

GAS-FIRED LOW-INTENSITY RADIANT TUBE HEATER INSTALLATION, OPERATION, AND MAINTENANCE

DISCONTINUED MODEL TR



⚠ DANGER ⚠

FIRE OR EXPLOSION HAZARD

- Failure to follow safety warnings exactly could result in serious injury, death, or property damage.
- Improper installation, adjustment, alteration, service, or maintenance can cause serious injury, death, or property damage.
- Installation and service must be performed by a qualified installer, service agency, or the gas supplier.
- Be sure to read and understand the installation, operation, and service instructions in this manual.
- Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

WHAT TO DO IF YOU SMELL GAS

- Do not try to light any appliance.
- Do not touch any electrical switch; do not use any phone in your building.
- Leave the building immediately.
- Immediately call your gas supplier from a phone remote from the building. Follow the gas supplier's instructions.
- If you cannot reach your gas supplier, call the fire department.

DO NOT DESTROY. PLEASE READ CAREFULLY. KEEP IN A SAFE PLACE FOR FUTURE REFERENCE.

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FOR YOUR SAFETY

If you smell gas:

- 1. Open windows.**
- 2. Don't touch electrical switches.**
- 3. Extinguish any open flame.**
- 4. Immediately call your gas supplier.**

FOR YOUR SAFETY

The use and storage of gasoline or other flammable vapors and liquids in open containers in the vicinity of this appliance is hazardous.

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

WARNING: Gas-fired appliances are not designed for use in hazardous atmospheres containing flammable vapors or combustible dust, in atmospheres containing chlorinated or halogenated hydrocarbons, or in applications with airborne silicone substances. See Hazard Levels, Page 2.

GENERAL

Installation should be done by a qualified agency in accordance with the instructions in this manual and in compliance with all codes and requirements of authorities having jurisdiction. The instructions in this manual apply to the heater models shown below.

Model Characteristics	
TR	Indoor, Gas-Fired, Low-Intensity Infrared Tubular System, 0-2000 ft (0-610M) elevation
TR-H	Indoor, Gas-Fired, Low-Intensity Infrared Tubular System, for 2001-8000 ft (611-2438M) elevation



HAZARD INTENSITY LEVELS

1. **DANGER:** Failure to comply will result in severe personal injury or death and/or property damage.
2. **WARNING:** Failure to comply could result in severe personal injury or death and/or property damage.
3. **CAUTION:** Failure to comply could result in minor personal injury and/or property damage.

1A. Installation Codes

These units must be installed in accordance with local building codes. In the absence of local codes, in the United States, the unit must be installed in accordance with the National Fuel Gas Code ANSI Z223.1a (latest edition). A Canadian installation must be in accordance with the CAN/CGA B149.1 and B149.2 Installation Code for Gas Burning Appliances and Equipment. These codes are available from CSA Information Services, 1-800-463-6727. Local authorities having jurisdiction should be consulted before installation is made to verify local codes and installation procedure requirements.

All electrical wiring must be in accordance with the National Electric Code ANSI/NFPA NO. 70 (latest edition) or, in Canada, the Canadian Electrical Code, part I-C.S.A. Standard C22.1.

The installing contractor must be familiar with all of the various requirements and is responsible for installing this heater in compliance with the applicable codes.

Special Installations --

Aircraft Hangars: In the United States, the heaters must be installed in accordance with ANSI NFPA 409 (latest edition), Chapter 5. NFPA Publications are available from the National Fire Protection Association, Batterymarch Park, Quincy, MA 02269. In Canada, installation in an aircraft hangar must comply with CAN/CGA-B149.2, Section 4.21. Both ANSI NFPA 409 and the CAN/CGA-B149.2 specify that the heater shall not be located in an area of an aircraft hangar where it may be subjected to physical damage by aircraft, cranes, moveable scaffolding, or other objects.

NFPA 409 specifies a clearance of 10 feet to the bottom of the heater from the highest surface of the wings or engine enclosures of the highest aircraft which may be housed in the hangar. CAN/CGA B149.2 specifies that an infrared heater installed in an aircraft hangar be at least 10 ft (3m) above either the highest fuel storage compartment or the highest engine enclosure of the highest aircraft which may occupy the hangar. NFPA 409 and CAN/CGA B149.2 specify a minimum clearance of eight feet from the floor to the heater in other sections, such as offices, or shops, that communicate with the aircraft hangar.

Public Garages: In the United States, heaters installed in public garages must be in accordance with National Fire Protection Association (NFPA) 88B (latest edition), Section 3-2.3. Overhead heaters must be located not less than eight feet above the floor and installed in accordance with the conditions of their approval. NFPA 88B requires the following warning:

WARNING: Minimum clearance marked on the heater must be maintained from vehicles parked under the heater.

In Canada, in a garage, the minimum clearance from the bottom of an infrared heater to the upper surface of the highest vehicle which may be housed therein shall be 50 percent greater than the certified clearance, and in no case less than eight feet (2.4m).

WARNING: These tubular radiant heaters DO NOT qualify for explosion-proof installations.

WARNING: The installing contractor must be certain that the area where the heater is being installed does not contain corrosive or toxic fumes or that elements in the atmosphere do not produce corrosive or toxic fumes in the presence of an open flame.

The chlorine atmosphere in enclosed swimming pool areas may cause burner and tube corrosion if the area is not ventilated. ASHRAE design guides suggest a minimum of 5-6 air changes per hour. The manufacturer recommends outside combustion air. To provide outside combustion air, Option DE2, Combustion Air Inlet Kit, must be used.

1B. Warranty

Refer to limited warranty information on the warranty sheet in the "Owner's Envelope".

2. Description/General

These radiant tubular heaters are low-intensity infrared heaters using a power burner that fires into a 4" diameter steel tube, either 20, 30, 40, 50, 60, or 70 feet in length. The power burner is equipped with a blower for supplying combustion air and a spark-to-pilot-to-main burner ignition system. The highly emissive tubes are in 10-foot sections, and each section has a polished reflector. The tube section attached to the burner is the combustion chamber and all other sections are heat exchanger tubes with the exhaust end heat exchanger tube being identified as the tail pipe. Optional "L"-shaped, "U"-shaped, and 5-foot heat exchanger tubes are available to change the heater configuration to adapt to various applications.

Standard model heaters are designed to operate at full input rates of 50,000, 75,000, 100,000, 125,000, 150,000, 175,000, or 200,000 BTUH at altitudes from 0 to 2000 ft elevation. High altitude model heaters are designed to operate at full input rates of 50,000, 75,000, 100,000, 125,000, 150,000, 175,000, or 200,000 BTUH at altitudes from 2001 to 6000 ft elevation and from 6001 to 8000 ft at full input rates from 50,000 to 175,000 BTUH.

Venting may be either vertical or horizontal. A vent cap must be used. Install a vent cap supplied as Option CC1 or a fully-comparable, field-supplied vent terminal cap such as a Type L Breidert Air-x-hauster®. (Type L Air-x-hauster® is a trademark of The G. C. Breidert Company.) Dual venting of two units is permissible when using an Optional Dual Vent Kit (Option CC5). These heaters are also approved for operation without outdoor venting.

Combustion air can either come from the heated space or be piped from outside. Outside combustion air should be supplied (1) if the building atmosphere has negative pressure; (2) if the building atmosphere is dirty or dusty; (3) if the building atmosphere contains substances that will cause toxic gas when combined with flame or flue products; or (4) if the heater is being installed in a tightly closed room that does not provide required air for combustion. Installation of an Optional Combustion Air Inlet Kit is required to provide outside combustion air.

3. Specifications

BTUH/Length/Configurations

Depending on the length and size of the heater, the heat exchanger sections may be installed in various configurations. Optional "L"-

BTUH Input	Minimum Length	Maximum Length
50,000	20 feet	30 feet
75,000	20 feet	40 feet
100,000	30 feet	50 feet
125,000	40 feet	50 feet
150,000	50 feet	60 feet
175,000	50 feet	70 feet
200,000	50 feet	70 feet

shaped, 5-foot, and "U"-shaped heat exchanger tubes are available to adapt the heaters to these configurations (Option UC2 for "L"; Option UB3 for "U"; Option UA1 for 5-foot heat exchanger tube). Refer to the Suspension Dimensions and Configuration Drawings Booklet (in the Owner's Envelope) to determine the permissible configurations for each size and length of heater and guidelines for using the 5-ft heat exchanger tube.

Gas Type and Supply Gas Pressure

Sizes 50-150 heaters are available for use with either natural or

propane gas. Sizes 175-200 are available for use with natural gas only. The

BTUH Input	Gas Type	Supply Pressure	
		Minimum	Maximum
50,000 - 150,000	Natural	4.5" w.c.	14" w.c.
175,000 - 200,000	Natural	6" w.c.	14" w.c.
50,000 - 150,000	Propane	11" w.c.	14" w.c.

supply pressure listed is the gas pressure required at the gas valve inlet. Measure gas pressure with a manometer.

Electrical Characteristics

Voltage/Phase	Standard 115/1; Optional 208/1, 230/1, 460/1
Frequency	60 Hertz
Maximum Amps	3.0
Flame Safety	Electronic
Pilot Burner Ignition	Spark
Main Burner Ignition	Pilot

4. Clearances to Combustibles

Required clearances depend on the size of the heater (BTUH input), the position of the reflector, and the addition of an optional side shield on the rear side of the heater. Refer to illustrations in Figure 1 to define clearances.

Clearances to Combustibles							
BTUH Input (000)		Below	Top*	Horizontal Clearances			Vent
				Burner End	Heat Exchanger Bend (U or L)	Exhaust End	
50/75/100	inches	66	12	24	36	24	6
	mm	1676	305	610	914	610	152
125/150	inches	78	12	30	48	24	6
	mm	1981	305	762	1219	610	152
175/200	inches	84	12	30	48	24	6
	mm	2134	305	762	1219	610	152
BTUH Input (000)		With Reflector Positioned					
		0-30°		31-45°		0-30° with Side Shield **	
		Front	Rear	Front	Rear	Front	Rear
50/75/100	inches	30	30	48	18	36	12
	mm	762	762	1219	457	914	305
125/150	inches	42	42	66	32	42	12
	mm	1067	1067	1676	813	1067	305
175/200	inches	54	54	78	36	54	12
	mm	1372	1372	1981	914	1372	305

* If the heater is not vented to the outside of the building, the top clearance to combustibles is 18" (457mm).

** Refer to Paragraph 10 for side shield installation.

Figure 1 - Clearance Orientation

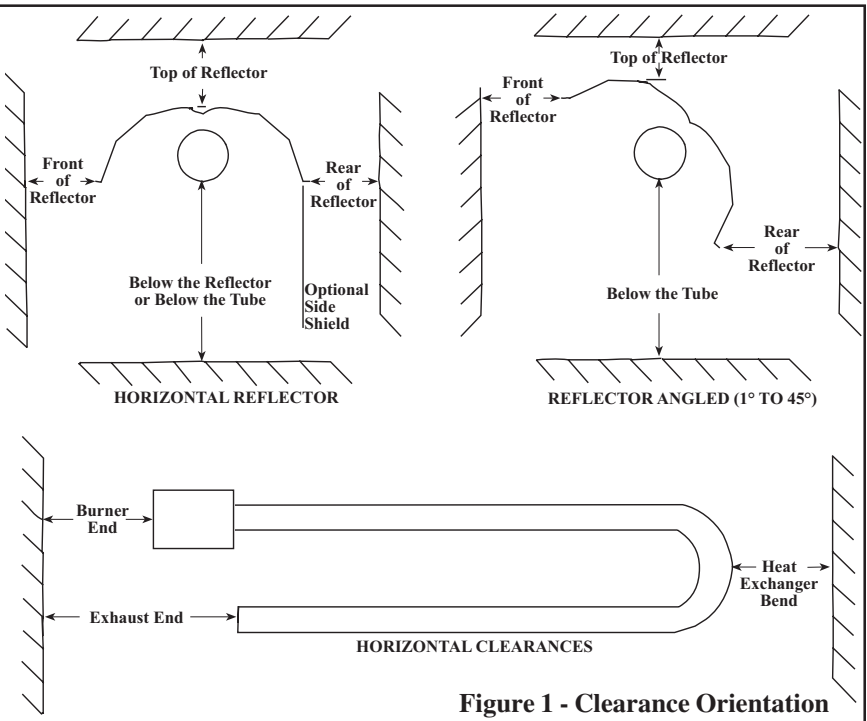


Figure 1 - Clearance Orientation

Clearance to combustibles is defined as the minimum distance from the heater to a surface or object that is necessary to ensure that a surface temperature of 90°F above the surrounding ambient temperature is not exceeded.

The clearances listed in the tables are installation requirements. In addition, ANSI Z-223-1, Section 6.18, requires that signs be posted specifying the maximum permissible stacking heights to assure that the required clearances from the heater to combustibles are maintained in areas where items are stored under the heater.

Refer to Paragraph 1, Special Installations, for specific clearance requirements for heaters installed in aircraft hangars and public garages.

5. Location and Mounting Height

When selecting the installation location, major factors to consider are (1) Personal and Property Safety, (2) Personal Comfort, and (3) Heating Efficiency

(1) Safety

The location must meet the Installation Codes listed in Paragraph 1 and any local codes. These heaters are approved for indoor commercial/industrial installations only. Do not install these tubular radiant heaters in areas that contain corrosive or toxic fumes or where elements in the atmosphere could produce corrosive or toxic fumes in the presence of an open flame. These heaters do not qualify for explosion-proof installations.

5. Location and Mounting Height (cont'd)

Clearance to combustibles must be observed (See Paragraph 4), including clearances to stock that might be periodically stacked underneath the heater.

The supporting structure must have a load-carrying capacity of at least 200 lbs.

Do not locate the heater above or too close to electric lines, gas pipes, emergency sprinkler systems, or any such structures that could be adversely affected by radiant or convection heat.

Do not locate the heater where it could be damaged by high lifts, cranes, or any other such equipment.

Since chain suspension is required to allow for expansion and contraction of the tubes, proper positioning near large door openings is important. If the heater is being installed near a large door (ex: garage, loading dock, aircraft hangar, etc.), position the heater so that it will not "swing" in the wind. Lateral movement of the tubular system should be limited.

(2) Comfort

Because of the unique heat transfer features of an infrared heater, the comfort quality of the heat is greatly affected by the location of the heater. Rays of heat are emitted from the surface of the tubes and directed by the reflectors. When radiant heat rays reach a surface, those rays are absorbed, raising the temperature of that "object". Since infrared heat does not heat the air, a comfort advantage is that stratification does not occur. When the rays are not obstructed from reaching the floor, the floor and lower level areas maintain a more comfortable temperature than with convection (warm air) heating equipment.

For optimum comfort when infrared heaters are being used to "heat" personnel (spot heating), it is recommended that (1) the rays of heat be directed toward the person(s) from an angle rather than from directly overhead, and (2) the heater(s) be arranged so that rays are directed against at least two sides (or front and back) of the person(s). If the heater must be hung directly overhead, a higher mounting height will increase the comfort level because the greater distance will decrease the intensity level of the rays. **Another significant factor when locating the heater in relation to people is that the heat emitted from the burner/combustion chamber end of the tubular infrared heater is more intense than the heat emitted from the exhaust end. For this reason, a U-tube configuration is often best suited for overhead spot heat applications.**

Tubular radiant heaters are engineered to provide comfort-level personal spot and space heating, but each application should be designed individually to determine the best, quality-comfort locations.

(3) Efficiency

Because of the unique features of radiant heat transfer, selecting the most efficient location for infrared equipment depends on the "floor" coverage of the emitted heat rays. Floor coverage distance can be figured as approximately two times the mounting height of the unit. However, comfort level heating depends on the infrared intensity, and intensity levels decrease with higher mounting heights and greater floor coverage. For more accurate measurement, consult the manufacturer's flux density tables.

For space heating infrared applications, the location of the units must be evaluated as part of the heater size selection. Determine the total BTU's required, the floor coverage required, and the mounting height. From this information design a heater size and location plan that will provide the most complete floor coverage without excessive overlapping. In most cases, perimeter heaters should be located parallel to the wall. The distance from the wall is determined by whether the reflectors will be angled or horizontal.

For spot heating applications, the tubular system should be located to direct the rays toward the area requiring heat. Depending on the installation, this can be done from directly overhead or reflector angled from the side. U-tube configurations are often best suited to overhead spot

heating applications. Refer to the recommended minimum mounting heights below. Use the mounting height, the size of the heater, the heater configuration, and the application conditions to determine the most efficient location of the heater.

Recommended Minimum Mounting Height								
Reflector Position		Size (000 BTUH Input)						
		50	75	100	125	150	175	200
Horizontal	feet	11	12	13	15	16	17	18
	M	3.4	3.7	4.0	4.6	4.9	5.2	5.5
30° Angle	feet	9	10	11	13	14	15	16
	M	2.7	3.0	3.4	4.0	4.3	4.6	4.9
45° Angle	feet	8	9	10	11	13	14	15
	M	2.4	2.7	3.0	3.4	4.0	4.3	4.6

6. Uncrating/Packaging

Check for shipping damage. If any damage is found, document the damage with the shipping agency and immediately contact your Reznor Distributor.

Because of their modular design, these heaters are packaged in sections and require field assembly. The burner/control box is in one carton, and the tubes are packaged in one, two or three cartons depending on the length of the system.

Burner/Control Box Carton - For the convenience of both the stocking and the non-stocking distributor, the burner/control boxes have two different packaging methods. **Read carefully to determine whether or not the burner/control box requires field conversion before being installed.**

(1) Burner/Control Box Packages

Package	Contents
TR50	Factory-assembled Size 50,000 BTUH heater
TR75/100	Factory-assembled Size 75,000 BTUH heater Conversion kit to change to a Size 100,000 BTUH heater
TR125/150	Factory-assembled Size 125,000 BTUH heater Conversion kit to change to a Size 150,000 BTUH heater
TR175/200	Factory-assembled Size 175,000 BTUH heater Conversion kit to change to a Size 200,000 BTUH heater

(2) Burner/Control Box Factory Built to a Specific Size - If the burner/control box carton does not have a label about field conversion, the carton contains a burner/control box factory-built to a specific size. Check the rating plate to verify size and type of gas.

Tube Cartons - Tubes are also packaged so that a minimum number of cartons will cover all lengths of heater systems. This package identification system applies to all heaters, whether shipped from distributor stock or shipped to order from the factory. Before beginning installation, verify that the packages at the job site match the length of heater being installed.

Packaging Scheme for Tubes

Pkg P/N	Contents
120294	Combustion Chamber Tube; Tail Pipe with Turbulator
120295	Combustion Chamber Tube; Heat Exchanger Tube; Tail Pipe with Turbulator
120296	Heat Exchanger Tube; Heat Exchanger Tube with Turbulator
Tube Packages (left) Required by Length of System	
Length	Qty Pkg Qty Pkg
20 ft system requires	1 P/N 120294
30 ft system requires	1 P/N 120295
40 ft system requires	1 P/N 120294 1 P/N 120296
50 ft system requires	1 P/N 120295 1 P/N 120296
60 ft system requires	1 P/N 120294 2 P/N 120296
70 ft system requires	1 P/N 120295 2 P/N 120296
Reflectors, reflector brackets, and hardware packages are included i	

each carton. (NOTE: Chain for hanging is not included. Use either an Optional Hanger Kit and/or Turnbuckle Kit or field-supplied hardware. See suspension requirements in Paragraph 7.)

Accessory Cartons -- All field-installed options are shipped in separate cartons.

7. High Altitude Operation

All factory-built Model TR-H units are designed to operate at full input rates at elevations from 2001 to 6000 ft (611-1830M). In addition, Model TR-H in Sizes 50 to 175 will operate at full rate at elevations from 2001 to 8000 ft (611-2440M).

High altitude kits are available to convert Size 50, 75, 100, 175, and 200 sea level burner/control boxes for use at high altitudes. Kits are available for all sizes to convert from one high altitude level to another.

If the heater being installed requires high altitude conversion, contact your distributor to obtain the appropriate kit and complete the conversion as part of the burner/control box preparation in Paragraph 9.

High Altitude Conversion Kits (full rate operation)				TR/TR-H			TR-H only		TR/TR-H	
Gas	feet	meters		50	75	100	125*	150*	175	200
Natural	2001-4000	610-1219	U.S. or Canada**	126440	120880	120882	132664	132667	132670	132673
Gas	4001-6000	1220-1828	U.S. Only	126442	120884	120886	132682	132685	132688	132691
Only	6001-8000	1829-2438	U.S. Only	126444	120888	120890	132700	132703	132706	N/A
Propane	2001-4000	610-1219	U.S. or Canada**	126441	120881	120883	132676	132679	N/A	N/A
Gas	4001-6000	1220-1828	U.S. Only	126443	120885	120887	132694	132697	N/A	N/A
Only	6001-8000	1829-2438	U.S. Only	126445	120889	120891	132712	132715	N/A	N/A

*Kits for Sizes 125 and 150 may only be used to change a Model TR-H from one high altitude elevation to another.
DO NOT attempt to field convert a sea level Model TR125 or TR150 to high altitude.
**Canadian high altitude installations must choose kits designed for 2001-4000 ft (610-1219M) elevation.

8. Suspension Dimensions and Preparation

Refer to the Suspension Point Dimensions and Installation Configuration Drawings Booklet. This booklet provides suspension point dimensions, illustrations of permissible configurations for each size and length of heater, and requirements that must be met to include an optional 5-ft heat exchanger tube in the system.

From the dimensions on the selected configuration drawing, determine the building suspension points.

WARNING: Install heaters only in the configurations illustrated or noted in the configuration booklet (Form RZ 607 in the Owner's Envelope). Don't install a heater in a configuration that is not permissible for that BTUH input capacity or length. See Paragraph 3 and Hazard Levels on page 2.

Suspension Point Requirements:

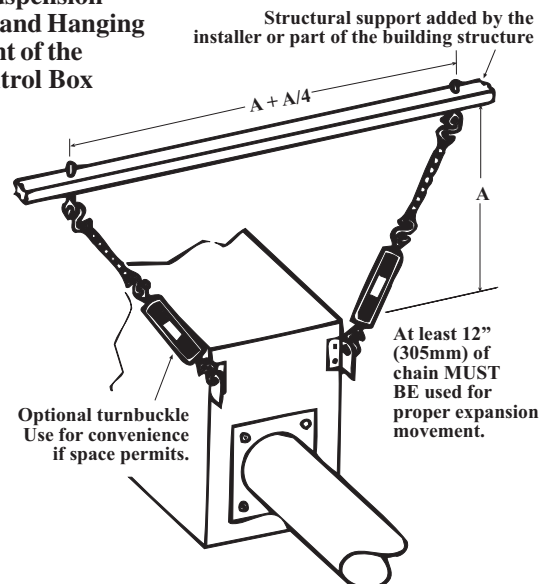
- Supporting structure must have a minimum load-carrying capacity of 200 lbs. (Do not suspend the heater from gas piping or electrical conduit.)
 - Clearances to combustibles must be observed. See Paragraph 4.
 - Heater must be suspended by hanging chains. Chain, "S" hooks, and/or turnbuckle length at each suspension point must be a minimum of 12 inches. All chains suspending tubes must be plumb. See Figure 2 for dimensions for burner/control box suspension points.
 - Refer to Paragraph 5 for recommended minimum mounting heights. The installer is responsible for properly and adequately fastening the chains to the building and supporting the weight of the heater. Depending on the type of building construction at the installation site, either attach the chain support directly to the building or attach and extend a support to the location needed. SUPERSTRUT® brackets or a comparable metal strut material is well suited as a support structure that requires numerous suspension points.
- Chain must accept a 1/4" "S" hook and have a minimum of 200 lbs working load rating. Use either optional hanging chain kit (Option CK11) or field-supplied chain.

- Since the heater must be level, turnbuckles are recommended at the "S" hook connections on the heater. Turnbuckles must be of steel or malleable iron. Use either optional turnbuckle kits (Options CK12-20) or field-supplied equivalent.
- A minimum length of 12" of chain, "S" hooks and/or turnbuckle is required at each suspension point.
- Chains suspending tubes must be plumb when the heater is installed.
- Suspension points required for the burner/control box are illustrated in Figure 2.

This tubular radiant heater must be suspended with chain because the tubes will expand when heated. The overall length of a straight system will expand approximately as shown in the table.

Straight System	Expansion Length
70 ft	2-3/4" (70mm)
60 ft	2-3/8" (60mm)
50 ft	2-1/8" (54mm)
40 ft	1-7/8" (48mm)
30 ft	1-1/2" (38mm)
20 ft	1-1/8" (29mm)

Figure 2 - Suspension Dimensions and Hanging Arrangement of the Burner/Control Box



9. Prepare and Install Burner/Control Box and Combustion Chamber Tube

There are very important steps that must be followed to prepare, suspend, and assemble these tubular radiant heaters. Preparing the heater, suspension, and field assembly are the responsibility of the installer. Follow all instructions carefully.

STEP 1) Prepare Burner/Control Box

All burner/control boxes require some field preparation. The type of preparation depends on how the unit was ordered and where it will be installed. Determine which of these six situations matches your application and follow the appropriate instructions. The first three are for units ordered by specific size; the last three are for burner/control box packages that cover two sizes. (Refer to Paragraph 6 for further explanation on packaging.)

- **The unit was ordered as a specific size to be installed at a specific elevation (sea level or high altitude) and is being installed at that elevation.** Proceed to STEP 2 of these Preparation instructions.
- **The unit was ordered as a specific size to be installed at sea level to 2000 ft and is being installed above 2000 ft** (NOTE: Does not apply to Sizes 125 and 150). Install the high altitude kit selected in Paragraph 7. Follow the instructions provided with the kit. When the kit is installed, proceed to STEP 2 of these Preparation Instructions.
- **The unit was ordered as a specific size to be installed at an elevation above 2000 ft and is being installed at a different elevation above 2000 ft.** Install the high altitude kit selected in Paragraph 7. Follow the instructions provided with the kit. When the kit is installed, proceed to STEP 2 of these Preparation Instructions.
- **The burner/control box was ordered as a TR75/100, TR125/150, or TR175/200 and will be installed at sea level to 2000 ft as a Size 75, 125, or 175.** Proceed to STEP 2 of these Preparation instructions. (The Size Conversion Kit shipped with the burner/control box will not be used.)
- **The burner/control box was ordered as a TR75/100 or TR175/200 and will be installed above 2000 ft elevation as a Size 75, 100, 175, or 200.** Install the high altitude kit selected in Paragraph 7. Follow the instructions provided with the kit. When the kit is installed, proceed to STEP 2 of these Preparation Instructions. (The Size Conversion Kit shipped with the burner/control box will not be used.)
- **The burner/control box was ordered as a TR75/100, TR125/150, or TR 175/200 and will be installed at sea level to 2000 ft elevation as a Size 100, 150, or 200.** Follow the instructions below to install the size conversion kit shipped with the burner/control box.

Instructions to Change the Combustion Air Restrictor Plate and Burner Orifice to Field Convert a Burner/Control Box from Size 75,000 to 100,000; or from Size 125,000 to 150,000; or from Size 175,000 to 200,000.

Parts Required: Conversion package in the burner/control box including a burner orifice, a combustion air restrictor plate, and conversion labels.

1. **Conversion Size Labels** (one on the restrictor plate, one or two loose) -- Fill-in all labels stating that the burner/control box has been converted to either a Size 100,000, 150,000 or 200,000.
2. **Change Air Restrictor Plate** -- Refer to Figure 3A and identify the combustion air inlet on the side of the burner box. Locate the paper warning label on the factory-installed combustion air restrictor plate. Attached to the restrictor plate is a combustion air sensor tube and bracket. See Figure 3B. Remove the hardware (screws and/or nuts) holding the combustion air sensor bracket and the restrictor plate. Remove and discard the factory-installed combustion air restrictor plate. Using the same hardware, attach the combustion air restrictor plate shipped in the parts bag. Re-attach the combustion air flow sensor bracket.

Figure 3A - Combustion Air Inlet Side of Burner/Control Box

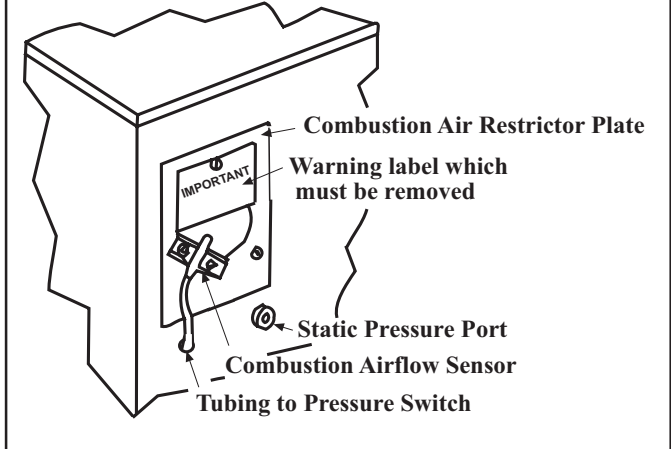
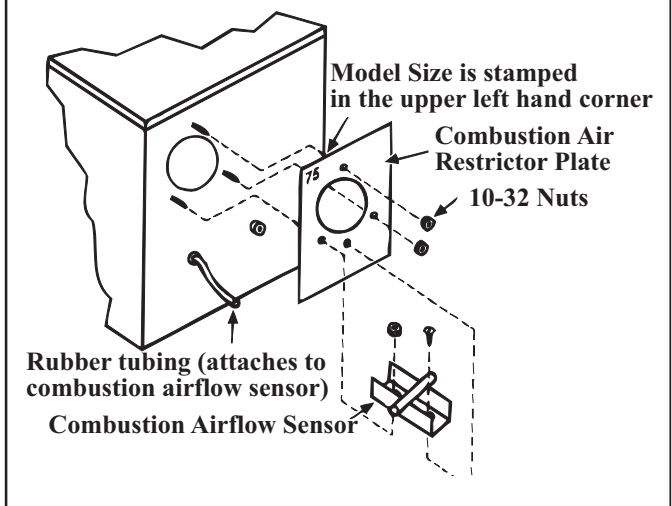
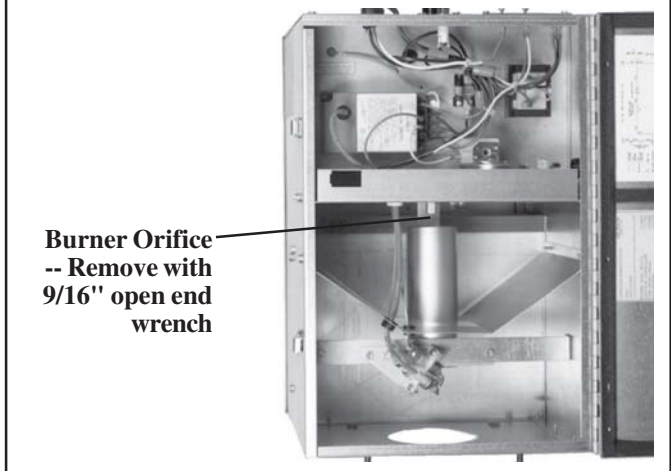


Figure 3B - Remove factory-installed air restrictor plate and replace with the restrictor plate in the parts bag



3. **Change Burner Orifice** - Open the hinged access panel on the bottom of the burner/control box. Locate the burner orifice. See Figure 4. Using a 9/16" open-end wrench, remove and discard the factory-installed burner orifice. Install the burner orifice shipped in the parts bag. Close the bottom panel.

Figure 4 - Burner/Control Box Showing Location of the Burner Orifice



- Adhere label(s) to the burner/control box directly below the rating plate.

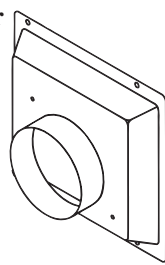
Field size conversion is complete. Continue to **STEP 2) Install Combustion Air Inlet Cover.**

STEP 2 -- Install Combustion Air Inlet Cover -- Applies to **all** burner/control boxes.

From the hardware bag in the burner/control box, remove the instruction sheet and the parts listed in Figure 5.

Figure 5 - Combustion Air Inlet Cover

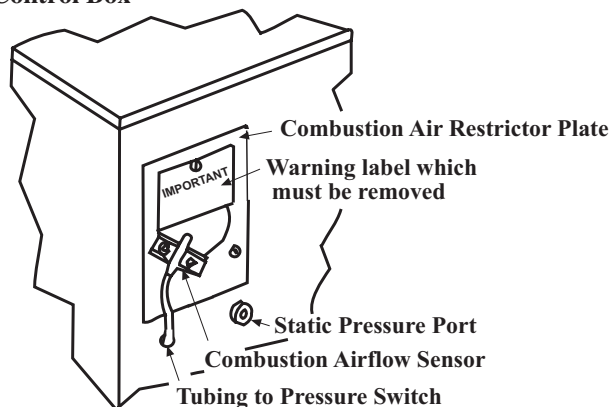
Qty	Description
1	Combustion Air Inlet Cover
4	Screws, #10 x 1/2" long



Instructions:

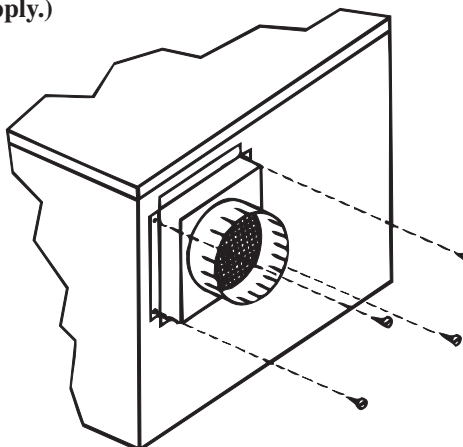
- Refer to Figure 6 and identify the combustion air inlet side of the burner box. If paper warning label is attached, remove.

Figure 6 - Combustion Air Inlet Side of the Burner/Control Box



- Position the combustion air inlet cover over the air inlet opening. Using the four screws in the parts bag, attach the cover to the burner/control box. See Figure 7.

Figure 7 - Attach Combustion Air Inlet Cover (Field-attachment of the combustion air inlet cover is required with either an indoor or outdoor combustion air supply.)



STEP 3 -- Assemble and Suspend the Burner/Control Box and Combustion Chamber Tube

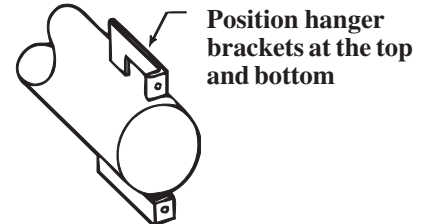
Use these parts (from the hardware bag) to assemble the box and tube.

Qty	Description	P/N
4	Lockwashers	1333
4	Nuts	1035
1	Gasket	116029

Instructions:

- Identify the Combustion Chamber Tube --** The tube with the square flange welded to one end.
- Attach Combustion Chamber Tube to Burner/Control Box --** Slide the gasket over the bolts on the burner end of the burner/control box (See Figure 8B). Position the tube so that the hangers (on the end of the tube) are toward the top and bottom. See Figure 8A. Slide the flange over the bolts. See Figure 8B.

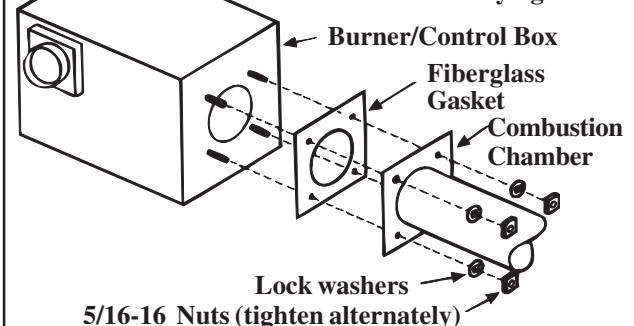
Figure 8A - End of Combustion Chamber Tube Showing Position of Hanger Brackets



Use the washers and nuts to attach the combustion chamber flange securely to the burner/control box. (The bolts are pre-welded to the inside of the box.)

- Suspend the Combustion Chamber Tube/Burner Box Assem-**

Figure 8B - Attach the Combustion Chamber Tube to the Burner/Control Box. Alternately tighten nuts.



bly

Parts needed from the hardware bag: 3 "S" Hooks

Attach the two "S" hooks to the hanger brackets on the burner/control box. Attach the third to the top hanger bracket on the end of the combustion chamber tube. Suspend the assembly from the three hanging chains. Refer to Figure 9.

The illustration in Figure 9 includes turnbuckles. Turnbuckles are

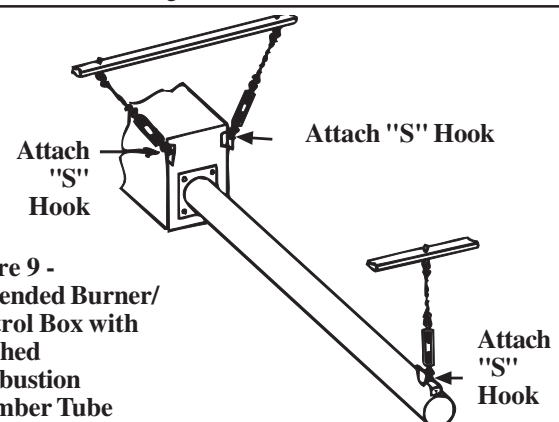


Figure 9 - Suspended Burner/Control Box with attached Combustion Chamber Tube

9. Install Burner/Control Box and Combustion Chamber Tube (cont'd)

3. Suspend the Combustion Chamber Tube/Burner Box Assembly (cont'd)

recommended for use in leveling the heater. If turnbuckles are included in heater suspension, use only optional turnbuckles or field-supplied turnbuckles of steel or malleable iron.

4. **Draw Bolts** -- There are two 4-1/2" long bolts left in the hardware bag. These bolts are provided as an aid in connecting tubes. Keep the bolts and follow the tube connection instructions in Paragraph 10.

10. Install the Heat Exchanger Tube(s), Tail Pipe Tube, and Turbulator Strip

There are very important steps that must be followed to suspend and assemble these tubular radiant heaters. Preparing the heater, suspension, and field assembly are the responsibility of the installer. Follow all instructions carefully. Throughout the instructions, continued reference to the installation configuration drawing is required.

- 1) **Identify the Heat Exchanger and Tail Pipe Tubes and the Parts Packaged with them (Refer to the illustrations in Figures 10A-10E and the configuration drawing in the configuration booklet):**

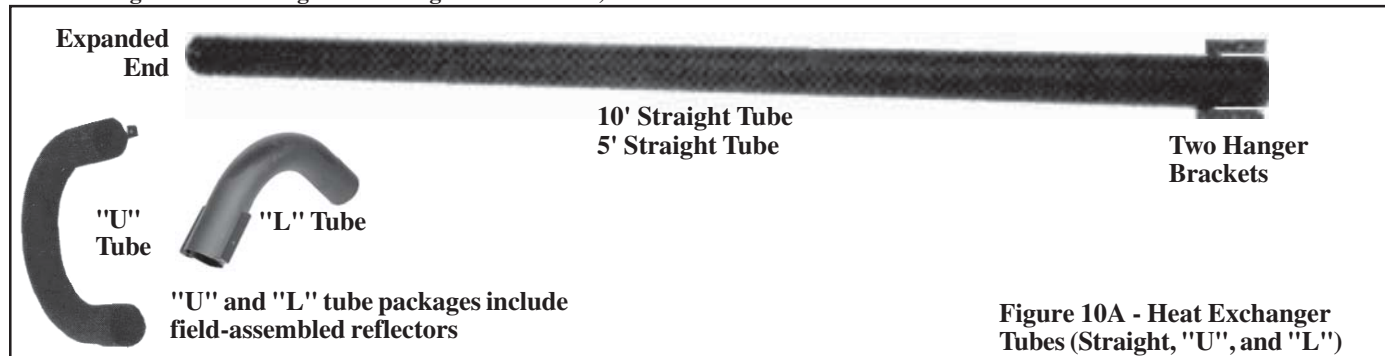


Figure 10A - Heat Exchanger Tubes (Straight, "U", and "L")



A parts bag is supplied with each heater tube and tail pipe. The bag contains hardware needed to connect two tubes, an "S" hook, and an instruction sheet.

Figure 10C - Connection Hardware Parts Bag, P/N 116017

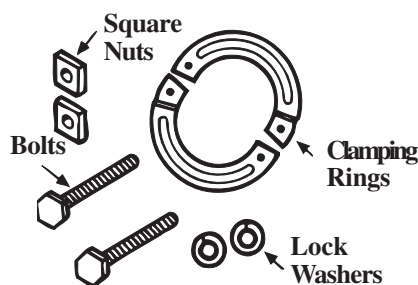
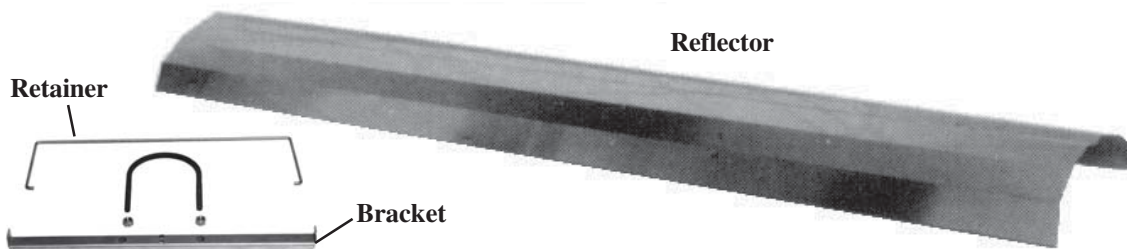


Figure 10D - One Section of the Field-Installed Turbulator Strip



Figure 10E - Reflector, Reflector Retainer, and Reflector Bracket and Hardware (U-bolt and nuts)



One 10' reflector and two reflector retainers and two brackets with hardware per 10' straight tube. Optional 5' heat exchanger tube includes a 5' reflector and two sets of retainers and brackets with hardware. Follow installation instructions in Paragraph 11.

2) Suspend and Connect the Heat Exchanger Tubes and Tail Pipe -- Follow the Configuration Drawing Layout

Connect each tube as it is suspended. If your configuration requires a turbulator strip before a "U" or "L" tube, insert the turbulator strip before the "U" or "L" tube is connected. Follow the instructions in Step No. 3) on pages 9-11, and install two sections of turbulator strip. (This will only

occur when installing a 40' to 70' system in a configuration where a "U" or "L" tube connects directly to the tail pipe.)

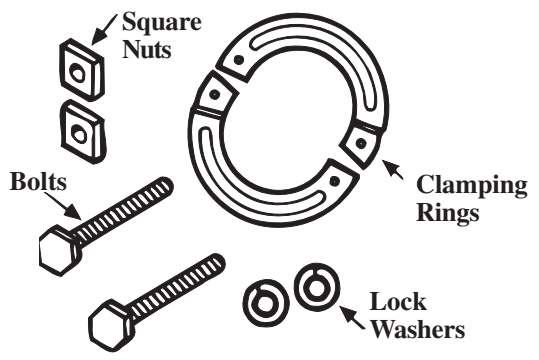
Suspending Straight (5-ft or 10-ft) Heat Exchanger Tubes and "U" Tubes - Attach an "S" hook to the hanger bracket and suspend the tube from the next hanging chain. Slide the expanded end over the previous tube and make the connection.

Installing "L" Heat Exchanger Tubes - "L" tubes do not require a suspension point. When the configuration requires an "L" tube, slide the expanded end over the previous tube and make the connection.

Suspending the Tail Pipe - Attach an "S" hook to the hanger bracket and suspend the tube from the last hanging chain. Slide the expanded end over the previous tube and make the connection.

Connecting the Tubes - Using the hardware in the bag packaged with each tube, follow the steps in Figure 11 to connect the tubes.

1) Connection Hardware



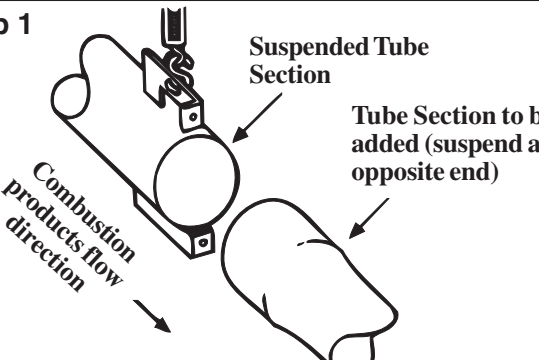
Square Nuts

Bolts

Clamping Rings

Lock Washers

2) Step 1



Suspended Tube Section

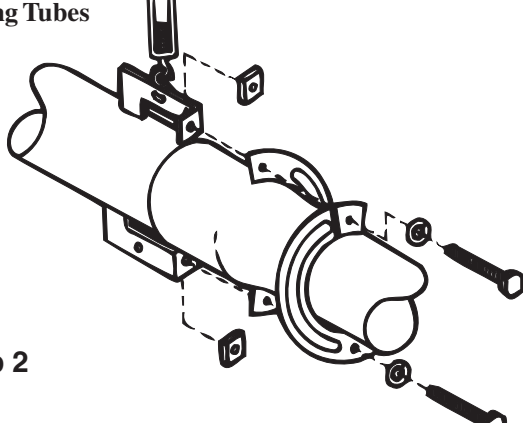
Tube Section to be added (suspend at opposite end)

Combustion products flow direction

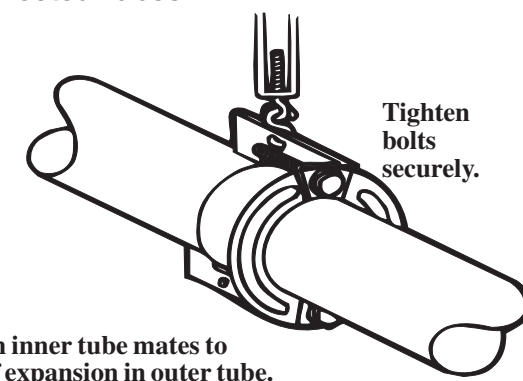
IMPORTANT: If tubes do not slide together easily, follow Installation Tip below.

Figure 11 - Steps for Connecting Tubes

3) Step 2



4) Connected Tubes



Tighten bolts securely.

Be certain inner tube mates to bottom of expansion in outer tube.

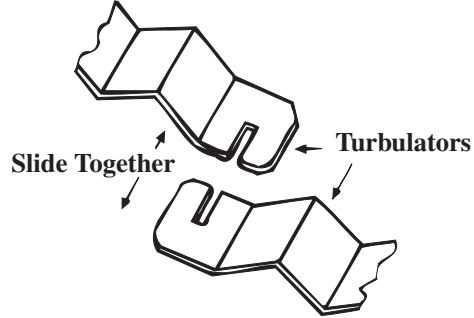
Installation Tip: If tubes are difficult to slide tubes together, use the two 4-1/2" long bolts from the burner/control box parts bag to draw the tubes together. Follow illustrated Step 2 (Figure 11, page 9), using the 4-1/2" bolts. Alternate tightening the upper and lower bolts. When the tubes are in position, remove one of the long bolts, replace with a connecting bolt, and secure. Repeat, replacing the other bolt. Re-use the 4-1/2" bolts as needed.

3) Install the Turbulator Strip -- Locate turbulator strip sections.

System Length	20	30	40		50		60			70		
Tube Package(s)	E	F	E	G	F	G	E	G	G	F	G	G
Full Size Turbulator Section, 37-1/8" long	3	3	3	2	3	2	3	2	2	3	2	2
Small Turbulator Section, 26" long	1	0	1	0	0	0	1	0	0	0	0	0

Instructions: Install a turbulator strip in a tube **only** after that tube has been suspended and connected to the previous tube. Refer to Figures 12A and 12B. Install the turbulator strip by sliding a section into the tube, connecting the next section, and sliding the connected sections on into the tube(s). Follow the selected configuration drawing in the configuration booklet and the instructions in the chart on page 11.

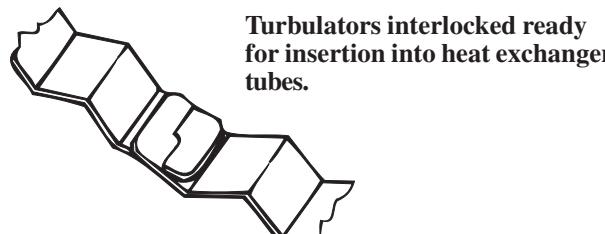
Figure 12A - Turbulator Strip Section



Slide Together

Turbulators

Figure 12B - Interlock Sections as Turbulator Strip is Installed



Turbulators interlocked ready for insertion into heat exchanger tubes.

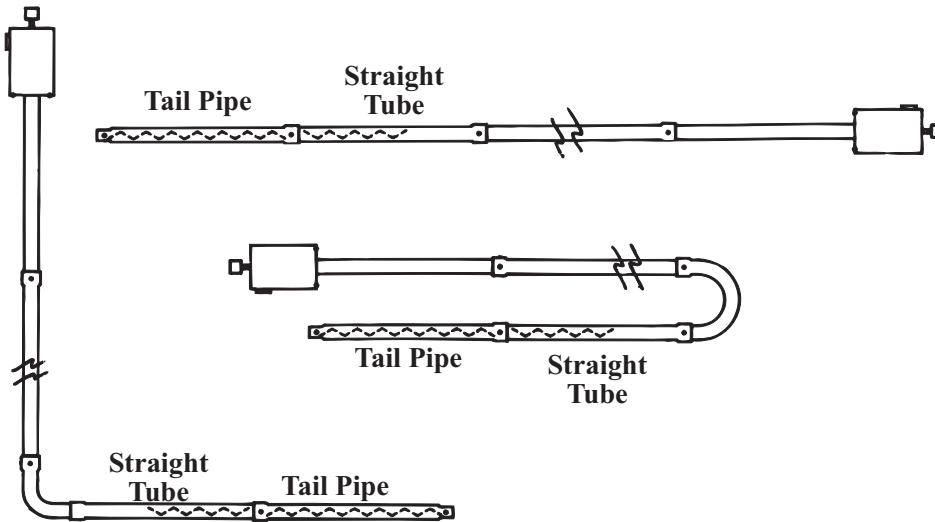
10. Installing the System (cont'd)

Length of Straight Tubes	BTUH Size (000)	Elevation	Configuration (Must be illustrated in the Suspension Dimension and Configuration Booklet.)	Turbulator Sections (Some sections may not be used; follow instructions.)					
				In Tube Packages		Used in the Configuration		Quantity, Type and WHEN to Install	WHERE to Install
				Qty	Size**	Qty	Size**		
20 ft	50 75	0 - 8000 ft*	Straight	3	37-1/8"	3	37-1/8"	All 4 sections <i>after</i> tail pipe is connected	Into exhaust end of tail pipe
				1	26"	1	26"		
			"U" or "L"	3	37-1/8"	3	37-1/8"	3 long sections <i>after</i> tail pipe is connected	Into exhaust end of tail pipe
				1	26"				
25 ft	50 75	0 - 8000 ft*	All	3	37-1/8"	3	37-1/8"	All 3 sections <i>after</i> tail pipe is connected	Into exhaust end of tail pipe
30 ft	50 75 100	0 - 8000 ft*	All	3	37-1/8"	3	37-1/8"	All 3 sections <i>after</i> tail pipe is connected	Into exhaust end of tail pipe
35 ft	75 100	0 - 8000 ft*	All	3	37-1/8"	3	37-1/8"	All 3 sections <i>after</i> tail pipe is connected	Into exhaust end of tail pipe
40 ft	75 100 125	0 - 8000 ft*	Straight heat exchanger tube <i>adjacent</i> to the tail pipe (See Figure 12C)	5	37-1/8"	5	37-1/8"	5 long sections <i>after</i> tail pipe is connected	Into exhaust end of tail pipe
				1	26"				
			"U" or "L" tube <i>adjacent</i> to the tail pipe (See Figure 12D)	5	37-1/8"	5	37-1/8"	2 long sections <i>before</i> "U" or "L" is connected	Into end of straight tube before "U" or "L"
				1	26"			3 long sections <i>after</i> tail pipe is connected	Into exhaust end of tail pipe
45 ft	100 125	0 - 8000 ft*	Straight heat exchanger tube <i>adjacent</i> to the tail pipe (See Figure 12C)	5	37-1/8"	5	37-1/8"	5 long sections <i>after</i> tail pipe is connected	Into exhaust end of tail pipe
				1	26"				
			"U" or "L" tube <i>adjacent</i> to the tail pipe (See Figure 12D)	5	37-1/8"	5	37-1/8"	2 long sections <i>before</i> "U" or "L" is connected	Into end of straight tube before "U" or "L"
				1	26"			3 long sections <i>after</i> tail pipe is connected	Into exhaust end of tail pipe
50 ft	100 125 150	0 - 8000 ft*	Straight heat exchanger tube <i>adjacent</i> to the tail pipe (See Figure 12C)	5	37-1/8"	5	37-1/8"	All 5 sections <i>after</i> tail pipe is connected	Into exhaust end of tail pipe
	175 200	0 - 2000 ft	"U" or "L" tube <i>adjacent</i> to the tail pipe (See Figure 12D)	5	37-1/8"	5	37-1/8"	2 sections <i>before</i> "U" or "L" is connected	Into end of straight before "U" or "L"
								3 sections <i>after</i> tail pipe is connected	Into exhaust end of tail pipe
	175 200	2001-8000 ft* 2001-6000 ft*	All	5	37-1/8"	3	37-1/8"	3 sections <i>after</i> tail pipe is connected	Into exhaust end of tail pipe
55 ft	150	0 - 8000 ft*	Straight heat exchanger tube <i>adjacent</i> to the tail pipe (See Figure 12C)	5	37-1/8"	5	37-1/8"	All 5 sections <i>after</i> tail pipe is connected	Into exhaust end of tail pipe
	175 200	0 - 2000 ft	"U" or "L" tube <i>adjacent</i> to the tail pipe (See Figure 12D)	5	37-1/8"	5	37-1/8"	2 sections <i>before</i> "U" or "L" is connected	Into end of straight tube before "U" or "L"
								3 sections <i>after</i> tail pipe is connected	Into exhaust end of tail pipe
	175 200	2001-8000 ft* 2001-6000 ft*	All	5	37-1/8"	3	37-1/8"	3 sections <i>after</i> tail pipe is connected	Into exhaust end of tail pipe
60 ft	150	0 - 8000 ft*	Straight heat exchanger tube <i>adjacent</i> to the tail pipe (See Figure 12C)	7	37-1/8"	5	37-1/8"	5 sections <i>after</i> tail pipe is connected	Into exhaust end of tail pipe
	175 200	0 - 2000 ft	"U" or "L" tube <i>adjacent</i> to the tail pipe (See Figure 12D)	7	37-1/8"	5	37-1/8"	2 sections <i>before</i> "U" or "L" is connected	Into end of straight before "U" or "L"
								3 sections <i>after</i> tail pipe is connected	Into exhaust end of tail pipe
	175 200	2001-8000 ft* 2001-6000 ft*	All	7	37-1/8"	3	37-1/8"	3 sections <i>after</i> tail pipe is connected	Into exhaust end of tail pipe
65 or 70 ft	175 200	0 - 2000 ft	Straight heat exchanger tube <i>adjacent</i> to the tail pipe (See Figure 12C)	7	37-1/8"	5	37-1/8"	5 sections <i>after</i> tail pipe is connected	Into exhaust end of tail pipe
			"U" or "L" tube <i>adjacent</i> to the tail pipe (See Figure 12D)	7	37-1/8"	5	37-1/8"	2 sections <i>before</i> "U" or "L" is connected	Into end of straight before "U" or "L"
	175 200	2001-8000 ft* 2001-6000 ft*						3 sections <i>after</i> tail pipe is connected	Into exhaust end of tail pipe
			All	7	37-1/8"	3	37-1/8"	3 sections <i>after</i> tail pipe is connected	Into exhaust end of tail pipe

* To install a heater above 2000 ft elevation, that heater must either be factory-built for the required elevation or field-converted to that elevation. Check the rating plate or field conversion label for allowable altitude.

** Metric equivalent: 37-1/8" is 943mm; 26" is 660mm

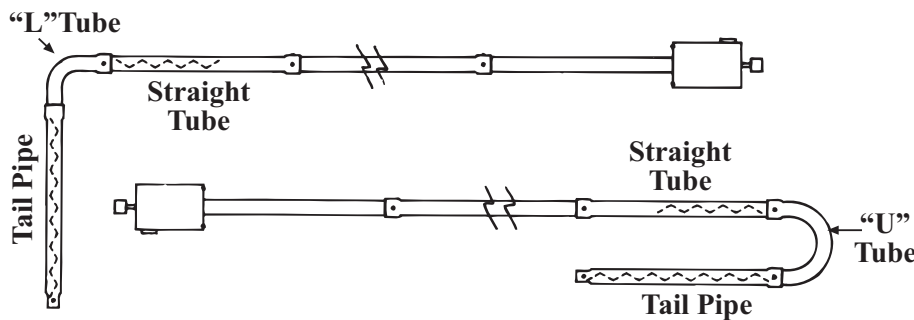
Figure 12C - Examples of Configurations with the Tail Pipe Adjacent to a Straight Heat Exchanger Tube



To install turbulator:

- 1) Attach the tail pipe to the straight pipe.
- 2) Insert a turbulator section into the tail pipe.
- 3) Interlock turbulator sections as they are inserted (See Figure 12B).
- 4) Continue until all required sections are in place.

Figure 12D - Examples of Configurations that require more than three turbulator strips and have the tail pipe adjacent to an "L" or "U" heat exchanger tube



To install turbulator:

- 1) *Before* attaching the "U" or "L" tube, insert two interlocked turbulator sections (See Figure 12B) into the last straight tube.
- 2) Attach the "U" or "L" heat exchanger tube to the straight tube.
- 3) Attach the tail pipe to the "U" or "L" tube.
- 4) Insert three interlocked turbulator sections into the tail pipe.

Summary of Number of Sections Required to "Build" Turbulator Strip

(NOTE: There may be sections in the packages that are not used.)

Elevation of Installation (ft)	BTUH Sizes (000)	Length (Straight)	Configuration	No. of Sections used in Turbulator Strip	
0 - 8000	50-75	20 ft	Straight	4 (3 long, 1 short)	
		20 ft	"U" or "L"	3	
		25 ft	Straight, "U", and "L"	3	
	50-75-100	30 ft		3	
	75-100	35 ft		3	
	75-100-125	40 ft		5	
	100-125	45 ft		5	
	100-125-150	50 ft		5	
	0 - 2000			175-200	5
	2001-8000			175-200*	3
0 - 8000	150			55, 60 ft	5
0 - 2000	175-200	55, 60,		5	
2001-8000	175-200*	65, 70 ft	3		

*Size 200 - Maximum elevation is 6000 feet.

4) Level the System and Close "S" Hooks

Tubes must be level. Use a spirit level and adjust the turnbuckles or chain links. Close all "S" hooks being careful not to change the chain length. When the system is level, re-check to be sure that all bolts connecting the tubes are tightened securely.

Straight systems should be straight; systems with "L" tubes should be at right angles; and "U" shaped systems should be parallel.

11. Install Reflectors (including Standard Reflectors, Optional Side Shield and Optional Reflector Gap and End Covers)

WARNING: Do not operate heater without reflectors. See Hazard Intensity Levels, page 2.

Packaged with each straight tube is a reflector, two reflector brackets with hardware, and two reflector retainers (Refer to Figure 10E on page 7). Follow the instructions to install a reflector on all straight tubes.

NOTE: If the installation includes an optional side shield, the side shield package (Options CD13-20) includes two additional reflector brackets and retainers for each 10-ft tube. All four brackets must be attached to each 10-ft tube before installing the reflector.

Reflector Installation Instructions

- From the table, determine the number of brackets (and retainers) required per tube and select the appropriate illustration (Figure 13A or 13B).
- Install Reflector Brackets**

Tube Length	Side Shield	Number of Brackets	Refer to Figure
10-ft	Without	2	13A
10-ft	With	4	13B
5-ft	Without	2	13A
5-ft	With	2	13B

(See Figure 13A or 13B)

- Slide the U-bolt over the tube at the determined location.
- Position the reflector bracket as illustrated (end flanges extending upward) and slide the bracket over the bolt ends. Adjust the bracket to the desired reflector angle (0-45°). Use the nuts to attach the reflector bracket to the U-bolt.
- Repeat the procedure to install all required brackets.

Figure 13A - Locations for Reflector Brackets for Systems without an Optional Side Shield

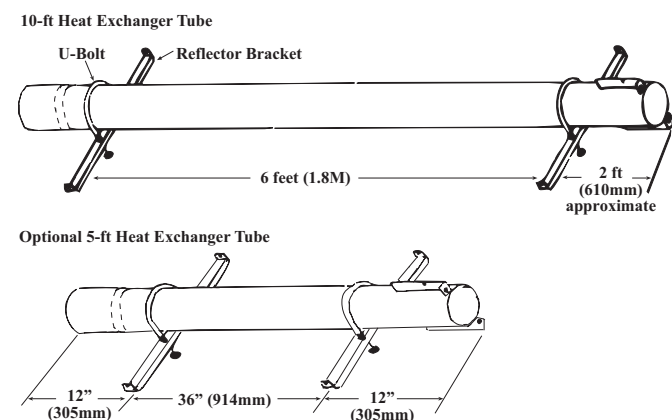
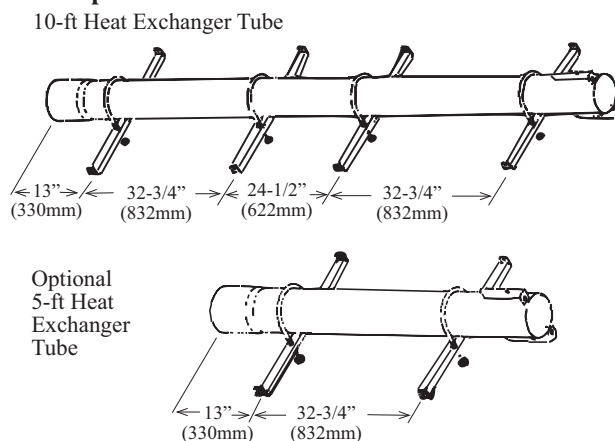


Figure 13B - Locations for Reflector Brackets for Systems with an Optional Side Shield



3. Install the Reflector, Optional Side Shield, and Reflector Retainers (Refer to Figure 15)

- All Installations** -- Nestle the reflector inside the flanged edges of the reflector brackets.
- Installations with Optional Side Shield** -- The side shield is modular with two sections per 10-ft tube. When side shields are included in the installation, drill a 9/64" hole in each tube joint and insert the screw provided (See Figure 14). Hang the side shield sections over the ends of the reflector brackets (Maximum angle with side shield is 30°). **IMPORTANT:** Install side shield on one side of the system only.

Figure 14 - With optional side shield, insert a screw in each tube joint to prevent tubes from turning

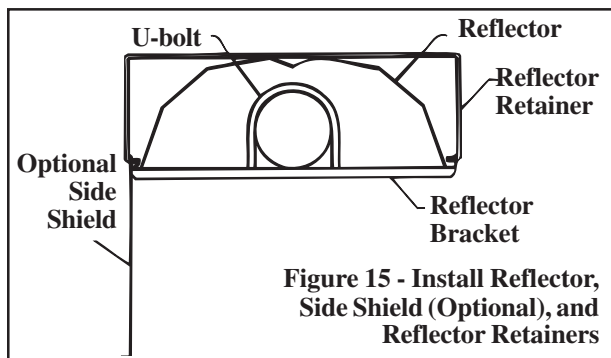
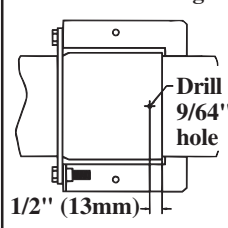


Figure 15 - Install Reflector, Side Shield (Optional), and Reflector Retainers

- All Installations** -- Position a wire retainer over the reflector and hook the ends through the holes in the reflector brackets. Install a retainer at each reflector bracket.
- All Installations** -- Repeat the instructions to install reflectors on each straight section of tube in the system. **Do not operate the heater without all reflectors installed.**

- Install Optional Reflector Gap Covers** -- The optional gap covers are designed to provide the infrared tubular system with a continuous reflector while still allowing for system expansion. If optional reflector gap covers are included in the installation, follow the illustrated instructions included in the option package. Reflectors on systems with gap covers cannot be rotated.

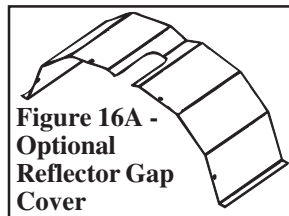


Figure 16A - Optional Reflector Gap Cover

- Install Optional Reflector End Cover** -- The optional end covers are designed to "close" the vertical space on both the combustion chamber end and the tail pipe end of the reflector length. The end covers may only be installed on units that have optional reflector gap covers. Follow the illustrated instructions included in the option package.

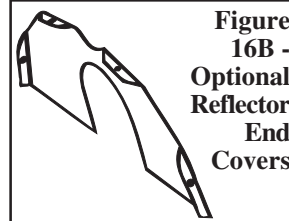


Figure 16B - Optional Reflector End Covers

- Rotating Reflectors** -- Reflectors on straight systems without reflector gap covers or a side shield may be angled up to 45° by rotating the U-bolt and reflector bracket. Reflectors with gap covers cannot be rotated. Reflectors on straight systems with a side shield may be angled up to 30°. The side shield must hang vertically.

If the system includes a "U" or "L" heat exchanger tube, the reflectors on either adjacent side of the "U" or "L" reflector cannot be rotated and must remain horizontal. All reflectors in a section or leg of the tubular system should be at the same angle.

12. Venting

Venting must be in accordance with the National Fuel Gas Code Z223.1 (NFPA 54) or CAN/CGA B149.1 and B149.2, Installation Code for Gas Burning Appliances and Equipment, and all local codes.

ANSI standard applicable to this heater does not require venting categorization; if such a requirement existed, this heater would be in Category III. (Category III appliances have a positive-pressure vent requiring a gastight sealed vent system.) These tubular infrared heaters have been designed to operate safely and efficiently with vent pipe lengths shown in the Vent Length Table. Vent systems may either be vertical or horizontal. The type of vent required depends on the size of heater and the vent run configuration.

Type of Vent Required by Vent Category		
Model Sizes	50-125	150-200
- with a Horizontal Vent Run	Category III	Category III
- with a Vent Run that is at least one-half vertical (using equivalent lengths from the Vent Length Table below)	Category I or Category III	Category III
- with a Dual Vent Adapter (Option CC5)	Category III	Category III

Vent terminal end may be either single-wall pipe or double-wall pipe. A vent terminal cap is required. Install a vent cap supplied as Option CC1 or a fully-comparable, field-supplied vent terminal cap such as a Type L Breidert Air-x-hauster®. (Type L Air-x-hauster® is a trademark of The G. C. Breidert Company.) Dual venting of two units is permissible when using an Optional Dual Vent Kit (Option CC5).

Comply with the specific requirements and instructions in the following paragraphs.

Specific Vent Requirements

1. Vent Pipe Length - The vent lengths shown in the Vent Table are based on (1) the maximum permissible resistance to flow at which each model size will operate and (2) the potential for continuous condensing. Condensing in the vent pipe should not occur after equilibrium has been reached when the surrounding ambient temperature is 60°F unless otherwise noted (See Requirement No. 6, Condensation).

Do not exceed maximum vent length. Minimum vent length is 5 feet.

Use equivalents listed when calculating for elbows and optional dual vent adapter (Option CC5).

Vent Length Table for Tubular Infrared Heaters												
Input Size (000)	Straight Tube Length (ft)	Vent Diameter (inches)	Vent Length				Equivalent Length for					
			feet		M		90° Elbow		45° Elbow		Dual Vent Adapter Box*	
			Max	Min	Max	Min	ft	M	ft	M	ft	M
50	20, 25, 30	4	20	5	6.1	1.5	3	0.9	1-1/2	0.5	3	0.9
	20, 25	4	45	5	13.7	1.5	6	1.8	3	0.9	6	1.8
75	30, 35	4	35	5	10.7	1.5	5	1.5	2-1/2	0.8	5	1.5
	40	4	20	5	6.1	1.5	3	0.9	1-1/2	0.5	3	0.9
100	30, 35	4	45	5	13.7	1.5	6	1.8	3	0.9	6	1.8
	40, 45	4	35	5	10.7	1.5	5	1.5	2-1/2	0.8	5	1.5
	50	4	20	5	6.1	1.5	3	0.9	1-1/2	0.5	3	0.9
125	40, 45, 50	4	60	5	18.3	1.5	12	3.7	6	1.8	12	3.7
150	50, 55, 60	4	60	5	18.3	1.5	12	3.7	6	1.8	12	3.7
175	50, 55, 60, 65, 70	4	60	5	18.3	1.5	12	3.7	6	1.8	12	3.7
200	50, 55, 60, 65, 70	4	60	5	18.3	1.5	12	3.7	6	1.8	12	3.7

*Must be deducted from the total vent length of *each* heater.

2. Vent Pipe Type - Use only 4-inch diameter vent pipe.

If the type of vent required is Category III (refer to table above), use either a vent pipe approved for a Category III heater or appropriately sealed 26-gauge galvanized steel or equivalent single-wall pipe.

If the type of vent required is Category I (refer to table above), unsealed 26-gauge galvanized steel or equivalent single-wall pipe or double-wall (Type B) vent pipe may be used.

3. Vent Pipe Joints - Vent system joints depend on the vent category and the type of pipe being used.

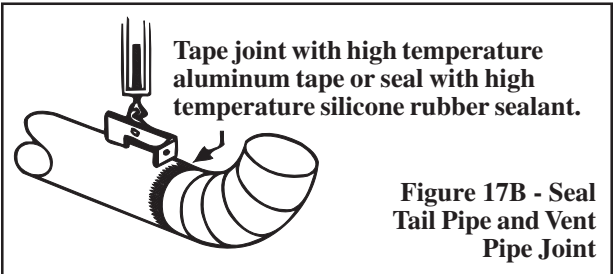
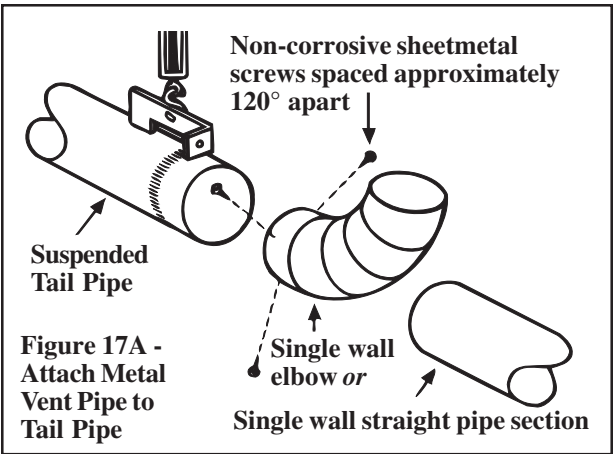
If installed as a Category III appliance and using single-wall vent pipe, join pipes with at least two non-corrosive screws per vent pipe joint and **seal all joints** to prevent leakage of flue gases into the building. For sealing joints, the use of Aluminum or TEFLON® (trademark of DuPont Corporation) tape suitable for 550°F is recommended (required in California). Vent tape of this type is available from the heater manufacturer as P/N 98266.

If installed as a Category III appliance and using vent pipe specifically approved for Category III vent systems, follow the pipe manufacturer's instructions for proper sealing.

If installed as a Category I appliance (allowed only for Sizes 50-125 when at least half of the total equivalent length of the vent system is vertical), use at least two non-corrosive screws per vent pipe joint on single-wall pipe or follow the pipe manufacturer's instructions for joining double-wall pipe.

4. Attach Vent Pipe to Heater - The last heat exchanger section (tail pipe) is designed to permit direct attachment of a vent pipe, either straight or elbow.

Attach metal vent pipe using three non-corrosive screws spaced equal distance apart. See Figures 17A and 17B.



5. Vent System Support - Vent pipe support is especially important with the tubular infrared system because of the added stress which may be caused by expansion and contraction of the overall system. Support lateral runs a minimum of every six feet using non-combustible material, such as steel strap or chain. Do not rely on the heater for support of either horizontal or vertical vent pipe.

11. Venting (cont'd)

6. Condensation - If single-wall vent pipe is exposed to cold air or run through unheated areas, it must be insulated. Where extreme conditions are anticipated, install a means of condensate disposal.

7. Vent Terminal and Vent Cap - The vent system must be terminated with the type of vent cap approved for use with this heater. The vent terminal and vent cap must be the same diameter as the vent run. Use either an optional (Option CC1) vent cap or equivalent such as a Type L Breidert Air-x-hauster®. (Type L Air-x-hauster® is a trademark of The G. C. Breidert Company.) A different style vent cap could cause nuisance problems and/or unsafe conditions.

See the illustrations in Figures 18 and 19 for requirements of both vertical and horizontal vent termination. Using either single or double wall vent terminals is illustrated. Many local codes require the use of double-wall (Type B) vent for the portion of vent pipe (terminal) on the outside of the building.

If double-wall pipe is used in the vent terminal, follow the instructions below to attach the vent cap and to connect the double-wall pipe to the single-wall vent system.

INSTRUCTIONS FOR DOUBLE WALL PIPE INSTALLATION: Material Required: Double wall (Type B) Vent Pipe (**Note:** Use only one piece of double wall vent pipe.); a thimble designed for double wall pipe (if construction is combustible); six 3/4" long sheetmetal screws; the vent cap; and a tube of silicone sealant.

Instructions to attach VENT CAP to DOUBLE WALL (Type B) VENT TERMINAL

Look for the "flow" arrow on the vent pipe. Attach the vent cap to the "exhaust" end of the double wall pipe.

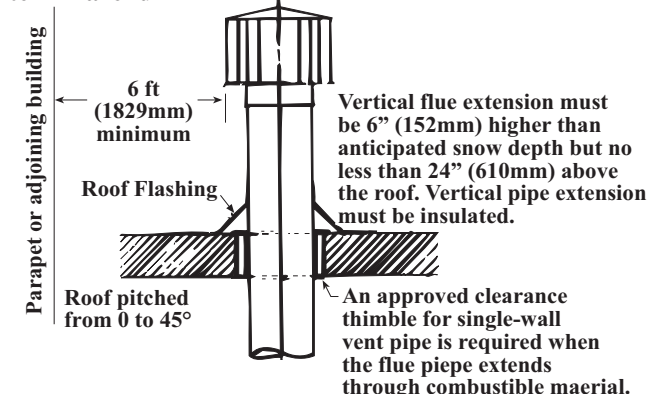
- 1) Slide the vent cap inside the pipe.
- 2) Drill a hole through the pipe and the vent cap. (Hole should be slightly smaller than the sheet metal screw being used.) Using a 3/4" long sheet metal screw, attach the cap to the pipe.
- 3) Repeat Step 2) drilling and inserting two additional screws evenly spaced (120° apart) around the pipe.

Instructions to connect the SINGLE WALL VENT system to a DOUBLE WALL (Type B) VENT TERMINAL:

- 1) Slide the single wall pipe inside the inner wall of the double-wall terminal pipe.
- 2) Drill a hole through both walls of the double wall pipe and the single wall pipe. (Hole should be slightly smaller than the sheet metal screws being used.) Using a 3/4" long sheet metal screw, attach the two pieces of pipe. Do not overtighten.
- 3) Repeat Step 2) drilling and inserting two additional screws evenly spaced (120° apart) around the pipe.
- 4) To seal the annular opening (the gap between the single and double wall pipe), run a large bead of silicone sealant in the opening. The bead of sealant must be large enough to seal the opening, but it is not necessary to fill the full volume of the annular area.

Figure 18A - Vertical Vent Terminal Arrangements (drawings are not proportional; read all information)

SINGLE WALL - Single wall vent run and single wall terminal end



DOUBLE WALL - Single wall vent run and double wall terminal end

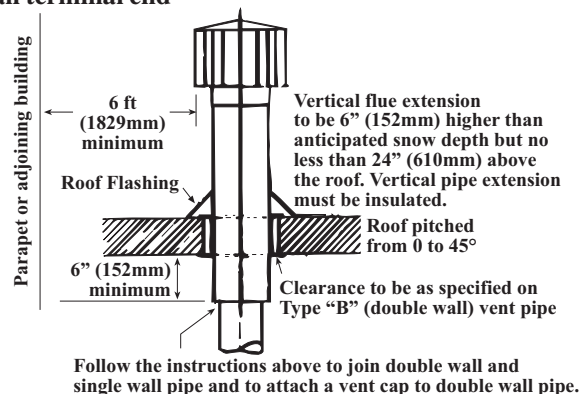
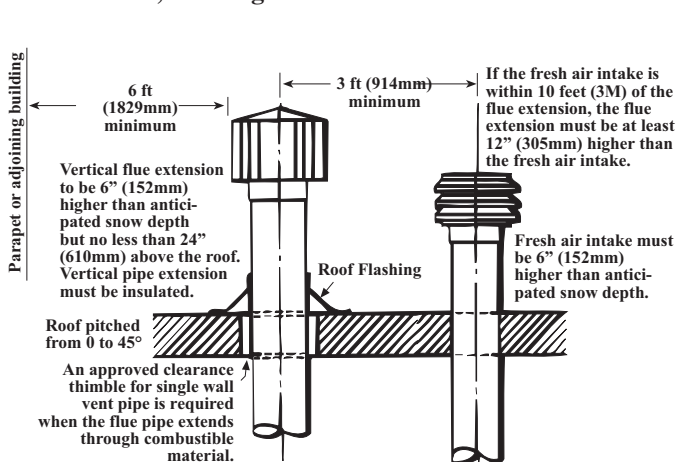
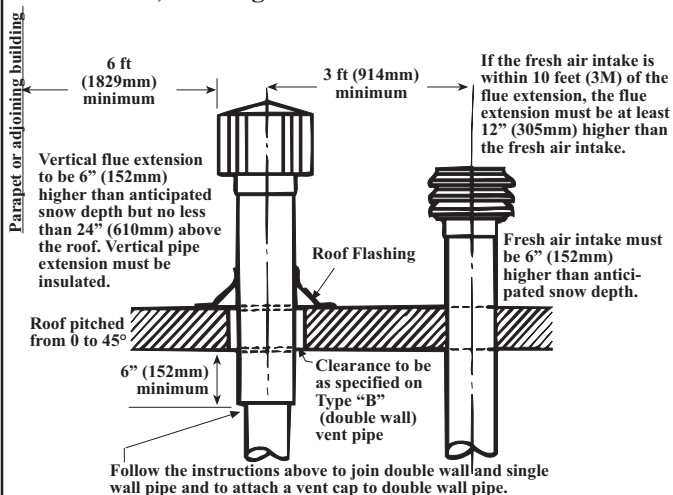


Figure 18B - Vertical Vent Terminal/Air Intake Arrangements (drawings are not proportional; read all information)

SINGLE WALL - Single wall vent run; single wall terminal end; and single wall fresh air intake



DOUBLE WALL - Single wall vent run; double wall terminal end; and single wall fresh air intake



Horizontal Vent Terminal Clearances (See Figure 19)

Air Inlet Terminal Clearance -- The bottom of the air inlet terminal shall be located not less than one foot (30 cm) above grade and at least 6 inches (15 cm) above anticipated snow depth.

The distance of termination of the horizontal vent from adjacent public walkways, adjacent buildings, openable windows, and building openings must be in accordance with local codes, or in the absence of local codes, must conform with the National Fuel Gas Code. More stringent local codes supersede all provisions in these instructions and in the National Fuel Gas Code. Minimum clearances for the horizontal vent terminal are shown in the table on the right.

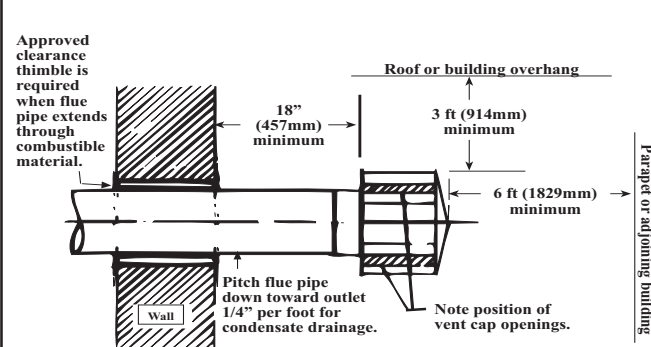
NOTE: Maintain the required 18" clearance from the wall to the vent terminal cap for stability under wind conditions and to protect the building. Products of combustion can cause discoloration of some building finishes and deterioration of masonry materials. Applying a clear silicone sealant that is normally used to protect concrete driveways can protect masonry materials. If discoloration is an esthetic problem, relocate the vent or install a vertical vent.

Structure	Minimum Clearances for Vent Termination Location (all directions unless specified)
Forced air inlet within 10 ft (3.1m)	3 ft (0.9m) above*
Combustion air inlet of another appliance	6 ft (1.8m)
Door, window or gravity air inlet (any building opening)	4 ft (1.2m) horizontally 4 ft (1.2m) below 3 ft (0.9m) above
Electric meter, gas meter ** and relief equipment	4 ft (1.2m) horizontally
Gas regulator **	3 ft (0.9m)
Adjoining building or parapet	6 ft (1.8m)
Grade (ground level)	7 ft (2.1m) above

*This heater is approved for installation as illustrated in Figure 19B.
 **Do not terminate the vent directly above a gas meter or service regulator.

Figure 19A - Horizontal Vent Terminal Arrangements (drawings are not proportional; read all information)

SINGLE WALL - Single wall vent run and single wall terminal end



DOUBLE WALL - Single wall vent run and double wall terminal end

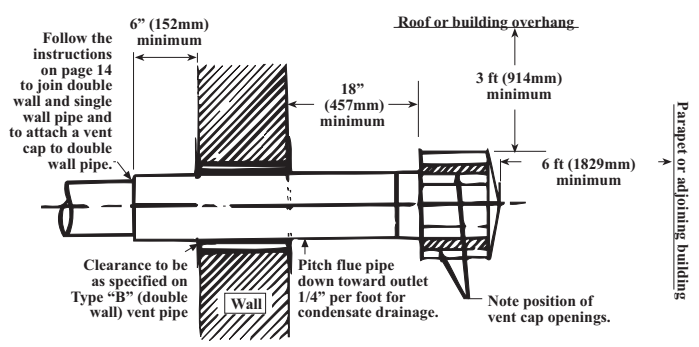
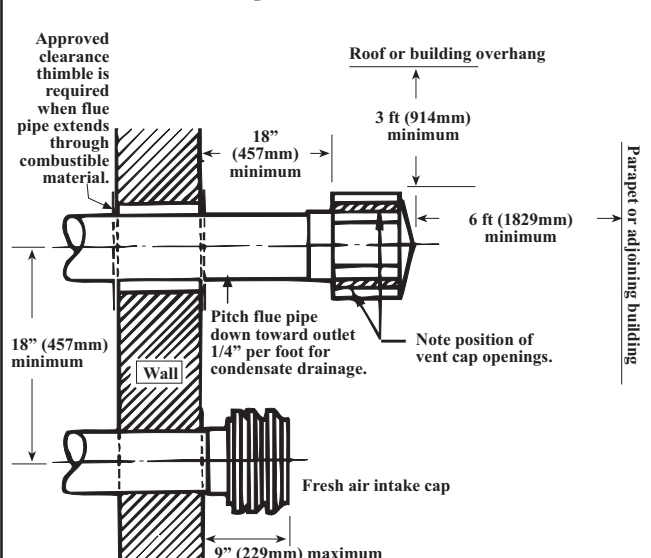
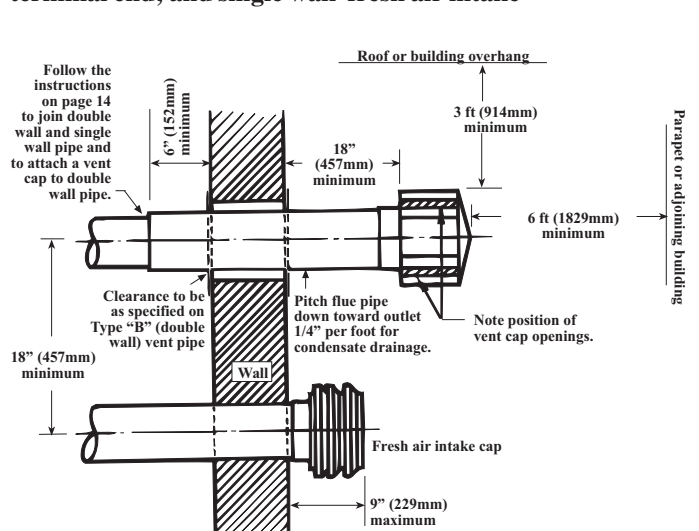


Figure 19B - Horizontal Vent Terminal/Air Intake Arrangements (drawings are not proportional; read all information)

SINGLE WALL - Single wall vent run; single wall terminal end; and single wall fresh air intake



DOUBLE WALL - Single wall vent run; double wall terminal end; and single wall fresh air intake



11. Venting (cont'd)

Vent Terminal Arrangements (cont'd)

WARNING: Dual venting of two heaters is permitted only when using the Dual Vent Kit, Option CC5. (Refer to Figures 20A and 20B.) No other manifolding of vent runs is permitted due to possible back pressure and recirculation of combustion products into the building. See Hazard Levels, page

2.

Dual Venting -- By using the Dual Vent Option Kit, Option CC5, two heaters may use the same vent terminal. No other dual venting arrangement is approved.

Follow the installation instructions and requirements included in the Option Kit. See Vent Terminal Arrangements in Figures 20A and 20B.

Figure 20A - Vertical Dual Vent Terminal Arrangement

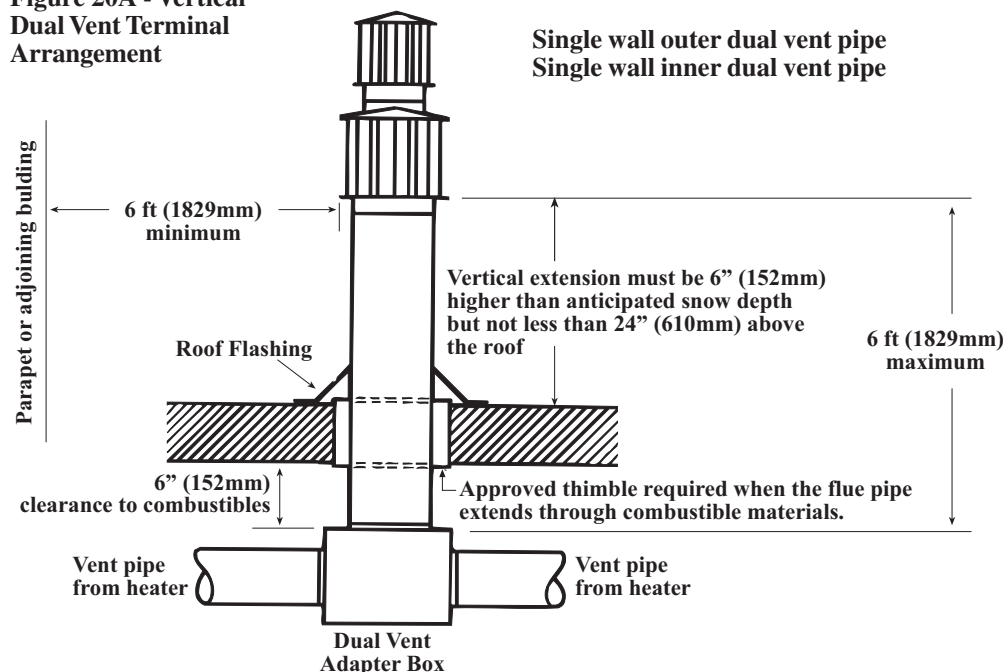
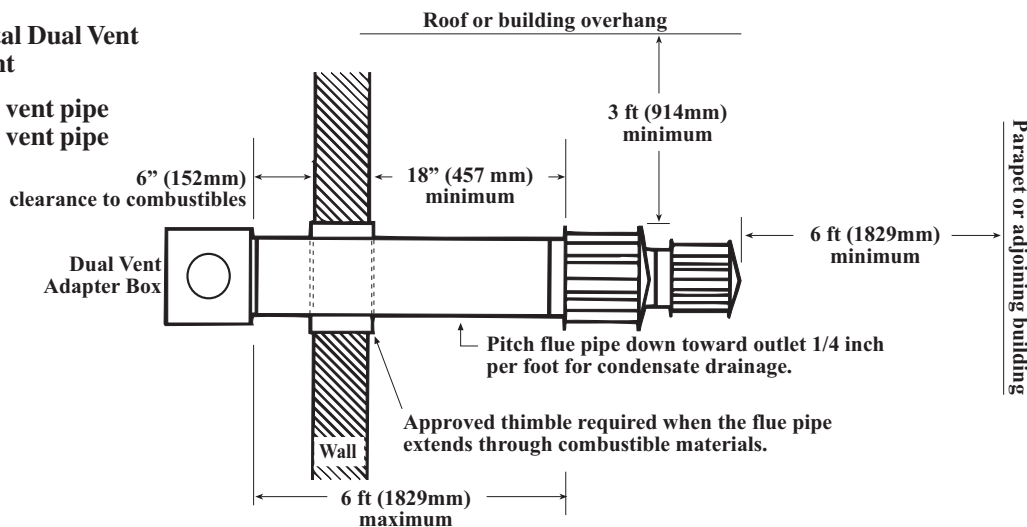


Figure 20B - Horizontal Dual Vent Terminal Arrangement

Single wall outer dual vent pipe
Single wall inner dual vent pipe



Unvented Installation -- These tubular radiant heaters are approved for operation without an outdoor vent. Before installing a tubular infrared heater in the unvented mode, extreme care should be exercised in examining the building atmosphere and structure. **Fresh air requirements are 4 CFM/1000 BTUH for natural gas and 5 CFM/1000 BTUH for propane gas.**

- **Do not** operate in the unvented mode when dust or dirt are present.
- **Do not** operate in the unvented mode in a building where contaminants are in the air that will produce a toxic gas when burned or exposed to high temperatures.

NOTE: If either of the above situations exist, it is recommended that a vented system with an optional combustion air inlet be installed.

- **Do not** operate in the unvented mode if there is any doubt about the

quality of the insulation in the building. Unvented operation in a building that has an uninsulated roof or that may have uninsulated structural members partially exposed to the outdoors may result in condensation. The condensation may be severe enough to drip and/or cause corrosion.

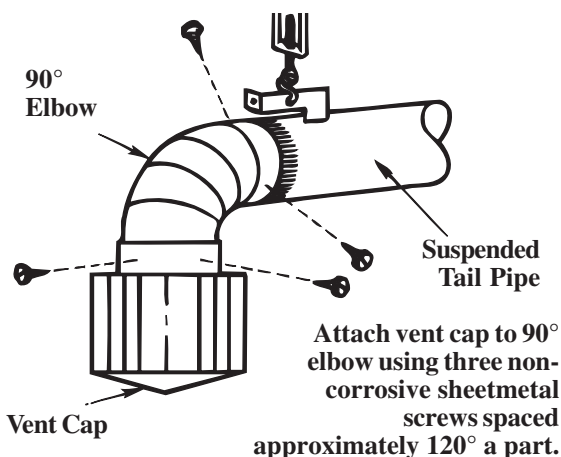
- Do not install in the unvented mode with outside combustion air unless the inlet air cap is at or below the plane of the heater.

When installing a tubular infrared heater in the unvented mode, a vent cap must be used and must be installed inverted as illustrated in Figure 21.

When a heater is operated without being vented to the outdoors, "TOP" clearance to combustibles changes to 18 inches (See Paragraph 4).

Figure 21 - Invert Terminal Cap on Indoor Vent

Attach 90° elbow to tail pipe using three non-corrosive sheetmetal screws spaced approximately 120° a part.



13. Combustion Air

The burner is equipped with a centrifugal blower to provide combustion air. The air for combustion can come either from the heated space or be piped directly from the outside. Combustion air should be piped from the outside if (1) the pressure in the building is negative, (2) the atmosphere is dirt laden, (3) the atmosphere contains any substance that will cause toxic gas when passed through a flame, or (4) the heater is installed in a tightly closed room that does not provide required air for combustion.

If drawing combustion air from the heated space, the screened combustion air opening on the burner box must be kept clean. Maintain a minimum 12" clearance from the combustion air inlet opening. If the heater is located in a tightly closed room and is not equipped with a combustion air inlet pipe, provision must be made to supply air for combustion to the room.

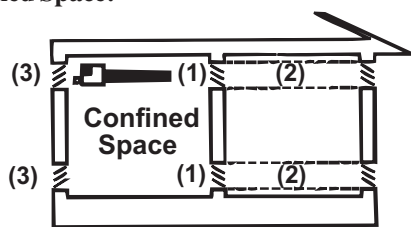
The requirements for combustion and ventilation air depend upon whether the unit is located in a confined or unconfined space. An "unconfined" space is defined as a space whose volume is not less than 50 cubic feet per 1000 BTUH of the aggregate input rating of all appliances installed in that space. Under all conditions, enough air must be provided to ensure there will not be a negative pressure condition within the equipment room or space.

Do not install a unit in a confined space without providing wall openings leading to and from this space. Provide adequate openings near floor and ceiling for ventilation and air for combustion, as shown in Figure 22, depending on combustion air source as noted below.

Add total BTUH of all appliances in the confined space and divide by figures below for square inch free area size of each (top and bottom) opening.

Figure 22 - Confined Space:

A space whose volume is less than 50 cubic feet per 1000 BTUH of the installed appliance input rating.



- 1. Air from inside building** -- openings 1 square inch free area per 1000 BTUH. Never less than 100 square inches free area for each opening. See (1) in Figure 22 above.

- 2. Air from outside through duct** -- openings 1 square inch free area per 2000 BTUH. See (2) in Figure 22 above.

- 3. Air direct from outside** -- openings 1 square inch free area per 4000 BTUH. See (3) in Figure 22 above.

NOTE: For further details on supplying combustion air to confined space, see National Fuel Gas Code Z223.1 (latest edition).

If directly piped outside combustion air is required, the burner/control box is designed to accommodate attachment of a 4" diameter inlet air pipe. For outside combustion air, use optional inlet air kit, Option DE2. Follow the instructions included with the kit. The inlet air pipe should be 4" diameter pipe of a noncorroding material. The maximum length of the inlet air pipe must not exceed the length shown in the Combustion Air Inlet Length Table below. If the inlet air pipe passes through moisture-laden air, insulation or double wall tubing may be needed to prevent condensation on the outside of the pipe. Use the combustion air inlet cap supplied with the option kit. A different type of combustion air inlet cap could cause nuisance problems and/or unsafe operating conditions.

Maximum Length of Outside Combustion Air Inlet Pipe					
Type of Inlet Pipe	BTUH Size	Heater Length (Straight Tubes)	Maximum Length	Equivalent Length for	
				90° Elbow	45° Elbow
① 4" Smooth Wall	50	20/25/30	80 ft (24.3M)	10 ft (3M)	5 ft (1.5M)
	75	20/25/30/35/40			
	100	30/35/40/45/50			
	125	40/45/50	60 ft (18.3M)	10 ft (3M)	5 ft (1.5M)
	150	50/55/60			
	175	50/55/60/65/70			
	200	50/55/60/65/70			
4" Corrugated or Flexible	50	20/25/30	40 ft (12.2M)	N/A	N/A
	75	20/25/30/35/40			
	100	30/35/40/45/50			
	125	40/45/50	30 ft (9.1M)	N/A	N/A
	150	50/55/60			
	175	50/55/60/65/70			
	200	50/55/60/65/70			
① Assumes the use of three feet of flexible pipe at the combustion air inlet on the burner/control box.					

If the air inlet terminal is located adjacent to the exhaust terminal, the terminals must be separated by a minimum distance of three feet. The only exception is when the air inlet is located directly below the horizontal vent cap. The required clearance between an air inlet terminal located directly below the vent cap is 18 inches as illustrated in Figure 19B. See Figures 18B and 19B in Paragraph 12 for illustrations and clearance requirements of an air inlet terminal located adjacent to the heater vent terminal.

14. Gas Piping and Pressures

All piping must be in accordance with requirements outlined in the National Fuel Gas Code ANSI/Z223.1a (latest edition) or CAN/CGA-B149.1 and B149.2, published by the Canadian Gas Association (See Paragraph 1). Gas supply piping installation should conform with good practice and with local codes.

Heaters for natural gas are orificed for operation with gas having a heating value of 1000 (± 50) BTUH per cubic ft. If the gas at the installation does not meet this specification, consult the factory for proper orificing.

The gas supply must have sufficient pressure to supply the burner plus any other gas-fired appliances. Gas Supply pressure required at the burner (measured with a manometer):

BTUH Input	Gas Type	Supply Pressure	
		Minimum	Maximum
50,000 - 150,000	Natural	4.5" w.c.	14" w.c.
175,000 - 200,000	Natural	6" w.c.	14" w.c.
50,000 - 150,000	Propane	11" w.c.	14" w.c.

14. Gas Piping and Pressures (cont'd)

Sizing Gas Supply Lines		Capacity of Piping											
		Cubic Feet per Hour based on 0.3" w.c. Pressure Drop											
		Specific Gravity for Natural Gas -- 0.6 (Natural Gas -- 1000 BTU/Cubic Ft)											
		Specific Gravity for Propane Gas -- 1.6 (Propane Gas -- 2550 BTU/Cubic Ft)											
Length of Pipe	Diameter of Pipe												
	1/2"		3/4"		1"		1-1/4"		1-1/2"		2"		
	Natural	Propane	Natural	Propane	Natural	Propane	Natural	Propane	Natural	Propane	Natural	Propane	
20'	92	56	190	116	350	214	730	445	1100	671	2100	1281	
30'	73	45	152	93	285	174	590	360	890	543	1650	1007	
40'	63	38	130	79	245	149	500	305	760	464	1450	885	
50'	56	34	115	70	215	131	440	268	670	409	1270	775	
60'	50	31	105	64	195	119	400	244	610	372	1105	674	
70'	46	28	96	59	180	110	370	226	560	342	1050	641	
80'	43	26	90	55	170	104	350	214	530	323	990	604	
90'	40	24	84	51	160	98	320	195	490	299	930	567	
100'	38	23	79	48	150	92	305	186	460	281	870	531	
125'	34	21	72	44	130	79	275	168	410	250	780	476	
150'	31	19	64	39	120	73	250	153	380	232	710	433	
175'	28	17	59	36	110	67	225	137	350	214	650	397	
200'	26	16	55	34	100	61	210	128	320	195	610	372	
Note: When sizing supply lines, consider possibilities of future expansion and increased requirements. Refer to National Fuel Gas Code for additional information on line sizing.													

WARNING

This appliance is equipped for a maximum gas supply pressure of 1/2 pound, 8 ounces, or 14 inches water column.

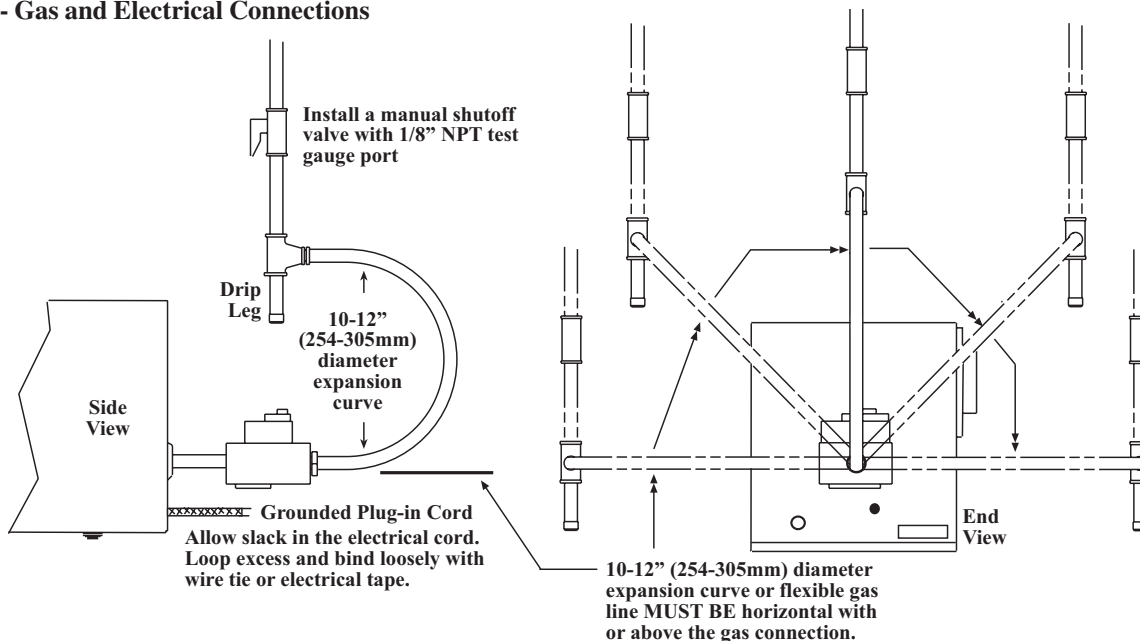
NOTE: Supply pressure higher than 1/2 pound requires installation of an additional service regulator external to the unit.

PRESSURE TESTING SUPPLY PIPING

Test Pressures Above 1/2 PSI: Disconnect the heater and manual valve from the gas supply line which is to be tested. Cap or plug the supply line.

Test Pressures Below 1/2 PSI: Before testing, close the manual valve on the heater.

Figure 23 - Gas and Electrical Connections



DANGER: Do not install gas piping where it may be exposed to radiant or convection heat. See Hazard Levels, page 2.

Since the tubular heater does expand and contract, the connection between the supply line and the heater must allow for expansion and contraction. Use either an expansion coil (12" minimum diameter) or, if permitted by local code, a flexible connection. If a flexible connector is installed, use only an CSA certified, stainless steel connector with a maximum length of 24" and a minimum size of 1/2" I.D. If a flexible connector, Option CE3 or CE4, was ordered with the heater, it will be shipped separately. Optional flexible connectors have the following pressure drops.

WARNING: Strong cleaning solutions or chemical substances must not come in contact with the flexible connector.

BTUH Input	Pressure Drop (Inches W.C.)	
	Option CE3, 1/2" I.D.	Option CE4, 3/4" I.D.
50,000	0.25	0.05
75,000	0.25	0.05
100,000	0.25	0.10
125,000	0.50	0.15
150,000	0.75	0.20
175,000	0.80	0.40
200,000	0.90	0.50

A shutoff valve and a drip leg or sediment trap must be provided in the gas supply line at each heater. See Figure 23.

Use a joint compound that is resistant to propane gas at all connections. Test all gas lines using a leak-detecting solution.

WARNING: All components of the gas supply system must be leak-tested prior to placing equipment in service. NEVER TEST FOR LEAKS WITH AN OPEN FLAME. See Hazard Levels, page 2.

Manifold Pressure Settings		
BTUH Input	Gas	Manifold Pressure
50,000 - 150,000	Natural	3.5" w.c.
175,000 - 200,000	Natural	5" w.c.
50,000 - 150,000	Propane	10" w.c.

Manifold or Orifice Pressure Settings

Measuring manifold gas pressure cannot be done until the heater is in operation. It is included in the steps of the "Check-Test-Start" procedure in Paragraph 16. The following warnings and instructions apply.

Before attempting to measure or adjust manifold gas pressure, the inlet (supply) pressure must be within the specified range for the gas being used both when the heater is in operation and on standby. Incorrect inlet pressure could cause excessive manifold gas pressure immediately or at some future time.

Instructions for Checking Manifold Pressure:

1) With the manual valve (on the combination valve) positioned to prevent flow to the main burners, connect a manometer to the 1/8" pipe outlet pressure tap in the valve. NOTE: A manometer (fluid-filled gauge) is recommended rather than a spring type gauge due to the difficulty of maintaining calibration of a spring type gauge.

2) Open the valve and operate the heater. Measure the gas pressure to the manifold. Normally, adjustments should not be necessary to the factory preset regulator.

If adjustment is necessary, set pressure to correct settings by turning the regulator screw IN (clockwise) to increase pressure. Turn regulator screw OUT (counterclockwise) to decrease pressure.

Consult the valve manufacturer's literature provided with the heater for more detailed information.

15. Electrical Supply and Connections

All electrical wiring and connections, including electrical grounding MUST be made in accordance with the National Electric Code ANSI/NFPA No. 70 (latest edition) or, in Canada, the Canadian Electrical Code, Part I-C.S.A. Standard C22.1. In addition, the installer should be aware of any local ordinances or gas company requirements that might apply. The heater must be electrically grounded and connected to a separately fused circuit with a disconnect as required by the National Electrical Code.

Heaters equipped for 115, 208, or 230 supply voltage have a grounded plug-in cord. Be sure the outlet used provides the appropriate supply voltage. Heaters equipped for 460 supply voltage require a separate disconnect switch and line voltage supply run directly from the main electrical panel to the unit. All external wiring must be within approved conduit and have a minimum temperature rise of 60°C. The electrical supply connects at the rear (valve end) of the burner/control box. Make connections as shown on the wiring diagram located on the inside of the service door.

WARNING: If you turn off or disconnect the electrical power supply, turn off the gas. See Hazard Levels, page 2.

If the heater has field-installed options that require electrical connections, consult the instruction sheet and wiring diagram supplied in the option package.

Control Thermostat

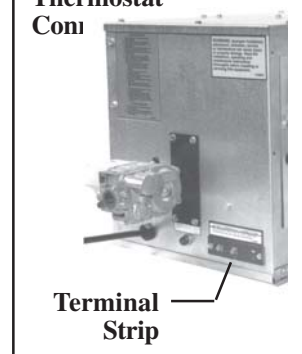
The heater is designed for automatic control from a remotely positioned or optional unit-mounted 24-volt thermostat and is equipped with a terminal strip to facilitate thermostat connections. See Figure 24.

Use either an optional thermostat (Option CL1) or a field-supplied 24-volt thermostat. Do not attempt to operate with a line voltage thermostat. Locate a remote thermostat on an inside wall in the heated area but not in the direct path of the infrared rays. See the wiring diagram on page 20 or inside the heater door panel.

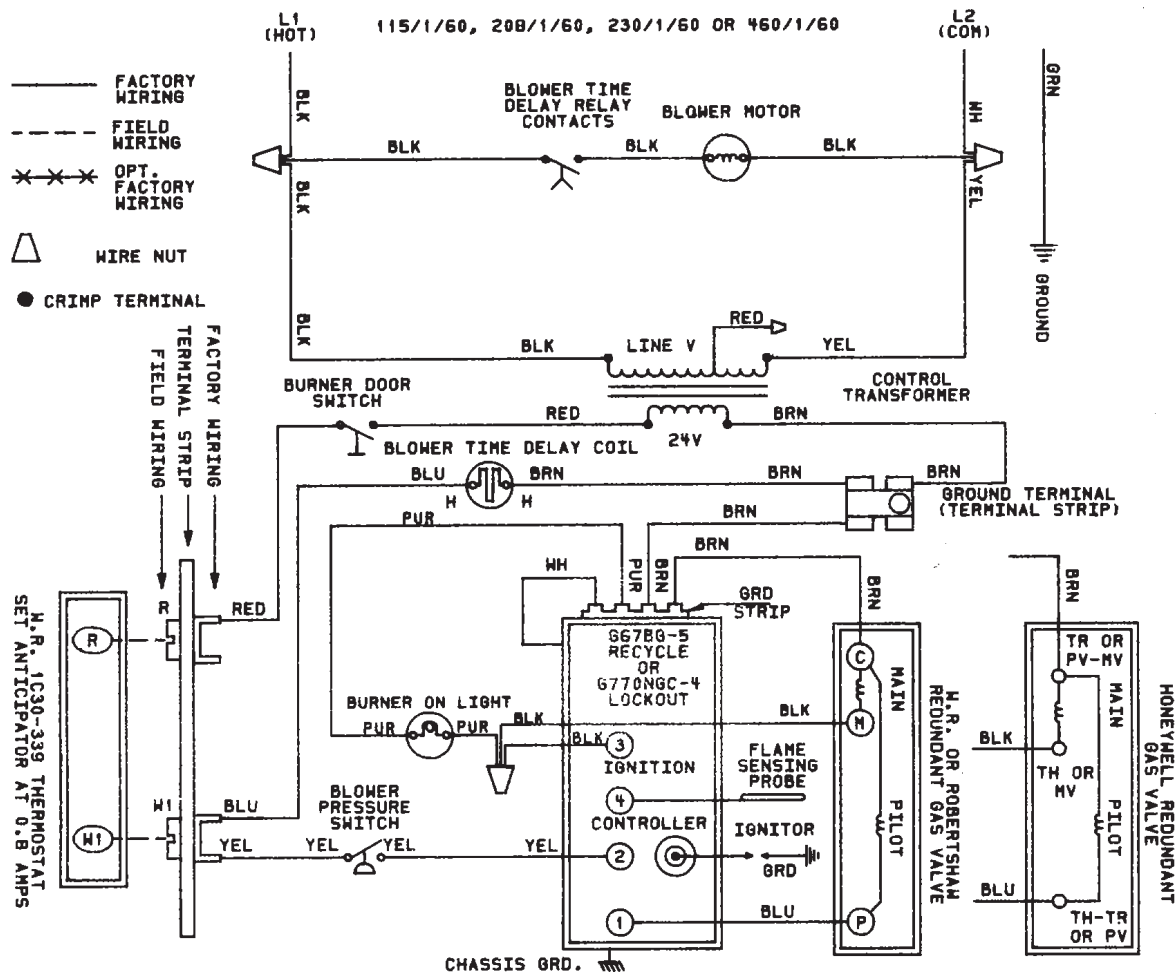
Multiple-Heater Control

Options are available to permit control of up to six heaters from a single thermostat or a time clock and single/multiple thermostats. For maximum safety, the multiple control is done in the low voltage circuit. Complete instructions are included in each Option Kit. See Paragraph 24.

Figure 24 - Thermostat Conn



WIRING DIAGRAM



OPERATING SEQUENCE

1. SET THERMOSTAT AT LOWEST SETTING.
2. TURN ON MAIN AND PILOT MANUAL GAS VALVES.
3. TURN ON POWER TO UNIT.
4. SET THERMOSTAT AT DESIRED SETTING.
5. THERMOSTAT CALLS FOR HEAT ENERGIZING THE BLOWER MOTOR AFTER TIME DELAY.
6. BLOWER PRESSURE SWITCH CLOSURES, FIRING UNIT AFTER PILOT PROVING SEQUENCE.
7. IF THE FLAME IS EXTINGUISHED DURING MAIN BURNER OPERATION, THE SAFETY SWITCH CLOSURES THE MAIN VALVE AND RECYCLES THE SPARK GAP. ON UNIT EQUIPPED WITH THE 6770NGC-4 LOCKOUT CONTROL, IF PILOT IS NOT ESTABLISHED WITHIN 120 SECONDS (APPROX.) UNIT LOCKS OUT AND MUST BE RESET BY INTERRUPTING POWER TO THE CONTROL CIRCUIT (SEE LIGHTING INSTRUCTIONS).

NOTES

1. THE FOLLOWING CONTROLS ARE FIELD INSTALLED OPTIONS: THERMOSTAT
2. DOTTED WIRING INSTALLED BY OTHERS.
3. CAUTION: IF ANY OF THE ORIGINAL WIRING AS SUPPLIED WITH THE APPLIANCE MUST BE REPLACED, IT MUST BE REPLACED WITH WIRING MATERIAL HAVING A TEMPERATURE RATING OF AT LEAST 105 DEGREES C., EXCEPT FOR SENSOR LEAD WIRE WHICH MUST BE 150 DEGREES C.
4. USE 18 GA. WIRE FOR ALL WIRING ON UNIT.
5. LINE AND MOTOR BRANCH WIRE SIZES SHOULD BE OF A SIZE TO PREVENT VOLTAGE DROP BEYOND 5% OF SUPPLY LINE VOLTAGE.
6. ON 230V. UNITS THE CONTROL TRANSFORMER HAS A DUAL VOLTAGE PRIMARY.
FOR 230V. UNITS USE BLACK AND YELLOW LEADS (CAP RED).
ON 208V. UNITS THE CONTROL TRANSFORMER HAS A DUAL VOLTAGE PRIMARY.
FOR 208V. UNITS USE BLACK AND RED LEADS (CAP YELLOW).
7. ON 115/460V. UNITS THE CONTROL TRANSFORMER IS SINGLE VOLTAGE PRIMARY.
FOR 115/460V. UNITS USE BLACK AND YELLOW LEADS.
7. SEE INSTALLATION INSTRUCTIONS FOR GREATER DETAIL.

REZNOR TR SERIES WD #119457 REV. #3

16. Check Installation and Start-Up

Check the installation prior to start-up:

- ☐ Does the installation comply with all electrical and gas codes?
- ☐ Is the system hung securely according to the instructions? See Paragraphs 8, 9, and 10. Are the "S" hooks closed?
- ☐ Does the installation comply with required clearances? Requirements are shown in Paragraph 4. Signs are required specifying maximum permissible stacking height underneath the heater.
- ☐ If required, was Size or High Altitude Conversion Kit installed? See Paragraph 9.
- ☐ Are turbulator strips installed? See Paragraph 10.
- ☐ Is the vent system installed properly and supported securely? See Paragraph 12.
- ☐ Has the system been checked for gas leaks? Has the gas supply pressure been verified? Will the gas connection allow for expansion and contraction? See Paragraph 13.
- ☐ Is the system level? Before initial start-up, it is important that the system be checked again to be sure that it is level. Use a spirit level and check the burner and all sections of tubes. If the tubes are not level, hot spots could occur causing premature failure. Check all sections including "L" and "U" tubes. Adjust turnbuckle or chain as required.

Start-Up:

- ☐ Bleed all air from the gas supply lines to the heater. Rotate the knob on the combination valve to the "ON" position.
Set the thermostat to above room temperature. This heater is equipped with a fully automatic ignition; do not attempt to light by hand. After

several seconds, listen for the quiet hum of the combustion air motor. With combustion air motor operating, the spark at the pilot burner will be visible. As the air bleeds from the pilot supply tubing, the pilot flame will try to ignite. When all of the air is gone, the pilot will ignite NOTE: On propane fueled models, it may be necessary to reset the lockout ignition control a number of times by lowering the thermostat below room temperature.

With a fully established pilot flame, the main burner gas flow will be initiated. The indicator light on the burner/control box indicates that the main gas valve is energized. The main burner flame will burn directly off the face of the burner. Natural gas burners will have a blue flame with very little yellow tipping. Propane fueled burners will also have a blue flame, but the flame will have some yellow tipping. (NOTE: On initial start-up, there will be some odor and light smoke released from the tubes and reflectors).

Operate the heater for at least ten minutes to bring it to full temperature to ensure proper operation.

Check installation after start-up:

- ☐ With the unit in operation, measure manifold gas pressure. Manifold pressure for natural gas should be 3.5" w.c. and 10" w.c. for propane gas. See Paragraph 13.
- ☐ Turn the unit off and on, pausing two minutes between each cycle. Observe for smooth ignition.
- ☐ Place "Owner's Envelope" containing the Maintenance and Service Manual and this manual in a safe, accessible location near the heater. Observe clearances; do not place envelope in direct line of radiant heat.

DANGER: The gas burner in this gas-fired equipment is designed and equipped to provide safe and economically controlled complete combustion. However, if the installation does not permit the burner to receive the proper supply of combustion air, complete combustion may not occur. The result is incomplete combustion which produces carbon monoxide, a poisonous gas that can cause death. These tubular infrared heaters may be safely operated in the vented or unvented mode. FAILURE TO PROVIDE PROPER VENTING OR TO MEET FRESH AIR REQUIREMENTS FOR UNVENTED INSTALLATIONS WILL RESULT IN A HEALTH HAZARD THAT COULD CAUSE SERIOUS PERSONAL INJURY OR DEATH.

Always comply with the combustion air requirements in the installation codes and instructions. If combustion air is brought from outside, use only the outside combustion air kit specifically designed for this heater. NEVER RESTRICT OR OTHERWISE ALTER THE SUPPLY OF COMBUSTION AIR TO ANY HEATER. Indoor units installed in a confined space must be supplied with air for combustion as required by Code and in this heater installation manual. If two heaters use the same vent terminal, a specially designed dual vent kit must be installed. If the unit is vented, MAINTAIN THE VENT SYSTEM TO BE STRUCTURALLY SOUND AND IN FREE FLOWING OPERATING CONDITION. If the unit is unvented, PROVIDE 4 CFM OF FRESH AIR PER 1000 BTUH'S FOR NATURAL GAS OR 5 CFM OF FRESH AIR PER 1000 BTUH'S FOR PROPANE GAS.

Optional Equipment -- Field Installed

This section includes a brief description of most field-installed options. Field-installed option kits include illustrated instructions.

17. Optional Heat Exchanger Tubes

Optional heat exchanger tubes in "U" shape (Option UB3) and "L" shape (Option UC2), and 5-ft straight length (Option UA1) are used to change the configuration of the tubular system. With these optional tubes, the system can be custom-designed to suit the application. All approved configuration layouts are illustrated or noted in the Suspension Dimensions and Configuration Drawing booklet provided with each heater.

The "L" tube Option Package includes an "L" shaped heat exchanger tube, tube connection hardware, components to field-assemble an L-shaped reflector, and an illustrated instruction sheet. Tube connection is the same as for straight tubes; see Paragraph 9, Figure 11.

The "U" tube Option Package includes a "U" shaped heat exchanger tube, connection hardware, components to field-assemble a "U" shaped reflector, and an illustrated instruction sheet. Tube connection is the same as for straight tubes; see Paragraph 9, Figure 11.

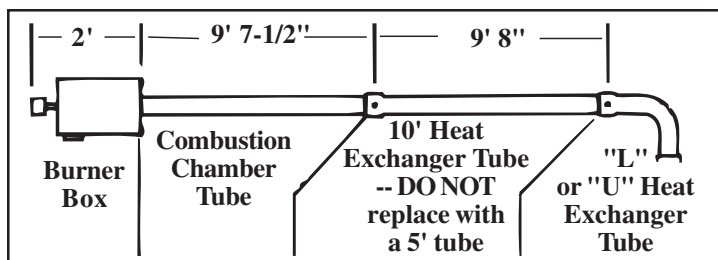
The 5-foot Heat Exchanger Option Package includes a 5-ft tube, tube connection hardware, a 5-ft reflector, and two reflector brackets. Tube suspension and installation instructions are the same as for a 10-ft heat exchanger tube. See Paragraphs 7, 9 and 10. The configuration must meet the guidelines listed below.

If **ALL** of the following conditions are met, the configuration may be customized by replacing any 10-ft heat exchanger tube(s) with one or two 5-ft heat exchanger tubes.

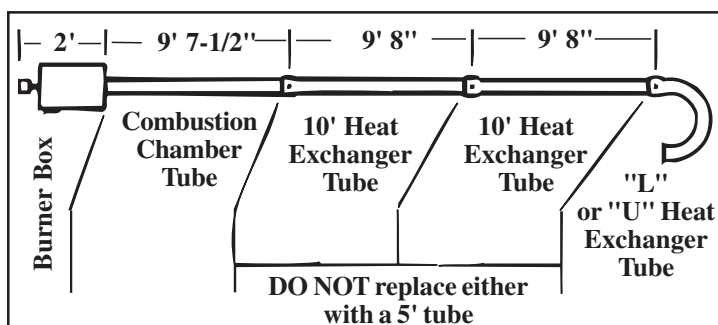
1) Do not deviate from the specified minimum or maximum length of straight tubes for the size of heater being installed.

BTUH Size (000)	Minimum Length	Maximum Length	Alternate Allowable Overall Lengths
50	20 feet	30 feet	25 feet
75	20 feet	40 feet	25 or 30 feet
100	30 feet	50 feet	35 or 45 feet
125	40 feet	50 feet	45 feet
150	50 feet	60 feet	55 feet
175	50 feet	70 feet	55, 60, or 65 feet
200	50 feet	70 feet	55, 60, or 65 feet

2A) Sizes 100, 125, and 150 -- DO NOT replace the first 10-ft heat exchanger tube with a 5-ft tube. Sizes 100, 125, and 150 require a minimum of 20 feet of straight tube length before an "L" or "U" shape is installed.



2B) Sizes 175 and 200 -- DO NOT replace either the first or second 10-ft heat exchanger tube with a 5-ft tube. Sizes 175 and 200 require a minimum of 30 feet of straight tube length before an "L" or "U" shaped tube is installed.



3) Do not install a 5-ft heat exchanger tube in place of a 10-ft tail pipe. A 10-ft tail pipe is required in all configurations.

4) On a "U" configuration, the straight tube length on the burner side of the "U" must be equal to or longer than the tube length on the exhaust side.

5) Adjust both the overall dimension and the suspension point dimensions shown in the configuration drawing when using a 5-ft heat exchanger tube. Reduce or increase appropriate dimensions by 5 feet. (5-ft heat exchanger tubes require a suspension point.)

18. Hanger Kit, Option CK11

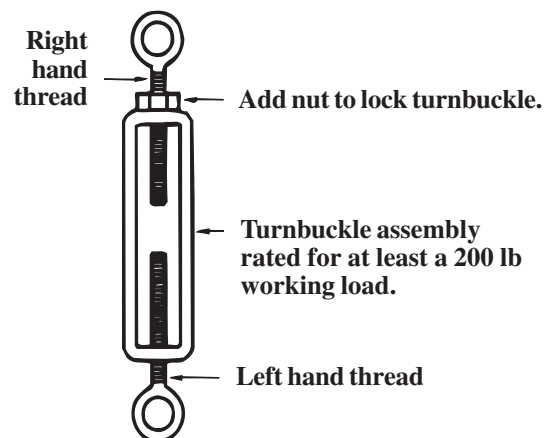
This option kit includes 50' of chain with a 200 lb working capacity and 18 "S" hooks. Minimum chain, "S" hooks, and/or turnbuckle length between the tubes and the building suspension points is 12". If turnbuckles are included in heater suspension, use either optional turnbuckles (Paragraph 18) or field-supplied turnbuckles of steel or malleable iron.

IMPORTANT: Chain in Option CK11 has links consisting of two loops. When cutting 50' chain to required lengths, be certain to remove both loops of the "cut" link.

19. Turnbuckle Kit, Options CK12-18

Tubular infrared heaters must be level. For ease in leveling the system, the use of turnbuckles is recommended. The optional turnbuckle kit provides a turnbuckle as illustrated in Figure 25 to attach to the "S" hook at each heater hanger bracket.

Figure 25 - Turnbuckle in Optional Turnbuckle Kits



20. Combustion Air Inlet Kit, Option DE2

Combustion air can either come from the heated space or be piped from the outside. Combustion air should be piped from the outside if (1) the pressure in the building is negative, (2) the atmosphere is dirt laden, (3) the atmosphere contains any substance that will cause toxic gas when passed through a flame, or (4) the heater is installed in a tightly closed room that does not provide required air for combustion. If outside combustion air is required, the optional

combustion air inlet kit must be installed. See requirements in Paragraph 12.

Each kit includes inlet air pipe expandable to three feet, a terminal cap, connection hardware, and illustrated installation instructions.



**Figure 26 -
Combustion Air Inlet
Kit, Option DE2**

21. Dual Vent Kit, Option CC5

The dual vent option kit permits venting of two of these heaters through only one opening in the roof or side wall of a building. The concentric design of the vent allows each of the two heaters to be safely operated totally independent of the other. The two heaters may be controlled by the same or different thermostats. Heaters vented through the optional dual vent do not have to match in capacity, length or configuration. The adapter box in the dual vent kit converts the two separate vent pipe runs into the concentric vent terminal arrangement. The specially designed dual vent adapter box attaches indoors, close to the wall or roof opening.

Each dual vent option kit includes the adapter box, a 4" vent cap, a 6" vent cap with concentric opening for passage of 4" vent pipe, adapter box mounting brackets, and complete instructions. Vent pipe is field supplied. Use only single wall metal pipe.



**Figure 27 -
Dual Vent
Kit, Option
CC5**

22. Optional Side Shield, Options CD13-20

The optional side shield hangs vertically from the reflector brackets. Installation of the optional side shield allows for less clearance from one side of the heater. See Paragraph 4.

The side shield is modular with two sections required per 10-ft tube. Install the two additional reflector brackets required for the side shield at the same time as the two standard reflector brackets. With a side shield attached, reflectors may not be rotated more than 30°. When an optional

side shield is included in the installation, a screw must be inserted at each tube joint to prevent the tubes from turning. Follow the illustrated instructions included in the side shield package.

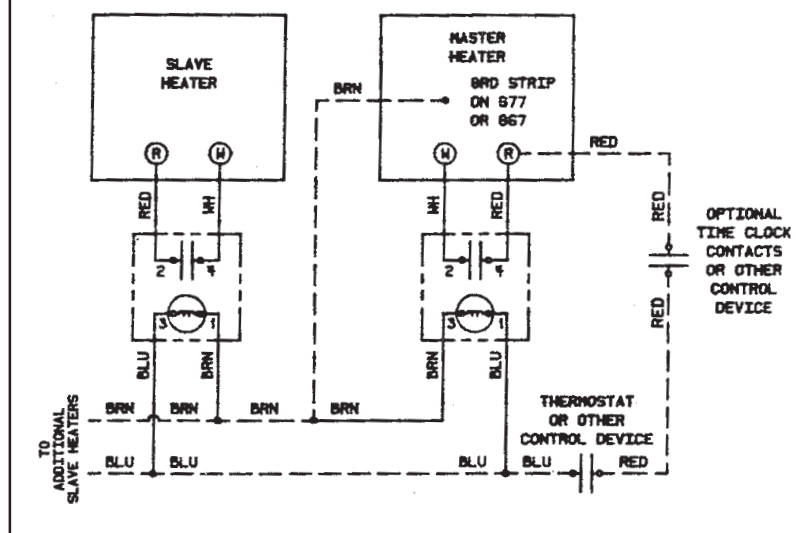
23. Optional Reflector Gap and End Covers, Options CD21-27

The optional gap covers are designed to provide the infrared system with a continuous reflector while still allowing for system expansion. The end covers are designed to "close" the vertical space on the ends of the reflector length. Optional end covers may only be used when gap covers are installed. Reflectors on systems with gap covers cannot be rotated. Gap Covers are Option CD21-26; End Covers are Option CD27. Each option kit includes illustrated instructions.

24. Multiple Heater Control, Options CL31 and 32

These multiple heater control options permit the control of up to six heaters (one master

**Figure 28 - Multiple Heater Control Wiring with
Option CL31 and/or CL32**



and five slave units) from a single thermostat or a time clock and single/multiple thermostats. For maximum safety, the multiple control is done in the low voltage circuit. See wiring diagram in Figure 28.

25. Optional Unit-Mounted Thermostat Bracket Kit, Option CM3

The optional thermostat bracket kit allows attachment of the controlling thermostat to the burner/control box. The bracket attaches at the same location as the thermostat strip and includes a junction box for mounting the thermostat. Complete instructions are included with the option kit. The thermostat is not included in the kit. The low voltage thermostat may be either an optional thermostat (Option CL1) or an equivalent field-provided thermostat.

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FOR YOUR SAFETY

If you smell gas:

1. Open windows.
2. Don't touch electrical switches.
3. Extinguish any open flame.
4. Immediately call your gas supplier.

FOR YOUR SAFETY

The use and storage of gasoline or other flammable vapors and liquids in open containers in the vicinity of this appliance is hazardous.

General

The operation/maintenance/service instructions in this booklet apply to INFRA-REZ® Tubular, Low-Intensity Infrared Heaters, Models TR/TR-H. As with any gas-burning equipment, regular maintenance procedures are required to ensure continued safety, reliability, and efficiency of the installation.

If service is required, this heater should be serviced only by a qualified service person. Service information in this booklet is intended as a guideline for a qualified gas-fired equipment service person.

WARNING: Improper installation, adjustment, alteration, service, or maintenance can cause property damage, injury or death. Read the installation, operation, and maintenance instructions thoroughly before installing or servicing this equipment. (See Installation Form 456 for installation instructions.)

Maintenance Section

These tubular infrared heaters are designed to need only a minimum amount of maintenance. Some maintenance procedures outlined in this Section require inspection only, and some require action. All of the procedures described should be performed annually. Depending of the environment and the number of operating hours, more frequent cleaning may be required to certain components as indicated in the instructions for that component. Although the maintenance requirements for this heater are minimal, the routine maintenance procedures in this Section are necessary to ensure safe, reliable, and/or efficient operation.

The paragraphs which follow discuss the components and systems that require routine inspection/maintenance. At the beginning of each section, there is a code indicating the main reason why that maintenance procedure is necessary. The legend for that code is shown in the table below.

Maintenance Codes	Reason for Maintenance
S	= Safety (to avoid personal injury and/or property damage)
R	= Continued Reliability
E	= Efficient Operation

Maintenance Section (cont'd)

S 1. Flexible Gas Connection and Electrical Supply Connection

Expansion and contraction of the heater causes these components to be flexed on each completed heating cycle. Carefully inspect the flexible gas connector for any evidence that a fatigue crack has developed or is developing. If the inspection indicates that replacement is needed, replace the connector with an equivalent one (particularly the internal diameter because flexible connectors have large pressure losses). Inspect the electrical supply connection for any insulation damage, and replace it if any irregularities are noted.

S 2. Combustion Chamber Tube

Check the combustion chamber tube for any evidence of burn-out. A burned-out combustion chamber could allow fire to escape outside of the tube. If a burn out or weakness in the combustion chamber is discovered, the cause should be established and the tube replaced before heater operation is resumed. Burn out is the evidence of excessive flame temperature. Excessive flame temperature would most likely be caused by a restriction in the system.

S 3. Heat Exchanger Tubes

Check all of the heat exchanger tubes for any indications of a hole developing. A hole in a heat exchanger tube would allow flue products and/or flame to escape into the heated space. Replace any suspect heat exchanger tube.

S 4. Vent Pipe

During a "cold" startup, transient condensation is formed. Over a period of time, condensation will cause metal pipe to develop holes and eventually fail completely. Replace any vent pipe that has condensation damage. The vent pipe system should be maintained at a quality where all flue products will be conveyed through the vent pipe to the outdoors.

If equipped with an optional dual vent kit, remove the cover from the dual vent adapter box to check the inner pipe.

R 5. Vent Terminal and Combustion Air Inlet Terminal (if optional outside combustion air kit is installed)

To prevent the pressure switch from cycling, check the vent terminal and the combustion air inlet terminal for any restrictions and/or damage. Clean if restricted, and replace if damaged.

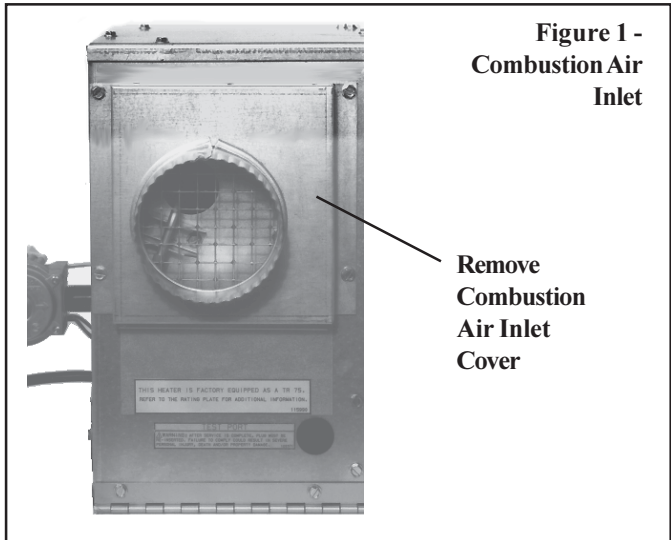
S 6. Combustion Air System and Main Burner

R During an average heating season, approximately 65 ton of air passes through a Size 100 burner. That air is always carrying some dirt. Obviously, the amount of dirt varies with the environment. As the air passes through, some of that dirt is deposited on the inlet screen of the combustion air intake, on the combustion air blower wheel, and inside the main burner. This buildup of dirt will eventually affect the operation of the heater. To maintain safe and reliable heater operation, an annual cleaning (more frequently in dirty environments) is recommended.

Instructions for Cleaning the Combustion Air Blower (requires a wire brush, cleaning cloth, and an automotive-type aerosol degreaser or refrigerant coil cleaner):

CAUTION: Use of eye protection is recommended.

- 1) Turn off the electrical supply to the heater and rotate the knob on the gas valve to the "OFF" position.
- 2) Remove the combustion air inlet cover (Refer to Figure 1). If the heater is equipped with an outside combustion air inlet pipe, it is not necessary to disconnect the pipe. Remove the inlet cover with the pipe attached.



- 3) Open the access panel on the bottom of the burner/control box. Either (1) cover the air inlet to the main burner to prevent foreign debris from entering the burner tube or (2) remove the burner for cleaning (Refer to Paragraph 7 on Cleaning the Main Burner).
- 4) Remove the combustion air flow sensor tube bracket and the combustion air restrictor plate (Figure 2). The combustion air blower wheel is now visible (Figure 3).
- 5) Clean the blower wheel. Remove any dust, dirt and/or oily deposits. Non-oily deposits can be removed with a small brush and low-pressure compressed air. Be careful not to damage the blower wheel. Use an aerosol degreaser (available in automotive stores) or a refrigerant coil cleaner to clean oily deposits.

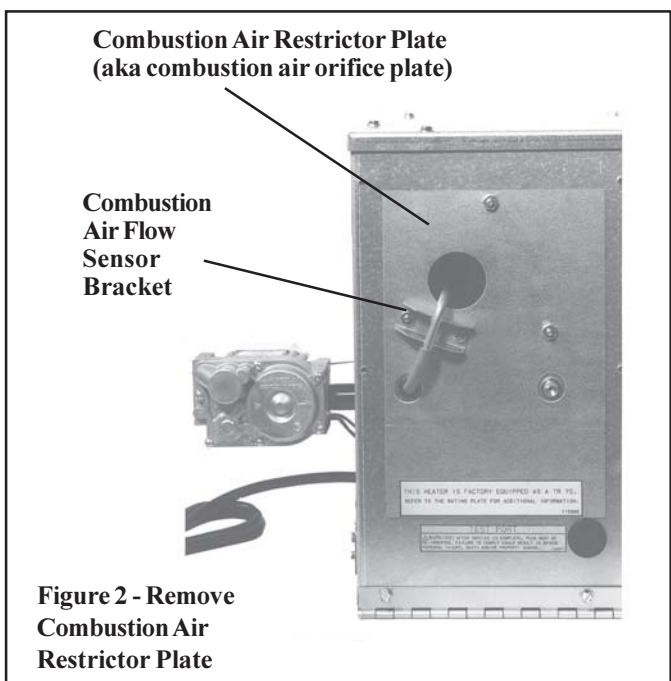
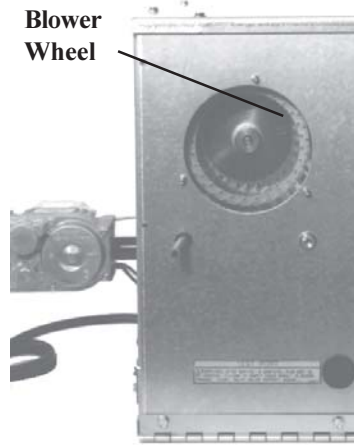


Figure 3 -
Clean the
blower wheel
using a brush,
low-pressure
compressed air,
and an aerosol
degreaser or
refrigerant coil
cleaner. Be
careful not to
damage the
blower wheel.



- 6) Clean the inside of the burner/control box. Remove any dirt/debris that collected during normal operation and from the wheel-cleaning process. Do not let any foreign material enter the main burner or collect on the pilot assembly.
- 7) Clean and re-install the combustion air restrictor plate. Re-attach the combustion air flow sensor tube bracket making certain there is no dirt inside the tube. Clean the combustion air inlet cover and re-install it on the heater.
- 8) Close the access panel. Restore the electric and the gas. Test fire the heater and check for proper operation.

S 7. Main Burner

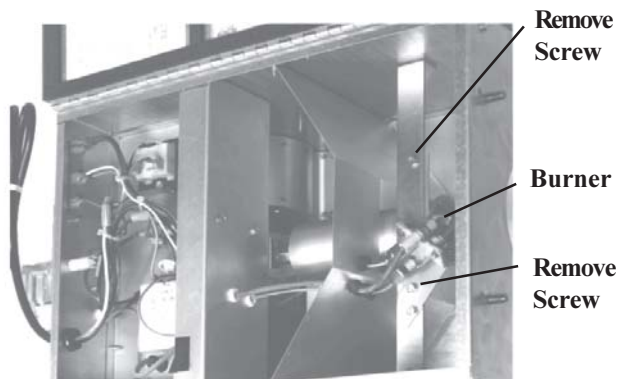
R Excessive dirt buildup on and inside the concentric port rings on the main burner could cause fuel gas to spill out of the back of the burner tube. Fuel gas spilling out of the back of the burner tube will cause gas odor inside the building, and if not corrected, could eventually cause a fire/explosion hazard. To prevent fuel gas spilling from the back of the burner tube, clean the main burner ports at least annually.

Instructions for Removing and Cleaning the Main Burner (requires a wire brush, cleaning cloth, and an automotive-type aerosol degreaser or refrigerant coil cleaner):

CAUTION: Use of eye protection is recommended.

- 1) Turn off or disconnect the main electric supply and rotate the knob on the gas valve to the "OFF" position.
- 2) Open the access panel.
- 3) While supporting the front of the burner, remove the two screws that retain the main burner (Refer to Figure 4). The

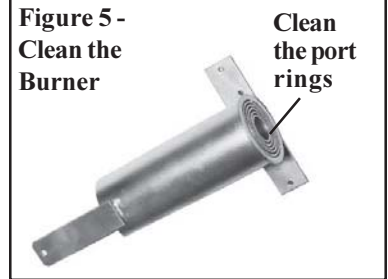
Figure 4 - Remove Main Burner



rear of the burner is supported by a retention clip. Slide the burner toward the combustion chamber, carefully manipulate, and remove the burner from the burner/control box.

- 4) Remove any soot deposits from the burner with a wire brush. Clean between the port rings with an aerosol degreaser and/or compressed air. Wipe the inside of the burner tube clean. (Cleaning the burner with an aerosol degreaser is highly recommended as the degreaser will retard future buildup of dirt.)

Figure 5 -
Clean the
Burner



- 5) Inspect the cleaned burner for any damage or deterioration. If the burner has any damage or signs of deterioration, replace it. Carefully reverse the above procedures to re-install or replace the burner. Test the heater for proper operation.

R 8. Pilot Burner Assembly

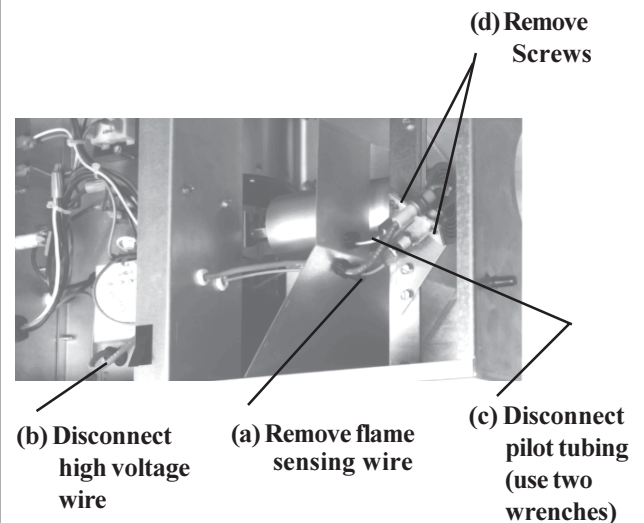
The pilot burner performs several necessary functions, and to ensure reliable service, it must be cleaned periodically. The required frequency of cleaning will vary depending on the installation site and the hours of operation. No less than annual cleaning is recommended.

One of the most important reasons for cleaning the pilot burner is that the low voltage DC current needed to prove pilot flame must flow from the flame sensing rod through the pilot flame to the burner hood. That current can be either retarded or totally blocked by deposits and/or corrosion on the flame sensing rod and/or the pilot burner hood.

Instructions for Removing and Cleaning the Pilot Assembly (requires 5/16" nut driver, 1/2" open-end wrench, 7/16" open-end wrench, and emery cloth):

- 1) Turn off or disconnect the main electric supply and rotate the knob on the gas valve to the "OFF" position.
- 2) Open the access panel.
- 3) Remove the Pilot Assembly (Refer to Figure 6):

Figure 6 - Remove Pilot Assembly



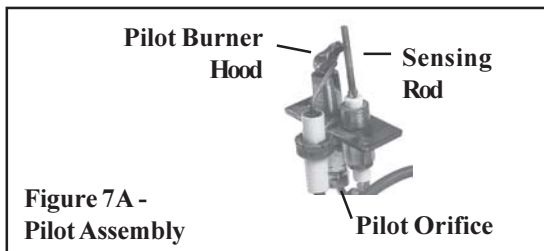
Maintenance Section (cont'd)

8. Pilot Burner Assembly (cont'd)

- Remove the flame sensing wire from the pilot burner.
- Disconnect the high voltage wire from the ignition controller and pull the wire free from the divider wall.
- Use the two open-end wrenches to disconnect the gas supply tubing. (Do not attempt using only one wrench; pilot line tubing could be damaged.) Use one wrench to hold the pilot orifice and the second to loosen the pilot gas line fitting.
- Remove the two screws that retain the pilot burner assembly to its mounting bracket. Remove the pilot assembly.
- Clean the pilot assembly:

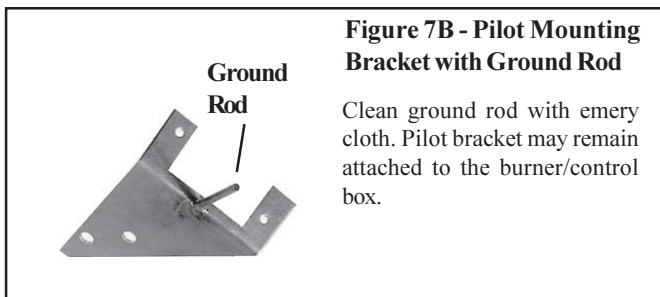
CAUTION: Use of eye protection is recommended.

- Remove the pilot orifice. Hold the orifice toward a bright light and look through the tubing end. There should be two tiny holes visible. If the two holes are



not visible, clean the orifice with solvent and compressed air. DO NOT REAM THE ORIFICE.

- Remove the sensing rod and clean with an emery cloth. Rub the metal sensing rod with the emery cloth until it is bright. Wipe off the ceramic insulator.
- Clean the pilot burner hood. Use the emery cloth to carefully clean the pilot burner hood. After the pilot burner hood is cleaned, blow away dirt from the pilot with compressed air.
- Clean the ground rod (the ground rod is part of the pilot mounting bracket assembly, Figure 7B). Clean with an emery cloth; rub until metal is bright.



- Re-assemble, reversing above procedure. Test the heater for proper operation.

Service Section - Control Location, Operation, and Service

WARNING: Service work on this heater should only be done by a qualified gas service person. This service information and the troubleshooting guides are intended as an aid to a qualified service person.

To service this heater, it is necessary to understand the normal operating functions of the heater controls. Refer to Figure 8 and to the individual illustrations to identify and locate each of the controls.

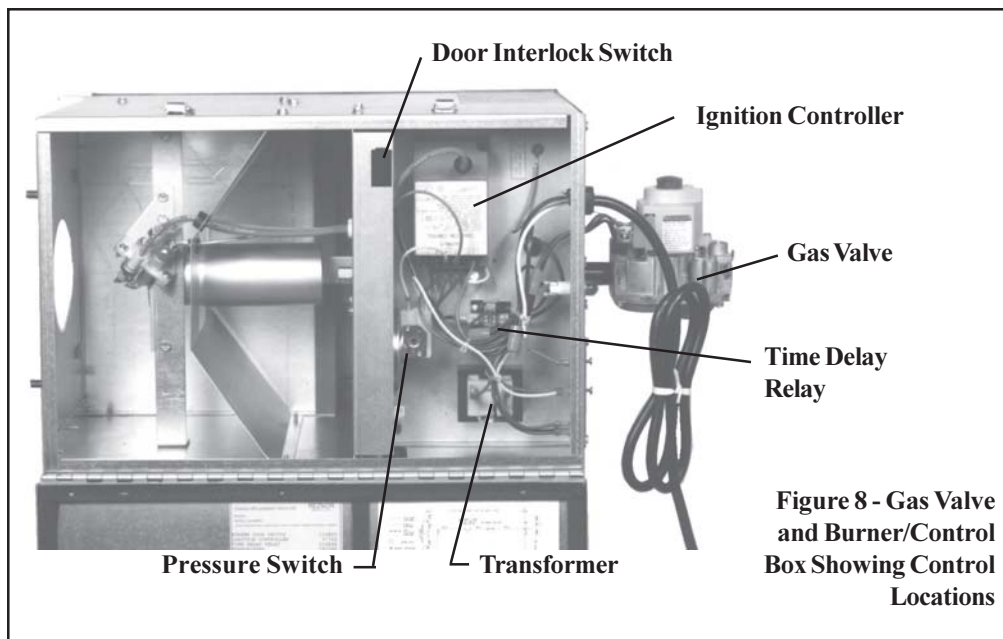
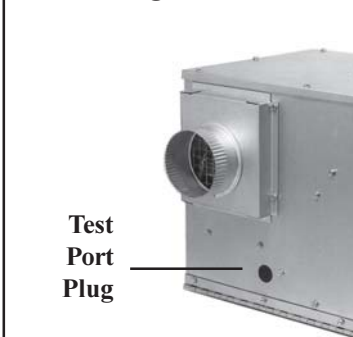


Figure 9 - Control Box Test Port and Plug



Remove the plastic plug from the inside, by pinching tabs and pushing from the outside. After service is complete, **PLUG MUST BE RE-INSERTED.**

9. Time Delay Relay

Function -- This device is used to provide a post purge of the combustion chamber, heat exchanger tubes, and vent pipe. The post purge timing is approximately 75 to 180 seconds. On startup, after the thermostat closes, there is a delay of 5 to 15 seconds in combustion air blower startup. The time delay heater is in the low voltage control circuit, and the normally open contacts control the combustion air blower.

Time Delay Relay Check (requires a voltmeter and an ohmmeter) -- Before checking the time delay relay, determine that low voltage (24 volts) is available. Set the thermostat to above room temperature. Using a voltmeter, check the voltage between Terminal R on the thermostat terminal strip (on the valve end of the burner/control box) and the ground terminal on the ignition controller. If the voltage is between 10 to 28 volts, proceed to check the time delay relay. If there is no voltage, replace the transformer (See Paragraph 15). If the voltage is not within the specified range, check the supply voltage.

Table 1 - Acceptable Supply Voltage Range	
Rated	Acceptable Range
115V	105-130 volts
208V	200-235 volts
230V	210-250 volts
460V	440-480 volts

Having established that an acceptable low voltage is present, rotate the knob on the combination valve to the "OFF" position.

- 1) Disconnect or shutoff the main electrical supply.
- 2) Open the access panel on the bottom of the burner/control box. Remove the black plastic plug from the test port on the side of the burner/control box (See Figure 9).
- 3) Route the leads from an ohmmeter through the test port to the inside of the control box. Locate the time delay relay, disconnect the two black wires from the time delay relay terminals, and attach the ohmmeter leads to those terminals.
- 4) Close the access panel, turn on the main electric supply, and set the thermostat above room temperature.
- 5) After 30 seconds, the ohmmeter should show continuity. If continuity is not observed, replace the time delay relay.
- 6) When testing is complete, be sure to re-insert the black plastic plug in the test port.

10. Pressure Switch

Function -- The pressure switch is a safety control to ensure that adequate air is being provided for proper combustion. The device "senses" a small differential pressure created by the flow of the combustion air.

The pressure switch is factory set to "close" at pressure differential of $0.57 \pm .05$ w.c. and to "open" when the pressure is reduced to $0.47 \pm .05$ w.c. (Exceptions for high altitude operation -- Size 50 at 6001-8000 ft (Options AB6 or AB7) and all high altitude (over 2000 ft) Sizes 175 and 200 units require a reduced pressure setting of $0.42 \pm .05$ w.c.)

Figure 10 - Time Delay Relay



Figure 11 - Pressure Switch



Table 2 - Correct Sensing Pressure

Size	"Cold" Sensing Pressure Range*	"Hot" Sensing Pressure Range*
50	0.95 - 1.10" w.c.	0.55 - 0.95" w.c.
75	0.65 - 0.80" w.c.	0.55 - 0.75" w.c.
100	0.75 - 1.00" w.c.	0.55 - 0.75" w.c.
125-150	0.95 - 1.30" w.c.	0.55 - 1.00" w.c.
175-200	0.80 - 1.20" w.c.	0.55 - 0.90" w.c.

*Pressure will vary slightly depending on inlet and/or outlet restrictions.

Sensing Pressure Check (requires a sensitive slope gauge, several feet of 3/16" O.D. rubber tubing, and two 1/4" O.D. barbed tees)

- 1) Disconnect the electrical supply and open the access panel.
- 2) Using one of the tees, attach the tubing to one side of the pressure switch so that the switch will continue to sense pressure. Repeat on the other side of the pressure switch.
- 3) Remove the test plug from the side of the burner/control box (See Figure 9.) and route the pieces of tubing through the test port. Connect the tubing to the slope gauge being careful not to "mix" the tubes.
- 4) Close the access panel, turn on the electrical power, and set the room thermostat above room temperature.
- 5) On the slope gauge, take the "cold" readings. If the "cold" sensing pressure is sufficient to cause the pressure switch to close, observe at what sensing pressure the switch opens.
- 6) When testing is complete, be sure to re-insert the black plastic plug in the test port.

Service -- The pressure switch is a very reliable device which has no field-repairable parts and seldom needs to be replaced. Usually a pressure sensing problem is an indication that there is a problem with the vent pipe and/or combustion air inlet. The most likely causes of low sensing pressure are listed below.

- ☐ On new installations, the cause(s) is usually due to either too much vent pipe, too much combustion air inlet pipe, and/or the use of non-specified terminals. (See the heater installation manual for venting/combustion air requirements.)
- ☐ On units that are not equipped with an outside combustion air inlet, low sensing pressure may be caused by negative building pressure. When negative building pressure exists, install an outside combustion air inlet.
- ☐ An obstruction in the vent pipe or combustion air inlet. Remove obstruction.
- ☐ A dirty combustion air blower wheel. See Maintenance Section, Paragraph 6, for cleaning instructions.

Check the installation, make necessary changes, and re-check the sensing pressure. If it should be determined that the pressure switch needs to be replaced, replace with an identical switch only -- do not substitute.

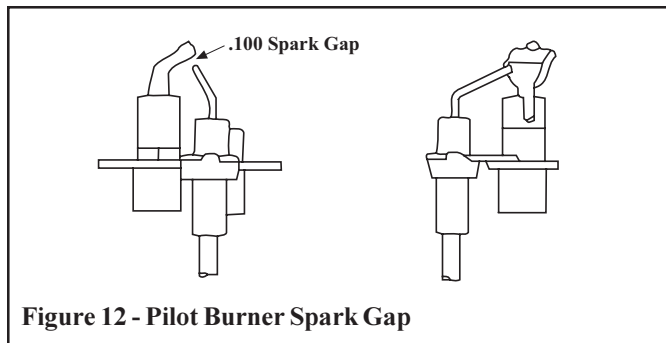
WARNING: If replacement of the pressure switch is necessary, replace with the identical model pressure switch only. Do not substitute.

Service Section (cont'd)

11. Ignition Controller

Function -- The ignition controller functions to ignite the pilot flame and as a flame supervision device. Natural gas heaters are equipped with a Model G67 ignition control. The Model G67 controller permits pilot gas flow continuously as long as the thermostat calls for heat. Heaters designed to operate on propane gas are equipped with a Model G770 ignition controller. The Model G770 controller shuts off the pilot gas flow after 120 seconds if the pilot is not ignited. Both models will shut off main burner gas flow immediately if the pilot flame is lost.

Pilot flame ignition is achieved by a high voltage (15KW) spark that occurs between the spark electrode and the pilot burner hood. The proper gap and location are important.



The presence of the pilot flame is detected by the ignition controller's sensing circuit when a low voltage DC current flows through the pilot flame to ground. A current flow of at least 0.2 microamps is required for pilot flame detection.

Ignition Controller and Flame Signal Strength Test (requires a volt meter to check the ignition controller and microamp meter capable of reading tenths of a microamp to test the flame signal strength) --

- 1) Disconnect the main electrical supply.
- 2) Open the access panel and remove the plug from the test port (See Figure 9).
- 3) Route the microamp meter leads through the test port to the inside of the burner/control box. Remove the red wire from terminal No. 4 on the ignition controller and connect the microamp meter to the red wire and Terminal No. 4.
- 4) Close the access panel.
- 5) At the combination valve, disconnect the black wire. Connect the voltmeter to the black wire and Terminal C on the gas valve.
- 6) Restore the main power supply. Set the thermostat to above room temperature and wait for the time delay relay to start the combustion air blower.
- 7) If the flame signal reading on the microamp meter is 0.2 microamps or greater, but there is no voltage reading on the voltmeter, replace the ignition controller. (The ignition controller is not field-repairable.)

If there is 24 volts to the gas valve (voltmeter reading), but the flame signal microamp reading is low (less than 0.2 microamps), check for the following:

- (1) Improper gas pressure

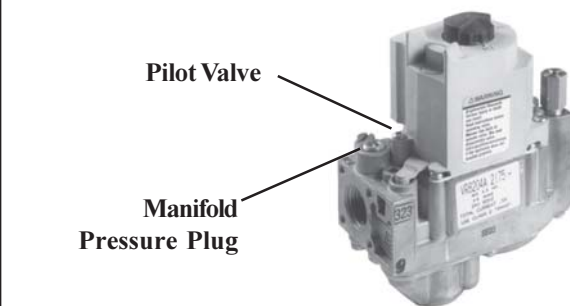
Table 3 - Gas Supply Pressure			
BTUH Input	Gas Type	Supply Pressure	
		Minimum	Maximum
50,000 - 150,000	Natural	4.5" w.c.	14" w.c.
175,000 - 200,000	Natural	6" w.c.	14" w.c.
50,000 - 150,000	Propane	11" w.c.	14" w.c.

- (2) Dirty or misaligned flame sensor electrode and pilot burner hood (Refer to Maintenance Section, Paragraph 8 for cleaning instructions).
 - (3) Dirty or restricted pilot orifice (Refer to Maintenance Section, Paragraph 8 for instructions on cleaning the pilot orifice.)
- 8) When testing is complete, re-connect the wires according to the wiring diagram. Be sure to re-insert the black plastic plug in the test port.

12. Combination Gas Valve

Function - The combination valve provides a number of functions. It automatically controls the gas flow to the pilot and the main burner. It regulates the main burner gas pressure; and it contains a manual valve for complete interruption of the gas flow. The combination valve also contains a needle valve for adjustment of the pilot gas flow (units are shipped with the needle valve full open) and pressure tap ports for measuring inlet (supply) gas pressure and manifold gas pressure.

Figure 13 - Combination Gas Valve



Normally, it is not necessary to adjust the pilot gas flow or the manifold gas pressure. Do not attempt to correct for low inlet (supply) pressure by adjusting the pressure regulator. Adjusting the pressure regulator on the combination gas valve will not increase the supply pressure, and if at a later time, the inlet pressure is increased, an unsafe condition could result. The inlet gas pressure range which provides safe and efficient operation of the heater is shown in Table 3, Paragraph 11)

Manifold Pressure Settings

Table 4 - Manifold Pressure Settings		
BTUH Input	Gas Type	Manifold Pressure
50,000 - 150,000	Natural	3.5" w.c.
175,000 - 200,000	Natural	5" w.c.
50,000 - 150,000	Propane	10" w.c.

Checking Manifold Gas Pressure

Before attempting to measure or adjust manifold gas pressure, the inlet (supply) pressure must be within the specific range for the gas being used, both when the heater is in operation and on standby. Incorrect inlet pressure could cause excessive manifold pressure immediately or at some future time.

With the manual valve (on the combination valve) positioned to prevent flow to the main burners, connect a manometer to the 1/8" pipe outlet pressure tap in the valve. Open valve and operate the heater to measure the manifold gas pressure. NOTE: Use a manometer (fluid-filled gauge) rather than a spring-type gauge due to the difficulty of maintaining calibration of a spring-type gauge.

Normally adjustments will not be necessary to the factory preset regulator. If adjustment is necessary, set pressure to proper settings by

turning regulator screw IN (clockwise) to increase pressure or OUT (counterclockwise) to decrease pressure. Consult the valve manufacturer's literature provided with the heater for more detailed information.

Service - The combination valve has no field-repairable parts.

13. Combustion Air Blower System

Function - The function of the combustion air blower system is to provide a metered flow of air to the burner for proper combustion of the fuel gas. The quantity of air flow also serves to control the temperature of the radiating surfaces. The combustion air blower system is comprised of the combustion air orifice, the blower wheel, the blower housing, and the blower motor.

Service - This system contains no field serviceable parts. If any of the components become defective, it must be replaced. The blower motor is permanently oiled and requires no additional oiling. For proper blower motor operation, the voltage supplied to the motor must be within the range shown in Table 1 (Paragraph 9). If any part(s) must be replaced, the correct blower wheel spacing must be maintained. (Refer to Maintenance Section, Paragraph 6.) Use only replacement parts identical to the factory-installed parts.

14. Interlock Switch

Function/Service - The function of the door interlock switch is to prevent the heater from operating when the access door is open. The switch is a personal safety device to prevent potentially severe, accidental burns. This switch should never be disabled or eliminated. If during the course of service or maintenance, it is noted that the interlock safety switch is sticking, replace the switch. Use only replacement switch identical to the factory-installed switch.

NOTE: If the access door is opened during a burner cycle, the venter motor and wheel will continue to operate until the time delay is de-energized.

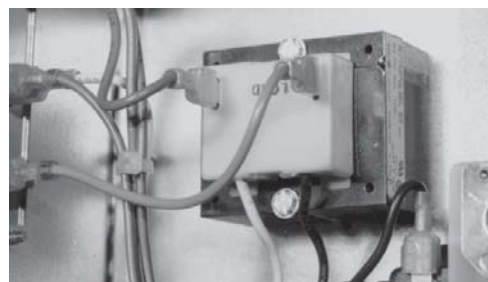
Figure 14 - Safety Door Interlock Switch



15. Transformer

Function - The function of the transformer is to reduce the supply voltage to a 24-volt circuit in order to operate the 24-volt controls.

Figure 15 - Transformer



Transformer Check (requires a voltmeter) - To verify the 24-volt circuit, checking the operation of the transformer, set the thermostat to above room temperature. Using a voltmeter, check the voltage between Terminal R on the thermostat terminal strip (on the burner/control box) and the ground terminal on the ignition controller. If there is no voltage in this circuit, the transformer is not functioning. The service of a transformer is like that of a light bulb; it is either good or bad and when bad, it must be replaced.

Service - If replacement of the transformer is necessary, do not substitute any other transformer. Use a replacement transformer IDENTICAL to the factory-installed model. The electrical compartment is not intended to be pressurized, and replacement of another type transformer could cause combustion air leakage.

Important Note: To prolong the life of the transformer, do not short the "hot" side of the transformer to ground when servicing the heater. Doing so will cause the transformer to fail.

DANGER: The gas burner in this gas-fired equipment is designed and equipped to provide safe and economically controlled complete combustion. However, if the installation does not permit the burner to receive the proper supply of combustion air, complete combustion may not occur. The result is incomplete combustion which produces carbon monoxide, a poisonous gas that can cause death. These tubular infrared heaters may be safely operated in the vented or unvented mode. **FAILURE TO PROVIDE PROPER VENTING OR TO MEET FRESH AIR REQUIREMENTS FOR UNVENTED INSTALLATIONS WILL RESULT IN A HEALTH HAZARD WHICH COULD CAUSE SERIOUS PERSONAL INJURY OR DEATH.**

Always comply with the combustion air requirements in the installation codes and instructions. If combustion air is brought from outside, use only the outside combustion air kit specifically designed for these heaters. NEVER RESTRICT OR OTHERWISE ALTER THE SUPPLY OF COMBUSTION AIR TO ANY HEATER. Indoor units installed in a confined space must be supplied with air for combustion as required by Code and in the heater installation manual. If two heaters use the same vent terminal, a specially designed dual vent kit must be installed. If the unit is vented, MAINTAIN THE VENT SYSTEM TO BE STRUCTURALLY SOUND AND FREE FLOWING. If the unit is unvented, PROVIDE 4 CFM OF FRESH AIR PER 1000 BTUH'S FOR NATURAL GAS OR 5 CFM OF FRESH AIR PER 1000 BTUH'S FOR PROPANE GAS.

16. Troubleshooting

WARNING: Service work on this heater should only be done by a qualified gas service person. All service information including the Troubleshooting Guides is intended as an aid to a qualified service person.

Figure 16 - Basic Troubleshooting Guide

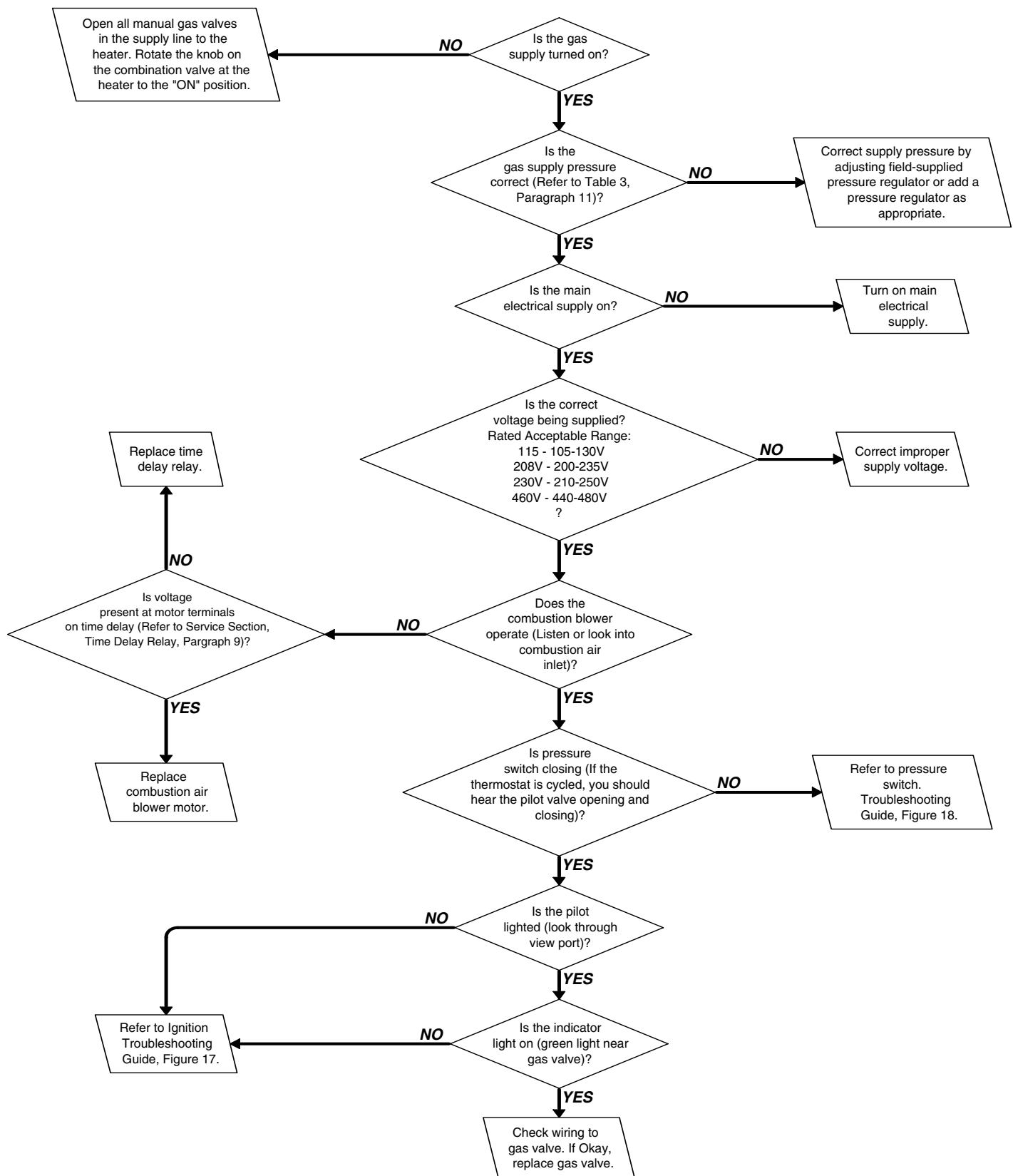
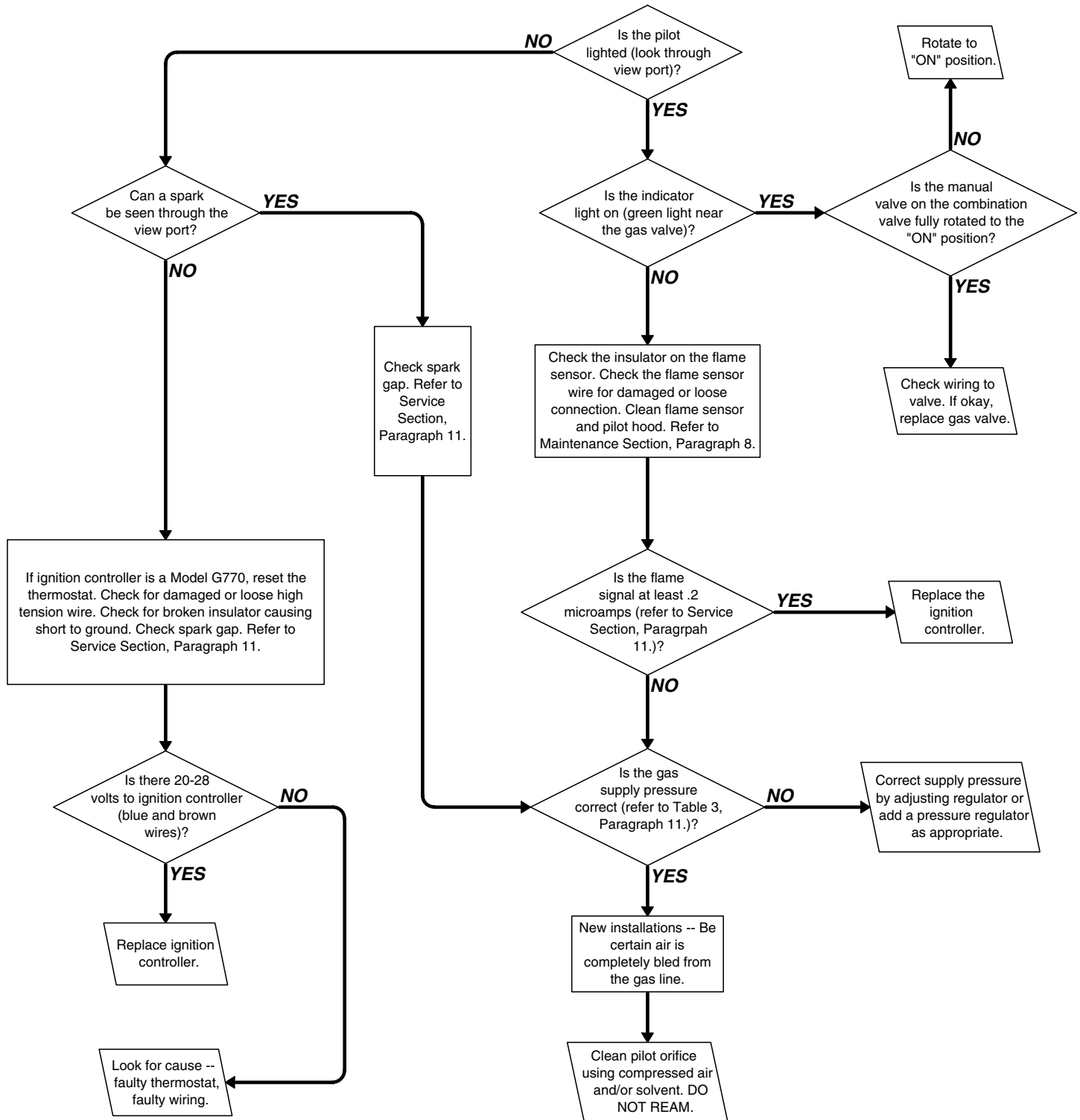
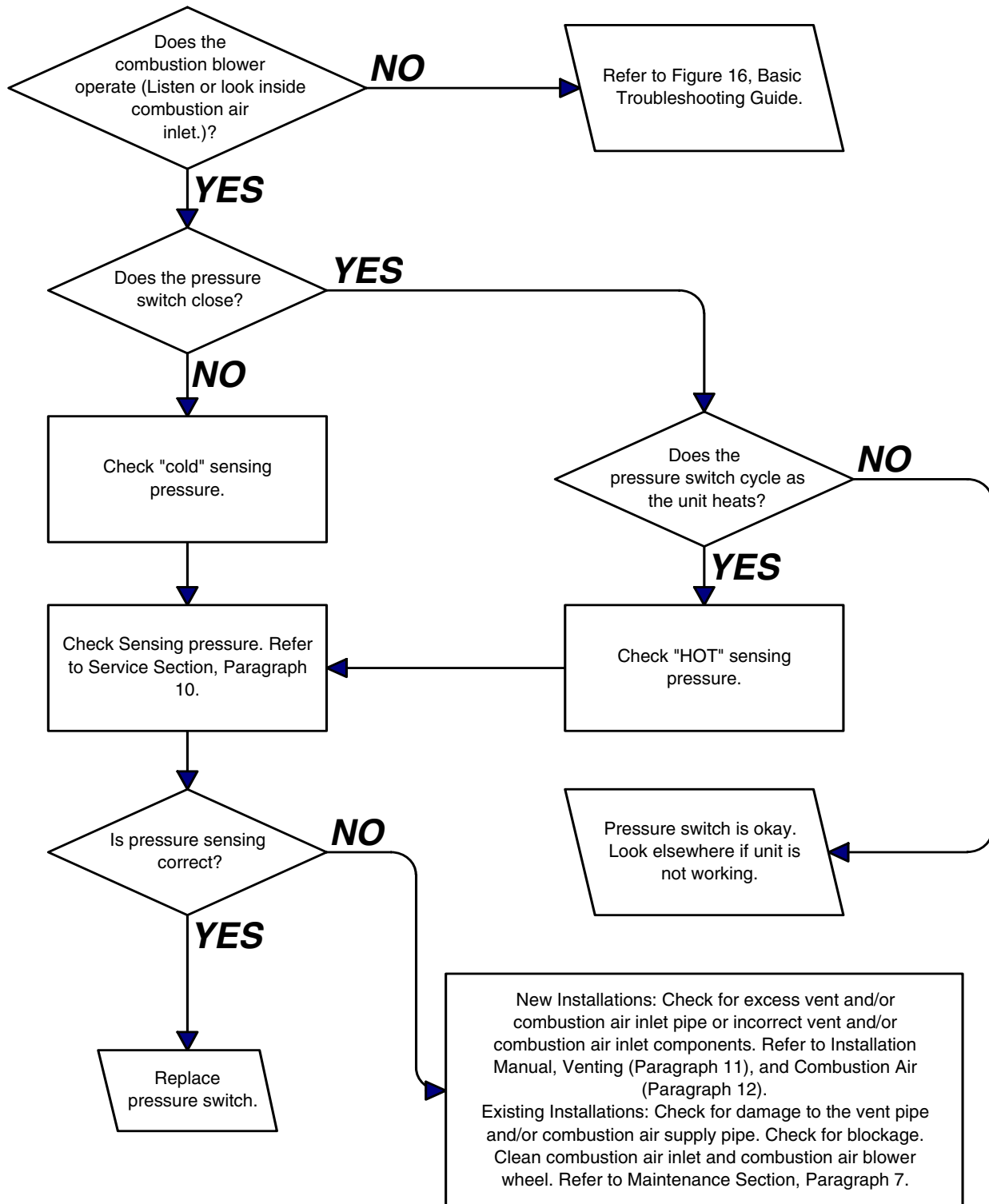


Figure 17 - Ignition Troubleshooting Guide (Assumes pressure switch is actuated.)

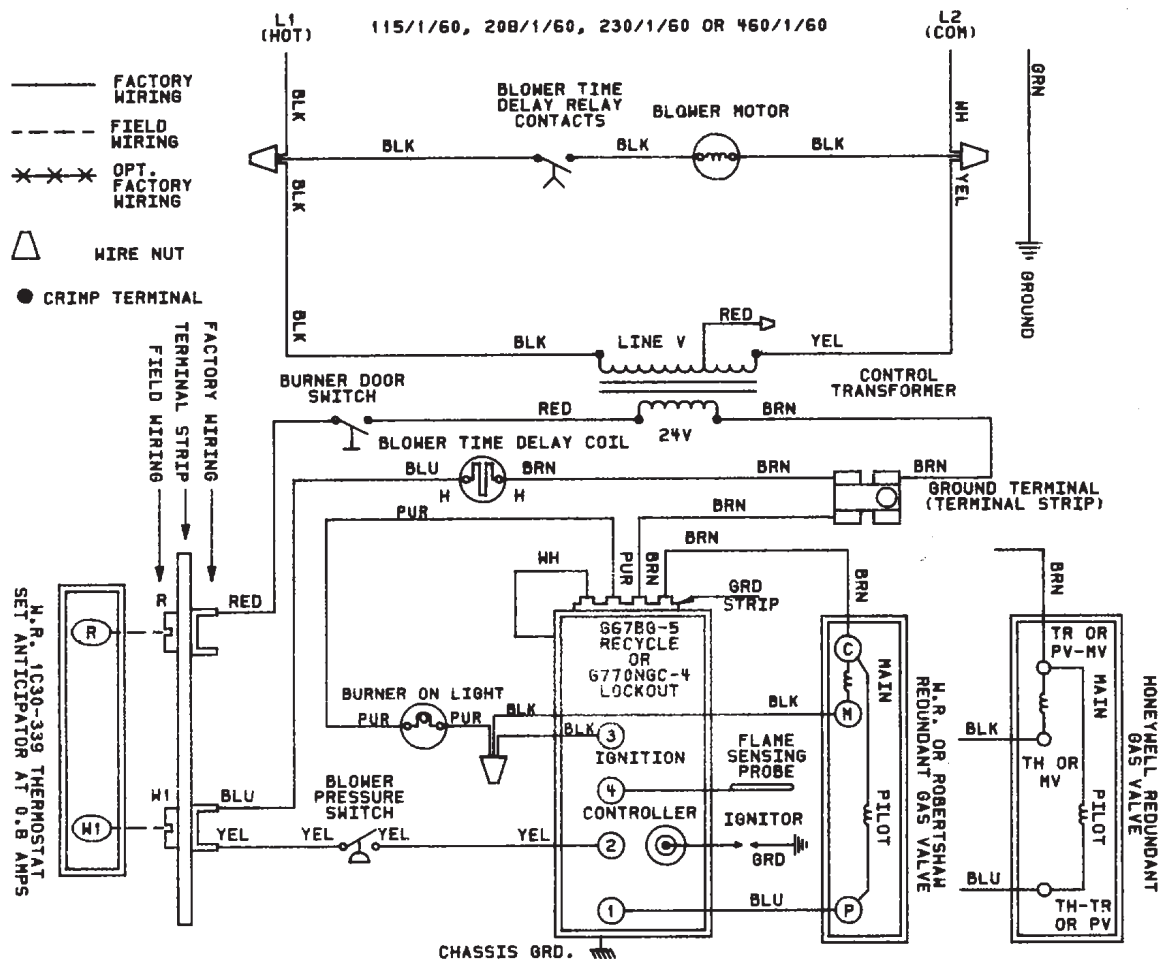


16. Troubleshooting (cont'd)

Figure 18 - Pressure Switch Troubleshooting Guide



17. Wiring Diagram



OPERATING SEQUENCE

1. SET THERMOSTAT AT LOWEST SETTING.
2. TURN ON MAIN AND PILOT MANUAL GAS VALVES.
3. TURN ON POWER TO UNIT.
4. SET THERMOSTAT AT DESIRED SETTING.
5. THERMOSTAT CALLS FOR HEAT ENERGIZING THE BLOWER MOTOR AFTER TIME DELAY.
6. BLOWER PRESSURE SWITCH CLOSING, FIRING UNIT AFTER PILOT PROVING SEQUENCE.
7. IF THE FLAME IS EXTINGUISHED DURING MAIN BURNER OPERATION, THE SAFETY SWITCH CLOSING THE MAIN VALVE AND RECYCLES THE SPARK GAP. ON UNIT EQUIPPED WITH THE 6770NGC-4 LOCKOUT CONTROL, IF PILOT IS NOT ESTABLISHED WITHIN 120 SECONDS (APPROX.) UNIT LOCKS OUT AND MUST BE RESET BY INTERRUPTING POWER TO THE CONTROL CIRCUIT (SEE LIGHTING INSTRUCTIONS).

NOTES

1. THE FOLLOWING CONTROLS ARE FIELD INSTALLED OPTIONS: THERMOSTAT
2. DOTTED WIRING INSTALLED BY OTHERS.
3. CAUTION: IF ANY OF THE ORIGINAL WIRING AS SUPPLIED WITH THE APPLIANCE MUST BE REPLACED, IT MUST BE REPLACED WITH WIRING MATERIAL HAVING A TEMPERATURE RATING OF AT LEAST 105 DEGREES C., EXCEPT FOR SENSOR LEAD WIRE WHICH MUST BE 150 DEGREES C.
4. USE 18 GA. WIRE FOR ALL WIRING ON UNIT.
5. LINE AND MOTOR BRANCH WIRE SIZES SHOULD BE OF A SIZE TO PREVENT VOLTAGE DROP BEYOND 5% OF SUPPLY LINE VOLTAGE.
6. ON 230V. UNITS THE CONTROL TRANSFORMER HAS A DUAL VOLTAGE PRIMARY. FOR 230V. UNITS USE BLACK AND YELLOW LEADS (CAP RED). FOR 208V. UNITS THE CONTROL TRANSFORMER HAS A DUAL VOLTAGE PRIMARY. FOR 208V. UNITS USE BLACK AND RED LEADS (CAP YELLOW). ON 115/460V. UNITS THE CONTROL TRANSFORMER IS SINGLE VOLTAGE PRIMARY. FOR 115/460V. UNITS USE BLACK AND YELLOW LEADS.
7. SEE INSTALLATION INSTRUCTIONS FOR GREATER DETAIL.

REZNOR TR SERIES WD #119457 REV. #3

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INSTALLATION RECORD (TO BE COMPLETED BY INSTALLER)

Model	Serial No.	Date of Installation	Notes
	Installer	Distributor	
Name			
Company			
Address			
Phone No.			

For more information on Reznor HVAC products:

- **Contact your local Reznor representative at 1-800-695-1901**
- **Refer to the technical specifications, manuals, and consumer materials found at www.reznorhvac.com**

