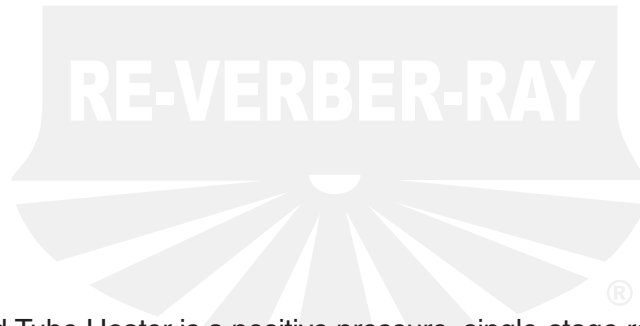


DES Series Insert Manual



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



The DES Series Infra-Red Tube Heater is a positive pressure, single-stage radiant heater system. This insert manual is a supplement to the Tube Heater General Manual and provides specific information related to the DES 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 Tube Heater General Manual accompanying this insert.

⚠ 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.

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

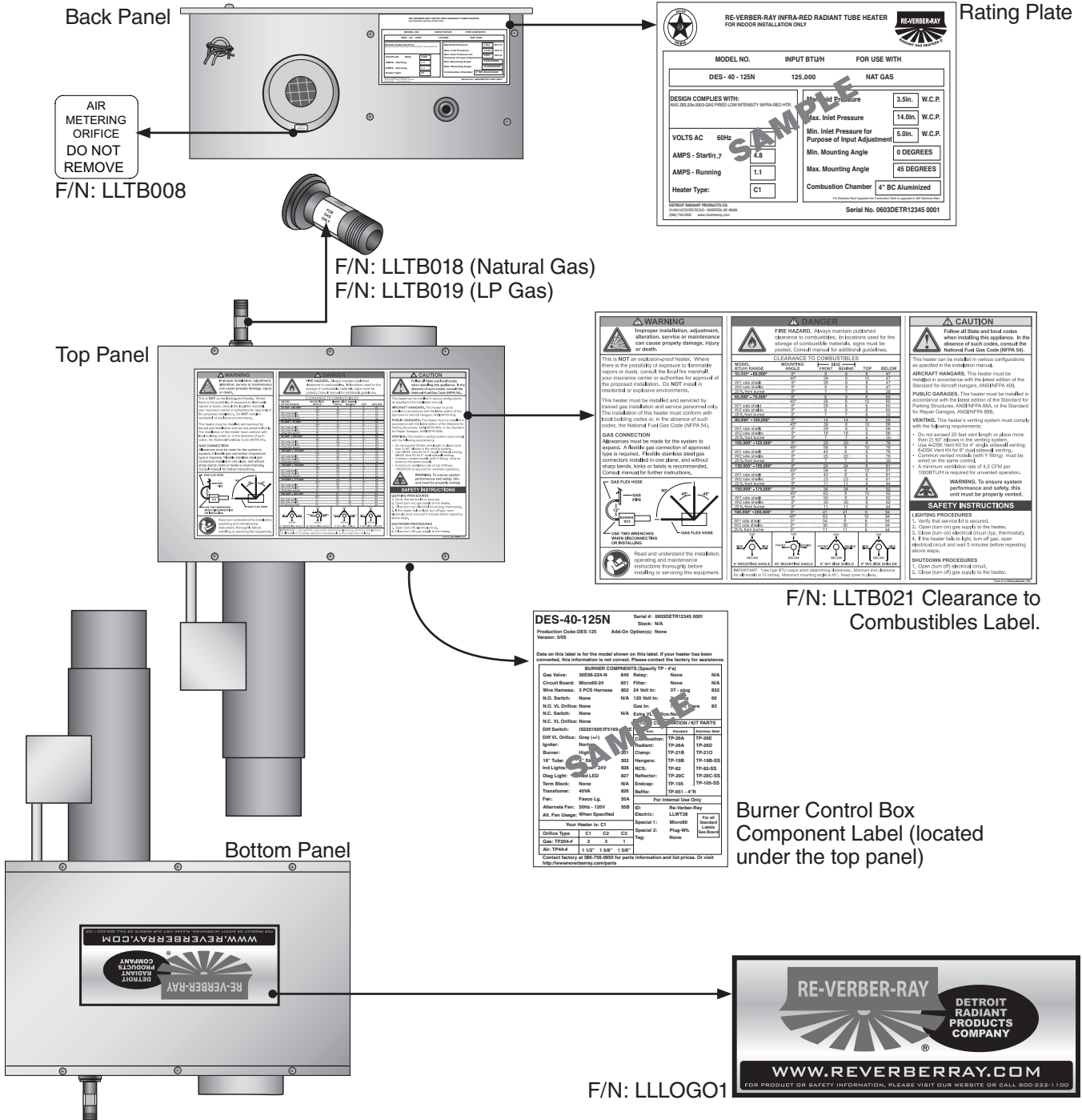
1.0 Safety

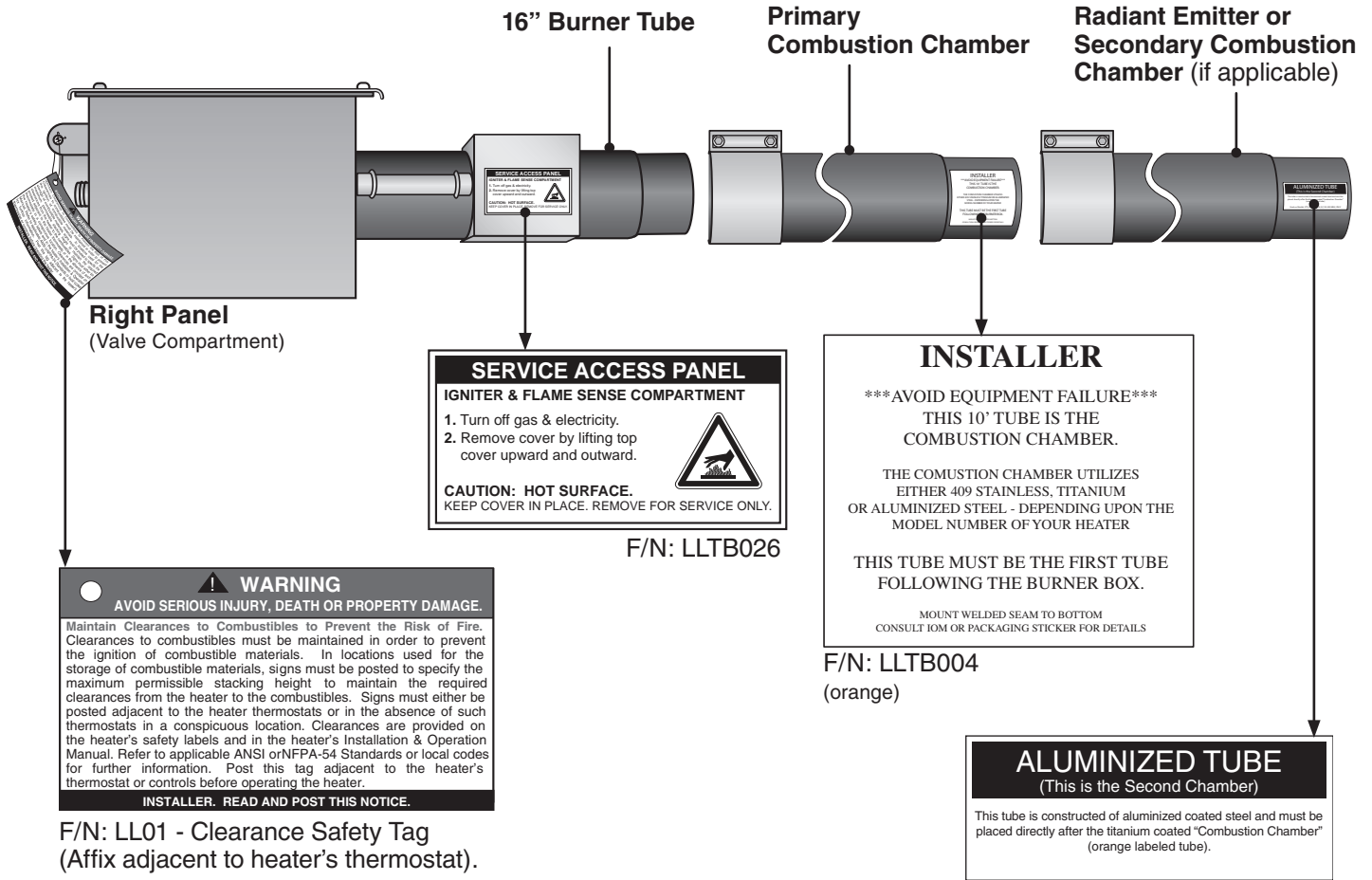


Read and understand all safety information and warnings in this insert manual and the Tube Heater General Manual before installation, operation and maintenance of the radiant tube heater system.

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.





Clearance to Combustibles



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 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.

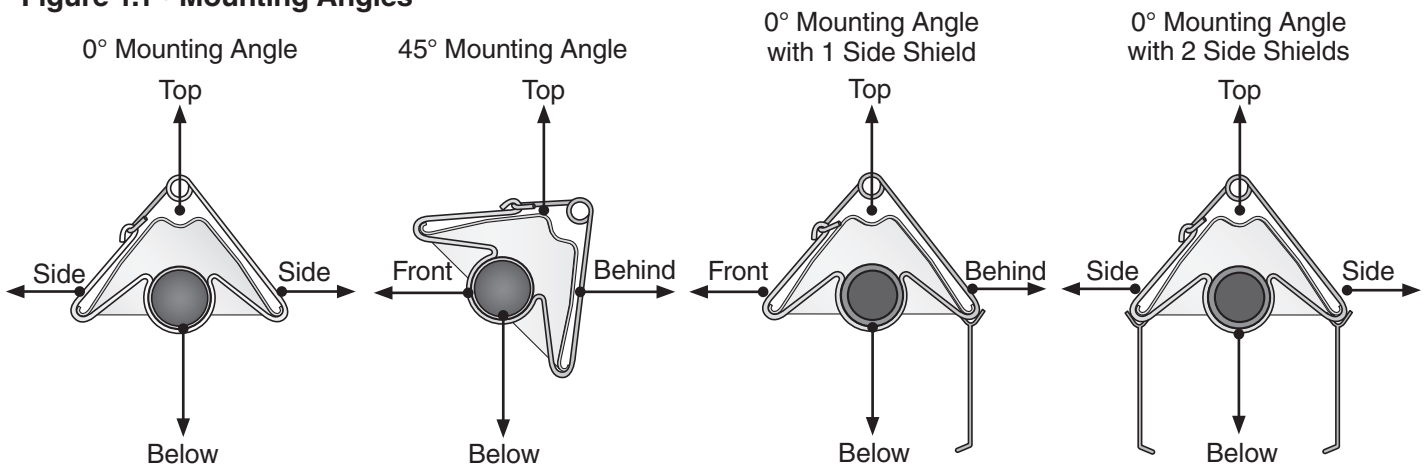
When installing the tube heater system, clearances to combustibles for the Series tube heater and configuration must be maintained. Refer to Chart 1.1 on the following page to determine the required distances for your model.

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

Model Number	Mounting Angle *	Sides		Top	Below	
		Front	Behind			
DES (20, 30, 40) - (50, 60) [N, P]	0°	9	9	6	47	
	45°	39	8	10	47	
	with 1 side shield	0°	29	8	6	47
	with 2 side shields	0°	9	9	6	47
	20 ft. from burner	0°	7	7	6	30
DES (20, 30, 40) - 75 [N, P]	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
DES (30, 50, 40) - 100 [N, P]	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
DES (40, 50, 60) - 125 [N, P]	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
DES (40, 50, 60) - 150 [N, P]	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
DES (50, 60) - 175 [N, P]	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
DES (50, 60) - 200 [N, P]	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.

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:

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

- 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

Electrical Requirements

NOTICE

It is recommended that the thermostat be installed on the hot side of a fused supply line and have sufficient ampere rating for the heater(s) that it controls.

- 120 Volt - 60 Hz, 3-wire.
- 120 Volt thermostat connection.
- Starting current 1.7 amps
- Running current 1.1 amps

Wiring

⚠ WARNING

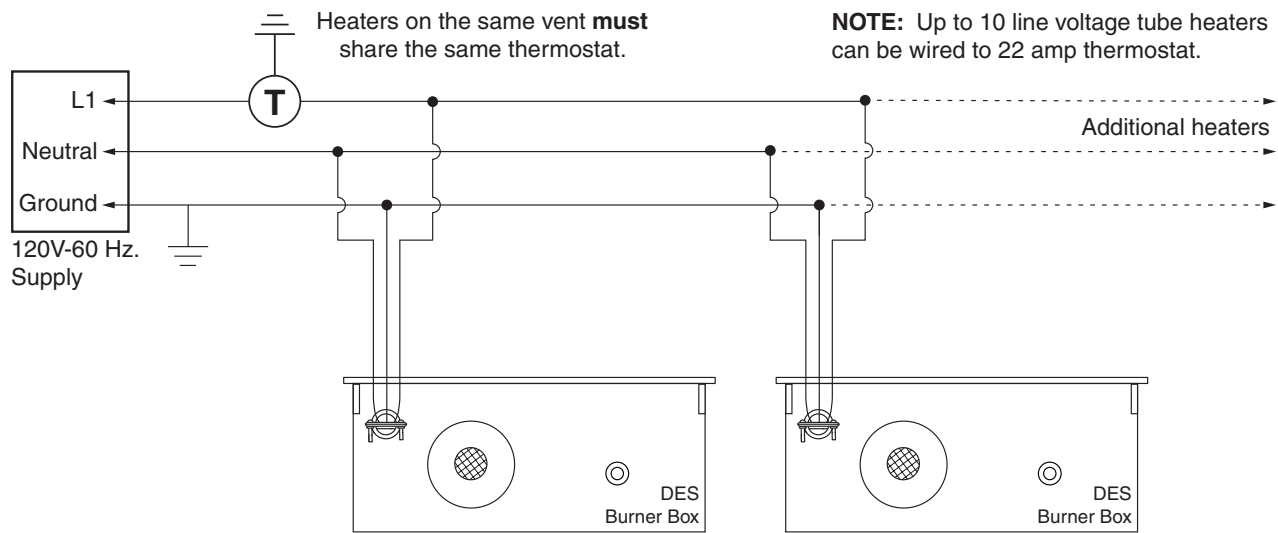


Electric Shock

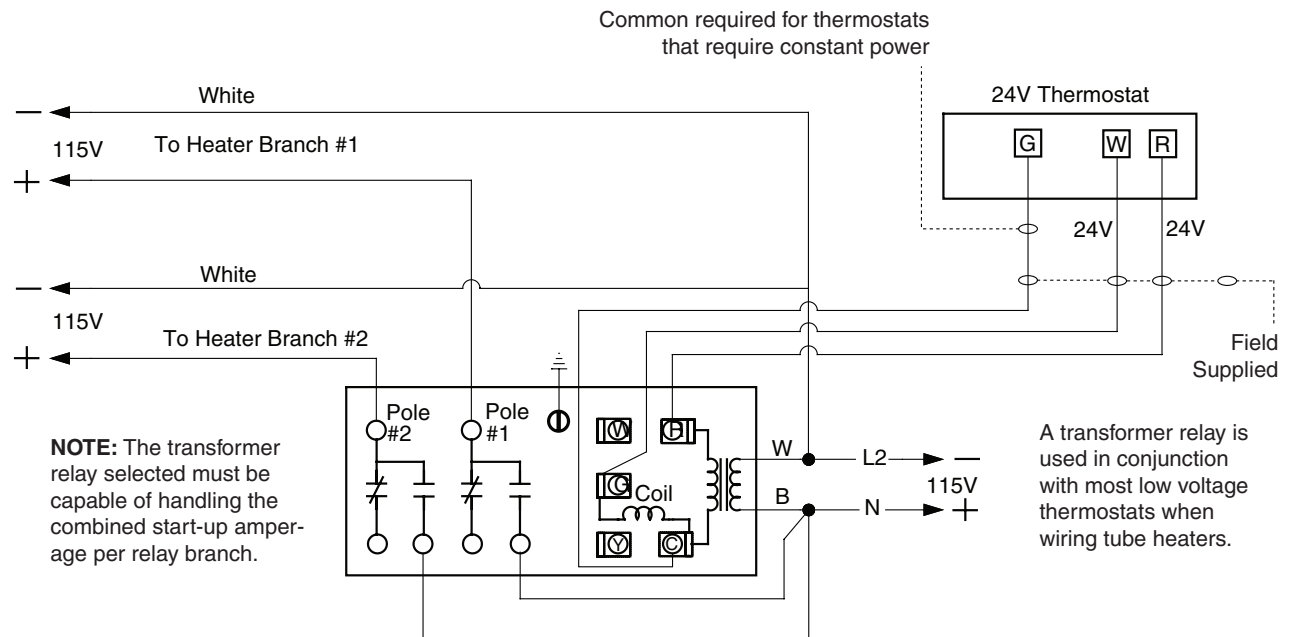
Field wiring to the tube heater must be connected and grounded in accordance with national, state, provincial, local codes and to the guidelines in the Detroit Radiant General and Series manuals. In the United States refer to the most current revisions to the ANSI/NFPA 70 Standard and in Canada refer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

Figure 2.1 • Field Wiring Diagrams

A. 120V Thermostat Connection(s).



B. 24V Thermostat Control (requires optional combination relay transformer P/N: R8285B).

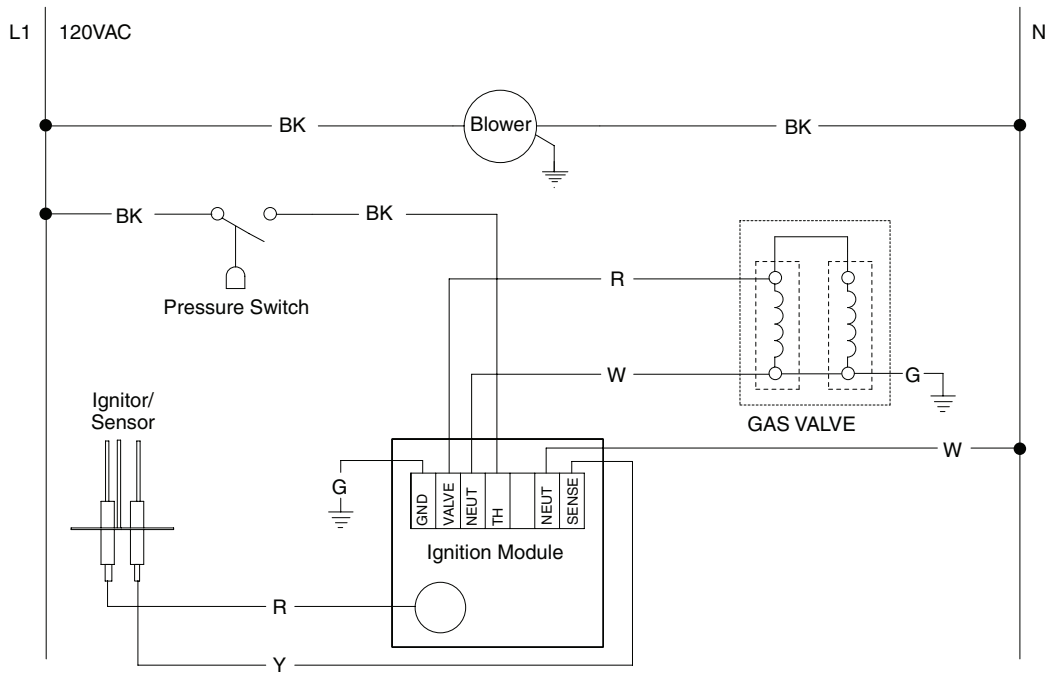


Before field wiring this appliance - Check existing wiring; replace if necessary.

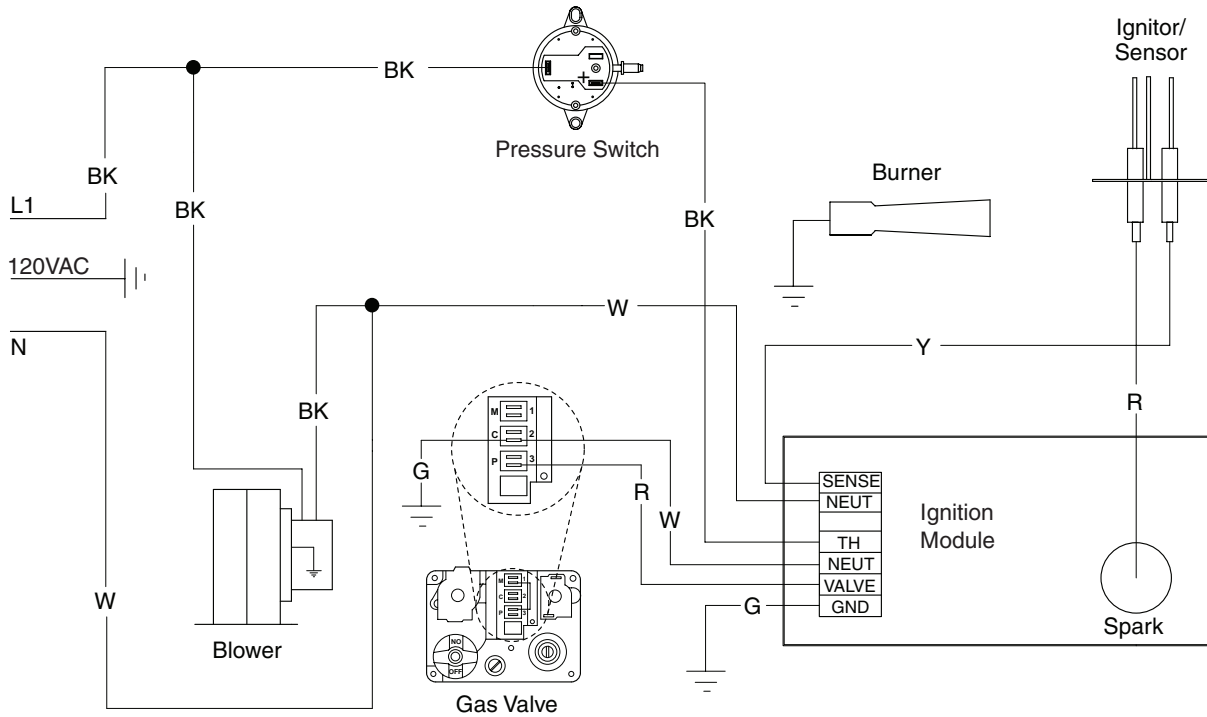
NOTE: If any of the original wire as supplied with the appliance must be replaced, it must be replaced with wiring material having a temperature rating of at least 105 °C.

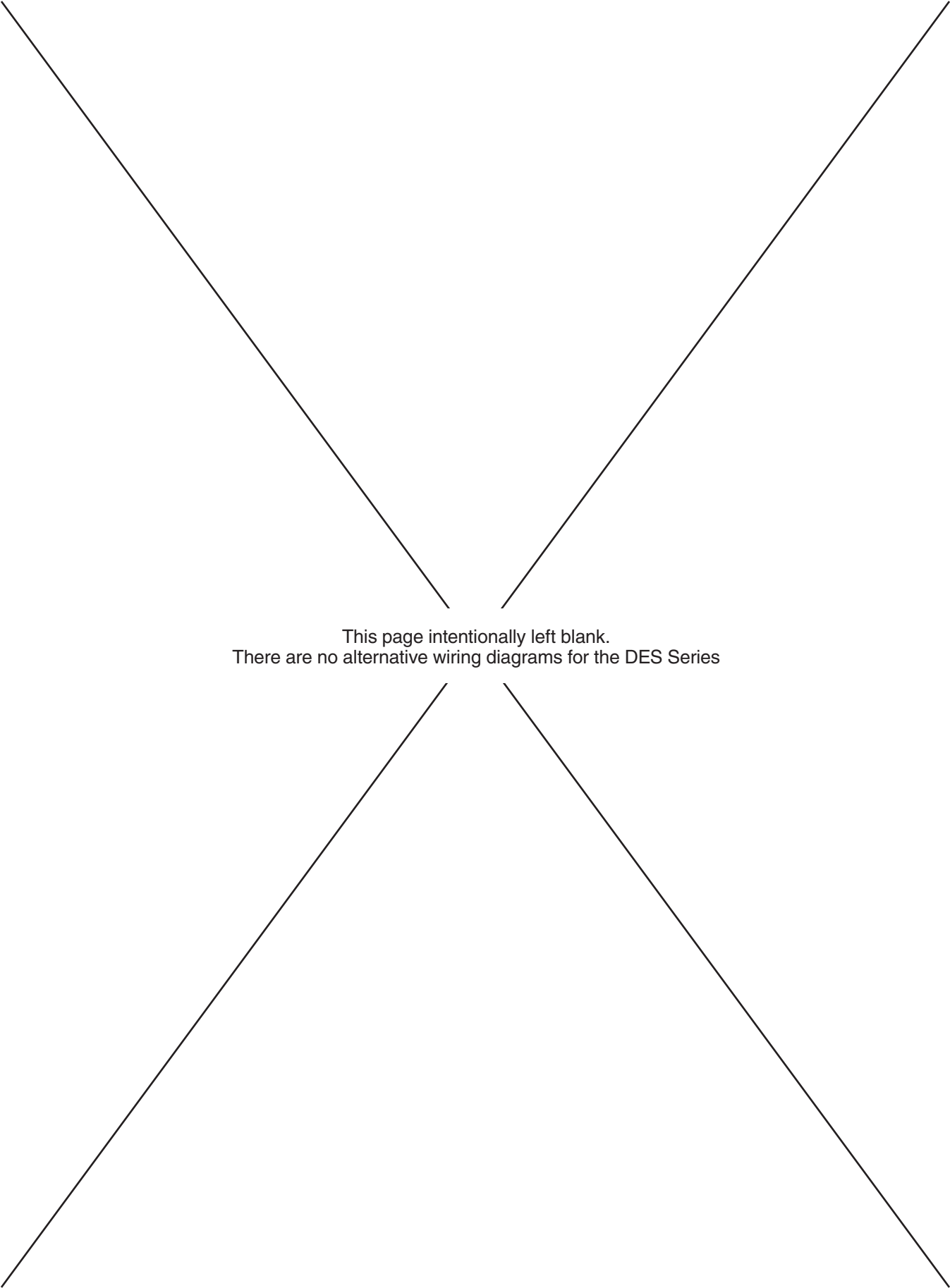
Figure 2.2 • Internal Wiring Diagrams

A. DES Ladder Diagram



B. DES Block Diagram





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There are no alternative wiring diagrams for the DES Series

Chart 2.1 • DES Series Specifications

Model Number	Gas Type (Select One)	BTU/H	Straight Length (Dim. A)	U-Tube Length (Dim. B)	Weight (lbs.)	Recommended Mounting Heights [^]	4" Combustion Chamber(s) (Black Coated)	4" Radiant Emitter Tube(s) (Uncoated)	Radiant Surface Area (sq. ft.)	36" Baffle Sections
DES-20-50	N or LP	50,000	21'-7"	13'-0"	120	9' to 14'	Aluminized	Hot-rolled	20.2	5
DES-20-60	N or LP	60,000	21'-7"	13'-0"	120	10' to 15'	Aluminized	Hot-rolled	20.2	5
DES-20-75	N or LP	75,000	21'-7"	13'-0"	120	11' to 18'	Aluminized	Hot-rolled	20.2	5
DES-30-50	N or LP	50,000	31'-3"	**17'-8"	160	10' to 15'	Aluminized	Hot-rolled	30.4	4
DES-30-60	N or LP	60,000	31'-3"	**17'-8"	160	11' to 18'	Aluminized	Hot-rolled	30.4	4
DES-30-75	N or LP	75,000	31'-3"	**17'-8"	160	12' to 20'	Aluminized	Hot-rolled	30.4	4
DES-30-100	N or LP	100,000	31'-3"	**17'-8"	160	13' to 23'	Aluminized	Hot-rolled	30.4	5
DES-40-50	N or LP	50,000	40'-11"	22'-8"	190	11' to 18'	Aluminized	Hot-rolled	40.5	2
DES-40-60	N or LP	60,000	40'-11"	22'-8"	190	11' to 18'	Aluminized	Hot-rolled	40.5	2
DES-40-75	N or LP	75,000	40'-11"	22'-8"	190	12' to 20'	Aluminized	Hot-rolled	40.5	2
DES-40-100	N or LP	100,000	40'-11"	22'-8"	190	13' to 23'	Aluminized	Hot-rolled	40.5	4
DES-40-125	N or LP	125,000	40'-11"	22'-8"	190	14' to 25'	Aluminized	Hot-rolled	40.5	4
DES-40-150	N or LP	150,000	40'-11"	22'-8"	190	15' to 27'	Titan/Alum	Hot-rolled	40.5	4
DES-50-100	N or LP	100,000	50'-7"	**27'-4"	235	15' to 27'	Aluminized	Hot-rolled	50.6	2
DES-50-125	N or LP	125,000	50'-7"	**27'-4"	235	15' to 27'	Aluminized	Hot-rolled	50.6	4
DES-50-150	N or LP	150,000	50'-7"	**27'-4"	235	16' to 30'	Titan/Alum	Hot-rolled	50.6	4
DES-50-175	N or LP	* 175,000	50'-7"	**27'-4"	235	17' to 35'	Titan/Alum	Hot-rolled	50.6	2
DES-50-200	N or LP	* 200,000	50'-7"	**27'-4"	235	18' to 40'	Titan/Alum	Hot-rolled	50.6	2
DES-60-125	N or LP	125,000	60'-3"	32'-4"	265	16' to 30'	Aluminized	Hot-rolled	60.7	2
DES-60-150	N or LP	150,000	60'-3"	32'-4"	265	17' to 35'	Titan/Alum	Hot-rolled	60.7	2
DES-60-175	N or LP	* 175,000	60'-3"	32'-4"	265	17' to 35'	Titan/Alum	Hot-rolled	60.7	2
DES-60-200	N or LP	* 200,000	60'-3"	32'-4"	265	18' to 40'	Titan/Alum	Hot-rolled	60.7	2

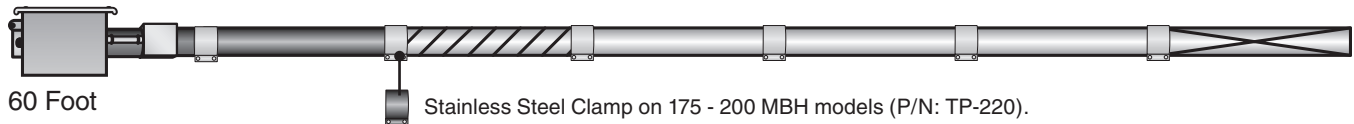
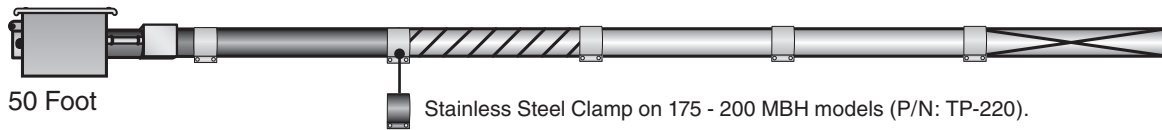
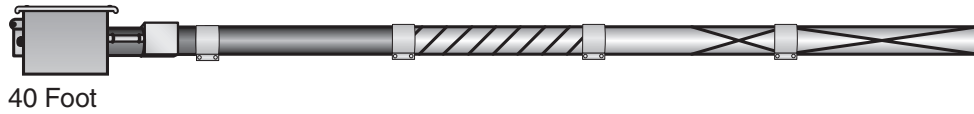
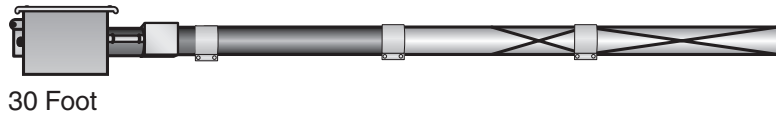
* Model requires stainless steel tube clamp (P/N: TP-220) to be located at the seam between the primary combustion chamber and the secondary combustion tube downstream of the burner control box.

** Model requires 5EA-SUB accessory package when installing in a 'U' configuration (P/N: TF1B).

^ Factory recommended mounting heights are listed as a guideline.

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

Note: Refer to the Tube Heater General Manual, Chart 3.6 (page 22) 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 (LIOGTa) for installation requirements.

Sequence of Operation

Starting Circuit: Upon a call for heat, the fan is energized. Once operational static pressure is achieved, the differential switch will close, allowing power to the control and initiating the ignition sequence. After a 7-second pre-purge, the spark electrode is energized and the gas valve opens simultaneously. The trial for ignition is 15 seconds. If flame is not sensed, the heater will attempt two (2) additional times to re-ignite with 15-second interpurge periods.

Single Stage Running Circuit: After ignition, the flame rod monitors burner flame. If sense of flame is lost, the control immediately acts to reignite the gas-air mixture (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 hard lockout. The control can be reset by briefly interrupting the power source.

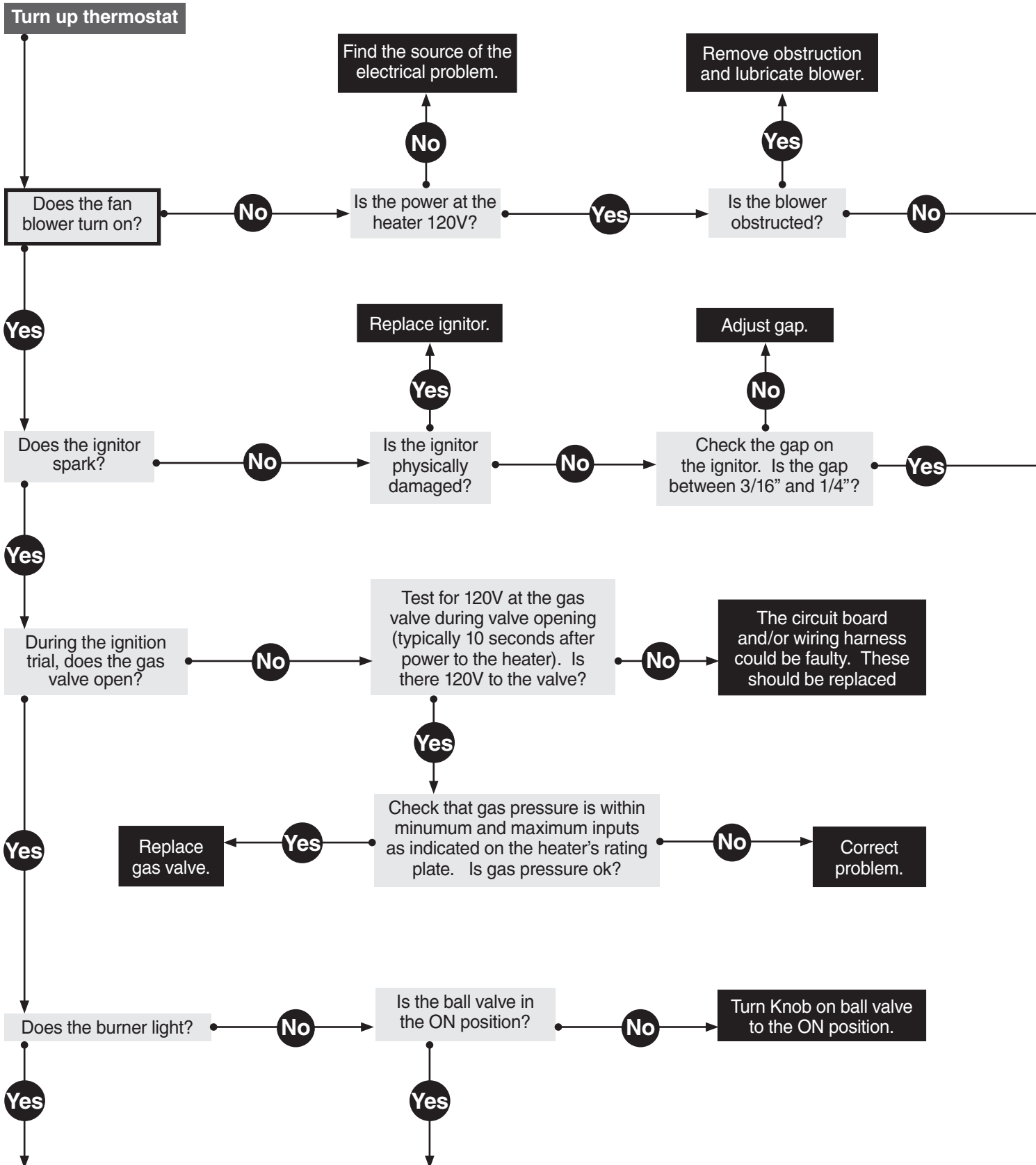
Thermostat

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



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4.0 Troubleshooting Guide



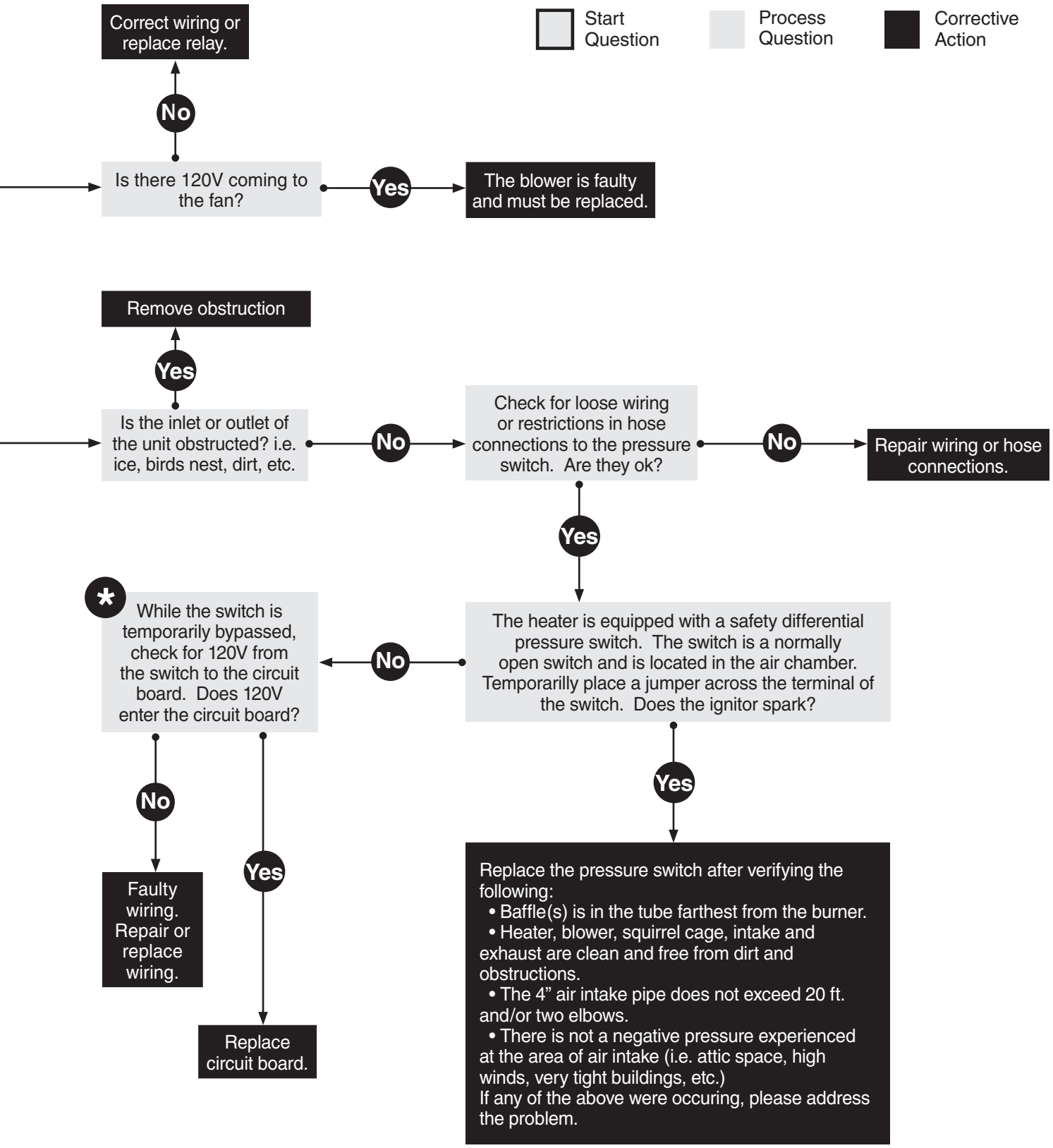
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*** NOTICE**

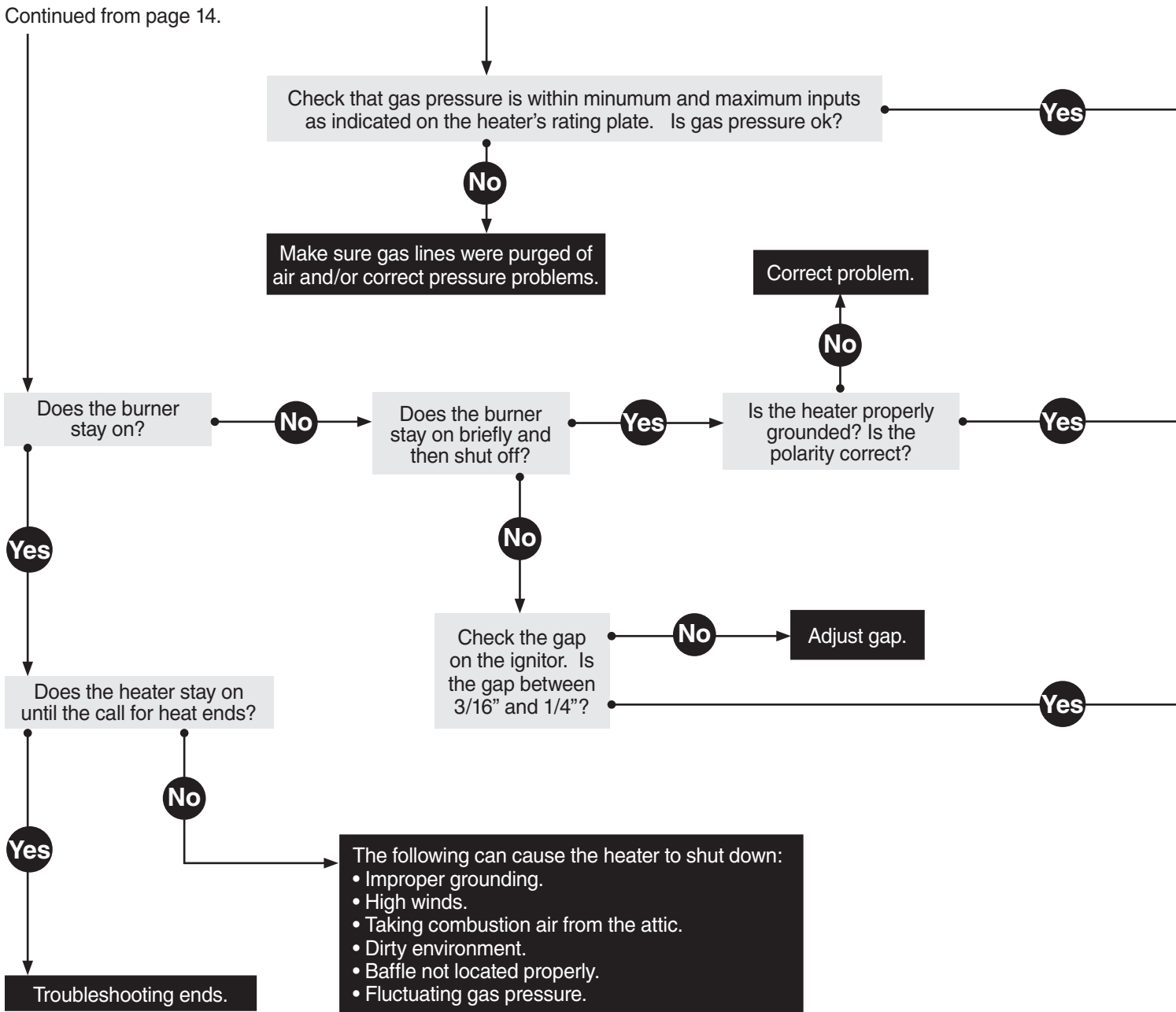
Bypassing any switch is intended for testing purposes only. Do not leave switch bypassed during normal operation or the heater's built-in safety mechanisms will be compromised.

Key

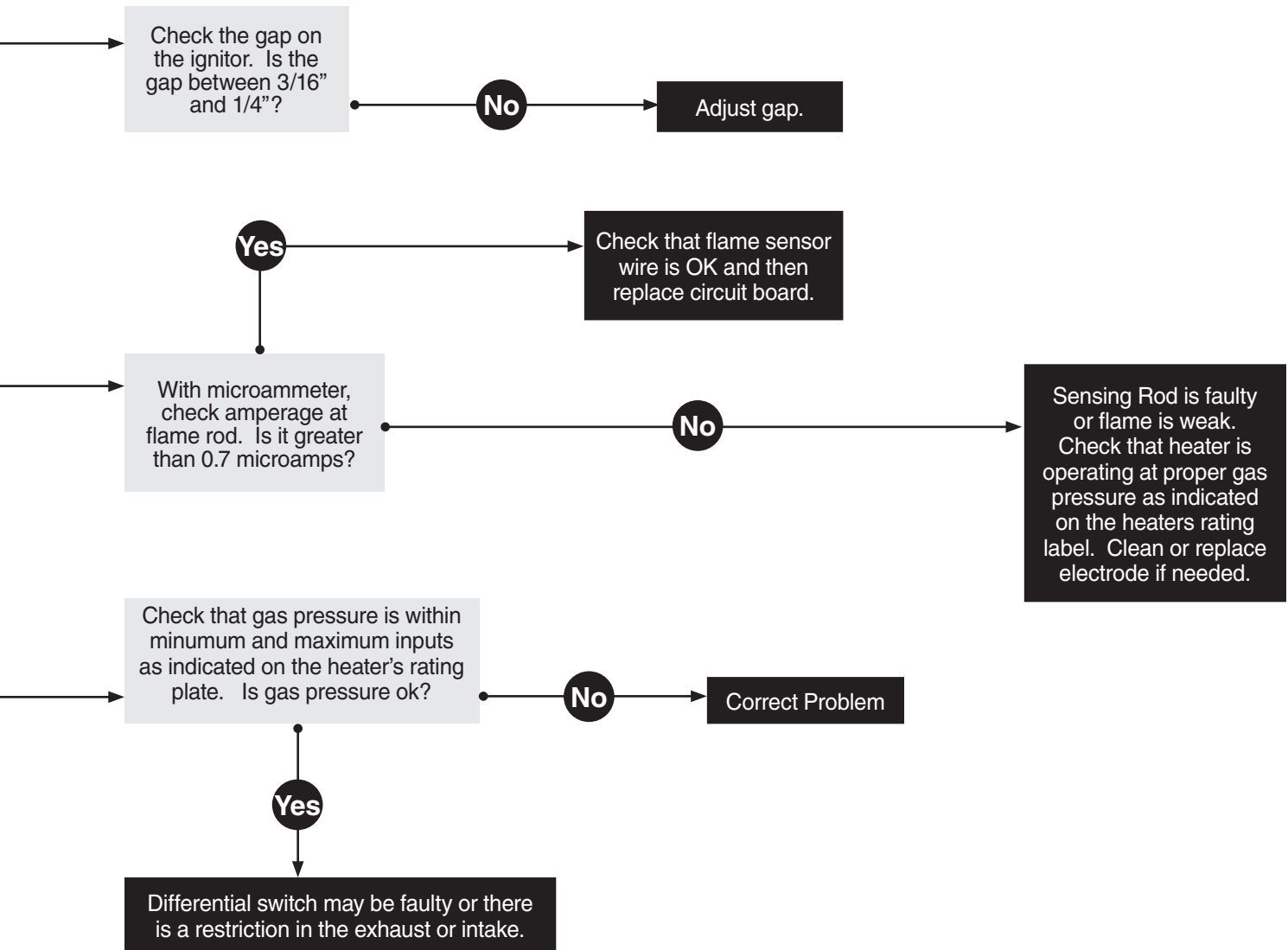
- Start Question
- Process Question
- Corrective Action



Continued from page 14.



DES Series



5.0 Parts

Figure 5.1 • Burner Assembly Components

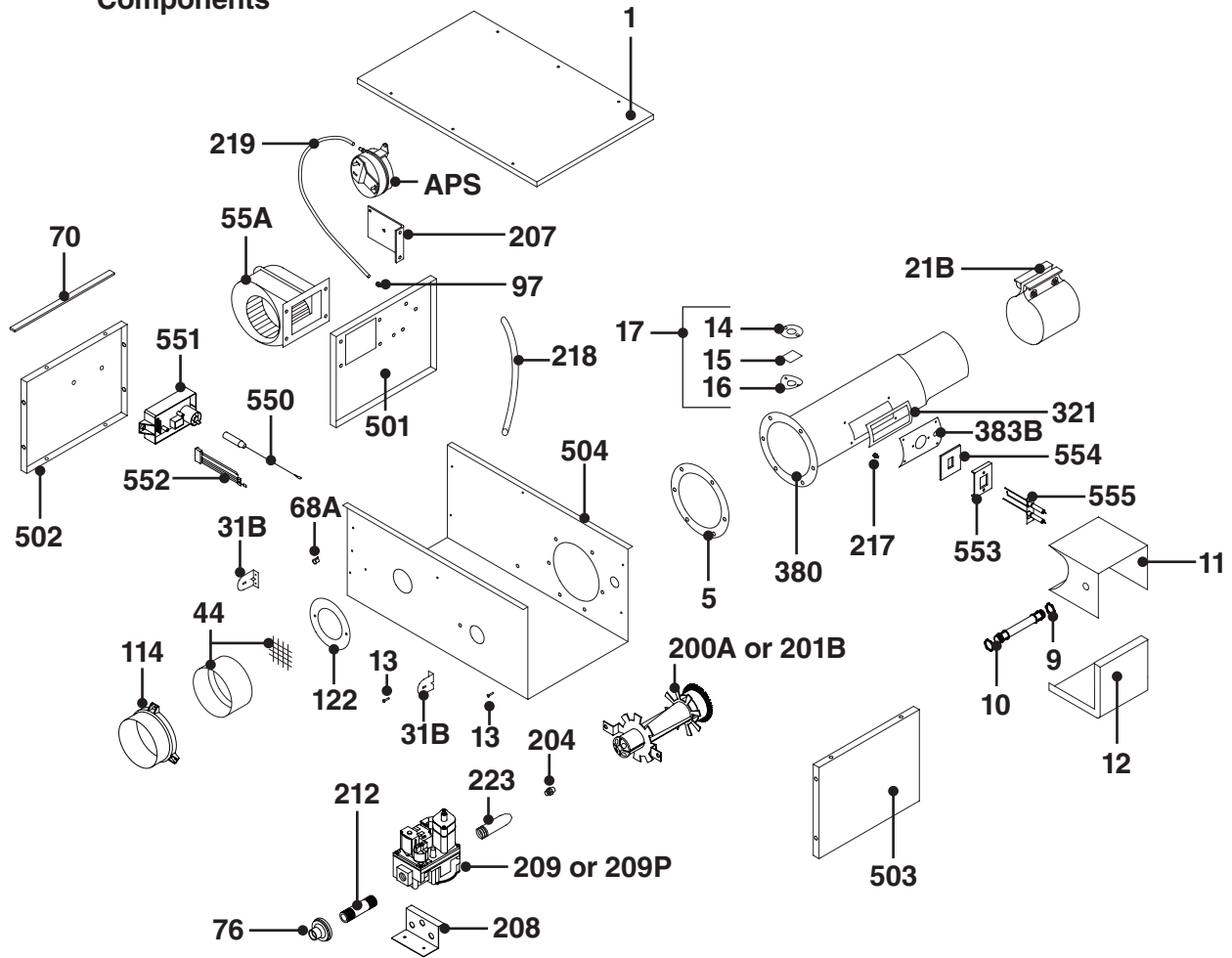
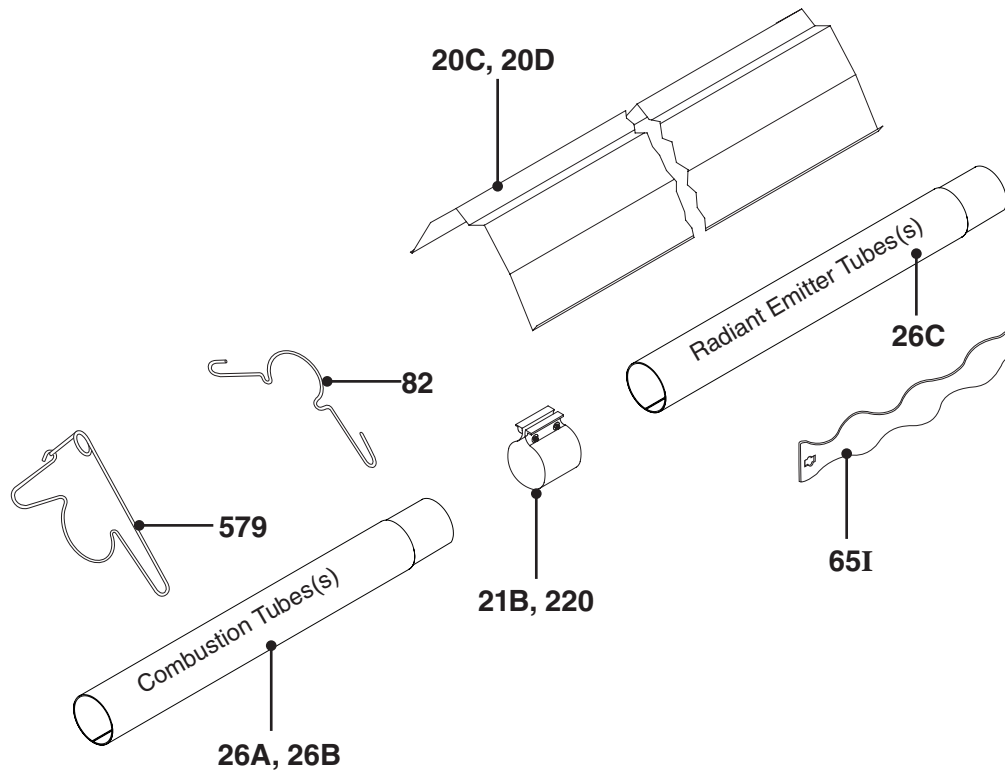


Chart 5.1 • Parts List

Part #	Description	Part #	Description
TP-1	Control Box Cover	TP-26C	10 Ft. Uncoated Hot Rolled Radiant Tube
TP-5	Flange Gasket	TP-31B	Control Box Mounting Bracket
TP-9	Conduit Coupling	TP-44	Metal Air Orifice w/ Screen - Consult Factory
TP-10	Conduit	TP-55A	Fan Blower
TP-11	Ignitor Box	TP-65I	Interlocking 36" Turbulator Baffle Section
TP-12	Ignitor Box Cover	TP-68A	Strain Relief Bushing
TP-13	8 x 1/2" Self-Drilling Screw	TP-70	Control Box Cover Gasket (**per foot)
TP-14	Sight Glass Gasket	TP-76	Rubber Grommet
TP-15	Sight Glass	TP-82	Reflector Center Support
TP-16	Sight Glass Washer	TP-97	1/4" x 1/4" Brass Int./Ext. Atmos. Barb Fitting
TP-17	Sight Glass Kit	TP-108	5 Ft. Coated Alum-Titan Tube w/ Clamp
TP-20C	10 Ft. Aluminum Reflector	TP-111	5 Ft. Coated Aluminized Tube w/ Clamp
TP-20D	10 Ft. Optional 304 Stainless Steel Reflector	TP-112	5 Ft. Aluminum Reflector
TP-21B	4" Tube Clamp	TP-114	Plastic Air Orifice - Consult Factory
TP-26A	10 Ft. Aluminized Combustion/Radiant Tube	TP-122	Gasket for Air Orifice and Air Collar
TP-26B	10 Ft. Titanium Treated Combustion Tube	TP-200A	Burner (50-100 MBH)

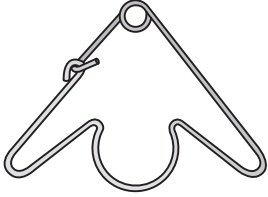

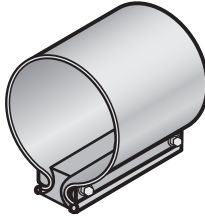
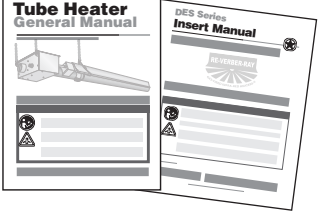
Figure 5.2 • Tube & Reflector Components



Part #	Description	Part #	Description
TP-201B	Burner (125-200 MBH)	TP-502	Left End Panel
TP-204	Gas Orifice - Consult Factory	TP-503	Right End Panel
TP-207	Pressure Switch Mounting Bracket	TP-504	Control Box Shell
TP-208	"Z" Mounting Bracket	TP-550	Spark Transfer Wire - Orange
TP-209	36E36A-246 Gas Valve Assembly - Natural Gas	TP-551	MARK 10DX-117 DSI Circuit Board w/ Pre-Purge
TP-209P	36E36A-240 Gas Valve Assembly - LP Gas	TP-552	Wiring Harness
TP-212	1/2" x 3" Pipe Nipple	TP-553	Spark Ignitor Mounting Bracket
TP-217	Pressure Barb Fitting	TP-554	Spark Ignitor Mounting Bracket Gasket
TP-218	Vinyl Differential Exhaust Sensing Tube	TP-555	Spark Ignitor Electrode
TP-219	Vinyl Differential Burner Sensing Tube	TP-579	4" Wire Hanger
TP-220	4" Stainless Steel Tube Clamp		
TP-223	Gas Manifold	APS	Select Pressure Switch Below (BTU Dependent)
TP-331	Green Self-Tap Ground Screw	(TP-264B)	Atmospheric Pressure Switch (50 to 100 MBH)
TP-380	16" Burner Tube with Flange	(TP-264E)	Atmospheric Pressure Switch (125 to 150 MBH)
TP-383B	Spark Ignitor Plate	(TP-264D)	Atmospheric Pressure Switch (175 MBH)
TP-501	Divider Panel	(TP-264F)	Atmospheric Pressure Switch (200 MBH)

Kit Contents Check List

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

DES Series Kit Contents						
TP-579 4" Wire Hanger 	TP-82 4" Reflector Center Support (RCS) 	TP-21B 4" Tube Clamps* 	General Manual and DES Series Insert F/N: LIOGTa & LIODESa 			
Part No.	Description	20 ft.	30 ft.	40 ft.	50 ft.	60 ft.
TP-579	4" Hanger	3	4	5	6	7
TP-21B	4" Tube Clamps	2	3	4	5*	6*
TP-82	4" Reflector Center Support	1	1	1	1	1
LIO - -	General Manual & Insert Manual	1	1	1	1	1
1/2" Shut-Off Valve & Inlet Tap		————— Field Supplied —————				
24" S.S. Flexible Gas Connector		————— Field Supplied —————				
Filled By: _____						

* 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 Design Certified
- Commercial/Industrial 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.

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