DET3 Series
Insert Manual

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

RE-VERBER-RAY

The DET3 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 DET3 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.

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)

LIODET3-Rev. 21314
Print: 1M-8/15 (CDS)
Replaces: LIODET3-1M-6/15 (CDS)

Contents

1.0 Safety 3
Safety Labels and Their Locations 3
Clearances to Combustibles 4

2.0 Installation 6
Gas Requirements 6
Electrical Requirements. 6
Wiring 7
Specifications 10
Tube Installation Sequence 11

3.0 Operation 12
Sequence of Operation 12
Thermostat 13

4.0 Troubleshooting Guide 14

5.0 Parts 18
Burner Assembly Components 18
Tube and Reflector Components 19
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

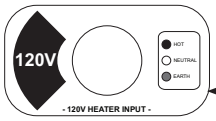


Read and understand all safety information and warnings in this Insert Manual and the Tube Heater General Manual before installation, operation and maintenance of the radiant tube heater system.

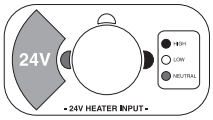
Safety Labels and Their Locations

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.

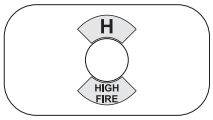
F/N: LLV3EP1
120V Input

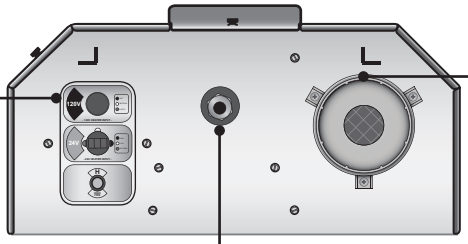


F/N: LLV3EP2
24V Input



F/N: LLV3EP7
High Fire Light

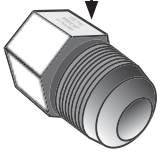




Rear Panel

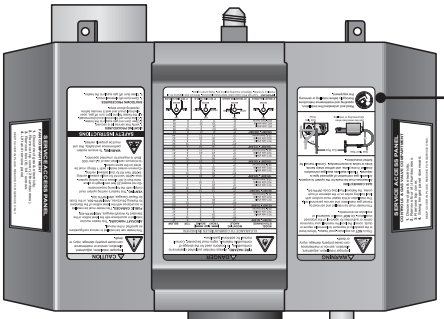


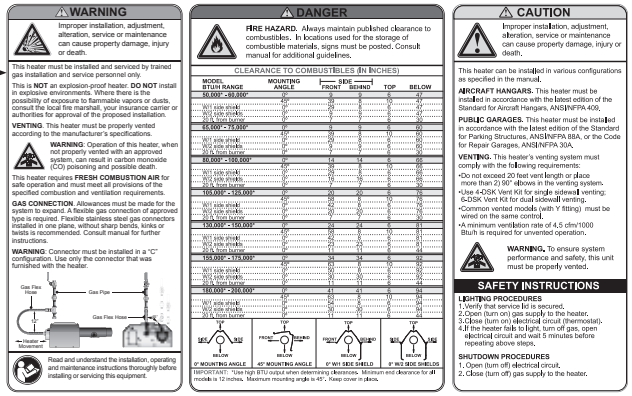
F/N: LLAC
Air Metering Orifice



F/N: LLTB018 (Natural Gas)
F/N: LLTB019 (Propane Gas)

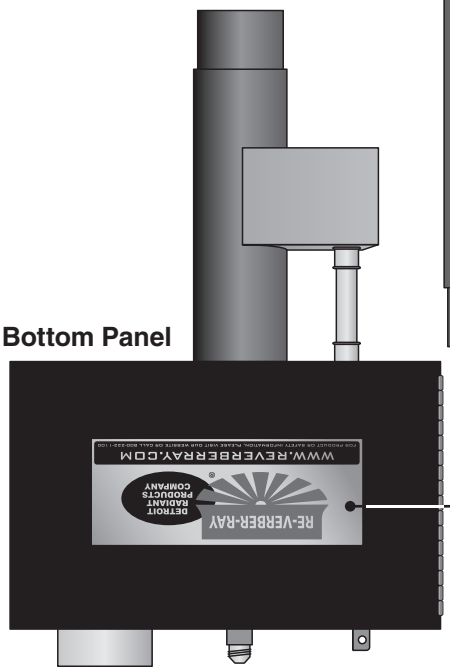
Top Panel

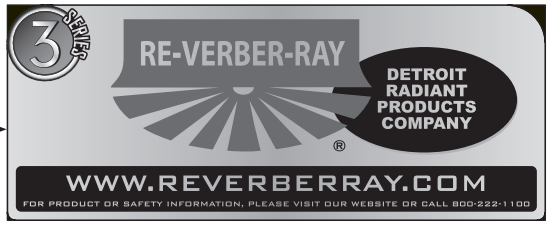




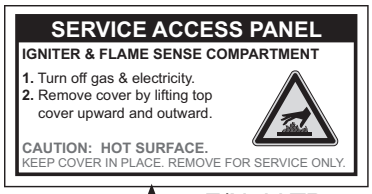
F/N: LLTCL006L, LLTCL001C/R
Clearance to Combustibles Labels

Bottom Panel

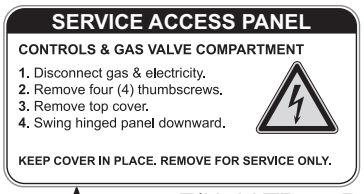




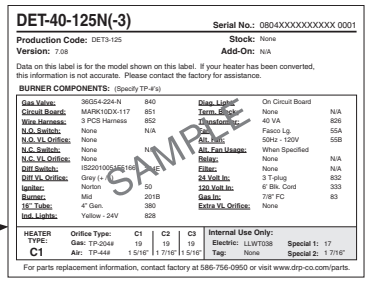
F/N: LLLOGO4
Logo Label



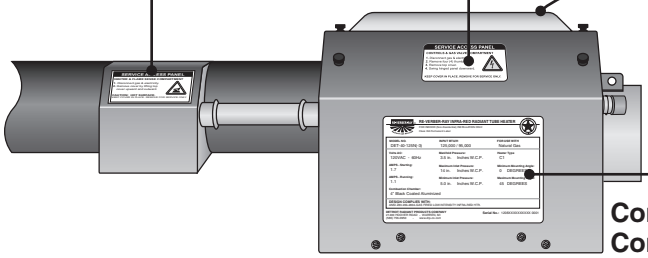
F/N: LLTB026



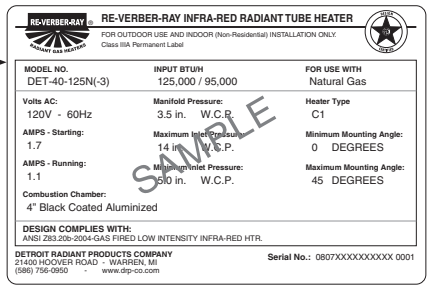
F/N: LLTB024R



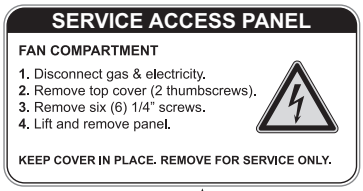
Burner Control Box Component Label
(affixed to center valve compartment lid)



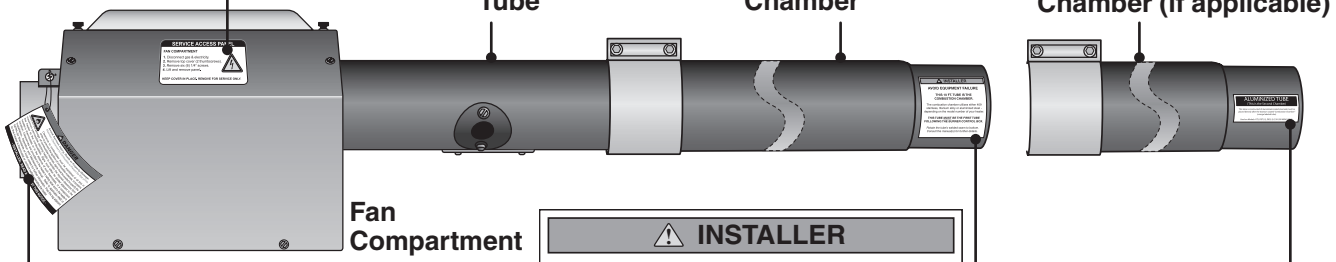
Controls Compartment



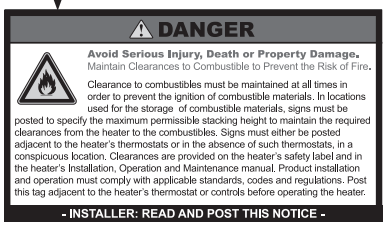
Rating Plate



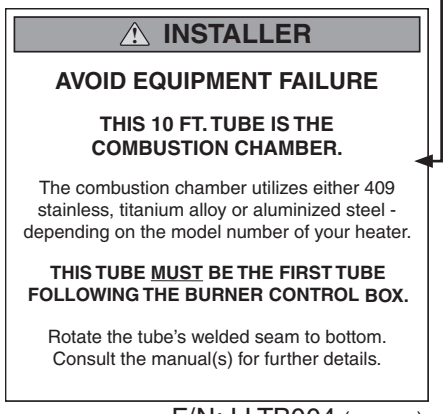
F/N: LLTB025L



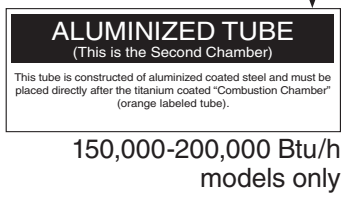
Fan Compartment



F/N: LL01 - Clearance Safety Tag
(Affix adjacent to heater's thermostat)



F/N: LLTB004 (orange)



150,000-200,000 Btu/h models only

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 and vapor in the vicinity 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.

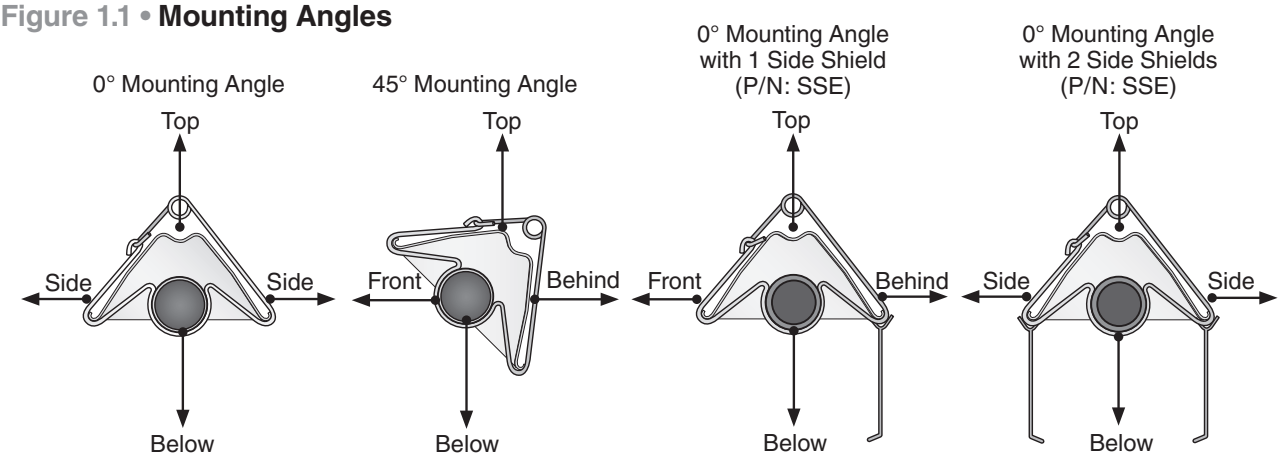
Chart 1.1 • Clearance to Combustibles in Inches (see Figure 1.1 for Mounting Angles)

Model Number	Mounting Angle*	Side		Top	Below
		Front	Behind		
DET (20, 30, 40) - (65, 75) [N, P] (-3)	0°	9	9	6	60
	45°	39	8	10	60
with 1 side shield	0°	29	8	6	60
with 2 side shields	0°	9	9	6	60
20 ft. from burner	0°	7	7	6	30
DET (30, 40) - 100 [N, P] (-3)	0°	14	14	6	66
	45°	39	8	10	66
with 1 side shield	0°	29	8	6	66
with 2 side shields	0°	16	16	6	66
20 ft. from burner	0°	7	7	6	30
DET (40, 50) - 125 [N, P] (-3)	0°	20	20	6	76
	45°	58	8	10	76
with 1 side shield	0°	42	8	6	76
with 2 side shields	0°	20	20	6	76
20 ft. from burner	0°	7	7	6	30
DET (40, 50, 60) - 150 [N, P] (-3)	0°	24	24	6	81
	45°	58	8	10	81
with 1 side shield	0°	42	8	6	81
with 2 side shields	0°	23	23	6	81
20 ft. from burner	0°	11	11	6	44
DET (50, 60) - 175 [N, P] (-3)	0°	34	34	6	92
	45°	63	8	10	92
with 1 side shield	0°	50	8	6	92
with 2 side shields	0°	30	30	6	92
20 ft. from burner	0°	11	11	6	44
DET (50, 60) - 200 [N, P] (-3)	0°	41	41	6	94
	45°	63	8	10	94
with 1 side shield	0°	54	8	6	94
with 2 side shields	0°	30	30	6	94
20 ft. from burner	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.

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

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

- 120VAC-60 Hz., single-phase, 3-wire.
- 24VAC thermostat connection.
- Starting current 1.7 amps
- Running current 1.1 amps

NOTICE

Connecting the thermostat with a voltage other than 24VAC may damage the heater. The DET3 Series requires a 24VAC connection to the thermostat. The DET3 Series is equipped with an internal relay board. A field supplied external transformer must be installed, see wiring diagram (Figures 2.1A-B).

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

Wiring

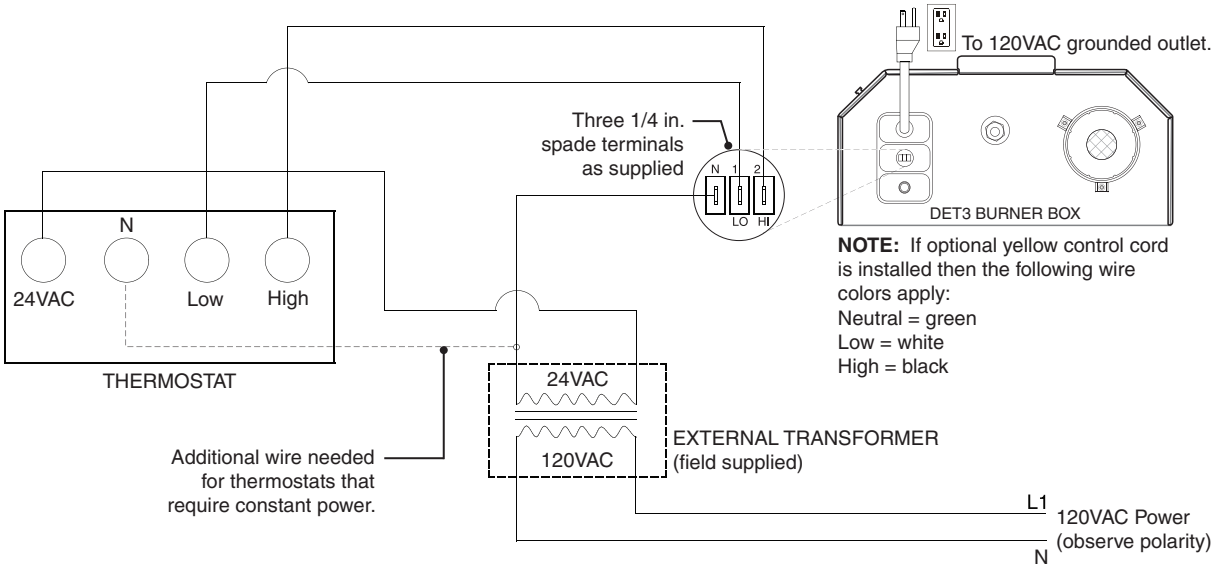
⚠ WARNING

Electric Shock

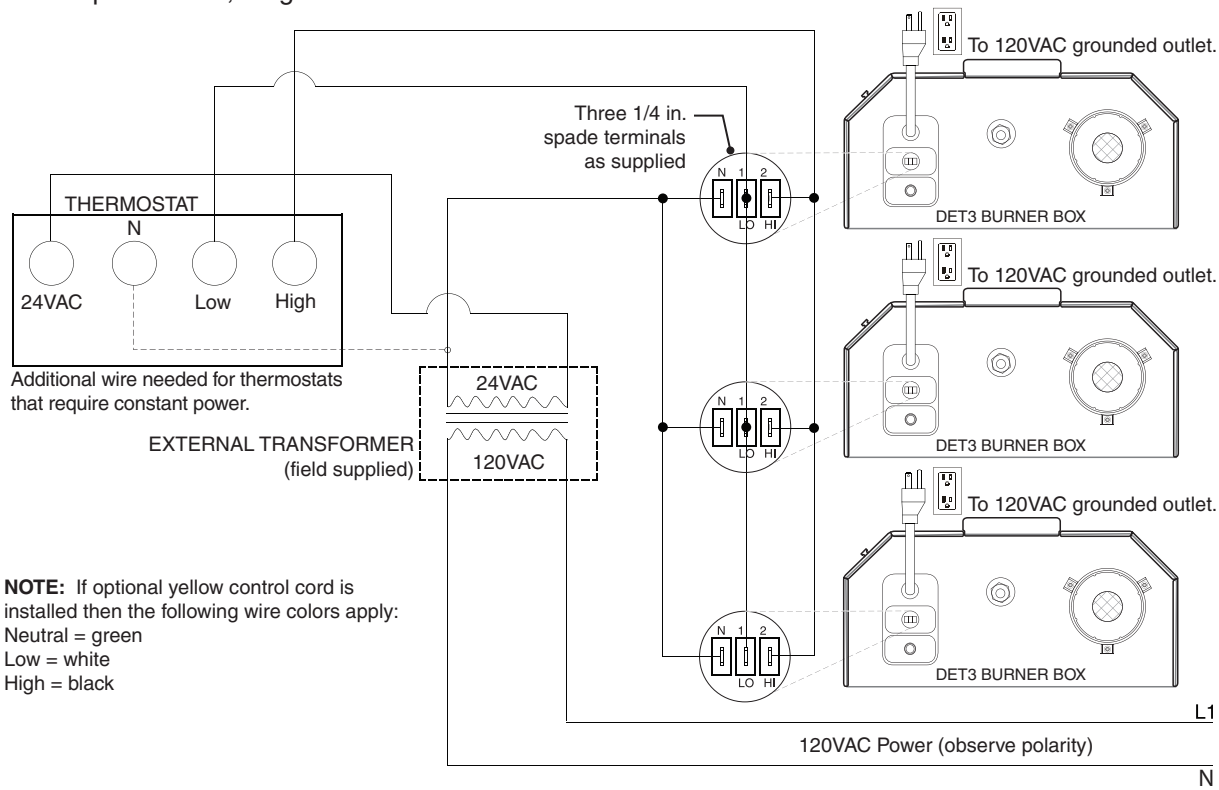
Field wiring to the tube heater must be connected and grounded in accordance with national, state, provincial, local codes and to the guidelines in the Tube Heater General Manual and Series Insert Manual. In the United States refer to the most current revisions to the ANSI/NFPA 70 Standard, and in Canada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

Figure 2.1 • Field Wiring Diagrams

A. Single Heater, Single Thermostat.



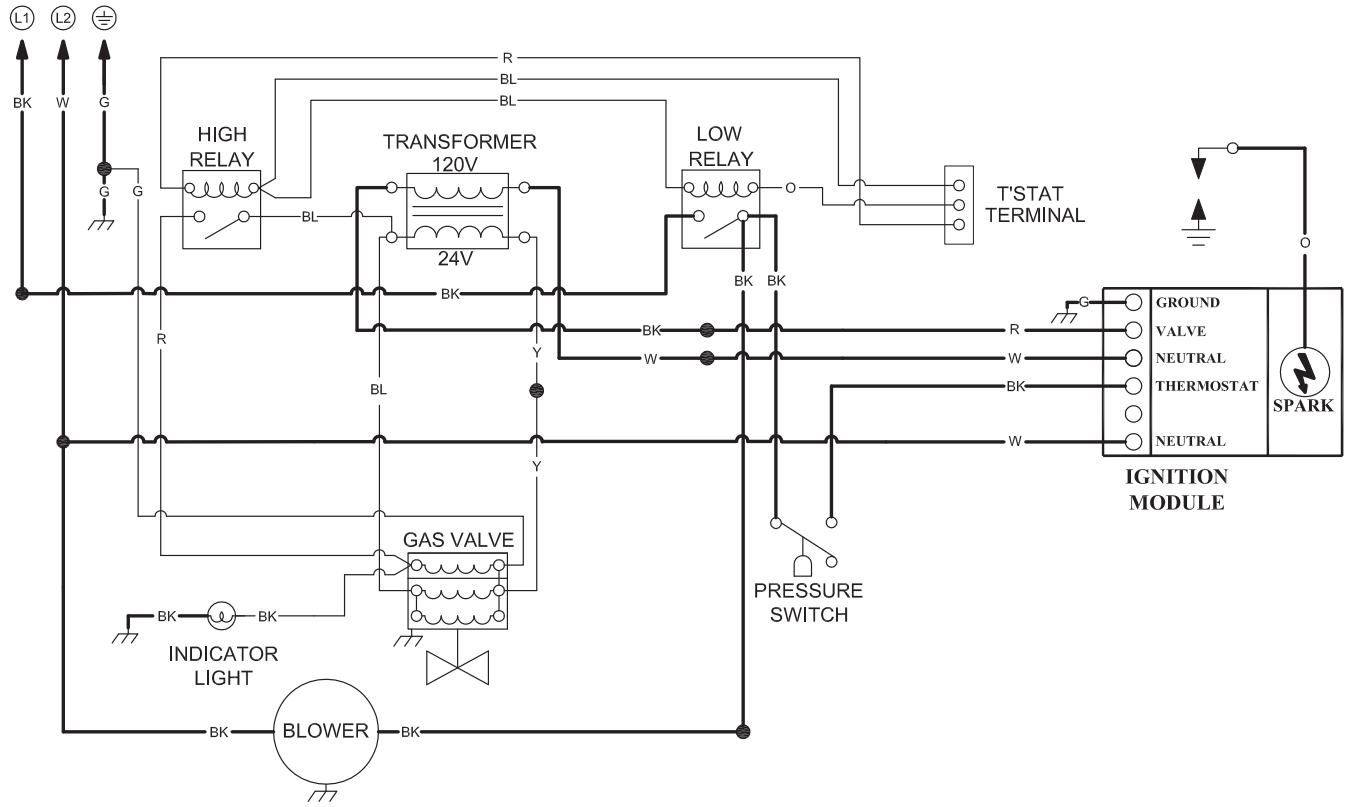
B. Multiple Heaters, Single Thermostat.



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 temperature rating of at least 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 — — — — — —

This page intentionally left blank.
There are no alternative wiring diagrams for the DET3 Series

Specifications

Chart 2.1 • Specifications

Model Number	Gas Type (Select One)	BTU/h (High Fire)	BTU/h (Low Fire)	Straight Length	U-Tube Length	Weight (lbs.)	Recommended Mounting Heights^	Combustion Chamber(s) (Black Coated)	Radiant Emitter Tube(s) (Uncoated)	Radiant Surface Area (sq. ft.)	36" Baffle Quantity
DET3-20-65	N or P	65,000	50,000	21'-9"	13'-1"	120	9' to 14'	Alum	HRT	20.2	5
DET3-20-75	N or P	75,000	50,000	21'-9"	13'-1"	120	10' to 15'	Alum	HRT	20.2	5
DET3-30-65	N or P	65,000	50,000	31'-5"	**17'-9"	160	10' to 15'	Alum	HRT	30.4	4
DET3-30-75	N or P	75,000	50,000	31'-5"	**17'-9"	160	11' to 18'	Alum	HRT	30.4	5
DET3-30-100	N or P	100,000	65,000	31'-5"	**17'-9"	160	12' to 20'	Alum	HRT	30.4	5
DET3-40-65	N or P	65,000	50,000	41'-1"	22'-9"	190	11' to 18'	Alum	HRT	40.5	3
DET3-40-75	N or P	75,000	50,000	41'-1"	22'-9"	190	11' to 18'	Alum	HRT	40.5	4
DET3-40-100	N or P	100,000	65,000	41'-1"	22'-9"	190	12' to 20'	Alum	HRT	40.5	4
DET3-40-125	N or P	125,000	82,000	41'-1"	22'-9"	190	13' to 23'	Alum	HRT	40.5	5
DET3-40-150	N or P	150,000	100,000	41'-1"	22'-9"	190	14' to 25'	Titan/Alum	HRT	40.5	5
DET3-50-125	N or P	125,000	82,000	50'-9"	**27'-5"	235	15' to 27'	Alum	HRT	50.6	3
DET3-50-150	N or P	150,000	100,000	50'-9"	**27'-5"	235	15' to 27'	Titan/Alum	HRT	50.6	3
DET3-50-175	N or P	*175,000	125,000	50'-9"	**27'-5"	235	16' to 30'	Titan/Alum	HRT	50.6	3
DET3-50-200	N or P	*200,000	145,000	50'-9"	**27'-5"	235	17' to 35'	Titan/Alum	HRT	50.6	2
DET3-60-150	N or P	150,000	100,000	60'-5"	32'-5"	265	16' to 30'	Titan/Alum	HRT	60.7	2
DET3-60-175	N or P	*175,000	125,000	60'-5"	32'-5"	265	16' to 30'	Titan/Alum	HRT	60.7	2
DET3-60-200	N or P	*200,000	145,000	60'-5"	32'-5"	265	17' to 35'	Titan/Alum	HRT	60.7	2

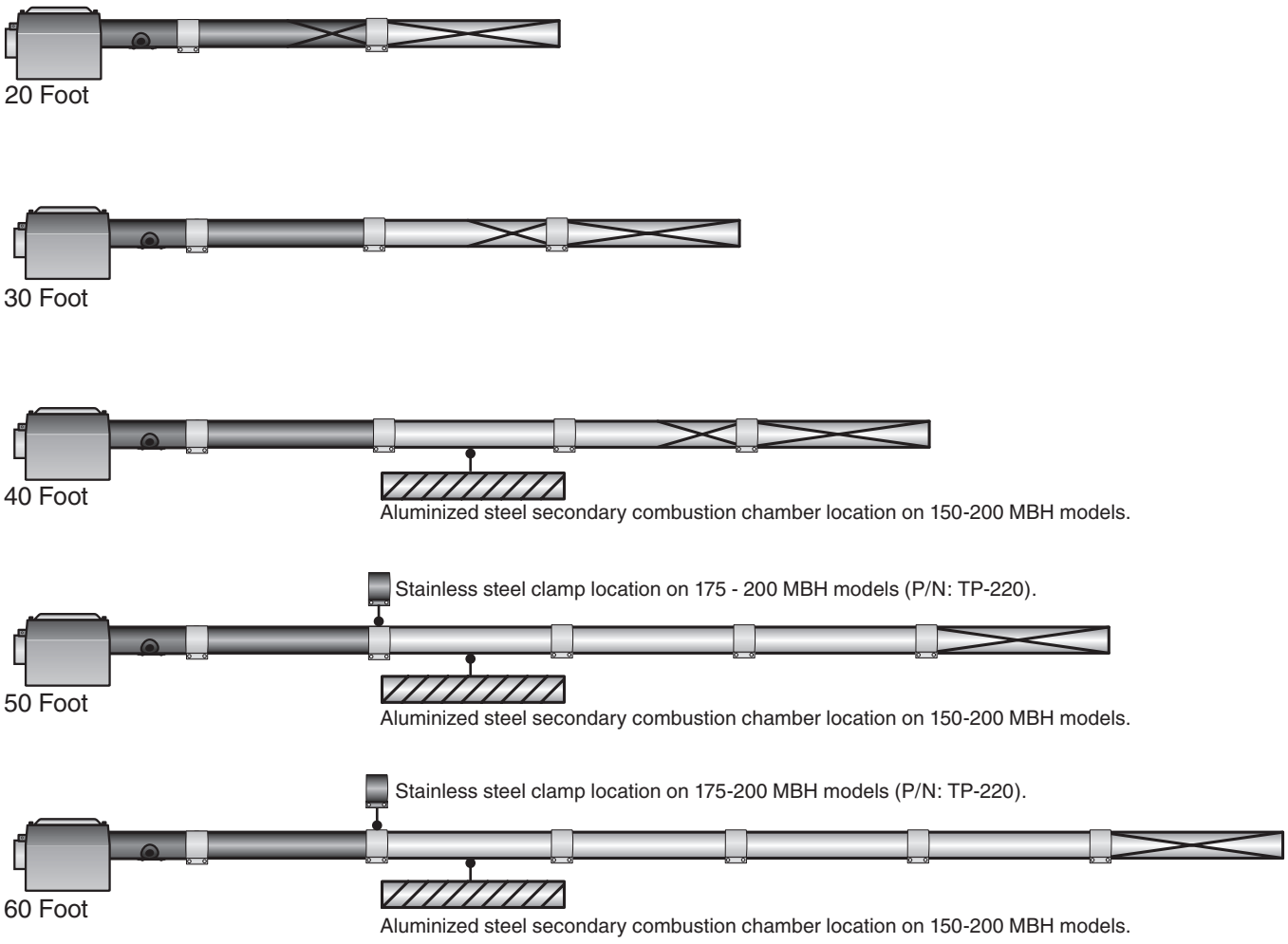
* Model requires stainless steel tube clamp (P/N: TP-220) to be located at the seam between the primary combustion chamber and the secondary combustion tube downstream of the burner control box.
** Model requires 5EA-SUB accessory package when installing in a 'U' configuration (P/N: TF1B).
^ Factory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

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

HRT = Uncoated hot-rolled steel.
Alum= Black coated aluminized treated steel.
Titan = Black coated titanium stabilized aluminized steel.

Figure 2.4 • Tube Installation Sequence

Important! The combustion chamber(s) & radiant tube section(s) must be installed in the following order.



Key

- Burner Control Box with 16” Burner Tube
- Primary Combustion Chamber Tube
- Secondary Aluminized Steel Combustion Chamber (150-200 MBH models only)
- Hot-rolled Steel 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

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 Tube Heater General Manual for installation requirements.

Sequence of Operation

Two voltages (120VAC supply and 24VAC control) must be supplied to the DET3 Series burner control box for proper operation.

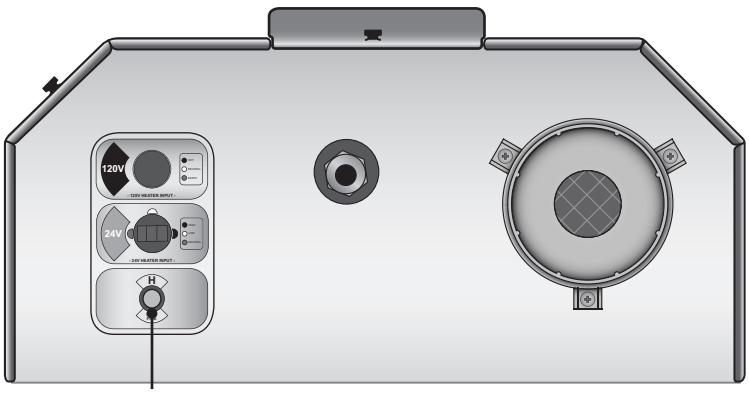
Starting Circuit: Upon a call for heat, the low fire relay is energized by 24VAC from the thermostat. The relay is closed sending 120VAC to the blower beginning the sequence of operation.

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 24VAC signal to the high fire relay. The energized coil of the relay is closed, allowing 24VAC to continue onto the high fire of the gas valve.

Figure 3.1 • Operational Indicator Light



Light 1
Indicates High Fire Mode

Thermostat

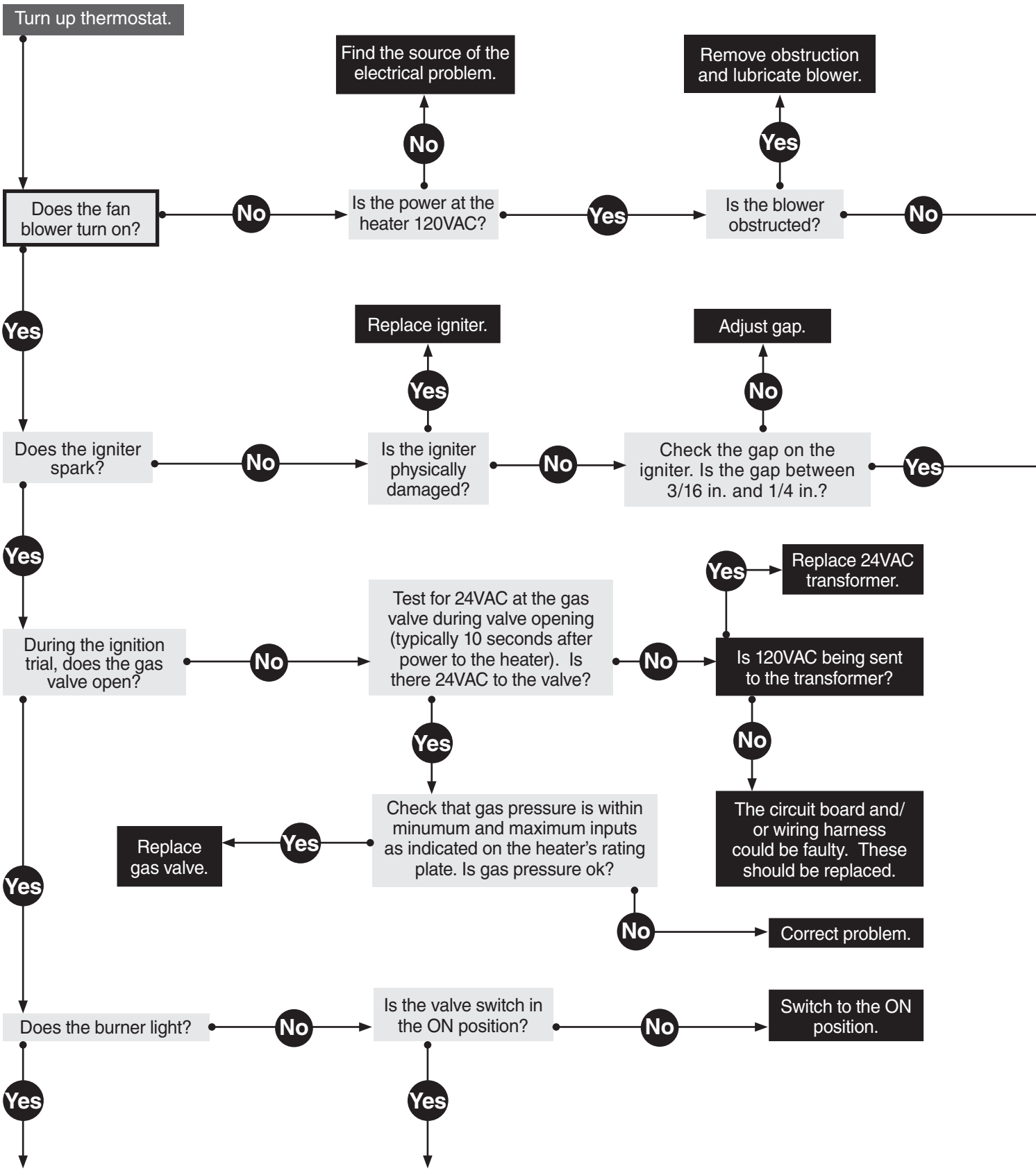
NOTE: Different thermostats operate according to their particular features. Refer to thermostat specifications for details.

DET3 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 in. female spade terminals. Do not supply 120VAC to the 24VAC connection.

Example: Desired room temperature is 65° F. The preset differential of the thermostat is 1° F. The preset differential for High fire mode is 3° F.

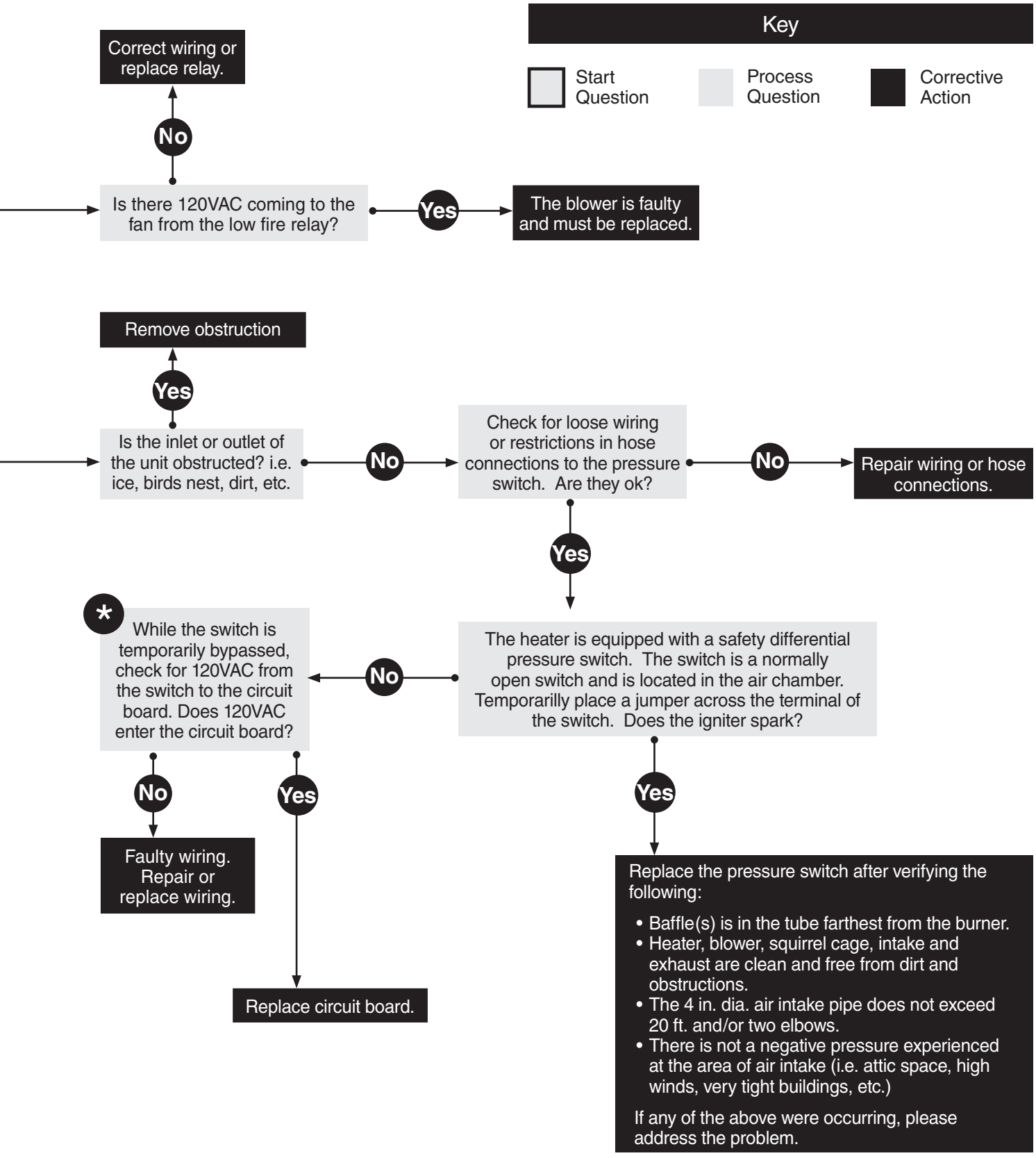
When the temperature drops below the Low Fire preset differential of the thermostat (63° F), Low Fire will activate. If the temperature continues to drop below the preset differential for High Fire, High Fire will activate bringing the temperature back up to the Low Fire preset quickly.

4.0 Troubleshooting Guide

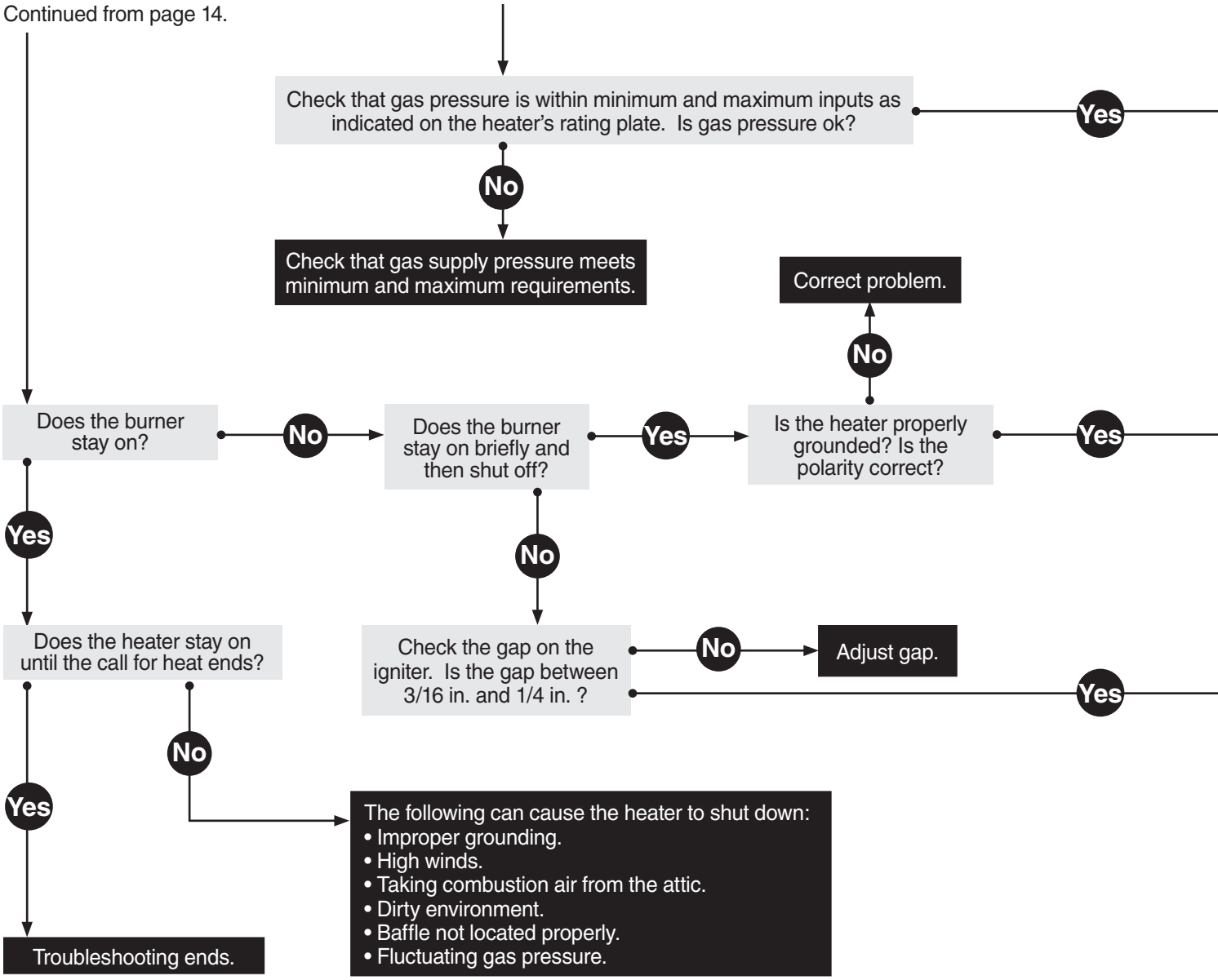


Continued on page 16.

***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.

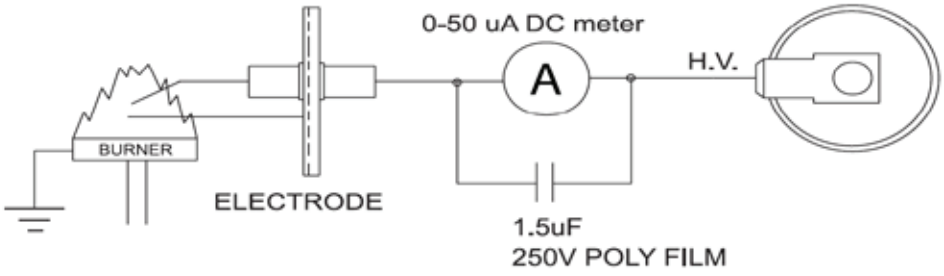


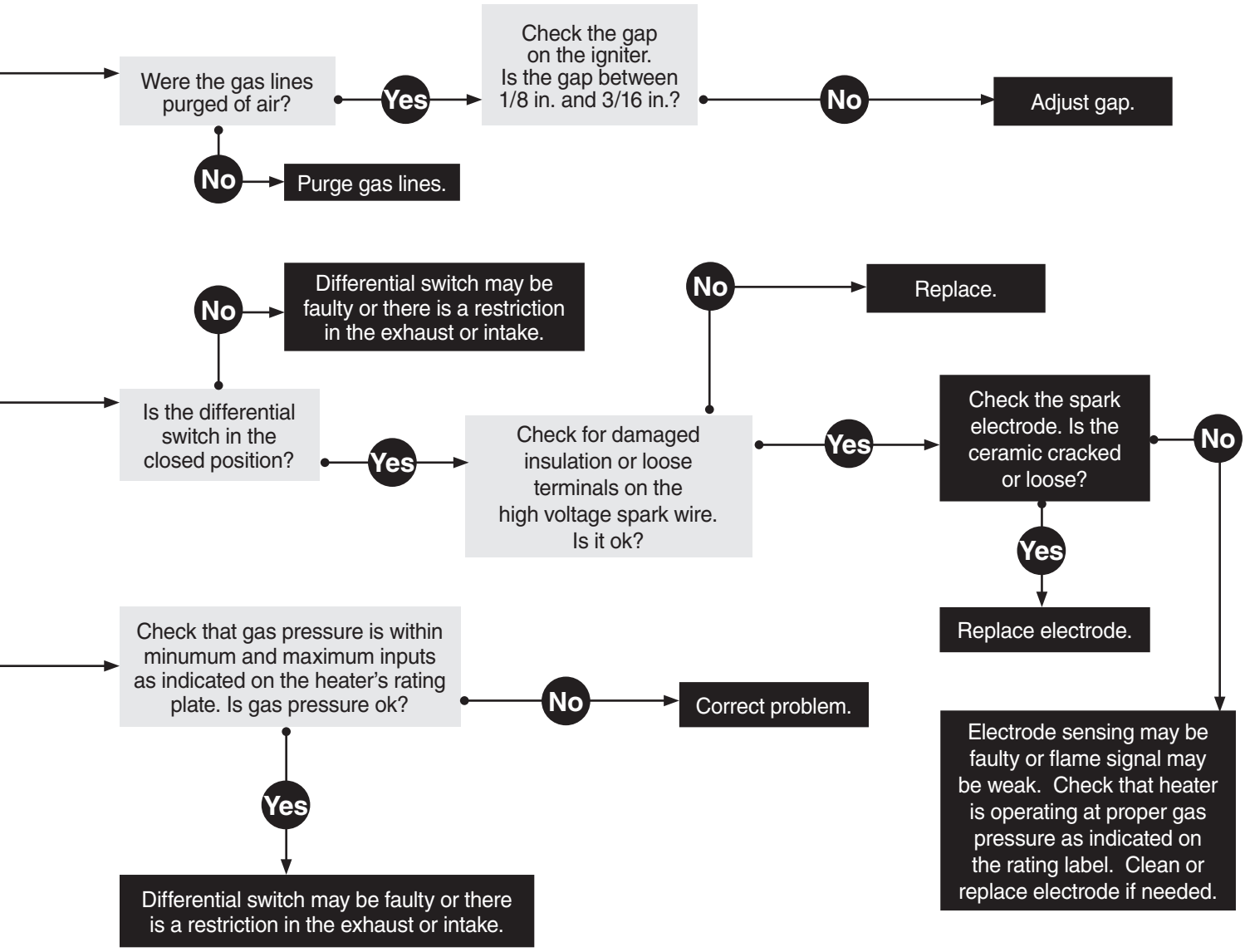
Continued from page 14.



Flame Current Check: Single Spark & Sense

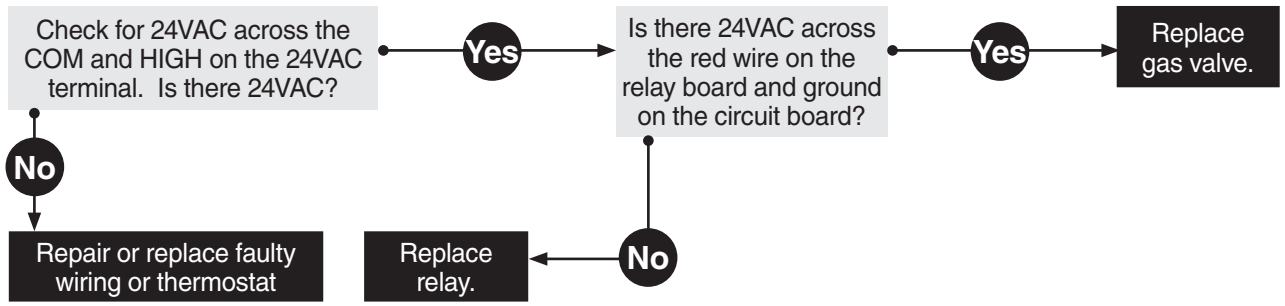
To measure flame current, disconnect input voltage, then insert a 0-50 µA DC meter and capacitor in series with the spark electrode as shown below. Reconnect input voltage and initiate call for heat. After sparking is complete and flame is established, meter should read 1.0 µA or higher while flame is 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

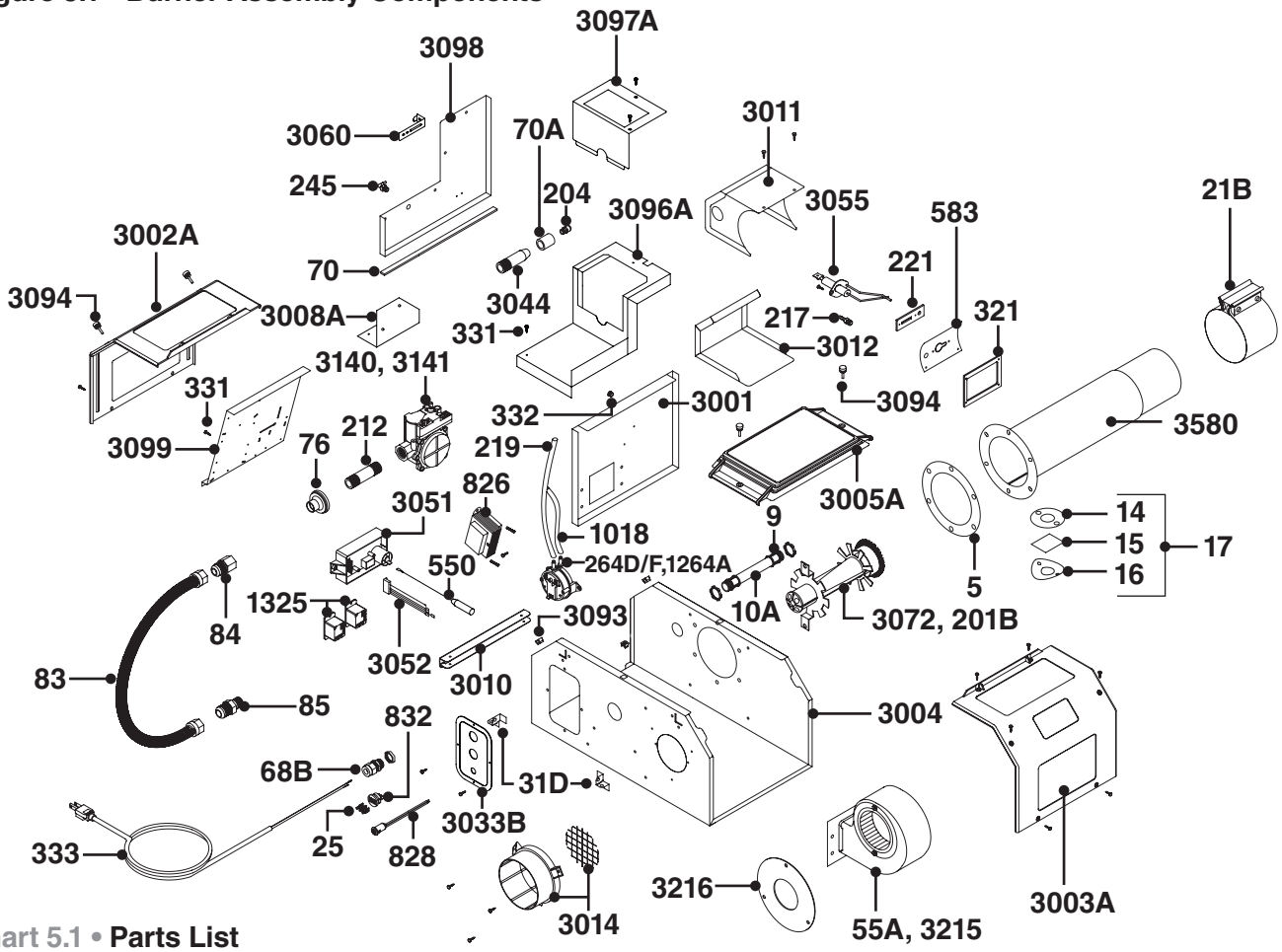
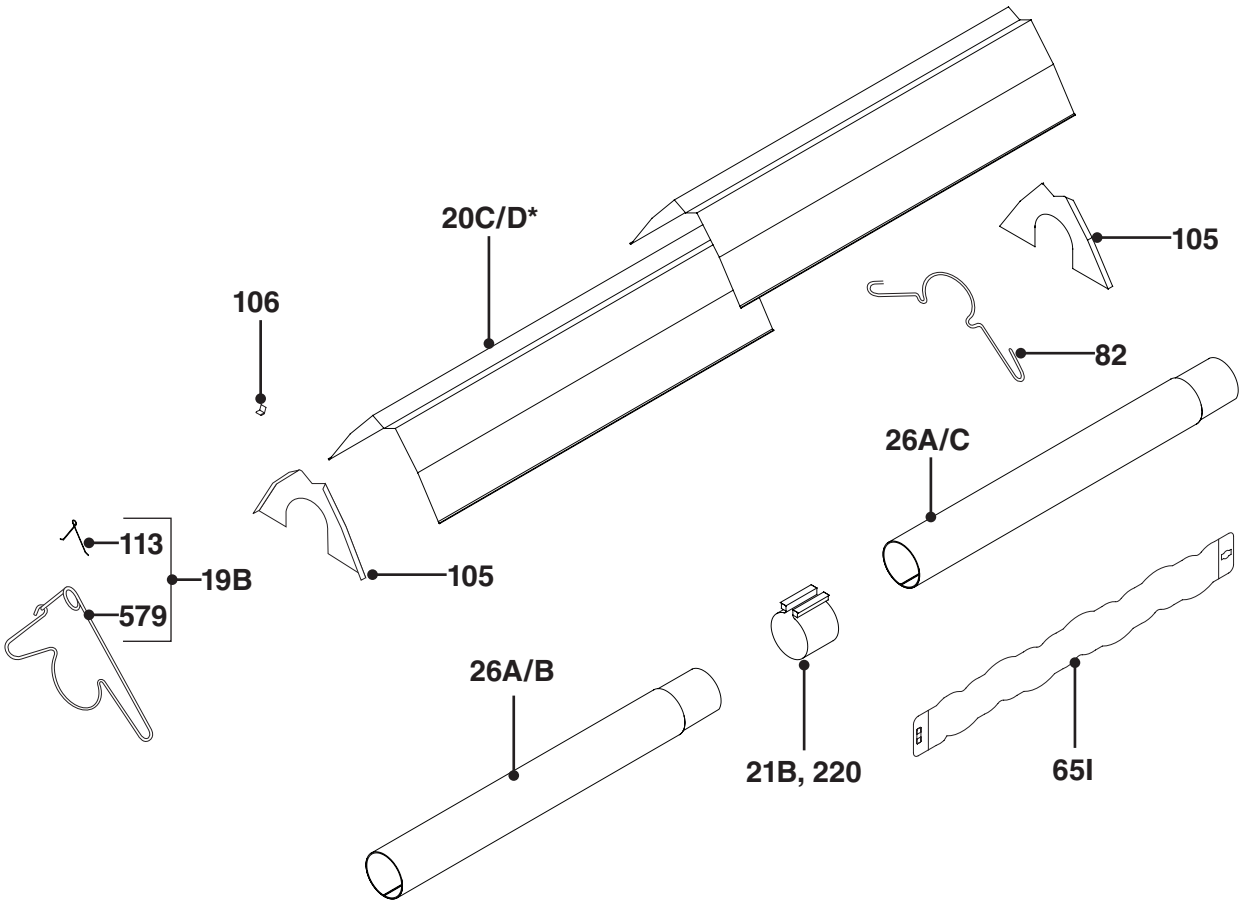


Chart 5.1 • Parts List

Part #	Description	Part #	Description
TP-5	Flange Gasket	TP-70A	1 in. Control Box Gasket (6 inches)
TP-9	Conduit Coupling	TP-76	Rubber Grommet
TP-10A	Conduit 4” x 3/4”	TP-82	Reflector Center Support
TP-14	Sight Glass Gasket	TP-83	Stainless Steel Flexible Gas Connector
TP-15	Sight Glass	TP-84	1/2 in. Female/Male Flare Fitting
TP-16	Sight Glass Washer	TP-85	1/2 in. Male/Male Flare Fitting
TP-17	Sight Glass Kit	TP-105	Reflector End Cap
TP-19B	4 in. Wire Hanger with Tension Spring	TP-106	Reflector End Cap Clips (8 pcs.)
TP-20C	10 ft. Aluminum Reflector	TP-113	Reflector Tension Spring
TP-20D*	10 ft. Stainless Steel Reflector	TP-201B	V.3 Mid-High Burner (Color Code - TAN)
TP-21B	4 in. Tube Clamp	TP-204	Gas Orifice - Consult Factory
TP-25	1/4 in. Female Spade Terminal (Qty. 3)	TP-212	1/2” x 3” Pipe Nipple
TP-26A	10 ft. Aluminized Combustion Tube	TP-217	Brass Pressure Switch Barb Fitting
TP-26B	10 ft. Titanium Primary Combustion Tube	TP-219	Differential Vinyl Sensing Tube
TP-26C	10 ft. Uncoated Hot Rolled Radiant Tube	TP-220	4 in. Dia. Stainless Steel Tube Clamp
TP-31D	Mounting Bracket (Qty. 2)	TP-221	Spark Igniter Mounting Bracket Gasket
TP-55A	1/20 hp Inducer Assembly (50-150 MBH)	TP-245	3/16” X 1/8” Plastic Gas Valve 90° Vent
TP-65I	36 in. Interlocking Turbulator Baffle Section	TP-264D	Differential Pressure Switch, 60 to 75 MBH
TP-68B	Large Strain Relief Bushing	TP-264F	Differential Pressure Switch, 150 to 200 MBH
TP-70	1/2 in. Control Box Gasket (10.3 inches)	TP-321	Ignition Plate Gasket

* Optional upgrade or add-on item.

Figure 5.2 • Tube & Reflector Components

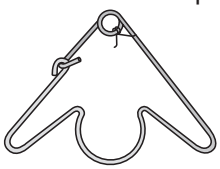
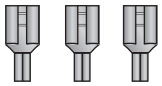
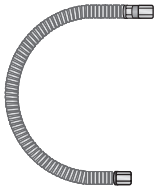
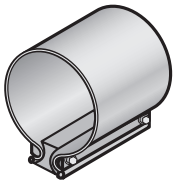
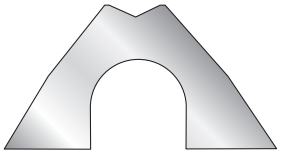
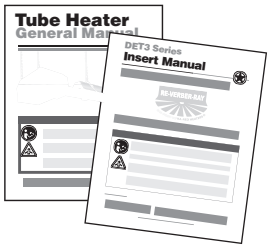


Part #	Description	Part #	Description
TP-331	Green Self-Tap Ground Screw (Qty. 2)	TP-3012	Spark Igniter Box Cover
TP-332	Divider Grommet	TP-3014	Plastic Air Orifice w/ Screen - Contact Factory
TP-333	6 ft. Black 120VAC Power Cord	TP-3033B	DET3 Power Entry Plate
TP-550	Spark Transfer Wire - Orange	TP-3044	Gas Manifold
TP-579	4 in. Wire Hanger	TP-3051	35-72 DSI Circuit Board
TP-583	Spark Igniter Plate	TP-3052	Wiring Harness
TP-826	40VA Transformer	TP-3055	Spark Igniter Electrode
TP-828	Yellow 24VAC High Fire Indicator Light	TP-3060	Pressure Switch Mounting Bracket
TP-832	Thermostat Terminal Strip	TP-3072	Low BTU Burner (Color Code - GREEN)
TP-1018	APS 1/4 in. Silicone Sensing Tube	TP-3093	#8-32 Cage Nut (Qty. 4)
TP-1264A	Differential Pressure Switch, 100 to 125 MBH	TP-3094	#8-32 x ½ in. Black Nylon Shoulder Screw (Qty. 4)
TP-1325	24VAC Switching Relay (Qty. 2)	TP-3096A	Valve Compartment Bottom Panel
TP-3001	Divider Panel	TP-3097A	Valve Compartment Top Panel
TP-3002A	Plastic Control Compartment End Panel	TP-3098	Valve Compartment Side Panel
TP-3003A	Plastic Fan Compartment End Panel	TP-3099	Controls Mounting Panel
TP-3004	Main Control Box Panel	TP-3140	36G54-224 Gas Valve - Natural Gas Assembly
TP-3005A	Plastic Valve Compartment Lid	TP-3141	36G54-226 Gas Valve - Propane Gas Assembly
TP-3008A	Gas Valve Mounting Bracket	TP-3215	1/15 hp Inducer Assembly (175-200 MBH)
TP-3010	Service Panel Hinge	TP-3216	Restrictor Plate (175-200 MBH)
TP-3011	Spark Igniter Box	TP-3580	16 in. DSI Burner Tube Flange with Fittings

* Optional upgrade or add-on item.

Kit Contents Check List

Chart 5.2 • Kit Contents for DET3 Series - Reference the length column for your model.

DET3 Series Kit Contents			
TP-19B 4" Hanger with Reflector Tension Spring 	**TP-82** 4 in. Reflector Center Support (RCS) 	**TP-25*** 1/4 in. Female Spade Terminals 	**TP-106** Reflector End Cap Clips 
TP-83 24 in. Stainless Steel Flex. Gas Connector 	**TP-21B** 4 in. Tube Clamp 	**TP-105** Reflector End Cap 	General Manual and DET3 Series Insert **F/N: LIOGT3 & LIODET3** 

Part No.	Description	20 ft.	30 ft.	40 ft.	50 ft.	60 ft.
TP-19B	4 in. Wire Hanger	3	4	5	6	7
TP-21B	4 in. Tube Clamps	2	3	4	5**	6**
TP-25*	1/4 in. Female Spade Terminals*	3	3	3	3	3
TP-82	4 in. Reflector Center Support	1	1	1	1	1
TP-83	24 in. S.S. Flexible Gas Connector	1	1	1	1	1
TP-105	Reflector End Caps	2	2	2	2	2
TP-106	Reflector End Cap Clips	8	8	8	8	8
LIOGT3	Tube Heater General Manual	1	1	1	1	1
LIODET3	DET3 Series Insert Manual	1	1	1	1	1
Filled By:						

* Not included when heater is equipped with yellow control cord.

** 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.

Approvals

- CSA
- Commercial approval.

Limited Warranty

- 1 year - Burner box components.
- 2 years - Combustion and radiant tubes.
- 3 years - Stainless steel burner.
- See page 36 of the General Tube Heater Manual for Terms and Conditions.

© 2015 Detroit Radiant Products Co.

21400 Hoover Road • Warren, MI 48089
Phone: 586-756-0950 • Fax: 586-756-2626
www.detroitradiant.com • sales@drp-co.com