The HL3 Series Infrared Tube Heater is a positive pressure, two stage radiant heater system. This insert manual is a supplement to the Tube Heater General Manual and provides specific information related to the HL3 Series model. All persons involved with the installation, operation, and maintenance of the heater system must read and understand the information in this insert manual and the accompanying Tube Heater General Manual.

**WARNING**

Improper installation, adjustment, alteration, service, or maintenance can cause property damage, injury, or death. Read the installation, operation, and maintenance instructions thoroughly before installing or servicing this equipment.

This heater must be installed and serviced by trained gas installation and service personnel only. Failure to comply could result in personal injury, asphyxiation, death, fire, or property damage.

In locations used for the storage of combustible materials, signs must be posted to specify the maximum permissible stacking height to maintain the required clearances from the heater to the combustibles. Signs must either be posted adjacent to the heater thermostats or, in the absence of such thermostats, in a conspicuous location.

**Not for residential use!** Do not use this heater in the home, sleeping quarters, attached garages, etc. Installation of a commercial tube heater system in residential indoor spaces may result in property damage, serious injury, asphyxiation, or death.

**For Your Safety**

If you smell gas:

- Do not try to light any appliance.
- Do not touch any electrical switch.
- Do not use any phone in your building.
- Immediately call your gas supplier from a neighbor’s phone.
- Follow the gas supplier’s instructions.
- If you cannot reach your gas supplier, call the fire department.
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**NOTE:** See page 10 for a list of available models and specifications.

### WARNING

**California Proposition 65**

This product can expose you to chemicals including lead and carbon monoxide, which are known to the State of California to cause birth defects or other reproductive harm.

For more information, go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).
1.0 Safety

**WARNING**

Improper installation, adjustment, alteration, service, or maintenance can cause property damage, serious injury, or death. Read and understand the installation, operating, and maintenance instruction thoroughly before installing or servicing this equipment. Only trained, qualified gas installation and service personnel may install or service this equipment.

**Safety Labels and Their Locations**

Product safety signs or labels should be replaced by the product user when they no longer are legible. Contact either your local distributor or the product manufacturer for obtaining replacement signs or labels.

---

**Back Panel**

- F/N: LLAC
- Air Metering Orifice
- DO NOT REMOVE

**Top Panel**

- F/N: LLV3EP1
  - 120V Input
- F/N: LLV3EP2
  - 24V Input
  - (Orange crescent - with relay option)
- F/N: LLV3EP4
  - 24V Input
  - (White crescent - no relay)
- F/N: LLV3EP14
  - (Operational Indicator Lights)

**Bottom Panel**

- F/N: LLTCL006L, LLTCL001C/R
  - Clearance to Combustibles Labels

**Logo Label**

- F/N: LLLOGO32

---

1.0 Safety • Safety Labels and Locations
1.0 Safety • Safety Labels and Their Locations • Clearances to Combustibles

Clearances to Combustibles

**WARNING**

Placement of explosive objects, flammable objects, liquids, and vapors close to the heater may result in explosion, fire, property damage, serious injury, or death. Do not store or use explosive objects, liquids, or vapor in the vicinity of the heater.

Clearances to combustibles is defined as the minimum distance that must exist between the tube surface, or reflector, and any combustible items (see Figure 1.1). It also pertains to the distance that must be maintained from moving objects around the tube heater.
When installing the tube heater system, clearances to combustibles for the model tube heater and configuration must be maintained. Refer to Chart 1.1 below to determine the required distances for your model.

**Chart 1.1 • Clearances to Combustibles in Inches** (see Figure 1.1 for Mounting Angles)

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Mounting Angle*</th>
<th>Sides</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Front</td>
<td>Behind</td>
</tr>
<tr>
<td>HL3 (20, 30, 40) - (65, 75) [N, P]</td>
<td>0°</td>
<td>9</td>
</tr>
<tr>
<td>with 1 side shield</td>
<td>45°</td>
<td>39</td>
</tr>
<tr>
<td>with 2 side shields</td>
<td>0°</td>
<td>29</td>
</tr>
<tr>
<td>20 ft. from burner</td>
<td>0°</td>
<td>9</td>
</tr>
<tr>
<td>HL3 (30, 40) - 100 [N, P]</td>
<td>0°</td>
<td>14</td>
</tr>
<tr>
<td>with 1 side shield</td>
<td>45°</td>
<td>39</td>
</tr>
<tr>
<td>with 2 side shields</td>
<td>0°</td>
<td>29</td>
</tr>
<tr>
<td>20 ft. from burner</td>
<td>0°</td>
<td>16</td>
</tr>
<tr>
<td>HL3 (30, 40, 50) - 125 [N, P]</td>
<td>0°</td>
<td>14</td>
</tr>
<tr>
<td>with 1 side shield</td>
<td>45°</td>
<td>58</td>
</tr>
<tr>
<td>with 2 side shields</td>
<td>0°</td>
<td>20</td>
</tr>
<tr>
<td>20 ft. from burner</td>
<td>0°</td>
<td>7</td>
</tr>
<tr>
<td>HL3 (40, 50, 60) - 150 [N, P]</td>
<td>0°</td>
<td>14</td>
</tr>
<tr>
<td>with 1 side shield</td>
<td>45°</td>
<td>58</td>
</tr>
<tr>
<td>with 2 side shields</td>
<td>0°</td>
<td>23</td>
</tr>
<tr>
<td>20 ft. from burner</td>
<td>0°</td>
<td>11</td>
</tr>
<tr>
<td>HL3 (40, 50, 60, 70) - 175 [N, P]</td>
<td>0°</td>
<td>14</td>
</tr>
<tr>
<td>with 1 side shield</td>
<td>45°</td>
<td>63</td>
</tr>
<tr>
<td>with 2 side shields</td>
<td>0°</td>
<td>30</td>
</tr>
<tr>
<td>20 ft. from burner</td>
<td>0°</td>
<td>11</td>
</tr>
<tr>
<td>HL3 (50, 60, 70) - 200 [N, P]</td>
<td>0°</td>
<td>14</td>
</tr>
<tr>
<td>with 1 side shield</td>
<td>45°</td>
<td>63</td>
</tr>
<tr>
<td>with 2 side shields</td>
<td>0°</td>
<td>30</td>
</tr>
<tr>
<td>20 ft. from burner</td>
<td>0°</td>
<td>11</td>
</tr>
</tbody>
</table>

* Heaters mounted on an angle between 0° and 45° must maintain clearances posted for 0° or 45°; whichever is greater.

The stated clearance to combustibles represents a surface temperature of 90°F (50°C) above room temperature. Building materials with a low heat tolerance (such as plastics, vinyl siding, canvas, tri-ply, etc.) may be subject to degradation at lower temperatures. It is the installer’s responsibility to assure that adjacent materials are protected from degradation.

**Figure 1.1 • Mounting Angles**

![Diagram of tube heater with mounting angles](image-url)


## 2.0 Installation

### WARNING

Improper installation, adjustment, alteration, service, or maintenance can cause property damage, serious injury, or death. Read and understand the installation, operating, and maintenance instructions thoroughly before installing or servicing this equipment. Only trained, qualified gas installation and service personnel may install or service this equipment.

**Not for residential use!** Do not use this heater in the home, sleeping quarters, attached garages, etc. **Installation of a commercial tube heater system in residential indoor spaces may result in property damage, serious injury, or death.**

Instructions for the following are detailed in the Tube Heater General Manual:

- Design considerations
- Hanger suspension and placement
- Tube layout and assembly
- Burner control box suspension
- Reflectors (and accessories)
- Venting and combustion air intake
- Gas requirements
- Baffle assembly

**Note:** Electronic versions of all manuals are available at www.detroitradiant.com

### Gas Requirements

<table>
<thead>
<tr>
<th>Type of Gas</th>
<th>Required Manifold Pressure</th>
<th>Minimum Inlet Pressure</th>
<th>Maximum Inlet Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural</td>
<td>3.5 Inches. W.C.</td>
<td>5.0 Inches. W.C.</td>
<td>14.0 Inches. W.C.</td>
</tr>
</tbody>
</table>

**IMPORTANT:** Consult the Tube Heater General Manual for gas connection requirements.

### Electrical Requirements

- 120VAC - 60 Hz, GND, 3-wire
- 24VAC thermostat connection
- Starting current 4.8 amps
- Running current 1.1 amps

**NOTICE**

Connecting the thermostat with a voltage other than 24V may damage the heater. The HL3 Series requires a 24 VAC connection to the thermostat. This is either supplied by the heater internally (standard) or by an external transformer (with optional isolation relays, P/N: HLRP). See Figure 2.1A-B.

**NOTE:** A yellow control cord replaces the external terminal plug on stainless steel models and models with water resistant upgrades.
**Wiring**

**WARNING**

**Electric Shock**

Field wiring to the tube heater must be connected and grounded in accordance with national, state, provincial, local codes, and to the guidelines in the Tube Heater General Manual and Series Insert Manual. In the United States refer to the most current revisions to the ANSI/NFPA 70 Standard and in Canada refer to the most current revisions to the CSA C22.1 Part I Standard.

---

**Figure 2.1 • Field Wiring Diagrams**

**A. Single Heater, No Relay (Single Thermostat)**

![Diagram A](image)

**NOTE:** If optional yellow control cord is installed then the following wire colors apply:
- **Neutral** = green
- **Low** = white
- **High** = black

Additional wire needed for thermostats that require constant power.

**Burner Box**

- 24VAC
- Low
- High

1/4" spade terminals required (as supplied)

---

**B. Multiple Heaters with Relay Option (Single Thermostat)**

![Diagram B](image)

**NOTE:** If optional yellow control cord is installed then the following wire colors apply:
- **Neutral** = green
- **Low** = white
- **High** = black

When using a thermostat that requires constant power a common wire must be run from the C terminal on the thermostat back to the transformer.
Before field wiring this appliance - Check existing wiring; replace if necessary.

**Note:** If any of the original wire supplied with the appliance must be replaced, it must be replaced with wiring material having a temperature rating of at least 105° C.

**Figure 2.2 - Internal Wiring Diagram**

**WIRING INFORMATION:**

<table>
<thead>
<tr>
<th>LOW VOLTAGE:</th>
<th>LINE VOLTAGE:</th>
</tr>
</thead>
<tbody>
<tr>
<td>FACTORY STANDARD</td>
<td>FACTORY STANDARD</td>
</tr>
<tr>
<td>FACTORY OPTION</td>
<td>FACTORY OPTION</td>
</tr>
<tr>
<td>FIELD INSTALLED</td>
<td>FIELD INSTALLED</td>
</tr>
</tbody>
</table>
Figure 2.3 • Internal Wiring Diagram with Optional HLRP Relay

WIRING INFORMATION:
LOW VOLTAGE:
- FACTORY STANDARD
- FACTORY OPTION
- FIELD INSTALLED

LINE VOLTAGE:
- FACTORY STANDARD
- FACTORY OPTION
- FIELD INSTALLED

*IF THERMOSTAT IS A YELLOW CONTROL CORD, USE PARENTHESIZED COLOR CODE
### Specifications

#### Chart 2.1 • Specifications

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Gas Type (select one)</th>
<th>BTU/h (High Fire)</th>
<th>BTU/h (Low Fire)</th>
<th>Straight Length</th>
<th>U-Tube Length</th>
<th>Standard Weight (lbs.)</th>
<th>Stainless Steel Weight (lbs.)</th>
<th>Recommended Mounting Height</th>
<th>Combustion Chamber (Black Coated)</th>
<th>Radiant Emitter Tube(s) (Black Coated)</th>
<th>36&quot; Baffle Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>HL3-20-65</td>
<td>Nat. or Prop.</td>
<td>65,000</td>
<td>50,000</td>
<td>21'-9&quot;</td>
<td>13'-1&quot;</td>
<td>120</td>
<td>N/A</td>
<td>9' to 14'</td>
<td>Alum</td>
<td>Alum</td>
<td>5</td>
</tr>
<tr>
<td>HL3-20-75</td>
<td>Nat. or Prop.</td>
<td>75,000</td>
<td>50,000</td>
<td>21'-9&quot;</td>
<td>13'-1&quot;</td>
<td>120</td>
<td>145</td>
<td>10' to 15'</td>
<td>Alum</td>
<td>Alum</td>
<td>5</td>
</tr>
<tr>
<td>HL3-30-65</td>
<td>Nat. or Prop.</td>
<td>65,000</td>
<td>50,000</td>
<td>31'-5&quot;</td>
<td>**17'-9&quot;</td>
<td>160</td>
<td>N/A</td>
<td>10' to 15'</td>
<td>Alum</td>
<td>Alum</td>
<td>4</td>
</tr>
<tr>
<td>HL3-30-75</td>
<td>Nat. or Prop.</td>
<td>75,000</td>
<td>50,000</td>
<td>31'-5&quot;</td>
<td>**17'-9&quot;</td>
<td>160</td>
<td>195</td>
<td>11' to 18'</td>
<td>Alum</td>
<td>Alum</td>
<td>5</td>
</tr>
<tr>
<td>HL3-30-100</td>
<td>Nat. or Prop.</td>
<td>100,000</td>
<td>65,000</td>
<td>31'-5&quot;</td>
<td>**17'-9&quot;</td>
<td>160</td>
<td>195</td>
<td>12' to 20'</td>
<td>Alum</td>
<td>Alum</td>
<td>5</td>
</tr>
<tr>
<td>HL3-30-125</td>
<td>Nat. or Prop.</td>
<td>125,000</td>
<td>82,000</td>
<td>31'-5&quot;</td>
<td>**17'-9&quot;</td>
<td>160</td>
<td>195</td>
<td>13' to 23'</td>
<td>Alum</td>
<td>Alum</td>
<td>6</td>
</tr>
<tr>
<td>HL3-40-65</td>
<td>Nat. or Prop.</td>
<td>65,000</td>
<td>50,000</td>
<td>41'-1&quot;</td>
<td>22'-9&quot;</td>
<td>190</td>
<td>N/A</td>
<td>11' to 18'</td>
<td>Alum</td>
<td>Alum</td>
<td>3</td>
</tr>
<tr>
<td>HL3-40-75</td>
<td>Nat. or Prop.</td>
<td>75,000</td>
<td>50,000</td>
<td>41'-1&quot;</td>
<td>22'-9&quot;</td>
<td>190</td>
<td>235</td>
<td>11' to 18'</td>
<td>Alum</td>
<td>Alum</td>
<td>4</td>
</tr>
<tr>
<td>HL3-40-100</td>
<td>Nat. or Prop.</td>
<td>100,000</td>
<td>65,000</td>
<td>41'-1&quot;</td>
<td>22'-9&quot;</td>
<td>190</td>
<td>235</td>
<td>12' to 20'</td>
<td>Alum</td>
<td>Alum</td>
<td>4</td>
</tr>
<tr>
<td>HL3-40-125</td>
<td>Nat. or Prop.</td>
<td>125,000</td>
<td>82,000</td>
<td>41'-1&quot;</td>
<td>22'-9&quot;</td>
<td>190</td>
<td>235</td>
<td>13' to 23'</td>
<td>Alum</td>
<td>Alum</td>
<td>5</td>
</tr>
<tr>
<td>HL3-40-150*</td>
<td>Nat. or Prop.</td>
<td>150,000</td>
<td>100,000</td>
<td>41'-1&quot;</td>
<td>22'-9&quot;</td>
<td>190</td>
<td>235</td>
<td>14' to 25'</td>
<td>Titan</td>
<td>Alum</td>
<td>5</td>
</tr>
<tr>
<td>HL3-40-175*</td>
<td>Nat. or Prop.</td>
<td>175,000</td>
<td>125,000</td>
<td>41'-1&quot;</td>
<td>22'-9&quot;</td>
<td>190</td>
<td>235</td>
<td>15' to 27'</td>
<td>Titan</td>
<td>Alum</td>
<td>5</td>
</tr>
<tr>
<td>HL3-50-125</td>
<td>Nat. or Prop.</td>
<td>125,000</td>
<td>82,000</td>
<td>50'-9&quot;</td>
<td>**27'-5&quot;</td>
<td>235</td>
<td>290</td>
<td>15' to 27'</td>
<td>Alum</td>
<td>Alum</td>
<td>3</td>
</tr>
<tr>
<td>HL3-50-150*</td>
<td>Nat. or Prop.</td>
<td>150,000</td>
<td>100,000</td>
<td>50'-9&quot;</td>
<td>**27'-5&quot;</td>
<td>235</td>
<td>290</td>
<td>15' to 27'</td>
<td>Titan</td>
<td>Alum</td>
<td>3</td>
</tr>
<tr>
<td>HL3-50-175*</td>
<td>Nat. or Prop.</td>
<td>175,000</td>
<td>125,000</td>
<td>50'-9&quot;</td>
<td>**27'-5&quot;</td>
<td>235</td>
<td>N/A</td>
<td>16' to 30'</td>
<td>Titan</td>
<td>Alum</td>
<td>3</td>
</tr>
<tr>
<td>HL3-50-200*</td>
<td>Nat. or Prop.</td>
<td>200,000</td>
<td>145,000</td>
<td>50'-9&quot;</td>
<td>**27'-5&quot;</td>
<td>235</td>
<td>N/A</td>
<td>17' to 35'</td>
<td>Titan</td>
<td>Alum</td>
<td>2</td>
</tr>
<tr>
<td>HL3-60-150*</td>
<td>Nat. or Prop.</td>
<td>150,000</td>
<td>100,000</td>
<td>60'-5&quot;</td>
<td>**32'-5&quot;</td>
<td>265</td>
<td>330</td>
<td>16' to 30'</td>
<td>Titan</td>
<td>Alum</td>
<td>2</td>
</tr>
<tr>
<td>HL3-60-175*</td>
<td>Nat. or Prop.</td>
<td>175,000</td>
<td>125,000</td>
<td>60'-5&quot;</td>
<td>**32'-5&quot;</td>
<td>265</td>
<td>N/A</td>
<td>16' to 30'</td>
<td>Titan</td>
<td>Alum</td>
<td>2</td>
</tr>
<tr>
<td>HL3-60-200*</td>
<td>Nat. or Prop.</td>
<td>200,000</td>
<td>145,000</td>
<td>60'-5&quot;</td>
<td>**32'-5&quot;</td>
<td>265</td>
<td>N/A</td>
<td>17' to 35'</td>
<td>Titan</td>
<td>Alum</td>
<td>2</td>
</tr>
<tr>
<td>HL3-70-175*</td>
<td>Nat. or Prop.</td>
<td>175,000</td>
<td>125,000</td>
<td>70'-'1&quot;</td>
<td>**37'-3&quot;</td>
<td>300</td>
<td>N/A</td>
<td>19' to 42'</td>
<td>Titan</td>
<td>Alum</td>
<td>2</td>
</tr>
<tr>
<td>HL3-70-200*</td>
<td>Nat. or Prop.</td>
<td>200,000</td>
<td>145,000</td>
<td>70'-'1&quot;</td>
<td>**37'-3&quot;</td>
<td>300</td>
<td>N/A</td>
<td>19' to 42'</td>
<td>Titan</td>
<td>Alum</td>
<td>2</td>
</tr>
</tbody>
</table>

* Model requires stainless steel tube clamp (P/N: TP-220) to be located at the seam between the primary combustion chamber and the secondary combustion tube downstream of the burner control box.
** Model requires 5EA-SUB accessory package when installing in a 'U' configuration (P/N: TF1B).
^ Factory recommended mounting heights are listed as a guideline.

**IMPORTANT:** Reference box label to determine the number of required baffle sections for each model heater.

Alum = Black coated aluminized treated steel.
Titan = Black coated titanium stabilized aluminized steel.
Tube Installation Sequence

Figure 2.4 • Tube Installation Sequence

Important! The combustion chamber & radiant tube sections must be installed in the following order.

20 Foot

30 Foot

Stainless steel clamp location on 150 MBH models (P/N: TP-220)

40 Foot

Stainless steel clamp location on 150 - 200 MBH models (P/N: TP-220)

50 Foot

Stainless steel clamp location on 150-200 MBH models (P/N: TP-220)

60 Foot

Stainless steel clamp location on 150-200 MBH models (P/N: TP-220)

70 Foot

Key

Burner Control Box with 16-inch Burner Tube
Black Coated Combustion Chamber Tube*
Black Coated Aluminized Combustion Chamber/Radiant Emitter Tube

Standard Tube Clamp
Stainless Steel Tube Clamp (P/N: TP-220)
150-200 MBH models only - Located between 1st and 2nd 10 ft. tube sections.

Baffle Location

*Aluminized tubes (50,000 to 125,000 BTU/H models); Titan tubes (150,000 to 200,000 BTU/H models).

NOTE: Refer to the Tube Heater General Manual, Chart 3.6 (page 23) for secured reflector joints.
3.0 Operation

WARNING

This heater must be installed and serviced by trained gas installation and service personnel only.

Do not bypass any safety features or the heater’s built in safety mechanisms will be compromised.

Note: Reference the Tube Heater General Manual for installation requirements.

Sequence of Operation

Standby: The 35-66 control continually checks for internal faults, circuit integrity, and relay contact positioning.

Starting Circuit: Upon a call for heat, the control verifies that the differential switch is in the proper position (open). The control energizes the fan. Once operational static pressure is achieved, the differential switch will close initiating the ignition sequence. The glo-bar is powered and the gas valve opens after 45 seconds. If the flame is not sensed, the heater will attempt to re-ignite for a total of three (3) trials for ignition before proceeding to soft lockout.

Single Stage Running Circuit: After ignition, the flame rod monitors burner flame. If sense of flame is lost, the control closes the gas valve within one second and a new trial sequence (identical to the starting sequence) is initiated. If flame sense is not established within 8.5 seconds, the heater will attempt two (2) additional ignition sequences before proceeding to soft lockout. The control can be reset by briefly interrupting the power source.

Two Stage Running Circuit: The second stage on the gas valve is powered directly from the second stage of the thermostat. In order for two stage to flow to a higher output, single stage must be energized as well. The thermostat determines which stage to maintain for the desired temperature.

Shut Down: When the thermostat is satisfied, the fan will enter a two (2) minute post-purge cycle. Refer to Soft and Hard Lockout under Diagnostics on page 13.

Thermostat

HL3 Series heaters require a 24VAC, two-stage thermostat to operate. The burner control box is equipped with a round terminal strip that accepts three (3) 1/4” insulated female spade terminals. Do not supply 120V to the 24V connection.

The HL3 Series is equipped with or without relays (P/N: HLRP). The optional relays must be factory installed. NOTE: Units with a relay installed must have an external transformer (field supplied), see wiring diagram (Figure 2.2B).

Standard Configuration
Without relays (identified with white label around the terminal block):
• Single burner control box
• Single thermostat

Optional Configuration
With relays (identified with orange label around the terminal block):
• A single thermostat controls two or more burner control boxes.
• Heaters are common vented
• Must be factory installed
Diagnostics

Lockout:

The controls will automatically lockout the heater system when an external or system fault occurs. There are two types of lockout:

**Soft Lockout:** The heater will attempt to light three times. In the event of a failed attempt to light, (gas pressure, valve, no flame sense etc.), the heater will enter a soft lockout period for 15 minutes and then attempt to light three more times before entering Hard Lockout mode.

**Hard Lockout:** If proof of flame is not established, a component failure occurs or blockages are evident, the heater will enter hard lockout. If lockout occurs, the control can be reset by briefly interrupting the power source. Refer to Chart 3.1 and 3.2 below for a description of LED codes.

**Figure 3.1 • Operational Indicator Lights**

| Light 1 (amber) | Indicates Low Fire Mode |
| Light 2 (amber) | Indicates High Fire Mode |
| Light 3 (green) | Indicates Pressure Switch Closes |

**Chart 3.1 • LED Diagnostic Codes - Fenwal Circuit Board**

<table>
<thead>
<tr>
<th>LED Code</th>
<th>Fault Status</th>
<th>Fault Code Delay*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial flash on power up, then steady off</td>
<td>No fault, normal operation</td>
<td>No delay</td>
</tr>
<tr>
<td>Steady on</td>
<td>Module failure / Internal fault</td>
<td>No delay</td>
</tr>
<tr>
<td>1 flash</td>
<td>Ignition failure</td>
<td>3 minutes</td>
</tr>
<tr>
<td>2 flashes</td>
<td>APS (Air Proving Switch) (Fan/Intake/Exhaust)</td>
<td>0-30 seconds</td>
</tr>
<tr>
<td>3 flashes</td>
<td>Lockout</td>
<td>17 minutes</td>
</tr>
<tr>
<td>4 flashes</td>
<td>Solenoid valve fault, Leaky valve, Flame amplifier fault</td>
<td>No delay</td>
</tr>
<tr>
<td>No flash on 117V startup</td>
<td>Transformer fault</td>
<td>No delay</td>
</tr>
</tbody>
</table>

* Some LED codes have a time delay before the LED will flash.

**Chart 3.2 • LED Diagnostic Codes - Capable Controls Circuit Board**

<table>
<thead>
<tr>
<th>LED Code</th>
<th>Fault Status</th>
<th>Fault Code Delay*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial flash (Red) on power up</td>
<td>Normal operation</td>
<td>Immediate</td>
</tr>
<tr>
<td>Steady flash (Green) during ignition</td>
<td>Normal operation</td>
<td>Immediate</td>
</tr>
<tr>
<td>Steady on (Green) after flame sense</td>
<td>Normal operation</td>
<td>1 minute</td>
</tr>
<tr>
<td>1 flash (Red)</td>
<td>Ignition failure</td>
<td>3 minutes</td>
</tr>
<tr>
<td>1 flash (Red)</td>
<td>Reverse Polarity</td>
<td>30 Seconds</td>
</tr>
<tr>
<td>2 flashes (Red)</td>
<td>Ignition error</td>
<td>12 seconds</td>
</tr>
<tr>
<td>3 flashes (Red)</td>
<td>Gas valve error</td>
<td></td>
</tr>
<tr>
<td>4 flashes (Red)</td>
<td>Line voltage frq. error</td>
<td></td>
</tr>
<tr>
<td>5 flashes (Red)</td>
<td>Internal control error</td>
<td></td>
</tr>
<tr>
<td>6 flashes (Red)</td>
<td>Pressure switch error</td>
<td></td>
</tr>
</tbody>
</table>
**NOTICE**
Bypassing any switch is intended for testing purposes only. Do not leave switch bypassed during normal operation or the heater’s built-in safety mechanisms will be compromised.

---

**Key**

**Without HLRP Isolation Relays:**

- **Start**
- **Process**
- **Corrective**

**With HLRP Isolation Relays:**

- **Process**
- **Corrective**

---

**Without HLRP Isolation Relays:**

- **Is the power across the 24V wire on the circuit board and ground 24V?**
  - Yes → **Is the power across the t-stat wire on the circuit board and ground 24V?**
    - Yes → **Is the circuit board sending 120V to the fan?**
      - Yes → **Is the fan obstructed?**
        - Yes → Remove obstruction.
        - No → **Is the pressure switch stuck in the closed position?**
          - Yes → Replace switch.
          - No → **The relay board is faulty and must be replaced.**
    - No → **The internal transformer is faulty and must be replaced.**
- No → **Repair wiring between power in and transformer.**

**With HLRP Isolation Relays:**

- **Is the power across the t-stat wire on the circuit board and ground 24V?**
  - Yes → **Is the circuit board sending 120V to the fan?**
    - Yes → **Is the fan obstructed?**
      - Yes → Remove obstruction.
      - No → **The pressure switch stuck in the closed position?**
        - Yes → Replace pressure switch.
        - No → **The fan is faulty and must be replaced.**
  - No → **The circuit board is faulty and must be replaced.**

---

**Is the power across the 24V wire on the circuit board and ground 24V?**

**Is the power across the middle (low) terminal of 24V plug and ground (screw on the Burner Control Box) 24 Volts?**

**Is there 120V on the primary side of the internal transformer?**

**Is there 24V across the TH and ground terminals on the circuit board?**

**Is the pressure switch stuck in the closed position?**

**Is the pressure switch stuck in the closed position?**

**Check for loose wiring or restrictions in hose connections to pressure switch. Are they OK?**

**Replace the pressure switch after verifying:**
- Baffle(s) are in the radiant tube furthest from the burner.
- Heater, fan blowers, squirrel cage, intake and exhaust are clean and free from dirt and obstructions.
- The 4” air intake pipe does not exceed 20 ft. and/or 2 elbows.
- There is not a negative pressure experienced at the area of air intake (e.g.; high winds, attic space, tightly sealed building).

---

*Refer to LED diagnostic Fault Code Chart; p.13.*
4.0 Troubleshooting Guide

After igniter is warmed up, does gas valve open?

Yes

No

Replace circuit board.

Does The burner light?

Yes

No

Is the ball valve/shut-off valve in the ON position?

Yes

Check to make sure gas pressure is within minimum and maximum inputs, as indicated on the heater’s rating plate. Is gas pressure OK?

Yes

No

Correct problem.

Turn on.

Does the burner stay on for approximately 8 seconds and then shut off?

Yes

No

Check to make sure gas pressure is within minimum and maximum inputs, as indicated on the heater’s rating plate. Is gas pressure OK?

Yes

No

Correct problem.

Pressure switch may be faulty or there is a restriction in the exhaust.

The heater can shut down due to:
- Improper grounding.
- High winds.
- Taking combustion air from the attic.
- Dirty environment.
- Improperly positioned baffles.
- Fluctuating gas pressure.

Does the heater stay ON until a call for heat ends?

Yes

Troubleshooting ends.

No

Correct problem.

Continued from page 14
Check to make sure gas pressure is within minimum and maximum inputs, as indicated on the heater’s rating plate. Is gas pressure OK?

- **Yes** → Replace gas valve.
- **No** → Correct problem.

Were the gas lines purged of air?

- **Yes** → Replace gas valve.
- **No** → Purge gas line.

Is the heater properly grounded? Is the heater’s polarity correct?

- **Yes** → Check to make sure flame sensor wire is OK and then replace circuit.
- **No** → Correct problem.

With microampmeter, check DC amperage at flame rod. Is it greater than 1.0 microamps?

- **Yes** → Check to make sure flame sensor wire is OK and then replace circuit.
- **No** → Sensing rod is faulty or flame is weak. Check to make sure heater is operating at proper gas pressure as indicated on the heater’s rating plate and then, if needed, replace sensing rod.

If heater does not go into high fire mode:

**NOTE:** To confirm that the heater is not in high fire mode, check manifold pressure. If manifold pressure is 3.3” to 3.5” for natural gas or 9” to 10” for propane, the light is faulty and should be replaced.

When the heater is in low fire mode, manifold pressure is approximately 2.0” to 2.5” for natural gas or 5.0” to 6.5” for propane. If this is the case, the following troubleshooting steps should be followed:

- **Yes** → Measure voltage across the red wire on the VALVE and GROUND (red wire on RELAY to GROUND on heaters with isolation relays). Is it 24V?
- **No** → Repair or replace faulty wiring or thermostat.
- **Yes** → Replace gas valve.
- **No** → Replace relay.
## 5.0 Parts

**Figure 5.1 • Burner Assembly Components**

---

**Chart 5.1 • Parts List**

<table>
<thead>
<tr>
<th>Part #</th>
<th>Description</th>
<th>Part #</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TP-5</td>
<td>Flange Gasket</td>
<td>TP-70</td>
<td>1/2 in. Control Box Gasket (10.3 inches)</td>
</tr>
<tr>
<td>TP-9</td>
<td>Conduit Coupling</td>
<td>TP-70A</td>
<td>1 in. Control Box Gasket (6 inches)</td>
</tr>
<tr>
<td>TP-10A</td>
<td>Conduit 4” x 3/4”</td>
<td>TP-76</td>
<td>Rubber Grommet</td>
</tr>
<tr>
<td>TP-14</td>
<td>Sight Glass Gasket</td>
<td>TP-82</td>
<td>Reflector Center Support (RCS)</td>
</tr>
<tr>
<td>TP-15</td>
<td>Sight Glass</td>
<td>TP-83</td>
<td>24 in. Stainless Steel Flexible Gas Connector</td>
</tr>
<tr>
<td>TP-16</td>
<td>Sight Glass Washer</td>
<td>TP-84</td>
<td>1/2 in. Female / Male Flare Fitting</td>
</tr>
<tr>
<td>TP-17</td>
<td>Sight Glass Kit</td>
<td>TP-85</td>
<td>1/2 in. Male / Male Flare Fitting</td>
</tr>
<tr>
<td>TP-19B</td>
<td>4 in. Wire Hanger with Tension Spring</td>
<td>TP-105</td>
<td>Aluminum Reflector End Cap</td>
</tr>
<tr>
<td>TP-20C</td>
<td>120 in. Aluminum Reflector</td>
<td>TP-106</td>
<td>Reflector End Cap Clips (8 pcs.)</td>
</tr>
<tr>
<td>TP-20D*</td>
<td>120 in. Stainless Steel Reflector</td>
<td>TP-113</td>
<td>Reflector Tension Spring</td>
</tr>
<tr>
<td>TP-21B</td>
<td>4 in. Standard Tube Clamp</td>
<td>TP-201B</td>
<td>V.3 Mid-High Burner (Color Code - TAN)</td>
</tr>
<tr>
<td>TP-25</td>
<td>1/4 in. Female Spade Terminal (Qty. 3)</td>
<td>TP-204</td>
<td>Gas Orifice (consult factory)</td>
</tr>
<tr>
<td>TP-26A</td>
<td>10 ft. Aluminized Radiant / Combustion Tube</td>
<td>TP-205</td>
<td>Glo-Bar™ Holder</td>
</tr>
<tr>
<td>TP-26B</td>
<td>10 ft. Titanium Coated Combustion Tube</td>
<td>TP-206</td>
<td>Glo-Bar™ Holder Spring Clip</td>
</tr>
<tr>
<td>TP-26D*</td>
<td>10 ft. 304 Stainless Steel Radiant Tube</td>
<td>TP-212</td>
<td>1/2” x 3” Pipe Nipple</td>
</tr>
<tr>
<td>TP-26E*</td>
<td>10 ft. 409 Stainless Steel Combustion Tube</td>
<td>TP-217</td>
<td>Brass Pressure Switch Barb Fitting</td>
</tr>
<tr>
<td>TP-31D</td>
<td>Interlocking Mounting Bracket (Qty. 2)</td>
<td>TP-219</td>
<td>Differential Vinyl Sensing Tube (burner)</td>
</tr>
<tr>
<td>TP-50A</td>
<td>Glo-Bar™ Igniter (Qty. 2)</td>
<td>TP-220</td>
<td>Stainless Steel Tube Clamp (150 &amp; 200 MBH)</td>
</tr>
<tr>
<td>TP-55A</td>
<td>1/20 hp Inducer Assembly (50-150 MBH)</td>
<td>TP-221</td>
<td>Glo-Bar™ Holder Gasket</td>
</tr>
<tr>
<td>TP-65I</td>
<td>36 in. Interlocking Turbulator Baffle</td>
<td>TP-222</td>
<td>Flame Rod</td>
</tr>
<tr>
<td>TP-68B</td>
<td>Large Strain Relief Bushing</td>
<td>TP-222A</td>
<td>Flame Rod Wire</td>
</tr>
</tbody>
</table>

* Optional upgrade or add-on item.
**Figure 5.2 • Tube and Reflector Components**

**Chart 5.2 • Parts List**

<table>
<thead>
<tr>
<th>Part #</th>
<th>Description</th>
<th>Part #</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TP-245</td>
<td>3/16&quot; X 1/8&quot; Plastic Gas Valve 90° Vent</td>
<td>TP-3008A</td>
<td>Gas Valve Mounting Bracket</td>
</tr>
<tr>
<td>TP-264D</td>
<td>Differential Pressure Switch, 65 to 75 MBH</td>
<td>TP-3010</td>
<td>Service Panel Hinge</td>
</tr>
<tr>
<td>TP-264F</td>
<td>Differential Pressure Switch, 150 to 200 MBH</td>
<td>TP-3011</td>
<td>V.3 Igniter Box</td>
</tr>
<tr>
<td>TP-321</td>
<td>Ignition Plate Gasket</td>
<td>TP-3012</td>
<td>V.3 Igniter Box Cover</td>
</tr>
<tr>
<td>TP-331</td>
<td>Green Self-Tap Ground Screw (Qty. 2)</td>
<td>TP-3014</td>
<td>Plastic Air Orifice with Screen</td>
</tr>
<tr>
<td>TP-332</td>
<td>Divider Grommet</td>
<td>TP-3033C</td>
<td>HL3 Power Entry Plate</td>
</tr>
<tr>
<td>TP-333</td>
<td>60 in. Black 120V Power Cord with Ground</td>
<td>TP-3044</td>
<td>Gas Manifold</td>
</tr>
<tr>
<td>TP-383</td>
<td>Glo-Bar™ Igniter Plate</td>
<td>TP-3060</td>
<td>V.3 Pressure Switch Mounting Bracket</td>
</tr>
<tr>
<td>TP-579</td>
<td>4 in. Wire Hanger w/o Tension Spring</td>
<td>TP-3072</td>
<td>Low BTU Burner (Color Code - GREEN)</td>
</tr>
<tr>
<td>TP-826</td>
<td>40VA Transformer</td>
<td>TP-3093</td>
<td>#8-23 Cage Nut (Qty. 4)</td>
</tr>
<tr>
<td>TP-828</td>
<td>24V Yellow Operational Indicator Light (Qty. 2)</td>
<td>TP-3094A</td>
<td>#8-32 x ½” Zinc Coated Steel Knurled Thumb Screw (Qty. 4)</td>
</tr>
<tr>
<td>TP-832</td>
<td>Thermostat Terminal Strip</td>
<td>TP-3096</td>
<td>Valve Compartment Bottom Panel</td>
</tr>
<tr>
<td>TP-851B</td>
<td>35-66 Diagnostic Circuit Board</td>
<td>TP-3097</td>
<td>Valve Compartment Top Panel</td>
</tr>
<tr>
<td>TP-1018</td>
<td>Differential Switch Vinyl Sensing Tube (exhaust)</td>
<td>TP-3098</td>
<td>Valve Compartment Side Panel</td>
</tr>
<tr>
<td>TP-1264A</td>
<td>Differential Pressure Switch, 100 to 125 MBH</td>
<td>TP-3099</td>
<td>Controls Mounting Panel</td>
</tr>
<tr>
<td>TP-1325</td>
<td>Optional HLRP Isolation Relay* (Qty. 2)</td>
<td>TP-3100</td>
<td></td>
</tr>
<tr>
<td>TP-1428</td>
<td>24V Green Operational Indicator Light</td>
<td>TP-3140</td>
<td>36G54-224 Gas Valve - Natural Gas Assembly</td>
</tr>
<tr>
<td>TP-3001</td>
<td>Divider Panel</td>
<td>TP-3141</td>
<td>36G54-226 Gas Valve - Prop. Gas Assembly</td>
</tr>
<tr>
<td>TP-3002A</td>
<td>Plastic End Panel, Control Compartment</td>
<td>TP-3215</td>
<td>1/15 hp Inducer Assembly (175-200 MBH)</td>
</tr>
<tr>
<td>TP-3003A</td>
<td>Plastic End Panel, Fan Compartment</td>
<td>TP-3216</td>
<td>Reducer Plate (175-200 MBH)</td>
</tr>
<tr>
<td>TP-3004</td>
<td>V.3 Control Box</td>
<td>TP-3252</td>
<td>4-Piece Wire Harness Set</td>
</tr>
<tr>
<td>TP-3005A</td>
<td>Plastic Valve Chamber Lid</td>
<td>TP-3380</td>
<td>V.3 16” HSI Burner Tube w/ Flange and Fittings</td>
</tr>
</tbody>
</table>

* Optional upgrade or add-on item.
### Kit Contents Check List

**Chart 5.3 • Kit Contents for HL3 Series - Reference the length column for your model.**

#### HL3 Series Kit Contents

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
<th>20 ft.</th>
<th>30 ft.</th>
<th>40 ft.</th>
<th>50 ft.</th>
<th>60 ft.</th>
<th>70 ft.</th>
</tr>
</thead>
<tbody>
<tr>
<td>TP-19B</td>
<td>4&quot; Hanger with Reflector Tension Spring</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>TP-21B</td>
<td>4&quot; Tube Clamp</td>
<td>2</td>
<td>3</td>
<td>4*</td>
<td>5*</td>
<td>6*</td>
<td>7*</td>
</tr>
<tr>
<td>TP-25</td>
<td>1/4&quot; Female Spade Terminal</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>TP-82</td>
<td>4&quot; Reflector Center Support (RCS)</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>TP-83</td>
<td>24&quot; Stainless Steel Flexible Gas Connector</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>TP-105</td>
<td>Reflector End Cap</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>TP-106</td>
<td>Reflector End Cap Clips</td>
<td>8</td>
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<td>8</td>
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<td>8</td>
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</tr>
<tr>
<td>LIOGT3</td>
<td>General Manual</td>
<td>1</td>
<td>1</td>
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<td>1</td>
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<tr>
<td>LIOHL3</td>
<td>HL3 Series Insert Manual</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

**Filled By:**

*NOTE: One 4" stainless steel tube clamp (P/N: TP-220) is provided for each 150,000 - 200,000 BTU/h model. Place as shown on page 11.

** Part number for models upgraded with stainless steel options.

### Approvals

- CSA
- Indoor Approval
- Outdoor Approval with OD-Kit
- Commercial Approval

### Limited Warranty

- 3 years - Burner box components
- 5 years - Combustion and radiant tubes
- 10 years - Stainless steel burner
- See page 40 of the General Tube Heater Manual for terms and conditions

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