

RHT Series Insert Manual



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



The RHT 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 RHT series models. 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.

INSTALLER: Present this manual to the end user.

Keep these instructions in a clean and dry place for future reference.

Model#: _____ Serial #: _____
(located on rating label)

LIORHTa-Rev. 00218
Print: 1c-05/20 (DRPC)

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

1.0 Safety

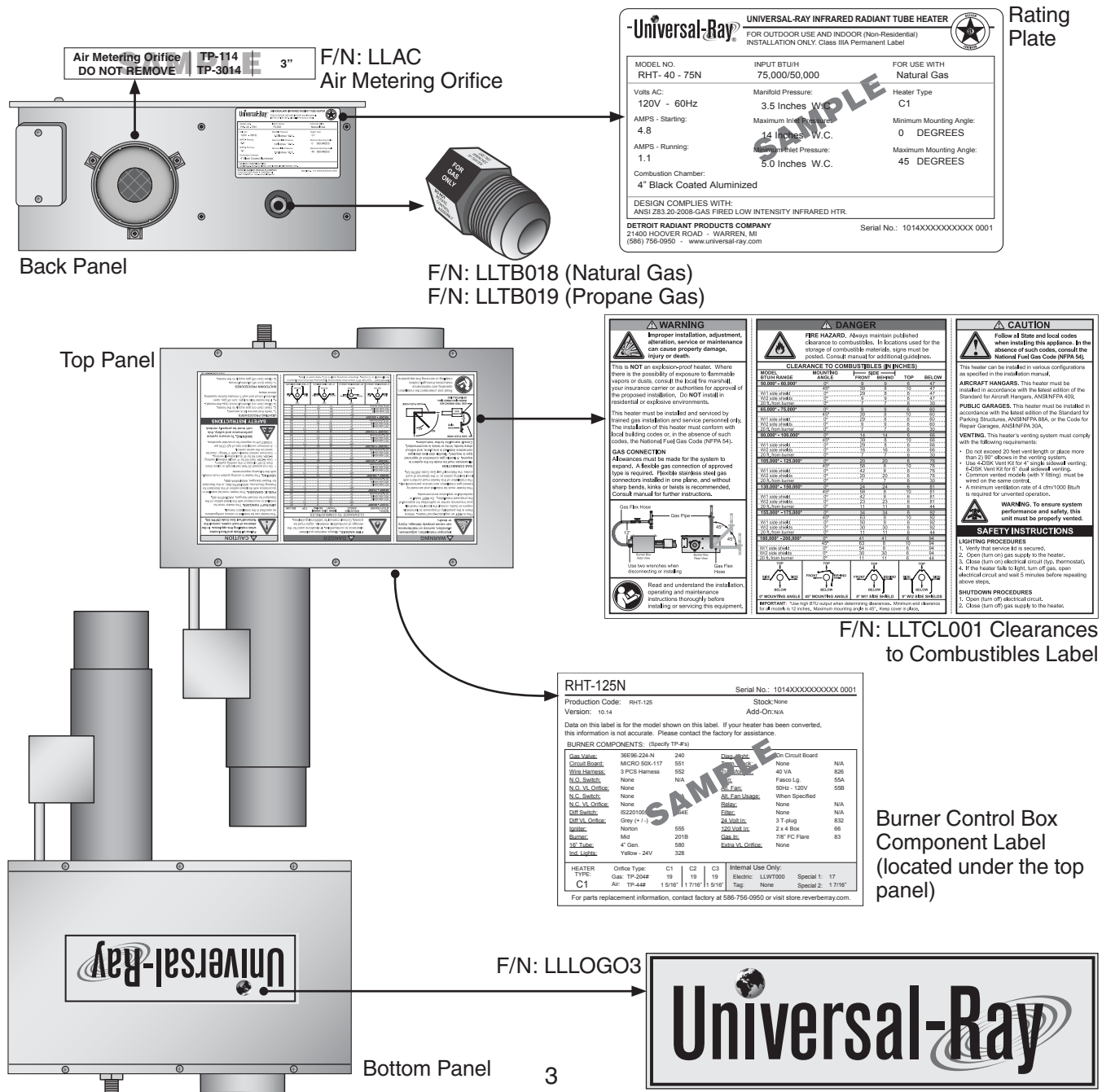
⚠ WARNING

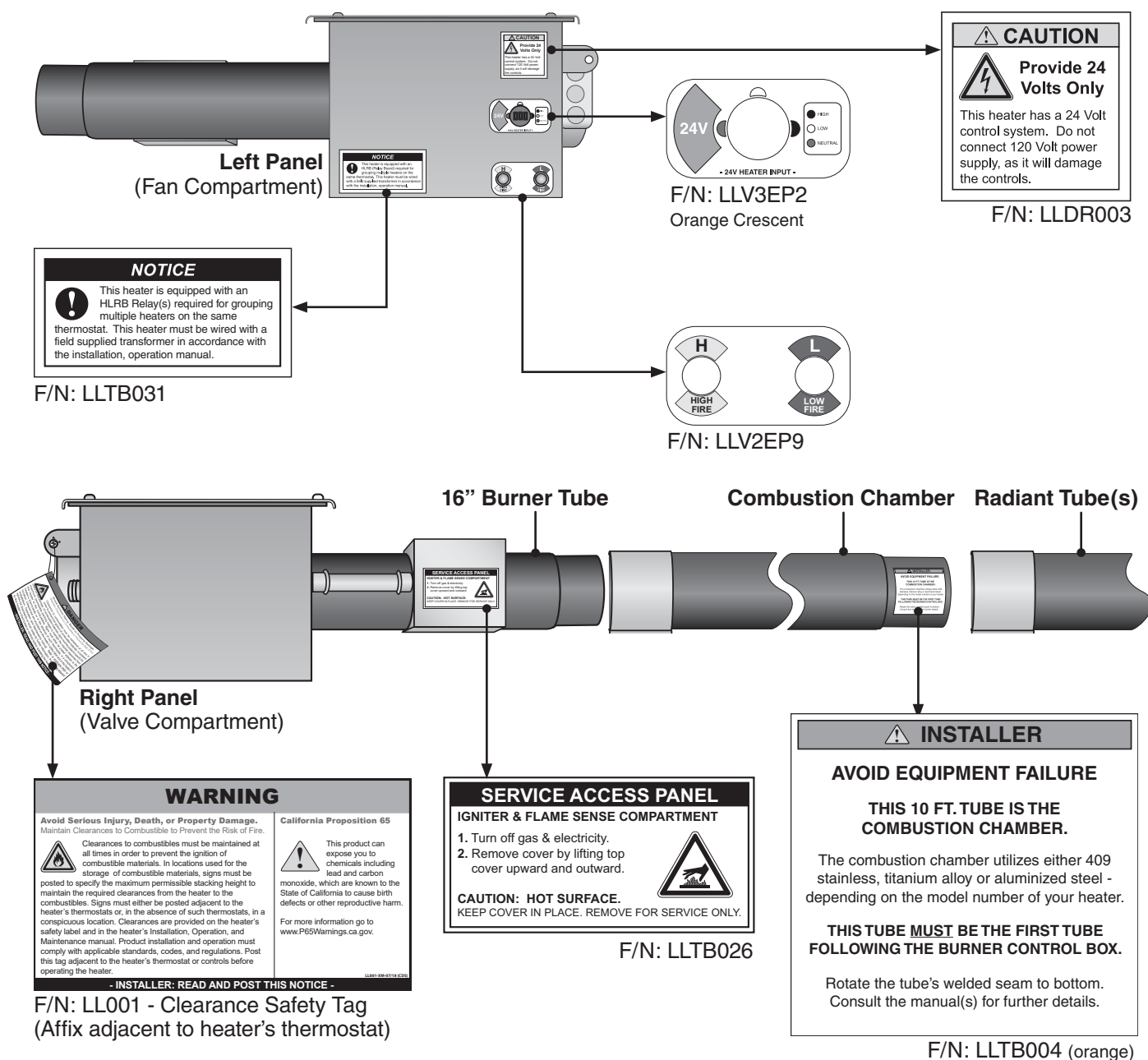


Improper installation, adjustment, alteration, service, or maintenance can cause property damage, serious injury, or death. Read and understand the installation, operating, and maintenance instruction thoroughly before installing or servicing this equipment. Only trained, qualified gas installation and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





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 vapors 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.

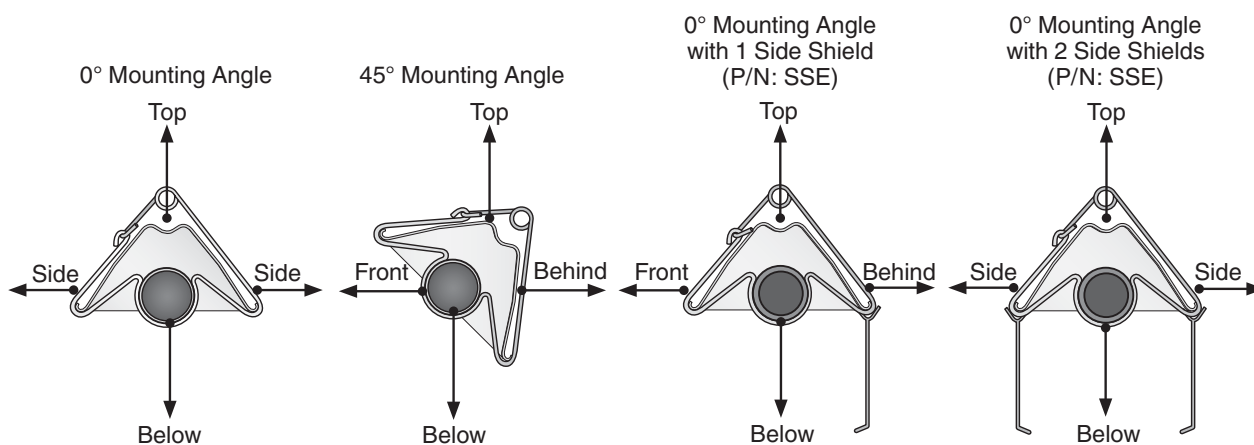
When installing the tube heater system, clearances to combustibles for the model tube heater and configuration must be maintained. Refer to Chart 1.1 on page 5 to determine the required distances for your model.

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

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

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

The stated clearances to combustibles represent 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

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.universalray.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.
Propane	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 VAC - 60 Hz., single phase, 3-wire
- 24 VAC thermostat connection
- Starting current 1.7 Amps
- Running current 1.1 Amps

NOTICE

Connecting the thermostat with a voltage other than 24 V may damage the heater. The RHT series requires a 24 V connection to the thermostat. The RHT series is equipped with an internal relay board. A field supplied external transformer must be installed. See wiring diagram (Figures 2.1A-B).

Wiring

⚠ WARNING

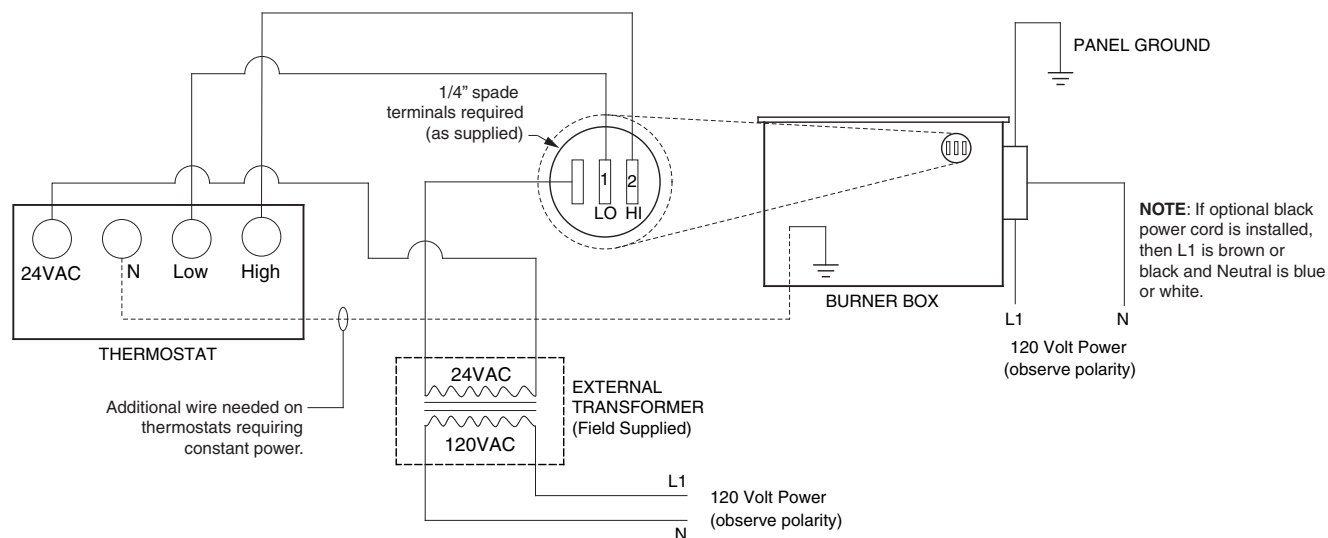


Electric Shock

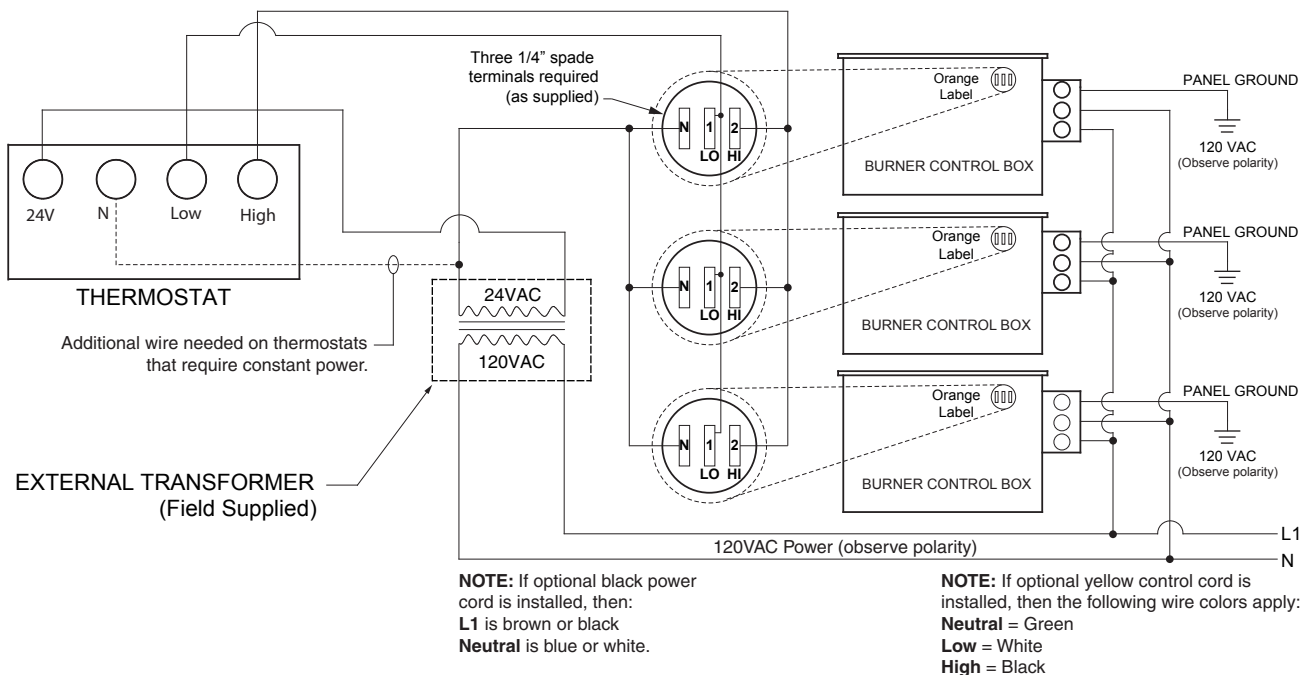
Field wiring to the tube heater must be connected and grounded in accordance with national, state, provincial, and local codes, and to the guidelines in the Tube Heater General Manual and Series Insert Manual. In the United States, refer to the most current revisions to the ANSI/NFPA 70 Standard and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



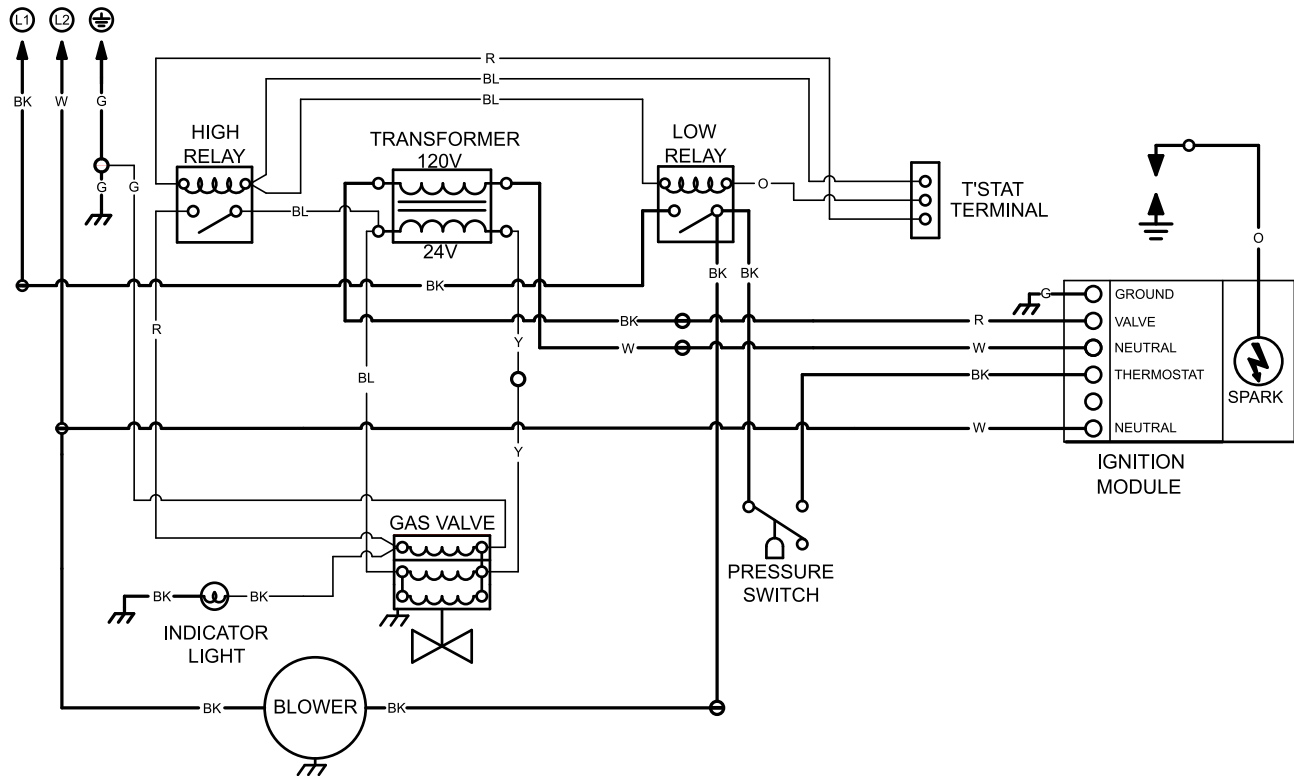
B. Multiple Heaters, Single Thermostat.



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 rating of at least 600 V, 105°C.

Figure 2.2 • Internal Wiring Diagram



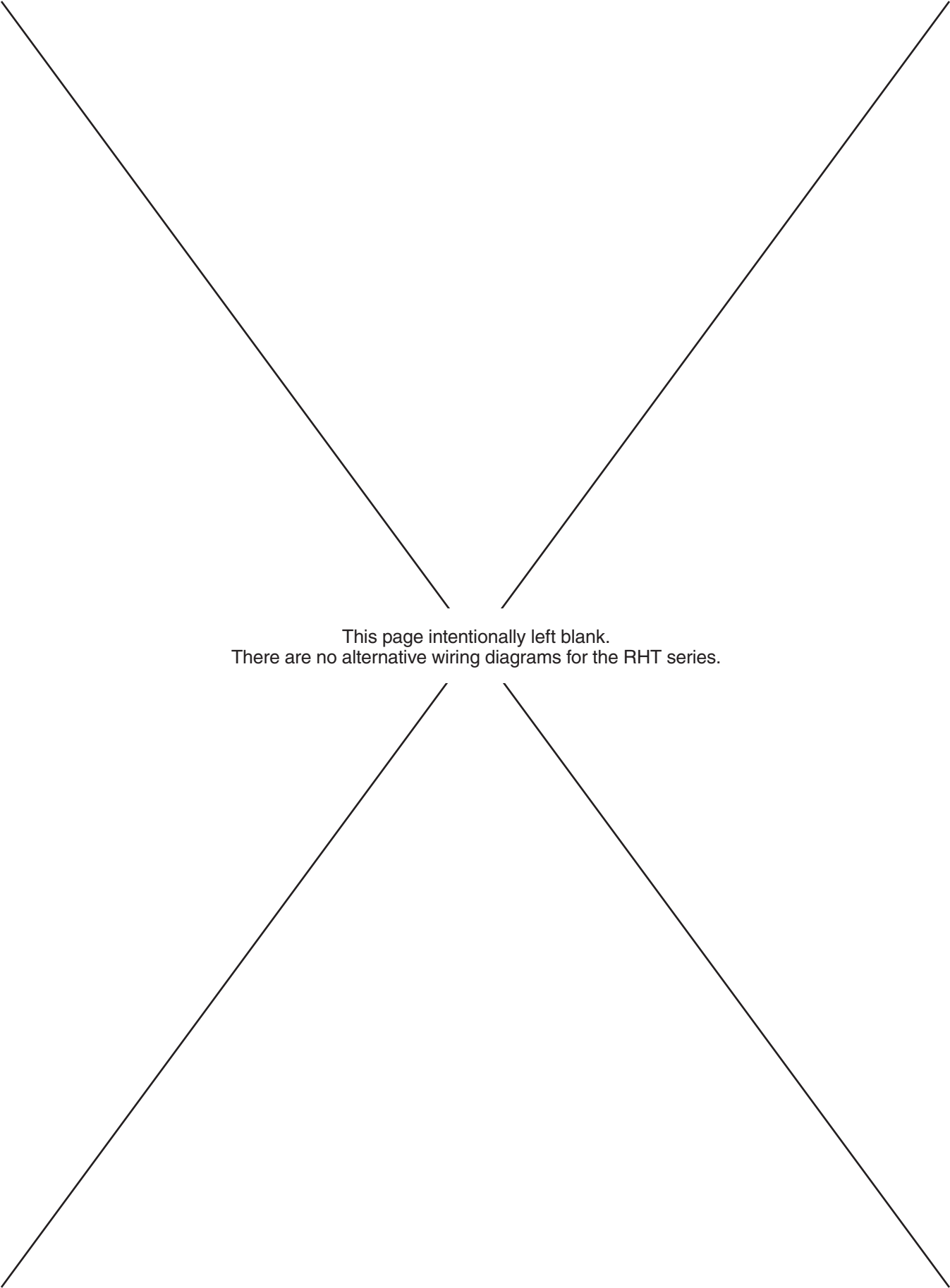
WIRING INFORMATION:

LINE VOLTAGE:

FACTORY STANDARD _____
 FACTORY OPTION -----
 FIELD INSTALLED - - - - -

LOW VOLTAGE:

FACTORY STANDARD _____
 FACTORY OPTION -----
 FIELD INSTALLED - - - - -



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There are no alternative wiring diagrams for the RHT series.

Specifications

Chart 2.1 • Specifications

Model Number	Gas Type (Select One)	BTU/h High Fire	BTU/h Low Fire	Tube Length	36" Baffle Sections	Weight (lbs.)	Typical Mounting Heights	Tube Package Options (see Chart 2.2)	
								Hot-Rolled	Aluminized
RHT-65-20	Nat. or Prop.	65,000	50,000	20'	5	120	9' to 14'	TPK-B	TPK-H
RHT-65-30	Nat. or Prop.	65,000	50,000	30'	4	160	10' to 15'	TPK-D	TPK-I
RHT-65-40	Nat. or Prop.	65,000	50,000	40'	2	190	11' to 18'	TPK-F	TPK-K
RHT-75-20	Nat. or Prop.	75,000	50,000	20'	5	120	10' to 15'	TPK-B	TPK-H
RHT-75-30	Nat. or Prop.	75,000	50,000	30'	4	160	11' to 18'	TPK-D	TPK-I
RHT-75-40	Nat. or Prop.	75,000	50,000	40'	2	190	11' to 18'	TPK-F	TPK-K
RHT-100-30	Nat. or Prop.	100,000	65,000	30'	5	160	12' to 20'	TPK-D	TPK-I
RHT-100-40	Nat. or Prop.	100,000	65,000	40'	4	190	12' to 20'	TPK-F	TPK-K
RHT-125-30	Nat. or Prop.	125,000	82,000	30'	5	160	13' to 23'	TPK-D	TPK-I
RHT-125-40	Nat. or Prop.	125,000	82,000	40'	4	190	13' to 23'	TPK-F	TPK-K
RHT-125-50	Nat. or Prop.	125,000	82,000	50'	4	235	15' to 27'	TPK-F,A	TPK-K,G
RHT-150-40	Nat. or Prop.	150,000	100,000	40'	4	190	14' to 25'	TPK-F	TPK-K
RHT-150-50	Nat. or Prop.	150,000	100,000	50'	4	235	15' to 27'	TPK-F,A	TPK-K,G
RHT-150-60	Nat. or Prop.	150,000	100,000	60'	2	265	16' to 30'	TPK-F,C	TPK-K,H
RHT-175-40	Nat. or Prop.	175,000	125,000	40'	4	190	16; to 30'	TPK-F	TPK-K
RHT-175-50	Nat. or Prop.	175,000	125,000	50'	2	235	16' to 30'	TPK-F,A	TPK-K,G
RHT-175-60	Nat. or Prop.	175,000	125,000	60'	2	265	16' to 30'	TPK-F,C	TPK-K,H
RHT-200-50	Nat. or Prop.	200,000	145,000	50'	2	235	17' to 35'	TPK-F,A	TPK-K,G
RHT-200-60	Nat. or Prop.	200,000	145,000	60'	2	265	17' to 35'	TPK-F,C	TPK-K,H

Chart 2.2 • Tube Packages

Package ID	Description	Weight
TPK-A	1) 10 ft. Hot-Rolled Steel Tube	35 lbs.
TPK-B	1) 10 Ft. Aluminized and 1) 10 ft. Hot-Rolled Steel Tube	70 lbs.
TPK-C	2) 10 ft. Hot-Rolled Steel Tubes	70 lbs.
TPK-D	1) 10 Ft. Aluminized and 2) 10 ft. Hot-Rolled Steel Tubes	110 lbs.
TPK-E	1) 10 Ft. Aluminized and 3) 10 ft. Hot-Rolled Steel Tubes	145 lbs.
TPK-F	1) 10 Ft. Titanium Stabilized 1) 10 Ft. Aluminized and 2) 10 ft. Hot-Rolled Steel Tubes	145 lbs.

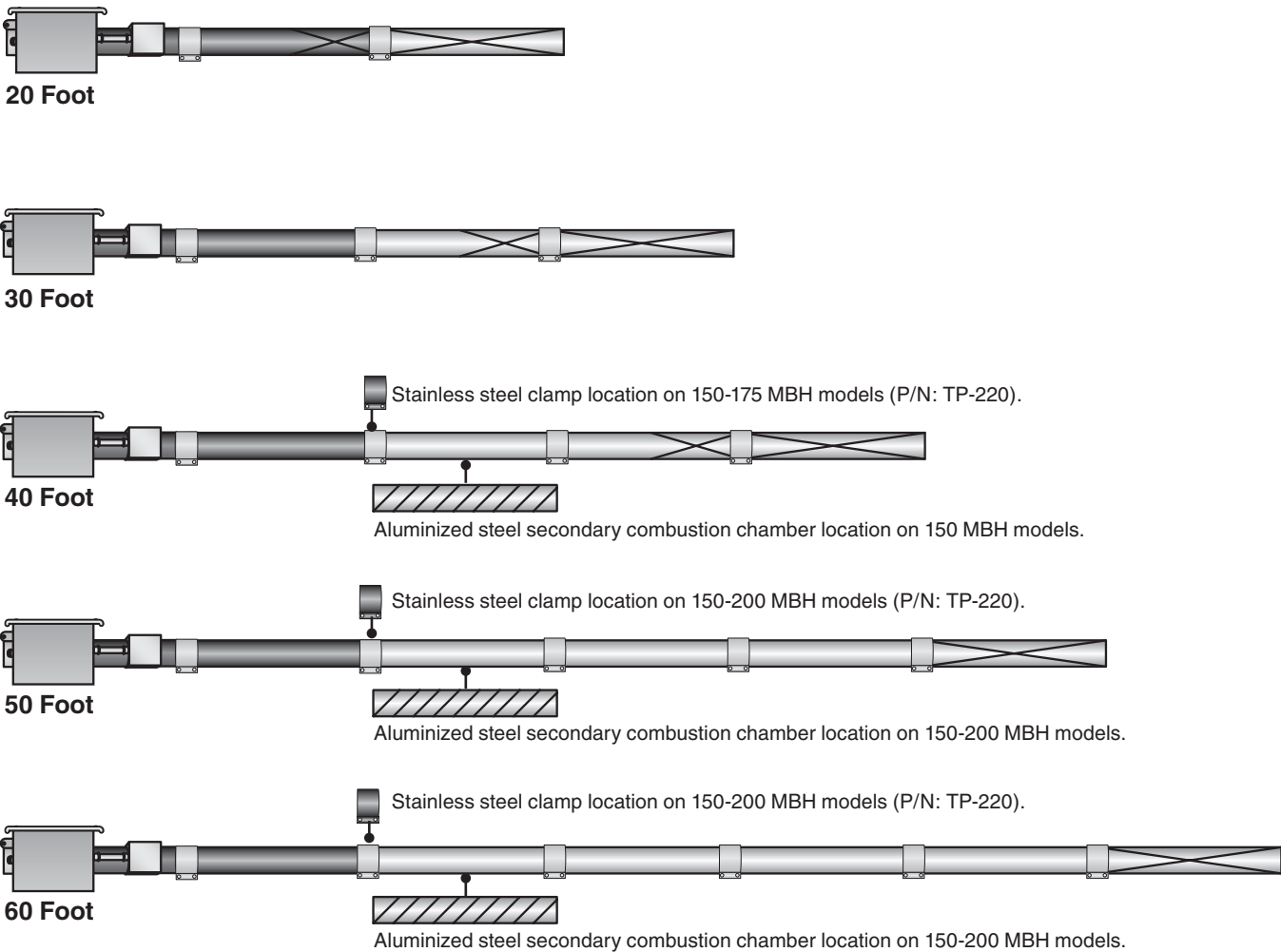
Package ID	Description	Weight
TPK-G	1) Aluminized Steel Tube	35 lbs.
TPK-H	2) Aluminized Steel Tubes	70 lbs.
TPK-I	3) Aluminized Steel Tubes	110 lbs.
TPK-K	1) Titanium Stabilized and 3) Aluminized Steel Tubes	145 lbs.

Tube packages include corresponding quantity of aluminum reflectors. All Aluminized and titanium stabilized steel tube are black coated. Hot-Rolled steel tube are uncoated. Reference Chart 2.1 above to determine correct burner and tube combinations for burner model.

Tube Installation Sequence

Figure 2.4 • Tube Installation Sequence

Important! The combustion chamber and radiant tube sections must be installed in the following order:



Key

	Burner Control Box with 16" Burner Tube		Aluminized or Hot-rolled Steel Radiant Emitter Tube
	Primary Combustion Chamber Tube*		Standard Tube Clamp
	Secondary Aluminized Steel Combustion Chamber (150-175 MBH models only)		Stainless Steel Tube Clamp (P/N: TP-220) <i>150-200 MBH models only - Located between 1st and 2nd 10 ft. tube sections.</i>
			Baffle Location

*Aluminized steel (50,000 to 125,000 BTU/h burner models), Titanium stabilized aluminized steel (150,000 to 175,000 models). **NOTE:** Refer to the Tube Heater General Manual, Chart 3.6 (page 23) for secured reflector joints.

3.0 Operation

Sequence of Operation

Two voltages (120 VAC supply and 24 VAC control) must be supplied to the RHT series burner control box for proper operation.

Starting Circuit: Upon a call for heat, the low fire relay is energized by 24 VAC from the thermostat. The relay is closed sending 120 VAC to the blower beginning the sequence of operation.

Air pressure generated by the blower causes the normally open pressure switch to close, sending power to the ignition module. After a seven-second pre-purge, the spark electrode, transformer, and gas valve are simultaneously energized. The trial for ignition is 15 seconds.

Single Stage Running Circuit: After ignition, the electrode monitors burner flame. If sense of flame is lost, the control immediately disrupts power to the gas valve and then re-cycle the unit (identical to the starting sequence). If flame sense is not established within 15 seconds, the heater will attempt two (2) additional ignition sequences before proceeding to lockout mode. The control can be reset by briefly interrupting the power source.

Two Stage Running Circuit: High fire operation is actuated by the thermostat sending a 24 VAC signal to the high fire relay. The energized coil of the relay is closed, allowing 24 VAC to continue onto the high fire of the gas valve.

Thermostat

NOTE: Different thermostats operate according to their particular features. Refer to thermostat specifications for details.

RHT series heaters require a 24 V, two-stage thermostat to operate. The burner control box is equipped with either a round terminal strip that accepts three (3) 1/4-inch insulated female spade terminals or a 36-inch yellow 24 VAC control wire. Do not supply 120 VAC to the 24 VAC connection.

Standard Configuration

With relay board (orange terminal label*):

- Required when a single thermostat controls two or more burner control boxes or when heaters are common vented.

NOTE: Units with a relay board installed must have an external transformer (field supplied), see wiring diagram. (Figure 2.1B) Stainless steel heaters, with a relay board, are indicated with the suffix 'D' on the heater's rating plate.

*A yellow control wire replaces the external terminal plug on stainless steel models or models with water resistant upgrades.

Diagnostics

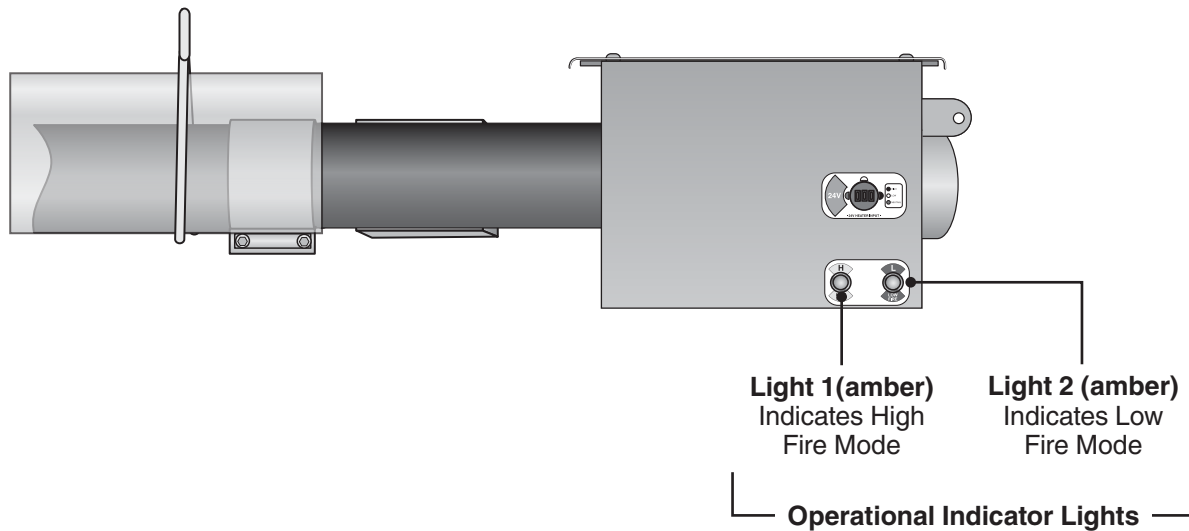
Lockout:

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

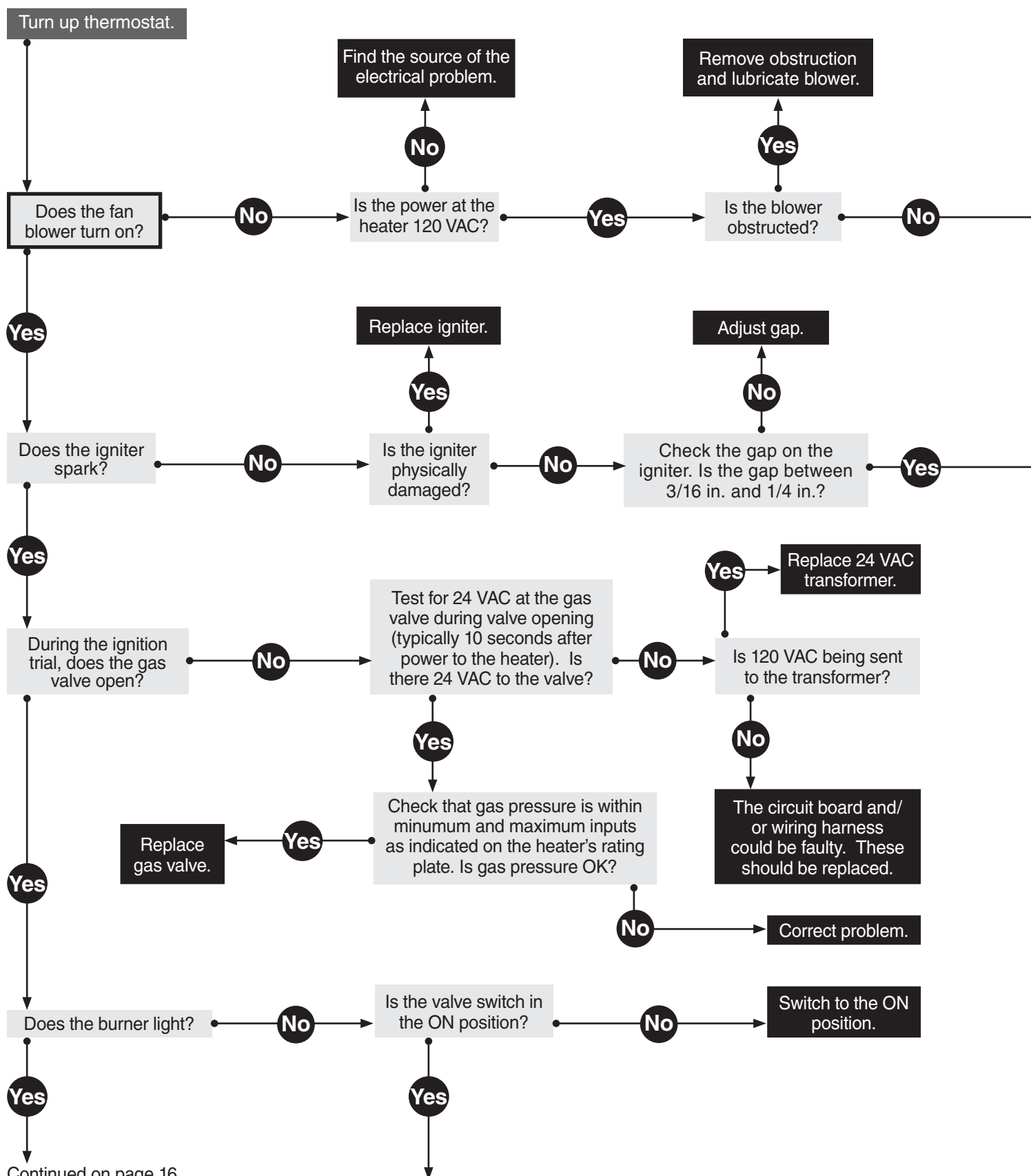
Soft Lockout: The heater will attempt to light three times. In the event of a failed attempt to light, (gas pressure, valve, no flame sense, etc.), the heater will enter Soft Lockout mode for 30 minutes, then attempt to light three more times before entering Hard Lockout mode.

Hard Lockout: If proof of flame is not established, a component failure occurs or blockages are evident, the heater will enter Hard Lockout mode. If lockout occurs, the control can be reset by briefly interrupting the power source.

Figure 3.1 • LED Operation Indicator Lights

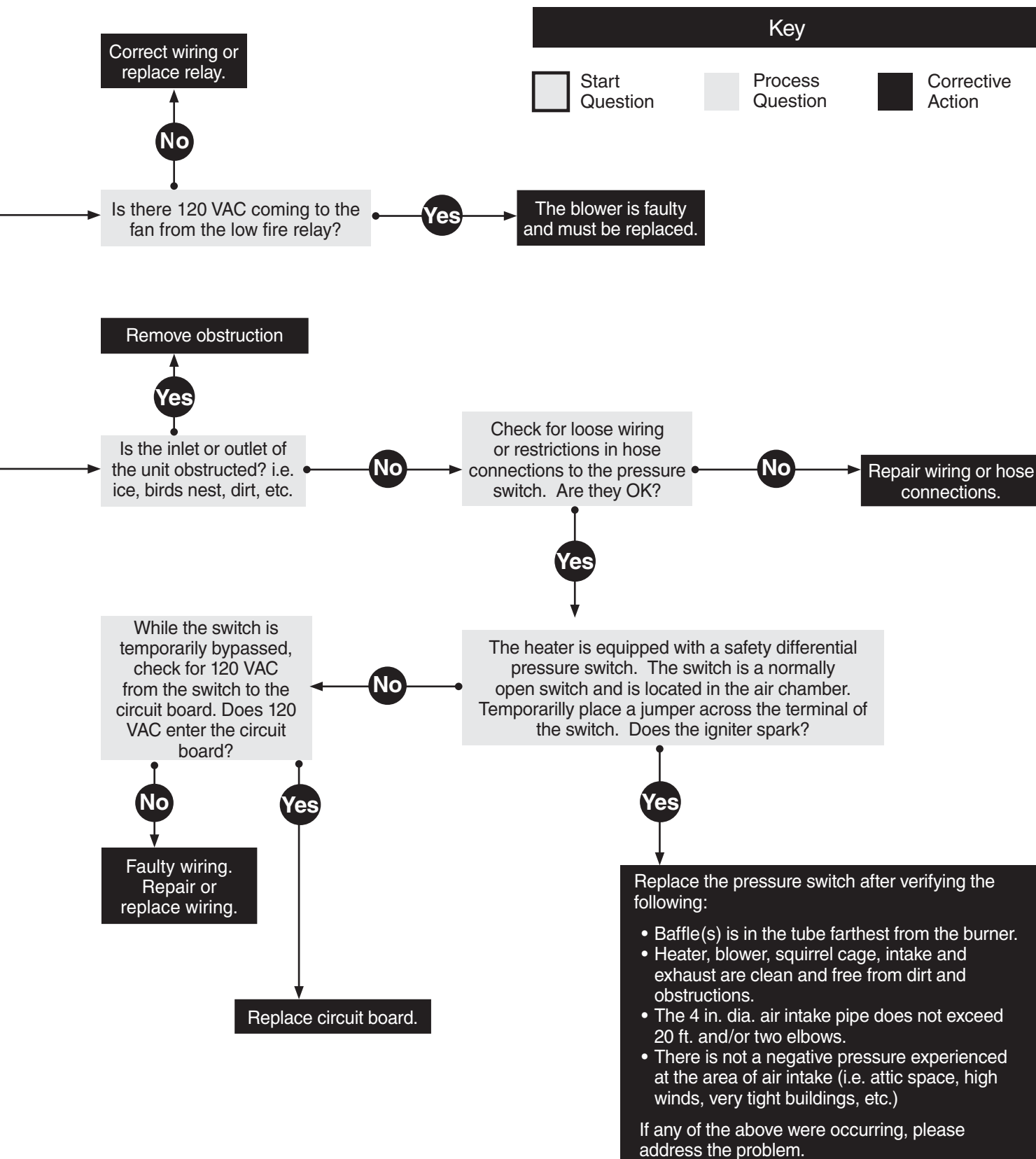


4.0 Troubleshooting Guide

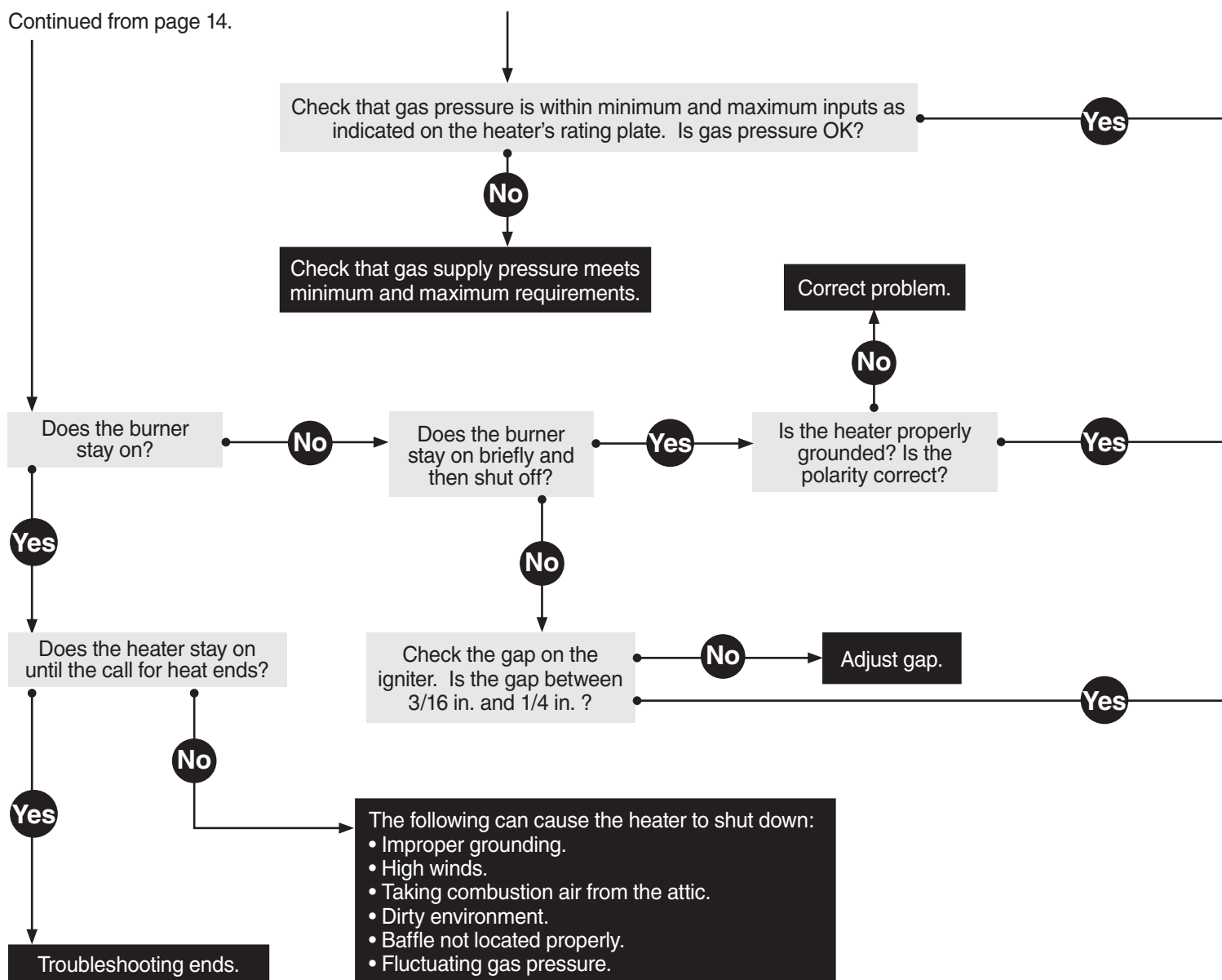


NOTICE

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.

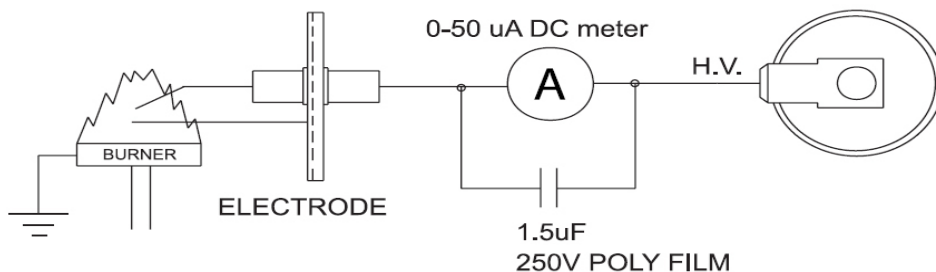


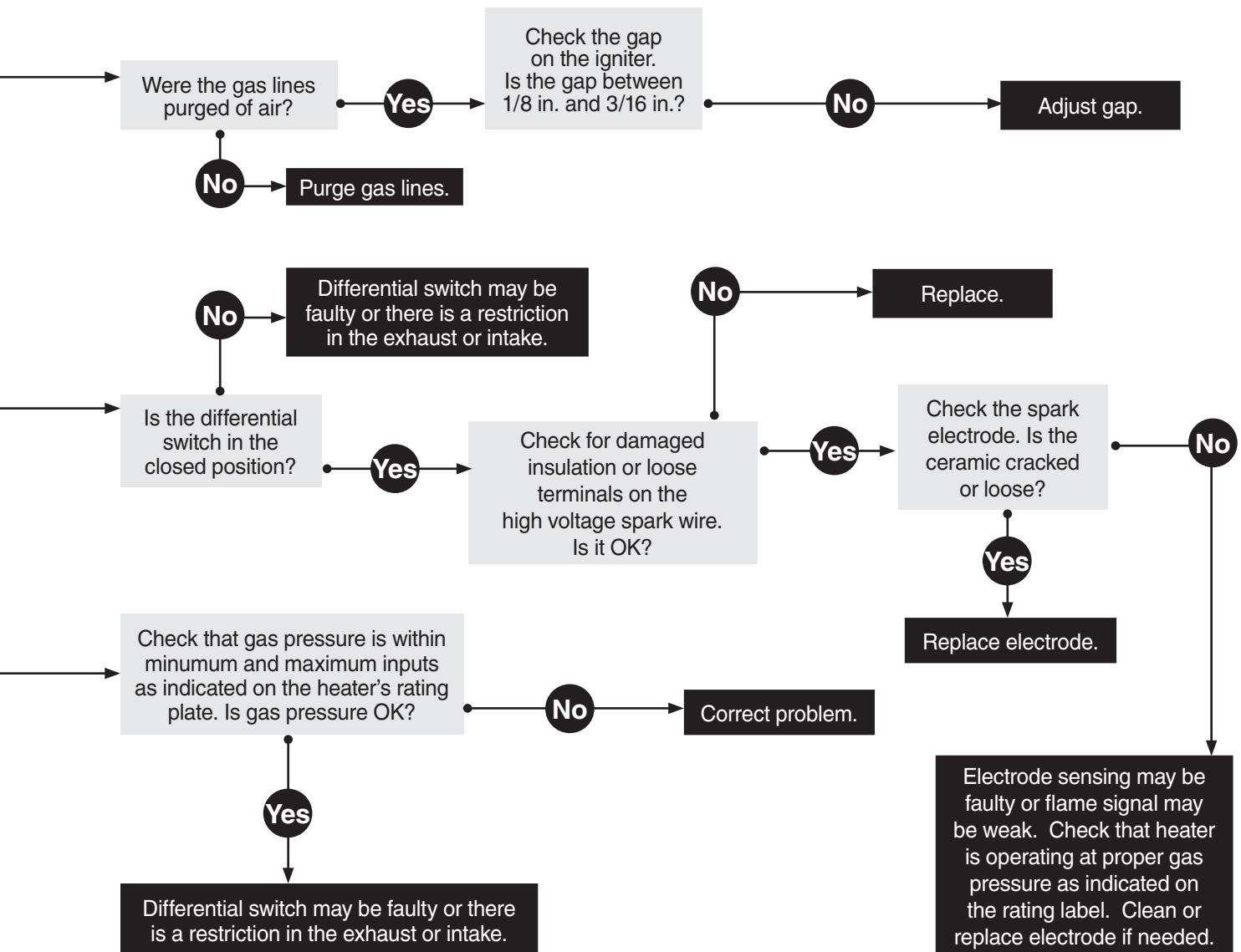
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Flame Current Check: Single Spark & Sense

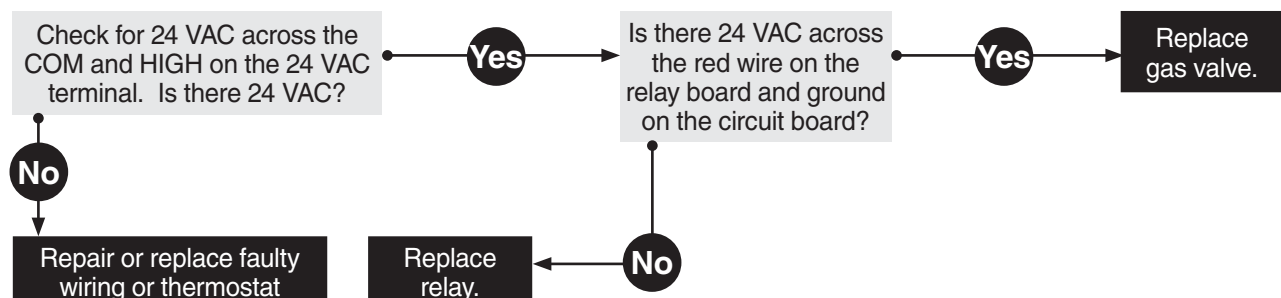
To measure flame current, disconnect input voltage, then insert a 0-50 μA DC meter and capacitor in series with the spark electrode as shown below. Reconnect input voltage and initiate call for heat. After sparking is complete and flame is established, meter should read 1.0 μA or higher while flame is established. If meter reads below "0" on the scale, meter leads are reversed. Disconnect power and reconnect meter lead for proper polarity.





If heater does not enter high fire mode, check the following:

NOTE: To confirm the heater is not in high-fire mode, check the manifold pressure (3.5 inches W.C. natural gas or 10 inches W.C. propane gas). If the indicator light is not illuminated, it is faulty and should be replaced. If the manifold pressure ranges from 2.3 to 2.8 inches W.C. natural gas (model dependent) and 6.0 to 7.5 inches W.C. propane gas (model dependent), the heater is in low fire mode and the troubleshooting steps described below should be followed.



5.0 Parts

Figure 5.1 • Burner Assembly Components

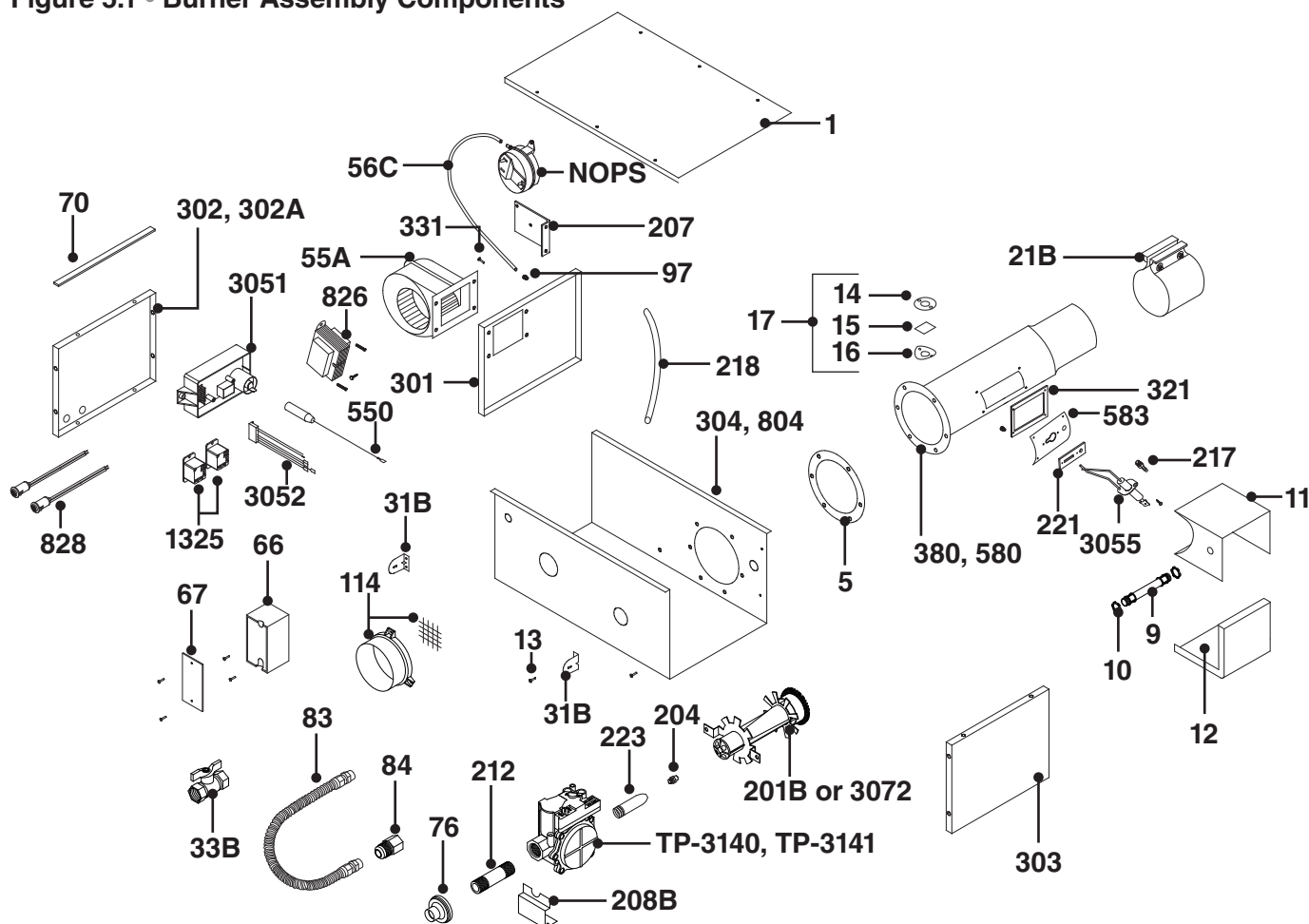
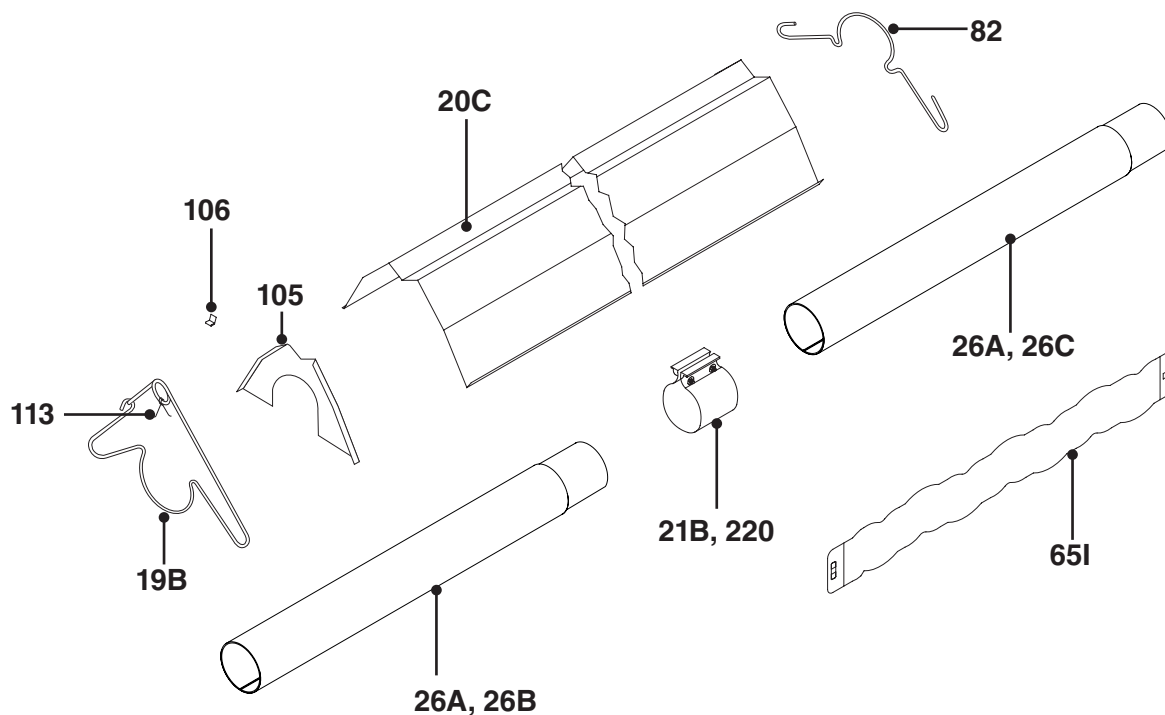


Chart 5.1 • Parts List

Part No.	Description	Part No.	Description
TP-1	Control Box Cover	TP-31B	Control Box Mounting Bracket
TP-5	Flange Gasket	TP-33B	1/2" Shut-Off Ball Valve / Inlet Tap
TP-9	Conduit Coupling	TP-55A	Fan Blower
TP-10	Conduit 4" x 1/2"	TP-56C	1/4" Atmospheric Tube (Vinyl)
TP-11	Ignitor Box	TP-65I	36" Interlocking Turbulator Baffle
TP-12	Ignitor Box Cover	TP-66	2" x 4" Outlet Box
TP-13	8 x 1/2" Self-Drilling Screw	TP-67	2" x 4" Outlet Box Cover
TP-14	Sight Glass Gasket	TP-70	Control Box Cover Gasket (per foot*)
TP-15	Sight Glass	TP-76	Rubber Grommet
TP-16	Sight Glass Washer	TP-82	Reflector Center Support (RCS)
TP-17	Sight Glass Kit	TP-83	24" Stainless Steel 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-97	1/4" x 1/4" Brass Int./Ext. Atmos. Barb Fitting
TP-21B	4" Standard Tube Clamp	TP-105	Aluminum Reflector End Cap
TP-26A	10 ft. Coated-ALUM Combustion/Radiant Tube	TP-106	Reflector End Cap Clips (8 pcs.)
TP-26B	10 ft. Coated-AL-TI Combustion Tube	TP-113	Reflector Tension Spring
TP-26C	10 ft. Uncoated Hot-Rolled Steel Radiant Tube	TP-114	Plastic Air Orifice w/ Screen (consult factory)

* 6 feet total required to cover outer edges of the burner control box.

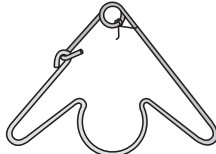

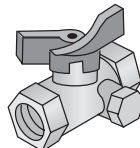


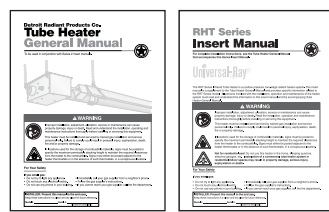
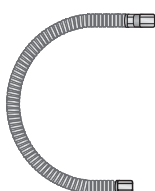
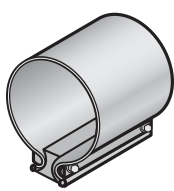

Figure 5.2 • Tube and Reflector Components



Part No.	Description	Part No.	Description
TP-201B	Burner (Tan) - consult factory	TP-580	16" Burner Tube with Flange (with fittings)
TP-204	Gas Orifice (consult factory)	TP-583	DSI Igniter Plate
TP-207	Pressure Switch Mounting Bracket	TP-804	Burner Control Box Outer Shell
TP-208B	Gas Valve Mounting Bracket	TP-826	40VA Transformer
TP-212	1/2" x 3" Pipe Nipple	TP-828	Yellow Operational Indicator Light
TP-217	Pressure Switch Barb	TP-1325	24VAC Switching Relay (Qty 2)
TP-218	Differential Switch Vinyl Exhaust Sensing Tube	TP-3140	Natural Gas Valve Assembly
TP-220	Stainless Steel Tube Clamp (150-200MBH)	TP-3141	Propane Gas Valve Assembly
TP-221	Spark Igniter Mounting Bracket Gasket	TP-NOPS	Normally Open Pressure Switch (see below)
TP-223	Gas Manifold	TP-264B	Differential Pressure Switch 50-100 MBH
TP-301	Center Divider Panel	TP-264E	Differential Pressure Switch 125-150 MBH
TP-302	End Panel, Left	TP-264D	Differential Pressure Switch 175 MBH
TP-303	End Panel, Right	TP-264F	Differential Pressure Switch 200 MBH
TP-304	Burner Control Box Outer Shell	TP-3051	DSI Circuit Board
TP-321	Ignition Plate Gasket	TP-3052	Wiring Harness
TP-331	Green Self Tap Ground Screw	TP-3055	Spark Igniter Electrode
TP-380	16" Burner Tube with Flange (no fittings)	TP-3072	Burner (Green) - Consult Factory
TP-550	Spark Transfer Wire - Orange		

Kit Contents Check List

Chart 5.2 • Kit Contents for RHT Series - Reference the length column for your model.

RHT Series Kit Contents						
TP-19B 4" Hanger with Reflector Tension Spring 	TP-82 4" Reflector Center Support (RCS) 	TP-33B 1/2" Shut-Off Valve (Ball Valve & Inlet Tap) 	TP-106 Reflector End Cap Clips 	TP-25** 1/4" Female Spade Terminal 	Tube Heater General Manual and RHT Series Insert Manual F/N: LIOGTa & LIORHT 	
TP-83 24" Stainless Steel Flexible Gas Connector 	TP-21B* 4" Tube Clamp 	TP-105 Reflector End Cap 				
Part No.	Description	20 ft.	30 ft.	40 ft.	50 ft.	60 ft.
TP-19B	4" Hanger w/ Tension Spring	3	4	5	6	7
TP-21B	4" Tube Clamp	2	3	4	5*	6*
TP-25	1/4" Female Spade Terminal**	3	3	3	3	3
TP-33B	1/2" Shut-Off Valve & Inlet Tap	1	1	1	1	1
TP-82	4" Reflector Center Support	2	3	4	5	6
TP-83	24" S.S. Flexible Gas Connector	1	1	1	1	1
TP-105	Reflector End Cap	2	2	2	2	2
TP-106	Reflector End Cap Clips	8	8	8	8	8
LIOGTa	General Tube Heater Manual	1	1	1	1	1
LIORHT	RHT Series Insert Manual	1	1	1	1	1
Filled By:						

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

** Not included with models installed with yellow control cord.

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 40 of the General Tube Heater Manual for terms and conditions.

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