REZNOR

Revision: I-UEZ (04-21) 1034347-0

Supersedes: — (Original Version)

UNIT HEATER INSTALLATION/OPERATION/MAINTENANCE

MODEL UEZ: HIGH-EFFICIENCY, SEPARATED-COMBUSTION, LOW-STATIC

⚠ 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.**
- **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 neighbor's phone. 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 the models listed. Accessories referenced may not apply to all models.

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.

References

NOTE: Both this installation/operation manual and the appropriate venting instructions are shipped with the heater. Verify that the literature is correct for the heater being installed. If either manual is missing or incorrect, contact your distributor before beginning installation.

Table 1. Related Technical Manuals Available from Factory Distributor

Type	Form	PN*
Replacement parts	P-UEZ	1034348
Venting	I-OPT-VC	205892
Vertical louver installation	CP-UB-UD-UEZ-VL	1036173

*Also available at **www.reznorhvac.com**.

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 high efficiency separated-combustion system is responsible for the installation.**

Certification

- These high-efficiency unit heaters are design-certified by Intertek for use in industrial and commercial installations in the United States and in Canada.
- 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. A Canadian installation must be in accordance with the CSA B149 Installation Codes. These codes are available from CSA Information Services, 1-800-463-6727. Local authorities having jurisdiction should be consulted before installation is made to verify local codes and installation procedure requirements.
- Installations in aircraft hangars should be in accordance with ANSI/NFPA No. 409 (latest edition), Standard for Aircraft Hangars. Installations in public garages should be in accordance with ANSI/NFPA No. 88A (latest edition), Standard for Parking Structures. Installations in repair garages should be in accordance with ANSI/NFPA No. 88B (latest edition), Standard for Repair Garages. In Canada, installations in aircraft hangars should be in accordance with the requirements of the enforcing authorities, and in public garages, in accordance with CSA B149 codes.
- If the heater is being installed in the Commonwealth of Massachusetts, installation must be performed by a licensed plumber or licensed gas fitter.

Unit Location

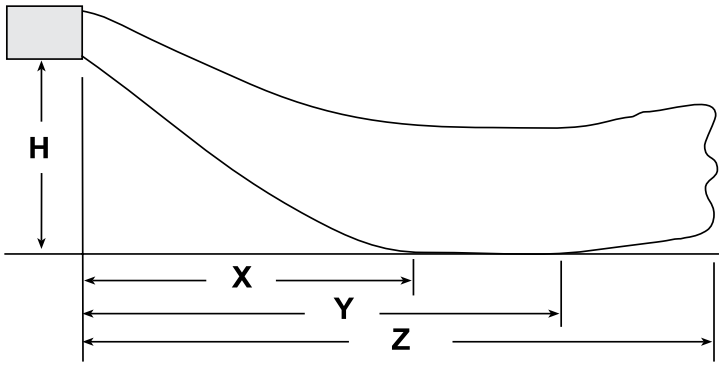
⚠ CAUTION ⚠

- **Unit heaters should not be used in an application where the heated space temperature is below 50°F. 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.**

- Refer to the venting instructions provided with the unit for venting requirements.
- Refer to the following sections of this manual to determine where to suspend the heater: **Heater Throw**, **Mounting Height Requirements**, **Hazards of Chlorine**, **Dimensions**, **Clearances**, **Weights**, and **Venting and Combustion Air Requirements**.

Heater Throw

Figure 1 shows throw patterns for fan model units. Table 2 and Table 3 list throw distances for standard, adjustable horizontal louvers at the angles listed. The louver angles listed are relative to the top of the heater. The throw pattern changes with the addition of optional vertical louvers and/or downturn nozzles.



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

Figure 1. Heater Throw Patterns (Refer to Table 2 and Table 3)

Table 2. Heater Throw Distances with Standard Horizontal Louvers at Mounting Heights of 8 to 18 Feet

H	Distance*			Louver Angle	Distance*			Louver Angle	Distance*			Louver Angle	Distance*			Louver Angle
	X	Y	Z		X	Y	Z		X	Y	Z		X	Y	Z	
	Unit Size															
	130				180				260				310			
8	13	24	73	–26°	16	30	93	–20°	15	28	94	–24°	17	31	105	–20°
10	14	24	69	–32°	17	31	91	–25°	16	28	89	–29°	18	32	103	–25°
12	14	24	64	–39°	18	31	88	–30°	17	28	85	–34°	19	32	98	–30°
14	14	22	59	–45°	19	30	84	–34°	17	27	80	–40°	20	32	95	–34°
16	13	20	53	–51°	19	29	79	–39°	17	25	74	–45°	21	31	90	–38°
18	11	17	44	–58°	19	28	74	–44°	16	24	66	–51°	20	30	85	–43°

*Distance in feet (see Figure 1).

Table 3. Heater Throw Distances with Standard Horizontal Louvers at Mounting Heights of 2.4 to 5.5 Meters

H	Distance*			Louver Angle	Distance*			Louver Angle	Distance*			Louver Angle	Distance*			Louver Angle
	X	Y	Z		X	Y	Z		X	Y	Z		X	Y	Z	
	Unit Size															
	130				180				260				310			
2.4	4	7	22	–26°	5	9	28	–20°	5	9	29	–24°	5	9	32	–20°
3.0	4	7	21	–32°	5	9	28	–25°	5	9	27	–29°	6	10	31	–25°
3.7	4	7	20	–39°	6	9	27	–30°	5	9	26	–34°	6	10	30	–30°
4.3	4	7	18	–45°	6	9	26	–34°	5	8	24	–40°	6	10	29	–34°
4.9	4	6	16	–51°	6	9	24	–39°	5	8	23	–45°	6	9	27	–38°
5.5	3	5	13	–58°	6	9	23	–44°	5	7	20	–51°	6	9	26	–43°

*Distance in meters (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.

- For best results, the heater should be mounted with certain rules in mind. In general, a unit should be located 8 to 12 feet (2.4 to 3.7 meters) above the floor. 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.
- 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 to 20 feet (4.6 to 6.1 meters).

Hazards of Chlorine

The presence of chlorine vapors in the combustion air of gas-fired heating equipment presents a potential corrosion hazard for separated-combustion heaters with regard to the combustion air inlet. Chlorine is usually found in the form of freon or degreaser vapors. When chlorine is exposed to flame, it will precipitate from the compound and go into solution with any condensation that is present in the heat exchanger or associated parts. The result is hydrochloric acid, which readily attacks all metals including 300 grade stainless steel. Care should be taken to separate these vapors from the combustion process. This may be done by wise location of the unit vent and combustion air terminals with regard to exhausters or prevailing wind directions. Chlorine is heavier than air. Keep these facts in mind when determining installation location of the heater in relation to building exhaust systems.

Dimensions

Unit dimensions are shown in **Figure 2** and listed in **Table 4**. All dimensions are in inches (mm).

Dimensions—Continued

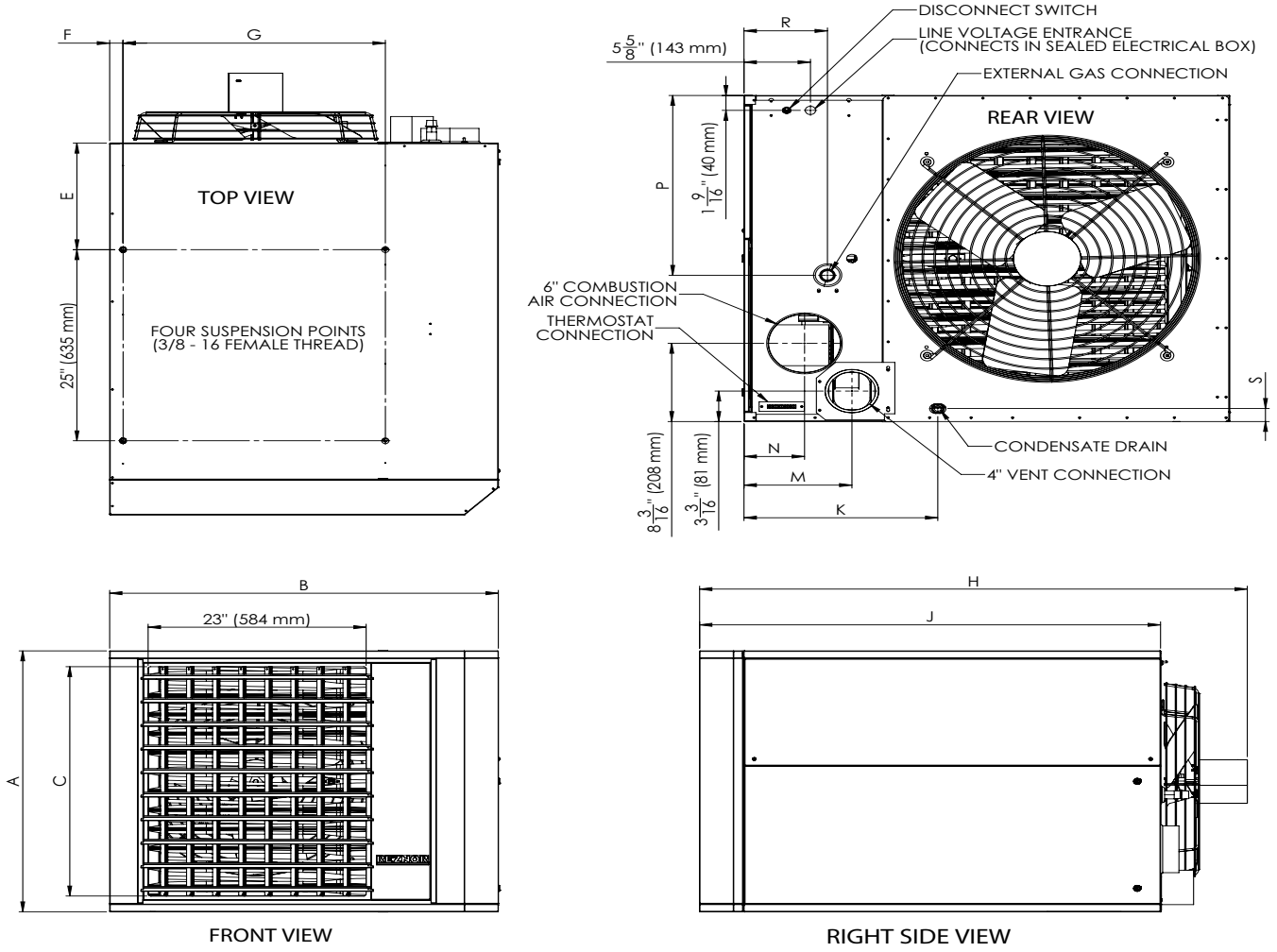


Figure 2. Dimensions (Refer to Table 4)

Table 4. Dimensions

Unit Size	Dimension (See Figure 2)													
	A	B	C	E	F	G	H	J	K	M	N	P	R	S
	Inches (±1/8) (mm (±3))													
130, 180	20-1/8 (511)	39-3/16 (995)	16-1/16 (408)	11-31/32 (304)	2-3/8 (60)	25-11/16 (652)	55-13/32 (1407)	46-1/32 (1169)	15-19/32 (396)	8-5/16 (211)	4-5/16 (110)	5-1/16 (129)	6-9/32 (160)	1-3/4 (45)
260, 310	34-1/8 (867)	41 (1041)	30 (762)	13-31/32 (355)	1-13/32 (36)	27-11/16 (703)	58 (1473)	48-21/32 (1236)	16-15/32 (418)	9-3/32 (231)	5-3/32 (129)	18-13/16 (478)	7 1/32 (179)	1-3/8 (35)

Clearances

Units must be installed so that the clearances listed in **Table 5** 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 listed in **Table 4** and shown in **Figure 2** when determining clearances to combustibles.

Table 5. Clearances to Combustibles	
HeaterSurface	**Minimum Clearance (Inches (mm))**
Top	4 (102)
Flue connector	6 (152)
Access panel	18 (457)
Non-access side	2 (51)
Bottom*	1 (25)
Rear**	18 (457)
*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

⚠ WARNING ⚠

Check the supporting structure to be used to verify that it has sufficient load carrying capacity to support the weight of the unit. Suspend the heater only from the threaded nut retainers or with a manufacturer-provided kit. Do NOT suspend from the heater cabinet.

NOTE: For unit shipping weight, contact an authorized Factory Distributor.

Before suspending the heater, ensure that the supporting structure to be used has sufficient load-carrying capacity to support the weight (refer to **Table 6**) of the unit.

Table 6. Unit Weights			
Unit Size			
130	**180**	**260**	**310**
Pounds (kg)			
230 (104)	245 (111)	360 (163)	395 (179)

Venting and Combustion Air Requirements

- All separated-combustion units MUST BE equipped with both combustion air and exhaust piping to the outdoors. 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.
- Concentric horizontal and vertical vent/combustion air systems (option CC6 or CC2) are the only venting/combustion air systems approved for this heater.
- These units are certified as Category IV heaters. These heaters are very thermal efficient and will produce condensate during operation.

Vent/Combustion Air System Piping Requirements

- **Types of pipe:** provide field-supplied pipe in the following types:
  - **Vent pipe:** schedule 40 PVC or CPVC pipe—in Canada, all PVC vent pipe must be approved to ULC 636.
  - **Combustion air inlet pipe:** sealed, single-wall galvanized pipe is recommended.
- **Venter outlet and combustion air inlet:** located at rear of heater (see **Figure 3**).

Venting and Combustion Air Requirements—Continued

Vent/Combustion Air System Piping Requirements—Continued

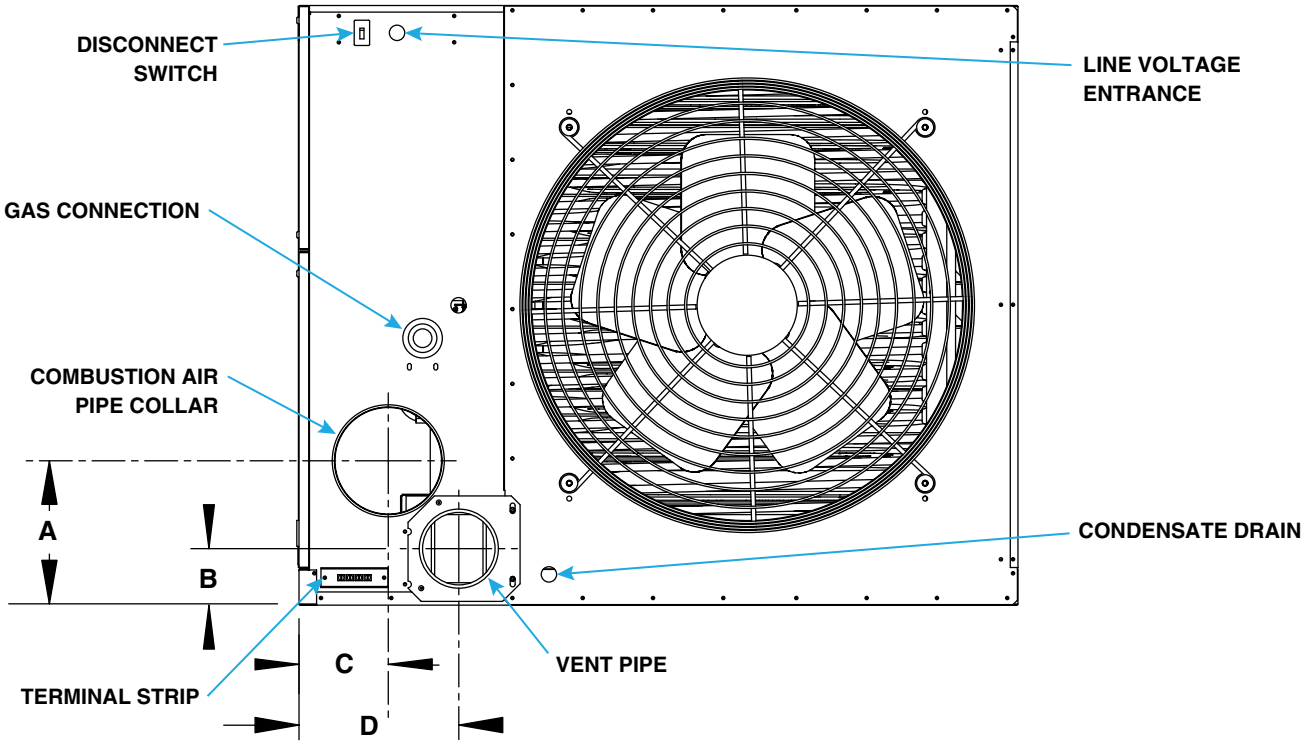


Figure 3. Connections at Rear of Unit (Refer to Table 7)

Table 7. Connection Sizes and Locations

Dimension (See Figure 3) or Connection	Description	Dimension/Diameter	
		Unit Size 130 or 180	Unit Size 260 or 310
		Inches (mm)	
A	—	8-1/4 (210)	8-1/4 (210)
B		3-1/4 (83)	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)	6 (153)
Vent pipe	PVC	4 (102)	4 (102)
Condensate drain	PVC	1/2 (13)	1/2 (13)

- **Pipe size requirements:** size requirements are as follows:
  - **Vent piping:** from heater to terminal end of vertical or horizontal vent (refer to **Table 8**)
  - **Combustion air piping:** from heater to concentric adapter box and from concentric adapter box to outdoors (refer to **Table 9**).

Table 8. Vent Piping Size Requirements

Unit Size	Diameter (Inches (Millimeters))	Maximum Length (Feet (Meters))	Equivalent Straight Length for Elbows	
			90-Degree Elbow*	45-Degree Elbow
130, 180, 260, 310	4 (102)	50 (15.2)	8 (2.4)	4 (1.2)
*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 Terminal Options section).

Table 9. Combustion Air Piping Size Requirements				
Unit Size	Pipe Section	Diameter (Inches (Millimeters))	Length (Feet (Meters))	
			Minimum	Maximum
130, 180, 260, 310	Heater to concentric adapter box	6 (152)	3 (914)	Same as vent pipe
	Concentric adapter box to outdoors	8 (203)	Refer to **Vent Terminal Options** section	

- **Vent pipe clearance:** do not install the vent piping near any high temperature steam lines, radiant heaters, or other sources of heat.
- **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.

Vent/Combustion Air System Piping Joints

- **Piping joints:** 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 schedule 40 PVC or CPVC 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 2–3 applicator brush:**
   a. Ensure that primer conforms to ASTM F 656.
   b. Ensure that primer does not puddle inside system.
4. **Apply cement using 2–3 applicator brush, quickly assembling joint while cement is fluid:**
   a. Ensure that cement conforms to ASTM D 2564.
   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.

Venting and Combustion Air Requirements—Continued

Vent/Combustion Air System Piping Support

⚠ 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 4**.

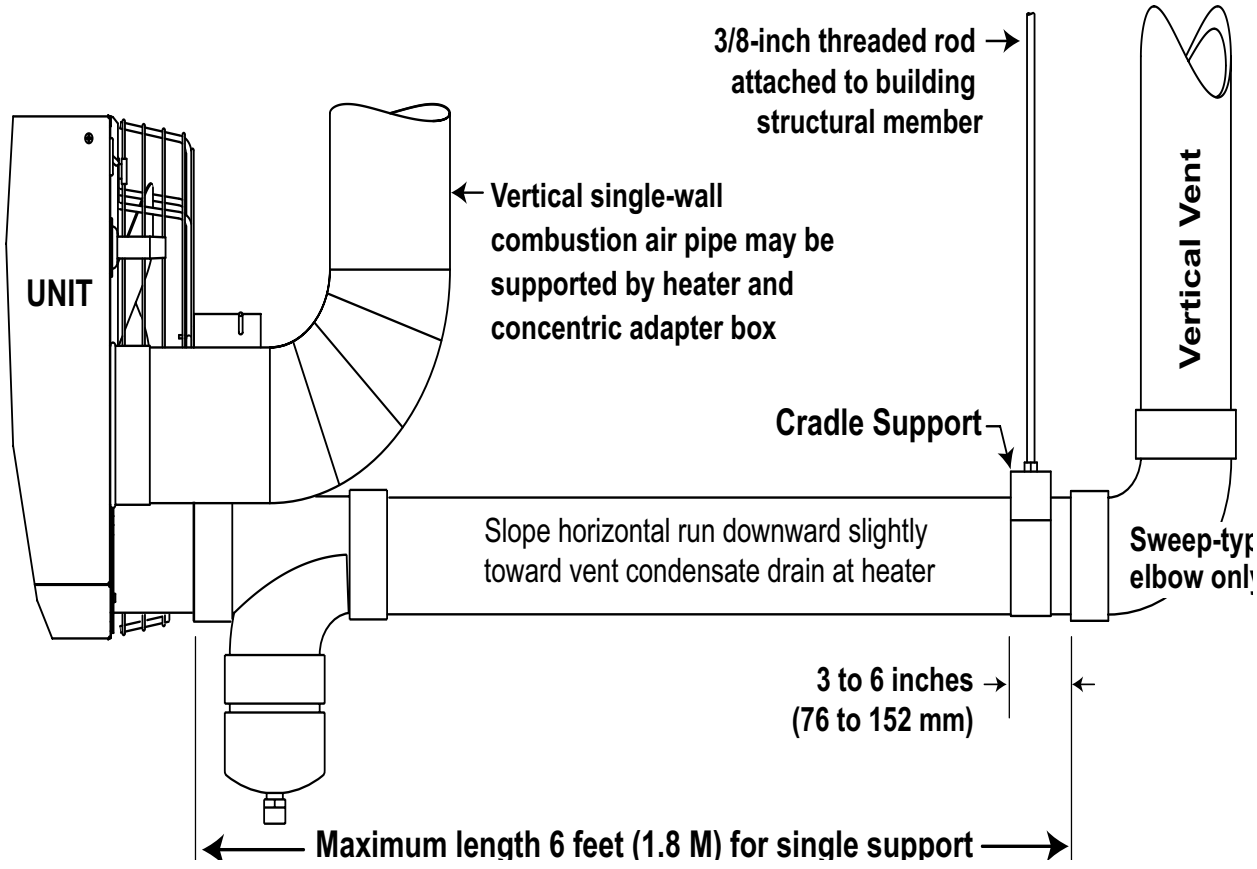


Figure 4. Vent Pipe Support

- **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.

⚠ 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.
- The unit's operating principle showing combustion airflow and supply airflow is shown in **Figure 5**. Related technical data is listed in **Table 10**.

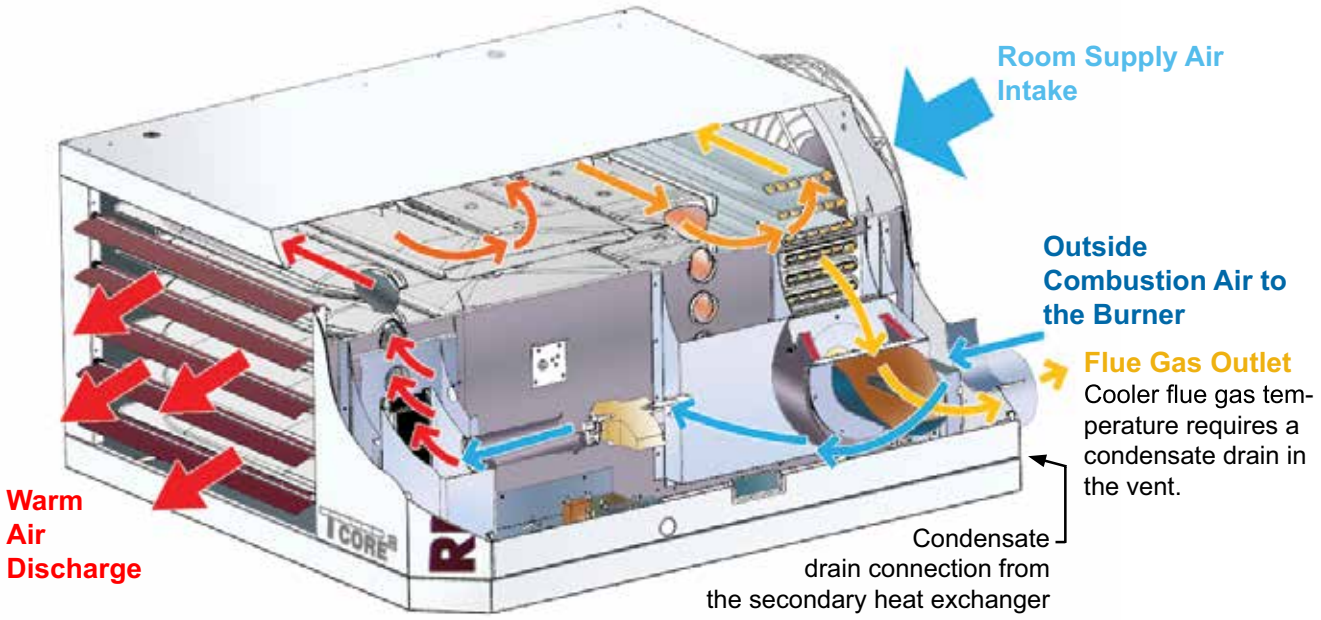


Figure 5. Combustion Airflow and Supply Airflow

Table 10. Technical Data

Parameter	Unit Size				Unit of Measurement
	130	180	260	310	
Input heating capacity	131,000	175,000	260,000	305,000	BTUh
	38.4	51.2	76.1	89.3	kWh
Thermal efficiency	93	91	92	91	%
Output heating capacity*	121,830	159,250	239,200	277,550	BTUh
	35.7	46.6	70.0	81.3	kWh
Gas connection, natural**	1/2		3/4		Inches
Gas connection, propane**					
Vent connection diameter	4		4		
Combustion air inlet diameter	6		6		
Control, 24V	1.0		1.0		Amps
Full load amps, 115V	6.3		10.0		
Maximum overcurrent protection, 115V***	15.0		20.0		Amps
Normal power consumption	657		1020		Watts
Discharge air temperature rise	50	60	50	60	°F
Air volume	2256	2458	4430	4283	cfm
	63.9	69.6	125.4	121.3	Meter³/minute
Discharge air opening area	2.56		4.79		Foot²
	0.2		0.5		Meter²

*CSA ratings for elevations up to 2,000 feet.

**Size shown is for gas connection to a single-stage gas valve—not supply line size.

***MOCP = 2.25 × (largest motor FLA) + smallest motor FLA. Answer is rounded to the next lower standard circuit breaker size.

Technical Data—Continued

Table 10. Technical Data—Continued

Parameter	Unit Size				Unit of Measurement
	130	180	260	310	
Output velocity	883	962	924	894	fpm
	269	293	282	272	Meter/minute
Standard open fan motor size	1/4		1/2		Horsepower
Optional enclosed fan motor size					
Fan motor speed	1050		1050		rpm
Fan diameter	18		24		Inches
Approximate condensate per hour	1		2		Gallons
	3.8		7.6		Liters

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 **Converting Unit from Natural Gas to Propane**. 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. Instructions are in this manual or in the option package (option packages are shipped separately).

Table 11. Field-Installed Options

Name	Code	Description
Vent/combustion air inlet terminal kit	CC2	Vertical roof vent
	CC6	Horizontal through-wall vent
Vertical louvers	CD1	—
Downturn nozzle	CD2	25- to 65-degree variable air deflection range
	CD3	50- to 90-degree variable air deflection range
	CD4	25- to 65-degree variable air deflection range nozzle with vertical louvers
Manual shutoff valve	CE1	Natural gas or propane
Hanger kit	CK10	Adapts 3/8-inch hangers for suspension from 1-inch threaded pipe

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.**
- **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.**

The heater is designed to be suspended using four-point suspension by one of the following methods:

1. **Suspending heater using field-supplied 3/8-inch threaded rods (see Figure 6, DETAIL A):**
   a. A 3/8-16 threaded nut retainer is located at each suspension point.
   b. Install 3/8-inch nut and washer to lock heater to threaded rod at each suspension point. Ensure that threaded rod does not extend into heater more than 1/2 inch (13 mm). Recommended rod length is 6 feet (1.8 meters).
2. **Using swivel connectors to suspend heater from 1-inch pipes (see Figure 6, DETAIL B):**
   a. Lock threaded swivel connectors (option CK10) to heater at 3/8-16 threaded nut retainers.
   b. Swivel connectors are threaded to suspend heater from 1-inch pipe.

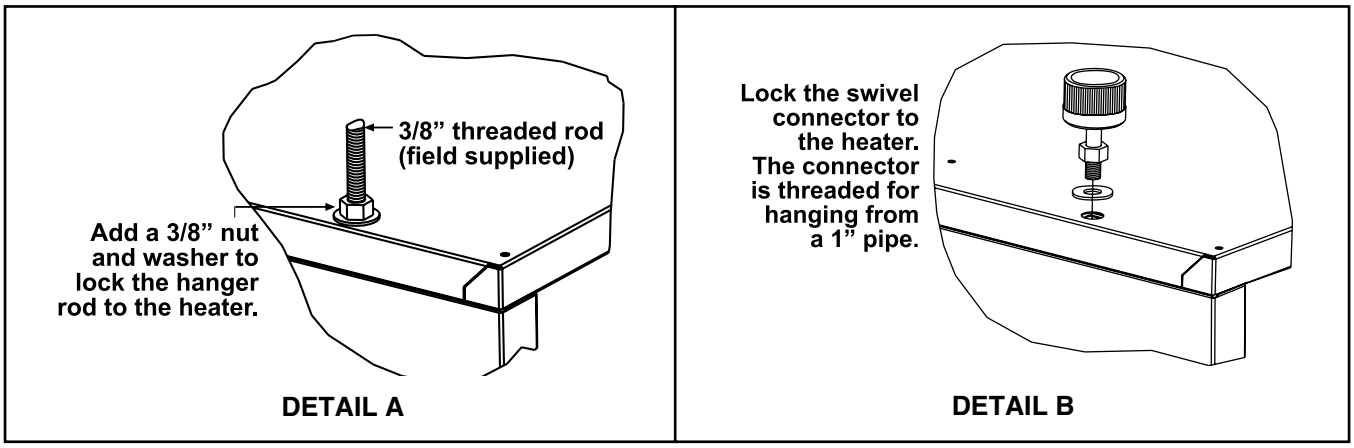


Figure 6. Heater Suspension

Suspension of Heater with Downturn Nozzle

Downturn nozzle kits (option CD2, CD3, or CD4) require four-point suspension. Follow the instructions provided with the kit to install.

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.

NOTES:

Supply pressure higher than 1/2 psi requires the installation of an additional lockup-type service regulator external to the unit.

PRESSURE TESTING SUPPLY PIPING

- **Test pressures *above* 1/2 psi—disconnect the heater and manual valve from the gas supply line to be tested. Cap or plug the supply line.**
- **Test pressures *below* 1/2 psi—before testing, close the manual valve on the heater.**

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.**

- All piping must be in accordance with requirements outlined in the National Fuel Gas Code ANSI/Z223.1 (latest edition) or CSA-B149.1 and B149.2 (refer to **Installation Codes** section).
- 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 possibilities of future expansion and increased requirements. Refer to National Fuel Gas Code for additional information on line sizing.

Table 12. Gas Supply Line Sizes												
Length of Pipe (Feet)	Diameter of Pipe (Inches)											
	1/2		3/4		1		1-1/4		1-1/2		2	
	Natural Gas	Propane	Natural Gas	Propane	Natural Gas	Propane	Natural Gas	Propane	Natural Gas	Propane	Natural Gas	Propane
	Cubic Feet per Hour											
20	92	56	190	116	350	214	730	445	1100	671	2100	1281
30	73	45	152	93	285	174	590	360	890	543	1650	1007
40	63	38	130	79	245	149	500	305	760	464	1450	885
50	56	34	115	70	215	131	440	268	670	409	1270	775
60	50	31	105	64	195	119	400	244	610	372	1105	674
70	46	28	96	59	180	110	370	226	560	342	1050	641
80	43	26	90	55	170	104	350	214	530	323	990	604
90	40	24	84	51	160	98	320	195	490	299	930	567
100	38	23	79	48	150	92	305	186	460	281	870	531
125	34	21	72	44	130	79	275	168	410	250	780	476
150	31	19	64	39	120	73	250	153	380	232	710	433
175	28	17	59	36	110	67	225	137	350	214	650	397
200	26	16	55	34	100	61	210	128	320	195	610	372

Supply Piping Connections

- Gas connection sizes are listed in **Table 13**.
- Install a ground joint union and manual shutoff valve upstream of the unit control system, as shown in **Figure 7**.
- The 1/8-inch plugged tapping in the manual shutoff valve in **Figure 7** provides connection for a supply line pressure test gauge.
- The National Fuel Gas Code requires the installation of a trap with a minimum 3-inch drip leg (see **Figure 7**). Local codes may require a drip leg longer than 3 inches (typically 6 inches). To permit burner removal, this drip leg must extend beyond the edge of the heater.
- Leak-test all connections by brushing on a leak-detecting solution. Bleed trapped air from gas lines as needed.
- The gas connection is made at the pipe nipple that extends outside the cabinet, as shown in **Figure 7**.

Table 13. Gas Connection Sizes		
Unit Size	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).		

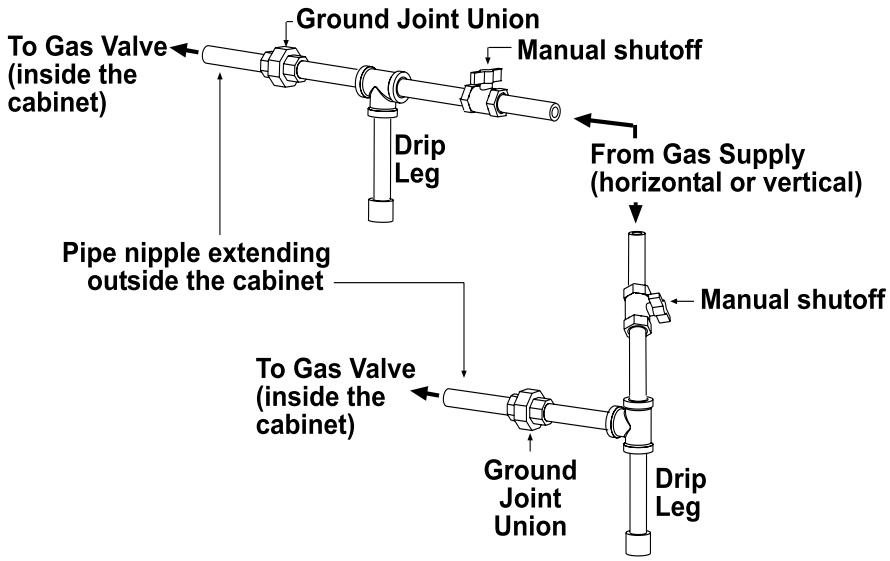


Figure 7. Gas Connections

Concentric Adapter Box Connections

- All model UEZ installations require a concentric adapter box. 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 8**. Dimensions and connections are shown in **Figure 9**.

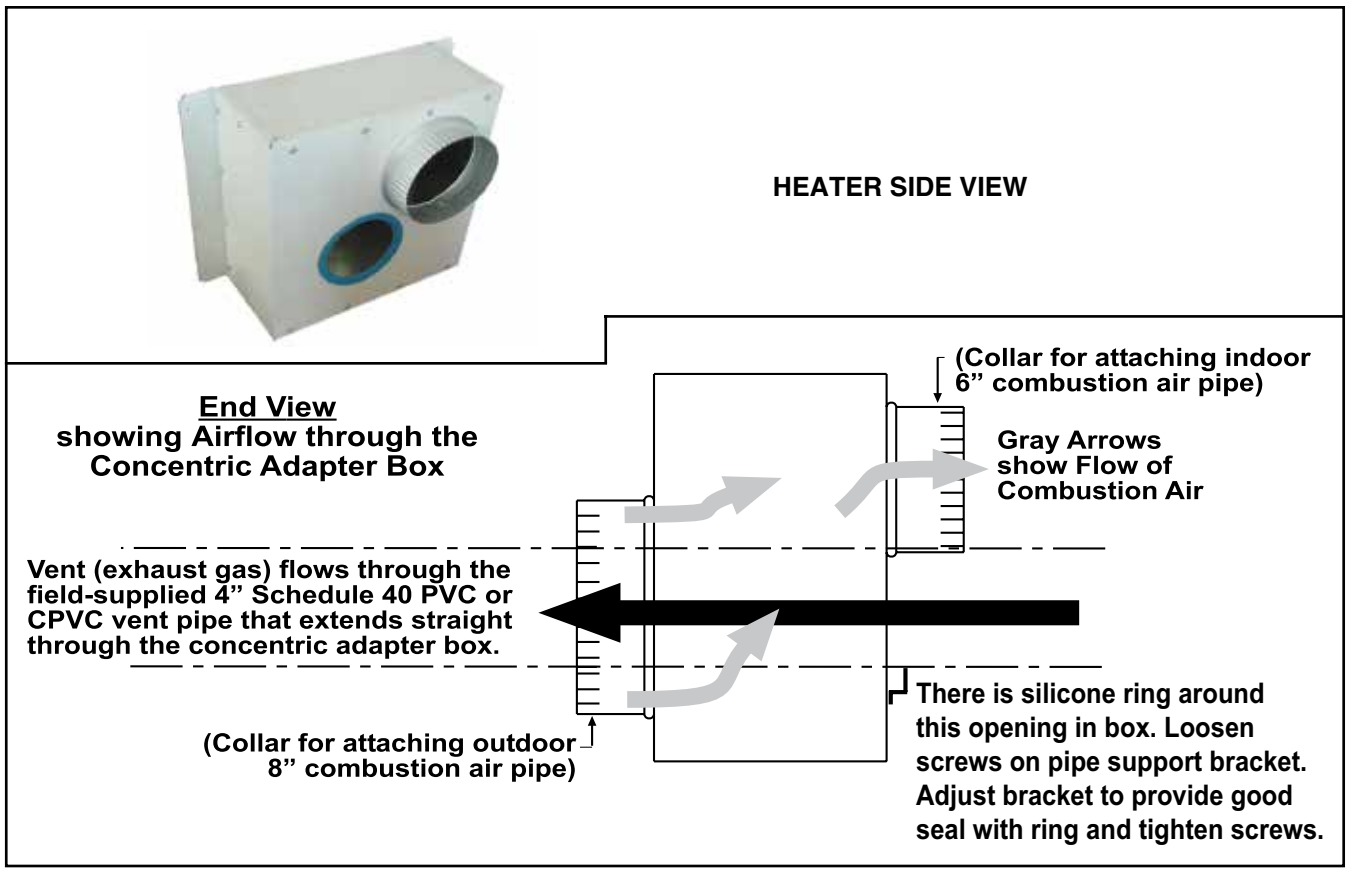


Figure 8. Concentric Adapter Box

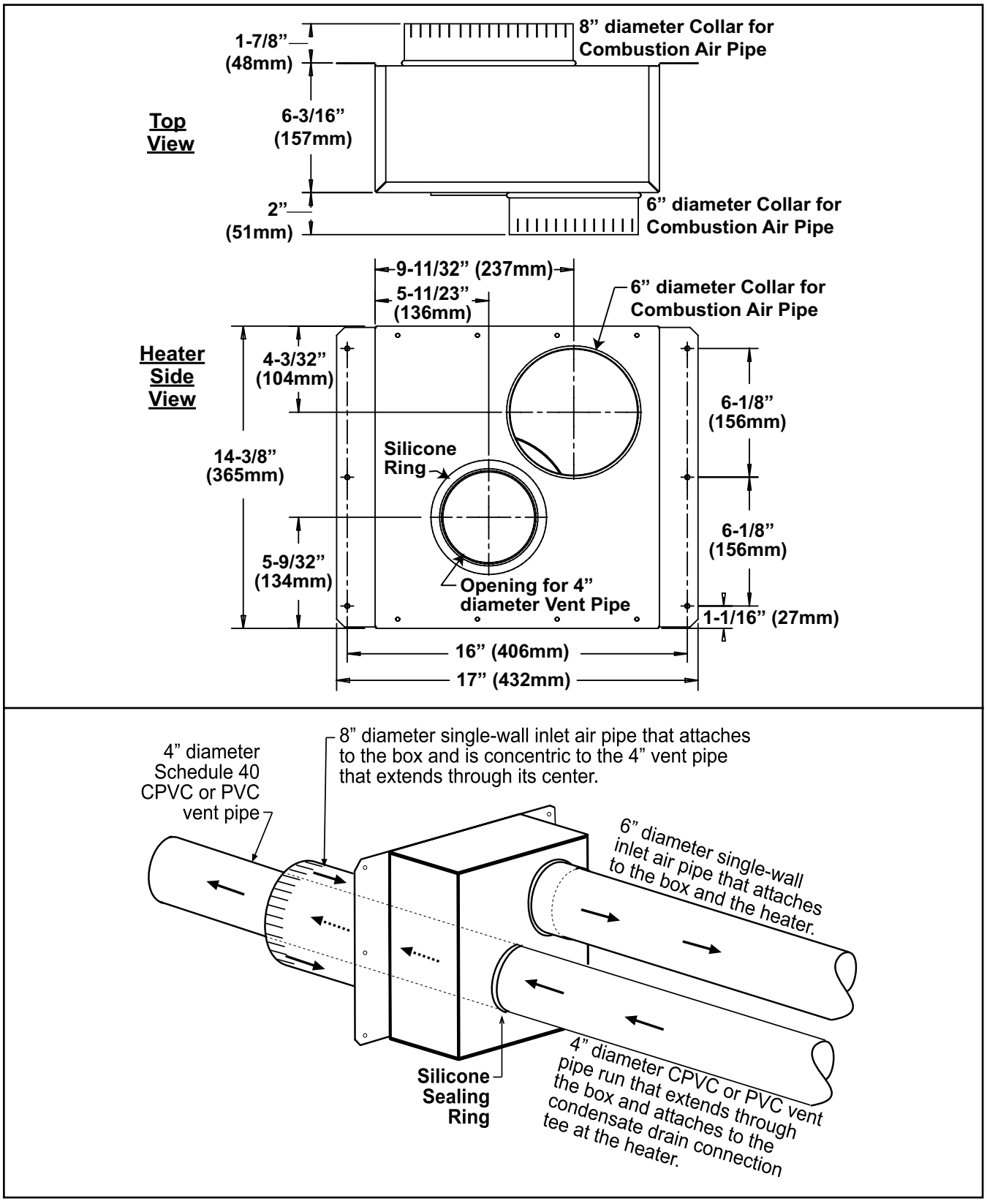


Figure 9. Concentric Adapter Box Dimensions and Connections

Vent Terminal Options

Vent terminal options CC2 (vertical vent configuration) and CC6 (horizontal vent configuration) are shown in **Figure 10**.

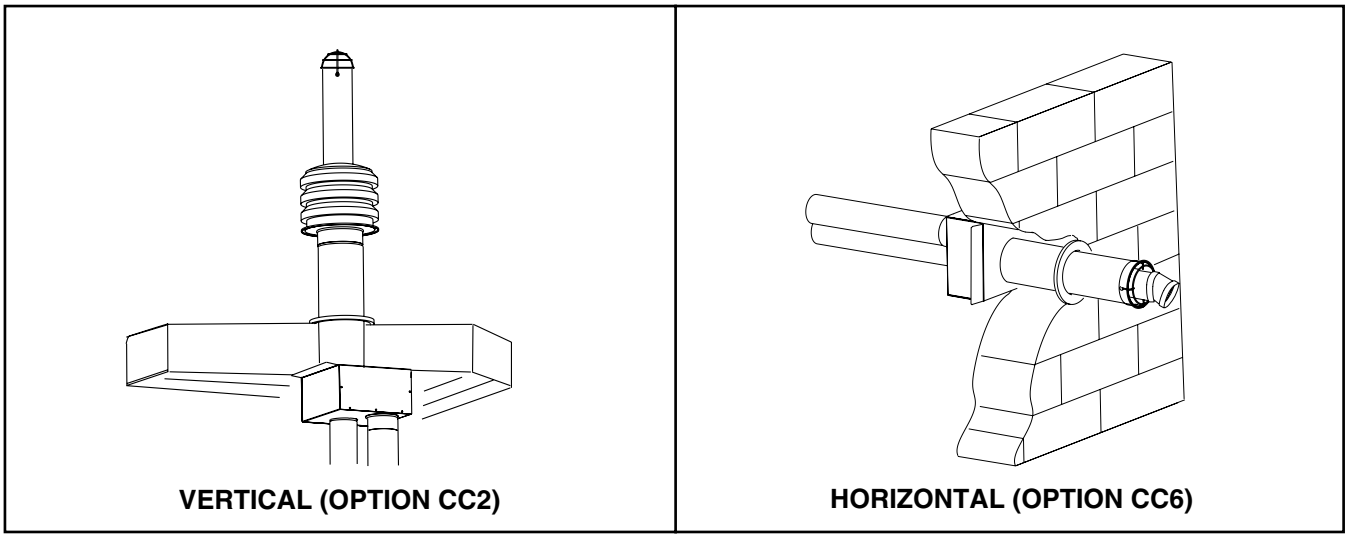


Figure 10. Vent Terminal Options

Vertical Vent Terminal (Option CC2) Installation

- Field-supplied components required for installation of the vertical vent kit are as follows:
  - Vent and combustion air piping—6- and 8-inch single-wall galvanized pipe
  - Tapered vent pipe diameter reducers and/or increasers, as required
  - Thimble (not required if wall is of non-combustible construction)
  - Flashing
  - 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 11**.

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

PN	Description	Qty
221248	Kit package	1
221069	Concentric adapter box with silicone sealing ring (see **Figure 8** and **Figure 9**)	1
221185	Rain collar (see **Figure 11**)	1
221250	Combustion air inlet (see **Figure 11**)	1
221091	Cap, condensate drain connection, 4-inch PVC	1
221215	Bird guard (see **Figure 11**)	1
37661	Screw, self-drilling, #10-16 × 1/2, bird guard	2

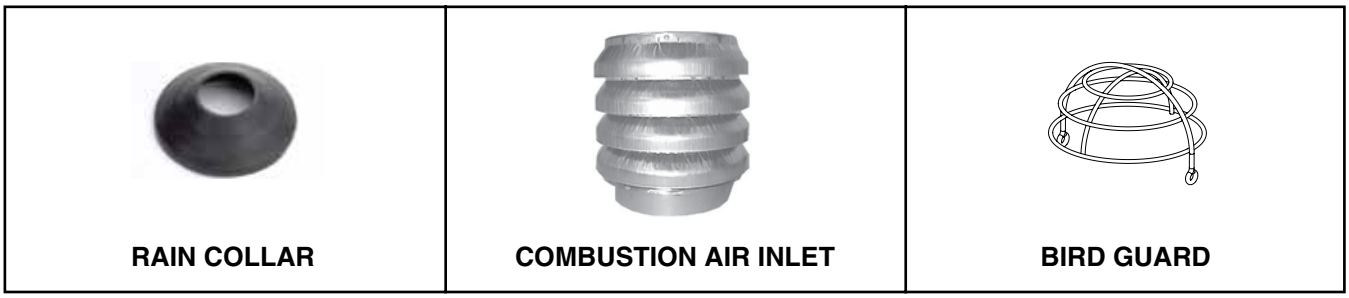


Figure 11. Option CC2 Components

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** to ensure that location complies with minimum outdoor design temperature requirements.

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)

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 12**.

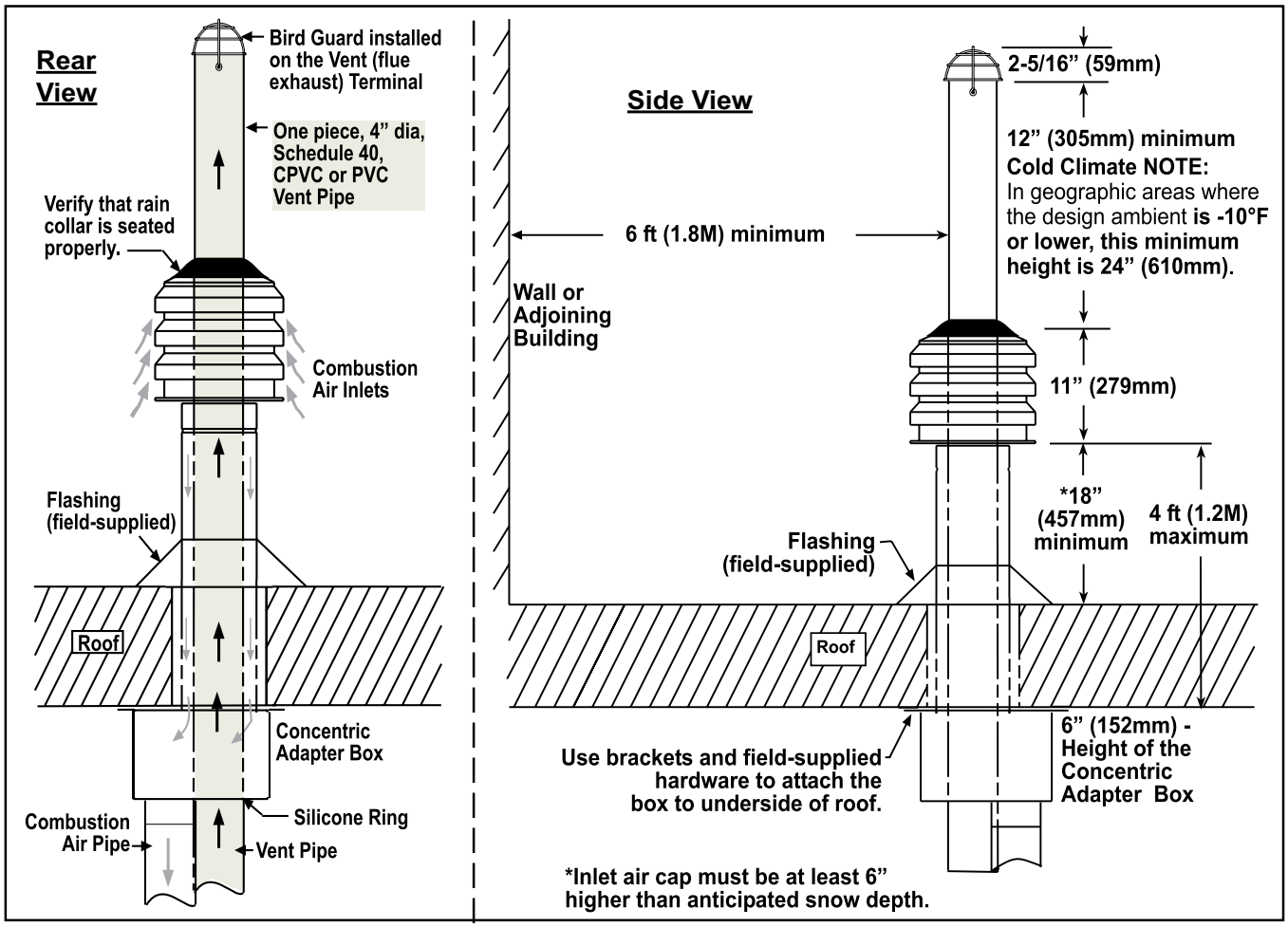


Figure 12. Option CC2 Installation

Vent Terminal Options—Continued

Vertical Vent Terminal (Option CC2) Installation—Continued

2. Install vent pipe and combustion air pipe runs:

a. Connect piping to heater in accordance with specifications listed in **Venting and Combustion Air Requirements** section.

b. Seal all joints in accordance with specifications listed in **Venting and Combustion Air Requirements** 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 **Venting and Combustion Air Requirements** 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 outside wall 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.

4. Connect combustion air pipe to concentric adapter box (see Figure 13):

a. Determine length of combustion air pipe so that dimension X in **Figure 13** 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.

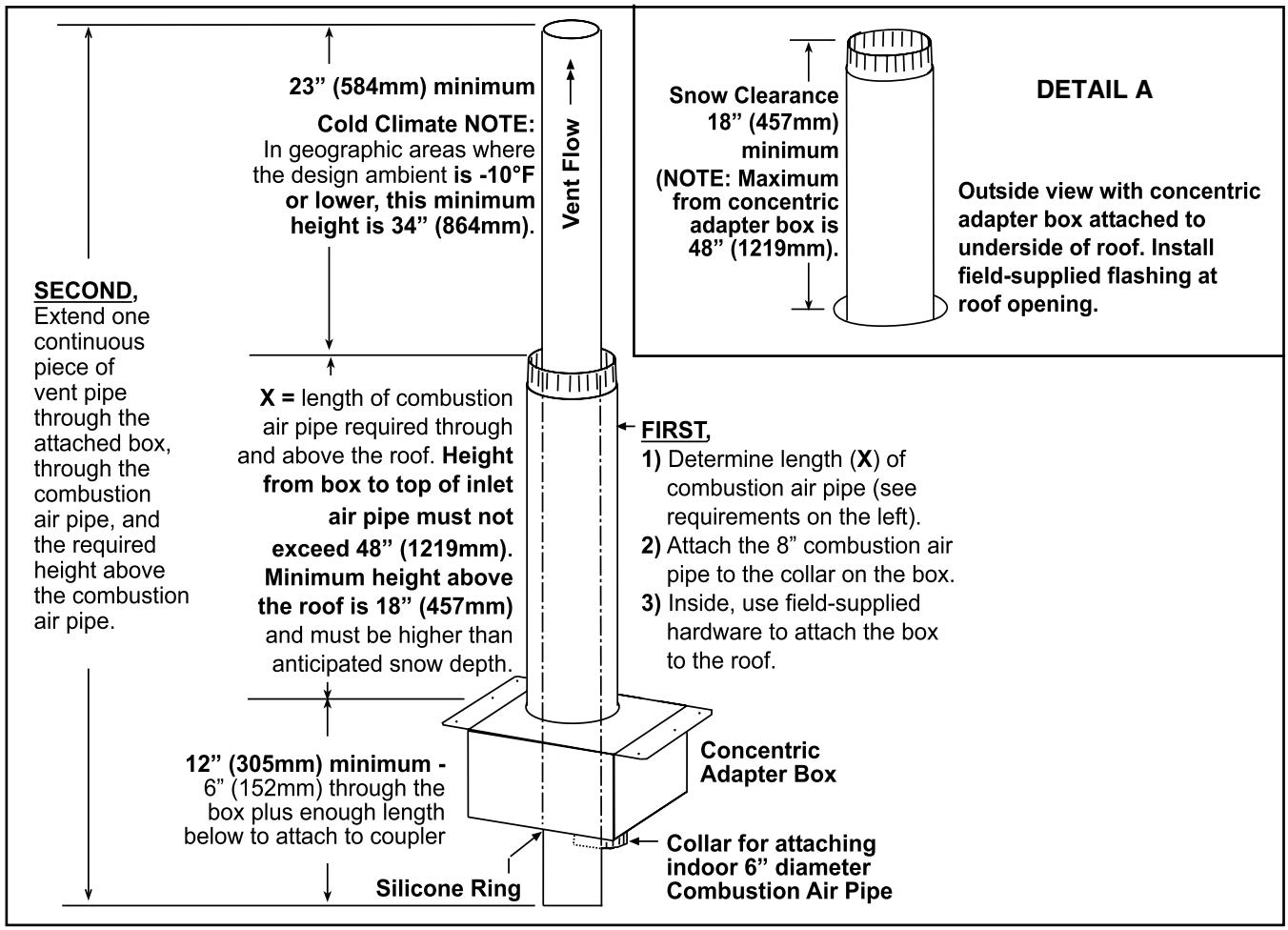


Figure 13. Combustion Air Pipe Installation

5. **Secure concentric adapter box to underside of roof (see Figure 12):**
   a. Insert combustion air pipe through roof as shown in **Figure 13**, DETAIL A.
   b. Position concentric adapter box to match pipe runs and secure box to underside of roof using field-supplied hardware.
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 13** 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.
8. **Install outdoor combustion air inlet, rain collar, bird screen, and field-supplied flashing (see Figure 14):**
   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.

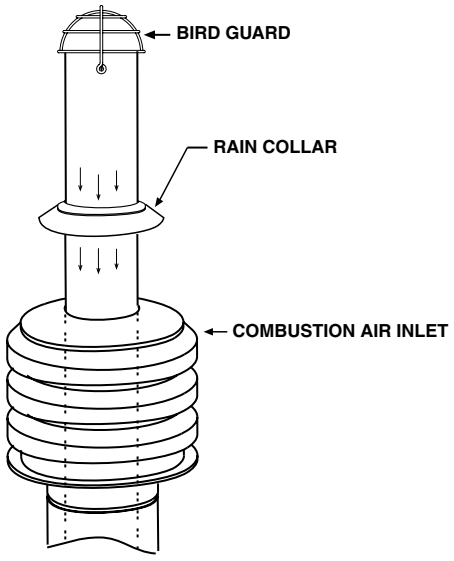


Figure 14. Combustion Air Inlet, Rain Collar, and Bird Guard

9. **Verify compliance with Figure 12 and with all specifications listed in Venting and Combustion Air Requirements and Hazards of Chlorine sections.**

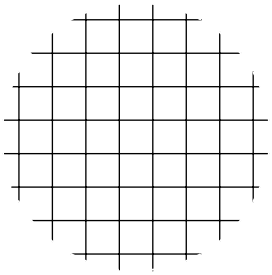
Vent Terminal Options—Continued

Horizontal Vent Terminal (Option CC6) Installation

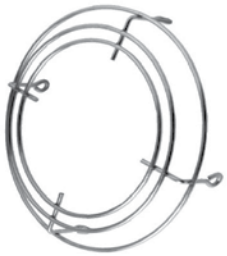
- Field-supplied components required for installation of the horizontal vent kit are as follows:
  - Vent and combustion air piping—6- and 8-inch single-wall galvanized pipe
  - 22.5-degree elbow (if available)
  - Flashing
  - Sheet metal screws, tape, and sealant, as required
- Factory-supplied components for installation of the vertical vent kit are listed in **Table 16** and shown in **Figure 15**.

Table 16. Horizontal Vent Terminal/Combustion Air Package (Option CC6) Components

PN	Description	Qty
221247	Kit package	1
221069	Concentric adapter box with silicone sealing ring (see **Figure 8** and **Figure 9**)	1
221089	Bird screen, exhaust outlet (see **Figure 15**)	1
124940	Ring guard, air inlet (see **Figure 15**)	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 15. 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.**

1. **Determine vent/combustion air terminal location on outside wall:**
   a. Refer to **Table 8** and **Table 9** 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 National Fuel Gas Code Z223.1.

   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 Z223.1.

⚠ DANGER ⚠

Consider local snow depth conditions. The vent must be at least 6 inches (152 mm) above the anticipated snow depth.

⚠ 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.

⚠ 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 **Venting and Combustion Air Requirements** section.

b. Seal all joints in accordance with specifications listed in **Venting and Combustion Air Requirements** 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 **Venting and Combustion Air Requirements** 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.

Vent Terminal Options—Continued

Horizontal Vent Terminal (Option CC6) Installation—Continued

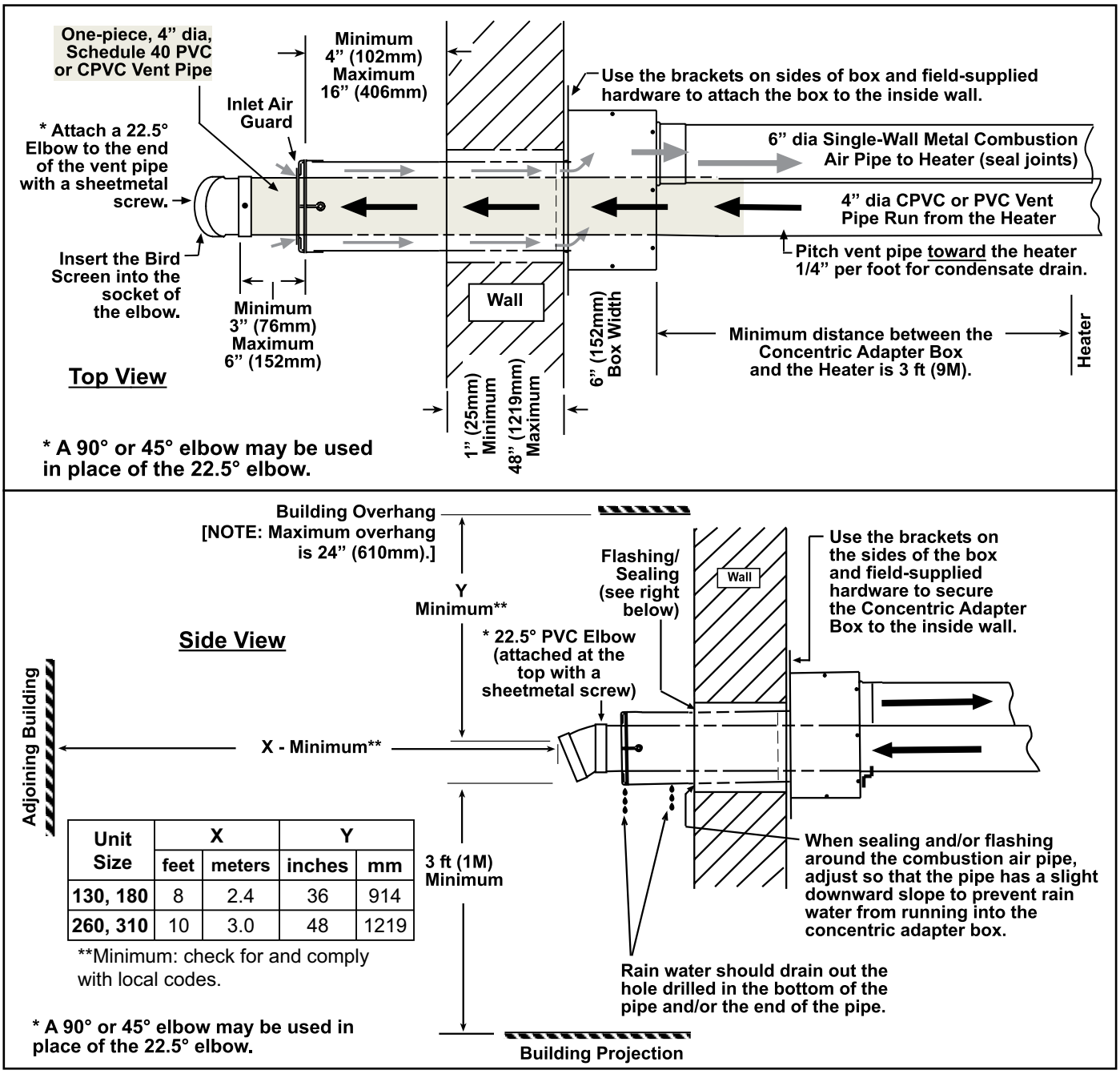
4. Connect concentric adapter box (see Figure 16):

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 16. 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 16**.
   b. Secure inlet air ring guard to inlet air pipe using four 1/2-inch-long screws provided.
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 16** 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 16 and with all specifications listed in Venting and Combustion Air Requirements and Hazards of Chlorine sections.**

Condensate Drain Installation

⚠ CAUTION ⚠

Apply general plumbing practices if pipe insulation or heat tapes are required to prevent freezing of the condensate drain system.

- 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.
- 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 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.
- Each condensate drain must include a drain trap:
  - 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.
  - The most important part of fabricating and assembling the traps is the length of the individual legs of the traps. If the difference in the lengths of the legs of the traps are not as shown (see **Figure 17** for vent drain trap or **Figure 18** for heat exchanger drain trap), 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.

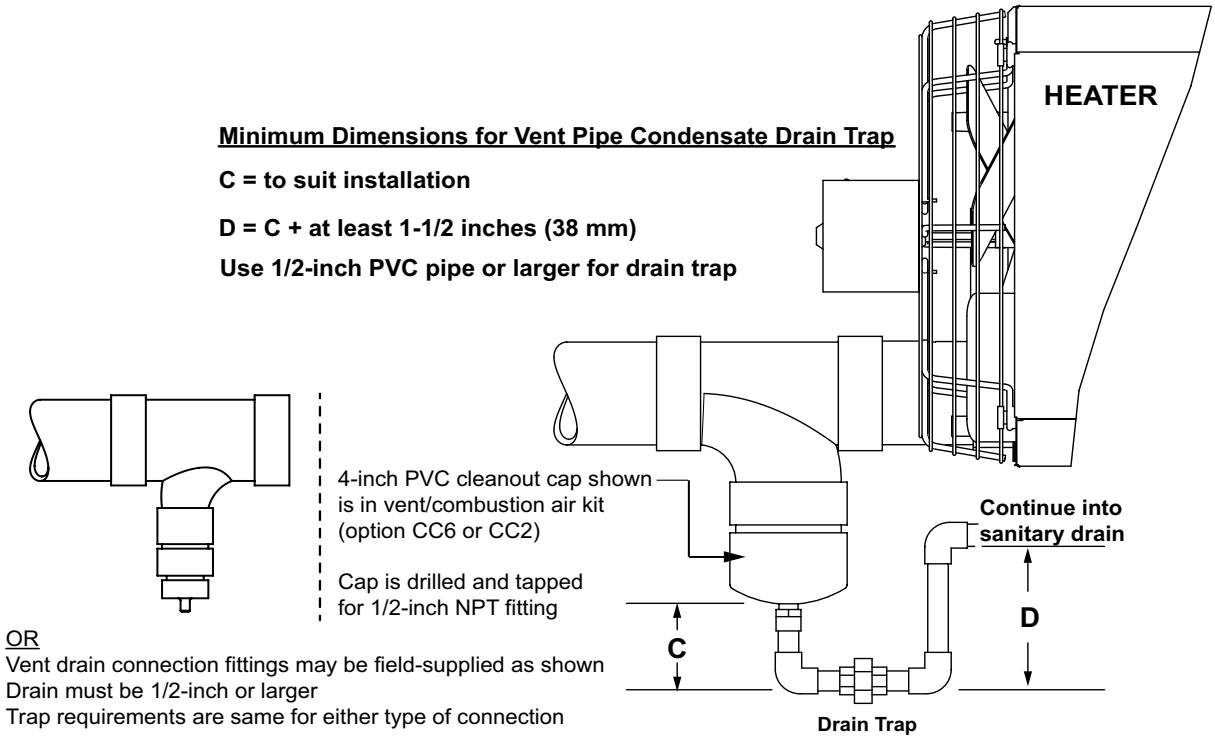


Figure 17. Vent Condensate Drain Trap

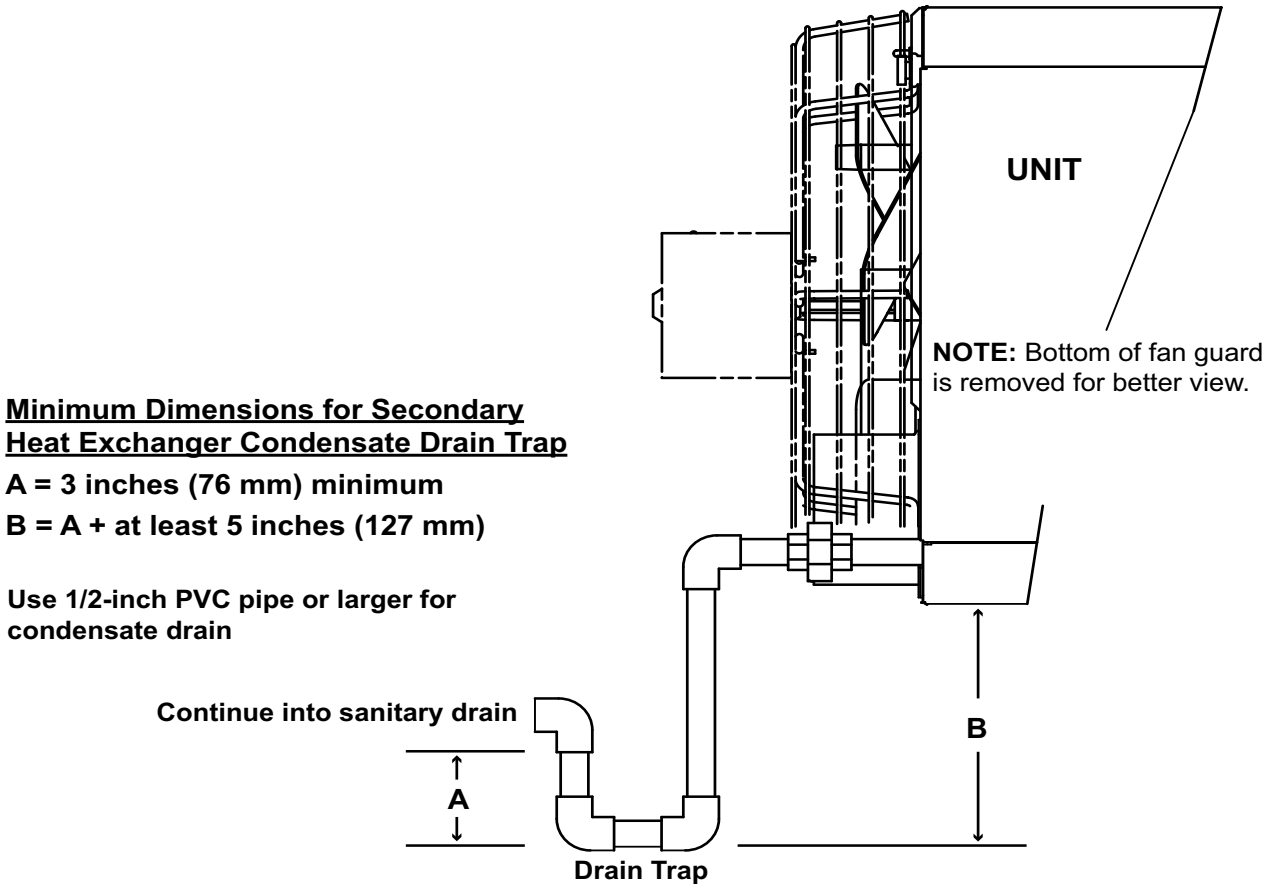


Figure 18. Heat Exchanger Condensate Drain Trap

Vent Condensate Drain Installation

NOTE: In Canada, all PVC vent pipe must be approved to ULC S636.

- A 4-inch PVC cleanout cap that is drilled and tapped for a 1/2-inch NPT fitting is furnished with the heater for the vent drain. All other material must be field-supplied.
- Instructions for installing a condensate drain connection with a vertical vent (US INSTALLATIONS ONLY) using the factory-provided 4-inch PVC cap are shown in **Figure 19**.
- Instructions for installing a condensate drain connection with a vertical vent (US OR CANADIAN INSTALLATIONS) using field-supplied vent and drain components are shown in **Figure 20**.
- Instructions for installing a condensate drain connection with a vertical or horizontal vent (US INSTALLATIONS ONLY) in a horizontal vent run using the factory-provided 4-inch PVC cap are shown in **Figure 21**.
- Instructions for installing a condensate drain connection with a vertical or horizontal vent (US OR CANADIAN INSTALLATIONS) using field-supplied vent and drain components are shown in **Figure 22**.
- Ensure that the drain trap is in accordance with **Figure 17**.

Condensate Drain Installation—Continued

Vent Condensate Drain Installation—Continued

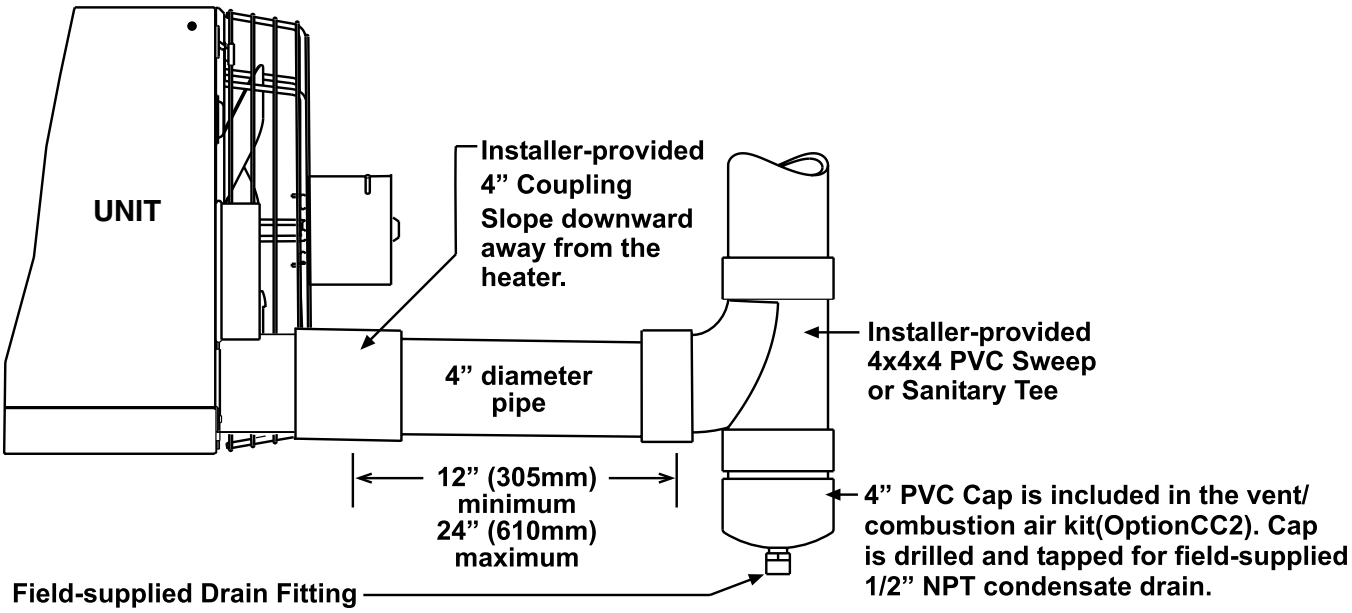


Figure 19. Installing Condensate Drain in Vertical Vent (US Installations Only)

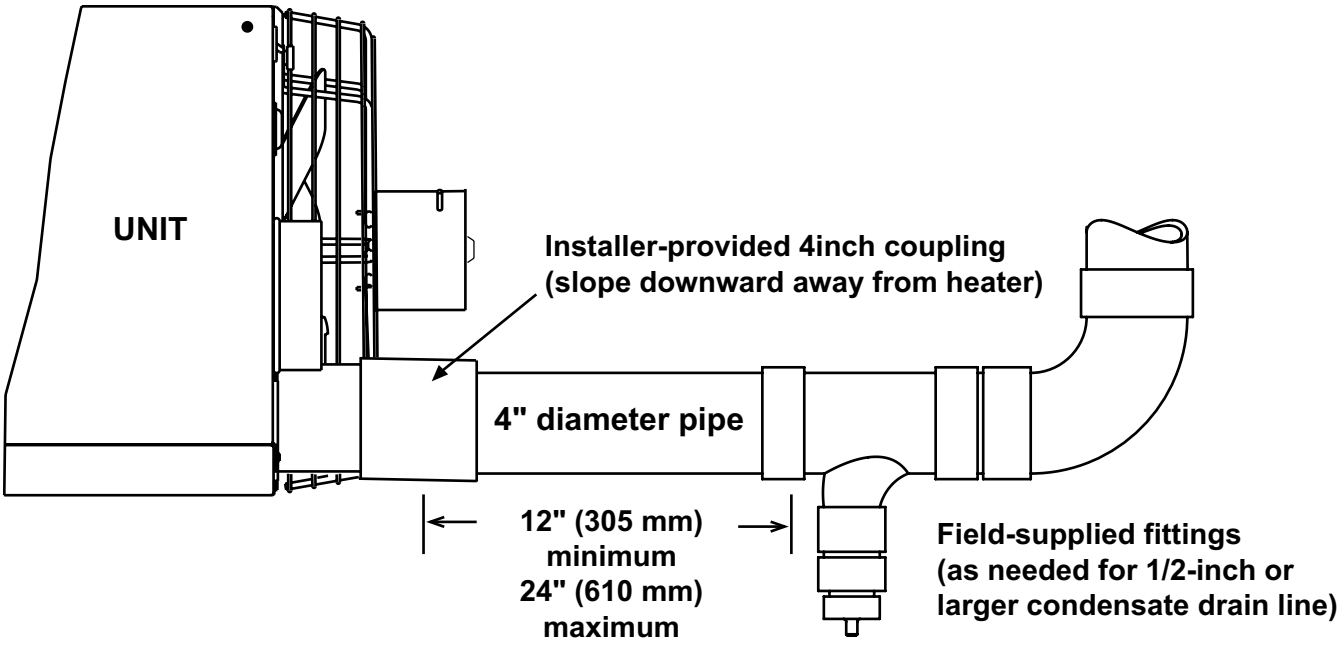


Figure 20. Installing Condensate Drain in Vertical Vent (US or Canadian Installation)

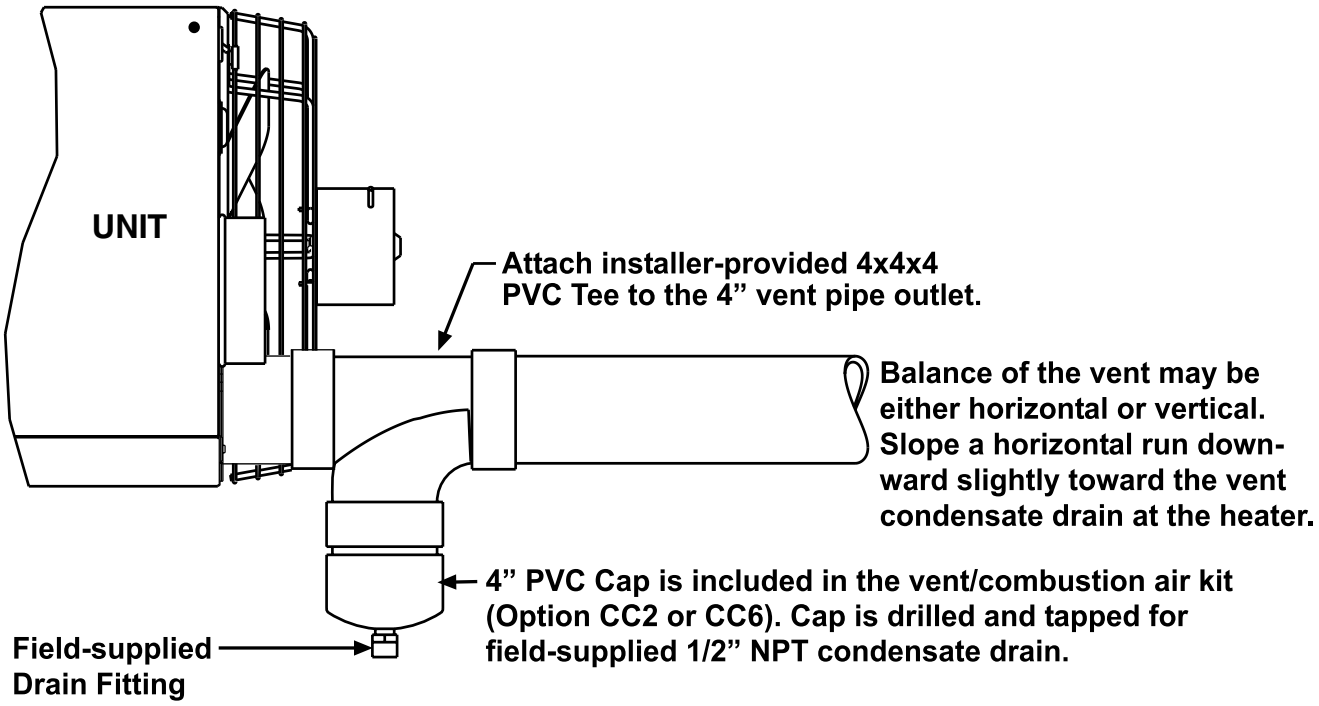


Figure 21. Installing Condensate Drain in Vertical or Horizontal Vent (US Installations Only)

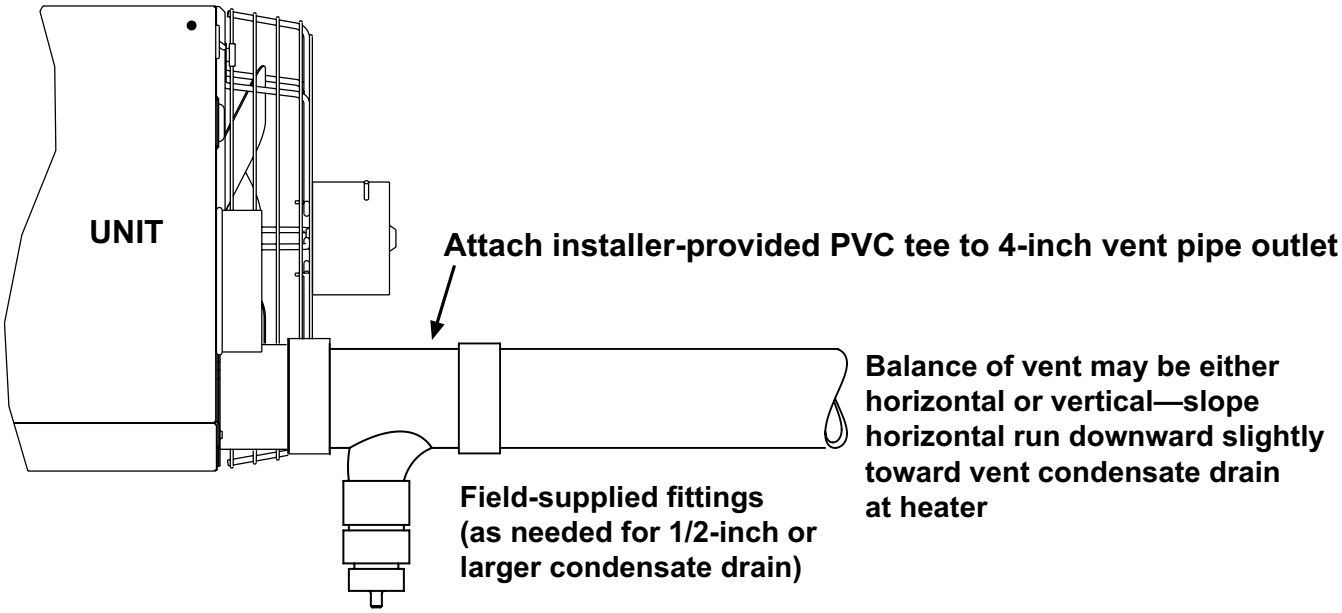


Figure 22. Installing Condensate Drain in Vertical or Horizontal Vent (US or Canadian Installation)

Heat Exchanger Condensate Drain Installation

Install the heat exchanger condensate drain in accordance with all piping requirements listed in this manual and with **Figure 18**.

Electrical Connections

⚠ CAUTION ⚠

- **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 105°C, except for limit control, flame rollout, and sensor lead wires which must be rated at 150°C.**

NOTES:

- **Specific wiring diagrams that include standard and factory-installed options are provided with the unit. Ensure that all wiring is in accordance with these wiring diagrams.**
- **A two-stage valve circuit is NOT available on all models.**

- 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, with CSA Standard C22.1. In addition, the installer should be aware of any local ordinances or gas company requirements that might apply.
- Check the rating plate on the heater for the supply voltage and current requirements. A dedicated line voltage supply with a disconnect switch should 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 60°C. Conduit must be run so as not to interfere with the heater access panel.
- 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).
- The supply wiring enters at the rear of the heater, as shown in **Figure 23**. 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.
- 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 23**. Wires from the terminal strip are factory-wired to the circuit board.

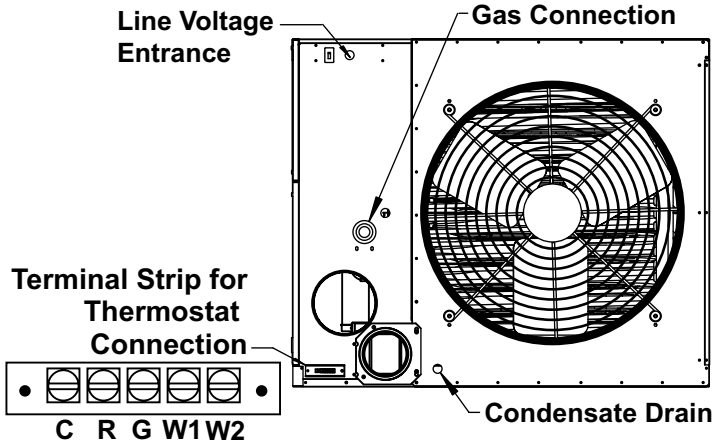


Figure 23. Supply Wiring Entrance and Control Connection Terminal Strip

- The circuit board (see **Figure 24**) is located inside on the bottom of the control compartment. The circuit board is polarity sensitive. It is advisable to check the electrical supply 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.

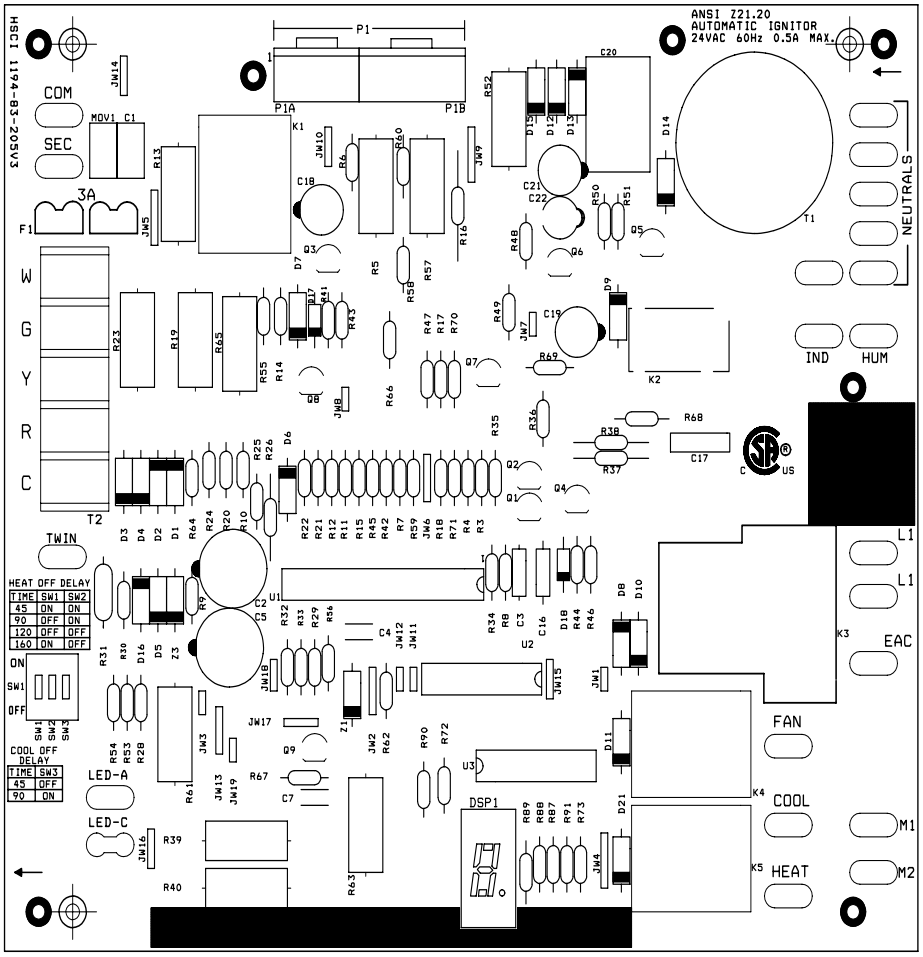


Figure 24. Circuit Board (DSI Control Module)

CONTROLS

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

Locations for the following controls are shown in **Figure 25**.

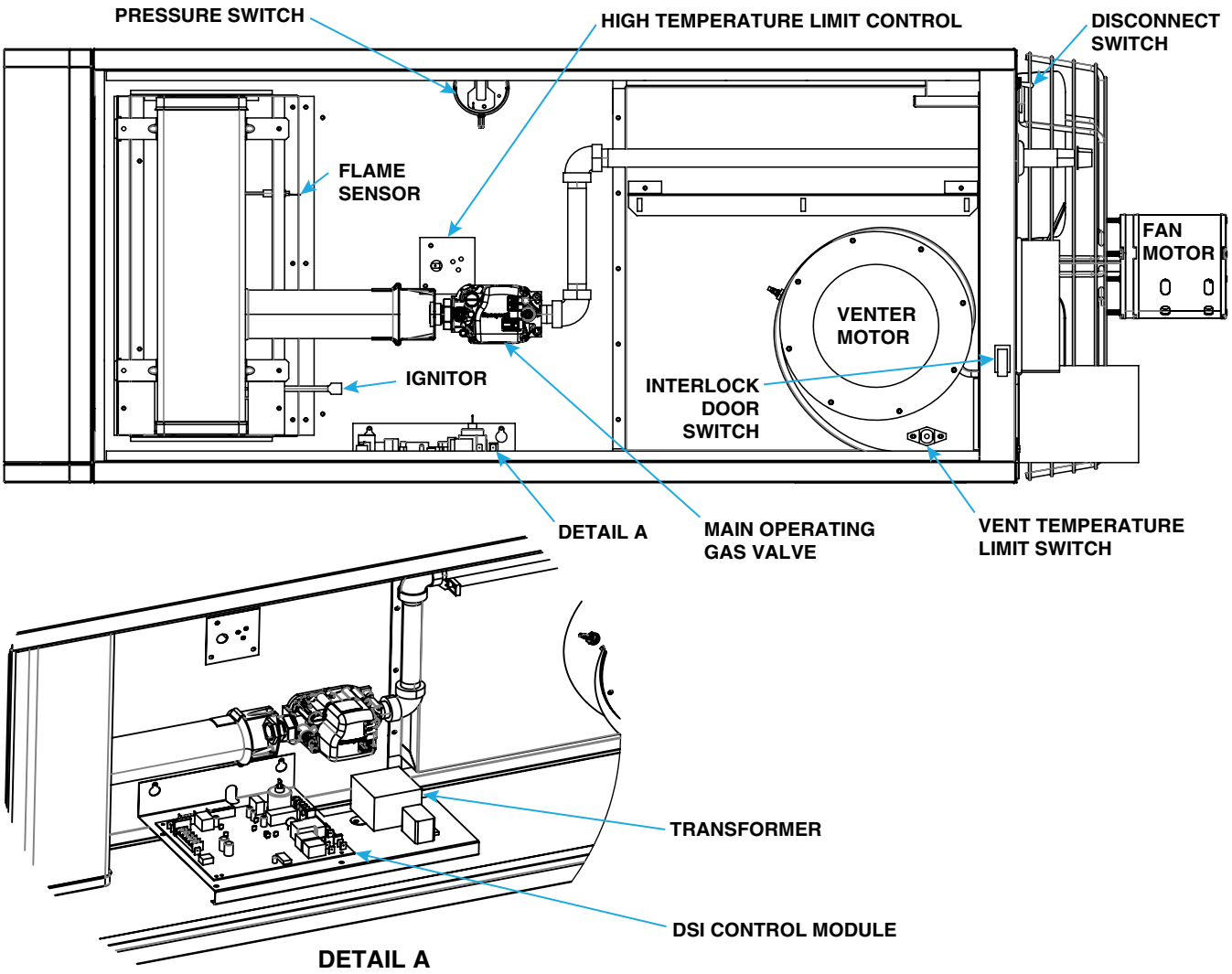


Figure 25. Component Locations

Thermostat Options

NOTES:

- **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.**

- Install an optional thermostat (available with the heater) or a field-supplied 24V thermostat in accordance with the thermostat manufacturer's instructions. Pay particular attention to the requirements regarding the location of the thermostat.
- 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.
- Make thermostat connections at the terminal strip on the back of the heater (see **Figure 23**). The strip has five terminals: C, R, G, W1, and W2. Refer to the wiring diagram provided with the heater.
- If the heater was ordered with a multiple heater control option, one thermostat can be used to control up to six

- 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 six 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.

Main Operating Gas Valve

⚠ WARNING ⚠

The main operating 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 main operating gas valve (see **Figure 25** 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.

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 25** 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	Switch PN
	Startup Cold	Equilibrium Hot	Setpoint OFF	Setpoint ON		
130	3.50	3.00	2.40	2.65	White	1013436
180	3.20	2.50	2.30	2.45	Blue	221228
260	3.50	3.10	2.40	2.65	White	1013436
310	3.30	2.80	2.40	2.65	White	1013436

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 25** for location). The control is factory-set and is non-adjustable. If the setpoint is reached, the control interrupts the electric supply to the 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 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 25** for location). If the setpoint is reached, the switch interrupts the electric supply to the gas valve. If the switch is activated, identify and correct the cause before resetting the switch.

Interlock Door Switch

All units are equipped with an interlock door switch (see **Figure 25** 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.

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 24**) that monitors the safety devices and controls the operation of the fan and venter motors and the 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 24**). The display's codes are listed and described in **Table 19**.

Table 19. 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

NOTE: 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.

Venter Motor

The venter motor (see **Figure 25** for location) is assembled to the venter wheel and operates to provide combustion airflow. Operation is controlled by the circuit board (see **Figure 24**). Refer to the **Circuit Board (DSI Control Module)** section for details.

⚠ 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:**
  - **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 your fire department.**
- **Use only your hand to turn the gas control ON/OFF knob on the 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 5**
- ❑ Check vent system to ensure that it is installed in accordance with appropriate venting instructions listed in **Table 1**
- ❑ 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

Startup Procedure

Startup 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 gas valve (see **Figure 26**).

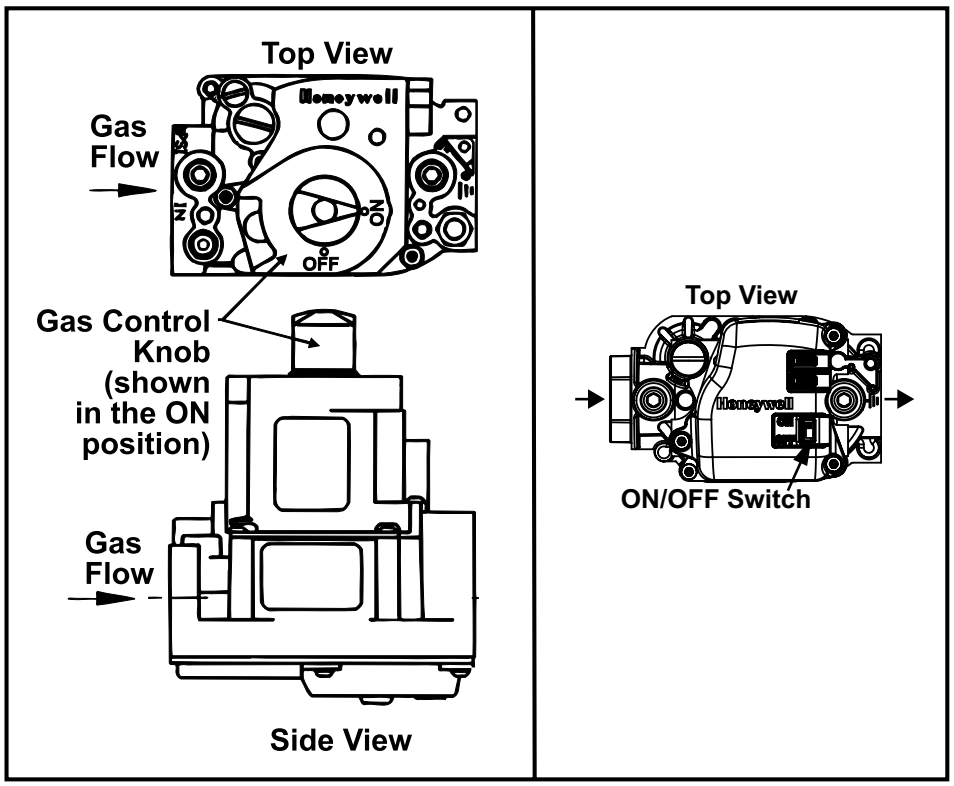


Figure 26. Gas Valve ON/OFF Control

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 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 20 describes the heater's normal operating sequence. **Table 21** describes the heater's abnormal heat cycle functions. **Table 22** describes the heater's fault modes. Refer to **Table 19** for LED indications.

Table 20. 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 step 3
3. Ignition trial period	Spark and main gas valve are energized	The 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 21**: 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

Startup—Continued

Operating Sequences—Continued

Table 21. 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 22. 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 in **Table 1**.
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 **Measure and Adjust Manifold (Outlet) Gas Pressure** 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, venting instructions, 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

After startup, the gas valve outlet pressure must be measured and adjusted if necessary in accordance with the **Measure and Adjust Manifold (Outlet) Gas Pressure** section. 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.

Pressure Switch Replacement

For installations at elevations >6,000 feet (>1,830 meters), the pressure switch (see **Figure 27**) must always be replaced before the heater is operated. If ordered with the unit as part of a high-elevation kit (option DJ20 or DJ21), the switch is shipped separately for field-installation. Replace the pressure switch as follows:

1. Locate pressure switch in control compartment (see **Figure 25**) 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 (refer to replacement parts manual listed in **Table 1** for PN) using mounting bracket and two screws. Reconnect sensing tube(s) and wires.

Figure 27. Pressure Switch

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.

⚠ 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 Converting Unit from Natural Gas to Propane 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:

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

NOTE: A manometer (fluid-filled gauge) is recommended rather than a spring-type gauge due to the difficulty of maintaining the calibration of a spring-type gauge. Use a water column manometer that is readable to the nearest tenth of an inch.

2. Connect manometer to 1/8-inch output pressure tap on valve (see **Figure 28**).

Measure and Adjust Manifold (Outlet) Gas Pressure—Continued

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

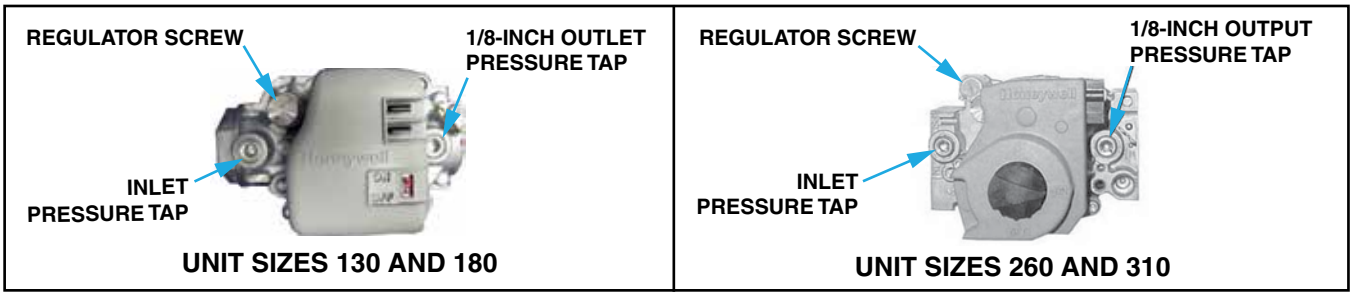


Figure 28. Gas Valves

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

⚠ 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.

5. 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.
6. 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

Elevation		Natural Gas	Unit Size	
			130, 260	180, 310
			Propane	
Feet	Meters	Manifold Pressure (IN WC)		
US				
0–2000	0–610	3.5	10.0	9.5
2001–3000	611–915	3.1	8.8	8.4
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)
Canada				
0–2000	0–610	3.5	10.0	9.5
2001–4500	611–1373	2.8	8.1	7.7

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.
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 gas valve.

NOTE: A manometer (fluid-filled gauge) is recommended rather than a spring-type gauge due to the difficulty of maintaining the calibration of a spring-type gauge. Use a water column manometer that is readable to the nearest tenth of an inch.

4. Connect manometer to 1/8-inch output pressure tap on valve (see **Figure 28**).
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 1/8-inch 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** or **Table 25** 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.

Table 24. Inputs and Capacities by Elevation in US

Elevation (Feet (Meters))	Unit Size							
	130		180		260		310	
	Normal Input	Thermal Output Capacity	Normal Input	Thermal Output Capacity	Normal Input	Thermal Output Capacity	Normal Input	Thermal Output Capacity
	BTUh							
0–2000 (0–610)	131,000	121,830	175,000	159,250	260,000	239,200	305,000	277,550
2001–3000 (611–915)	123,140	114,520	164,500	149,695	244,400	224,848	286,700	260,897
3001–4000 (916–1220)	120,520	112,084	161,000	146,510	239,200	220,064	280,600	255,346
4001–5000 (1221–1525)	117,900	109,647	157,500	143,325	234,000	215,280	274,500	249,795
5001–6000 (1526–1830)	115,280	107,210	154,000	140,140	228,800	210,496	268,400	244,244
6001–7000 (1831–2135)	112,660	104,774	150,500	136,955	223,600	205,712	262,300	238,693
7001–8000 (2136–2440)	110,040	102,337	147,000	133,770	218,400	200,928	256,200	233,142
8001–9000 (2441–2745)	107,420	99,901	143,500	130,585	213,200	196,144	250,100	227,591
9001–10,000 (2746–3045)	104,800	97,464	140,000	127,400	208,000	191,360	244,000	222,040

Measure and Adjust Manifold (Outlet) Gas Pressure—Continued

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

Table 25. Inputs and Capacities by Elevation in Canada

Elevation (Feet (Meters))	Unit Size							
	130		180		260		310	
	Normal Input	Thermal Output Capacity	Normal Input	Thermal Output Capacity	Normal Input	Thermal Output Capacity	Normal Input	Thermal Output Capacity
	BTUh							
0–2000 (0–610)	131,000	121,830	175,000	159,250	260,000	239,200	305,000	277,550
2001–4500 (611–1373)	117,900	109,647	157,500	143,325	234,000	215,280	274,500	249,795

13. Observe heater operation for at least one complete cycle to check for safe and proper operation. Depress and hold safety door switch.

Converting Unit from Natural Gas to Propane

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 26**) and install the kit as follows:

1. Install propane regulator spring kit in gas valve in accordance with valve manufacturer's instructions included with kit.
2. Attach propane disk near gas valve.
3. Carefully remove natural gas orifice (see **Figure 25**) from heater and install propane orifice.
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.

Table 26. Propane Conversion Kit Components

Component	Description	Unit Size			
		130	180	260	310
		PN			
Conversion kit	Package PN	261647	1036196R	1036197R	221445
Regulator spring kit	Honeywell #396221	260605		—	
	Honeywell #393691	—		98720	
Single-stage gas controls	With standard or slow-opening pressure regulator	VR82**XX**S*	VR82**XX**T*	VR82**XX**K*	VR82**XX**M*
		VR83**XX**S*	VR83**XX**T*	VR83**XX**K*	VR83**XX**M*
Burner orifice	3.3 mm	120145	—		
	#24	—	196899	—	
	4.6 mm	—		1034352	—
	#8	—			196903
Label	Conversion	64391			
	Regulated propane	79718			
Gas disk	Propane	37752			
***XX** = variable numeric charactors.					

MAINTENANCE

⚠ WARNING ⚠

If you turn OFF the electrical power supply, turn OFF the gas.

⚠ CAUTION ⚠

- **Eye protection is recommended when cleaning unit.**
- **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.

Service Checklist

The following section is designed to aid a qualified service person in maintaining and servicing this equipment. At a minimum, perform the following annually (see **Figure 25** 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

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

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 burner as follows:

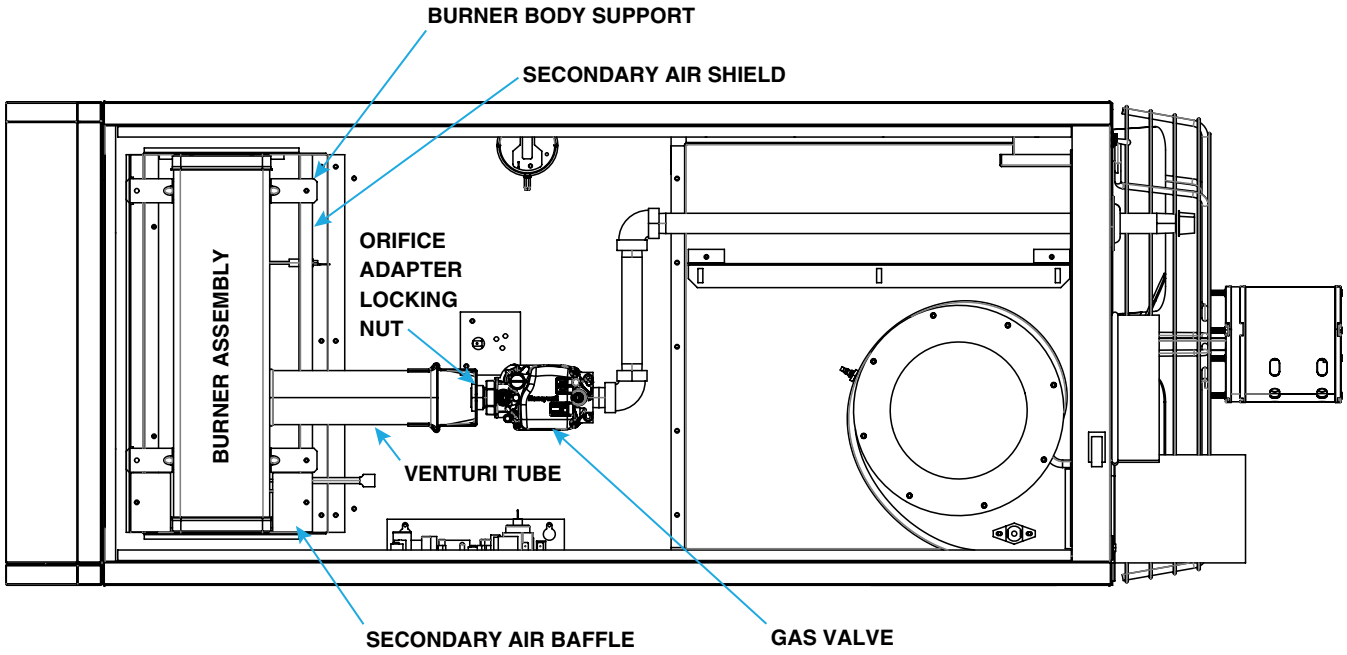


Figure 29. Burner Assembly

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.

⚠ WARNING ⚠

Use of eye protectection is recommended.

2. **Remove burner assembly (see Figure 29):**
   a. Remove access panel.
   a. Detach gas train:
      (1) Mark and disconnect wires at gas valve.
      (2) Carefully remove burner orifice and orifice adapter locking nut.
      (3) Slide orifice adapter out through bracket on burner while pushing gas train to right. This will move gas train out of way.
   b. 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.

c. 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).

d. 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.

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

f. 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 29):

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. Attach 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 gas orifice and reconnect wires to 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.

Maintenance Procedures—Continued

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. When removing or replacing the burner orifice, take care not to damage the venturi tube and/or the bracket.

Heat Exchanger Maintenance

NOTES:

- **The unit is equipped with a TCORE^3® heat exchanger.**
- **Inspection of the lower portion of the heat exchanger is done with the burner removed. Refer to the Burner Maintenance section for information on inspecting the lower portion of the heat exchanger.**

1. Remove burner in accordance with **Burner Maintenance** section.
2. Remove any external dirt or dust accumulation.
3. Visually inspect check both primary and secondary heat exchanger sections for cracks and holes.
4. If crack or hole is found, replace heat exchanger.
5. Install burner in accordance with **Burner Maintenance** section.

Ignition System Maintenance

- The DSI control module (circuit board, see **Figure 24**) 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 25** 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.

⚠ CAUTION ⚠

When reassembling, the brown ground wire must remain attached to the ignitor.

- For the ignitor (see **Figure 25** for location), disconnect the wire and remove the screw and ignitor. Clean the ignitor assembly with an emery cloth before reinstalling.

⚠ WARNING ⚠

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

- The spark gap (see **Figure 30**) must be maintained to 1/8 inch.

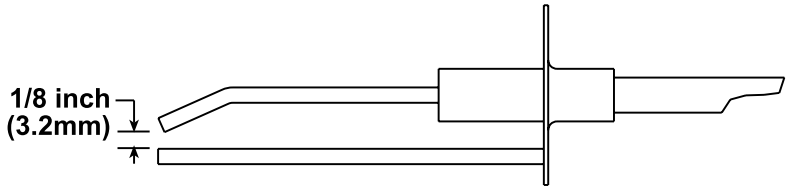


Figure 30. Ignitor Spark Gap

Maintenance of Fan Motor, Fan Blades, and Fan Guard

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 31**).

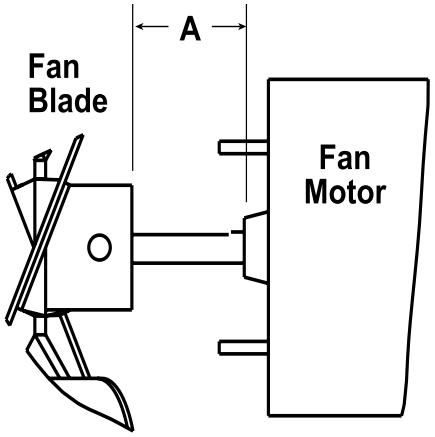


Figure 31. Fan Blade Positioning (Refer to Table 27)

Table 27. Fan Blade Positioning

Unit Size	Dimension A*	
	Inches	Millimeters
130, 180	1-5/8	67
260	2	51
310	1-7/8	48

*See **Figure 31**.

7. Position assembly on heater and attach fan guard.
8. Rotate fan blade to check for adequate clearance. If adjustment is required, loosen mounting screws, reposition fan guard, and tighten screws. Repeat until assembly is positioned properly.
9. Reconnect fan motor wires in accordance with wiring diagram.
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.

Maintenance Procedures—Continued

Venter Motor, Wheel, and Pressure Sensing Tap Maintenance

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 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. Disconnect three venter motor wires at DSI control, capacitor wires at capacitor (if applicable), and ground screw (located on control panel).
4. While holding venter motor, remove six screws that secure venter motor mounting plate to venter housing. Remove motor and wheel assembly from heater.
5. Reassemble with replacement venter motor and wheel. Ensure that venter wheel is properly positioned on shaft (see **Figure 32**).

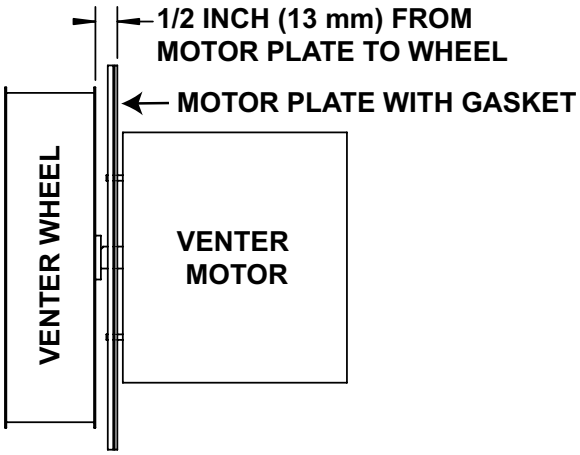


Figure 32. Venter Wheel Position on Shaft

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

Operating Gas Valve Maintenance

⚠ WARNING ⚠

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

Inspect the operating 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:

1. Turn manual valve OFF to prevent flow to gas valve.

NOTE: A manometer (fluid-filled gauge) is recommended rather than a spring-type gauge due to the difficulty of maintaining the calibration of a spring-type gauge. Use a water column manometer that is readable to the nearest tenth of an inch.

2. Connect manometer to 1/8-inch output pressure tap on valve (see **Figure 28**).
3. Turn manual valve ON and heater OFF.
4. Use finger to fully block main burner orifice for several seconds.
5. Observe manometer with orifice blocked. If ***any*** pressure is indicated, gas valve is leaking.
6. Replace leaking gas valve before heater is restored to operation.

Pressure Switch Maintenance

If it is determined that the pressure switch (see **Figure 27**) 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 33**) 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 25**.

				
HIGH TEMPERATURE LIMIT CONTROL	**INTERLOCK DOOR SWITCH**	**TRANSFORMER**	**VENT TEMPERATURE LIMIT SWITCH**	**DISCONNECT SWITCH**

Figure 33. Replaceable Components

Interlock Door Switch Maintenance

If it is determined that the interlock door switch (see **Figure 33)** needs replacing, use only a factory-authorized replacement part that is designed for the heater. For the approximate door switch location, see **Figure 25**.

Transformer Maintenance

Use a voltmeter to verify that there are 24V output from the transformer (see **Figure 33**). 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 25**.

Vent Temperature Limit Switch Maintenance

The vent temperature limit switch (see **Figure 33)** 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 33**) 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.

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

Unit Troubleshooting Using DSI Control Module

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 to determine the cause and/or to eliminate certain causes. See **Figure 34** for a flowchart for troubleshooting the unit using the 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 24), 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.**

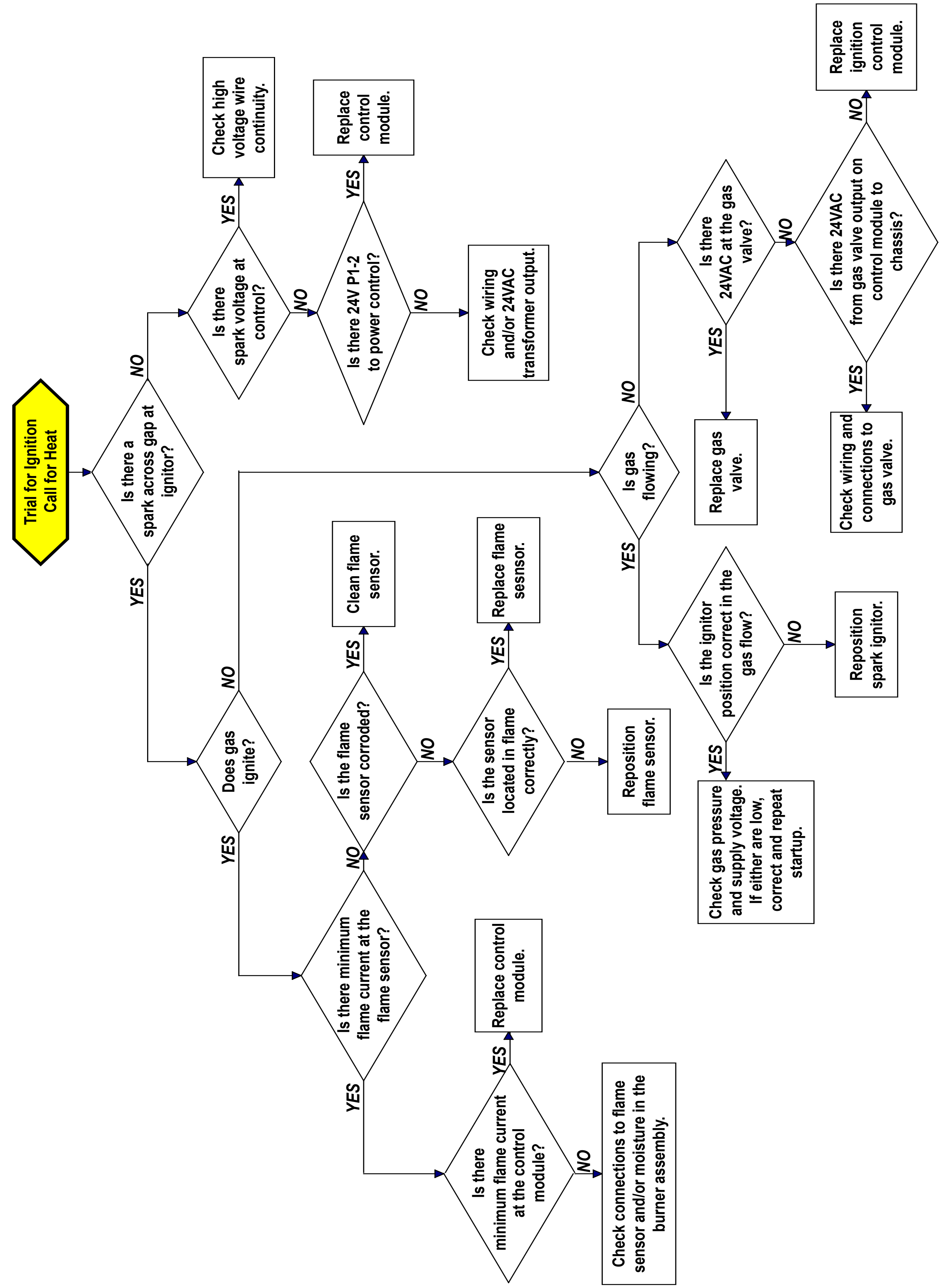


Figure 34. DSI Control Module Troubleshooting Flowchart

General Troubleshooting

Refer to **Table 28** for general troubleshooting symptoms, probable causes, and remedies.

Table 28. General Troubleshooting

Symptom	Probable Cause	Remedy
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, Wheel, and Pressure Sensing Tap Maintenance** section)
Burner will not light	1. Manual valve not open	Open manual valve
	2. Air in the 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
	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

Table 28. General Troubleshooting—Continued		
Symptom	**Probable Cause**	**Remedy**
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
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
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
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
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

NOTES

NOTES

INSTALLATION RECORD (TO BE COMPLETED BY INSTALLER)

Installer:

Name _____

Company _____

Address _____

_____

Phone _____

Distributor (company from which the unit was purchased):

Company _____

Contact _____

Address _____

_____

Phone _____

Model _____ **Serial No.**_____**Date of Installation** _____

SPECIFIC INSTALLATION NOTES: (i.e. Location, Amps, Gas Pressure, Temperature, Voltage, Adjustments, Warranty, etc.)

_____

_____

_____

BUILDING OWNER OR MAINTENANCE PERSONNEL:

For service or repair

- Contact the installer listed above.
- If you need additional assistance, contact the Distributor listed above.
- For more information, contact your Factory Representative.

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