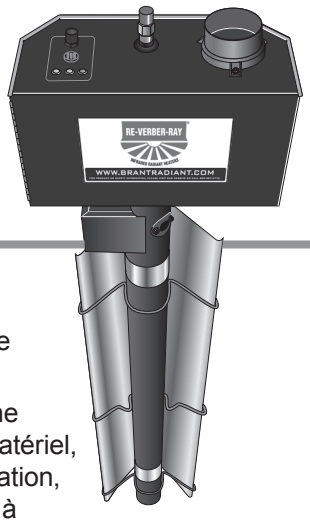
Brant Radiant Heaters, Ltd.

HL3 Series

Gas-Fired Infrared Tube Heater



WARNING: Improper installation, adjustment, alteration, service or maintenance can cause property damage, injury or death. Read the installation, operating and maintenance instructions thoroughly before installing or servicing this equipment.

AVERTISSEMENT: Une installation, un réglage, une modification, une réparation ou un entretien incorrect peut entraîner des dommages matériel, des blessures ou la mort. lisez attentivement les instructions d'installation, de fonctionnement et d'entretien avant de procéder à l'installation ou à l'entretien de cet équipement.

⚠ WARNING

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.**

⚠ AVERTISSEMENT

Cet appareil de chauffage doit être installé et entretenu par l'installation à gaz formée et le personnel de service seulement. L'échec de se soumettre pourrait aboutir à la blessure personnelle, l'asphyxie, la mort, le feu ou des dégâts de propriété.

Dans des emplacements utilisés pour le stockage de matériels combustibles, les signes doivent être postés pour spécifier la hauteur d'entassement permise maximale pour maintenir les dégagements exigés de l'appareil de chauffage au combustibles. Les signes doivent ou être postés adjacents aux thermostats d'appareil de chauffage ou en absence de tels thermostats, dans un emplacement remarquable.

Pas pour utilisation résidentielle! N'utilisez pas cet appareil de chauffage dans la maison, des chambres à coucher, des garages attachés, etc. **L'installation d'un système d'appareil de chauffage de tube commercial dans des espaces intérieurs résidentiels peut aboutir aux dégâts de propriété, la blessure grave, l'asphyxie ou la mort.**

For Your Safety

If you smell gas:

- Open windows.
- Do not touch electrical switches.
- Extinguish any open flame.
- Do not try to light any appliances.
- Immediately call your gas supplier from a neighbours phone.

Pour Votre Sécurité

Si vous sentez le gaz:

- Fenêtres ouvertes.
- Ne touchez pas d'échanges électriques.
- Éteignez n'importe quelle flamme ouverte.
- N'essayez pas d'éclairer d'appareils.
- Appelez immédiatement votre fournisseur de gaz d'a les voisins téléphonent.

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)

Contents

1.0 Introduction

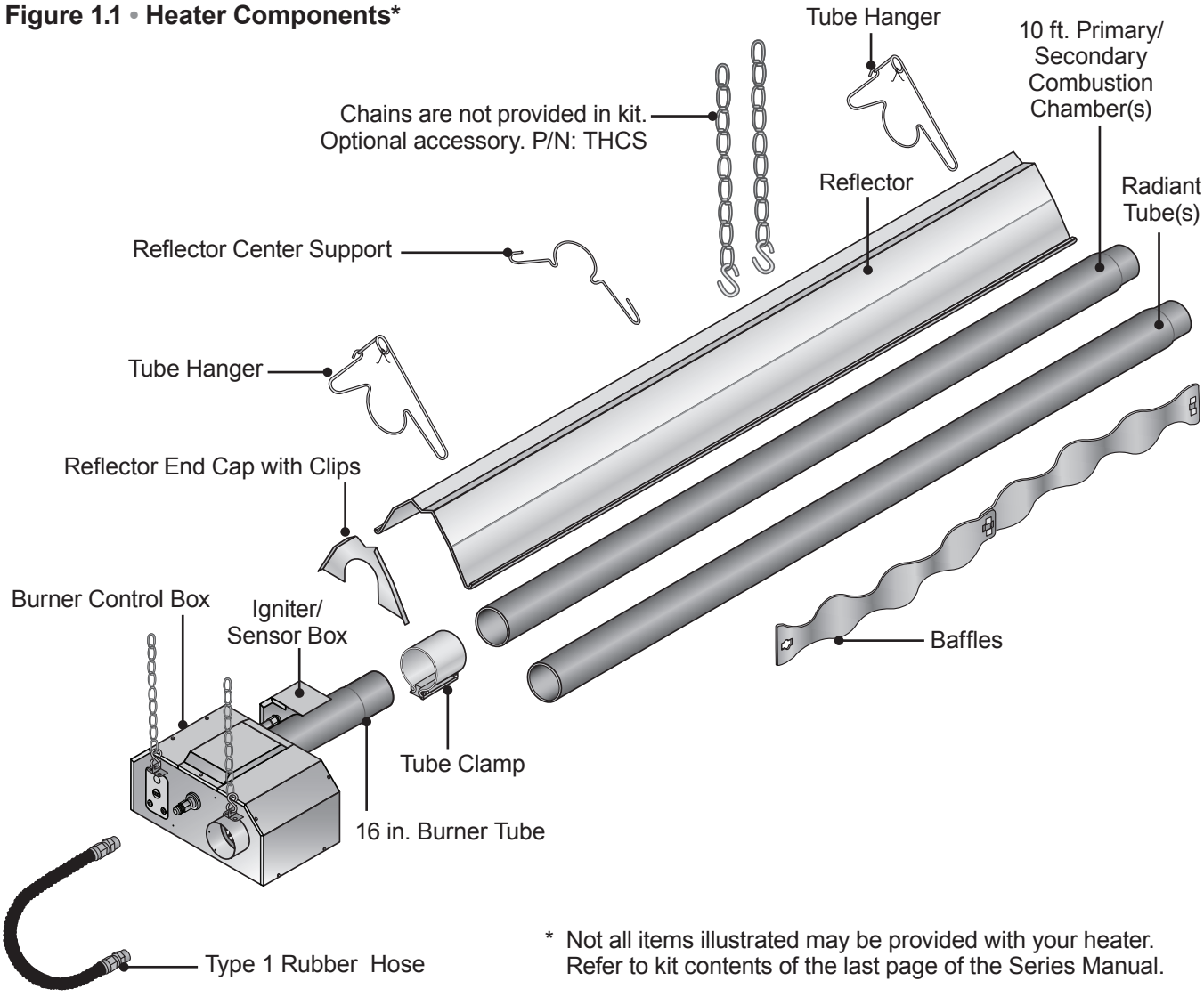
Overview

The intent of this manual is to provide information regarding general safety, installation, operation and maintenance of the tube heater. You must read, and understand, the instructions and safety warnings in this manual before installing the tube heater. Additional literature on this and other products is available at www.brantradiant.com.

Heater Components*

Prior to installation, verify that the heater's gas type and voltage (as listed on the rating plate) match that of your application. Also verify that you have received all heater contents included with your tube heater. Refer to the last page for a list of the kit contents for your model heater. Materials not included in the heater kit contents (e.g., screws, vent material, terminals, etc.) are the responsibility of the installer. Notify your product representative or Brant Radiant Heaters Ltd. of any discrepancy or missing kit contents prior to installing unit.

Figure 1.1 • Heater Components*



* Not all items illustrated may be provided with your heater. Refer to kit contents of the last page of the Series Manual.

Product Specifications

Chart 1.1 • **HL3 Series Specifications**

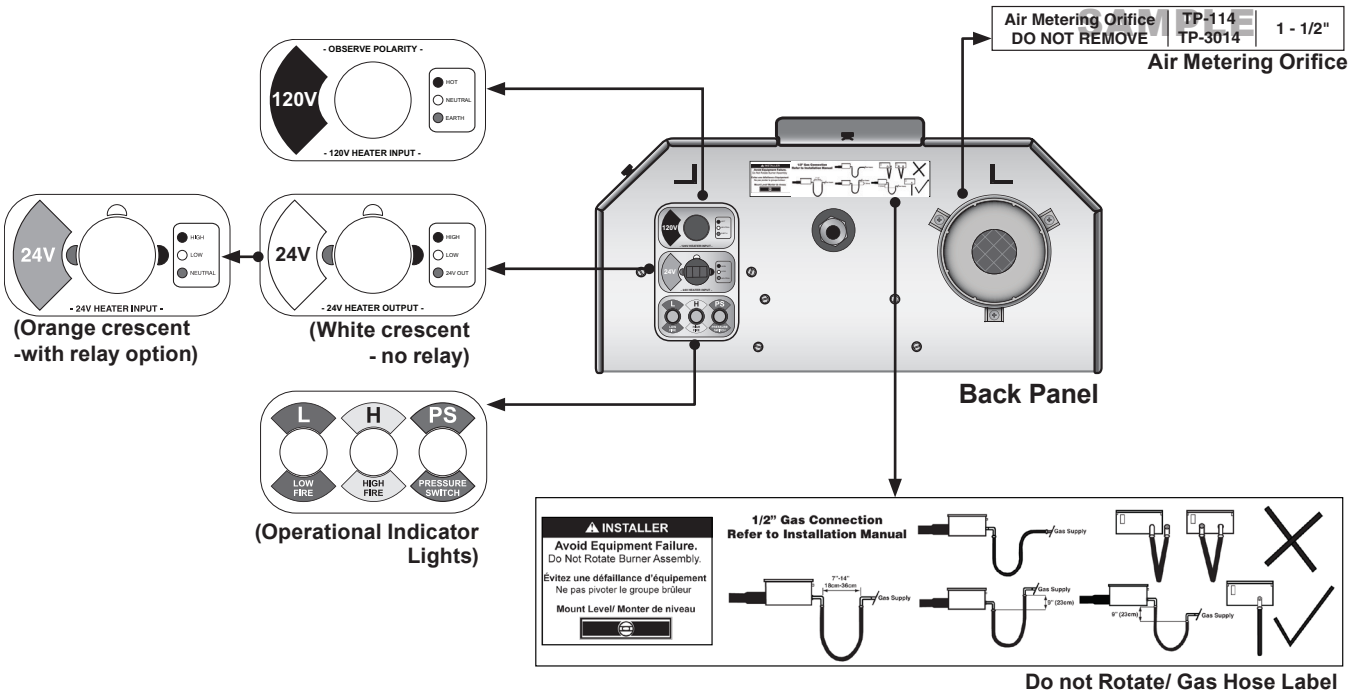
Model Number	Gas Type (select one)	BTU/h (High Fire)	BTU/h (Low Fire)	Straight Length	U-Tube Length	Standard Weight (lbs.)	Stainless Steel Weight (lbs.)	Recommended Mounting Height	Combustion Chamber (Black Coated)	Radiant Emitter Tube(s) (Black Coated)	Radiant Surface Area (sq. ft.)	36" Baffle Quantity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

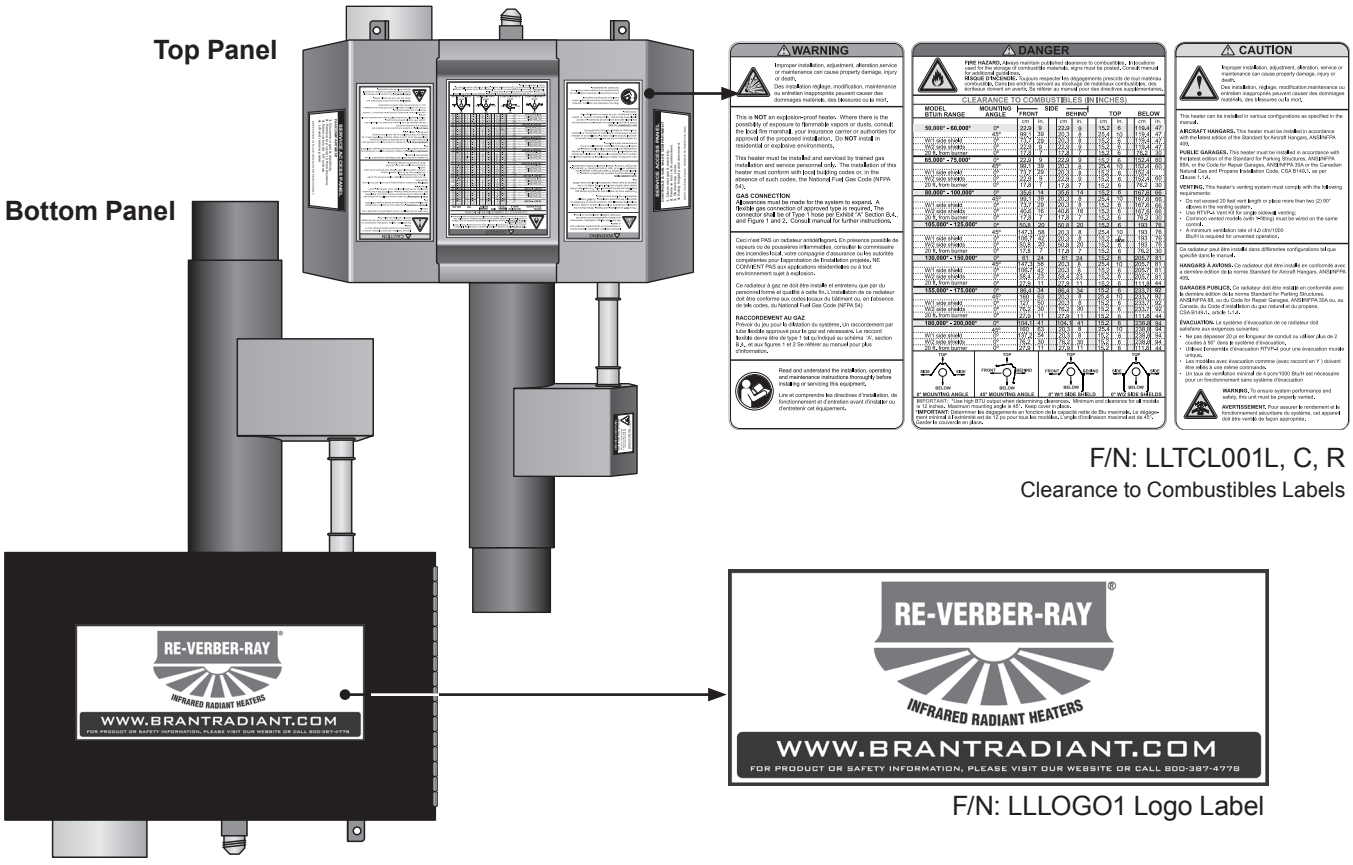
* Model requires stainless steel tube clamp (P/N:TP-220) to be located at the seam between the primary combustion chamber and the secondary combustion tube downstream of the burner control box.

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

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: LLTCL001L, C, R
Clearance to Combustibles Labels

F/N: LLLOGO1 Logo Label

SERVICE ACCESS PANEL

IGNITER & FLAME SENSE COMPARTMENT
COMPARTIMENT ALLUMEUR ET DÉTECTEUR DE FLAMME

1. Turn off gas & electricity.
2. Remove cover by lifting top cover upward and outward.

1. Débrancher le gaz et l'électricité.
2. Retirer le couvercle en soulevant le couvercle supérieur vers le haut et vers l'extérieur.

CAUTION: HOT SURFACE/ATTENTION: SURFACE CHAUDE.
KEEP COVER IN PLACE. REMOVE FOR SERVICE ONLY.
GARDER LE COUVERCLE EN PLACE. NE L'ENLEVER QUE POUR L'ENTRETIEN.

F/N: LLTB026

SERVICE ACCESS PANEL

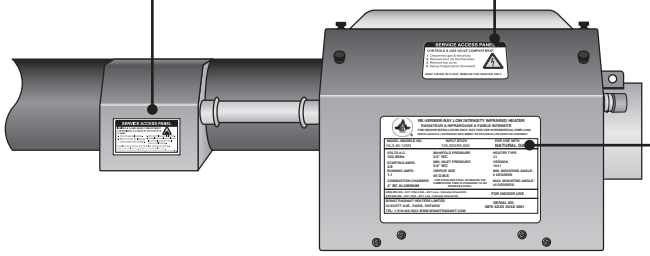
CONTROLS & GAS VALVE COMPARTMENT
COMPARTIMENT COMMANDES ET VALVE À GAZ

1. Disconnect gas & electricity.
2. Remove four (4) thumbscrews.
3. Remove top cover.
4. Swing hinged panel downward.

1. Débrancher le gaz et l'électricité.
2. Retirer les 4 vis à main du couvercle supérieur.
3. Retirer le couvercle supérieur.
4. Basculer le panneau articulé vers le bas.

KEEP COVER IN PLACE. REMOVE FOR SERVICE ONLY.
GARDER LE COUVERCLE EN PLACE. NE L'ENLEVER QUE POUR L'ENTRETIEN.

F/N: LLTB024L



Controls Compartment

RE-VERBER-RAY LOW INTENSITY INFRARED HEATER
RADIATEUR A INFRAROUGE A FAIBLE INTENSITE
FOR INDOOR INSTALLATION ONLY. NOT FOR USE IN RESIDENTIAL DWELLING.
INSTALLATION À L'EXTÉRIEUR SEULEMENT. NE PAS INSTALLER DANS UN LOGEMENT.

MODEL /MODELE NO.	INPUT BTU/H	FOR USE WITH
HL3-40-125N	125,000/95,000	**NATURAL GAS**
VOLTS A.C. 120–60Hz	MANIFOLD PRESSURE 3.5" WC	HEATER TYPE C1
STARTING AMPS. 4.8	MIN. INLET PRESS.: 5.0" WC	VERSION 10/11
RUNNING AMPS. 1.1	ORIFICE SIZE #4	MIN. MOUNTING ANGLE: 0 DEGREES
COMBUSTION CHAMBER: 4" BC ALUMINIZED	FOR [illegible] STEEL UPGRADES THE [illegible] TION TUBE IS UPGRADED TO 409 STAINLESS STEEL.	MAX. MOUNTING ANGLE: 45 DEGREES
ANSI Z83.20b - 2011 CSA 2.32b - 2011 Low - Intensity Infrared Htr. ANS Z83.20b - 2011 CSA - 2011 Low - Intensity Infrared Htr.		FOR INDOOR USE
BRANT RADIANT HEATERS LIMITED 34 SCOTT AVE., PARIS, ONTARIO TEL: 1-519-442-7823 WWW.BRANTRADIANT.COM		SERIAL NO. 0870 XXXX XXXX 0001

SAMPLE

Rating Plate

SERVICE ACCESS PANEL

FAN COMPARTMENT
COMPARTIMENT VENTILATEUR

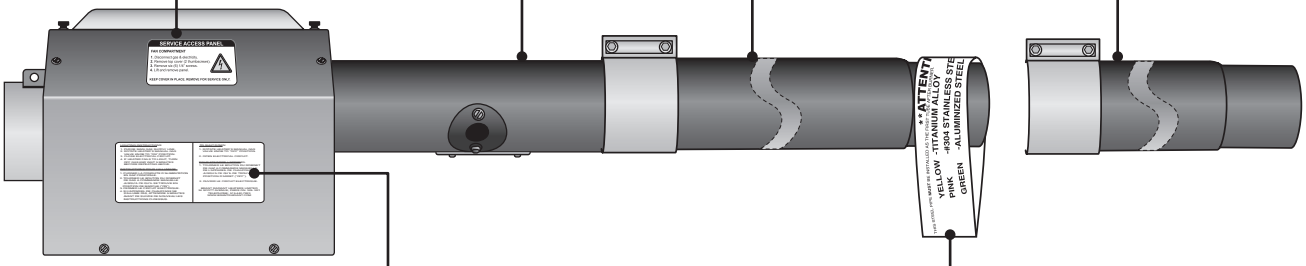
1. Disconnect gas & electricity.
2. Remove top cover (2 thumbsscrews).
3. Remove six (6) 1/4" screws.
4. Lift and remove panel.

1. Débrancher le gaz et l'electricité.
2. Retirer les 2 vis à main du couvercle supérieur.
3. Retirer les 6 vis 1/4 po.
4. Soulever et retirer le panneau.

KEEP COVER IN PLACE. REMOVE FOR SERVICE ONLY.
GARDER LE COUVERCLE EN PLACE. NE L'ENLEVER QUE POUR L'ENTRETIEN.

F/N: LLTB025R

16" Burner Tube **Combustion Chamber** **Radiant Tube(s)**



Fan Compartment

LIGHTING INSTRUCTIONS

1. PURGE MAIN GAS SUPPLY LINE.
2. ROTATE HEATER'S MANUAL GAS VALVE KNOB TO "ON" POSITION.
3. CLOSE ELECTRICAL CIRCUIT.
4. IF HEATER FAILS TO LIGHT, TURN OFF GAS AND WAIT 5 MINUTES BEFORE REPEATING ABOVE.

INSTRUCTIONS POUR L'ALLUMAGE

1. PURGER LA CONDUITE D'ALIMENTATION EN GAZ PRINCIPALE.
2. TOURNER LE BOUTON DU ROBINET DE GAS A COMMANDE MANUELLE JUSQU'A CE QU'IL SE TROUVE EN POSITION DE MARCHE ("ON")
3. FERMER LE CIRCUIT ELECTRIQUE.
4. SI L'APPAREIL DE CHAUFFAGE NE S'ALLUME PAS, ATTENDRE 5 MINUTES AVANT DE SUIVRE DE NOUVEAU LES INSTRUCTIONS CI-DESSUS.

TO SHUT DOWN

1. ROTATE HEATER'S MANUAL GAS VALVE KNOB TO "OFF" POSITION.
2. OPEN ELECTRICAL CIRCUIT.

POUR ETEINDRE L'APPAREIL

1. TOURNER LE BOUTON DU ROBINET DE GAZ A COMMANDE MANUELLE DE L'APPAREIL DE CHAUFFAGE JUSQU'A CE QU'IL DE TROUVE EN POSITION D'ARRET ("OFF").
2. OUVRIR LE CIRCUIT ELECTRIQUE.

BRANT RADIANT HEATERS LIMITED
34 SCOTT AVENUE, PARIS ON. N3L 3R1
TELEPHONE: 519-442-7823
WWW.BRANTRADIANT.COM

Lighting /Shut Down Instructions Label

****ATTENTION****

THIS STEEL PIPE **MUST** BE INSTALLED AS THE FIRST TUBE AFTER BURNER.

YELLOW	-TITANIUM ALLOY	PAINTED OR UNPAINTED
PINK	-#304 STAINLESS STEEL	
GREEN	-ALUMINIZED STEEL	

WELDED SEAM TO BOTTOM. SEE INSTALLATION INSTRUCTIONS.
REMOVE THIS LABEL BEFORE STARTUP.

CE TUYAU EN ACIER **DOIT** ÊTRE INSTALLÉ COMME PREMIER TUBE APRÈS LE BRÛLEUR.

JAUNE	-ALLIAGE DE TITANE	PAINTED OR UNPAINTED
ROSE	-ACIER INOXYDABLE No. 304	
VERT	-ACIER ALUMINÉ	

JOINTS SOUDÉS JUSQU'EN BAS. CONSULTER LES DIRECTIVES D'INSTALLATION
ENLEVER CETTE ÉTIQUETTE AVANT LA MISE EN SERVICE.

Yellow Titanium Alloy Tag
(150,000 BTU/H models and greater)

2.0 Safety

⚠ WARNING

This heater must be installed and serviced by a trained gas installation and service personnel only! 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.

Warning Symbols

Safety is the most important consideration during installation, operation and maintenance of the tube heater. You will see the following symbols and signal words when there is a hazard related to safety or property damage.

⚠ WARNING — **Warning** indicates a potentially hazardous situation which, if not avoided, could result in death or injury.

⚠ CAUTION — **Caution** indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury.

NOTICE — **Notice** indicates a potentially hazardous situation which, if not avoided, could result in property damage.

Applications

This is **not** an explosion proof heater. No tube heater may be used in a Class 1 or Class 2 Explosive Environment. Consult your local fire Marshall, insurance carrier and other authorities for approval if the proposed installation is in question.

Commercial / Industrial

Unless otherwise indicated, tube heaters are designed and certified for use in industrial and commercial buildings, such as warehouses, manufacturing plants, aircraft hangars and vehicle maintenance shops. For maximum safety the building must be evaluated for potential problems before installing the heating system. A critical safety factor to consider before installation is the clearance to combustibles.

⚠ WARNING

Not For Residential Use. Installation of a commercial tube heater system in residential indoor spaces may result in property damage, serious injury or death.

Standards, Certifications and Government Regulations

Installation of this tube heater must comply with all applicable local, state and national specifications, regulations and building codes. Contact the local building inspector and/or fire marshall for guidance.

In the absence of local codes, the installation must conform to the latest edition of:

United States: National Fuel Gas Code, ANSI Z223.1 (NFPA 54).

Canada: CAN/CGA B149.1-10, Canadian Electrical Code C22.1

Chart 2.1 • Standards and Code Installation Guidelines • Building Type

Building Type	Codes and Guidelines
Public Garages	Installation of this tube heater in public garages must conform to the following codes: **United States:** Standard for Parking Structures NFPA 88A (latest edition) or the Code for Motor Fuel Dispensing Facilities and Repair Garages NFPA 30A (latest edition). **Canada:** Refer to CAN/CGA B149.1-10: Installation Codes for Gas Burning Appliances and applicable Standards for Public Garages. Guidelines: • Heaters must not be installed less than 8 ft. (2.4 m) above the floor. Minimum clearances to combustibles must be maintained from vehicles parked below the heater. • When installed over hoists, minimum clearances to combustibles must be maintained from the upper most point of objects on the hoist.
Aircraft Hangars	Installation of this tube heater in aircraft hangars must be in accordance with the following codes: **United States:** Refer to Standard for Aircraft Hangars, ANSI/NFPA 409 (latest edition). **In Canada:** Refer to Standard CAN/CGA B149.1-10 and applicable Standards for Aircraft Hangars. Guidelines: • In aircraft storage and servicing areas, heaters shall be installed at least 10 ft. (3 m) from above the upper surface of wings or of the engine enclosures of the highest aircraft that may be housed in the hangar. The measurement shall be made from the wing or engine enclosure, whichever is higher from the floor, to the bottom of the heater. • In areas adjoining the aircraft storage area (e.g., shops, offices) the bottom of heaters shall be installed no less than 8 ft. (2.4 m) above the floor. • Suspended or elevated heaters shall be located in spaces where they shall not be subject to damage by aircraft, cranes, movable scaffolding or other objects. Provisions shall be made to assure accessibility to suspended tube heaters for recurrent maintenance purposes.

Chart 2.2 • Standards and Code Installation Guidelines • Building Location

Building Location	Guidelines
High Altitude	Guidelines: Installation of this tube heater is approved, without modifications, for elevations up to 6,000 feet (1,829 m) MSL (sea level) in the United States. Contact the factory for installations above these elevations. The type of gas appearing on the nameplate must be the type of gas used. Installation must comply with national and local codes and requirements of the local gas company.
Non-Standard BTU Gas	Guidelines: Unless otherwise noted on the rating plate, this infrared heater is designed and orificed to operate on standard BTU gas. Contact the factory if utilizing non-standard BTU gas.

Chart 2.3 • Standards and Code Installation Guidelines • Building Aspect

Building Aspect	Codes and Guidelines
Electrical	The tube heater must be electrically grounded in accordance with the following codes: **United States:** Refer to National Electrical Code®, ANSI/NFPA 70 (latest edition). Wiring must conform to the latest edition of National Electrical Code®, local ordinances, and any special diagrams furnished. **Canada:** Refer to Canadian Electrical Code CSA C22.1 Part 1 (latest edition).
Venting	Venting must be installed in accordance with the requirements within this manual and the following codes: **United States:** Refer to NFPA 54/ANSI Z223.1 (latest edition), National Fuel Gas Code. **Canada:** Refer to CAN/CGA B149.1 Installation Codes for Gas Burning Appliances.

Applicable authorities governing the manufacturing or installation of this infrared heater include (but are not limited to) the following organizations:

- NFPA - National Fire Protection Association.
- ANSI Z83.20b - American National Standards Institute.
- NFPA 54/ANSI Z223.1 - National Fuel Gas Code.
- CSA - Canadian Standards Association.
- OSHA - Occupational Safety & Health Administration.
- IAS - International Approval Services.
- AGA - American Gas Association.
- IRSC- Infrared Heater Safety Council.

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 of the heater.

Hazards:
For maximum safety the building must be evaluated for hazards before installing the heating system. Examples of hazards include, but are not limited to:

- Gas and electrical lines
- Combustible and explosive materials
- Chemical storage areas
- Areas of high chemical fume concentrations
- Provisions for accessibility to the heater
- Adequate clearances around air openings
- Combustion and ventilating air supply
- Vehicle parking areas
- Vehicles with lifts or cranes
- Storage areas with stacked materials
- Lights
- Sprinkler heads
- Overhead doors and tracks
- Dirty, contaminated environment

If you are unsure of the potential hazards, consult your local fire Marshall, fire insurance carrier or other qualified authorities on the installation of gas fired tube heaters for approval of the proposed installation.

A critical safety factor to consider before installation is the clearances to combustibles. **Clearance to combustibles** is defined as *the minimum distance you must have between the tube surface, or reflector, and the combustible item*. Considerations must also be made for moving objects around the tube heater. The following is a partial list of items to maintain clearances from:

Combustible items:
- Wood
- Paper
- Fabric
- Chemicals
- Paint
- Parked vehicles
- Gasoline
- Storage racks

Moving Objects:
- Overhead doors
- Vehicle lifts
- Cranes
- Hoists

Safety Signs and Labels

It is important to provide warnings to alert individuals to potential hazards and safety actions. ANSI Z83.20b and CSA 2.34 require you to post a sign “specifying the maximum permissible stacking height to maintain the required clearances from the heater to the combustibles” near the heaters thermostat or in absence of such thermostats in a conspicuous location. Contact Brant Radiant Heaters Ltd. or an authorized dealer for Clearance Safety Limit Signs(P/N: BR-SIGN).

Safety warning labels must be maintained on the tube heater. Illustrations of the safety labels, and their locations, are pictured in the Series Manual. 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 combustibles. Signs must either be posted adjacent to the heater thermostats or in the absence of such thermostats in a conspicuous location.

When installing the tube heating system, the minimum clearances to combustibles for your model tube heater and system configuration **must** be maintained. Refer to Chart 2.4 below to determine the required distances for your model.

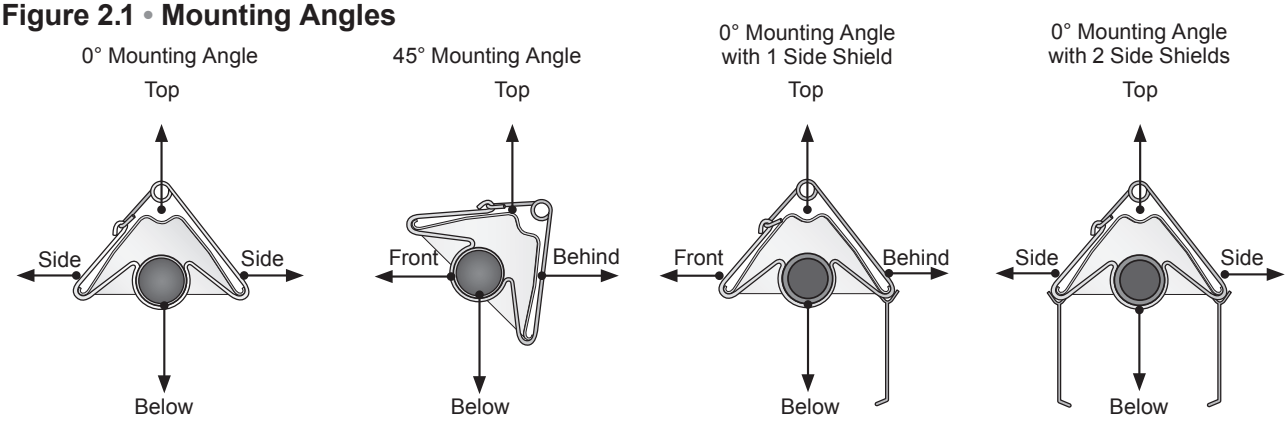
Chart 2.4 • Clearance to Combustibles in Inches (cm)(see figure 2.1 for Mounting Angles)

Model Number	Mounting Angle*	Sides							
		Front		Behind		Top		Below	
HL3 (20, 30, 40) - 65, 75 [N, P]	0°	9	(23)	9	(23)	6	(15)	60	(152)
	45°	39	(99)	8	(20)	10	(25)	60	(152)
with 1 side shield	0°	29	(74)	8	(20)	6	(15)	60	(152)
with 2 side shields	0°	9	(23)	9	(23)	6	(15)	60	(152)
20 ft. from burner	0°	7	(18)	7	(18)	6	(15)	30	(76)
HL3 (30, 40) - 100 [N, P]	0°	14	(35)	14	(35)	6	(15)	66	(168)
	45°	39	(99)	8	(20)	10	(25)	66	(168)
with 1 side shield	0°	29	(74)	8	(20)	6	(15)	66	(168)
with 2 side shields	0°	16	(41)	16	(41)	6	(15)	66	(168)
20 ft. from burner	0°	7	(18)	7	(18)	6	(15)	30	(76)
HL3 (30, 40, 50) - 125 [N, P]	0°	20	(51)	20	(51)	6	(15)	76	(193)
	45°	58	(147)	8	(20)	10	(25)	76	(193)
with 1 side shield	0°	42	(107)	8	(20)	6	(15)	76	(193)
with 2 side shields	0°	20	(51)	20	(51)	6	(15)	76	(193)
20 ft. from burner	0°	7	(18)	7	(18)	6	(15)	30	(76)
HL3 (40, 50, 60) - 150 [N, P]	0°	24	(61)	24	(61)	6	(15)	81	(206)
	45°	58	(147)	8	(20)	10	(25)	81	(206)
with 1 side shield	0°	42	(107)	8	(20)	6	(15)	81	(206)
with 2 side shields	0°	23	(58)	23	(58)	6	(15)	81	(206)
20 ft. from burner	0°	11	(28)	11	(28)	6	(15)	44	(112)
HL3 (40, 50, 60, 70) - 175 [N, P]	0°	34	(86)	34	(86)	6	(15)	92	(234)
	45°	63	(160)	8	(20)	10	(25)	92	(234)
with 1 side shield	0°	50	(127)	8	(20)	6	(15)	92	(234)
with 2 side shields	0°	30	(76)	30	(76)	6	(15)	92	(234)
20 ft. from burner	0°	11	(28)	11	(28)	6	(15)	44	(112)
HL3 (50, 60, 70) - 200 [N, P]	0°	41	(104)	41	(104)	6	(15)	94	(239)
	45°	63	(160)	8	(20)	10	(25)	94	(239)
with 1 side shield	0°	54	(137)	8	(20)	6	(15)	94	(239)
with 2 side shields	0°	30	(76)	30	(76)	6	(15)	94	(239)
20 ft. from burner	0°	11	(28)	11	(28)	6	(15)	44	(112)

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

The stated clearances to combustibles represents 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 ensure that adjacent materials are protected from degradation.

Figure 2.1 • Mounting Angles



3.0 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.

Design Considerations and Prechecks

Placement of infrared heaters is influenced by many factors. Aside from safety factors, considerations such as the number of heater or vent elbows that are allowed, maximum vent lengths, ducting of combustion air and combining exhaust vents are a few examples. This installation manual, along with national, provincial and local codes address these issues. It is critical that you read, understand and follow all guidelines and instructions.

To ensure a properly designed heating system, a layout should be developed for the correct placement of the burner control box, tubes, vents and combustion air intake ducts. Inspect and evaluate the mounting conditions, vent locations, gas supply and wiring.

When designing an infrared radiant heating system, consider the following:

- Has the building's heat loss been evaluated?
- Does the design meet the needs of the space?
- Have recommended mounting heights been observed?
- Have all clearance to combustibles situations been observed?
- Is the supply (burner) end of the heater located where more heat is required?
- Is it best to offset the heaters and/or rotate the reflectors towards the heat zone?
- Are extra guards, side shields, 'U' or 'L' reflector covers required?
- Does the heater require outside fresh air for combustion?
- Is the environment harsh or contaminated (requiring outside air for combustion)?
- Are chemicals or vapors a concern (requiring outside air for combustion or additional ventilation)?

IMPORTANT: Fire sprinkler heads must be located at an appropriate distance from the heater to avoid an inadvertent discharge. This distance may exceed the published clearance to combustibles. Certain applications may require the use of high temperature sprinkler heads or the relocation of the heaters.

⚠ CAUTION

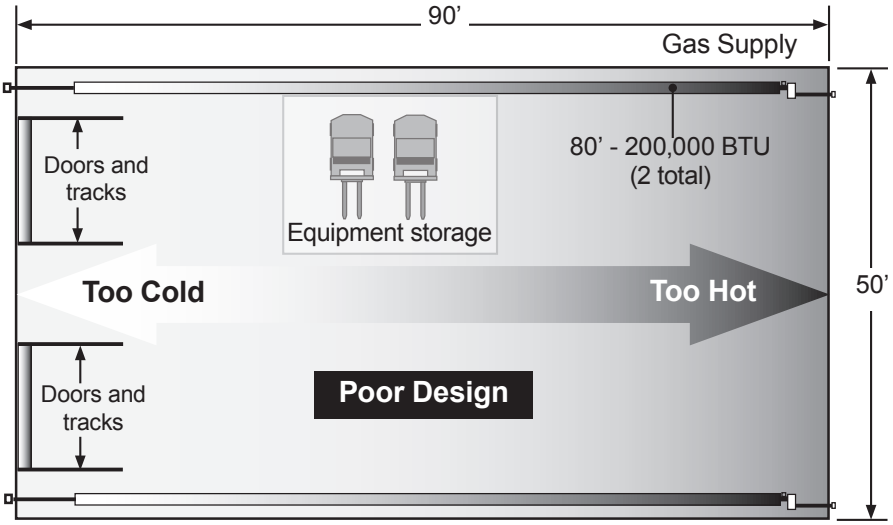
Fire sprinkler systems containing propylene glycol, antifreeze or other potentially flammable substances shall not to be used in conjunction with this heater without careful consideration for and avoidance of inadvertent discharge hazards. For further information consult NFPA 13. Always observe applicable provinces and local codes.

When heated, materials high in hydrocarbons (solvents, paint thinner, mineral spirits, formaldehydes, etc.) can evaporate. This may result in odors or fumes being emitted into the environment. To correct this problem, clean the area and/or introduce additional ventilation. The heaters themselves, when installed and serviced in accordance with the installation manual, do not emit foul odors into the environment.

Design Scenario:

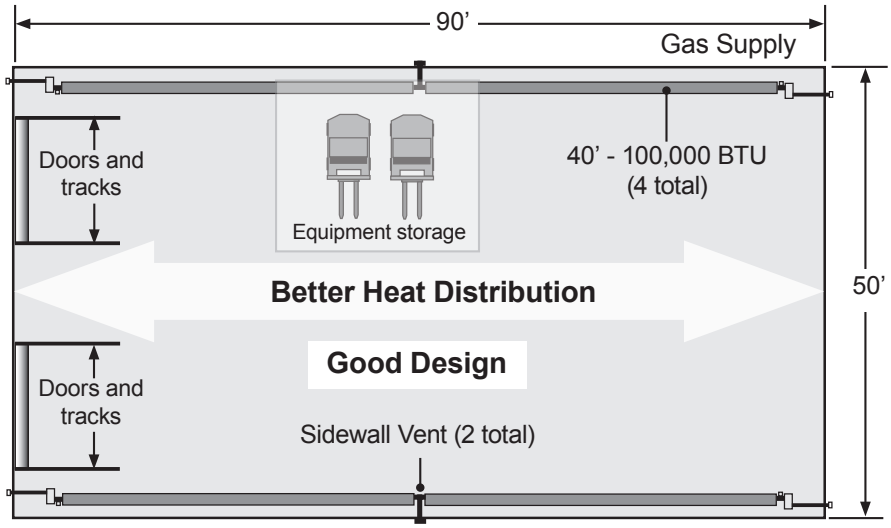
A tube heater system is being installed in a 90’ (L) x 50’ (W) x 14’ (H) space. Two overhead doors are located at one end and an equipment storage area on one side. The calculated heat load is 400,000 BTU/h.

Figure 3.1 • Poor Design



- Two burners (200,000 BTU each) are placed at one end, opposite the area of highest demand (e.g., overhead doors).
- Recommended mounting heights are not observed (see Chart 3.1).
- Produces an uneven heat distribution.

Figure 3.2 • Good Design



- Four burners (100,000 BTU each) are placed in each corner. Burner (hotter) ends direct heat to areas of highest heat demand.
- Recommended mounting heights have been observed.
- Distributes heat more evenly.

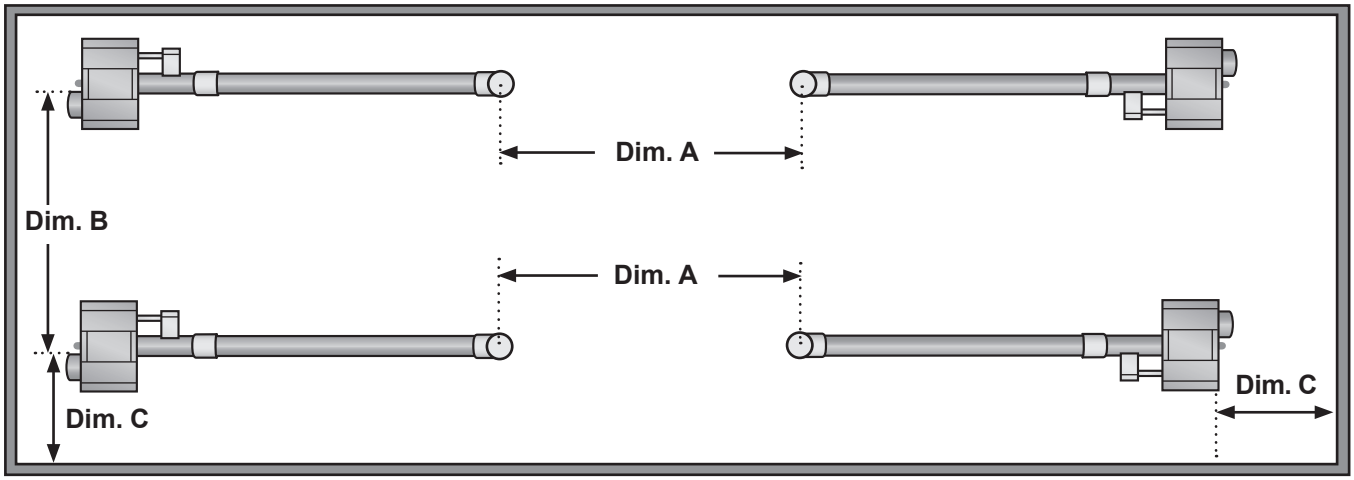
Chart 3.1 • Recommended Mounting Heights and Coverages in Inches

NOTE: This chart is provided as a guideline. Actual conditions may dictate variation for this data.

Model	BTU Range	Recommended Mounting Height ft.	Coverage Area Straight Config. (LxW) ft.	Coverage Area U-Tube Config. (LxW) ft.	Distance Between Heaters ft. Dimension A	Distance Between Heater Rows ft. Dimension B	Maximum Distance Between Heaters and Wall ft. Dimension C
20 ft.	65 MBH	10’ - 16’	20’ x 12’	12’ x 12’	10’ - 20’	20’ - 40’	16’
	75 MBH	12’ - 20’	22’ x 15’	N/A	20’ - 30’	30’ - 50’	18’
30 ft.	50-65 MBH	10’ - 16’	30’ x 14’	17’ x 13’	10’ - 20’	20’ - 40’	17’
	75-125 MBH	12’ - 20’	33’ x 18’	18’ x 15’	20’ - 30’	30’ - 50’	20’
40 ft.	50-65 MBH	10’ - 16’	40’ x 16’	22’ x 14’	10’ - 20’	20’ - 40’	20’
	75-125 MBH	12’ - 20’	44’ x 21’	23’ x 17’	20’ - 30’	30’ - 50’	20’
	150-175 MBH	16’ - 30’	45’ x 26’	24’ x 20’	30’ - 40’	40’ - 60’	25’
50 ft.	100-125 MBH	15’ - 25’	55’ x 24’	28’ x 19’	20’ - 30’	30’ - 50’	25’
	150-200 MBH	16’ - 30’	56’ x 30’	29’ x 23’	30’ - 40’	40’ - 60’	25’
60 ft.	125 MBH	16’ - 25’	66’ x 27’	33’ x 21’	20’ - 30’	30’ - 50’	25’
	150-200 MBH	17’ - 40’	67’ x 34’	34’ x 26’	30’ - 40’	40’ - 60’	25’
70 ft.	175-200 MBH	17’ - 40’	78’ x 38’	39’ x 29’	30’ - 40’	40’ - 60’	30’

Factory recommended mounting heights are listed as a guideline. If infrared heaters are mounted too low or too high, they may result in discomfort or lack of heat. Brant Radiant Heaters Ltd. generally recommends observing the recommended mounting heights to optimize comfort conditions. However, certain applications such as spot heating, freeze protection, outdoor patio heating or very high ceilings may result in the heaters being mounted outside of the factory recommended mounting heights.

Figure 3.3 • Mounting Height Dimensions (see Chart 3.1 for measurements)



Note: Dimensions A, B & C are based upon heaters hung at the factory recommended mounting height.

Hanger Placement and Suspension

⚠ WARNING

Improper suspension of the tube heater may result in collapse and being crushed. Always suspend from a permanent part of the building structure that can evenly support the total force and weight of the heater.

Failure to maintain minimum clearance to combustibles may result in fire and/or explosion, property damage, serious injury or death. Always maintain minimum clearances and post Clearance Safety Limit signs (P/N: BR-SIGN) where needed.

Suspension of the heater must conform to applicable codes referenced in the Safety section and these instructions.

❶ Lay all radiant tubing out in the following order. Position tubes in approximate location (see figure 3.4).

- 10 ft. primary combustion chamber.
- Radiant emitter tubes.

  Important! 150,000-200,000 BTU/h models must use the 10 ft. titanium alloy treated combustion chamber as the first tube downstream of the burner control box. The combustion chamber has a yellow identification label located on the swaged end of the tube (remove label prior to starting up heater).

❷ Mark locations for hanging points.

NOTE: If the available hanging points do not allow for the recommended spacing then additional hangers (P/N: TP-19B) may be necessary.

- The spacing between the burner control box mounting brackets and the first hanger should be approximately 2’-4”(0.7 m).
- The space between the first two hangers placed on the first tube, should be approximately 8’-10”(2.7 m).
- The space between hangers thereafter, one per tube, should be approximately 9’-8”(3 m).

Figure 3.4 • Heater Mounting Layout

NOTE: A yellow band identifying the combustion chamber(s) is located in the middle of the tube(models 150-200 MBH). Remove paper band before starting up heater.

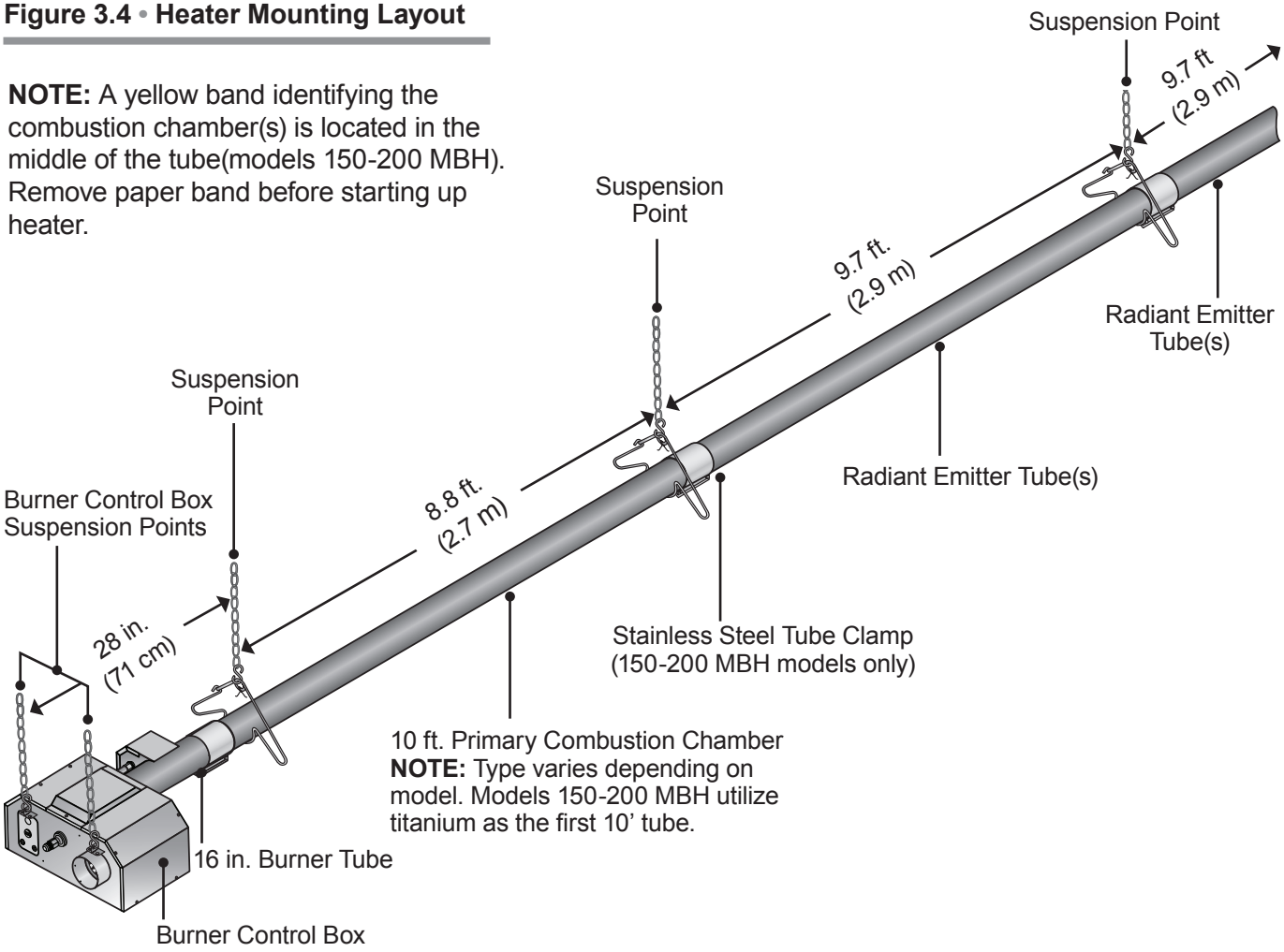


Chart 3.2 • Heater Mounting Requirements and Weights

Model	Dimension Straight Configuration	Suspension Points	Control Box Stabilizer	Shipping Weight	Chain Set Qty. Straight Configuration (P/N: THCS)	Chain Set Qty. w/U-bend (TF1B) Configuration	Optional Brass Knuckle (P/N:BK)
HL3-20	21'-9" / 261"	3	2	120 lbs.	5	6	3
HL3-30	31'-5" / 377"	4	2	160 lbs.	6	8	4**
HL3-40	41'-1" / 493"	5	2	190 lbs.	7	8	5
HL3-50	50'-9" / 609"	6	2	235 lbs.	8	10	6**
HL3-60	60'-5" / 725"	7	2	265 lbs.	9	10	7
HL3-70	70'-1" / 841"	8	2	300 lbs.	10	12	8**

*Refer to page 22 for U-bend configuration dimensions.
** Model requires 5EA-SUB accessory package when installing in a U-shaped configuration.

❸ Prepare mounting surface, if necessary weld blocks, drill holes (see figure 3.5).
NOTE: The burner control box and radiant tubes should be in straight alignment and level.

❹ Fasten beam clamp, screw hook or other type of suspension anchor to hanging point.

❺ Attach and close S-Hook (P/N: S-HOOK) and #1 double-loop chain (P/N: THCS) to anchor. Check that it is securely attached. **NOTE**: Threaded rod and turnbuckles may be used.

❻ Attach hangers to chains. Adjust chain lengths until radiant tubing is level and equal weight distribution is achieved. Chains must be straight up and down. Do not install chains at an angle as this can result in tube warpage or separation.

Figure 3.5 • Mounting the Hangers

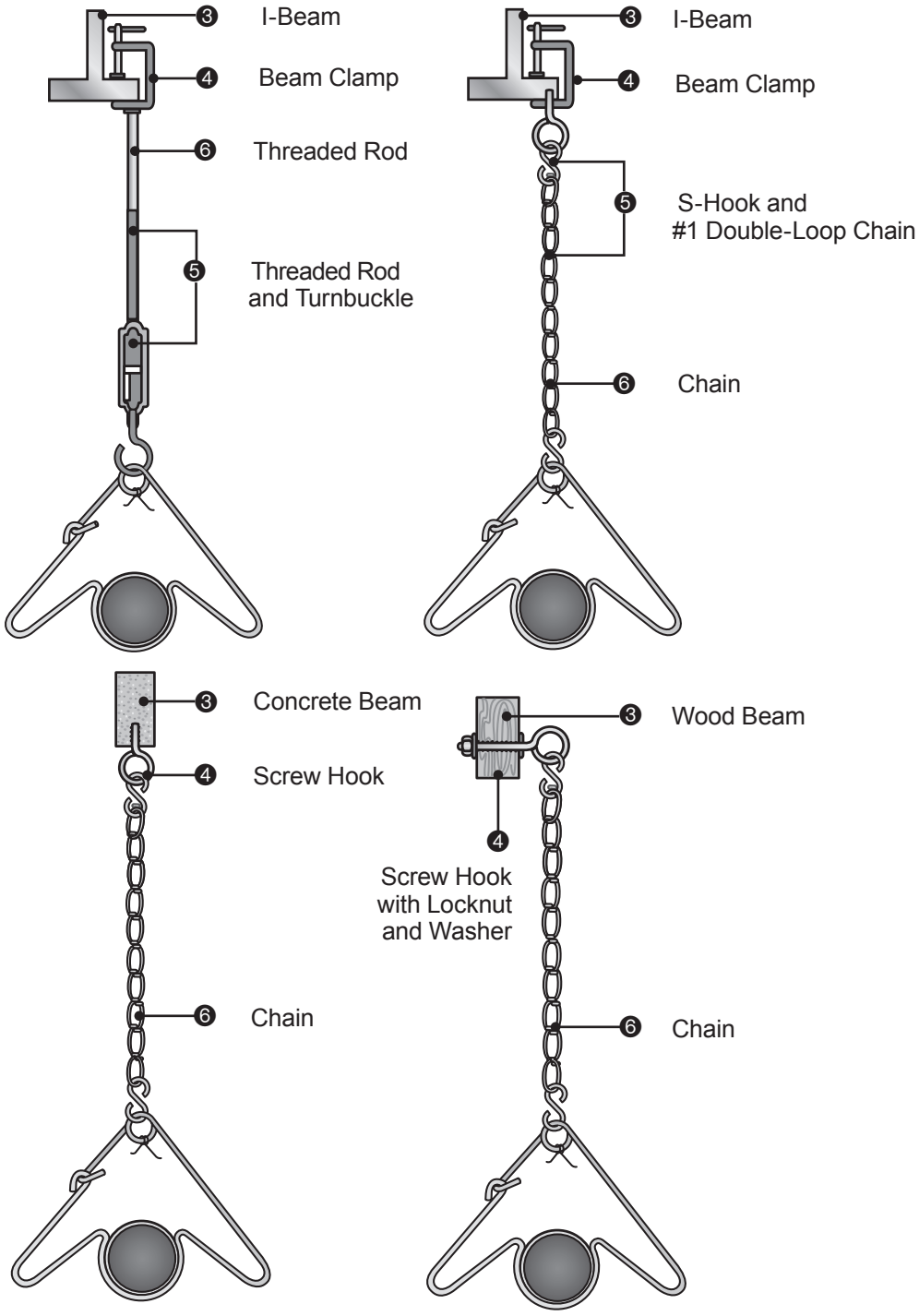
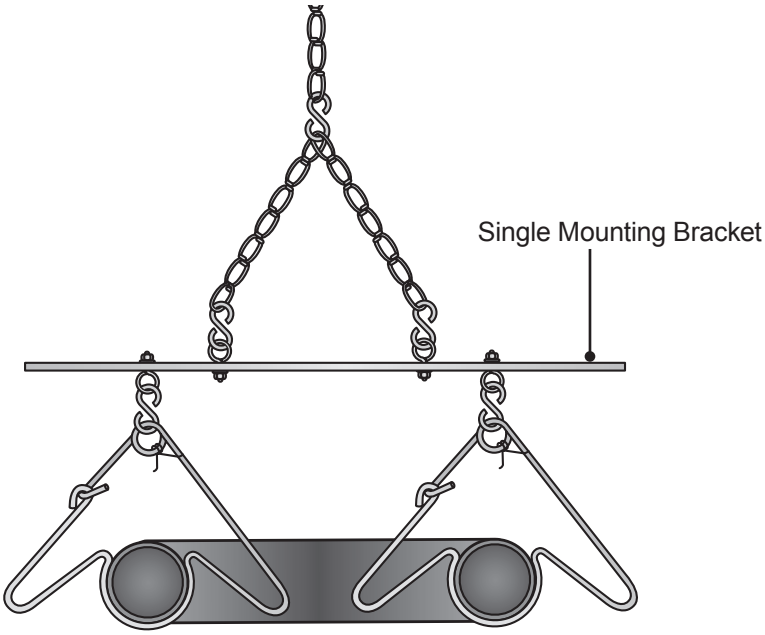
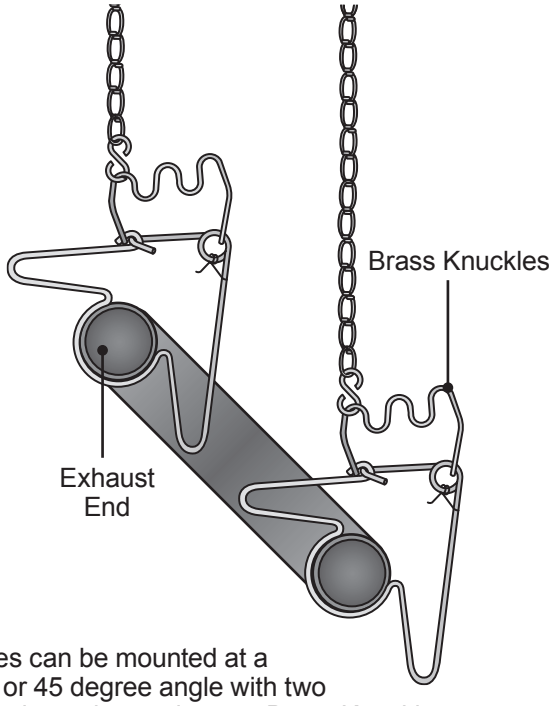


Figure 3.6 • U-Tube Hanger Mounting Options



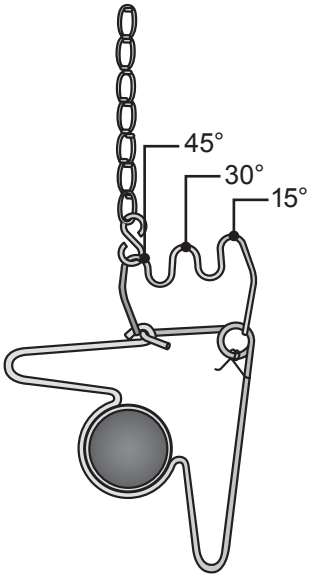
U-Tubes can be mounted from a single suspension point using a Single Mounting Bracket (P/N: SMB) with five S-hooks and #1 double-loop chains.



U-Tubes can be mounted at a 15, 30 or 45 degree angle with two suspension points, using two Brass Knuckles (P/N: BK) fittings, #1 double-loop chains and S-hooks.

Figure 3.7 • Angled Hanger Mounting Options

For 45 degree hanging angle use two S-hooks and two #1 double-loop chains.



For variety of hanging angles, use the Brass Knuckle (P/N: BK) fitting with a #1 double-loop chain and S-hook.

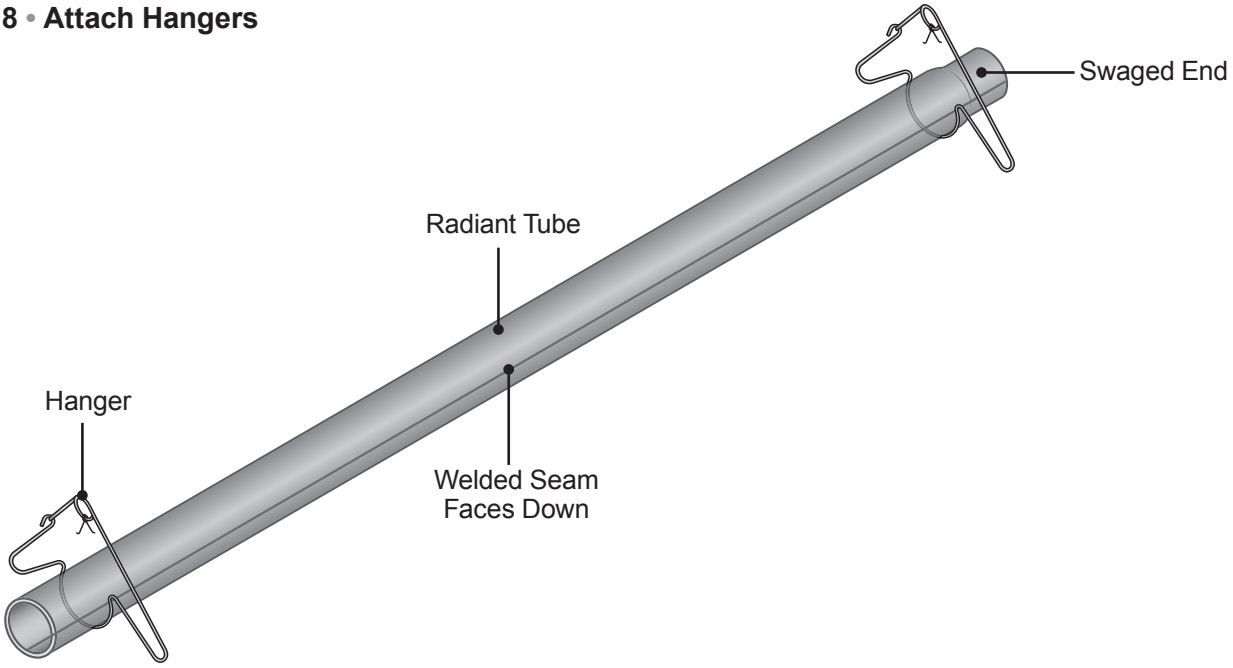
Radiant Tube Assembly

To install the radiant tubes:

❶ Place tubes in hangers with the welded seam facing downward and the swaged end of the tube towards the exhaust end of the heater system (see figure 3.8).

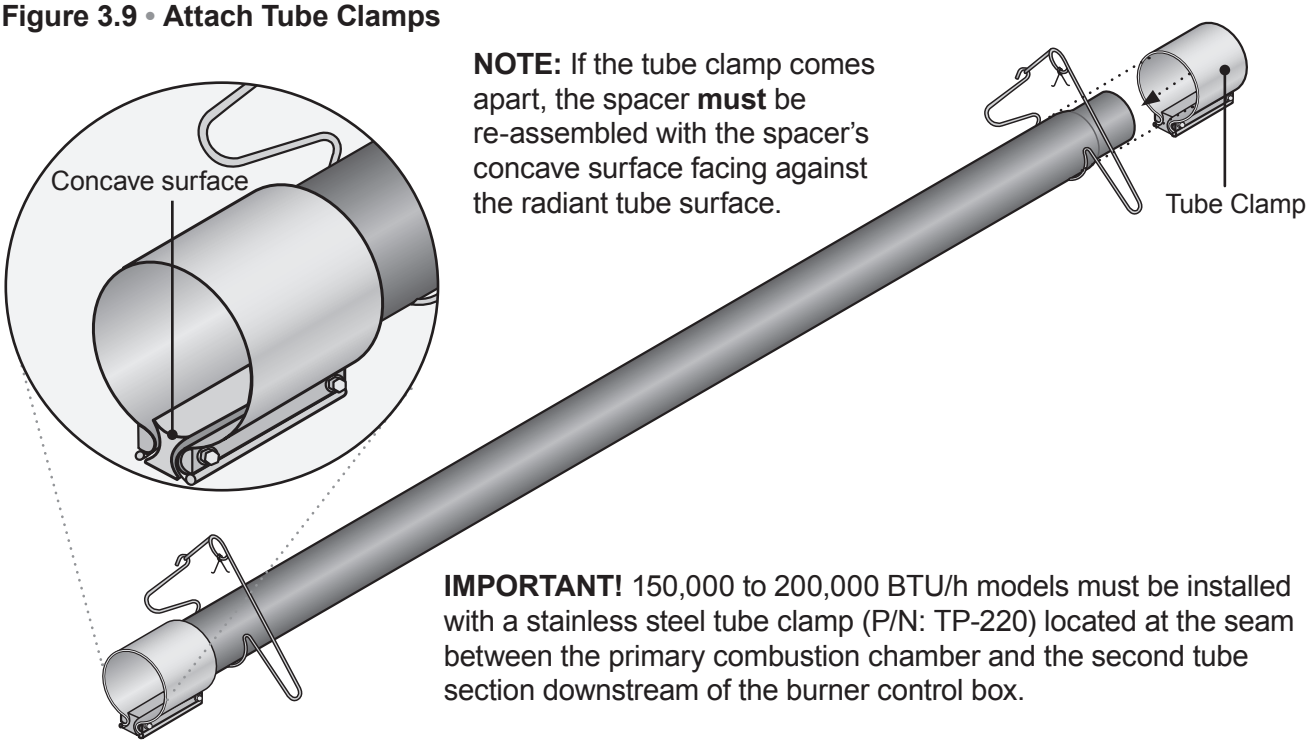
Refer to page 27 for tube installation sequence. Place the combustion chamber as the first tube connected to the burner control box. Models 150-200 MBH utilize a titanium combustion chamber with yellow identification tag.

Figure 3.8 • Attach Hangers



❷ Slide tube clamps onto radiant tubes (see figure 3.9)

Figure 3.9 • Attach Tube Clamps



NOTE: If the tube clamp comes apart, the spacer **must** be re-assembled with the spacer's concave surface facing against the radiant tube surface.

IMPORTANT! 150,000 to 200,000 BTU/h models must be installed with a stainless steel tube clamp (P/N: TP-220) located at the seam between the primary combustion chamber and the second tube section downstream of the burner control box.

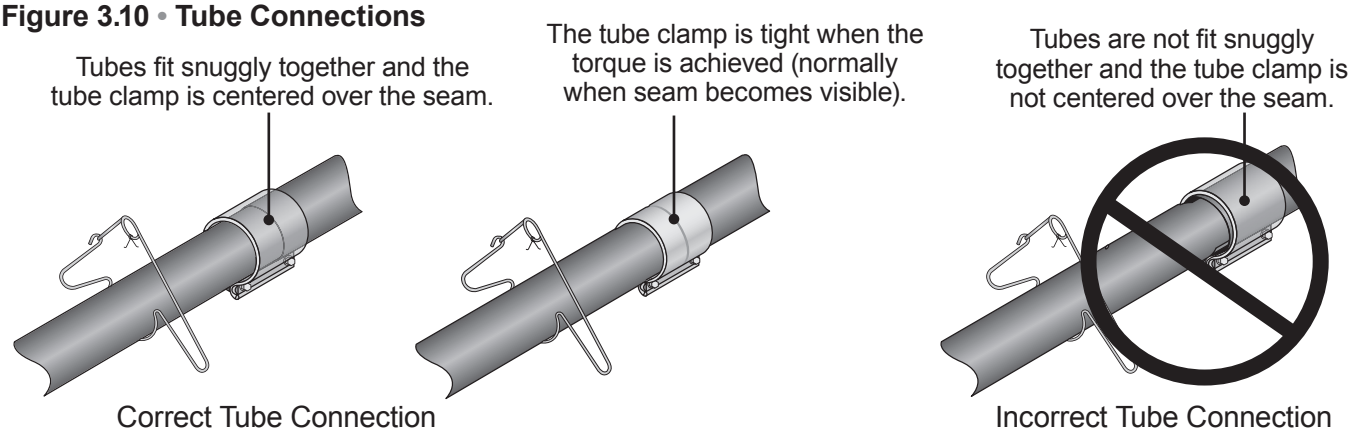
❸ Slip-fit the radiant tube sections together until tightly connected (install the swaged end of each tube towards exhaust end). **NOTE:** If it is difficult to mate the tubes, they may be installed incorrectly.

❹ Center tube clamps over the seam where two radiant tube sections connect. If necessary, rotate tube clamps so they will not interfere with the reflector end caps during expansion and contraction of the heater.

❺ Tighten tube clamp bolts to secure. When proper compression is obtained (40-60 ft-lbs. torque) the tube seam will create a visible mark on the tube clamp. **NOTE:** Excessive torque may damage the tube clamp.

❻ Determine the location of the burner control box and note the placement of the mounting chains.

Figure 3.10 • Tube Connections



Optional Elbow or U-Bend Accessory Configuration

A 90 degree elbow or 180 degree U-bend accessory fitting may be installed in the radiant tube heating system. Refer to Chart 3.3 on page 22 for minimum distance requirements from the burner control box.

When installing an Elbow or U-Bend Accessory Fitting:

- The top clearance of an uncovered (no reflector) elbow or U-bend accessory fitting to combustibles is 18 in. (0.45 m)
- If operating the heater unvented, separate the intake air to the heater from its exhaust products a minimum of 4 ft., further separation may be necessary. Combustion air may also be supplied.
- A maximum of two 90° elbows or one 180° U-bend can be installed on a heater.
- Remove one 36 in. section of baffle. Refer to baffle assembly section on page 26.

Figure 3.11 • Optional Tube Connections

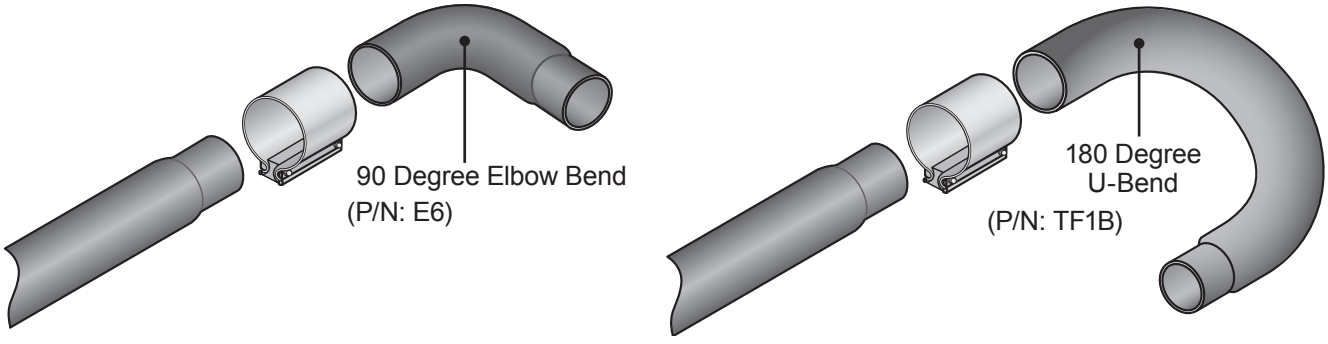


Figure 3.12 • Elbow and U-Bend Clearances

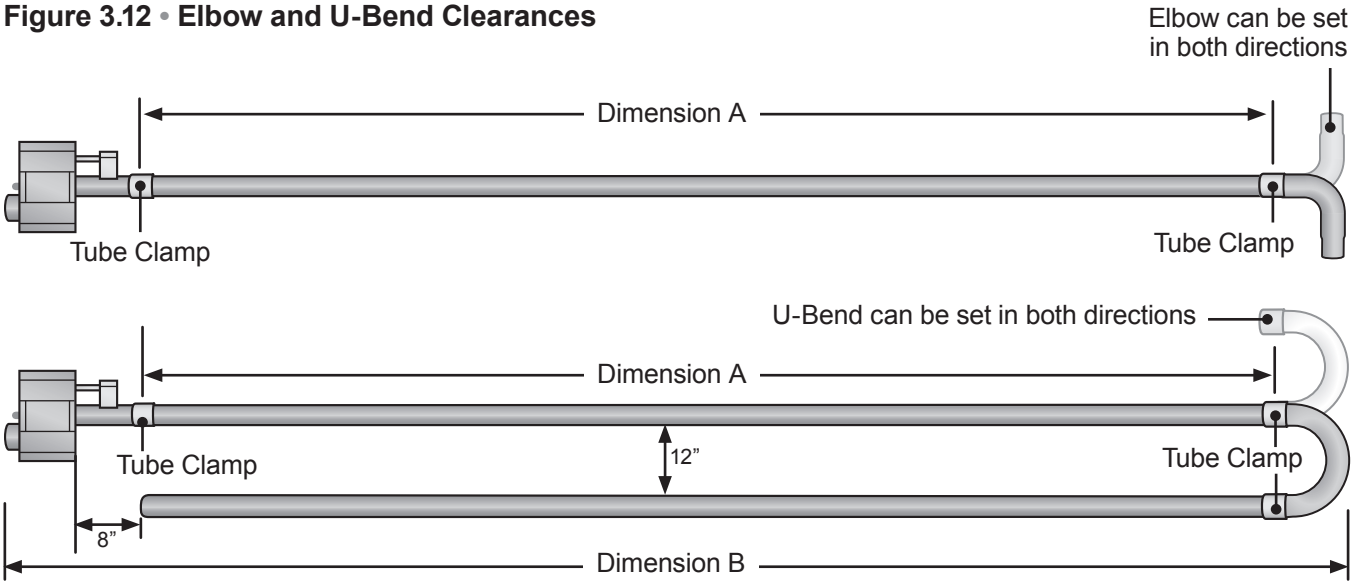


Figure 3.13 • U-Bend and Elbow Dimensions

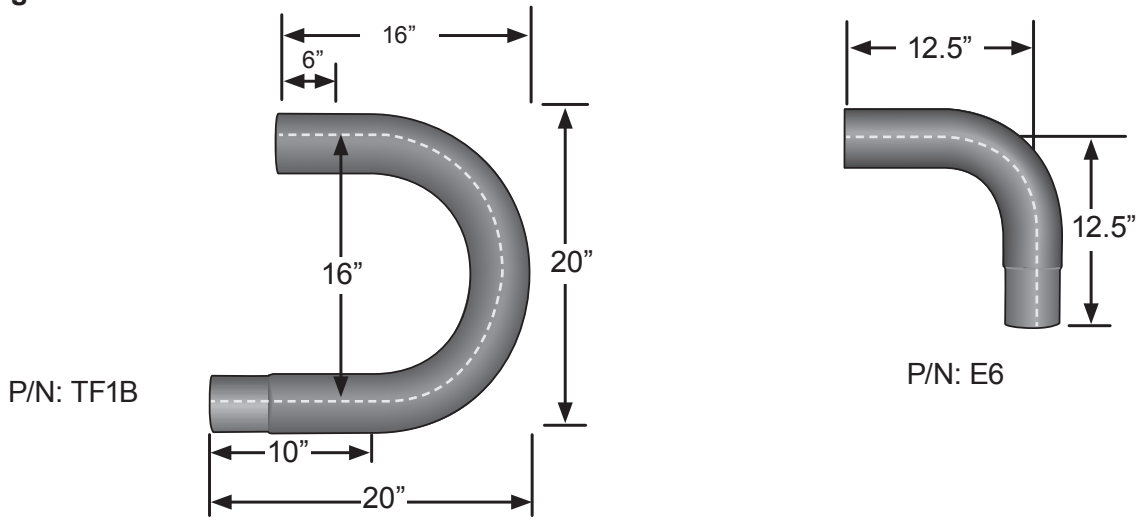


Chart 3.3

Minimum Distance From Burner Control Box to Elbow or U-bend Accessory Fitting

Models (MBH)	Dimension A
65 - 100	10 ft.
125	15 ft.
150 - 175	20 ft.
200	25 ft.

NOTE: Maintain a 36” minimum distance from vent to combustion air intake on heaters fitted with a U-bend accessory fitting.

Chart 3.4

Overall Dimensions for Heaters Configured With U-Bend (P/N: TF1B)

Model	Dimension B	Notes
HL3-20	13’ - 1” / 157”	N/A
HL3-30	17’ - 9” / 213”	Requires P/N: 5EA-SUB*
HL3-40	22’ - 9” / 273”	N/A
HL3-50	27’ - 5” / 329”	Requires P/N 5EA-SUB*
HL3-60	32’ - 5” / 389”	N/A
HL3-70	37’ - 3” / 447”	Requires P/N 5EA-SUB*

* 5EA-SUB may only be ordered at the time of heater production. Field corrections require two (2) TR-60 packages.

Burner Control Box Suspension

Suspending the burner control box must be done in accordance with applicable codes listed in the Safety section and these instructions.

The burner control box must be in straight alignment with all radiant tubes and level. Contact your local distributor or the factory to see if your application allows for the rotation of the burner control box.

❶ Determine the mounting chain locations for hanging the burner control box.

❷ Fasten beam clamp, screw hook or other type of suspension anchor to hanging point.

❸ Attach S-hook and chain assembly (P/N: THCS) to anchor. Check that it is securely connected.

❹ Attach chain assemblies and S-hooks to mounting brackets on the burner control box. Adjust chain lengths until level and in straight alignment with radiant tubes. Burner sight glass will be visible from the floor.

Figure 3.14 • Burner Control Box Assembly • Side View

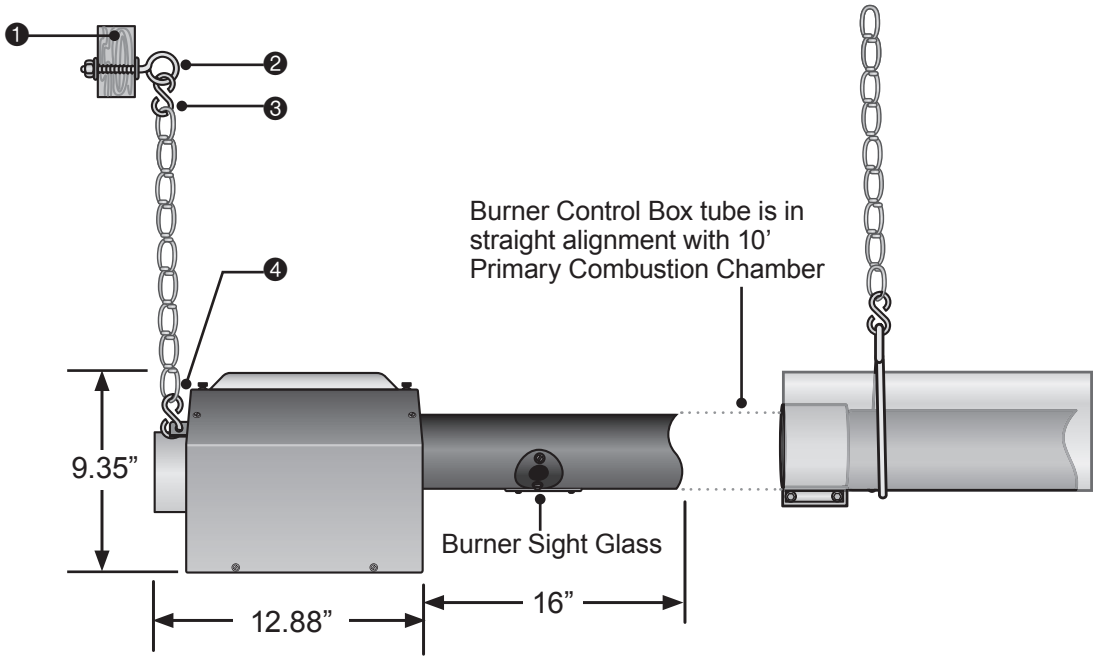
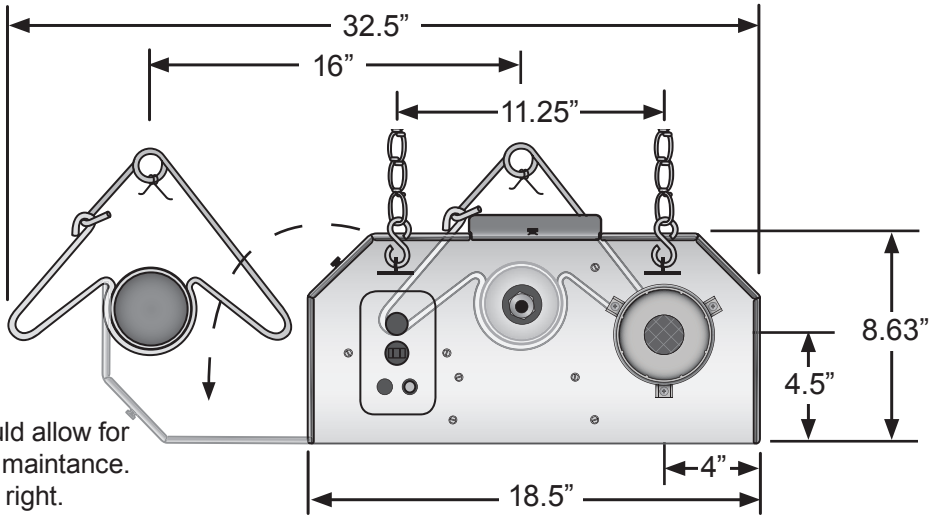


Figure 3.15 • Burner Control Box with U-Bend • End View



NOTE: Control Box Cover should allow for clearance for easy service and maintance.
* Recommended U-Tube to the right.

Reflector Assembly

To install the reflectors (see figure 3.16)**:**

❶ Attach the reflector center supports onto radiant tubes.

❷ Slide each reflector section through the hangers and adjust the reflector tension spring into the V-groove on the top of the reflector. The reflectors should overlap approximately 4 inches.

❸ To prevent the reflectors from shifting, secure the reflector sections together using sheet metal screws, except at the expansion joint (see Chart 3.6). **NOTE:** Installer to supply sheet metal screws.

❹ Attach reflector end caps with polished finish inward, to each end of the reflector run. Secure with clips.

Reflectors, and reflector accessories, direct infrared energy to the floor level. The reflector assembly depends on the heater configuration, proximity to combustibles and space surrounding the heater.

Before you begin assembly, determine if the use of reflector accessories are necessary (see Chart 3.5).

Figure 3.16 • Reflector Assembly

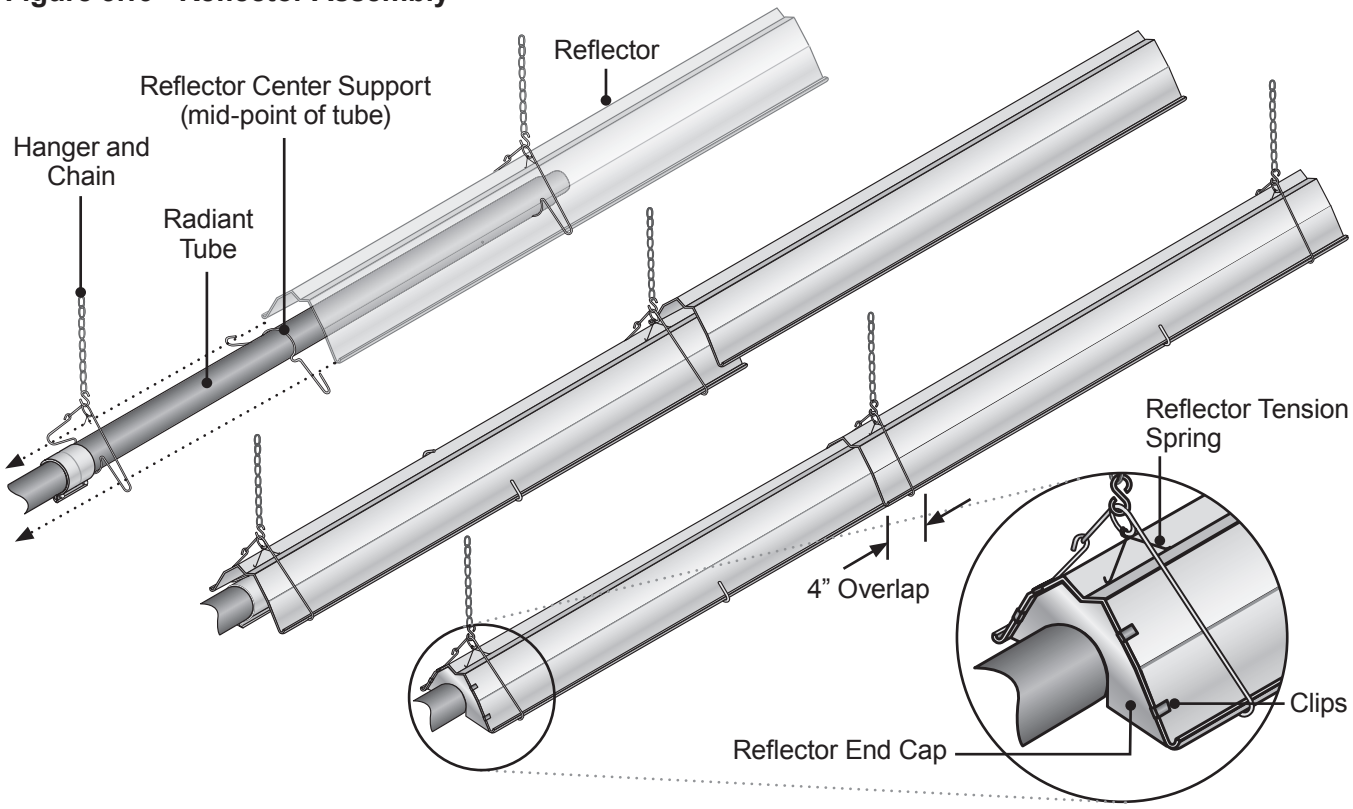


Figure 3.17 • Width of Installed Reflector - Top View

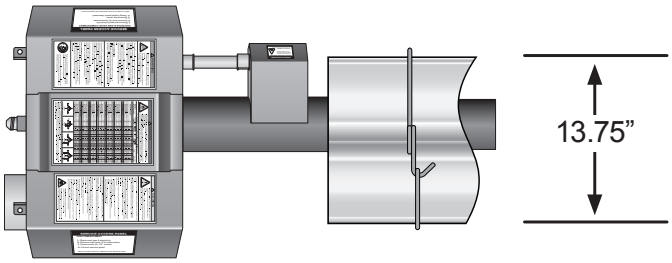
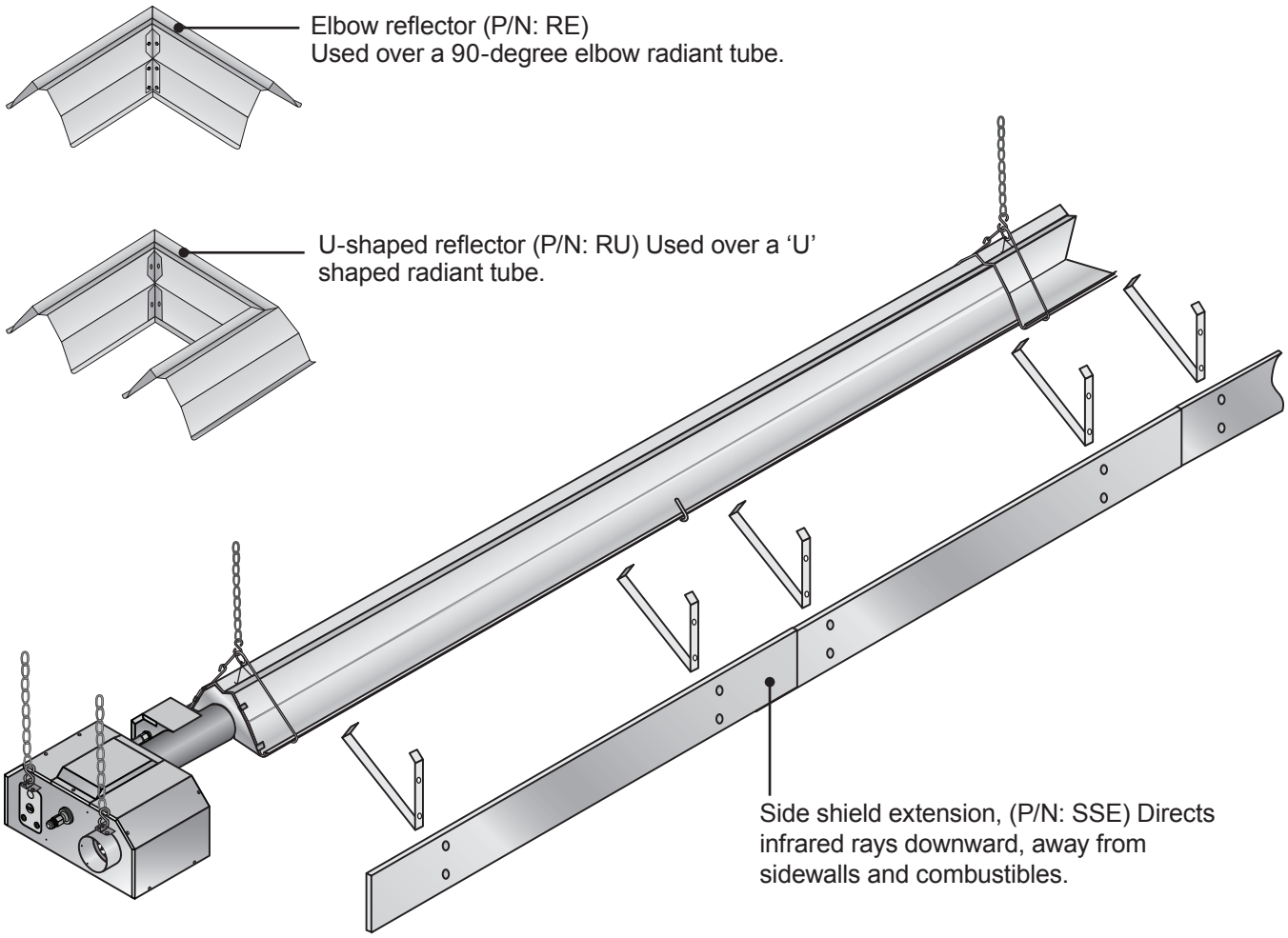


Chart 3.5
Common Optional Accessories

Reflector Accessory	Description	Part Number
Elbow Reflector*	90° bend, highly polished aluminum reflector elbow designed to fit atop one elbow accessory fitting.	RE
U-Reflector*	180° bend, highly polished aluminum reflector U-bend designed to fit atop one U-bend accessory fitting.Reference figure 3.6	RU
Side Shield Extension**	Highly polished side shield extension used to direct infrared rays downward, away from sidewalls and combustibles.	SSE
Protective Guard	Used to prevent debris or objects from becoming lodged between the radiant tube and reflector. Required when mounting heaters below 8 ft.	PG

* Reflectors cannot be rotated when used with a reflector elbow (RE),or side shield (SSE).
** Refer to the Clearance to Combustible chart see page 12 for minimum distances to combustibles when side shield extension(s) are used.

Figure 3.18 • Reflector Shield Accessories



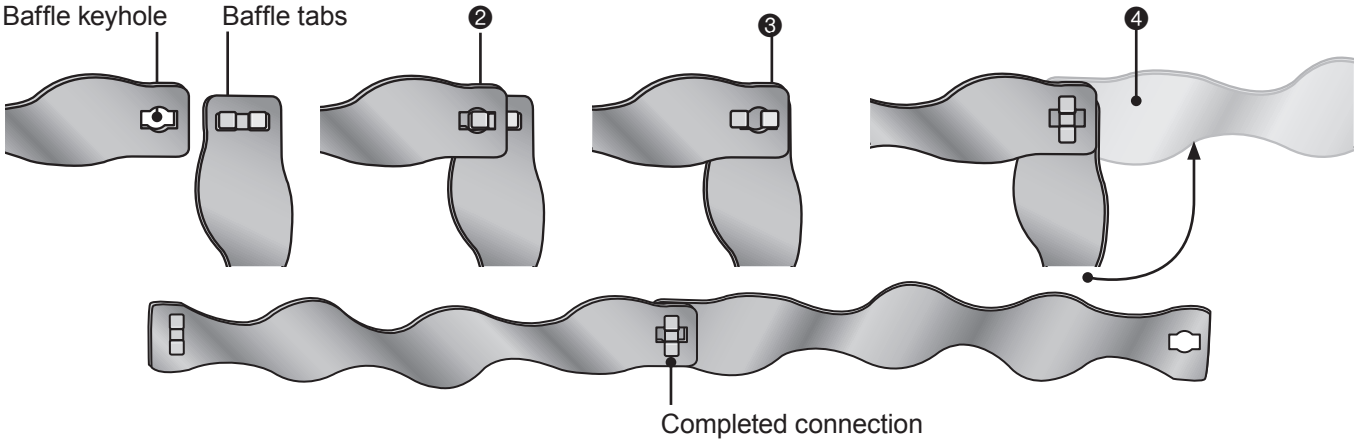
Baffle Assembly and Placement

Different models and inputs utilize specific baffle lengths. Remove all enclosed baffle sections from box and retain with applicable heater. Reference shipping label for proper baffle size.

To assemble the baffles: NOTE: Baffles may be inserted into the tube while being assembled.

1. Determine the number of baffles needed for your model number. **Remove one 36 in. baffle section if heater is fitted with an elbow** (P/N: E6) **or U-bend** (P/N: TF1B) **accessory.**
2. Orient the baffle tabs at a 90° angle to the baffle keyhole (see figure 3.19).
3. Insert one baffle tab into keyhole and slide completely to one side until both baffle tabs appear in the keyhole.
4. Adjust the tabs to the center of the keyhole and rotate the baffle 90 degrees to lock the baffle sections together.
5. Repeat this process with all remaining baffle sections to complete assembly.

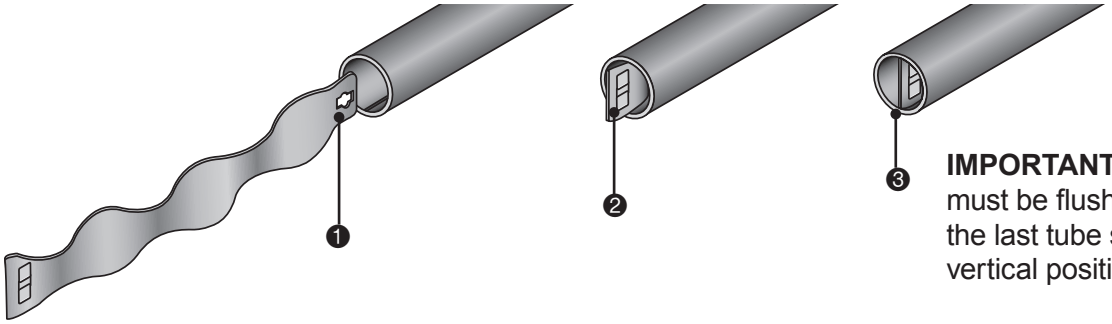
Figure 3.19 • Assembling the Baffles



To insert the baffles:

1. Insert baffles with the keyhole end first.
2. Rotate baffle assembly so that it is in the **vertical position**.
3. Slide baffle assembly into the last radiant tube section, furthest from the burner control box. **NOTE:** Baffle assemblies longer than 10 ft. will continue to be fed into next tube section. **When the heater is configured with a 'U' or 'L' shaped accessory fitting** It may be necessary to cut the baffle in two sections. In this case, place as much baffle as possible downstream of the fitting and the remainder just before the fitting.

Figure 3.20 • Inserting the Baffles

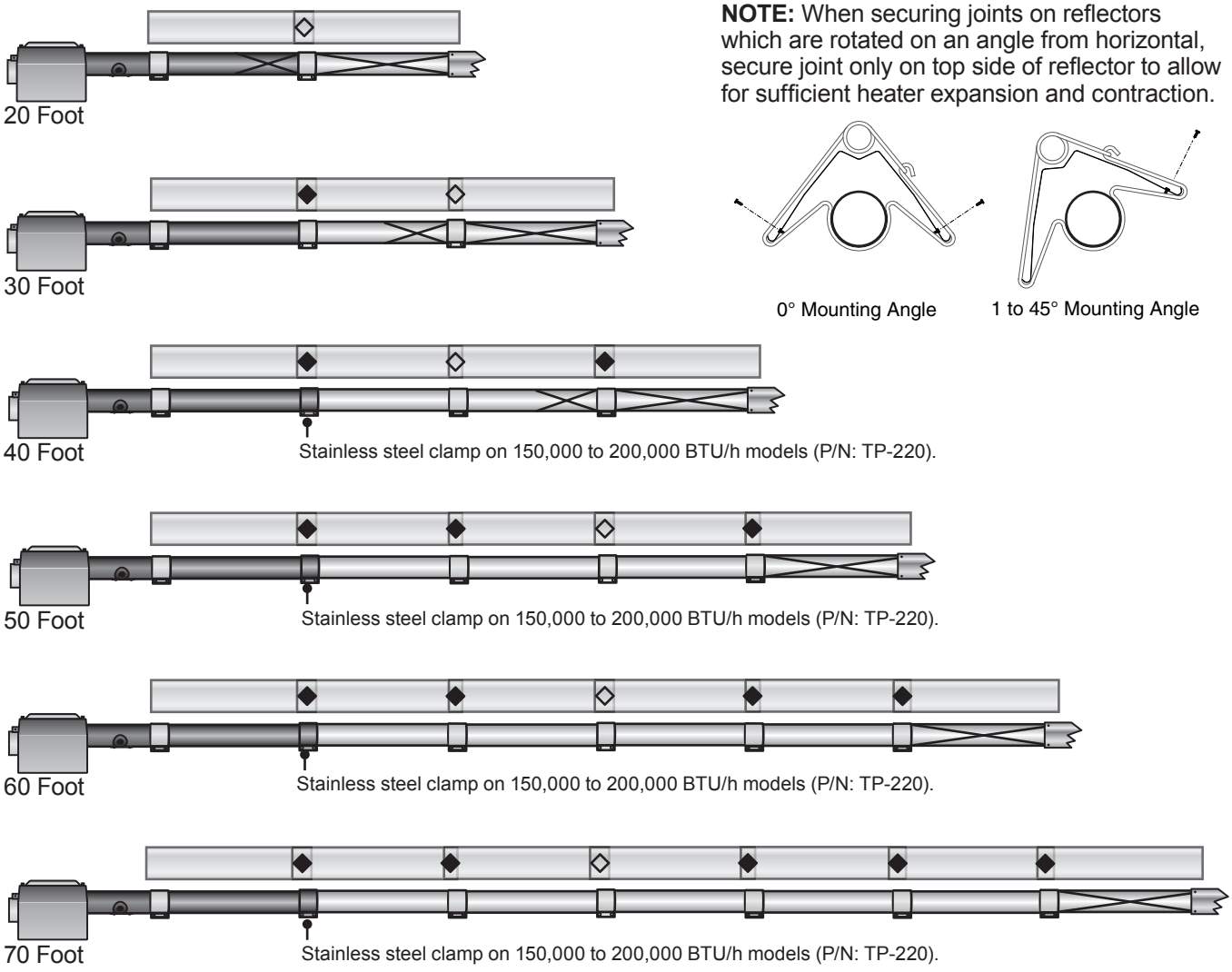


IMPORTANT: Baffle assembly must be flush with the end of the last tube section and in the vertical position.

Final Heater Assembly

Chart 3.6

Tube Installation Sequence, Baffle Location and Secured Joints for Reflectors



NOTE: When securing joints on reflectors which are rotated on an angle from horizontal, secure joint only on top side of reflector to allow for sufficient heater expansion and contraction.

0° Mounting Angle

1 to 45° Mounting Angle

Key

- Burner Control Box w/16 in. Burner Tube
- Expansion Joint on Reflectors
- Secured Joint on Reflectors
- Primary Combustion Chamber with Clamp
- Radiant Tube Exchanger with Clamp
- Baffle Location
- Secure vent material to exchanger with three #8 sheet metal screws. Seal with high temperature silicone sealant. Do not use tube clamp.

Venting

The heating system must be vented as described here to properly direct flue gases from the unit to the outside atmosphere. The venting can terminate vertically through the roof (up) or horizontally through a sidewall (sideways).

Follow these guidelines and all applicable codes for all models prior to installing the vent material. Local codes may vary.

In the absence of local codes:

United States: Refer to NFPA 54/ANSI Z223.1 (latest edition), National Fuel Gas Code.
Canada: Refer to CAN/CGA B149.1 and B149.2 Installation Codes for Gas Burning Appliances.

⚠ WARNING

Gas-fired heaters must be vented. A built in power exhauster is provided. Additional external power exhausters are not required or permitted.

Insufficient ventilation and/or improperly sealed vents may release gas into the building which could result in health problems, carbon monoxide poisoning, or death. Improper venting may result in fire, explosion, injury, or death.

⚠ WARNING

Do not vent this appliance through a masonry chimney.

Do not use dampers in the heater vent pipe.

Single wall vent pipe must not pass through any unoccupied attic, inside wall, concealed space, or floor.

Un-insulated single wall vent pipe must not be used outdoors for venting appliances in regions where winter design temperature is below freezing.

Replacing Existing Equipment

If the heater is replacing existing equipment and using an existing vent system, inspect the venting for proper size and horizontal pitch as directed in these instructions and the latest edition of the National Fuel Gas Code, ANSI Z223.1 (NFPA 54) or CSA B149.1 Installation Code. When an existing Category I heater is removed or replaced, the original venting system may no longer be sized to properly vent the attached appliances.

Determine that there is no blockage or restriction, leakage, corrosion, or other deficiencies that can cause hazards. The vent pipe should be corrosion-resistant galvanized steel of a thickness that meets the National Fuel Gas Code. Minimum thickness for connectors varies depending on the pipe diameter. Never vent the heating system with PVC or plastic pipe.

⚠ WARNING

If replacing an existing heater, vents may require re-sizing. Improperly sized venting systems can result in vent gas leakage or condensation. Refer to the National Fuel Gas Code ANSI Z223.1 (NFPA 54) or CSA B149.1 - latest edition. Failure to follow these instructions can result in serious injury or death.

General Venting Requirements

The venting system for HL3 Series heaters may terminate horizontally through a sidewall or vertically through the roof, and may be individually or commonly vented. Configuration of the vent termination determines the category type. All model heaters must be installed in accordance to the requirements of this section, as well as the requirements of its category determination, as described in this manual. To determine your applications category type, review 'Vertical Venting' (Category I) and 'Horizontal Venting' (Category III) sections of this manual.

All HL3 Series Model Requirements:

- Exhaust vent pipe must be 4 inch nominal size.
- Use vent pipe material that is corrosion-resistant galvanized steel of a thickness that meets the National Fuel Gas Code.
- Do not exceed a maximum vent length of 20 feet.
- Maintain a minimum vent length of 3 feet.
- Maintain a minimum 12 inches of straight pipe from the flue outlet before any directional changes are made in the venting system.
- Have all vent pipe seams or connectors sealed with high temperature silicone sealant approved for at least 550°F (field supplied) and fastened together with at least three (3) corrosion resistant sheet metal screws (field supplied).
- Maintain a 6 inch clearance around all single wall vent pipe from any combustible materials. For double-wall type B vent or Duravent PVP venting, follow the vent manufacturer's clearances to combustibles.
- The equivalent length for a 4 inch 90° elbow is 5 feet.
- Avoid using more than two 90° directional changes in the venting system.
- Suspend and secure all horizontal runs in a manner consistent with local codes and in such a way that the vent system is supported to prevent sagging.
- Vent termination must maintain a minimum distance of 6 feet from any mechanical air supply inlet.
- The vent terminal must be installed to prevent any blockage by snow and protect building material from degradation by flue gases.
- Consult NFPA ANSI Z223.1 Gas Vent Termination criteria for vents that terminate on a roof pitch that exceeds 9:12.
- **Canada:** Vents must terminate a minimum of 3 feet from a window or door that may be opened, and a non-mechanical air supply inlet or combustion air inlet into the building.

When possible, avoid venting through an unconditioned space. Venting through an unconditioned space promotes condensation. When venting through an unconditioned space is unavoidable, or if the unit is installed in an area that is prone to condensation, insulate venting runs greater than 5 feet to minimize the production of condensation. Inspect for leakage prior to insulating the venting and only use insulation that is non-combustible with a temperature rating of not less than 550°F. Install a tee fitting at the low point of the vent system and provide a drip leg with a clean out cap as shown in Figure 3.21.

When venting pipe passes through a combustible interior wall or floor, a metal thimble with a diameter 4 inches greater than the vent pipe diameter must be used. If there is 6 feet or more of vent pipe prior to passing through the combustible wall or floor, then the metal thimble need only be 2 inches greater than the vent pipe diameter. If a metal thimble is not used, all clearances to combustibles from the vent pipe must be 6 inches. When permitted, type B vent or Duravent PVP venting may be used for the last section of vent pipe to reduce the required clearances to combustibles when passing through a combustible wall or floor. When using type B vent or Duravent PVP venting, follow the manufacturer's recommended clearances to combustibles. Any material used to close or insulate the opening must be non-combustible.

Vertical Venting (Category I)

An appliance that operates with a non-positive vent static pressure and with a vent gas temperature that avoids excessive condensate production in the vent is said to be 'Category I'. The heater is considered a Category I appliance if the venting system meets all of the following criteria:

- The vent system terminates vertically (up).
- The length of the horizontal portion of the vent run is less than 75% of the vertical rise length. (e.g.- If the vertical vent height is 10 feet, the horizontal run is less than 7 1/2 feet).
- The vent terminates a minimum of 5 feet above the vent connection on the unit.
- Horizontal venting sections of the vent pipe must be installed with an upward slope from the appliance at a pitch of 1/4 inch per foot.

For vertical vent termination, the venting must comply with all parts of this section, in addition to the requirements of the general venting.

Category I (Vertical) venting is venting at a non-positive pressure. An appliance vented as a Category I is considered a fan-assisted appliance and the vent system does not have to be 'gas tight'. It is recommended that the venting system is installed with a tee, drip leg, and clean-out cap as shown in Figure 3.21.

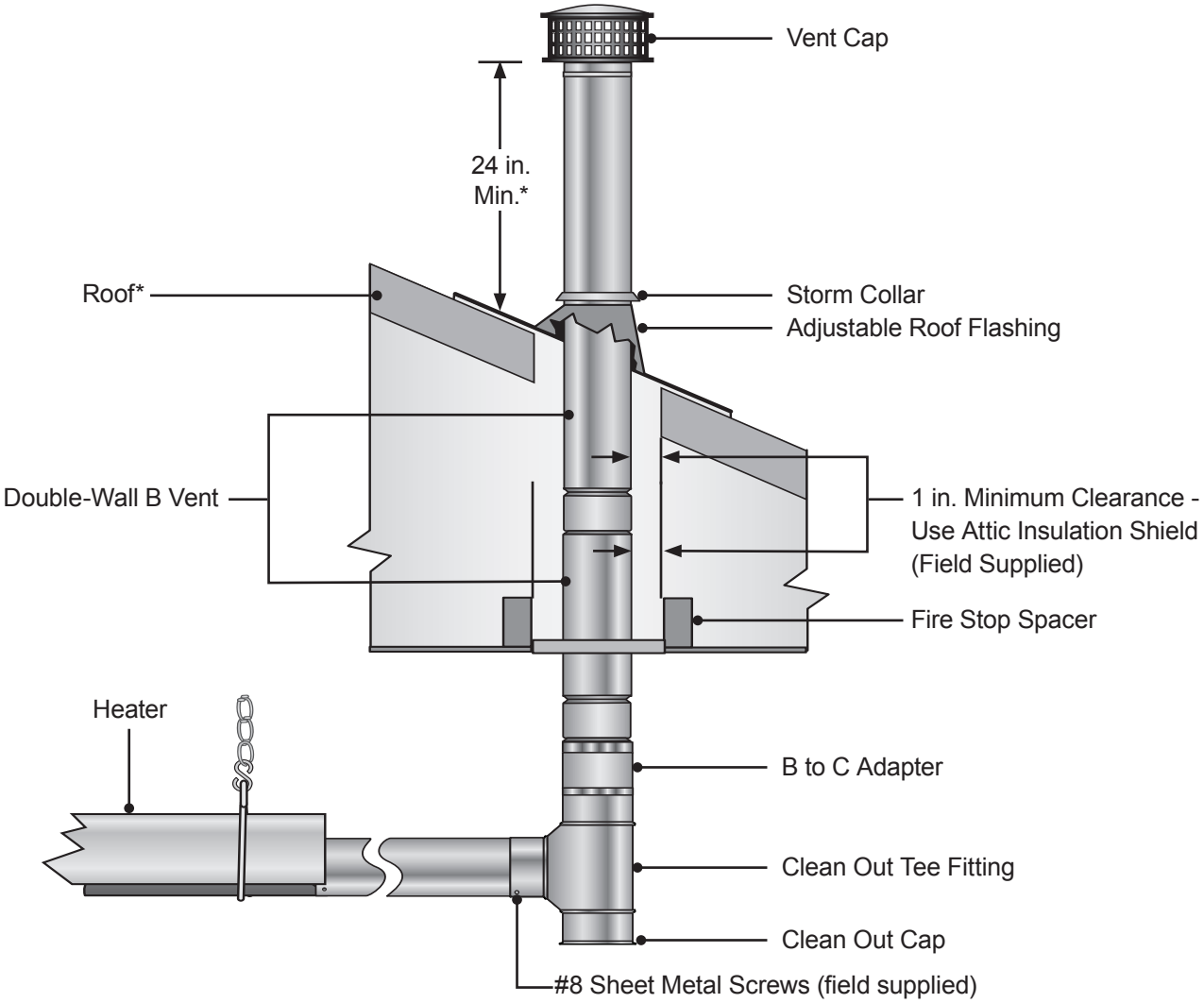
Vent Locations and Clearances:

- Separate air intake duct from vent pipe by a minimum of 4 feet by placing vent pipes higher than adjacent air intake ducts.
- Utilize a listed type B vent termination cap.
- The vent terminal must extend a minimum of 2 feet above the roof.
- Vent caps should be located a minimum of 2 feet away from adjoining structures.

All vertically vented heaters that are Category I must be connected to a chimney or vent complying with a recognized standard, or lined masonry (or concrete) chimney with a material acceptable to the authority having jurisdiction. Venting into an unlined masonry chimney is not permitted. Refer to the National Fuel Gas Code and page 28 of this manual.

Use a listed vent terminal to reduce down drafts and moisture in the vent.

Figure 3.21 • Rooftop Venting - Side View



*Consult the NFPA ANSI Z223.1 Gas Vent Termination criteria if roof pitch exceeds 9:12

Horizontal Venting (Category III)

An appliance that operates with a positive vent static pressure and with a vent gas temperature that avoids excessive condensate production in the vent is said to be “Category III”. The heater is considered a Category III appliance if the venting system meets all of the following criteria:

- The vent system terminates horizontally (sideways).
- The vent terminates vertically, but the length of the horizontal portion of the vent run exceeds 75% of the vertical rise length. (e.g.- If the vertical vent height is 10 feet, the horizontal run is greater than 7 1/2 feet).
- The vent terminates below 5 feet of the vent connection on the unit.
- Horizontal venting sections of the vent pipe must be installed with a downward slope from the appliance at a pitch of 1/4 inch per foot.

Vent enclosed spaces and buildings according to the guidelines in this manual and applicable national, state, provincial, and local codes.

The venting system must be provided by the installer and should be comprised of single-wall venting materials with a thickness of no less than 26 gauge. All joints must be sealed with a high temperature silicone sealant approved for at least 550°F using a minimum bead of 1/4” x 1/4”, and fastened with at least three corrosion resistant #8 sheet metal screws evenly spaced.

One continuous section of double-wall B vent or Duravent PVP vent may be used to pass through a combustible wall or barrier, or the installer may continue to use single-wall vent provided a combustible wall thimble is used which provides adequate clearances to combustibles.

All horizontal Category III vents must be terminated with a Simpson-Duravent sidewall vent cap (P/N: SWD-4 for 4” venting).

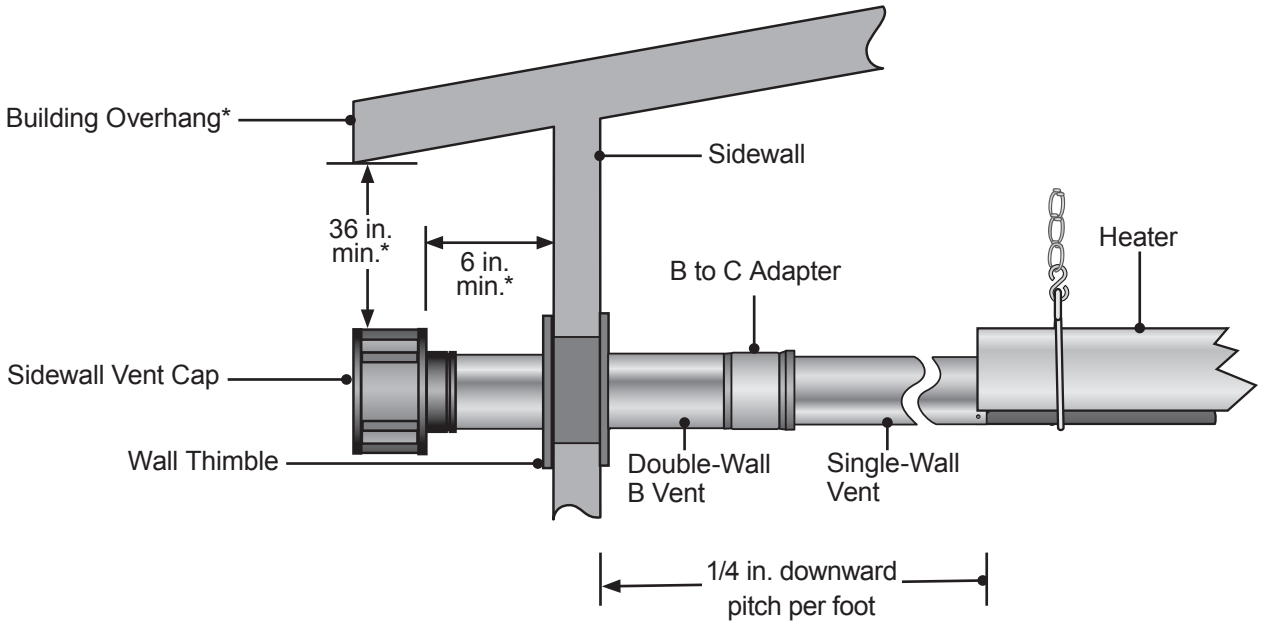
IMPORTANT! Once all silicone sealant has fully cured according to manufacturer’s instructions, the installer must perform a leak test on the complete venting system. A solution of soap and water may be used to test the venting inside the occupied space. Once the installer has verified the venting system is completely sealed and free of leaks, the heater may be placed into operation.

Vent Locations and Clearances:

- Vent must terminate a minimum of 4 feet below, 4 feet horizontally from, or 1 foot above any window or door that may be opened or gravity air inlet into the building.
- Vent must terminate a minimum of 3 feet above any forced air inlet that is located within 10 feet.
- The bottom of the vent terminate must be located a minimum of 12 inches above grade level and must extend beyond any combustible overhang. Vents adjacent to public walkways must terminate a minimum of 7 feet above grade level.
- The vent cap must be a minimum of 6 inches from the sidewall of the building.
- Vent must be a minimum of 36 inches below or extend beyond any combustible overhang.

Never join two sections of double wall vent pipe within one horizontal vent system as it is impossible to verify that inner pipes are completely sealed.

Figure 3.22 • Sidewall Venting Requirements



*Vent must extend beyond any combustible overhang if the vent is less than 36 in. below the combustible overhang.

Common Venting (Category I)

The common vent system and all attached appliances must be Category I and must be on the same control device.

The vent connector should be routed in the most direct route from the units to the common vent.

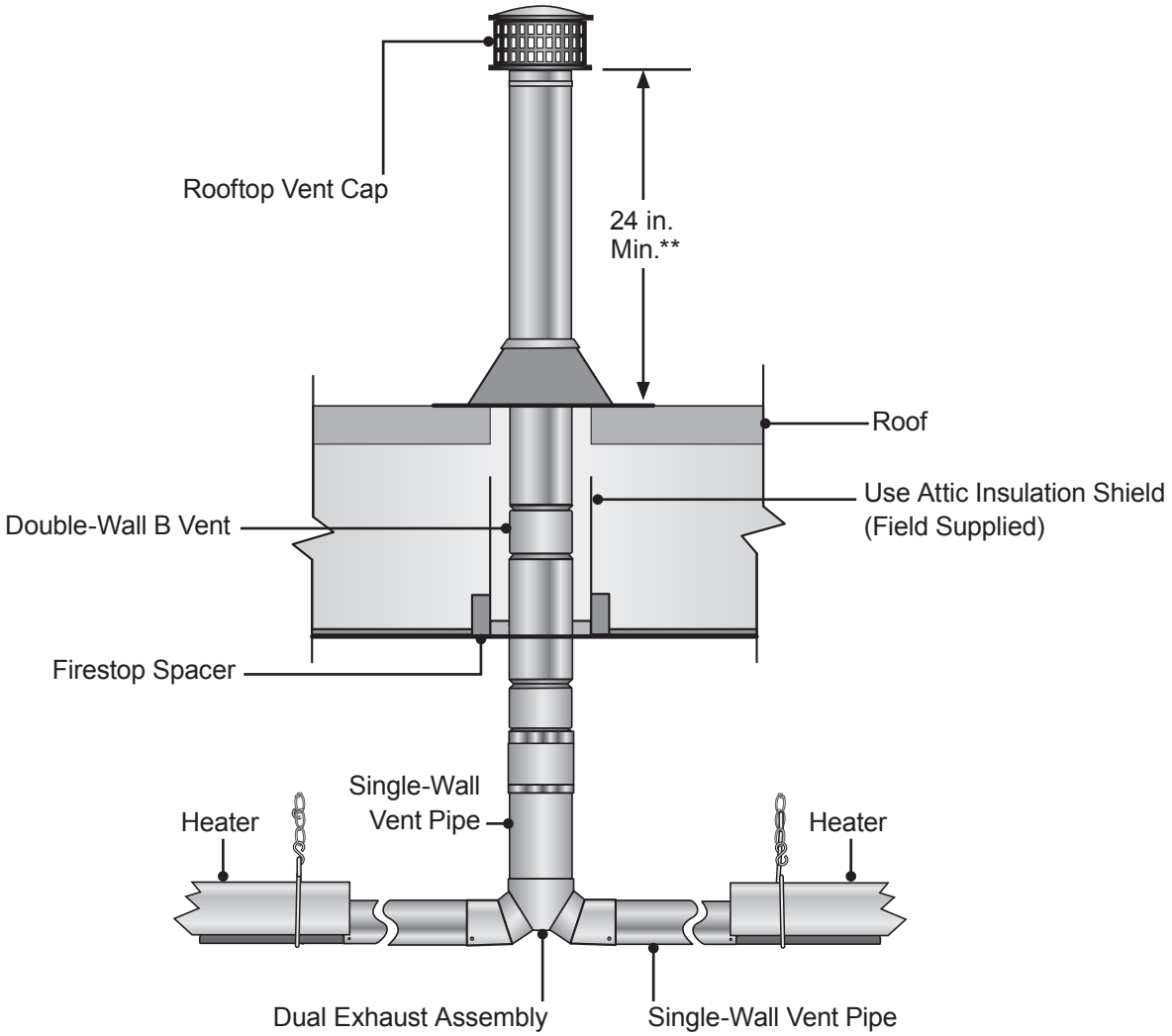
Where two or more vent connectors enter a common gas vent or chimney flue, the smaller connector shall enter at the highest level consistent with the available head room or clearance to combustible material.

Restrictions within the common vent such as elbows should be minimized. Each elbow installed within the common portion of the vent carrying system reduces the maximum common vent capacity by 10%. Refer to NFPA 54 IFEC tables 11.2 and 11.3 for capacity.

The vent connector capacities allow for the use of two 90° directional changes. For each additional required elbow, the vent connector capacity is reduced by 10%.

The common vent cross sectional area must be equal to or greater than the largest vent connector cross sectional area.

Figure 3.23 • Common Rooftop Venting - Side View

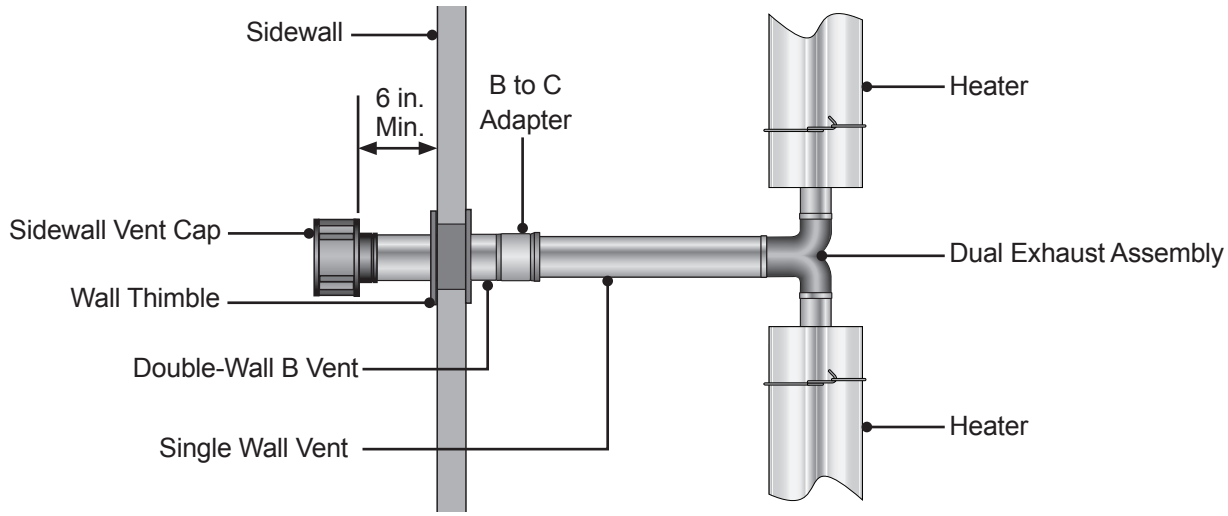


**Consult the NFPA ANSI Z223.1 Gas Vent Termination criteria if roof pitch exceeds 9:12.

Common Venting (Category III)

- A staggered arrangement or a dual exhaust assembly (P/N: Y) must be used when joining two heaters to a common vent so that by-products of one heater do not flow into the adjoining vent of the other heater.
- A Category III appliance may be common vented only if the appliances are on the same control device so that they may only be operated at the same time to prevent the backflow of exhaust gases into a non-operational appliance. The venting system must follow all guidelines for Category III venting as listed on pages 28-29.
- The vent connector should be routed in the most direct route from the units to the common vent.
- Where two or more vent connectors enter a common gas vent or chimney flue, the smaller connector shall enter at the highest level consistent with the available head room or clearance to combustible material.
- Restrictions within the common vent such as elbows should be minimized. Each elbow installed within the common portion of the vent carrying system reduces the maximum common vent capacity by 10%. Refer to NFPA 54 IFEC tables 13.2(a) through 13.2(e) for capacity.
- The vent connector capacities allow for the use of two 90° directional changes. For each additional required elbow, the vent connector capacity is reduced by 10%.
- The common vent cross sectional area must be equal to or greater than the largest vent connector cross sectional area.

Figure 3.24 • Common Sidewall Venting - Top View



Optional Unvented Operation

⚠ WARNING

Not for residential use. The use of unvented tube heaters in residential indoor spaces may result in property damage, serious injury or death. Use unvented operation in commercial and industrial installations with proper ventilation rates only.

When using an unvented configuration (commercial & industrial use only)**, consider the following:**

- A factory vent cap/diffuser (P/N: WVE-GALV) **must** be used.
- Where unvented heaters are used, natural or mechanical means **must** be provided to supply and exhaust a minimum of 4 CFM/1,000 BTU/h input of installed heaters.

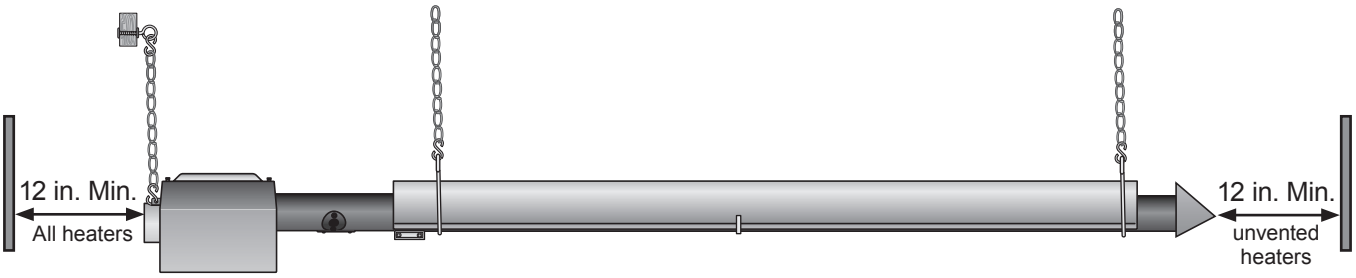
NOTE: Gravity or mechanical means may be used to accomplish the air displacement. Local codes may require that the mechanical exhaust system be interlocked with the electrical supply line to the heaters, enabling both to function simultaneously.

- The minimum clearance between the air intake and the exhaust terminal is 4 feet.

NOTE: When installing in a U-tube configuration, use extra caution to separate vent gases from heater intake.

- Exhaust openings for removing the flue products must be located above the level of the heater(s).

Figure 3.25 • Minimum End Clearances



Combustion Air Requirements

Combustion air may be supplied to the heater by indoor or outdoor means.

If using combustion air intake from indoors, the required volume of the space must be a minimum of 50 ft^3 per 1,000 BTU/h (4.8 m^3/kW) unless the building is of unusually tight construction. If the building is of unusually tight construction with air infiltration rates of less than 0.40 air changes per hour, outside combustion air is typically needed unless the sheer size of the building allows otherwise. Contact the factory for further determination of air infiltration rates.

Non-contaminated outside air for combustion must be ducted to the heater if any of the following apply:

- Chemicals such as chlorinated or fluorinated hydrocarbons (typical sources are refrigerants, solvents, adhesives, degreasers, paints, paint removers, lubricants, pesticides, etc.).
- High humidity.
- Contaminants such as sawdust, welding smoke, etc.
- Negative building pressure.
- Unusually tight construction where there is an air infiltration rate of less the 0.40 air changes per hour.

Guidelines:
Combustion air intake may be located on either the sidewall or roof (see figures 3.26-3.28).

Figure 3.26 • Vertical Outside Air Supply for Single Heater Intake - Side View

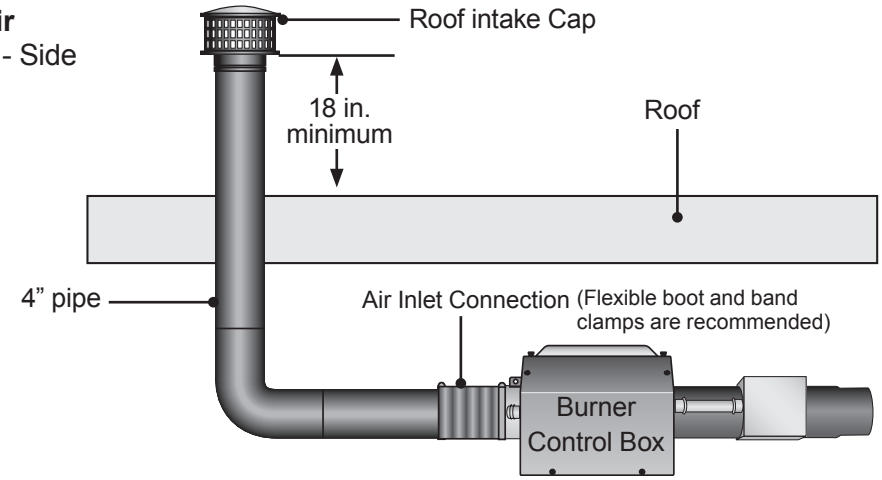


Figure 3.27 • Horizontal Outside Air Supply for Single Heater Intake - Side View

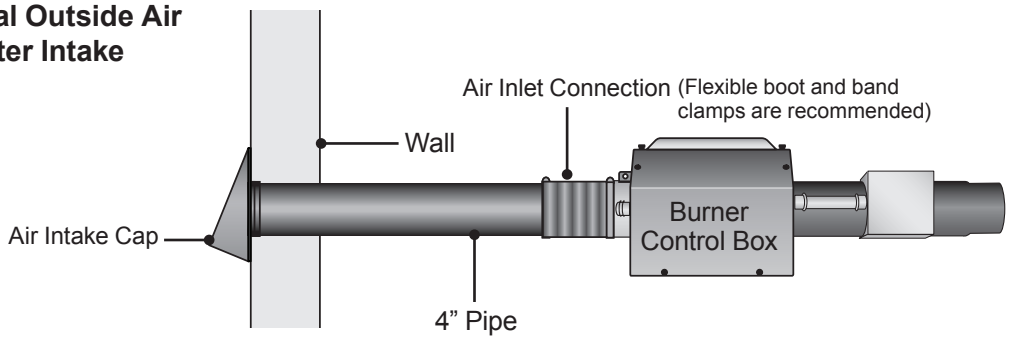


Figure 3.28 • Vertical Outside Air Supply for Common Intake - Side View

NOTE: Common intake heaters must share the same thermostat.

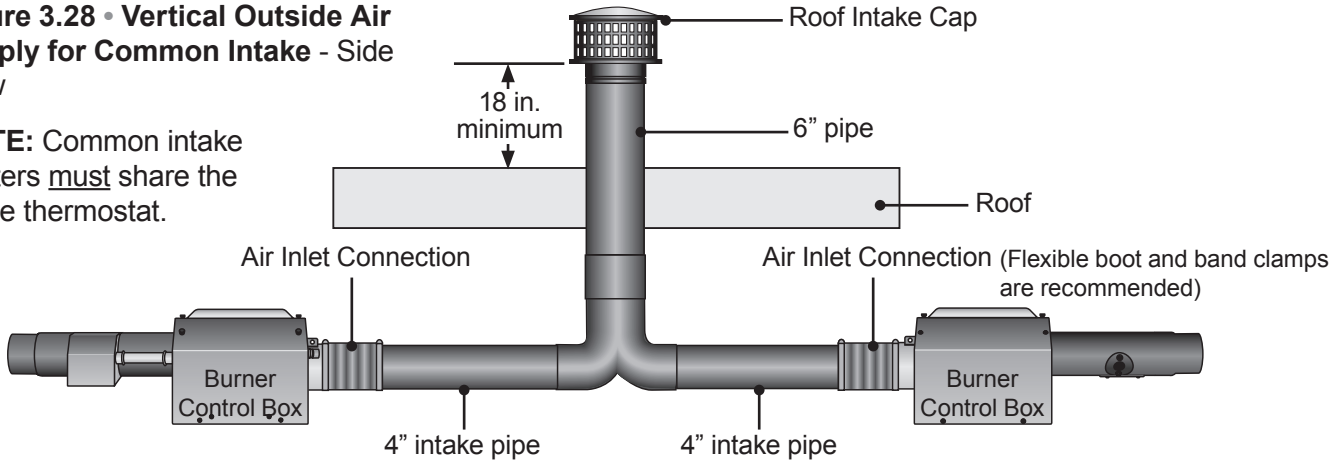
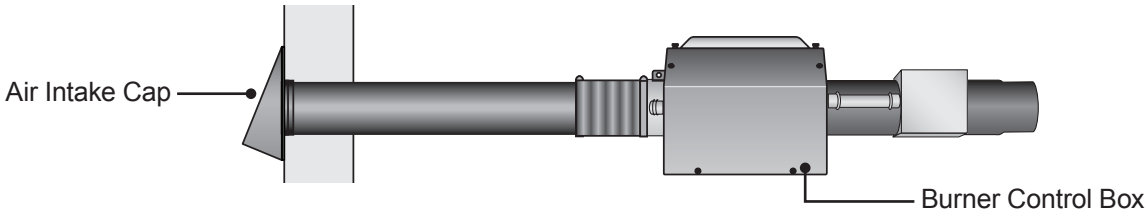


Chart 3.7 • Limitations for Length and Size of Combustion Air Intake Duct

Single Heater Intake		Dual Heater Intake	
Air Intake Duct Size	Max. Intake Length	Duct Size	Max. Intake Length
4 in.	20 ft.	4 in. (single)/6 in. (dual)	20 ft.
5 in.	30 ft.	4 in. (single)/8 in. (dual)	30 ft.
6 in.	40 ft.	Consult factory for longer intake lengths.	

General

- No more than two 90° elbows are allowed.
- Allow for expansion. Use a 4 in. flexible hose to connect the duct to the burner control box.
- In humid environments, use insulated duct, PVC pipe or DWV (drain waste vent) to prevent condensation on the outer surface.
- Do not draw air from attic space.
- A factory approved wall intake cap (P/N: WIV-4) must be used with horizontal outside intake ducts. The wall intake cap (P/N: WIV-4) must be installed to prevent blockage. Locate the intake where dirt, steam, snow, etc. will not contaminate or clog the intake screen.
- Separate air intake duct from vent pipe a minimum of 4 ft. Also, place vent pipe higher than adjacent air intake duct.



Gas Supply

⚠ WARNING

Improperly connected gas lines may result in fire, explosion, poisonous fumes, toxic gases, asphyxiation, or death. Connect gas lines in accordance to national, state, provincial, and local codes.

Important! Before connecting the gas supply to the burner control box:

- Verify that the heater's gas type (as listed on the rating plate) matches that of your application.
- Check that the gas piping and service has the capacity to handle the total gas consumption of all heaters being installed, as well as any other gas appliances being connected to the supply line.
- Check that the main gas supply line is of proper diameter to supply the required fuel pressures.
- If utilizing used pipe, verify that its condition is clean and comparable to a new pipe. Test all gas supply lines in accordance with local codes.

Gas Supply Installation Instructions

The gas supply to the tube heater must be connected and tested in accordance with national, state, provincial, and local codes along with guidelines in this manual. In the United States refer to the latest edition of the ANSI Z223.1 (NFPA54) Standard and in Canada refer to the latest edition of the CAN/CGA B149.1 Standard.

Supply gas piping to the unit should conform with the local and national requirements for type and volume of gas handled, and pressure drop allowed in the line. Avoid pipe sizes smaller than 1/2”. The installation must conform with local building codes or, in the absence of such codes, the National Fuel Code (NFPA 54) and in conjunction with ANSI Z21.24/CSA 6.10 “Connectors for Gas Appliances”.

⚠ WARNING

Improperly connected gas lines may result in serious injury and death, explosion, poisonous fumes, toxic gases or asphyxiation. Connect gas lines in accordance to national, state, provincial and local codes.

Gas pressure to the appliance controls must never exceed 1/2 PSI (14” W.C.). Damage to the controls may result.

⚠ CAUTION

Gas lines should be purged of air as described in ANSI Z223.1 (NFPA 54) or CSA-B149.1– latest version. Installation of the piping must also conform with the local building codes, or in the absence of local codes, with the latest edition of the National Fuel Gas Code (NFPA 54). In Canada, installation must be in accordance with CSA-B149.1

NOTICE

The total input to the appliance must fall within +/- 5% of the rated input as indicated on the rating plate. Otherwise the heat exchanger may prematurely fail.

IMPORTANT! The heating system will expand and contract during operation. **Allowances for expansion must be made between the connection to the heater and the gas supply.** A flexible gas connection of approved type is required. Flexible Type 1 gas connectors installed in one plane, without any sharp bends, kinks or twists.

IMPORTANT! Before connecting the gas supply to the burner control box:

- Verify that the heater's gas type (as listed on the rating plate) matches that of your application and the installation complies with national and local codes and requirements of the local gas company.
- Unless otherwise noted on the rating plate, this infrared heater is designed and orificed to operate on standard BTU gas. Contact the factory if utilizing non-standard BTU gas.
- Check that the gas piping and service has the capacity to handle the total gas consumption of all heaters being installed, as well as any other gas appliances being connected to the supply line.
- Check that the main gas supply line is of proper diameter to supply the required fuel pressures.
- If utilizing used pipe, verify that its condition is clean and comparable to a new pipe. Test all gas supply lines in accordance with local codes.

Chart 3.7 • **Manifold Pressure**

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

NOTE: Check manifold pressure at the tap on the gas valve. Small variations in manifold pressure (actual vs. published) may exist due to changing atmospheric conditions. Readings will be above atmospheric pressure.

Pressure Equivalents: 1 inch W.C. equals .058 oz/sq. in. equals 2.49 mbar.

To connect the gas:

⚠ WARNING

Failure to install, operate or service this appliance in the approved manner may result in property damage, injury or death. Only trained, qualified gas installation and service personnel may install or service this equipment.

The HL3 Series heater is equipped to connect to the Type 1 rubber gas connector (Included). **Do not connect the main gas line directly to the heaters gas inlet without the use of the flexible connector.** All piping must be installed in accordance with the requirements outlined in the National Fuel Gas Code ANSI/Z223.1 (latest edition) or CSA-B149.1. Support all gas piping with pipe hangers, metal strapping, or other suitable material. Do not rely on the heater to support the gas pipe.

⚠ WARNING

Always use two (2) opposing wrenches to tighten mating pipe connections to prevent excessive torque on the gas valve and manifold pipe. Excessive torque can damage the valve and/or misalign the orifice, resulting in fire, explosion, serious injury or death.

When connecting piping to the unit, the use of a thread joint compound is required. The thread compound (pipe dope) shall be resistant to the action of liquefied petroleum gas or any other chemical constituents of the gas to be conducted through piping. Use of Teflon® tape is not permitted.

Install ground joint union with a brass seat and a manual shut-off valve adjacent to the unit for emergency shut-off and easy servicing of controls. A 1/8" NPT plugged tap that is accessible for a test gauge connection is also recommended, as illustrated in figure 3.31.

A sediment trap must be installed in the supply line in the lowest spot prior to connecting to the heater. The trap length shall be at least three inches long. Ideally, the trap would be installed as close as possible to the shut-off, as shown in figure 3.31.

Connect the main gas supply line with an approved flexible connector or, if the authority having jurisdiction requires rigid piping, the use of approved swing joints may be used. If swing joints are utilized, the heater must be allowed to freely expand and contract without causing undue stress on the gas pipe.

The heater shall not be connected to the building piping system with rigid pipe or semi-rigid metallic tubing, including copper. When using such material, an intermediate connection device that allows for the heater expansion must be used.

The gas outlet must be in the same room as the appliance is installed, and must be accessible. It may not be concealed within or run through any wall, floor or partition. When installing the heater in a corrosive environment (or near corrosive substances), use a gas connector suitable for the environment. Do not use the gas piping to electrically ground the heater.

Installation of the Gas Line to the Heater

❶ Install a sediment trap / drip leg if condensation may occur at any point of the gas supply line. This will decrease the possibility of loose scale or dirt in the supply line entering the heater's control system and causing a malfunction. **NOTE:** High pressure gas above 14 Inches W.C. (water column pressure) requires a high pressure regulator and ball valve (optional).

❷ Form the Type 1 hose connector (supplied) into a smooth U-shape allowing a maximum of 14 in. between the flexible connector's end nuts (see figure 3.31).

❸ Attach the ball valve (optional) to the gas supply pipe. Apply pipe compound to NPT adapter threads to seal the joint. Use only a pipe compound resistant to LP.
NOTE: Provide a 1/8 in. (.31 cm) NPT plugged tapping accessible for test gauge connection immediately upstream of gas connection to the heater (provided an optional ball valve).

❹ Attach the Type 1 hose connector to the adapter and burner control box inlet. Seal the joints.
NOTE: Excessive torque on the manifold may misalign the orifice. **Always** use two wrenches to tighten mating pipe connections.

❺ Final assembly must be tested for gas leaks according to CAN/CSA B149.1 Code and all local codes and/or Standards.

⚠ CAUTION

When using a Type 1 flexible gas connector, **do not** attach the connector nuts directly to the gas pipe supply. Connector nuts must be installed to an approved adapter.

⚠ WARNING

Testing for gas leaks with an open flame or other sources of ignition may lead to a fire or explosion and cause serious injury or death. Test in accordance with CAN/CSA codes.

Figure 3.29 • Installation 1/2" Gas Connection

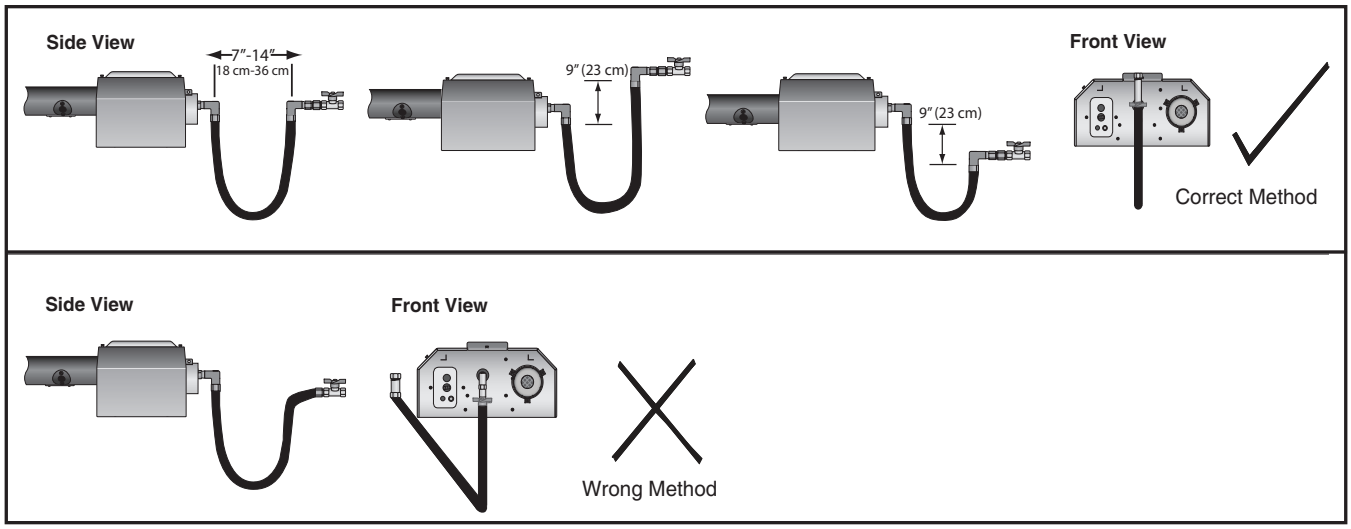


Figure 3.30 • Intallation 3/4" Gas Connection

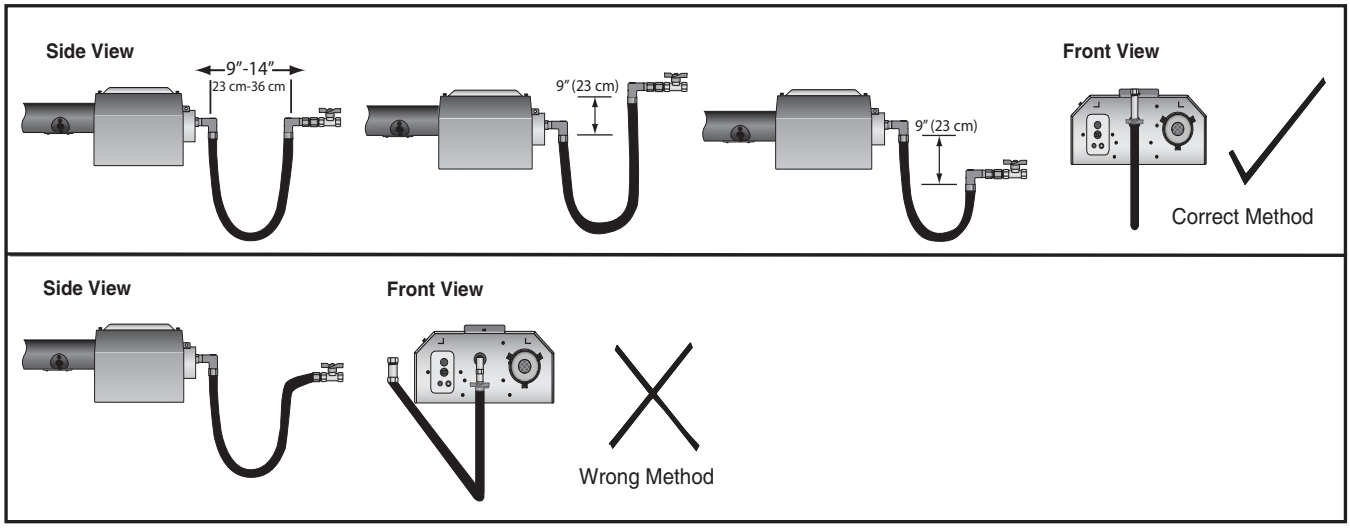


Figure 3.31 • Gas Connection (Type 1 Hose Gas Connector shown) • Side View

NOTE: Do not exceed 14 Inches W.C. to the appliance.

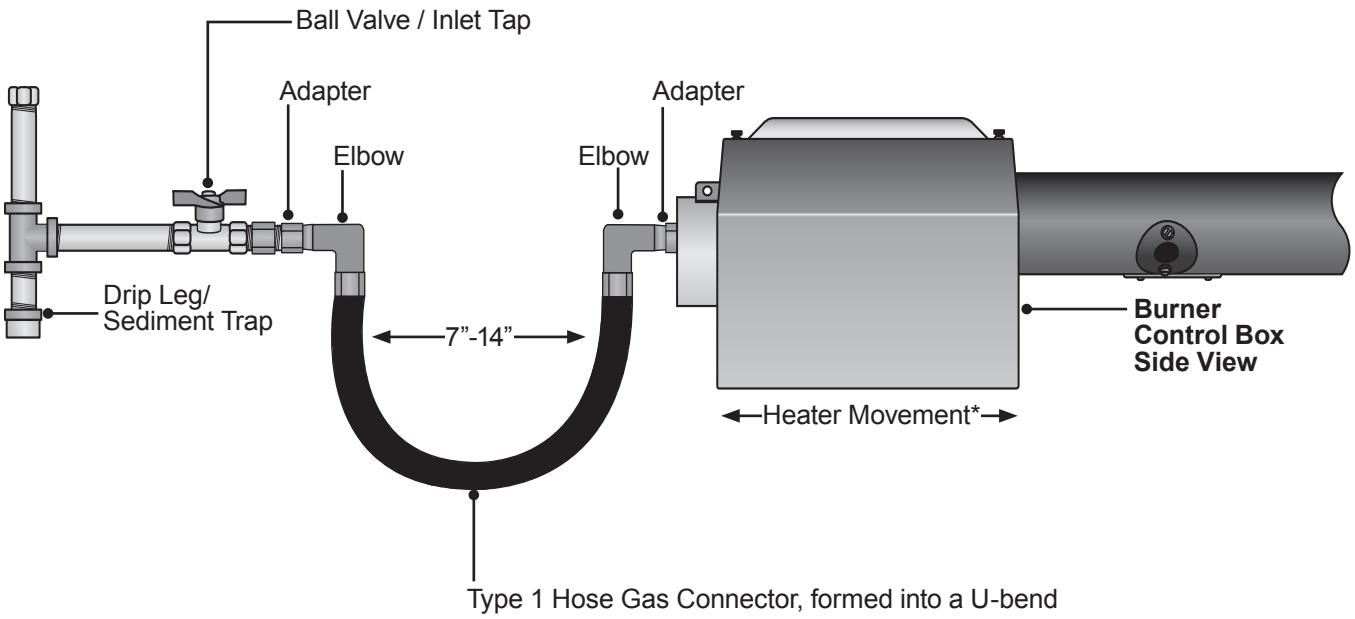
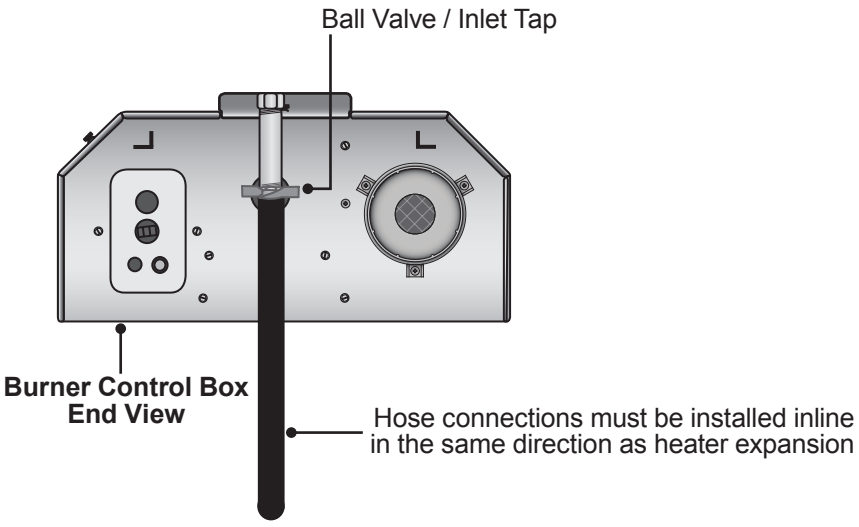


Figure 3.32 • Gas Connection (Type 1 Hose Gas Connector shown) • End View



*The tube heater expands and contracts during operation. Follow the installation instructions to ensure allowances are made for this movement. To ensure your safety, and comply with the terms of the warranty, all units must be installed in accordance with these instructions.

Leak Testing

⚠ WARNING

Testing for gas leaks with an open flame or other sources of ignition may lead to a fire or explosion and cause serious injury or death. Test in accordance with NFPA or local codes.

⚠ WARNING

Gas pressures to the appliance controls must never exceed 14 inches W.C. (1/2 PSI). Supply pressures greater than 14” W.C. can damage the controls, resulting in personal injury, property damage, or death.

Use a soap solution or equivalent for leak testing. Leak testing solution must be non-corrosive, and be rinsed off immediately after the leak test. Never test for leak with an open flame. Failure to comply could result in personal injury, property damage or death.

Always leak test final gas assembly for gas leaks according to the procedures outlined in NFPA 54 and all local codes and/or Standards.

For leak testing on pressures below 1/2 PSI

Before leak testing, close the field installed manual shut off valve shown on figure 3.31 on the supply line to isolate the gas valve from the pressure. **NOTE:** All factory installed gas connections have passed an approved leak test.

For leak testing on pressures above 1/2 PSI

When leak testing with pressures above 1/2 PSI (14 inches W.C.), the unit must be isolated from the supply pipe. Close the field installed manual shut off valve, disconnect the supply line to the unit, and temporarily cap the supply line for testing purposes.

⚠ 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.**

All field installed wiring to the tube heater must be done in accordance with the national, state, provincial, local codes and to the guidelines in this manual. In the United States, refer to the most current revisions to the Electrical Code ANSI/NFPA 70 and in Canada refer to the most current revisions to the Canadian Electrical Code CSA C22.1 Part 1. The unit must be electrically grounded according to these codes. Line polarity must be observed when making field connections.

Electrical Requirements

- 120 Volt - 60 Hz GRD, 3-wire.
- 24VAC thermostat connection.
- Starting current 4.8 amps
- Running current 1.1 amps

⚠ 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.

- This heater must be electrically grounded in accordance with the Canadian Electrical Code C22.1 (latest edition).
- Applications must conform to the Canadian Electrical Codes C22.1 (latest edition) when an external electrical source is used.
- Refer to the rating label on heater for the required amperage rating.
- Under no circumstance is the electrical supply line to the heater to provide any assistance in the suspension of the heater.
- Neither the electrical supply line nor sprinkler heads shall be located within the minimum clearances to combustibles.

Thermostat

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 3.33

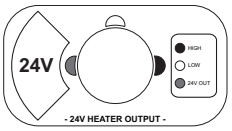
HL3 Series heaters require a 24VAC, two-stage thermostat to operate. The burner control box is equipped with a round terminal strip that accepts three (3) 1/4" insulated female spade terminals. Do not supply 120V to the 24V connection.

The HL3 Series is equipped with or without relays (P/N: HLRP). The optional relays must be factory installed. **NOTE:** Units with a relay installed must have an external transformer (field supplied), see wiring diagram. (See figure 3.34B).

Standard Configuration

Without relays (identified with white label around the terminal block):

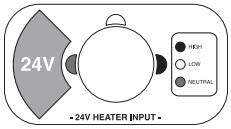
- Single burner control box.
- Single thermostat.



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.



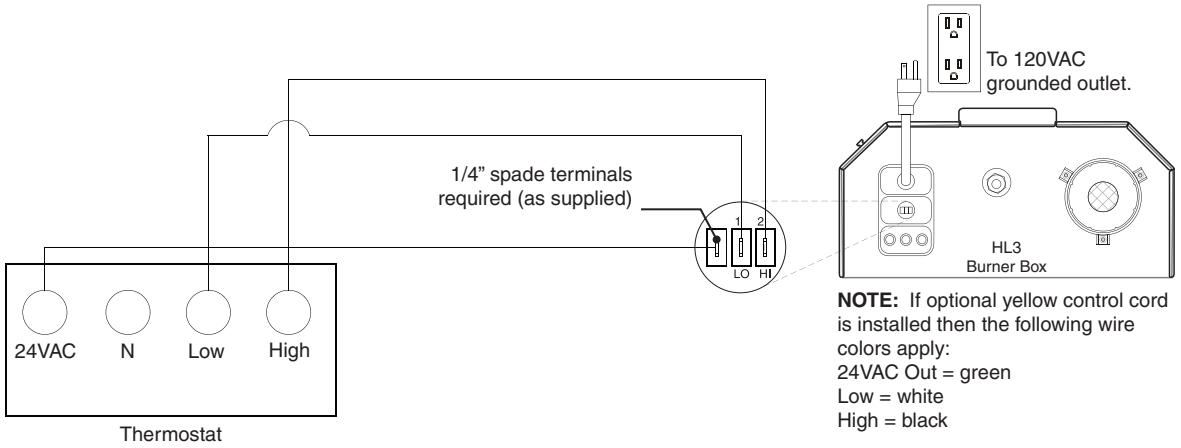
Wiring

⚠ WARNING

Electric Shock
Field wiring to the tube heater must be connected and grounded in accordance with national, provincial and local codes. In absence of these codes refer to the most current revision to the Canadian Electrical Code CSA C22.1 Part I Standard.

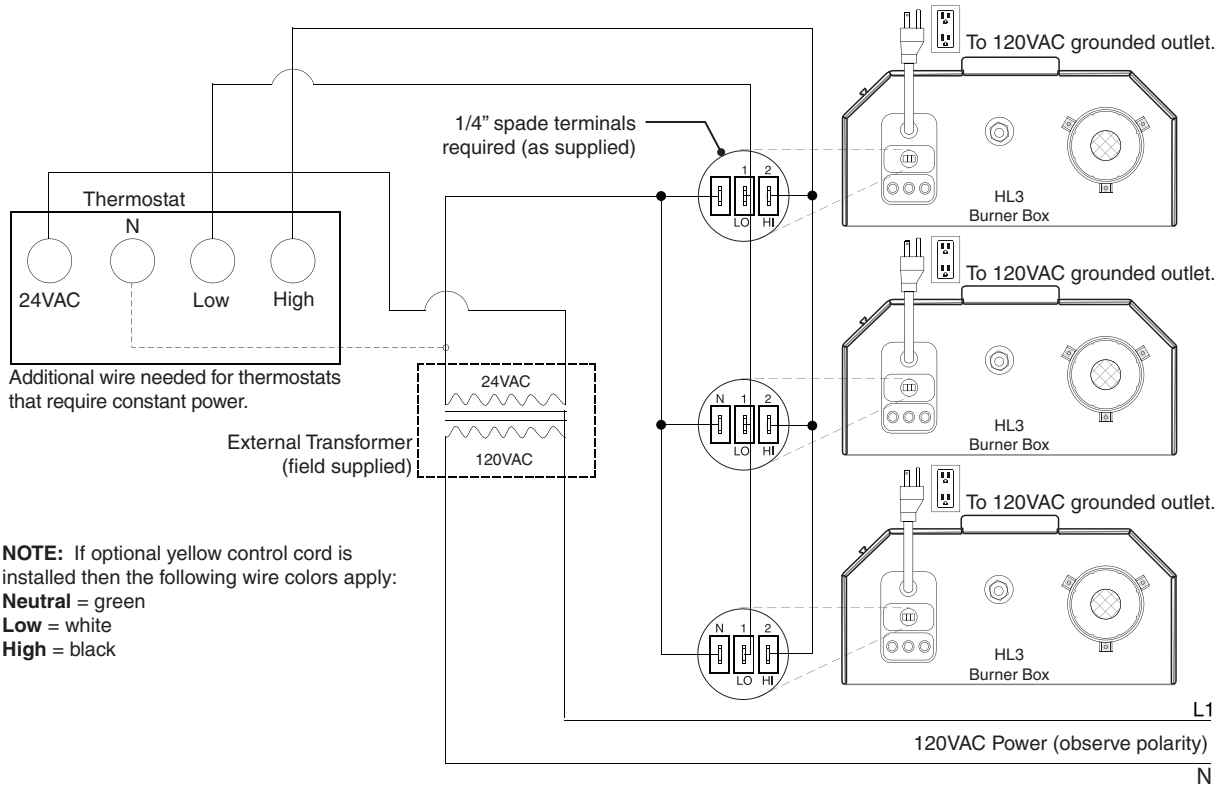
Figure 3.33 • Field Wiring Diagrams

A. Single Heater, No Relay (Single Thermostat).



NOTE: If optional yellow control cord is installed then the following wire colors apply:
24VAC Out = green
Low = white
High = black

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



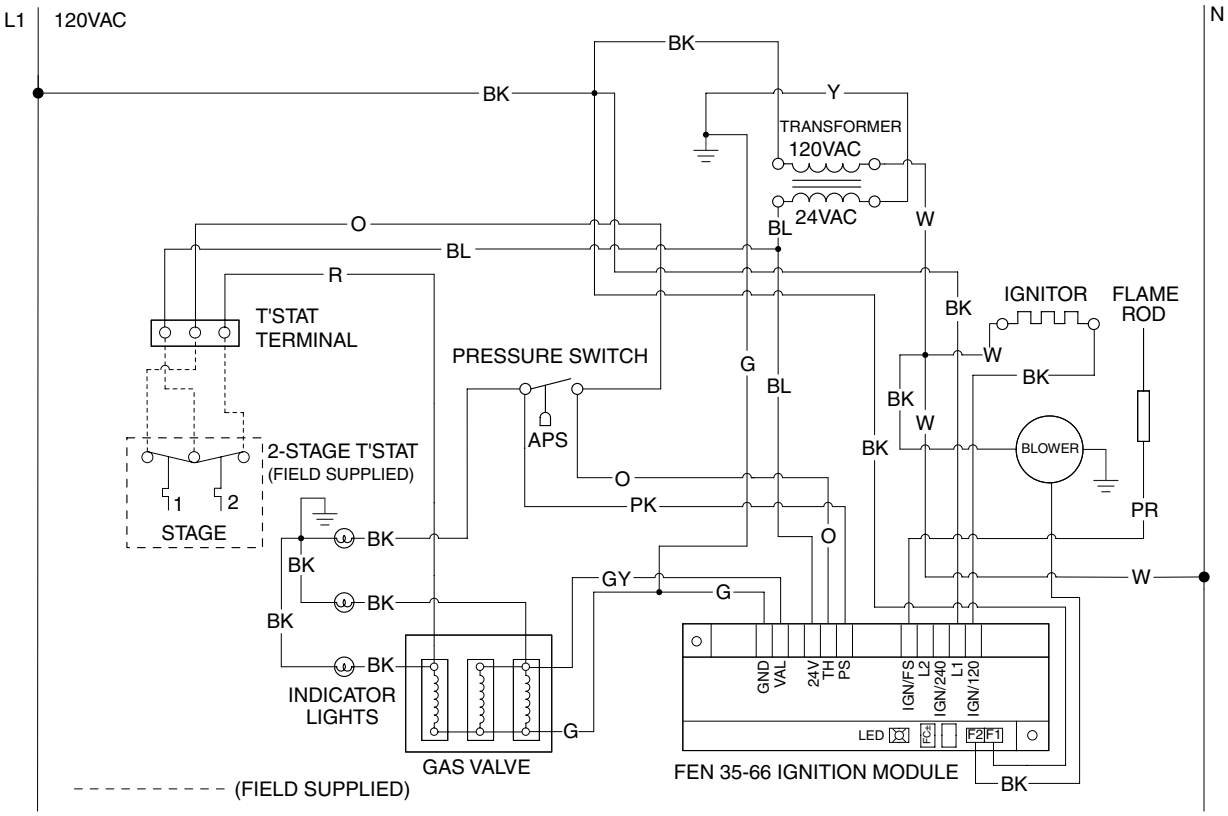
NOTE: If optional yellow control cord is installed then the following wire colors apply:
Neutral = green
Low = white
High = black

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 3.34 • Internal Wiring Diagrams

A. 35-66 Ladder Diagram



B. 35-66 Block Diagram

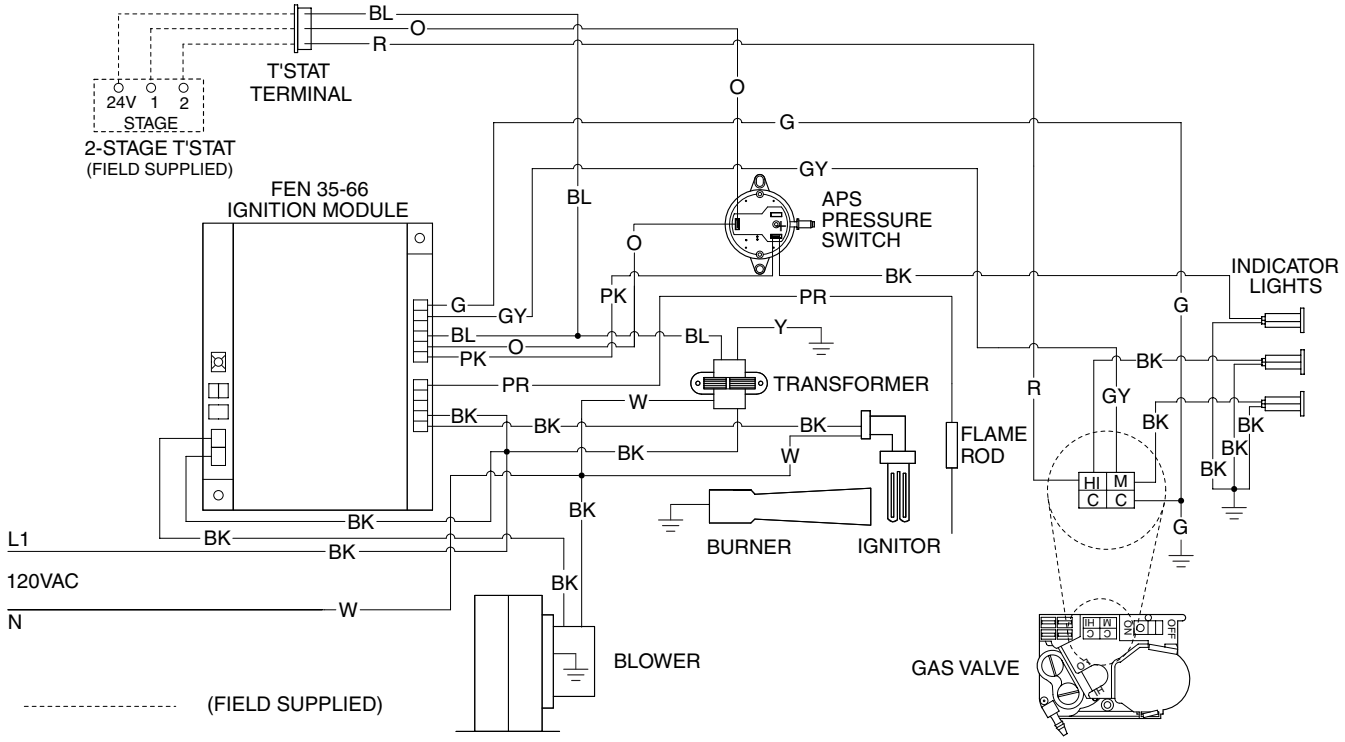
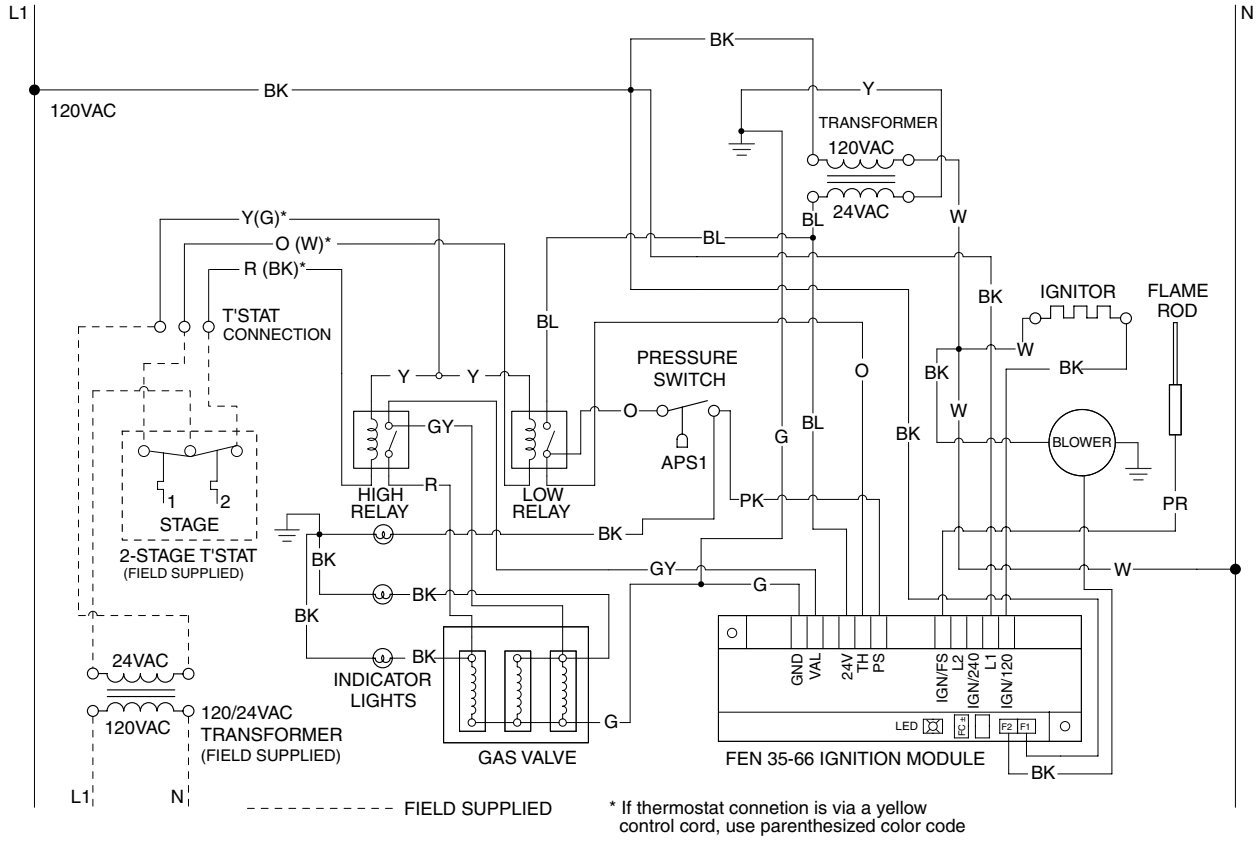
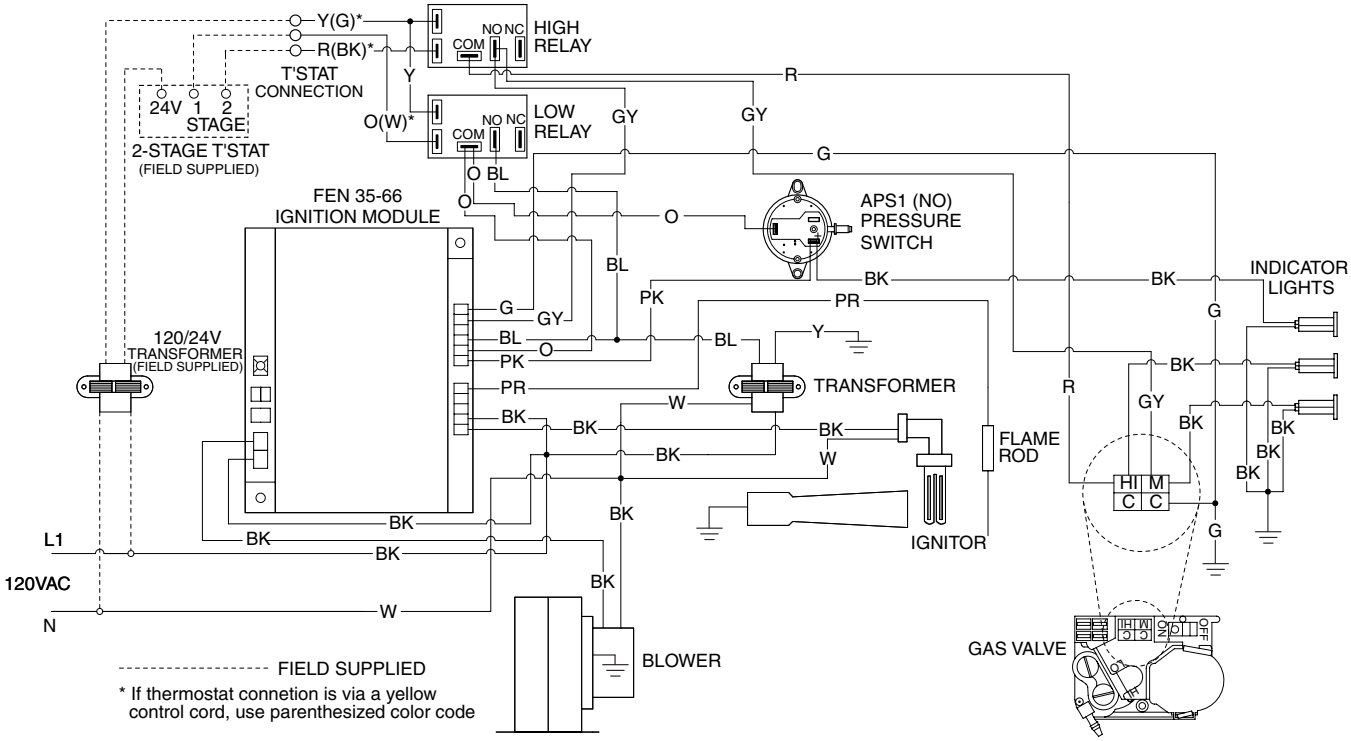


Figure 3.35 • Alternative Wiring Diagrams

A. 35-66 Ladder Diagram - **With HLRP Relay**



B. 35-66 Block Diagram - **With HLRP Relay**



Unit Start-up (Commissioning)

⚠ WARNING

Improper installation, adjustment, alteration, service or maintenance can cause property damage, serious injury, or death. This heater must be installed and serviced by a trained gas installation and service personnel only.

⚠ CAUTION

Shock Hazard.

Before attempting to perform any service or maintenance, turn electrical power to unit OFF at disconnect switch.

Pre-Start Up Checks

Verify that the installation conforms to all of the specifications of the manual, as well as with local, state, national, and provincial codes. In absence of local codes, the unit heater must be installed according to the current National Fuel Gas Code ANSI Z223.1 (NFPA 54). In Canada, the installation must conform to the current National Standard of Canada CSA-B149 Sections 1.

Prior to starting up the unit, verify that:

- ✓ The gas type listed on the rating label matches that of your application.
- ✓ The gas connections have been purged of air and properly leak tested.
- ✓ The voltage type and frequency listed on the rating label matches that of your application.
- ✓ The unit is properly grounded as per the National Electrical Code, ANSI/NFPA 70 or Canadian Electrical code CSA C22.1 Part 1.
- ✓ The unit is properly mounted to a permanent structure able to bear the weight of the unit.
- ✓ The proper mounting height is observed for the application.
- ✓ All clearance to combustible distances or service clearances are maintained.
- ✓ The unit is properly isolated or installed to prevent excessive vibration.
- ✓ The unit is level horizontally.
- ✓ Venting is properly installed in accordance with this manual and any applicable codes.
- ✓ Combustion air supply is sufficient to support proper operation at all times.

High Altitude Operation

⚠ WARNING

Explosion hazard. This heater must be converted by a trained gas installation and service personnel only. Failure to comply could result in personal injury, asphyxiation, death, and fire or property damage.

High altitude operation of this tube heater is approved, without modification, for elevations up to 6,000 feet (1,829 m) above MSL (sea level) in the United States. If the heater is being installed at an elevation above 6,000 ft, the input rate will have to be de-rated to ensure proper operation. The deration is achieved by a gas orifice change. Contact the factory for installations above these elevations.

Prior to leaving the Job Site

Prior to leaving the job site, verify that:

- ✓ Service access door is properly secured to the unit.
- ✓ The heater is clear of any objects that would interfere with the proper air circulation or that violate the listed clearance to combustibles.
- ✓ Manual gas shut off is ON.
- ✓ Electrical power is ON.
- ✓ Thermostat is set to desired temperature.
- ✓ Properly dispose of all packaging materials.
- ✓ Check to be sure you have all of your tools.
- ✓ Leave the Installation, Manual with the owner or end user.

4.0 Operation

⚠ WARNING

This appliance does not have a pilot ignition. It is equipped with an ignition device which automatically lights the burner. **Do not** attempt to light the system by hand.

BEFORE OPERATING, smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle to the floor. Refer to the cover page “If you smell gas” and on safety label affixed to the heater.

Do not use this appliance if any part has been under water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control which has been under water.

Operating Instructions

⚠ WARNING

Use only your hand to turn the manual shutoff. Never use tools. If the knob will not turn by hand, don’t try to repair it; call a qualified technician. Force or attempted repair may result in a fire or explosion.

LIGHTING PROCEDURES:

1. Verify that service lid is secured.
2. Open (turn on) gas supply to the heater.
3. Close (turn on) electrical circuit (typically thermostat).
4. If the heater fails to light, turn off gas, open electrical circuit (set thermostat to lowest setting or to off). Wait five (5) minutes before repeating above steps.

SHUTDOWN PROCEDURES:

1. Open (turn off) electrical circuit.
2. Close (turn off) gas supply to the heater.
3. Wait five (5) minutes before relighting heater.

⚠ 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.

Sequence of Operation

Standby: The 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. 54.

Diagnostics

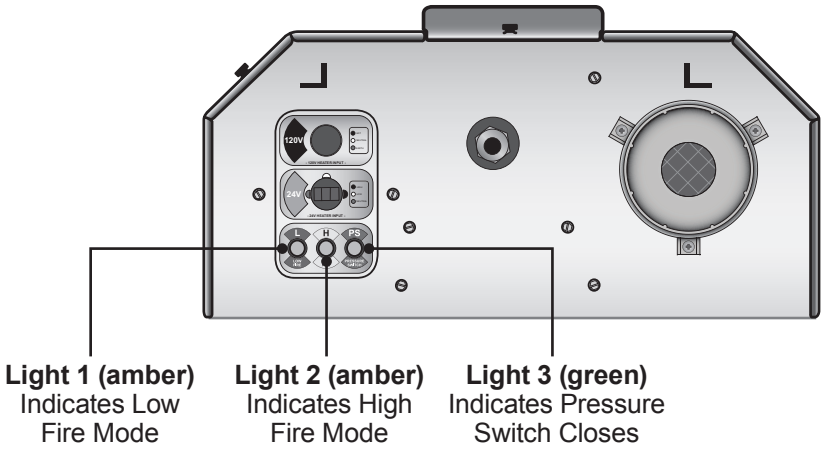
Lockout:

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 4.1 and 4.2 below for a description of LED codes.

Figure 4.1 • Operational Indicator Lights



Light 1 (amber) Indicates Low Fire Mode

Light 2 (amber) Indicates High Fire Mode

Light 3 (green) Indicates Pressure Switch Closes

Chart 4.1 • LED Diagnostic Code - Fenwal 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

Chart 4.2 • LED Diagnostic Codes - Capable Controls Ciruit Board

LED Code	Fault Status	Fault Code Delay*
Initial flash(Red) on power up	Normal operation	Immediate
Steady flash (Green) during ignition	Normal operation	Immediate
Steady flash (Green) after flame sense	Normal operation	1 minutes
1 flash (Red)	Ignition failure	3 minutes
2 flashes (Red)	Ignition error	12 seconds
3 flashes (Red)	Gas valve error	
4 flashes (Red)	Live voltage frq. error	
5 flashes (Red)	Internal control error	
6 flashes (Red)	Pressure switch error	

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

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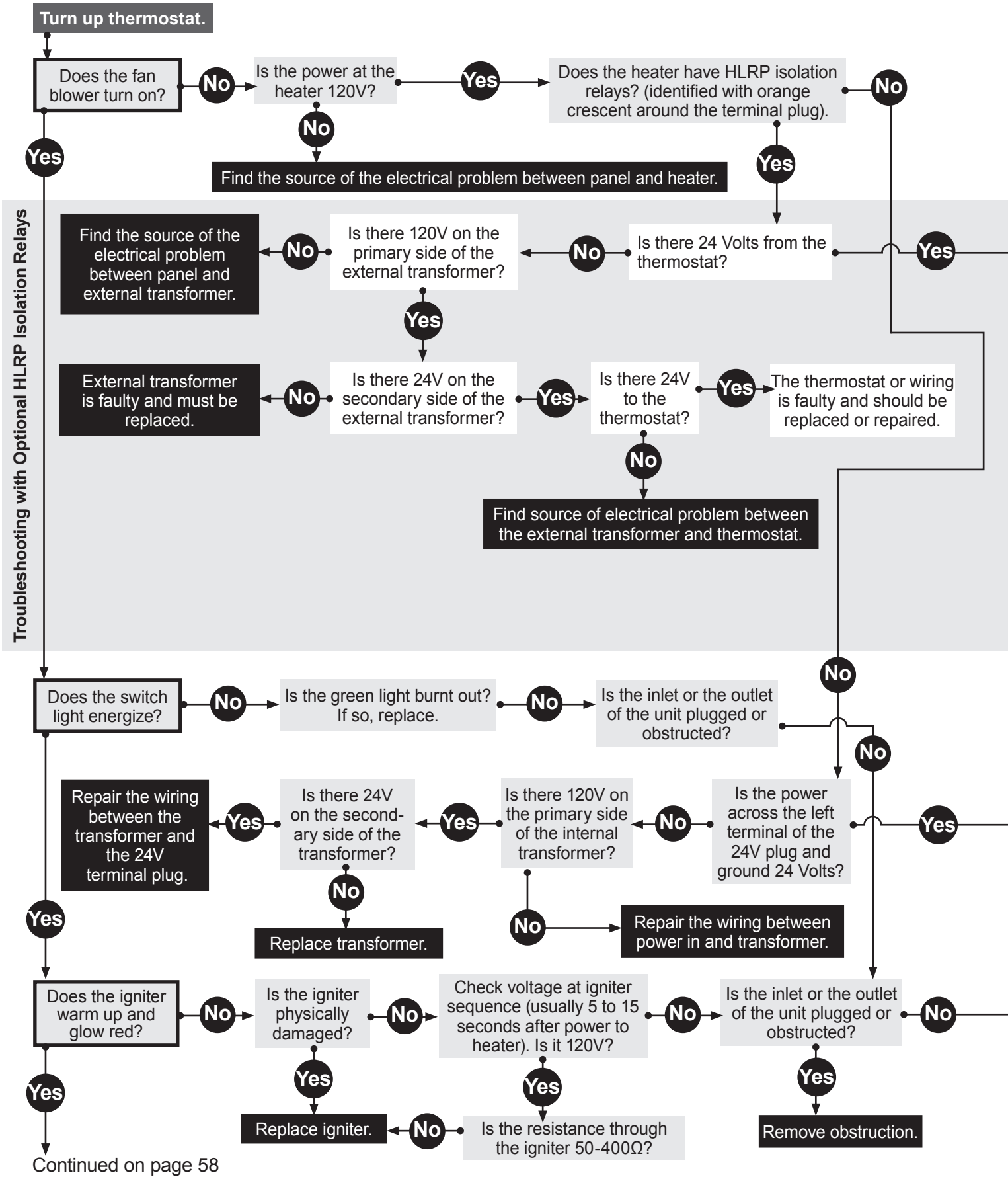
5.0 Troubleshooting Guide



Continued on page 58

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.

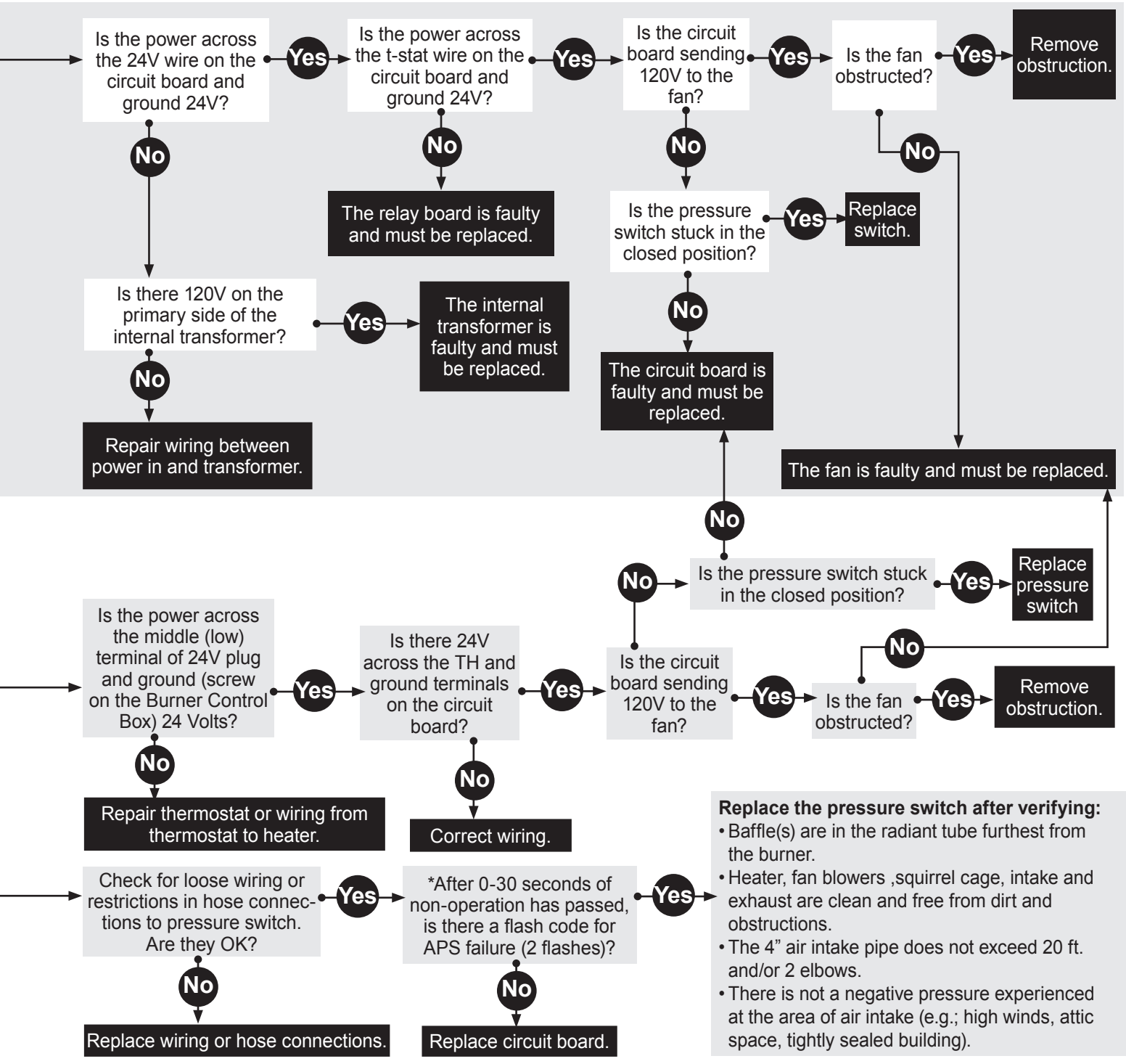
Key

Without HLRP Isolation Relays:

- Start Question
- Process Question
- Corrective Action

With HLRP Isolation Relays:

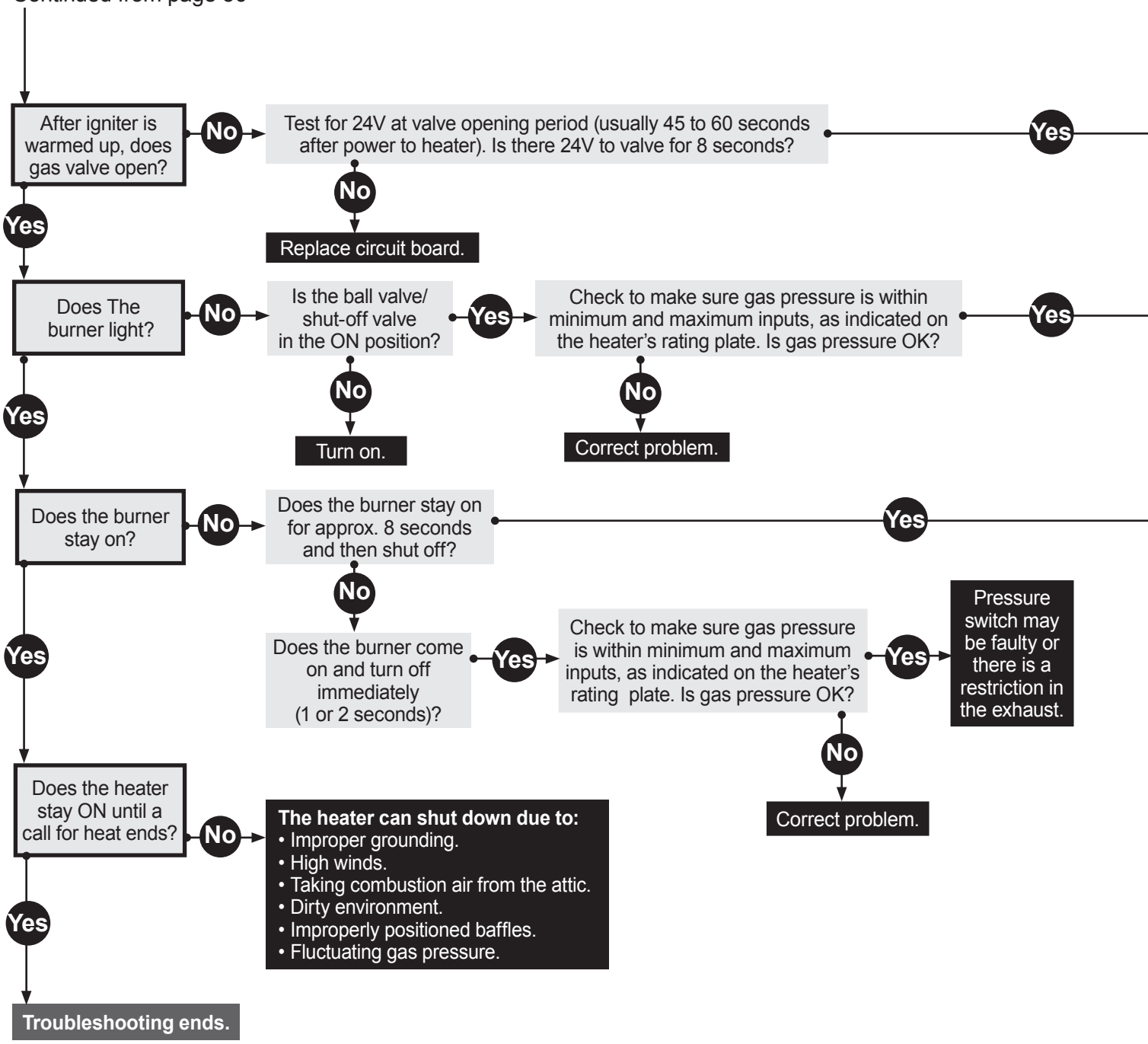
- Process Question
- Corrective Action

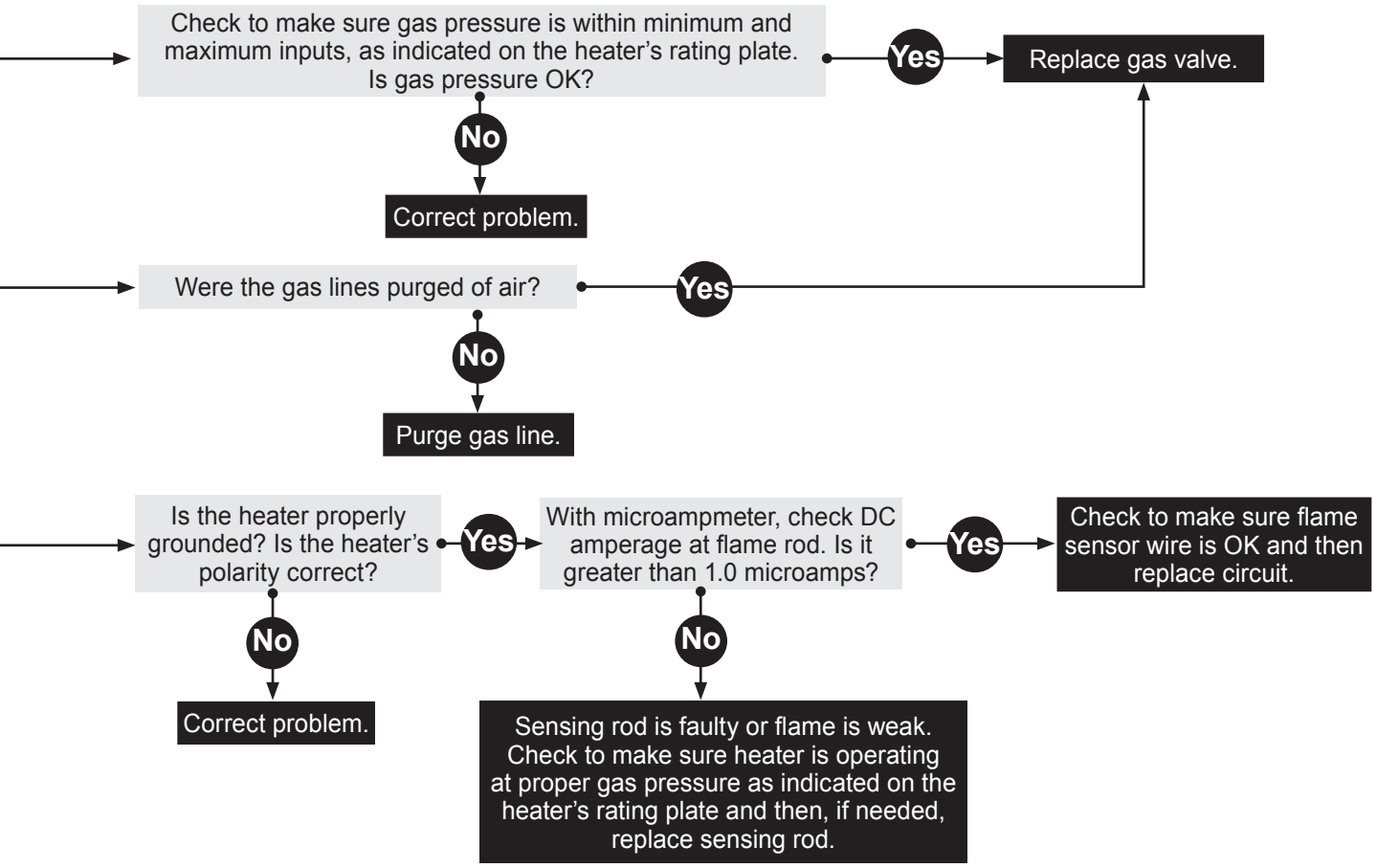


Replace the pressure switch after verifying:

- Baffle(s) are in the radiant tube furthest from the burner.
- Heater, fan blowers ,squirrel cage, intake and exhaust are clean and free from dirt and obstructions.
- The 4" air intake pipe does not exceed 20 ft. and/or 2 elbows.
- There is not a negative pressure experienced at the area of air intake (e.g.; high winds, attic space, tightly sealed building).

Continued from page 56

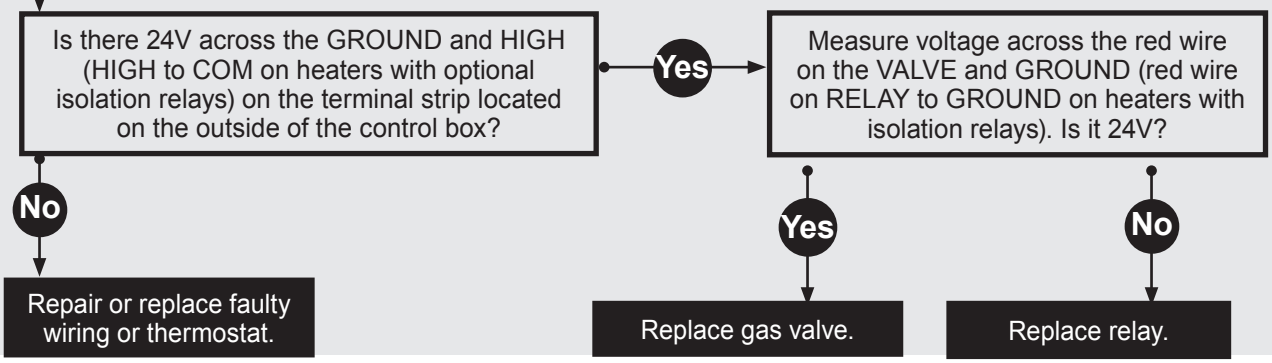




If heater does not go into high fire mode:

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:



6.0 Maintenance

⚠ WARNING

Personal injury or death may result if maintenance is not performed by properly trained gas installer or service personnel. Contact the installing distributor or place of purchase for service. **Do not operate heating system if repairs are necessary**.

Allow heater to cool prior to servicing.

Disconnect power to heater before servicing.

Use protective glasses when maintaining the heater.

Routine Inspection:

At least once per year, the heating system should be inspected and serviced by trained gas installation and service personnel only. This inspection should be performed at the beginning of the heating season to insure that all heater components are in proper working order and that the heating system operates at peak performance. Particular attention should be paid to the following items.

- **Blower Motor:** Annual oiling of the blower motor with SAE oil will extend bearing life significantly. Motors with sealed ball bearings (no oil ports) do not require oiling. Ensure that the squirrel cage in the blower is kept clean. If dirt becomes a problem, installation of outside air intake ducts for combustion is recommended.

  Check lubrication instructions on motor. If oiling is required, add three to four drops of SAE 20 electric motor oil:

  - After three years or 25,000 hours of operation (light-duty)
  - After two years or 8,000 hours of operation (medium-duty)
  - Annually or after 1,500 hours of operation (heavy-duty)

  NOTICE

  Never over-oil the motor, or premature failure may occur.

- **Vent pipe system**: Check the outside termination and the connections at the heater. Inspect the vent exhausts for leakage, damage, fatigue, corrosion and obstructions. If dirt becomes a problem, installation of outside air intake ducts for combustion is recommended.
- **Combustion air intake system** (when applicable): Check for blockage and/or leakage. Check the outside termination and the connection at the heater.
- **Heat exchangers**: Check the integrity of the heat exchangers. Replace if there are signs of structural failure. Check for corrosion and/or buildup within the tube exchanger passageways.
- **Burner**: Check for proper ignition, burner flame and flame sense. Flame should extend directly outward from burner without floating or lifting.
- **Wiring:** Check electrical connections for tightness and/or corrosion. Check wires for damage.
- **Gas Connection:** Inspect the integrity of the gas connection to the heater. Check for leaks, damage, fatigue or corrosion. Do not operate if repairs are necessary and turn off gas supply to the heater. Contact service personnel.
- **Reflectors**: Inspect the integrity of the reflectors for damage, separation, missing or misaligned sections. Do not operate if repairs are necessary. Repair or replace as required per the general installation manual. To maintain effective infrared heating, always keep both sides of the reflector clean. Dirt and dust can be vacuumed up or wiped with a soap and water solution. Use metal polish if the reflectors are severely dirty.

Contact service personnel if repairs are necessary. Do not operate unit.

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Heater Components and Parts List

Figure 6.1 • Burner Assembly Components

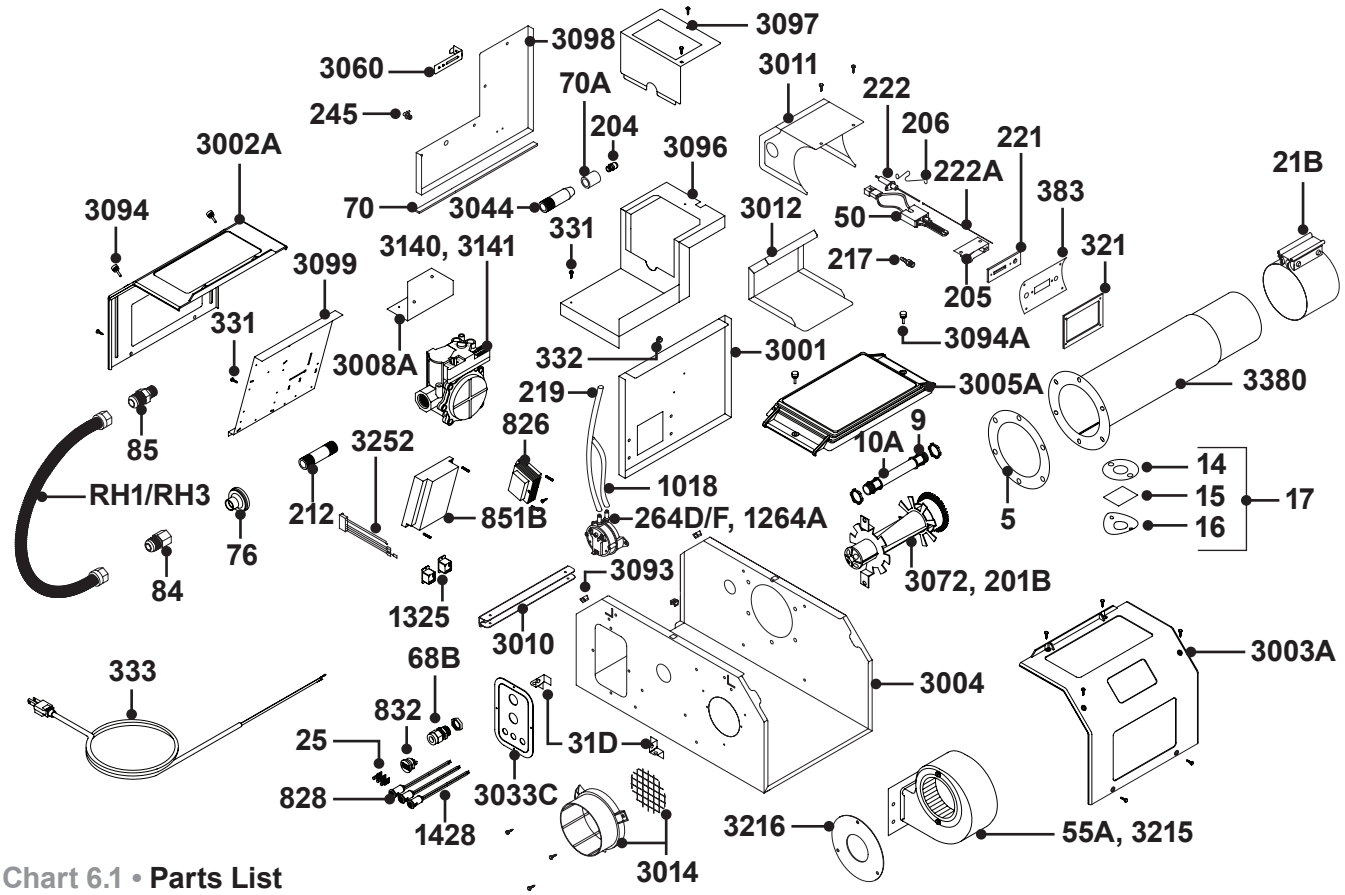
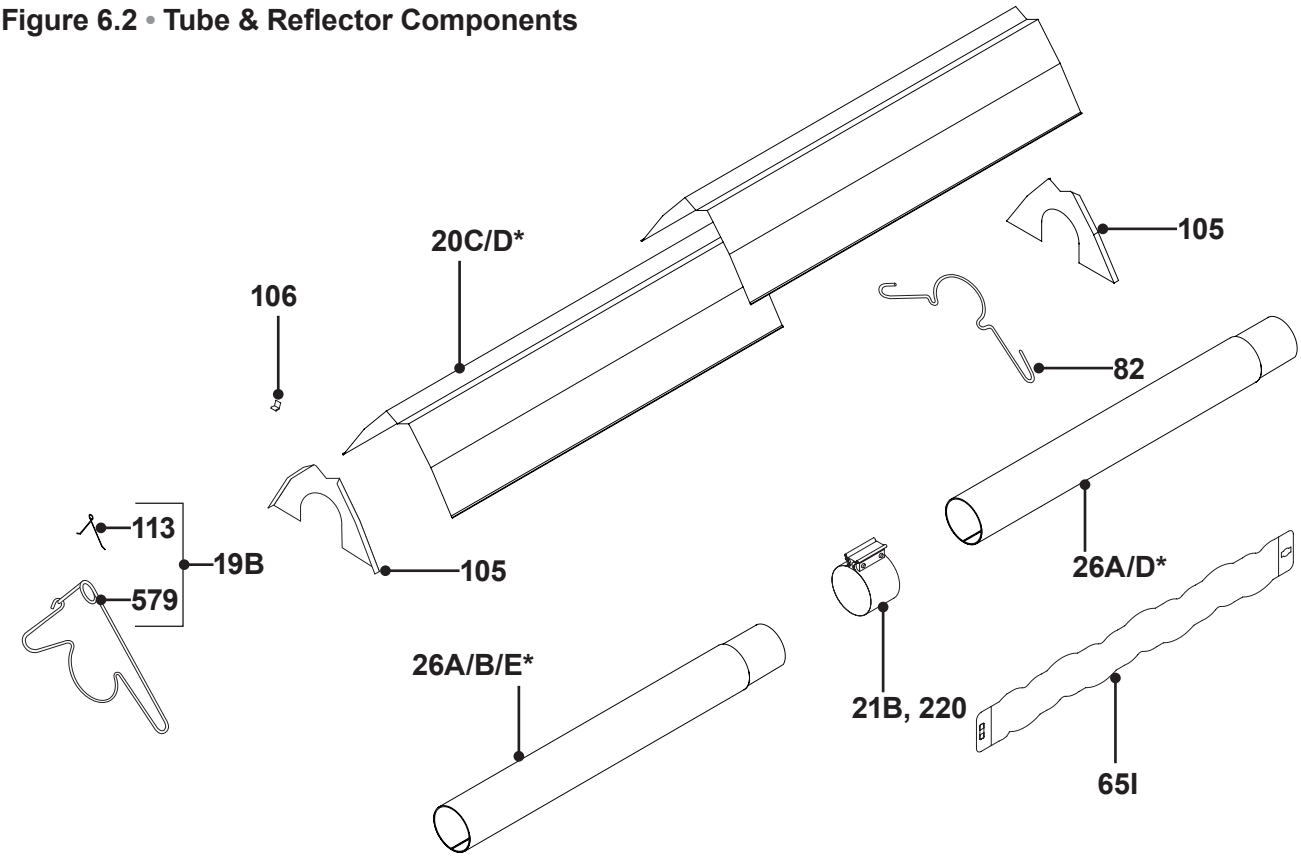


Chart 6.1 • Parts List

Part #	Description	Part #	Description
RH-1	30 in. Type 1 Hose Gas Connection (1/2”)	TP-65I	36 in. Interlocking Turbulator Baffle
RH-3	30 in. Type 1 Hose Gas Connection (3/4”)	TP-68B	Large Strain Relief Bushing
TP-5	Flange Gasket	TP-70	1/2 in. Control Box Gasket (10.3 inches)
TP-9	Conduit Coupling	TP-70A	1 in. Control Box Gasket (6 inches)
TP-10A	Conduit 4” x 3/4”	TP-76	Rubber Grommet
TP-14	Sight Glass Gasket	TP-82	Reflector Center Support
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	Aluminum Reflector End Cap
TP-19B	4 in. Wire Hanger w/ Tension Spring	TP-106	Reflector End Cap Clips (8 pcs.)
TP-20C	120 in. Aluminum Reflector	TP-113	Reflector Tension Spring
TP-20D*	120 in. Stainless Steel Reflector	TP-201B	V.3 Mid-High Burner (Colour Code - TAN)
TP-21B	4 in. Standard Tube Clamp	TP-204	Gas Orifice (consult factory)
TP-25	1/4 in. Female Spade Terminal (Qty. 3)	TP-205	Glo-Bar™ Holder
TP-26A	10 ft. Aluminized Radiant / Combustion Tube	TP-206	Glo-Bar™ Holder Spring Clip
TP-26B	10 ft. Titanium Coated Combustion Tube	TP-212	1/2” x 3” Pipe Nipple
TP-26D*	10 ft. 304 Stainless Steel Radiant Tube	TP-217	Brass Pressure Switch Barb Fitting
TP-26E*	10 ft. 409 Stainless Steel Combustion Tube	TP-219	Differential Vinyl Sensing Tube (burner)
TP-31D	Interlocking Mounting Bracket (Qty. 2)	TP-220	Stainless Steel Tube Clamp, 150MBH+
TP-50	Glo-Bar™ Igniter	TP-221	Glo-Bar™ Holder Gasket
TP-55A	Fan Blower	TP-222	Flame Rod

* Optional upgrade or add-on item.

Figure 6.2 • Tube & Reflector Components



Part #	Description	Part #	Description
TP-222A	Flame Rod Wire	TP-3005A	Plastic Valve Chamber Lid
TP-245	3/16” X 1/8” Plastic Gas Valve 90° Vent	TP-3008A	Gas Valve Mounting Bracket
TP-264D	Differential Pressure Switch, 65 to 75 MBH	TP-3010	Service Panel Hinge
TP-264F	Differential Pressure Switch, 150 to 200 MBH	TP-3011	Igniter Box
TP-321	Ignition Plate Gasket	TP-3012	Igniter Box Cover
TP-331	Green Self-Tap Ground Screw (Qty. 2)	TP-3014	Plastic Air Orifice with Screen
TP-332	Divider Grommet	TP-3033C	HL3 Power Entry Plate
TP-333	60 in. Black 120V Power Cord	TP-3044	Gas Manifold
TP-383	Glo-Bar™ Igniter Plate	TP-3060	V.3 Pressure Switch Mounting Bracket
TP-579	4 in. Wire Hanger w/o Tension Spring	TP-3072	Low BTU Burner (Colour Code-Green)
TP-826	40VA Transformer	TP-3093	#8-23 Cage Nut (Qty. 4)
TP-828	24V Yellow Operational Indicator Light (Qty. 2)	TP-3094A	#8-32 x ½” Zinc Coated Steel Knrled Thumb Screw (Qty 4)
TP-832	Thermostat Terminal Strip	TP-3096	Valve Compartment Bottom Panel
TP-851B	Diagnostic Circuit Board	TP-3097	Valve Compartment Top Panel
TP-1018	Differential Switch Vinyl Sensing Tube (exhaust)	TP-3098	Valve Compartment Side Panel
TP-1264A	Differential Pressure Switch, 100 to 125 MBH	TP-3099	Controls Mounting Panel
TP-1325	Optional HLRP Isolation Relay* (Qty. 2)	TP-3140	Gas Valve - Natural Gas Assembly
TP-1428	24V Green Operational Indicator Light	TP-3141	Valve - LP Gas Assembly
TP-3001	Divider Panel	TP-3215	1/15 hp Inducer Assembly (175-200 MBH)
TP-3002A	Plastic End Panel, Control Compartment	TP-3216	Reducer Plate (175-200 MBH)
TP-3003A	Plastic End Panel, Fan Compartment	TP-3252	4-Piece Wire Harness Set
TP-3004	V.3 Control Box	TP-3380	V.3 16” HSI Burner Tube w/ Flange and Fittings

* Optional upgrade or add-on item.

7.0 Limited Warranty

One-Year Limited Warranty. Radiant Tube Heaters covered in this manual, are warranted by Brant Radiant Heaters Limited to the original user against defects in workmanship or materials under normal use for one year after date of purchase. Any part which is determined to be defective in material or workmanship and returned to an authorized service location, as Brant Radiant Heaters Limited designates, shipping costs prepaid, will be, as the exclusive remedy, repaired or replaced at Brant Radiant Heaters Limited's option. For limited warranty claim procedures, see PROMPT DISPOSITION below. This limited warranty gives purchasers specific legal rights which vary from jurisdiction to jurisdiction.

Additional Limited Warranty. In addition to the above mentioned one-year warranty, Brant Radiant Heaters Limited warrants the original purchaser an additional extension on the combustion chamber, radiant tubes and stainless steel burner. This extension excludes electrical/purchased components. See specific product warranties on last page of the Series Manual.

General Conditions. The Company will not be responsible for labor charges for the analysis of a detective condition of the heater or of the installation of replacement parts. The warranties provided herein will not apply if the input of the heater exceeds the rated input at time of manufacturing or if the heater in the judgement of the Company has been subjected to misuse, excessive dust, improper conversion, negligence, accident, corrosive atmospheres, excessive thermal shock, excessive vibration, physical damage to the heater, alterations by unauthorized service personnel , operation contrary to the Company's instructions or if the serial number has been altered, defected, or removed. The Company shall not liable for any default or delay in the performance of these warranties caused by contingency beyond its control, including war, government restriction or restraints, strikes, fire, flood, short or reduced supply of raw materials, or parts.

The warranties herein shall be null and void if the heater is not installed by a competent heating contractor and/or if the heater is not installed according to Company instructions, normal industry practices and/or if the heater is not maintained and repaired according to Company instructions. Normal product degradation and wear (rust, oxidation, etc.) does not constitute a material defect and applicable warranty claim.

Limitation of Liability. To the extent allowable under applicable law, Brant Radiant Heaters Limited's liability for consequential and incidental damages is expressly disclaimed. Brant Radiant Heaters Limited's liability in all events is limited to and shall not exceed the purchase price paid.

Warranty Disclaimer. Brant Radiant Heaters Limited has made a diligent effort to provide product information and illustrate the products in this literature accurately; however, such information and illustrations are for the sole purpose of identification, and do not express or imply a warranty that the products are merchantable, or fit for a particular purpose, or that the products will necessarily conform to the illustrations or descriptions. Except as provided below, no warranty or affirmation of fact, expressed or implied, other than as stated in the "LIMITED WARRANTY" above is made or authorized by Brant Radiant Heaters Limited.

Product Suitability. Many jurisdictions have codes and regulations governing sales, construction, installation, and/or use of products for certain purposes, which may vary from those in neighboring areas. While Brant Radiant Heaters Limited attempts to assure that its products comply with as many codes, it cannot guarantee compliance, and cannot be responsible for how the product is installed or used. Before purchase and use of the product, installation, and use will comply with them. Certain aspects of disclaimers are not applicable to consumer products: e.g.,(a) some jurisdictions do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you: (b) also, some jurisdictions do not allow a limitation on how long an implied warranty lasts, consequently the above limitation may not apply to you: and (c) by law, during the period of this limited warranty, any implied warranties of implied merchantability or fitness for a particular purpose applicable to consumer products purchased by consumers, may not be excluded or otherwise disclaimed.

Prompt Disposition. Brant Radiant Heaters Limited will make a good faith effort for prompt correction or other adjustment with respect to any product which proves to be defective within limited warranty. For any product believed to be defective within limited warranty, first write or call dealer from whom the product was purchased. Dealer will give additional directions. If unable to resolve satisfactorily, write to Brant Radiant Heaters Limited at address below, giving dealer's name, address, date and number of the dealer's invoice, and describe the nature of the defect. Title and risk of loss pass to buyer on delivery to common carrier. If product was damaged in transit to you file claim with carrier.

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Notes

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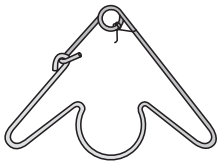
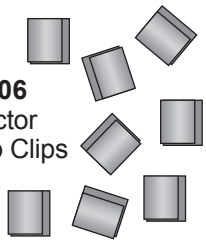
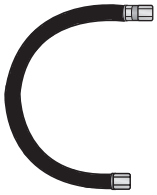
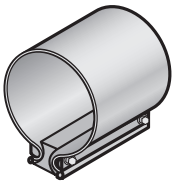
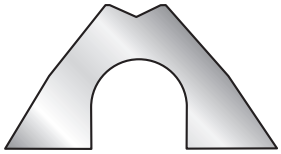
8.0 Kit Contents

Chart 8.1 • **Kit Contents Check List -** Reference the length column for your model.

HL3 Series Kit Contents

TP-19B 4" Hanger with Reflector Tension Spring 	**TP-82** 4" Reflector Center Support (RCS) 	**TP-106** Reflector End Cap Clips 	HL3 Installation, Operation and Maintenance Manual **F/N BRHL3** 
****RH-1, RH-3** Type 1 Hose Gas Connector 	**TP-220** Stainless Steel 4" Tube Clamp* 	**TP-105** Reflector End Cap 	

Part No.	Description	20 ft.	30 ft.	40 ft.	50 ft.	60 ft.	70 ft.
BRHL3	HL3 Series Manual	1	1	1	1	1	1
TP-82	4" Reflector Center Support	2	3	4	5	6	7
RH-1	1/2" Type 1 Hose Gas Connector	1	1	1**	1**	1**	0
RH-3	3/4" Type 1 Hose Gas Connector	0	0	1**	1**	1**	1
TP-19B	4" Hanger w/ Tension Spring	3	4	5	6	7	8
TP-220	4" S.S Tube Clamp	0	0	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
Filled By:							

NOTE:

* One 4" stainless steel tube clamp (P/N: TP-220) is provided for each 150,000 - 200,000 BTU model. Placement as shown on page 27. Packed on TP-26B, titanium pipe, when bought as a burner only.

** RH-1- 30" x 1/2" diameter Type 1 hose supplied with Models 125,000 BTU/h and below.
RH-3- 30" x 3/4" diameter Type 1 hose supplied with Models 150,000 BTU/h and greater.

Approvals

- CAN/CSA.
- Indoor approval.
- Outdoor approval with OD-Kit.
- Industrial/Commercial approval.

Limited Warranty

- 1 year - Burner box components.
- 5 years - Combustion and radiant tubes.
- 10 years - Stainless steel burner.

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