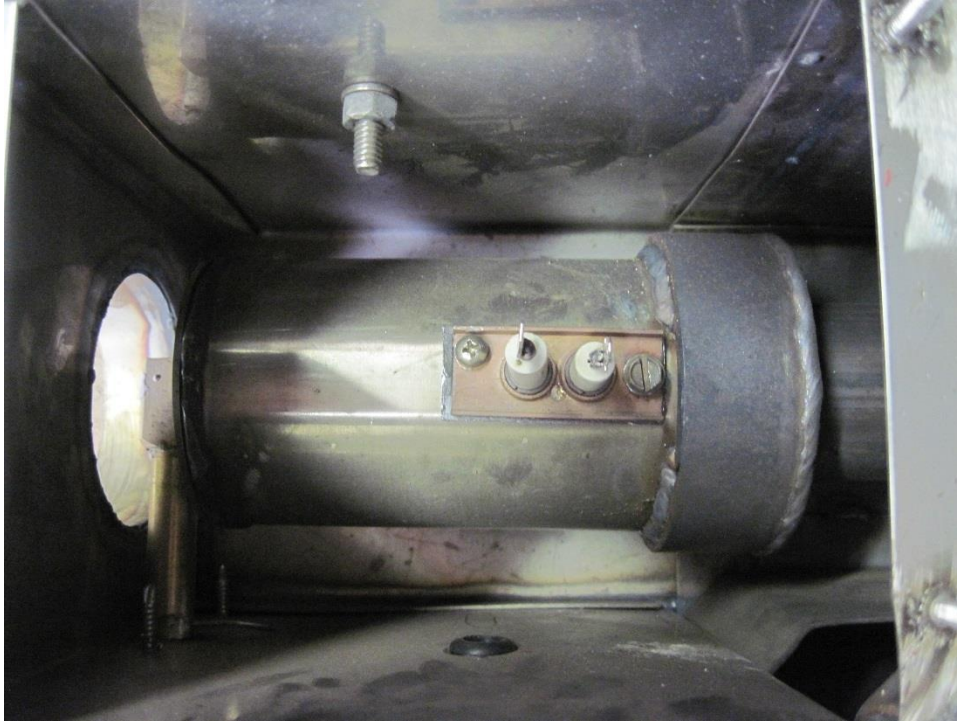


*Figure 4: Uninstalled Electrode Assembly after 1 year of operation*



*Figure 5: Electrode Assembly as Installed*

- Inspect the electrode assembly sealing gasket for leaks or damage. This gasket, when installed as shown in *Figure 6*, will conform to the flat face of the electrode assembly and the 3" OD stainless steel combustion burner tube providing superb separation of combustion air and heat exchanger air. Over time or after numerous examinations of the electrode assembly, cracks and damage may be formed in the gasket. Replace gasket as necessary.



*Figure 6: Electrode Assembly, with Sealing Gasket, mounted into Combustion Burner*



*Figure 7: Sealing Gasket for Electrode Assembly*



## 5 Troubleshooting

If this guide does not help fix the problem exhibited by the heater, please contact the company where the heater was purchased for additional assistance. If you are unable to contact them or additional help is needed, please contact Elston Manufacturing at 1-800-845-1385.

### CAUTION

For your safety, the propane should always be turned off and the power turned off when troubleshooting this product except when necessary for testing. The heater can start unexpectedly and could pinch or cut fingers, sustain damage from tools, or cause burns from rapidly warming internal surfaces.

### NOTICE

See the Appendix for wiring diagrams.

### 5.1 Description of Normal Operation

To aid in troubleshooting, it is often useful to have a clear description of the normal operation of the heater to better prescribe what is wrong with it. The following details a normal operation process:

- Begin with the heater off, the propane turned on, and the thermostat set to its minimum setting.
- Turn on the heater at the control box. The green indicator light will come on.
- Turn up the thermostat to turn on the heater (this will be unnecessary below 20 °F).
- If the safety system checks out properly (i.e. the airflow sail switch, high temperature safety switch, and ignition control have proper initial conditions), the blower will energize.
- Once the blower energizes, it will generate enough force to activate the actuation lever on the airflow sail switch, causing the electrical circuit associated with the sail switch to change from a Normally Open (NO) SPST switch to a closed SPST switch.
- If the airflow sail switch, high temperature safety switch and wiring associated with the safety system creates a proper closed loop with the ignition control, the ignition process will begin.
- After a 15 – 30 second delay, the electronic gas valve will be opened via the ignition control, allowing a controlled amount of propane gas to flow into the combustion burner. This action is simultaneously complemented by the ignition control sending in a high voltage pulse through the high voltage cable into the electrode assembly. The electronic ignition is identified by an audible clicking noise. The high voltage pulse sent to the electrode assembly will ignite the supplied propane gas within the combustion burner. All exhaust components exit the heater through the exhaust tubing.
- By means of the heat exchanger, heat will be transferred via the blower warming the trailer air by passing it over the sealed combustion exhaust tubing and forcing it back into the trailer.



## 5.2 Diagnosis of LED Fault Codes

As stated in previous sections, this heater has an ignition control that outputs diagnostic error codes to the red indicator light on the control box. There are 5 fault conditions that can occur with this ignition module, as shown in Table 1.

Fault Conditions	
LED Indication	Fault Mode
OFF	Normal Operation
1 Flash	Blower or Airflow Fault
2 Flashes	Flame Sense Out of Sequence
3 Flashes	Failed Ignition Lockout
4 Flashes	Gas Valve Not Connected
Steady ON	Internal Control Failure

*Table 1: Fault Condition Table for Ignition Control*

The LED will flash ON for  $\frac{1}{4}$  second, then off for a  $\frac{1}{4}$  second during a fault condition. The pause between fault codes is 3 seconds.

### 1) 1 Flash LED Indication = Blower or Airflow Fault

- a) This failure code indicates that the blower is malfunctioning or there is an issue within the safety circuit of the heater.

i) Troubleshoot the blower and associated circuitry

(1) Check the wiring associated with the blower.

- (a) Make sure that the two female quick connections are installed on the associated terminals of the blower. The 14 gauge Black wire with female connection should be connected to the Negative terminal on the blower while the 14 gauge Red wire with female connection should be connected to the Positive terminal on the blower.
- (b) Check for loose connections (especially with the quick connections), corroded wiring and terminals, and damaged wiring.

(2) Check that the blower is free from obstructions

- (a) Remove the blower from the heater assembly by loosening the hose clamp on the blower and slide it off the combustion chamber. Disconnect the two female quick connections used for powering the blower. Check to see if the blower rotates freely and is free of obstructions. If not, attempt to clear the obstructions to see if the blower operates properly. If it does not turn freely, it needs to be replaced.

(3) Check that the blower can operate on its own

- (a) Remove the blower from the heater assembly and directly connect it to a 12 VDC power source. If the blower powers up and is free of obstructions, continue troubleshooting since the blower is operating properly.

ii) Troubleshoot the safety system

In order for the ignition sequence to start, the ignition control and the associated safety system must have the correct initial conditions. If airflow sail switch signal is lost or the high temperature safety switch opens during heat mode, the gas valve is immediately de-energized and the blower stays on. If the switch closes again, a normal ignition sequence will resume. If not and this condition persists for more than 5 minutes, the ignition control will enter lockout

with the blower off. Recovery from lockout requires a manual reset by either recycling the thermostat, removing 12 VDC power to the ignition control for a period of 5 seconds, or waiting for the soft reset period to end.

**(1) Check switch resistance measurements.**

**(a)** All switches must have proper resistance measurements (high temperature safety switch  $\approx 1\Omega$ , airflow sail switch  $\approx 0$  to  $2\Omega$ , thermostat  $\approx 0$  to  $1\Omega$ )

**(i)** If any of these conditions are not met, the ignition control will not allow for ignition cycle to start. Replace or repair damaged safety component.

**(2) Check switch for proper initial conditions**

**(a)** All switches must be in correct electrical state (airflow sail switch must be NO before blower energizes and must be NC after blower energizes, high temperature safety switch must be NC (temperature reading below  $250^\circ\text{F}$ ) and the thermostat dial reading should be above coil/bulb reading).

**(i)** If any of these conditions are not met, the ignition control will not allow for ignition sequence to start. Replace or repair damaged safety component.

---

**2) 2 Flash LED Indication = Flame Sense Out of Sequence**

---

**a)** This failure code indicates that the electrode assembly cannot detect the presence of a flame within the combustion burner, a real flame is detected before the gas valve is about to be turned on (at the end of purge intervals), or an internal control failure of the flame sensing circuitry.

**i) Troubleshoot the electrode assembly and the associated circuitry.**

**(1) Check spark generation system.**

**(a)** Uninstall the electrode assembly and look for excessive carbon deposits, damage to electrode assembly rods, and potential cracks in the ceramic electric insulation. For electrode assembly to generate a signal, the rods must be placed within the flame. This signal must then be transferred back to the ignition control via the high-voltage cable (for ignition controls with local sensing) or the Test terminal wire on the ignition control wiring harness (for ignition controls with remote sensing).

**(i)** Verify ignition control is generating spark. Verify high voltage cable is transferring spark from ignition control to electrode assembly. Verify electrode assembly is generating spark between the two electrode rods. Replace or repair damaged component/s.

**(b)** If the established flame signal is lost while the burner is operating, the control will respond in 0.8 seconds. The gas valve will de-energize and the ignition control will attempt the ignition sequence again. The control will make two more attempts to relight the burner. If the burner does not relight, the control will go into lockout. If flame is re-established, normal operation resumes.

**ii) Troubleshoot gas valve**

**(1) Check gas valve for leakage**

**(a)** If gas valve is leaking, fix leaks with proper sealant methods such as pipe thread compound or pipe thread tape. If the gas valve operating mechanism has failed, replace the gas valve.

**(i)** If the gas valve has no leakage, replace the ignition control since the flame sensing circuitry on the control may be damaged or inoperable.

### 3) 3 Flashes from LED Indication = Failed Ignition Lockout

---

- a) This failure code indicates that the ignition control could not successfully place the heater into heat mode since combustion could not be initiated or sustained.
  - i) Troubleshoot the propane flow into the heater.
    - (1) Verify each component of the propane fuel supply system is intact and supplying fuel, at the intended pressure of 10.5 - 11 In WC (after the regulator) to each consecutive component in the system. Start with the propane supply tanks and finish at the hose supplying propane to the combustion burner via the electronic gas valve.
      - (a) If any component is malfunctioning or damaged, the ignition control will not have the proper fuel supply to start heat mode. Replace or repair damaged fuel component.

#### **WARNING**

Verify there are no gas leaks by using a rich soap and water solution on all joints and pipe connections. Never use a match or lighter to test for the presence of gas. Failure to test properly before operation can lead to explosion or fire and may result in severe injury or death.

- ii) Troubleshoot electrode assembly and the associated circuitry
  - (1) Check spark generation system.
    - (a) Uninstall the electrode assembly and look for excessive carbon deposits, damage to electrode assembly rods, and potential cracks in the ceramic electric insulation. For electrode assembly to generate a signal, the rods must be placed within the flame. This signal must then be transferred back to the ignition control via the high-voltage cable (for ignition controls with local sensing) or the Test terminal wire on the ignition control wiring harness (for ignition controls with remote sensing).
      - (i) Verify ignition control is generating spark. Verify high voltage cable is transferring spark from ignition control to electrode assembly. Verify electrode assembly is generating spark between the two electrode rods. Replace or repair damaged component/s.
    - (b) If the established flame signal is lost while the burner is operating, the control will respond in 0.8 seconds. The gas valve will de-energize and the ignition control will attempt the ignition sequence again. The control will make two more attempts to relight the burner. If the burner does not relight, the control will go into lockout. If flame is re-established, normal operation resumes.

### 4) 4 Flashes from LED Indication = Gas Valve Not Connected

---

- a) This failure code indicates that the gas valve is having issues connecting with the ignition control.
  - i) Check the gas valve for proper operation.
    - (1) Disconnect the electrical connections to the gas valve and connect 12 VDC to the gas valve to check for proper operation. Connect one of the yellow wires to the positive terminal and the other two wires (yellow/green and yellow) to the negative terminal.
      - (a) If the gas valve coil is inoperable or stuck open, replace the gas valve.
  - ii) Check the gas valve and the associated wiring
    - (1) Ensure the male and female quick connections for the wiring are not loose or damaged.

Verify that the brown wire (from the Valve terminal) from the wiring harness connects to one of the yellow wires on the gas valve. Verify all wiring is not loose, damaged, or corroded.

(a) If the gas valve wiring is deemed unacceptable or the wiring transferring the signal to the gas valve is damaged, replace the corresponding component.

iii) Check the ignition control for proper operation.

(1) Verify there is a 12 VDC voltage reading between Valve output and Ground output on the ignition control.

(a) If the reading was anything outside the range of 10 – 14 VDC, the ignition control may be bad. Replace the ignition control if bad.

### 5) Steady ON = Internal Control Failure

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- a) This failure code indicates that the ignition control has failed completely and needs replacement.
  - i) To verify control failure, remove 12 VDC power from the control for at least 5 seconds and resupply power to the control. If the red LED turns to “Steady ON” again, replace the damaged or faulty ignition control.

### 5.3 What is wrong with the heater?

- A. Nothing happens when I turn on the heater
  - B. Blower does not run and heater fails to ignite
  - C. Blower runs but heater fails to ignite
  - D. Heater usually ignites but sometimes does not
  - E. Heater ran down the truck batteries at night while plugged into 110 VAC wall socket
  - F. Black smoke from exhaust outlet or carbon deposits near exhaust outlet
- 

### Problem A: Nothing happens when I turn on the heater

Does the green indicator light on the control box come on momentarily when you turn on the heater?

**YES.** Check the electrical connections in the heater and control box for loose connections and the blower in the heater for obstructions. To check for obstructions, loosen the hose clamp on the blower and slide it off the combustion chamber. If there are no obstructions, the blower should turn freely. If the blower does not turn freely, it needs to be replaced.

**NO.** If the heater is running off of truck power, check the fuse supplying power to the trailer and the 10 Amp DC circuit breaker on the electrical cover. If the heater is running off the 110 VAC wall socket power, check that the extension cord is properly plugged in. Also check the fuse in the circuit supplying power to the 110 VAC wall socket and the 3 Amp AC circuit breaker on the electrical cover.

## Problem B: Blower does not run and heater fails to ignite

Turn down the thermostat and turn off power to the heater using the switch.

Does the green indicator come on when the power is turned on?

**YES, but just for a moment.** There is probably a short inside the heater. Check for loose or damaged wires and connections.

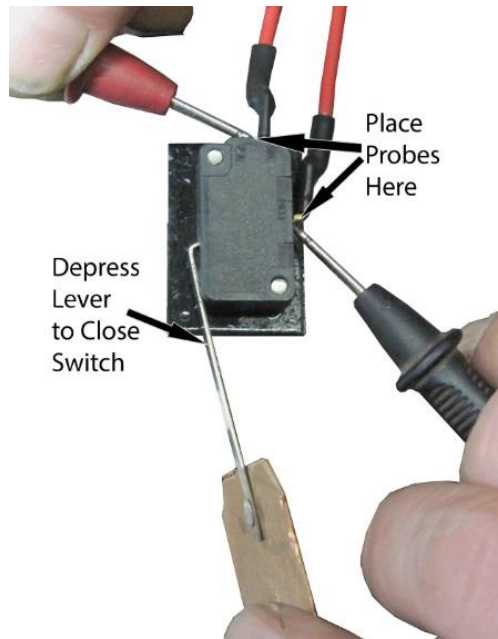
**YES.** Focus your troubleshooting on the blower, the associated circuitry for the blower, and the electronic safety system by checking the following items:

- **Verify blower is operational and free from obstructions.** Check that the two power wires attached to the blower are firmly attached and there are no obstructions in the blower. To check for obstructions, loosen the hose clamp on the blower and slide it off of the combustion chamber. If there are no obstructions, the blower should turn freely. If the blower does not turn freely, it needs to be replaced. Uninstall the blower and connect directly to a 12 VDC power supply to check for proper operation.
- **Inspect electrical wiring.** Check the wiring within the heater and control box. Look for loose, corroded, and damaged wiring especially at the power and fan terminals on the back of the ignition module.
- **Verify operating voltages via the thermostat.** Remove the cover to the thermostat. Using a digital multi-meter, check the voltage between one of the brass screws on the thermostat and the ground stud (far left most on 4 post terminal block). While running off 110 VAC wall socket power, the digital multi-meter should read 12 VDC with no blower running. While running off 12 VDC truck power, the digital multi-meter should read 10.50 VDC with no blower running. Voltages below these values indicate a problem in electrical system and/or the truck battery is significantly run down.
- **Verify thermostat is operational.** Check that the thermostat is turned on and set to heat. Check that the temperature of the thermostat is set high enough that it will turn on the heater. If the thermostat is a digital model, replace the batteries. If none of these things work, check that the +12 VDC is coming into the thermostat from the heater and there are no loose connections inside the thermostat. Check the thermostat for an electrical short caused by water damage. Check the thermostat capillary bulb for physical damage or severed connection between the thermostat and the capillary bulb.
- **Verify components in safety system are operational and in correct initial positions.** The safety system consists of 2 switches wired in series with the ignition module. The 2 switches are:
  - High Temperature Safety Switch (Elston P/N **HLC-632**)
  - Recirculating Fan Airflow Sail Switch (Elston P/N **HLC-237**)

The safety system for the heater must have the correct initial setup for ignition to commence. The correct initial setup consists of the sail switch in the open position and the high temperature switch in the closed position. If the sail switch is stuck in the closed position, the ignition process will not begin. If the high temperature switch is opened by a large temperature reading (above 250 °F) or is damaged, the safety circuit is an open loop.



Check wiring associated with the safety circuit. With the power off to the heater, use a multi-meter to check the resistance of the high temperature switch. If the resistance measurement is less than 1  $\Omega$ , the switch is fully functional. If the resistance measurement is more than 1  $\Omega$ , then the high temperature switch should be replaced. Also, check to see if the sail switch closes when the heater runs by disconnecting the wiring to the sail switch and checking if the resistance drops to 0 to 2  $\Omega$  range when the sail switch lever is depressed, as shown in *Figure 8* and *Figure 9*. Check that the flap for the sail switch is not stuck in the open or closed position. If the sail switch is not physically stuck open or closed, check that the resistance across the sail switch is in the range of 0 to 2  $\Omega$  when the heater is off. If the resistance reading is above this value or behaves erratically, the sail switch needs replacement. See *Figure 8* for where to place probes while holding down switch and *Figure 9* for a read out from a digital multi-meter for resistance measurement for switch when lever is depressed (closing switch).



*Figure 8: Resistance Measurement for Sail Switch*



*Figure 9: Digital Multi-meter Readout for New Sail Switch*

Does the green indicator come on when the power is turned on?

**NO.** Check that the heater is receiving power and the positive and ground have not been reversed. The heater ships with 4 feet of 14 gauge cord attached to the control box. The white wire should be connected to the constant power supply on the trailer while the black

wire should be connected to the negative or ground of the system. Using a digital multi-meter, check the voltage across ground stud (far left most on 4 post terminal block) and the positive stud (1 stud to the right of the ground stud). The digital multi-meter should read 12 VDC when powered by 110 VAC wall socket power and 10.5 VDC when powered by truck power. If voltage is not detected, do a quick inspection of the electrical system from the heater to the vehicle for obvious problems. If there are no obvious problems, it is recommended that you start at the thermostat and work your way through the components supplying power from the vehicle to the heater until you find the problem. Possible problems include loose connections at terminal bolts, corrosion or mechanical damage to wires, and tripped circuit breakers and blown fuses.

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### **Problem C: Blower runs but heater fails to ignite**

With the gas off, start the heater by turning up the thermostat to the maximum temperature. After the blower energizes, you should hear a faint clicking noise, an indication of the ignition process, fifteen to thirty seconds after the blower starts. If you do, then:

**Rule out general problems.** Carefully check the fuel system: specifically the propane tank(s) for fuel levels, the propane lines for damage or leaks, the propane line fittings for tightness, and the regulators for proper pressure and liquid build up.

**Inspect electrical wiring and verify operating voltages.** Check the connections at the thermostat for problems. Check the wiring for damage or loose connections and the components in the heater for obvious damage. Using a digital multi-meter, check the voltage between one of the brass screws on the thermostat and the ground stud (far left most on 4 post terminal block). While running off 110 VAC wall socket power, the digital multi-meter should read 12 VDC with no blower running, 11.75 VDC with blower running, and 11.50 VDC with the fans running and within ignition timeframe. While running off 12 VDC truck power, the digital multi-meter should read 10.50 VDC with no blower running, 10.25 VDC with blower running, and 10.00 VDC with the fan running and within the ignition timeframe.

**Inspect the spark ignition system.** The spark ignition system should create one spark across the tip of the metal probes in the combustion chamber on each faint click. The spark can be in an incorrect location for any of the following reasons: damage to the spark probe wires, loose connections, and deposits on the spark probe. To access the spark probe to check it for deposits, remove the burner cover on the combustion chamber. The metal tips of the spark probe should only be slightly rounded with a 1/8" gap at the tip. In addition, the insulator on the probe should have no cracks or chips missing and only have light deposits on the insulator. If the spark probe is damaged or excessively round, it should be replaced. If the spark probe only has deposits, carefully remove them with a damp rag or abrasive plastic pad. A new ignitor, as installed, can be seen in *Figure 5*.

If the ignition process does not start and you do not hear the faint clicking noise:

**The sail switch or high temperature switch may be malfunctioning.** If the sail switch fails to close or the high temperature switch is stuck open, the heater will not attempt to ignite. Also loose or damaged wire to either of these items will cause the same problems. Check the wiring to these two items. With the power off to the heater, use a multi-meter to check the resistance of the

high temperature switch. If the resistance measurement is less than 1  $\Omega$ , the switch is fully functional. If the resistance measurement is more than 1  $\Omega$ , then the high temperature switch should be replaced. Also, check to see if the sail switch closes when the heater runs by disconnecting the wiring to the sail switch and checking if the resistance drops to 0 to 2  $\Omega$  range when the sail switch lever is depressed, as shown in *Figure 8* and *Figure 9*. If the wiring and two switches check out okay, refer to the troubleshooting tips above for troubleshooting the sail switch.

If the ignition process starts but you do not hear the faint clicking noise:

**This indicates either a short in the high voltage cable or a malfunctioning ignition module.** Check the high voltage cable for damage. If no problems are found, remove the high voltage cable from the spark probe on the combustion chamber (it can be accessed by removing the access panel on the side of the heater by the combustion chamber). With the gas off, double check that a spark is being produced by improvising a 1/8" spark gap from the end of the high voltage terminal to the combustion chamber. IF a spark is being produced, remove and inspect the spark probe. Check and fix any possible shorts, adjust the spark gap to 1/8" if necessary, and reinstall the spark probe. If this does not fix the problem refer to the troubleshooting tips at the start of this problem. If no spark is being produced, the spark ignition module need to be replaced.

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## **Problem D: Heater usually ignites but sometimes does not**

Check that the propane tank fuel level is not low and gas is getting to the heater. Verify that the tank valve is fully open to allow for maximum output of propane gas to the heater. Carefully check the fuel system: specifically the propane tank(s) for fuel levels, the propane lines for damage or leaks, the propane line fittings for tightness, and the regulators for proper pressure and liquid build up.

Is any extra ductwork connected to the exhaust or air inlets or outlets?

**YES.** The heater should have less than 15 feet connected to the hot air inlet and outlet. Any additional pipe connected to the exhaust should be 3" diameter or larger pipe that is less than 8 ft. long and have minimal number of bends. Disconnect all pipe and ductwork from the heater to see if this corrects the problem.

**NO.** Carefully check all the inlets, outlets, and blower for debris and obstructions. Follow the troubleshooting suggestions for Problem B. Using a digital multi-meter, check the voltage between one of the brass screws on the thermostat and the ground stud (far left most on 4 post terminal block).

- While running off 110 VAC wall socket power, the digital multi-meter should read 12 VDC with no blower running, 11.75 VDC with blower running, and 11.50 VDC with the fans running and within ignition timeframe.
- While running off 12 VDC truck power, the digital multi-meter should read 10.50 VDC with no blower running, 10.25 VDC with blower running, and 10.00 VDC with the fans running and within ignition timeframe.
  - Typically, truck battery operating voltage should be 11.5 VDC to 13.5 VDC for the heater to operate reliably.

- Operating at low voltages (11 to 11.5 VDC) for substantial amounts of time will cause the heater to build up carbon deposits, choking the unit, and cause poor ignition with chunks of carbon deposits exiting the exhaust upon start up.
- 

### **Problem E: Heater ran down the truck batteries at night while plugged into wall socket**

When the 110 VAC power supply has problems, the heater will switch back to drawing 12 VDC power from the truck batteries via a 20 Amp, 12 VDC automotive relay.

Plug in the 110 VAC power cord and restore power to the heater. Does the green light on the control box come on momentarily?

**YES.** Carefully check the wiring in the heater for loose connections, specifically loose insulated quick connections.

**NO.** Check the power supply for operation.

Is the green LED on the power supply lit?

**YES.** Use a digital multi-meter to verify that 12 VDC is coming from all 4 output terminals on power supply as well as verifying that 110 VAC is coming into the power supply.

**NO.** If the green LED on the power supply is not lit and/or the voltage from the terminals of the power supply is not 12 VDC, the power supply needs replacement.

If you do not find any problems

The control box or the electrical tray assembly needs to be inspected and serviced. Again, check for loose, corroded, and damaged wiring and connections.

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### **Problem F: Black Smoke from Exhaust Outlet or Carbon Deposits near Exhaust Outlet**

Under normal use, the heater will produce very little, if any, black smoke and carbon deposits near the exhaust outlet. A white “smoke” of water vapor is normal during cold weather but darker smoke and carbon deposits are often an indication of a problem with the heater. In addition, this problem often shows up first when the vehicle powering the heater is not running. These carbon deposits and black smoke typically indicate that one of the openings in the heater is obstructed or the heater is not receiving enough voltage while it is running.

Check if the heater is running off of the battery only (i.e. the vehicle is not running). If the battery is significantly run down or running many accessories, the heater cannot receive enough voltage to operate properly. Running the heater for less time on the battery or starting the vehicle should correct the problem.

If this problem occurs when the vehicle is running or after less than an hour of running on the battery, check the following:

1. Check that none of the inlets or outlets to the heater are partially blocked or any ductwork leading to or from the heater is damaged.
2. Check the blower for obstructions or blockages. Verify that the blower rotates freely.
3. Remove ductwork from inlets, outlets, and exhaust to see if this eliminates the black smoke. If so, the ductwork maybe too long or have too many bends causing the heater to run fuel-rich due to excessive exhaust backpressure.
4. Using a digital multi-meter, check the voltage between one of the brass screws on the thermostat and the ground stud (far left most on 4 post terminal block). While running off 110 VAC wall socket power, the digital multi-meter should read 12 VDC with no blower running, 11.75 VDC with blower running, and 11.50 VDC with the blower running and within ignition timeframe. A voltage below 11.5 VDC, when the blower is running, typically indicates a problem in the electrical system between the heater and the power source. Start by looking for loose or corroded connections and verifying that the power source is generating 110 VAC.
5. Using a digital multi-meter, check the voltage between one of the brass screws on the thermostat and the ground stud (far left most on 4 post terminal block). While running off 12 VDC truck power, the digital multi-meter should read 10.5 VDC with no blower running, 10.25 VDC with blower running, and 10.00 VDC with the blower running and within ignition timeframe. A voltage below 10.25 VDC, when the blower is running, typically indicates a problem in the electrical system between the heater and the vehicle. Start by looking for loose or corroded connections.
6. Check that the regulator is producing the correct pressure of 10.5-11 inches of water column. A high pressure will cause the heater to receive too much propane resulting in a fuel-rich combustion leading to carbon deposit build up, smelly and black exhaust, and potentially more problems down the line.

After you have corrected the problem, remove any carbon deposits present in the exhaust tubing. If problem reoccurs, the air adjustment disc on the combustion burner can be adjusted so the heater will run leaner. Please consult us at Elston Manufacturing for additional instructions. Again, Elston Manufacturing's toll free number is 1-800-845-1385.

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## 6 Installation

### **⚠ WARNING**

Improper installation of this heater creates a substantial safety hazard including the risk of property damage, fire, and/or death.

### **NOTICE**

Compliance with local regulations is the responsibility of the installer. Current regulations in your area may require that the installer of this heater or that the installer of the propane system fueling this heater meet certain requirements and/or that the completed installation be inspected. If you are unsure what local regulations require, please refer to the current regulations in your area or speak with the authority having jurisdiction before beginning installation.

### 6.1 Overview

The choices you make in installation have huge effects on the safe and reliable operation of this heater. There are four primary issues to focus on:

1. Safe and robust installation of the propane fuel system
2. Safe and robust installation of the electrical system
3. Securing mounting of all parts against long-term vibration
4. Keeping out water (and its corrosive effects)
5. Ensuring adequate and consistent air-flow to the heater

The purpose of these instructions is to aid you in installing a fully functional heater that is safe and secure under both normal condition and, as much as possible, during an accident. However, these instructions are not a substitute for personal knowledge and experience with installing propane and/or electrical systems. Please do not install those areas of the heater unless you have personal knowledge and experience in these areas.

These instructions were written with the latest standards for the US and Canada in mind and are intended to guide you in an installation that meets these standards. At the time of the writing, the latest standards were the [2014 edition of the NFPA 58: The Liquefied Petroleum Gas Code](#) and the [2010 edition CAN/CSA-B149.5-10: Installation Code for Propane Fuel Systems and Tanks on Highway Vehicles](#). However, if the regulations that apply in your area conflict with these installation instructions, the local regulations should always be followed instead.

Throughout this guide, the word “must” is used for any instruction that if not followed would create safety hazard and/or yield an installation that would not comply with current standards. An instruction with the word “should” is necessary either for the proper function of the product or improves the long-term safe operation of the product. If you are unable to follow any instructions with the words “must” or “should”, please contact us and/or the authority responsible for regulating or approving your installation to discuss how your installation can be completed in a manner that is functional, safe, and compliant. Finally, an instruction that recommends an instruction designed to maximize the working life of the product, simplify installation, or improve the appearance of the installed product.

## 6.2 Unpacking the Heater and Gathering Supplies

Parts needed for installation included with all models of HLC heater:

- Recirculating-style HLC Heater
- 1 template for mounting holes
- 9 feet self-stick rubber seal
- 6 fender washers – 1/2” x 2”
- Post-installation checklist
- (3) stainless steel eye straps for 1/2” conduit between control box and heater
- (optional) [Series 32A laydown propane tank](#), [X-1025 bottle holder](#), or [X-1050 bottle holder](#)
- (optional) [H-LC-S32I installation kit for propane fuel system](#)

Additional parts required:

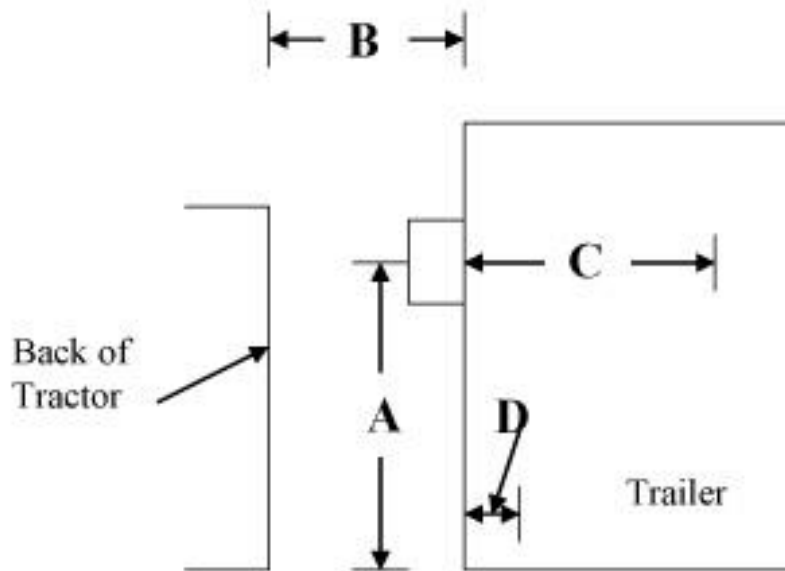
- (6) 1/2” diameter grade 5 bolts 1 to 1 1/2” longer than the thickness of the front wall of the trailer with 12 flat washers, 6 lock washers, and 6 nuts to match
- Sheet metal screws for mounting control box and eye straps
- Brackets and clips for attaching fuel lines to outside of trailer, electrical lines to heater, and thermostat and associated wiring to the trailer wall.
- Suitable propane fuel line and fittings or [HLC propane installation kit](#)
- 12” of 4” double walled duct pipe (optional) [For extended cold air intake]

## 6.3 Heater Placement

Please reference *Figure 10* for the suggested placement of the heater for optimum performance.

- The primary consideration for the placement of the heater is the location of the hot air outlet and the return air opening. These openings cannot be blocked with freight or other objects.
  - A. Mount the heater about 3/4 of the way up on the front of the trailer such that the heater allows 6 feet worth of clearance straight out from the openings (C) without sacrificing too much cargo space. Mounting the heater with the hot air outlet 3/4 of the way up from the bottom of the trailer (or slightly less) is a good compromise between lost cargo space and the reduced air movement through the trailer that comes from mounting the heater too close to the top of the trailer.
  - B. Mount the heater where there is enough clearance to open the heater door when the trailer is hooked up.
  - C. Cargo should not be within 6 feet straight out from the hot air and return air openings (it may be below them [D]). This is for good circulation and the smallest temperature distribution within the trailer.
  - D. Allow for a small space with no cargo at the front of the trailer for circulation and optional extended cold air inlet. Cargo may be placed below the heater as long as it does not hinder the airflow into and out of the heater.

Again, all these considerations are shown in *Figure 10*.



*Figure 10: Suggested Placement of Heater on Nose of Trailer*

## 6.4 Mounting

Tape the drilling template in the desired location for the heater, checking that it is level and flat against the trailer. Center punch the two large holes and the mounting holes indicated on the template. Remove the template and identify the size of the holes on the trailer. If you are cutting the larger holes with a jigsaw or saber saw, use a compass to mark the circles on the trailer.

Drill all the holes to the size indicated on the template. Mount the weather seal on the back of the heater around the perimeter of the heater, an inch or two from the edge.

Lift the heater into place and align it with the mounting holes. Once the heater is lined up, slide the ½” bolts (with a washer) into the top mounting holes you drilled. Finger tighten the nuts with lock washers on these bolts to keep the heater from pulling away from the wall. If you are using duct work, place the double walled duct tubing on the hot air outlet and adjust the position of the heater slightly if the hole is not lined up. Insert the bolts into the remaining mounting holes and tighten all six mounting bolts.

Install the double walled tubing (optional) and cut it so it is slightly below the surface of the trailer. Slide a few small pieces of fiberglass insulation in the spaces remaining around this tubing to insulate it and prevent vibration.

The connection for the remote thermostat should be wired and installed such that it exits the return air outlet. When mounting the heater, make sure to pull the remote thermostat connection into the trailer area such that the remote thermostat, complete with 25 feet worth of extension, can be installed inside the trailer. It is suggested that the thermostat be mounted on a non-metallic surface on the front wall of the trailer about 2 – 3 feet off the floor. Uninstall the thermostat cover and fasten the thermostat body to the trailer wall using self-tapping sheet metal screws or other acceptable hardware. Make sure to prevent against vibration when installing. Once the thermostat is mounted to the trailer wall, reinstall the thermostat cover. See *Figure 11* for an installed remote thermostat and connections.



*Figure 11: Remote thermostat installation*

## **6.5 Wiring**

The high levels of vibration and the temperature extremes these heaters are exposed to are hard on electrical connections. Always use quality electrical connectors, fittings, and wire as clean, secure connections are essential for both the proper operation of this heater as well as long-term, trouble-free operation.



*Figure 12: Suggested Paths for Propane Fuel and Electrical Lines*

Before you begin wiring, check that the power switch to the heater is off and the trailer has no power. Mount the control box on the trailer in a location where it may be easily accessible without being exposed to the full force of the wind and weather. The box and associated wiring must not obstruct the propane system that will be mounted next. In order to make both the installation of both the electrical and propane system as easily as possible, it is recommended that the electrical components be mounted toward the right side of the front wall (when facing the outside front wall of the trailer) and the propane system be mounted on the left side with the regulator as close to the propane tank as possible, as shown in *Figure 12*. The control box should be mounted with the wire exiting on the sides. There should be a dip in the wire entering the boxes so that water running down the wire drips off before it gets to the fittings. The heater ships with 4 feet of 14 gauge cord attached. Connect the white wire to the constant powersupply on the trailer, trimming the cable if necessary. Connect the black wire to the negative or ground of the system. Always use electrical connectors, fittings, and wire approved for outdoor use. Using parts that give a clean, secure, and waterproof connection is essential for the proper operation of the heater.

## 6.6 Fuel System

### 6.6.1 General Installation Instructions (including [X-1025](#), [X-1050](#), or user supplied setup)

#### NOTICE

These instructions are intended for general guidance only. Consult the current regulations in your area or the latest standards, [NFPA 58 for the United States](#) or [CAN/CGA149.5-10 for Canada](#), for exact requirements.

Before you begin mounting any components, it is recommended that you determine the approximate mounting location of all components to ensure that all parts can be connected with the available lengths of hose and tubing. The recommended order of installation is:

1. Install the propane tanks or propane carriers

All propane tanks must be “DOT” or “ASME” approved, setup for vapor withdrawal, and mounted in line with the manufacturer’s instructions and the applicable code.

Install the propane tank or propane tank carrier, such as the [X-1025 single bottle carrier](#) or the [X-1050 dual bottle carrier](#), following the instructions included with the product. Installation instructions are available for all tanks purchased from Elston Manufacturing. If your tank or tank carrier does not have instructions, contact the manufacturer for guidance and refer to the installation code that applies in your area.

Any tanks should be mounted at least 18” from any portion of the exhaust system for the heater or the vehicle. If this is not possible, it must be shielded from the exhaust components by a vehicle frame member or a baffle of noncombustible material. The item that is shielding the tank must have an air space between itself and the exhaust component itself and the tank to properly shield the tank from the heat. If a baffle is used, it should be constructed so that it is expected to resist corrosion at least as long as the propane tank.

#### NOTICE

New tanks that are purchased empty come filled with air or an inert gas that needs to be purged before the tanks are filled for the first time. Also, tank fabricators are required by ASME and DOT to complete hydrostatic testing of tanks after fabrication. Hydrostatic testing frequently uses water. **By not removing the air/inert gas and residual water properly, the tank could read false pressures resulting in opening of the safety relief valve and blowing off excess pressure, the tank could slow fill due to container air being**



**compressed above the liquid level, and the tank could supply improper fuel resulting in improper fuel mixture for combustion.** Remember to inform the propane supplier if your tank is new.

Some propane suppliers will open the bleeder valve and purge the tank until vapor fuel comes out. **THIS IS NOT THE SUGGESTED METHOD FOR PURGING A NEW TANK!** One must purge a new tank according to NPGA safety bulletin 133-89A. Manchester Tank, one of our tank suppliers, references it in [their helpful hints website](#).

[Follow this link to learn how to purge new propane tanks](#). This gentleman worked with our old propane regulator and hose supplier, Marshall Gas, to develop this guide for RV systems.

There are several different methods to purge tanks. We will focus on these two:

- **One method** uses a [Propane Tank Purge Kit like the one at this website](#).
  - Hook the tank to be purged (new tank) to the kit and the other end to a tank that delivers propane vapor (supply tank).
  - Open the inline purge lever to purge position, open the new tank's valve and use the bleed port on the purge kit to bleed any shipping air out to 1 atm.
  - Open the supply valve on the supply tank and turn the inline purge lever to the charge position to supply the new tank with propane vapor. Doing this once will result in a mixture of air to propane vapor to be 1:1 (50% air 50% propane vapor).
  - Repeat this process another 3 times to get to 6.25% air or less, which is an acceptable level of air/inert gas for the initial fill.

This process wastes a lot of propane vapor to do this since you must purge the tank 3 times after the initial purge to get the percentage of air down to safe levels to prevent internal rusting, excessive pressures, and etc.

- **Another method** consists of the Vacuum method in which an approved vacuum pump or LP gas compressor is needed to vacuum the tank to 26 in of Hg. Fill the purged container with propane vapor until it reaches 1 atm of pressure. It is then ready to be filled with liquid propane, after disconnecting the vacuum purge kit. This would be the preferred method.

## 2. Mount the regulators

All regulators must be CSA/UL approved and rated for 11" of column water. The regulator must be securely attached with the vent opening facing downward. We recommend that the regulator be mounted as close to the propane tank as possible. It should be mounted on exterior surface and must not be installed in the space that the heater will be heating. It must be attached so it is supported by screws attached to the mounting holes on the regulator and not by the fittings attached to it. If the regulator is mounted in an unsheltered location, it must have either a durable cover or be installed in an enclosure. If the regulator is mounted at or below the floor level of the vehicle, it must be installed in an enclosure. The enclosure must be:

- Sufficient size to allow connection to and replacement of the regulator
- Vapor tight to the interior of the vehicle

- Have 1 square in (in<sup>2</sup>) or larger vent opening within 1 inch of the bottom compartment and 2 inches below the regulator vent opening
- Contain no flame or spark producing equipment
- Designed and mounted with as much ground clearance as practical

### 3. Install all hoses and fittings

Attach all fittings to the regulators, heater and tanks. The POL fitting attached to the tank must have a built-in excess flow valve. All fittings including bulkheads must have wrench flat or similar way that each fitting can be individually tightened or loosened (close nipples are not allowed). The threads in fittings must be a tapered pipe thread and sealed with a joint sealant approved for this use.

Attach the hoses as necessary. All hose assemblies must carry a CSA/UL approved label and be 60" or shorter.

### 4. Install the copper propane line

The copper line should be run as directly as possible between components while maintaining adequate clearance from the exhaust system and areas with a high risk of impact damages such as above tires. Once the route for the copper tubing is determined, any necessary holes in the frame or floor supports can be drilled and installed with grommets and the tubing can be pulled into place, trimmed to length, deburred, fitted with the correct nut, flared, and attached. The 3/8" copper line must:

- Meet either the specification for either ASTM B 88 (Type K or L) or ASTM B 280. In Canadian installations, the tubing must additionally be marked and plastic or rubber coated in accordance with [CAN/CSA-B149.5-10](#).
- Have no joints and cannot be extended in any way.
- Be protected by grommets or another method with similar protection when traveling through bulkheads or portions of the trailer frame, be securely clamped to the front wall of the trailer, and otherwise supported and secured to minimize the effects of vibration.
- Be installed in a protected location that is visible for inspection. It cannot be installed inside the frame or any pipe or tubing.
- Not be installed inside the cargo area of the vehicle except as necessary to hook up to the heater. It should not be closer than 4" to any part of the exhaust system, run directly above any tire, or within 6" of any tire.
- Not be in contact with any electrical wiring.
- Be connected so that slight shifting and the expansion or contraction that occur with temperature do no cause stress on the fittings.

### 5. Test the system for leaks

The propane system must be tested for leaks before the operation of the heater is tested or it is placed into operation. This leak test must use a pressure gauge or manometer. If a leak is found, it must be located using a combustible gas indicator, suitable leak detection solution, isolated testing and inspection of piping segments, or a combination of these methods.

## 6.6.2 Installation Instructions for [Series 32A 100# Laydown Tank](#) with [H-LC-S32I Installation Kit](#)

### NOTICE

These instructions are intended for general guidance only. Consult the current regulations in your area or the latest standards, [NFPA 58 for the United States](#) or [CAN/CGA149.5-10 for Canada](#), for exact requirements.

Before you begin mounting any components, it is recommended that you determine the approximate mounting location of all components to ensure that all parts can be connected with the available lengths of hose and tubing. See the parts list for the [H-LC-S32I installation kit](#) for the order that the parts are connected and the length of included parts. The recommended order of installation is:

#### 1. [Install the Propane Tanks or Propane Tank Carriers](#)

Install the Series 32 propane tank following the [instructions](#) included with product. Additional copies of the instructions are available from Elston Manufacturing.

### NOTICE

New tanks that are purchased empty come filled with air or an inert gas that needs to be purged before the tanks are filled for the first time. Remember to inform the propane suppliers if your tank is new.

#### 2. [Attach Hoses and Fittings](#)

Attach all fittings to the regulators, heater, and the tanks. All joints with tapered pipe thread must be sealed with a joint sealant certified for use with propane vapor. See the [parts list for the H-LC-S32I installation kit](#) for a [list of fittings](#) that connect to the heater, regulators, and the tanks.

#### 3. [Mount the Propane Regulator](#)

The propane regulator and enclosure should be mounted near the propane tank with as much ground clearance as practical at the correct distance for the propane hose to attach between the regulator and the Series 32 tank. The regulator is attached to the enclosure with four #8-32 thread cutting screws, #8 lock washers, and #8 washers. The enclosure must be bolted to a trailer support with the vent slots toward the bottom.

#### 4. [Attach the Hoses as Necessary to the Regulator, Series 32 Tank, and Heater](#)

#### 5. [Install the Copper Propane Line](#)

The copper line should be run as directly as possible between components while maintaining adequate clearance from the exhaust system and areas with a high risk of impact damages such as above the tires. The end of the copper line connecting to the heater should be designed such that the HLC-908 hose can attach between the end of the tubing and the heater. Once the route for the copper tubing is determined, any necessary holes in the frame or floor supports can be drilled and installed with grommets and the tubing can be pulled into place, trimmed to length, deburred, fitted with the correct nut, flared and attached. The 3/8" copper line must:

- Meet either the specification for either ASTM B 88 (Type K or L) or ASTM B 280. In Canadian installations, the tubing must additionally be marked and plastic or rubber coated in accordance with [CAN/CSA-B149.5-10](#).
- Have no joints and cannot be extended in any way.

- Be protected by grommets or another method with similar protection when traveling through bulkheads or portions of the trailer frame, be securely clamped to the front wall of the trailer, and otherwise supported and secured to minimize the effects of vibration.
- Be installed in a protected location that is visible for inspection. It cannot be installed inside the frame or any pipe or tubing.
- Not be installed inside the cargo area of the vehicle except as necessary to hook up to the heater. It should not be closer than 4” to any part of the exhaust system, run directly above any tire, or within 6” of any tire.
- Not be in contact with any electrical wiring.
- Be connected so that slight shifting and the expansion or contraction that occur with temperature do no cause stress on the fittings.

#### 6. Test the System for Leaks

The propane system must be tested for leaks before the operation of the heater is tested or it is placed into operation. This leak test must use a pressure gauge or manometer. If a leak is found, it must be located using a combustible gas indicator, suitable leak detection solution, isolated testing and inspection of piping segments, or a combination of these methods.

### **6.7 Final Details**

Although we recommend a X-850 ventilator for the H-LC vented nose-mount heaters the X-850 ventilator is not needed for the H-LC re-circulating nose-mount heaters.

Give the installation one final check to make sure nothing has been forgotten or improperly completed. If everything looks good, the heater is ready to be test fired. For instructions on firing up the heater for the first time, please consult the quick start guide. Once the heater has been test fired, the low pressure regulator should be set to deliver 10.5” to 11” of water column of pressure to the heater while it is running.

The installation is now complete and the heater can be placed into service.

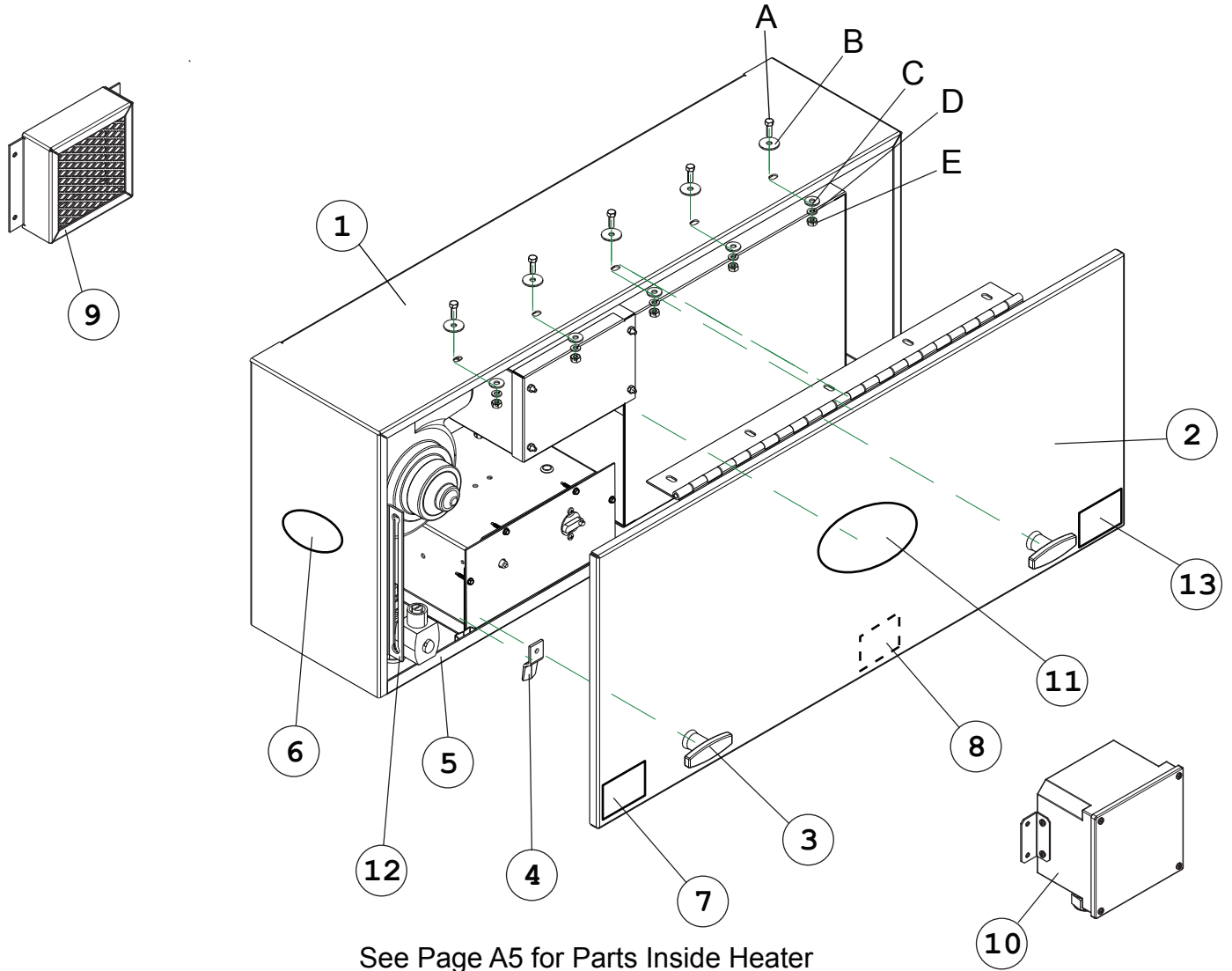
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**Parts List for HLC Heaters**

**H-LC-110RS-16**



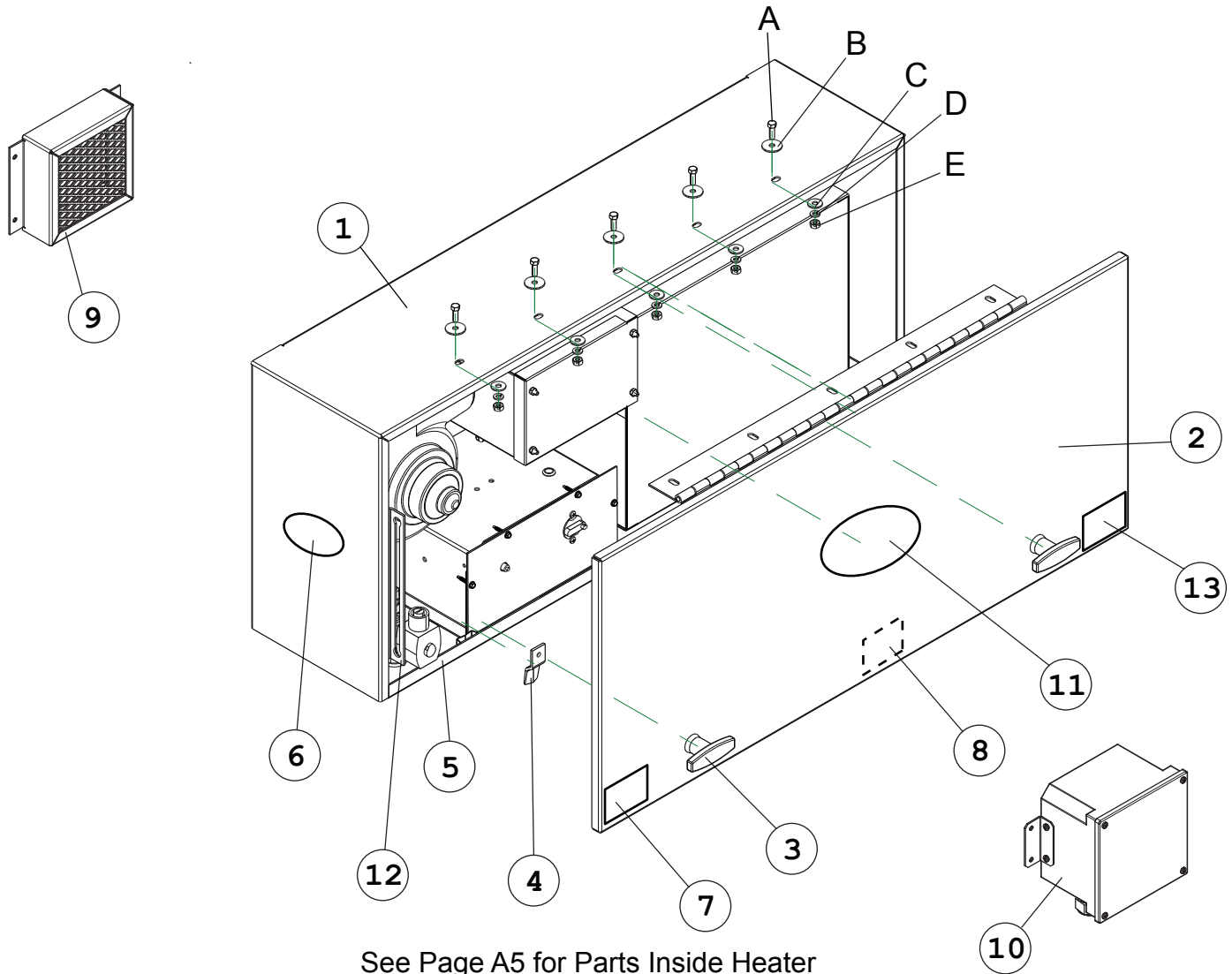
See Page A5 for Parts Inside Heater

Label	Name	Part #
1	Powdercoated Steel Heater Shell	HLC-130RS
2	Powdercoated Aluminum Door w/ Hinge	HLC-132P
3	Door Handle	HLC-139
4	Cam for Door Handle	HLC-139-01
5	Door Seal (Not Shown)	HLC-121
6	Elston Decal	SD-02
7	Requirements Decal	HD-23
8	Service Decal	HD-09
9	Hot Air Outlet Cover	HLC-851
10	Control Box (See A10)	HLC-7A
11	Large Elston Decal	SD-08
12	Door Retainer	HLC-140
13	V2 Decal	HD-20
	Mounting Template	HC-25R

Label	Name	Quan.
A	3/4" 1/4"-20 SS Hex Head Bolt	5
B	1/4"x1 1/2" SS Washer	5
C	1/4" SS Washer	5
D	1/4" SS Lock Washer	5
E	1/4"-20 SS Nut	5

**Parts List for HLC Heaters**

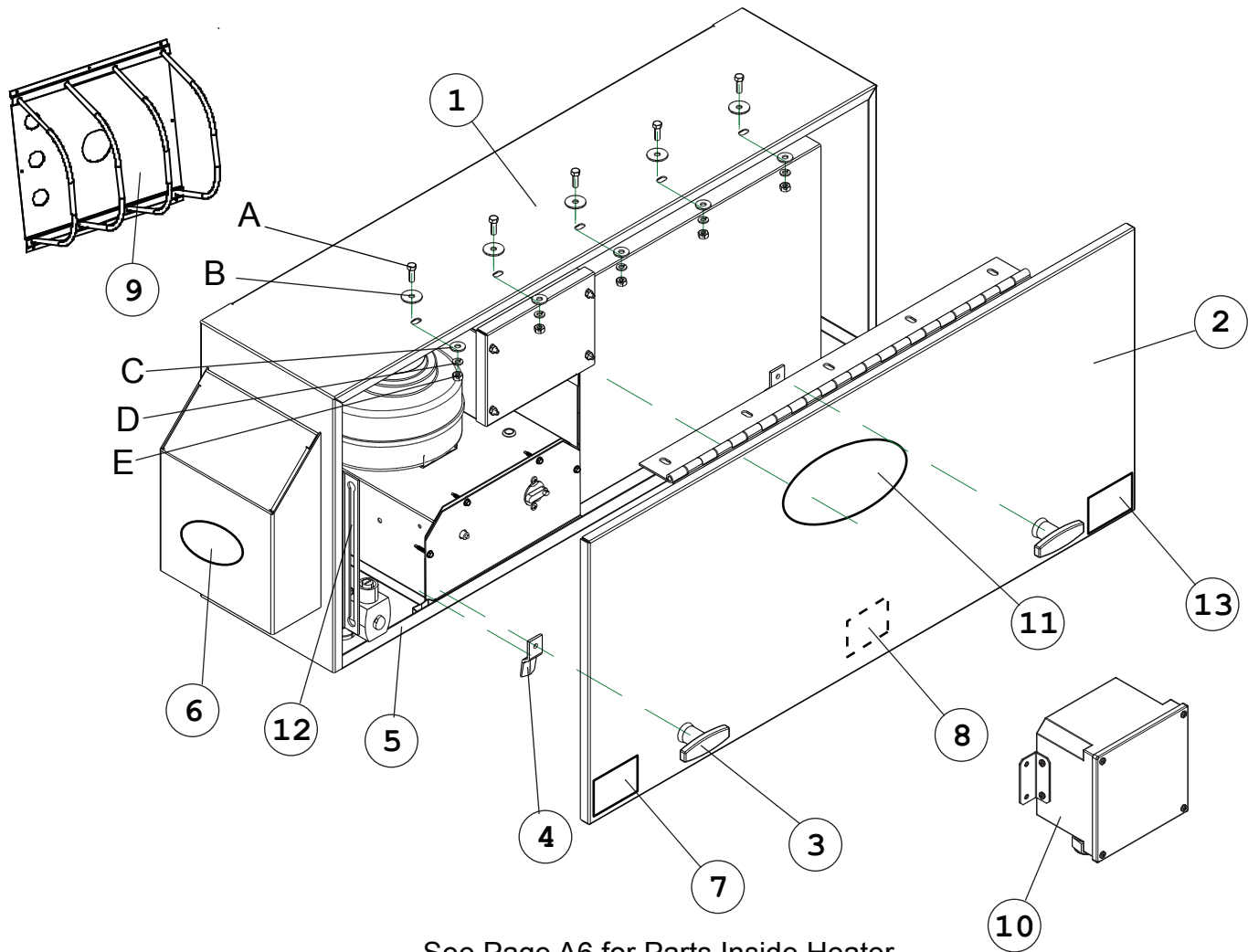
**H-LC-110RA-16**



See Page A5 for Parts Inside Heater

Label	Name	Part #
1	Aluminum Heater Shell	HLC-130RAL
2	Aluminum Door w/ Hinge	HLC-132AL
3	Door Handle	HLC-139
4	Cam for Door Handle	HLC-139-01
5	Door Seal (Not Shown)	HLC-121
6	Elston Decal	SD-02
7	Requirements Decal	HD-23
8	Service Decal	HD-09
9	Hot Air Outlet Cover	HLC-851
10	Control Box (See A10)	HLC-7A
11	Large Elston Decal	SD-08
12	Door Retainer	HLC-140
13	V2 Decal	HD-20
	Mounting Template	HC-25R

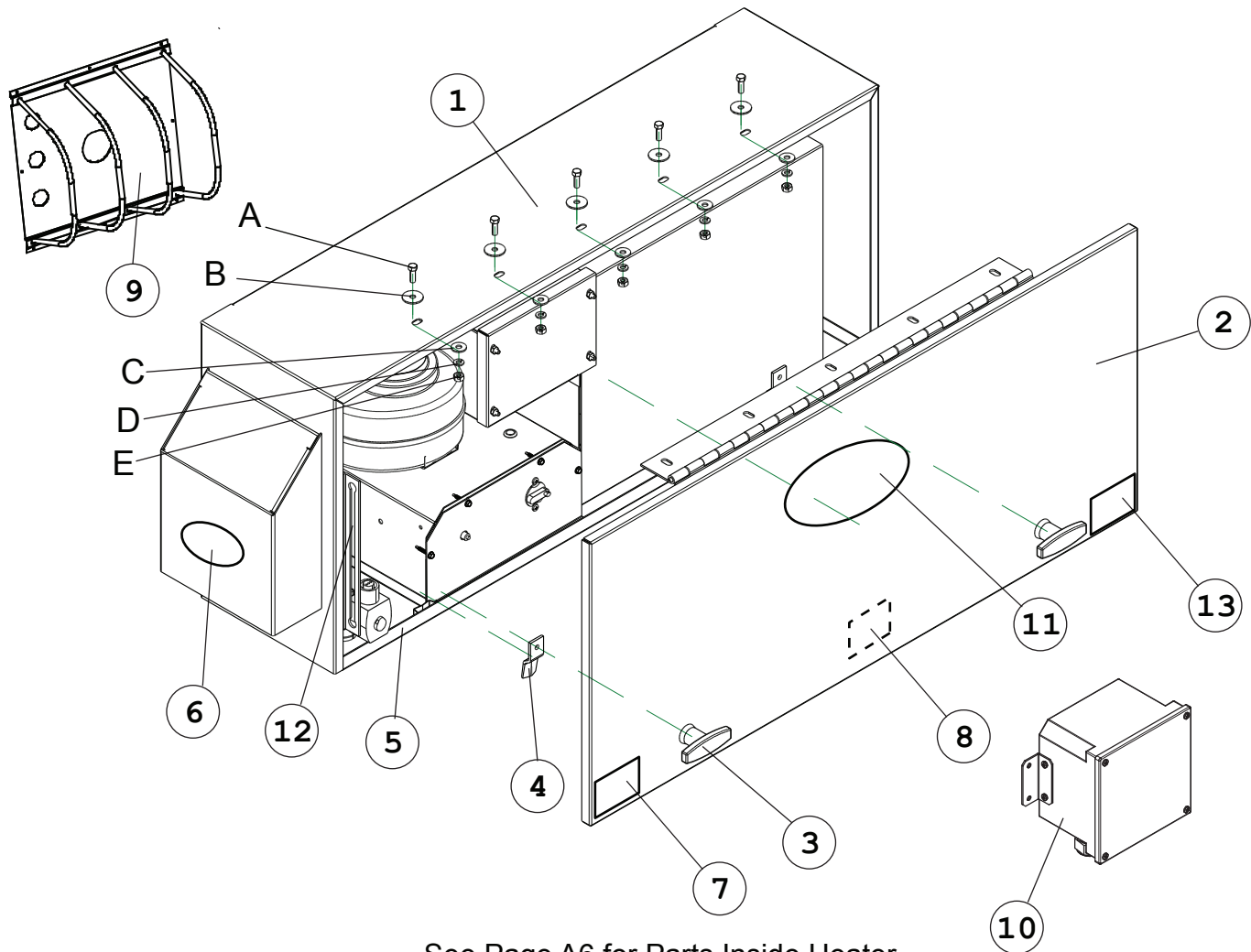
Label	Name	Quan.
A	3/4" 1/4"-20 SS Hex Head Bolt	5
B	1/4"x1 1/2" SS Washer	5
C	1/4" SS Washer	5
D	1/4" SS Lock Washer	5
E	1/4"-20 SS Nut	5



See Page A6 for Parts Inside Heater

Label	Name	Part #
1	Powdercoated Vented Steel Heater Shell	HLC-130VS
2	Powdercoated Aluminum Door w/ Hinge	HLC-132P
3	Door Handle	HLC-139
4	Cam for Door Handle	HLC-139-01
5	Door Seal (Not Shown)	HLC-121
6	Elston Decal	SD-02
7	Requirements Decal	HD-23
8	Service Decal	HD-09
9	Hot Air Outlet Guard	HLC-852
10	Control Box (See A10)	HLC-7A
11	Large Elston Decal	SD-08
12	Door Retainer	HLC-140
13	V2 Decal	HD-20
	Mounting Template	HC-25V

Label	Name	Quan.
A	3/4" 1/4"-20 SS Hex Head Bolt	5
B	1/4"x1 1/2" SS Washer	5
C	1/4" SS Washer	5
D	1/4" SS Lock Washer	5
E	1/4"-20 SS Nut	5



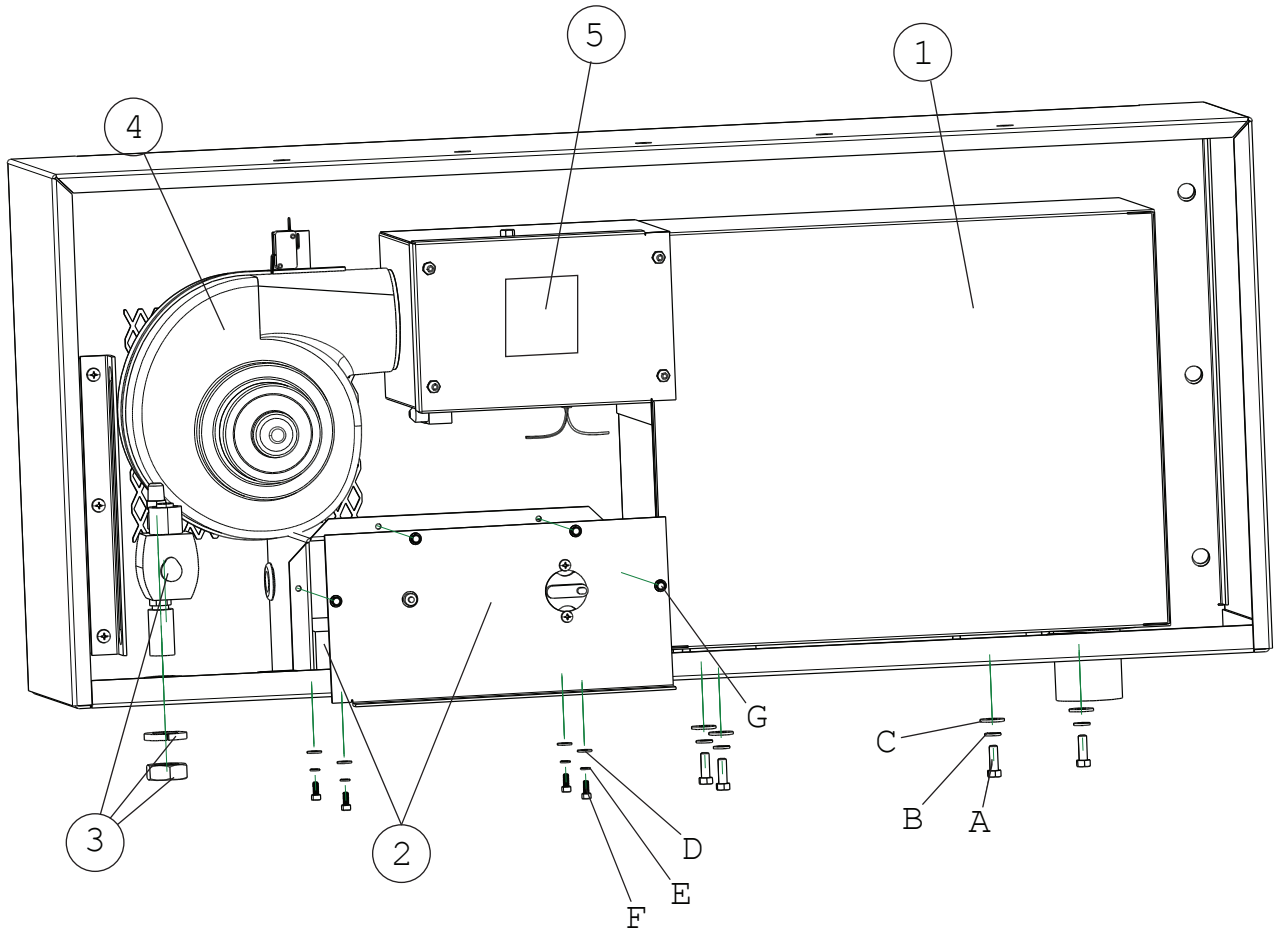
See Page A6 for Parts Inside Heater

Label	Name	Part #
1	Vented Aluminum Heater Shell	HLC-130VAL
2	Aluminum Door w/ Hinge	HLC-132AL
3	Door Handle	HLC-139
4	Cam for Door Handle	HLC-139-01
5	Door Seal (Not Shown)	HLC-121
6	Elston Decal	SD-02
7	Requirements Decal	HD-23
8	Service Decal	HD-09
9	Hot Air Outlet Guard	HLC-852
10	Control Box (See A10)	HLC-7A
11	Large Elston Decal	SD-08
12	Door Retainer	HLC-140
13	V2 Decal	HD-20
	Mounting Template	HC-25V

Label	Name	Quan.
A	3/4" 1/4"-20 SS Hex Head Bolt	5
B	1/4"x1 1/2" SS Washer	5
C	1/4" SS Washer	5
D	1/4" SS Lock Washer	5
E	1/4"-20 SS Nut	5

**Parts List for HLC Heaters**

**Inside of Recirculating Heater Shell**



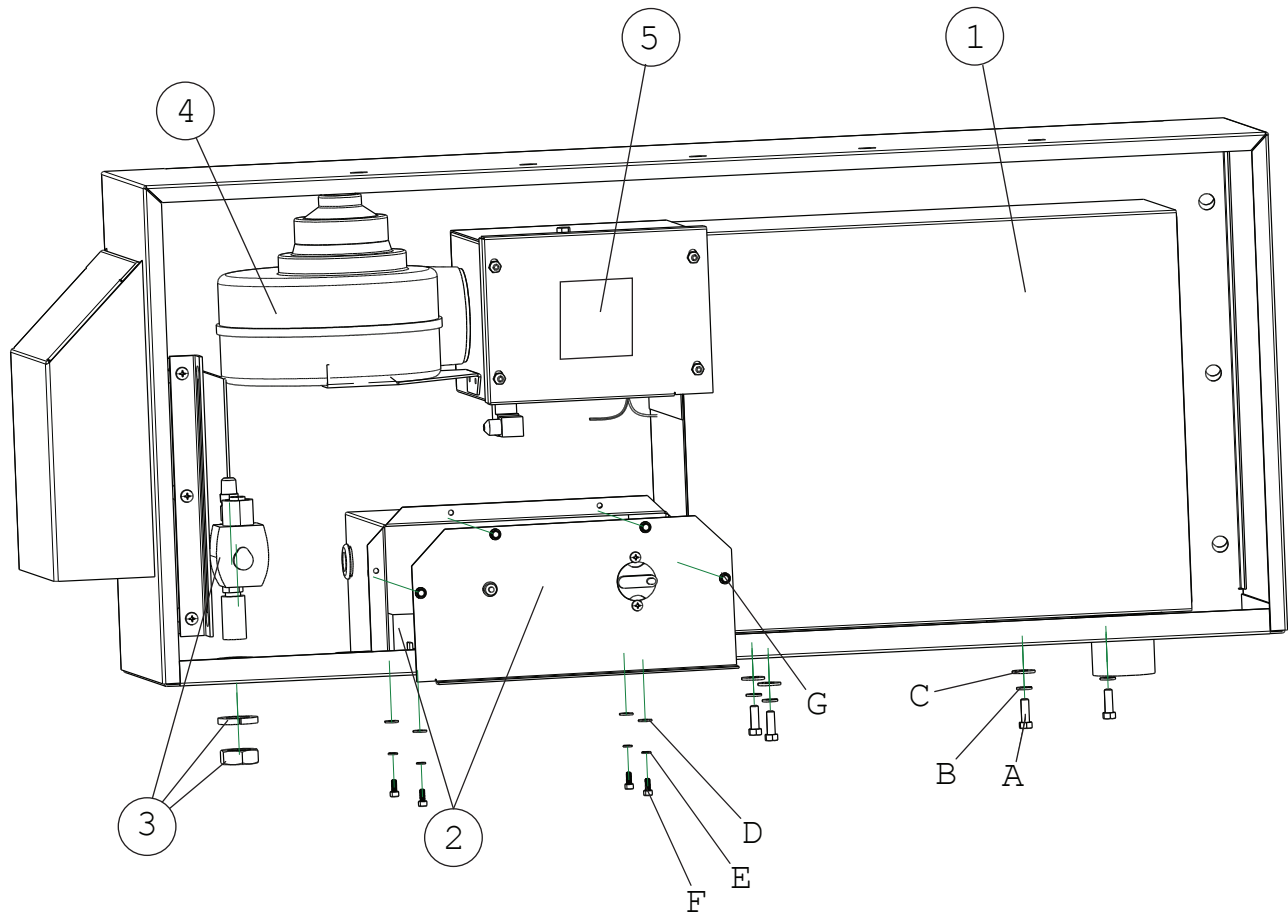
Label	Name	Part #
1	Stainless Steel Combustion Chamber Assembly (See A7)	HLC-600-700A
2	Removable Electrical Tray Assembly (See A9)	HLC-400-16
3	Gas Valve Assembly (See A9)	HLC-229A
4	Blower Assembly - Recirculating Style (See A8)	HLC-800
	17" Pigtail Gas Hose(not shown)	HLC-904
5	Recirc. Heater Spec. Decal	HD-45

Label	Name	Quan.
A	3/4" 1/4"-20 SS Hex Hd Bolt	4
B	1/4" SS Lock Washer	4
C	1/4" SS Washer	4
D	#8 Washer	4
E	#8 Lock Washer	4
F	3/8" 8-32 SS Soc Hd Screw	4
G	1/2" 8-32 SS Machine Screw	4

For clarity, wiring and insulation is not shown above.

## Parts List for HLC Heaters

## Inside of Vented Heater Shell



Label	Name	Part #
1	Stainless Steel Combustion Chamber Assembly (See A7)	HLC-600-700A
2	Removable Electrical Tray Assembly (See A9)	HLC-400-16
3	Gas Valve Assembly (See A9)	HLC-229A
4	Blower Assembly - Vented Style (See A8)	HLC-800V
	17" Pigtail Gas Hose(not shown)	HLC-904
5	Vented Heater Spec. Decal	HD-46

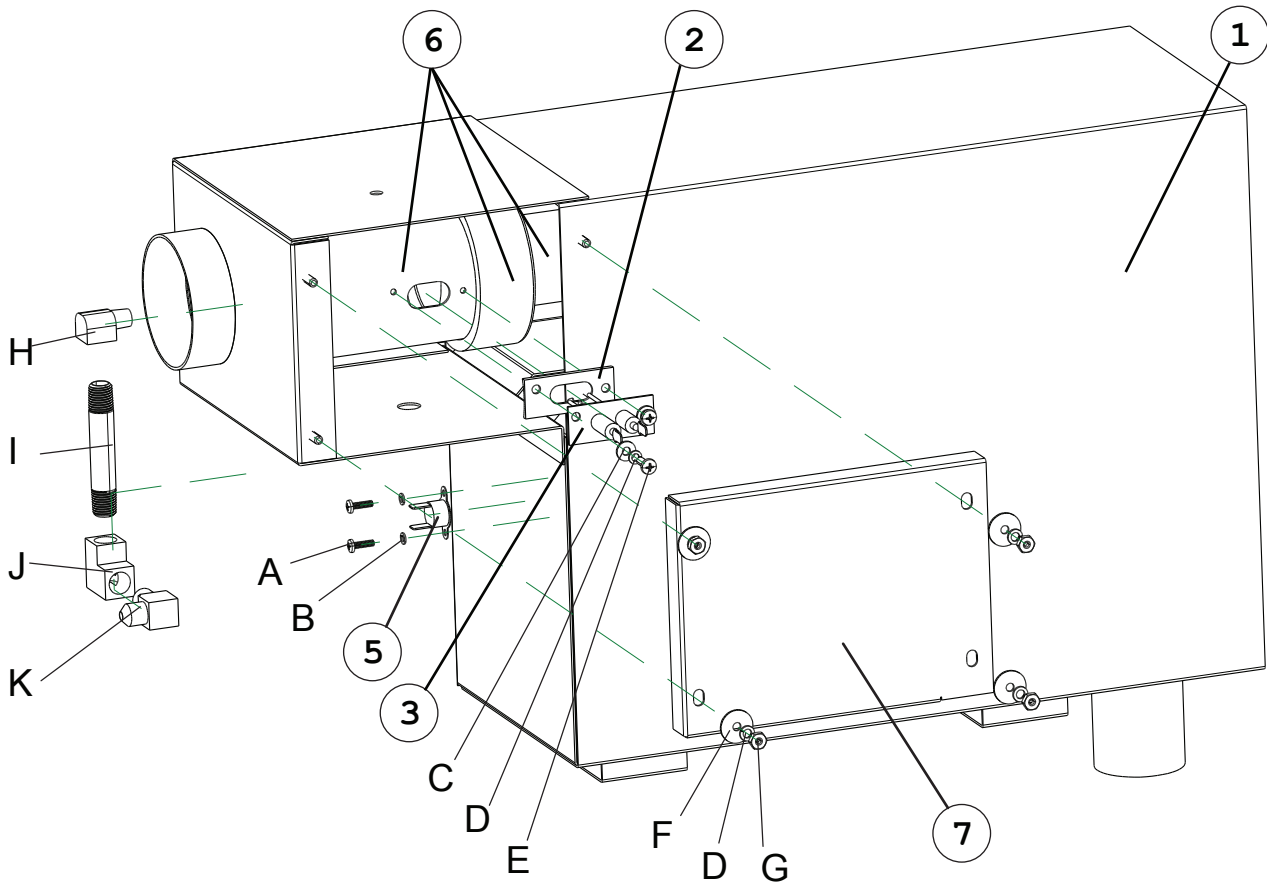
Label	Name	Quan.
A	3/4" 1/4"-20 SS Hex Hd Bolt	4
B	1/4" SS Lock Washer	4
C	1/4" SS Washer	4
D	#8 Washer	4
E	#8 Lock Washer	4
F	3/8" 8-32 SS Soc Hd Screw	4
G	1/2" 8-32 SS Machine Screw	4

For clarity, wiring and insulation is not shown above.



# Parts List for HLC Heaters

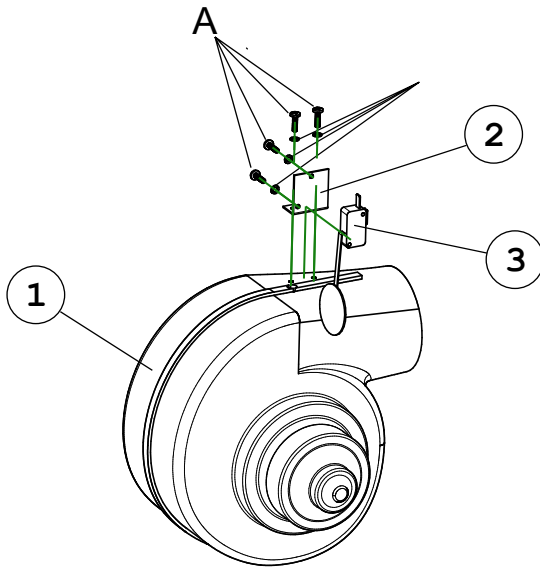
# Combustion Chamber Assembly



Label	Name	Part #
2	High Temp Electrode Gasket	HLC-629
3	Dual Prong Spark Electrode	HLC-630
4	High Voltage Cable (Not Shown)	HLC-631
5	High Temp Limit Switch (250 °F)	HLC-632
6	Burner & Exhaust Tubing Assy (Not Sold Separately)	HLC-706
7	Burner Cover	HLC-606
1,6,7	Combustion Chamber w/o Burner Electronics	HLC-700A
1-7,A-K	Combustion Chamber Assembly w/ Burner Electronics	HLC-600-700A

Label	Name	Quan.
A	1/2" #6-32 Machine Screw	2
B	#6 SS Lock Washer	2
C	#8 SS Flat Washer	2
D	#8 SS Lock Washer	6
E	1/2" #8-32 Machine Screw	2
F	#8 SS Flat Washer	4
G	#8-32 SS Hex Nut	4
Label	Name	Part #
H	1/4" NPT Street Elbow - Brass	B-X115-B
I	3" NPT Brass Nipple	B-113-B3
J	1/4" NPT Elbow - Brass	B-X100-B
K	1/4" SAE 45 Flare Male Elbow - Brass	B-49-4B

**Blower Assembly - Recirculating Style**

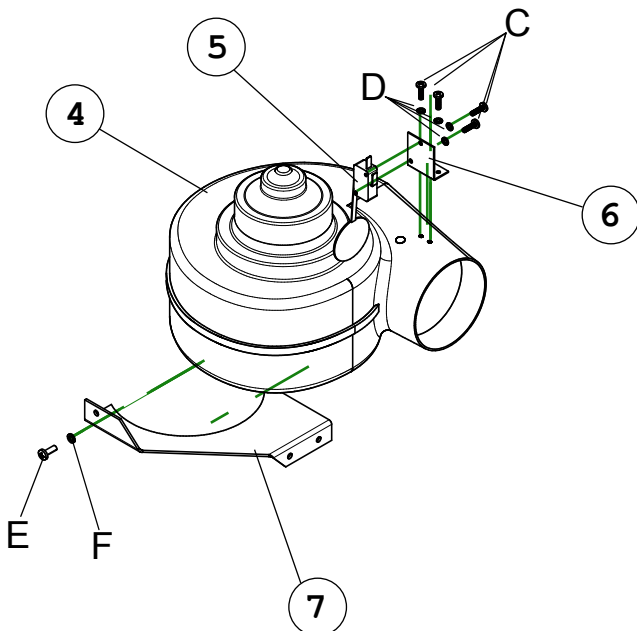


Label	Name	Quan.
A	1/2" #6-32 SS Machine Screw	4
B	#6 SS Lock Washer	4

Label	Name	Part #
1	Blower	HLC-803 <sup>1</sup>
2	Sail Switch Mounting Brkt	HLC-212
3	Sail Switch Assy	HLC-237
1-3,A,B	Blower Assembly - Recirculating Style	HLC-800

<sup>1</sup> Requires Field Modifications - Use HLC-800 Instead

**Blower Assembly - Vented Style**

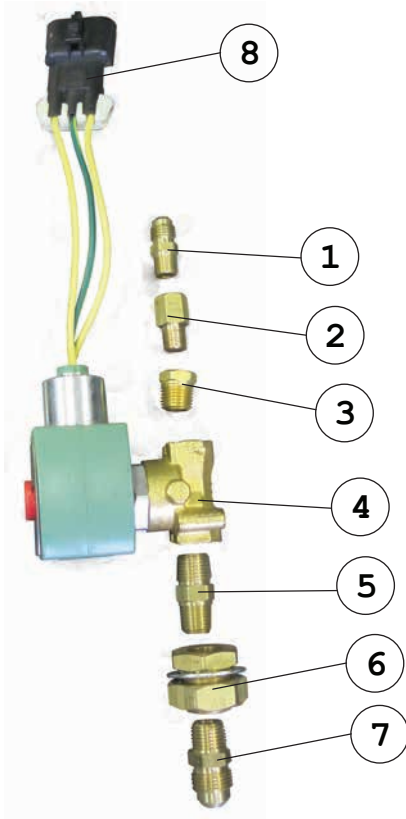


Label	Name	Quan.
C	1/2" #6-32 SS Machine Screw	4
D	#6 SS Lock Washer	4
E	1/2" #8-32 SS Machine Screw	1
F	#8 SS Lock Washer	1

Label	Name	Part #
4	Blower	HLC-803 <sup>2</sup>
5	Sail Switch Assy	HLC-237
6	Sail Switch Mounting Brkt	HLC-212
7	Blower Support Bracket	HLC-800V-01
4-6,C-F	Blower Assembly - Vented Style	HLC-800V

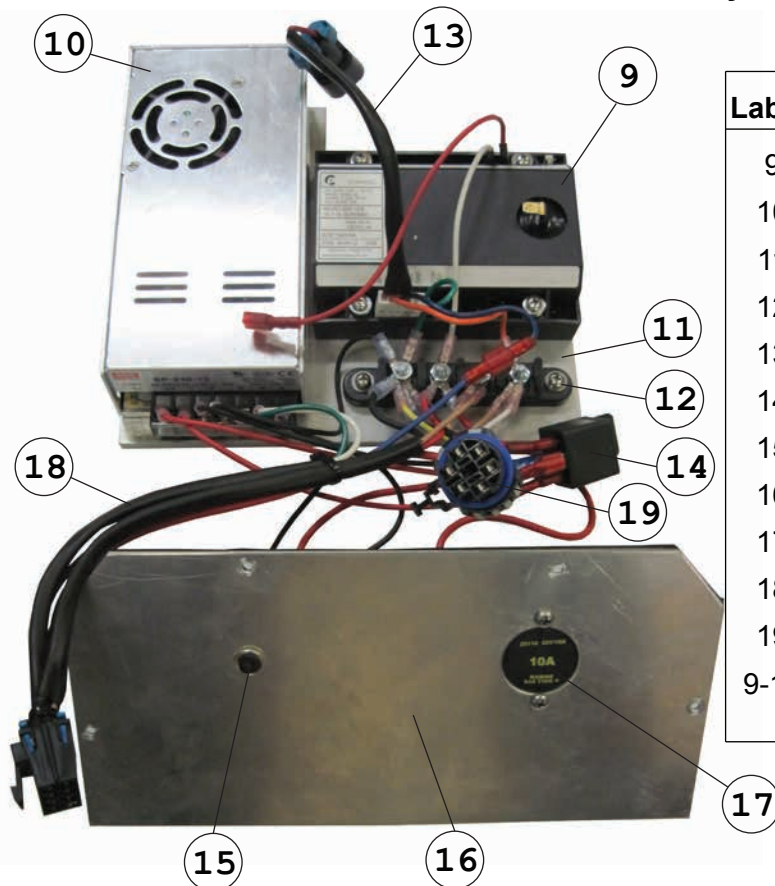
<sup>2</sup> Requires Field Modifications - Use HLC-800V Instead

Gas Valve Assembly



Label	Name	Part #
1	1/4" NPT SAE 45 M Connector	B-48-4A
2	Gas Orifice Fitting	HC-413HLC
3	1/4" - 1/8" Bushing	B-110-BA
4	Gas Valve w/o 3-Way Conn.	HLC-229
5	1/4" NPT Hex Nipple	B-122-B
6	Brass Bulkhead Fitting	HLC-218
7	3/8" NPT SAE 45 M Connector	B-48-6B
8	3-Way Male Connector Assy	SE-44
1-8	Gas Valve Assembly with 3-Way Male Connector	HLC-229A

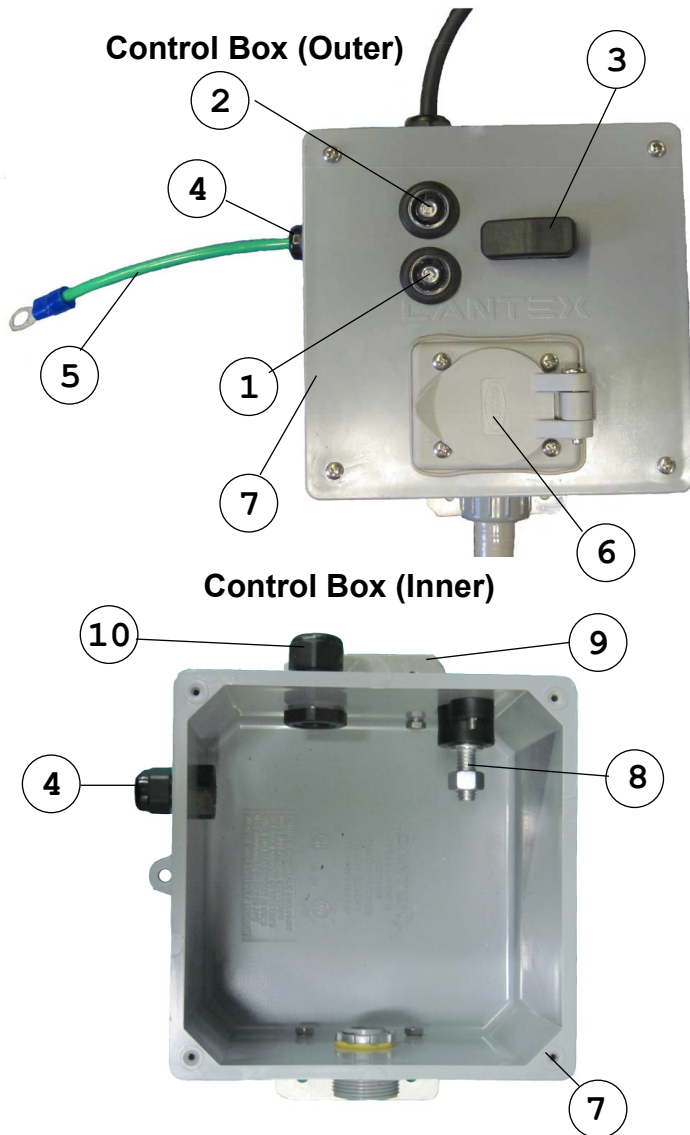
Electrical Tray Assembly



Label	Name	Part #
9	Ignition Module w/ Relay	HLC-936W
10	Power Supply	HLC-526A
11	Electrical Tray	HLC-527A
12	4 Spade Terminal Block	HC-418
13	Ignition Module Wiring Harness	HLC-938B
14	Automotive 5-Pin Relay	HLC-230W
15	3 Amp AC Circuit Breaker	HLC-431
16	Aluminum Electrical Cover	HLC-135A
17	10 Amp DC Circuit Breaker	HLC-429W
18	Conduit OUT Wiring Harness	HLC-961
19	Terminal Block Wiring Harness	HLC-962
9-19	Removable Electrical Tray Assembly (including wiring & harnesses)	HLC-400-16

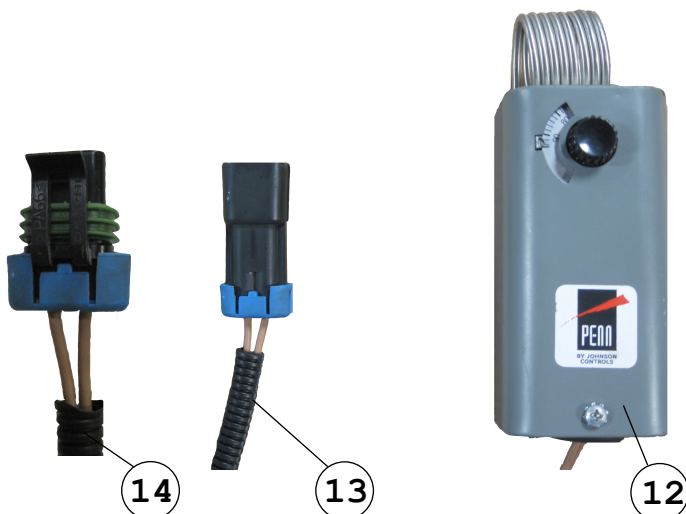
## Parts List for HLC Heaters

## Control Box & Remote Thermostat Assy



Label	Name	Part #
1	Red Indicator Light	HLC-424
2	Green Indicator Light	HLC-425
3	Rocker Switch	HLC-415
4	3/8" Cord Grip for 6 Ga Wire	HLC-534
5	6 Ga Ground Wire with 6 Ga 1/4" Ring Terminal	HLC-934
6	110 Volt Receptacle	HLC-513W
7	6X6X4 PVC Junction Box	HLC-518
8	Junction Block	HLC-325
9	Control Box Mounting Bracket	HLC-2-03
10	1/2" Strain Relief Fitting	HLC-532
11	Conduit IN Wiring Harness (not shown)	HLC-960
1-10	Control Box (above plus enclosure and wiring)	HLC-6A-16
1-11	Control Box Assembly	HLC-7A

## Remote Thermostat Assembly



Label	Name	Part #
12	Remote Thermostat	HLC-239
13	Female Connector Plug	SE-42
14	Male Connector Plug	SE-43A
12-13	Remote Thermostat Assy (includes 25 ft of wire)	HLC-440

# Wiring Diagrams

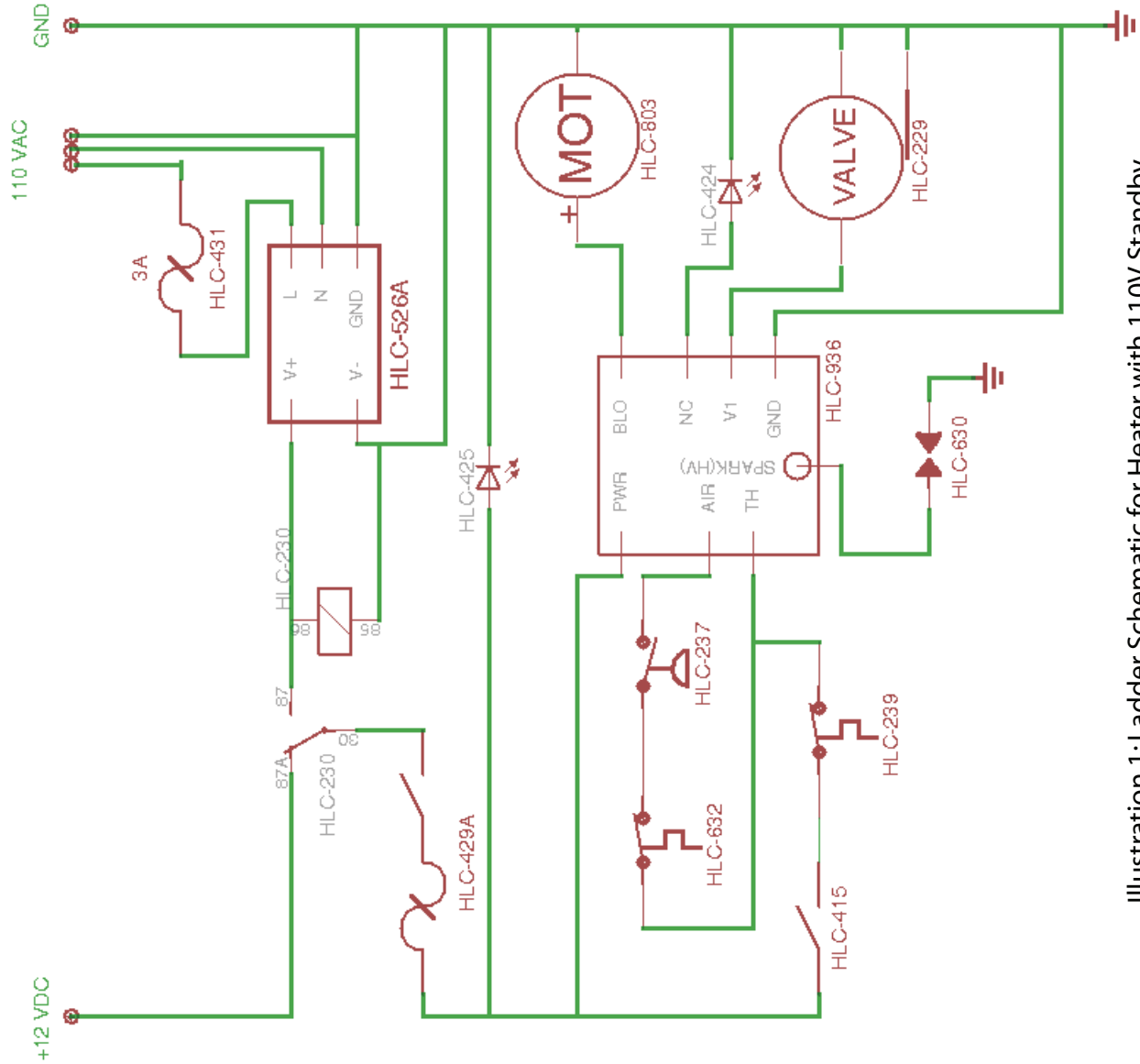


Illustration 1: Ladder Schematic for Heater with 110V Standby

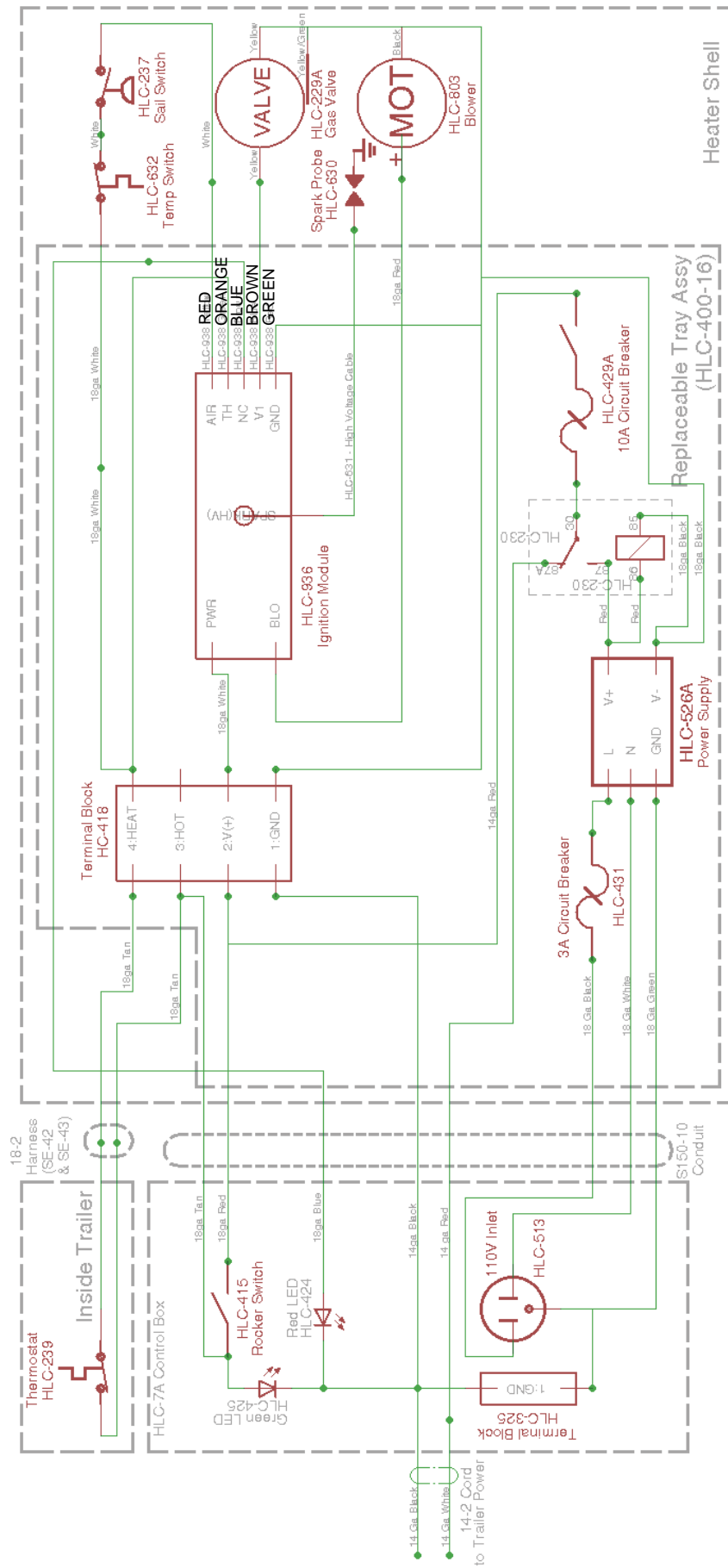


Illustration 2: Wiring Diagram for H-LC Heater with 110V Standby REV 5



## LIMITED WARRANTY TERMS

Elston Manufacturing, Inc. offers a one (1) year, non-transferable, Limited Warranty against specified defects as set forth below for Elston Manufacturing, Inc. product lines from the date of purchase through proof of purchase by providing original receipt.

This Limited Warranty specifically excludes normal wear and tear of products and is provided solely under the conditions that the product has been properly installed, operated and maintained in accordance with all applicable instructions. Proper installation instructions, or operating manuals, are provided with each product and operating condition. Travel, diagnostic cost, labor, transportation and any and all such costs related to repairing a defective product will be the responsibility of the owner. This warranty is extended only to the original owner of any equipment, the end user.

Elston Manufacturing, Inc.'s sole obligation under this Limited Warranty is to, in its sole and absolute discretion, either repair, modify, or replace (i.e. correct), Elston Manufacturing, Inc.'s products subject to this Limited Warranty. The allegedly defective products must be returned to Elston Manufacturing Inc. or an authorized service center freight paid by buyer. After confirmation by Elston Manufacturing, Inc. that a defect does exist in the product that is covered under this Limited Warranty then Elston Manufacturing, Inc. shall, in its sole and absolute discretion, either repair, modify or replace the product(s) and return the product(s) to the owner freight paid by Elston Manufacturing, Inc.

Elston Manufacturing, Inc. products received by Elston Manufacturing, Inc. within one (1) year from the original sale date to customer and found to be defective as referenced above will be corrected as referenced in the previous paragraph at no charge for parts (provided by original factory) or labor but will include freight paid by buyer. Failure to use original factory parts voids this warranty. Elston Manufacturing, Inc. products received by Elston Manufacturing, Inc. after one (1) year from original shipment date to customer will be corrected as foresaid for a charge of the then-current sale price of parts and labor with freight paid by buyer. Exception: Any parts to be found defective at any time that come under a recall status from providing manufacturer, will be covered under the terms and conditions of the recall status provided by manufacturer.

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Accessory items furnished by Elston Manufacturing, Inc. are covered by a Limited Warranty for a period of one (1) year from date of original sale, subject to the conditions, limitations, and disclaimers stated above, for replacement of defective materials, provided such items are returned freight paid by buyer to Elston Manufacturing, Inc. and are determined by Elston Manufacturing, Inc. to be defective in its sole and absolute discretion.

This Limited Warranty shall not apply to any piece of equipment, parts or accessories repaired by anyone other than Elston Manufacturing, Inc. personnel, or its authorized service organizations.



**ELSTON MANUFACTURING INC.**

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