

Sun Heat

LOW INTENSITY INFRA-RED HEATERS

Listed for Vented and Unvented Applications

Installation, Operation, Maintenance Manual



ATTENTION !

Read this manual and all labels attached to the unit before attempting to install, operate or service the heater.

Check the unit data plate for the type of gas and electrical specifications. Make sure that they are correct for this application.

WARNING !

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

CAUTION !

Do not store gasoline flammable liquids or vapors in the vicinity of this or any other fuel burning appliance.



Installer: Please leave this manual with the building owner!

FOR YOUR SAFETY

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

FOR YOUR SAFETY

If you smell gas:

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

INSTALLER'S RESPONSIBILITY

Installer Please Note: This equipment has been test fired and inspected. It has been shipped free from defects from our factory. However, shipment and installation problems such as loose wires, leaks, or loose fasteners may occur. It is the installer's responsibility to inspect and correct any problems that may be found.

RECEIVING INSTRUCTIONS

Inspect shipment immediately when received to determine if any damage has occurred to the unit during shipment. After the unit has been uncrated, check for any visible damage to the unit. If any damage is found, the consignee should sign the bill of lading indicating such damage and immediately file a claim for damage with the transportation company.

DESCRIPTION

Power gas burners are shipped completely assembled or ready for installation, main orifice drilled for 60,000, 80,000, 100,000, 125,000, 150,000, 175,000 or 200,000 BTU/hr. Blower motor, pressure switch, gas valve, regulator, hot surface ignition system and tubing. All radiant units are equipped with all the necessary CSA designed certified controls, with build-in gas pressure regulator. The electronic ignition has a time delay of 45 seconds to allow the hot surface igniter to heat up before gas valve opens.

Input: 60,000, 80,000, 100,000, 125,000, 150,000, 175,000, 200,000 BTU/HR.

Installation of Air Divider Insert Plates and Orifice: Reference page 32 for installation instructions.

Motor: 120V, 1 Phase, Less than 12 Amps.

Thermostat: 120 Volts, 2 wire; Optional 24 Volt, 2 wire.

<u>Gas Pressure:</u>	<u>Nat Gas</u>	<u>LP Gas</u>
Min. Supply Press.	5" W.C./ (1.24 kPa)	11"W.C./ (2.74 kPa)
Max. Supply Press.	12" W.C./ (2.98 kPa)	14"W.C./ (3.48 kPa)
Manifold Press.	3.5" W.C./ (.87 kPa)	10" W.C./ (2.49 kPa)

GENERAL SAFETY INFORMATION

The following terms are used throughout this manual, in addition to the CSA requirements to bring attention to the presence of potential hazards, or to important information concerning the product:

DANGER Indicates an imminently hazardous situation which, if not avoided, will result in death, serious personal injury, or substantial property damage.

WARNING

Indicates an imminently hazardous situation which, if not avoided, will result in death, serious injury, or substantial property damage.

CAUTION

Indicates an imminently hazardous situation which, if not avoided, may result in minor injury or property damage.

NOTICE: Used to notify of special instructions on installation, operation, or maintenance which are important to equipment but not related to personal injury.

WARNING

Failure to comply with the general safety information may result in extensive property damage, severe personal injury, or death!

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 latest edition. In any case, the codes providing the greatest safety will prevail. All of the ANSI and NFPA Standards referred to in these installation instructions are those that were applicable at the time the design was certified. The ANSI Standards are available from the American Gas Association, 400 North Capitol Street NW, Washington, DC 20001. The NFPA Standards are available from the National Fire Protection Association, Batterymarch Park, Quincy MA 02269. These radiant units are designed for use in

airplane hangers when installed in accordance with the Standard for Aircraft Hangers, ANSI/NFPA No. 409, and (2) garages when installed in accordance with the Standard for Parking Structures, ANSI/NFPA No. 88A, or the Standard for Repair Garages, ANSI/NFPA No.88B, and are so marked.

If installed in Canada, the installation must conform with local building codes, or in the absence of local building codes, with CAN1-B149.1 "Installation Codes for Natural Gas Burning Appliances and Equipment" or CAN1-B149.2 "Installation Codes for Propane Gas Burning Appliances and Equipment." These infrared heaters have been designed and certified to comply with CAN 1-2.16. Also see section on installation in AIR-CRAFT HANGERS and PUBLIC GARAGES.

WARNING

Do not alter the Radiant Heater in any way, or damage to the unit and/or severe personal injury or death may occur!

WARNING

Disconnect all power and gas supplies before installing or servicing heater. If power disconnect is out of sight, lock in the open position and tag it to prevent unexpected application of power. Failure to do so could result in fatal electric shock, or severe personal injury.

WARNING

Insure that all electric power sources conform to the requirements of the radiant unit, or damage to the unit will result.

Follow installation instructions CAREFULLY to avoid creating unsafe conditions. All wiring should be done by a qualified electrician, using copper wire only. All external wiring and including the grounding means must conform to the applicable codes, to the National Electrical Code ANSI/NFPA No. 70, CSA C22.2 No.3, Electrical Features of Fuel-Burning Equipment and CSA C22.1, Canadian Electrical Code Parts I and II (latest edition). All gas connections should be made and leak-tested by a suitably qualified individual, per instructions in this manual.

Use only the fuel for which the radiant heater is designed (see rating plate). Using propane (LP) gas in a heater that requires natural gas, or vice versa, will create risk of gas leaks, carbon monoxide poisoning, and explosion.

WARNING

Do not attempt to convert heater for use with fuel other than the one intended. Such conversion is dangerous, as it will create the risks previously listed.

Make certain that the power source conforms to the electrical requirements of the radiant unit.

WARNING

Do not depend upon a thermostat or other switch as sole means of disconnecting power when installing or servicing the radiant heater. Always disconnect power at the main circuit breaker as described above. Failure to do so could result in electrical shock!

Special attention must be given to any grounding information pertaining to this radiant heater. To reduce the risk of electrocution, the unit must be securely and adequately grounded. This should be accomplished by connecting a ground conductor between the service panel and the heater. To ensure a proper ground, the

grounding means must be tested by a qualified electrician.

Do not insert fingers or foreign objects into radiant unit or its air moving device. Do not block or tamper with the heater in any manner while in operation, or just after it has been turned off, as some parts may be hot enough to cause injury.

This radiant unit is intended for installation in and heating outdoor spaces or non-residential indoor spaces ONLY. It must NOT be used on potentially dangerous locations such as flammable, explosive, chemical-laden, or wet atmospheres.

Although heaters covered by this standard may, in certain instances be suitable for application in industrial processes, this standard does not cover industrial process burners.

In cases in which property damage may result from malfunction of the radiant unit, a back-up system or temperature sensitive alarm should be used.

CAUTION

The open end of piping systems being purged shall not discharge into areas where there are sources of ignition or into confined spaces UNLESS precautions are taken as follows: (1) by ventilation of the space, (2) elimination of all hazardous conditions. All precautions must be taken to perform this operation in a safe manner!

Unless otherwise specified, the following conversions may be used for calculating SI/Metric unit measurements:

1 foot = 0.305m	196.8FPM = 1m/s
1 inch = 25.4mm	1 inch W.C. = 0.249 kPa
1 psig = 6.894 kPa	1 cubic foot = 0.028m
1 gal. = 3.785 L	1000 BTUH = 0.293 kW
0.472 CFM = 1 l/s	1000 BTU/FT ³ = 37.5MJ/m ³

EQUIPMENT LIST

Tube lengths range from 20 to 40 ft. (6-12m) for 60,000 Btu/hr input, 30 to 40 ft. (9-12m) for 80,000 Btu/hr input, 30 to 50 ft (9-15m) 100,000 Btu/hr input. 40 to 60 ft. (12- 18m) for 125,000 Btu/hr input. 50 to 60 ft. (15-18m) for 150,000 Btu/hr input, 40 to 60 ft (18m) for 175,000 Btu/hr input, 70 ft (21m) for 200,000 Btu/hr input.

20 Ft. (6m) Systems Part Description Qty.

Power Gas Burner	1
10' Comb. Chamber	1
10' Heat Exchanger	1
10' Turbulator	1
Wire Hanger	4
8' Reflector	2
4' Reflector	1
Reflector Clip	8
3/8-16x6 Draw Bolt	4
3/8 Hex Nut	4
3/8 Washer	8

30 Ft. (9m) Systems Part Description Qty.

Power Gas Burner	1
10' Comb. Chamber	1
10' Heat Exchanger	2
10' Turbulator	1
Wire Hanger	5
8' Reflector	4
4' Reflector	0
Reflector Clip	10
3/8-16x6 Draw Bolt	6
3/8 Hex Nut	6
3/8 Washer	12

40 Ft. (12m) Systems Part Description Qty.

Power Gas Burner	1
10' Comb. Chamber	1
10' Heat Exchanger	3
10' Turbulator	1
Wire Hanger	7
8' Reflector	5
4' Reflector	0
Reflector Clip	10
3/8-16x6 Draw Bolt	8
3/8 Hex Nut	8
3/8 Washer	16

50 Ft (15m) Systems Part Description Qty.

Power Gas Burner	1
10' Comb. Chamber	1
10' Heat Exchanger	4
10' Turbulator	1
Wire Hanger	8
8' Reflector	6
4' Reflector	1
Reflector Clip	12
3/8-16x6 Draw Bolt	10
3/8 Hex Nut	10
3/8 Washer	20

60 Ft (18m) Systems Part Description Qty.

Power Gas Burner	1
10' Comb. Chamber	1
10' Heat Exchanger	5
3' Turbulator	1
Wire Hanger	10
8' Reflector	7
4' Reflector	1
Reflector	14
3/8-16x6 Draw Bolt	12
3/8 Hex Nut	12
3/8 Washer	24

70 Ft. (21m) Systems Part Description Qty.

Power Gas Burner	1
10' Comb. Chamber	1
10' Heat Exchanger	6
Turbulator	0
Wire Hanger	12
8' Reflector	9
4' Reflector	0
Reflector Clip	16
3/8-16x6 Draw Bolt	14
3/8 Hex Nut	14
3/8 Washer	28

NOTE:

The turbulator should be installed
In the last section of the heat exchanger
tube (farthest away from the burner).

INSTALLATION

WARNING

Do not install radiant units in corrosive or flammable atmospheres! Premature failure of, or damage to unit will result.

WARNING

Avoid locations where extreme drafts can affect burner operation. Radiant units must not be installed in locations where air for combustion would contain chlorinated, halogenated or acidic vapors. If location in such an environment, premature failure of the unit will occur!

AIRCRAFT HANGERS: Radiant units must be installed in aircraft hangers and public garages as follows: Radiant units must be at least 10 feet (3.05m) above the surface of wings or engine enclosures of the highest aircraft to be stored in the hanger and 8 feet (2.44m) above the floor in shops and offices and other sections of the hanger where aircraft are not stored or housed. Refer to current ANSI/NFPA No. 409, Aircraft Hangers.

PUBLIC GARAGES: In public garages, Radiant units must be at least 8 feet (2.44m) above floor. Radiant units should be located at a sufficient height to void overheating vehicles parked beneath. Refer to current ANSI/NFPA No. 88A, Parking Structures, and ANSI/NFPA No.88B, Repair Garages.

CLEARANCES TO COMBUSTIBLES:

Infrared tube systems for indoor overhead installation, as a vented or unvented heater with the following minimum clearances to combustibles. All clearances listed below are CSA approved. It is recommended that the system be installed with clearances great enough to be safe from any possible equipment failure. **THE SYSTEMS MUST BE INSTALLED SO THAT MINIMUM CLEARANCES WILL BE MAINTAINED FROM VEHICLES PARKED DIRECTLY**

BELOW UNITS. ANSI Standard Z223.1 (NFPA No. 54) National Fuel Gas Code (latest edition), Section 6.19 requires that signs be posted specifying the maximum permissible stacking heights to assure that the required clearances from the heater to combustibles are maintained where items are stored under the heater.

PARABOLIC REFLECTORS: Clearances to combustibles are determined by the following factors: BTU/Hr. input, angle position of reflector. Refer to figure 1 below to determine clearances for the installation of your infrared tube system.

Figure 1 - Standard Parabolic Unit

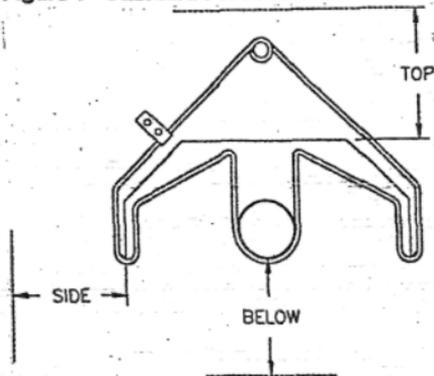


Table 1

BTU/Hr. Input	Tube Lengths	Top	Side	Below	End*
60000	20'-40"/8-12m	12'/3m	40"/1.02m	90"/2.3m	24'/6m
80000	30'-40"/9-12m	12'/3m	40"/1.02m	90"/2.3m	24'/6m
100000	30'-50"/9-15m	12'.3m	40"/1.02m	90"/2.3m	24'/6m
125000	40'-60"/12-18m	12'/3m	40"/1.02m	90"/2.3m	24'/6m
150,000	50'-60"/15-18m	12'/3m	40"/1.02m	90"/2.3m	24'/6m
175,000	60"/18m	12'/3m	40"/1.02m	90"/2.3m	24'/6m
200,000	70"/21m	12'/3m	40"/1.02m	90"/2.3m	24'/6m

*Measured from burner/exhaust ends.

Figure 2 - Standard Unit with Diffuser

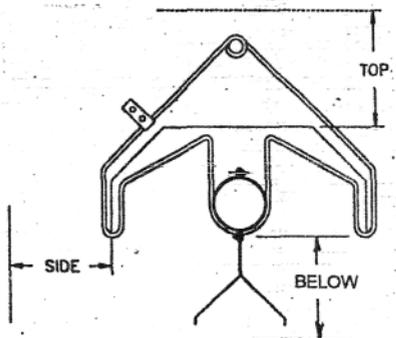


Table 2

BTU/Hr. Input	Tube Lengths	Top	Side	Below	End*
80,000	20'-40/6-12m	2'1.1m	42'1.1m	50'1.3m	24'1.6m
80,000	30'-40/9-12m	2'1.1m	42'1.1m	50'1.3m	24'1.6m
100,000	30'-50/9-15m	2'1.1m	42'1.1m	50'1.3m	24'1.6m
125,000	40'-80/12-16m	2'1.1m	42'1.1m	50'1.3m	24'1.6m
150,000	50'-80/15-18m	2'1.1m	42'1.1m	50'1.3m	24'1.6m
175,000	60'18m	2'1.1m	42'1.1m	50'1.3m	24'1.6m
200,000	70'21m	2'1.1m	42'1.1m	50'1.3m	24'1.6m

*Measured from burner/exhaust ends.

Figure 3 - Standard Parabolic Unit with 1° to 45° Angle Mount

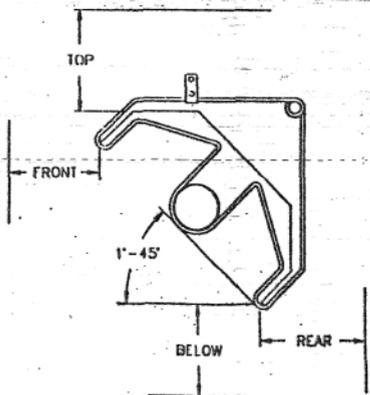


Table 3

BTU/Hr. Input	Tube Lengths	Top	Front	Rear	Below	End*
80,000	20'-40/6-12m	12'1.3m	80'12.3m	40'11.0m	90'12.3m	24'1.6m
80,000	30'-40/9-12m	12'1.3m	80'12.3m	40'11.0m	90'12.3m	24'1.6m
100,000	30'-50/9-15m	12'1.3m	80'12.3m	40'11.0m	90'12.3m	24'1.6m
125,000	40'-80/12-16m	12'1.3m	80'12.3m	40'11.0m	90'12.3m	24'1.6m
150,000	50'-80/15-18m	12'1.3m	80'12.3m	40'11.0m	90'12.3m	24'1.6m
175,000	60'18m	12'1.3m	80'12.3m	40'11.0m	90'12.3m	24'1.6m
200,000	70'21m	12'1.3m	80'12.3m	40'11.0m	90'12.3m	24'1.6m

*Measured from burner/exhaust ends.

Before installing unit take note of the following:

- Carefully survey area to be heated, place burner and combustion chamber in the coldest area possible. Burner should be mounted in horizontal position.
- Unpackage system: Burner, combustion chamber (section of tubing with flange attached), accessories.
- Suspend tubing minimum of 10' to 12' (3.05m to 3.66m) from floor for best results.
- Radiant system must terminate with vertical vent. If venting horizontally out side of structure, vent vertically far enough from side of building to prevent static pressure buildup from interfering with burner operation.
Refer to local codes for venting height!
- The greatest concentration of radiant heat is within the first 20' (.51m) of tubing, and tapers off for a low economical stack temperature. An insulated stack, no longer than 15' (4.6m) is recommended to preclude the possibility of condensation.
- Radiant units should not be installed to maintain low temperatures and/or freeze protection of buildings. A minimum of 40°F (4°C) thermostat setting must be maintained.

If radiant units are operated to maintain lower than of 40°F (4°C), hot flue gases are cooled inside the heat exchanger tubing to a point where water vapor (a flue gas by-product) condenses onto the heat exchanger walls. The result is a mild corrosive acid that prematurely corrodes the aluminized heat exchanger tubing and can actually drop water down from the unit to the floor surface. Additional units should be installed if minimum of 40°F (4°C) thermostat setting cannot be maintained.

WARNING

Make certain that the lifting methods used to lift the heater and the method of suspension are capable of supporting the weight of the heater at all times. Failure to heed this warning may result in property damage or personal injury.

NOTICE: Increasing clearance distances may be necessary if there is a possibility of distortion or discoloration of adjacent materials.

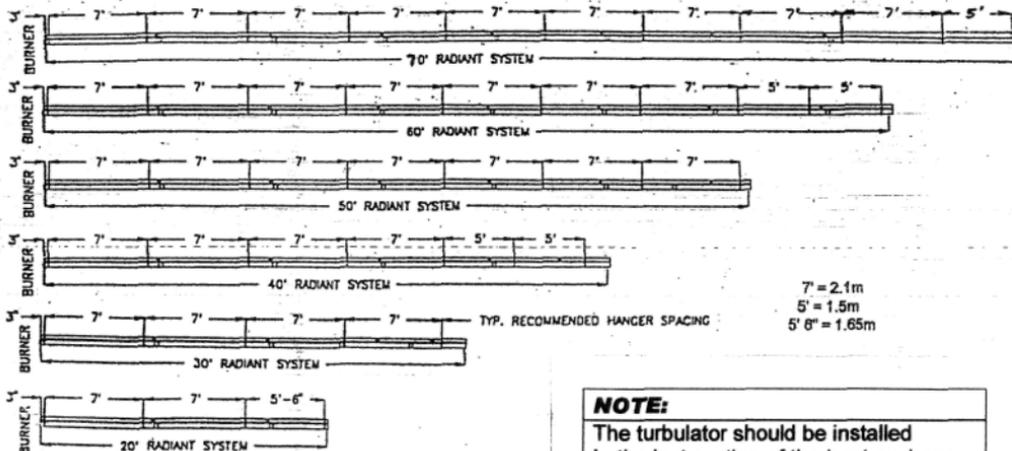
WARNING

Make certain that the structure to which the unit is to be mounted is capable of safely supporting its weight. Under no circumstances must the gas lines, venting system, or electrical conduit be used to support the unit: or should any objects (i.e. ladder, person) lean against the unit, gas line, venting system or electrical conduit for support. Failure to heed these warnings may result in property damage, personal injury or death.

WARNING

Insure that all hardware used in the suspension of each unit is more than adequate for the job. Failure to do so may result in extensive property damage, severe personal injury or death!

Figure 4



NOTE:

The turbulator should be installed in the last section of the heat exchanger tube (farthest away from the burner).

A. Hanger Spacing: Using Figure 4, determine hanger spacing intervals that correspond to your units. Diagram shows recommended intervals for unit lengths from 20 feet to 70 feet (6.1m to 21.3m).

B. Mounting Hangers: After determining where the infrared tube system is to be located and all clearances to combustibles, the following steps are recommended to begin installation. Refer to Figure 5.

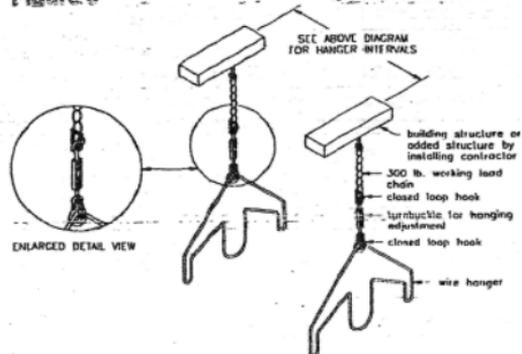
1. Refer to figure 4 for hanging spacing intervals for your unit.
2. Hang chains from building structure at spacing determined from Figure 4. Chain should be rated at 300 lbs. (136.3kgm) working load.
3. Mounting tumbuckle to chain securing with closed loop hook. Tumbuckle recommended for hanging adjustments as needed.
4. Mount wire hanger to tumbuckle securing with closed loop hook.

NOTICE: System must be suspended from chains so that unit can expand and contract as is necessary without damaging system. See chart for approximate distances unit will expand during heating cycles.

Table 4 - Unit Length Expansion

20 Ft. (6.1m) System	1.00" (25.4mm)
30 Ft. (9.1m) System	1.50" (38mm)
40 Ft. (12m) System	2.00" (50.8mm)
50 Ft. (15m) System	2.50" (64mm)
60 Ft. (18m) System	2.75" (70mm)
70 Ft. (21m) System	3.00" (76mm)

Figure 5

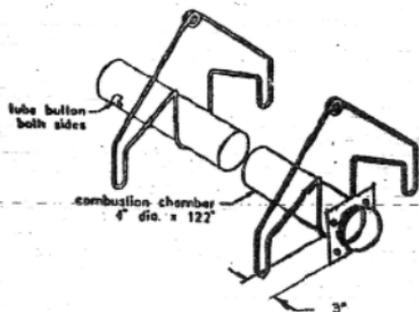


C. Hanging Combustion Chambers:

After all wire hangers are installed, hang combustion chamber onto the wire hangers. Following are recommended guidelines when installing the combustion chamber:

1. Insert combustion chamber through first and second wire hangers with tubing resting on the bottom of center loop of hanger. See Figure 6.
2. Burner flange of the combustion chamber should be approximately 3" (76.2mm) from first hanger. See reference in Figure 6.

Figure 6

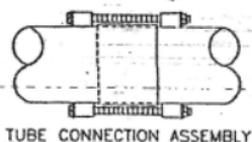
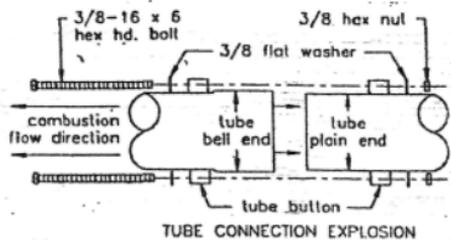


D. Hang Heat Exchangers: After combustion chamber has been mounted onto the wire hangers, install heat exchanger tubing. Following are recommended guidelines for the heat exchanger tubing:

1. Insert heat exchanger tubing through remaining wire hangers with tubing resting in bottom of the center loop of hangers.
2. Tube connections are made by sliding flared tube end over plain tube end of preceding tube. See Figure 7.
3. Line up buttons on each end and secure tubing using: (1) 3/8- 16 x 6 Hex Hexhead Drawbolts, (2) 3/8 Flat Washers, and (1) 3/8 Hex Nut on each side of connection.

Alternate tightening bolts to allow connecting tubes to remain in straight line positions. Bolts to be tightened to 10 - 12 ft. lbs. (13.6 - 16.3Nm) Repeat steps 1 through 4 for each heat exchanger tube.

Figure 7



E. Hang Reflectors: After all radiant tubing has been mounted on wire hangers, install reflectors. Following are recommended guidelines when installing reflectors:

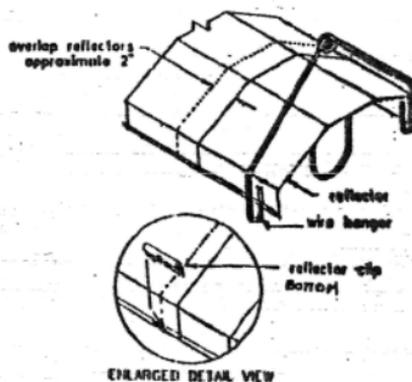
1. Start at the burner end, insert first reflector through the wire hangers so the reflector is resting on the wire hangers.

First reflector to start flush with combustion chamber flange. (Approximately 3" (76mm) from first hanger). Refer to Figures 4 & 6.

2. Insert second reflector through hangers, overlapping the first reflector approximately 2" (51mm) See Figure 8.
3. Connect reflectors by attaching reflector clips to both sides of overlapping reflectors. See enlarge detail, Figure 8.
4. Repeat steps 2 and 3 for each additional reflector.

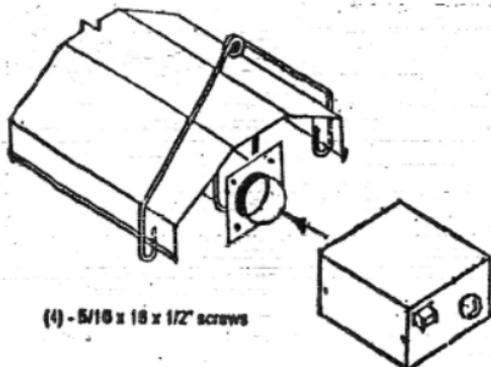
NOTICE: Parabolic reflector is mounted with above instructions.

Figure 8



F. Mount Burner: After radiant tube system has been installed, mount burner in system. Following are recommended guidelines for mounting radiant burner into system. See Figure 9.

1. Attach burner to flange on the combustion chamber with (4) four 5/16 x 18 x 1/2" (12.7mm) long screws.
2. Position burner in combustion chamber so that the burner is horizontal to ground level.



GAS PIPING

WARNING

To avoid damage or possible personal injury, do not connect gas piping to this unit until a supply line pressure/leak test has been completed. Connecting the unit before completing the pressure/leak test may damage the unit gas valve and result in a fire hazard.

Do not rely on a shut-off valve to isolate the unit while concluding gas pressure/leak tests. These valves may not completely shut off, exposing the gas valve to excessive pressure and damage.

Pipe Sizing

To provide adequate gas pressure to the radiant unit, size the gas piping as follows:

1. Find the cu. ft./hr. by using this formula:
Cu. ft./hr. = Input/BTU
2. Refer to Table 5. Match "Pipe Run in Feet" with appropriate "Gas Input - Cu. FT./Hr." figure. This figure can then be matched to the pipe size at the top of the column.

Example:

It is recommended that a 67 foot (20.4m) run of gas pipe is required to connect a 100 MBTU gas unit heater to a 1,000 BTU/cu.ft. natural gas supply.

$$100,000 \text{ BTU/hr.} \div 1,000 \text{ BTU/cu.ft.} = 100 \text{ Cu. ft./hr.}$$

Using Table 5, 3/4 inch (19mm) pipe is needed.

Note: See General Safety Information section for English/Metric unit conversion factors.

NOTICE: HEATER INSTALLATION FOR USE WITH PROPANE (BOTTLED) GAS MUST BE MADE BY A QUALIFIED L.P. GAS DEALER OR INSTALLER. THEY WILL ENSURE THAT PROPER JOINT COMPOUNDS ARE USED FOR MAKING PIPE CONNECTIONS; THAT AIR IS PURGED FROM LINES; THAT A THOROUGH TEST IS MADE FOR LEAKS BEFORE OPERATING UNIT; AND THAT IT IS PROPERLY CONNECTED TO THE PROPANE SUPPLY SYSTEM. IF METALLIC TUBING IS TO BE EMPLOYED, REVIEW PROPER SECTIONS OF ANSI Z223.1/NFPA 54 AND CAN1-B149.2.

Before any connection is made to the existing line supply other gas appliances, contact the local gas company to make sure that the existing line is of adequate size to handle the combined load.

NOTICE: If more than one gas radiant unit is to be served by the same piping arrangement, the total cu. ft./hr. input and length of pipe must be considered.

Table 5 - Gas Pipe Size

Maximum Capacity of Pipe in Cubic Feet of Gas per Hour (Cubic Meters per Hour) for Gas Pressures of 0.5 psig (3.5 kPa) or less, and a Pressure Drop of 0.5 inches Water Column (124.4 kPa)
(Based on a 0.60 Specific Gravity Gas)

Nominal Iron Pipe Size in.	Internal Dia. in.	Length of Pipe, Feet (meter)													
		10 3.0	20 6.1	30 9.1	40 12.2	50 15.5	60 18.3	70 21.3	80 24.4	90 27.4	100 30.5	125 38.1	150 45.7	175 53.3	200 61.0
1/2	0.622	175 (4.86)	120 (3.40)	97 (2.75)	82 (2.32)	73 (2.07)	66 (1.87)	61 (1.73)	57 (1.61)	53 (1.50)	50 (1.42)	44 (1.25)	40 (1.13)	37 (1.05)	35 (0.99)
3/4	0.824	360 (10.2)	250 (7.62)	200 (5.96)	170 (4.81)	151 (4.28)	138 (3.90)	125 (3.54)	118 (3.34)	110 (3.11)	103 (2.92)	93 (2.63)	84 (2.38)	77 (2.18)	72 (2.04)
1	1.049	680 (19.3)	465 (13.2)	375 (10.6)	320 (9.06)	285 (8.07)	260 (7.36)	240 (6.80)	220 (6.23)	205 (5.80)	195 (5.52)	175 (4.96)	160 (4.53)	145 (4.11)	135 (3.82)
1 1/4	1.380	1400 (99.6)	950 (26.9)	770 (21.8)	690 (18.7)	590 (16.4)	530 (15.0)	490 (13.9)	460 (13.0)	430 (12.2)	400 (11.3)	380 (10.2)	325 (9.20)	300 (8.50)	280 (7.93)
1 1/2	1.610	2100 (59.5)	1480 (41.3)	1180 (33.4)	990 (28.0)	900 (25.5)	810 (22.9)	750 (21.2)	690 (19.5)	650 (18.4)	620 (17.6)	550 (15.6)	500 (14.2)	460 (13.0)	430 (12.2)
2	2.087	3950 (112)	2750 (77.9)	2200 (62.3)	1900 (53.8)	1680 (47.6)	1520 (43.0)	1400 (39.6)	1300 (36.8)	1220 (34.5)	1150 (32.8)	1020 (28.9)	950 (26.9)	850 (24.1)	800 (22.7)
2 1/2	2.468	6300 (179)	4350 (123)	3520 (99.7)	3000 (85.0)	2650 (75.0)	2400 (69.0)	2250 (63.7)	2050 (58.0)	1950 (55.0)	1800 (52.4)	1650 (46.7)	1500 (42.5)	1370 (38.8)	1280 (36.02)
3	3.088	11000 (311)	7700 (218)	6250 (177)	5300 (150)	4750 (135)	4300 (122)	3900 (110)	3700 (105)	3450 (105)	3250 (92.0)	2650 (83.5)	2550 (75.0)	2450 (69.4)	2280 (64.04)
4	4.03	23000 (651)	15800 (447)	12800 (362)	10900 (308)	9700 (275)	8800 (246)	8100 (229)	7500 (212)	7200 (202)	6700 (190)	6000 (170)	5500 (156)	5000 (142)	4600 (130)

1. Determine the required Cu. FL/HR. by dividing the input by 1,000. For SI/Metric measurement: Convert BTU/HR. to Kilowatts. Multiply the units input (KW) by 0.0965 to determine Cu. Meters/HR. 2. FOR NATURAL GAS: Select pipe size directly from table. 3. FOR PROPANE (LP) GAS: Multiply the Cu. FL/HR. value by 0.6333; then, use the table. 4. Refer to the metric conversion factors listed in the General Safety Information section for SI unit measurement conversion.

PIPE INSTALLATION

1. Install the gas piping in accordance with the applicable local codes.
2. Check gas supply pressure. Each radiant unit must be connected to a gas supply capable of supplying its full rated capacity at a pressure not less than 5" W.C. (1.5kPa), and not greater than 14" W.C. (3.5kPa) for natural gas. The manifold pressure for natural gas must be 3.5" W.C. (0.87kPa). For propane (LP) gas operation, the manifold pressure be 10" W.C. (2.5kPa) and the minimum supply pressure must be 11" W.C. (2.7kPa).

A field LP tank regulator must be used to limit the supply pressure to a maximum of 14" W.C. (3.5kPa). All piping should be sized in accordance with the latest edition of the National Fuel Gas code, ANSI Z223.1/NFPA No. 54 and CAN1-B149(.1,.2). See table 5 for correct gas piping size. If gas pressure is excessive on natural gas applications, install a pressure regulating valve in the line upstream from the main shutoff valve.

- Adequately support the piping to prevent strain on the burner.
- To prevent the mixing of moisture with gas, run the take-off piping from the top, or side, of the main.
- A 1/8" (12.7mm) N.P.T. plugged tapping, accessible for test gauge connection, must be installed immediately upstream of the gas supply connection to the appliance.
- Provide a drip leg in the gas piping near the main gas. A ground joint union and a manual gas shutoff valve should be installed ahead of the radiant heaters controls to permit servicing. The manual shutoff valve must be located external to the jacket. See Figure 10.
- Make certain that all connections have been adequately doped and tightened.

WARNING

Do not over tighten the inlet gas piping into the valve. This may cause stresses that will crack the valve!

NOTICE: Use pipe joint sealant resistant to the action of liquefied petroleum gases regardless of the gas conducted.

WARNING

Check all piping joints for leakage using soap solution or other approved method. Never use an open flame or severe personal injury or death may occur!

WARNING

Never use an open flame to detect gas leaks. Explosive conditions may exist which may result in personal injury or death!

The appliance and its individual shutoff valve must be disconnected from the gas supply piping system during any pressure testing of that system in excess of 1/2 psig (3.5kPa).

The appliance must be isolated from the gas supply piping system by closing its individual manual shutoff valve during any pressure testing of the gas supply system at test pressures equal to or less than 1/2 psig (3.5 kPa).

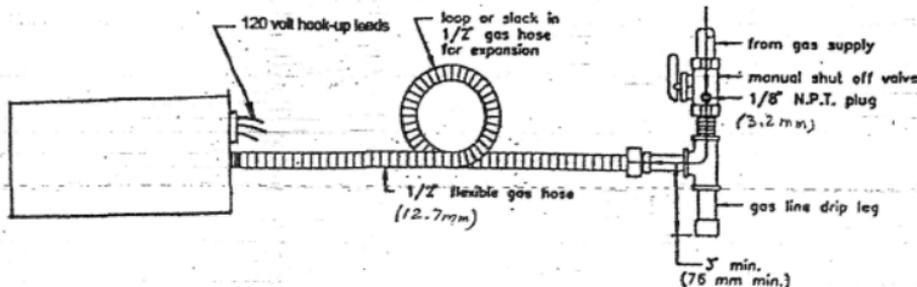


Figure 10

VENTING

A) VENTED

Venting must be in accordance with the National Fuel Gas Code, ANSI Z223.1/NFPA 54 and the Installation Codes for Natural and Propane Gas Burning Appliances and Equipment, CAN1-B149.1 and CAN1-B149.2 latest editions.

NOTICE: Never operate this unit unless it is vented to the outside and/or has adequate air supply to avoid risk of improper operation, fire explosion, or asphyxiation. **NEVER** operate units in negative conditions.

WARNING

CARBON MONOXIDE! Your venting system must not be blocked by any snow, snow drifts, or any foreign matter. Inspect your venting system to ensure adequate ventilation exists at all times! Failure to heed these warnings could result in Carbon Monoxide Poisoning (symptoms include grogginess, lethargy, inappropriate tiredness, or flu-like symptoms).

THE MAXIMUM TEMPERATURE OF THE FLUE GASES FROM THE HEATER DESIGNED FOR CONNECTION TO VENT SHALL NOT EXCEED 400°F (202°C) ABOVE ROOM TEMPERATURE.

It is recommended that the vent piping be insulated using a fire-proof insulation to help prevent condensation within the unit. All vent pipe joints should be secured using at least three non-corrosive screws. Seal all pipe joints to prevent leakage of flue gases into the building. We recommend the use of aluminum tape suitable for 550°F (285°C) or its equivalent. See Figure 12.

Vent piping horizontal runs must be supported every 4 feet (1.22m) using non-combustible material, such as chain or a steel strap. Vent pipe support must be used because of the added stress which may be caused by expansion and contraction of the tube system.

All horizontal venting runs must be pitched at approximately 1/4" per foot (6.35mm per meter).

NOTICE: MAXIMUM VENT LENGTH FOR ALL RADIANT TUBE SYSTEMS NOT TO EXCEED 15 FEET (4.6m).

SINGLE UNIT VENTING: When venting a single radiant tube system, use only 4" (.1m) diameter approved metal vent pipe. Vent pipe is to be attached to the tube system by using a 4" (.1m) steel tube to 4" (.1m) class "B" vent adaptor. Maximum length of vent pipe is not to exceed 15 feet (4.6m) and is to be terminated using 4" (.1m) vent terminal cap. See Figure 11.

Figure 11

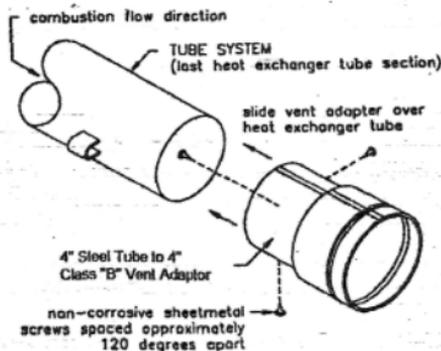
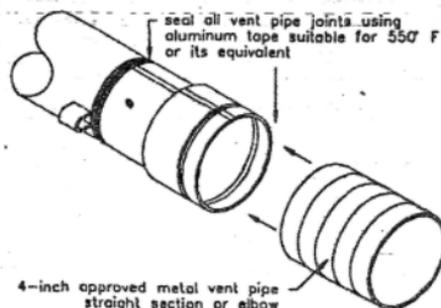


Figure 12



Single Unit Venting - SUV Arrangements:

Arrangement #SUV - 1

Single unit venting, pitched roof, stack 10 feet (3.0m) or less from Peak. See Figure 13.

Arrangement #SUV - 2

Single unit venting, pitched roof, stack greater than 10 feet (3.0m) from peak. See Figure 14.

Arrangement #SUV - 3

Single unit venting, flat roof. See Figure 15.

Arrangement #SUV - 4

Single unit venting, flat roof, stack 10 feet (3.0m) or less from wall or parapet. See Figure 16.

Arrangement #SUV - 5

Single unit venting, one story building, side wall vent with horizontal run. See Figure 17.

Figure 14

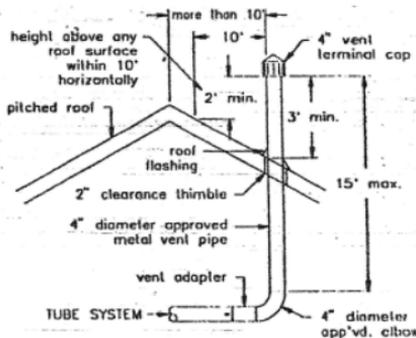
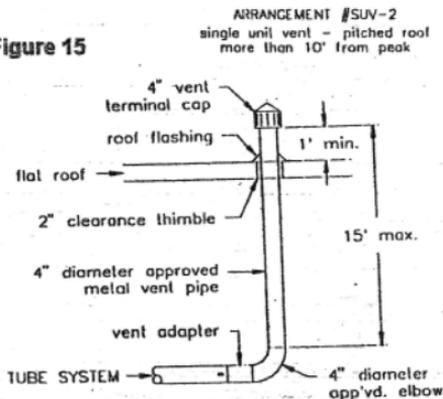
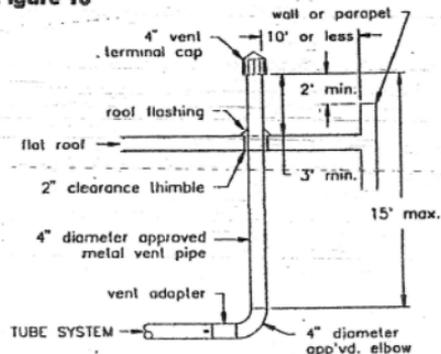


Figure 15



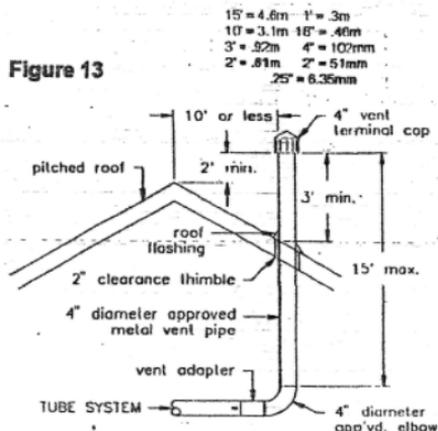
ARRANGEMENT #SUV-3
single unit vent - flat roof

Figure 16



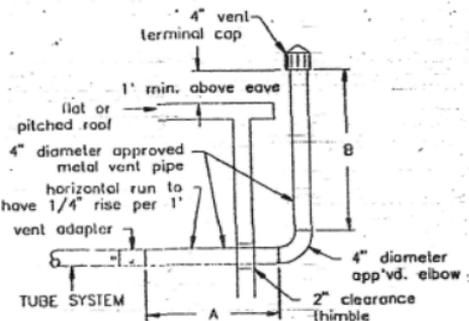
ARRANGEMENT #SUV-4
single unit vent - flat roof
10' or less from wall or parapet

Figure 13



ARRANGEMENT #SUV-1
single unit vent - pitched roof
10' or less from peak

15' = 4.6m 1' = 3m
10' = 3.1m 16' = 4.9m
3' = .92m 4' = 1.07m
2' = .61m 2' = 51mm
.25" = 6.35mm

Figure 17

NOTE: A + B = 15' max.

ARRANGEMENT #SUV-5

single unit vent - one story bldg.
side wall vent with horizontal run

15' = 4.6m 1" = 25mm
10' = 3.1m 18" = 46mm
3" = 92mm 4" = 102mm
2" = 81mm 2" = 51mm
1.25" = 6.25mm

Arrangement #DUV-2

Dual unit venting, pitched roof, stack greater than 10 feet (3.0m) from peak. See Figure 20.

Arrangement #DUV-3

Dual unit venting, flat roof. See Figure 21.

Arrangement #DUV-4

Dual unit venting, flat roof, stack 10 feet (3.0m) or less from wall or parapet. See Figure 22.

Arrangement #DUV-5

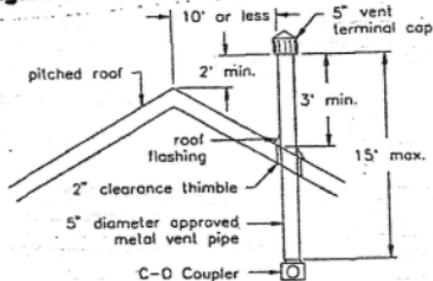
Dual unit venting, one story building, side wall overhead space, side wall vent with horizontal run. See Figure 23.

DUAL UNIT VENTING: When venting a two radiant tube systems with one common stack, a C-O Coupler must be used. The C-O coupler is a 4 inch x 4 inch x 5 inch (102mm x 102mm x 127mm) tee with a center baffle plate to allow two tube systems to be vented together. Use only 5 inch diameter approved metal vent pipe for attachment to C-O coupler. Maximum length of vent pipe not to exceed 15 feet (4.6m) and is to be terminated using 5 inch vent terminal cap. (Note: C-O coupler is designed for either vertical or horizontal application.) See Figure 18.

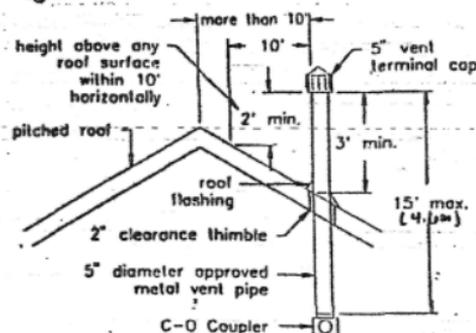
Dual Unit Venting - DUV Arrangements:

Arrangement #DUV-1

Dual unit venting, pitched roof, stack 10 feet (3.0m) or less from peak. See Figure 19.

Figure 19

ARRANGEMENT #DUV-1
dual unit vent - pitched roof
10' or less from peak

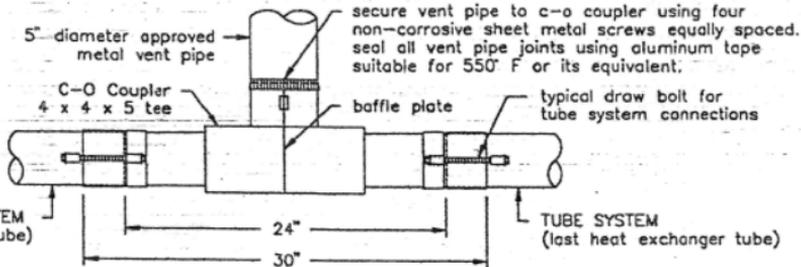
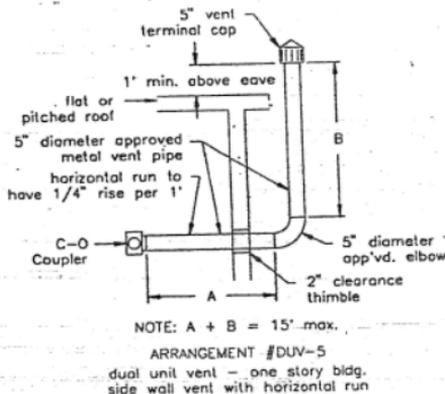
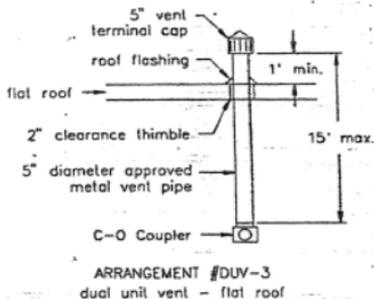
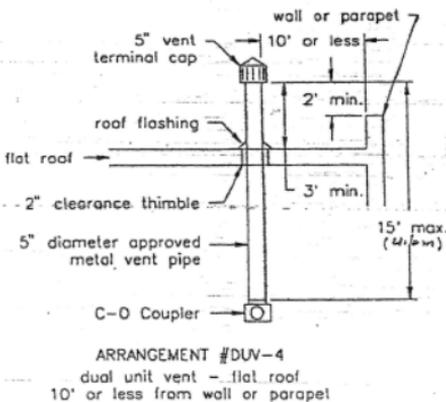
Figure 20

ARRANGEMENT #DUV-2
dual unit vent - pitched roof
more than 10' from peak

Figure 19

15' = 4.6m 1" = 25mm
 10' = 3.1m 18" = 46mm
 3" = .92m 4" = 102mm
 2" = .61m 2" = 51mm
 .25" = 6.35mm

TUBE SYSTEM
 (last heat exchanger tube)

**Figure 21****Figure 23****Figure 22**

B) UNVENTED

UNVENTED SYSTEMS: Radiant tube systems are CSA approved for operation without the use of an outdoor vent (unvented operation). Prior to installation of an unvented radiant tube system, a critical examination of the building-atmosphere and structure should be made. Building air must be diluted in order to maintain CO and CO₂, as well as to reduce the dew point temperature of the products combustion which are injected into the building.

Outside/fresh air requirements are as follows for calculating adequate ventilation loads for using a radiant tube system in a unvented operation:

Natural gas - 4CFM per 1,000 BTU/Hr

Propane/LP gas - 5CFM per 1,000 BTU/Hr

Dew point temperature is the air temperature, along with the moisture content, that will create condensation (sweating) within the building.

If any of the following conditions exist within the building, we recommend not using the radiant tube system in unvented operation, the vent terminal cap must be inverted when installed. Secure the vent cap to steel elbow supplied using three non-corrosive sheetmetal screws equally spaced around the diameter. Attach elbow/vent assembly to the tube system using supplied Drawbolts. See Figure 24.

1. In environments where dust and/or dirt are present.
2. In environments where atmospheric contaminants are present that produce toxic fumes or vapors when exposed to high temperatures or are burned. For example, trichlorethylene (used for degreasing) may form phosgene (toxic) and hydrogen chloride acid (corrosive).

3. In environments where insulation is lacking, or is inadequate for present conditions.

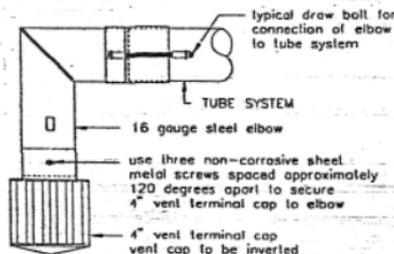
Operation of the tube system in unvented operation may result in the formation of condensate, or "sweating".

Condensation may also occur on building structures exposed to the outdoors, or to cold temperatures. These conditions may cause corrosion and/or dripping from the resulting condensation.

4. In tube systems that are supplied with outside air for combustion.

NOTICE: If the conditions described exist as in Number 1 and/or 2 above, outside air for combustion should be used.

Figure 24



COMBUSTION AIR

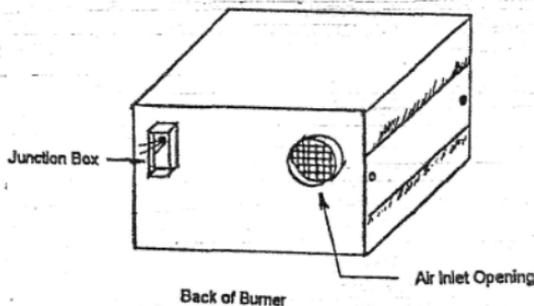
The radiant tube system shall be installed in a location in which the facilities for ventilation permit satisfactory combustion of gas, proper venting and the maintenance of ambient temperature at safe limits under normal conditions of use. When the radiant tube system is located in a tightly closed room, provisions must be made for wall opening to supply adequate combustion air. These openings are to be located within 12 inches (.305m) from both top and bottom of the enclosure and sized on the basis of one square inch (m^2) or more of free area per 1,000 BTU/Hr. input. (Never less than 100 square inches($645.2cm^2$) per opening).

NOTICE: For more information on supplying combustion air to confined spaces, refer to ANSI Standard Z223.1/NFPA 54, National Fuel Gas Code, CAN1-B149(1,2), Installation Codes for Natural and Propane Gas Burning Appliances and Equipment latest editions.

COMBUSTION AIR FROM HEATED

SPACE: When combustion air is supplied from the heated space, it is supplied to the burner through the inlet air port, located on the back side of the burner housing. See Figure 25. The inlet air port must be kept clean of debris and other obstructions. Maintain a minimum of 12 inches (.305m) from inlet air opening. Failure to comply may reduce the air flow through the burner resulting in poor and/or incomplete combustion. If the tube system is located in a tightly closed room, provisions must be made to supply sufficient air to the room for combustion as described previously in this section.

Figure 25



NOTICE: Supply air must be on the same plane as the exhaust to avoid an unbalanced venting condition.

THERMOSTAT WIRING AND LOCATION:

NOTICE: The thermostat must be mounted on a vertical vibration-free surface from air currents and in accordance with the instructions:

Mount the thermostat approximately 5 feet (1.5m) above the floor in an area where it will be exposed to a free circulation of average temperature air. Always refer to the thermostat-stat in the following locations:

1. Cold area - Outside walls or area where drafts may affect the operation of the control.
2. Hot area - Area where the sun's rays, radiant or warm air currents may affect the operation of the control.
3. Dead area - Areas where air cannot circulate freely such as behind doors and in corners.

THERMOSTAT HEAT ANTICIPATOR

ADJUSTMENT: The initial heat anticipator set point should equal the thermostat's current amperage draw when the unit is firing. This setpoint should be measured for the best results. If further information is needed, consult your thermostat manufacturer's instructions.

Recommended heat Anticipator Setting Ranges:

For 25 foot (7.6m) T'stat wire: 0.8 to 1.0 A.

For 50 foot (15.2m) T'stat wire: 1.0 to 1.2 A.

▲ WARNING

HAZARDOUS VOLTAGE! disconnect ALL ELECTRIC POWER INCLUDING REMOTE DISCONNECTS BEFORE SERVICING. Failure to disconnect power before servicing can cause severe personal injury or death.



Radian tube systems are shipped for use on 120 volt, 60 hertz, single phase electric power. The motor nameplate and electrical rating on the transformer should be checked before energizing the unit electrical system. All external wiring must conform with ANSI/NFPA No. 70, National Electrical Code, CSA C22.1, Canadian Electrical Code and CSA C22.2 No. 3, Electrical Features of Fuel-Burning Equipment.

CAUTION

Do not use any tools (i.e. screwdriver, pliers, etc.) across any terminals to check for power. Always use a voltmeter.

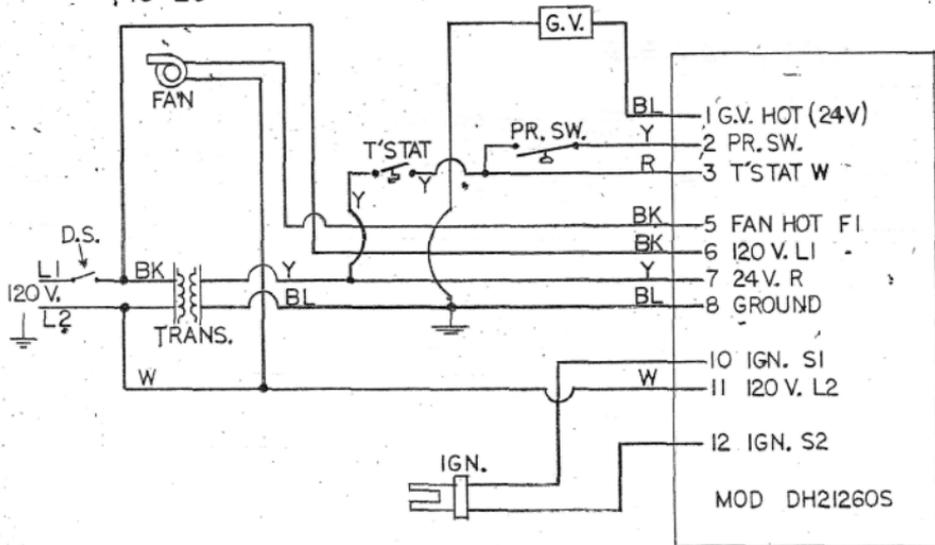
Each unit must be electrically grounded in accordance with ANSI/NFPA No. 70, National Electrical Code and CSA C22.1, Canadian Electrical Code.

Connections for electric supply line are made in the junction box located on the back of the burner. The supply must be 120 volts, 60 hertz. The electric connection should be made to a separate fused circuit by means of approved wire, 14 gauge minimum, and a service shut-off switch installed in the circuit within easy reach of the burner. See Figure 26.

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

FIG-26

SH-WIRING



OPERATION

START-UP

This radiant tube burner is equipped with electronic hot surface ignition which utilizes a microprocessor to continually and safely monitor, analyze and control proper operation of the gas burner.

WARNING

Never use an open flame to detect gas leaks. Explosive conditions may exist which could result in personal injury or death! Always check for leaks using a soap solution.

- Before turning on the main power switch, open manual valve supplying gas to the radiant heater, and with the union connection loose, purge air from the gas line. Tighten the union and check for gas leaks.
- Close main valve on unit by pushing in and letting lever snap to the "OFF" position. Wait 5 minutes. Then turn main valve on by rotating the lever to the "ON" position.
- Turn on main power switch and set room thermostat to the desired temperature.
- The hot surface igniter will heat-up after blower reaches the desired speed allowing the pressure switch to activate the ignition circuit. The gas valve will open after the igniter reaches the desired temperature and gas will flow. The igniter will then function as the sensor ensuring safe operation of the system.
- The ignition module used allows for 100% lockout on either Natural or LP gases to ensure that no gas flow occurs if the burner looks out, turn the thermostat to lowest setting. Wait 5 minutes, then reset to the desired temperature. If the condition persists, contact a qualified service agency or technician.

6. A complete operating cycle should be observed to assure that all components are operating properly. Check tube system to assure that unit is not restricted and is free to expand and contract during the heating and cooling cycles.

SHUT-DOWN

1. Push in on the main valve lever until it snaps to the "OFF" position.
2. Turn electricity "OFF".

GAS INPUT RATE

Check the gas input rate as follows (Refer to General Safety Information section for metric conversion).

CAUTION

Never overfire the burner, as this may cause unsatisfactory operation, or shorten the life of the heater.

1. Turn off all gas appliances that use gas through the same meter as the radiant heater.
2. Turn gas on to the heater and let heater operate for 15 minutes.
3. Clock the time in seconds required to burn 1 cu. ft. (m³) of gas by checking the gas meter.
4. Insert the time required to burn 1 cu. ft. (m³) of gas into the following formula and compute the input rate.

$$\frac{3600 \text{ (Sec. / Hr.)} \times \text{BTU/Cu. FT.}}{\text{Time (Sec.)}} = \text{Input Rate}$$

For example:

Assume the BTU content of 1 cubic foot of gas is 1000, and that it takes 18 seconds to run one cubic foot of gas.

$$3600 \times 1000 \div 18 = 200,000$$

Notice: If the computation exceeds, or is less than 95% of the gas BTU/hr. input rating (See Table 6), adjust the gas press.

MANIFOLD PRESSURE ADJUSTMENT

If the manifold pressure requires adjustment, remove the cap from the pressure regulator and turn the adjustment screw clockwise to increase the pressure, counterclockwise to decrease the pressure. The adjusted manifold pressure should not vary more than 10% from the pressures shown in Table 6.

Table 6 - Main Burner Orifice Schedule*

INPUT IN 1000 BTU	TYPE OF GAS	NATURAL	PROPANE (LP)
	HEATING VALUE	1050 BTU/ft ³	2500 BTU/ft ³
	MANIFOLD PRESSURE	3.5" W.C. (0.87 kPa)	10" W.C. (2.94 kPa)
60	FT ³ /HR ORIFICE DRILL	61 26	24 44
80	FT ³ /HR ORIFICE DRILL	81 18	32 37
100	FT ³ /HR ORIFICE DRILL	101 12	40 33
125	FT ³ /HR ORIFICE DRILL	128 3	50 30
150	FT ³ /HR ORIFICE DRILL	150 A	60 27
175	FT ³ /HR ORIFICE DRILL	175 .6	70 22
200	FT ³ /HR ORIFICE DRILL	200 L	60 19

*This section is for units operating at normal altitudes of 2000 ft. (610m) or less. Special orifices are required for installation above 2000 ft. (610m). For high altitudes dense burner 4% for every 1000 ft. above sea level.

Adjust the gas pressure as follows:

NATURAL GAS

Best results are obtained when the radiant heater is operating at its full rated input with the manifold pressure of 3.5 inches W.C. (0.87kPa). Adjustment of the pressure regulator is not normally necessary since it is preset at the factory.

However, field adjustment may be made as follows:

1. Remove the 1/8" (3.2mm) N.P.T. plugged tapping from the downstream side of the combination gas valve and attach the manometer.
2. Remove the regulator adjustment screw cap located on the combination gas valve.

- c. With a small flat blade screwdriver, rotate the adjustment screw either counter-clockwise to decrease the pressure or clockwise to increase the pressure. **Do not** vary the pressure by more than or less than 0.3" W.C. (0.1kPa).
- d. Replace regulator adjustment screw cap.

PROPANE (LP) GASES

An exact manifold pressure of 10.0 inches W.C. (2.94kPa) must be maintained for proper operation of the radiant heater. If the pressure requires adjusting, follow steps "a" through "d" above.

MAINTENANCE

WARNING

Turn off all electrical power and gas before servicing unit. Failure to do so may result in personal injury or death.

NOTICE: The heater and vent system should be inspected once a year by a qualified technician.

All Maintenance/Service information should be recorded on the Inspection sheet provided on the last page of this manual. At the beginning of each heating season, a routine maintenance check of the tube system should be completed. Listed below are items that should be inspected during this maintenance check.

WARNING

Under no circumstances should combustible material be located within the clearances specified in this manual. Failure to provide proper clearances could result in personal injury or equipment damage from fire.

1. Turn off electric power and gas to the unit. Manual gas valve is located outside of the radiant heater.
2. Inspect the area near the unit to be sure that there is no combustible material located within the minimum clearance requirements. (See "Installation" section of this manual).
3. Inspect burner blower wheel for dust build-up. If dirty, use air hose and blow through air inlet opening. If unable to

remove build-up, the blower assembly should be taken out from inside burner housing, by removing the three nuts located on the outside, and clean.

4. If providing the burner with outside air for combustion, inspect inlet air duct and hood for blockage. Remove any blockage that would restrict air supply to the burner.
5. Remove vent pipe at end of tubing system, inspect for sooting or build-up. Clean tube.
6. Inspect vent pipe for possible corrosion or blockage. Either remove any blockage that may be found or replace any that has corroded.
7. Clean reflectors with non-abrasive cloth using soap and water.
8. Restart unit. Follow complete start-up procedure as given in the "Operation" section of this manual.
9. Check all gas control valves and pipe connections for leaks.
10. Check the operation of the radiant heater by lowering the setting of the thermostat, stopping the operation of the unit. Reset thermostat to the desired setting and let it operate through one complete heating cycle.
11. Using proper test equipment, measure CO and CO₂. CO should test without a trace. CO₂ should measure approximately 8%.
12. Using a thermometer, measure stack temperature at the end of the tube. Reading should be 300° - 350°F (149° - 177°C).

13. Lubricate motor once a year using 3 drops of SAE20 oil. Motor will have to be removed from inside of burner housing by removing the 3 nuts on outside of housing.

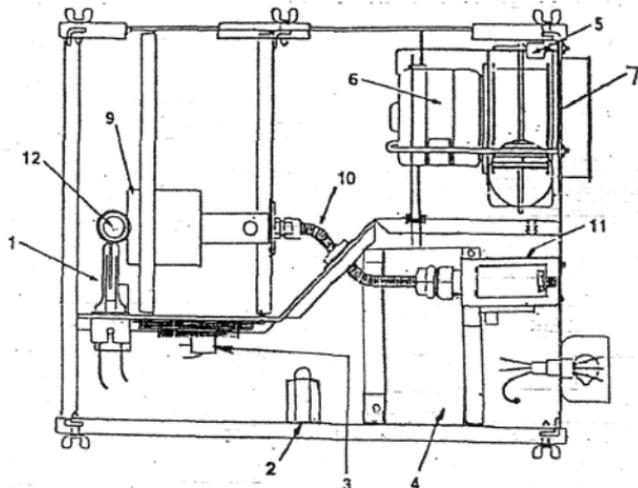
Main Burner Orifice Removal (If necessary):

1. Break union from the gas control piping and disconnect supply wiring from inside of the junction box.
2. Remove radiant burner from tube. Set on a flat surface.
3. Take off both access panels by removing the wing nuts.

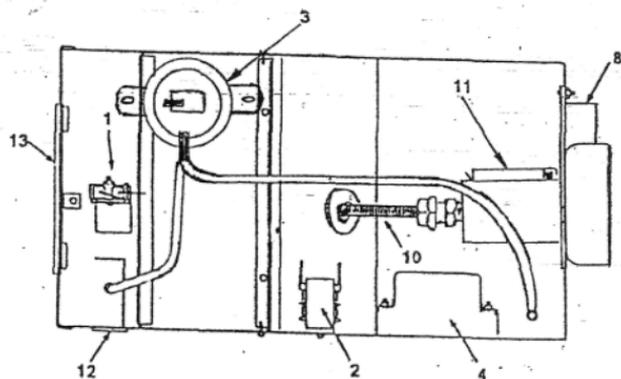
4. Remove the hot surface igniter from the mounting bracket by removing the nut and screw.
5. Loosen burner head with a screw driver. Continue to unscrew burner head until it comes off the manifold.
6. Use a 1/2" (12.7mm) open/closed end wrench to remove the orifice.
7. Clean and replace orifice with same hole drill size as necessary.
8. Re-assemble in reverse order. Check for gas leaks before restarting the radiant heater.

Figure 27

TOP VIEW



SIDE VIEW



1.) ANGLE MOUNTING PARABOLIC SYSTEM

Parabolic radiant tube systems have the advantage of the option to angle mount the system. Applications that require installation of the radiant tube systems close to walls or equipment may benefit from the flexibility of angle mounting. Radiant tube systems are CSA approved for angle mounting for angles from 1° to 45°. (30° and 45° angle mounting are the most commonly used and are specified in the following installation instructions.) To angle mount a parabolic radiant tube system:

1. Attach angle mounting clip to one side of the wire hanger. Secure the hanger using bolt, washers and nut supplied, **BUT DO NOT OVER TIGHTEN**. Refer to Figure 28.
2. Attached hanging chain to angle mounting clip by sliding the second bolt through the top hole in the clip and the end chain link. Secure chain to clip and **TIGHTEN**. Refer to Figure 29.

Figure 28

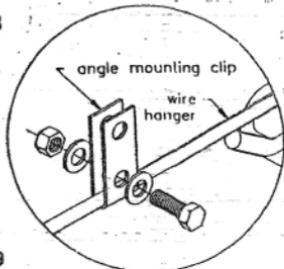
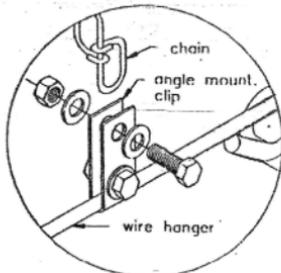


Figure 29



3. Set angle mounting clip to appropriate position on wire hanger for the desired mounting angle of the tube system. **TIGHTEN** the first bolt to secure clip position on the hanger. Refer to Figure 30 for clip measurement location.
4. Repeat steps 1 through 3 for each hanger used. All hangers should be compared for proper placement of mounting clips.
5. Figure 31 shows where to check tube system for desired angle position.
6. Check "Installation" section of this manual for minimum clearances to combustibles for angle mounted parabolic systems.

Figure 30

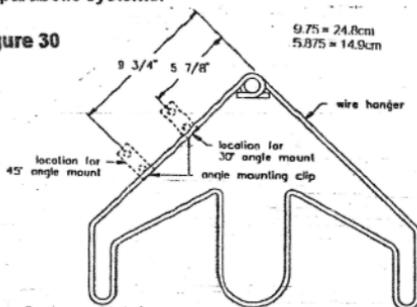
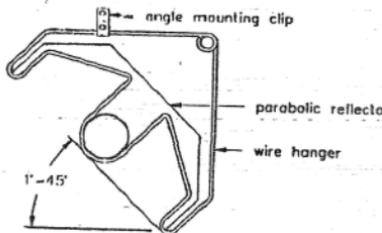


Figure 31

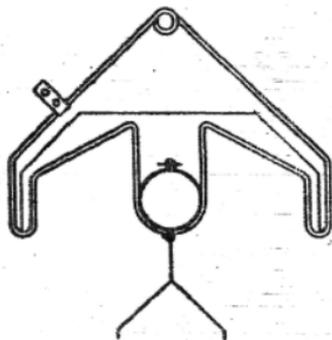


2.) DIFFUSER REFLECTOR(S) (Kit No. SH8035)

The diffuser reflector is designed to redirect infrared rays emitting directly beneath the radiant tube. While the diffuser reflector may be used anywhere on the tube system, it is primarily located beneath the combustion chamber; since greatest amount of heat is within the first 10' (3.05m) of the system. The diffuser reflector is used primarily in low mounting height applications to help spread apart the infrared rays and decrease the heating effect directly below the tube system. To install reflectors:

1. Place three hanger brackets to clamps on radiant tubing approximately 8' (2.44m) apart.
2. Attach hanger brackets to clamps on radiant tubing. Secure brackets with supplied bolt, nut and washer. **DO NOT TIGHTEN.**

Figure 32



3. Place diffuser reflector on hanger brackets by sliding the notches on each end of the reflector against the hanger brackets. (NOTE: The diffuser reflector will appear as an upside down "V" below the tube system.)
4. Tighten the hanger clamp/bracket assemblies to the radiant tubing.
5. Repeat steps 1 through 4 for each additional diffuser reflector.

NOTICE:

1. Diffuser reflector lengths are 4' (1.22m).
2. Diffuser reflectors are secured to the hanger brackets by notches on the reflectors, sheetmetal screws are not required.

TABLE 8 - TROUBLE SHOOTING GUIDE

SYMPTOMS	POSSIBLE CAUSE(S)	CORRECTIVE ACTION
A. Gas odor.	1. Shut off gas immediately. 2. Blocked heat exchanger/venting. 3. Negative pressure in building.	1. Inspect all gas piping for leaks. Replace if necessary. 2. Clean heat exchanger/venting system. 3. See "Installation" section.
B. No combustion blower motor.	1. Electrical power off. 2. Door switch does not work. 3. Wiring loose. 4. Bad motor.	1. Check circuit breaker. 2. Check continuity. If bad, replace. 3. Make sure all leads are connected. 4. Replace motor/blower assembly.
C. No ignition.	1. Igniter broken. 2. Differential pressure switch bad. 3. Hoses off pressure taps. 4. Pressure switch taps broken. 5. Ignition module does not work. 6. Main gas valve off. 7. Blocked flue. Pressure switch open.	1. Replace. 2. Jumper pressure switch wires. If ignition results, replace pressure switch. 3. Make sure hoses are on the pressure taps. 4. Replace taps. 5. Replace. 6. Open all manual gas valves. 7. Check for restriction in heat exchanger and flue outlet. Clean as necessary or replace.
D. Burner ignites but does not stay lit.	1. Check module. 2. Check differential pressure switch.	1. Test terminals FC1 & FC2 with a microamp meter. If microamp is less than 1.5, replace. 2. Jumper pressure switch leads. If burner operates, replace pressure switch.
E. Too much heat under combustion chamber.	1. Unit too low.	1. Raise unit, or install diffuser reflector.
F. Condensation of water vapor.	1. Stack too long. 2. Low stack temperature. Firing at less than rated input.	1. Check "Venting" for acceptable stack lengths. 2. Insulate stack. Check gas pressure with manometer. Check for proper orifice drill size.
G. Not enough heat.	1. Incorrect gas input. 2. Heat undersized. 3. Thermostat malfunction.	1. Refer to "Operation" section. 2. Do heat loss calculations and compare to heater output (80% of input). If under sized, add additional units. 3. Replace thermostat.
H. Noisy.	1. Blower wheel loose. 2. Blower wheel dirty. 3. Blower wheel rubbing housing.	1. Replace or tighten. 2. Clean power ventor wheel. 3. Realign.
I. Too Much Heat.	1. Thermostat malfunction. 2. Heater runs continuously.	1. Replace thermostat. 2. Check wiring diagram; check operation at valve & for any shorts.

PARTS LIST

See page 24 for assembly drawing

Item No.	Description	Part Number				
		60	80	100	125	150
1	Hot Surface Igniter	SH-8020	SH-8020	SH-8020	SH-8020	SH-8020
2	Transformer	21066	21066	21066	21066	21066
3	Differential Pressure Switch	SH-8042-1	SH-8042-1	SH-8042-1	SH-8042-1	SH-8042-1
4	Ignition Module	SH-8025\$	SH-8025\$	SH-8025\$	SH-8025\$	SH-8025\$
5	Door Switch	2001HEO	2001HEO	2001HEO	2001HEO	2001HEO
6	Motor/Blower Assy.	SH-8026	SH-8026	SH-8026	SH-8026	SH-8026
7	Blower Assembly Gasket	SH-8029	SH-8029	SH-8029	SH-8029	SH-8029
8	Orifice (Nat/LP)	SH-8015-01/02	SH-8015-03/04	SH-8015-05/06	SH-8015-07/08	SH-8015-09/10
9	Burner Assy.	SH-8002	SH-8002	SH-8002	SH-8002	SH-8002
10	Flexible Manifold Hose Assy.	SH-8012	SH-8012	SH-8012	SH-8012	SH-8012
11	Gas Valve	SH-8024-1	SH-8024-1	SH-8024-1	SH-8024-1	SH-8024-1
12	Mica Sight Glass	SH-8019	SH-8019	SH-8019	SH-8019	SH-8019
13	Clear Plastic tubing (16")	SH-8023	SH-8023	SH-8023	SH-8023	SH-8023
13A	Clear Plastic tubing (7")	SH-8023-1	SH-8023-1	SH-8023-1	SH-8023-1	SH-8023-1
14	Air Divider Plate	SH-8007-20	SH-8007-20	SH-8007-20	SH-8007-20	SH-8007-20
14A	Air Divider Insert	SH-8045-6	SH-8045-8	SH-8045-10	SH-8045-12	SH-8045-15
15	*Control Compartment Door	SH-8009	SH-8009	SH-8009	SH-8009	SH-8009
15A	*Blower Compartment Door	SH-8009-1	SH-8009-1	SH-8009-1	SH-8009-1	SH-8009-1
16	*Combustion Chamber (10')	SH-8016	SH-8016	SH-8016	SH-8016	SH-8016
17	*Heat Exchanger (10')	SH-8017	SH-8017	SH-8017	SH-8017	SH-8017
18	*Turbulator (10')	SH-8055	SH-8055	SH-8055	SH-8055	SH-8055
19	*Parabolic Reflectors (8')	SH-8027	SH-8027	SH-8027	SH-8027	SH-8027
19A	*Parabolic Reflectors (4')	SH-8027-1	SH-8027-1	SH-8027-1	SH-8027-1	SH-8027-1
20	*Optional Diffuser Reflector (8')	SH-8035	SH-8035	SH-8035	SH-8035	SH-8035
21	*Optional 24 Volt Thermostat	SH-8044	SH-8044	SH-8044	SH-8044	SH-8044
22	*Hangers	SH-8038	SH-8038	SH-8038	SH-8038	SH-8038
23	*Instruction Manual	SH-8043	SH-8043	SH-8043	SH-8043	SH-8043

* Picture not shown.

Item No.	Description	Part Number	
		175	200
1	Hot Surface Igniter	SH-8020	SH-8020
2	Transformer	21066	21066
3	Differential Pressure Switch	SH-8042-2	SH-8042-3
4	Ignition Module	SH-8025 S	SH-8025 S
5	Door Switch	2001HEO	2001HEO
6	Motor/Blower Assy.	SH-8026	SH-8026
7	Blower Assembly Gasket	SH-8029	SH-8029
8	Orifice (Nat/LP)	SH-8015-11/12	SH-8015-13/14
9	Burner Assy.	SH-8002	SH-8002
10	Flexible Manifold Hose Assy.	SH-8012	SH-8012
11	Gas Valve	SH-8024-2	SH-8024-2
12	Mica Sight Glass	SH-8019	SH-8019
13	Clear Plastic Tubing (16")	SH-8023	SH-8023
13A	Clear Plastic Tubing (7")	SH-8023-1	SH-8023-1
14	Air Divider Plate	SH-8007-20	SH-8007-20
14A	Air Divider Insert	SH-8045-17	—————
15	*Control Compartment Door	SH-8009	SH-8009
15A	*Blower Compartment Door	SH-8009-1	SH-8009-1
16	*Combustion Chamber (10')	SH-8016	SH-8016
17	*Heat Exchanger (10')	SH-8017	SH-8017
18	*Turbulator (3')	SH-8055-1	None
19	*Parabolic Reflector (8')	SH-8027	SH-8027
19A	*Parabolic Reflector (4')	SH-8027-1	SH-8027-1
20	*Optional Diffuser Reflector (8')	SH-8035	SH-8035
21	*Optional 24 Volt Thermostat	SH-8044	SH-8044
22	*Hanger	SH-8038	SH-8038
23	Insallation Manual	SH-8043	SH-8043

*Picture not shown

**GAS EQUIPMENT
START-UP**

Customer _____ Job Name & Number _____

PRE-INSPECTION INFORMATION WITH POWER AND GAS OFF

Type of Equipment: Infrared Radiant tube Heater

Serial Number _____ Model Number _____

Name Plate Voltage: _____ Name Plate Amperage: _____

Type of Gas: Natural _____ Propane (LP) _____

Tank Capacity _____ lbs. Rating: _____ BTU @ _____ °F (_____ °C)
_____ kg.

- Has unit suffered any external damage? Damage _____
- Does gas piping and electric wiring appear to be installed in a professional manner?
- Has the gas and electric been inspected by the local authority having jurisdiction?
- Is the gas supply properly sized for the equipment?
- Were the installation instructions followed when the equipment was installed?
- Have all field controls been installed?
- Has the installer gone over the operation of the heater and its controls?
(DO NOT START THE HEATER UNLESS YOU UNDERSTAND EVERYTHING.)

**GENERAL
With power and gas off.**

- Make certain all packing has been removed.
- Tighten all electrical terminals and connections.
- Check all controls for proper settings.

**GAS HEATING
With power and gas on.**

- Inlet gas pressure: _____ in. W.C. or _____ kPa.
- Main burner ignition.
- Manifold gas pressure: _____ in. W.C. or _____ kPa.
- Cycle by thermostat.

Remarks: _____

INSTALLATION OF AIR DIVIDER INSERT & ORIFICE

There is one basic model and a total of seven (7) firing rates in this series of *infra-red tube heaters*.

Breakdown as follows with Part Number:

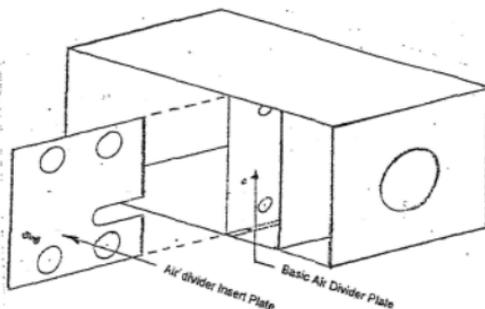
	<u>Model No.</u>	<u>Input Rate</u>	<u>Air Divider Plate</u>	<u>Air Divider Insert</u>	<u>Orifice (Nat/LP)</u>
Basic	SH-200	200,000	SH-8007-20		SH-8015-(13/14)
	SH-175	175,000	SH-8007-20	SH-8045-17	SH-8015-(11/12)
Basic	SH-150	150,000	SH-8007-20	SH-8045-15	SH-8015-(09/10)
	SH-125	125,000	SH-8007-20	SH-8045-12	SH-8015-(07/08)
Basic	SH-100	100,000	SH-8007-20	SH-8045-10	SH-8015-(05/06)
	SH-80	80,000	SH-8007-20	SH-8045-8	SH-8015-(03/04)
	SH-60	60,000	SH-8007-20	SH-8045-6	SH-8015-(01/02)

Note: Orifice and air divider insert plate is wired together. The insert air divider plate will show the correct rate in BTU/Hr. The orifice will show the drill size and gas.

REMEMBER: Read the instruction manual to find the correct tube length based on the input rate before installation begins. **NEVER** exceed the required length for that particular input.

REMEMBER AN "X" MARK WILL HAVE TO BE MADE ON THE RATING PLATE IN THE MODEL NUMBER COLUMN INDICATING WHICH MODEL IS BEING INSTALLED.

Figure 34



Following steps are required:

1. Remove both blower and control cover plates.
2. Pull out the air divider insert plate(s) with orifice attached from the blower area.
3. Pick the desired air divider insert plate and remove orifice that is wired to it long with the tag indicating orifice size.
4. Install the air divider insert plate between screws of the Basic divider plate and secure in place with the sheet metal screw provided. See figure 34.
5. Remove the screw and nut holding the HSI igniter from its mounting bracket and gently lift out the igniter.
6. With a long socket assembly and a piece of masking tape inside the socket, loosen and remove this orifice. Mark this original orifice with a tag so that it does not get lost.
7. With the same socket take the new orifice and push into the socket. Then install and tighten.
8. Re-install the HSI igniter and tighten screw and nut.
9. Put access cover plates on.
10. Mark the rating plate to indicate the correct input rate and Model Number.
11. Follow the instruction manual for the final installation of the system, hooking up the gas supply, starting unit and checking input rate.