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.

Keep these instructions for future reference.
Contents

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NOTE: See page 10 for a list of available models and specifications.
1.0 Safety

Read and understand all safety information and warnings in this insert manual and the Tube Heater General Manual before installation, operation and maintenance of the radiant tube heater system.

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.

![Diagram showing various safety labels and their locations](image-url)

- **Back Panel**: Air Metering Orifice, Back Panel, F/N: LLAC
- **Bottom Panel**: F/N: LLLOGO1 Logo Label
- **Clearance to Combustibles Labels**: F/N: LLTCL001L/C/R

---

**WARNING**

- Never replace a unit while it is hot. Always follow the manufacturer's instructions for replacing the unit.

**CAUTION**

- Always unplug and disconnect the unit before making any service or maintenance adjustments.

---

**F/N: LLV3EP1**
- (Orange crescent - with relay option)

**F/N: LLV3EP2**
- 24V LOW HEATER OUTPUT

**F/N: LLV3EP4**
- (White crescent - no relay)

**F/N: LLV3EP14**
- (Operational Indicator Lights)
## Clearance 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.

Clearance 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 • Clearance 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>
<th>Front</th>
<th>Behind</th>
<th>Top</th>
<th>Below</th>
</tr>
</thead>
<tbody>
<tr>
<td>HL3 (20, 30, 40) - (65, 75) [N, P]</td>
<td>0°</td>
<td>9</td>
<td>9</td>
<td>6</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td></td>
<td>45°</td>
<td>39</td>
<td>8</td>
<td>10</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td></td>
<td>with 1 side shield</td>
<td>0°</td>
<td>29</td>
<td>8</td>
<td>6</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>with 2 side shields</td>
<td>0°</td>
<td>9</td>
<td>9</td>
<td>6</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>20 ft. from burner</td>
<td>0°</td>
<td>7</td>
<td>7</td>
<td>6</td>
<td>30</td>
</tr>
<tr>
<td>HL3 (30, 40) - 100 [N, P]</td>
<td>0°</td>
<td>14</td>
<td>14</td>
<td>6</td>
<td>66</td>
<td></td>
</tr>
<tr>
<td></td>
<td>45°</td>
<td>39</td>
<td>8</td>
<td>10</td>
<td>66</td>
<td></td>
</tr>
<tr>
<td></td>
<td>with 1 side shield</td>
<td>0°</td>
<td>29</td>
<td>8</td>
<td>6</td>
<td>66</td>
</tr>
<tr>
<td></td>
<td>with 2 side shields</td>
<td>0°</td>
<td>16</td>
<td>16</td>
<td>6</td>
<td>66</td>
</tr>
<tr>
<td></td>
<td>20 ft. from burner</td>
<td>0°</td>
<td>7</td>
<td>7</td>
<td>6</td>
<td>30</td>
</tr>
<tr>
<td>HL3 (30, 40, 50) - 125 [N, P]</td>
<td>0°</td>
<td>20</td>
<td>20</td>
<td>6</td>
<td>76</td>
<td></td>
</tr>
<tr>
<td></td>
<td>45°</td>
<td>58</td>
<td>8</td>
<td>10</td>
<td>76</td>
<td></td>
</tr>
<tr>
<td></td>
<td>with 1 side shield</td>
<td>0°</td>
<td>42</td>
<td>8</td>
<td>6</td>
<td>76</td>
</tr>
<tr>
<td></td>
<td>with 2 side shields</td>
<td>0°</td>
<td>20</td>
<td>20</td>
<td>6</td>
<td>76</td>
</tr>
<tr>
<td></td>
<td>20 ft. from burner</td>
<td>0°</td>
<td>7</td>
<td>7</td>
<td>6</td>
<td>30</td>
</tr>
<tr>
<td>HL3 (40, 50, 60) - 150 [N, P]</td>
<td>0°</td>
<td>24</td>
<td>24</td>
<td>6</td>
<td>81</td>
<td></td>
</tr>
<tr>
<td></td>
<td>45°</td>
<td>58</td>
<td>8</td>
<td>10</td>
<td>81</td>
<td></td>
</tr>
<tr>
<td></td>
<td>with 1 side shield</td>
<td>0°</td>
<td>42</td>
<td>8</td>
<td>6</td>
<td>81</td>
</tr>
<tr>
<td></td>
<td>with 2 side shields</td>
<td>0°</td>
<td>23</td>
<td>23</td>
<td>6</td>
<td>81</td>
</tr>
<tr>
<td></td>
<td>20 ft. from burner</td>
<td>0°</td>
<td>11</td>
<td>11</td>
<td>6</td>
<td>44</td>
</tr>
<tr>
<td>HL3 (40, 50, 60, 70) - 175 [N, P]</td>
<td>0°</td>
<td>34</td>
<td>34</td>
<td>6</td>
<td>92</td>
<td></td>
</tr>
<tr>
<td></td>
<td>45°</td>
<td>63</td>
<td>8</td>
<td>10</td>
<td>92</td>
<td></td>
</tr>
<tr>
<td></td>
<td>with 1 side shield</td>
<td>0°</td>
<td>50</td>
<td>8</td>
<td>6</td>
<td>92</td>
</tr>
<tr>
<td></td>
<td>with 2 side shields</td>
<td>0°</td>
<td>30</td>
<td>30</td>
<td>6</td>
<td>92</td>
</tr>
<tr>
<td></td>
<td>20 ft. from burner</td>
<td>0°</td>
<td>11</td>
<td>11</td>
<td>6</td>
<td>44</td>
</tr>
<tr>
<td>HL3 (50, 60, 70) - 200 [N, P]</td>
<td>0°</td>
<td>41</td>
<td>41</td>
<td>6</td>
<td>94</td>
<td></td>
</tr>
<tr>
<td></td>
<td>45°</td>
<td>63</td>
<td>8</td>
<td>10</td>
<td>94</td>
<td></td>
</tr>
<tr>
<td></td>
<td>with 1 side shield</td>
<td>0°</td>
<td>54</td>
<td>8</td>
<td>6</td>
<td>94</td>
</tr>
<tr>
<td></td>
<td>with 2 side shields</td>
<td>0°</td>
<td>30</td>
<td>30</td>
<td>6</td>
<td>94</td>
</tr>
<tr>
<td></td>
<td>20 ft. from burner</td>
<td>0°</td>
<td>11</td>
<td>11</td>
<td>6</td>
<td>44</td>
</tr>
</tbody>
</table>

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

The stated clearance to combustibles represents a surface temperature of 90ºF (32ºC) 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**
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

- 120 Volt - 60 Hz GRD, 3-wire.
- 24V 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 24V 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 2.1.
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 of single heater, no relay connection]

- 1/4” spade terminals required (as supplied)
- Thermostat
- 24VAC
- Low
- High
- To 120VAC grounded outlet.

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

---

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

![Diagram of multiple heaters with relay connection]

- External Transformer (field supplied)
- Additional wire needed for thermostats that require constant power.
- 24VAC
- 1/4” spade terminals required (as supplied)
- Thermostat
- To 120VAC grounded outlet.

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

---

120VAC Power (observe polarity)
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 Diagrams

A. 35-66 Ladder Diagram

B. 35-66 Block Diagram
Figure 2.3 • Alternative Wiring Diagrams

A. 35-66 Ladder Diagram - With HLRP Relay

B. 35-66 Block Diagram - With HLRP Relay

* If thermostat connection is via a yellow control cord, use parenthesized color code.
## Specifications

**Chart 2.1 • Specifications**

| Model Number | Gas Type | BTU/h (High Fire) | BTU/h (Low Fire) | Straight Length | U-Tube Length | Standard Weight (lbs.) | Stainless Steel Weight (lbs.) | Recommended Mounting Height | Combustion Chamber (Black Coated) | Radiant Emitter Tube(s) (Black Coated) | Radiant Surface Area (sq. ft.) | 36" Baffle Quantity |
|--------------|----------|-------------------|------------------|-----------------|---------------|-----------------------|-------------------------------|------------------|----------------------------------|--------------------------------|----------------------------------|-----------------------------|-------------------|
| HL3-20-65    | N or LP  | 65,000            | 50,000           | 21'-9"          | 13'-1"        | 120                   | N/A                          | 9' to 14'                  | Alum                             | Alum                             |                                  | 20.2                        | 5                 |
| HL3-20-75    | N or LP  | 75,000            | 50,000           | 21'-9"          | 13'-1"        | 120                   | 145                          | 10' to 15'                  | Alum                             | Alum                             |                                  | 20.2                        | 5                 |
| HL3-30-65    | N or LP  | 65,000            | 50,000           | 31'-5"          | **17'-9"      | 160                   | N/A                          | 10' to 15'                  | Alum                             | Alum                             | 30.4                          | 4                 |
| HL3-30-75    | N or LP  | 75,000            | 50,000           | 31'-5"          | **17'-9"      | 160                   | 195                          | 11' to 18'                  | Alum                             | Alum                             | 30.4                          | 5                 |
| HL3-30-100   | N or LP  | 100,000           | 65,000           | 31'-5"          | **17'-9"      | 160                   | 195                          | 12' to 20'                  | Alum                             | Alum                             | 30.4                          | 5                 |
| HL3-30-125   | N or LP  | 125,000           | 95,000           | 31'-5"          | **17'-9"      | 160                   | 195                          | 13' to 23'                  | Alum                             | Alum                             | 30.4                          | 6                 |
| HL3-40-65    | N or LP  | 65,000            | 50,000           | 41'-1"          | 22'-9"        | 190                   | N/A                          | 11' to 18'                  | Alum                             | Alum                             | 40.5                          | 3                 |
| HL3-40-75    | N or LP  | 75,000            | 50,000           | 41'-1"          | 22'-9"        | 190                   | 235                          | 11' to 18'                  | Alum                             | Alum                             | 40.5                          | 4                 |
| HL3-40-100   | N or LP  | 100,000           | 65,000           | 41'-1"          | 22'-9"        | 190                   | 235                          | 12' to 20'                  | Alum                             | Alum                             | 40.5                          | 4                 |
| HL3-40-125   | N or LP  | 125,000           | 95,000           | 41'-1"          | 22'-9"        | 190                   | 235                          | 13' to 23'                  | Alum                             | Alum                             | 40.5                          | 5                 |
| HL3-40-150   | N or LP  | 150,000           | 100,000          | 41'-1"          | 22'-9"        | 190                   | 235                          | 14' to 25'                  | Alum                             | Alum                             | 40.5                          | 5                 |
| HL3-40-175   | N or LP  | *175,000          | 125,000          | 41'-1"          | 22'-9"        | 190                   | 235                          | 15' to 27'                  | Titan                            | Titan                            | 40.5                          | 5                 |
| HL3-50-125   | N or LP  | 125,000           | 95,000           | 50'-9"          | **27'-5"      | 235                   | 290                          | 15' to 27'                  | Alum                             | Alum                             | 50.6                          | 3                 |
| HL3-50-150   | N or LP  | 150,000           | 100,000          | 50'-9"          | **27'-5"      | 235                   | 290                          | 15' to 27'                  | Titan                            | Titan                            | 50.6                          | 3                 |
| HL3-50-175   | N or LP  | *175,000          | 125,000          | 50'-9"          | **27'-5"      | 235                   | N/A                          | 16' to 30'                  | Titan                            | Titan                            | 50.6                          | 3                 |
| HL3-50-200   | N or LP  | *200,000          | 145,000          | 50'-9"          | **27'-5"      | 235                   | N/A                          | 17' to 35'                  | Titan                            | Titan                            | 50.6                          | 2                 |
| HL3-60-150   | N or LP  | 150,000           | 100,000          | 60'-5"          | 32'-5"        | 265                   | 330                          | 16' to 30'                  | Titan                            | Titan                            | 60.7                          | 2                 |
| HL3-60-175   | N or LP  | *175,000          | 125,000          | 60'-5"          | 32'-5"        | 265                   | N/A                          | 16' to 30'                  | Titan                            | Titan                            | 60.7                          | 2                 |
| HL3-60-200   | N or LP  | *200,000          | 145,000          | 60'-5"          | 32'-5"        | 265                   | N/A                          | 17' to 35'                  | Titan                            | Titan                            | 60.7                          | 2                 |
| HL3-70-175   | N or LP  | *175,000          | 125,000          | 70'-1"          | **37'-3"      | 300                   | N/A                          | 19' to 42'                  | Titan                            | Titan                            | 70.9                          | 2                 |
| HL3-70-200   | N or LP  | *200,000          | 145,000          | 70'-1"          | **37'-3"      | 300                   | N/A                          | 19' to 42'                  | Titan                            | Titan                            | 70.9                          | 2                 |

* 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).

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

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

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

- **20 Foot**
- **30 Foot**
- **40 Foot**
  - Stainless steel clamp location on 175 - 200 MBH models (P/N: TP-220).
- **50 Foot**
  - Stainless steel clamp location on 175-200 MBH models (P/N: TP-220).
- **60 Foot**
  - Stainless steel clamp location on 175-200 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)**
  - 175-200 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; p. 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 below for a description of LED codes.

**Figure 3.1 • Operational Indicator Lights**

![Operational Indicator Lights](image)

**Light 1 (amber)** Indicates Low Fire Mode

**Light 2 (amber)** Indicates High Fire Mode

**Light 3 (green)** Indicates Pressure Switch Closes

**Operational Indicator Lights**

**Chart 3.1 • LED Fault Code Status** (located internally on 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</td>
<td>No delay</td>
</tr>
<tr>
<td></td>
<td>Leaky valve</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Flame amplifier fault</td>
<td></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.*
4.0 Troubleshooting Guide

Turn up thermostat.

Does the fan blower turn on?

- No: Is the power at the heater 120V?
  - Yes: Does the heater have HLRP isolation relays? (identified with orange crescent around the terminal plug).
  - No: Find the source of the electrical problem between panel and heater.

- Yes: Find the source of the electrical problem between panel and external transformer.

Find the source of the electrical problem between panel and external transformer.

Investigate.

- No: Is there 24V on the primary side of the external transformer?
  - Yes: Is there 24V to the thermostat?
    - Yes: The thermostat or wiring is faulty and should be replaced or repaired.
    - No: Find source of electrical problem between the external transformer and thermostat.

- Yes: External transformer is faulty and must be replaced.

External transformer is faulty and must be replaced.

Investigate.

- No: Is there 24V on the secondary side of the external transformer?
  - Yes: Is there 24V to the thermostat?
    - Yes: The thermostat or wiring is faulty and should be replaced or repaired.
    - No: Find source of electrical problem between the external transformer and thermostat.

- No: Is there 24V on the secondary side of the external transformer?

Is the igniter warm up and glow red?

- No: Repair the wiring between the transformer and the 24V terminal plug.
  - Yes: Replace transformer.

Repair the wiring between the transformer and the 24V terminal plug.

Investigate.

- No: Is the green light burnt out?
  - Yes: If so, replace.

- No: Is the inlet or the outlet of the unit plugged or obstructed?
  - Yes: Repair the wiring between power in and transformer.

- No: Is the power across the left terminal of the 24V plug and ground 24 Volts?
  - Yes: Replace transformer.

Replace transformer.

Investigate.

- No: Is the igniter physically damaged?
  - Yes: Replace igniter.

- No: Check voltage at igniter sequence (usually 5 to 15 seconds after power to heater). Is it 120V?
  - Yes: Replace igniter.

- No: Is the inlet or the outlet of the unit plugged or obstructed?
  - Yes: Remove obstruction.

- No: Is the resistance through the igniter 50-400Ω?

Continued on page 16
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:

<table>
<thead>
<tr>
<th>Start</th>
<th>Process</th>
<th>Corrective</th>
</tr>
</thead>
<tbody>
<tr>
<td>Question</td>
<td>Question</td>
<td>Action</td>
</tr>
</tbody>
</table>

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

- Yes
- No

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

- Yes
- No

Repair wiring between power in and transformer.

Yes

Is the power across the t-stat wire on the circuit board and ground 24V?

- Yes
- No

The relay board is faulty and must be replaced.

No

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

- Yes
- No

Correct wiring.

No

Is the circuit board sending 120V to the fan?

- Yes
- No

The circuit board is faulty and must be replaced.

Yes

Is the pressure switch stuck in the closed position?

- Yes
- No

Replace pressure switch

No

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).

- After 0-30 seconds of non-operation has passed, is there a flash code for APS failure (2 flashes)?

Yes

- Replace wiring or hose connections.
- Replace circuit board.

No

Replace wiring or hose connections.

* Refer to LED diagnostic Fault Code Chart; p.13.
After igniter is warmed up, does gas valve open?

- **No**
  - Test for 24V at valve opening period (usually 45 to 60 seconds after power to heater). Is there 24V to valve for 8 seconds?
  
- **Yes**
  - Replace circuit board.

Does The burner light?

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

Does the burner stay on?

- **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**
  - Does the burner stay on for approx. 8 seconds and then shut off?

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

- **No**
  - **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.

- **Yes**
  - Correct problem.

Troubleshooting ends.
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 → Purge gas line.
- 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.

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

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

Is there 24V across the GROUND and HIGH (HIGH to COM on heaters with optional isolation relays) on the terminal strip located on the outside of the control box?

- 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.

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?

- 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 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-212</td>
<td>1/2” x 3” Pipe Nipple</td>
</tr>
<tr>
<td>TP-26D*</td>
<td>10 ft. 304 Stainless Steel Radiant Tube</td>
<td>TP-217</td>
<td>Brass Pressure Switch Barb Fitting</td>
</tr>
<tr>
<td>TP-26E*</td>
<td>10 ft. 409 Stainless Steel Combustion Tube</td>
<td>TP-219</td>
<td>Differential Vinyl Sensing Tube (burner)</td>
</tr>
<tr>
<td>TP-31D</td>
<td>Interlocking Mounting Bracket (Qty. 2)</td>
<td>TP-220</td>
<td>Stainless Steel Tube Clamp (175 &amp; 200 MBH)</td>
</tr>
<tr>
<td>TP-50</td>
<td>Glo-Bar™ Igniter</td>
<td>TP-221</td>
<td>Glo-Bar™ Holder Gasket</td>
</tr>
<tr>
<td>TP-55A</td>
<td>Fan Blower</td>
<td>TP-222</td>
<td>Flame Rod</td>
</tr>
<tr>
<td>TP-65I</td>
<td>36 in. Interlocking Turbulator Baffle</td>
<td>TP-222A</td>
<td>Flame Rod Wire</td>
</tr>
<tr>
<td>TP-68B</td>
<td>Large Strain Relief Bushing</td>
<td>TP-245</td>
<td>3/16” X 1/8” Plastic Gas Valve 90° Vent</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Part #</th>
<th>Description</th>
<th>Part #</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TP-264D</td>
<td>Differential Pressure Switch, 65 to 75 MBH</td>
<td>TP-3008</td>
<td>Gas Valve Mounting Bracket</td>
</tr>
<tr>
<td>TP-264F</td>
<td>Differential Pressure Switch, 150 to 200 MBH</td>
<td>TP-3010</td>
<td>Service Panel Hinge</td>
</tr>
<tr>
<td>TP-321</td>
<td>Ignition Plate Gasket</td>
<td>TP-3011</td>
<td>V.3 Igniter Box</td>
</tr>
<tr>
<td>TP-331</td>
<td>Green Self-Tap Ground Screw (Qty. 2)</td>
<td>TP-3012</td>
<td>V.3 Igniter Box Cover</td>
</tr>
<tr>
<td>TP-332</td>
<td>Divider Grommet</td>
<td>TP-3014</td>
<td>Plastic Air Orifice with Screen</td>
</tr>
<tr>
<td>TP-333</td>
<td>72 in. Black 120V Power Cord</td>
<td>TP-3033C</td>
<td>HL3 Power Entry Plate</td>
</tr>
<tr>
<td>TP-383</td>
<td>Glo-Bar™ Igniter Plate</td>
<td>TP-3044</td>
<td>Gas Manifold</td>
</tr>
<tr>
<td>TP-579</td>
<td>4 in. Wire Hanger w/o Tension Spring</td>
<td>TP-3060</td>
<td>V.3 Pressure Switch Mounting Bracket</td>
</tr>
<tr>
<td>TP-826</td>
<td>40VA Transformer</td>
<td>TP-3071</td>
<td>High BTU Burner (Color Code - PURPLE)</td>
</tr>
<tr>
<td>TP-828</td>
<td>24V Yellow Operational Indicator Light (Qty. 2)</td>
<td>TP-3072</td>
<td>Low BTU Burner (Color Code - GREEN)</td>
</tr>
<tr>
<td>TP-832</td>
<td>Thermostat Terminal Strip</td>
<td>TP-3093</td>
<td>#8-23 Cage Nut (Qty. 4)</td>
</tr>
<tr>
<td>TP-851B</td>
<td>35-66 Diagnostic Circuit Board</td>
<td>TP-3094A</td>
<td>#8-32 x ½” Zinc Coated Steel Knurled Thumb Screw (Qty. 4)</td>
</tr>
<tr>
<td>TP-1018</td>
<td>Differential Switch Vinyl Sensing Tube (exhaust)</td>
<td>TP-3096</td>
<td>Valve Compartment Bottom Panel</td>
</tr>
<tr>
<td>TP-1264A</td>
<td>Differential Pressure Switch, 100 to 125 MBH</td>
<td>TP-3097</td>
<td>Valve Compartment Top Panel</td>
</tr>
<tr>
<td>TP-1325</td>
<td>Optional HLRP Isolation Relay* (Qty. 2)</td>
<td>TP-3098</td>
<td>Valve Compartment Side Panel</td>
</tr>
<tr>
<td>TP-1428</td>
<td>24V Green Operational Indicator Light</td>
<td>TP-3099</td>
<td>Controls Mounting Panel</td>
</tr>
<tr>
<td>TP-3001</td>
<td>Divider Panel</td>
<td>TP-3100</td>
<td>36G54-224 Gas Valve - Natural Gas Assembly</td>
</tr>
<tr>
<td>TP-3002A</td>
<td>Plastic End Panel, Control Compartment</td>
<td>TP-3101</td>
<td>36G54-226 Gas Valve - LP Gas Assembly</td>
</tr>
<tr>
<td>TP-3003A</td>
<td>Plastic End Panel, Fan Compartment</td>
<td>TP-3141</td>
<td>4-Piece Wire Harness Set</td>
</tr>
<tr>
<td>TP-3004</td>
<td>V.3 Control Box</td>
<td>TP-3252</td>
<td>V.3 16” HSI Burner Tube w/ Flange and Fittings</td>
</tr>
<tr>
<td>TP-3005A</td>
<td>Plastic Valve Chamber Lid</td>
<td>TP-3380</td>
<td></td>
</tr>
</tbody>
</table>

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

**Kit Contents** - Reference the length column for your model.

<table>
<thead>
<tr>
<th>HL3 Series Kit Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TP-19B</strong> 4&quot; Hanger with Reflector Tension Spring</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>TP-220</strong> 4&quot; Tube Clamp</td>
</tr>
</tbody>
</table>

<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>
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</thead>
<tbody>
<tr>
<td>TP-19B</td>
<td>4&quot; Hanger w/ 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</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; S.S. Flexible Gas Connector</td>
<td>1</td>
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<tr>
<td>TP-105</td>
<td>Reflector End Cap</td>
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<td>2</td>
<td>2</td>
<td>2</td>
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<tr>
<td>TP-106</td>
<td>Reflector End Cap Clips</td>
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<td>LIOGT3</td>
<td>V3 General Tube Heater Manual</td>
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<td>LIOHL3</td>
<td>HL3 Series Insert Manual</td>
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<td>1</td>
<td>1</td>
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</tr>
</tbody>
</table>

Filled By:

* **NOTE:** One 4" stainless steel tube clamp (P/N: TP-220) is provided for each 175,000 - 200,000 BTU 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
- 1 year - Burner box components.
- 5 years - Combustion and radiant tubes.
- 10 years - Stainless steel burner.