



# Model **STS-JZ**

LOW INTENSITY TUBE TYPE  
INFRA RED HEATERS

&

# Model **IQ**

LOW INTENSITY TUBE TYPE  
INFRA RED HEATERS

THESE HEATER SERIES ARE APPROVED TO ANSI Z83.20-2016/CSA 2.34-2016

## INSTALLATION / OWNER'S MANUAL



### WARNING

Improper installation, adjustment, alteration, service or maintenance can cause property damage, injury or death.



Read the installation and operating and maintenance instructions thoroughly before installing or servicing this equipment.



### SAFETY ALERT:

This heater must be installed and serviced only by a trained gas service technician. Failure to comply could result in personal injury, death, fire and/or property damage.

Do not store or use gasoline or other flammable vapours and liquids in the vicinity of this or any other gas fired appliance.



### IF YOU SMELL GAS:

- Extinguish any open flame
- Do not attempt to light this or any other appliance
- Don't touch any electrical switch, or telephone
- Immediately call your gas supplier from a neighbor's phone
- Follow any and all instruction from your gas supplier
- If your gas supplier is not available, call the fire department



**Keep this manual in a secure place .**  
*Record for future reference:*

Model #: \_\_\_\_\_

Serial #: \_\_\_\_\_

*(located on heater rating label)*

**GAS-FIRED**



**NOTICE:**

*This manual is current for this product. Occasional revision of the product Certification Standard may require changes to the product and/or this manual.*

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# STS-JZ and IQ SERIES GAS FIRED INFRARED LOW INTENSITY TUBE TYPE

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## WARNING

Improper installation, adjustment, alteration, service or maintenance can cause property damage, injury or death. Read and

understand this installation and operation manual thoroughly prior to assembly, installation, operation or service to this appliance.



This heater must be installed and serviced only by a trained gas service technician.

Do not store or use gasoline or other flammable vapours and liquids in the vicinity of this or any other gas fired appliance.



Failure to comply could result in personal injury, death, fire and/or property damage.

Do not store or use gasoline or other flammable vapours and liquids in the vicinity of this or any other gas fired appliance.



This appliance may have sharp edges and corners. Wear protective clothing such as gloves and protective eye wear when servicing this or any other appliance.

### California Proposition 65:



**WARNING:** This product can expose you to chemicals including carbon monoxide, which is known to the State of California to cause birth defects or other reproductive harm. For more information, go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

## APPLICATION

A gas-fired radiant tube heater may be installed for heating of commercial / industrial non-residential spaces. It is beyond the scope of these instructions to consider all conditions that may be encountered. Installation must conform with local building codes or, in the absence of local codes, with the National Fuel Gas Code, ANSI Z223.1/NFPA 54 in the U.S.A. or the Natural Gas and Propane Installation Code, CSA B149.1 in Canada. The latest edition Electrical Code ANSI/NFPA N0 70 in the U.S.A. and PART 1 CSA C22.1 in Canada must also be observed.

Installation of a gas fired tube heater must conform to all heating installation design procedures including clearance to combustibles, connection to the gas and electrical supplies, and ventilation.

This heater is not for installation in a Class 1 or Class 2 explosive environment, nor a residence. If installation of this equipment is in question, consult with local authorities having jurisdiction (Fire Marshall, labor department, insurance underwriter, or others).

Revisions to codes and/or standards, may require revision to equipment and installation procedures. In case of discrepancy, the latest codes, standards, and installation manual will take priority over prior releases.

**Models STS-JZ and IQ** may be installed for heating of commercial / industrial non-residential indoor spaces.

### MODELS AVAILABLE FOR OTHER APPLICATIONS:

***Models SPW-JZ and IWP*** have a powder coated water resistant burner enclosure and may be installed for heating of commercial / industrial non-residential **outdoor spaces and wet indoor environments.**

***Models STW-JZ and IW*** have a stainless steel water resistant burner enclosure and may be installed for heating of commercial / industrial non-residential **outdoor spaces and harsh wet indoor environments.**



## WARNING

### Heater Expansion



It is a normal condition that during heat-up and cool-down a tube heater will expand and contract. Allowances for heater expansion must be made in the gas connection, venting and combustion air ducting. Improper installation, alteration, or adjustment can result in property damage, injury or death. **Refer to Section 13**



## WARNING

### Gas Connection



Improper installation, connection, or adjustment can result in property damage, toxic gases, asphyxiation, injury or death. Using an approved flexible gas connector in the USA or Type 1 hose connector in Canada, the gas supply to the heater must be connected and tested in accordance with all local, state, provincial, and national codes (ANSI Z223.1/NFPA 54 in USA; B149.1 in Canada) and as indicated in this manual. **Refer to Section 13**



## WARNING

### Venting



Inadequate venting of a heater may result in asphyxiation, carbon monoxide poisoning, injury or death. This heater may be directly or indirectly vented from the space. Venting must be in accordance with all local, state, provincial, and national codes (ANSI Z223.1/NFPA 54 in USA; B149.1 in Canada) and as indicated in this manual.



## WARNING

### Start-Up 'SMOKE' Condition

During start up, the heating of material coatings used in the production process of tubes and reflectors will create smoke during the initial period of operation. This condition is normal and temporary .

Ensure that there is sufficient ventilation to adequately clear any smoke from the space. Notify site and safety personnel to ensure that alarm systems are not unduly activated.



## IMPORTANT

### THERMOSTAT SETTING FOR COMFORT

Infrared radiant (IR) heating system provide comfort with the effect of radiant heat and ambient air heat.

If your IR system is controlled with a thermostat (TruTemp or ThermoControl Plus) that senses radiant heat, then set the thermostat to the desired comfort temperature (ie: 65°; 68°; 20°C).

If your IR system is controlled with a standard 24V or 120V thermostat that senses only air temperature, then start with a thermostat setting that is 5° to 7°F (3° to 5°C) lower than the desired comfort temperature. Some trial and error setting may be required to 'fine tune' the comfort temperature that best suits your site and provides most economical operation.



## WARNING

### Tube “GLOW”

It is a normal condition that the combustion tube (1st tube) can appear to “glow red”. For inputs up to 150,000 Btuh, the top surface of the tube can appear red where heat is trapped between the reflector and the tube. The stainless steel tube used for inputs 175,000 and greater can appear to entirely glow red. The tube material is designed into the heater because it can withstand the high temperature of combustion, and the “red glow” is a normal occurrence.



## WARNING

### Clearance to combustibles

Location of flammable or explosive objects, liquids or vapors close to the heater may cause fire or explosion and result in property damage, injury or death. Do not use, store or locate flammable or explosive objects, liquids or vapors in proximity of the heater.



**The clearance to combustible material represents the minimum distance that must be maintained between the outer heater surface and a nearby surface. The stated clearance to combustibles represents a surface temperature of 90F° (50C°) above room temperature. It is the installer’s responsibility to ensure that building materials with a low heat tolerance which may degrade at lower temperatures are protected to prevent degradation. Examples of low heat tolerance materials include vinyl siding, fabrics, some plastics, filmy materials, etc.**

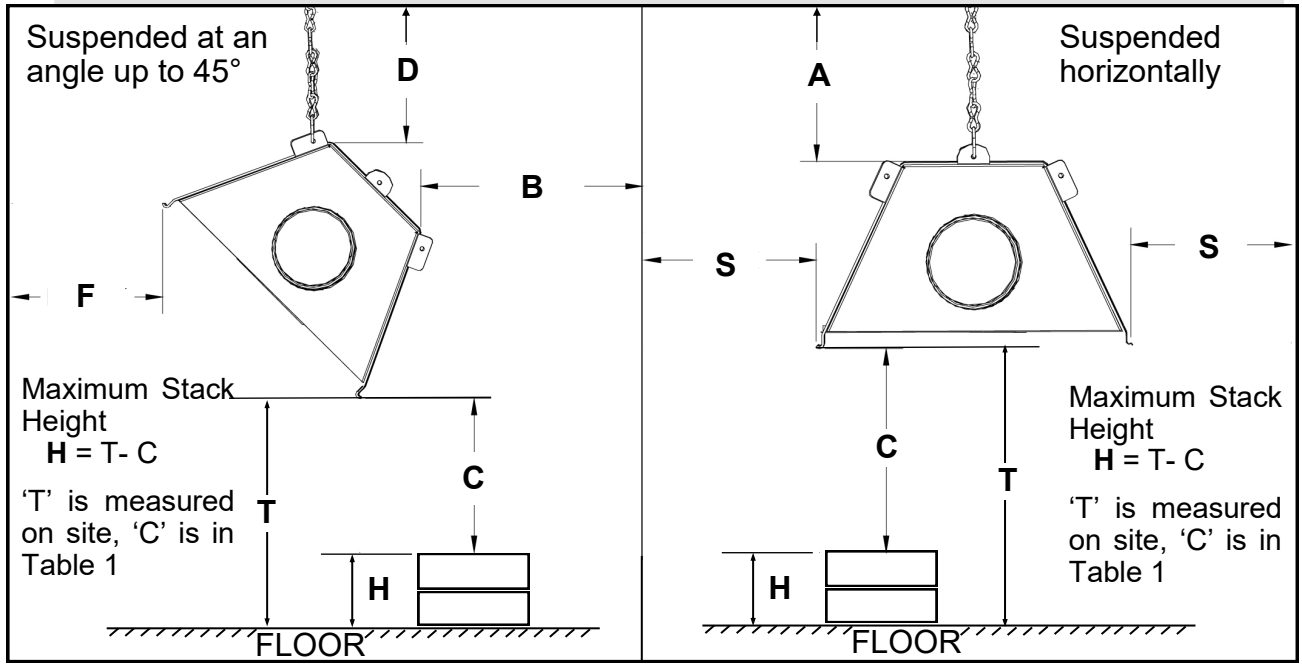
In locations used for the storage of combustible materials, signs must be posted to specify the maximum permissible stacking height to maintain the required clearances from the heater to the combustibles. Such signs must either be posted adjacent to the heater thermostats or in the absence of such thermostats in a conspicuous location. In addition to stored or stationary material, consideration must also be given to moveable objects such as cranes, vehicles, and overhead doors, and structural objects such as sprinkler heads, electrical and gas lines, and electrical fixtures.

It is beyond the scope of these instructions to consider all conditions that may be encountered. Consult local authorities such as the Fire Marshall, insurance carrier, or safety authorities if you are uncertain as to the safety or applicability of the proposed installation.

**Refer to Figure 1 and Table 1 for the certified clearances to combustibles for the appropriate model input/size.**

**FIGURE 1 MINIMUM CLEARANCES TO COMBUSTIBLES\*** - refer to Table 1 for values

**NOTE:** A 'PEEL & STICK' SIGN IS SUPPLIED: USE AN INDELIBLE MARKER TO ENTER VALUES 'H', 'S', 'F', & 'B' ON .  
 POST THE SIGN ADJACENT TO THE HEATER THERMOSTAT OR IN A PROMINENT LOCATION. See next page for details.



**TABLE 1 MINIMUM CLEARANCES TO COMBUSTIBLES\***

MODEL	SUSPENDED AT AN ANGLE UP TO 45 DEGREES				SUSPENDED HORIZONTALLY		
	D inches (cm)	B inches (cm)	F inches (cm)	C inches (cm)	A inches (cm)	S inches (cm)	C inches (cm)
STS-JZ / IQ 200	13 (33)	6 (15.2)	74 (188)	70 (178)	14 (36)	44 (112)	76 (193)
STS-JZ / IQ 175	12 (31)	6 (15.2)	72 (183)	68 (172)	13 (33)	42 (107)	74 (188)
STS-JZ / IQ 155	5.5 (14)	1 (2.5)	64 (163)	64 (163)	3.5 (9)	22 (48)	70 (178)
STS-JZ / IQ 130	4.5 (11)	1 (2.5)	60 (152)	60 (152)	3.3 (9)	21 (28)	65 (165)
STS-JZ / IQ 110	3.5 (9)	1 (2.5)	54 (137)	54 (137)	2 (5)	19 (25)	60 (137)
STS-JZ / IQ 100	6.5 (16.5)	1 (2.5)	57 (145)	68 (172)	6 (15)	22 (56)	68 (172)
STS-JZ / IQ 80	3 (8)	1 (2.5)	23 (59)	38 (97)	1.75 (5)	6 (15)	38 (97)
STS-JZ / IQ 60	2.5 (6)	1 (2.5)	17 (43)	34 (86)	1.5 (4)	5.5 (14)	34 (86)
STS-JZ / IQ 45	2.75 (7)	1 (2.5)	24 (61)	32 (81)	2.25 (6)	7 (18)	32 (81)

\*The clearance to combustible materials represents the minimum distance that must be maintained between the heater and a nearby surface. The stated clearance to combustibles represents a surface temperature of 90F° (50C°) above room temperature. .

**NOTE** that in the above table the clearances are measured from the reflector.

**It is the installer's responsibility to ensure that building materials with a low heat tolerance which may degrade at lower temperatures are protected to prevent degradation. Examples of low heat tolerance materials include vinyl siding, fabrics, some plastics, filmy materials, etc.**

**VENT END CLEARANCE:** Clearances from the vent pipe are determined by local or national installation codes, but must not be less than 6 inches (15 cm).  
For 'unvented' installation, a minimum distance of 48 inches (122 cm) is required from the end of heater to a combustible surface.



**WARNING**

**In locations used for the storage of combustible materials: Signs must be posted specifying the *maximum permissible stacking height* to maintain the required clearances from the heater to the combustibles.**

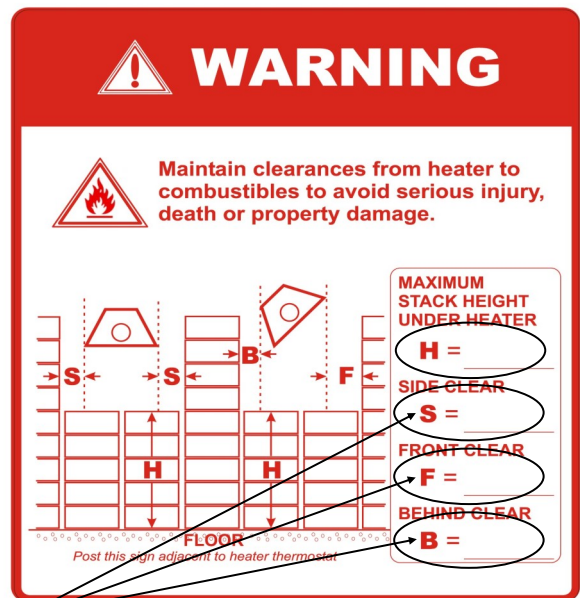
The signs must be posted either adjacent to the IR heating system thermostats or in the absence of such thermostats, in a conspicuous place.

**For your convenience a “peel and stick” sign is provided with this heater. Use a permanent marker to record the required dimensions on the sign.**

To calculate the value 'H': ( $H = T - C$ )

- Measure the on site distance between bottom of the heater and the floor = 'T' inches (cm).
- Refer to Table 1 to get the value 'C' that corresponds to the model you are installing
- Subtract the clearance below the heater 'C' from 'T' to get value 'H'.
- Enter this value 'H' on the sign.

Refer to the information for the heater model being installed in Figure 1 and Table 1 to get the values for dimensions 'S', 'F' and 'B'.



Post this sign as instructed above.



## 1. LABOR REQUIREMENTS

Two persons are required to safely install this equipment. Wear gloves and other required safety protection.

## 2. INSTALLATION IN COMMERCIAL AIRCRAFT HANGARS

Low intensity radiant tube heaters are suitable for use in aircraft hangars when installed in accordance with the latest edition of the Standard for *Aircraft Hangars*, ANSI/NFPA No 409 in the USA, or the Canadian *Natural Gas and Propane Installation Code*, B149.1.

- A. A minimum clearance of 10 ft (3 m) above either the highest fuel storage compartment or the highest engine enclosure of the highest aircraft which may occupy the hangar. The clearance to the bottom of the heater shall be measured from the upper surface of either the fuel storage compartment or the engine enclosure, whichever is higher from the floor.
- B. A minimum clearance of 8 ft (2.4 m) must be maintained from the bottom of the heater to the floor in other sections of the aircraft hangar, such as offices and shops, which communicate with areas for servicing or storage. Refer to Table 1 for proper mounting clearances to combustibles.
- C. Heaters must be located so as to be protected from damage by aircraft and other objects, such as cranes and movable scaffolding.
- D. Heaters must be located so as to be accessible for servicing and adjustment.

## 3. INSTALLATION IN COMMERCIAL GARAGES AND PARKING STRUCTURES

Low Intensity Heaters are suitable for use in commercial garages when installed in accordance with the latest edition of the Standard for *Parking Structures*, ANSI/NFPA 88A, or the Standard for *Repair Garages*, ANSI/NFPA No. 88B, or the Canadian *Natural Gas and Propane Installation Code*, B149.1.



### **WARNING**

An overhead heater shall be located high enough to maintain the minimum distance to combustibles, as shown on the heater rating plate, from the heater to any vehicles parked below the heater.

Overhead heaters shall be installed at least 8 ft (2.4 m) above the floor.

## 4. INSTALLATIONS OTHER THAN SPACE HEATING

Use for process or other applications that are not space heating will void the C.S.A. certification and product warranty. Process application requires field inspection and/or certification by local authorities having jurisdiction.



## WARNING



Improper installation, adjustment, alteration, service or maintenance can cause property damage, injury or death. Read and understand this installation and operation manual thoroughly prior to assembly, installation, operation or service to this appliance.



This heater must be installed and serviced only by a trained gas service technician.

Do not store or use gasoline or other flammable vapours and liquids in the vicinity of this or any other gas fired appliance.



Failure to comply could result in personal injury, death, fire and/or property damage.

Do not store or use gasoline or other flammable vapours and liquids in the vicinity of this or any other gas fired appliance.

## 5. PRE INSTALLATION SURVEY

It is recommended that a full heating design including heat loss calculation be conducted on the structure or area to be heated. Heater sizing and placement must consider available mounting height, sources of greatest heat loss, and the certified clearances to combustibles with respect to stored material, moveable objects (cranes, vehicles, lifts, overhead doors, etc), sprinkler system heads, and other obstructions on the site. Consideration must also be given to vent / duct placement and the allowable combined lengths of vent and duct. Carefully survey the area to be heated, and for best results place burner and combustion chamber in the coldest area(s) .

Installation must conform with all local, state, provincial and national code requirements including the current latest edition ANSI Z223.1 (NFPA 54) in the U.S.A. and B149.1 installation code in Canada, for gas burning appliances and equipment. The latest edition Electrical Code ANSI/NFPA N0 70 in the U.S.A. and PART 1 CSA C22.1 in Canada must also be observed.

The heating system must have gas piping of the correct diameter, length, and arrangement to function properly. For this reason, a layout drawing is necessary.

## **6. MOUNTING CLEARANCES**

This heater must be mounted with at least the minimum clearances between the heater and combustibles as shown in FIG-1, TABLE 1, Page 7. It is the installer's responsibility to ensure that building materials with a low heat tolerance which may degrade at lower temperatures are protected to prevent degradation. Examples of low heat tolerance materials include vinyl siding, fabrics, some plastics, filmy materials, etc.

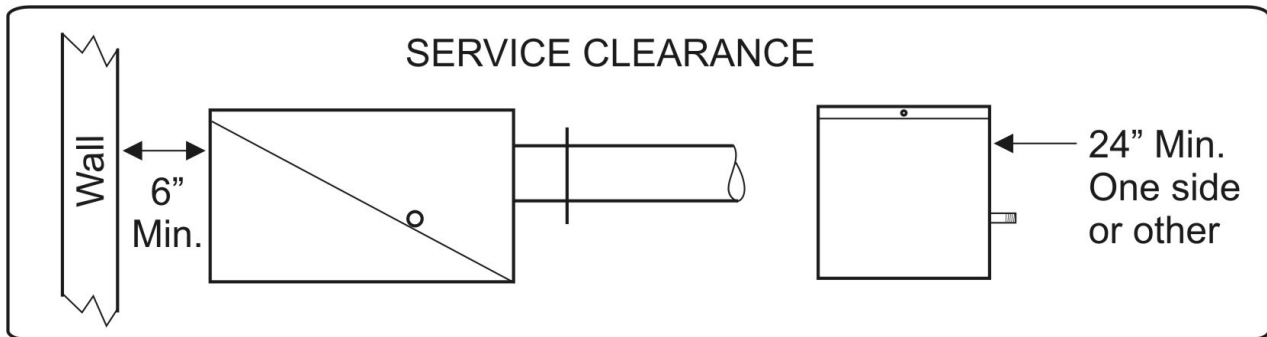
Positioning of lights, sprinkler heads, overhead doors, storage areas, gas and electrical lines, parked vehicles, cranes and any other possible obstruction or hazard must be evaluated prior to installation.

**Ensure adequate clearance around the air intake at the burner to allow sufficient combustion air supply to the heater.**

**6A. SERVICE CLEARANCE:** The lower 'jaw' of the burner cabinet swings down to provide convenient service access to burner components. Provide a minimum clearance from any wall or obstruction of 6 inches (15 cm) to the access end of the burner housing, and a minimum of 24 inches (61 cm) to any ONE side to allow servicing of burner, blower and controls. (see Figure 2 below) - the minimum clearances to combustibles must always be maintained.

For guidelines to heater placement refer to TABLE 2 (next page).

**FIGURE 2**



## 7. GUIDELINES FOR HEATER PLACEMENT

**TABLE 2: GUIDELINES FOR HEATER PLACEMENT**

MODEL “Straight” or “U-Tube”	MOUNTING HEIGHT ft (m)	MAXIMUM DISTANCE BETWEEN HEATERS ft (m)	DISTANCE – OUTSIDE WALL TO HEATER LONG AXIS (PARALLEL TO WALL) IN “FEET”	
			HORIZONTAL ft (m)	ANGLE
STS-JZ / IQ 200	18 – 25 (6 - 8)	50 (15)	17 – 25 (5 - 8)	COMBUSTIBLE CLEARANCE BEHIND (refer to Table 1)
STS-JZ / IQ 175	18 – 25 (6 - 8)	50 (15)	17 – 25 (5 - 8)	
STS-JZ / IQ 155	16 – 21 (5 - 7)	45 (14)	15 – 20 (5 - 7)	
STS-JZ / IQ 130	15 – 21 (5 - 7)	40 (12)	15 – 20 (5 - 7)	
STS-JZ / IQ 110	13 – 19 (4 - 6)	35 (11)	13 – 18 (4 - 6)	
STS-JZ / IQ 100	13 – 19 (4 - 6)	35 (11)	13 – 18 (4 - 6)	
STS-JZ / IQ 80	10 – 16 (3 - 5)	30 (9)	12 – 16 (4 - 5)	
STS-JZ / IQ 60	8 – 14 (2.5 - 5)	25 (8)	11 – 15 (3.4 - 5)	
STS-JZ / IQ 45	8 – 12 (2.5 - 4)	20 (6)	8 – 12 (2.5 - 4)	

- \* GUIDELINE MOUNTING HEIGHTS are typical to provide optimum comfort in general space heating applications. Variance to these typical heights can occur in some applications:
- Higher mounting heights due to structure or application requirements
  - Lower mounting heights: Area or ‘spot’ heat; locations with sufficient horizontal separation distance from personnel; areas with greater infiltration losses (near overhead doors, etc)



**IMPORTANT:** Single or multiple heater placement must be such that continuous operation of heater(s) will not cause combustible material or materials in storage to reach a temperature in excess of ambient temperature plus 90F° (50C°).

**It is the installer’s responsibility to ensure that building materials with a low heat tolerance which may degrade at lower temperatures are protected to prevent degradation. Examples of low heat tolerance materials include vinyl siding, fabrics, some plastics, filmy materials, etc.**

**Refer to “Clearance to Combustibles” information on pages 6 to 8, and Figure 1 and Table 1.**

## 8. TURBULATOR LENGTH & LOCATION IN SYSTEM:



**NOTE:** Improper location of a turbulator can cause malfunction of the heater, property damage, and will void the heater warranty.

Tubes with turbulators are clearly labeled for easy identification. Models with asterisk refer to notes below the table.

*See next page for an illustration of turbulator length and location.*

**TABLE 3: TURBULATOR LENGTH & LOCATION IN SYSTEM:**

GAS TYPE	MODEL x Length (ft)	TURBULATOR LENGTH(S)
NG or Propane	45 x 20	39" + 96"
NG or Propane	60 x 20	39" + 96"
NG or Propane	60 x 30 <sup>1</sup>	96" <sup>1</sup>
NG or Propane	80 x 20	39" + 96"
NG or Propane	80 x 30 <sup>1</sup>	96" <sup>1</sup>
NG or Propane	80 x 40	24" + 109"
NG ONLY	100 x 20	Stamped S/S
NG or Propane	110 x 30	60" + 96"
NG or Propane	110 x 40	24" + 109"
NG or Propane	110 x 50	24" [3rd Tube]
NG ONLY	130 x 30	60" + 96"
NG or Propane	130 x 40	24" + 109"
NG or Propane	130 x 50	24" [3rd Tube]
NG or Propane	155 x 40	24" + 109"
NG or Propane	155 x 50	24" [3rd Tube]
NG or Propane	155 x 60	24" [3rd Tube]
NG or Propane	175 x 50/60 <sup>2</sup>	40" + 72" <sup>2</sup>
NG ONLY	175 x 70 <sup>2</sup>	40" + 72" <sup>2</sup>
NG ONLY	200 x 50	40" + 72"
NG or Propane	200 x 60/70 <sup>3</sup>	40" + 72" <sup>3</sup>

### TURBULATOR FOOTNOTES:

- 60 / 80 x 30'**: Remove 5 ft section of turbulator from the aluminized steel tube (2nd tube in system); install tube with 96" turbulator at the vent end of the system
- 175 Propane x 60'**: Install tube with turbulators as **5th tube** in the system  
**175 NG x 60' & 70'**: Install tube with turbulators as **6th tube** in the system
- 200 x 60' & 70'**: Remove 40" piece of turbulator from the upstream end of tube with turbulator, and install the tube with turbulator as the **6th tube** in the system

### FIGURE 3: TURBULATOR LENGTH & LOCATION IN SYSTEM:



**NOTE:** Improper location of a turbulator can cause malfunction of the heater, property damage, and will void the heater warranty.

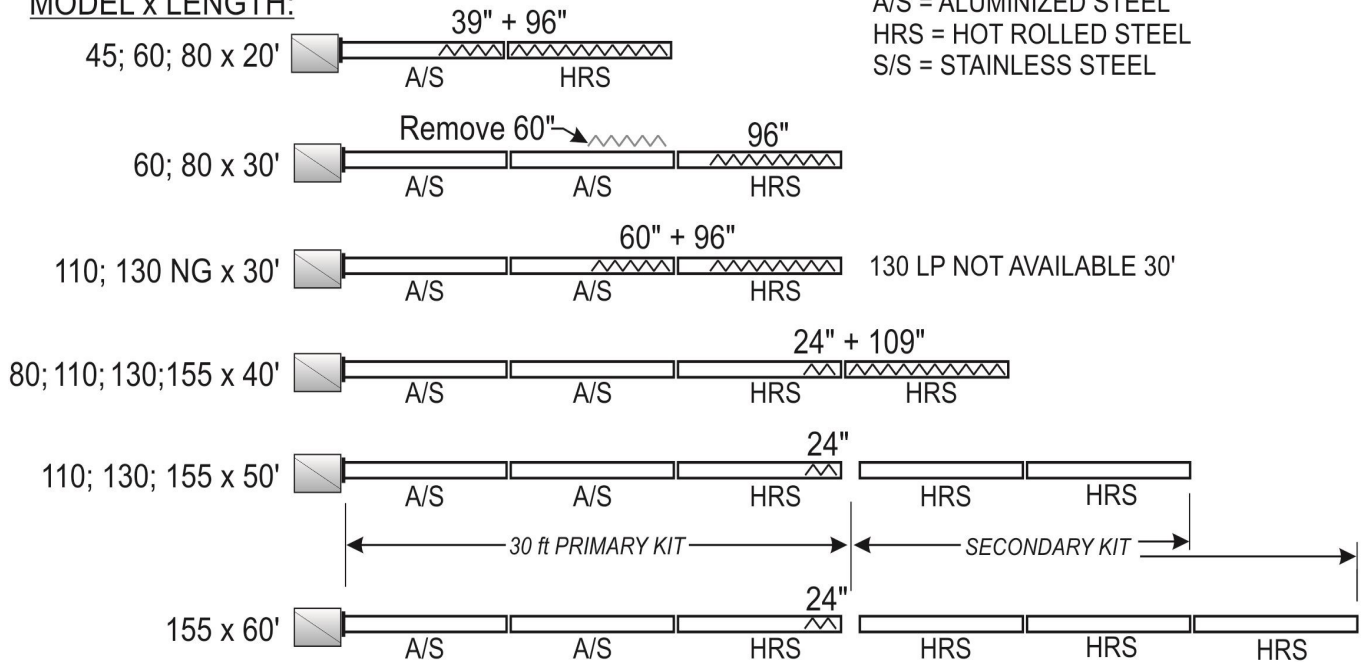
Tubes with turbulators are clearly labeled for easy identification. Models with asterisk refer to notes below the table.

#### SINGLE STAGE

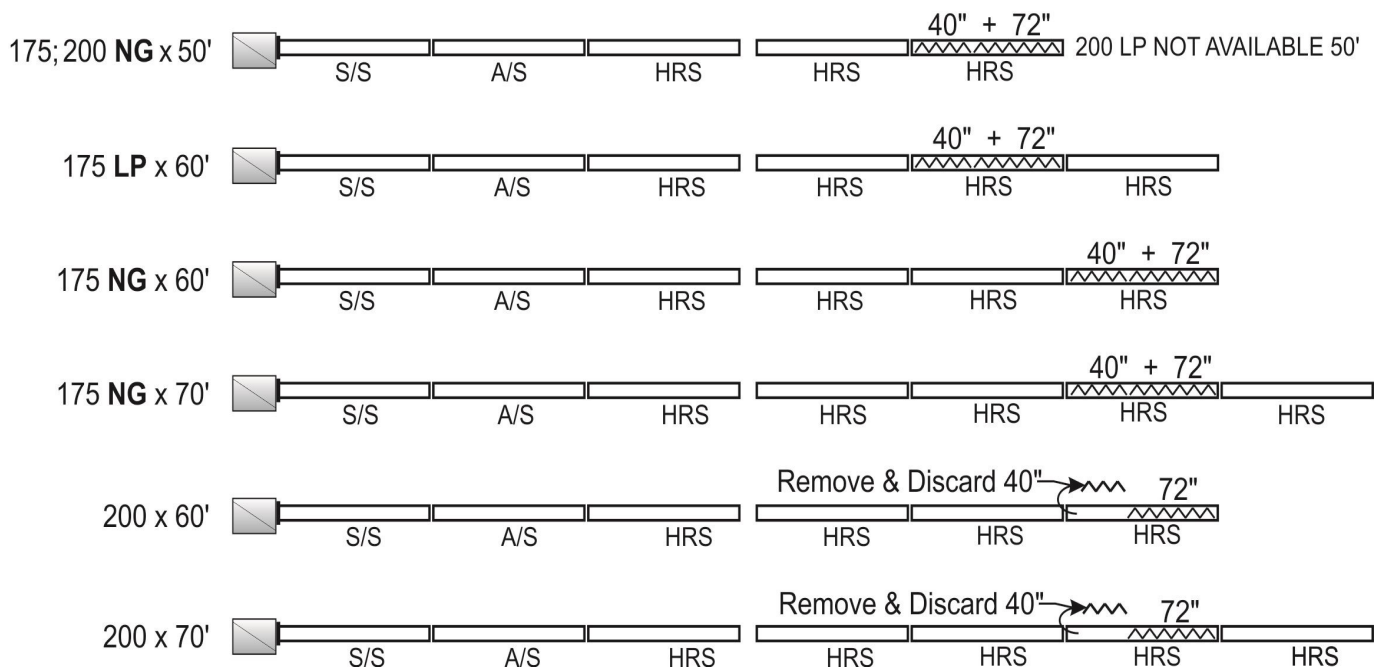
##### MODEL x LENGTH:

##### TUBE MATERIAL LEGEND:

A/S = ALUMINIZED STEEL  
 HRS = HOT ROLLED STEEL  
 S/S = STAINLESS STEEL



**NOTE: FOR FOLLOWING MODELS TUBE WITH TURBULATOR IS PACKAGED IN THE 30 FT PRIMARY TUBE KIT**



## 9. FLUE VENTING - RADIANT TUBE HEATER



### IMPORTANT

**Effective January 1, 2019: Changes to the ANSI/CSA standard that governs Radiant Tube Heaters specify the following appliance CATEGORIES and VENTING:**

- **Vertical Vent Through Roof (Category I):** For vertical vent, this tube heater series operates with a negative static vent pressure and a vent temperature that does not result in excessive condensate in the vent and is defined as a Category I appliance. Refer to details below.
- **Horizontal Vent Through Wall (Category III):** For horizontal vent, this tube heater series operates with a positive static vent pressure and a vent temperature that does not result in excessive condensate in the vent and is considered a Category III appliance. Refer to details below.



### WARNING

Inadequate venting of a heater may result in asphyxiation, carbon monoxide poisoning, injury or death. This heater may use a vent connection or indirect venting system to remove products of combustion from the space. Seal all vent connections with high temperature sealant. Venting must be in accordance with all local, state, provincial, and national codes (ANSI Z223.1/NFPA 54 in USA; B149.1 in Canada) and as indicated below in this manual.



**THIS TUBE HEATER IS CERTIFIED FOR VENTING DIRECTLY TO THE OUTSIDE OR UNVENTED (INDIRECT VENTING) APPLICATIONS.**

### UNVENTED (INDIRECT MECHANICAL VENTING SYSTEM)

**USA:** Natural or mechanical means shall be provided to supply and exhaust at least 4ft<sup>3</sup>/min/1000Btuh (0.38m<sup>3</sup>/min/kW) input of installed heaters. Some local codes may require an electrical interlock to a dedicated exhaust fan. Exhaust must be located as high as practicable in the structure above the level of the heater(s). Consult your local code and ANSI Z223.1 latest edition for all venting requirements and practices.

**Canada:** It is required that the heater(s) be electrically interlocked to dedicated exhaust fan(s) by means of an Air Proving Switch. Exhaust fan(s) must be sized to create 300 cfm (8.5 cu m/min) exhaust for every 100,000 Btuh (30 kW) or any fraction thereof of total input of installed equipment. Exhaust must be located as high as practicable in the structure above the level of the heater(s). Sufficient supply air must be provided. Consult the latest edition of CSA.B149.1 Section 8 for venting system and air supply requirements.

### VENTED TO THE OUTSIDE - GENERAL REQUIREMENTS

It is the responsibility of the installer to adhere to these instructions and all current local codes and/or ANSI Z223.1 (NFPA 54) or CSA.B149.1 latest editions for all venting requirements, and practices. All vent pipe will be certified to meet Category I (vertical vent) or Category III (horizontal vent) appliance requirements, depending on the vent configuration of a particular installation.

It is a normal condition that during heat-up and cool-down a tube heater will expand and contract. Allowances for heater expansion must be made in the venting and combustion air ducting. Improper installation can result in property damage, injury or death.

- When vented: The system must not be operated in a negative air condition unless combustion air is ducted from outside to the burner. If negative pressure is experienced or anticipated, the open port (barb) on each of the blocked flue and proving air switches must be Tee'd together and connected directly to outside air using a field supplied 1/4" plastic hose from the tee between the switches to outside of building.
- All approved vent pipe, connectors, and adapters are supplied locally by others according to

appliance Category, and specifications below.

- All venting must meet requirements of Local Codes or, in the absence of local codes, with the *National Fuel Gas Code*, ANSI Z223.1/NFPA 54; or the *Natural Gas and Propane Installation Code* CSA B149.1.
- A vent connector shall comply with local codes and be firmly attached to the flue collar by 3 x 1/2" sheet metal screws. Seal penetrations and connections with high temperature RTV silicone sealant.
- Install a minimum 12" [305 mm] straight vent connector before any Tee or 90° Elbow.
- The connection of vent components must be secured as specified in the installation instructions by the vent manufacturer.
- For vertical vent, any horizontal vent section will slope upwards away from the heater not less than 1/4 inch rise per foot of run.
- For horizontal vent, slope downward away from heater a maximum of 1/4 inch down per foot of run.
- When the vent pipe passes through a cold or unheated area where the ambient temperature is likely to produce condensation of the flue gases, the vent pipe will be insulated with a suitable material as certified and specified by the insulation manufacturer to withstand temperature up to 460°F (238°C).
- The vent system must **always** be adequately supported to prevent sagging.
- The vent configuration will allow for expansion and contraction in length of the tube heater.
- As an Option for vertical vent, two heaters may be vented through an approved common 4" x 4" x 6" Vent Tee (10 x 10 x 15 cm), supplied by the manufacturer, or by using approved components as indicated in local codes. Vent pipe from each heater is not required to be equidistant to the vent Tee, but must comply with local code requirements. A common thermostat or "ON/OFF" switch must control commonly vented heaters. **Common vent is not allowed for Category III horizontal vent application.**

#### **COMBINED SYSTEM LENGTH: Tube Heater + Vent + Combustion Air Duct:**

- **Refer to Table 4 next page, COMBINED SYSTEM LENGTH: TUBE + AIR DUCT + VENT.** Lengths in the table apply to either Vertical or Horizontal vent.
- **COMBINED SYSTEM LENGTH includes:** Tube Heater length + combustion air duct + vent + elbows. Each 90° elbow in the system has an equivalent length of 5 ft.
- A maximum of 2 elbows is allowed in any portion (duct, tube heater, vent) with the exception of up to three 90° elbows in a vertical vent run through the roof, for a total of maximum 6 (vertical vent: 7) 90° elbows in the combined system.
- Combustion air duct is not to exceed lengths in table below and may be 4" or 5" diameter for inputs less than 200,000 Btuh, but must be 5" diameter for inputs 200,000 Btuh and greater.
  - 5" diameter duct requires a reducer to 4" diameter at the connection to blower inlet.
- Exceeding the allowable lengths in the table below can create combustion and/or condensation issues and will void Certification and the heater warranty.
- Do not exceed the **Maximum Combined System Length** regardless of the allowed maximum length of individual vent or combustion air duct.



**TABLE 4 COMBINED SYSTEM LENGTH: TUBE + AIR DUCT + VENT**

*Installations up to 4500 ft - Higher altitudes refer to Section 27*

High Input Rate (Btuh)	Do Not Exceed Maximum Combined System Length		Max. Air Duct Length (by Duct Diameter)		Max. Vent Length Individual: 4"Ø OR Combined: 6"Ø from each heater	Example
	Using 4" Air Duct	Using 5" Air Duct	4" Ø	5" Ø		
45,000 & 60,000	<b>60 ft</b>	<b>80 ft</b>	20 ft	40 ft	20 ft	<b>150,000 Btuh Heater:</b> Tube Heater Length      50 ft 1 x 90° elbow (vent)      5 ft Straight vent              20 ft 1 x 90° elbow (duct)      5 ft Air Duct: 4" Ø <u>17 ft</u> Combined Length          97 ft Max. Allowed              100 ft Additional 20' for 5" Ø Air Duct
80,000	<b>70 ft</b>	<b>90 ft</b>	20 ft	40 ft	20 ft	
110,000 to 150,000	<b>100 ft</b>	<b>120 ft</b>	30 ft	50 ft	30 ft	
175,000	<b>120 ft</b>	<b>140 ft</b>	30 ft	50 ft	40 ft	
200,000	-	<b>130 ft</b>	Use 5"Ø	30 ft	40 ft	

**HEATER EXPANSION AND VENT CONFIGURATION**

A radiant tube heater will expand and contract as it heats and cools. Configuration of the vent must allow for heater expansion.

**VERTICAL VENT:** Orientation of the vent at 90° to heater will allow for heater expansion and contraction.

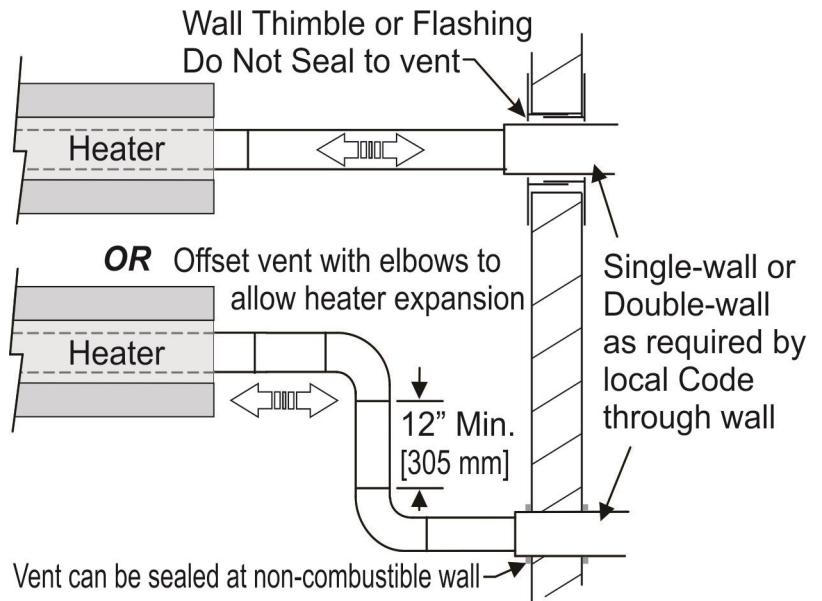
**HORIZONTAL VENT:** (See FIG. 4)

- Wall Thimble or flashing at wall that allows movement of the vent through the opening. Do not seal the vent to the thimble or flashing with caulking.

OR

- Offset vent with two x 90° elbows. Install minimum 12 inch [305 mm] length of straight vent between elbows. Vent can be sealed with caulking at non-combustible wall.
- Other means of slip fit installation of the vent are acceptable providing there is adequate allowance for free expansion and contraction of the system, and free flow of vent gases.

**FIGURE 4: ALLOW FOR HEATER EXPANSION - HORIZONTAL VENT - TOP VIEW**



**COMMON VENTING**

For vertical vent only, two heaters can be commonly vented using 4"x 6"x 4" Vent Tee JA- 0514-XX. Both heaters must be operated using one common thermostat. Common vent is 6 inch [150 mm] diameter.

Category III (horizontal vent) heaters cannot be common vented.

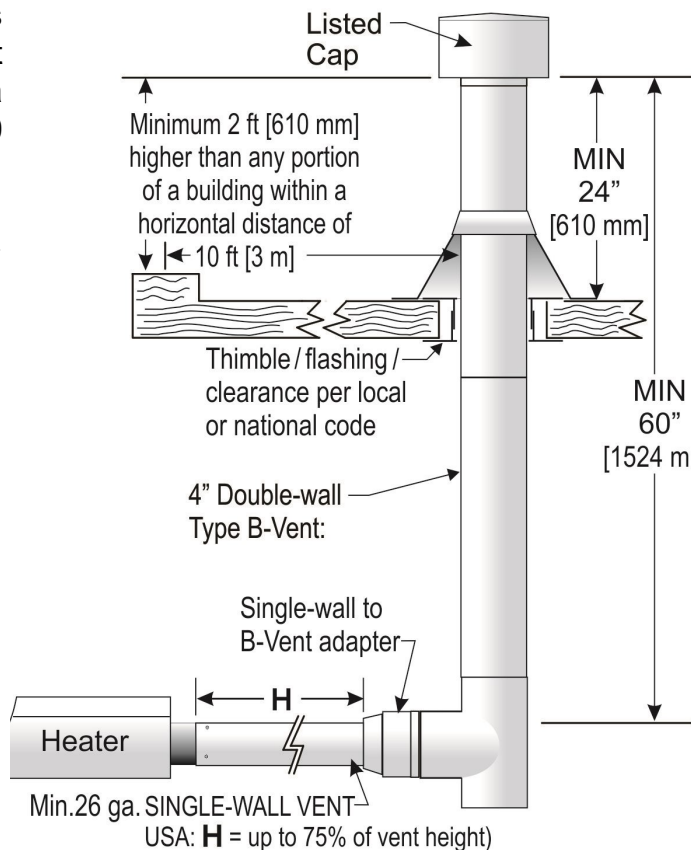
## VERTICAL VENT THROUGH THE ROOF (CATEGORY I):

It is the sole responsibility of the installer to adhere to all current local codes and/or ANSI Z223.1 / CSA.B149.1 latest editions for all venting requirements, and practices. Also adhere to instructions below, and the instructions of the vent manufacturer. Use vent materials certified for Category I.

All models of this series heater are certified Category I for vertical venting. See FIG. 5.

- The vertical Type B-vent must extend at least 5 feet [1524 mm] above the flue collar of the highest connected heater.
- USA: Horizontal run of single wall vent or vent connector (“H” in FIG. 5) must not exceed 75% of the vertical height of the vent. If it does, then the vent system must be for Category III.
- Single wall vent connector material must be corrosion-resistant galvanized steel with a minimum thickness specified in local code.
- A vent connector must be secured to the flue collar using quantity 3 x #8 x 1/2” sheet metal screws. Seal penetrations and connections with high temperature RTV silicone sealant.
- A horizontal vent connector shall be installed and supported without any dips or sags and shall slope upward toward the vent or chimney at least 1/4 in./ft (20 mm/m).
- Use a certified termination cap as supplied by the manufacturer of the vent.
- When vent and combustion air are taken through the roof, the exhaust vent should always terminate higher than the combustion air intake, to prevent recycling the products of combustion back into the heater.
- The vent must extend at least 2 feet [610 mm] above the highest point where it passes through a roof. The vent must also extend at least two feet higher than any portion of a building within a horizontal distance of 10 feet [3 m].
- Keep vent connector runs as short as possible with a minimum number of elbows. Refer to the current edition of ANSI Z223.1 (NFPA 54) or CSA-B149 installation codes for maximum length of horizontal vent and vent connector.
- Total length of the vent connector and vent pipe cannot exceed the values in Table 4 above.
- A single-wall vent connector shall not be insulated.
- For single-wall vent clearance to combustibles is 6" [152mm] except where a listed clearance thimble is used. Clearance to combustible material for Type B-Vent or factory-built vent per the vent manufacturer's instructions.
- When an existing Category I heater is removed or replaced, the original venting system may no longer be sized to properly vent the attached appliances. Improperly sized venting systems can result in vent gas leakage or condensation.

**FIGURE 5: VERTICAL VENT**



### **HORIZONTAL VENT THROUGH THE SIDEWALL (CATEGORY III):**

All vent must be installed in accordance with local codes or, in the absence of local codes, with the *National Fuel Gas Code* in the USA, ANSI Z223.1/NFPA 54; or the *Natural Gas and Propane Installation Code* CSA B149.1 in Canada.

When installed with a horizontal vent through a sidewall, this heater is a Category III appliance, and the vent system must be approved for Category III application in accordance with UL-1738 or ULC-S636. Do not use PVC or plastic vent pipe.

- Use either a certified Category III venting system, or single wall vent pipe with all of the joints and seams sealed with a heat-resistant pliable sealant.
- The vent system must be installed in accordance with these instructions, and the instructions of the vent manufacturer.
- A single wall vent system may use a single continuous 36 inch section of double wall vent pipe to pass through an exterior wall:
  - Single wall galvanized vent pipe (C-Vent): Minimum 26 ga.
  - Single Wall to Double Wall Adapter: Duravent 4PVP-AD Adapter or equivalent.
  - 36 Inch Double wall vent through outside wall: Duravent PelletVent Pro (PVP) or equivalent:
- Single-wall vent: Seal all joints and seams in the pipe, and the adapter with high temperature Red RTV sealant for temperatures up to 600°F [315°C]. The sealant must remain pliable when in use. Follow the instructions of the vent manufacturer for sealing vent pipe connections.
- All vent sections and vent connector must be secured using quantity 3 x #8 x 1/2" sheet metal screws. Seal penetrations and connections with high temperature RTV silicone sealant.
- Any horizontal portion of the flue vent system must slope downwards away from the heater a minimum of 1/4" per foot run [63 mm/ 300 mm] toward the vent terminal.
- Horizontally vented Category III heaters must be individually vented and cannot use a common vent.
- Use approved 4" [102 mm] (JA-0528-XX) horizontal wall vent terminal or an approved high-wind termination cap.
- Installation of the vent must prevent blockage by snow and protect building materials from degradation by flue gases.
- Install termination cap a minimum of 18 inches (45 cm) from the outside wall to the inside edge of terminal opening to alleviate back pressure caused by turbulent wind conditions (See Fig. 8). This also ensures flue gases are directed away from the structure to protect building materials from degradation by the exhausted flue gases.
- At most two 90° elbows can be installed in a horizontal vent.
- All seams and joints must be checked for gas tightness after installation. With the heater in operation, conduct a leak test on all vent connections, joints, and seams using a soap solution.
- A horizontal flue vent will not terminate less than 1 ft [30 cm] above grade level, unless its location is adjacent to a public walkway, then it must not terminate less than 7 ft [2.1m] above the walkway.
- Clearance above vent terminal under a combustible overhang or soffit:
  - As indicated in FIG. 6 for approved terminations: 4" [100 mm] JA-0528-XX.
  - For other approved terminations: Will terminate 3 ft [915 mm] or more below a combustible soffit or overhang.
- A horizontal vent termination must be a minimum of 6 feet [1830 mm] from an inside corner formed by two exterior walls.
- All vent pipe, adapters, thimbles, supplied locally by others.

Specific requirements for horizontal vent in the USA and Canada are on the next page.

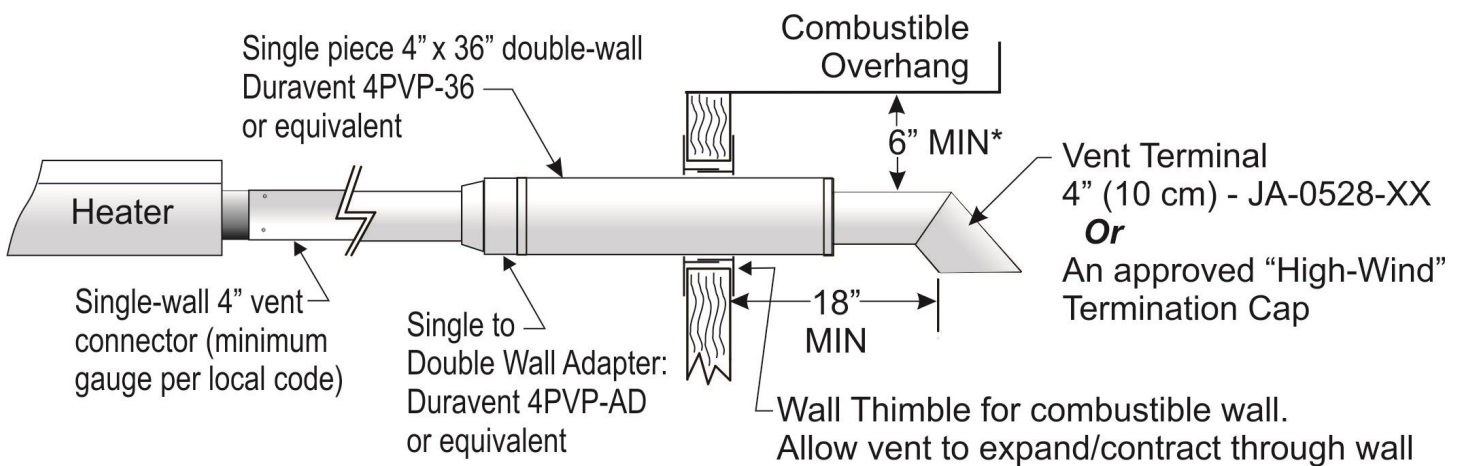
**USA specific horizontal vent requirements:**

- The vent terminal of an appliance with an input up to 50,000 Btu/hr (14.7kW) shall be installed with a 9 inch [230mm] vent termination clearance from any air opening into a building, and an appliance with an input over 50,000 Btu/hr (14.7kW) shall have at least a 12 inch [305 mm] vent termination clearance. The bottom of the vent terminal and the air intake shall be located at least 12 inches [305 mm] above grade.
- A horizontal vent will not terminate:
  - Less than 3 ft [915 mm] above a mechanical air inlet located within 10 ft [3 m].
  - Less than 4 ft [1219 mm] below, 4 ft [1219 mm] horizontally from, and 1 ft [102 mm] above any window or door that opens, or gravity air inlet to a building.
  - Less than 4 ft [1219 mm] horizontal clearance from gas and electric meters, regulators and relief equipment.

**CANADA specific horizontal vent requirements:**

- A horizontal vent will not terminate:
  - Within 6 ft [1830 mm] of a mechanical air supply inlet to any building.
  - Above a gas utility meter and regulator assembly within 3 ft [915 mm] horizontally of the vertical centerline of the regulator vent outlet to a maximum vertical distance of 15 ft [4.5 m].
  - Within 3 ft [915 mm] of any gas pressure regulator vent outlet.
  - Within the following distances of a window or door that can be opened in any building, of any non-mechanical air-supply inlet to any building, or of the combustion air inlet of any other appliance:
    - 12 inches [305 mm] for inputs up to and including 100,000 Btuh (30 kW).
    - 3 ft [915 mm] for inputs exceeding 100,000 Btuh (30 kW).

**FIGURE 6: HORIZONTAL VENT THROUGH WALL**



\* 6" Clearance above optional Vent Terminal JA-0528-XX - 4" (10 cm). Use of alternate High-Wind terminal may require higher clearance. Refer to Vent Cap manufacturer's instructions.

## 10. COMBUSTION AIR DUCTING

**Do not install filters on the combustion air intake.**

**Ensure adequate clearance at the burner air intake for sufficient combustion air supply.**

**Do not drop the level of the air intake below the level of the heater.**

When tube heater is vented to the outside and operated in a negative air condition or air-borne dust or contaminants are present (woodworking, welding shops, etc) air for combustion must be ducted from outside the negative pressure or contaminated area to the 4 inch (100 mm) diameter intake flange on the blower. **NOTE: 200,000 Btuh burner requires 5" [125 mm] air duct reduced to 4" [100 mm] at the collar on the blower.** Combustion air duct must be of noncombustible material. Maximum system, vent and duct lengths are listed in Table 4 above.

- The total system length and individual flue vent or the combustion air duct is not to exceed the lengths listed above
- Total combined system length is reduced by five feet for every 90° elbow installed in the vent or duct *and* in the tube system (see above for allowable total lengths)
- Exceeding the allowable lengths may create condensation or soot conditions and will void CSA Design Certification and product warranty

The air intake will not be located less than:

- Three feet above grade
- Twelve inches from flue vent terminal of any heater with input up to 100,000 Btu/hr
- Three feet from flue vent terminal of any heater over 100,000 Btu/hr

This heater has an optional fresh air intake duct hood for wall (JS-0532-VC) or roof cap (JS-0530-XX) to bring combustion air to the heater from outside. Ensure adequate clearance around the air intake to allow sufficient combustion air supply to the heater. If drawing fresh air from outside, it is recommended that any single wall pipe containing cold air be insulated to prevent or reduce condensation on the pipe.

**CAUTION:** If a tube system is indirectly vented, ensure that warm moist outside air is not drawn through the air duct and tube system during summer months - condensation can occur inside the system and cause damage.

**Do not use flexible dryer hose** or any 'soft wall' tubing for air inlet duct, the corrugated sides of this tubing restrict air flow. A good quality industry approved insulated flex duct is allowed for lengths up to 10 feet - ensure duct is straight or has uniform bends to minimize friction.



**CAUTION:** In locations where chlorinated Hydrocarbons are in use, such as Trichloroethylene or Chloroethylene Nu it is essential that combustion air be brought in from a non-contaminated area. Burning the fumes from these gases will create Hydrochloric acid fumes, which are detrimental to humans, equipment and buildings. Typical sources of other contaminants are paint removers, paints, refrigerants, solvents, adhesives, degreasers, lubricants, pesticides, etc.



The heater manufacturer cannot anticipate all types and chemical composition of possible contaminants at project sites. Confer with project site safety, health and engineering staff and/or local authorities having jurisdiction such as the Fire Marshall and Department of Labor for possible contaminants and any conflict with the installation of hot surface heating equipment.

## 11. GAS SUPPLY - HEATER EXPANSION - GAS CONNECTION

The gas supply must be installed to the heater using:

- **USA:** an approved Stainless Steel Flexible Gas Connector certified for use on an infrared radiant tube heater (ANSI Z21.24 CSA 6.10);
- **CANADA:** an approved Type 1 Hose Gas Connector (CAN/CGA 8.1).
- The heater must be isolated from the gas supply piping system by closing its individual manual shut off valve (field supplied) during any pressure testing of the gas supply piping system.

**CAUTION:** Compensation for normal gas supply pipe expansion, and radiant tube heater expansion must be provided. All piping must conform to local codes—



Provide a 1/8 in (3.2 mm) NPT plugged tapping, accessible for test gauge connection, immediately upstream of the gas supply connection to the heater.

**DO NOT** use pressure greater than 1/2 psig to pressure check the heater.



*TEST FOR LEAKS: All gas piping and connections must be tested for leaks after the installation is completed.*

Apply soap suds solution to all connections and joints and if bubbles appear, leaks have been detected and must be corrected. **DO NOT USE A MATCH OR OPEN FLAME OF ANY KIND TO TEST FOR LEAKS. NEVER OPERATE THE HEATER WITH LEAKING CONNECTIONS.**



The supply system should be checked first with heater turned “OFF” followed by another check with heater turned “ON”.



**IMPORTANT:** Minimum supply line pressure at the inlet to the heater regulator must not be lower than 5.0 inches of water column pressure for natural gas. The supply gas pressure must be checked with all heaters in operation.

Installation of a gas line (trap) “drip leg” is required at the inlet connection tee following the pipe drop to the heater. Failure to provide a “drip leg” could result in condensation and foreign matter passing into the gas valve. Failure to install a “drip leg” in the gas line can cause property damage, injury or death and will void the heater warranty.



**TABLE 5: GAS SUPPLY AND MANIFOLD PRESSURES**

GAS TYPE	<u>LINE PRESSURE</u> INCHES WATER COLUMN		<u>MANIFOLD PRESSURE</u> (tap at gas valve outlet) INCHES WATER COLUMN
	MINIMUM	MAXIMUM	
Natural Gas	5.0	14.0	3.5
Propane	11.0	14.0	10.0

**NOTE:** Access to the manifold pressure test port is on the top of the valve. A 3/16" Allen Wrench is necessary to check this. When checking or setting the manifold pressure, a **water manometer** should be used. Gauges which measure in ounces per square inch or pounds per square inch are not accurate enough to properly measure or set the pressure.

 **WARNING**



**THIS HEATER WILL EXPAND IN LENGTH AS IT HEATS UP.** It is a normal condition that during heat-up and cool-down a tube heater will expand and contract. Allowances for heater expansion must be made in the gas connection, venting and combustion air ducting. Improper installation, alteration, or adjustment can result in property damage, injury or death.




The Btuh input and the tube length determine the overall expansion that occurs. A typical infrared tube installation will expand toward both the Burner and the vent end.



To allow heater expansion the gas supply must be installed using:

**In the USA:** a stainless steel Flexible Gas Connector certified for use on an infrared radiant tube heater (ANSI Z21.24 CSA 6.10);

**in CANADA:** a Type 1 Hose Connector (CAN/CGA 8.1). Also the flue vent, and combustion air intake (if used) must be installed in such a manner that the normal expansion of the heater will be accommodated.

 **IMPORTANT:** See next page: orientation of connection between heater and gas supply.

**TABLE 6: HEATER EXPANSION & FLEXIBLE GAS CONNECTOR**

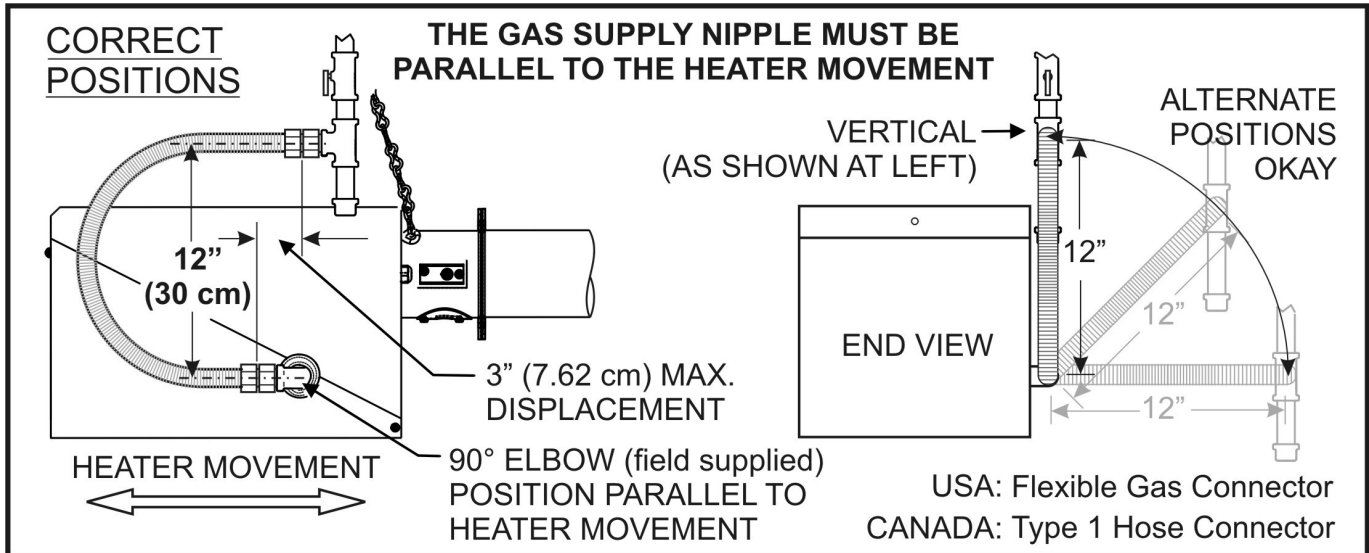
Input Rating Btuh	Tube Length Feet	Approx. Expansion in Length	USA: Mandatory Flexible Gas Connector ID x Length - Part #	CANADA: Mandatory Type '1' Gas Hose Size - Part #
40,000	10 U	1"	1/2" x 24" - JL-0771-XX	1/2" x 36" - JL-0771-RC
45,000	20	1 1/4"	1/2" x 24" - JL-0771-XX	1/2" x 36" - JL-0771-RC
60,000	20 / 30	1 1/2"	1/2" x 24" - JL-0771-XX	1/2" x 36" - JL-0771-RC
80,000	20 / 30 / 40	1 3/4"	1/2" x 24" - JL-0771-XX	1/2" x 36" - JL-0771-RC
100,000	20	2"	1/2" x 24" - JL-0771-XX	1/2" x 36" - JL-0771-RC
110,000	30 / 40 / 50	2"	1/2" x 24" - JL-0771-XX	1/2" x 36" - JL-0771-RC
125,000	30 / 40 / 50	2"	1/2" x 24" - JL-0771-XX	1/2" x 36" - JL-0771-RC
150,000	40 / 50 / 60	2 1/2"	3/4" x 36" - JL-0771-YY	3/4" x 36" - JL-0771-RB
175,000	50 / 60 / 70	2 3/4"	3/4" x 36" - JL-0771-YY	3/4" x 36" - JL-0771-RB
200,000	50	2 3/4"	3/4" x 36" - JL-0771-YY	3/4" x 36" - JL-0771-RB
200,000	60 / 70	3 1/4"	3/4" x 36" - JL-0771-YY	3/4" x 36" - JL-0771-RB

## FIGURE 7 ORIENTATION OF FLEXIBLE GAS CONNECTOR

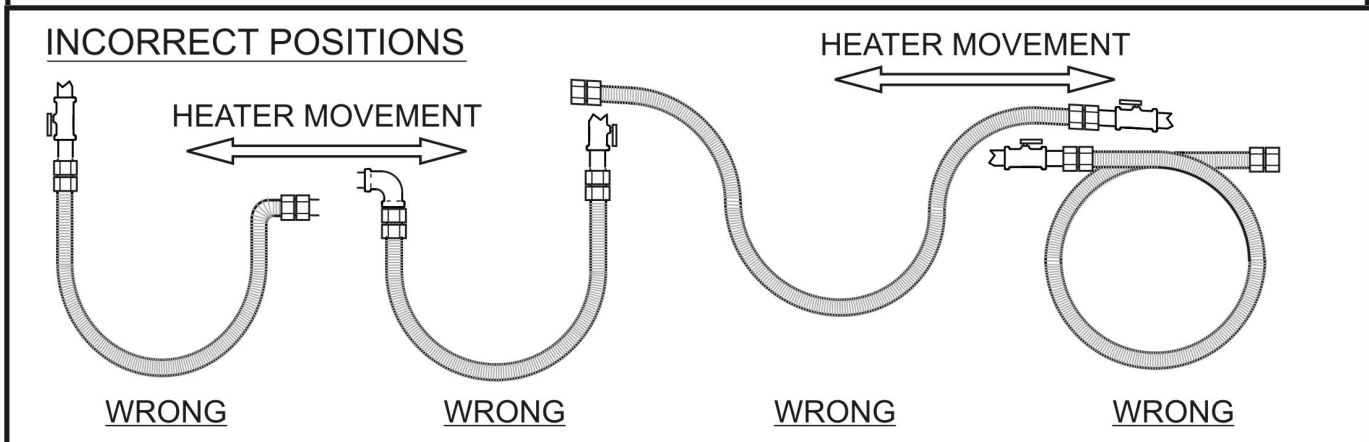


The flexible gas connector **MUST** be installed in the orientation shown below as required by national installation codes and by the certification standard of this heater. This orientation protects the flexible gas connector from damage due to movement during heater expansion.

It is the responsibility of the installer to ensure correct installation of the flexible



**WARNING: CONNECTOR MUST BE INSTALLED IN "C" CONFIGURATION. USE ONLY THE CONNECTOR OF PROPER LENGTH AND NOMINAL ID THAT IS FURNISHED WITH THIS HEATER - SEE TABLE PREVIOUS PAGE.**



The flue vent, and combustion air duct (if installed) must also be configured in such a manner that the normal expansion of the heater will be accommodated. **See Section 11.**



## 12. ELECTRICAL AND THERMOSTAT WIRING (WIRING DIAGRAMS PAGES 38 & 39)



### NOTICE

The heater must be electrically grounded in accordance with the National Electrical Code. ANSI / NFPA 70 or current Canadian Electrical code CSA C22.1.

Appliance and control wiring must be in accordance with all applicable local codes. The total load of all heaters must be considered in determining the required contact rating of the controlling thermostat or switch. Each tube heater requires 120V, 60 HZ electrical power sized for 145VA. Maximum power flow for internal 24V burner components is 21VA.

The ignition control includes a 24V/120V relay switch that provides a 45 second post-purge of the system. **A 24V Thermostat, TruTemp Thermostat, or 24V controller signal must be used for the post-purge feature to function.** A line voltage Thermostat or an "ON/OFF" switch will disable the post-purge feature.

A maximum night set-back of 9°F (5°C) is recommended for optimum economy and comfort. To maintain satisfactory comfort levels do not turn off the heating system over night/weekends.

## 13. HIGH ALTITUDE INSTALLATIONS - Refer to chart in Section 27 for Restrictions **- Refer to Section 27 page 53: Total Combined System Length Over 4500 ft**

When installed above the altitude stipulated below, the input must be de-rated by 4% for each 1000 ft above the altitude listed. Refer to the chart in Section 28 for orifice size and restrictions that apply to high altitude installation. Check with your local utility regarding the gas supply and the de-rating of this appliance. Maintain gas supply pressure indicated in Table 4, page 33.

**Installations above 4,000 ft: Restrict the length of any model to the shortest tube length.**

**USA:** The factory installed orifice for this appliance is approved for altitudes zero to 2000 feet above sea level. When installed above 2000 feet, **refer to Section 27.**

**Canada:** The factory installed orifice for this appliance is approved for altitudes zero to 4500 feet above sea level. When installed above 4500 feet, **refer to Section 27.**

## 14. LIGHTING INSTRUCTIONS

Refer to the lighting instructions label on the outside of the burner housing. If the unit locks out on safety, main power to the unit must be manually interrupted for a 30 second reset period before the heater can be restarted.

**NOTE: On initial installation, the unit may lock out on safety owing to the length of time required to bleed air from the gas piping system.**

## 15. RECOMMENDED MAINTENANCE



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

1. Inspect the entire heater system, venting, and gas supply connections at least annually prior to the heating season. Replace worn parts and repair deficiencies.
2. Check the inlet air opening and the blower periodically, cleaning off any lint or foreign matter. It is important that the flow of combustion and ventilation air must not be obstructed.
3. Lubricate Blower motor, by adding several drops of oil to oil ports located on the left hand side of the motor.

THE TUBE HEATER BURNER IS COMPLETELY FACTORY ASSEMBLED AND TESTED. ANY ALTERATION VOIDS THE CSA CERTIFICATION AND MANUFACTURER'S WARRANTY. FOR ADDITIONAL INFORMATION, CONTACT YOUR LOCAL DISTRIBUTOR OR THE MANUFACTURER.

## 16. SUSPENDING THE SYSTEM - GENERAL



Inadequate or improper suspension of the tube heater can result in collapse of the system, property damage, and personal injury or death.

It is the installer's responsibility to ensure that the hardware and structural supports from which the heater is suspended are sound and of adequate strength to support the weight and expansion forces of the heater.

Consider that the heater will expand in length as much as 1/2 inch (12.5 mm) or more for every 10 ft (3 m) of system length – typically the greater the firing rate, the greater the expansion.

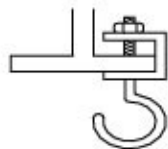
**Refer to Section 11**

- 1) Survey the available structural supports, considering the system configuration and heat requirements of the area to establish the optimum heater location.
  - a) Locating a heater directly under joists or beams, or installing supplemental steel support rail or angle iron can substantially reduce labor and materials
- 2) In a Tube Kit package tubes with turbulators are labelled as to their location in the system. Also refer to Section 8: TURBULATOR LENGTH & LOCATION
- 3) Tube system hangers must be located: A) straight in line; B) at a common height (level); and C) 116" (295 cm) apart.- see *Figures 9 & 10 next page*.
  - a) NOTE: It is important that the tubes in the system are installed in alignment horizontally (level) and vertically (in line) – this will ensure system integrity
- 4) Hardware with a minimum 100 lb. (45 kg) work load must be used at each heater suspension point. A #2 Lion Chain or equivalent is typically used for suspending the heater.
  - a) Connect to the structure using typical hardware as illustrated in FIGURE 8 (below) or by other mechanically sound means
  - b) If rigid devices such as 3/8" threaded rods are used for suspension, swing joints or other means must be provided to allow for system expansion - approximately 1/2 inch to 1 inch for every 10 ft (1 cm to 2.5 cm for every 3 m) of system length.
- 5) Two types of hangers are provided to suspend the tube system – see FIGURES 9 & 10
  - a) Plate hangers support the tubes and reflectors at each end of the system
  - b) Webbed hangers support tubes and reflectors at each tube junction

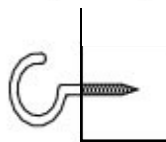
**FIGURE 8 TYPICAL MOUNTING HARDWARE**



HOOK OR EYE  
BOLT THROUGH  
HOLE IN BEAM



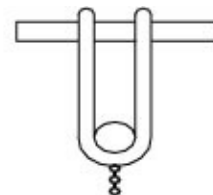
BEAM CLAMP  
WITH HOOK OR  
EYE



HOOK OR  
EYE  
SCREW



PIPE RING  
OR CLEVIS  
HANGER



BAR-JOIST  
CLAMP

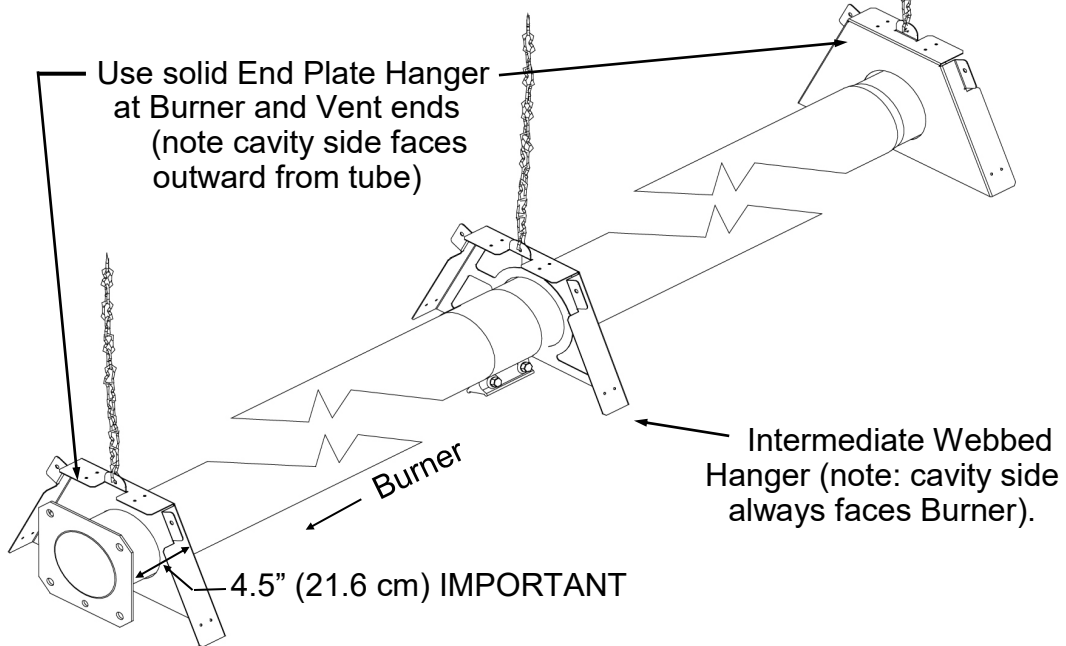


NOTE: It is the installer's responsibility to ensure that mounting hardware and fastening to structure are of sufficient strength to support the system.

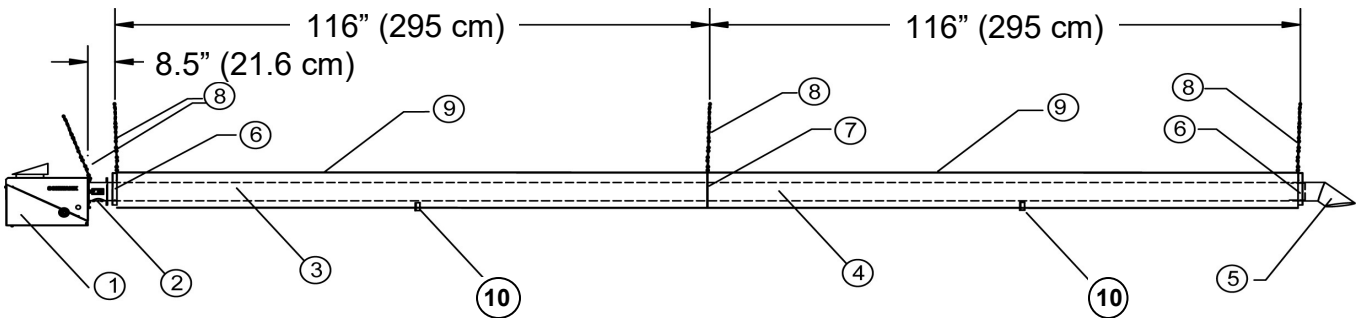
- 6 Please NOTE that each hanger has a 'flat' side and a 'cavity' side – FIGURE 6
- Starting at the burner end of the heater: all hangers (except the last plate hanger) are oriented with the cavity side of the hanger facing toward the burner end
  - Only the cavity side of the vent end plate hanger faces the vent - FIGURE 6

Refer to Figures on next pages, then proceed to Section 9. Burner and Tube Installation

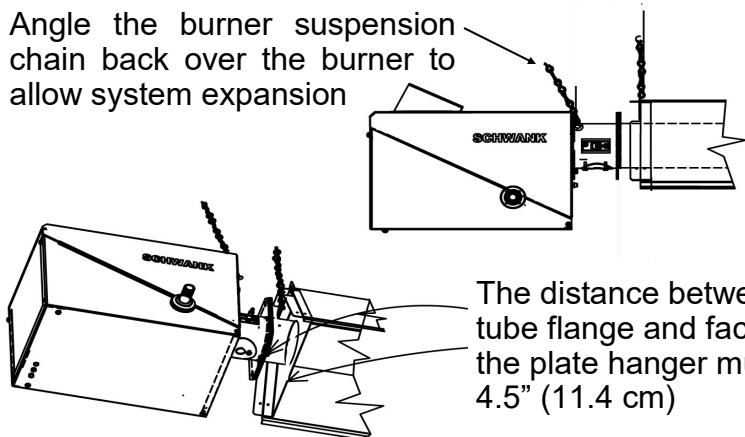
**FIGURE 9 END PLATE & WEBBED HANGERS**



**FIGURE 10 TYPICAL HANGER & SUPPORT SPACING**



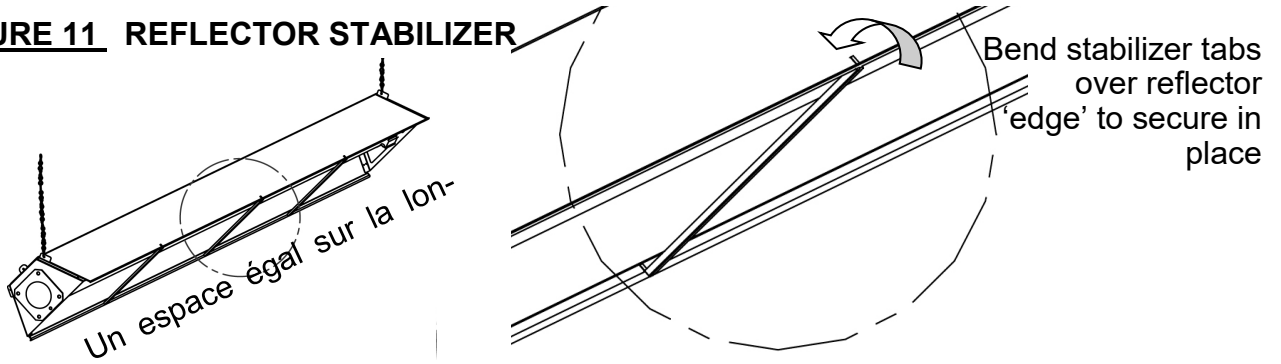
Angle the burner suspension chain back over the burner to allow system expansion



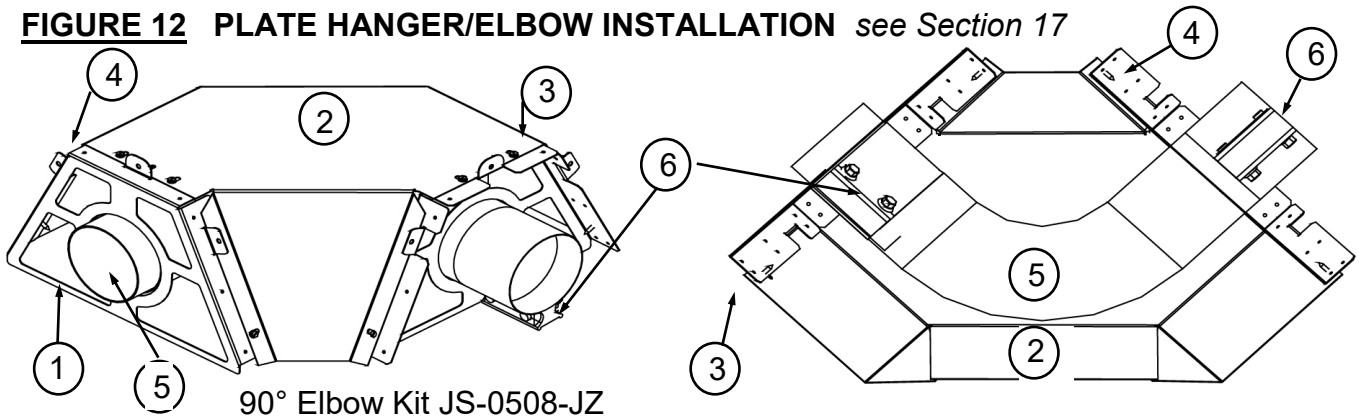
The distance between the tube flange and face of the plate hanger must be 4.5" (11.4 cm)

- Burner Assembly
- Flange Adapter
- Flanged Tube
- Swaged Tube
- Vent termination (optional; wall or roof)
- End Plate Hanger
- Webbed Hanger
- Hanging Chains
- Focus Shield Reflector
- Reflector Stabilizer

**FIGURE 11 REFLECTOR STABILIZER**

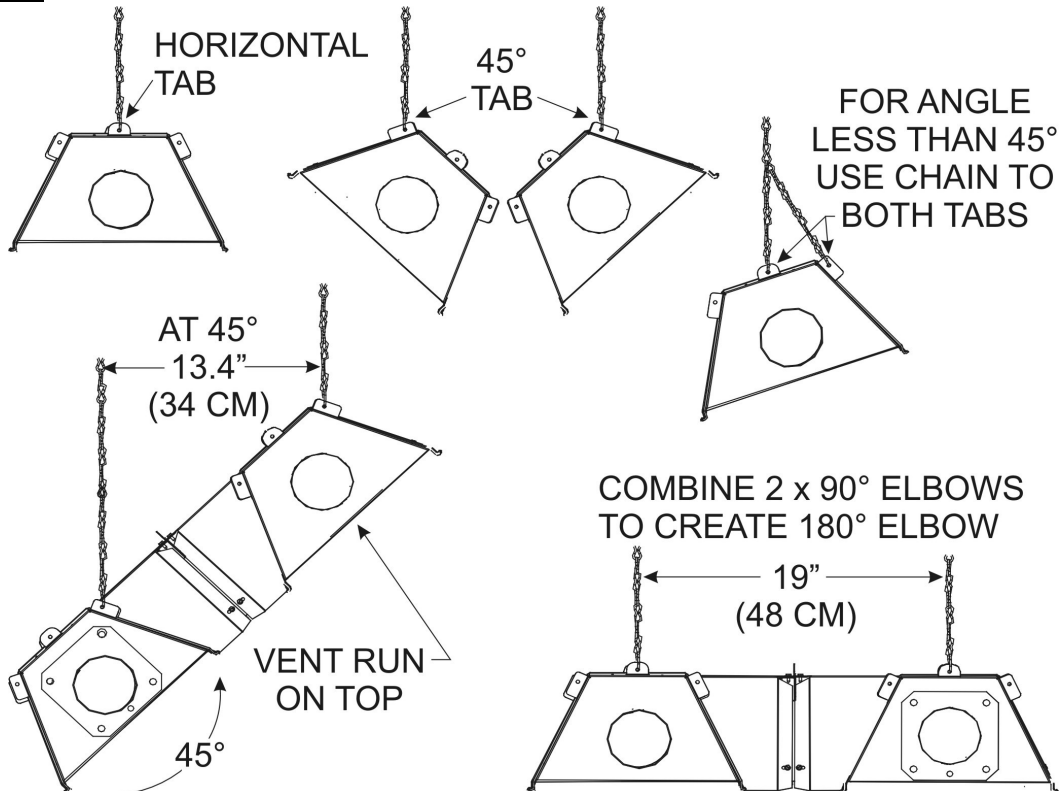


**FIGURE 12 PLATE HANGER/ELBOW INSTALLATION** see Section 17



- 1. Webbed-Hanger
- 2. Reflectors
- 3. Webbed-Hanger Flange UNDER Reflector
- 4. Webbed Hanger Flange mounts UNDER and fastens the next Reflector
- 5. 90° Tube Elbow
- 6. Tube/Elbow Coupler

**FIGURE 13 HANGER / REFLECTOR ORIENTATION HORIZONTAL TO 45°**



## 17. SYSTEMS INCORPORATING 90° ELBOWS AND 180° ELBOWS

A radiant tube heater can be installed in configurations as illustrated in FIGURE 4. (below) with a maximum of two 90° elbows per heater. The use of elbows reduces the total maximum vent allowable. (See Section 9 : Flue venting)

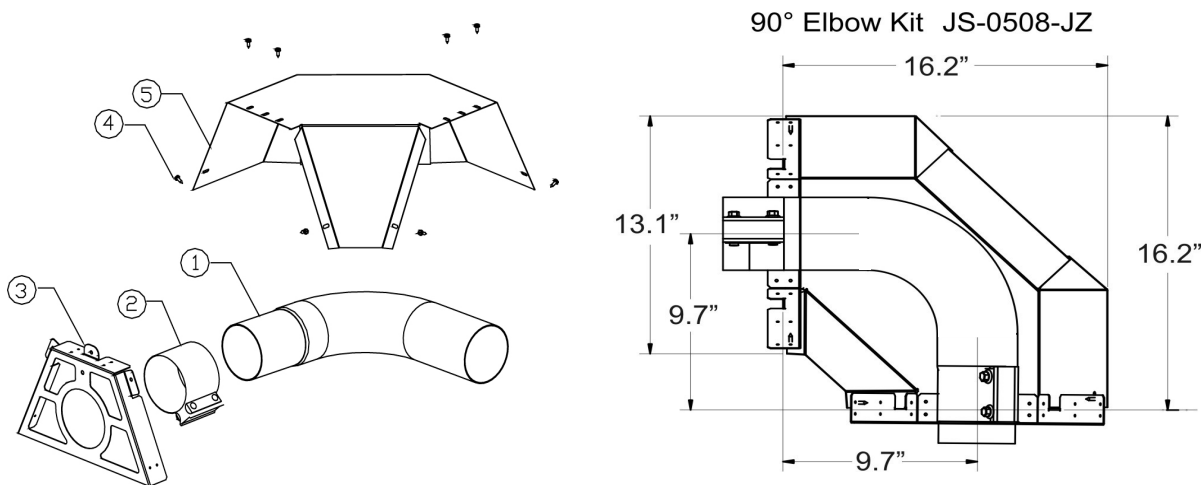
90° elbows (JS-0528-JZ) are shipped as a kit with one coupler, one reflector and one plate hanger. For a 180° elbow, order 2 x 90° kits that connect to create a 180°. An optional kit (JS-0504-JZ) to angle mount a reflector adjacent to an elbow is also available and must be ordered separately. The reflectors must be secured to each of the elbow plate hangers with sheet metal screws.



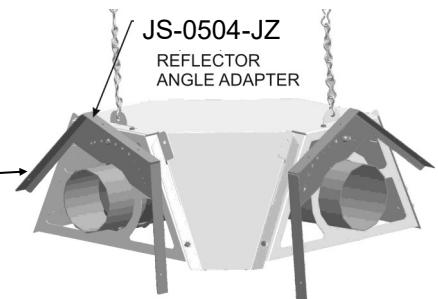
**IMPORTANT:** Models with input 100 Mbh x 20 ft (30 kW x 6 m) must only be installed as a straight system with no elbows allowed at the 10 ft (3 m) location.

**Elbow Location / Input:** A minimum run of straight radiant tube must be connected to the burner before any elbow as follows: Inputs 200,000 and 175,000 = 25 ft (7.6 m); 150,000 = 20 ft (6 m); 125,000 and 110,000 = 15 ft (4.6 m); and inputs 80,000 and 60,000 a minimum of 10 ft (3 m) straight tube before elbow.

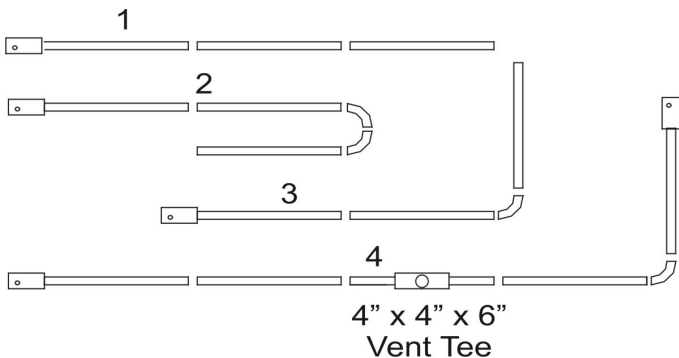
**FIGURE 14** SYSTEM ELBOW KIT - see page 56 for 180° elbow dimensions



Angle mounting of the reflector system either side of an elbow requires adapter JS-0504-JZ. The elbow always remains in a horizontal orientation.



**FIGURE 15** SYSTEM CONFIGURATIONS

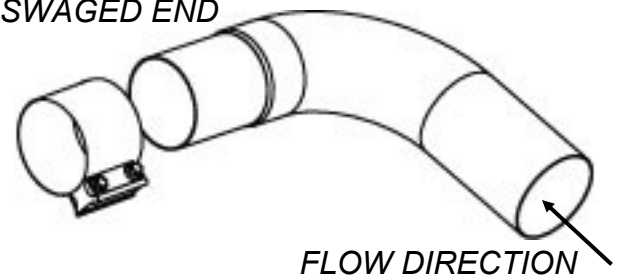
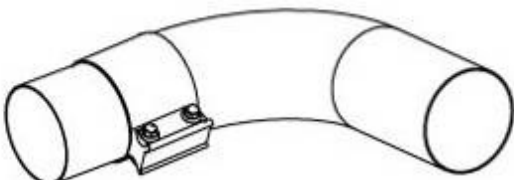
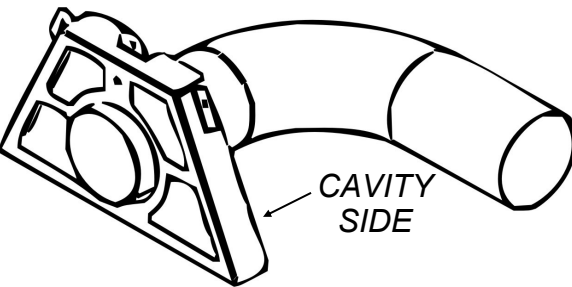

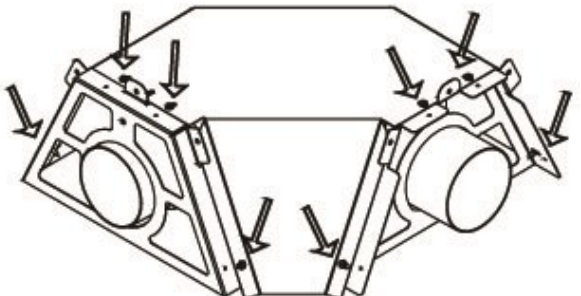


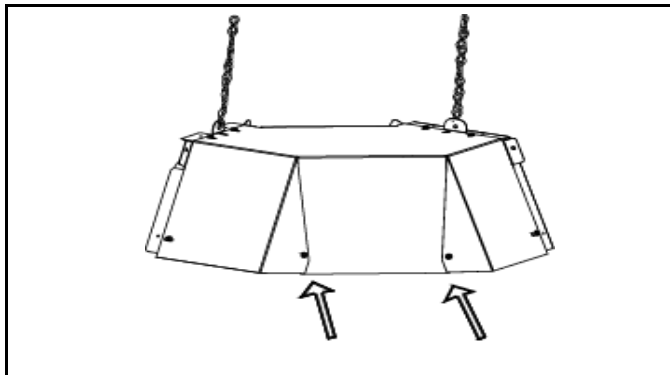
**System Configuration**

- 1 Straight line
- 2 "U" tube with 2 x 90° elbow kits
- 3 "L" tube with one 90° elbow kit
- 4 Twinned tubes into common TEE flue vent

## INSTALLATION INSTRUCTIONS FOR 90° AND 180° ELBOW KITS

When installing systems that incorporate a 90° or 180° elbow, assembly of the system is facilitated by first locating and installing the elbow assembly, then install the remainder of the tube/reflector system working away from the elbow.

 <p>SWAGED END</p> <p>FLOW DIRECTION</p>	<p><b><u>90° ELBOW KIT ASSEMBLY</u></b></p> <p>#1</p> <p>Add the coupler to the 90° elbow over the swaged end of the elbow.</p>
	<p>#2</p> <p>Slacken the coupler bolts. Slide the coupler over the elbow from the swaged end.</p>
 <p>CAVITY SIDE</p>	<p>#3</p> <p>Add the plate hanger to the system</p> <p>Important: the plate hanger must be installed with the cavity side facing upstream toward the burner.</p>
	<p>#4</p> <p>Install the next plate hanger (supplied with tube kit) over the unswaged end of the elbow with the cavity side facing upstream toward the burner.</p> <p>(Not to be reversed)</p>
	<p>#5</p> <p>Place the reflector over the plate hangers. Secure reflector to hangers with sheet metal screws provided.</p>

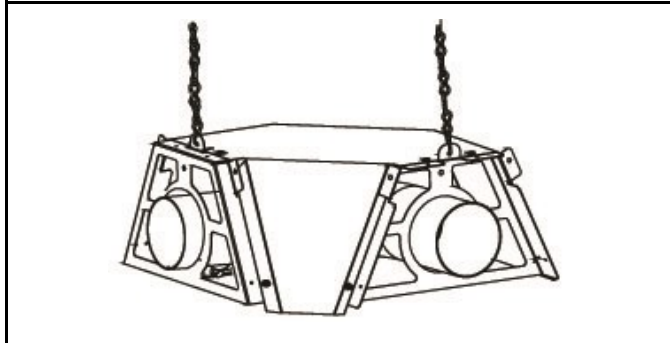


#6

After installation of the elbow assembly, fasten the corners of the reflector cover with the 2 screws provided.

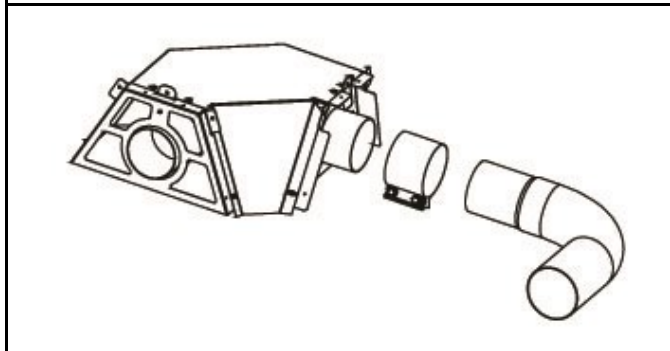
For 90° installation finish with step # 7

For 180° installation skip # 7 and proceed to step # 8



#7

Suspending the elbow kit in horizontal position prepared for tube installation in horizontal mode.

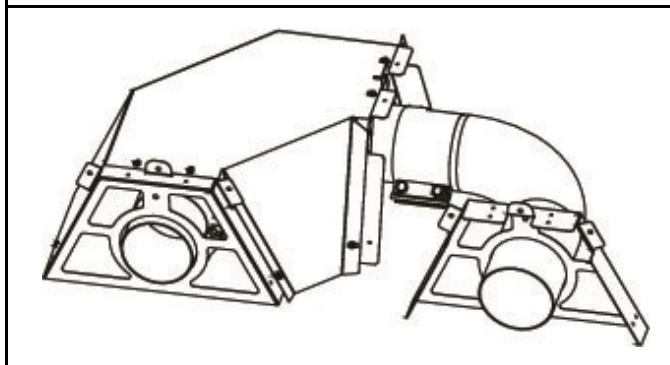


#8

**180° ELBOW KIT ASSEMBLY**

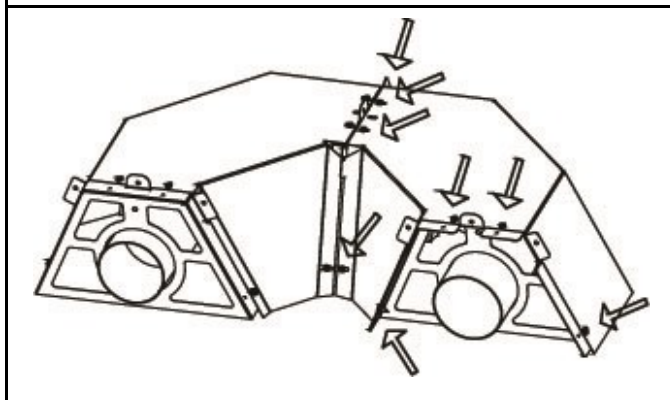
Add the second coupler to the 90° elbow kit to form 180° elbow kit

Slacken the bolts and slide the coupler over the elbow at the swaged end.



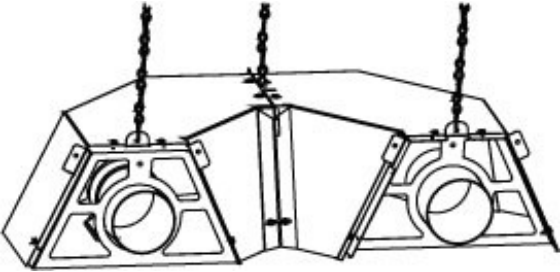
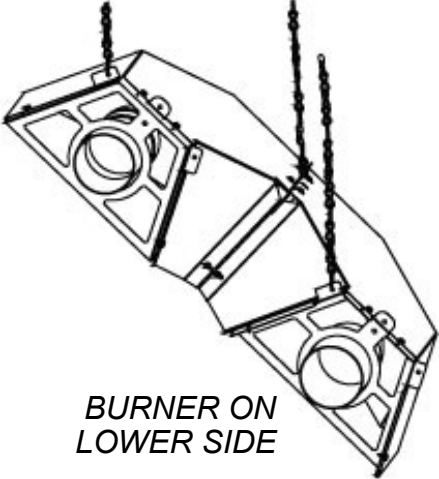
#9

Add the third plate hanger to the elbow kit – pay attention to the mounting position of the plate. Always with the cavity facing toward the ‘burner end’ of the system



#10

Place the second reflector over the plate hangers. Secure the reflector with 8 screws to the plate hanger.

	<p>#11/A</p> <p>Suspend with 3 chains in horizontal position and continue installing the tubes and reflectors to complete the system.</p>
 <p>BURNER ON LOWER SIDE</p>	<p>#11/B</p> <p>When hanging a heater with a 180° elbow kit at 45° angle the <u>vent run tubes must be on top, with the burner on the lower side.</u></p>

JS-0504-JZ REFLECTOR ANGLE ADAPTER -JZ SERIES





## 18. BURNER AND TUBE INSTALLATION

PRIOR TO PROCEEDING with the tube installation: **Read and understand Section 8 - "Suspending the System", and the following section of "IMPORTANT SPECIAL NOTES".**

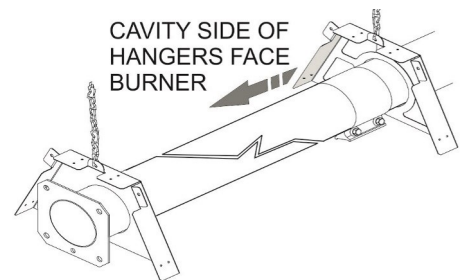


### IMPORTANT SPECIAL NOTES: READ FIRST

1. STS-JZ/IQ **100 x 20 ft**: Special Tube Coupling - Refer to Section 9.1, Fig 15
2. STS-JZ/IQ **175 & 200**: Special Tube Coupling - Refer to Section 9.2, Fig 16  
These firing rates have an unpainted titanium alloy stainless steel first tube with a flange (painted "white"), and an unpainted aluminized steel tube as the second tube; all subsequent tubes are painted steel. The first tube (titanium alloy stainless steel ) will "glow red" while heater is in operation - THIS IS A NORMAL CONDITION
3. IF a 90° or 180° elbow is to be installed in the system, **refer NOW** to Section 8 and the Elbow Kit installation instructions supplied with the elbow kit
4. **TURBULATORS**: *Also refer to Table 3 & Illustration pages 23 & 24*  
**60,000, & 80,000 Btuh:**
  - **30 ft heater**: REMOVE 5 ft turbulator from the 2nd tube (aluminized steel) in the system. Steel tube with 8 ft turbulator installs at vent end.
    - All other turbulators are factory installed inside tube(s) that are clearly labeled with instruction as to where the tube(s) must be installed  
**200,000 x 60 ft & 70 ft: Remove short piece of turbulator from the upstream end of the turbulator tube prior to installation** (see sheet in Primary tube kit)

ALL MODELS: INSTALL THE FIRST AND SECOND TUBES ONLY (FROM BURNER END) WITH THE WELDED SEAM ALONG THE TUBE LENGTH FACING DOWNWARD

1. All hangers must be:
  - a) Suspended at the same height = horizontal alignment of tubes (level)
  - b) In a straight line = vertical alignment of tubes
  - c) Spaced 116" (295 cm) apart = correct spacing for reflector length and attachment to hangers
  - d) Orient hangers with the "cavity side" facing the burner end of the system (except the last plate hanger at the vent end = the cavity side faces the vent)
2. Insert the swaged end of the first tube (tube with flange) through the 4" (10 cm) hole in the first plate hanger - 1st Tube: Locate welded seam facing downward
  - a) Ensure the 'cavity' side of the hanger faces the burner end of the system
  - b) The distance between the tube flange and first hanger must be 4.5 inches (114 mm)**
  - b) Slide a Torctite tube coupler past the swage onto the tube
    - The final position of the coupler will be on the 'burner' side of the 2nd hanger
  - c) Guide the tube into the second hanger (webbed) – ensure the cavity side of the hanger faces the burner end of the system
  - d) Position first plate hanger 4.5 inches (114 mm) from the tube flange – provides access to bolt the burner to the flange, and ensures correct spacing of consecutive system hangers
  - e) Check that the first tube is level



3. On the second tube to be installed, slide a Torctite tube coupler on to the tube past the swage (downstream end of tube)
4. Insert the swaged end of the second tube into the next (3rd) hanger to support its weight.

5. NOTE: **100,000 x 20 ft and 175,000 & 200,000 Btuh Systems: Special Coupling**  
 • Refer to Section 18.1 & 18.2



The second tube is unpainted aluminized steel for the 175,000 & 200,000

**FOR ALL OTHER INPUT RATES:** See FIG 16 below

6. Slide the female (upstream) end of the second tube over the swage of the first tube
  - a) The welded seam of the second tube must face downward
  - b) Ensure that the swage on the first tube is fully inserted into the second tube
  - c) Adjust the hanger so that it is located on the second tube, approximately 2" (5 cm) from the end of the tube – in this location the hanger supports both tubes.
  - d) Slide the Torctite coupler into position across the center of the joint
  - e) Prior to tightening the coupler: CHECK THAT THE SECOND TUBE IS LEVEL, ALIGNED HORIZONTALLY AND VERTICALLY WITH THE FIRST TUBE – MAKE ALIGNMENT ADJUSTMENT TO THE TUBE CONNECTION AS REQUIRED

**f) IMPORTANT: TORQUE THE COUPLER BOLTS TO 40 ft-lbs**

**FIGURE 16: TUBE COUPLER INSTALLATION**

1. Swaged end of upstream tube
2. Tube joint - end of downstream tube
3. Center coupler on tube joint
4. Hanger

**Torque coupler bolts to 40 ft/lbs**

7. Install a focus shield reflector over the first tube - secure with sheet metal screws to the hanger at each end
8. Install three reflector stabilizers on the bottom of the reflector
  - a) Equally space stabilizers with one at the reflector center point
  - b) Firmly bend the end tabs on each stabilizer up over the 'trough' at each side of reflector
9. Repeat assembly of one section of tube and reflector at a time until the system is complete.

**NOTE:** After the second tube, DO NOT face welded seam of additional tubes downward. Typically the welded seam should face the side (approximately 90° up from bottom)

**IMPORTANT: TURBULATOR LOCATION IN SYSTEM - REFER TO Section 8**

10. ENSURE THAT THE SYSTEM IS LEVEL AND THAT ALL TUBES ARE ALIGNED HORIZONTALLY AND VERTICALLY – MAKE ADJUSTMENT AT SUSPENSION POINTS AS REQUIRED - WELDED SEAM OF 1st & 2nd TUBES ONLY MUST FACE DOWNWARD
11. Mount the Burner to the first tube flange using the four nuts and bolts provided (FIG 17)
  - a) Insert two bolts through top holes in burner flange

*Continued .....*

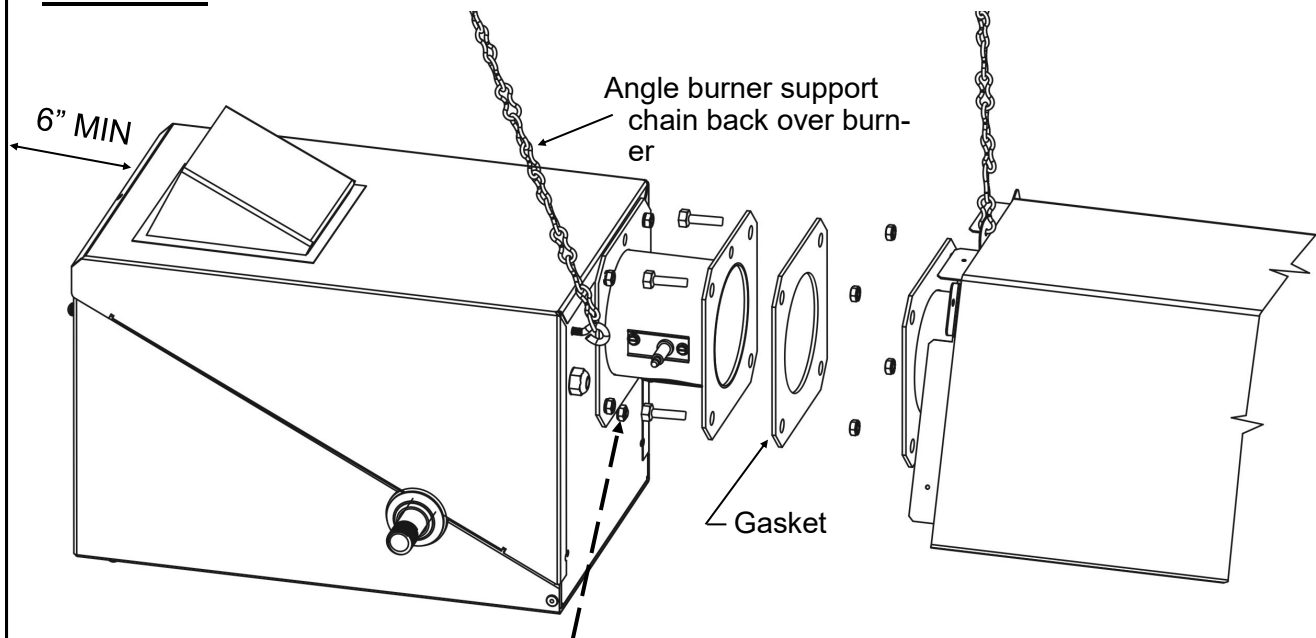
- b) Install gasket onto the two bolts to position it between the burner and tube flanges
- c) Align burner and tube flanges and secure the two bolts with nuts
- d) Install bottom bolts and nuts and snug to align the two flanges
- e) **TIGHTEN THE BOLTS IN AN OPPOSITE CORNER SEQUENCE AND ENSURE THAT THE BURNER IS IN HORIZONTAL ALIGNMENT WITH THE TUBE**

14) The 'center of gravity' of the burner is slightly off-center that of the tube system.

In order to prevent rotation of the burner:

- Install support chain from the burner eye hook to a point approximately 6 to 10 inches (15 to 25 cm) back over the burner away from the first tube hanger to allow expansion of the system
- **DO NOT** fasten chain from the burner eye hook to the first hanger suspension point
- The support chain angled back over the burner will allow "straight back" movement of the burner when the system heats and expands.

**FIGURE 17 BOLT BURNER TO FLANGED TUBE**



- Do not loosen or remove the fifth nut directly below the burner flange
- Secure suspension chain to eye hook in order to stabilize burner—angle chain back over burner 6 to 10 inches to allow for heater expansion.

**SERVICE ACCESS:** ALLOW A MINIMUM OF 6 INCHES (15 cm) FROM THE ACCESS END OF THE BURNER AND A MINIMUM OF 24 INCHES (60 cm) FROM EITHER SIDE OF THE BURNER TO A WALL OR ANY OBSTRUCTION THAT WOULD RESTRICT OR LIMIT ACCESS TO THE BURNER FOR SERVICE OR REPAIRS. (SEE SECTIONS 5 & 6 - PRE-INSTALLATION SURVEY AND MOUNTING CLEARANCES)



## 18.1 SPECIAL TUBE CONNECTION: 100,000 Btuh x 20 ft ONLY

NOTE: The connection of 1ST & 2ND tubes of the 100,000 x 20 ft heater experiences strong forces of expansion. Follow instructions below for special coupling of the tubes and orientation of the turbulator in the 2nd tube..

### SPECIAL COUPLER INSTALLATION

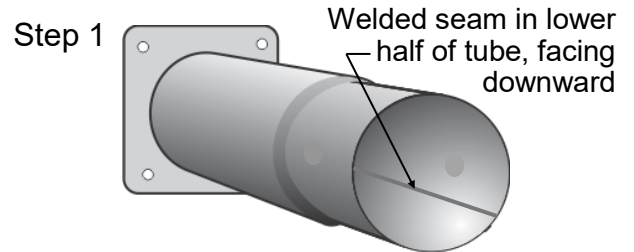
1. Install first tube so that the welded seam along the tube length is in the lower half of the tube facing downward
2. Slide the loosened tube coupler on to the first tube, past the swage
3. The second tube is supplied with a 1/4" hole in the tube at the female end.
4. Slide second tube over swaged end of first tube so that 1/4" hole is located 90° up from the bottom (3 or 9 o'clock position)
5. Note that the spine of the turbulator should be oriented in a vertical position
6. Through the existing 1/4" hole, drill a 1/4" hole through the wall of the first tube
7. Insert 1/4" rivet into the hole
8. Slide coupler into position – half onto each tube – covering the rivet head
9. Tighten coupler bolts to 40 ft-lb
10. Install reflectors

**TOOLS REQUIRED:** ✓ Electric Drill  
✓ 1/4" Drill Bit (supplied)

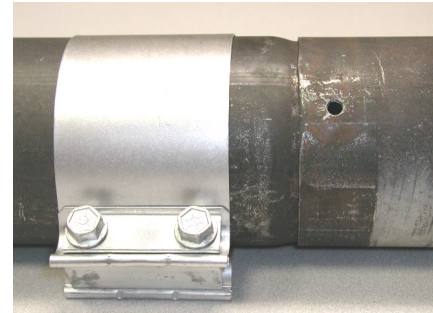
### FIGURE 18 SPECIAL COUPLING:

- 100,000 x 20 ft

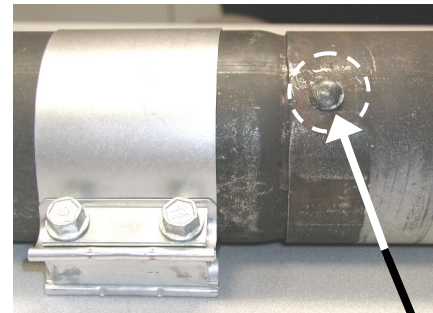
- Fasten Second Tube to First Tube -



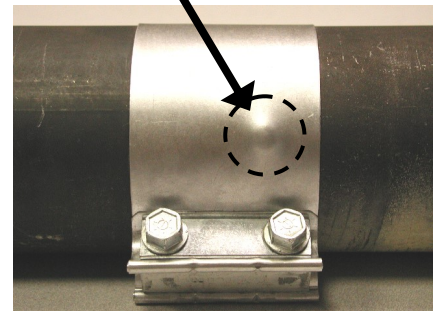
Steps 2 thru 6



Step 7



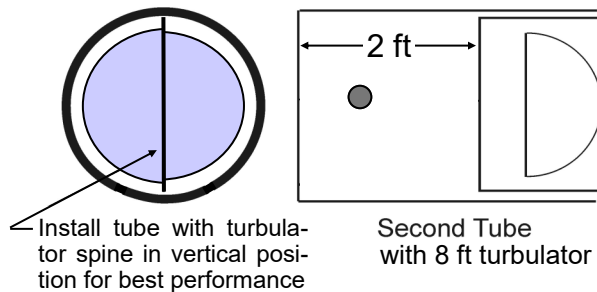
Steps 8 & 9



Step 5

### NOTE: 100,000 Btuh x 20 ft Heater TURBULATOR ORIENTATION

100,000 Btuh x 20 ft  
Turbulator Location



VIEW INSIDE TUBE: Ensure the 8 ft (2.4 m) turbulator installed in the second tube is oriented with its spine in a vertical position, and located at the vent end of the tube.

This will result in the best performance and radiant output from the system.



## 18.2 SPECIAL TUBE CONNECTION: 175,000 & 200,000 Btuh ONLY

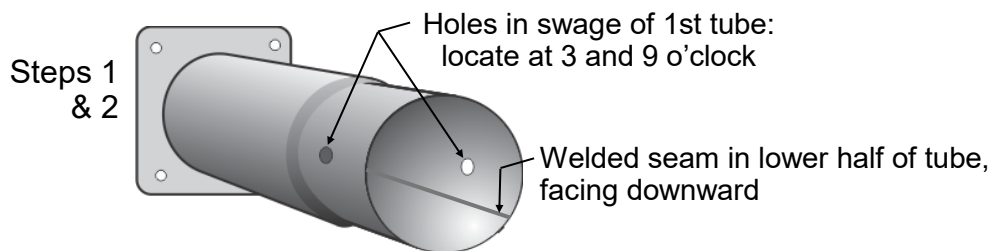
NOTE: The connection of 1ST & 2ND tubes of 175,000 & 200,000 heaters experience strong forces of expansion. Follow instructions below for special coupling of the tubes.

### SPECIAL COUPLER INSTALLATION

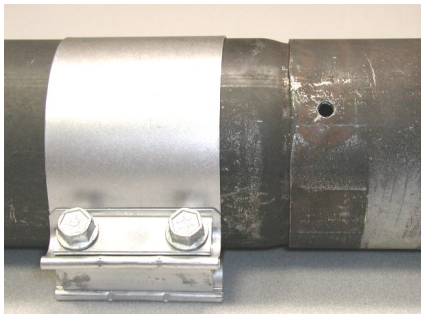
1. Note the 2 holes opposite each other at the swaged end of the first tube (flanged)
2. Install the **first tube** with 2 holes (swaged end) at the 3 and 9 o'clock position, with the **welded seam located in the lower half of tube, facing downward**
3. Slide the loosened tube coupler on to the first tube, past the swage
4. The second tube has a  $\frac{1}{4}$ " hole at the female end.
5. Slide second tube over swaged end of first tube to align the hole in the second tube with one of the holes in the first tube
6. Final alignment of the holes can be accomplished using a screw driver or other tool
7. **IMPORTANT:** Insert  $\frac{1}{4}$ " rivet into the hole to secure the tube connection
8. Slide coupler into position – half onto each tube – covering the rivet head
9. Tighten coupler bolts to 40 ft-lb
10. Install reflectors

### FIGURE 19 SPECIAL COUPLING:

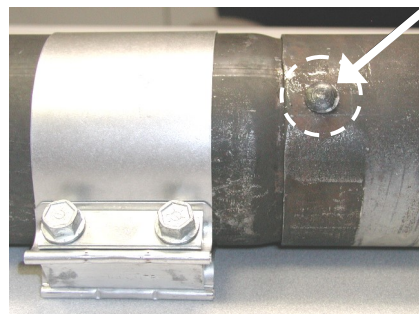
- 175,000 & 200,000 Btuh - Fasten Second Tube to First Tube -



Steps 3 to 6

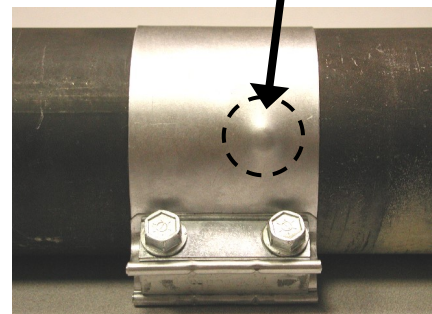


Step 7



1/4" Rivet

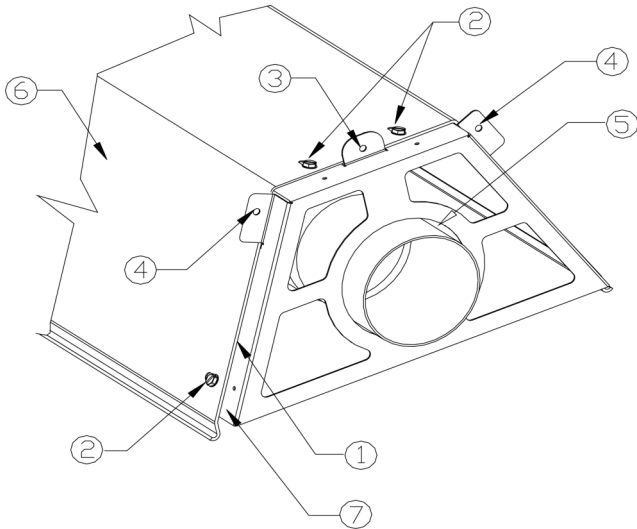
Steps 8 & 9



## 19. FOCUS SHIELD REFLECTOR INSTALLATION

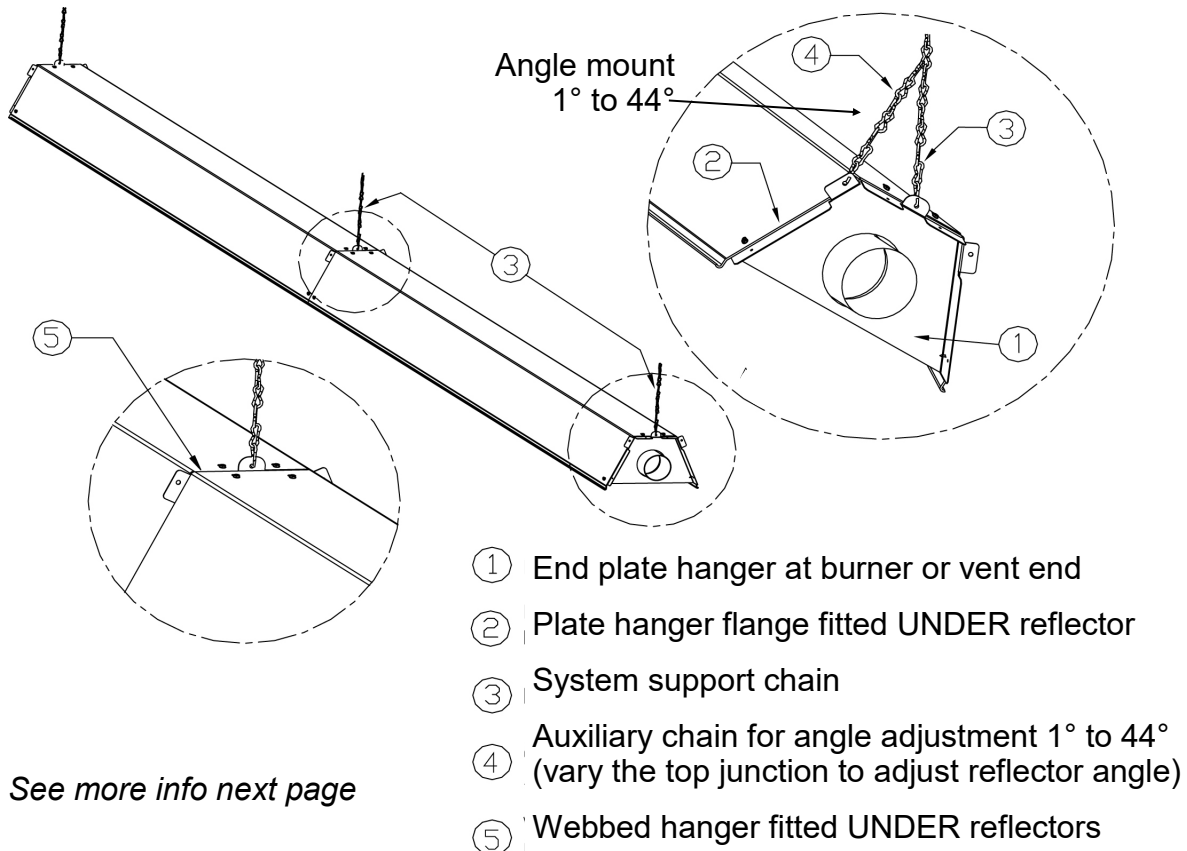
The focus shield reflector system can be adjusted to either side up to 45° from horizontal. Note that for both horizontal and angle mounting, the tube must be level along its length. Improper mounting can result in overheating of controls and combustible materials. Use only non-combustible mounting hardware.

**FIGURE 20 MOUNTING FOCUS SHIELD REFLECTOR TO HANGER**



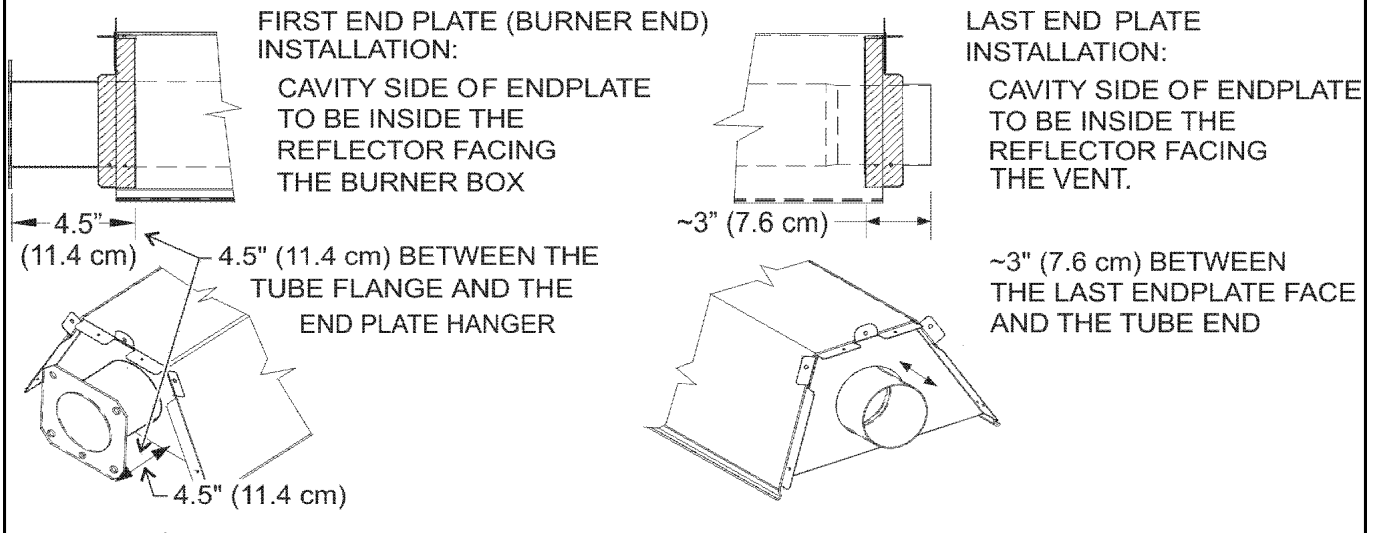
- 1 Webbed Hanger Flange under Reflector
  - 2 Screws to secure Reflector to Plate Hanger.
  - 3 Tab for horizontal suspension
  - 4 Tab for 45° suspension
- NOTE: For suspension between 1° and 44°, use both suspension points 3 and 4 (see Fig.15 below).
- 5 Opening for Tube
  - 6 Reflector
  - 7 The next Reflector will mount over and on-  
to this side of the Webbed Hanger.

**FIGURE 21 HANGER ARRANGEMENTS**



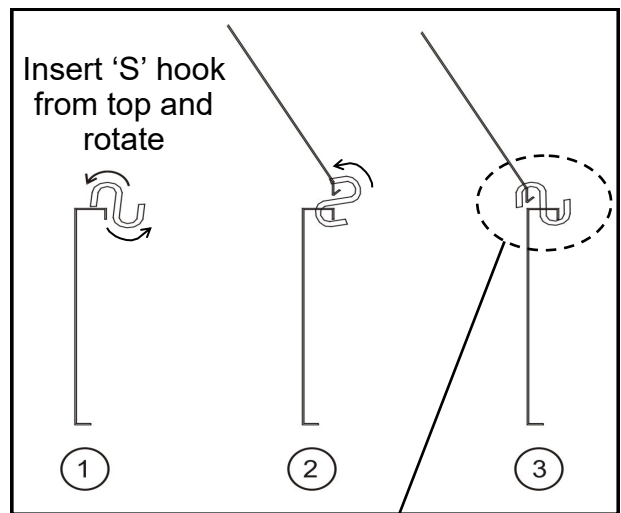
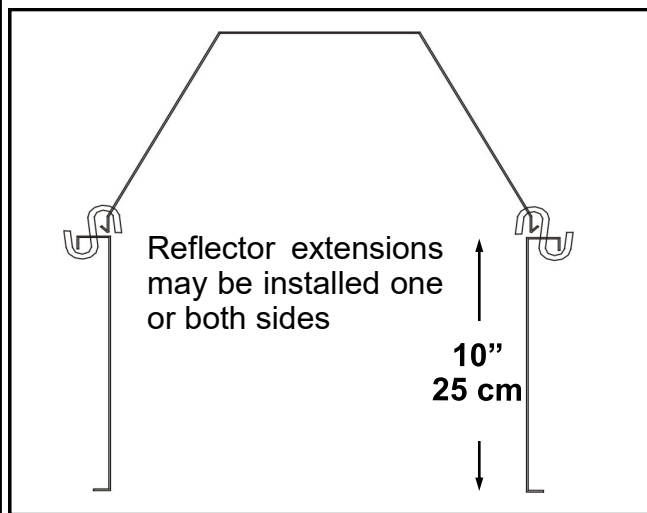
See more info next page

**NOTE:** All hangers must be installed with the cavity side facing the burner end of the system - Except the vent end hanger - the hanger cavity side at vent end of the must face the vent.

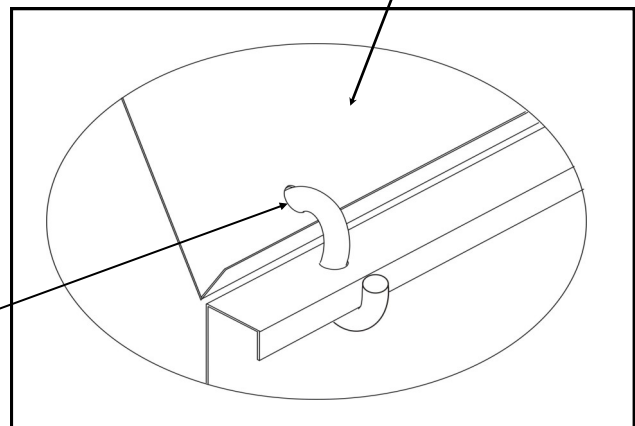


**FIGURE 22 REFLECTOR EXTENSIONS**

**(OPTIONAL - IF REQUIRED)**



1. Reflector extensions may be installed on one side or both sides of the reflector
2. Reflector extensions are 116" (295 cm) long
3. Holes (3) for "S" hooks are located 2.25" (5.7 cm) from each end and one at the center of the reflector extension
4. Drill 1/4" (7 mm) holes in the reflector 3/4" (2 cm) up from the bottom edge of the reflector to align with the 3 holes in the top of the reflector extension



5. Insert "S" hook down through hole in the top of the reflector extension
6. Rotate "S" hook approx. 90°, and insert into hole in reflector
7. Settle reflector extension into place

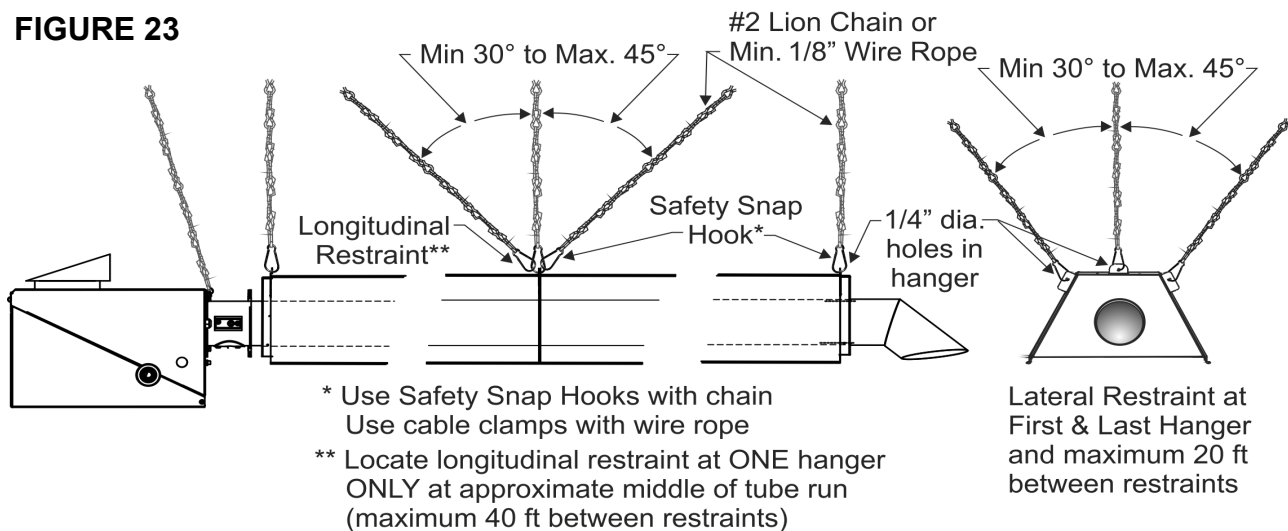
## 20. SEISMIC RESTRAINT - LATERAL AND LONGITUDINAL

In areas prone to earthquake, or as specified on a project, install lateral and longitudinal seismic restraints. If the heater location can be impacted by wind (aircraft hangars, etc) refer to **High Wind Restraint section 11-B** below. **NOTE: Any suspension / restraint system must allow for expansion of the tube and reflector system during operation.**

Any and all required seismic mounting hardware is field supplied by the installer. The restraint systems illustrated below are suggested only and typical of suspension and attachment to the heater. Other restraint methods or systems may be required by local or national codes, or specified by project engineering. It is the installer's responsibility to confirm restraint requirements with local authority prior to proceeding with the installation of restraints. The attachment of suspension hardware to the structure is as required by site structural conditions, installation codes, and/or local engineering design requirements.

Schwank / InfraSave offers optional items: #2 Lion Chain 115 lb work load x 200 ft roll (PN: JL-0800-XX); and Safety Snap Hooks (PN: JL-0800-SH = pkg 24; JL-0800-SH-B = pkg 100).

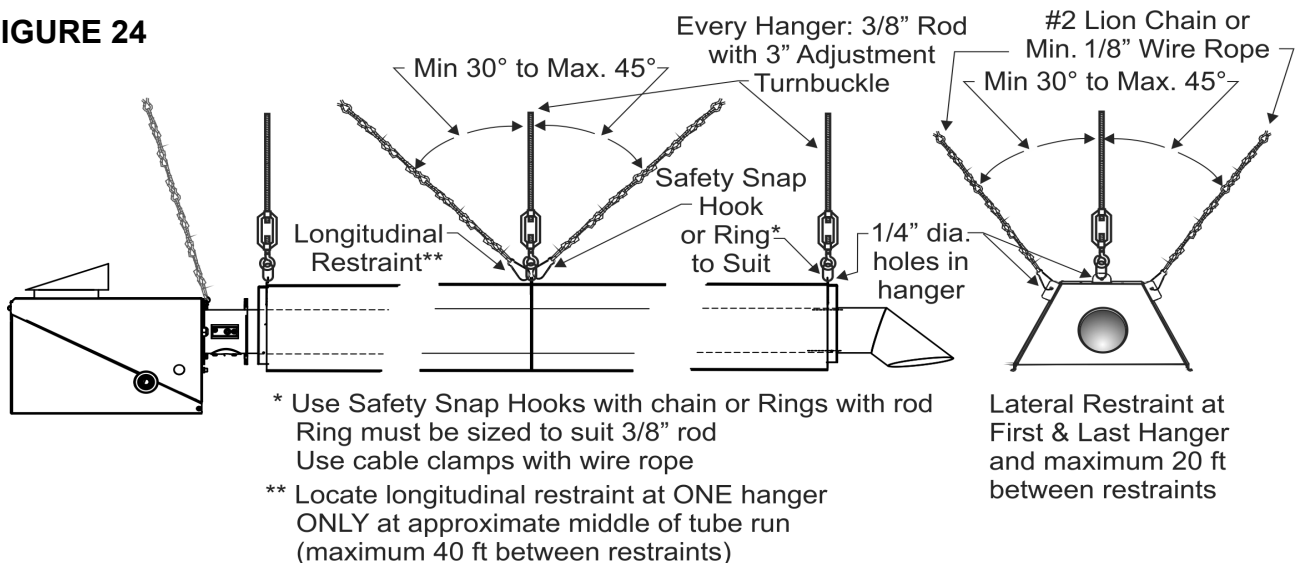
**FIGURE 23**



### 20-A. HIGH WIND RESTRAINT - LATERAL, LONGITUDINAL, AND VERTICAL

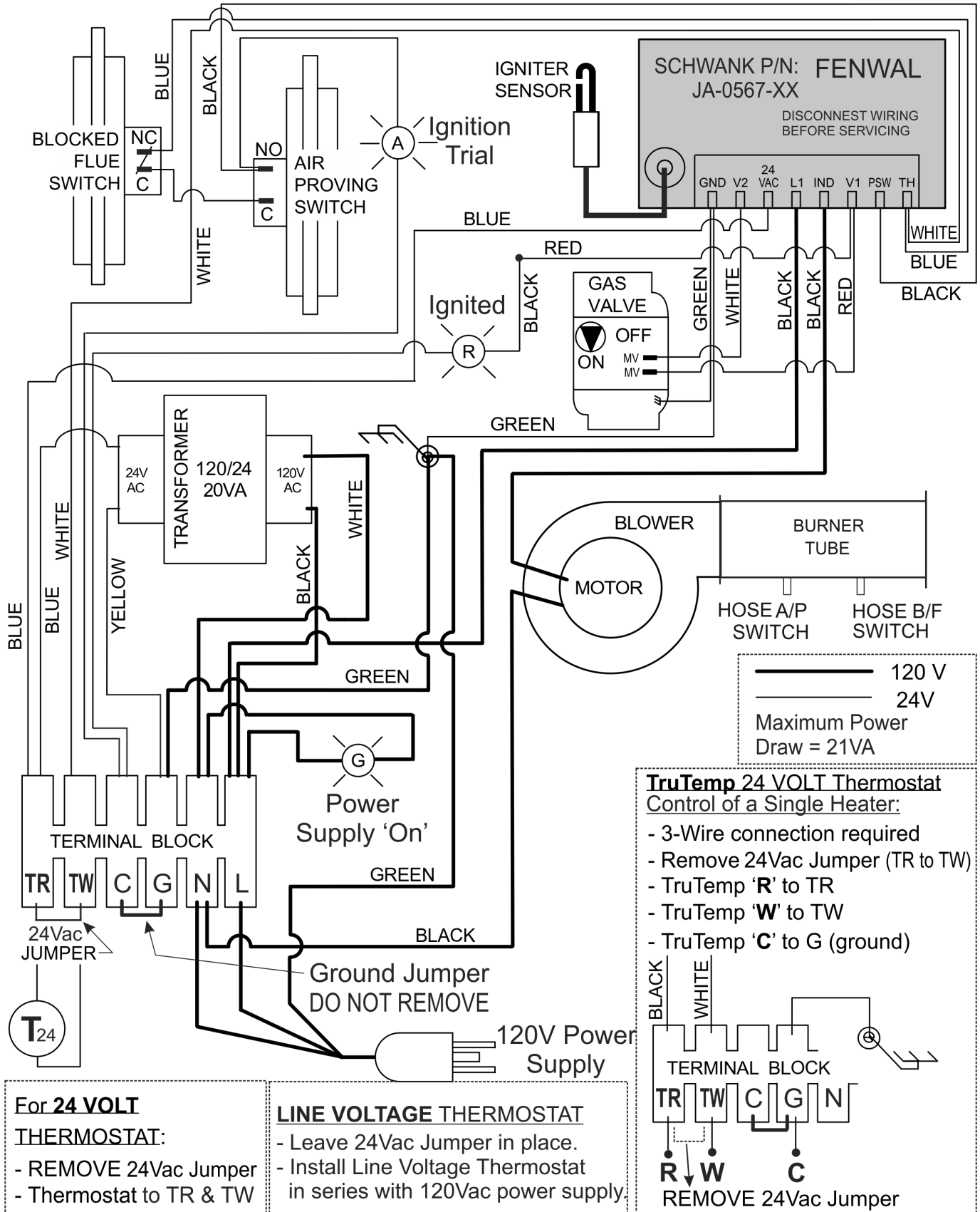
In areas with wind conditions (aircraft hangars, etc) in addition to lateral and longitudinal restraint the heater must be restrained from vertical movement. Suspend the heater using 3/8" threaded rod with 3" adjustment turnbuckle through a safety ring at each hanger location.

**FIGURE 24**

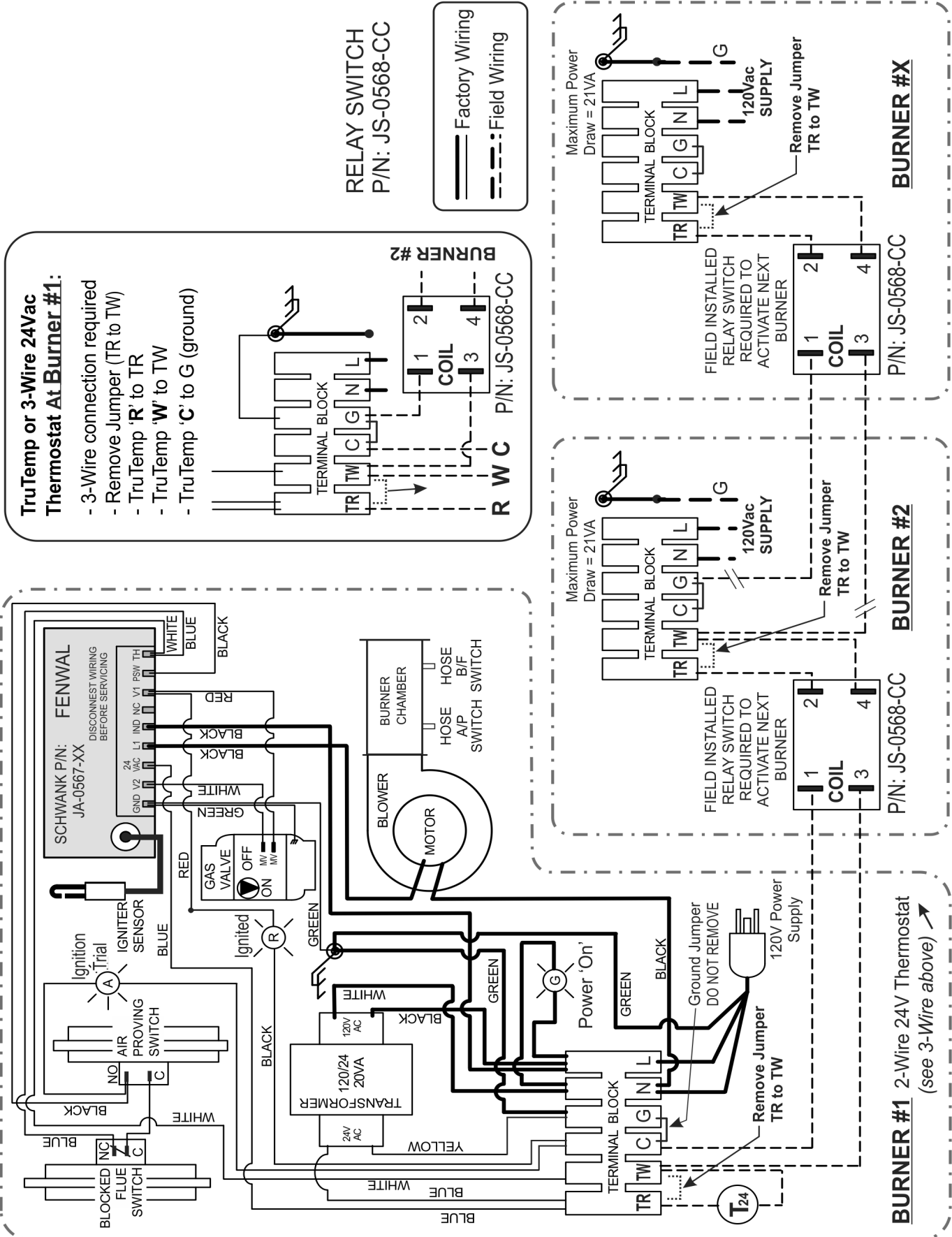




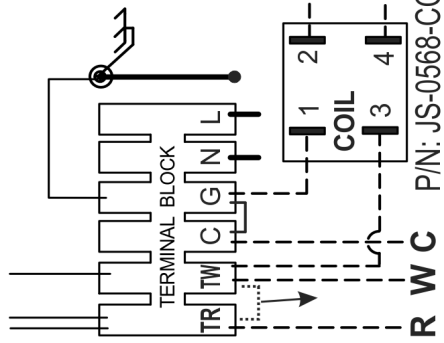
**21. FENWAL DSI: WIRING DIAGRAM: 24V OR 120 VOLT THERMOSTAT OPERATION**  
**SINGLE HEATER PER THERMOSTAT** (Multiple Heaters per Thermostat—next page)



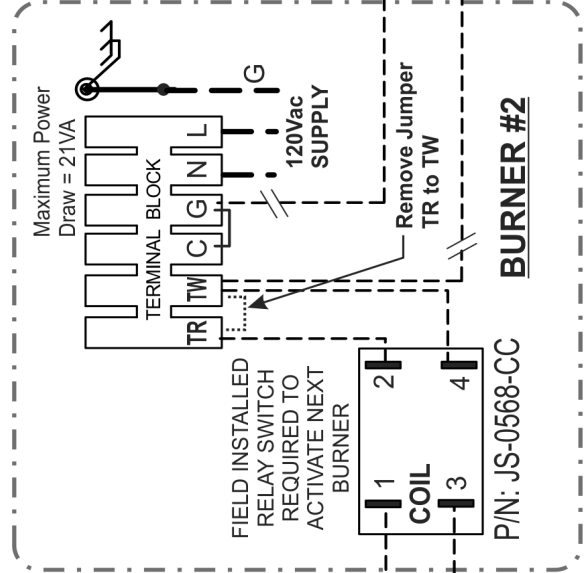
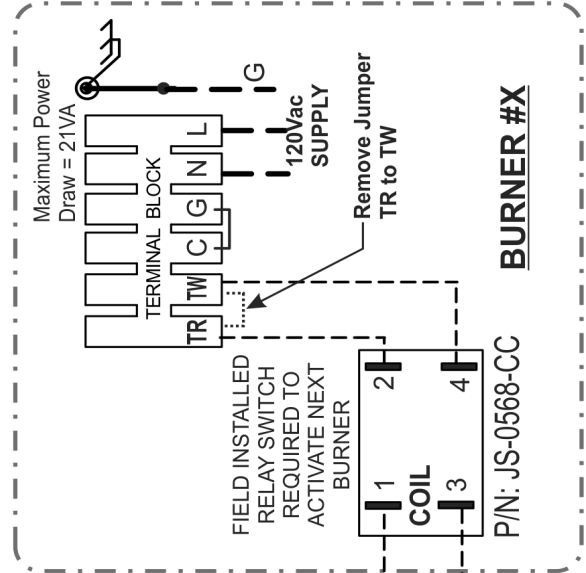
**21-A. MULTIPLE TUBE HEATERS per 24VAC THERMOSTAT (Fenwal DSI)**



- TruTemp or 3-Wire 24Vac Thermostat At Burner #1:**
- 3-Wire connection required
  - Remove Jumper 'R' to TW
  - TruTemp 'R' to TR
  - TruTemp 'W' to TW
  - TruTemp 'C' to G (ground)



RELAY SWITCH  
P/N: JS-0568-CC



**BURNER #1** 2-Wire 24V Thermostat  
(see 3-Wire above) →

## **22. FENWAL DSI: SEQUENCE OF OPERATION / FLAME RECOVERY / SAFETY LOCKOUT**

### **Power Up / Stand By**

Upon applying 24 volts power to 24VAC, the control will reset, perform a self check routine, initiate full time flame sensing, flash the diagnostic LED for up to four seconds, and enter the thermostat scan state.

### **Heat Mode**

When a call for heat is received from the thermostat supplying 24 volts to TH, the control checks the pressure switch for normally open contacts. The combustion blower is then energized and once the pressure switch contacts close, a 30 second purge delay begins. Following the purge period the gas valve is energized and spark commences for the 15 second trial for ignition.

When flame is detected during the trial for ignition, spark is shutoff immediately and the gas valve combustion blower remains energized. The thermostat, pressure switch, and main burner flame are constantly monitored to assure the system continues to operate properly. When the thermostat is satisfied and the demand for heat ends, the main valve is de-energized immediately, the control senses the loss of flame signal and initiates a 30 second post-purge period before de-energizing the combustion blower.

### **Failure to Light - Lockout (THREE TRIAL MODEL)**

This three-try control will attempt two additional ignition trials with a 30 second inter-purge between trials, before going into 'soft' lockout. The valve relay will be de-energized immediately, and the combustion blower will be turned off following the 30 second post purge period.

If the thermostat continues to call for heat after one hour the control will automatically reset and attempt to ignite the burner again (three trials).

At any time less than the 1 hour auto-reset, recovery from lockout requires a manual reset by either resetting the thermostat or removing 24 volts for a period of 5 seconds.

### **Flame Failure - Re-Ignition**

If the established flame signal is lost while the burner is operating, the control will respond within 0.8 seconds. The HV spark will be energized for a trial ignition period in an attempt to relight the burner. If the burner does not light the control will de-energize the gas valve. Two more attempts will be made to relight the burner. If the burner does not relight the control will go into 'soft' lockout as noted above in "Failure to Light". If flame is re-established, normal operation resumes.

### **Combustion Airflow Problems -Lockout**

Combustion air flow is continually monitored during an ignition sequence by the air flow switch (PSW). If during the initial call for heat the pressure contacts are in the closed position for 30 seconds without an output to the Combustion Blower, an air flow fault will be declared and the control will remain in this mode with the combustion blower off.

If the air flow switch remains open for more than 30 seconds after the combustion blower output (L1 & IND) is energized, an air flow fault will be declared and the control will stay in this mode with the combustion blower on, waiting for the air flow switch to close.

When proper air flow is detected from the air flow switch input (PSW) the control begins the pre-purge period followed with a 15 second ignition sequence.

If the air flow signal is lost while the burner is firing, the control will immediately de-energize the gas valve and the combustion blower will remain on. If the call for heat remains, the control will wait for proper air flow to return. If proper air flow is not detected after 30 seconds an air flow fault signal will be declared. If proper air flow is detected at any time, a normal sequence will begin with the pre-purge period.

## Flame Fault

If at any time the main valve fails to close completely and maintains a flame, the full time flame sense circuit will detect it and energize the combustion blower. Should the main valve later close completely removing the flame signal, the combustion blower will power off following the optional post purge period.

## Fault Conditions

The LED will flash on for 1/4 second, then off for 1/4 second during a fault condition. The pause between fault codes is 3 seconds.

Error Mode	LED Indication
Internal Control Failure	Steady on
Air Flow Fault	1 flash
Flame with No Call for heat	2 flashes
Ignition Lockout	3 flashes

## MOUNTING AND WIRING

The Series 35-61 is not position sensitive and can be mounted vertically or horizontally. The case may be mounted on any surface with #6 sheet metal screws. All wiring must be done in accordance with local and national electrical code. Refer to wire diagram page 35 when connecting the Series 35-61 to other components in the burner.



## WARNING

The Series 35-61 DSI Control uses voltages of shock hazard potential. Wiring and initial operation must be done by a qualified service technician. The control must be secured in an area that will experience a minimum of vibration and remain below the operating temperature of 160°F. All connections should be made with UL approved 105°C rated 18 gauge, stranded, .054 thick insulated wire. Refer to wire diagram page 35 when connecting the Series 35-61 to other components in the burner.

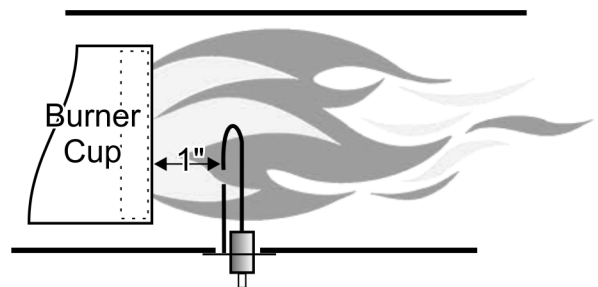
TERMINAL	SPADE	DESIGNATION
TH	1/4"	Thermostat Input
PSW	1/4"	Pressure Switch Input
V1	1/8"	Valve Power (MV)
IND	1/4"	Inducer Blower Output
NC	-	Alarm (Not used)
L1	1/4"	120/240 VAC Input (Hot)
24 VAC	1/4"	24 VAC Supply to Processor
V2	1/8"	Valve (MV)
GND	1/8"	Valve & System Ground
Spark	1/4"	Spark & Local Flame Sense

## CAUTION:

Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation. A functional checkout of a replacement control is recommended.

## PROPER ELECTRODE LOCATION

Proper location of the electrode assembly is important for optimum system performance. The electrode assembly should be located so that the spark gap is inside the flame envelope about 1 inch (2.5 cm) from the base of the flame at the burner cup.



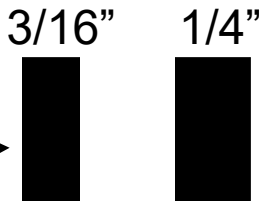
Electrodes should have a gap spacing of 3/16" (0.188" ± 0.031" or 4.76 mm ± 0.81 mm). If this spacing is not correct, the assembly must be adjusted or replaced. DO NOT adjust the curved igniter/sensor prong. Adjust/bend only the ground prong (also see next page).

## SPARK IGNITER SET UP

Use the following diagram to check the Igniter gap. If the gap is incorrect all adjustments should be made to the **GROUND PRONG/PIN ONLY!** **DO NOT BEND THE IGNITER PRONG!!!!**

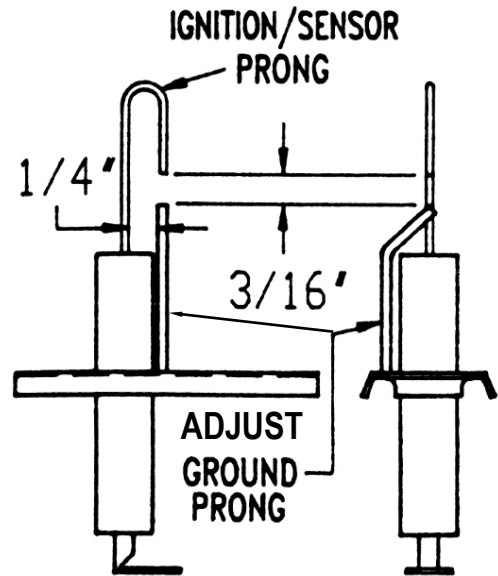
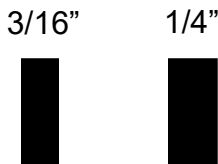
**USE THE BLACK BARS BELOW AS A GUIDE FOR ADJUSTMENT. USE THE BARS THAT COINCIDE WITH THE FORMAT & SIZE OF THIS PUBLICATION .**

IF this manual is in  
8.5" x 11" "booklet" format  
(pages folded in half)  
then use these bars



OR

IF this manual is printed  
8.5" x 11" "full page" format  
use these bars

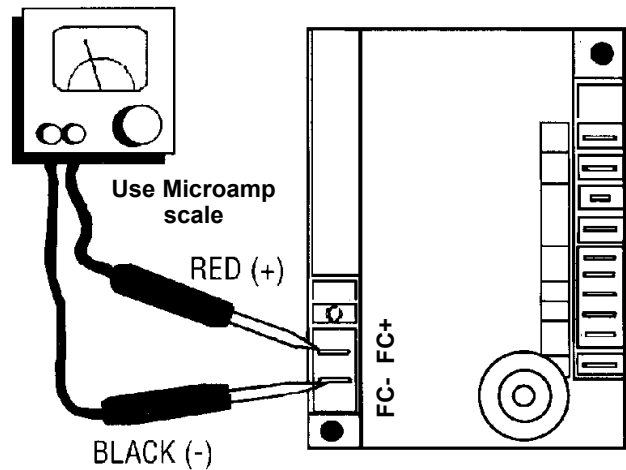


## **SERVICE CHECKS**

Flame current passes through the flame from the sensor to ground. The minimum flame current necessary to keep the system from lock-out is 0.7 microamps. To measure flame current, connect an analog DC microammeter to the FC- FC+ terminals per figure at right.

Meter should read 0.7  $\mu$ A or higher. If the meter reads below "0" on scale, meter leads are reversed. Disconnect power and reconnect meter leads for proper polarity.

Multipurpose Meter



**23. TROUBLESHOOTING GUIDE - FENWAL DSI**  
*(also see Heater Troubleshooting next page)*

SYMPTOM	RECOMMENDED ACTION(S)
<b>1. Dead</b>	<ul style="list-style-type: none"> <li>A. Miswired - check electrical supply (120Vac ± 10%)</li> <li>B. Transformer bad (24Vac ± 10%)</li> <li>C. Fuse/Circuit breaker bad</li> <li>D. Bad control (check LED for steady on)</li> </ul>
<b>2. Thermostat on - no blower output</b>	<ul style="list-style-type: none"> <li>A. Miswired</li> <li>B. Bad thermostat no voltage @ terminal W</li> <li>C. Confirm Air Proving switch is “Normally Open”</li> <li>D. Bad control (check LED for steady on)</li> </ul>
<b>3. Pressure switch input okay, but no Trial-for-Ignition after purge delay</b>	<ul style="list-style-type: none"> <li>A. Miswired (check PSW terminal voltage: 24Vac ± 10%)</li> <li>B. Flame sense problem (existing flame: check LED - 2 flashes)</li> <li>C. Bad control (check line voltage between L1 &amp; IND)</li> </ul>
<b>4. Valve on, no spark</b>	<ul style="list-style-type: none"> <li>A. Shorted electrode</li> <li>B. Open HV cable</li> <li>C. Bad control</li> </ul>
<b>5. Spark on, no valve</b>	<ul style="list-style-type: none"> <li>A. Valve coil open</li> <li>B. Open valve wire</li> <li>C. Bad control (check 24Vac voltage between V1 &amp; V2)</li> </ul>
<b>6. Flame ok during TFI, no flame sense (after TFI)</b>	<ul style="list-style-type: none"> <li>A. Bad electrode</li> <li>B. Bad HV igniter wire</li> <li>C. Poor ground at burner</li> <li>D. Poor flame (check flame current)</li> </ul>

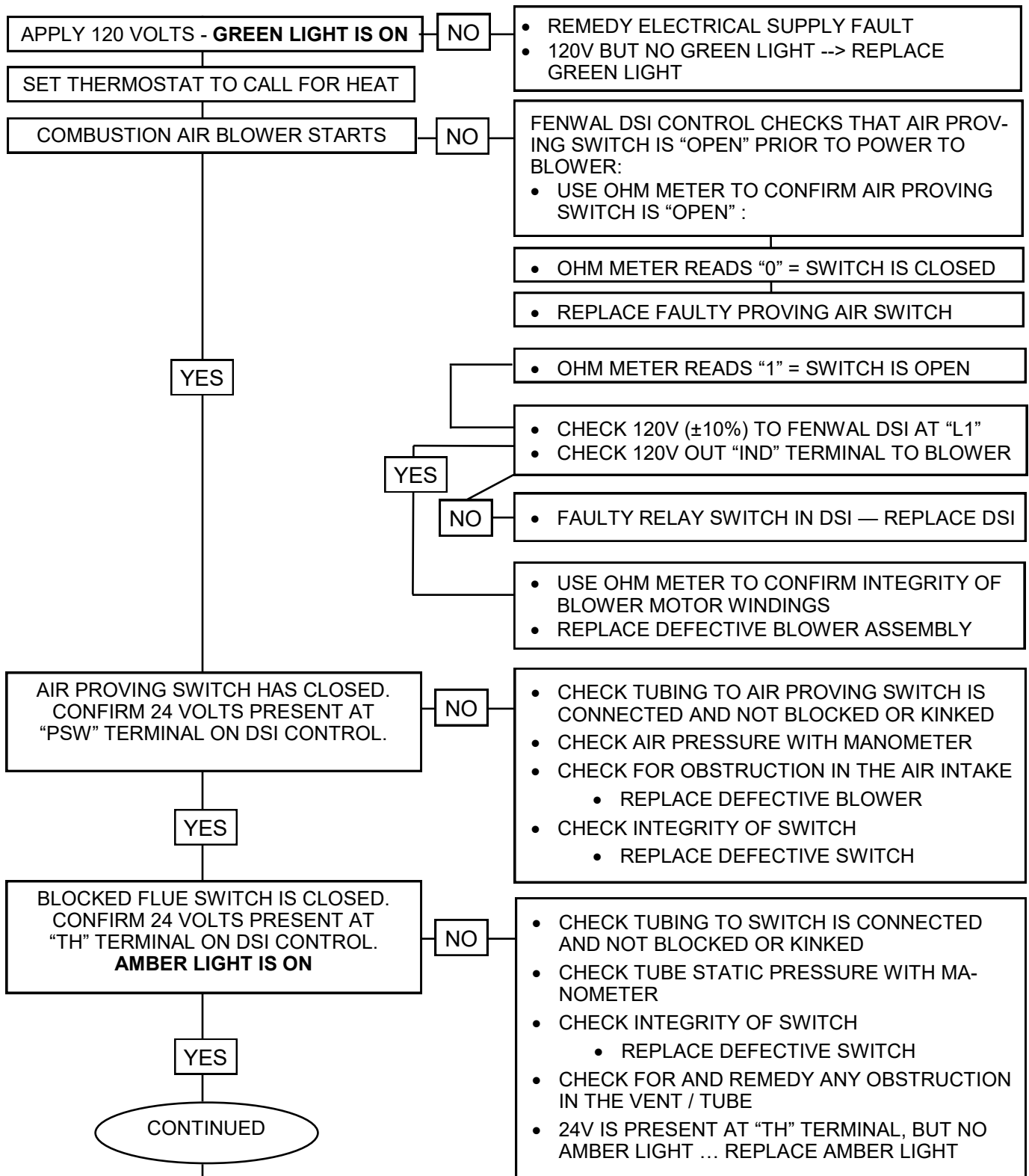
## 24. TROUBLESHOOTING GUIDE — HEATER OPERATION — FENWAL DSI

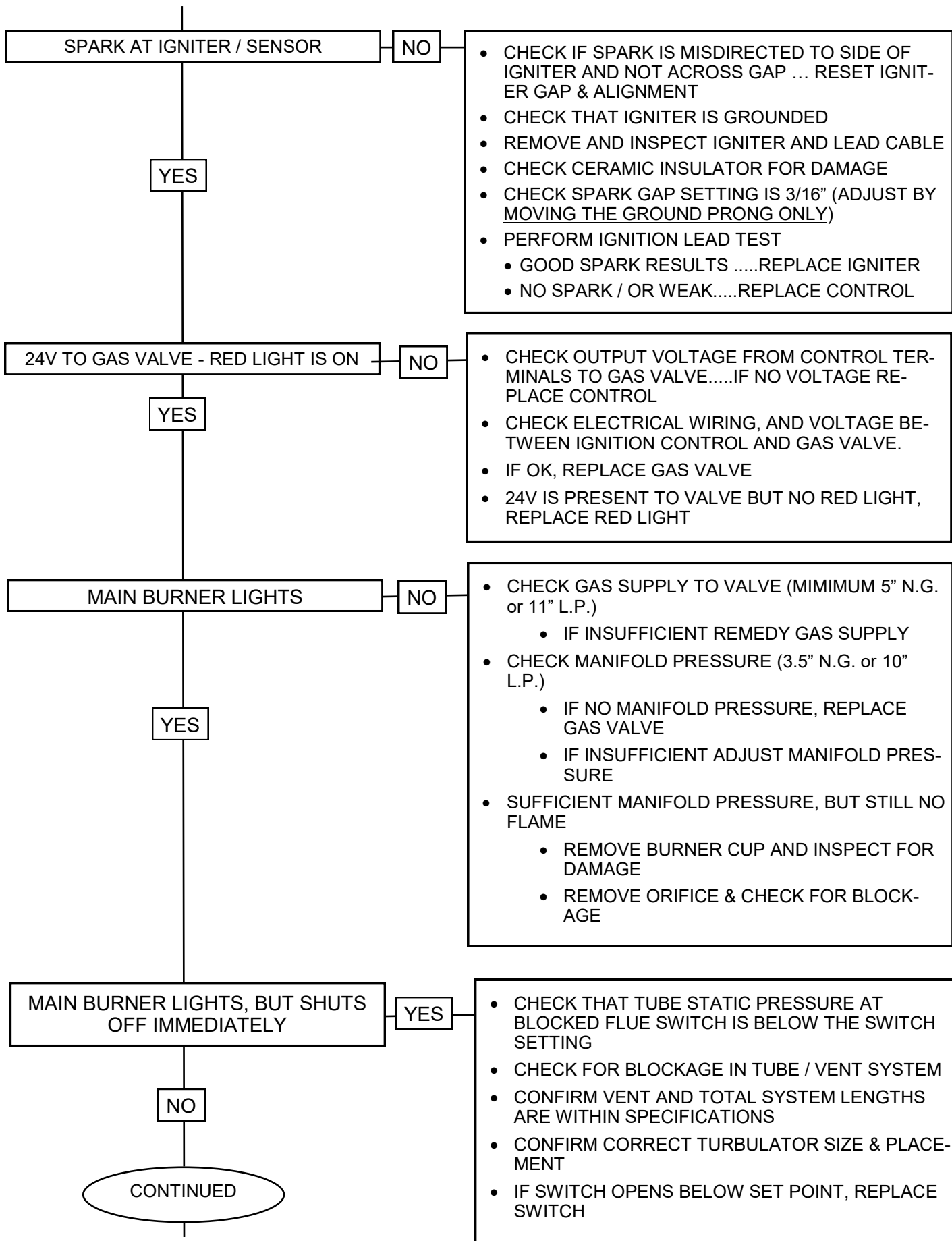


### WARNING

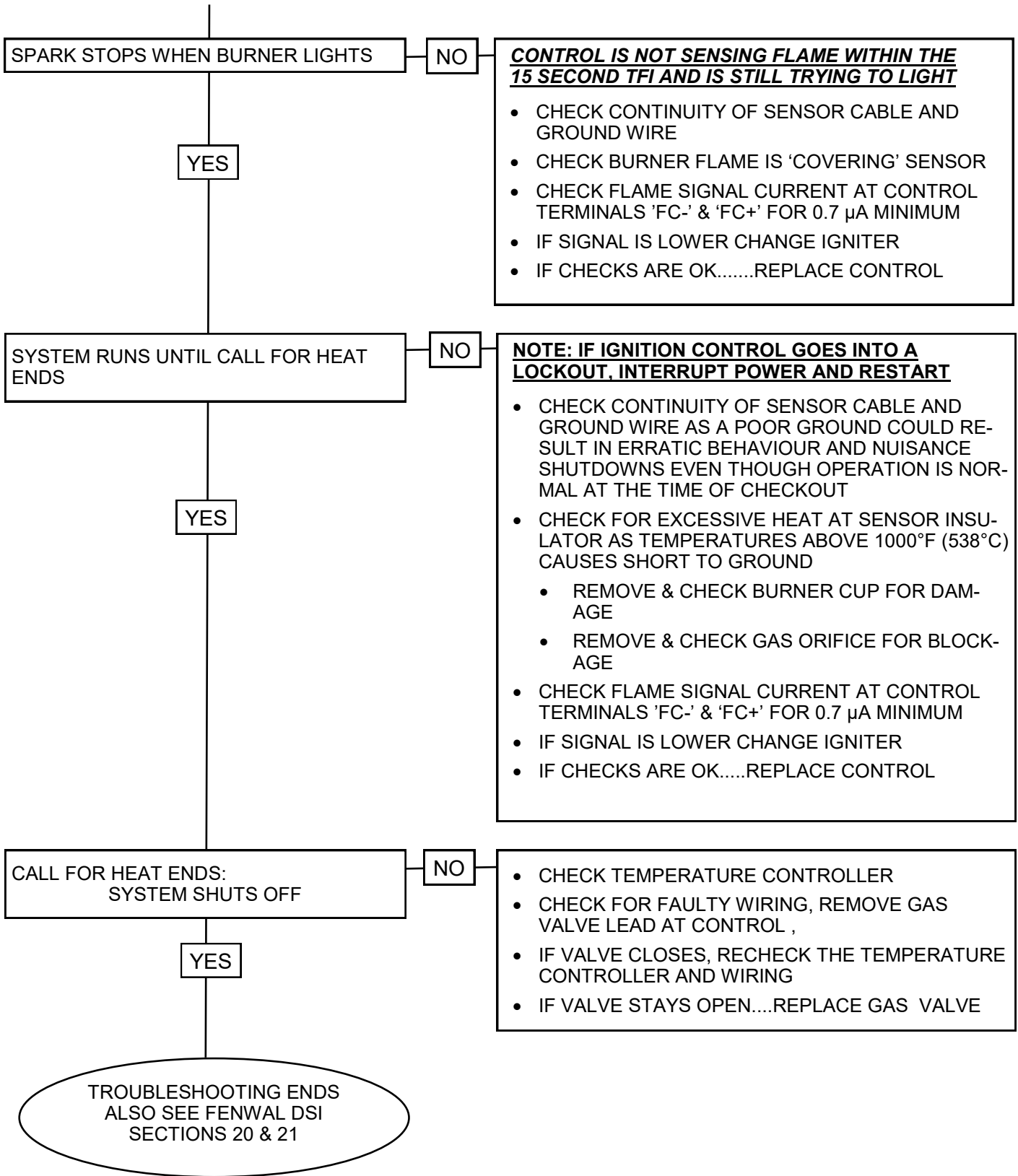
Improper adjustment, alteration, service or maintenance can cause property damage, injury or death. This heater must be installed and serviced only by a trained gas service technician

### SEQUENCE OF EVENTS (also see Fenwal DSI Control Troubleshooting previous page)









**25. START-UP / COMMISSIONING: PER LOCAL & NATIONAL CODE REQUIREMENT**



**THIS EQUIPMENT HAS BEEN FACTORY FIRED AND TESTED PRIOR TO SHIPMENT. HOWEVER, THIS APPLIANCE REQUIRES COMMISSIONING AND FIELD ADJUSTMENT / SPECIFICATIONS CONFIRMATION TO ENSURE SAFE AND EFFICIENT OPERATION.**

PROJECT NAME: \_\_\_\_\_

Area / Bldg: \_\_\_\_\_

Project Location: \_\_\_\_\_

Contractor: \_\_\_\_\_

Address: \_\_\_\_\_

City: \_\_\_\_\_ State / Prov: \_\_\_\_\_

Phone: \_\_\_\_\_ Cell #: \_\_\_\_\_

Commission Date: \_\_\_\_\_

Project Heater Number / Identifier: \_\_\_\_\_

Heater Model Number: \_\_\_\_\_

Heater Serial Number: \_\_\_\_\_

**TO ENSURE THAT SITE CONDITIONS ARE COMPATIBLE WITH THE HEATER'S PERFORMANCE AND TO ALLEVIATE NUISANCE CALL-BACKS, THE FOLLOWING START-UP NEEDS TO BE COMPLETED BY THE QUALIFIED GAS INSTALLER.**

**A TECHNICIAN CALLING FOR TECHNICAL SUPPORT MUST PROVIDE THE INFORMATION FROM THE COMPLETED COMMISSIONING REPORT ON THE NEXT PAGE**

**FAX COMPLETED REPORT TO TECHNICAL SERVICES:  
FAX 1-866-361-0523,  
VOICE 1-877-446-3727**



**WARNING**

**START UP 'SMOKE'**

During start up, material coatings used in the production process of tubes and reflectors will "burn off" and create smoke during the first hour of operation. This is temporary and normal. Please ensure that there is sufficient ventilation to adequately clear the smoke from the space. Notify site and safety personnel to ensure that alarm systems are not unduly activated.

## **COMPLETE THIS TUBE HEATER START-UP CHECKLIST / REPORT**

HEATER: MODEL #: \_\_\_\_\_ SERIAL #: \_\_\_\_\_ TUBE LENGTH: \_\_\_\_\_ FT

- TYPE OF FUEL GAS: NG  LP

### SITE CONDITIONS:

DOES BUILDING HAVE A NEGATIVE CONDITION? YES  NO   
If "YES" refer to Section 11- *FLUE VENTING*

IS THIS HEATER INSTALLED 2000 FT OR MORE ABOVE SEA LEVEL? YES  NO   
If "YES" refer to Section 15 - *HIGH ALTITUDE INSTALLATION*

DOES THE APPLICATION REQUIRE FRESH AIR TO BURNER? YES  NO   
If "YES" refer to Section 12 - *COMBUSTION AIR DUCTING*

IS HEATER EXPOSED TO CHEMICAL OR CORROSIVE ATMOSPHERE? YES  NO   
Is the correct Model heater installed? Also see Section 12 – *COMBUSTION AIR DUCTING*

CAN HEATER BE AFFECTED BY OVERHEAD CRANES / VIBRATION? YES  NO   
If "YES" ensure heater is protected by vibration isolation hardware

• MAIN GAS LINES AND BRANCH LINES HAVE BEEN PURGED OF AIR YES  NO

• MINIMUM CLEARANCES TO COMBUSTIBLES ARE MAINTAINED (PER TABLE 1) YES  NO

• "MAXIMUM STACKING HEIGHT" SIGN(S) HAVE BEEN POSTED AT THERMOSTAT(S) YES  NO

• DOES THE HEATER GAS TYPE ON RATING LABEL MATCH THE GAS SUPPLY YES  NO

• IS GAS SUPPLY PIPING ADEQUATELY SIZED FOR ENTIRE SYSTEM YES  NO

• IS THE FLEXIBLE GAS CONNECTOR PROPERLY 'C' CONFIGURED AND LOCATED YES  NO

• INLET GAS SUPPLY PRESSURE TO THIS HEATER WITH ALL HEATERS IN OPERATION  "W.C.

• MANIFOLD PRESSURE (OUTLET OF GAS VALVE) WITH HEATER IN OPERATION  "W.C.

• ELECTRICAL SUPPLY: LINE VOLTAGE AT THE TERMINAL BLOCK  VOLTS

• THIS HEATER ELECTRICALLY GROUNDED PER CODE YES  NO

• VOLTAGE READING AT THE IGNITION MODULE  VOLTS

• WHAT IS THE FLAME SIGNAL STRENGTH FROM SENSOR IN MICRO AMPS   $\mu$ A

• IS HEATER THERMOSTAT CONTROLLED: TruTemp  ThermoControl Plus  24V  120V  NO

• IS THE THERMOSTAT STRATEGICALLY LOCATED YES  NO

• TOTAL LENGTH OF INSTALLED THERMOSTAT WIRE  FT

• GAUGE OF THE THERMOSTAT WIRE  GA

• DOES VENT & AIR DUCT CONFIGURATION ALLOW HEATER TO EXPAND/CONTRACT YES  NO

• TOTAL LENGTH OF VENT (each 90° bend equivalent to 5 linear feet)  FT

• TOTAL LENGTH COMBUSTION AIR DUCT (each 90° bend equivalent to 5 linear feet)  FT

*Refer to turbulator diagram in this manual:*

• IF REQUIRED, HAS A TURBULATOR SECTION BEEN REMOVED YES  NO

• ARE THE TURBULATOR(S) INSTALLED IN THE CORRECT LOCATION IN SYSTEM YES  NO

**FAX COMPLETED REPORT TO TECHNICAL SERVICES: FAX 1-866-361-0523, VOICE 1-877-446-3727**

**26. TABLE 7: MODEL DIMENSIONS**

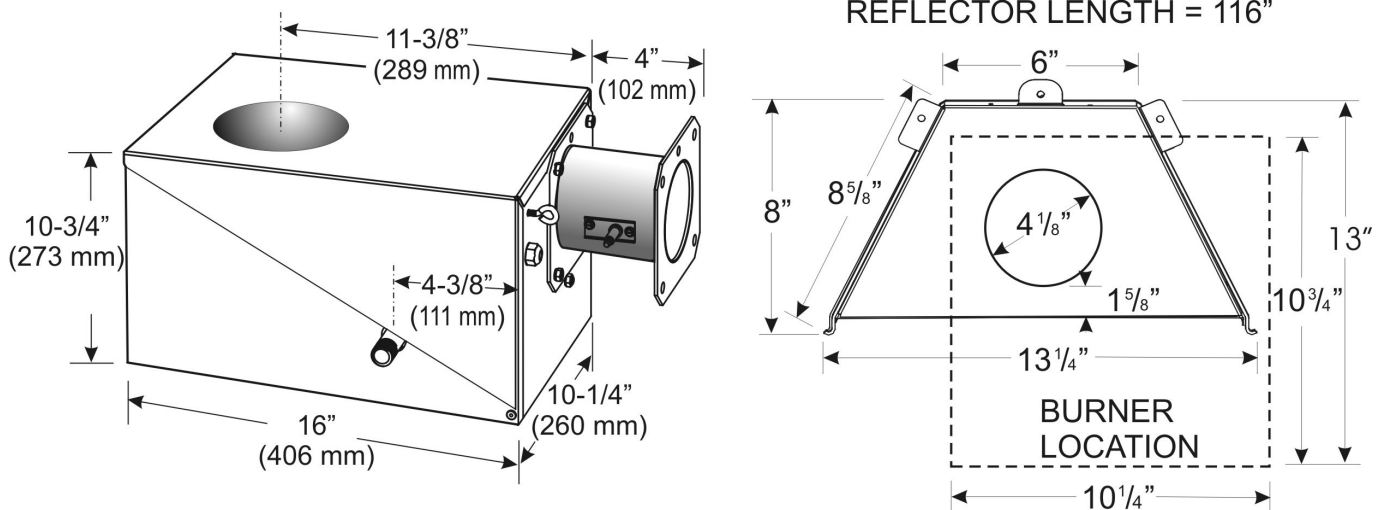
MODEL	NOMINAL LENGTH (FT)	OVERALL HEATER LENGTH* (FT)	APPROX NET WEIGHT** (LBS)
STS-JZ / IQ 200	70	69' 8"	324
STS-JZ / IQ 200	60	60'	282
STS-JZ / IQ 200	50 (NG Only)	50' 4"	239
STS-JZ / IQ 175	70 (NG Only)	69' 8"	324
STS-JZ / IQ 175	60	60'	282
STS-JZ / IQ 175	50	50' 4"	239
STS-JZ / IQ 155	60	60'	282
STS-JZ / IQ 155	50	50' 4"	239
STS-JZ / IQ 155	40	40' 8"	197
STS-JZ / IQ 130	50	50' 4"	239
STS-JZ / IQ 130	40	40' 8"	197
STS-JZ / IQ 130	30 (NG Only)	31'	154

MODEL	NOMINAL LENGTH (FT)	OVERALL HEATER LENGTH* (FT)	APPROX NET WEIGHT** (LBS)
STS-JZ / IQ 110	50	50' 4"	239
STS-JZ / IQ 110	40	40' 8"	197
STS-JZ / IQ 110	30	31'	154
STS-JZ / IQ 100	20 (NG Only)	21' 4"	111
STS-JZ / IQ 80	40	40' 8"	197
STS-JZ / IQ 80	30	31'	154
STS-JZ / IQ 80	20	21' 4"	111
STS-JZ / IQ 60	30	31'	154
STS-JZ / IQ 60	20	21' 4"	111
STS-JZ / IQ 45	20	21' 4"	111

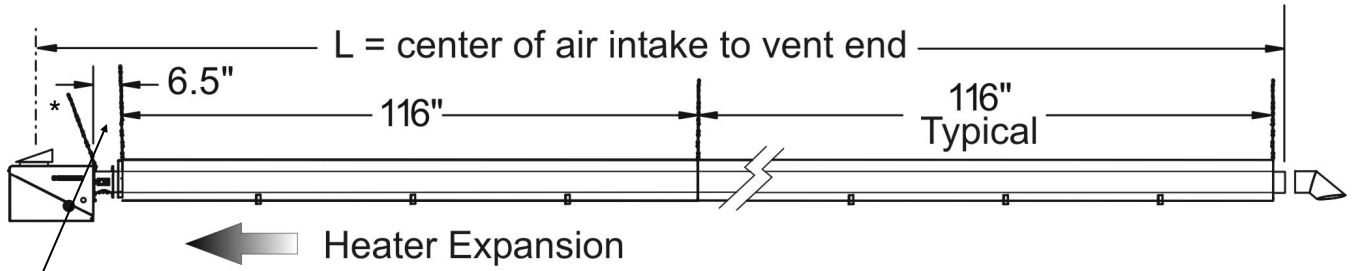
- Manufactured and shipped in 10 ft lengths.
- Swaged tube has approximate 4 inch (10 cm) overlap -
  - Net length of first and intermediate tubes is 116 inches (295 cm)
  - Last tube is 120" (305 cm) [the 4 inch swage portion is exposed for vent connection]
  - Total tube length is approximately 4 inches (10 cm) shorter for each multiple of 10 feet (305 cm)
  - Overall length of heater includes the burner.

\*\* Burner weight is 26 pounds (11.8 kg)  
 Each 10 ft (305 cm) tube/reflector section weighs 82 pounds (37.2 kg)

**FIGURE 25 BURNER DIMENSIONS**



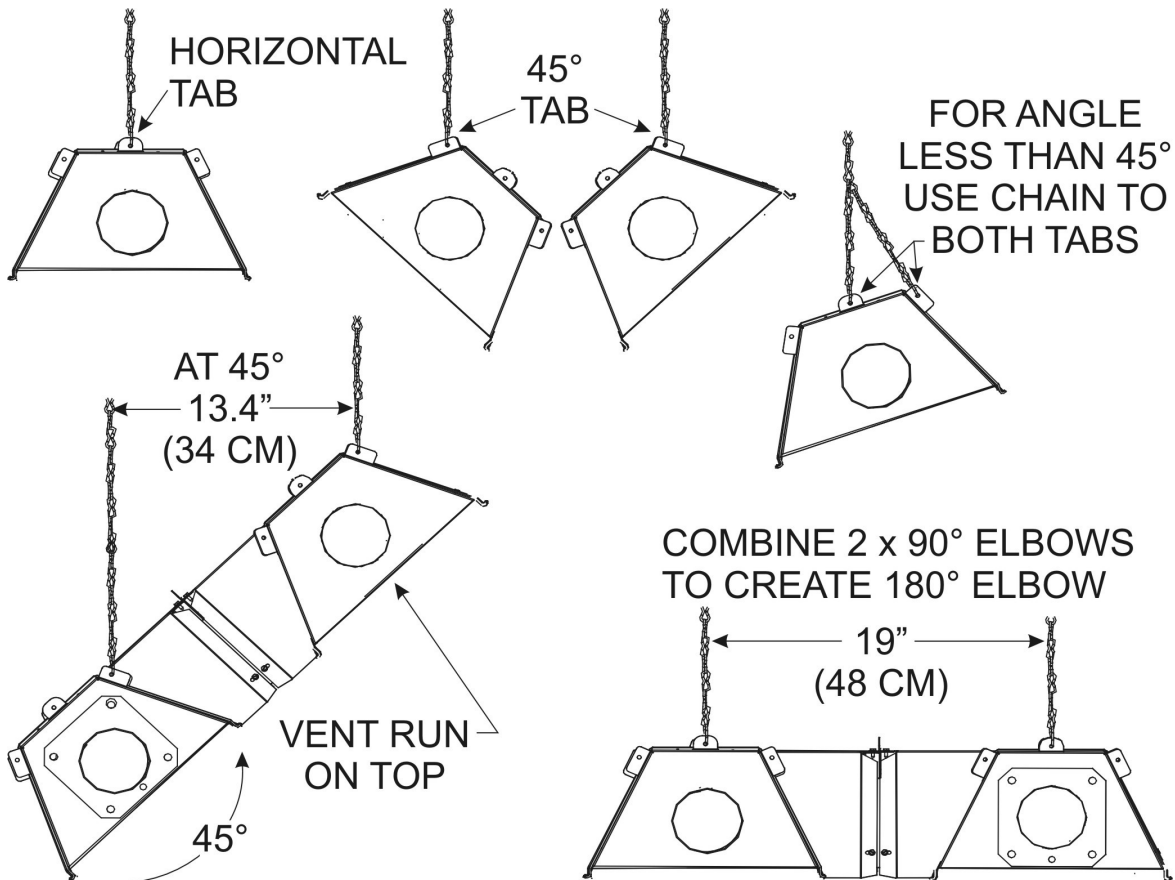
**FIGURE 26 HANGER SPACING / AIR INTAKE TO VENT LENGTH**



- POSITION BURNER END HANGER 6.5 INCHES (17 CM) FROM BURNER [2.5 INCHES (6.4 CM) FROM TUBE FLANGE]
- POSITION SYSTEM HANGERS 116 INCHES (295 CM) APART
- \* ANGLE BURNER SUPPORT CHAIN BACK OVER BURNER - ALLOWS TUBE SYSTEM EXPANSION


Tube Length	'L' = center air intake to end			Tube Length	'L' = center air intake to end		
10'	11'-3 3/4"	; 135 3/4"	; 345 cm	50'	49'-11 3/4"	; 599 3/4"	; 1523 cm
20'	20'-11 3/4"	; 251 3/4"	; 628 cm	60'	59'-7 3/4"	; 715 3/4"	; 1818 cm
30'	30'-7 3/4"	; 367 3/4"	; 934 cm	70'	69'-3 3/4"	; 831 3/4"	; 2113 cm
40'	40'-3 3/4"	; 483 3/4"	; 1229 cm				

**FIGURE 27 HANGER / REFLECTOR ORIENTATION HORIZONTAL TO 45°**



## 27. BURNER & TUBE KIT ASSEMBLY CHART MODELS STS-JZ / IQ

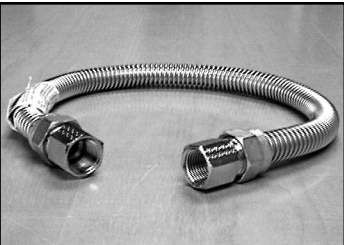

MODELS STS-JZ & IQ are approved for indoor commercial / industrial non-residential applications. For outdoor, wet and harsh environment applications refer to models SPW-JZ / IWP (powder coated burner box) and/or STW-JZ / IW (stainless steel burner box).

	<b>BEFORE INSTALLING: ENSURE you have the CORRECT TUBE KIT(s) for the BURNER INPUT</b>
---	--

### MODELS: **STS-JZ & IQ:** Commercial / Industrial Applications

		Order: TUBE KIT PART # & QUANTITY REQUIRED									
		Stand-Alone Kits					Primary Kits +		Secondary Kits		
		70	120	120	170	210	165	165	120	165	210
Gross Weight (lbs)-> Kit Tube Length (ft)->		10'	20'	20'	30'	40'	30'	30'	20'	30'	40'
Heater Tube Length		TS-4510-JZ	TS-1420-JZ	TS-1020-JZ	TS-1430-JZ	TS-1040-JZ	F030-JZ	TS-1030-JZ	TS-0020-JZ	TS-0030-JZ	TS-0040-JZ
FIRING RATE	Heater Tube Length										
45,000	10' Minimum	<b>1</b>									
	20' Maximum		<b>1</b>								
60,000	20' Minimum		<b>1</b>								
	30' Maximum				<b>1</b>						
80,000	20' Minimum		<b>1</b>								
	30'				<b>1</b>						
100,000	40' Maximum					<b>1</b>					
	20' Only			<b>1</b>							
110,000	30' Minimum				<b>1</b>						
	40'					<b>1</b>					
125,000	50' Maximum						<b>1+</b>		<b>1</b>		
	30' Minimum				<b>1</b>						
125,000	40'					<b>1</b>					
	50' Maximum						<b>1+</b>		<b>1</b>		
150,000	40' Minimum					<b>1</b>					
	50'						<b>1+</b>		<b>1</b>		
150,000	60' Maximum						<b>1+</b>			<b>1</b>	
	50' Minimum							<b>1+</b>	<b>1</b>		
175,000	60'							<b>1+</b>		<b>1</b>	
	70' Maximum							<b>1+</b>			<b>1</b>
200,000	50' Minimum							<b>1+</b>	<b>1</b>		
	60'							<b>1+</b>		<b>1</b>	
200,000	70' Maximum							<b>1+</b>			<b>1</b>

**NOTE: STS-JZ / IQ Series Burners require 120V supply**  
**Stand-Alone Tube Kits require no additional Tube Kits.**  
**30 ft Primary Tube Kits require a Secondary Tube Kit to create lengths 50 ft, 60 ft, or 70 ft.**  
**Secondary Tube Kits require a Primary Tube Kit.**

<b>FLEXIBLE GAS CONNECTOR (Included in Burner Kit) - MUST INSTALL - see Section 13</b>	
<p><b><u>USA</u> - Stainless Steel Flexible Gas Connector</b></p> <p>125,000 or less: JL-0771-XX - 1/2"x24"</p> <p>150,000 or more: JL-0771-YY - 3/4"x36"</p>	<p><b><u>CANADA</u> - Type 1 Hose Gas Connector</b></p> <p>125,000 or less: JL-0771-RC - 1/2"x36"</p> <p>150,000 or more: JL-0771-RB - 3/4"x36"</p>
	

## 28. HIGH ALTITUDE INSTALLATION

**Canada:** Heaters can be installed to an altitude of 4500 ft without revision.

- To install above 4500 feet refer to recommendation of local authority having jurisdiction.

**USA:** The factory installed orifice is approved for normal altitude up to 2000 ft.

When this appliance is installed above an altitude of 2000 feet in the USA, the input must be de-rated by 4% for each 1000 ft. Refer to the table next page for orifice sizing and restrictions that apply to high altitude installation. Check with your local authority regarding de-rating.

**NOTE: Installations above 4,500 ft: Restrict the Total Combined System Length as indicated in the TOTAL SYSTEM LENGTH RESTRICTIONS Table below.**

**MINIMUM VENT LENGTH:** (Vented or Unvented [indirect mechanical ventilation])

- Minimum vent length of 3 ft (91 cm) is required (**NOTE:** 200,000 Propane: Minimum 8 ft (244 cm))

**MAXIMUM SYSTEM LENGTH (includes: Tube Heater length + combustion air duct + vent):**

- Each 90° elbow in the system has an equivalent length of 5 ft.
- A maximum of 2 elbows are allowed in any portion (duct, tube heater, vent) with the exception of up to three 90° elbows in a vertical vent run through the roof
- Combustion air duct may be 4" or 5" diameter and is not to exceed lengths in table below
- Exceeding the allowable lengths in the table below can create combustion and/or condensation problems and will void CSA Certification and the heater warranty.
- Do not exceed the **Maximum Combined System Length** regardless of the allowed maxi-

**TABLE 8: TOTAL SYSTEM LENGTH RESTRICTIONS:  
INSTALLATIONS ABOVE 4500 FEET** (Lower altitudes refer to Section 12A)

Input (Btuh)	Do Not Exceed Maximum Combined System Length		Max. Air Duct Length (ft) (by Duct Diameter)		Max. Vent Length (ft) Individual: 4"Ø Combined: 6"Ø length from each heater
	4" Air Duct	5" Air Duct	4" Ø	5" Ø	
45,000 & 60,000	40 ft	60 ft	20 ft	40 ft	20 ft
80,000	50 ft	70 ft	20 ft	40 ft	20 ft
100,000	40 ft	60 ft	30 ft	50 ft	30 ft
110,000 to 150,000	80 ft	100 ft	30 ft	50 ft	40 ft
175,000 & 200,000	100 ft	120 ft	30 ft	50 ft	50 ft

Example	
<b>150,000 Btuh Heater:</b>	
Tube Heater Length	40 ft
1 x 90° elbow (vent)	5 ft
Straight vent	15 ft
1 x 90° elbow (duct)	5 ft
Air Duct: 4" Ø	<u>13 ft</u>
Combined Length	78 ft
Max. Allowed	80 ft
Additional 20' for 5" Ø Air Duct	

## HIGH ALTITUDE INSTALLATION - USA ORIFICE CHART - ALTITUDE CON-

**Altitude Restrictions this Model: - also see notes previous page**

1. Do not install the 45,000 Btuh and 100,000 Btuh models at altitudes greater than 4,500 ft
2. Do not install other input models at altitudes greater than 8,000 ft
3. At altitudes greater than 4,500 ft, restrict the Total Combined System Length of any model to the length indicated in Table 8 on the previous page

<b>INPUT (BTUH)</b>	<b>FOR USE AT ALTITUDES ABOVE (FEET)</b>							
	Gas Orifice Drill Size / Part#							
	<b>Supplied</b>	<b>USA</b>						
	<b>0 - 2000</b>	<b>2000</b>	<b>3000</b>	<b>4000</b>	<b>4500</b>	<b>5500</b>	<b>6500</b>	<b>7500</b>
<b>45,000 NG</b>	29 DMS JS-0729-DM	29 DMS JS-0729-DM	30DMS JS-0730-DM	30DMS JS-0730-DM	<b>45,000 Btuh not for use above 4,500 feet</b>			
<b>45,000 Propane</b>	46 DMS JS-0746-DM	46 DMS JS-0746-DM	46 DMS JS-0746-DM	48 DMS JS-0748-DM				
<b>60,000 NG</b>	25 DMS JS-0725-DM	26 DMS JS-0726-DM	27 DMS JS-0727-DM	27 DMS JS-0727-DM	28 DMS JS-0728-DM	28 DMS JS-0728-DM	29 DMS JS-0729-DM	29 DMS JS-0729-DM
<b>60,000 Propane</b>	42 DMS JS-0742-DM	42 DMS JS-0742-DM	43 DMS JS-0743-DM	43 DMS JS-0743-DM	43 DMS JS-0743-DM	44 DMS JS-0744-DM	44 DMS JS-0744-DM	45 DMS JS-0745-DM
<b>80,000 NG</b>	18 DMS JS-0718-DM	19 DMS JS-0719-DM	19 DMS JS-0719-DM	20,000 DMS JS-0720-DM	21 DMS JS-0721-DM	22 DMS JS-0722-DM	23 DMS JS-0723-DM	24 DMS JS-0724-DM
<b>80,000 Propane</b>	36 DMS JS-0736-DM	38 DMS JS-0738-DM	39 DMS JS-0739-DM	39 DMS JS-0739-DM	40 DMS JS-0740-DM	41 DMS JS-0741-DM	42 DMS JS-0742-DM	42 DMS JS-0742-DM
<b>100,000 NG</b>	11 DMS JS-0711-DM	13 DMS JS-0713-DM	13 DMS JS-0713-DM	14 DMS JS-0714-DM	<b>100,000 Btuh not for use above 4,500 feet</b>			
<b>110,000 NG</b>	5.2 mm JS-0752-MM	5.1 mm JS-0751-MM	5.0 mm JS-0750-MM	9 DMS JS-0709-DM	11 DMS JS-0711-DM	0.19 i N JS-0719-IN	13 DMS JS-0713-DM	14 DMS JS-0714-DM
<b>110,000 Propane</b>	31 DMS JS-0731-DM	32 DMS JS-0732-DM	32 DMS JS-0732-DM	32 DMS JS-0732-DM	33 DMS JS-0733-DM	34 DMS JS-0734-DM	35 DMS JS-0735-DM	36 DMS JS-0736-DM
<b>125,000 NG</b>	5.8 mm JS-0758-MM	5.7 mm JS-0757-MM	5.6 mm JS-0756-MM	5.5 mm JS-0755-MM	3 DMS JS-0703-DM	4 DMS JS-0704-DM	5 DMS JS-0705-DM	0.20 in JS-0720-IN
<b>125,000 Propane</b>	29 DMS JS-0729-DM	29 DMS JS-0729-DM	30 DMS JS-0730-DM	30 DMS JS-0730-DM	30 DMS JS-0730-DM	1/8" JS-0713-IN	31 DMS JS-0731-DM	31 DMS JS-0731-DM
<b>150,000 NG</b>	0.25 in JS-0725-IN	6.4 mm JS-0764-MM	6.3 mm JS-0763-MM	6.2 mm JS-0762-MM	6.1 mm JS-0761-MM	6.0 mm JS-0760-MM	5.9 mm JS-0759-MM	5.8 mm JS-0758-MM
<b>150,000 Propane</b>	0.14 in JS-0714-IN	3.5 mm JS-0735-MM	29 DMS JS-0729-DM	3.4 mm JS-0734-MM	3.3 MM JS-0733-MM	3.3 MM JS-0733-MM	30 dms JS-0730-DM	0.13 in JS-0713-IN
<b>175,000 NG</b>	6.7 mm JS-0767-MM	6.6 mm JS-0766-MM	6.6 mm JS-0766-MM	6.5 mm JS-0765-MM	6.5 mm JS-0765-MM	6.4 mm JS-0764-MM	6.3 mm JS-0763-MM	6.3 mm JS-0763-MM
<b>175,000 Propane</b>	24 DMS JS-0724-DM	25 DMS JS-0725-DM	26 DMS JS-0726-DM	27 DMS JS-0727-DM	28 DMS JS-0728-DM	28 DMS JS-0728-DM	29 DMS JS-0729-DM	29 DMS JS-0729-DM
<b>200,000 NG</b>	0.30 in JS-0730-IN	7.4 mm JS-0774-MM	7.3 mm JS-0773-MM	7.3 mm JS-0773-MM	7.2 mm JS-0772-MM	0.28 in JS-0728-IN	7.1 mm JS-0771-MM	7.0 mm JS-0770-MM
<b>200,000 Propane</b>	19 DMS JS-0719-DM	20 DMS JS-0720-DM	20 DMS JS-0720-DM	21 DMS JS-0721-DM	22 DMS JS-0722-DM	23 DMS JS-0723-DM	25 DMS JS-0725-DM	26 DMS JS-0726-DM



## 29. OPTIONAL ACCESSORIES

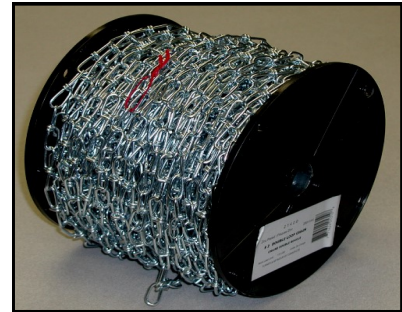
**#2 Lion Chain** (115 lb work load)  
- 200 ft roll

JL-0800-XX

**Safety Snap Hooks** - 2" - package of 25  
- package of 100

JL-0800-SH

JL-0800-SH-B



### **Flue Vent Terminal**

4" wall horizontal  
6" wall horizontal

JA-0528-XX  
JA-0529-XX



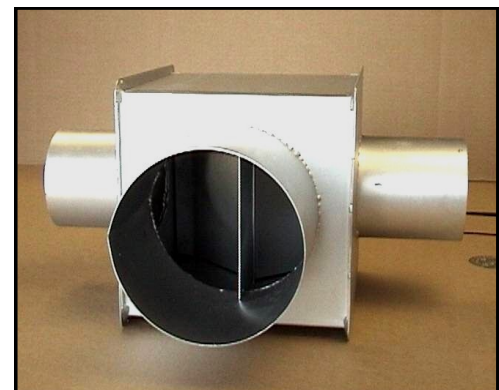
**Torctite Coupler** (c/w 2 bolts)

JA-0516-SW



**Vent Tee** 4" X 4" X 6"  
(2 couplers optional)

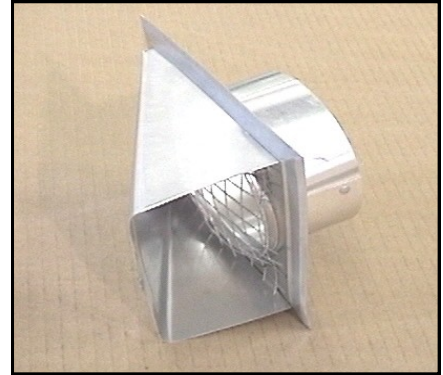
JA- 0514-XX



## 28. OPTIONAL ACCESSORIES

### Fresh Air Intake Cap—Wall

JS-0532-VC



### Clearance Sign

- Required in some jurisdictions:

- Vehicle service garages
- 3/4" high red lettering on white background

JL-0798-CS

**WARNING**

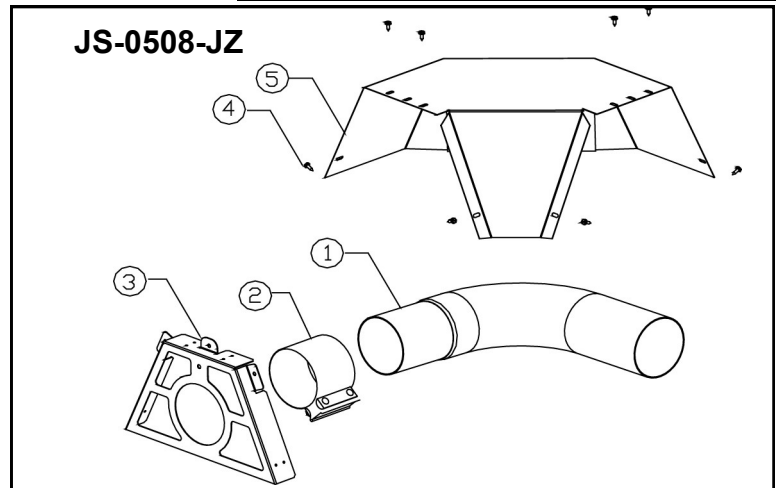
**MAINTAIN \_\_\_" CLEARANCE FROM  
TUBE HEATER TO VEHICLES  
AND COMBUSTIBLE MATERIALS**

### 90 degree Elbow Kit\* - Aluminized Steel

- \*Kit includes: 1. elbow,  
2. tube coupler,  
3. reflector end cap,  
4 screws,  
5. reflector cap.

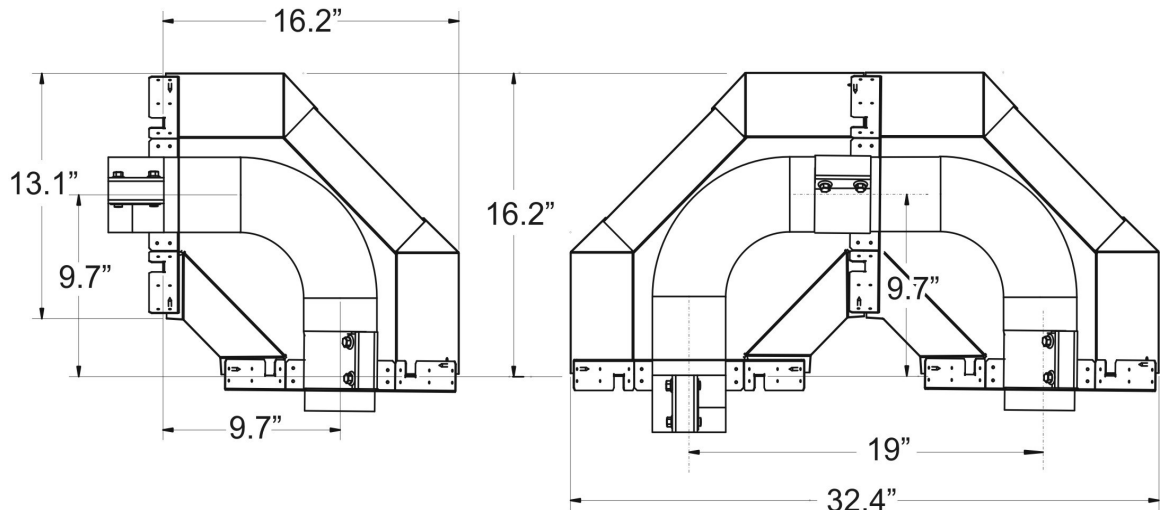
See dimensions below

For 180 degree elbow applications



90° Elbow Kit JS-0508-JZ

2 x 90° Elbow Kit = 180° Elbow



**Options For 24V Thermostat Control:**

**NOTE: Fenwal DSI has an onboard relay switch to control the blower motor (120 Vac) and allows for heater control with either 24V or 120V thermostat. The Fenwal DSI has a post-purge feature. A 24V Thermostat MUST be used to enable the post-purge feature. A line voltage thermostat will disable the post-purge feature**

**Low Voltage Digital Thermostat**  
(24 Volts - °F or °C selectable)

*Not for use in corrosive or wet environments*

JS-0569-WR



**TruTemp Thermostat (24Vac - 3-Wire)**

True comfort control for radiant heating systems - senses and averages ambient and radiant temperatures. Occupancy sensor with auto set-back of 9°F (5°C).

*Do not use in wet or corrosive environments*

JM-0150-XX



**Line Voltage Thermostat:**

Dual Scale: °F or °C

*Not for use in corrosive or wet environments*

JL-0772-XX



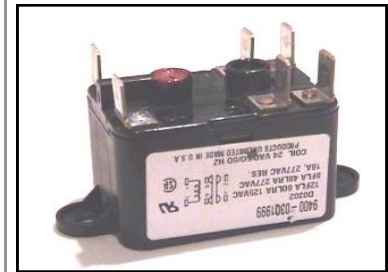
**Multiple Heaters per 24V Thermostat**

**Relay Switch:** One required for each burner after the first burner in a zone (1st burner connects to 24V thermostat)

Refer to wiring diagram Page 36  
(field installed at or in burner)

NOTE: FENWAL DSI has built in relay for blower operation

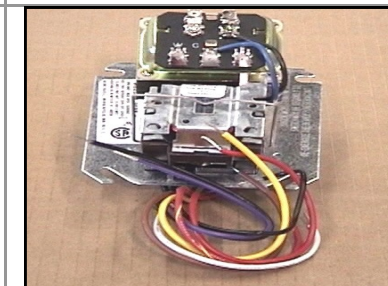
JS-0568-CC


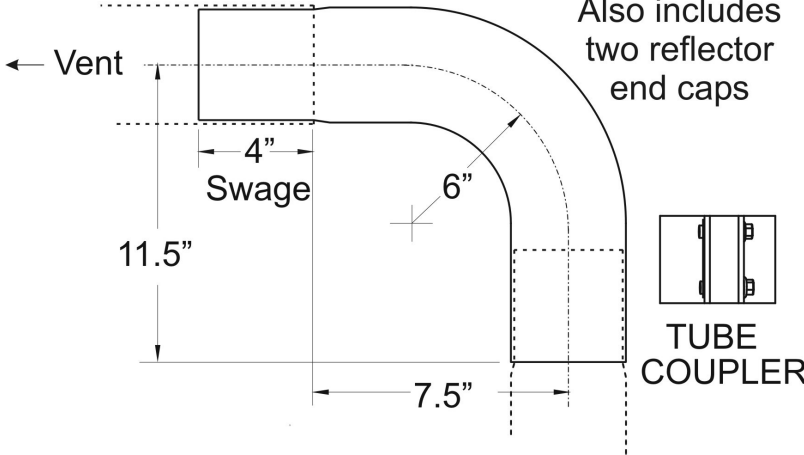
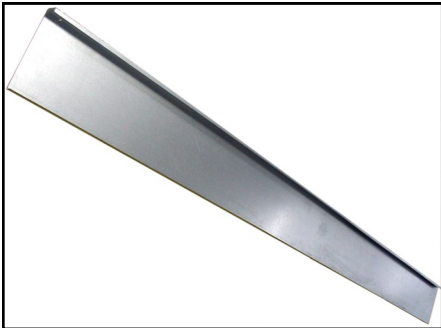
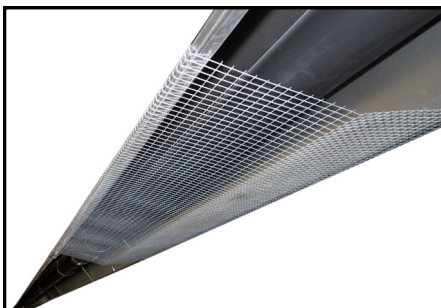


**24 Volt Option: Control Center**

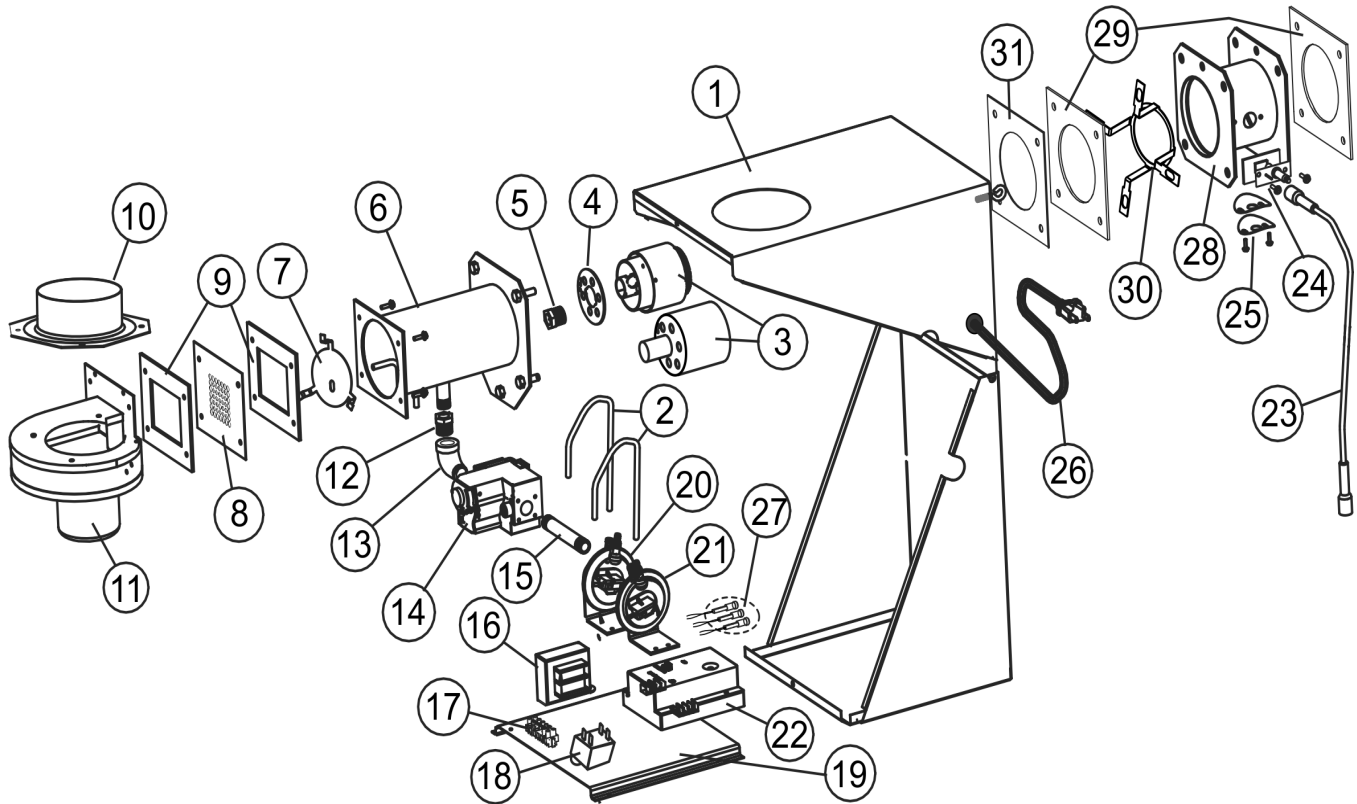
Use when Multiple Tube Heaters are controlled by a single 24V Thermostat or TruTemp  
(for field mounting)

JM-0303 -KT



<p><b>90 degree Aluminized Steel Elbow Kit</b></p> <p>(Kit includes: aluminized steel elbow, coupler, and two end plate hangers)</p> <p>For 180° elbow use two x JS-0508-SM, or use Model S100U / ITBU</p>	<p>JS-0508-SM</p>	
		<p>90° Elbow Kit JS-0508-SM</p> <p>Also includes two reflector end caps</p> 
<p><b>Side Reflector Extension Kit-</b> 10" deep, 10 ft long Each</p>	<p>JS-0509-KT</p>	
<p><b>Tube Protection Screen</b> -5 foot lengths</p>	<p>JA-0780-XS <i>For Builder Model</i></p>	

## 29. REPLACEMENT PARTS LIST: *Model & Serial Numbers Required*



#	PART DESCRIPTION	MODEL	MODEL DASH # / GAS TYPE	PART #	PART DESCRIPTION PRIMARY
1	BURNER HOUSING	ALL	Schwank	JS-0582-XX	Burner housing coated orange
		ALL	Infrasave	JJ-0582-XX	Burner housing coated gray
2	PRESSURE SWITCH TUBING	ALL		JS-0572-SE	Tubing set 2 x 20" PVC SE
3	BURNER CUP	45	NG; LP	JS-0510-LP-45	Burner Cup w/ Center Hole
		60, 80, 100	NG; LP	JS-0510-LP	Burner Cup with Vanes
		110-155	NG; LP	JS-0512-XX	Burner Cup
		175	NG	JS-0512-XX	Burner Cup
		175	LP	JS-0512-UL	Burner Cup - Cast Aluminum - No Hole
		200	NG; LP	JS-0512-UL	Burner Cup - Cast Aluminum - No Hole
		4	BURNER CUP AIR RESTRICTOR RING	45	NG; LP
		60	LP	JS-0596-XX	Burner Cup air rest ring 0.375
		60-175	NG	JS-0596-XX	Burner Cup air rest ring 0.375
		80-155	LP	JS-0597-XX	Burner head air rest. ring .500
		175	-S; LP	JS-0597-XY	Burner Cup air rest ring 175-S LP
		200	-S; LP	JS-0597-YE	Burner Cup air rest ring 200-S LP
		200	-S; NG	JS-0597-YY	Burner Cup air rest ring 200-S NG
5	MAIN BURNER ORIFICE	45	LP	JS-0748-DM	Gas orifice low intensity HR 48 DMS
		45	NG	JS-0730-DM	Gas orifice low intensity HR 30 DMS
		60	LP; -FB	JS-0743-DM	Gas orifice low intensity HTR 43 DMS
		60	LP	JS-0742-DM	Gas orifice low intensity HTR 42 DMS
		60	NG; -FB	JS-0724-DM	Gas orifice low intensity HTR 24 DMS
		60	NG	JS-0725-DM	Gas orifice low intensity HTR 25 DMS
		80	LP; -FB	JS-0738-DM	Gas orifice low intensity HTR 38 DMS
		80	LP	JS-0736-DM	Gas orifice low intensity HTR 36 DMS
		80	NG; -FB	JS-0717-DM	Gas orifice low intensity HTR 17 DMS
		80	NG	JS-0718-DM	Gas orifice low intensity HTR 18 DMS

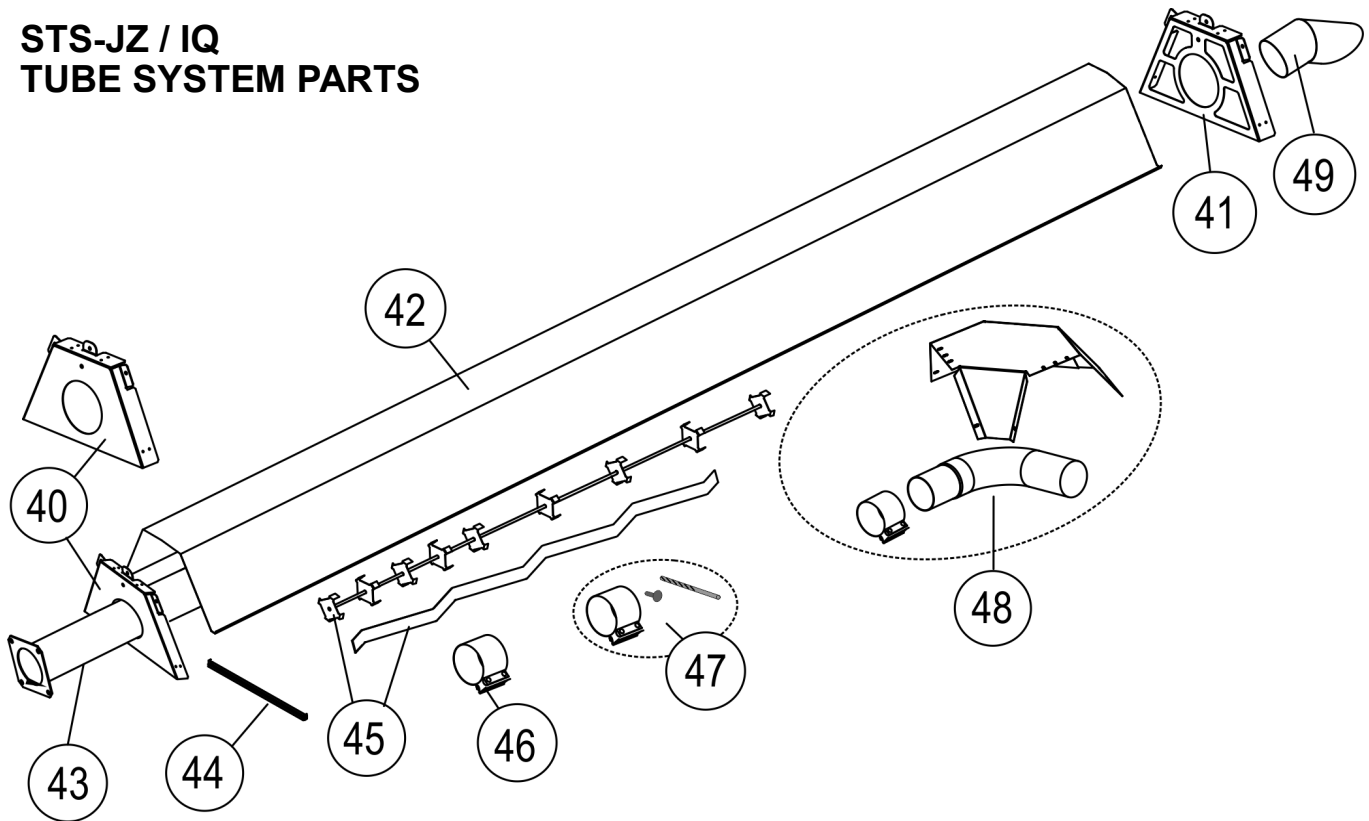
#	PART DESCRIPTION	MODEL	MODEL DASH #/ GAS TYPE	PART #	PART DESCRIPTION PRIMARY
5	MAIN BURNER ORIFICE	100, 110	LP	JS-0731-DM	Gas orifice low intensity HTR 31 DMS
		100, 110	NG	JS-0752-MM	Gas orifice low intensity HTR 5.2 mm
		130	LP	JS-0729-DM	Gas orifice low intensity HTR 29 DMS
		130	NG	JS-0758-MM	Gas orifice low intensity HTR 5.8 mm
		155	LP	JS-0714-IN	Gas orifice low intensity HTR 9/64 inch
		155	NG	JS-0725-IN	Gas orifice low intensity HTR 1/4 inch
		175	LP	JS-0724-DM	Gas orifice low intensity HTR 24 DMS
		175	NG	JS-0767-MM	Gas orifice low intensity HTR 6.7 mm
		200	LP	JS-0719-DM	Gas orifice low intensity HTR 19 DMS
		200	NG	JS-0730-IN	Gas orifice low intensity HTR 19/64 inch
6	BURNER CHAMBER	ALL		JS-0504-XX	Burner Chamber
7	BURNER AIR RESTRICTOR	45	NG & LP	JS-0592-AR	Burner air restrictor (45 Only)
8	EQUALIZER PLATE	45	LP	JS-0593-XL	Outlet equalizer plate 45 LP - 29 Holes
		45	NG	JS-0593-NG	Outlet equalizer plate 45 NG - 25 Holes
		60 to 155	NG & LP	JS-0593-XX	Outlet equalizer plate 60 to 155 LP & NG
		175	LP	JS-0593-XY	Outlet equalizer plate 175-S LP
		175	NG	JS-0593-XX	Outlet equalizer plate 175 NG
		200	NG & LP	JS-0593-XE	Outlet equalizer plate 200-S LP & NG
9	BLOWER GASKET	ALL	<i>Each</i>	JS-0578-XX	Outlet blower gasket
10	AIR INLET C/W SCREEN	45	NG	JS-0595-SC	Air Inlet Adapter 45 NG
		45	LP	JS-0594-ST	Air Inlet Adapter 45 LP
		60	NG & LP	JS-0594-ST	Air Inlet Adapter 60 NG & LP
		80	NG & LP	JS-0595-SP	Air Inlet Adapter 80 NG & LP
		100	NG	JS-0595-SP	Air Inlet Adapter 100NG
		110 to 200	NG & LP	JS-0595-AA	Air Inlet Adapter 110-200 NG & LP
11	BLOWER ASSEMBLY	45 to 175		JS-0579-AA	Blower Assembly 1/35 HP - 45 to 175
		200		JS-0579-ZZ	Blower Assembly 1/20 HP - 200,000
12	MANIFOLD BUSHING	ALL		JM-0589-XX	Manifold bushing
13	90 DEGREE ELBOW FITTING 1/2"	ALL		JS-0588-XX	Street elbow fitting 90 deg
14	GAS VALVE	45 to 155	NG	JL-0701-AA	Valve gas comb 3.5" WC 24VAC VR8 NG
		45 to 155	LP	JL-0703-AA	Valve gas comb 10" WC 24VAC VR8 LP
		175, 200	NG	JA-0506-XX	Gas Valve - Slow Open 3.5" WC NG
		175, 200	LP	JA-0507-XX	Gas Valve - Slow Open 10" WC LP
15	4" NIPPLE	ALL		JS-0590-XX	Nipple 4"
16	TERMINAL BLOCK	ALL		JM-0455-DD	Terminal block
17	STEP DOWN TRANSFORMER	ALL		JA-0775-XX	Transformer 120/24V, 20VA AT120B1028
18	RELAY SWITCH 24V/120V	ALL	S87J DSI	JS-0568-CC	Relay Switch 24V/120V
19	COMPONENT PLATE	ALL		JS-0581-XX	Component mounting plate SE
20	COMBUSTION AIR PROVING SWITCH	45	-C; -UH	JS-0576-XX	Air proving Switch 0.48" WC
		45, 100	-X1	JS-0576-AA	Air proving Switch 0.85" WC
		60	-FB	JS-0576-XX	Air proving Switch 0.48" WC
		60		JS-0576-YY	Air proving Switch 0.30" WC
		80	-FB	JS-0575-UL	Air proving Switch 0.70" WC
		80		JS-0576-XX	Air proving Switch 0.48" WC
		110		JS-0575-YY	Air proving Switch 0.65" WC
		110	-FB	JS-0575-ZB	Air proving Switch 0.90" WC

#	PART DESCRIPTION	MODEL	MODEL DASH #/ GAS TYPE	PART #	PART DESCRIPTION PRIMARY
20	COMBUSTION AIR PROVING SWITCH	130		JS-0575-YY	Air proving Switch 0.65" WC
		130	-FB	JS-0576-UL	Air proving Switch 1.10" WC
		155		JS-0575-YY	Air proving Switch 0.65" WC
		155	-A, -FB	JS-0576-UG	Air proving Switch 1.00" WC
		175	-S; NG	JS-0576-AA	Air proving Switch 0.85" WC
		175	-S; LP	JS-0576-XY	Air proving Switch 1.15" WC
		200	-S	JS-0575-ZA	Air proving Switch 1.40" WC
21	BLOCKED FLUE PRESSURE SWITCH	45	-X1	JS-0577-YY	Blocked flue switch 0.90" WC
		45	-C; -UH	JS-0577-ZZ	Blocked flue switch 1.41" WC
		60, 80	-FB; NG; LP	JS-0578-UL	Blocked flue switch 1.03" WC
		60	NG; LP	JS-0577-SS	Blocked flue switch 0.58" WC
		110	-FB	JS-0578-UL	Blocked flue switch 1.03" WC
		130	-FB	JS-0577-XZ	Blocked flue switch 1.25" WC
		80-155	NG; LP	JS-0577-YY	Blocked flue switch 0.90" WC
		100, 175	-S; NG	JS-0577-ZZ	Blocked flue switch 1.41" WC
		175	-S; LP	JS-0577-XY	Blocked flue switch 1.20" WC
		200	-S; LP	JS-0577-UW	Blocked flue switch 1.33" WC
		200	-S; NG	JS-0578-BB	Blocked flue switch 1.50" WC
22	See below - Confirm Make of Ignition Control installed in burner				
23					
24	IGNITER KIT	ALL		JA-0571-KT	Igniter & gasket kit / DSI tube heater
25	SIGHT GLASS ASSEMBLY	ALL		JS-0536-XX	Sight glass assembly - tube heater
26	ELECTRICAL CORD	ALL		JB-0567-XX	Cord - electrical 6'
27	INDICATOR LAMPS	ALL		JW-0519-AM	Indicator light amber STS/IQ
		ALL		JW-0519-GR	Indicator light green STS/IQ
		ALL		JW-0519-RE	Indicator light red STS/IQ
28	FLANGED ADAPTER	ALL		JS-0501-ZZ	Flanged adapter 4" STS/IQ 45-200
29	FLANGE GASKET	ALL	Each	JS-0591-XX	Flange Adapter Gasket
30	FLAME RECTIFICATION	60	-FB	JS-0592-RR	Flame Rectifier 60, 80 -FB Models
		80	-FB	JS-0592-RR	Flame Rectifier 60, 80 -FB Models
		110	-FB	JS-0592-RT	Flame Rectifier 110, 130 -FB Models
		130	-FB	JS-0592-RT	Flame Rectifier 110, 130 -FB Models
		200	-S LP	JS-0592-RZ	Flame Rectifier 200-S LP
31	FLAME RECTIFICATION PLATE	175	-S LP	JS-0591-XY	Flame Rectifier Plate 175-S LP
	COMBUSTION AIR INLET WALL CAP 4"	ALL	OPTIONAL	JS-0532-VC	Fresh air intake horizontal (wall) vent cap 4"

Burners with FENWAL IGNITION CONTROL - Models: STS-F; IQ-F					
22	FENWAL DSI CONTROL	ALL		JA-0567-XX	3-Trial 24Vac with blower relay
	REPLACEMENT KIT: FENWAL replaces S87J	ALL		JA-0567-RK	Fenwal Control + Wire Harness + Cable + Igniter: Replaces S87J
23	IGNITION CABLE	ALL		JS-0518-FW	Hi voltage wire (24") STW - 2 x 1/4" Spades

BURNERS WITH HONEYWELL S87-J IGNITION CONTROL					
22	IGNITION CONTROL	S87J DIS- CONTIN UED		JA-0568-XX	Control DSI 24VAC S87J 1034
	REPLACEMENT KIT: FENWAL replaces S87J			JA-0567-RK	Fenwal Control + Wire Harness + Cable + Igniter: Replaces S87J
23	IGNITION CABLE HONEYWELL S87J			JS-0518-XX	Wire high voltage (24") S87J Bullet Connection

# STS-JZ / IQ TUBE SYSTEM PARTS



#	PART DESCRIPTION	MODEL	MODEL DASH #/ GAS TYPE	PART #	PART DESCRIPTION PRIMARY
40	END PLATE HANGER	ALL		JS-0506-JZ	End Plate hanger
41	WEBBED HANGER	ALL		JS-0505-JZ	Webbed Hanger
42	REFLECTOR	ALL		JS-0502-JZ	Reflector 24" x 116"
43	FLANGED COMBUSTION TUBES	45 to 155		JA-0501-SW-P	Tube flanged aluminized sw no ports
		175 & 200	See next item	<del>JS-0499-XX-P</del>	<del>Flanged, Alumatherm tube—DISCONTINUED</del>
		175 & 200		JA-0500-SS-P	Stainless Steel tube, Flanged, swaged, no ports; replaces JA-0499-SW-P
	SWAGED TUBES - NO FLANGE	175 & 200		JS-0501-SW	Aluminized tube, 10' with hole for rivet
		ALL		JS-0515-SW-P	Tube steel coated sw 10'
44	REFLECTOR BRACE	ALL		JS-0506-RB	Reflector brace
45	TURBULATOR (see Table in Manual)	45 x 10 FT		JS-0534-SS	Turbulator 5' (7 PLATE) - Discontinued
				JS-0533-SH	Turbulator 40" X 1.25" - Aluminized
		45-80 x 20FT		JS-0533-SK	Turbulator 39" x 2" - Stainless Steel
		45-80 x 20FT		JS-0533-SL	Turbulator 96" x 2" - Stainless Steel
		60-130 x 30FT		JS-0533-SS	Turbulator 60" x 1.25" - Stainless Steel
		60-130 x 30FT		JS-0533-SL	Turbulator 96" x 2" - Stainless Steel
		80-155 x 40FT		JS-0533-LG	Turbulator 109" x 1.25" - Aluminized
		100		JS-0535-XX	Turbulator 10' Special - 100,000 Btuh ONLY
46	COUPLER	ALL		JA-0516-SW	4" swaged tube coupler torctite
47	COUPLER + STAINLESS STEEL RIVET + 1/4" DRILL BIT	175 & 200	1st to 2nd tube connections	JA-0516-RK	Tube Connection Kit: Coupler + Rivet + Drill Bit (175 & 200: 1st to 2nd & 2nd to 3rd tube)
48	90° ELBOW KIT - JS-0508-JZ	ALL	OPTIONAL	JA-0508-SW	90 degree elbow
				JA-0516-SW	4" swaged tube coupler torctite
				JA-0503-US	90 degree elbow Reflector Cap
49	HORIZONTAL VENT TERMINATION		OPTIONAL	JA-0528-XX	4" horizontal wall vent terminal
	COMPLETE TUBE KITS			Refer to Current Price List	





**FOR GAS-FIRED INFRA-RED LOW INTENSITY TUBE HEATERS: STS-JZ & IQ SERIES**

The Manufacturer warrants that this product is free from defects in material or workmanship under normal use and service subject to the terms of this document.

**THREE YEAR WARRANTY**

Subject to the conditions and limitations stated herein, during the term of this limited warranty, we will supply any component part (at our option a new or repaired component part) of the heater as defined below, excluding any labor, which the Manufacturer's examination determines to be defective in workmanship or material for a period of three years (3 years) from the date of installation, unless otherwise specified below. This warranty applies to the heater's original owner, and subsequent transferees and only if the unit is installed and operated in accordance with the printed instructions accompanying the unit and in compliance with all applicable installation codes and good trade practices. Warranty is only applicable to Schwank components, other parts are limited to their own Manufacturer's warranty period of one year (1 year).

**TEN YEAR WARRANTY**

The Manufacturer warrants the burner sub-assembly comprising of ceramic and immediate metal tubing, and the radiating tubes (excluding couplings) for a period of ten years (10 years).

**WHAT IS NOT COVERED**

The Manufacturer shall not be responsible for any expenses, including service, labor, diagnosis, analysis, material or transportation charges incurred during removal or reinstallation of this product, or any of its components or parts. All labor or service charges shall be paid by the owner. This warranty does not cover heating products improperly installed, misused, exposed to or damaged by negligence, accident, corrosive or contaminating atmosphere, water, excessive thermal shock, impact, abrasion, normal wear due to use, alteration or operation contrary to the owner's manual or if the serial number has been altered, defaced or removed. This warranty shall not apply if the input to the heating product exceeds by more than 2% of the rated input on the rating plate. The Manufacturer shall not be liable for any default or delay in performance by its warranty caused by any contingency beyond its control, including war, government restrictions, or restraints, strikes, fire, flood, acts of God, or short or reduced supply of raw materials or products.

**WARRANTY PROCEDURE**

To establish the installation date for any purpose under this Limited Warranty, you must retain the original records that can establish the installation date of your unit. If you do not provide such documents, the start date of the term of this Limited Warranty will be based upon the date of unit manufacture, plus thirty (30) days. Failure to maintain the equipment through regular annual service maintenance by a qualified service technician shall void the warranty.

**LIMITATIONS AND EXCLUSIONS**

This document contains all warranties made by the Manufacturer and may not be varied, altered or extended by any person. There are no promises, or agreements extending from the Manufacturer other than the statements contained herein. THIS WARRANTY IS IN LIEU OF ALL WARRANTIES EXPRESSED OR IMPLIED, TO THE EXTENT AUTHORIZED BY THE LAWS OF THE JURISDICTION, INCLUDING SPECIFICALLY THE WARRANTIES OR MERCHANTABILITY OF FITNESS FOR A PARTICULAR PURPOSE.

It is understood and agreed that the Manufacturer's obligation hereunder is limited to repairing or replacing parts determined to be defective as stated above. In no event shall the Manufacturer be responsible for any alleged personal injuries or other special, incidental or consequential damages. As to property damages, contract, tort or other claim the Manufacturer's responsibility shall not exceed the purchase price paid for the product.

All replacement parts will be warranted for the unused portion of the warranty coverage period remaining on the applicable unit.

Some Authorities do not allow certain warranty exclusions or limitations on duration of warranty or the exclusions or limitations of incidental or consequential damages. In such cases, the above limitations or exclusions may not apply to you and are not intended to do so where prohibited by law. This warranty gives you specific legal rights. You may also have other rights which vary by jurisdiction.

**SCHWANK**  
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