

HL3 Series Insert Manual



For complete installation instructions, see the Tube Heater General Manual that accompanies this Series Insert Manual.

RE-VERBER-RAY

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

1.0 Safety	3
Safety Labels and Locations	3
Clearances to Combustibles	4
2.0 Installation	6
Electrical Requirements	6
Wiring	7
Specifications	10
Tube Installation Sequence	11
3.0 Operation	12
Sequence of Operation	12
Thermostat	12
Diagnostics	13
4.0 Troubleshooting Guide	14
5.0 Parts	18
Components	18
Parts List	18
Kit Contents Check List	20
Approvals	20
Limited Warranty	20

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

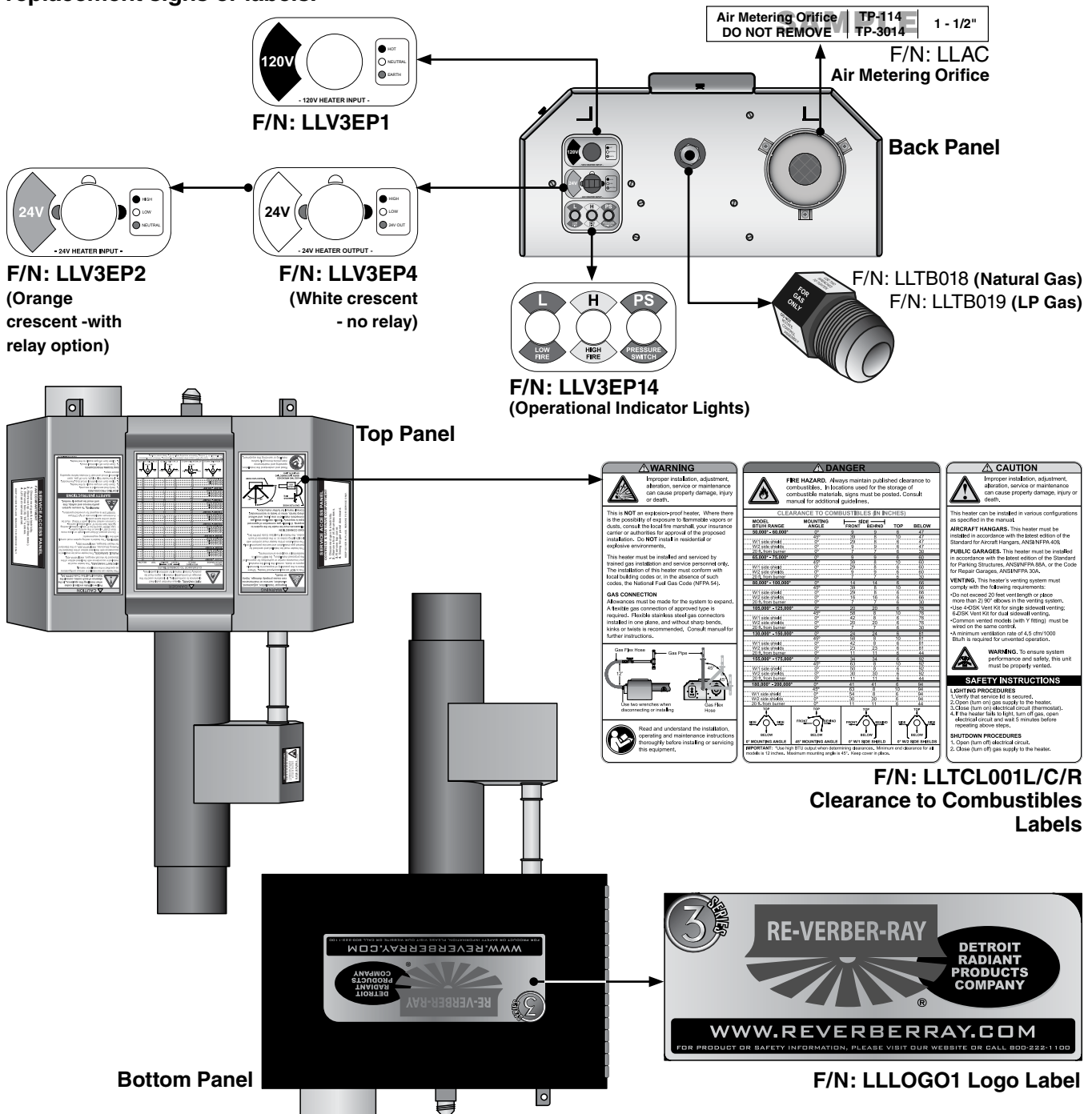
1.0 Safety

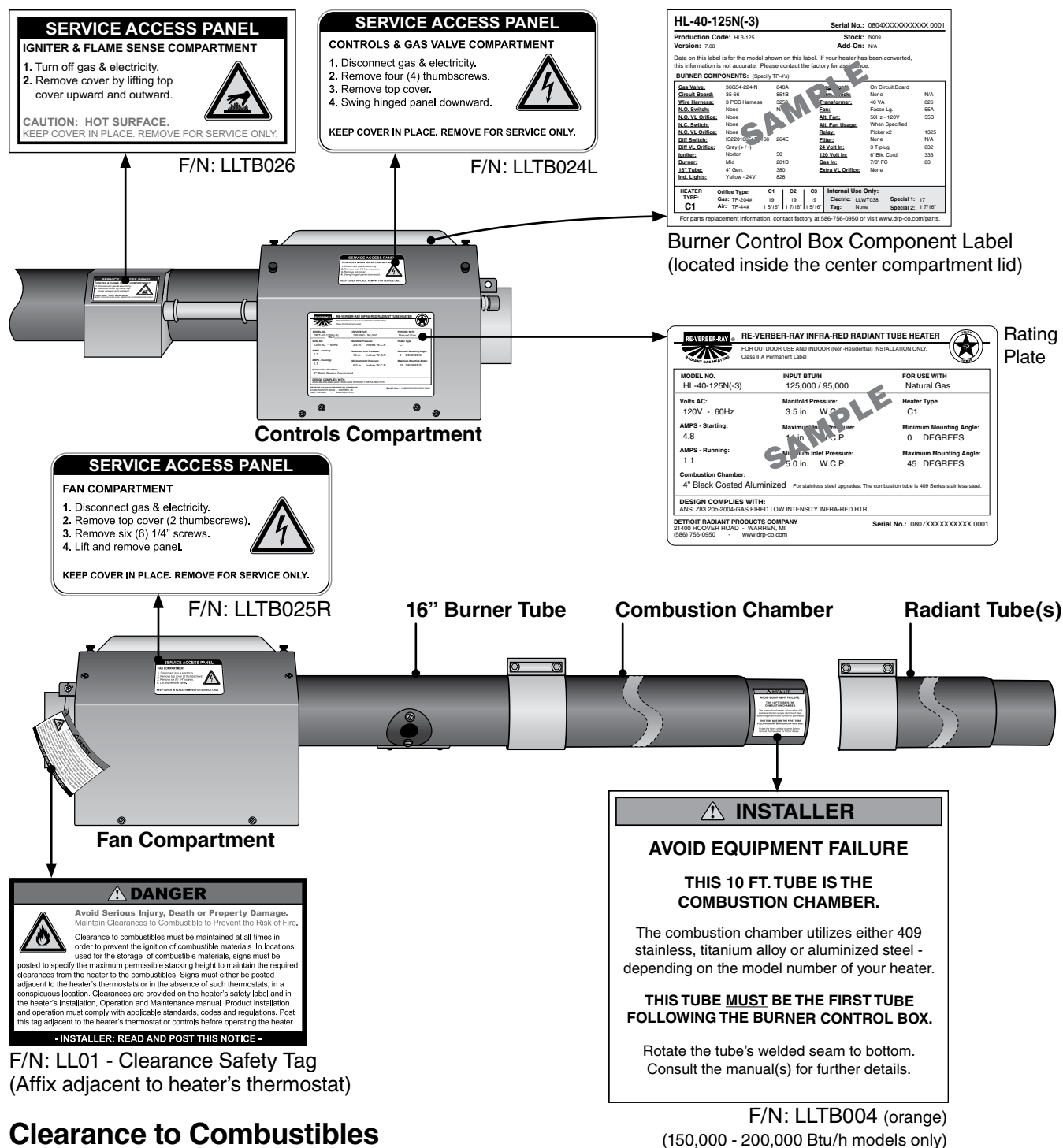


Read and understand all safety information and warnings in this insert manual and the Tube Heater General Manual before installation, operation and maintenance of the radiant tube heater system.

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.





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.

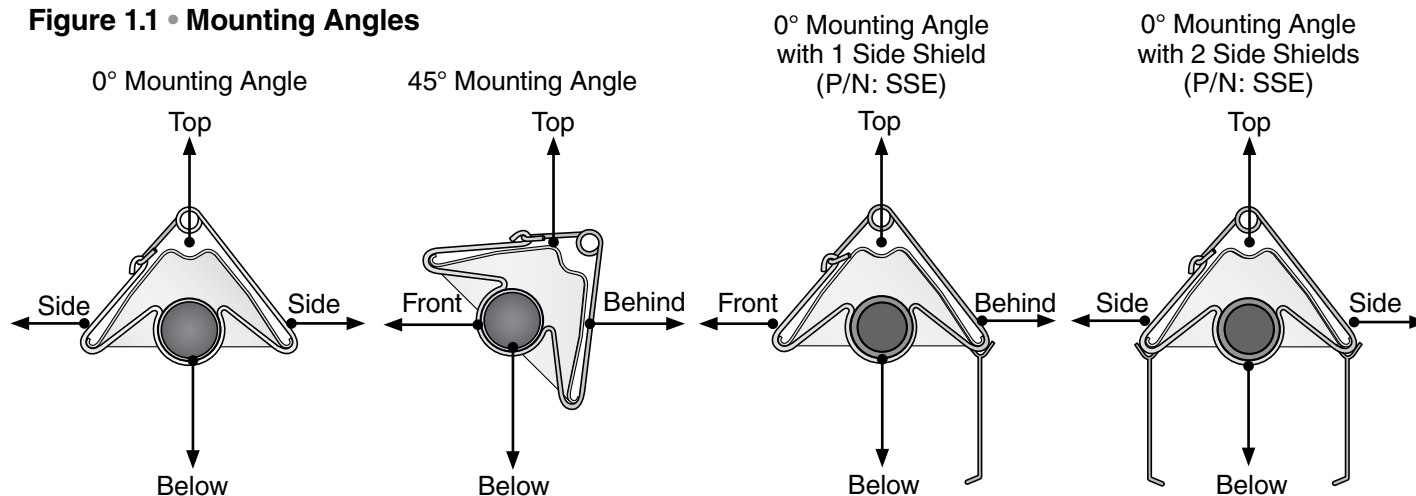
When installing the tube heater system, clearances to combustibles for the model tube heater and configuration must be maintained. Refer to Chart 1.1 below to determine the required distances for your model.

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

Model Number	Mounting Angle*	Sides		Top	Below
		Front	Behind		
HL3 (20, 30, 40) - (65, 75) [N, P] with 1 side shield with 2 side shields 20 ft. from burner	0°	9	9	6	60
	45°	39	8	10	60
	0°	29	8	6	60
	0°	9	9	6	60
	0°	7	7	6	30
HL3 (30, 40) - 100 [N, P] with 1 side shield with 2 side shields 20 ft. from burner	0°	14	14	6	66
	45°	39	8	10	66
	0°	29	8	6	66
	0°	16	16	6	66
	0°	7	7	6	30
HL3 (30, 40, 50) - 125 [N, P] with 1 side shield with 2 side shields 20 ft. from burner	0°	20	20	6	76
	45°	58	8	10	76
	0°	42	8	6	76
	0°	20	20	6	76
	0°	7	7	6	30
HL3 (40, 50, 60) - 150 [N, P] with 1 side shield with 2 side shields 20 ft. from burner	0°	24	24	6	81
	45°	58	8	10	81
	0°	42	8	6	81
	0°	23	23	6	81
	0°	11	11	6	44
HL3 (40, 50, 60, 70) - 175 [N, P] with 1 side shield with 2 side shields 20 ft. from burner	0°	34	34	6	92
	45°	63	8	10	92
	0°	50	8	6	92
	0°	30	30	6	92
	0°	11	11	6	44
HL3 (50, 60, 70) - 200 [N, P] with 1 side shield with 2 side shields 20 ft. from burner	0°	41	41	6	94
	45°	63	8	10	94
	0°	54	8	6	94
	0°	30	30	6	94
	0°	11	11	6	44

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

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

Type of Gas	Required Manifold Pressure	Minimum Inlet Pressure	Maximum Inlet Pressure
Natural	3.5 Inches. W.C.	5.0 Inches. W.C.	14.0 Inches. W.C.
Liquefied Petroleum	10.0 Inches. W.C.	11.0 Inches. W.C.	14.0 Inches. W.C.



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

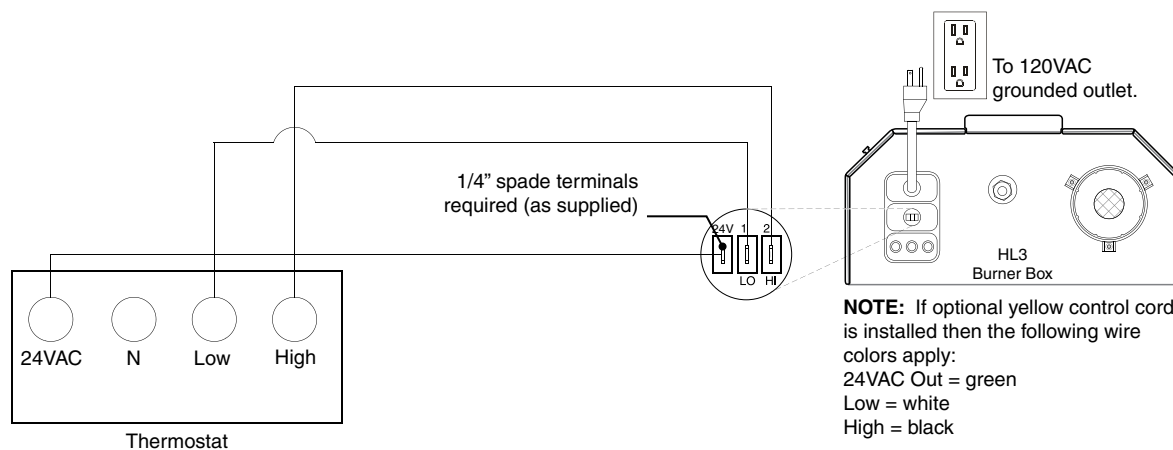


Electric Shock

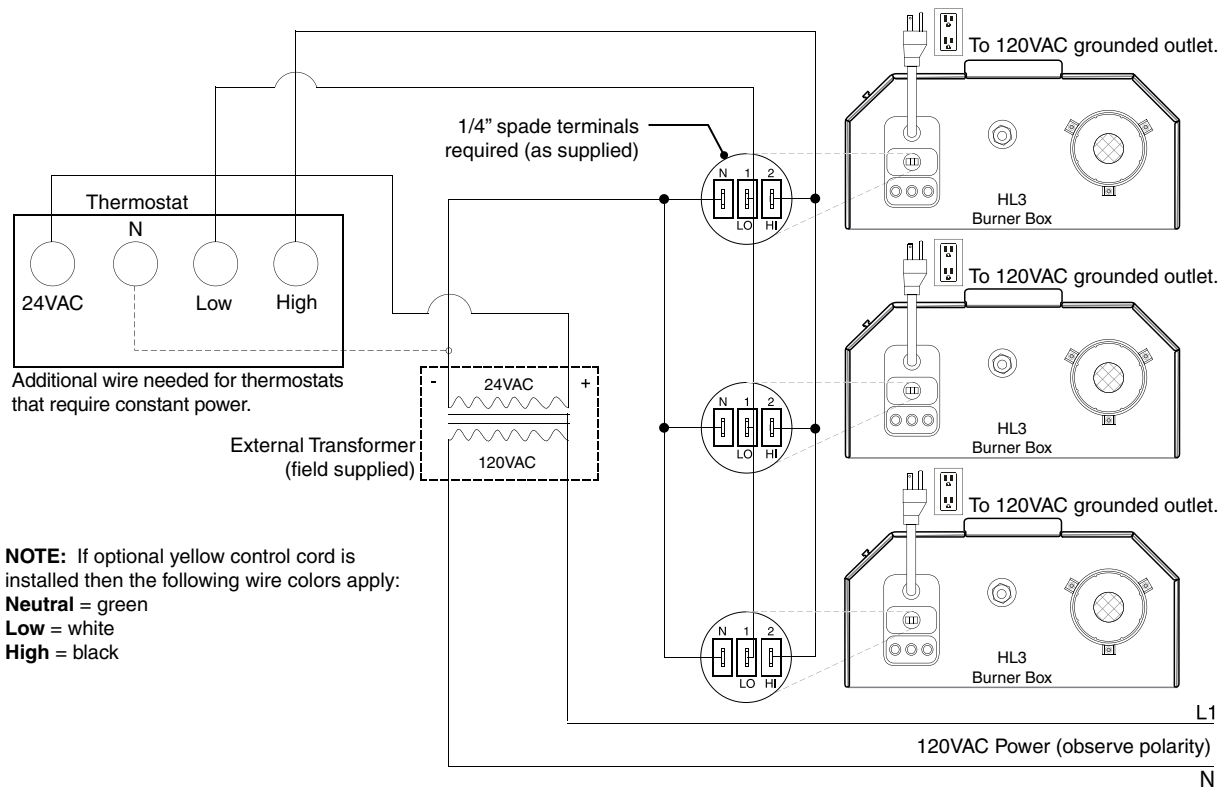
Field wiring to the tube heater must be connected and grounded in accordance with national, state, provincial, local codes and to the guidelines in the Tube Heater General Manual and Series Insert Manual. In the United States refer to the most current revisions to the ANSI/NFPA 70 Standard and in Canada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



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

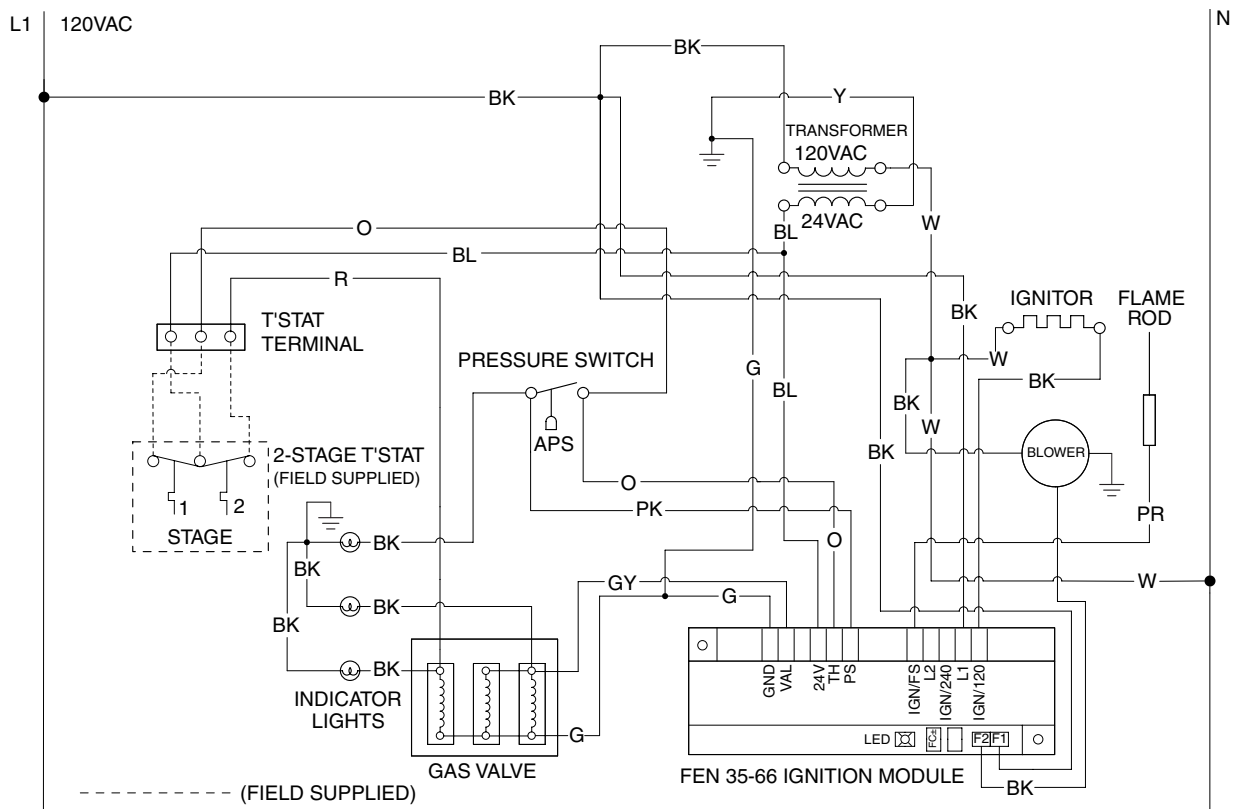


Before field wiring this appliance - Check existing wiring; replace if necessary.

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

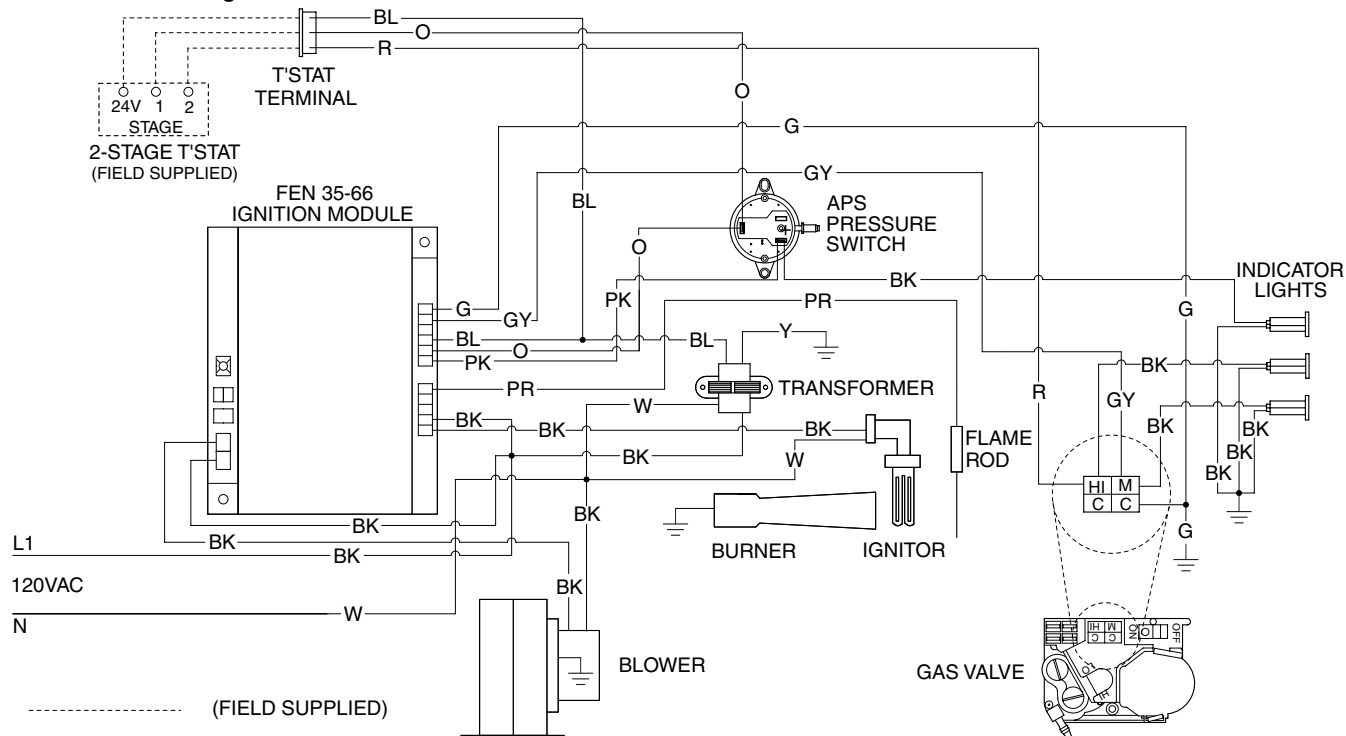
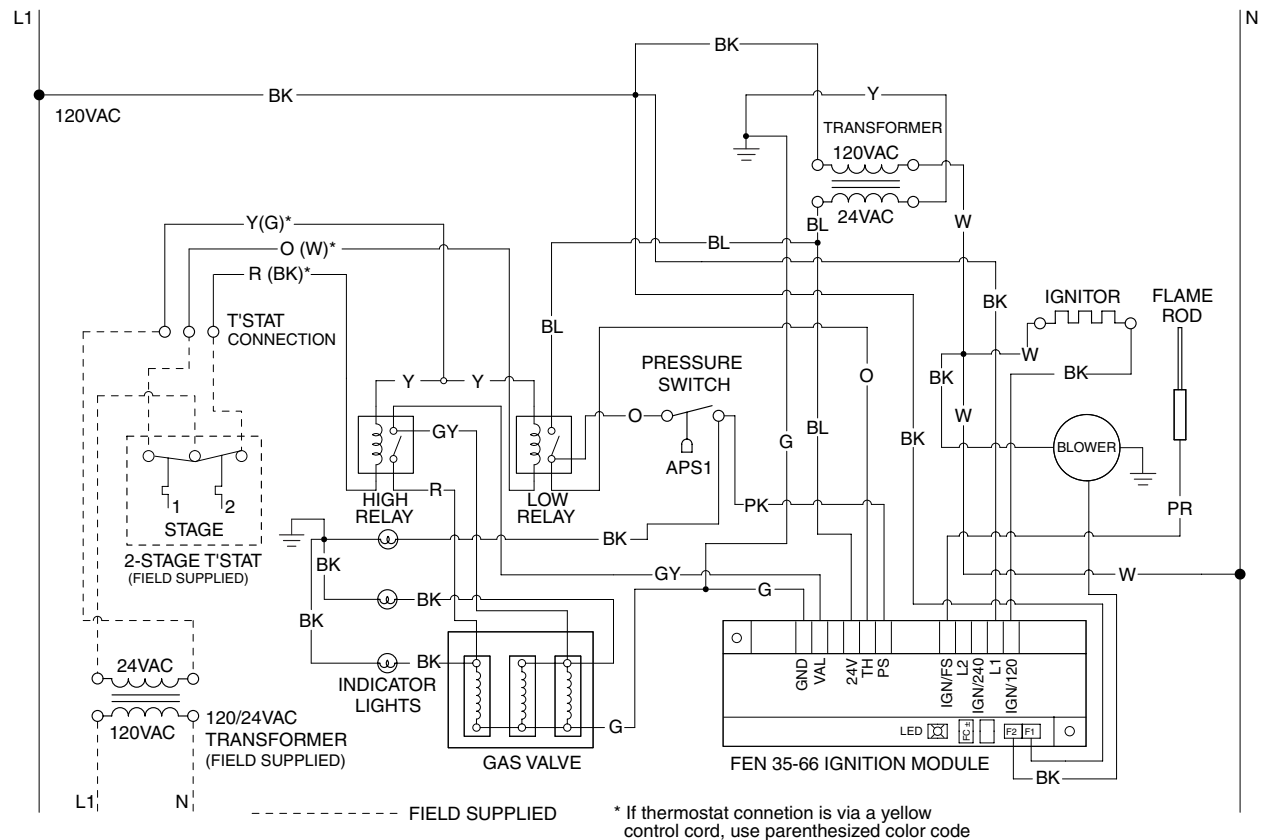
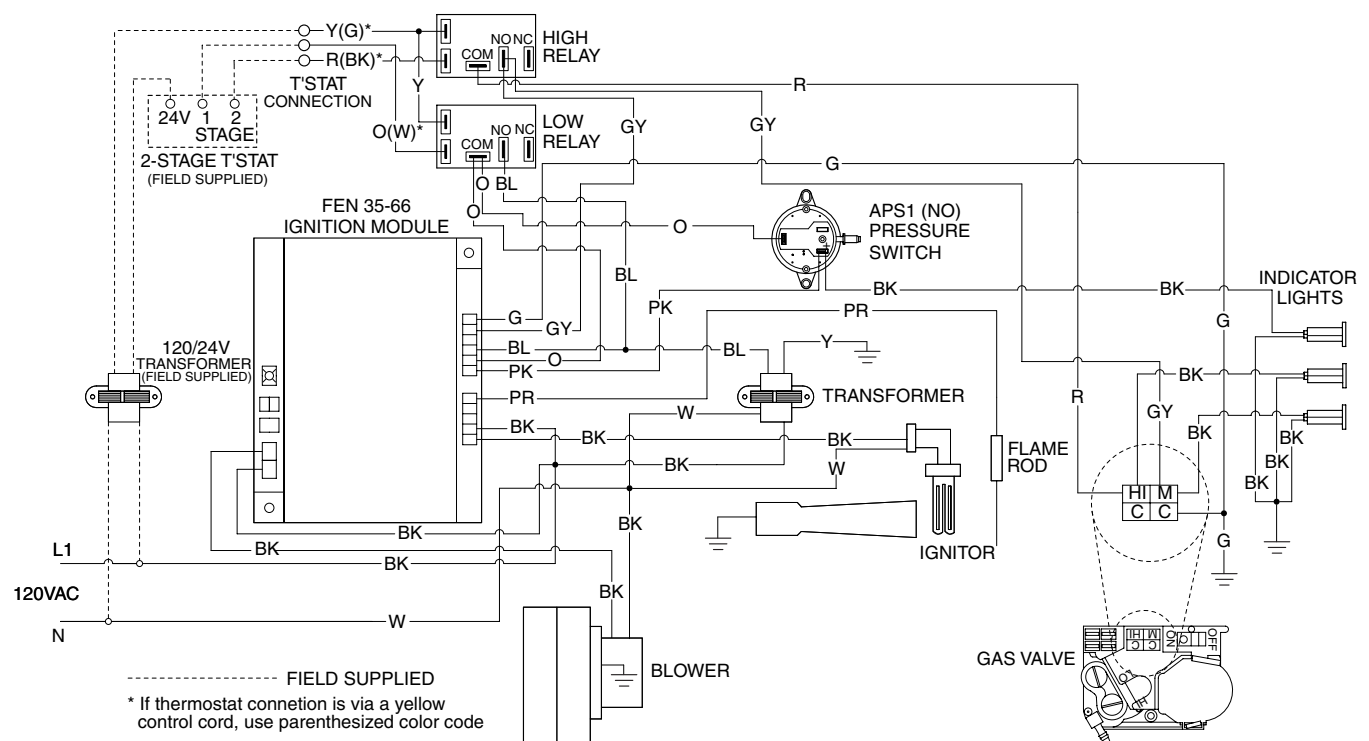


Figure 2.3 • Alternative Wiring Diagrams

A. 35-66 Ladder Diagram - With HLRP Relay



B. 35-66 Block Diagram - With HLRP Relay



Specifications

Chart 2.1 • Specifications

Model Number	Gas Type (select one)	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.)
HL3-20-65	N or LP	65,000	50,000	21'-9"	13'-1"	120	N/A	9' to 14'	Alum	Alum	20.2
HL3-20-75	N or LP	75,000	50,000	21'-9"	13'-1"	120	145	10' to 15'	Alum	Alum	20.2
HL3-30-65	N or LP	65,000	50,000	31'-5"	**17'-9"	160	N/A	10' to 15'	Alum	Alum	30.4
HL3-30-75	N or LP	75,000	50,000	31'-5"	**17'-9"	160	195	11' to 18'	Alum	Alum	30.4
HL3-30-100	N or LP	100,000	65,000	31'-5"	**17'-9"	160	195	12' to 20'	Alum	Alum	30.4
HL3-30-125	N or LP	125,000	95,000	31'-5"	**17'-9"	160	195	13' to 23'	Alum	Alum	30.4
HL3-40-65	N or LP	65,000	50,000	41'-1"	22'-9"	190	N/A	11' to 18'	Alum	Alum	40.5
HL3-40-75	N or LP	75,000	50,000	41'-1"	22'-9"	190	235	11' to 18'	Alum	Alum	40.5
HL3-40-100	N or LP	100,000	65,000	41'-1"	22'-9"	190	235	12' to 20'	Alum	Alum	40.5
HL3-40-125	N or LP	125,000	95,000	41'-1"	22'-9"	190	235	13' to 23'	Alum	Alum	40.5
HL3-40-150	N or LP	150,000	100,000	41'-1"	22'-9"	190	235	14' to 25'	Titan	Alum	40.5
HL3-40-175	N or LP	*175,000	125,000	41'-1"	22'-9"	190	235	15' to 27'	Titan	Alum	40.5
HL3-50-125	N or LP	125,000	95,000	50'-9"	**27'-5"	235	290	15' to 27'	Alum	Alum	50.6
HL3-50-150	N or LP	150,000	100,000	50'-9"	**27'-5"	235	290	15' to 27'	Titan	Alum	50.6
HL3-50-175	N or LP	*175,000	125,000	50'-9"	**27'-5"	235	N/A	16' to 30'	Titan	Alum	50.6
HL3-50-200	N or LP	*200,000	145,000	50'-9"	**27'-5"	235	N/A	17' to 35'	Titan	Alum	50.6
HL3-60-150	N or LP	150,000	100,000	60'-5"	32'-5"	265	330	16' to 30'	Titan	Alum	60.7
HL3-60-175	N or LP	*175,000	125,000	60'-5"	32'-5"	265	N/A	16' to 30'	Titan	Alum	60.7
HL3-60-200	N or LP	*200,000	145,000	60'-5"	32'-5"	265	N/A	17' to 35'	Titan	Alum	60.7
HL3-70-175	N or LP	* 175,000	125,000	70'-1"	**37'-3"	300	N/A	19' to 42'	Titan	Alum	70.9
HL3-70-200	N or LP	* 200,000	145,000	70'-1"	**37'-3"	300	N/A	19' to 42'	Titan	Alum	70.9

* 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 baffles sections for each model heater.

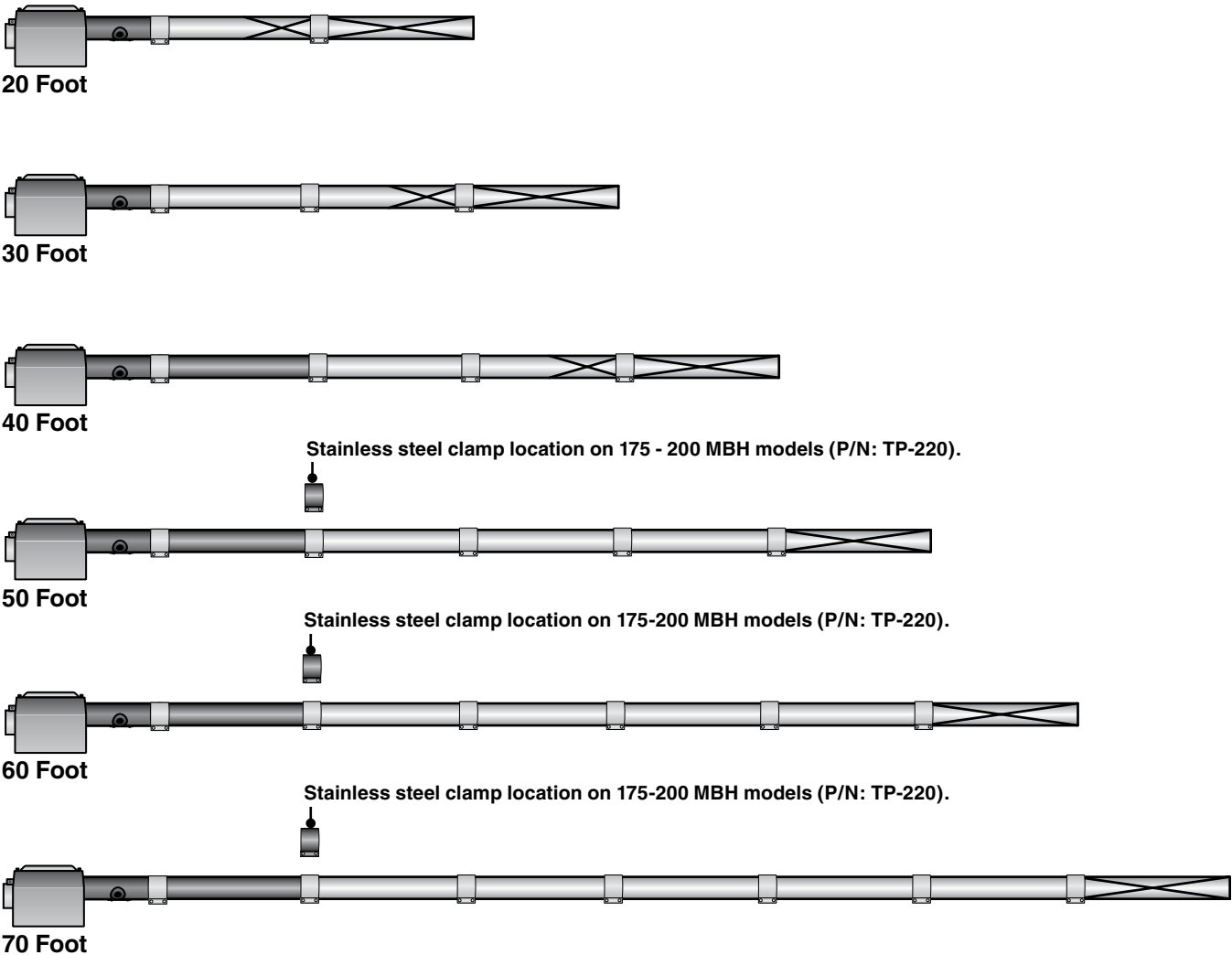
Titan = Black coated titanium stabilized aluminized steel.

Alum = Black coated aluminized treated steel.

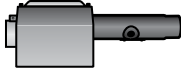
Tube Installation Sequence

Figure 2.4 • Tube Installation Sequence


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




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

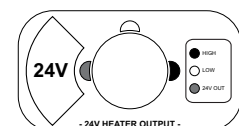
HL3 Series heaters require a 24VAC, two-stage thermostat to operate. The burner control box is equipped with a round terminal strip that accepts three (3) 1/4" insulated female spade terminals. Do not supply 120V to the 24V connection.

The HL3 Series is equipped with or without relays (P/N: HLRP). The optional relays must be factory installed. **NOTE:** Units with a relays 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):

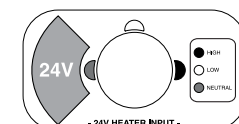
- Single burner control box.
- Single thermostat.



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

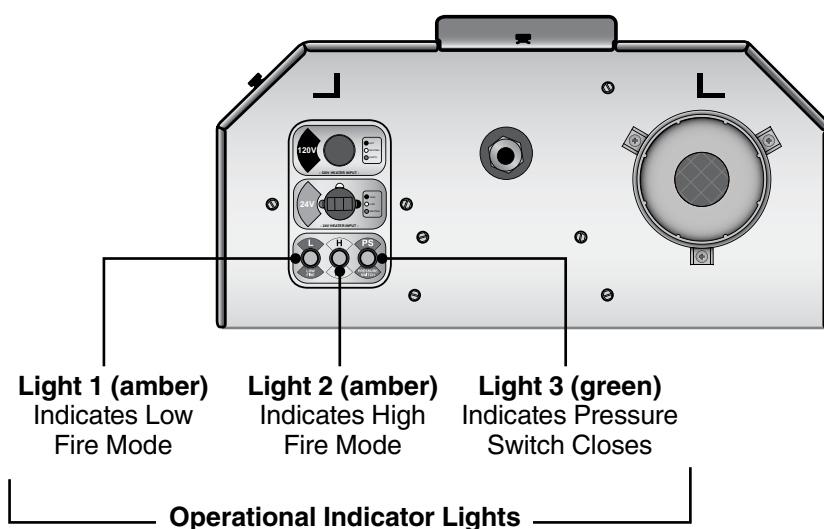
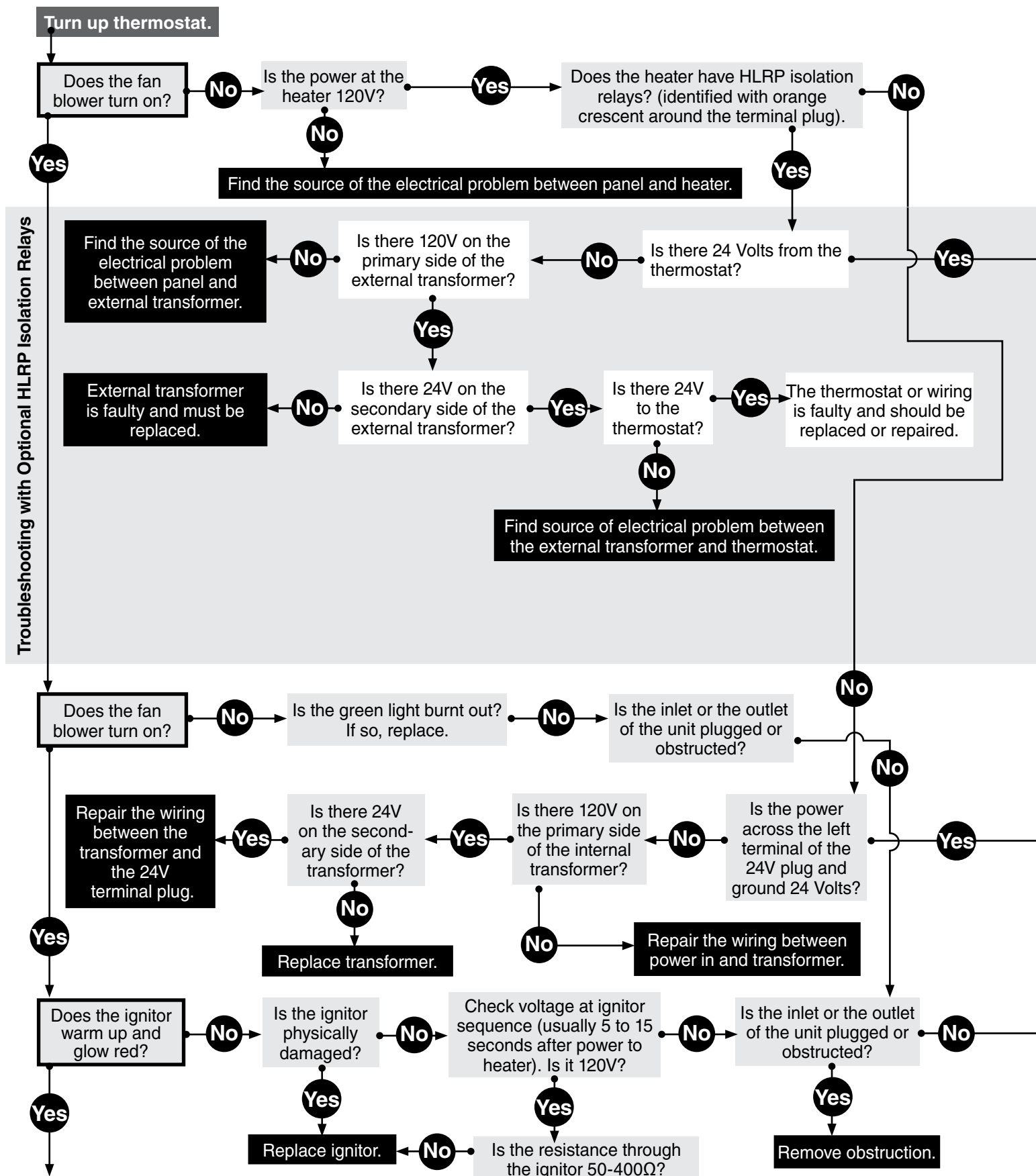


Chart 3.1 • LED Fault Code Status (located internally on circuit board)

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

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

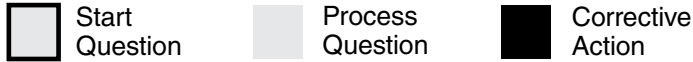
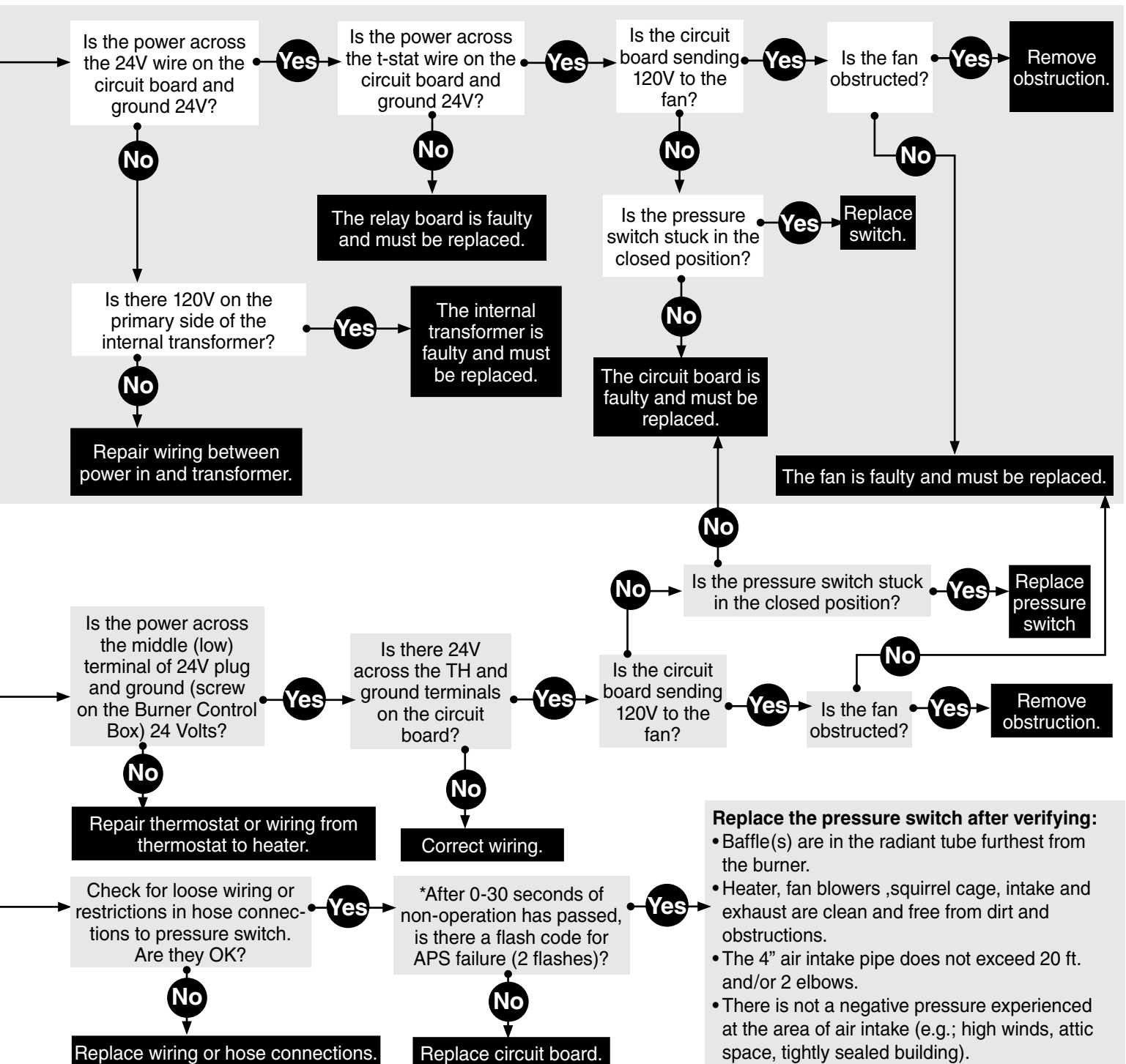
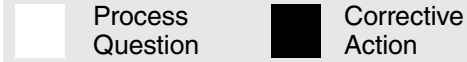
4.0 Troubleshooting Guide



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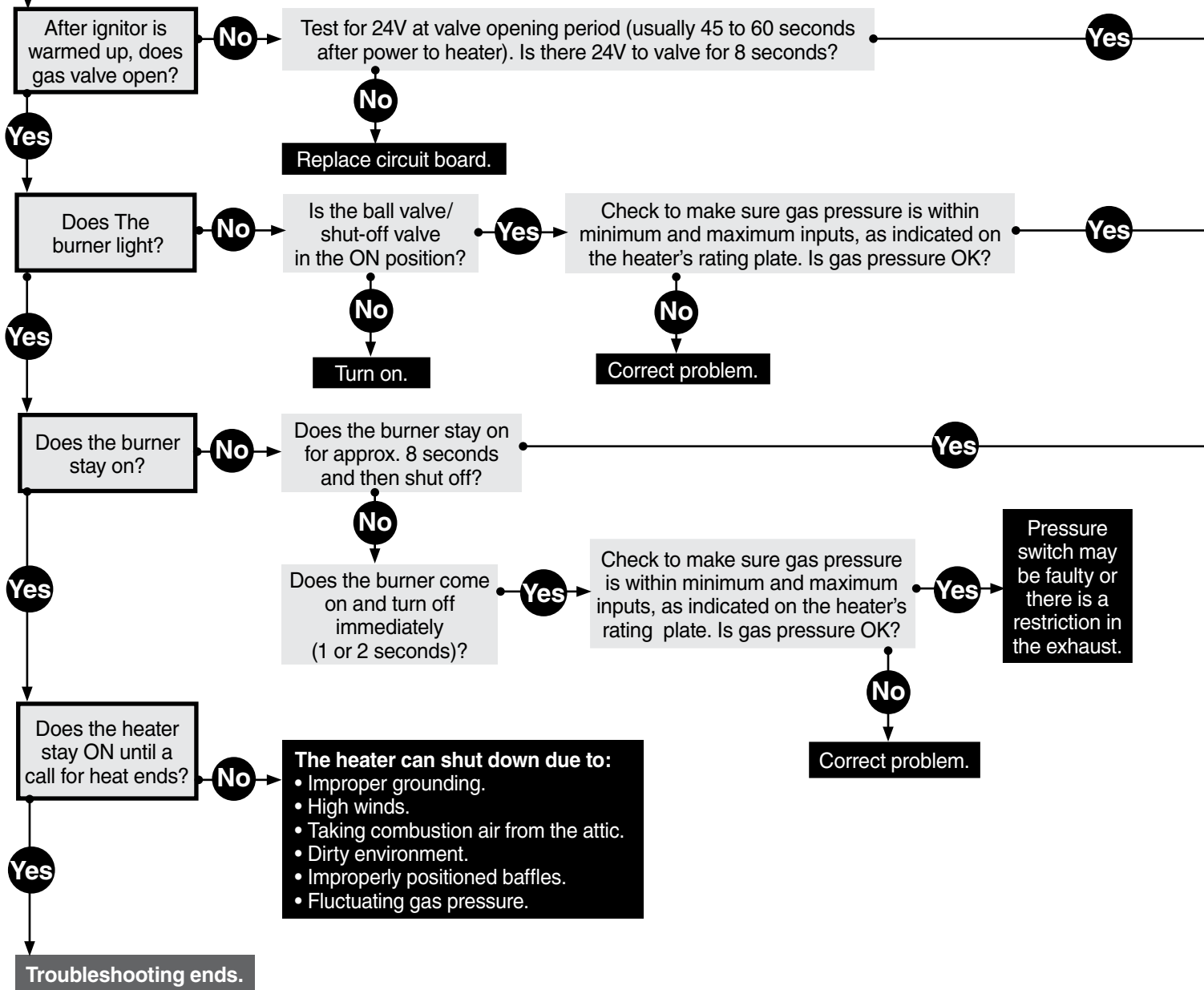
NOTICE

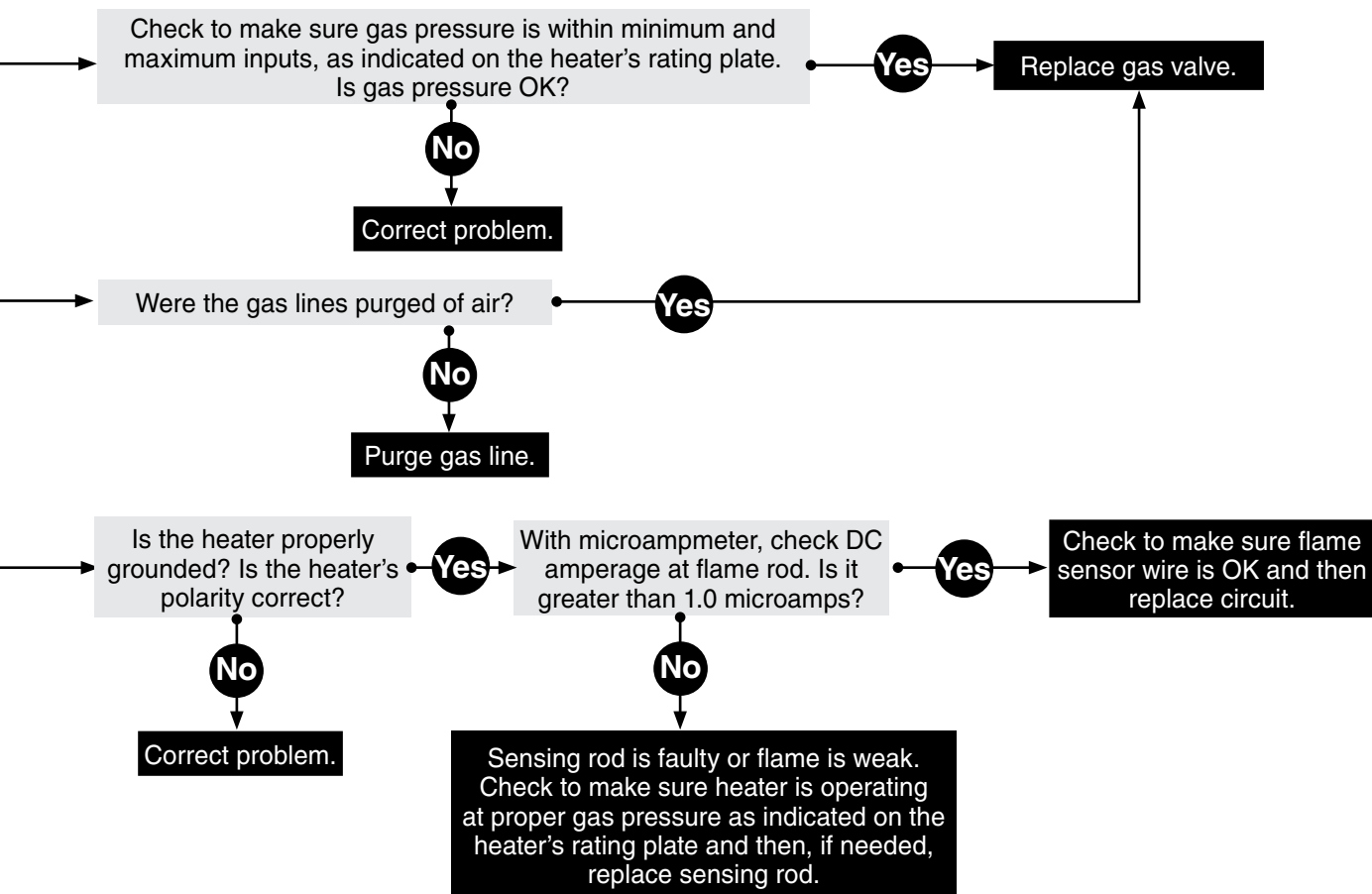
Bypassing any switch is intended for testing purposes only. Do not leave switch bypassed during normal operation or the heater's built-in safety mechanisms will be compromised.

Key**Without HLRP Isolation Relays:****With HLRP Isolation Relays:**

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

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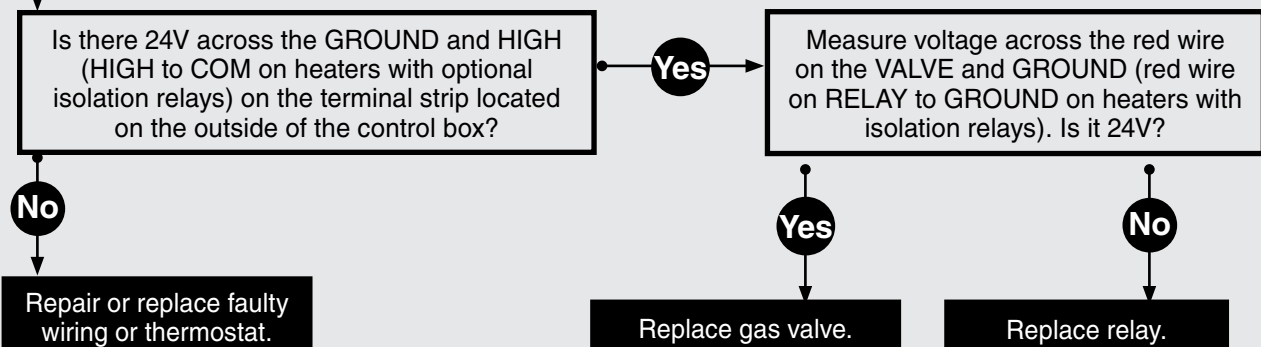




If heater does not go into high fire mode:

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:



5.0 Parts

Figure 5.1 • Burner Assembly Components

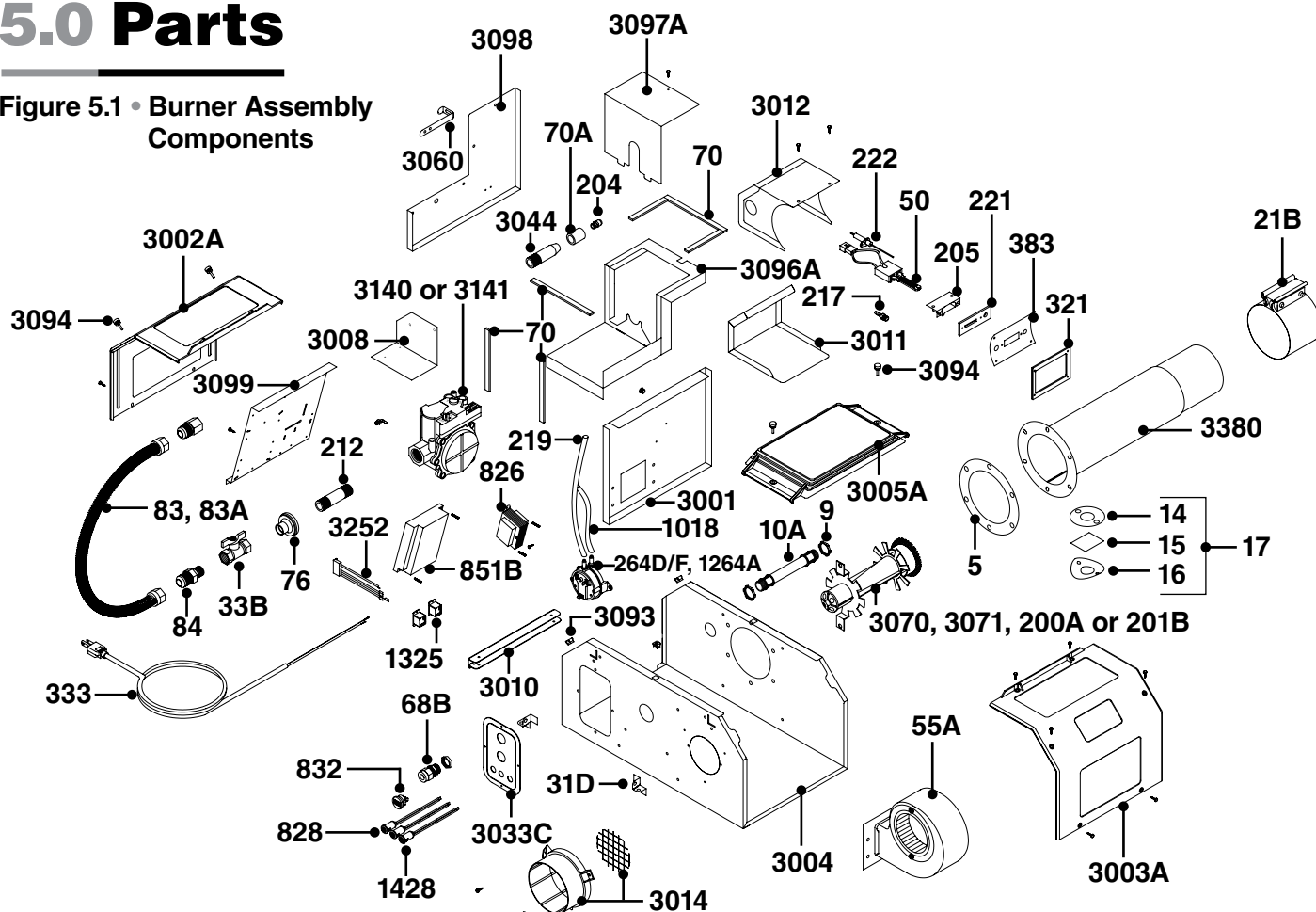
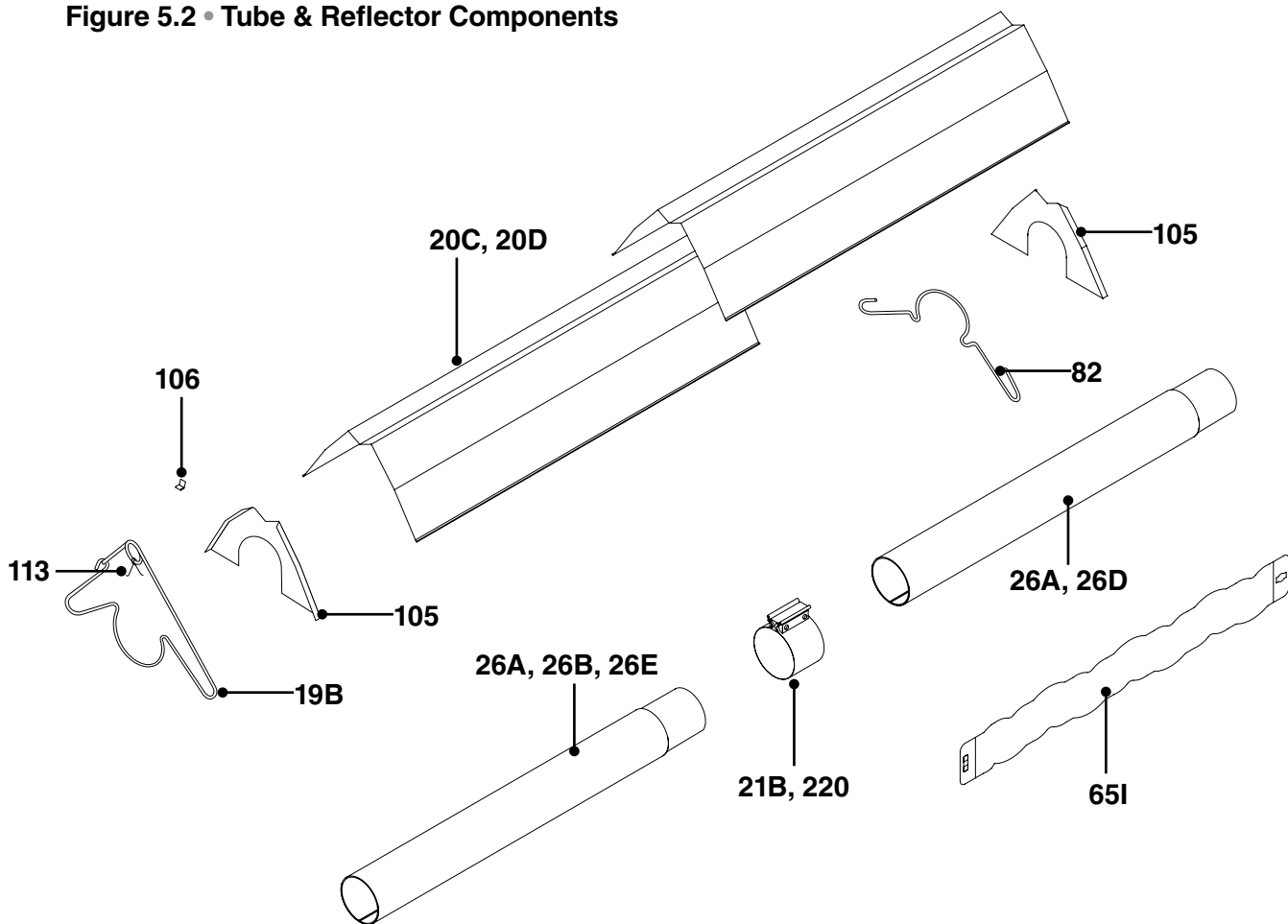


Chart 5.1 • Parts List

Part No.	Description	Part No.	Description
TP-5	Flange Gasket	TP-68B	Large Strain Relief Bushing
TP-9	Conduit Coupling	TP-70	Control Box Cover Gasket (per foot**)
TP-10A	Conduit 4" x 3/4"	TP-70A	1" Control Box Gasket (6 inches)
TP-14	Sight Glass Gasket	TP-76	Rubber Grommet
TP-15	Sight Glass	TP-82	Reflector Center Support (RCS)
TP-16	Sight Glass Washer	TP-83	24" Stainless Steel Flexible Gas Connector
TP-17	Sight Glass Kit	TP-83A	24" PVC Coated S.S. Flexible Gas Connector*
TP-19B	4" Wire Hanger with Tension Spring	TP-84	1/2" Female / Male Flare Fitting
TP-20C	120" Aluminum Reflector	TP-105	Aluminum Reflector End Cap
TP-20D	120" Stainless Steel Reflector*	TP-106	Reflector End Cap Clips (8 pcs.)
TP-21B	4" Standard Tube Clamp	TP-113	Reflector Tension Spring
TP-26A	10 ft. Aluminized Radiant / Combustion Tube	TP-200A	V.3 Low SS Burner (50-100 MBH LP GAS ONLY)
TP-26B	10 ft. Titanium Coated Combustion Tube	TP-201B	V.3 Mid SS Burner (125-150 MBH)
TP-26D	10 ft. 304 Stainless Steel Radiant Tube*	TP-204	Gas Orifice (consult factory)
TP-26E	10 ft. 409 Stainless Steel Combustion Tube*	TP-205	Glo-Bar™ Holder
TP-31D	Interlocking Mounting Bracket (Qty. 2)	TP-212	1/2" x 3" Pipe Nipple
TP-33B	1/2" Shut-Off Ball Valve / Inlet Tap	TP-217	Pressure Switch Barb
TP-50	Glo-Bar™ Ignitor	TP-219	Differential Vinyl Sensing Tube (burner)
TP-55A	Fan Blower	TP-220	Stainless Steel Tube Clamp (175 & 200 MBH)*
TP-65I	36" Interlocking Turbulator Baffle	TP-221	Glo-Bar™ Holder Gasket

* Optional or upgrade item. ** 6 feet total required to cover outer edges of the burner control box.

Figure 5.2 • Tube & Reflector Components

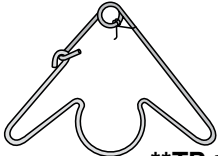

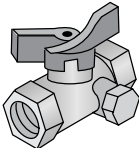

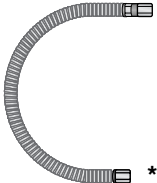
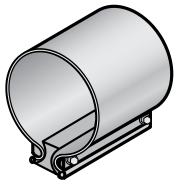
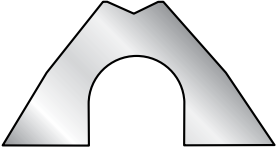
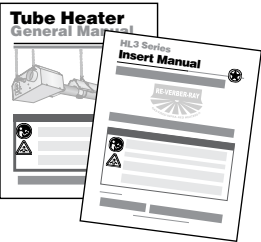


Part No.	Description	Part No.	Description
TP-222	Flame Rod	TP-3008	Gas Valve Mounting Bracket
TP-245	3/16" X 1/8" Plastic Gas Valve 90° Vent	TP-3010	Service Panel Hinge
TP-264D	Differential Pressure Switch, 65 to 75 MBH	TP-3011	V.3 Ignitor Box
TP-264F	Differential Pressure Switch, 125 to 200 MBH	TP-3012	V.3 Ignitor Box Cover
TP-321	Ignition Plate Gasket	TP-3014	Plastic Air Orifice with Screen
TP-333	72" Black 120V Power Cord	TP-3033C	HL3 Power Entry Plate
TP-383	Glo-Bar™ Ignitor Plate	TP-3044	Gas Manifold
TP-826	40VA Transformer	TP-3060	V.3 Pressure Switch Mounting Bracket
TP-828	24V Yellow Operational Indicator Light	TP-3070	V.3 Low SS Burner (50-100 MBH NAT GAS ONLY)
TP-832	Thermostat Terminal Strip	TP-3071	V.3 High SS Burner (175-200 MBH)
TP-851B	35-66 Diagnostic Circuit Board	TP-3093	#8-23 Cage Nut
TP-1018	Differential Switch Vinyl Sensing Tube (exhaust)	TP-3094	#8-32 x 1/2" Black Nylon Shoulder Screw
TP-1264A	Differential Pressure Switch, 100 MBH	TP-3096A	Valve Compartment Bottom Panel
TP-1325	Optional HLRP Isolation Relay* (2 required)	TP-3097A	Valve Compartment Top Panel
TP-1428	24V Green Operational Indicator Light	TP-3098	Valve Compartment Side Panel
TP-3001	V.3 Blower Panel	TP-3099	Controls Mounting Panel
TP-3002A	Plastic End Panel, Control Compartment	TP-3252	4-Piece Wire Harness Set
TP-3003A	Plastic End Panel, Fan Compartment	TP-3140	36G54-224 Gas Valve - Natural Gas Assembly
TP-3004	V.3 Control Box	TP-3141	36G54-226 Gas Valve - LP Gas Assembly
TP-3005A	Plastic Valve Chamber Lid	TP-3380	V.3 16" HSI Burner Tube w/ Flange and Fittings

* Optional or upgrade item.

Kit Contents Check List

Kit Contents - Reference the length column for your model.

HL3 Series Kit Contents							
TP-19B 4" Hanger with Reflector Tension Spring  **TP-19C		TP-82 4" Reflector Center Support (RCS)  **TP-829		TP-33B 1/2" Shut-Off Valve (Ball Valve & Inlet Tap) 		TP-106 Reflector End Cap Clips 	
TP-83 24" Stainless Steel Flexible Gas Connector  **TP-83A		TP-220 4" Tube Clamp  **TP-220		TP-105 Reflector End Cap  **TP-105A		General Manual and HL3 Series Insert F/N: LIOGT3 & LIOHL3 	
Part No.	Description	20 ft.	30 ft.	40 ft.	50 ft.	60 ft.	70 ft.
TP-19B	4" Hanger w/ Tension Spring	3	4	5	6	7	8
TP-21B	4" Tube Clamp	2	3	4	5*	6*	7*
TP-25	1/4" Female Spade Terminal	3	3	3	3	3	3
TP-33B	1/2" Shut-Off Valve & Inlet Tap	1	1	1	1	1	1
TP-82	4" Reflector Center Support	2	3	4	5	6	7
TP-83	24" S.S. Flexible Gas Connector	1	1	1	1	1	1
TP-105	Reflector End Cap	2	2	2	2	2	2
TP-106	Reflector End Cap Clips	8	8	8	8	8	8
LIOGT3	V3 General Tube Heater Manual	1	1	1	1	1	1
LIOHL3	HL3 Series Insert Manual	1	1	1	1	1	1
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.
- See page 36 of the General Tube Heater Manual for terms and conditions.



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