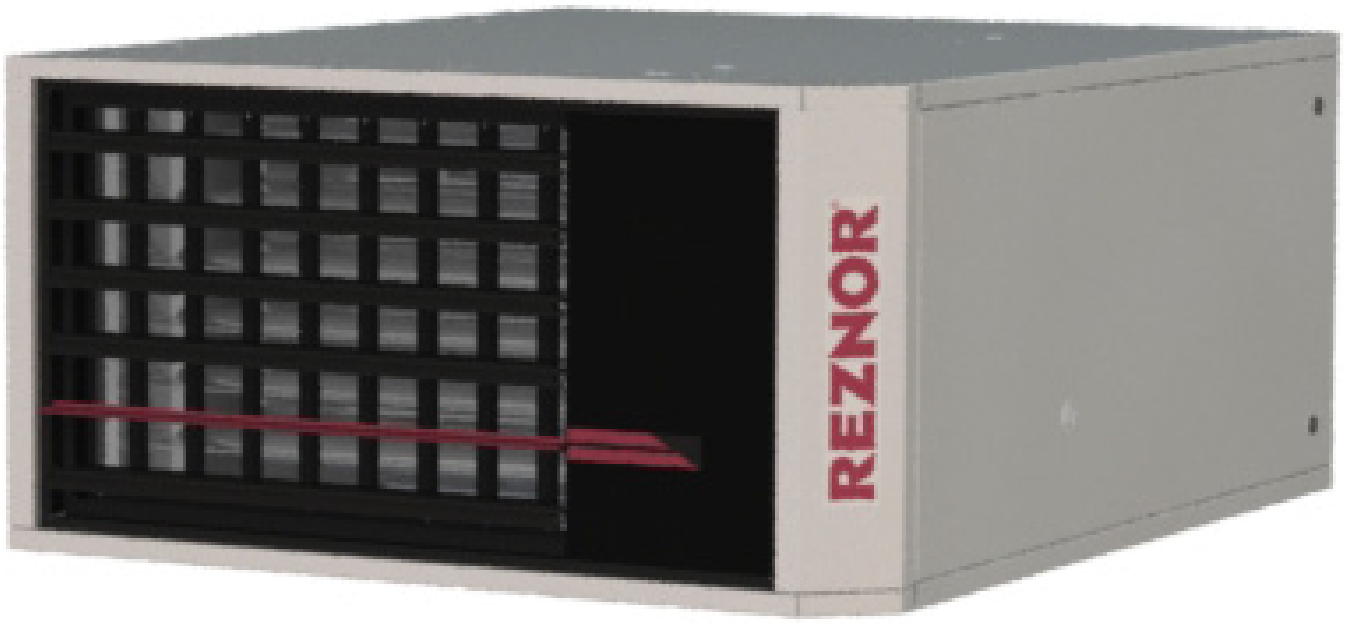
REZNOR®

Revision: UEZ-IOM (10-26) 1034347-R

Supersedes: UEZ-IOM (06-26) 1034347-Q

GAS-FIRED UNIT HEATER INSTALLATION, OPERATION, AND MAINTENANCE

MODEL UEZ



⚠ DANGER ⚠

FIRE OR EXPLOSION HAZARD

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

WHAT TO DO IF YOU SMELL GAS

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

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

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GENERAL INFORMATION

- This unit heater has been tested for capacity and efficiency so as to provide many years of safe and dependable comfort providing it is properly installed and maintained. With regular maintenance, this unit will operate satisfactorily year after year. Abuse, improper use, and/or improper maintenance can shorten the life of the appliance and create unsafe hazards.
- To achieve optimum performance and minimize equipment failure, it is recommended that periodic maintenance be performed on this unit. The ability to properly perform maintenance on this equipment requires certain tools and mechanical skills.
- This manual applies only to UEZ models (high-efficiency, separated-combustion, low-static).

Important Safety Information

Please read all information in this manual thoroughly and become familiar with the capabilities and use of your appliance before attempting to operate or maintain this unit. Pay attention to all dangers, warnings, cautions, and notes highlighted in this manual. Safety markings should not be ignored and are used frequently throughout to designate a degree or level of seriousness.

DANGER: A danger statement describes a potentially hazardous situation that if not avoided, will result in severe personal injury or death and/or property damage.

WARNING: A warning statement describes a potentially hazardous situation that if not avoided, can result in severe personal injury and/or property damage.

CAUTION: A caution statement describes a potentially hazardous situation that if not avoided, can result in minor or moderate personal injury and/or property damage.

NOTE: A note provides important information that should not be ignored.

⚠ WARNING ⚠

- **Gas-fired appliances are not designed for use in hazardous atmospheres containing flammable vapors or combustible dust, in atmospheres containing chlorinated or halogenated hydrocarbons, or in applications with airborne silicone substances.**
- **Should overheating occur, or the gas supply control system fail to shut off the flow of gas, shut off the manual gas valve to the unit before shutting off the electrical supply.**
- **Do not use this appliance if any part has been under water. Immediately call a qualified service technician to inspect the appliance and replace any gas control that has been under water.**
- **Installation should be done by a qualified agency in accordance with these instructions. The qualified service agency installing this heater is responsible for the installation.**
- **This appliance is not intended for use by persons with reduced physical, sensory, or mental capabilities or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety.**
- **Children should be supervised to ensure that they do not play with the appliance.**

⚠ CAUTION ⚠

To prevent damage to the unit or to its internal components, it is recommended that two wrenches be used when loosening or tightening nuts. Do not over tighten!

Condensate Drain Requirements

⚠ CAUTION ⚠

DO NOT use copper or copper-based alloys for condensate drains.

The combustion process forms condensation, which is collected and directed to a drainage point inside the unit. The heater is equipped with a 1/2-inch (12.7-mm) PVC pipe for connecting to a condensate drain. The water condensed from the products of combustion will be acidic. The level of concentration is dependent upon the environment where the appliance is installed and may be as high as 6 pH.

Certification

- These unit heaters are listed by Intertek for use in industrial and commercial installations in the United States and Canada. In addition, unit sizes 55, 85, and 110 are listed in the United States and Canada as utility heaters for use in non-living spaces that are attached to, adjacent to, or part of a structure that contains space for family living quarters.
- These unit heaters are available for use with either natural or propane gas. The type of gas, the input rate, and the electrical supply requirement are shown on the heater rating plate. Check the rating plate to determine if the heater is appropriate for the intended installation. All heaters are factory-equipped for use with natural gas and include a conversion kit for field-conversion for use with propane.
- These unit heaters have a titanium stabilized primary heat exchanger with a MacroChannel® secondary heat exchanger.

Warranty

Refer to the limited warranty form in the literature bag provided with the unit. The warranty is void if:

- Wiring is not in accordance with the diagram furnished with the heater.
- The unit is installed without proper clearance to combustible materials.
- A fan model is connected to a duct system or if the air delivery system is modified.

Installation Codes

- These units must be installed in accordance with local building codes. In the absence of local codes, in the United States, the unit must be installed in accordance with the *National Fuel Gas Code* (ANSI Z223.1, latest edition). A Canadian installation must be in accordance with the *Natural Gas and Propane Installation Code* (CSA B149, latest edition). This code is available from CSA Information Services, 1-800-463-6727. Local authorities having jurisdiction should be consulted before installation is made to verify local codes and installation procedure requirements.
- Installations in aircraft hangars should be in accordance with the *Standard for Aircraft Hangars* (ANSI/NFPA 409, latest edition). Installations in public garages should be in accordance with the *Standard for Parking Structures* (ANSI/NFPA 88A, latest edition). Installations in repair garages should be in accordance with the *Standard for Repair Garages* (NFPA 88B), which has been incorporated into the *Code for Motor Fuel Dispensing Facilities and Repair Garages* (NFPA 30A, latest edition). In Canada, installations in aircraft hangars and public garages should be in accordance with CSA B149.
- If the heater is being installed in the Commonwealth of Massachusetts, installation must be performed by a licensed plumber or licensed gas fitter.

Heater Location

⚠ CAUTION ⚠

- **Unit heaters should not be used in an application where the heated space temperature is below 40°F (4°C). The combination of low space and combustion air temperatures may result in condensate freezing in the secondary heat exchanger and/or condensate drain.**
- **Do not locate the heater where it may be exposed to water spray, rain, or dripping water.**

For best results, the heater should be mounted with certain rules in mind:

- Units should always be arranged to blow toward or along exposed wall surfaces, if possible. Where two or more units are installed in the same room, a general scheme of air circulation should be maintained for best results.
- Suspended heaters are most effective when located as close to the working zone as possible, and this fact should be kept in mind when determining the mounting heights to be used. However, care should be exercised to avoid directing the discharged air directly on the room occupants.
- Partitions, columns, counters, or other obstructions should be taken into consideration when locating the unit heater so that a minimum quantity of airflow will be deflected by such obstacles.
- When units are located in the center of the space to be heated, the air should be discharged toward the exposed walls. In large areas, units should be located to discharge air along exposed walls with extra units provided to discharge air in toward the center of the area.

Heater Location—Continued

Heater Throw

Figure 1 shows throw patterns for fan model units. Table 1 lists throw distances for standard, adjustable horizontal louvers at the angles listed. The throw pattern changes with the addition of optional vertical louvers and/or downturn nozzles. Throw distances for units with downturn nozzles are listed in the downturn nozzle kit installation manual provided with the kit.

H = the distance from the bottom of the heater to the floor
X = the distance from the heater to the start of floor coverage
Y = the distance from the heater to the end of floor coverage
Z = the distance at which air velocity drops below 50 feet (15.2 meters) per minute

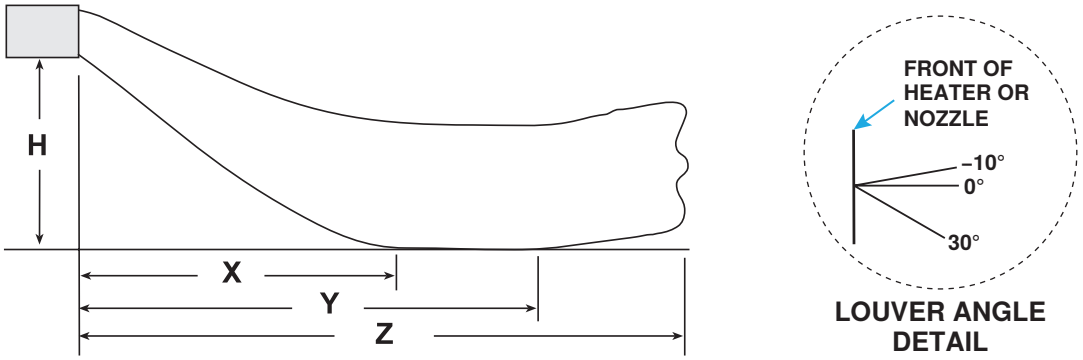


Figure 1. Heater Throw Patterns (Refer to Table 1)

Table 1. Heater Throw with Standard Horizontal Louvers

Dimension H* (Feet (Meters))	Louver Angle* and Dimension*	Unit Size (MBTUh) 55	85	110	130	180	260	310
		Feet (Meters)						
5 (1.5)	**Angle**	**15°**	**15°**	**15°**	—			
	X	13 (4.0)	11 (3.4)	12 (3.7)				
	Y	17 (5.2)	15 (4.6)	17 (5.2)				
	Z	37 (11)	44 (13.4)	49 (14.9)				
8 (2.4)	**Angle**	**27°**	**22°**	**22°**	**26°**	**20°**	**24°**	**20°**
	X	11 (3.4)	14 (4.3)	13 (4.0)	13 (4.0)	16 (4.9)	15 (4.6)	17 (5.2)
	Y	16 (4.9)	17 (5.2)	21 (6.4)	24 (7.3)	30 (9.1)	28 (8.5)	31 (9.4)
	Z	35 (10.7)	42 (12.8)	46 (14.0)	73 (22.3)	93 (28.3)	94 (28.7)	105 (32.0)
10 (3.0)	**Angle**	**32°**	**27°**	**27°**	**32°**	**25°**	**29°**	**25°**
	X	13 (4.0)	13 (4.0)	14 (4.3)	14 (4.3)	17 (5.2)	16 (4.9)	18 (5.5)
	Y	17 (5.2)	17 (5.2)	17 (5.2)	24 (7.3)	31 (9.4)	28 (8.5)	32 (9.8)
	Z	33 (10.1)	38 (11.6)	43 (13.1)	69 (21.0)	91 (27.7)	89 (27.1)	103 (31.4)
12 (3.7)	**Angle**	**—**	**32°**	**32°**	**39°**	**30°**	**34°**	**30°**
	X	—	16 (4.9)	14 (4.3)	14 (4.3)	18 (5.5)	17 (5.2)	19 (5.8)
	Y		19 (5.8)	17 (5.2)	24 (7.3)	31 (9.4)	28 (8.5)	32 (9.8)
	Z		35 (10.7)	41 (12.5)	64 (19.5)	88 (26.8)	85 (25.9)	98 (29.9)
14 (4.3)	**Angle**	**—**	**39°**	**36°**	**45°**	**34°**	**40°**	**34°**
	X	—	14 (4.3)	14 (4.3)	14 (4.3)	19 (5.8)	17 (5.2)	20 (6.1)
	Y		17 (5.2)	18 (5.5)	22 (6.7)	30 (9.1)	27 (8.2)	32 (9.8)
	Z		30 (9.1)	41 (12.5)	59 (18.0)	84 (25.6)	80 (24.4)	95 (29.0)
16 (4.9)	**Angle**	**—**			**51°**	**39°**	**45°**	**38°**
	X	—			13 (4.0)	19 (5.8)	17 (5.2)	21 (6.4)
	Y				20 (6.1)	29 (8.8)	25 (7.6)	31 (9.4)
	Z				53 (16.2)	79 (24.1)	74 (22.6)	90 (27.4)
18 (5.5)	**Angle**	**—**			**58°**	**44°**	**51°**	**43°**
	X	—			11 (3.4)	19 (5.8)	16 (4.9)	20 (6.1)
	Y				17 (5.2)	28 (8.5)	24 (7.3)	30 (9.1)
	Z				44 (13.4)	74 (22.6)	66 (20.1)	85 (25.9)

*See Figure 1.

Mounting Height Requirements

⚠ WARNING ⚠

If touched, the vent pipe and internal heater surfaces that are accessible from outside the heater will cause burns. Suspend the heater a minimum of 5 feet (1.5 meters) above the floor.

In general, a unit should be located 8–12 feet (2.4–3.7 meters) above the floor. At those points where infiltration of cold air is excessive, such as at entrance doors and shipping doors, it is desirable to locate the unit so that it will discharge directly toward the source of cold air from a distance of 15–20 feet (4.6– 6.1 meters).

Halogenated Hydrocarbons

Halogenated hydrocarbons are a family of chemical compounds characterized by the presence of halogen elements (fluorine, chlorine, bromine, etc.). These compounds are used in refrigerants, cleaning agents, and solvents and are heavier than air, a fact that should be kept in mind when determining the installation location of heaters and building exhaust systems.

⚠ CAUTION ⚠

CORROSION HAZARD: Halogenated hydrocarbons, when exposed to flame, precipitate with any condensation present in the heater to form hydrochloric acid, which readily attacks all metals, including 300 grade stainless steel. Care should be taken to separate these vapors from the combustion process. An outside air supply MUST BE provided to the burner whenever the presence of these compounds is suspected.

Clearances

Units must be located so that the clearances listed in **Table 2** are provided for with regards to combustion air space, inspection, and service and for proper spacing from combustible construction. Clearance to combustibles is defined as the minimum distance from the heater to a surface or object for which it is necessary to ensure that a surface temperature of 90°F (50°C) above the surrounding ambient temperature is not exceeded. Refer to the **Dimensions** section when determining clearances to combustibles.

Table 2. Clearances

HeaterSurface	Minimum Clearance (Inches (mm))
Top	1 (25)
Flue connector	0 (0)
Access panel	18 (457)
Non-access side	1 (25)
Bottom*	1 (25)
Rear**	18 (457)
Front	Refer to values for variable X (distance from heater to start of floor coverage) in **Heater Throw** section
*Suspend the heater so that the bottom is a minimum of 5 feet (1.5 meters) above the floor.	
**Measure rear clearance from the fan motor.	

Weights

Table 3. Weights

Unit Size (MBTUh)						
55	85	110	130	180	260	310
Pounds (kg)						
85 (39)	103 (47)	123 (56)	230 (104)	245 (111)	360 (163)	395 (179)

Dimensions

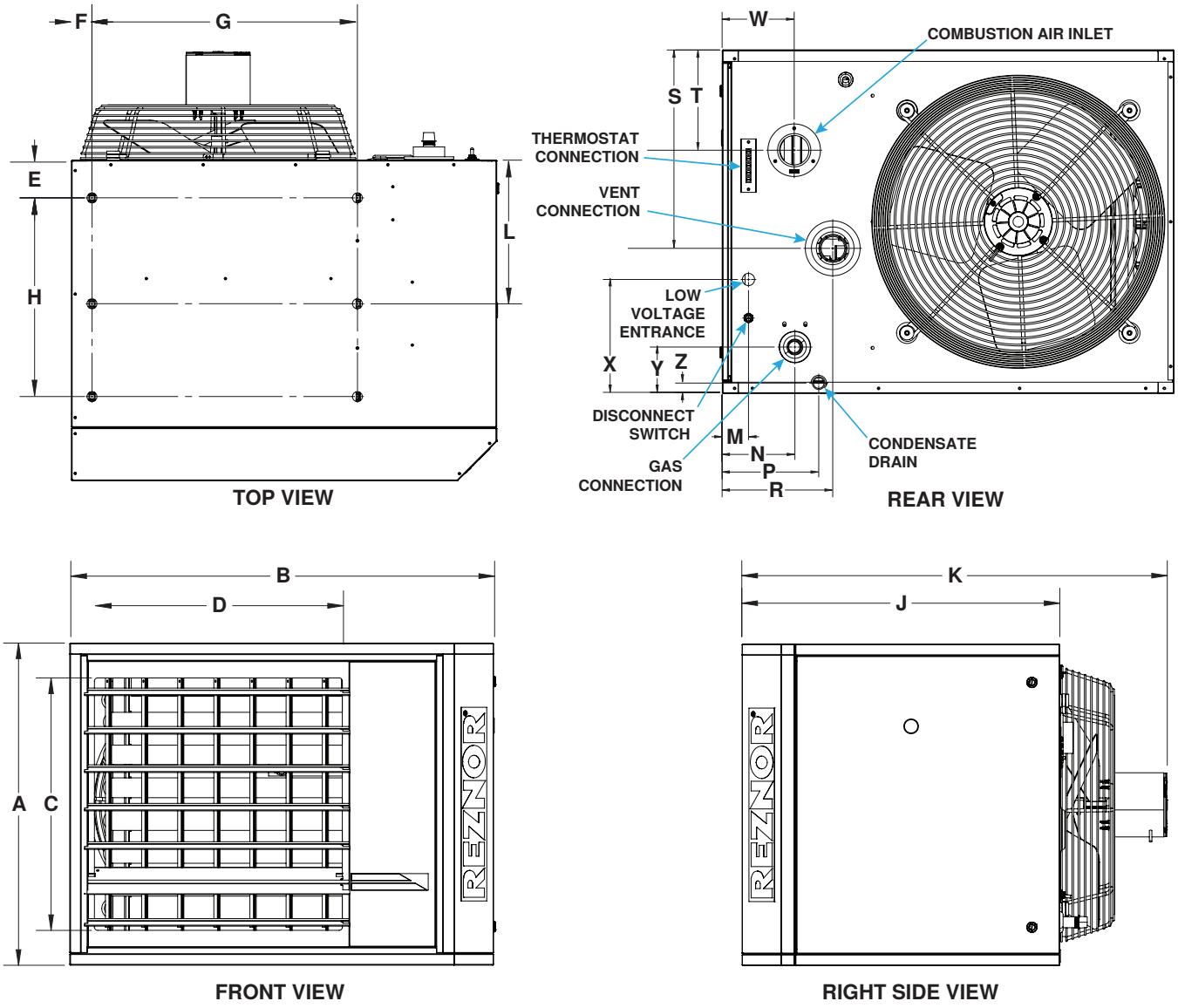


Figure 2. Dimensions—Unit Sizes 55–110 (Refer to Table 4)

Table 4. Dimensions (Unit Sizes 55–110)

Unit Size (MBTUh)	Dimension (See Figure 2)						
	A	B	C	D	E*	F*	G*
	Inches (mm)						
55	17-5/8 (448)	28-1/4 (718)	12-1/2 (318)	15-7/8 (403)	2-27/32 (72)	1-9/16 (40)	18-1/8 (460)
85	21 (533)	30-1/4 (768)	16-7/8 (429)	17-7/8 (454)			20-1/8 (511)
110	24-1/2 (622)	32-1/4 (819)	19-1/4 (489)	18-7/8 (479)			
	H*	J	K	L*	M	N	P
55	15 (381)	24-1/4 (616)	31 (787)	12 (305)	2 (51)	3-3/16 (81)	4-7/8 (124)
85			33 (838)		1-7/8 (48)		
110				10-7/8 (276)		5-3/16 (132)	6-7/8 (175)
	R	S	T	W	X	Y	Z
55	6 (152)	7-1/4 (184)	3-1/4 (83)	3-3/16 (81)	6-1/8 (156)	2-1/4 (57)	3/4 (19)
85		10-11/16 (271)	3-11/16 (94)		10-11/16 (271)	2-3/4 (70)	
110	7-7/8 (200)	14-1/8 (359)	7-7/8 (200)	5-1/8 (130)	8-1/8 (206)	3-3/8 (86)	

*Heater suspension points (3/8-16 FEM).

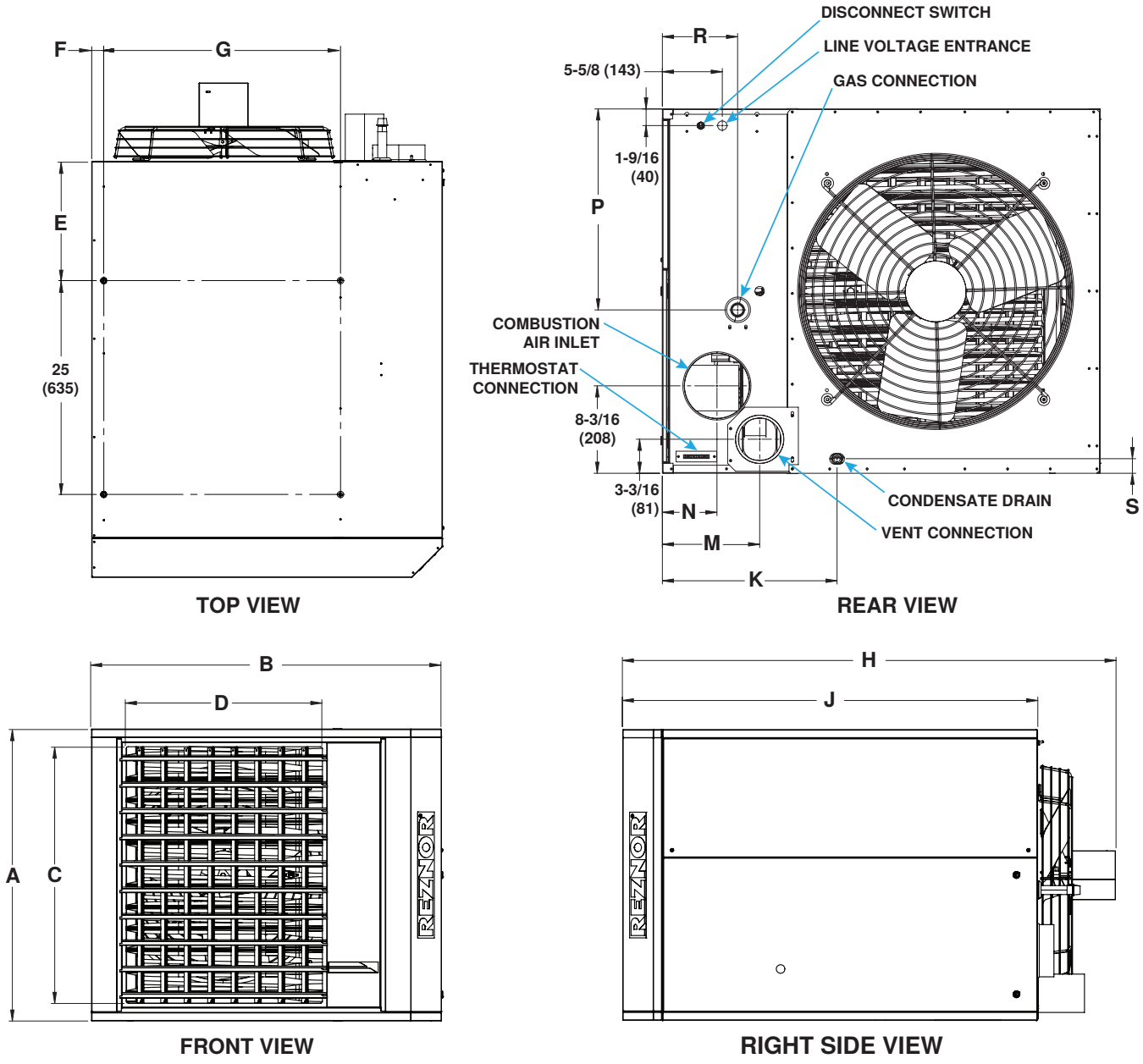


Figure 3. Dimensions—Unit Sizes 130–310 (Refer to Table 5)

Table 5. Dimensions (Unit Sizes 130–310)

Unit Size	Dimension (See Figure 3)				
	A	B	C	D	E*
	Inches (mm)				
130, 180	20-1/8 (511)	39-3/16 (995)	16 (406)	23 (584)	11-31/32 (304)
260, 310	34-1/8 (867)	41 (1041)	30 (762)		13-31/32 (355)
	F*	G*	H	J	K
130, 180	2-3/8 (60)	25-11/16 (652)	55-13/32 (1407)	46-1/32 (1169)	15-19/32 (396)
260, 310	1-13/32 (36)	27-11/16 (703)	58 (1473)	48-21/32 (1236)	16-15/32 (418)
	M	N	P	R	S
130, 180	8-5/16 (211)	4-5/16 (110)	5-1/16 (129)	6-9/32 (160)	1-3/4 (45)
260, 310	9-3/32 (231)	5-3/32 (129)	18-13/16 (478)	7-1/32 (179)	1-3/8 (35)

*Heater suspension points (3/8-16 FEM).

NOTE: Refer to the Vent Connections section for details on vent system installation.

These units are certified as Category IV heaters. These heaters are very thermal efficient and will produce condensate during operation. Refer to **Table 6** for suggested Category IV venting system providers.

Table 6. Suggested Category IV Venting System Providers

IPEX USA LLC	ENERVEX Inc.	Industrial Chimney Co.
Centrotherm ECO Systems	METAL-FAB Inc.	SFL Flue & Chimney
The Schebler Co.	Tokyo Gas Renovation Co. Ltd.	Industrial Combustion LLC
Cheminee Lining E Inc.	Lifetime Chimney Supply LLC	CaptiveAire Systems
Selkirk Corporation	Van-Packer Co. Inc.	Sunair Products
Z-FLEX US Inc.	Security Chimneys International Ltd.	ECCO Manufacturing Division of ECCO Heating Products Ltd.
DuraVent Inc.		

Vent/Combustion Air System Piping Requirements

⚠ DANGER ⚠

All separated-combustion units MUST BE equipped with both combustion air and exhaust piping to the outdoors.

Vent/Combustion Air Piping Requirements (Unit Sizes 55–110)

NOTE: Unit sizes 55, 85, and 110 are recommended for use with UL-1738-compliant Category IV venting systems in the US, and with any ULC-S636-listed Category IV venting system in Canada. Venting may be terminated horizontally or vertically, provided that instructions for the selected system are followed.

- Where permitted by local codes, PVC/CPVC pipes meeting ASTM D1785 and/or ASTM F441 designated Schedule 40 are permitted to be used.
- Refer to **Table 7** for vent and combustion air piping size requirements.
- The venter outlet and combustion air inlet are located at the rear of the heater (see **Figure 4**).

Table 7. Vent/Combustion Air Piping Size Requirements (Unit Sizes 55–110)

Unit Size	Vent Piping				Combustion Air Piping			
	Diameter (Inches (mm))	Maximum Length	Equivalent Straight Length for Elbows		Pipe Section	Diameter (Inches (mm))	Length (Feet (Meters))	
			90-Degree Elbow*	45-Degree Elbow			Minimum	Maximum
		Feet (Meters)						
55, 85	2 (51) or 3 (76)	50 (15.2)	8 (2.4)	4 (1.2)	Heater to concentric vent	2 (51)	3 (914)	50 (15.2)
110	2 (51)	25 (7.6)				2 (51)	3 (914)	25 (7.6)
	3 (76)	50 (15.2)				3 (76)	3 (914)	50 (15.2)

*All 90-degree elbows in the vent system must be sweep type.

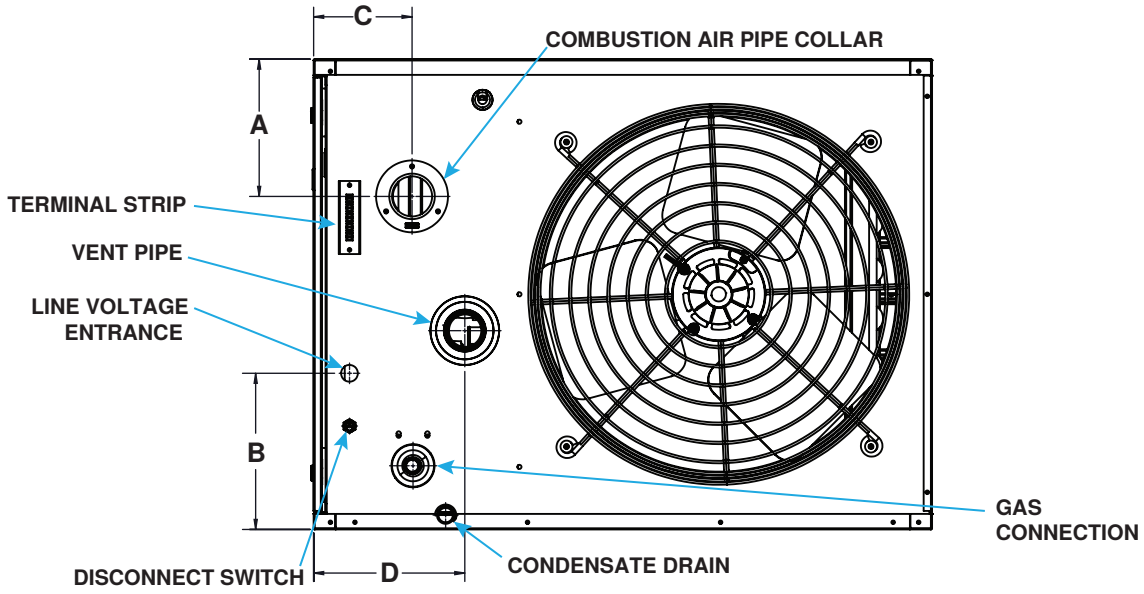


Figure 4. Connections at Rear of Unit—Unit Sizes 55–110 (Refer to Table 8)

Table 8. Connection Sizes and Locations (Unit Sizes 55–110)

Dimension (See Figure 4) or Connection	Unit Size (MBTUh)		
	55	85	110
	Dimension/Diameter (Inches (mm))		
A	3-1/4 (83)	3-11/16 (94)	7-1/8 (181)
B	7-1/4 (184)	10-11/16 (271)	14-1/8 (359)
C	3-3/16 (81)		5-1/8 (130)
D	6 (152)		7-7/8 (200)
Combustion air pipe collar	2 (51)		
PVC vent pipe			
PVC condensate drain pipe	3/4 (19)		

Vent/Combustion Air Piping Requirements (Unit Sizes 130–310)

NOTE: Concentric horizontal and vertical vent/combustion air systems (option CC6 or CC2) are the only venting/combustion air systems approved for unit sizes 130, 180, 260, and 310. The unique concentric adapter box required with this heater allows for both combustion air and exhaust piping with only one horizontal or vertical penetration hole in the building.

- **Vent pipe:** schedule 40 PVC or CPVC pipe or listed venting system of any type (polypropylene, metallic, etc.)—in Canada, all vent pipe must be approved to ULC-636.
- **Vent pipe clearance:** do not install the vent piping near any high temperature steam lines, radiant heaters, or other sources of heat.
- **Vent piping size requirements:** from heater to terminal end of vertical or horizontal vent (refer to **Table 9**).
- **Combustion air inlet pipe:** sealed, single-wall galvanized pipe is recommended.
- **Combustion air piping size requirements:** from heater to concentric adapter box and from concentric adapter box to outdoors (refer to **Table 9**).
- **Condensate drain connections:** during operation, condensate is produced both in the heater and in the venting system. Therefore, the installation requires a condensate drain from the secondary heat exchanger and from the vent pipe. For safe performance of the heater, each condensate drain must include a trap. Install the condensate drains in accordance with the **Condensate Drain Installation** section.
- **Venter outlet and combustion air inlet:** located at rear of heater (see **Figure 5**).

Table 9. Vent/Combustion Air Piping Size Requirements (Unit Sizes 130–310)

Vent Piping				Combustion Air Piping			
Diameter (Inches (mm))	Maximum Length	Equivalent Straight Length for Elbows		Pipe Section	Diameter (Inches (mm))	Length (Feet (Meters))	
		90-Degree Elbow*	45-Degree Elbow			Minimum	Maximum
	Feet (Meters)						
4 (102)	50 (15.2)	8 (2.4)	4 (1.2)	Heater to concentric adapter box	6 (152)	3 (914)	Same as vent pipe
				Concentric adapter box to outdoors	8 (203)	Refer to **Vent Connections** section	

*All 90-degree elbows in the vent system must be sweep type.

NOTE: The minimum/maximum requirements for the length of vent pipe that extends outdoors are different for horizontal and vertical vent terminals (refer to **Vent Connections** section).

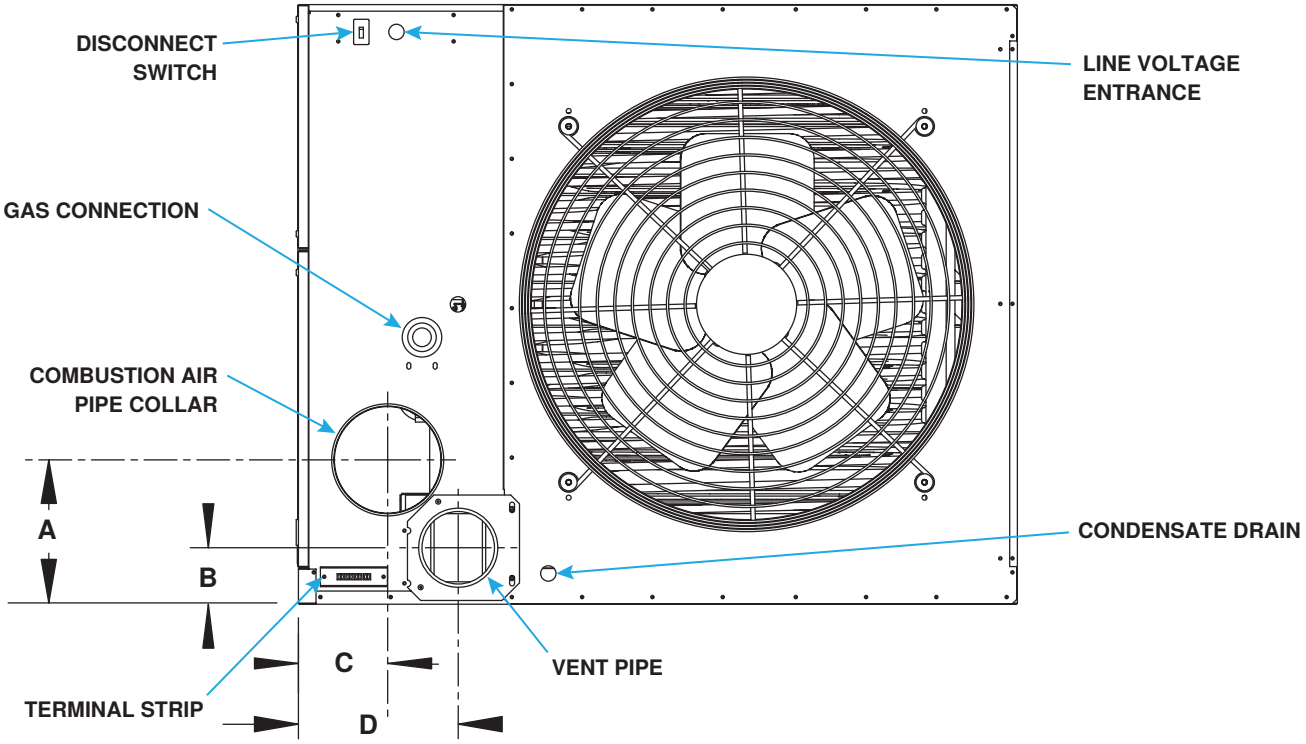


Figure 5. Connections at Rear of Unit—Unit Sizes 130–310 (Refer to Table 10)

Table 10. Connection Sizes and Locations (Unit Sizes 130–310)

Dimension (See Figure 5) or Connection	Unit Size (MBTUh)	
	130, 180	260, 310
	Dimension/Diameter (Inches (mm))	
A	8-1/4 (210)	
B	3-1/4 (83)	
C	8-5/16 (211)	9-3/32 (231)
D	4-5/16 (110)	5-1/16 (129)
Combustion air pipe collar	6 (153)	
PVC vent pipe	4 (102)	
PVC condensate drain pipe	1/2 (13)	

Vent/Combustion Air System Piping Joints

Vent/Combustion Piping Joints (Unit Sizes 55–110)

All vent/combustion piping joints for unit sizes 55, 85, and 110 must comply with the vent system manufacturer's requirements.

Vent/Combustion Piping Joints (Unit Sizes 130–310)

NOTE: If using a UL-1738-listed Category IV venting system in the US or a ULC-S636-listed Category IV venting system in Canada, follow the instructions provided for that system. Category IV venting systems listed to UL-1783 and/or ULC-S636 are permitted to be used between the heater vent outlet and the concentric adapter. The concentric adapter must be used.

When ready to install the vent system, ensure that piping joints are in accordance with the following:

- **Combustion air piping:** secure slip-fit joints of single-wall combustion air pipe using sheet metal screws or rivets. Seal joints and seams with aluminium tape or silicone sealant.
- **Vent piping:** the vent system should be installed in a manner consistent with normal industry standards and in compliance with all local fire and building code requirements. Failure to follow proper installation practices, procedures, or techniques can result in system failure, property damage, or personal injury. The installer is responsible for the installation. Read the following procedure before beginning installation:

NOTE: Install piping joints one at a time. Pipe and fittings should be assembled quickly while cement is fluid.

1. Cut pipe square—angled cut may result in joint failure:
   a. Remove all burrs from inside and outside diameter of cut end of pipe burrs using deburring tool, file, or knife edge.
   b. Chamfer (bevel) end of pipe 10 to 15 degrees.
   c. Remove surface dirt, grease, and moisture from pipe sections and fittings using clean dry cloth.
2. Check for proper fit—test fit using light pressure:
   a. Install dry pipe one-half to one-third of way into fitting hub.
   b. Ensure that pipe and fittings are not too tight or too loose.
3. Apply primer to pipe and fitting surfaces using 2- to 3-inch applicator brush:
   a. Ensure that primer conforms to ASTM F656.
   b. Ensure that primer does not puddle inside system.
4. Apply cement using 2- to 3-inch applicator brush, quickly assembling joint while cement is fluid:
   a. Ensure that cement conforms to ASTM D2564.
   b. Apply full even layer of cement to pipe OD slightly greater than depth of socket on coupler (fitting).
   c. Coat coupler (fitting) socket with medium layer of cement, ensuring that cement does not puddle inside system.
   d. Apply second full even layer of cement to pipe OD.
5. Join pipe and coupler (fitting):
   a. Working quickly while cement is fluid, insert pipe into coupler (fitting) until it touches socket bottom.
   a. Turn pipe quarter turn and hold joint together until pipe will not pull out.
   b. Clean excessive cement from exterior—properly made joint will have continuous bead of cement around perimeter.

Vent/Combustion Air System Piping Support

Vent/Combustion Piping Support (Unit Sizes 55–110)

All vent/combustion piping supports for unit sizes 55, 85, and 110 must comply with the vent system manufacturer's requirements.

Vent/Combustion Piping Support (Unit Sizes 130–310)

⚠ CAUTION ⚠

DO NOT use the heater or concentric adapter box to provide vent pipe support.

- **Vent pipe support:** for continued safe operation, the vent system must be properly supported. A 10-foot (3-meter) length of PVC pipe weighs 20 pounds (9 kg) and has an expansion rate of four times that of metal pipe.
- **Horizontal CPVC or PVC vent:** must be supported every 6 feet (1.8 meters). The hangers should provide as much bearing surface as possible and must be free of sharp edges and burrs. Hangers must allow the pipe to expand laterally. Consider pipe expansion when placing hangers. Changes in pipe direction will allow for expansion. Hangers must be placed to allow for some direction movement. The slip joint at the concentric adapter box is designed to permit some limited expansion.
- **Vertical CPVC or PVC vent:** it is recommended that an engineer design the vertical support system. An acceptable field-supplied cradle-type support that allows for expansion for a simple vertical vent that is 30 feet (9.1 meters) or less and rises closely from the heater is shown in **Figure 6**.

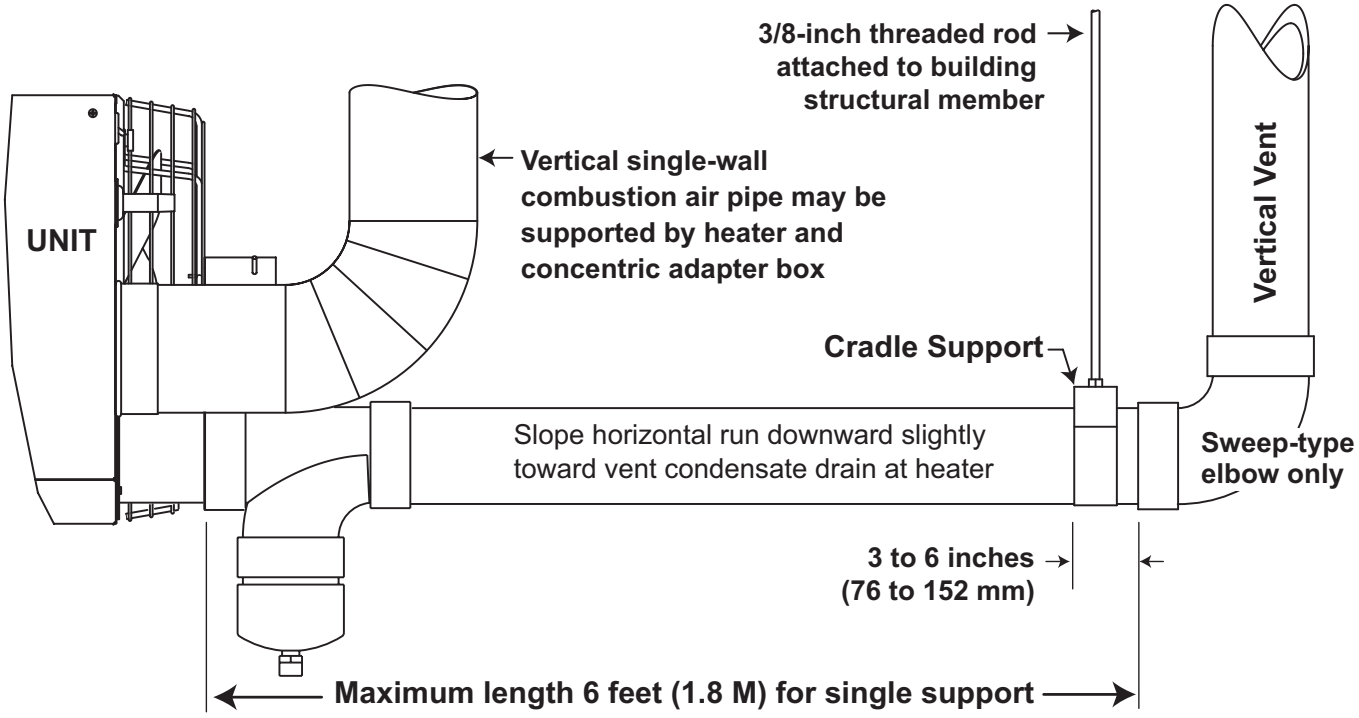


Figure 6. Vent Pipe Support

- **Combustion air pipe support:** support a single-wall metal horizontal combustion air run every 6 feet (1.8 meters). Support a vertical single-wall metal combustion air pipe in accordance with accepted industry practices. The heater and concentric adapter box may be used to support a vertical combustion air pipe.
- This unit heater is a high-efficiency appliance designed to extract part of the latent heat from the products of combustion.

INSTALLATION

Unpacking and Inspection

- The unit was test-operated and inspected at the factory prior to crating and was in operating condition.
- It is important to note when uncrating the unit that shipping brackets are attached with cabinet screws. When removing shipping brackets, re-insert ALL screws into the cabinet.
- If, upon removing it from its crate, the unit has been found to have incurred any damage in shipment, document the damage with the transporting agency and contact an authorized Factory Distributor. If you are an authorized Distributor, follow the FOB freight policy procedures.
- A conversion kit is included with the heater for converting for use with propane (refer to **Gas Conversion** section).

Pre-Installation Checklist

- ❑ Check the rating plate for the gas specifications and electrical characteristics of the heater to ensure that they are compatible with the gas and electric supplies at the installation site.
- ❑ Read this manual and become familiar with the installation requirements of your particular heater.
- ❑ If you do not have knowledge of local requirements, check with the local gas company or any other local agencies who might have requirements concerning this installation.
- ❑ Before beginning, make preparations for necessary supplies, tools, and manpower.
- ❑ Check to see if there are any field-installed options (refer to **Table 11**) that need to be assembled/installed prior to unit installation. Ensure that all options ordered are at the installation site.

Table 11. Field-Installed Options

Option	Description
CC2	Vertical vent terminal/combustion air kit
CC6	Horizontal vent terminal/combustion air kit
CC18	Universal vent terminal assembly, 2-inch diameter × 40 inches long
CC19	Horizontal vent terminal assembly, 3-inch diameter × 20 inches long
CC20	Universal vent terminal assembly, 3-inch diameter × 44 inches long
CC22	Low profile horizontal vent terminal assembly, 2-inch diameter
CC23	Low profile horizontal vent terminal assembly, 3-inch diameter
CC24	Horizontal vent terminal assembly, 2-inch diameter × 16 inches long
CC25	Universal vent terminal assembly, 2- or 3-inch diameter × 24 inches long
CD1	Vertical louvers, direct discharge air to provide wider throw pattern
CD2	Downturn nozzle, 25- to 65-degree variable air deflection range
CD3	Downturn nozzle, 50- to 90-degree variable air deflection range
CD4	Downturn nozzle, 25- to 65-degree variable air deflection range with vertical louvers
CE1	Manual shutoff valve, natural gas or propane
CK8	Adapts 3/8-inch hangers for two-point suspension from 1-inch threaded pipe
CK10	Adapts 3/8-inch hangers for four-point suspension from 1-inch threaded pipe
CL1	Single-stage thermostat
CL83, CL84, CL90	Two-stage thermostats
CL31, CL32	Multiple unit control: option CL31 includes components for one control unit and one additional unit—option CL32 includes components for each additional non-control unit
CM1	Locking thermostat cover
CM1B	Large locking thermostat cover

Heater Suspension

⚠ WARNING ⚠

- **Before suspending the heater, check the supporting structure to be used to verify that it has sufficient load-carrying capacity to support the weight (refer to Weights section) of the unit.**
- **The heater must be level for proper operation. DO NOT place or add additional weight to a suspended heater.**

⚠ CAUTION ⚠

- **Before lifting the heater, verify that any screws used for holding shipping brackets were re-installed in the cabinet.**
- **Before lifting the heater, any unused suspension points MUST be plugged. Seal any unused holes in the top of the heater after installing the hanging hardware using capscrews and washers.**
- **When the heater is lifted for suspension, support the bottom of the heater with plywood or other appropriately placed material. If the bottom is not supported, damage could occur.**

NOTE: Four-point suspension is recommended. Two-point suspension is permitted only on unit sizes 55–110 when installed without a downturn nozzle.

A 3/8-16 threaded nut retainer is located at each suspension point. The heater may be suspended using either 3/8-inch threaded rods or a hanger kit option package.

Suspension of Heater Using Option CK8 or CK10 Hanger Kit

Options CK8 (two-point suspension, unit sizes 55–110) and CK10 (four-point suspension) are for suspending the heater using swivel connectors connected to 1-inch pipe. Attach the swivel connectors at the 3/8-16 threaded nut retainers. Ensure that the swivel connectors are locked to the heater as shown in **Figure 7**.

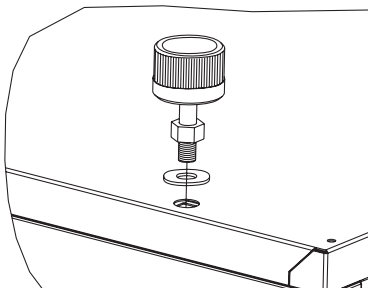


Figure 7. Option CK8 or CK10 Hanger Kit

Heater Suspension Using Field-Supplied Threaded Rods

The heater may be suspended from 3/8-inch threaded rods using either two- (unit sizes 55–110) or four-point suspension. The recommended maximum rod length is 6 feet (1.8 meters). The length of the threaded rod extending into the heater **MUST NOT** exceed 1/2 inch (13 mm). Ensure that the threaded rods are locked to the heater as shown in **Figure 8**.

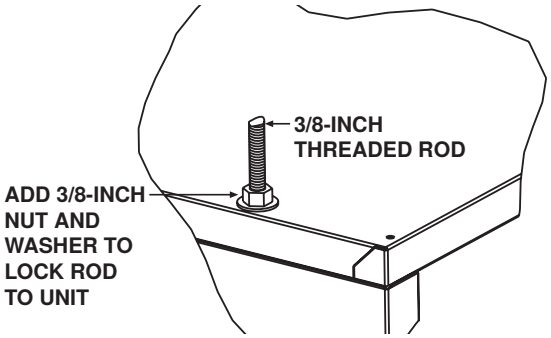


Figure 8. Heater Suspension Using Field-Supplied Threaded Rods

Suspension of Heater with Downturn Nozzle

Ensure that any unit with a downturn nozzle (option CD2, CD3, or CD4) is installed using one of the above **FOUR-POINT** suspension methods. Follow the instructions provided with the downturn nozzle kit.

Piping Connections

Gas Supply Pressure

- The unit is equipped for a maximum gas supply pressure of 1/2 psi, 3.5 kPa, or 14 IN WC for natural gas or propane. The minimum supply pressure, as measured while the unit is operating at full fire, is 5 IN WC for natural gas or 11 IN WC for propane.
- Supply pressure higher than 1/2 psi requires the installation of an additional service regulator external to the unit.
- **Pressure testing supply piping:** For test pressures ***above*** 1/2 psi, disconnect the heater and manual valve from the gas supply line to be tested and cap or plug the supply line. For test pressures ***below*** 1/2 psi, before testing, close the manual valve on the heater.

Piping Connections—Continued

Gas Supply Piping

⚠ DANGER ⚠

- **All components of a gas supply system must be leak tested prior to placing equipment in service. NEVER TEST FOR LEAKS WITH AN OPEN FLAME. Failure to comply could result in personal injury, property damage, or death.**
- **Pipe joint compounds (pipe dope) shall be resistant to the action of liquefied petroleum gas or any other chemical constituents of the gas being supplied.**

⚠ CAUTION ⚠

- **All piping must be in accordance with requirements outlined in the *National Fuel Gas Code* (ANSI Z223.1, latest edition) or the *Natural Gas and Propane Installation Code* (CSA B149.1, latest edition).**
- **Gas supply piping installation shall conform with good practice and with local codes.**
- **Support gas piping with pipe hangers, metal strapping, or other suitable material. Do not rely on the heater to support the gas pipe.**

- The heater is orificed for operation with natural gas having a heating value of 1,000 (±50) BTU per cubic foot or with propane gas having a heating value of 2,500 (±100) BTU per cubic foot. Sizing of gas supply lines depends on piping capacity and is based on cubic feet per hour based on a 0.3 IN WC pressure drop, a 0.6 specific gravity for natural gas at 1,000 BTU per cubic feet, and a 1.6 specific gravity for propane at 2,550 BTU per cubic feet. If the gas at the installation does not meet this specification, consult the factory for proper orificing.
- Variables for sizing gas supply lines are listed in **Table 12**. When sizing supply lines, consider the possibility of future expansion and increased requirements (refer to the *National Fuel Gas Code* for additional information).

Table 12. Gas Supply Line Sizes

Pipe Length (Feet)	Natural Gas						Propane					
	Pipe Diameter (Inches)											
	1/2	3/4	1	1-1/4	1-1/2	2	1/2	3/4	1	1-1/4	1-1/2	2
	Cubic Feet per Hour											
20	92	190	350	730	1100	2100	56	116	214	445	671	1281
30	73	152	285	590	890	1650	45	93	174	360	543	1007
40	63	130	245	500	760	1450	38	79	149	305	464	885
50	56	115	215	440	670	1270	34	70	131	268	409	775
60	50	105	195	400	610	1105	31	64	119	244	372	674
70	46	96	180	370	560	1050	28	59	110	226	342	641
80	43	90	170	350	530	990	26	55	104	214	323	604
90	40	84	160	320	490	930	24	51	98	195	299	567
100	38	79	150	305	460	870	23	48	92	186	281	531
125	34	72	130	275	410	780	21	44	79	168	250	476
150	31	64	120	250	380	710	19	39	73	153	232	433
175	28	59	110	225	350	650	17	36	67	137	214	397
200	26	55	100	210	320	610	16	34	61	128	195	372

Supply Piping Connections

NOTE: The *National Fuel Gas Code* requires the installation of a minimum 3-inch sediment trap with a drip leg. Local codes may require a sediment trap longer than 3 inches (typically 6 inches). To permit burner removal, this sediment trap must extend beyond the edge of the heater.

Connect the gas supply piping as follows (see **Figure 9**).

1. Make gas connection (refer to **Table 13** for gas connection sizes) at pipe nipple that extends outside cabinet using ground joint union.
2. Install manual shutoff valve upstream of unit control system. Manual shutoff valve's 1/8-inch plugged tapping provides connection for supply line pressure test gauge.
3. Install minimum 3-inch sediment trap (typically 6 inches).
4. Bleed trapped air from gas lines as needed.
5. Leak test all connections using leak detecting solution.

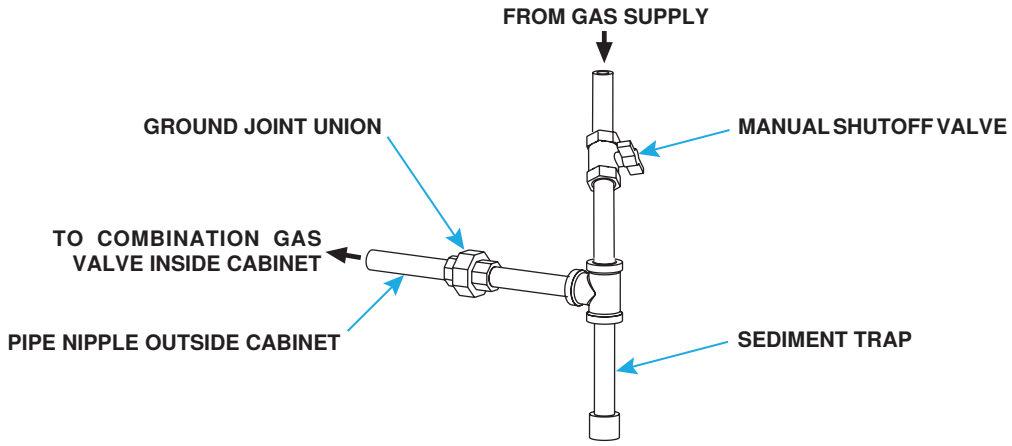


Figure 9. Gas Connections

Table 13. Gas Connection Sizes

Unit Size (MBTUh)	Natural Gas	Propane
	Connection (Inches)*	
130, 180	1/2	1/2
260, 310	3/4	3/4

*Connection size for a standard unit (not gas supply line size).

Vent Connections

NOTE: IMPORTANT: For unit sizes 55, 85, and 110, install the venting system in accordance with the venting system manufacturer's instructions. For unit sizes 130, 180, 260, and 310, install the venting system in accordance with the following paragraphs.

Concentric Adapter Box Connections

- The concentric adapter box is included in the vent/combustion air kit, which is ordered with the heater.
- A horizontal terminal vent/combustion air kit is option CC6; a vertical terminal vent/combustion air kit is option CC2. The concentric adapter box is included in both the horizontal and vertical vent/combustion air kits. Installation is included in the instructions for options CC6 and CC2.
- The concentric adapter box is shown **Figure 10**. Dimensions and connections are shown in **Figure 11**.

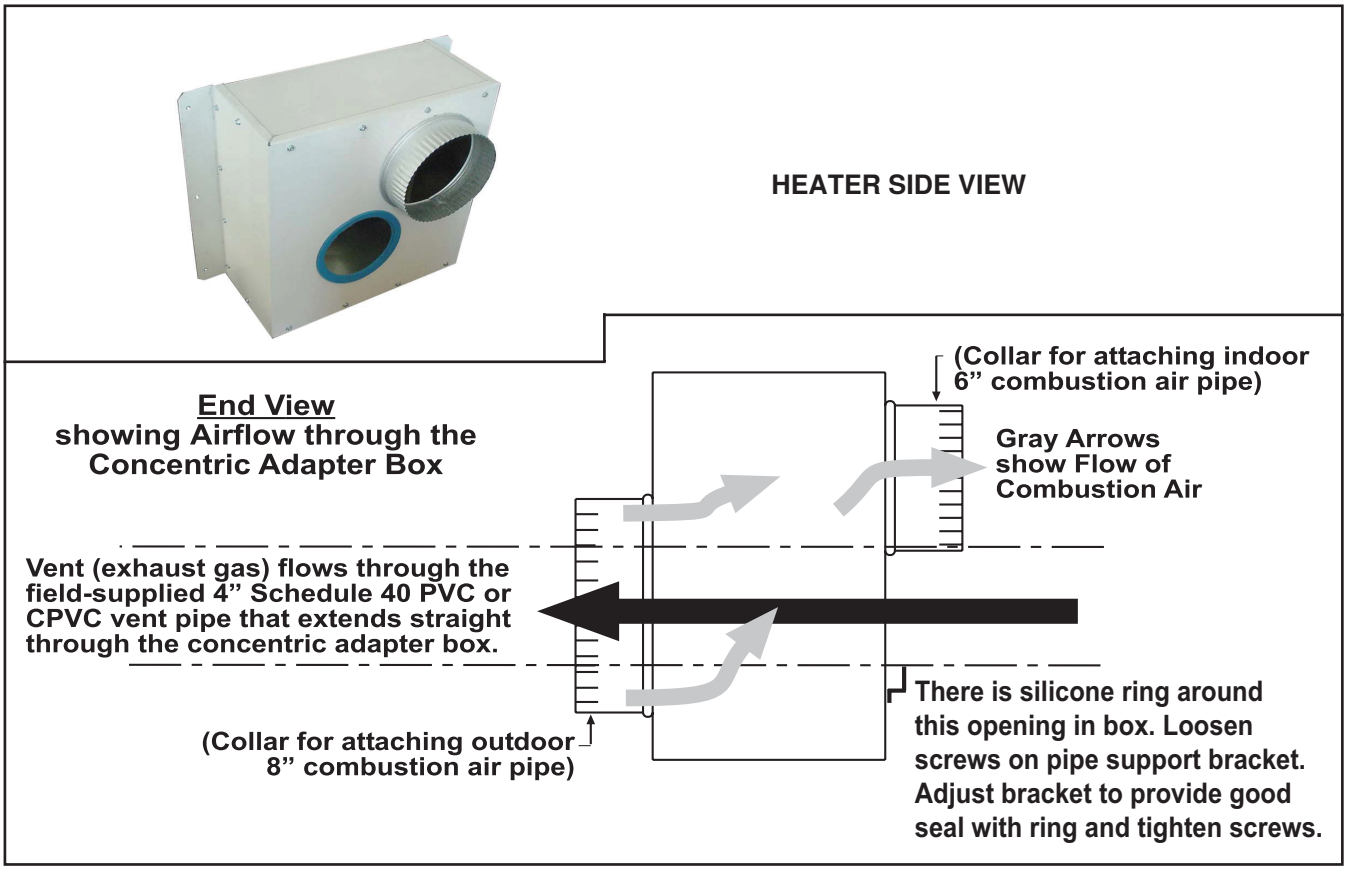


Figure 10. Concentric Adapter Box

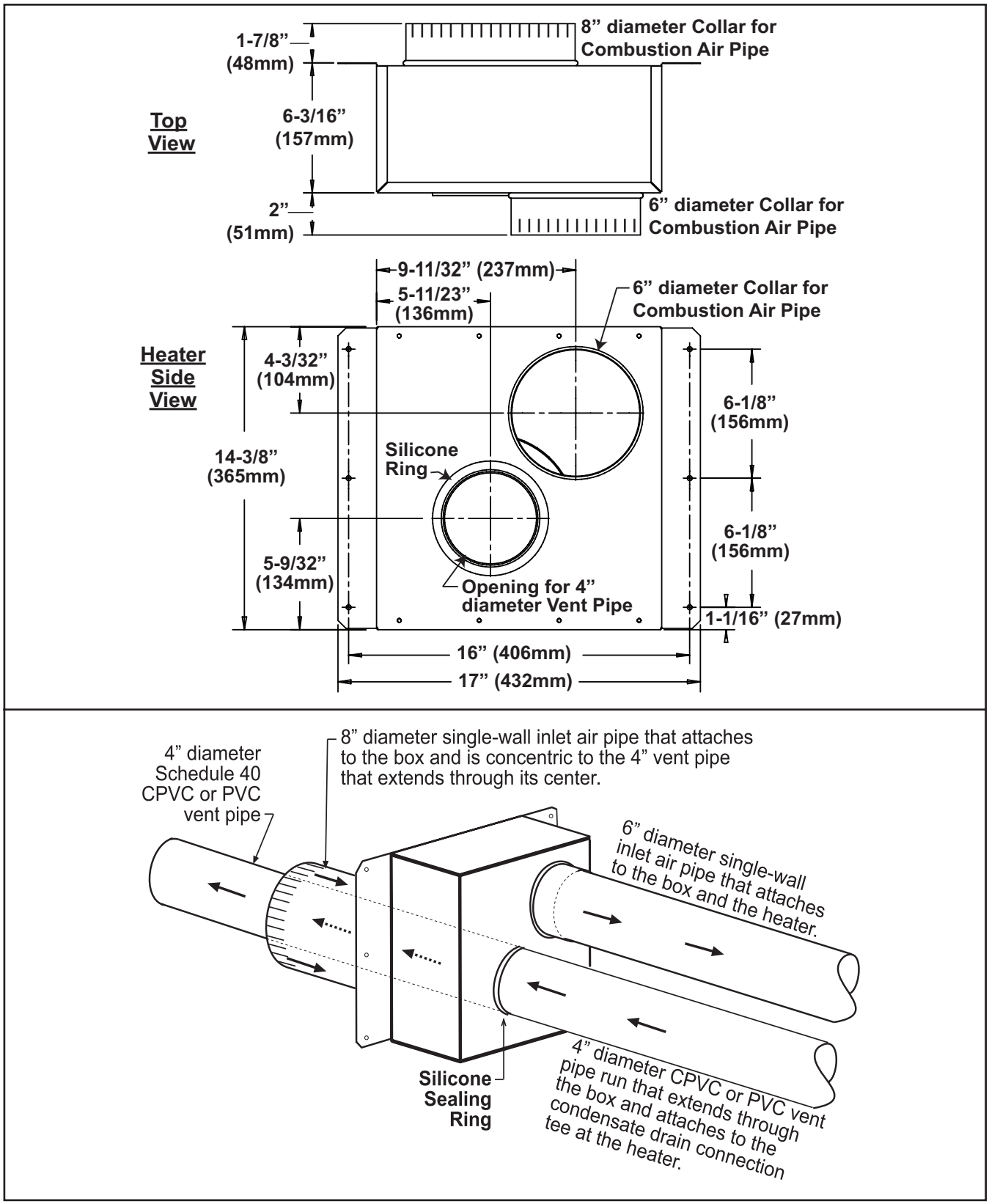


Figure 11. Concentric Adapter Box Dimensions and Connections

Vent Connections—Continued

Vent Terminal Options

Vent terminal options CC2 (vertical vent configuration) and CC6 (horizontal vent configuration) are shown in **Figure 12**.

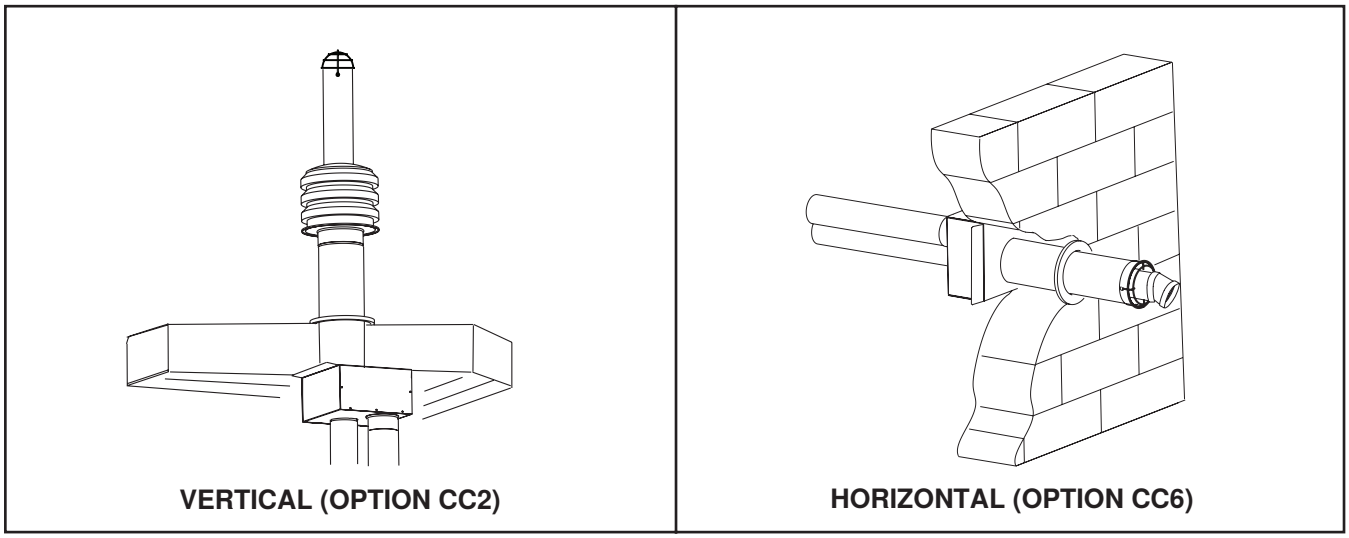


Figure 12. Vent Terminal Options

Vertical Vent Terminal (Option CC2) Installation

- Field-supplied components required for installation of the vertical vent kit are as follows:
  a. Vent and combustion air piping: 6- and 8-inch single-wall galvanized pipe
  b. Tapered vent pipe diameter reducers and/or increasers, as required
  c. Thimble (not required if wall is of non-combustible construction)
  d. Flashing
  e. Sheet metal screws, tape, and sealant, as required
- Factory-supplied components for installation of the vertical vent kit are listed in **Table 14** and shown in **Figure 13**.

Table 14. Vertical Vent Terminal/Combustion Air Package (Option CC2) Components

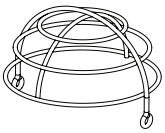
PN	Description	Quantity
221248	Kit package	1
221069	Concentric adapter box with silicone sealing ring (see **Figure 10** and **Figure 11**)	1
221185	Rain collar (see **Figure 13**)	1
221250	Combustion air inlet (see **Figure 13**)	1
221091	Cap, condensate drain connection, 4-inch PVC	1
221215	Bird guard (see **Figure 13**)	1
37661	Screw, self-drilling, #10-16 × 1/2, bird guard	2



RAIN COLLAR



COMBUSTION AIR INLET



BIRD GUARD

Figure 13. Option CC2 Components

- Install the vertical vent kit as follows:

⚠ DANGER ⚠

To prevent combustion products from entering the occupied space, all vent terminals must be positioned or located away from fresh air intakes, doors, and windows. Failure to comply could result in severe personal injury or death and/or property damage.

1. Determine vent terminal location on outside wall:
   a. If more than one vertical vent terminal is being installed, minimum spacing between vent center lines is determined by minimum outdoor design temperature (coldest outdoor condition at installation site). Refer to

Table 15. Minimum Spacing Between Center Lines of Vertical Vent Pipes

Minimum Outdoor Design Temperature	Minimum Spacing Between Center Lines of Vertical Vent Pipes (Inches (mm))
≥31°F (≥0°C)	36 (914)
−10 to 30°F (−23 to −1°C)	60 (1524)
< −10°F (< −23°C)	84 (2134)

   Table 15 to ensure that location complies with minimum outdoor design temperature requirements.
   b. Select location away from fresh air intakes, allowing space for concentric adapter box inside. Vent terminal must be located away from adjacent buildings as shown in **Figure 14**.
2. Install vent pipe and combustion air pipe runs:
   a. Connect piping to heater in accordance with specifications listed in **Vent/Combustion Air System Piping Requirements** section.
   b. Seal all joints in accordance with specifications listed in **Vent/Combustion Air System Piping Joints** section**.** Due to high temperature considerations, do not enclose exhaust pipe or place pipe closer than 6 inches (152 mm) to combustible material.
   c. Extend piping runs close to roof at location selected in step 1 and support piping in accordance with specifications listed in **Vent/Combustion Air System Piping Support** section.

NOTE: The vent pipe will extend through the roof after the concentric adapter box is installed. The indoor combustion air pipe will end at the box.

3. Cut hole through roof for combustion air pipe.
   a. Ensure that location and orientation of concentric adapter box are correct and mark and cut hole.
   b. Ensure that hole accommodates 8-inch (203-mm) combustion air pipe.

Vent Connections—Continued

Vertical Vent Terminal (Option CC2) Installation—Continued

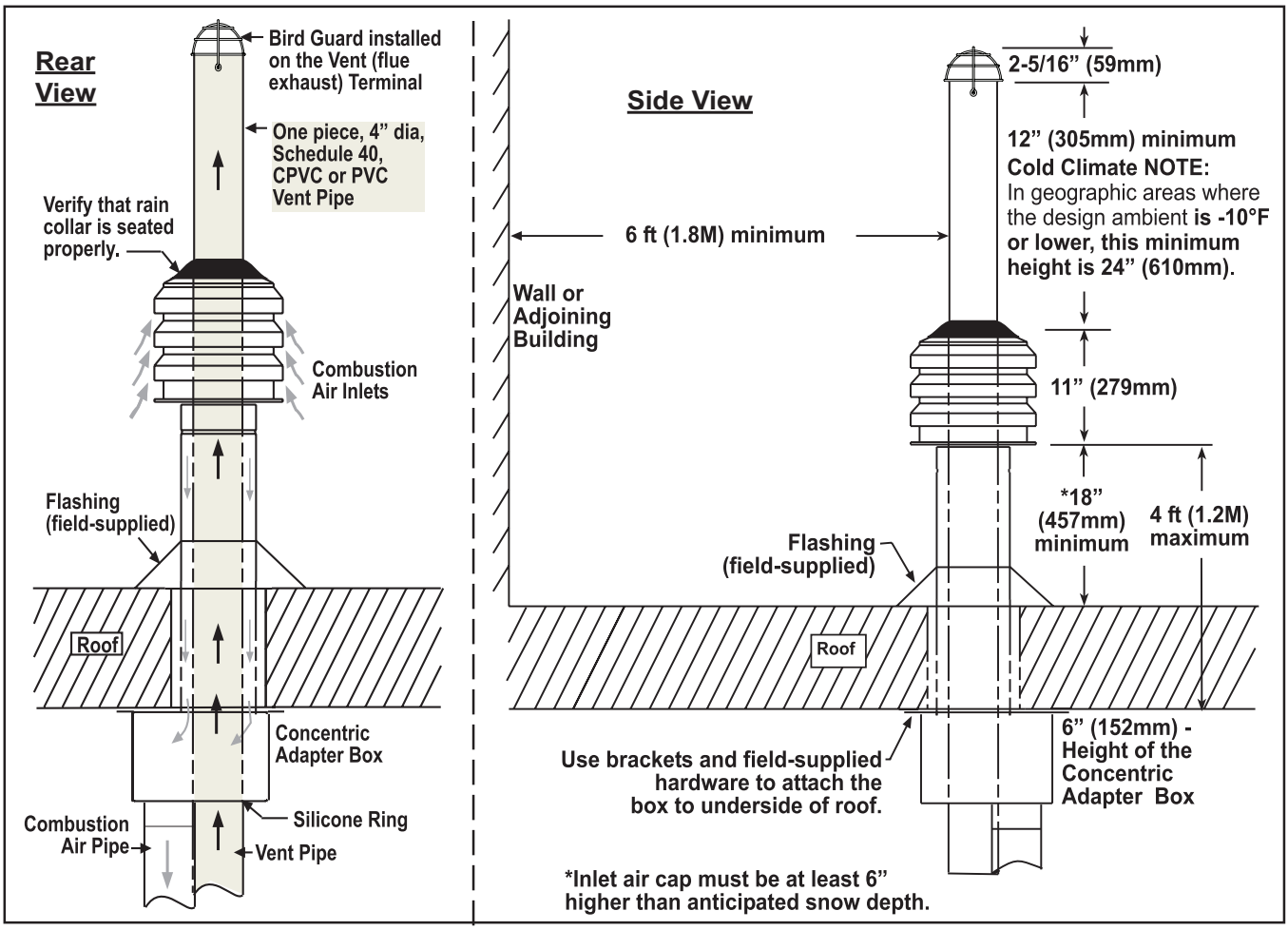


Figure 14. Option CC2 Installation

4. Connect combustion air pipe to concentric adapter box (see **Figure 15**):
   a. Determine length of combustion air pipe so that dimension X in **Figure 15** is equal to roof thickness plus anticipated snow depth. Ensure that length of combustion air pipe does not exceed 48 inches (1,219 mm) or does not extend *less than* 18 inches (457 mm) above roof.
   b. Secure inlet air pipe to collar of concentric adapter box using sheet metal screws. Seal joint and seam using tape or sealant.
5. Secure concentric adapter box to underside of roof (see **Figure 14**):
   a. Insert combustion air pipe through roof as shown in **Figure 15**, DETAIL A.
   b. Position concentric adapter box to match pipe runs and secure box to underside of roof using field-supplied hardware.

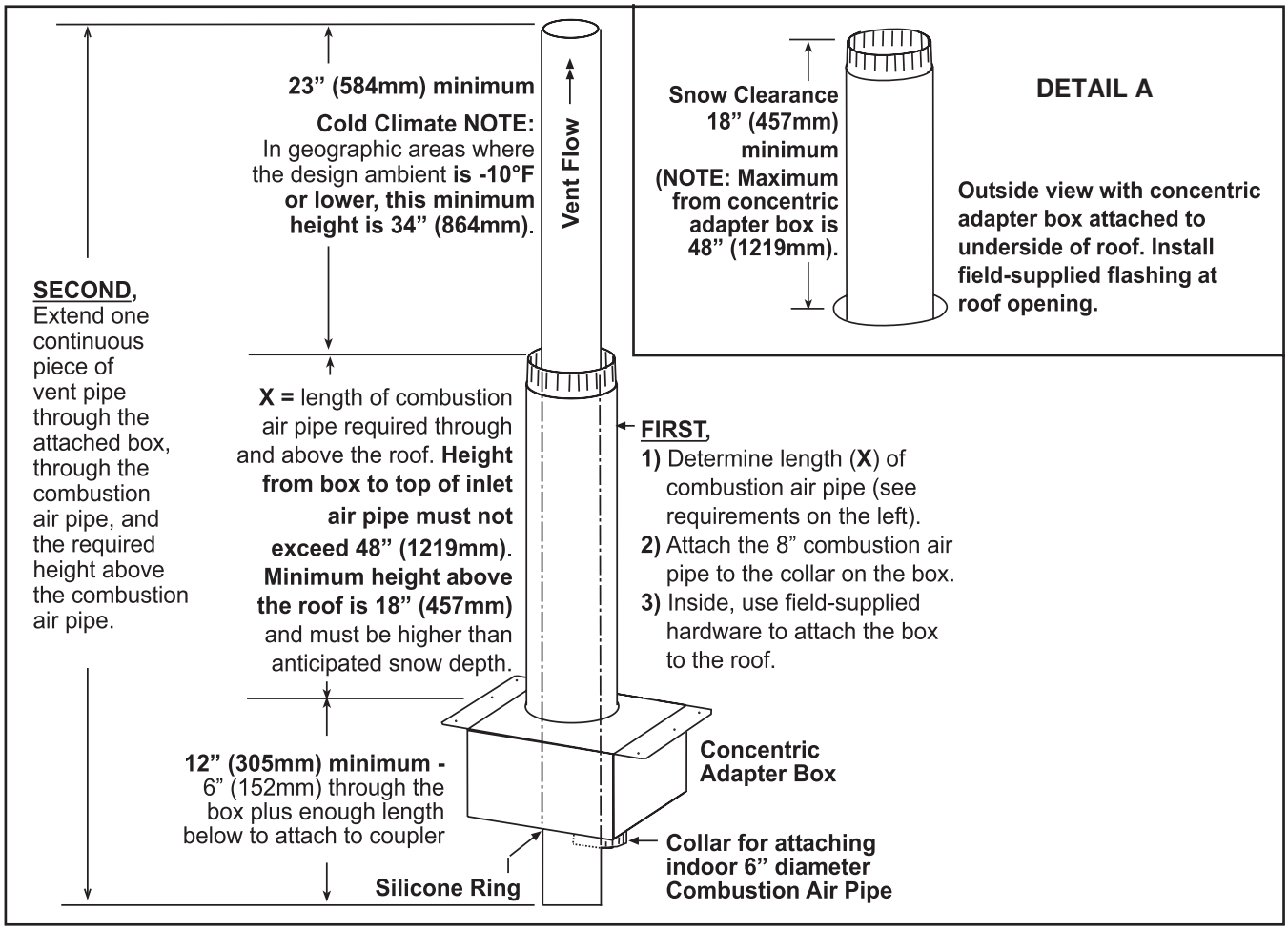


Figure 15. Combustion Air Pipe Installation

6. Install terminal-end vent pipe:

NOTE: The length of the terminal-end vent pipe is determined by the installation within maximum and minimum requirements. The vent pipe extending through the box, through the combustion air inlet pipe, and above the combustion air inlet air pipe must be one piece without joints.

   a. Refer to **Figure 15** to determine required length of continuous section of vent pipe. Determine length as follows: **1)** start with at least 6 inches (152 mm) below concentric adapter box for connecting to coupler, **2)** plus 6 inches (152 mm) through box, **3)** plus length of combustion air pipe, **4)** plus minimum of 23 inches (584 mm) beyond top of combustion air pipe—total is minimum length of vent pipe section.

NOTE: A longer vent pipe may be required.

   b. Ensure that vent pipe is in proper flow direction and slide end of pipe into box and out through combustion air pipe. Position vent pipe to lengths determined above.

   c. Ensure that silicone ring is seated properly and connect terminal vent pipe to vent pipe run.

   d. Recheck silicone ring to ensure that it is still properly seated.

7. Install indoor combustion air pipe:

   a. Secure single-wall combustion air pipe run to collar on concentric adapter box using field-supplied sheet metal screws.

   b. Seal pipe joint using tape or sealant.

Vent Connections—Continued

Vertical Vent Terminal (Option CC2) Installation—Continued

8. Install outdoor combustion air inlet, rain collar, bird screen, and field-supplied flashing (see **Figure 16**):
   a. Slide combustion air inlet over vent pipe and secure collar to combustion air pipe using sheet metal screws.
   b. Seal pipe joint using tape or sealant.
   c. To prevent rainwater leakage, slide rain collar over end of 4-inch vent pipe and seat it flush on top of combustion air inlet. Do not paint or use petroleum-based products on rain collar (silicone sealant is allowed).
   d. Install bird guard and secure using two sheet metal screws provided.
   e. Flash combustion air pipe on outside using field-supplied flashing.
9. Verify compliance with **Figure 14** and with all specifications listed in **VENTING AND COMBUSTION AIR REQUIREMENTS** and **Halogenated Hydrocarbons** sections.

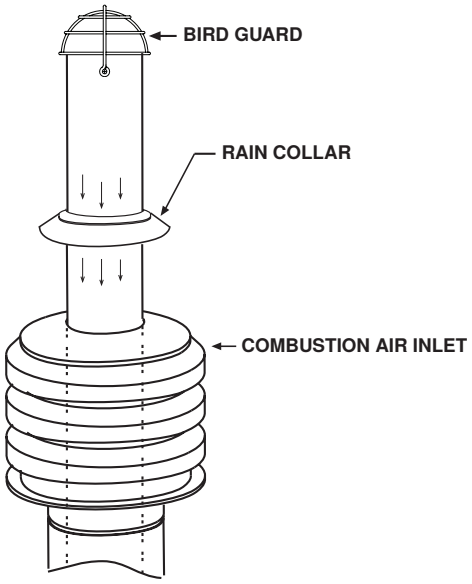
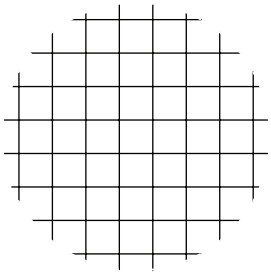


Figure 16. Combustion Air Inlet, Rain Collar, and Bird Guard

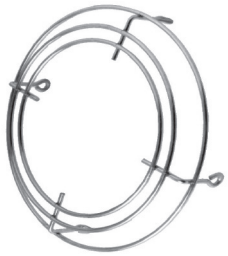
Horizontal Vent Terminal (Option CC6) Installation

- Field-supplied components required for installation of the horizontal vent kit are as follows:
  a. Vent and combustion air piping: 6- and 8-inch single-wall galvanized pipe
  b. 22.5-degree elbow (if available)
  c. Flashing
  d. Sheet metal screws, tape, and sealant, as required
- Factory-supplied components for installation of the horizontal vent kit are listed in **Table 16** and shown in **Figure 17**.

Table 16. Horizontal Vent Terminal/Combustion Air Package (Option CC6) Components		
PN	**Description**	**Quantity**
221247	Kit package	1
221069	Concentric adapter box with silicone sealing ring (see **Figure 10** and **Figure 11**)	1
221089	Bird screen, exhaust outlet (see **Figure 17**)	1
124940	Ring guard, air inlet (see **Figure 17**)	1
221186	Spacer, inlet air guard	4
37661	Screw, self-drilling, #10-16 × 1/2, inlet air guard	4
221091	Cap, condensate drain connection, 4-inch PVC	1



BIRD SCREEN



RING GUARD

Figure 17. Option CC6 Components

- Install the horizontal vent kit as follows:

⚠ DANGER ⚠

- **To prevent combustion products from entering the occupied space, all vent terminals must be positioned or located away from fresh air intakes, doors, and windows. Failure to comply could result in severe personal injury or death and/or property damage.**
- **In climates with below freezing temperatures, condensate may form icicles on the vent terminal. Locate the terminal where falling icicles do not present a hazard.**
- **Consider local snow depth conditions. The vent must be at least 6 inches (152 mm) above the anticipated snow depth.**

1. Determine vent/combustion air terminal location on outside wall:
   a. Refer to **Table 7** and **Table 8** or **Table 9** and **Table 10** to ensure that location complies with vent length requirements.
   b. For most applications, ensure that vent terminal is level with heater mounting height.
   c. Allow downward pitch of 1/4-inch per foot (6 mm per 305 mm) for condensate drain.

NOTE: Local codes supersede all provisions in these instructions and in the *National Fuel Gas Code* (ANSI Z223.1).

⚠ WARNING ⚠

Avoid positioning the vent terminal above a walkway as there may be a small amount of condensate that drips from the end of the vent/combustion air terminal. In cold climates, the condensate may form icicles.

   d. Ensure that distance of vent terminal from adjacent public walkways and buildings and window and building openings complies with local codes. Absent any local codes, distance must comply with *National Fuel Gas Code* (ANSI Z223.1).

Vent Connections—Continued

Horizontal Vent Terminal (Option CC6) Installation—Continued

⚠ CAUTION ⚠

Products of combustion can cause discoloration of some building finishes and deterioration of masonry materials. A clear silicone sealant normally used to protect concrete driveways may be used to protect masonry materials from discoloration and deterioration. If discoloration is an esthetic problem relocate the vent or install a vertical vent.

e. Refer to **Table 17** to ensure that location complies with minimum clearance requirements.

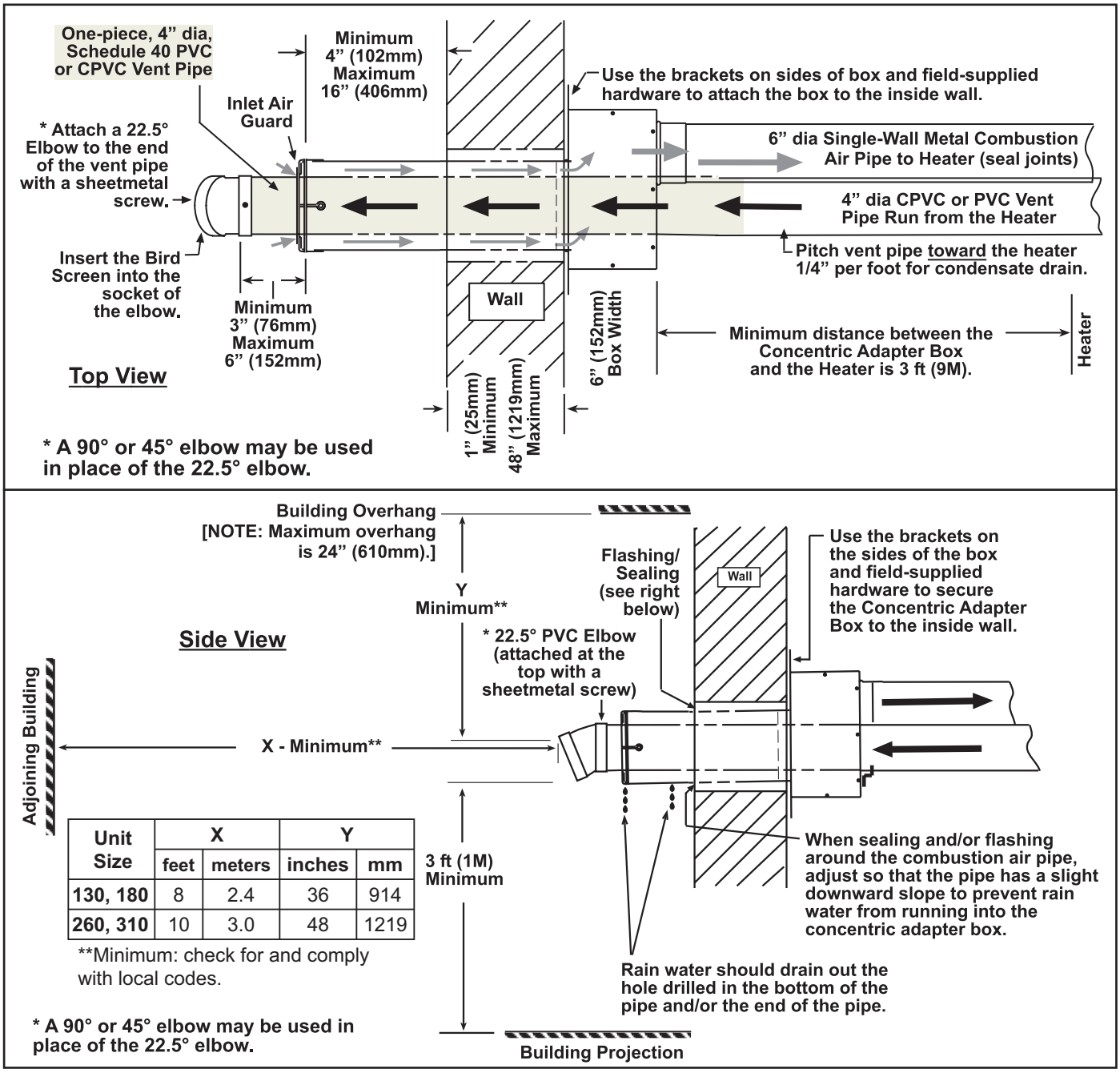
Table 17. Minimum Clearance Requirements for Horizontal Vent Termination Location

Component/Structure	Minimum Clearance, All Directions Unless Specified (Feet (Meters))
Forced air inlet within 10 feet (3.1 meters)*	3 (0.9) above
Combustion air inlet of another appliance	6 (1.8)
Mechanical air supply inlet to any building	Canada: 6 (1.8)
Any building opening (door, window, or gravity air inlet)	4 (1.2) horizontal and below
	1 (0.3) above
Gas meter,** electric meter, and relief equipment	US: 4 (1.2) horizontal
	Canada: 6 (1.8) horizontal
Gas regulator**	US: 3 (0.9) horizontal
	Canada: 6 (1.8) horizontal
Adjoining building or parapet	6 (1.8)
Adjacent public walkway	7 (2.1) above
Grade (ground level)	3 (0.9) above
*Does not apply to the inlet of a direct vent appliance.	
**Do not terminate the vent directly above a gas meter or service regulator.	

2. Install vent pipe and combustion air pipe runs:
   a. Connect piping to heater in accordance with specifications listed in **Vent/Combustion Air System Piping Requirements** section.
   b. Seal all joints in accordance with specifications listed in **Vent/Combustion Air System Piping Joints** section. Due to high temperature considerations, do not enclose exhaust pipe or place pipe closer than 6 inches (152 mm) to combustible material.
   c. Extend piping runs close to wall at location selected in step 1 and support piping in accordance with specifications listed in **Vent/Combustion Air System Piping Support** section.

NOTE: The vent pipe will extend through the wall after the concentric adapter box is installed. The indoor combustion air pipe will end at the concentric adapter box.

3. Cut hole through outside wall for combustion air pipe.
   a. Ensure that outside wall construction thickness is between 1 inch (25 mm) minimum and 48 inches (1,219 mm) maximum.
   b. Ensure that hole accommodates 8-inch (203-mm) combustion air pipe.
4. Connect concentric adapter box (see **Figure 18**):
   a. Determine length of combustion air pipe by measuring wall thickness plus 4–16 inches (102–406 mm) beyond minus width of pipe crimp that will be cut off.
   b. Cut crimp off end of combustion air pipe so that 8-inch inlet air guard will fit properly.
   c. Turn combustion air pipe so that is toward top side of concentric adapter box and slide it on collar.
   d. Secure combustion air pipe to collar using sheet metal screws and seal joint and seam using sealant or tape.



Unit Size	X		Y	
	feet	meters	inches	mm
130, 180	8	2.4	36	914
260, 310	10	3.0	48	1219

Figure 18. Option CC6 Installation

5. Drill drain hole:
   a. Mark location on bottom side of pipe that will be outside between end of pipe and building—about 2/3 of distance from end of pipe to edge of building—when concentric adapter box is installed.
   b. Drill 1/2-inch diameter drain hole at location marked in step 5a.
6. Install air inlet ring guard:
   a. Position inlet air ring guard over end of combustion air pipe in accordance with **Figure 18**.
   b. Secure inlet air ring guard to inlet air pipe using four 1/2-inch-long screws provided.

Vent Connections—Continued

Horizontal Vent Terminal (Option CC6) Installation—Continued

7. Secure concentric adapter box to the wall:
   a. Insert combustion air pipe with inlet guard attached out through wall.
   b. Position concentric adapter box so that pipe is centered in opening and secure box brackets to wall using field-supplied hardware.
8. Install terminal-end vent pipe:

NOTE: The length of the continuous piece of terminal-end vent pipe is determined by the installation within maximum and minimum requirements. The vent pipe extending through the box and through the combustion air inlet pipe must be one piece without joints.

   a. Refer to **Figure 18** to determine lengths of each pipe segment and to calculate total length required.
   b. Ensure that terminal-end vent pipe is in proper flow direction and temporarily fit elbow pointing down on exhaust end of vent pipe.

NOTE: For easier future service, the elbow is secured to the vent pipe using one field-provided 3/4-inch-long sheet metal screw.

   c. Drill hole through top center of elbow socket and vent pipe using drill bit one size smaller than 3/4-inch-long sheet metal screw. Remove elbow and enlarge drilled hole in elbow to 7/32 inch.
   d. Turn vent pipe so that drilled hole is at top and slide end of pipe out through concentric adapter box and combustion air pipe.
   e. Position vent pipe so that it extends 3–6 inches (76–152 mm) past end of combustion air pipe. Turn pipe so that screw hole is in top center.
   f. Ensure that silicone sealing ring on concentric adapter box is properly seated. Do not add sealant to ring.
   g. Connect terminal-end vent pipe to vent pipe run and recheck sealing ring to ensure that it is still properly seated.
9. Install indoor section of combustion air pipe:
   a. Secure single-wall combustion air pipe run to collar on concentric adapter box using sheet metal screws.
   b. Seal pipe joint using tape or sealant.
10. Install inlet air guard spacers, elbow, and bird screen on outdoor section of combustion air pipe:
   a. Remove inlet air ring guard screws installed in step 6b. Slide spacers onto ends of four spokes that support vent pipe. Re-install guard and secure using screws.
   b. Slide elbow pointing down on end of pipe, align hole drilled in step 8c, and secure elbow using field-supplied 3/4-inch-long sheet metal screw.
   c. Insert bird screen into socket on open end of elbow.
11. Seal or flash around combustion air pipe:
   a. Seal around combustion air pipe using an outdoor caulking material, masonry cement, or combination of flashing and caulking.
   b. Adjust sealant and pipe so that pipe has slight downward slope to outside. Downward slope and drain hole drilled in step 5b prevents rain water from running through pipe into concentric adapter box.
12. Verify compliance with **Figure 18** and with all specifications listed in **VENTING AND COMBUSTION AIR REQUIREMENTS** and **Halogenated Hydrocarbons** sections.

Condensate Drain Installation

⚠ DANGER ⚠

If the difference in the lengths of the legs of the traps is not as specified it could prevent proper drainage of the condensate and possibly permit vent gas to enter the building. Note that the length difference is also what provides a water seal to prevent the leakage of vent gas into the sanitary drain.

⚠ CAUTION ⚠

- **Because condensate is produced both in the heater and in the venting system, the installation requires a condensate drain from the vent pipe and from the secondary heat exchanger.**
- **In Canada, all PVC vent pipe must be approved to ULC S636.**
- **Apply general plumbing practices if pipe insulation or heat tapes are required to prevent freezing of the condensate drain system.**

NOTE: Each condensate drain must include a drain trap. The most important part of fabricating and assembling the drain traps is the length of the individual legs of the traps. Downstream from the traps, the condensate drains may be joined and both must be connected to a common pipe that is connected to a sanitary drain within the building. Check codes to ensure that this is permitted.

- Condensate from the heater has a pH of 6 and is not harmful to a sanitary drain. Actual pH may vary ±1 depending on fuel and combustion air.
- Unit sizes 55, 85, and 110 produce approximately 1/2 gallon (2 liters) of condensate per hour. Unit sizes 130 and 180 produce approximately 1 gallon (4 liters) of condensate per hour. Unit sizes 260 and 310 produce approximately 2 gallons (8 liters) of condensate per hour.
- A condensate disposal system that relies on gravity should be satisfactory for most installations as unit heaters are normally installed several feet above the floor. If a gravity system is not possible, a condensate pump may be installed. There are a number of commercially-available pumps made for this purpose. If using a condensate pump, follow the pump manufacturer's installation recommendations.
- The orientation of the piping is not critical and may be arranged to suit the installation. Unions are recommended to permit maintenance of the drains and to facilitate service of the heater. A union is shown in both of the traps and a third union is recommended in the drain pipe. If pipe insulation or heat tapes are required to prevent freezing, use should be in accordance with general accepted plumbing practices.

Vent Condensate Drain Installation

1. Install vent condensate drain on unit sizes 55–110 using PVC cleanout cap/trap assembly provided with heater (see **Figure 19**):
   a. Connect field-supplied PVC tee to 2-inch vent outlet on back of heater.
   b. Connect 2-inch PVC cleanout cap to tee.
   c. Connect field-supplied condensate drain hose to cap.

Condensate Drain Installation—Continued

Vent Condensate Drain Installation—Continued

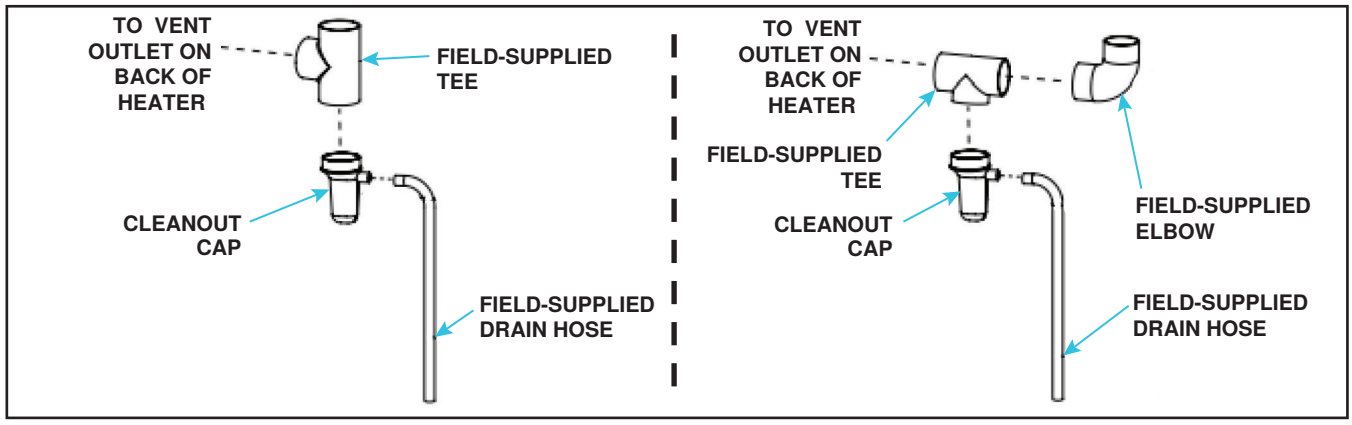


Figure 19. Installing Condensate Drain (Unit Sizes 55–110)

2. For vertical vent, install vent condensate drain on unit sizes 130–310 (see **Figure 20**):
   a. Connect field-supplied 4-inch coupling to 4-inch vent outlet on back of heater. Ensure that coupling slopes downward away from heater.
   b. Connect 4-inch diameter vent pipe—12-inch (305-mm) minimum length, 24-inch (610-mm) maximum length—to coupling.
   c. For US installations only (see **Figure 20**, DETAIL A):
      (1) Connect field-supplied 4 × 4 × 4 PVC tee to vent pipe.
      (2) Connect PVC cap included in option CC2 to tee. Cap is drilled and tapped for 1/2-inch NPT drain connection.
      (3) Connect field-supplied condensate drain to cap.
   d. For US or Canadian installations (see **Figure 20**, DETAIL B):
      (1) Connect field-supplied PVC tee to vent pipe.
      (2) Connect field-supplied fitting(s) to tee as needed for 1/2-inch or larger condensate drain line.

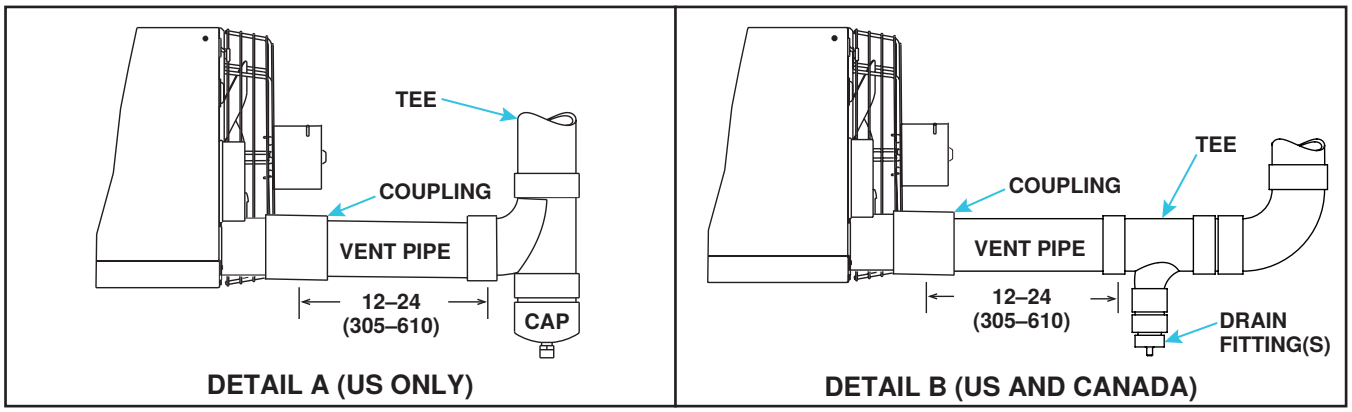


Figure 20. Installing Condensate Drain in Vertical Vent (Unit Sizes 130–310)

3. For horizontal or vertical vent, install vent condensate drain on unit sizes 130–310 (see **Figure 21**):
   a. For US installations only (see **Figure 21**, DETAIL A):
      (1) Connect field-supplied 4 × 4 × 4 PVC tee to 4-inch vent outlet on back of heater.

(2) Connect PVC cap included in option CC2 or CC6 to tee. Cap is drilled and tapped for 1/2-inch NPT drain connection.

(3) Connect field-supplied condensate drain to cap. Balance of vent may be either horizontal or vertical. Ensure that horizontal vent slopes downward toward drain.

b. For US or Canadian installations (see **Figure 21**, DETAIL B):

(1) Connect field-supplied PVC tee to 4-inch vent outlet on back of heater.

(2) Connect field-supplied fitting(s) to tee as needed for 1/2-inch or larger condensate drain line. Balance of vent may be either horizontal or vertical. Ensure that horizontal vent slopes downward toward drain.

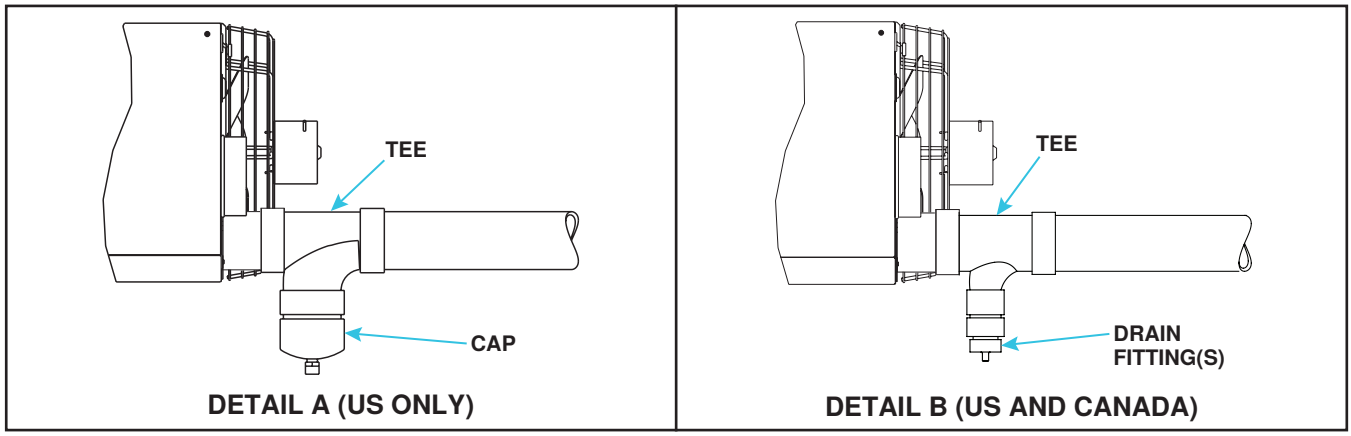


Figure 21. Installing Condensate Drain in Vertical or Horizontal Vent (Unit Sizes 130–310)

4. Install drain trap in accordance with **Figure 22**.

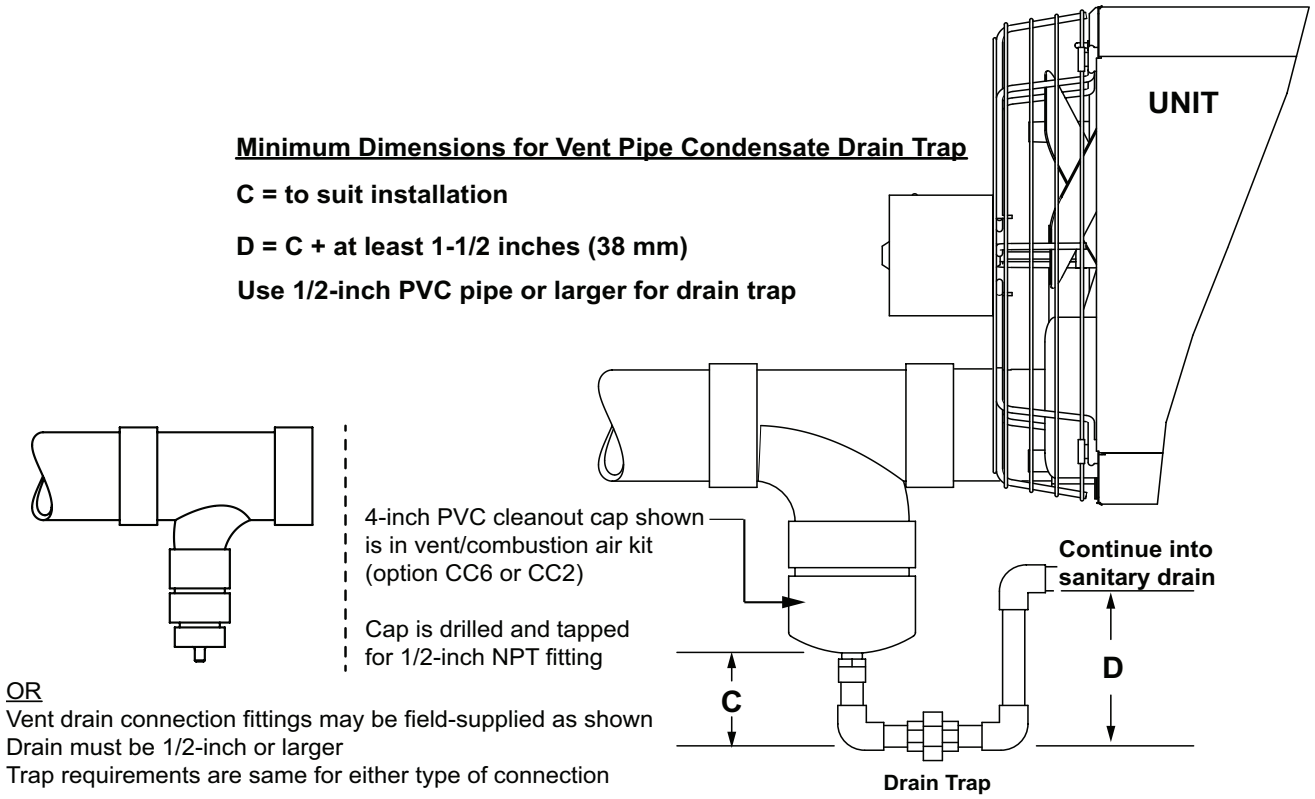


Figure 22. Vent Condensate Drain Trap

Condensate Drain Installation—Continued

Heat Exchanger Condensate Drain Installation

NOTE: The heat exchanger condensate drain connection on unit sizes 55–110 is a 1/2-inch vinyl hose connection. The connection on unit sizes 130–310 is 1/2-inch PVC.

Install the heat exchanger condensate drain in accordance with all piping requirements listed in this manual and with **Figure 23**. For drain kit components and installation instructions for replacement heat exchangers, refer to the replacement parts manual found at **www.reznorhvac.com**.

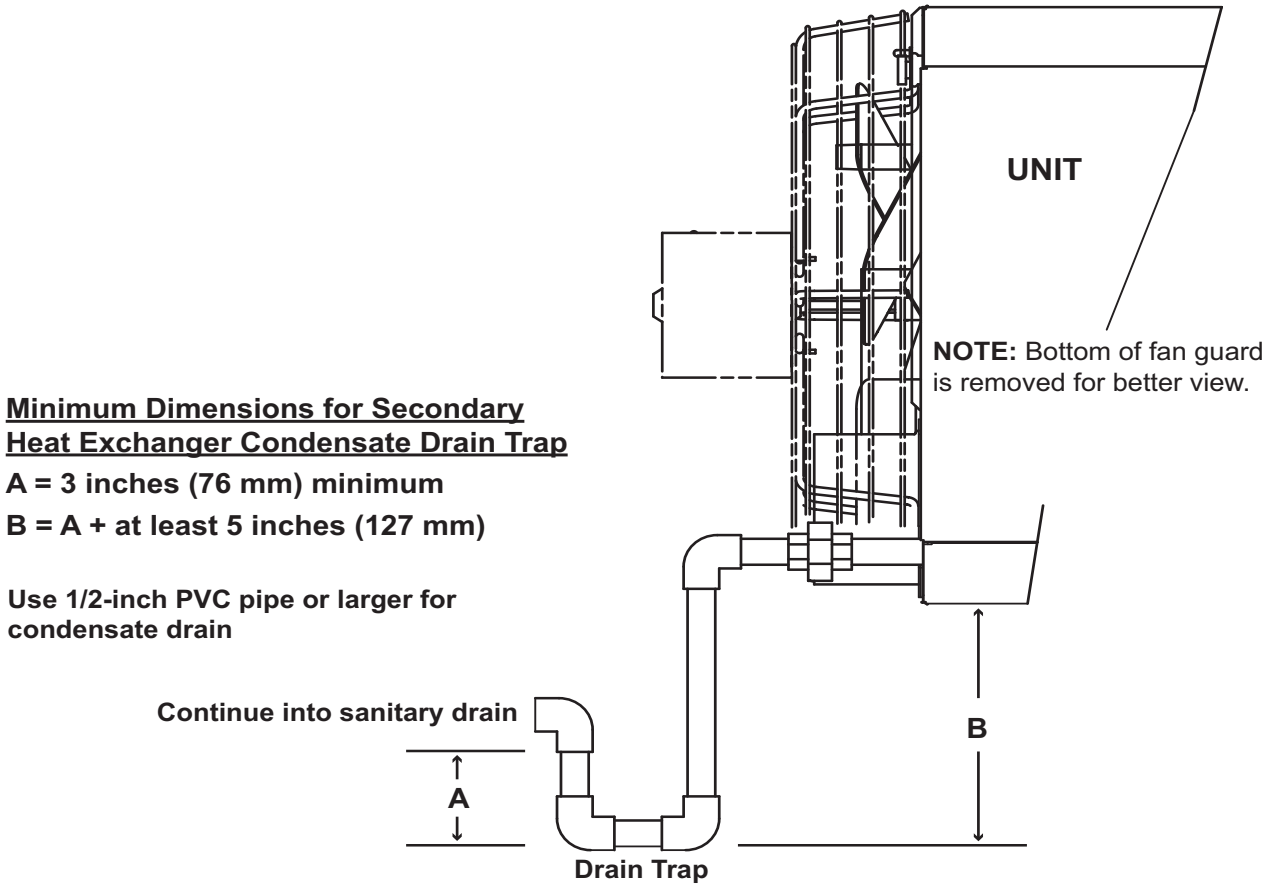


Figure 23. Heat Exchanger Condensate Drain Trap

Electrical Connections

⚠ CAUTION ⚠

- **All electrical wiring and connections, including electrical grounding MUST be made in accordance with the *National Electric Code* (ANSI/NFPA No. 70, latest edition) or, in Canada, the *Canadian Electric Code* (Part 1, CSA C.22.1). In addition, the installer should be aware of any local ordinances or gas company requirements that might apply.**
- **Route wires so that they do not contact the flue wrapper or venter housing.**
- **If any of the original wire supplied with the appliance must be replaced, it must be replaced with wiring material having a temperature rating of at least 220°F (105°C), except for limit control, flame rollout, and sensor lead wires which must be rated at 302°F (150°C).**

NOTES:

- **Ensure that all wiring is in accordance with the wiring diagram provided with the unit.**
- **A two-stage valve circuit is NOT available on all models.**

- If the installation requires a stepdown transformer (option CG), follow the instructions shipped with the option package for installing the transformer.
- The unit includes a built-in disconnect switch (20A@115V or 10A@230V rating).

Supply Wiring Connection

⚠ CAUTION ⚠

- **Check the rating plate on the heater for the supply voltage and current requirements.**
- **A dedicated line voltage supply with a disconnect switch MUST BE run directly from the main electrical panel to the heater.**
- **All external wiring MUST BE within approved conduit and have a minimum temperature rise rating of 140°F (60°C). Conduit MUST BE run so as not to interfere with the heater access panel.**

The supply wiring enters at the rear of the heater, as shown in **Figure 24**. Supply wiring connects to leads located inside a sealed electrical box. To maintain the sealing feature of the electrical box, always replace the cover plate.

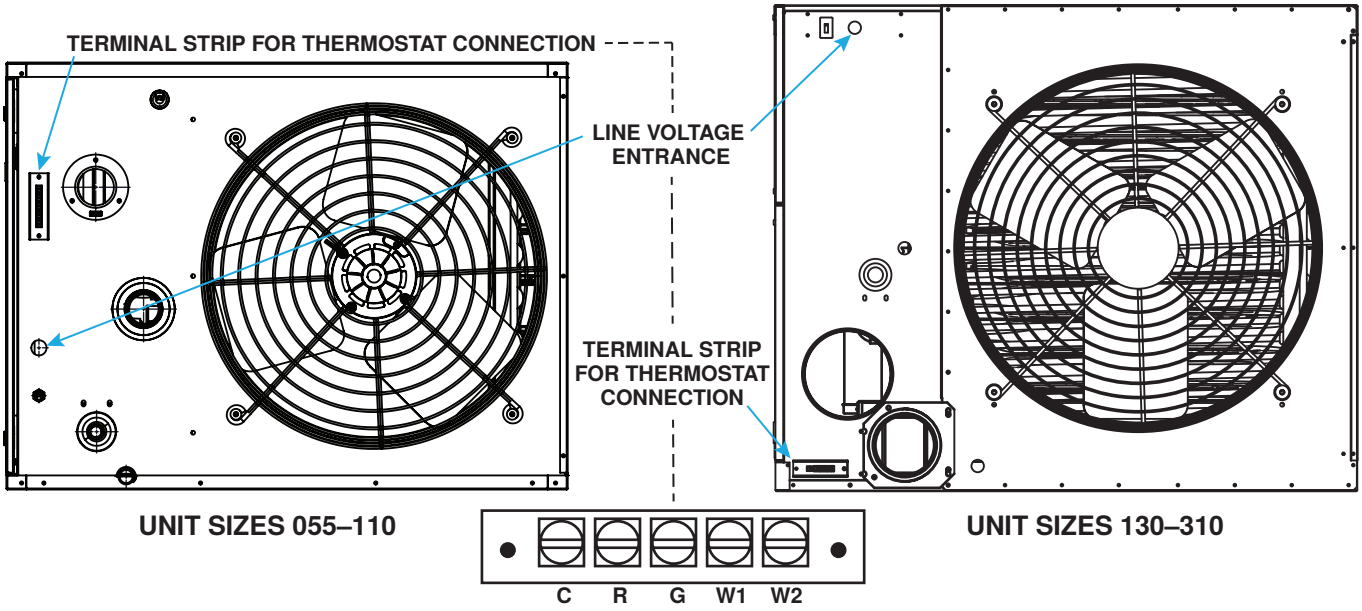


Figure 24. Supply Wiring Entrance and Control Connection Terminal Strip

Electrical Connections—Continued

Control Connections

- The terminal strip for the 24V thermostat connections is located on the outside of the cabinet at the back of the heater, as shown in **Figure 24**. The strip has five terminals: C, R, G, W1, and W2. Refer to the wiring diagram provided with the heater.Wires from the terminal strip are factory-wired to the circuit board.
- If the heater was ordered with a multiple heater control option, one thermostat can be used to control up to five heaters. This option includes a 40VA transformer that replaces the standard transformer in the control unit and a relay assembly that attaches to the additional unit. Option CL31 provides for control of two heaters. If control of additional heaters is desired (up to five total), option CL32, which is the relay assembly only, must be added to each additional heater. The option packages are shipped separately and include complete instructions on installation and wiring.

Circuit Board Connection

- The circuit board (see **Figure 25**) is located inside on the bottom of the control compartment. The circuit board is polarity sensitive. It is advisable to check the electrical supply to ensure that the black wire is the ***hot*** wire and that the white wire is the ***neutral*** wire. The ***hot*** wire must be connected to terminal L1 on the circuit board.

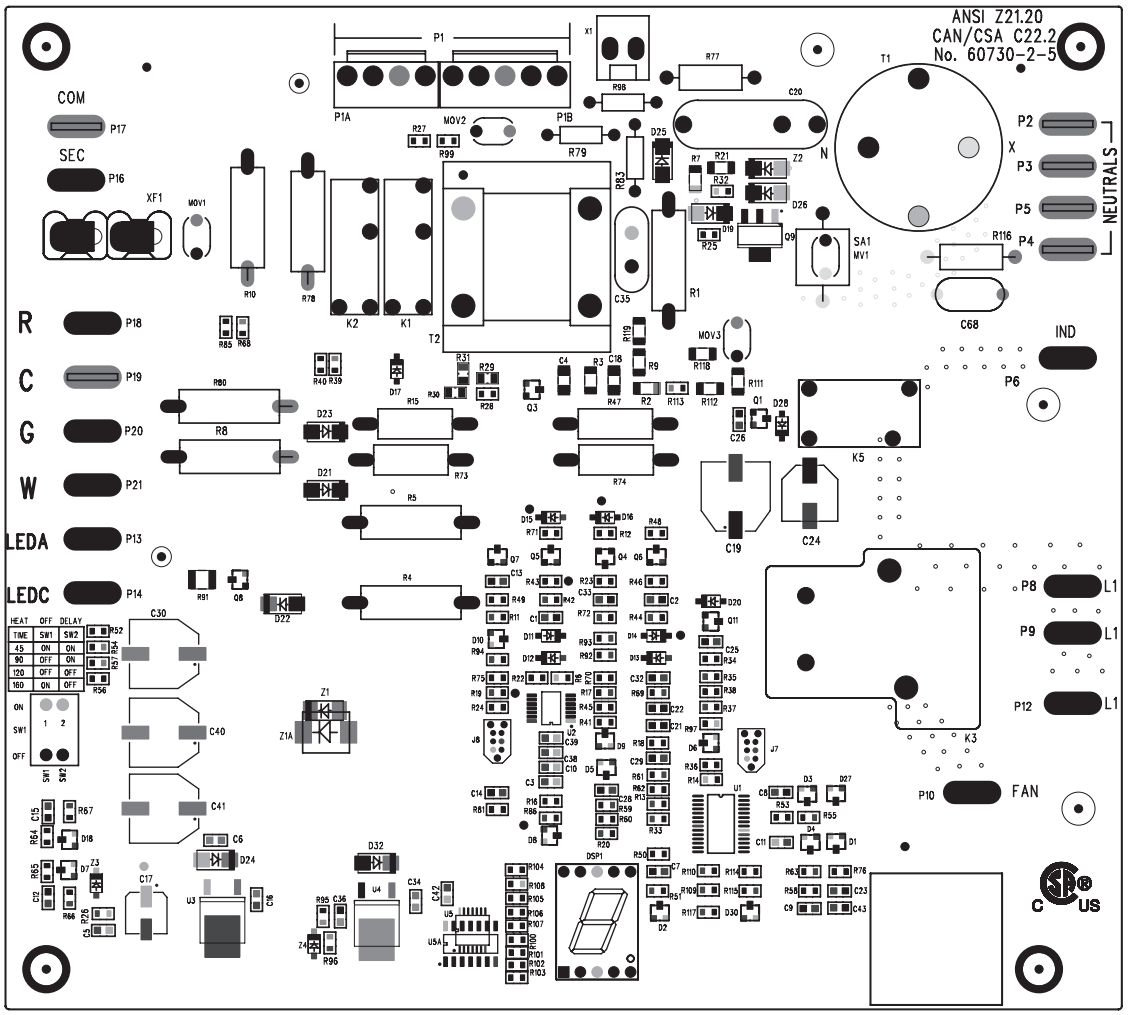
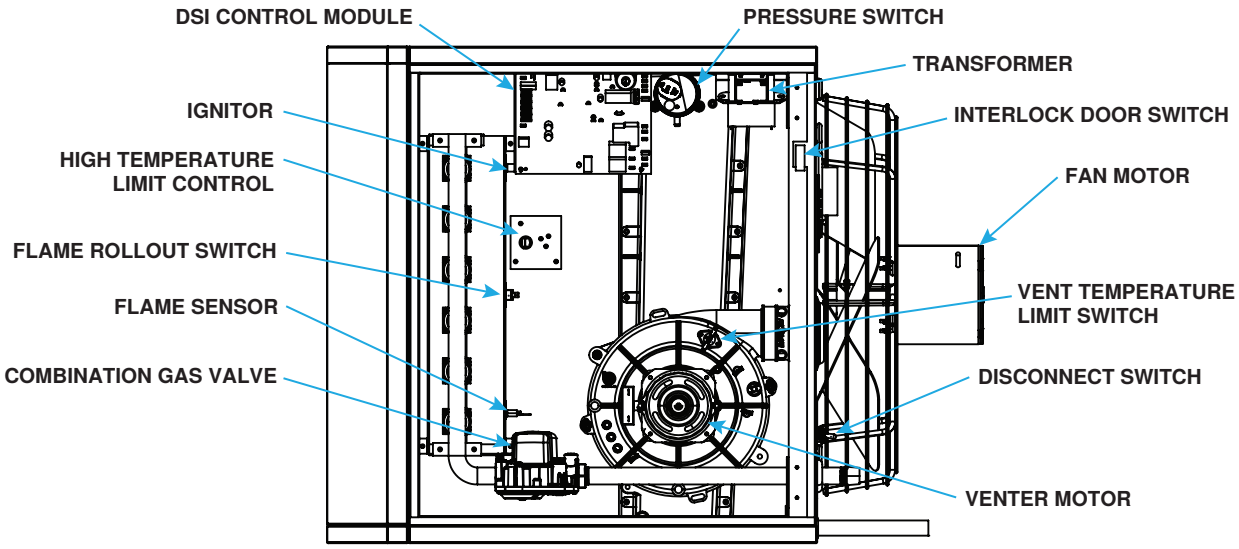
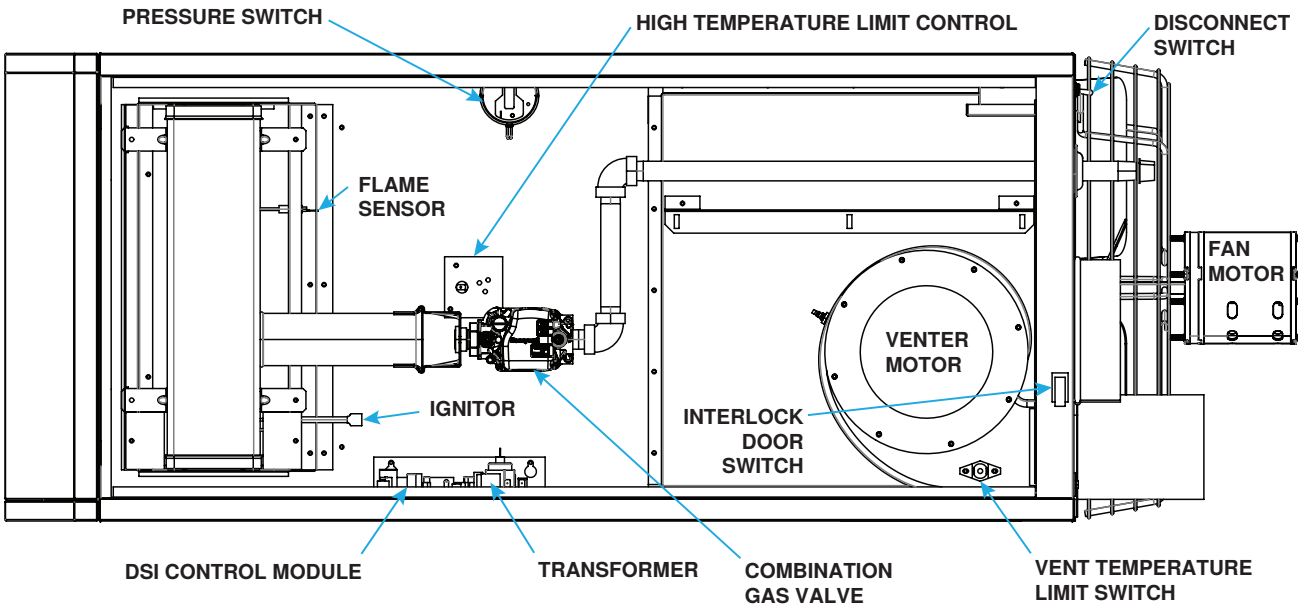


Figure 25. Circuit Board (DSI Control Module)

NOTE: Refer to the TROUBLESHOOTING section for probable causes and reset instructions for the following controls.



UNIT SIZES 055–110



UNIT SIZES 130–310

Figure 26. Component Locations

Thermostat

NOTE: IMPORTANT: all units MUST be operated by a 24V thermostat. Never use a line voltage disconnect switch as a means of operating the heater. For all availaible thermostat and thermostat accessory options, contact contact an authorized Factory Distributor.

- The unit may be controlled by a thermostat—either an optional thermostat (refer to **Table 11**) or a field-supplied 24V thermostat that must be field-installed in accordance with the thermostat manufacturer's instructions. Pay particular attention to the requirements regarding the location of the thermostat. In accordance with the wiring diagram provided with the unit, connect the thermostat at the 24V control wiring terminal strip on the back of the unit (refer to **Control Connections** section).
- Ensure that if there is a heat anticipator setting on the thermostat, it is set at 0.6 amps or in accordance with the amperage value noted on the heater wiring diagram.

Combination Gas Valve

⚠ WARNING ⚠

The combination gas valve is the prime safety shutoff. All gas supply lines must be free of dirt or scale before connecting the unit to ensure positive closure.

The combination gas valve (see **Figure 26** for location) is powered by the 24V control circuit through the thermostat and safety controls. The diaphragm-type valve is pre-set at the factory and provides regulated gas flow.

Interlock Door Switch

All units are equipped with an interlock door switch (see **Figure 26** for location) that prevents the heater from operating when the service door panel is open. The service panel is equipped with a pliable gasket that fully seals the door to provide added protection to prevent building air from entering the combustion zone of the heater.

Pressure Switch

⚠ DANGER ⚠

Safe operation of this unit requires proper venting flow. NEVER bypass the pressure switch or attempt to operate the unit without the venter running and the proper flow in the vent system. Hazardous conditions could result.

- The pressure (combustion air proving) switch (see **Figure 26** for location) is a pressure-sensitive switch that monitors air pressure to ensure that proper combustion airflow is available.
- The pressure switch senses the differential pressure between the negative pressure in the venter housing and the pressure in the cabinet.
- At startup when the heater is cold, the sensing pressure is at the most negative level, and as the heater and vent system warm up, the sensing pressure becomes less negative. After the system has reached equilibrium (about 20 minutes), the sensing pressure levels off.
- If a restriction or excessive vent length/turns cause the sensing pressure to be outside the pressure switch setpoint, the switch will function to shut off the main burner. The main burner will remain off until the system has cooled and/or the flue system resistance is reduced.
- Pressure switch settings are listed in **Table 18**.

Table 18. Pressure Switch Settings					
Unit Size	Negative Pressure (IN WC)				Label Color
	Startup Cold	Equilibrium Hot	Setpoint OFF	Setpoint ON	
55	1.90	1.60	0.60	0.75	Purple
85	1.80	1.30	0.60	0.75	
110	1.15	1.15	0.60	0.75	
130	3.50	3.00	2.40	2.65	White
180	3.20	2.50	2.30	2.45	Blue
260	3.50	3.10	2.40	2.65	White
310	3.30	2.80	2.40	2.65	

High Temperature Limit Control

⚠ WARNING ⚠

The automatic-reset high temperature limit control will continue to shut down the heater until the cause is corrected. Never bypass this control as hazardous conditions could result.

All units are equipped with a temperature-activated, automatic-reset high temperature limit control (see **Figure 26** for location). The control is factory-set and is non-adjustable. If the setpoint is reached, the control interrupts the electric supply to the combination gas valve. This safety device provides protection in the case of motor failure or lack of airflow due to a restriction at the inlet or outlet.

Vent Temperature Limit Switch

⚠ WARNING ⚠

If the manual vent temperature limit switch activates, identify and correct the cause before resetting the switch. Never bypass the vent temperature switch as hazardous conditions could result.

All units are equipped with a temperature-activated, manual-reset switch to limit the temperature of vent gases to below 145°F. The switch is attached to the side of the combustion air venter housing (see **Figure 26** for location). If the setpoint is reached, the switch interrupts the electric supply to the combination gas valve. If the switch is activated, identify and correct the cause before resetting the switch.

Fan Motor

The fan motor is equipped with automatic-reset thermal overload protection. If the motor does not run, the cause may be due to improper current. Ensure that the correct voltage is available at the motor.

Circuit Board (DSI Control Module)

The heater's ignition system is controlled by a circuit board (Direct-Spark Integrated (DSI) control module, see **Figure 25**) that monitors the safety devices and controls the operation of the fan and venter motors and the combination gas valve between heat cycles. To view the Seven-Segment Display (SSD), the door panel requires removal. In addition, there is a status LED on the bottom of the heater. Its status indications are **off** (heater is not powered or control board fault), **steady on** (heater is on with no faults), or **flashing** (heater is on with fault(s)). Additional status indications appear on the display at the bottom of the control module (labeled as DSP1, see **Figure 25**). The display's codes are listed and described in the **Unit Troubleshooting Using DSI Control Module** section.

CONTROLS—CONTINUED

Venter Motor

The venter motor (see **Figure 26** for location) is assembled to the venter wheel and operates to provide combustion airflow. Operation is controlled by the circuit board (see **Figure 25**). Refer to the **Circuit Board (DSI Control Module)** section for details.

Flame Rollout Switch (Unit Sizes 55–110)

⚠ DANGER ⚠

If the manual-reset flame rollout switch activates, identify and correct the cause before resetting the switch. Never bypass the flame rollout switch; hazardous conditions could result.

Unit sizes 55, 85, and 110 are equipped with a temperature-activated, manually-reset flame rollout switch (see **Figure 26** for location). The switch is factory-set and is non-adjustable. If the setpoint is reached, the switch interrupts the electric supply to the combination gas valve. If the flame rollout switch activates, identify and correct the cause before resetting the switch.

OPERATION

⚠ DANGER ⚠

- **For your safety, read before operating. If you do not follow these instructions exactly, a fire or explosion may result, causing property damage, personal injury, or loss of life.**
- **This appliance does not have a pilot. It is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand.**
- **Before operating, smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.**
- **WHAT TO DO IF YOU SMELL GAS:**
  - **a. Do not try to light any appliance.**
  - **b. Do not touch any electrical switch; do not use any phone in your building.**
  - **c. Leave the building immediately.**
  - **d. Immediately call your gas supplier from a phone remote from the building. Follow the gas supplier's instructions.**
  - **e. If you cannot reach your gas supplier, call your fire department.**
- **Use only your hand to turn the gas control ON/OFF knob on the combination gas valve. Never use tools. If the valve ON/OFF knob will not turn by hand, do not try to repair it. Call a qualified service technician. Force or attempted repair may result in a fire or explosion.**
- **Should overheating occur, or the gas supply control system fail to shut off the flow of gas, turn off the manual gas valve to the appliance before shutting off the electrical supply.**
- **Do not use this appliance if any part has been under water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control which has been under water.**
- **All components of a gas supply system must be leak tested prior to placing equipment in service. NEVER TEST FOR LEAKS WITH AN OPEN FLAME. Failure to comply could result in personal injury, property damage, or death.**

Pre-Startup Checklist

Check the following ***before*** startup:

- ❑ Check to ensure that all screws used to secure shipping brackets have been re-installed in heater cabinet.
- ❑ Check suspension—unit must be secure and level.
- ❑ Check to ensure that clearances from combustibles are in accordance with **Table 2**.
- ❑ Check vent system to ensure that it is installed in accordance with **Vent Connections** section.
- ❑ Check condensate drain system to ensure that it is installed in accordance with **Condensate Drain Installation** section.
- ❑ Check piping for leaks and proper gas line pressure and bleed trapped air from gas lines (refer to **Supply Piping Connections** section).
- ❑ Check electrical wiring—ensure that all wire gauges are as recommended—service disconnect switch should be used—verify that fusing or circuit breakers are adequate for load use.
- ❑ Check polarity—verify that line voltage exists between black L1 wire and earth ground.
- ❑ If installation elevation is >6,000 feet (>1,830 meters), replace pressure switch in accordance with **Pressure Switch Replacement** section.

Startup

Start up the heater as follows:

1. Set thermostat at lowest setting.
2. Turn OFF all electric power to appliance.

NOTE: This appliance is equipped with an ignition device that automatically lights the burner. Do not try to light the burner by hand.

3. Open access door and locate gas control (ON/OFF) knob or switch on combination gas valve (see **Figure 27**).

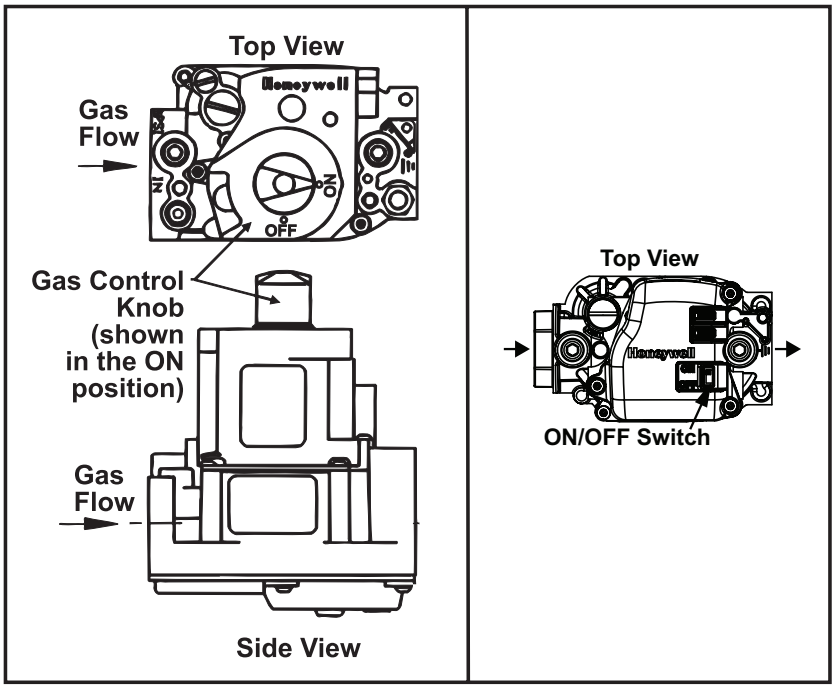


Figure 27. Combination Gas Valve ON/OFF Control

Startup—Continued

4. Turn gas control switch to OFF or turn knob clockwise to OFF.
5. Wait 5 minutes to clear out any gas and then smell for gas (including near floor).
   a. If you smell gas, STOP! and follow steps in DANGER message listed above or on heater operating label.
   b. If you do not smell gas, proceed to step 6.
6. Turn gas control switch to ON or turn knob counterclockwise to ON.
7. Close access door.
8. Turn ON electric power to heater.
9. Set thermostat to desired setting.
   a. If heater does not operate, follow instructions in step 13 or on heater operating label and call your service technician.
   b. If heater operates, thermostat calls for heat, which energizes venter motor.
10. Pressure switch closes, which fires unit.
11. Burner flame is sensed and in 30 seconds after combination gas valve is energized, fan motor is energized.
12. If flame is extinguished during main burner operation, integrated control system closes main valve and must be reset by interrupting power to control circuit (refer to lighting instructions provided with heater).
13. TO TURN OFF GAS TO APPLIANCE:
    a. Set thermostat to lowest setting.
    b. If service is to be performed, turn off all electric power to appliance.
    c. Open the access door.
    d. Turn gas control switch to OFF or turn knob clockwise to OFF (do not force).
    e. Close access door.

Operating Sequences

Table 19 describes the heater's normal operating sequence. **Table 20** describes the heater's abnormal heat cycle functions. **Table 21** describes the heater's fault modes. Refer to **Table 27** for LED indications.

Table 19. Operating Sequence (Normal Heat Cycle)		
Step	**Condition**	**Action**
1. Call for heat	Terminal W is energized	Thermostat calls for heat by energizing terminal W
		Control determines whether limit switch is open or closed and if pressure switch is open
	Limit switch is open	Control deenergizes gas valve, turns fan/blower motor onto heat speed, and runs venter motor
		SSD displays “5”
		Control is in soft lockout “L” before returning to normal operation
	Pressure switch is closed	SSD displays “4”
		Control waits indefinitely for pressure switch to open
	Pressure switch is open	Control proceeds to step 2
2. Prepurge	Venter motor is energized	Control waits for pressure switch to close
	Pressure switch not closed within 30 seconds of venter motor energizing	SSD displays “3”
		Control maintains venter motor energized indefinitely as long as call for heat remains and pressure switch is open
	Pressure switch is proven closed	Control begins prepurge
	Flame is present at any time during prepurge	Prepurge is restarted
	Flame is present long enough to cause lockout	Control runs venter motor and runs fan/blower motor on heat speed
		When flame is no longer sensed, venter motor runs through post-purge and fan/blower motor runs through selected delay OFF time
		Control proceeds to soft lockout but still responds to open limit and flame
		SSD displays “6” when lockout is due to undesired flame
	Venter motor runs for 20-second prepurge time	Control proceeds to step 3
3. Ignition trial period	Spark and main gas valve are energized	Venter remains energized
	Flame is sensed during first 16 seconds	Control deenergizes spark and proceeds to heat fan/blower on delay
	Flame is not sensed during first 16 seconds	Control deenergizes spark and maintains gas valve energized for additional 1-second flame-proving period
	Flame is not present after flame-proving period	Control deenergizes gas valve and proceeds with ignition retries as specified in **Table 20**: abnormal function ***Ignition Retry***
	Flame is present after flame-proving period	Control proceeds to step 4
4. Fan/blower ON delay	30 seconds after gas valve has opened	Control energizes fan/blower motor
	Gas valve and venter motor remain energized	Control proceeds to step 5
5. Steady heat	Limit switch is closed	Control continuously monitors inputs
	Pressure switch is closed	
	Flame is established	
	Thermostat call for heat remains	
	Thermostat call for heat is removed	Control deenergizes gas valve and proceeds to steps 6 and 7
6. Post-purge	Thermostat is satisfied	Venter motor remains on for 45-second post-purge period
7. Fan/blower OFF delay		Fan/blower motor is deenergized after selected fan/blower OFF delay

Operating Sequences—Continued

Table 20. Operating Sequence (Abnormal Heat Cycle)

Abnormal Function	Condition	Action
Interrupted thermostat call for heat	Thermostat demand for heat is removed before flame is recognized	Control runs venter motor for post-purge period
		All outputs are deenergized
	Thermostat demand for heat is removed after successful ignition	Control deenergizes gas valve
		Control runs venter motor through post-purge period
		Control runs fan/blower motor on heat speed for selected delay OFF time
Ignition retry	Flame is not established on first trial for ignition period	Control deenergizes gas valve
		Venter motor remains energized for 10-second inter-purge period
		Spark and gas valve are re-energized
		Control initiates another trial for ignition
	Flame is not established on second trial for ignition	Control deenergizes gas valve
		Control runs fan/blower motor on heat speed
		Venter motor remains energized
		Fan/blower motor deenergizes after selected delay OFF period and spark and gas valve are re-energized
		Control initiates another trial for ignition (this fan delay is self-healing feature for open auxiliary limit switch)
	Flame is not established on third trial for ignition	Control deenergizes gas valve
		Venter motor remains energized for 10-second inter-purge period
		Spark and gas valve are re-energized
		Control initiates another trial for ignition
	Flame is not established on fourth trial for ignition (initial try plus three re-tries)	Control deenergizes gas valve and proceeds to lockout
		SSD displays “L” to indicate ignition failure lockout
Limit switch*	Limit switch is open and call for heat is present	Control deenergizes gas valve
		Control runs venter motor and runs fan/blower motor on heat speed
		Control is in soft lockout (SSD displays “L”) before returning to normal operation
	Limit switch re-closes or call for heat is not present	Control runs venter motor through post-purge period
		Control runs fan/blower motor on heat speed through selected delay OFF period
Pressure switch operation	Pressure switch opens before trial for ignition period	Venter motor runs through 2-second pressure switch recognition delay
		Control deenergizes gas valve
		Control runs venter motor through post-purge period
		Control restarts heat cycle at pressure switch proving state if call for heat still exists
	Pressure switch opens for less than 2 seconds during trial for ignition period (shall not interrupt heat cycle)	Control deenergizes gas valve while pressure switch is open
	Pressure switch opens after successful ignition	Control deenergizes gas valve
	Flame is lost before end of 2-second pressure switch recognition delay	Control responds to loss of flame
	Pressure switch remains open for 2 seconds and flame remains	Control deenergizes gas valve
		Control runs venter motor through post-purge period
		Control runs fan/blower motor on heat speed through selected delay OFF period
		When fan OFF delay ends, fan/blower motor is deenergized, and heat cycle begins if call for heat still exists
Continuous fan operation	Thermostat calls for continuous fan (G) without call for heat	Fan motor is energized after 0.25-second delay (this brief ON delay allows terminal G to energize slightly before terminal Y and allows external changeover relay to switch from terminal G to terminal W without causing momentary glitches in fan/blower output
		Fan remains energized as long as call for fan remains without call for heat
	Thermostat calls for heat (W) during continuous fan operation	Fan/blower is deenergized
		Call for fan is ignored during lockout

*The limit switch is ignored unless a call for heat is present (terminal W energized).

Table 21. Fault Modes		
Fault Mode	**Condition**	**Action**
Undesired flame	Flame is sensed longer than 20 seconds while gas valve is deenergized	Control runs venter motor and runs fan/blower motor on heat speed
		When flame is no longer sensed, venter motor runs through post-purge and fan/ blower motor runs through selected delay OFF time
		Control proceeds to soft lockout but still responds to open limit and flame
		SSD displays “6” when lockout is due to undesired flame
Gas valve relay fault	Control senses that gas valve is energized for more than 1 second when control is not attempting to energize gas valve or control senses that gas valve is not energized when it is supposed to be energized	Control proceeds to lockout (SSD is blank)
		Control assumes either that contacts of relay driving gas valve have welded shut or that sensing circuit has failed
		Venter motor is forced OFF to open pressure switch to stop gas flow unless flame is present
	Control senses that gas valve is closed when it should be open (has not deenergized after venter motor has been shut off for 15 seconds	Venter motor is re-energized to vent unburned gas
Soft lockout	Control does not initiate call for heat or call for continuous fan operation while in lockout	Control still responds to open limit and undesired flame
		Lockout is automatically reset after 1 hour
		Lockout may be manually reset by removing power from control for more than 1 second or by removing thermostat call for heat for more than 1 but less than 20 seconds
Hard lockout	Control detects fault on control board	SSD is blank or displays “L” (fault dependent)
		Control remains in lockout as long as fault remains
		Hard lockout automatically resets when hardware fault clears
Power interruption	Momentary interruption or voltage level is below minimum operating voltage (line voltage or low voltage)	System self-recovers without lockout when voltage returns to operating range
	Interruption <80 milliseconds	Control does not change operating state
	Interruption >80 milliseconds	Control may interrupt current operating cycle to restart

Vent System Testing

For each heater or utility heater connected to the venting system and placed in operation while any other appliance(s) connected to the venting system(s) is not in operation, test the vent system as follows:

1. Seal unused openings(s) in vent system.
2. Inspect vent system for proper size and horizontal pitch as required in *National Flue Gas Code* (ANSI Z223.1/ NFPA 54) or *Natural Gas and Propane Installation Code* (CSA B149.1) and in venting instructions.
3. Verify that there is no blockage or restriction, leakage, corrosion, and/or other deficiencies that could cause any unsafe condition.
4. In so far as is practical, close all doors, windows, and other open spaces within building and all doors between space in which appliance(s) is connected and space where vent system is located.
5. Close any fireplace dampers.
6. Turn on clothes dryers and any exhaust fans (such as range hoods and bathroom exhausts) so that they operate at maximum speed. Do not operate a summer exhaust fan.
7. Following lighting instructions provided with heater, place utility heater being inspected in operation. Adjust thermostat so that utility heater will operate continuously.
8. After it has been determined that each utility heater connected to vent system properly vents when tested as outlined above, return doors, windows, exhaust fans, fireplace dampers, and any other gas-burning appliance to their previous condition of use.
9. If improper venting is observed during above tests, vent system must be corrected.

Post-Startup Checklist

Check the following ***after*** startup:

- ❑ Ensure that vent system has been tested in accordance with **Vent System Testing** section.
- ❑ With unit in operation, measure manifold (outlet) gas pressure in accordance with **Burner Orifice Replacement** section.
- ❑ Turn unit OFF and ON, pausing 2 minutes between each cycle; observe for smooth ignition.
- ❑ Place literature bag that contains Limited Warranty, this manual, and any control or optional information in accessible location near heater.

⚠ DANGER ⚠

- **The gas burner in this gas-fired equipment is designed and equipped to provide safe controlled *complete combustion*. However, *if the installation* does not permit the burner to receive the proper supply of combustion air, complete combustion may not occur. The result is *incomplete combustion*, which produces carbon monoxide, a poisonous gas that can cause death. *Safe operation of indirect-fired gas burning equipment requires a properly operating vent system that vents all flue products to the outside atmosphere*. FAILURE TO PROVIDE PROPER VENTING WILL RESULT IN A HEALTH HAZARD THAT COULD CAUSE SERIOUS PERSONAL INJURY OR DEATH.**
- **Always comply with the combustion air requirements listed in the installation codes and in this manual. Combustion air at the burner should be regulated only by manufacturer-provided equipment. NEVER RESTRICT OR OTHERWISE ALTER THE SUPPLY OF COMBUSTION AIR TO ANY HEATER. MAINTAIN THE VENT OR VENT/COMBUSTION AIR SYSTEM IN STRUCTURALLY SOUND AND PROPER OPERATING CONDITION.**

ADJUSTMENTS

If the gas that fires the unit is propane, the burner orifice(s) must be replaced (refer to **Burner Orifice Replacement** section) and the unit must be converted in accordance with the **Gas Conversion** section ***before*** startup. If the heater is being installed at an elevation of >6,000 feet (>1,830 meters), the pressure switch must be replaced in accordance with the **Pressure Switch Replacement** section ***before*** the gas pressure is adjusted. ***After*** startup, the combination gas valve outlet pressure must be measured and adjusted if necessary in accordance with the **Measure and Adjust Manifold (Outlet) Gas Pressure** section.

Burner Orifice Replacement

Replace the burner orifice(s) as follows:

⚠ CAUTION ⚠

When removing or replacing a burner orifice, use two wrenches and take care not to damage the Venturi tube and/or the bracket.

1. Unthread existing burner orifice.

⚠ DANGER ⚠

- **DO NOT use pipe tape or sealant (pipe dope or joint compound) on orifice threads because the hole in the orifice may become blocked and may cause fire, explosion, property damage, carbon monoxide poisoning, personal injury, or death.**
- **DO NOT attempt to drill out orifices in the field. Use only factory-supplied orifices. Improperly drilled orifices may cause fire, explosion, carbon monoxide poisoning, personal injury, or death.**

2. Thread replacement burner orifice into place—to prevent cross-threading, hand-tighten orifice until snug and then tighten one-and-one-half to two turns using wrench.

Gas Conversion

The heater is shipped factory-equipped for use with natural gas. A propane conversion kit is provided with each heater. Ensure that components in the kit are available (refer to **Table 22**) and install the kit as follows:

Table 22. Propane Conversion Kit Components

Component	Description	Unit Size (MBTUh)						
		55	85	110	130	180	260	310
		PN						
Conversion kit	Package PN	1041262			261647	1036196R	1036197R	221445
Regulator spring kit	Honeywell #396221	260605			260605		—	
	Honeywell #393691	—			—		98720	
Burner orifice	PN, drill size (quantity)	661057, #57 (4)	661079, 1.20 mm (5)	661082, 1.25 mm (6)	120145, 3.30 mm (1)	196899, #24 (1)	1034352, 4.6 mm (1)	196903, #8 (1)
Label	Conversion	64391			64391			
	Regulated propane	79718			79718			
Gas disk	Propane	37752			37752			

1. Install propane regulator spring kit in combination gas valve in accordance with valve manufacturer's instructions included with kit.
2. Attach propane disk near combination gas valve.
3. Carefully remove natural gas orifice(s) from heater and install propane orifice(s) in accordance with **Burner Orifice Replacement** section.
4. Install labels:
   a. Use permanent marker to fill in appropriate information on conversion label from kit.
   b. Select location for label near rating plate.
   c. Ensure that surface is clean and dry and affix conversion label and regulated propane label from kit.
5. During heater startup, check valve outlet pressure in accordance with **Measure and Adjust Manifold (Outlet) Gas Pressure** section.

Pressure Switch Replacement

For installations at elevations >6,000 feet (>1,830 meters), the pressure switch must always be replaced before the heater is operated. Replace the pressure switch as follows:

1. Locate pressure switch in control compartment (see **Figure 26**) and mark and disconnect two switch wires.
2. Mark and disconnect sensing tube(s) from pressure switch.
3. Remove two screws that secure mounting bracket and remove bracket and pressure switch. Save bracket and screws for reuse.
4. Install replacement pressure switch (order option AB14 switch for high elevations) listed in electrical components table in replacement parts manual found at **www.reznorhvac.com** using mounting bracket and two screws. Reconnect sensing tube(s) and wires.

Measure and Adjust Manifold (Outlet) Gas Pressure

If the heater is being installed at an elevation ≤2,000 feet (≤610 meters), adjust the manifold (outlet) gas pressure in accordance with the **Measure and Adjust Manifold Gas Pressure—Elevation ≤2,000 Feet (≤610 Meters)** section. If the heater is being installed at an elevation >2,000 feet (>610 meters), adjust the manifold (outlet) gas pressure in accordance with the **Measure and Adjust Manifold Gas Pressure—Elevation >2,000 Feet (>610 Meters)** section.

Measure and Adjust Manifold (Outlet) Gas Pressure—Continued

⚠ WARNING ⚠

Valve outlet gas pressure must never exceed 3.5 IN WC for natural gas or 10 IN WC for propane. The maximum inlet supply pressure for natural gas or propane is 14 IN WC.

⚠ CAUTION ⚠

Before attempting to measure or adjust valve outlet gas pressure, the inlet supply pressure must be within the specified range, both when the heater is in operation and when it is on standby. Incorrect inlet pressure could cause excessive valve outlet gas pressure immediately or at some future time. If natural gas supply pressure is too high, install a regulator in the supply line before it reaches the heater. If natural gas supply pressure is too low, contact your gas supplier.

NOTES:

- **Measuring outlet pressure cannot be done until the heater is in operation.**
- **During normal operation with natural gas at sea level, adjustment to factory-setting should not be necessary.**
- **For natural gas: when the heater leaves the factory, the combination gas valve is set so that the valve outlet gas pressure for a single-stage valve is regulated to 3.5 IN WC. Inlet supply pressure to the valve for natural gas must be a minimum of 5 IN WC or as noted on the rating plate and a maximum of 14 IN WC.**
- **For propane: the heater is shipped factory-equipped for use with natural gas. A propane conversion kit is included. Follow the instructions in the Measure and Adjust Manifold (Outlet) Gas Pressure section to convert for use with propane. Inlet supply pressure to the valve for propane must be a minimum of 11 IN WC and a maximum of 14 IN WC.**

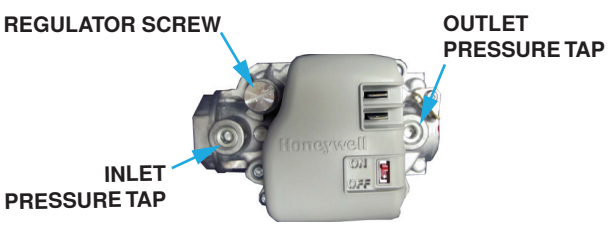
Measure and Adjust Manifold Gas Pressure—Elevation ≤2,000 Feet (≤610 Meters)

For installations at normal elevations, measure and adjust the manifold (outlet) gas pressure as follows:

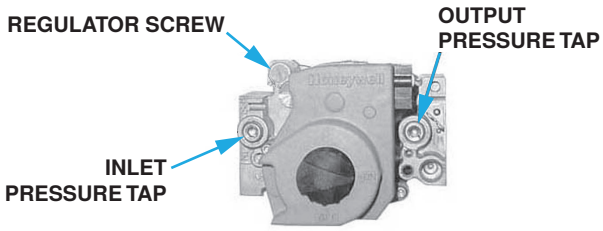
5. Turn knob or switch on top of valve to OFF to prevent flow to combination gas valve.

NOTE: Use a water column manometer that is readable to the nearest tenth of an inch.

6. Connect manometer to inch output pressure tap on valve (see **Figure 28**).



UNIT SIZES 055, 085, 110, 130, AND 180



UNIT SIZES 260 AND 310

Figure 28. Combination Gas Valves

7. Open manual valve and operate heater. Depress and hold door safety switch.
8. Cycle burner once or twice to properly seat adjustment spring in valve and observe manometer gauge to measure outlet pressure of combination gas valve.

⚠ CAUTION ⚠

DO NOT bottom out the combination gas valve regulator screw. This can result in excessive overfire and heat exchanger failure due to unregulated manifold pressure.

9. If manometer reading does not indicate that valve outlet pressure is in accordance with **Table 23**, remove cap from regulator screw(s) (see **Figure 28**) and adjust pressure by turning regulator screw IN (clockwise) to increase pressure or OUT (counterclockwise) to decrease pressure.
10. When manometer reading indicates that outlet pressure is in accordance with **Table 23**, disconnect manometer and install cap(s) on regulator screw(s).

Table 23. Required Manifold (Outlet) Gas Pressure

Installation Location	Elevation		Natural Gas	Unit Size (MBTUh)	
				55, 85, 110, 130, 260	180, 310
				Propane	
	Feet	Meters	Manifold Pressure (IN WC)		
US, Canada	0–2000	0–610	3.5	10.0	9.5
US	2001–3000	611–915	3.1	8.8	8.4
Canada	2001–4500	611–1373	2.8	8.1	7.7
US	3001–4000	916–1220	3.0	8.5	8.0
	4001- 5000	1221–1525	2.8	8.1	7.7
	5001–6000	1526–1830	2.7	7.7	7.3
	6001–7000	1831–2135	2.6	7.4	7.0
	7001–8000	2136–2440	2.5	7.1	6.7
	8001–9000	2441–2745	2.4	6.7	6.3
	9001–10,000	2746–3045	2.2	6.4	6.0)

Measure and Adjust Manifold Gas Pressure—Elevation >2,000 Feet (>610 Meters)

For installations at high elevations, measure and adjust the manifold (outlet) gas pressure as follows:

1. If installation is at elevation >6,000 feet (1,830 meters), replace pressure switch in accordance with **Pressure Switch Replacement** section.

⚠ WARNING ⚠

Manifold gas pressure must never exceed 3.5 IN WC for natural gas or 10 IN WC for propane.

2. Determine correct outlet pressure (refer to **Table 23**) for elevation of installation. If unsure of elevation, contact local gas supplier.
3. Turn knob or switch on top of valve to OFF to prevent flow to combination gas valve.

NOTE: Use a water column manometer that is readable to the nearest tenth of an inch.

4. Connect manometer to output pressure tap on valve (see **Figure 28**).

⚠ CAUTION ⚠

DO NOT bottom out the gas valve regulator screw. This can result in excessive overfire and heat exchanger failure due to unregulated manifold pressure.

Measure and Adjust Manifold (Outlet) Gas Pressure—Continued

Measure and Adjust Manifold Gas Pressure—Elevation >2,000 Feet (>610 Meters)—Continued

5. Turn knob or switch on top of valve to ON.
6. Remove cap from regulator screw (see **Figure 28**) and adjust pressure in accordance with **Table 23** by turning regulator screw IN (clockwise) to increase pressure or OUT (counterclockwise) to decrease pressure.
7. Turn up thermostat. Depress and hold door safety switch.
8. Cycle burner once or twice to properly seat adjustment spring in valve and recheck outlet pressure. When pressure corresponds to **Table 23**, disconnect manometer and install cap on regulator screw.
9. Check for leakage at outlet pressure tap fitting. Correct as necessary.
10. Connect manometer to inlet pressure tap (see **Figure 28**). While heater is operating, measure inlet pressure, which should be between 5 and 13.5 IN WC for natural gas or between 10 and 13.5 IN WC for propane.
11. If inlet pressure is not between 5 and 13.5 IN WC for natural gas or between 10 and 13.5 IN WC for propane, inlet pressure must be corrected by adjusting manifold (outlet) pressure in accordance with steps 3 through 6.

NOTE: The inputs and capacity of the heater varies depending on elevation.

12. Refer to **Table 24** for input and capacity values for elevation of installation.
    a. Use permanent marker to fill in appropriate input and capacity values on high-elevation adjustment label from literature bag provided with unit.
    b. Select location for label on outside of heater access panel that will be conspicuous to anyone operating or servicing unit.
    c. Ensure that surface is clean and dry and affix label.
13. Observe heater operation for at least one complete cycle to check for safe and proper operation. Depress and hold safety door switch.

Table 24. Inputs and Capacities by Elevation

Installation Location	Elevation (Feet (Meters))	Parameter	Unit Size (MBTUh)						
			55	85	110	130	180	260	310
			BTUh						
US, Canada	0–2000 (0–610)	Normal input	55,000	85,000	110,000	131,000	175,000	260,000	305,000
		Thermal output capacity	51,150	79,050	102,300	121,830	159,250	239,200	277,550
US	2001–3000 (611–915)	Normal input	52,800	81,600	105,600	123,140	164,500	244,400	286,700
		Thermal output capacity	49,104	75,888	98,208	114,520	149,695	224,848	260,897
Canada	2001–4500 (611–1373)	Normal input	48,660	75,203	97,321	117,900	157,500	234,000	274,500
		Thermal output capacity	45,254	69,938	90,508	109,647	143,325	215,280	249,795
US	3001–4000 (916–1220)	Normal input	50,688	78,336	101,376	120,520	161,000	239,200	280,600
		Thermal output capacity	47,140	72,852	94,280	112,084	146,510	220,064	255,346
	4001–5000 (1221–1525)	Normal input	48,660	75,203	97,321	117,900	157,500	234,000	274,500
		Thermal output capacity	45,254	69,938	90,508	109,647	143,325	215,280	249,795
	5001–6000 (1526–1830)	Normal input	46,714	72,194	93,428	115,280	154,000	228,800	268,400
		Thermal output capacity	43,444	67,141	86,888	107,210	140,140	210,496	244,244
	6001–7000 (1831–2135)	Normal input	44,845	69,307	89,691	112,660	150,500	223,600	262,300
		Thermal output capacity	41,706	64,455	83,413	104,774	136,955	205,712	238,693
	7001–8000 (2136–2440)	Normal input	43,052	66,534	86,103	110,040	147,000	218,400	256,200
		Thermal output capacity	40,038	61,877	80,076	102,337	133,770	200,928	233,142
	8001–9000 (2441–2745)	Normal input	41,330	63,873	82,659	107,420	143,500	213,200	250,100
		Thermal output capacity	38,437	59,402	76,873	99,901	130,585	196,144	227,591
	9001–10,000 (2746–3045)	Normal input	39,676	61,318	79,353	104,800	140,000	208,000	244,000
		Thermal output capacity	36,899	57,026	73,798	97,464	127,400	191,360	222,040

⚠ WARNING ⚠

- **If you turn OFF the electrical power supply, turn OFF the gas.**
- **Eye protection is recommended when cleaning unit.**

⚠ CAUTION ⚠

- **When any service is completed, ensure that the unit is reassembled correctly so that no unsafe conditions are created.**
- **When re-lighting, always follow the lighting instructions on the heater.**
- **If any of the original wire supplied with the appliance must be replaced, it must be replaced with wiring material having a temperature rating of at least 105°C, except for limit control, flame rollout, and sensor lead wires which must be rated at 150°C.**
- **If replacement parts are required, use only factory-authorized parts.**

NOTE: To ensure long life and satisfactory performance, a heater that is operated under normal conditions should be inspected and cleaned at the start of each heating season. If the heater is operating in an area where an unusual amount of dust or soot or other impurities are present in the air, more frequent maintenance is recommended.

The unit is designed to operate with a minimum of maintenance. However, to ensure long life and satisfactory performance, routine service is recommended. When servicing, follow standard safety procedures and those specific instructions and warnings in this manual.The following is designed to aid a qualified service person in maintaining and servicing this equipment.

Service Checklist

At a minimum, perform the following annually (see **Figure 26** for component locations):

- ❑ Inspect burner/control compartment annually to determine if cleaning is necessary.
- ❑ Clean all dirt, lint, and grease from combustion air opening and venter assembly.
- ❑ Clean all dirt, lint, and grease from fan blade, fan guard, and motor.
- ❑ Clean condensate drain traps.
- ❑ Check heat exchanger both internally and externally.
- ❑ Check burner for scale, dust, or lint accumulation and clean if needed.
- ❑ Check gas valve to ensure that gas flow is being shut off completely.
- ❑ Check vent or vent/combustion air system for soundness and clean openings.
- ❑ Replace any parts that do not appear sound.
- ❑ Check for any damaged wiring and replace as necessary.

Maintenance Procedures

Burner Maintenance (Unit Sizes 55–110)

NOTE: Burner cleaning is not normally necessary for unit sizes 55, 85, and 110, but may be required if the unit is in a dirty location.

Visually inspect the burner compartment (see **Figure 29**). If there is an accumulation of dirt, dust, and/or lint, clean the compartment and remove and clean the burners as follows:

Maintenance Procedures—Continued

Burner Maintenance (Unit Sizes 55–110)—Continued

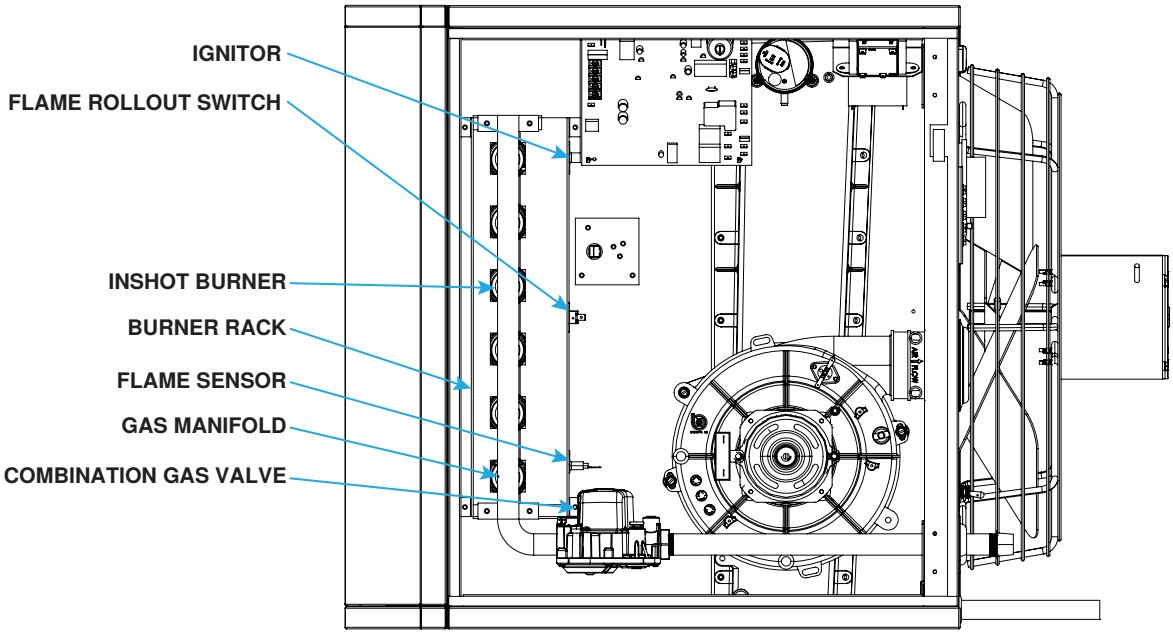


Figure 29. Burner Compartment (Unit Sizes 55–110)

1. Remove gas and electric supply:
   a. Shut OFF gas supply ahead of union at manual valve outside cabinet.
   b. Turn OFF electric supply.
   c. Disconnect gas supply at union outside of cabinet.
2. Remove burner assembly (see **Figure 29**):
   a. Remove access panel.
   b. Disconnect gas train.
   c. Mark and disconnect wires at combination gas valve, ignitor, flame sensor, and flame rollout switch.

⚠ CAUTION ⚠

Take care not to damage the ignitor while removing or cleaning the burner assembly.

3. Remove screws that secure gas manifold to burner box and carefully remove burner assembly.

NOTE: If, upon inspection, any burner components are damaged or deteriorated, replace the burner assembly.

4. Shine flashlight on burners and use compressed air or vacuum cleaner to loosen and remove any accumulated dust or debris.
5. Re-install burner assembly (see **Figure 29**):
   a. Install burner assembly and gas manifold and secure gas manifold to burner box using screws removed in step 3.
   b. Reconnect wires to combination gas valve, ignitor, flame sensor, and flame rollout switch.
   c. Reconnect gas train.
   d. Install access panel.
   e. Reconnect gas supply at union outside of cabinet.
   f. Leak test connection using leak detecting solution. If leak is detected, tighten connection. If leak cannot be stopped by tightening connection, replace part(s).

6. Turn ON electric and gas.
7. Check for proper operation.

Burner Maintenance (Unit Sizes 130–310)

NOTE: The unit is equipped with a TCORE^2® burner.

Visually inspect the burner compartment (see **Figure 30**). If there is an accumulation of dirt, dust, and/or lint, clean the compartment and remove and clean the burner as follows:

1. Remove gas and electric supply:
   a. Shut OFF gas supply ahead of union at manual valve outside cabinet.
   b. Turn OFF electric supply.
   c. Disconnect gas supply at union outside of cabinet.
2. Remove burner assembly (see **Figure 30**):
   a. Remove access panel.
   b. Disconnect gas train:
      (1) Mark and disconnect wires at combination gas valve.
      (2) Remove burner orifice in accordance with **Burner Orifice Replacement** section.
      (3) Carefully remove orifice adapter locking nut.
      (4) Slide orifice adapter out through bracket on burner while pushing gas train to right. This will move gas train out of way.

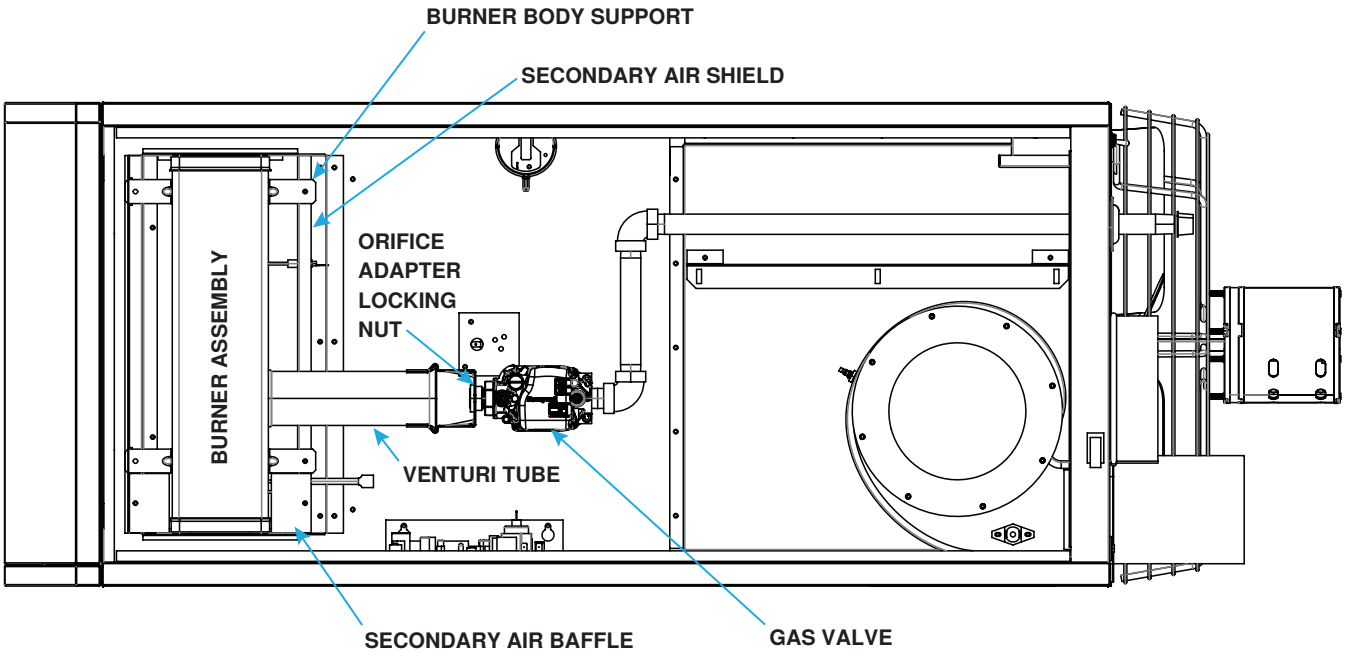


Figure 30. Burner Compartment (Unit Sizes 130–310)

   c. Detach control assembly:
      (1) Remove two screws that secure control assembly bracket.
      (2) Being careful not to disconnect any wires, slide control assembly to right.
   d. Remove secondary air baffle(s):
      (1) Locate flat plate(s) identified as secondary air baffle(s)—vertical along right side of burner. Quantity of baffles could be one to four depending on heater size. Each baffle is held in place by one screw.
      (2) For correct re-assembly on secondary air shield, mark location (top and bottom) of each baffle.
      (3) Remove screw(s) and remove baffle(s) (all).

Maintenance Procedures—Continued

Burner Maintenance (Unit Sizes 130–310)—Continued

e. Locate burner body supports—depending on size, burner will have two or more supports. At each support, remove one screw that secures support to secondary air shield.

f. While holding venturi tube, slide entire burner assembly slightly to right to disengage burner from supports on left.

g. Rotate open end of venturi tube inward toward heater and carefully pull burner assembly out of cabinet.

3. Inspect and clean burner:

NOTE: If, upon inspection, any of the burner components are damaged or deteriorated, replace the burner assembly.

a. With burner assembly removed, shine flashlight on burner ribbons. Look for carbon buildup, scale, dust, lint, and/or anything that might restrict flow through spaces between burner ribbons.

b. While holding burner assembly so that any foreign material will fall away from burner, use stiff bristle brush to loosen and remove any foreign material(s).

c. If burner is excessively dirty, remove one burner end cap:

(1) Remove four screws that secure end cap to burner housing.

(2) Lightly tap end cap to remove it.

d. Clean all foreign material from burner and venturi.

e. When burner is thoroughly clean, replace end cap, ensuring that it is tight against burner housing.

4. Inspect lower part of heat exchanger:

a. With burner assembly removed, shine bright light into each heat exchanger section at burner flame entrance of each tube.

b. With light shining into heat exchanger, observe outside for visible light. Repeat for each heat exchanger section.

c. If any light is observed, replace heat exchanger.

5. Re-install burner assembly (see **Figure 30**):

a. Attach burner assembly:

(1) While holding venturi tube, slide entire burner assembly into position.

(2) Align supports on left side with slots in burner shield and slide supports into slots.

(3) On right, install screw that secures each burner body support to secondary air shield.

b. Re-install secondary air baffles—install screw that secures each baffle(s)—baffles may be different sizes and each must be installed in correct location as marked.

c. Attach control assembly:

(1) Carefully slide control assembly into position and secure using same screws.

(2) Check to ensure that all wire connections are secure.

d. Reconnect gas train:

(1) Slide gas train into position so that orifice adapter is slid through bracket on burner.

(2) Secure gas train to bracket using locking nut.

(3) Install burner orifice in accordance with **Burner Orifice Replacement** section.

(4) Reconnect wires to combination gas valve.

e. Install access panel.

f. Reconnect gas supply at union outside of cabinet.

g. Leak test connection using leak detecting solution. If leak is detected, tighten connection. If leak cannot be stopped by tightening connection, replace part(s).

6. Turn ON electric and gas.
7. Check for proper operation.

Burner Orifice Maintenance

The burner orifice usually needs to be replaced only when installing a gas conversion kit. When ordering a replacement orifice only, provide BTUh content and specific gravity of gas as well as the model and serial number of the unit. Replace the burner orifice in accordance with the **Burner Orifice Replacement** section.

Heat Exchanger Maintenance

NOTE: Inspection of the lower portion of the heat exchanger is done with the burner removed. Refer to the Burner Maintenance (Unit Sizes 130–310) section for information on inspecting the lower portion of the heat exchanger.

1. Remove burner in accordance with **Burner Maintenance (Unit Sizes 55–110)** or **Burner Maintenance (Unit Sizes 130–310)** section.
2. Remove any external dirt or dust accumulation.
3. Visually inspect heat exchanger for cracks and holes.
4. If crack or hole is found, replace heat exchanger.
5. Install burner in accordance with **Burner Maintenance (Unit Sizes 55–110)** or **Burner Maintenance (Unit Sizes 130–310)** section.

Ignition System Maintenance

- The DSI control module (circuit board, see **Figure 25**) monitors the operation of the heater including ignition. The only replaceable component is the 3-amp Type ATC or ATO fuse (color code: violet, PN 201685). If the fuse is blown, the problem is most likely an external overload. Correct the problem and replace the fuse.
- Do not attempt to disassemble the control module. However, check the lead wires each heating season for insulation deterioration and good connections.
- For the flame sensor (see **Figure 26** for location), disconnect the wire and remove the screw and the flame sensor. Clean flame sensor with an emery cloth before reinstalling.
- Proper operation of the direct spark ignition system requires a minimum flame signal of 1.0 microamps as measured by a microampmeter.

⚠ WARNING ⚠

Due to high voltage on the spark wire and electrode, do not touch when energized.

⚠ CAUTION ⚠

When reassembling, the brown ground wire must remain attached to the ignitor for unit sizes 55, 85, and 110.

- For the ignitor (see **Figure 26** for location), disconnect the wire and remove the screw and ignitor. Clean the ignitor assembly with an emery cloth before reinstalling. The spark gap (see **Figure 31**) must be maintained to 1/8 inch.

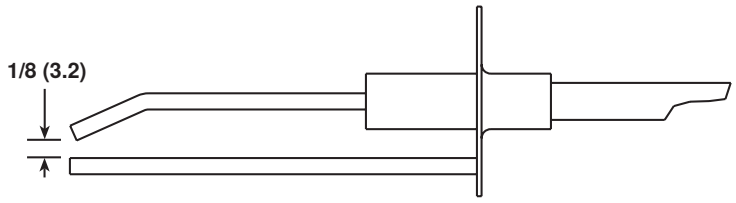


Figure 31. Ignitor Spark Gap

Maintenance Procedures—Continued

Fan and Motor Assembly Maintenance

Inspect and clean the motor, fan guard, and blades. Remove any dirt and grease. Take care when cleaning the fan blades so as prevent causing misalignment or imbalance. Check to ensure that the hub of the fan blades is secure to the shaft. If necessary, replace the assembly as follows:

1. If heater has been installed, turn OFF gas and disconnect electric power.
2. Remove access panel and disconnect fan motor wires, capacitor wires at capacitor, and ground screw.
3. Remove assembled parts (fan guard, motor, and fan blade).
4. Disassemble and replace part(s) as needed.
5. Reassemble using replacement part(s) as needed and original parts.
6. Ensure that fan blade is in proper position on shaft (see **Figure 32**), that setscrew is tightened to 130 (±10) inch-pounds, and that nuts securing motor to fan guard are torqued to to 30 inch-pounds.

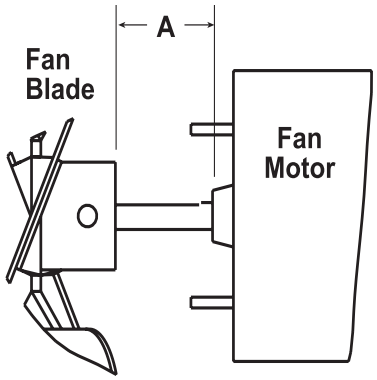


Figure 32. Fan and Motor Spacing (Refer to Table 25)

Table 25. Fan Blade Positioning

Unit Size (MBTUh)				
55	**85**	**110, 130, 180**	**260**	**310**
Dimension A* (Inches (mm))				
1-1/4 (32)	2-5/16 (59)	2-3/8 (60)	2 (51)	1-3/8 (35)

*See **Figure 32**.

7. Position assembly on heater and secure fan guard.
8. Rotate fan blade to check for adequate clearance. If adjustment is required, loosen mounting screws, reposition fan guard, and tighten screws to 30 inch-pounds. Repeat until assembly is positioned properly.
9. Reconnect fan motor wires in accordance with wiring diagram. Secure wires to fan guard leg using tie wrap(s).
10. Install access panel.
11. Restore electric power to heater and turn ON gas.
12. Follow instructions on lighting instruction plate to light heater.
13. Check for proper heater operation.

NOTES:

- **Venter motor bearings are permanently lubricated.**
- **Keep all hardware removed to be used in reassembling and installing the replacement parts.**

Remove dirt and grease from the venter motor casing, venter housing, pressure sensing tap, and venter wheel. Replace the venter motor and wheel assembly as follows:

1. Turn OFF gas and disconnect electric power.
2. Remove burner/control compartment access panel.
3. For unit sizes 55, 85, and 110, remove existing screws that secure existing motor and wheel assembly, loosen vent clamp, and remove existing motor and wheel assembly. Install replacement motor and wheel assembly and secure using existing screws.
4. For unit sizes 130–310:
   a. Disconnect three venter motor wires at DSI control, capacitor wires at capacitor (if applicable), and ground screw (located on control panel).
   b. While holding venter motor, remove six screws that secure venter motor mounting plate to venter housing. Remove motor and wheel assembly from heater.
   c. Reassemble with replacement venter motor and wheel. Ensure that venter wheel is properly positioned on shaft (see **Figure 33**).

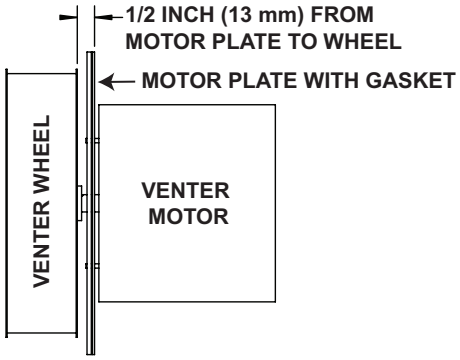


Figure 33. Venter Wheel Position on Shaft (Unit Sizes 130–310)

5. Reconnect venter wires in accordance with wiring diagram.
6. Install access panel.
7. Restore electric power to heater and turn ON gas.
8. Follow instructions on lighting instruction plate to light heater.
9. Check for proper heater operation.

Combination Gas Valve Maintenance

⚠ WARNING ⚠

The combination gas valve is the prime safety shutoff. All gas supply lines must be free of dirt or scale before connecting them to the unit to ensure positive closure.

Inspect the combination gas valve, carefully remove any external dirt accumulation, and check wiring connections. Check the valve annually to ensure that the valve is shutting off gas flow completely as follows:

Maintenance Procedures—Continued

Combination Gas Valve Maintenance—Continued

1. Close manual shutoff valve to prevent flow to combination gas valve.

NOTE: Use a water column manometer that is readable to the nearest tenth of an inch.

2. Connect manometer to 1/8-inch outlet pressure tap on combination gas valve (see **Figure 28**).
3. Open manual shutoff and combination gas valves.
4. Use finger to fully block main burner orifice for several seconds.
5. Observe manometer with orifice blocked. If ***any*** pressure is indicated, combination gas valve is leaking and must be replaced before heater is restored to operation.

Pressure Switch Maintenance

If it is determined that the pressure switch needs replacing, use only the factory-authorized replacement part that is designed for the model and size of heater being serviced. Replace the switch in accordance with the **Pressure Switch Replacement** section.

NOTE: A unit operating above 6,000 feet (1,830 meters) in elevation requires a high-elevation pressure switch (refer to Pressure Switch Replacement section).

High Temperature Limit Control Maintenance

If it is determined that the high temperature limit control (see **Figure 34**) needs replacing, use only a factory-authorized replacement part that is designed for the size of heater. For the approximate limit control location, see **Figure 26**.

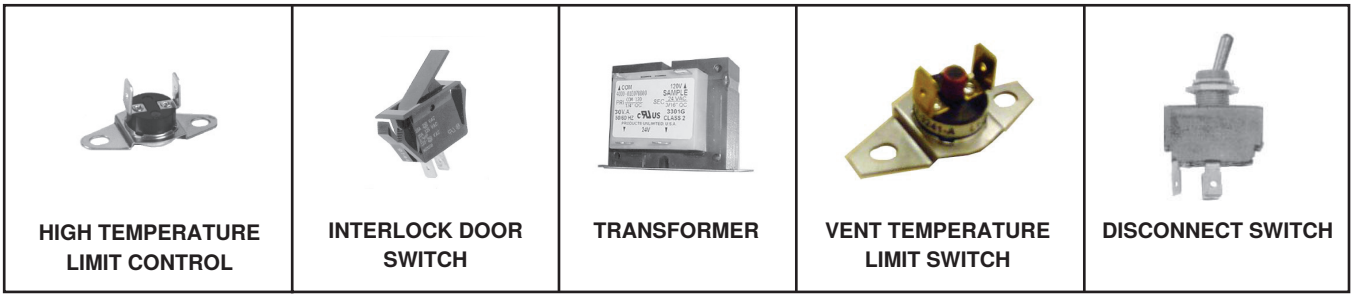


Figure 34. Replaceable Components

Interlock Door Switch Maintenance

⚠ CAUTION ⚠

Verify that the interlock door switch operates when opening the cabinet. While a temporary bypass of the switch may be required for troubleshooting, always return the switch to normal operation once troubleshooting is complete. Do not permanently bypass the switch.

If it is determined that the interlock door switch (see **Figure 34)** needs replacing, use only a factory-authorized replacement part that is designed for the heater. For the approximate door switch location, see **Figure 26**.

Transformer Maintenance

Use a voltmeter to verify that there are 24V output from the transformer (see **Figure 34**). If the transformer is not functioning, it must be replaced. Use a replacement transformer identical to the factory-installed model. For the transformer location, see **Figure 26**.

Vent Temperature Limit Switch Maintenance

The vent temperature limit switch (see **Figure 34)** is located on the discharge of the combustion air blower (venter) and its purpose is to prevent the vent gas temperature from exceeding a temperature that will harm the PVC vent pipe. If the vent temperature limit switch is activated, the cause must be determined and corrected before the heater is placed back into operation. Activation of the manually reset vent temperature limit switch could be caused by one or more of the following:

- Manifold gas pressure too high
- Heat content of fuel being burned is too high
- Reduced circulating airflow due to dirty and/or plugged air moving components
- Excess dirt on heat exchanger(s)
- Failed heat exchanger(s)

After the cause is determined and corrected, press the red button on the switch to reset it.

Disconnect Switch Replacement

The disconnect switch (see **Figure 34**) is located in the sealed electrical box inside the control compartment with the toggle on the rear of the heater. If it is determined that the disconnect switch needs replacing, use only the factory-authorized replacement part that is designed for the heater. Always replace the electrical box cover.

Flame Rollout Switch Maintenance (Unit Sizes 55–110)

- The cause of a flame rollout switch (see **Figure 26** for location) activating must be determined. Activation of the manually-reset flame rollout switch could be caused by one or more of the following:
  a. Restricted or plugged heat exchanger
  b. Too much building exhaust
  c. Manifold gas pressure too high
  d. Restricted combustion air inlet or exhaust outlet in combination with defective pressure switch
  e. Electrical power interruption during operation
  f. Unit being operated with line voltage disconnect (24V thermostat is required)
- If a flame rollout switch trips, inspect the burner/control compartment for signs of excessive heat and burned wiring. If there is damage to the control compartment, repairs must be made before resetting the switch.
- If the compartment appears normal, reset by depressing the red button on the switch (15– 20 minutes are required for the switch to cool sufficiently before resetting). A distinct click will be felt when the switch resets. Operate the furnace. If the flame rollout switch trips again, determine and correct the cause before resetting the switch.
- If it is determined that the flame rollout switch needs replacing, use only the factory-authorized replacement part that is designed for that size of heater. The disconnect switch is located in the sealed electrical box inside the control compartment with the toggle on the rear of the heater.

Vent or Vent/Combustion Air System Maintenance

Check the complete system at least once a year. Inspection should include all joints, seams, concentric adapter box, inlet air guard or inlet air cap, and the vent terminal cap. Clean all openings and replace any defective parts.

Condensate Drain System

Check the condensate disposal system annually. Remove the condensate traps and flush them with clear tap water to remove any sediment that may have accumulated. Check to be ensure that the piping to the sanitary drain has not been damaged. Check the sanitary drain to verify that it flows freely.

TROUBLESHOOTING

General Troubleshooting

Table 26. General Troubleshooting

Symptom	Probable Cause	Remedy
A. Venter motor will not start	1. No power to unit	Turn ON power and check supply fuses or circuit breaker
	2. No 24V power to integrated circuit board	Turn up thermostat
		Check control transformer output
	3. Integrated circuit board fuse blown	Correct cause and replace fuse (3A, type ATC or ATO, 32VDC)
	4. No power to venter motor	Tighten connections at circuit board and/or motor terminals
	5. Integrated circuit board defective	Replace integrated circuit board
	6. Defective venter motor	Replace venter motor (refer to **Venter Motor and Wheel Assembly Maintenance** section)
B. Burner will not light	1. Manual valve not open	Open manual valve
	2. Air in gas line	Bleed gas line (initial startup only)
	3. Gas pressure too high or too low	Supply pressure should be 5–14 IN WC for natural gas or 11–14 IN WC for propane
	4. No spark	Perform following:
	a. Loose wire connections	Ensure that all wire connections are solid
	b. Transformer failure	Ensure that 24V power is available
	c. Incorrect spark gap	Maintain spark gap at 1/8 inch
	d. Spark cable shorted to ground	Replace worn or grounded spark cable
	e. Spark electrode shorted to ground	Replace ceramic spark electrode if it is cracked or grounded
	f. Burner not grounded	Ensure that integrated circuit board is grounded (terminals P1–9)
	g. Circuit board not grounded	Ensure that integrated circuit board is grounded to furnace chassis
	h. Unit not properly grounded	Ensure that unit is properly field grounded to earth ground and properly phased (L1 to hot lead L2 to neutral)
	i. Integrated circuit board fuse blown	Correct cause and replace fuse (3A, type ATC or ATO, 32VDC)
	j. Faulty integrated circuit board	If 24V power is available to integrated circuit board and all other causes have been eliminated, replace board
	5. Lockout device interrupting control circuit by above causes	Reset lockout by interrupting control at thermostat or main power
	6. Interlock door switch open	Close access door or replace switch
	7. Pressure switch not closing	Perform following:
		Ensure that unit is properly vented
		Remove obstruction(s) from vent
		Replace faulty tubing to pressure switch
	8. Faulty pressure switch	Replace pressure switch
	9. Main valve not operating	Perform following:
	a) Defective valve	If 24V power is measured at valve connections and valve remains closed, replace valve
	b) Loose wire connections	Check and tighten all wiring connections

Table 26. General Troubleshooting —Continued		
Symptom	**Probable Cause**	**Remedy**
B. Burner will not light—continued	10. Integrated circuit board does not power main valve	Perform following:
	a) Loose wire connections	Ensure that all wire connections are solid
	b) Flame sensor grounded	Ensure that flame sensor lead is not grounded or that sensor insulation or ceramic is not cracked—replace as required
	c) Incorrect gas pressure	Supply pressure should be 5–14 IN WC for natural gas or 11–14 IN WC for propane
	d) Cracked ceramic at sensor	Replace sensor
C. Burner cycles ON and OFF	1. Gas pressure too high or too low	Supply pressure should be 5–14 IN WC for natural gas or 11–14 IN WC for propane
	2. Burner not grounded	Ensure that integrated circuit board is grounded (terminals P1–9)
	3. Circuit board not grounded	Ensure that integrated circuit board is grounded to furnace chassis
	4. Faulty integrated circuit board	If 24V power is available to integrated circuit board and all other causes have been eliminated, replace board
	5. Pressure switch not closing	Perform following:
		Ensure that unit is properly vented
		Remove obstruction(s) from vent
		Replace faulty tubing to pressure switch
	6. Faulty pressure switch	Replace pressure switch
	7. Flame sensor grounded	Ensure that flame sensor lead is not grounded or that sensor insulation or ceramic is not cracked—replace as required
	8. Cracked ceramic at sensor	Replace sensor
	9. Incorrect polarity	Reverse line volt leads to integrated circuit board
	10. Pin terminal loose on wire harness	Replace wire harness
D. No heat (heater operating)	1. Incorrect valve outlet pressure or orifice	Check valve outlet pressure (refer to unit rating plate for manifold pressure)
	2. Cycling on limit control	Check air throughput
	3. Improper thermostat location or adjustment	Refer to thermostat manufacturer's instructions
E. Fan or venter motor will not run	1. Circuit open	Check wiring and connections
	2. Defective integrated circuit board	Replace board
	3. Defective motor	Replace motor
F. Fan or venter motor turns ON and OFF while burner is operating	1. Motor overload device cycling ON and OFF	Check motor load against motor rating plate—replace motor if needed
G. Fan or venter motor cuts out on overload	1. Low or high voltage supply	Correct electric supply
	2. Defective motor	Replace motor
	3. Poor airflow	Clean motor, fan, and fan guard

Unit Troubleshooting Using DSI Control Module

NOTES:

- **If troubleshooting indicates that repair of the DSI control module is required, note that its only replaceable part is the fuse (see Figure 25), which is a type ATC or ATO 3A fuse, color code violet (PN 201685).**
- **IMPORTANT: When using a multimeter to troubleshoot the 24V circuit, place the multimeter's test leads into the connectors located on the ignition control. Do not remove connectors or terminals from the electrical components. Doing so can result in misinterpreted readings caused by the control module's fault mode monitoring circuits.**
- **Remove and reapply power to the control module to view the last five fault codes stored in its memory. The most recent to least recent fault codes will be displayed.**

- The SSD on the DSI control module (refer to **Circuit Board (DSI Control Module)** section) may be used to troubleshoot the unit. The control module monitors the operation of the heater, and the display indicates normal operation and various abnormal conditions. If the heater fails to operate properly, check this display (refer to **Table 27**) to determine the cause and/or to eliminate certain causes. Remove and reapply power to the control module to view the last five fault codes stored in its memory—the most recent to least recent fault codes will be displayed.
- See **Figure 35** for a flowchart for troubleshooting the unit using the DSI control module.

Table 27. Circuit Board (DSI Control Module) Display Codes

Display Code Status	Display Code	Indication
Steady	—	Normal operation—no call for heat
	0	Ignition sequence active
	H	Normal operation—call for heat (strong flame)
Flashing	2	Normal operation—call for heat (weak flame)
	L	Lockout from failed ignition or flame loss
	3	Pressure switch is not closed within 30 seconds of venter motor energizing
	4	Pressure switch is closed before venter motor is energized
	5	Limit switch or rollout open
	6	Undesired flame
	7	Polarity reversed
Steady	Off	Internal fault/power failure

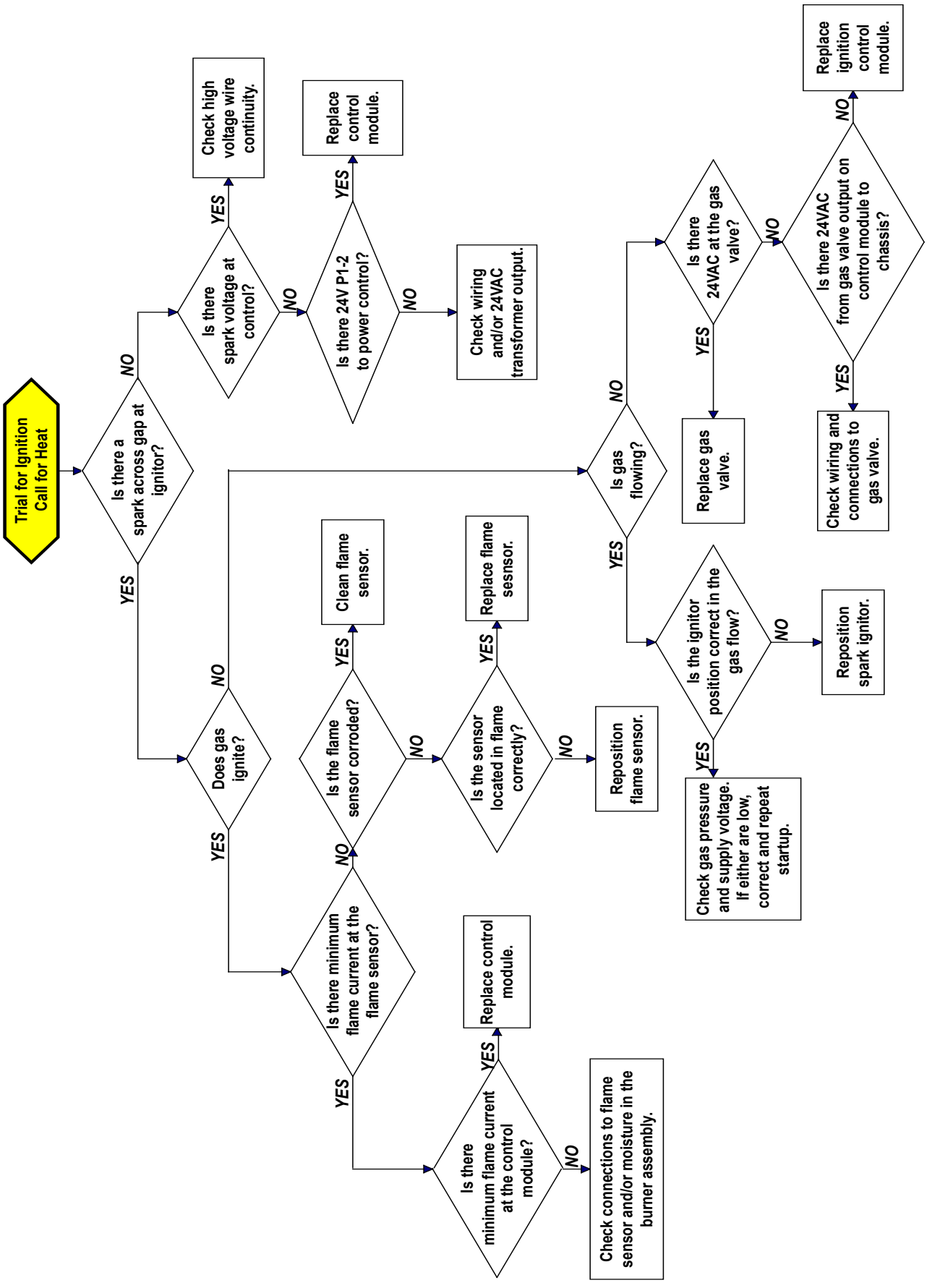


Figure 35. DSI Control Module Troubleshooting Flowchart

INSTALLATION RECORD (TO BE COMPLETED BY INSTALLER)

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

For more information on Reznor HVAC products:

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

Intertek

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