

INSTALLATION AND SERVICE MANUAL

low intensity gas-fired pressurized infrared heaters

model IPT



FOR YOUR SAFETY

IF YOU SMELL GAS:

1. Open windows (indoor installation only).
2. Do not touch electrical switches.
3. Extinguish any open flame.
4. Immediately call your gas supplier.

FOR YOUR SAFETY

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

IMPORTANT

The use of this manual is specifically intended for a qualified installation and service agency. A qualified installation and service agency must perform all installation and service of these appliances.

Inspection upon Arrival

1. Inspect unit upon arrival. In case of damage, report it immediately to transportation company and your local Modine Sales Representative.
2. Check rating plate on unit to verify that power supply meets available electric power at the point of installation.
3. Inspect unit upon arrival for conformance with description of product ordered (including specifications where applicable).

⚠ WARNING

1. Improper installation, adjustment, alteration, service or maintenance can cause property damage, injury or death, and could cause exposure to substances which have been determined by various state agencies to cause cancer, birth defects, or other reproductive harm. Read the installation, operating, and maintenance instructions thoroughly before installing or servicing this equipment.
2. Do not locate ANY gas-fired units in areas where chlorinated, halogenated, or acidic vapors are present in the atmosphere. These substances can cause premature heat exchanger failure due to corrosion which can cause property damage, serious injury or death.
3. For either indoor or outdoor installation. Not for use in residential dwellings.

⚠ CAUTION

As with all infrared equipment, clearances to combustible materials are critical. Be sure all units have reflectors installed along the entire length of the tube, and that they are not mounted at an angle greater than 45° from the horizontal plane. In locations used for storage of combustible materials, signs shall be clearly posted in the vicinity of the heater where readily apparent to material handlers to specify the maximum permissible stacking height to maintain required clearances from the heater to the combustibles.

SPECIAL PRECAUTIONS

SPECIAL PRECAUTIONS

THE INSTALLATION AND MAINTENANCE INSTRUCTIONS IN THIS MANUAL MUST BE FOLLOWED TO PROVIDE SAFE, EFFICIENT AND TROUBLE-FREE OPERATION. IN ADDITION, PARTICULAR CARE MUST BE EXERCISED REGARDING THE SPECIAL PRECAUTIONS LISTED BELOW. FAILURE TO PROPERLY ADDRESS THESE CRITICAL AREAS COULD RESULT IN PROPERTY DAMAGE OR LOSS, PERSONAL INJURY, OR DEATH. THESE INSTRUCTIONS ARE SUBJECT TO ANY MORE RESTRICTIVE LOCAL OR NATIONAL CODES.

HAZARD INTENSITY LEVELS

1. **DANGER:** Indicates an imminently hazardous situation which, if not avoided, WILL result in death or serious injury.
2. **WARNING:** Indicates a potentially hazardous situation which, if not avoided, COULD result in death or serious injury.
3. **CAUTION:** Indicates a potentially hazardous situation which, if not avoided, MAY result in minor or moderate injury.
4. **IMPORTANT:** Indicates a situation which, if not avoided, MAY result in a potential safety concern.

DANGER

Appliances must not be installed where they may be exposed to a potentially explosive or flammable atmosphere.

WARNING

1. Do not locate ANY gas-fired units in areas where chlorinated, halogenated, or acidic vapors are present in the atmosphere. These substances can cause premature heat exchanger failure due to corrosion which can cause property damage, serious injury or death.
2. To prevent risk of fire or improper unit operation, radiant tube baffle must be properly selected from Table 10.1 according to fuel type, burner input, and tube system length and it must also be properly assembled and installed.
3. To prevent tube sections from separating during unit operation, tube clamps must be centered over the joints of adjoining tube sections and tightened to 50 ft. - lb. and the clamp fastened to the tubes using (2) self-tapping screws. Failure to do so may result in separation of tube sections which could fall and result in death or serious injury.
4. All field gas piping must be pressure/leak tested prior to operation. Never use an open flame. Use a soap solution or equivalent for testing.
5. Gas pressure to appliance controls must never exceed 14" W.C. (1/2 psi).
6. Do not join two sections of Type B double wall vent pipe within the vent system. A compromised pipe joint/liner pipe may or not be detected, resulting in serious injury or death.
7. A built-in combustion air blower is provided – additional external draft hoods (diverters) or power exhausters are not required or permitted.
8. To reduce the opportunity for condensation, the minimum sea level input to the appliance, as indicated on the serial plate, must not be less than 5% below the rated input.
9. A certified flexible connector must be used (local codes permitting) as a the method of connecting the heaters to the gas supply to avoid placing stress on the gas supply line due to the expansion of the low intensity infrared tubes during operation.

WARNING

10. Disconnect power supply before making wiring connections to prevent electrical shock and equipment damage.
11. All appliances must be wired strictly in accordance with the wiring diagram furnished with the unit. Any wiring different from the wiring diagram could result in a hazard to persons and property.
12. Any original factory wiring that requires replacement must be replaced with wiring material having a temperature rating of at least 105°C.
13. Ensure that the supply voltage to the appliance, as indicated on the serial plate, is not 5% greater than rated voltage.
14. When servicing or repairing this equipment, use only factory-approved service replacement parts. A complete replacement parts list may be obtained by contacting Modine Manufacturing Company. Refer to the rating plate on the unit for complete unit model number, serial number, and company address. Any substitution of parts or controls not approved by the factory will be at owner's risk.

CAUTION

1. As with all infrared equipment, clearances to combustible materials are critical. Be sure all units have reflectors installed along the entire length of the tube, and that they are not mounted at an angle greater than 45° from the horizontal plane. In locations used for storage of combustible materials, signs shall be clearly posted in the vicinity of the heater where readily apparent to material handlers to specify the maximum permissible stacking height to maintain required clearances from the heater to the combustibles.
2. Installation must conform with local building codes or in the absence of local codes, with Part 7, Venting of Equipment, or the National Fuel Gas Code, ANSI Z223.1 (NFPA 54) – latest edition. In Canada installation must be in accordance with CAN/CGA-B149.1 for natural gas units, and CAN/CGA-B149.2 for propane units.
3. Purging of air from gas lines should be performed as described in ANSI Z223.1 – latest edition "National Fuel Gas Code" or in Canada in CAN/CGA-B149 codes.
4. When leak testing the gas supply piping system, the appliance and its combination gas control must be isolated during any pressure testing in excess of 14" W.C. (1/2 psi).
5. The unit should be isolated from the gas supply piping system by closing its field installed manual shut-off valve. This manual shut-off valve should be located within 6' of the heater.
6. Turn off all gas before installing appliance.
7. Ensure that the supply voltage to the appliance, as indicated on the serial plate, is not 5% less than the rated voltage.
8. Do not attempt to reuse any mechanical or electrical controllers which have been wet. Replace defective controller.

SI (METRIC) CONVERSION FACTORS/UNIT LOCATION

IMPORTANT

- Approval requirements for infrared heaters specify that the suspended type heaters shall be installed in accordance with certain sections of the National Fire Codes published by the National Fire Protection Association and various ANSI standards. SOME of the requirements are listed below.

Aircraft Hangars: Approval requirements are contained in the current edition of ANSI/NFPA 409 (or in accordance with the enforcing authority for Canada).

Public Garages: Approval requirements are contained in the current edition of NFPA 88B (CAN/CGA B149 for Canada).

Parking Structures: Approval requirements are contained in the current edition of NFPA 88A.

General: All installations must be in accordance with the current edition of ANSI Z-223.1 (NFPA 54) National Fuel Gas Code and the current edition of the National Electric Code, ANSI/NFPA 70. For Canada, installations must conform with local building codes, or in the absence of local codes, in accordance with the current edition of CAN/CGA B149 and the Canadian Electric Code, C22.1.

- Start-up and adjustment procedures should be performed by a qualified service agency.
- To check most of the Possible Remedies in the troubleshooting guide listed in Table 23.1, refer to the applicable sections of the manual.

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Table 3.1 - SI (Metric) Conversion Factors

To Convert	Multiply By	To Obtain	To Convert	Multiply By	To Obtain
"W.C.	0.249	kPa	feet	0.305	m
°F	(°F-32) x 5/9	°C	Gal/Hr.	0.00379	m ³ /hr
Btu	1.06	kJ	Gal/Hr.	3.79	l/hr
Btu/ft ³	37.3	kJ/m ³	gallons	3.79	l
Btu/hr	0.000293	kW	Horsepower	746	W
CFH (ft ³ /hr)	0.000472	m ³ /min	inches	25.4	mm
CFH (ft ³ /hr)	0.00000787	m ³ /s	pound	0.454	kg
CFM (ft ³ /min)	0.0283	m ³ /min	psig	6.89	kPa
CFM (ft ³ /min)	0.000472	m ³ /s	psig	27.7	"W.C.

UNIT LOCATION

DANGER

Appliances must not be installed where they may be exposed to a potentially explosive or flammable atmosphere.

WARNING

Do not locate ANY gas-fired units in areas where chlorinated, halogenated, or acidic vapors are present in the atmosphere. These substances can cause premature heat exchanger failure due to corrosion which can cause property damage, serious injury or death.

CAUTION

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Approval requirements for infrared heaters specify that the suspended type heaters shall be installed in accordance with certain sections of the National Fire Codes published by the National Fire Protection Association and various ANSI standards. SOME of the requirements are listed below.

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Parking Structures: Approval requirements are contained in the current edition of NFPA 88A.

General: All installations must be in accordance with the current edition of ANSI Z-223.1 (NFPA 54) National Fuel Gas Code and the current edition of the National Electric Code, ANSI/NFPA 70. For Canada, installations must conform with local building codes, or in the absence of local codes, in accordance with the current edition of CAN/CGA B149 and the Canadian Electric Code, C22.1.

UNIT LOCATION /AIR REQUIREMENTS

Location Recommendations

1. When locating the heater, consider the general space and heating requirements and availability of gas and electrical supply.
2. Be sure the structural support and chain at the unit location is adequate to support the weight of the unit.
3. Be sure that the minimum clearances to combustible materials are maintained. The minimum clearances to combustibles are shown in Table 4.1, and Figures 4.1 and 4.2, as well as affixed to the burner Model Identification plate.
4. Maintain a recommended minimum of 18" clearance from the access side of the burner box and also on the combustion air inlet end of the burner box.
5. Mounting height (measured from the bottom of unit) at which heaters are installed is important to maintain proper occupant comfort levels. Please refer to mounting height information in Table 21.1.
6. Do not locate units in areas where chlorinated, halogenated, or acid vapors are present in the atmosphere.
7. Unit gas control can be field configured for right or left access, depending on unit location. See general instructions for "Rotation of Gas Control" on page 5.

Combustion Air Requirements

Units installed in tightly sealed buildings or confined spaces must be provided with two permanent openings, one near the top of the confined space and one near the bottom. Each opening should have a free area of not less than one square inch per 1,000 BTU per hour of the total input rating off all units in the enclosure, freely communicating with interior areas having, in turn adequate infiltration from the outside.

For further details on supplying combustion air to a confined (tightly sealed) space or unconfined space, see the National Fuel Gas Code ANSI Z223.1 of CAN/CGA B149.1 or .2 Installation Code, latest edition.

An accessory combustion air intake collar can be used to bring outside combustion air to the unit using 4" pipe. Refer to the venting section "Utilizing Outside Combustion Air" on page 14 for details on pipe length and location.

Clearance to Combustibles

Ensure that:

1. Clearances to combustibles (as shown on the Model Identification plate and in Table 4.1) are maintained. These Clearances also apply to vehicles parked below the heater.
2. Adequate clearances to sprinkler heads are maintained. As a guideline, certified minimum distance to combustible material is based on the combustible material surface not exceeding 90°F above ambient (160°F typical).
3. The stated clearance to combustibles represents a surface temperature of 90°F (50°C) above room temperature. Building materials with a low heat tolerance (such as plastics, vinyl siding, canvas, tri-ply, etc.) may be subject to degradation at lower temperatures. It is the installer's responsibility to assure that adjacent materials are protected from degradation.

Storage of Combustible Materials

In locations used for storage of combustible materials, signs shall be clearly posted in the vicinity of the heater where readily apparent to material handlers to specify the maximum permissible stacking height to maintain required clearances from the heater to the combustibles. See Figure 4.3.

Table 4.1 - Combustible Material Clearances (inches) ①

Combustible Material Clearances (inches)			
Input MBH	"A" ①	"B"	"C"
50/60	9	54	20
75/100/125	9	76	24
150/175/200	12	106	38

① Clearance to each end and above the U-Tube is 12 inches. Refer to Figures 4.1 and 4.2.

Figure 4.1 - Combustible Material Clearances - Straight Tube

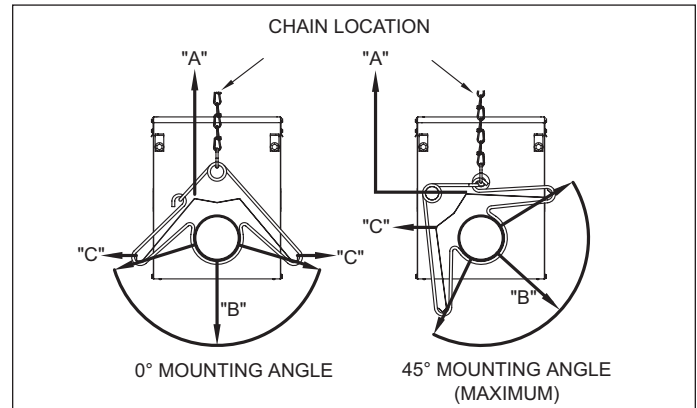


Figure 4.2 - Combustible Material Clearances - U-Tube

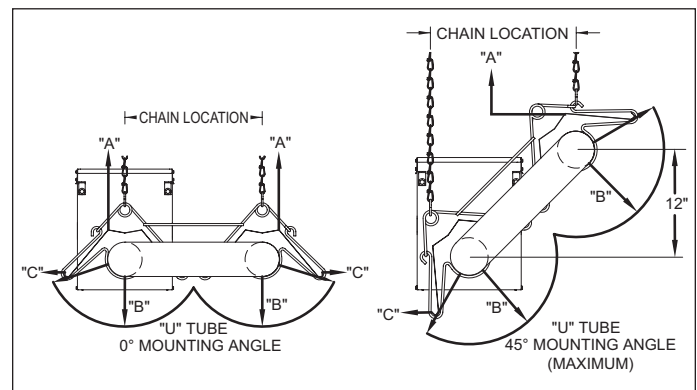
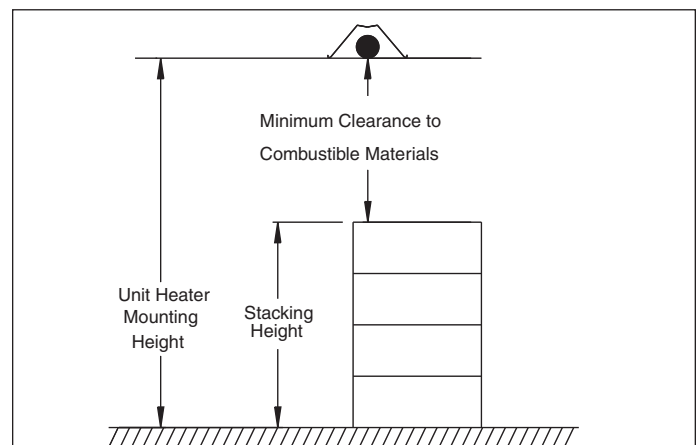


Figure 4.3 - Stacking Height



INSTALLATION

Unit Mounting – Pre-Installation Notes

! WARNING

1. To prevent risk of fire or improper unit operation, radiant tube baffle must be properly selected from Table 10.1 according to fuel type, burner input, and tube system length and it must also be properly assembled and installed.
2. To prevent tube sections from separating during unit operation, tube clamps must be centered over the joints of adjoining tube sections and tightened to 50 ft. - lb. and the clamp fastened to the tubes using (2) self-tapping screws. Failure to do so may result in separation of tube sections which could fall and result in death or serious injury.

1. Be sure the method of unit suspension is adequate to support the weight of the burner and tube system (see Tables 18.1 and 18.2 for system weights).
2. Combustible material and service clearances as specified in Table 4.1 and Figures 4.1 through 4.3 must be strictly maintained.
3. Maintain a recommended minimum of 18" clearance from the access side of the burner box and also on the combustion air inlet end of the burner box.
4. Before installing, review the components to be installed against Figure 6.1 and Table 6.1 for straight tube systems or Figure 7.1 and Table 7.1 for U-Tube systems. Ensure that all parts are identified and available before proceeding with installation of the unit.
5. It is recommended that the uninstalled system components be arranged on the floor, where possible, to match the intended layout. This can help ensure the layout matches the intended design.
6. The standard gas control access is on the left side when looking at the back end of the burner (combustion air inlet end). If the intended installation requires access from the opposite side, please follow the instructions in the section titled "Rotation of Gas Control" prior to burner installation.
7. For proper operation, the burner and tube system must be installed in a level horizontal position. Use a spirit level during installation to ensure that the unit is suspended level.
8. Under no circumstances should the gas supply line or the electrical supply line to the heater provide any assistance in the suspension of the heater. Do not locate any gas or electric service line directly above or below the heater.

Removal of Burner Side Access Panels

Each of the two side access panels are held in place by two (2) screws, as shown in Figure 5.1. Once the screws are removed, the panels slide down, where they can either hang on the hooks shown in Figure 22.1 or be removed completely during service or maintenance. The unit is designed to operate without these panels in place so that adjustments of the controls can be made. The panels must be returned to the unit once installation is complete.

Figure 5.1 - Side Access Panels



Rotation of Gas Control

! WARNING

1. All field gas piping must be pressure/leak tested prior to operation. Never use an open flame. Use a soap solution or equivalent for testing.
2. Gas pressure to appliance controls must never exceed 14" W.C. (1/2 psi).

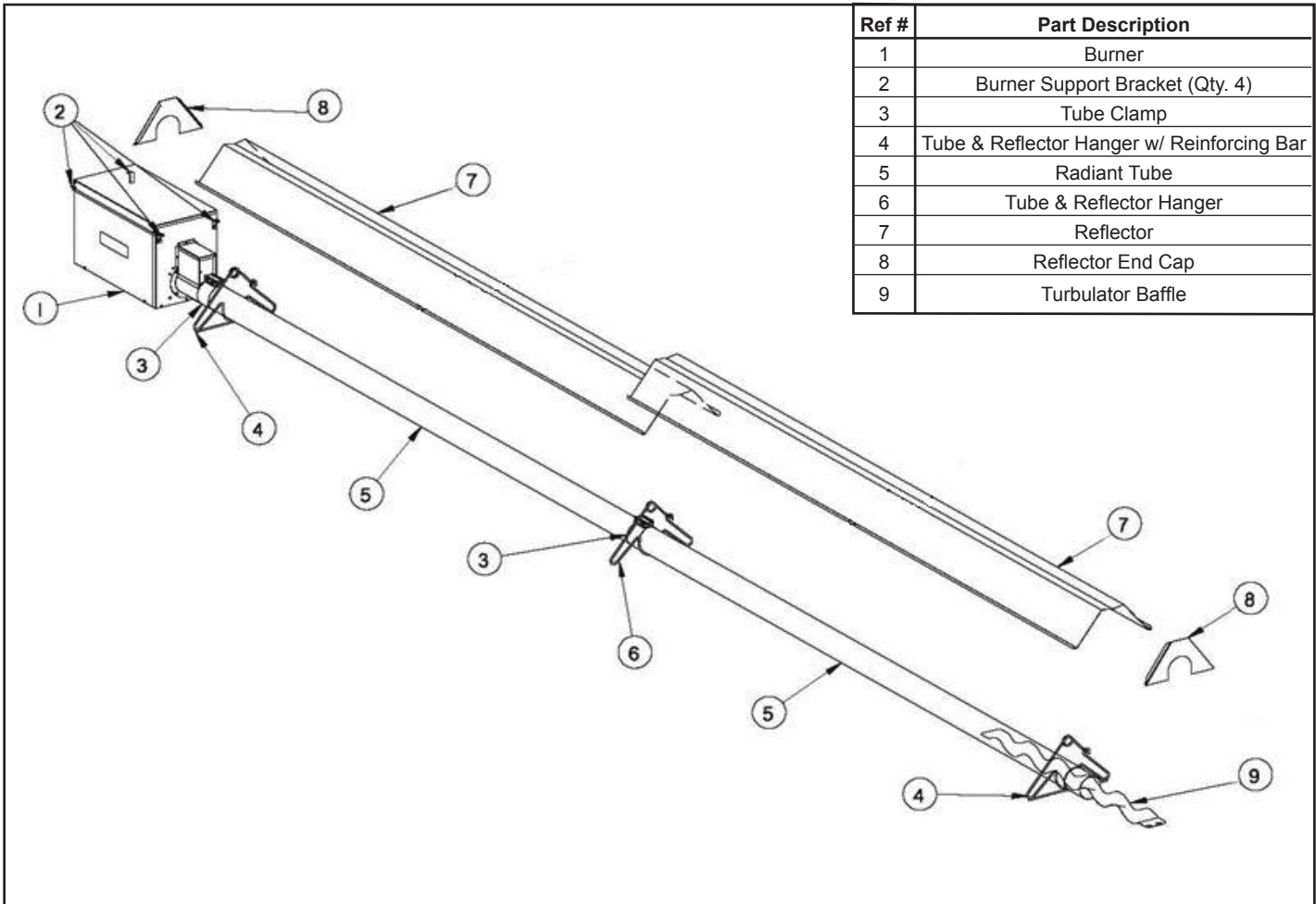
This section is only required if opposite side gas control access is required. The standard access is on the left side when looking at the back of the burner box (combustion air inlet end).

In order to install the heater so that the gas valve's controls can be accessed from the opposite side of the burner box, the valve may be rotated 180° by following the procedure below.

1. Remove burner side access panels as described in the previous section.
2. Unplug all wires from the valve.
3. Using two wrenches, loosen the factory-supplied union in the burner box and remove the gas valve. Do not apply the wrenches directly to either the gas valve or the gas manifold.
4. Remove the plug from the factory-supplied "tee" fitting and screw it into the opposite leg of the tee. Be sure to properly seal the threads of this connection.
5. Seat the gas valve onto the factory-supplied union, so that the valve faces the opposite side of the burner box. Tighten the union using two wrenches, without applying them directly to either the gas valve or the gas manifold.
6. Plug-in all wires removed from the valve in step 2.
7. The gas piping/fitting connections must be pressure/leak tested as outlined in the section titled "Gas Connections" on page 15.
8. Replace the burner side access panels.

INSTALLATION

Figure 6.1 - Straight Tube System Components



Ref #	Part Description
1	Burner
2	Burner Support Bracket (Qty. 4)
3	Tube Clamp
4	Tube & Reflector Hanger w/ Reinforcing Bar
5	Radiant Tube
6	Tube & Reflector Hanger
7	Reflector
8	Reflector End Cap
9	Turbulator Baffle

Table 6.1 - Straight Tube System Component List

Tube Length (ft.)	Available Burner Input MBH	10' Tubes	10' Reflectors	Single-Tube Hangers with Reinforcing Bar	Single-Tube Hangers (regular)	Tube Clamps	Reflector End Cap	Turbulator Baffle Sections	Stocking Kit Option Requires the Following Tube Kits ②:
20	50, 60, 75	2	2	2	1	3	2	4	A
30	50, 60, 75, 100	3	3	2	2	4	2	4	E
40	60, 75, 100, 125	4	4	2	3	5 ①	2	4	A + D
50	100, 125	5	5	2	4	6 ①	2	4	E + D
	150, 175, 200	5 ①	5	2	4	6 ①	2	4	B + C
60	125 - 1-Stage Only	6	6	2	5	7 ①	2	4	A + D + D
	150, 175, 200	6 ①	6	2	5	7 ①	2	4	B + D
70	175, 200	7 ①	7	2	6	8 ①	2	4	B + E

① Tube systems for input ratings of 150MBH and higher utilize a 409 Aluminized Stainless Steel First tube section with stainless steel tube clamps.

② Tube systems can be ordered as either Modular (complete system) or Stocking Kits (combination of kits to form complete system).

INSTALLATION

Figure 7.1 - U-Tube System Components

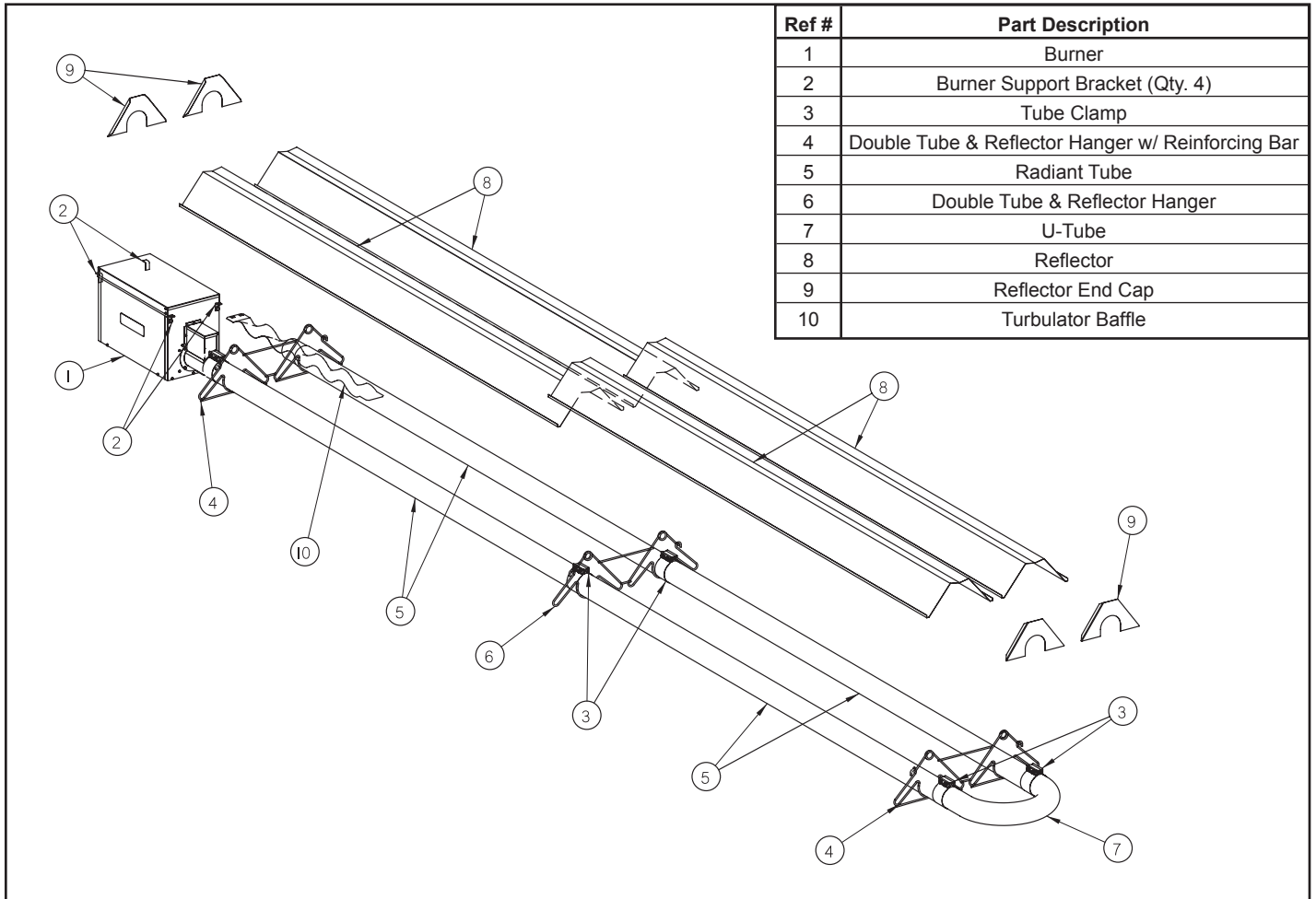


Table 7.1 - U-Tube System Component List

Tube Length (ft.)	Available Burner Input MBH	5' Tubes	10' Tubes	10' Reflectors	Double-Tube Hangers with Reinforcing Bar	Double-Tube Hangers (regular)	Tube Clamps	Reflector End Cap	U-Tube	Turbulator Baffle Sections ③	Stocking Kit Option Requires the Following Tube Kits ②
20	50, 60, 75	-	2	2	2	-	4	4	1	4	A + U-Tube
30	50, 60, 75, 100	2	2	4	2	1	6	4	1	4	N/A
40	60, 75, 100, 125	-	4	4	2	1	6	4	1	4	A + D + U-Tube
50	100, 125, 150, 175, 200	2	4 ①	6	2	2	8 ①	4	1	4	N/A
60	125 - 1-Stage Only	-	6	6	2	2	8	4	1	4	A + D + D + U-Tube
60	150, 175, 200	-	6 ①	6	2	2	8 ①	4	1	4	B + D + U-Tube
70	175, 200	2	6 ①	8	2	3	10 ①	4	1	4	N/A

① Tube systems for input ratings of 150MBH and higher utilize a 409 Aluminized Stainless Steel First tube section with stainless steel tube clamps.

② Tube systems can be ordered as either Modular (complete system) or Stocking Kits (combination of kits to form complete system).

③ For installations where 4 baffles are need on straight tube set ups, U-tube installations will only require 3 baffles.

INSTALLATION

Unit Mounting – Tube System

⚠ WARNING

To prevent tube sections from separating during unit operation, tube clamps must be centered over the joints of adjoining tube sections and tightened to 50 ft. - lb. and the clamp fastened to the tubes using (2) self-tapping screws. Failure to do so may result in separation of tube sections which could fall and result in death or serious injury.

For steps 1-8 of this section, please refer to Figures 8.1 and 9.1

1. Locate and install tube and reflector system hanging chains (200 lb. minimum working load) as shown, following spacing indicated in Table 8.1 or 9.1.
2. Fasten tube and reflector hangers to the hanging chains installed in the previous step using 1/4" diameter S-Hooks (70 lb. minimum working load). The hangers must be positioned so that the tube system to be installed will be in the horizontal plane and level. Refer to Figures 8.1 and 9.1 for chain location on tube systems mounted at a 45° angle. Also note that the first and last hangers are to be the type with reinforcing bar. Do not close ends until the tube system installed in subsequent steps is confirmed to be level.
3. Identify the first burner tube and first and second tube clamps as follows:

- For units under 150,000 Btu/hr, all tubes and clamps are the same.
- For units 150,000 Btu/hr and over, the first tube is shinier than the other tubes and is stenciled with the words "First Tube". The first two tube clamps have a shiny, mirror-like appearance.

4. Loosely slide the second tube clamp approximately 6" past the swaged end (see Figure 8.2 for identification of tube ends).
5. Starting from the end of the tube system where the burner will be installed (done in later steps), slide the first burner tube through the first and second tube hangers. The non-swaged end is to go through the first tube hanger and the swaged end is to go through the second tube hanger. Position the tube so the welded seam is directed toward the floor.
6. Loosely slide the next tube clamp over the swaged end of the next tube and slide the non-swaged end over the swaged end of the preceding tube, ensuring that the welded seam on the tube is directed toward the floor. The other end is to be inserted through the following tube hanger.
7. Center the tube clamp on the preceding tube over the joint of the two tubes as shown in Figures 8.1 or 9.1 and tighten the tube clamp bolts to 50 ft.-lb. Secure the tube clamp to both tubes using (2) self-tapping sheet metal screws.
8. Repeat steps 6 and 7 until all tube sections are installed.
9. Verify that the tube system is level. If the tube is not level, adjust the position of the hanger on the hanging chain. Once level, crimp the ends of the S-hooks on the hangers closed.

Figure 8.1 - Straight Tube System Suspension

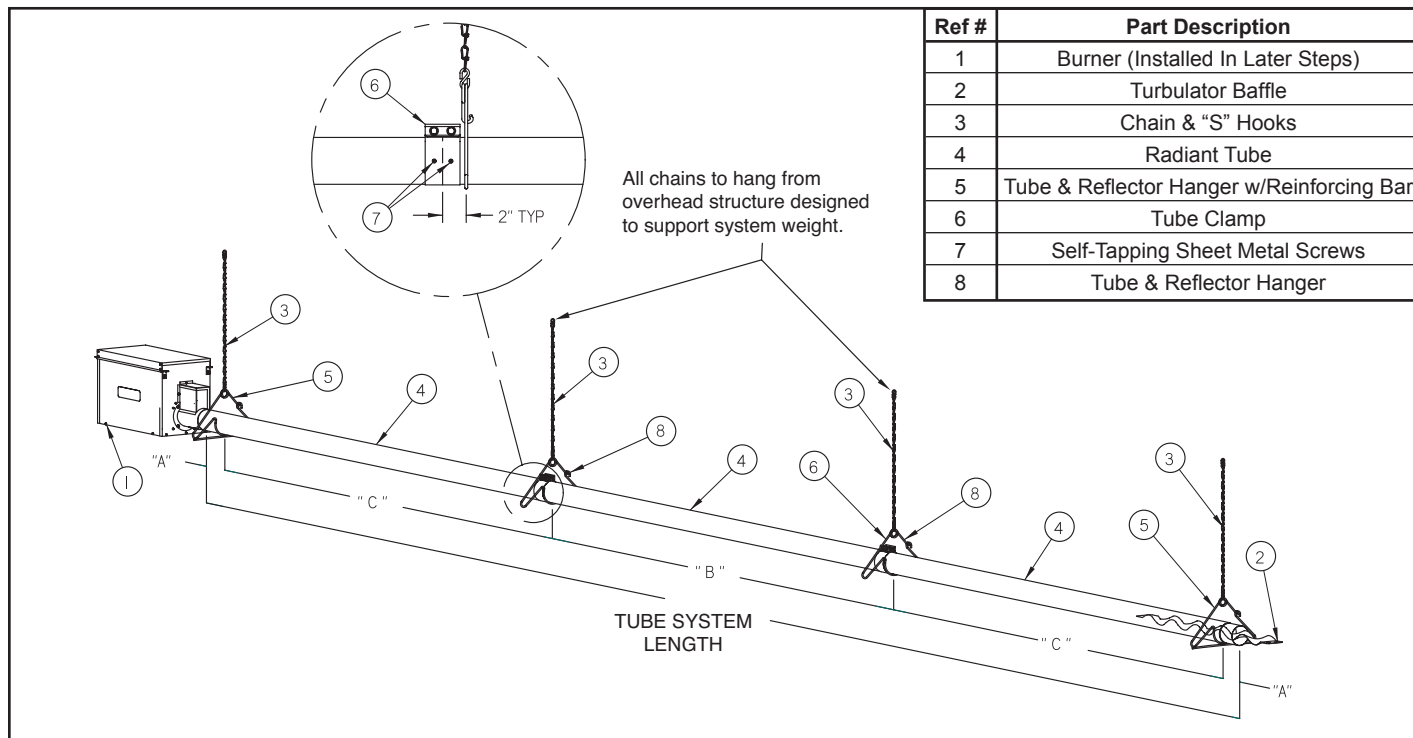
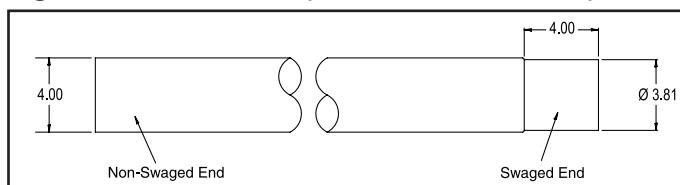


Table 8.1 - Straight Tube Chain Spacing

Tube System Length (ft)	Number of Chains	Minimum Chain Length	Chain to Chain Spacing Dimensions		
			"A" ①	"B" ②	"C" ③
20	3	18"	6"	N/A	9' 4"
30	4	18"			
40	5	18"			
50	6	18"			
60	7	24"			
70	8	24"			

- ① "A" Dimension is spacing from the tube system ends to the first and last hangers.
 ② "B" Dimension is spacing between hangers for tubes between "C" dimensions.
 ③ "C" Dimension is spacing between the first two hangers and the last 2 hangers.

Figure 8.2 - Tube Ends (Dimensions in inches)



INSTALLATION

Figure 9.1 - U-Tube System Suspension

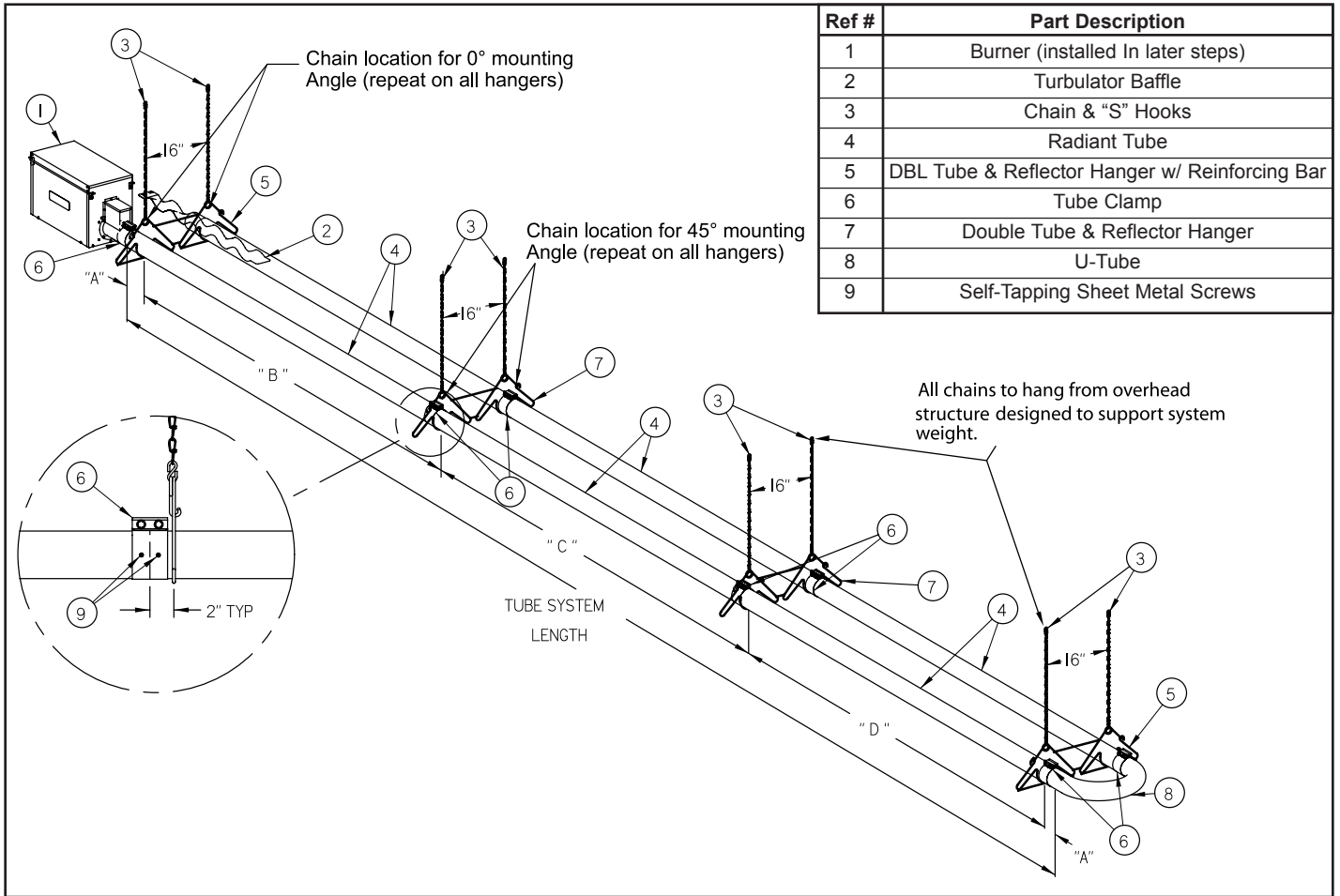


Table 9.1 - U-Tube Chain Spacing

Tube System Length (ft)	Number of Chains	Maximum Chain Length	Espacement des chaînes				
			"A" Dimension ①	"B" Dimension ②	"C" Dimension ③	"D" Dimension ④	
20	4	18"	6"	N/A	N/A	Sans objet	
30	6			9' 4"		9' 8"	4' 4"
40	6						4' 4"
50	8			4' 4"			
60	8			4' 4"			
70	10			4' 4"			

- ① "A" Dimension is spacing from the tube system ends to the first hanger and from the U-tube ends to the last hanger.
- ② "B" Dimension is spacing between first and second hangers away from burner.
- ③ "C" Dimension is spacing between hangers for tubes between "B" and "D" dimensions.
- ④ "D" Dimension is spacing between first and second hangers away from U-tube.

INSTALLATION

Unit Mounting – Turbulator Baffle

⚠ WARNING

To prevent risk of fire or improper unit operation, radiant tube baffle must be properly selected from Table 10.1 according to fuel type, burner input, and tube system length and it must also be properly assembled and installed.

1. The last section of radiant tube is to include a turbulator baffle assembly. Determine the quantity of baffle sections to be installed based on the burner rating and tube system length, per Table 10.1. Discard any baffle sections that will not be required for the assembly.

Table 10.1 - Turbulator Baffle Assembly Section Qty. Determination

Input MBH		Baffle Quantity					
		Tube Length (ft)					
		20	30	40	50	60	70
50	NG	2	2	-	-	-	-
	LP	1	1	-	-	-	-
60	NG	3	1	0	-	-	-
	LP	3	1	0	-	-	-
75	NG	4	2	2	-	-	-
	LP	4	2	-	-	-	-
100	NG	-	4	3	2	-	-
	LP	-	4	3	-	-	-
125	NG	-	-	3	2	2	-
	LP	-	-	4	3	1	-
150	NG	-	-	-	3	2	-
	LP	-	-	-	3	2	-
175	NG	-	-	-	3	2	2
	LP	-	-	-	3	2	0
200	NG	-	-	-	4	2	0
	LP	-	-	-	4	2	0

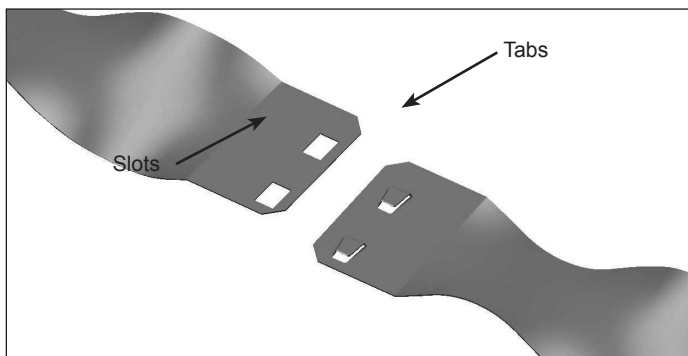
* Max. tube length on 125MBH 2-Stage units is 50'

* Note - Tube lengths shown are for units installed at elevations of 0-2001'. Allowable tube lengths may differ upon elevation changes.

* Note - For installations where 4 baffles are need on straight tube set ups, U-tube installations will only require 3 baffles.

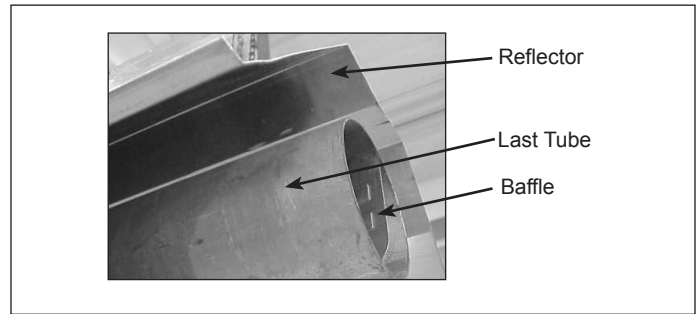
2. Assemble the turbulator baffle assembly by mating the sections determined in the previous step as shown in Figure 10.1.

Figure 10.1 - Assembly of Turbulator Baffle Assembly



3. Insert the completed turbulator baffle assembly into the last radiant tube, flush with the end as shown in Figure 10.2.

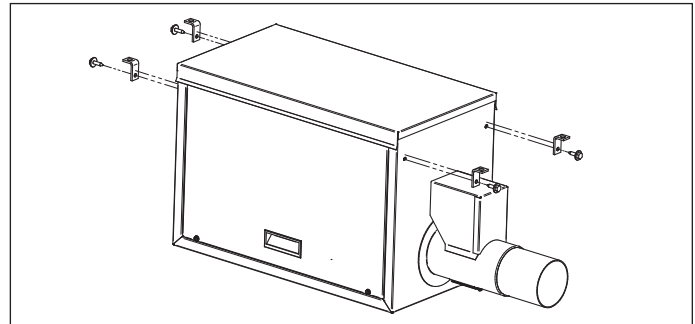
Figure 10.2 - Insertion of Turbulator Baffle Assembly



Unit Mounting – Burner

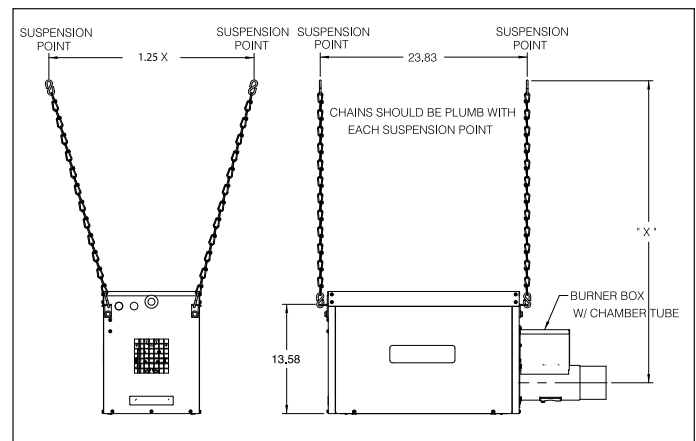
1. Install four burner support brackets as shown in Figure 10.3 with the bolts supplied.

Figure 10.3 - Burner Support Bracket Installation



2. The burner must be suspended with four chains (200 lb. minimum working load) to allow for system expansion and contraction during unit operation, as shown in Figure 10.4. Note that for U-tube systems mounted at a 45° angle, the exiting side of the tube system is 12" higher than the burner (see Figure 4.2). Locate and mount burner to ensure that Clearance to Combustibles are maintained (refer to "Clearance to Combustibles" on page 4).

Figure 10.4 - Burner Suspension



INSTALLATION

Unit Mounting – Radiant Reflector

⚠ CAUTION

As with all infrared equipment, clearances to combustible materials are critical. Be sure all units have reflectors installed along the entire length of the tube, and that they are not mounted at an angle greater than 45° from the horizontal plane. In locations used for storage of combustible materials, signs, shall be clearly posted in the vicinity of the heater where readily apparent to material handlers to specify the maximum permissible stacking height to maintain required clearances from the heater to the combustibles.

For steps 1-7, refer to Figure 11.1.

1. The entire radiant tube length must have radiant reflector installed. The only exception is that on U-tube systems, a reflector is not installed over the U-tube.
2. Remove any protective plastic covering the reflectors.
3. Starting from the burner, slide a reflector through the tube and reflector hangers and position the reflector so that it is centered over the tube. The end closest to the burner should be 6" from the first tube and reflector hanger.

4. Slide the next reflector through the tube and reflector hangers and center over the next tube. The reflector should overlap the previous reflector by 4". Repeat until all reflectors are installed (alternating top and bottom overlaps).
5. Starting from the burner end and working toward the vent end of the tube system, overlapping reflector joints are to be either secured or remain unsecured as follows:
 - Every odd numbered reflector to even numbered reflector joint (reflectors 1 to 2, 3 to 4, etc.) is to be secured with self-tapping sheet metal screws.
 - Every even numbered reflector to odd numbered reflector joint (reflectors 2 to 3, 4 to 5, etc.) is to remain unsecured to allow for expansion and contraction during operation.
6. Reflector end caps are to be fastened to both ends of the reflector system using sheet metal screws.

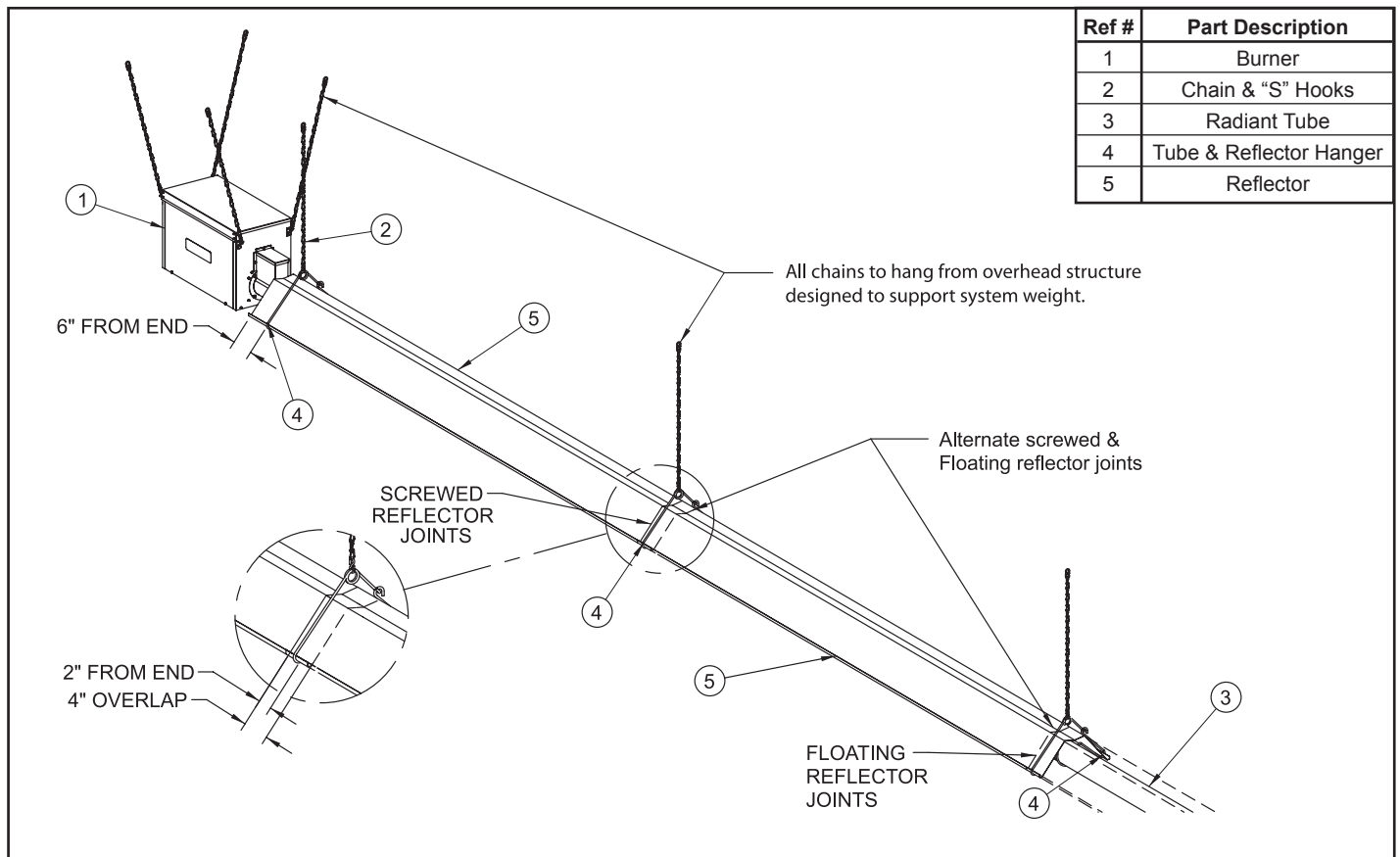
Additional Recommendations for Outdoor Installation

Complies with Canadian Standard CAN1-2.21

When utilized in an outdoor installation or in aircraft hangars, the following is required:

1. A screened combustion air intake cap.
2. All electrical connections must be water tight and suitable for outdoor use.

Figure 11.1 - Installation of the Radiant Reflectors



INSTALLATION

Venting

⚠ WARNING

1. A built-in combustion air blower is provided – additional external draft hoods (diverters) or power exhausters are not required or permitted.

⚠ CAUTION

Installation must conform with local building codes or in the absence of local codes, with Part 7, Venting of Equipment, or the National Fuel Gas Code, ANSI Z223.1 (NFPA 54) – latest edition. In Canada installation must be in accordance with CAN/CGA-B149.1 for natural gas units, and CAN/CGA-B149.2 for propane units.

General Venting Instructions

The vent pipe may be installed in either a vertical or horizontal method. Certified vent pipe lengths are as follows:

Table 12.1 - Maximum Vent Length

Input MBH	Min Vent Length (ft.)	Maximum Vent Length (ft.)	
		1-Stage	2-Stage
50, 60, 75, 100	5'	20'	20'
125		30'	30'
150, 175, 200		40'	30'

- All systems are considered a Category III appliance and the vent system must be approved for Category III application in accordance with UL1738 or ULCS636.
- Use either a certified Category III vent system with a maximum flue temperature of up to 550°F, or single wall vent pipe with all joints (fastened with 3 corrosion resistant sheet metal screws) and seams sealed with a 550°F or greater sealant. Follow the vent manufacturers instructions for clearance to combustibles.
- Refer to the National Fuel Gas Code for the minimum material thickness and composition of the vent material.
- If single wall vent systems are used, Type B vent can be used to terminate the vent system. The Type B double wall vent must be one continuous section. Under no circumstances should two sections of double wall vent pipe be joined together within one vent system due to the inability to verify complete seal at inner pipes.
- All seams and joints must be inspected to ensure gas tightness after installation. Vent system (connections, joints, and seams) must be leak checked using a soap solution
- Models 50-75 use 3" venting. Models 100-200 use 4". For models 50-75, a 4" to 3" reducer must be used to connect the last tube section to the 3" vent pipe. It is recommended that vent pipes be fitted with a tee with a drip leg and a clean out cap to prevent any moisture in the vent pipe from entering the unit. The drip leg should be inspected and cleaned out periodically during the heating season See figure 13.1 & 13.3.
- The National Fuel Gas Code requires a minimum clearance of 6 inches from combustible materials for single wall vent pipe. The minimum distance from combustible materials is based on the combustible material surface not exceeding 160°F. Clearance from the vent pipe (or the top of the unit) may be required to be greater than 6 inches if heat damage other than fire (such as material distortion or discoloration) could result.

Figure 12.2 - Vertical Venting

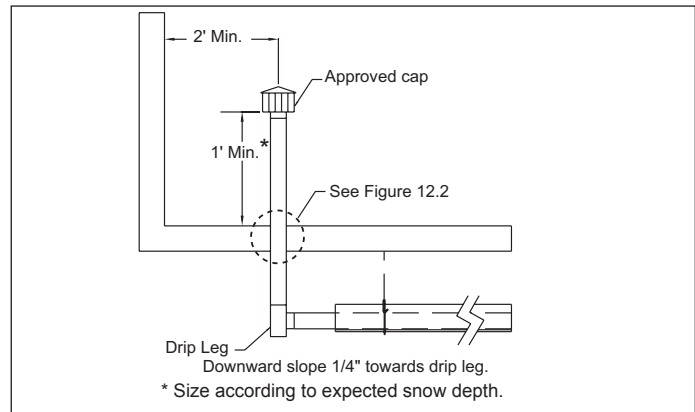
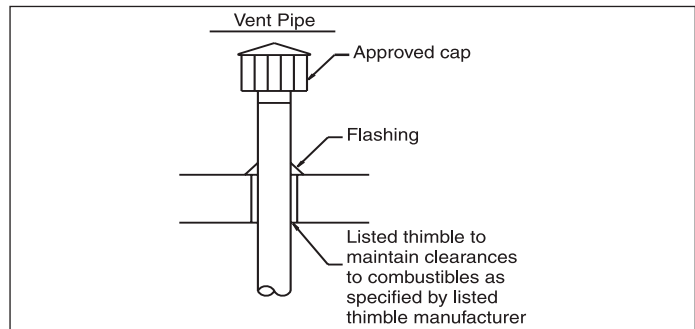


Figure 12.3 - Construction through Combustible Roof



- Avoid venting through unheated space when possible. When single wall pipe does pass through an unheated space, insulate runs greater than 5' to minimize condensation. Inspect for leakage prior to insulating and use insulation that is noncombustible with a rating of not less than 550°F. Install a tee fitting at the low point of the vent system and provide a drip leg with a clean out cap as shown in Figure 12.2. The drip leg should be cleaned annually.
- Where the vent passes through a combustible wall or floor or ceiling, a listed metal thimble 4" greater than the vent diameter is necessary. If there are six feet or more of vertical vent pipe in the open space between the unit heater and where the vent pipe passes through the floor or roof, the thimble need only be 2" greater than the diameter of the vent pipe. If a thimble is not used, all combustible material must be cut away to provide a 6 inch clearance. Any material used to close an opening must be noncombustible. Vent pipes must be adequately supported and sealed with a 550°F or greater sealant.
- The vent terminal must be Modine part number:
 - 5H0722850005 (item code 27865) 3" vent pipe
 - 5H0722850001 (item code 27866) 4" vent pipe
- Do NOT vent this appliance into a masonry chimney.
- Do NOT use dampers or other devices in the vent pipes.
- Do NOT use PVC pipe.
- Precautions must be taken to prevent degradation of building materials by flue products.
- The top of the vertical stack should extend at least 2' above any portion of a building within a horizontal distance of 2'.
- For pitched roof vertical venting, refer to Figure 13.1 and Table 13.1 for the vertical distance that the cap must extend above the pitched roof.
- Common venting is not allowed for Category III appliances.

INSTALLATION

Figure 13.1 - Vertical Venting through Sloped Roof

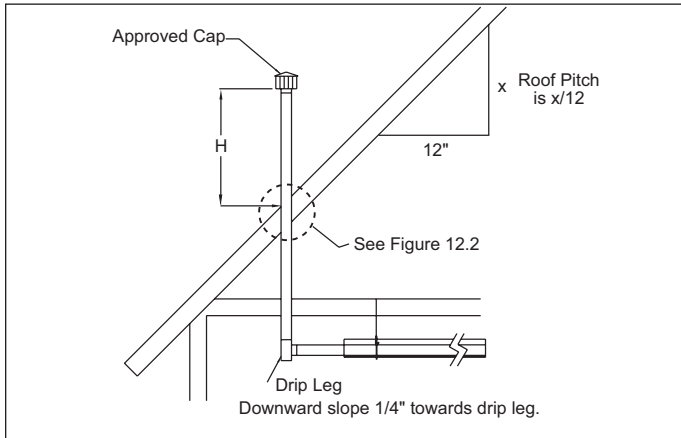


Table 13.1 - Minimum Height from Roof to Lowest Discharge Opening

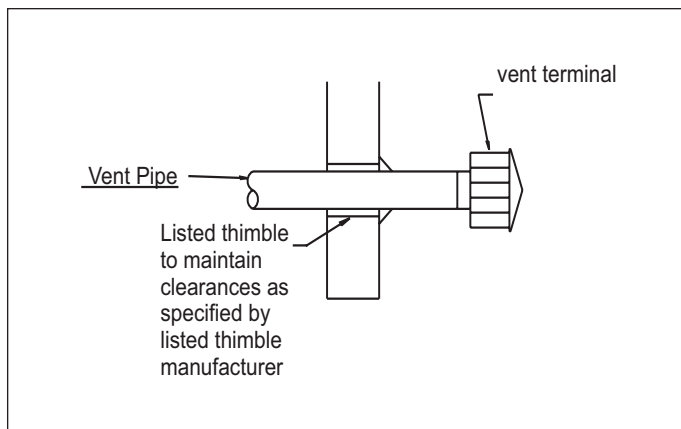
Rise X (inches)	Roof Pitch	Min. Height (ft)*
0-6	Flat to 6/12	1
6-7	6/12 to 7/12	1.25
7-8	7/12 to 8/12	1.50
8-9	8/12 to 9/12	2
9-10	9/12 to 10/12	2.50
10-11	10/12 to 11/12	3.25
11-12	11/12 to 12/12	4
12-14	12/12 to 14/12	5
14-16	14/12 to 16/12	6
16-18	16/12 to 18/12	7
18-20	18/12 to 20/12	7.50
20-21	20/12 to 21/12	8

* Size according to expected snow depth.

Additional Requirements for Horizontal Venting

- All horizontal terminal must be Modine part number:
 - 5H0722850005 (item code 27865) 3" vent pipe
 - 5H0722850001 (item code 27866) 4" vent pipe
 In the United States, the vent cap must be 24" from wall, while in Canada, a distance of 48" from the wall is required.
- When horizontal vents pass through a combustible wall (up to 8 inches thick), use a thimble with 2" clearances to the vent and insulate between thimble and vent. The vent passage may also be constructed and insulated as shown in Figure 13.2. Where horizontal vents pass through a non-combustible wall, no clearances to the wall are required.

Figure 13.2 - Vent Construction through Combustible Wall



- The vent system shall terminate at least 3' above any forced air inlet (except direct vent units) located within 10', and at least 4' below, 4' horizontally from, or 1' above any door, window or gravity air inlet into any building. The bottom of the vent terminal shall be located above the snow line or at least 1' above grade; whichever is greater. When located adjacent to public walkways the vent system shall terminate not less than 7' above grade.
- Vent must extend beyond any combustible overhang of the building.
- The vent system shall not terminate over public walkways, building entrances, or where condensate or vapor could cause a nuisance or hazard or could be detrimental to the operation of regulators, relief openings, or other equipment.
- Precautions must be taken to prevent degradation of building materials by flue products.
- When vented horizontally, maintain a 1/4" per foot rise away from the heater. Place a drain tee and clean out near the vent connector (see Figure 13.3). Where local authorities have jurisdiction, a 1/4" downward slope is acceptable. Use a drain tee with a clean out near the exit of the vent (see Figure 13.4) or allow the condensate to drip out the end.

Figure 13.3 - Horizontal Venting with Upward Pitch

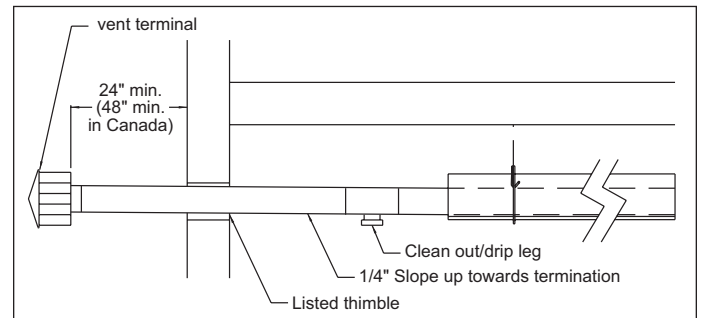
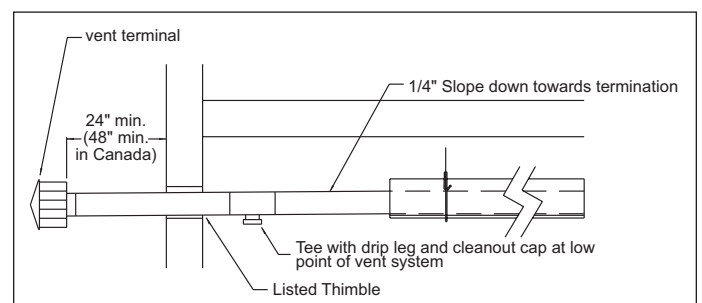


Figure 13.4 = Horizontal Venting w/Downward Pitch (with drip leg)



INSTALLATION

Utilizing Outside Combustion Air (Optional)

1. An accessory combustion air intake collar is required for connecting the combustion air piping to the burner box. For outdoor installation, the air intake collar connects directly to the accessory air intake cap.
2. All units may utilize a maximum of 20' of 4" O. D. fresh air intake pipe with two (2) 90° elbows, 25' with one (1) elbow, or 30' with no elbows.
3. Modine recommends using 4" insulated (sealed) pipe or Schedule 40 PVC pipe to provide fresh air and limit condensation from forming on outer surface. A Modine-specified accessory screened combustion air intake cap is required.
4. Insure that air intake cap is protected from snow blockage.
5. Keep intake opening at least 5 feet from any exhaust vent opening.
6. Where practical, the outside combustion air intake is recommended to be in the same pressure zone as the vent termination.

Gas Connections

WARNING

1. All field gas piping must be pressure/leak tested prior to operation. Never use an open flame. Use a soap solution or equivalent for testing.
2. Gas pressure to the appliance controls must never exceed 14" W.C. (1/2 psi).
3. To reduce the opportunity for condensation, the minimum sea level input to the appliance, as indicated on the serial plate, must not be less than 5% below the rated input.
4. A certified flexible connector must be used (local codes permitting) as the method of connecting the heaters to the gas supply to avoid placing stress on the gas supply line due to the expansion of the low intensity infrared tubes during operation.

1. Installation of piping must conform with local building codes, or in the absence of local codes, of the National Gas Fuel Code, ANSI Z223.1 (NFPA 54) – Latest Edition. In Canada, installation must be in accordance with CAN/CGA-B149.1 for natural gas units and CAN/CGA-B149.2 for propane units.
2. Piping to units should conform with local and national requirements for type and volume of gas handled, and pressure drop allowed in the line. Refer to Table 19.1 to determine the cubic feet per hour (cfh) for the type of gas and size of unit to be installed. Using this cfh value and length of pipe necessary, determine the pipe diameter from Table 19.1. Where several units are served by the same main, the total capacity, cfh, and length of main must be considered. Avoid pipe sizes smaller than 1/2". Table 19.1 allows for a 0.3" W.C. pressure drop in the supply pressure from the building main to the unit. The inlet pressure to the unit must be 6" W.C. for natural gas and 11-14" W.C. for propane gas. The gas supply pressure must never exceed 14" W.C. If the pressure exceeds 14" W.C., a gas pressure regulator must be added upstream of the combination gas valve. When sizing the inlet gas pipe diameter, make sure that the unit supply pressure can be met after the 0.3" W.C. has been subtracted. If the 0.3" W.C. pressure drop is too high, refer to the Gas Engineer's Handbook for other gas pipe capacities.

CAUTION

1. Purging of air from gas supply line should be performed as described in ANSI Z223.1 - latest edition "National Fuel Gas Code", or in Canada in CAN/CGA-B149 codes.
 2. When leak testing the gas supply piping system, the appliance and its combination gas control must be isolated during any pressure testing in excess of 14" W.C. (1/2 psi).
 3. The unit should be isolated from the gas supply piping system by closing its field installed manual shut-off valve. This manual shut-off valve should be located within 6' of the heater.
 4. Turn off all gas before installing appliance.
3. Install a ground joint union with brass seat and a manual shutoff valve adjacent to the unit for emergency shut-off and easy servicing of controls, including a 1/8" NPT plugged tapping immediately upstream of the gas supply connection to the heater, accessible for test gauge connection. See Figure 15.1.
 4. Provide a sediment trap before each unit and in the line where low spots cannot be avoided. (See Figure 15.1).
 5. A certified, metallic stainless steel connector (local codes permitting) of at least 3/4" minimum ID by 36" long, must be used as the method of connecting the heater to the gas supply line. The connector must be certified to ANSI Z21.24/CSA 6.10. A flexible connector avoids placing stress on the gas supply line due to the thermal expansion of the unit while operating. Canadian installation codes do not permit the use of flexible metallic connectors. In Canada, Installation Code CAN/CSA-B149.1-05 requires the use of a Type I hose connector certified to CSA CAN/CGA-8.1. Use a hose that is of the same diameter and length as noted above. The certified flexible connectors must be installed as illustrated in Figure 15.2, in one plane, without any sharp bends, kinks, or twists. The gas take-off from the drop line must be parallel to the burner gas inlet connection.
 6. Under no circumstances should the gas supply line to the heater provide any assistance in the suspension of the heater. Do not locate any gas service line directly above or below the heater.

INSTALLATION

- When pressure/leak testing pressures above 14" W.C. (1/2 psi), close the field installed shut-off valve, disconnect the unit, and its combination gas control from the gas supply line, and plug the supply line before testing. When testing pressures 14" W.C. (1/2 psi) or below, close the manual shut-off valve on the unit before testing.
- If the gas valve was rotated to change control access side, leak test fittings

Figure 15.1 - Recommended Sediment Trap/ Manual Shut-Off Valve Installation

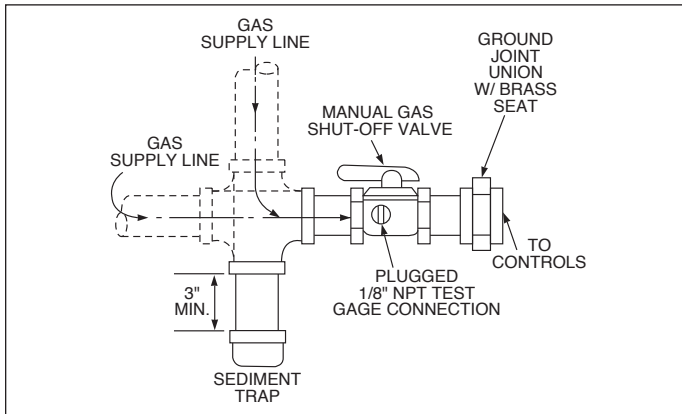
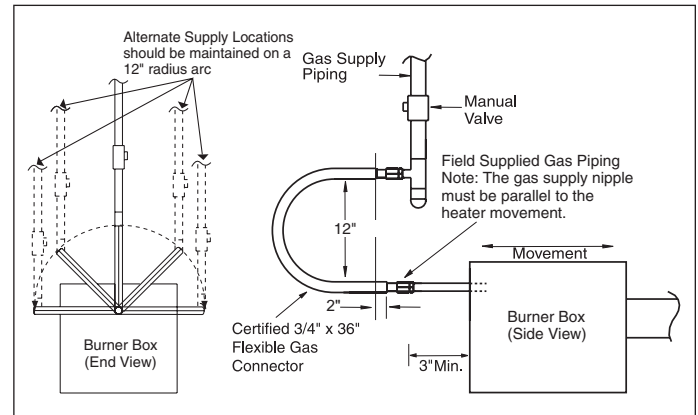


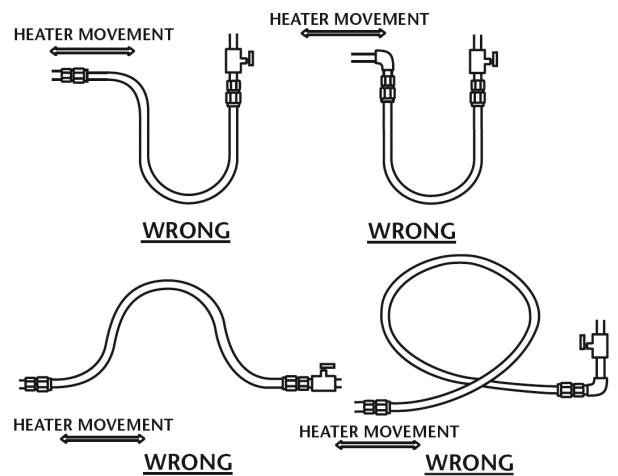
Table 15.1 - 3/4" x 36" Flexible Gas Connector Pressure Drop ("W.C.)

Input MBH	Gas Type	
	Natural	Propane
50	0.03	0.02
60	0.04	0.02
75	0.05	0.03
100	0.08	0.04
150	0.14	0.07
175	0.18	0.09
200	0.23	0.11

Figure 15.2 - Recommended Installation of Flexible Gas Connector



INCORRECT POSITIONS



Warning: Connector must be installed in a C configuration. Use only a 36" long connector of 3/4" nominal ID with this heater. This is offered as a factory supplied, field installed accessory.

Table 15.2 - Gas Pipe Capacities

Gas Pipe Capacities (Up to 14" W.C. Gas Pressure through Schedule 40 Pipe) Cubic Feet per Hour with Pressure Drop of 0.3" W.C. Natural Gas - Specific Gravity - 0.60 Propane Gas - Specific Gravity - 1.50												
Length Of Pipe (feet)	Pipe Diameter											
	1/2"		3/4"		1"		1-1/4"		1-1/2"		2"	
	Natural	Propane	Natural	Propane	Natural	Propane	Natural	Propane	Natural	Propane	Natural	Propane
10	132	83	278	175	520	328	1050	662	1600	1008	3050	1922
20	92	58	190	120	350	221	730	460	1100	693	2100	1323
30	73	46	152	96	285	180	590	372	890	561	1650	1040
40	63	40	130	82	245	154	500	315	760	479	1450	914
50	56	35	115	72	215	135	440	277	670	422	1270	800
60	50	32	105	66	195	123	400	252	610	384	1150	725
70	46	29	96	60	180	113	370	233	560	353	1050	662
80	43	27	90	57	170	107	350	221	530	334	990	624
90	40	25	84	53	160	101	320	202	490	309	930	586
100	38	24	79	50	150	95	305	192	460	290	870	548
125	34	21	72	45	130	82	275	173	410	258	780	491
150	31	20	64	40	120	76	250	158	380	239	710	447

INSTALLATION - HIGH ALTITUDE ACCESSORY KIT

HIGH ALTITUDE ACCESSORY KIT

Modine's gas-fired equipment standard input ratings are certified by ETL. For elevations above 2,000', ANSI Z223.1 requires ratings be reduced 4 percent for each 1000' above sea level. For units in Canada, CSA requires that ratings be reduced 10 percent at elevations above 2,000'. The high altitude adjustment instructions and pressure switch kits listed in this manual are for use with units that will be installed over 2,000'. These methods and kits comply with both ANSI Z223.1 and CSA requirements.

If a unit is to be installed at higher elevations AND converted from natural gas to propane gas operation, a propane conversion kit must be used in conjunction with the pressure adjustment methods and pressure switch kits listed herein. For the Selection and Installation Instructions for propane conversion kits, please see the latest revision of Modine Manual 75-538.

Selection of the Proper Pressure and Kit

To determine the proper manifold pressure at altitude and if required, the proper combustion air pressure switch kit, the full model number of the heater, the fuel to be used, and the altitude the unit will be installed at must be known. Refer to the unit serial plate or carton label to obtain the necessary information about the unit.

After obtaining this information, refer to the gas pressure and selection charts shown in Tables 16.1 through 17.1. The pressure charts are differentiated by elevation, fuel type, and country the product is being installed in. The selection charts are differentiated by product type, altitude and fuel type. Selection charts include the proper kit suffix, when required.

Table 16.1 - Natural Gas Heating Values at Altitude ①③④

Altitude (ft)	Gas Heating Values at Altitude (BTU/ft ³)	
	USA	Canada
0-2,000	1,050	1,050
2,001-3,000	929	945
3,001-4,000	892	
4,001-4,500	874	
4,501-5,000	856	856
5,001-6,000	822	822
6,001-7,000	789	789
7,001-8,000	757	757
8,001-9,000	727	727
9,001-10,000	698	698

① Values shown are for 3.5" W.C. manifold pressure, for other BTU content values (available from local utility) use Equation 17.1 to calculate manifold pressure.

② Values shown are for 10.0" W.C. manifold pressure, for other BTU content values (available from local utility) use Equation 17.1 to calculate manifold pressure.

③ When installed at altitudes above 2,000', a pressure switch may need to be changed. Refer to Table 17.1 to determine if a switch change is required.

④ Gas heating values are derated 4% per 1,000' of elevation in the USA and 10% between 2,000' and 4,500' elevation in Canada in accordance with ANSI Z223.1 and CSA-B149, respectively.

Manifold Pressure Adjustment

The inlet pressure to the unit must be confirmed to be within acceptable limits (6-7" W.C. for natural gas and 11-14" W.C. for propane gas) before opening the shutoff valve or the combination gas valve may be damaged.

Heaters for use with **natural gas**, the manifold pressure must be set at 3.5" W.C. for high fire and 2.5" W.C. for low fire.

Units for use with **propane gas**, the manifold pressure must be set at 10.0" W.C. for high fire and 6.2" W.C. for low fire.

Installation above 2,000'. elevation requires adjustment of the manifold pressure as described.

Derated BTU Content Gas and Manifold Pressure Calculation

Some utility companies may derate the BTU content (heating value) of the gas provided at altitude to a value other than 1,050 BTU/ft³ for natural gas or 2,500 BTU/ft³ for propane gas to allow certain heating appliances to be used with no manifold pressure adjustments. For this reason it is necessary that the supplying utility be contacted for detailed information about the gas type and BTU content (heating value) before operating any heater. Tables 16.1 and 16.2 show the standard derated heating values (4% per 1,000' of elevation in the USA and 10% between 2,001' and 4,500' elevation in Canada) of natural and propane gases at various altitudes. If the utility is supplying gas with heating values as shown in Tables 16.1 and 16.2, the manifold pressure should be set to 3.5" W.C for natural gas and 10.0" W.C. for propane gas.

NOTE: Both the high fire and low fire gas pressure must be adjusted for proper operation.

Table 16.2 - Propane Gas Heating Values at Altitude ②③④

Altitude (ft)	Gas Heating Values at Altitude (BTU/ft ³)	
	USA	Canada
0-2,000	2,500	2,500
2,001-3,000	2,212	2,250
3,001-4,000	2,123	
4,001-4,500	2,080	
4,501-5,000	2,038	2,038
5,001-6,000	1,957	1,957
6,001-7,000	1,879	1,879
7,001-8,000	1,803	1,803
8,001-9,000	1,731	1,731
9,001-10,000	1,662	1,662

INSTALLATION - HIGH ALTITUDE ACCESSORY KIT

Table 17.1 - High Altitude Kits for IPT

Conversion IPT - Natural Gas	50	60	75	100	125	150	175	200
0-2000 FT	77823	77824	77825	77826	77827	77828	77829	77830
2001-3500 FT	77831	77832						
3501-4000 FT								
4001-4500 FT								
4501-5000 FT	77836	77834						
5001-5500 FT								
5501-6000 FT	77836	77838						
6001-6500 FT								
6501-7500 FT								

Conversion IPT - LP	50	60	75	100	125	150	175	200
0-2000 FT	77839	77840	77841	77842	77843	77844	77845	77846
2001-3500 FT	77847							
3501-4000 FT								
4001-4500 FT								
4501-5000 FT	77850							
5001-5500 FT								
5501-6000 FT	77850	77854						
6001-6500 FT								
6501-7500 FT								

If the heating value of the gas being supplied is different than the values shown in Tables 16.1 and 16.2, use the following equation to determine the appropriate manifold pressure for the altitude and gas heating value being supplied.

Equation 17.1 - Manifold Pressure for Derated Gas

$$MP_{ACT} = \left(\frac{BTU_{TBL}}{BTU_{ACT}} \right)^2 \times MP_{SL}$$

WHERE:

- MP_{ACT}** = **Manifold Pressure (in. W.C.) at Altitude** – Manifold pressure setting for the heater being installed
- BTU_{TBL}** = **BTU/ft³ Content of Gas** – Obtained from Tables 16.1 or 16.2 (whichever is applicable)
- BTU_{ACT}** = **BTU/ft³ Content of Gas** – Obtained from the local utility company
- MP_{SL}** = **Manifold Pressure (in. W.C.), at Sea Level** – Use 3.5" W.C. for natural gas and 10.0" W.C. for propane gas

NOTE: High and Low fire manifold pressure must both be adjusted using the calculation shown in 17.1.

INSTALLATION/START-UP PROCEDURE

Electrical Connections

WARNING

1. Disconnect power supply before making wiring connections to prevent electrical shock and equipment damage.
2. All appliances must be wired strictly in accordance with wiring diagram furnished with the appliance. Any wiring different from the wiring diagram could result in a hazard to persons and property.
3. Any original factory wiring that requires replacement must be replaced with wiring material having a temperature rating of at least 105°C.
4. Ensure that the supply voltage to the appliance, as indicated on the serial plate, is not 5% greater than rated voltage.

CAUTION

Ensure that the supply voltage to the appliance, as indicated on the serial plate, is not 5% less than the rated voltage.

1. Installation of wiring must conform with local building codes, or in the absence of local codes, of the National Electric Code ANSI/NFPA 70 - Latest Edition. Unit must be electrically grounded in conformance to this code. In Canada, wiring must comply with CSA C22.1 Part 1, Electrical Code.
2. Make sure all multi-voltage components (motors, transformers, etc.) are wired in accordance with the power supply voltage.
3. The unit must be wired strictly in accordance with the wiring diagram furnished with the unit.
4. The power supply to the unit should be protected with a fused disconnect switch or circuit breaker.
5. The power supply must be within 5 percent of the voltage rating and each phase must be balanced within 2 percent of each other. If not, advise the utility company.
6. External electrical service connections that must be installed include:
 - a. Supply power connection (120 volts).
 - b. Connection of thermostats, summer/winter switches, or any other accessory control devices that may be supplied (24 volts).
7. Control wire used to connect the heater to the thermostat must have adequate ampacity and insulation temperature rating for the total connected load, see Table 21.2.
8. Under no circumstances should the electrical supply or control wiring to the heater provide any assistance in the suspension of the heater. Do not locate any wiring directly above or below the heater.
9. All outdoor electrical connections must be weatherized to prevent moisture from entering the electrical compartment.
10. Ensure proper polarity of unit and power source.
11. Refer to the unit dimensional drawings on Figure 20.1 for the electrical knockout locations.

START-UP PROCEDURE

CAUTION

Purging of air from gas lines should be performed as described in ANSI Z223.1 - Latest Edition "National Fuel Gas Code", or in Canada, CAN/CGA-B149 codes.

IMPORTANT

Start-up and adjustment procedures should be performed by a qualified service agency.

1. Turn off power to the unit at the disconnect switch. Check that fuses or circuit breakers are in place and sized correctly. Turn all hand gas valves to the "OFF" position.
2. Remove service access side burner access panel as outlined on page 5 in section titled "Removal of Burner Side Access Panels".
3. Check that the supply voltage matches the unit supply voltage listed on the serial plate. Verify that all wiring is secure and properly protected. Trace circuits to insure the unit has been wired according to the wiring diagram.
4. If utilizing indoor air for combustion, ensure adequate ventilation for intake of fresh air. Check to see that there are no obstructions to the intake of the unit.
5. Perform a visual inspection of the unit to make sure no damage has occurred during installation. Check reflectors to ensure they are installed between 0° and 45° from the horizontal plane.
6. Recheck the gas supply pressure. The inlet pressure to the unit must be 6" W.C. for natural gas and 11-14" W.C. for propane gas. The gas supply pressure must never exceed 14" W.C. If the pressure exceeds 14" W.C., a gas pressure regulator must be added upstream of the combinations gas valve.
7. Open the field installed manual shutoff valve and turn power on to the unit.
8. Check to make sure that the main gas valve opens upon a call for heat from the thermostat. Check the manifold gas pressure (see main burner adjustment).
9. Check to insure that gas controls sequence properly (See Control Operating Sequence).

During checkout procedure, use the following steps to verify that the venting system is adequately sized:

1. Inspect the venting system for proper size and horizontal pitch, as required in the National Fuel Gas Code ANSI Z223.1 or CAN/CGA B149.1 or .2 Installation Code – latest edition and these instructions. Determine that there is no blockage or restriction, leakage, corrosion and other deficiencies, which could cause an unsafe condition.
2. Insofar as practical, close all building doors and windows and all doors between the space in which the unit(s) connected to the venting system are located and other spaces of the building. Turn on any exhaust fans so they shall operate at maximum speed. Do not operate a summer exhaust fan.
3. Place the unit being inspected in operation. Adjust thermostat so that the unit will operate continuously.
4. After it has been determined that each unit connected to the venting system properly vents when tested as outlined above, return doors, windows, exhaust fans, and any other gas-burning unit to their previous condition of use.
5. If improper venting is observed during any of the above tests, the venting system must be corrected.
6. If the venting system must be resized, it must conform with the National Fuel Gas Code ANSI Z223.1 or CAN/CGA B149.1 or .2 Installation Code – latest edition. If the venting system must be resized, it should be resized to approach the minimum size as determined using the appropriate table in Appendix G of the National Fuel Gas Code ANSI Z223.1.

START-UP PROCEDURE

Main Burner Adjustment

The gas pressure regulator (integral to the combination gas control) is adjusted at the factory for average gas conditions. It is important that gas be supplied to the heater in accordance with the input rating on the serial plate. Actual input should be checked and necessary adjustments made after the heater is installed. Over-firing, a result of too high an input, reduces the life of the unit and increases maintenance. Under no circumstances should the input exceed that shown on the serial plate.

Measuring the manifold pressure is done at the manifold pressure tap on the main gas valve on the heater.

To adjust the manifold pressure:

1. The correct manifold pressure is 3.5" high fire and 2.5" W.C. low fire for natural gas. 10" high fire and 6.2" W.C. low fire for propane gas. Adjust the main gas pressure regulator spring to achieve the proper manifold pressure.
2. Move the field installed manual shut-off valve to the "OFF" position.
3. Remove the 1/8" pipe plug in manifold pressure tap or use the pressure tap tower in the combination gas control and attach a water manometer of "U" tube type that is at least 12" high.

Instructions for units with the pressure tap towers:

The inlet (IN P) and outlet (OUT P) pressure ports accept a 5/16" ID hose connection. Using a 3/32 (2.3mm) inch hex wrench, rotate pressure tap screw one revolution counter-clockwise (when measuring pressure, only loosen but do not remove screw).

4. Move the field installed manual shut-off valve to the "ON" position.
5. Create a call for heat from the thermostat.
6. After adjustment, move the field installed manual shut-off valve to the "OFF" position, remove manometer and hose from the outlet boss. turn outlet pressure tap screw clockwise to seal the pressure port. Tighten to 13 in. -lbs. minimum.
7. After the plug is in place, move the field installed manual shut-off valve to the "ON" position and recheck pipe plugs for gas leaks with a soap solution.
8. Replace the side access panels.

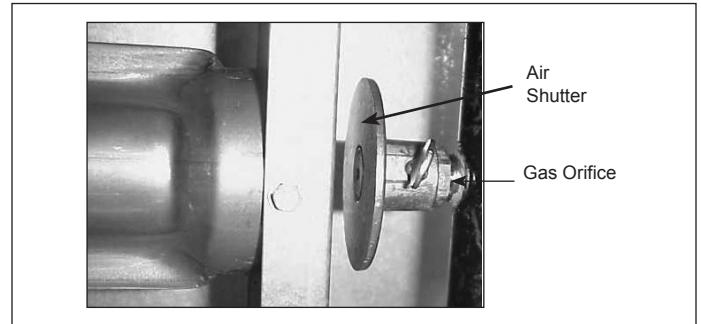
Table 19.1 - Manifold Pressure and Gas Consumption

Input MBH	Type of Gas	Natural	Propane	No. of Orifices
	Btu/ft ³	1040	2500	
	Specific Gravity	0.6	1.53	
Manifold Pressure " W.C.		3.5	10	
50	CFH	48.1	20.0	1
	Gal/Hr.Propane	n/a	0.55	
	Orifice Drill Size	3.3 mm	2.0 mm	
60	CFH	57.7	24.0	1
	Gal/Hr.Propane	n/a	0.66	
	Orifice Drill Size	#27	#43	
75	CFH	72.1	30.0	1
	Gal/Hr.Propane	n/a	0.83	
	Orifice Drill Size	#22	#38	
100	CFH	96.2	40.0	1
	Gal/Hr.Propane	n/a	1.10	
	Orifice Drill Size	#11	#32	
125	CFH	120.2	50.0	1
	Gal/Hr.Propane	n/a	1.38	
	Orifice Drill Size	#3	#30	
150	CFH	144.2	60.0	1
	Gal/Hr.Propane	n/a	1.65	
	Orifice Drill Size	#B	#28	
175	CFH	168.3	70.0	1
	Gal/Hr.Propane	n/a	1.93	
	Orifice Drill Size	#F	#23	
200	CFH	192.3	80.0	1
	Gal/Hr.Propane	n/a	2.20	
	Orifice Drill Size	#L	#18	

Primary Air Shutter (Propane Gas Only)

Propane gas models 75-200 are equipped with an adjustable primary air shutter, mounted flush with the end of the gas orifice, as shown in Figure 19.2. These are set at the factory; do not adjust.

Figure 19.2 - Propane Gas Primary Air Shutter on 75-200 Models Only



Control Operating Sequence

These models utilize a combination gas valve/ignition controller and a single or two stage thermostat.

1. The thermostat calls for heat.
2. The combustion air blower is energized and begins a fifteen (15) second pre-purge cycle. The pre-purge clears any residual gas left over from the previous operation.
3. The pressure switch closes during the pre-purge, energizing the indicator light on the back of the burner box.
4. The ignition control board is energized and the spark igniter attempts to light the gas at the burner. Ignition trial time is 7 seconds.
5. Upon proper ignition, the flame is visible through the combustion chamber sight glass (see Figure 22.2). The unit continues to operate until the thermostat is satisfied, at which time the thermostat contacts open and the gas valve is de-energized until the thermostat makes another call for heat.
6. If a flame is not sensed for any reason, the main gas valve will close and there will be a short purge period before ignition is tried again.
7. If flame is not sensed after three re-tries (four total tries), there will be at least a one hour wait before ignition is tried again. Power can be interrupted during this one-hour lockout to reset the sequence of operation.
8. On single stage units, the main gas valve is opened and the main burner is lit to 100% full fire.
9. 2-stage High heat warm-up. The control will run in high fire for the first 30 seconds following flame recognition period regardless of W2 demand. If W2 is not energized, or is in auto staging condition, at the end of this 30 second period the control de-energizes the high gas output (low gas remains energized). If W2 is energized the control remains on high heat.
10. 2-stage Low heat operation, the control keeps the main gas valve and induced draft motor energized while monitoring the call for heat .
11. 2-stage High heat operation. If the P5 shunt jumper is in place, the control will automatically stage into second stage following 10 minutes of a steady call for heat.

DIMENSIONAL DATA

Figure 20.1 - Casing Dimensions (in.)

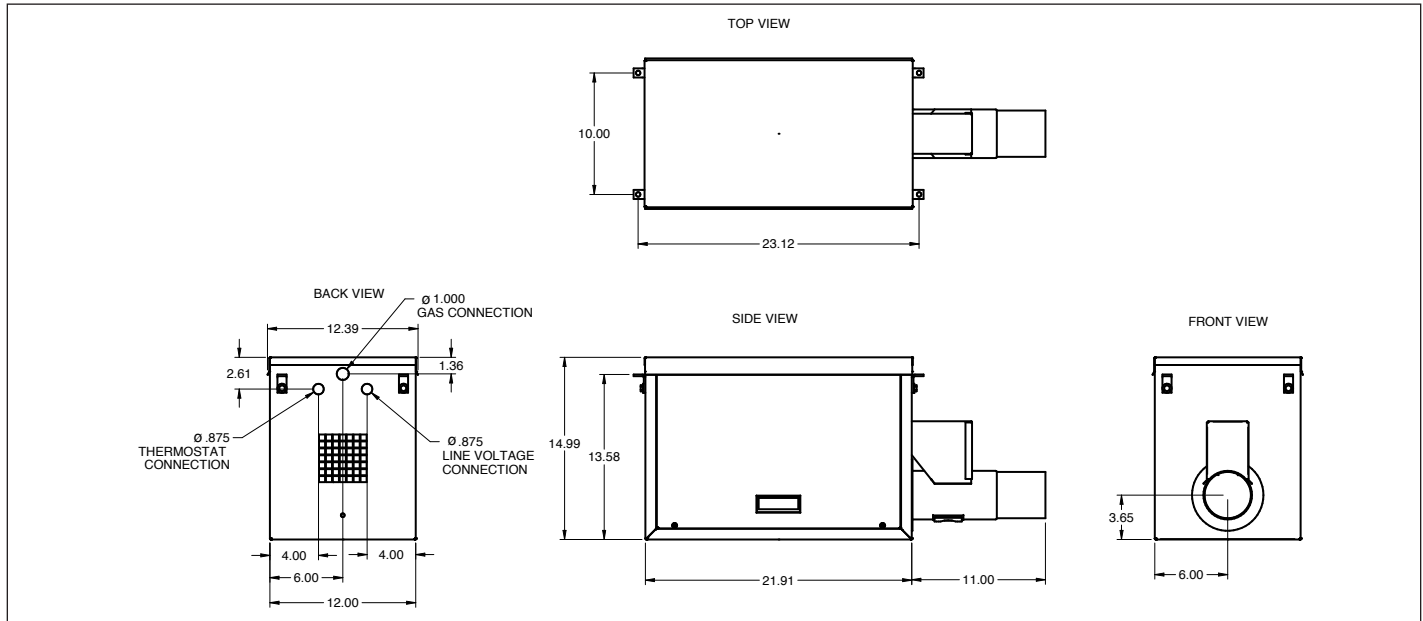


Figure 20.2 - Burner and Tube System Dimensions (inches)

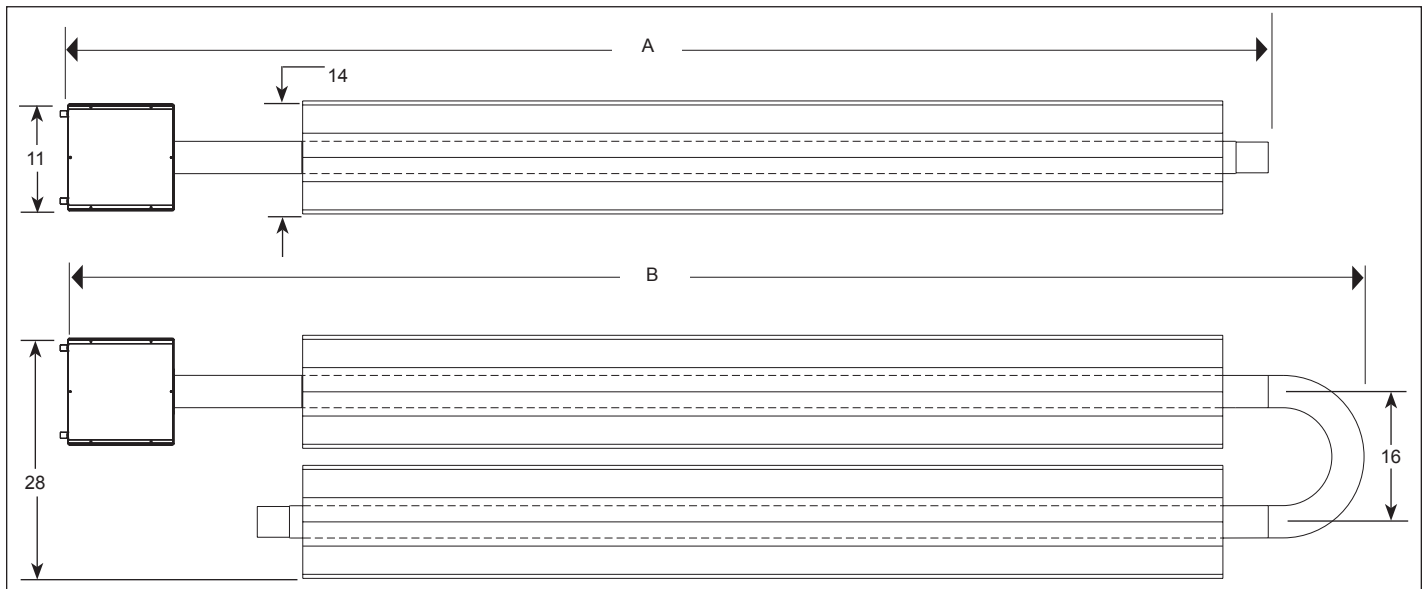


Table 20.1 - Tube Systems Data

Tube Length (ft.)	Straight Tube		U-Tube System	
	System Length "A" (ft.)	System Weight (lb.)	System Length "B"	System Weight (lb.) (ft.)
20	23	78	13	89
30	33	112	18	132
40	43	146	23	157
50	53	180	28	200
60	63	214	33	225
70	73	252	38	277

Table 20.2 - Burner Shipping Weights

Model	Shipping Wt. (lb.)
All Burners	43

PERFORMANCE

Table 21.1 - Performance

Input MBH	50	60	75	100	125	150	175	200
Certified Tube Lengths (ft.)	20, 30	20, 30, 40	20, 30, 40	30, 40, 50 ②	40, 50, 60 ④	50, 60	50, 60, 70	50, 60, 70
Recommended Mounting Height (ft.) ①	10 – 12	10 – 12	12 – 14 ③	12 – 14	15 – 22	15 – 22	18 – 28	20 - 30
Recommended Tube System Application ①	Spot or Area Heating	U-Tube						
	Total Building Heating	Straight Tube						

① Recommended Mounting Height and Tube System Applications are meant as a general guide and are adjusted to meet the requirements of the actual application.

The applications are as follows:

- Spot or Area Heating is an application where occupant comfort is the goal and occupant(s) are either relatively stationary (Spot - Example: small work cell or dispersed over a slightly wider range than with Spot Heating (Area - Example: assembly line). Mounting height is typically at the low end of the range shown above.
- Total Building Heating is an application where average space temperature is to be maintained, however due to the significant temperature gradient differences on long straight tube systems, areas may exist where direct occupant comfort is not achieved.

② IPT 100 not available for Propane Gas operation at 50 ft. tube system length.

③ IPT 75 not available for Propane Gas operation at 40 ft. tube section length.

④ IPT 125 only available for operation at 60 ft. tube section length for 1-Stage units.

Table 21.2 - Utilities

Electrical Rating	Gas Connection (inch)	Minumum Gas Inlet Pressure ("W.C.)	Maximum Gas Pressure ("W.C.)	Manifold Gas Pressure ("W.C.)	Tube/Vent Diameter (inch)
115V/60Hz/1Ph	1/2 NPT	6.0 (natural gas) 11.0 (propane gas)	14.0	3.5" (natural gas, high fire) 2.5" (natural gas, low fire) 10.0" (propane gas, high fire) 6.2" (propane gas, low fire)	4 (O.D.)

MAINTENANCE/SERVICE & TROUBLESHOOTING

MAINTENANCE

Qualified gas service personnel should service all heating equipment before each heating season to assure proper operation. The following items may require more frequent service based on the environment in which the unit is installed, and how long the unit is operated.

Burner Assembly

Disconnect all electrical power to the heater and close the gas supply valve installed adjacent to the heater. With an air hose regulated to 15 psig maximum, blow off any dust and dirt that has accumulated on the heater.

Burner Orifice

Remove burner orifice, clean, and reinstall on the heater manifold. Drill sizes can be found in Table 19.1.

Combustion Air Blower

The combustion air blower motor is permanently lubricated, and does not require additional lubrication. An air restrictor plate (see Figure 22.1), sized for the appropriate fuel type and burner input, is installed by the factory and must not be field-adjusted.

Radiant Tube and Vent System

Check for restrictions and/or condensate and correct as required. Sections with corrosion are to be replaced.

Electrical Wiring

The electrical wiring should be checked annually for loose connections or deteriorated insulation.

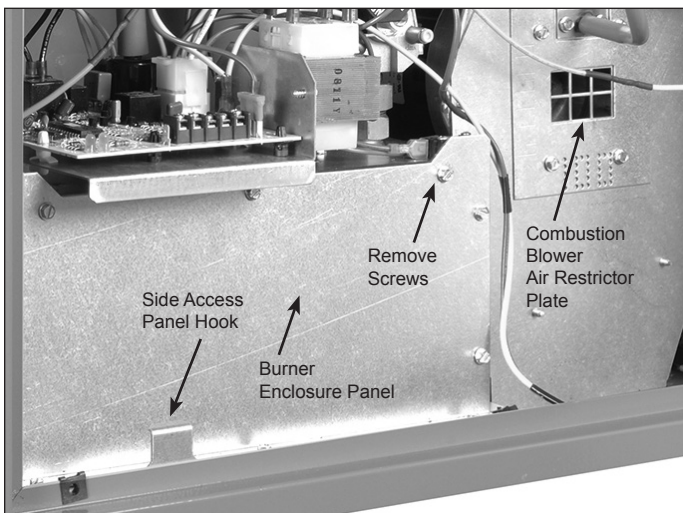
Gas Piping & Controls

The gas valves and piping should be checked annually for general cleanliness and tightness. Verify the manual shut-off valve is gas-tight on annual basis. The gas controls should be checked to insure that the unit is operating properly.

Removal of Burner Enclosure Panels

Each of the two burner enclosure side panels is held in place by screws, as shown in Figure 22.1. Once the screws are removed, the burner enclosure side panels can be removed for access to the burner assembly.

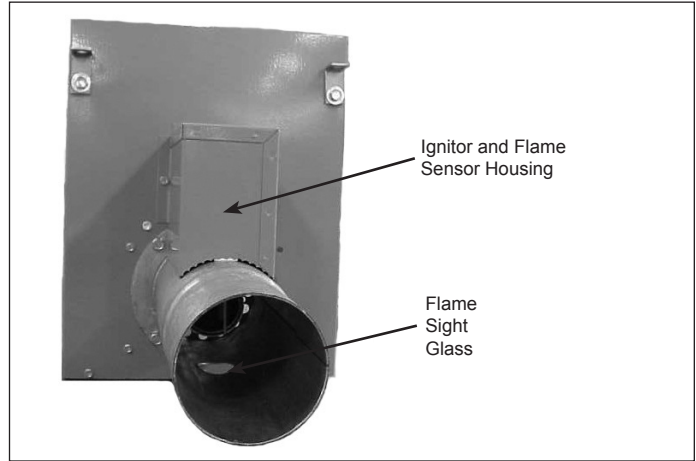
Figure 22.1 - Burner Enclosure



Removal of Ignitor and Flame Sensor Housing

The ignitor and flame sensor housing is held in place by three (3) screws, as shown in Figure 22.2. Once the screws are removed, the ignitor and flame sensor can be accessed. The housing must be returned to the unit once service/maintenance is complete.

Figure 22.2 - Ignitor and Flame Sensor Housing



SERVICE & TROUBLESHOOTING

IMPORTANT

To check most of the Possible Remedies in the troubleshooting guide listed in Table 23.1, refer to the applicable sections of the manual.

WARNING

When servicing or repairing this equipment, use only factory-approved service replacement parts. A complete replacement parts list may be obtained by contacting Modine Manufacturing Company. Refer to the rating plate on the unit for complete unit model number, serial number, and company address. Any substitution of parts or controls not approved by the factory will be at owner's risk.

CAUTION

Do not attempt to reuse any mechanical or electrical controllers which have been wet. Replace defective controller.

TROUBLESHOOTING

Table 23.1 - Troubleshooting

TROUBLE	POSSIBLE CAUSE	POSSIBLE REMEDY
Unit does nothing	<ol style="list-style-type: none"> 1. Power supply is off 2. No 24V power to thermostat 3. Thermostat malfunction 4. LED flashes 5. Blown fuse on control board 6. Defective control 	<ol style="list-style-type: none"> 1. Turn on main power 2 a. Check control transformer <ol style="list-style-type: none"> b. If failed transformer - check thermostat wire gage and length 3 a. Verify wire connections to R&W terminals only <ol style="list-style-type: none"> b. Check / replace thermostat 4. Check LED flash code 5. Replace fuse 6. Replace control
LED light off or flashing	<ol style="list-style-type: none"> 1. Blown fuse on control board 2. Multiple causes 	<ol style="list-style-type: none"> 1. Replace fuse 2. Control board LED flash codes vary with control type. A decal is installed in the unit giving a brief description of the applicable codes for your heater. For more detail, see the control board data sheet included with the unit.
Unit starts but does not ignite	<ol style="list-style-type: none"> 1. Main gas is off 2. Air in gas line 3. Main or manifold gas pressure 4. Check gas valve switch 	<ol style="list-style-type: none"> 1. Open manual gas valve 2. Purge gas line 3. Set gas pressures per manual instructions 4. Set gas valve switch to "ON" position
Unit goes through cycle but the burners go out in less than 10 seconds Air circulating fan inoperable	<ol style="list-style-type: none"> 1. Reversed main power polarity 2. Unit not grounded 3. Flame not sensed 1. Loose connections 2. Defective control board 3. Defective fan motor 	<ol style="list-style-type: none"> 1. Black wire - HOT, White wire - NEUTRAL, Green wire - GROUND 2. Ground unit and verify quality of ground connection 3. Check flame sense probe and connection 1. Check all connections 2. Check control board data sheet and function 3. Check fan motor

SERVICE & TROUBLESHOOTING/REPLACEMENT PARTS ORDERING

Replacement Parts Ordering

When servicing, repairing or replacing parts on these units, locate the model identification plate of the unit and always give the complete Model Number and Serial Number. The model identification plate is located inside the burner casing, and is shown in Figure 24.1. The part numbers for common replacement parts are also listed on a separate plate, shown in Figure 24.1. For a complete description of the Model Number and Serial Number, see Figures 25.1 and 25.2.

Figure 24.1 - Model Identification Plate

Odine Manufacturing Company 500 DeKoven Ave Racine, WI 53403-2552 Phone: 1-800-828-4328		INFRARED RADIANT TUBE HEATER FOR INDUSTRIAL/COMMERCIAL USE RADIATEUR A TUBE RAYONNANT A INFRA-ROUGES POUR USAGE INDUSTRIEL/COMMERCIAL NOT FOR USE IN RESIDENTIAL DWELLINGS. NE PAS INSTALLER DANS UN LOGEMENT. Minimum ambient air temperature -20°F. La température minimale de l'air ambiant -29°C.		MADE IN THE USA	
MODEL NUMBER NUMERO DE MODELE	IPT175S0111	MIN. INPUT DEBIT CALORIFIQUE MIN.	175000 BTU/HR 51240 W	VOLTS 115	AMPS 2.66
SERIAL NUMBER NUMERO DE SERIE	300017095115-1469	MIN. INLET PRESS. FOR PURPOSE OF INPUT ADJUSTMENT / PRESSION D'ALIMENTATION EN GAZ MIN. ADMISE	7 IN W.C. 1.74 kPa	DESIGN COMPLIES WITH: ANSI Z83.20b - 2011 CSA 2.34b - 2011	
TYPE OF GAS TYPE OF GAZ	Natural	MANIFOLD PRESSURE PRESSION A LA TUBULURE D'ALIMENTATION	3.5 IN W.C. 0.87 kPa	APPROVED FOR USE IN MASSACHUSETTS	APPROVED FOR USE IN CA BY THE CEC
(IN USA) FOR INSTALLATIONS ABOVE 2000 FEET, DERATE 4 PERCENT FOR EACH 1000 FEET OF ELEVATION ABOVE SEA LEVEL.		LIGHTING INSTRUCTIONS: 1. TURN OFF POWER. TURN THERMOSTAT DOWN. CLOSE ALL GAS VALVES AND WAIT 5 MINUTES. 2. OPEN ALL GAS VALVES. TURN ON POWER. 3. SET THERMOSTAT TO DESIRED SETTING (MAIN BURNER WILL LIGHT AUTOMATICALLY WHEN THERMOSTAT CALLS FOR HEAT). SHUT DOWN INSTRUCTIONS - TURN OFF PIPER & CLOSE ALL GAS VALVES. INSTRUCTIONS D'ALLUMAGE: 1. COUPER LE COURANT. BAISSER LE THERMOSTAT. FERMER TOUTES LES ROBINETS A GAZ ET ATTENDRE 5 MINUTES. 2. OUVRIR TOUTES LES ROBINETS A GAZ. DONNER LE COURANT. 3. REGLER LE THERMOSTAT SUR LA POSITION DESIREE (LE BRULEUR PRINCIPAL S'ALLUMERA AUTOMATICQUEMENT LORSQUE LE THERMOSTAT DEMANDERA DE LA CHALEUR).		CLEARANCE TO EACH END IS 12 IN. L'AUTORISATION DE CHAQUE EXTREMITE EST DE 30.48 CM	
INPUT DEBIT CALORIFIQUE	175000 BTU/HR 51240 W	(IN CANADA) 2000 TO 4500 FT 610 ET 1370 M	157500 BTU/HR 46116 W		
ORIFICE SIZE DIM DE L'INJECTEUR	F	INSTALLATIONS IN AIRCRAFT HANGARS, PARKING STRUCTURES, AND REPAIR GARAGES SHALL BE IN ACCORDANCE WITH THE STANDARD ON AIRCRAFT HANGARS, ANSI/NFPA 409, THE STANDARD FOR PARKING STRUCTURES, ANSI/NFPA 88A, THE STANDARD FOR REPAIR GARAGES, ANSI/NFPA 88B AND IN CANADA WITH THE CAN1-B149 CODES.		MINIMUM CLEARANCE TO COMBUSTIBLE MATERIAL DEGAGEMENT MINIMUM POUR MATIERES COMBUSTIBLES	
SH0819070000 REV C		THIS UNIT APPROVED FOR: INDOOR / OUTDOOR VENTED		TOP 12 IN HAUT 30.5 cm	SIDE 38 IN COTE 96.5 cm
				BOTTOM 106 IN BAS 269.2 cm	FRONT 106 IN DEVANT 269.2 cm

MODEL NUMBER / SERIAL NUMBER / WIRING DIAGRAM

Figure 25.1 - Model Number Designations

DIGIT SEQUENCE	1, 2, 3	4, 5, 6	7	8, 9	10, 11	
MODEL NUMBER	IPT	200	S	01	11	
MODEL PREFIX: IMPROVED PRESSURE TUBE: IPT			CONTROL CODE: 11: SINGLE STAGE, NATURAL GAS 21: SINGLE STAGE, PROPANE GAS 12: TWO STAGE, NATURAL GAS 22: TWO STAGE, PROPANE GAS			
MODEL SIZE: MBH INPUT: 50, 60, 75, 100, 125, 150, 175, 200			POWER CODE: 01: 115V/60HZ/1PH			
IGNITION TYPE: S: DIRECT SPARK						

Figure 25.2 - Serial Number Designations

DIGIT SEQUENCE	1	2, 3	3, 4	5, 6	7, 8	9, 10	11, 12	13, 14, 15, 16	17, 18, 19, 20, 21	
SERIAL NUMBER	S	30	00	17	09	10	98	1234	10000	
SPO MODEL			SPO NUMBER							
BLOWER MOTOR VENDOR CODE: 11: DAYTON 30: FASCO,			SEQUENTIAL NUMBER NUMBER VARIES FROM 0000 TO 9999. EACH UNIT WITHIN SAME WEEK OF MANUFACTURE IS TO HAVE UNIQUE NUMBER							
UNIT SERIES: 00: ORIGINAL, 01: MODIFIED			YEAR OF MANUFACTURE							
CONTROL SUPPLIER: 01: ROBERTSHAW, 09: WHITE ROGERS, 05: HONEYWELL, 17: UNITED TECH, 08: FENWAL			WEEK OF MANUFACTURE SAME AS REQUIREMENTS PLANNING SHOP CALENDAR							
GAS VALVE SUPPLIER: 01: ROBERTSHAW, 05: HONEYWELL, 09: WHITE ROGERS										

Figure 25.3 - Wiring Diagram (Single Stage)

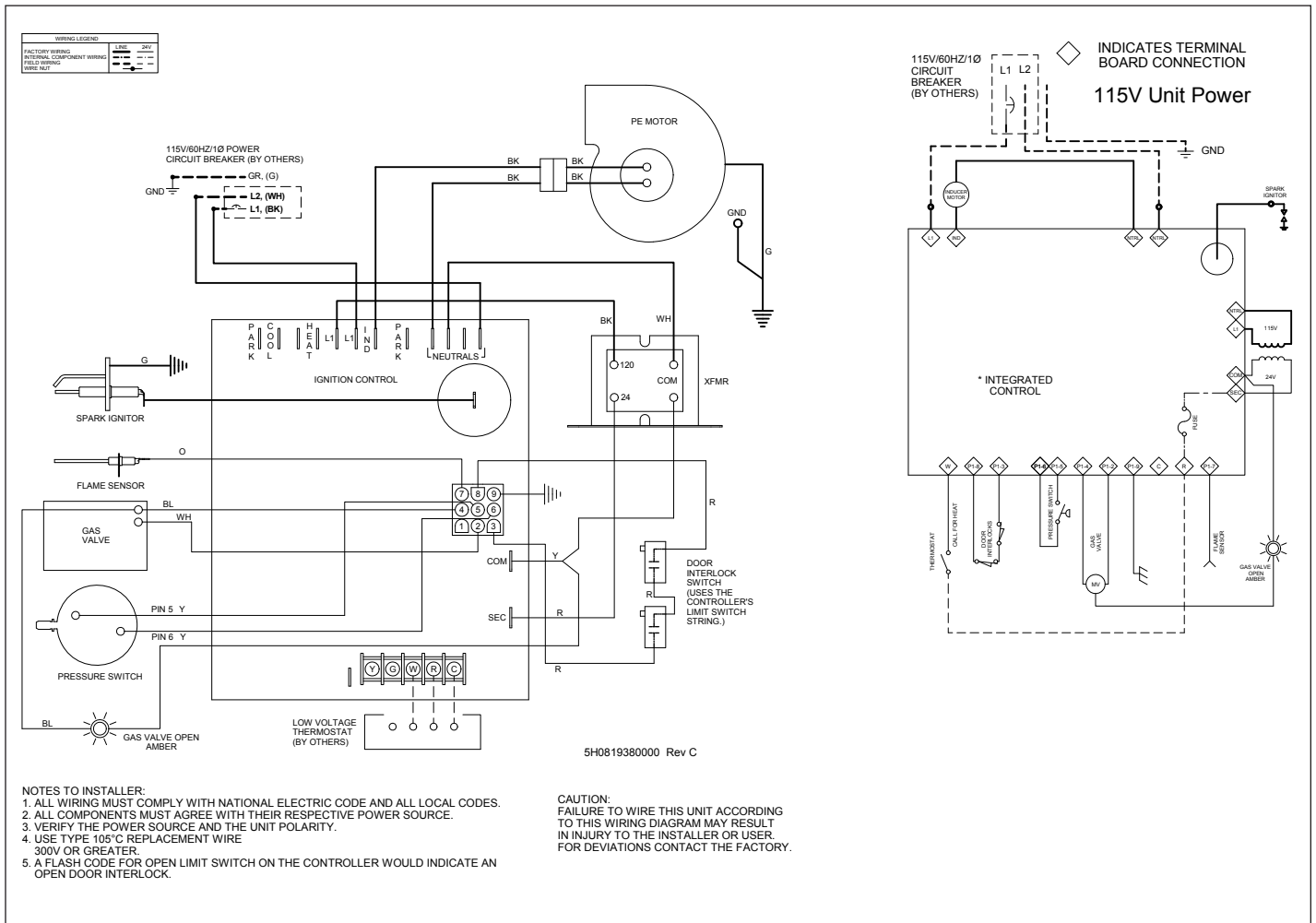
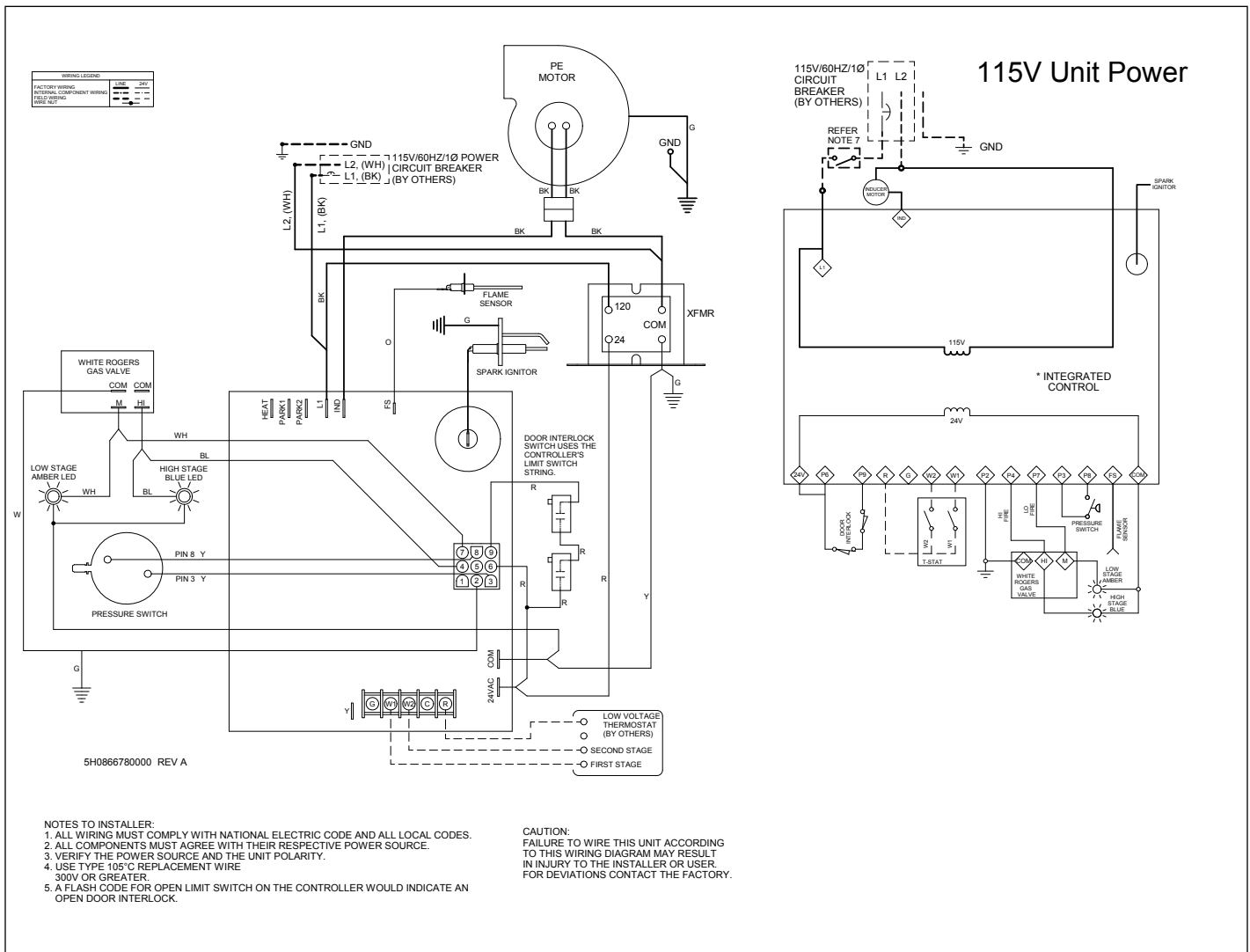


Figure 26.1 - Wiring Diagram (2-Stage)



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COMMERCIAL WARRANTY

Seller warrants its products to be free from defects in material and workmanship, EXCLUSIVE, HOWEVER, of failures attributable to the use of materials substituted under emergency conditions for materials normally employed. This warranty covers replacement of any parts furnished from the factory of Seller, but does not cover labor of any kind and materials not furnished by Seller, or any charges for any such labor or materials, whether such labor, materials or charges thereon are due to replacement of parts, adjustments, repairs, or any other work done. This warranty does not apply to any equipment which shall have been repaired or altered outside the factory of Seller in any way so as, in the judgment of Seller, to affect its stability, nor which has been subjected to misuse, negligence, or operating conditions in excess of those for which such equipment was designed. This warranty does not cover the effects of physical or chemical properties of water or steam or other liquids or gases used in the equipment.

BUYER AGREES THAT SELLER'S WARRANTY OF ITS PRODUCTS TO BE FREE FROM DEFECT IN MATERIAL AND WORKMANSHIP, AS LIMITED HEREIN, SHALL BE IN LIEU OF AND EXCLUSIVE OF ALL OTHER WARRANTIES, EITHER EXPRESS OR IMPLIED, WHETHER ARISING FROM LAW, COURSE OF DEALING, USAGE OF TRADE, OR OTHERWISE, THERE ARE NO OTHER WARRANTIES, INCLUDING WARRANTY OF MERCHANTABILITY OR FITNESS FOR PURPOSE, WHICH EXTEND BEYOND THE PRODUCT DESCRIPTION CONFIRMED BY BUYER AND SELLER AS OF THE DATE OF FINAL AGREEMENT.

This warranty is void if the input to the product exceeds the rated input as indicated on the product serial plate by more than 5% on gas-fired and oil-fired units, or if the product in the judgment of SELLER has been installed in a corrosive atmosphere, or subjected to corrosive fluids or gases, been subjected to misuse, negligence, accident, excessive thermal shock, excessive humidity, physical damage, impact, abrasion, unauthorized alterations, or operation contrary to SELLER'S printed instructions, or if the serial number has been altered, defaced or removed.

BUYER'S REMEDY FOR BREACH OF WARRANTY, EXCLUSIVE OF ALL OTHER REMEDIES PROVIDED BY LAW, IS LIMITED TO REPAIR OR REPLACEMENT AT THE FACTORY OF SELLER, ANY COMPONENT WHICH

SHALL, WITHIN THE APPLICABLE WARRANTY PERIOD DEFINED HEREIN AND UPON PRIOR WRITTEN APPROVAL, BE RETURNED TO SELLER WITH TRANSPORTATION CHARGES PREPAID AND WHICH THE EXAMINATION OF SELLER SHALL DISCLOSE TO HAVE BEEN DEFECTIVE; EXCEPT THAT WHEN THE PRODUCT IS TO BE USED BY BUYER AS A COMPONENT PART OF EQUIPMENT MANUFACTURED BY BUYER, BUYER'S REMEDY FOR BREACH, AS LIMITED HEREIN, SHALL BE LIMITED TO ONE YEAR FROM DATE OF SHIPMENT FROM SELLER. FOR GAS-FIRED PRODUCTS INSTALLED IN HIGH HUMIDITY APPLICATIONS AND UTILIZING STAINLESS STEEL HEAT EXCHANGERS, BUYER'S REMEDY FOR BREACH, AS LIMITED HEREIN, SHALL BE LIMITED TO TEN YEARS FROM DATE OF SHIPMENT FROM SELLER.

These warranties are issued only to the original owner-user and cannot be transferred or assigned. No provision is made in these warranties for any labor allowance or field labor participation. Seller will not honor any expenses incurred in its behalf with regard to repairs to any of Seller's products. No credit shall be issued for any defective part returned without proper written authorization (including, but not limited to, model number, serial number, date of failure, etc.) and freight prepaid.

OPTIONAL SUPPLEMENTAL WARRANTY

Provided a supplemental warranty has been purchased, Seller extends the warranty herein for an additional four (4) years on certain compressors. Provided a supplemental warranty has been purchased, Seller extends the warranty herein for an additional four (4) years or nine (9) years on certain heat exchangers.

EXCLUSION OF CONSUMABLES & CONDITIONS BEYOND SELLER'S CONTROL

The above referenced warranty shall not be applicable to any of the following items: refrigerant gas, belts, filters, fuses and other items consumed or worn out by normal wear and tear or conditions beyond Seller's control, including (without limitation as to generality) polluted or contaminated or foreign matter contained in the air or water utilized for heat exchanger (condenser) cooling or if the failure of the part is caused by improper air or water supply, or improper or incorrect sizing of power supply.

Component Applicable Models	"APPLICABLE WARRANTY PERIOD"
<u>Heat Exchangers</u> Gas-Fired Units except PSH/BSH	TEN YEARS FROM DATE OF FIRST BENEFICIAL USE BY BUYER OR ANY OTHER USER, WITHIN TEN YEARS FROM DATE OF RESALE BY BUYER OR ANY OTHER USER, WITHIN TEN YEARS FROM DATE OF RESALE BY BUYER IN ANY UNCHANGED CONDITION, OR WITHIN ONE HUNDRED TWENTY-SIX MONTHS FROM DATE OF SHIPMENT FROM SELLER, WHICHEVER OCCURS FIRST
<u>Heat Exchangers</u> Low Intensity Infrared Units <u>Compressors</u> Condensing Units for Cassettes	FIVE YEARS FROM DATE OF FIRST BENEFICIAL USE BY BUYER OR ANY OTHER USER, WITHIN FIVE YEARS FROM DATE OF RESALE BY BUYER OR ANY OTHER USER, WITHIN FIVE YEARS FROM DATE OF RESALE BY BUYER IN ANY UNCHANGED CONDITION, OR WITHIN SIXTY-SIX MONTHS FROM DATE OF SHIPMENT FROM SELLER, WHICHEVER OCCURS FIRST
<u>Burners</u> Low Intensity Infrared Units <u>Other</u> Components excluding Heat Exchangers, Coils, Condensers, Burners, Sheet Metal	TWO YEARS FROM DATE OF FIRST BENEFICIAL USE BY BUYER OR ANY OTHER USER, WITHIN TWO YEARS FROM DATE OF RESALE BY BUYER IN ANY UNCHANGED CONDITION, OR WITHIN THIRTY MONTHS FROM DATE OF SHIPMENT FROM SELLER, WHICHEVER OCCURS FIRST
<u>Heat Exchangers/Coils</u> Indoor and Outdoor Duct Furnaces and System Units, PSH/BSH, Steam/Hot Water Units, Oil-Fired Units, Electric Units, Cassettes, Vertical Unit Ventilators <u>Compressors</u> Vertical Unit Ventilators <u>Burners</u> High Intensity Infrared Units <u>Sheet Metal Parts</u> All Products	ONE YEAR FROM DATE OF FIRST BENEFICIAL USE BY BUYER OR ANY OTHER USER, WITHIN ONE YEAR FROM DATE OF RESALE BY BUYER IN ANY UNCHANGED CONDITION, OR WITHIN EIGHTEEN MONTHS FROM DATE OF SHIPMENT FROM SELLER, WHICHEVER OCCURS FIRST

As Modine Manufacturing Company has a continuous product improvement program, it reserves the right to change design and specifications without notice.



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