

# Elston Manufacturing LC Heater Owners Manual

  
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Revision B\_DEM

Valid for models LC-1 and LC-110 beginning with serial number H2211

## Safety Information

The heater you have purchased was designed, first of all, to be safe. However, since this heater burns propane and uses electricity, safety precautions are necessary for the safe and reliable operation of this product. Throughout this manual, this important safety information will be placed in special warning boxes.

### **Warning: Use Propane Only**

This heater is designed to operate on propane only. Do not attempt to use anything else as fuel since fire or explosion may result.

Use this heater only with regulators and tanks that provide propane vapor at 11 inches of water column.

### **Warning: Do Not Bypass or Substitute Safety Equipment**

Always use the regulator and excess flow valve supplied with the heater or a replacement that complies with Department of Transportation safety regulations.

Although we understand temporary measures must sometimes 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, and if you do, please fix these temporary measures as quickly as possible.

### **Warning: Exhaust Gases**

Do not operate the heater while the trailer is in an enclosed area. This heater, like all heaters that run on fossil fuel, produces exhaust containing carbon monoxide. This gas can build up in enclosed areas causing illness or death.

### **Warning: Electrical Safety**

Always disconnect power from the heater when performing maintenance or inspection.

**As always, apply common sense. If you're not absolutely sure it's safe then don't do it.**

## Description of Heater

The 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.

It is a heavy duty forced air heater with electronic ignition. To maximize energy efficiency, it heats air drawn from inside the trailer instead of heating up cold outside air. The exhaust exits out of the bottom of the heater.

### Specifications

Dimensions.....	33 in wide x 15 in tall x 9 in deep
Weight.....	80 lbs
Shipping Weight.....	82 lbs
Rating.....	28,000 BTU
Cold Air Inlet Diameter.....	6 in
Hot Air Outlet Diameter.....	4 in
Exhaust Outlet.....	2 in Steel Tubing
Rated Voltage.....	12 V
Operating Voltage Range (measured at thermostat).....	11.5-13.5 V
Current Draw.....	8 amps
Fuel Requirement.....	propane (LP gas)
Fuel Consumption.....	1.3 lbs/hr max
Maximum Recommended Thermostat Setting (call for advice on higher temperatures).....	70°F

## Quick Start Guide

Please read the important safety information on page 2 if you haven't already done so.

This guide assumes the heater has already been installed. For installation instruction please go to chapter 5 (page 13).

### For Instructions

**Before Running the Heater for the First Time .....See Below**

**On Running the Heater for the First Time.....See Page 5**

**And general recommendations**

**on loading and heating cargo ..... See Page 5**

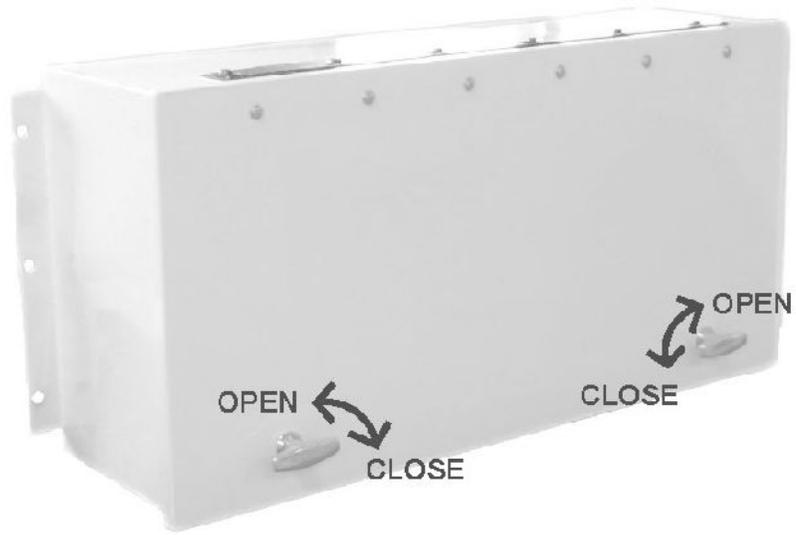
**On Running the Heater..... See Page 7**

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### Before Running the Heater the First Time

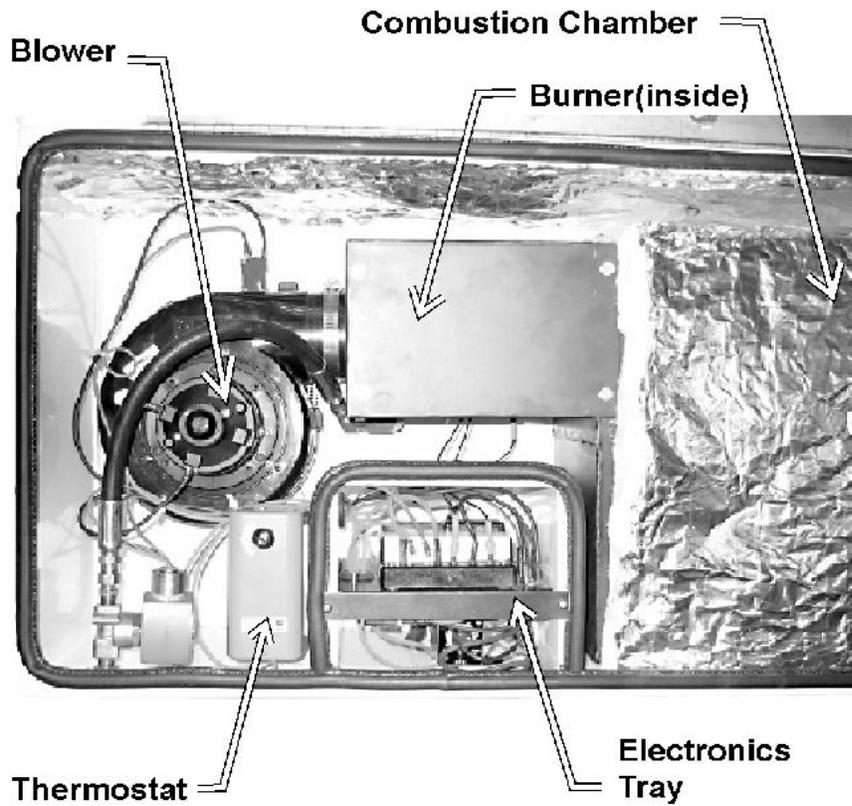
Please take a moment to familiarize yourself with the parts of your heater. It has three standard parts: the heater, control box, and propane tank carrier. You may also have a 110V standby power supply.

Let's begin with the heater. Open the heater by grasping each handle with your thumb pointing in and turning your hands a quarter turn so your thumbs point straight up. See Figure 1 for an illustration.



**Figure 1: Opening the Heater**

When you look inside the heater you will see what is shown in Figure 2 below.



**Figure 2: Inside of LC Heater**

Mounted at eye level on the trailer, you will see a small gray box, the control box, like that shown in figure 3. When you lift the cover you will see a rocker switch and two indicator lights. The rocker switch turns the heater on and off, the top (green) indicator lights when the heater is getting power, and the bottom (red) indicator lights when the ignition system is unsuccessful in lighting the heater (See the section on troubleshooting).



**Figure 3: Control Box**

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.

You may also have the optional 110V standby power supply (see figure 4) attached to the heater. This unit allows you to run the unit by plugging it in to a standard outlet, allowing



**Figure 4: 110V Standby Power Supply**

## **Running the Heater For the First Time or After the Unit Has Been Sitting a Long Time**

Whenever you need to verify that the heater is working properly, please follow the four steps below.

### **1) Check 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).

### **2) Set the thermostat to the maximum value**

If the temperature is above 80 or 90 degrees, you may not be able to turn the thermostat high enough for the heater to start in the next step. If you wish to continue setting up the heater you will need to chill the thermostat probe or wait for a cooler day.

### **3) Turn on the heater**

The heater will start and, after a few seconds, ignite. The red indicator light in the control box will turn on until the heater has ignited. If the heater doesn't ignite right away, the ignition system will try to ignite the heater again after a short delay. If the heater still doesn't ignite after a few minutes (the red indicator light will turn on and stay on), please refer to the troubleshooting guide to help fix the problem.

### **4) Set the thermostat to the desired temperature.**

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

## **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 your best guide.

These recommendations assume that the thermostat probe is mounted on a nonmetal surface on the front wall of the trailer about 2 to 3 feet off the floor, the walls have at least an inch of insulation, and the floor is uninsulated.

This heater operates most effectively when the following things 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 for the cold air to settle and unobstructed paths for this air to return to the front of the trailer.

- Cargo is standing off from all the walls and setting on insulating surface off the floor, like a wooden pallet. This is especially important for the rear walls since it tends to be the coldest place in the trailer.
- An extended cold air intake. If the cold air intake is extended so that the air is pulled from a couple feet off the floor, the circulation in the trailer will be better and there will much more even temperature 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 has at least modest insulation. As you already know, with more insulation the heater will use less fuel, the temperature in the trailer will be more even, and the heater can maintain the same trailer temperature in much lower outdoor temperatures.

If the heater has everything it needs to operate effectively, start by setting the thermostat 8 to 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, like cargo in a 70 degree warehouse that needs to be kept above freezing, you may need to set the thermostat higher since some areas of the trailer can cool considerably faster than others. To get started, try setting the thermostat an additional 3 degrees warmer (for a total of 11-13 degrees).

If the cargo is not loaded to allow good air circulation, the trailer is uninsulated, or you are hauling 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 definite recommendations but I would try starting with a setting 20 degrees above the desired minimum temperature.

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

## **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 on the valve on the propane tank.

### **2) Set the thermostat**

Set the thermostat to the desired temperature. Please refer to the previous page for recommendations on setting the temperature.

### **3) Turn on the heater**

Use the rocker switch in the control box to turn the heater on. Your heater is now ready for use and will automatically run as necessary to maintain the trailer at the desired temperature (just like a home furnace.)

### **4) Turn off the heater**

If possible, do not turn off the heater when it is running. If you need to turn off the heater while it is running, it is recommended that you first turn off the heater by turning off the propane, wait until the fan was stopped, and then turn off the heater. Turning off the heater with the power switch while it is running is not inherently dangerous, but it will reduce the life of some of the components inside the heater.

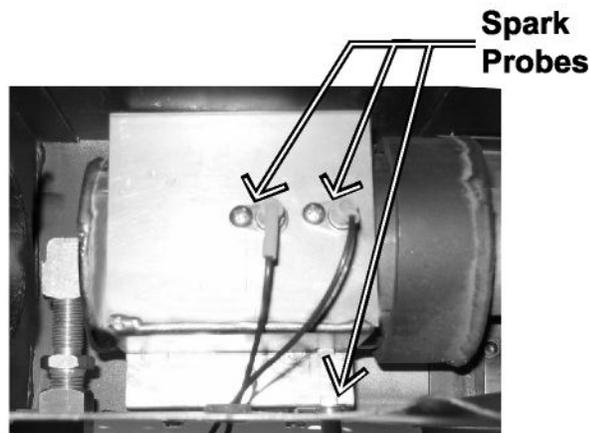
## Service Instruction

### Every time the trailer is loaded and unloaded

- Check the return air inlet and the heater outlet for damage and obstructions and the thermostat probe for damage
- Check the exterior of the heater and the exterior gas lines for damage
- Check that the handles are in the fully closed position

### Annually before the start of the winter season

- Carefully inspect the propane tank, regulator, and fuel lines. Replace any damaged components and tighten any loose fittings.
- Remove the burner cover and inspect the burner and the inside of the combustion chamber. Check that the spark probe screws are tight as shown in Figure 5 below.



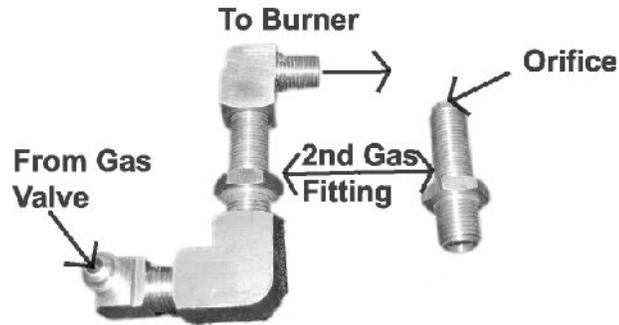
**Figure 5: Location of Spark Probes**

- Clean any dust or dirt around the blower and the air inlets and outlets.
- Start up and run the heater for a couple of minutes to check that everything is in working order.

### Every Three Years

In addition to the annual maintenance,

- Inspect the burner. Carefully clean the orifice in the second gas fitting (see Figure 6) with a solvent.



**Figure 6: Gas Fittings Connected to Burner**

**Caution:**

Do not use a drill bit to clean the orifice. Any change in the size of the orifice may cause the heater to function poorly or not at all.

- Remove the rightmost spark probes and check it for damage and deposits. It



**Figure 7: Spark Probe in Excellent Condition**

should not be darker than a light gray or have an excessively rounded tip. If the spark probe is damaged or excessively round, it should be replaced. If the spark probe has deposits then carefully remove them with a damp rag or abrasive plastic pad.

## Troubleshooting

If this guide doesn't fix your problem please contact the company where you purchased the heater. If you are unable to contact them or you need additional help, please contact Elston Manufacturing at 1-800-845-1385.

### Warning

For your safety, the propane should always be turned off when troubleshooting this product. Always keep the power to the heater off when working inside the heater.

### What is wrong with the heater?

- A. Heater fails to ignite and blower does not run.
  - B. Blower runs but heater fails to ignite.
  - C. Heater usually ignites but sometimes does not.
  - D. The heater ran down the battery while plugged in at night.
  - E. Carbon deposits near the outlet of heater.
- 

### **A** Problem: Heater fails to ignite and blower does not run.

Is the green indicator light in the control box on when you turn on the heater?

**Yes** Adjust the thermostat to its minimum setting, turn on the heater, and then adjust the thermostat to its maximum setting. If the heater runs for less than five minutes but doesn't ignite, the heater is probably not getting propane or getting insufficient voltage.

- 1) Carefully check the fuel system, especially that the propane tanks contain fuel and valve is fully open on the tank.
- 2) Remove the cover to the thermostat and check that the heater is receiving at least 11VDC.

**No** Turn off the switch on the control box, wait 15 seconds, and turn the switch back on to reset the internal circuit breaker. If the green indicator light stays on for less than a second, check the electrical connections in the heater and control box for loose connections and the blower in the heater for obstructions. If the indicator light stays off check the fuse supplying power to the trailer.

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**B Problem: Blower runs but heater fails to ignite**

Listen carefully. You should hear a faint clicking noise five to ten seconds after the blower starts. If you do, then:

- 1) Check the fuel system, especially that the propane tank(s) contain fuel and valve is open on the tank(s).
  - 2) Remove the cover to the thermostat and check that the heater is receiving at least 11.5 VDC while the blower is running.
  - 3) Check the sail switch on the blower. With the power to the heater off, check the resistance between the two terminals on the sail switch that have attached wires. Push the front of the switch closed (to simulate the blower running). The resistance should be less than 1 ohm. If not replace the sail switch.
  - 4) Check the primary spark probe. Remove the burner cover from the combustion chamber and the spark probe on the right side of the burner. The metal tip of the spark probe should only be slightly rounded and the spark probe should only have light deposits on the insulator. If the spark probe is damaged or excessively round, it should be replaced. If the spark probes has only deposits, carefully remove them with a damp rag or abrasive plastic pad.
  - 5) Check the red wire on the ignition module. If this connection doesn't get power sometime in the first ten seconds the blower is on then replace the ignition module.
- 

**C Problem: Heater usually ignites but sometimes does not**

Check that the valve on the propane cylinder is fully on. Occasionally, a tank will fail to supply enough gas to the heater unless the valve is fully open.

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 inlet and outlet in the trailer. Any additional pipe connected to the exhaust should be 3 inches in diameter and less than 8 ft long. Disconnect all ductwork to the heater to see if this corrects the problem.

**No** Carefully check all the inlets and outlets and blower for debris and obstructions. Follow the trouble shooting suggestions for problem B, paying special attention that the heater is getting sufficient voltage while the heater is under load and the spark probes are in good condition.

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**D Problem: Heater ran down the battery at night while plugged in**

When the 110V standby has problems the heater will switch back to 12 V power. With the 110V standby unplugged and the heater off, check the fuse in the 110V standby enclosure. Replace it with a 2.5A AGC fuse, if necessary.

Plug in the 110V standby and restore power to the heater. If the green light never comes on, check the fuse again. If it is already burnt out the 110V standby needs to be fixed. If the green light comes on momentarily, then carefully check the wiring in heater for loose connections. If you don't find any problems the 110V standby or the control box needs to be inspected and serviced.

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**E Problem: Carbon Deposits near Exhaust Outlet**

Under normal use, the heater will deposit very little, if any, carbon near the exhaust outlet. These deposits are often the first sign of a problem with the heater. In addition, this problem often shows up first when the heater is operating on battery power or the 110V standby. These deposit typically indicate that one of the openings in the heater is obstructed or the heater is not receiving enough voltage while it is running.

- 1) Check if the heater is running off of the battery. If the battery is significantly run down, the heater cannot receive enough voltage to operate properly. If this occurs even when the battery is fully charged, then the wiring to the heater is undersized or one of the inlets or outlets to the heater is partially blocked.
- 2) Check if the heater is running off the 110V standby. Check that none of the inlets or outlets to the heater are blocked or any ductwork is damaged. The voltage at the thermostat should be approximately 12V when the heater is running with the 110V standby plugged in. If the voltage is lower, check the fuse inside the 110V standby. If this fuse is not blown and the voltage at the thermostat was below 11.5V, then the 110V standby needs to be serviced.

## Installation

### Parts Needed for Installation Included with Heater:

- 6 ½"x2" fender washers
- 1 template for mounting holes
- 6 feet self stick rubber seal
- 1 brass fitting

### Additional parts required:

- 6 ½" bolts 1 to 1 ½ inches longer than the thickness of the front wall of the trailer
- 12 flat washers, 6 lock washers and 6 nuts to match the bolts above
- Brackets and clips for attaching fuel lines, electrical lines, and thermostat probe to the trailer walls
- 12" of 4" double walled duct pipe (optional)

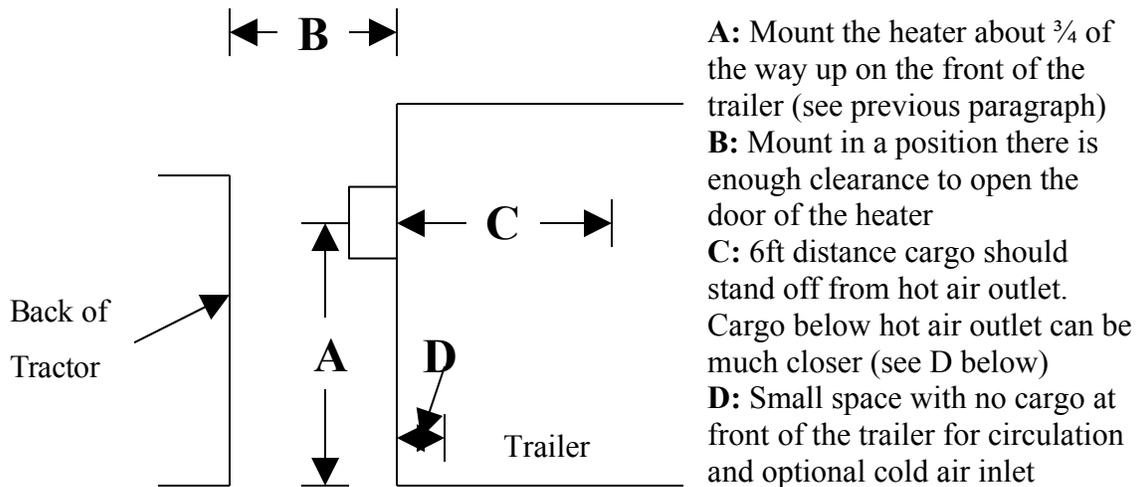
### Tools needed:

- Set of combination wrenches
- Crescent wrench
- #2 phillips screwdriver
- Heavy-duty ½ drill
- 9/16 drill bit
- hole saws or jig or saber saw (to cut hot air opening and return air opening)
- Wire cutter
- Wire stripper

### Heater placement:

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. For good circulation and the most even heat, cargo should not be within 6 feet straight out from these openings (it may be below them). As a result, the heater should be mounted high enough to allow this without sacrificing too much cargo space. Mounting the heater with the hot air outlet  $\frac{3}{4}$  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 thru the trailer that comes from mounting the heater too close to the top of the

trailer. The heater must also be mounted where there is enough clearance to open the door when the trailer is hooked up.



## Location and 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 one of the top 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 three 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 a  $\frac{1}{2}$ " bolt (with a washer) into the top mounting hole you drilled. Finger tighten the nuts on this bolt to keep the heater from pulling away from the wall. Level the heater and drill the other top-mounting hole. Insert a bolt and its washers into this hole and finger tighten the nut. Place the double walled duct tubing on the hot air outlet, adjusting the position of the heater slightly if the hole is not lined up. Drill the remaining mounting holes and insert the remaining bolts. Tighten all six mounting bolts

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

Mount the thermostat probe on a nonmetal surface on the front wall of the trailer about 2 to 3 feet off the floor. The probe should be attached with plastic tinnerman clips and the thermostat "wire" should be attached to the front wall with clips to prevent damage from vibration.

## Wiring

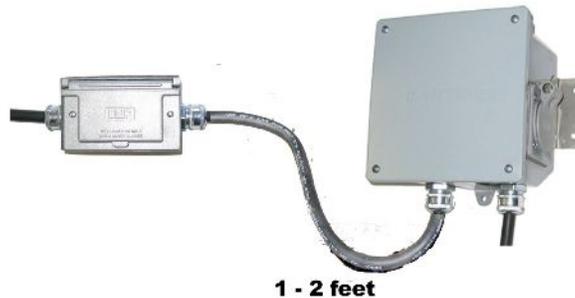
Before you begin wiring, check that the power switch to the heater is off and the trailer has no power.

Mount the control box and, if present, the 110 V standby on the trailer. Select a location where they may be easily accessed without being exposed to the full force of the wind and weather. Please follow the steps below to seal the control box:

- Place a bead of silicon around all mounting holes you drill in the back of the control box. This bead will help keep any water traveling between the back of the control box and the front wall of the trailer from getting inside the control box.
- After you mount the control box, seal the edge between the aluminum and the front edge of the aluminum box with silicon.

If you have a 110 V standby with your heater, the 110 V standby enclosures will have six feet of 14-gauge wire labeled “12V DC in” attached. If not, the control box comes with the six feet of wire labeled “12V DC” in. Connect the white wire to the constant power supply 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.

The connection between the heater and the control box and the control box and the 110V standby are typically already wired. If the control box and the 110V standby are not wired together or you need to shorten these wires, rewire the unit as shown below.



The black wire connects to the grounding screw inside each enclosure with a crimp on ring. The white wire connects to the rocker switch inside the control box and the number 30 spade terminal on the relay inside the 110V standby (It is the bottom connection on the relay and the only vertical spade.) Replace any quick connects you remove with premium quick connects to help prevent vibration from loosening the connections. Once all wiring is completed, secure all wiring to prevent it from blowing in the wind or being damaged from vibration or accidental pulling.

## **Fuel System**

Elston Manufacturing, Inc. offers three fuel supply options, a X-1025 single 20 lb. bottle carrier, a X-1050 dual 20 lbs. bottle carrier, and the series 32 for a 100# mounted tank. All three should be mounted on the belly of the trailer to the trailer frame.

Always follow best practices for installing the fuel system including installing propane tank(s) and the regulator outside of the space to be heated. Do not install the fuel system unless you know best practices for propane fuel systems.

Install the fuel lines between the tank and the heater. Use only quality approved LP gas hoses with properly crimped hose ends and connectors or proper copper tubing and flare connections and connectors. Be sure that all fuel lines are securely fastened between the tank and the heater.

Pressure check the system for leaks before running propane.

## **Final details**

It is recommended that a X-850 ventilator be mounted in the front of the trailer for proper ventilation and to ensure consistent ignition of the heater.

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.

## Repair

### Sliding Out Electronics Bay for Troubleshooting

1. Shut off gas at tank and disconnect unit from power.
2. Disconnect quick connects connected to the flame sensor and ground spark probes.
3. Remove screws holding electronics tray.
4. Slide the tray forward and lift until the tray comes loose of its mounting slots.
5. Carefully slide out the tray, trying not to rub the high voltage terminal against the top of the electronics enclosure. You may need to lightly push some of the excess wire bundled together into the electronics bay to allow the tray to pull out.
6. Just before the tray is fully slid out, disconnect the quick connect terminal connected to the high voltage terminal.
7. Slide the tray out the rest of the way, turning it if necessary.
8. You can now access all the wiring for the heater.

### Replacing electronics assembly

1. Follow the instructions for removing the electronics tray from the heater.
2. Disconnect wiring to fan, gas valve, and other components.
3. Disconnect the wiring for power into the heater.
4. Take the new electronics tray and feed the loose wires through the grommet on the left side of the electronics enclosure.
5. Connect the power connects back into the heater.

**Adjusting and replacing spark probes**

1. Remove burner cover. It is attached with four slotted hex head screws.
2. Remove bottom spark probe.
3. Remove gas line inlet and brass fittings.
4. Remove burner mounting bolts.
5. Disconnect spark probes from spark ignition module.
6. Slide out burner.

**Replacing Blower**

1. Disconnect wiring from blower and sail switch on top of fan. Carefully note where each connection was attached.
2. Loosen hose clamp.
3. Slide blower off mounting pipe and remove from heater.
4. Connect wiring to new blower.
5. Slide blower onto mounting pipe and tighten hose clamp to attach blower.

**Removing combustion chamber**

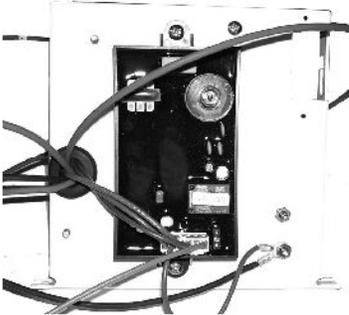
1. Shut off gas at tank and disconnect unit from power.
2. Remove the blower from the front of the combustion chamber.
3. Disconnect the leads for the three spark probes from the electronic igniter module.
4. Remove the 12" hose attaching the gas valve to the combustion chamber.
5. If present, remove the double walled tubing attached to the hot air outlet.

6. Loosen and remove the four bolts attaching the heater shell to the combustion chamber located on the bottom of the heater.
7. Carefully lift out and remove the combustion chamber from the heater by pulling out the top of the combustion until it clears the top edge of the heater shell and then lifting the combustion chamber out.

## Parts List

<b>Assembly</b>	<b>Part Name</b>	<b>Part Number</b>
Heater Assembly		
	Hinge – Stainless Steel	HLC-133
	Door Handle	HLC-139
	Combustion Chamber Assembly	HLC-700
	Burner Assembly	HLC-600
Electrical Components		
	Gas Valve	HLC-229
	Thermostat	HLC-225
	Blower Assembly	HLC-800
	Sail Switch	HLC-227
	Primary Spark Probe	HLC-224P
	Secondary Spark Probe	HLC-224S
Electrical Tray Assembly		HLC-900
	Changeover (SPDT) Relay	HLC-230
	5 Terminal SPST Relay	HC-415
	Electronic Spark Ignition Module	HLC-913
Control Box		HLC-003
110V Standby Power Supply		HLC-002
	Capacitor	HLC-233
	Rectifier	HLC-501
	Transformer	HLC-504

## Partial Illustrated Parts Directory

	<b>Primary Spark Probe</b>	<b>HLC224P</b>
	<b>Secondary Spark Probe</b>	<b>HLC224S</b>
	<b>Electrical Tray Assembly</b>	<b>HLC900</b>
	<b>Spark Ignition Module</b>	<b>HLC913</b>
	<b>Relay - SPDT (Changeover)</b>	<b>HLC230</b>
	<b>Relay - 5 Terminal SPST</b>	<b>HC415</b>
	<b>Gas Valve</b>	<b>HLC229</b>



**Control Box**

**HLC-003**



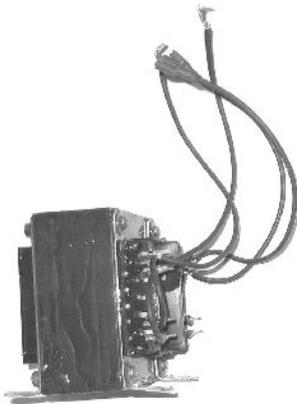
**110V Standby  
Power Supply**

**HLC-002**



**Capacitor**

**HLC-233**



**Transformer**

**HLC-504**

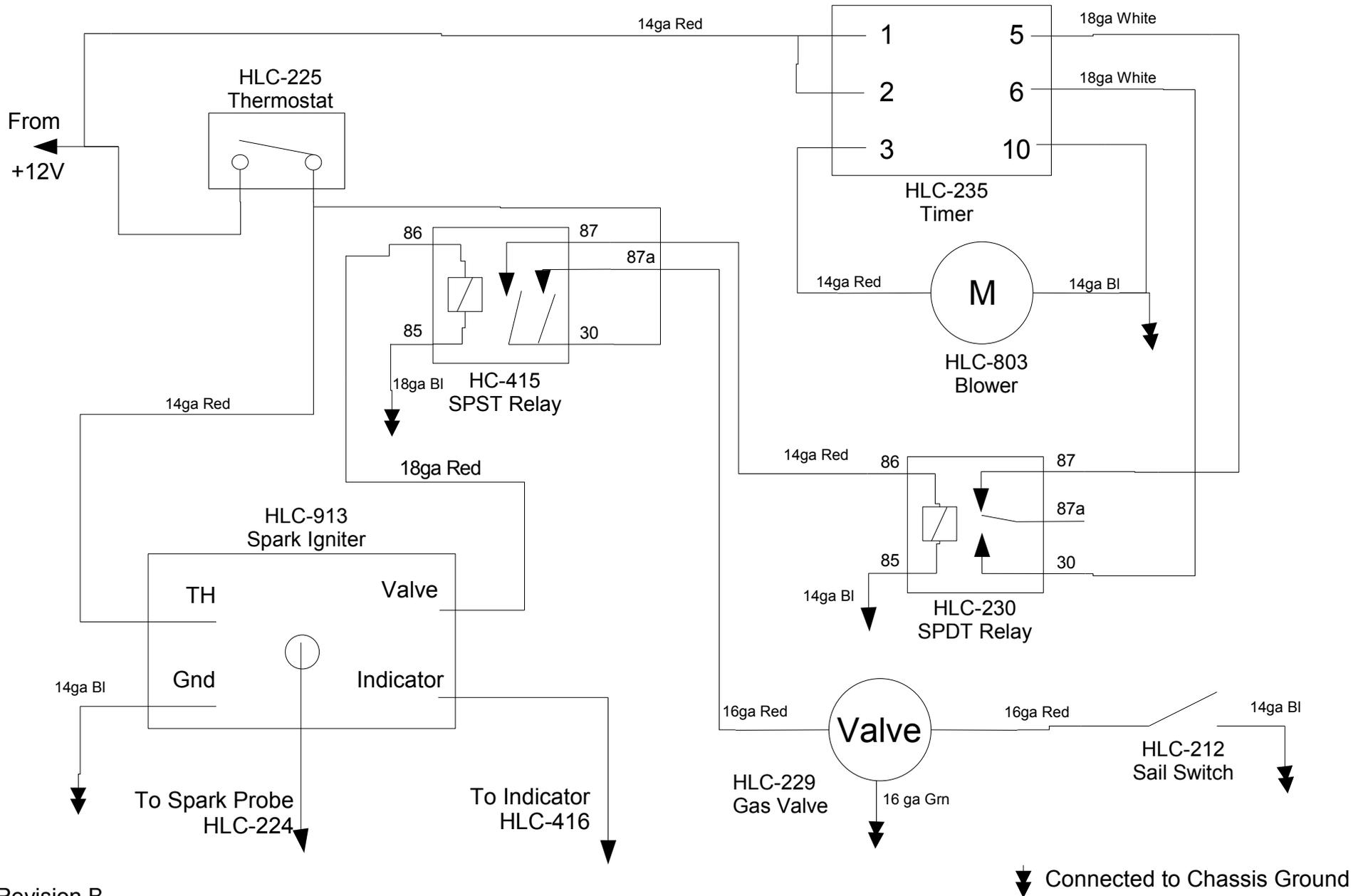


**Rectifier**

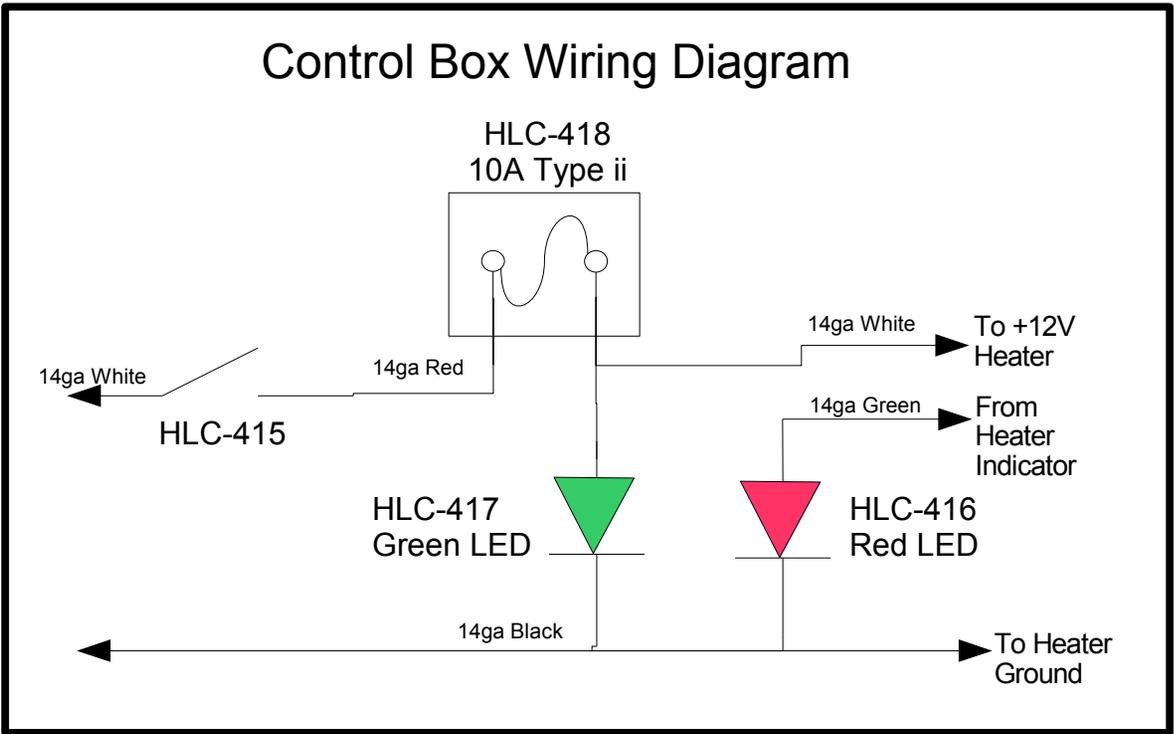
**HLC-501**

# LC Heater Wiring Diagram

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# Control Box Wiring Diagram

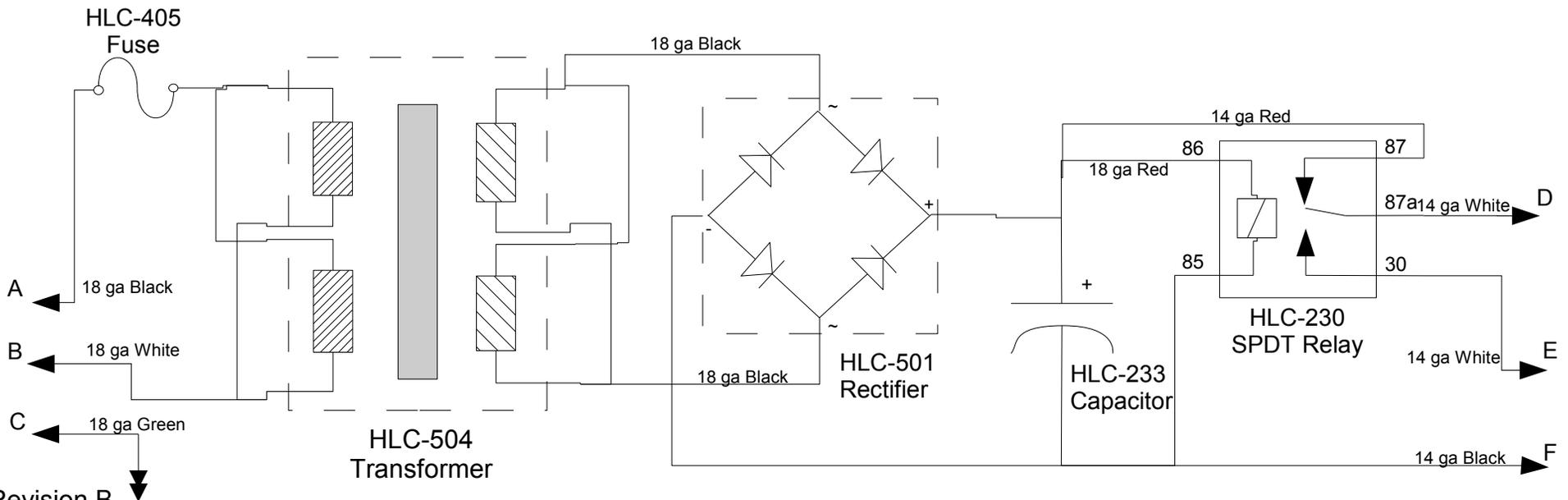


# 110V Standby Wiring Assembly

## External Connections

- A: To 110V AC Plug-in Hot Terminal
- B: To 110V AC Plug-in Neutral Terminal
- C: To 110V AC Plug-in Green Terminal
- D: To +12V Constant Trailer Power
- E: To +12V in Control Box
- F: To Control Box and Heater Ground

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