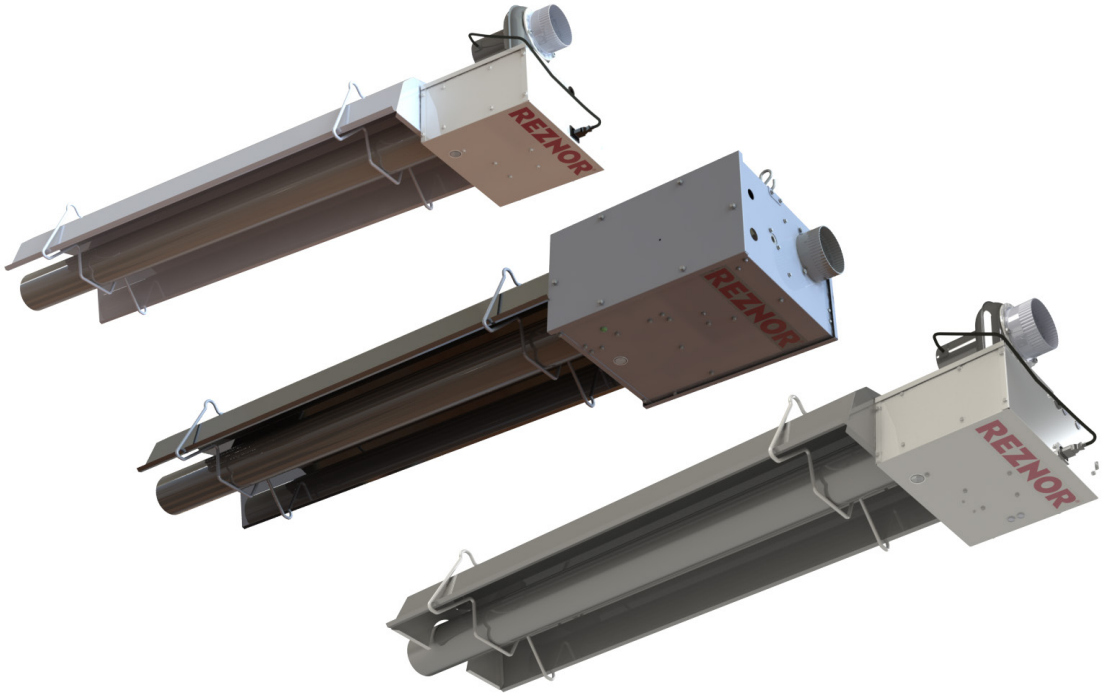
REZNOR®

Revision: VZ-VZH-VZT-IOM (09-25) 1047121-E

Supersedes: VZ-VZH-VZT-IOM (07-25) 1047121-D

GAS-FIRED LOW-INTENSITY RADIANT TUBE HEATER INSTALLATION, OPERATION, AND MAINTENANCE

MODELS VZ, VZH, AND VZT



⚠ DANGER ⚠

FIRE OR EXPLOSION HAZARD

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

WHAT TO DO IF YOU SMELL GAS

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

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

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GENERAL INFORMATION

- This 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.

Model Features

- **Model VZ (single-stage burner) and model VZT (two-stage (low- and high-fire) burner):** features painted burner cabinet with external blower and motor assembly—designed for non-harsh environment indoor installations.
- **Model VZH:** features stainless steel burner cabinet with integral blower and motor assembly—designed for harsh environment indoor and outdoor installations.

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.

Important Safety Information—Continued

⚠ WARNING ⚠

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

⚠ CAUTION ⚠

- **Never rest anything—especially a ladder—against the heater.**
- **To prevent damage to the unit or to its internal components, it is recommended that two wrenches be used when loosening or tightening nuts. DO NOT OVERTIGHTEN!**

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 unit.
- The unit is installed without proper clearance to combustible materials.
- Required turbulator or swirler is missing or incorrectly installed.
- The unit is exposed to halogenated hydrocarbons.

Certification

These heaters are listed to ANSI Z83.20/CSA 2.34, 2.17, 2.20 for indoor use only in the US and Canada by the Canadian Standards Association (CSA). They are not approved for residential dwellings. They are approved without modification for installation elevations up to 2,000 feet (610 meters) in the US and up to 4,500 feet (1,370 meters) in Canada. A high-elevation conversion kit is available for higher installation elevations.

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* (NFPA 54/ANSI Z223.1, latest edition). A Canadian installation must be in accordance with the *Natural Gas and Propane Installation Code* (CSA B149, latest edition). This code is available from CSA Information Services, 1-800-463-6727. Local authorities having jurisdiction should be consulted before installation is made to verify local codes and installation procedure requirements.
- Installations in aircraft hangars should be in accordance with the *Standard for Aircraft Hangars* (ANSI/NFPA 409, latest edition). Installations in public garages should be in accordance with the *Standard for Parking Structures* (ANSI/NFPA 88A, latest edition). Installations in repair garages should be in accordance with the *Standard for Repair Garages* (NFPA 88B), which has been incorporated into the *Code for Motor Fuel Dispensing Facilities and Repair Garages* (NFPA 30A, latest edition). In Canada, installations in aircraft hangars and public garages should be in accordance with CSA B149.
- If the heater is being installed in the Commonwealth of Massachusetts, installation must be performed by a licensed plumber or licensed gas fitter.

Dimensions

Table 1. Tube Assembly Dimensions							
Component	Unit of Measure	Unit Size (MBTUh)					
		40	60, 80	100, 115, 125	140, 150	175	200
Minimum straight tube length, model VZ	foot (meter)	10 (3)	20 (6.1)	30 (9.1)	40 (12.1)	40 (12.1)	50 (15.2)
Minimum straight tube length, model VZH						50 (15.2)	—
Minimum straight tube length, model VZT		—				40 (12.1)	50 (15.2)
Minimum U-tube length, model VZ	foot, inch	—	11, 7	16, 7	21, 7		31, 7
	meter, cm		3, 54	5, 6	6, 58		9, 63
Minimum U-tube length, model VZH	foot, inch		11, 7	16, 7	21, 7	26, 7	—
	meter, cm		3, 54	5, 6	6, 58	8, 11	
Minimum U-tube length, model VZT	foot, inch		11, 7	16, 7	21, 7		26, 7
	meter, cm		3, 54	5, 6	6, 58		8, 11
Reflector width	inch (cm)	14-3/16 (36)					
U-tube width with reflectors		32-3/16 (82)					

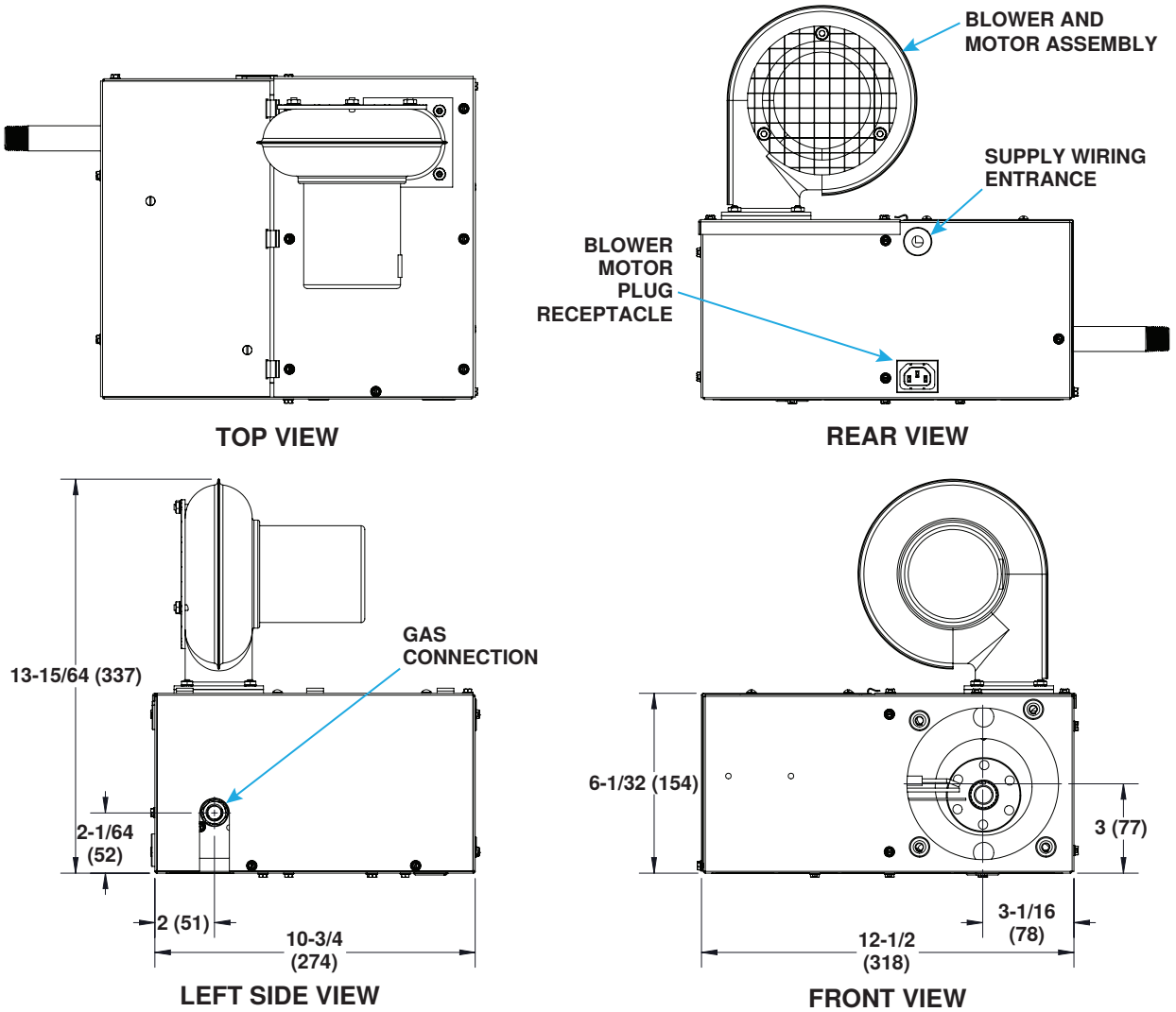


Figure 1. Model VZ Burner Cabinet Dimensions

Dimensions—Continued

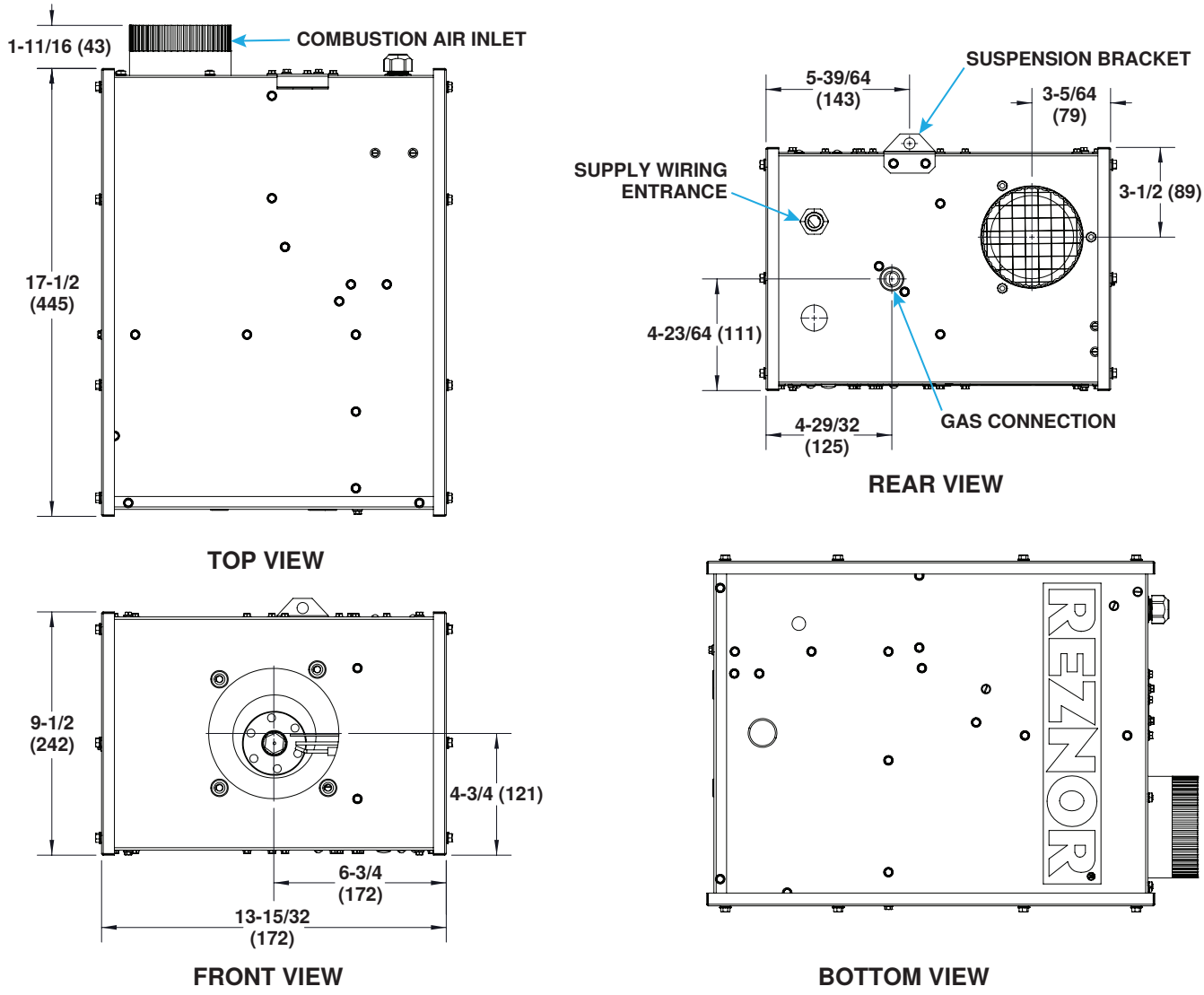


Figure 2. Model VZH Burner Cabinet Dimensions

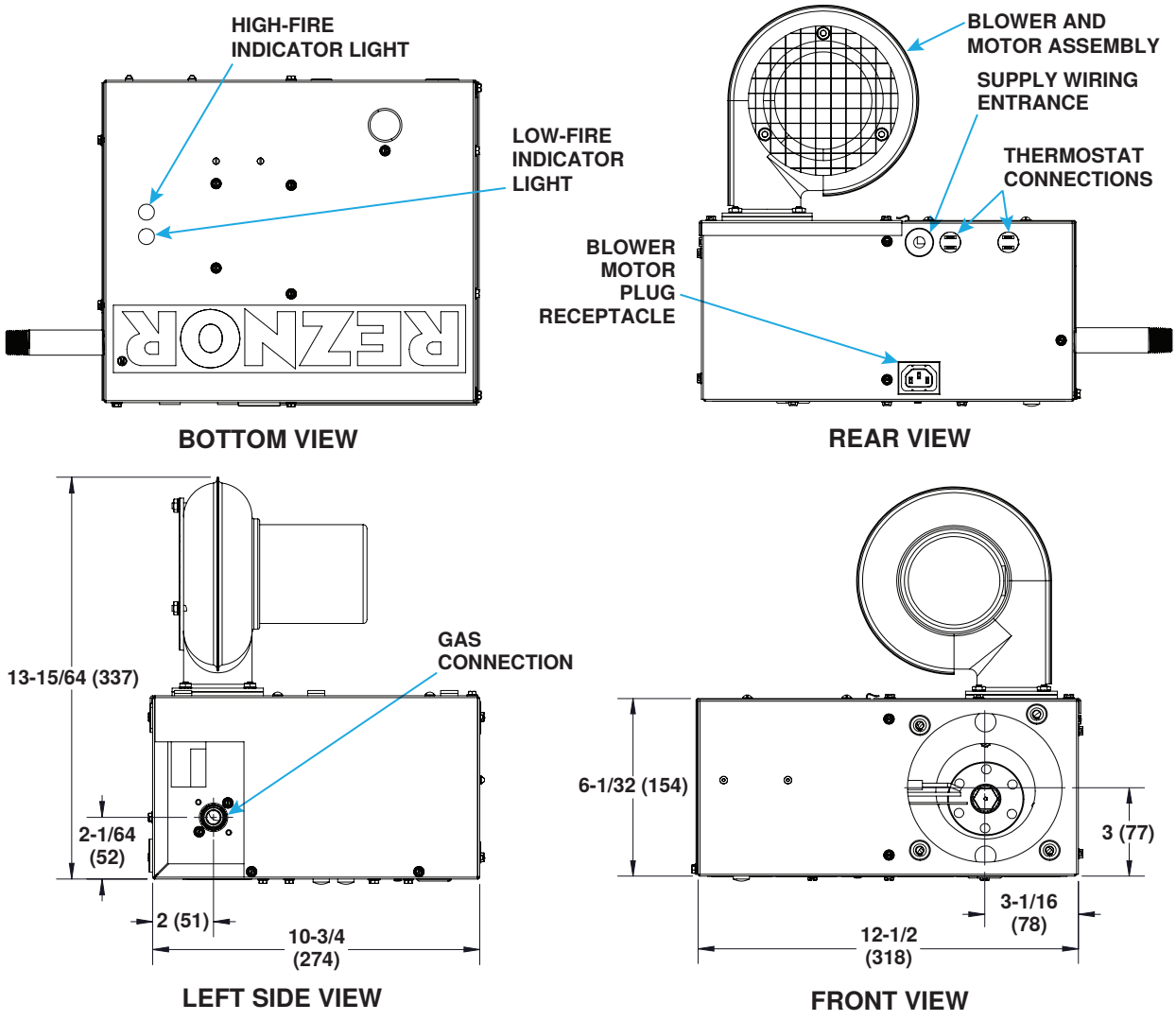


Figure 3. Model VZT Burner Cabinet Dimensions

Heater Location

⚠ CAUTION ⚠

- **Model VZ and VZT heaters should not be used in an application where the heated space temperature is below 40°F (4°C). Operating under low ambient conditions may cause condensation to form in the heat exchanger.**
- **Do not locate a model VZ or VZT heater where it may be exposed to water spray, rain, or dripping water.**
- **Model VZH heaters are water-resistant and are designed for harsh environments—defined as wet or mildly corrosive—such as car washes, outdoor patios, and greenhouses. These models are NOT intended for environments that are heavily-laden with chemicals or areas where halogenated hydrocarbons are present. For mildly-corrosive environments, ducted clean fresh air is required. A wind/rain hood is required for outdoor installations.**

NOTE: The heater must be installed in a location that it is readily accessible for servicing.

Clearances

⚠ DANGER ⚠

- **All listed minimum clearances to combustible materials MUST BE adhered to at all times. Adequate clearance MUST BE provided around air openings into the combustion chamber, and there MUST BE suitable clearance for service accessibility and for combustion/ventilation air.**
- **Minimum clearance from the heater must be maintained from vehicles parked below heater and from heat-sensitive equipment and workstations. In all situations, clearances to combustibles must be maintained. Signs should be posted in storage areas to specify maximum stacking height to maintain required clearance to combustibles. Such signs must either be posted adjacent to the heater thermostats or—in the absence of such thermostats—in a conspicuous location.**

⚠ CAUTION ⚠

Building materials that have a low heat tolerance (plastics, vinyl siding, canvas, tri-ply, etc.) may be subject to degradation at lower temperatures. It is the installer's responsibility to ensure that adjacent materials are protected from degradation.

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. Units must be installed so that clearances are in accordance with **Table 2**.

Table 2. Clearances

Configuration (See Figure 4)	Model	Clearance*	Unit Size (MBTUh)**							
			40	60	80	100	115, 125	140, 150	175	200
			Distance from Tube (Inches (cm))							
A. Straight tube with level reflector	VZ, VZT	Bottom	52 (133)	62 (158)	65 (166)	70 (178)	76 (194)	79 (201)	82 (209)	96 (244)
	VZH		53 (135)	63 (161)	66 (168)	71 (181)	77 (196)	80 (204)		—
	All	Top	6 (16)						8 (21)	
		Sides	27 (69)	35 (89)	38 (97)	40 (102)	46 (117)	50 (127)	52 (133)	
B. Straight tube with level reflector and one extension reflector	VZ, VZT	Bottom	52 (133)	62 (158)	69 (176)	76 (194)	82 (209)	85 (216)	88 (224)	102 (260)
	VZH		53 (135)	63 (161)	70 (178)	77 (196)	83 (211)	86 (219)		—
	All	Top	6 (16)						8 (21)	
		Extension reflector side	9 (23)							18 (46)
		Side opposite extension reflector	44 (112)	47 (120)	54 (138)	59 (150)	65 (166)	69 (176)	73 (186)	
C. Straight tube with level reflector and two extension reflectors	VZ, VZT	Bottom	52 (133)	65 (166)	71 (181)	77 (196)	83 (211)	87 (221)	91 (232)	102 (260)
	VZH		53 (135)	63 (161)	72 (183)	78 (199)	84 (214)	88 (224)		—
	All	Top	6 (16)						8 (21)	
		Sides	15 (39)	23 (59)	25 (64)	27 (69)	32 (82)	35 (89)	40 (102)	
D. Straight tube with angled reflector	VZ, VZT	Bottom	50 (127)	59 (150)	65 (166)	73 (186)	77 (196)	83 (211)	85 (216)	85 (216)
	VZH		51 (130)	60 (153)	66 (168)	74 (188)	78 (199)	84 (214)		—
	All	Top	8 (21)			10 (26)		12 (31)		
		Burner side	46 (117)	54 (138)	60 (153)	64 (163)	69 (176)	74 (188)	79 (201)	
		Side opposite burner	8 (21)							10 (26)
E. Straight tube with level reflector and optional protective grille	VZ, VZT	Bottom	52 (133)	62 (158)	65 (166)	70 (178)	76 (194)	79 (201)	82 (209)	96 (244)
	VZH		53 (135)	63 (161)	66 (168)	71 (181)	77 (196)	80 (204)		—
	All	Top	6 (16)						8 (21)	
		Sides	27 (69)	35 (89)	38 (97)	40 (102)	46 (117)	50 (127)	52 (133)	
F. Straight tube with level reflector and optional protective shield***	All	Bottom	27 (69)	33 (84)	38 (97)	44 (112)	48 (122)	50 (127)	—	
		Top	6 (16)							
		Sides	34 (87)	39 (100)	40 (102)	50 (127)	54 (138)	55 (140)		
G. U-tube with level reflectors	VZ, VZT	Bottom	—	62 (158)	68 (173)	75 (191)	78 (199)	83 (211)	87 (221)	102 (260)
	VZH			63 (161)	69 (176)	76 (194)	79 (201)	84 (214)		—
	All	Top	—	6 (16)					8 (21)	
		Burner side	—	35 (89)	38 (97)	40 (102)	46 (117)	50 (127)	54 (138)	
		Side opposite burner	—	30 (77)	37 (94)	39 (100)	43 (110)	47 (120)	51 (130)	51 (130)
H. Angled U-tube with level reflectors	VZ, VZT	Bottom	—	59 (150)	65 (166)	73 (186)	77 (196)	83 (211)	85 (216)	85 (216)
	VZH			60 (153)	66 (168)	74 (188)	78 (199)	84 (214)		—
	All	Top and burner side	—	8 (21)						
		Side opposite burner	—	42 (107)	46 (117)	52 (133)	61 (155)	66 (168)	70 (178)	
J. U-tube with reflectors angled in opposite directions	VZ, VZT	Bottom	—	59 (150)	65 (166)	73 (186)	77 (196)	83 (211)	85 (216)	85 (216)
	VZH			60 (153)	66 (168)	74 (188)	78 (199)	84 (214)		—
	All	Top	—	8 (21)		10 (26)		12 (31)		
		Burner side	—	54 (138)	60 (153)	64 (163)	70 (178)	74 (188)	76 (194)	
		Side opposite burner	—	22 (56)						
K. Unvented heater	All	Tube side	14 (36)		20 (51)					
		Tube end	18 (46)		24 (61)			30 (77)		30 (77)
K. Vented heater		Around vent pipe	18 (46)							18 (46)

*Bottom and side clearances can be reduced by 50% at a point 25 feet (7.5 meters) downstream from burner.

**Model VZH is not available in unit sizes 115, 140, and 200. Model VZT is not available in unit sizes 40, 60, 115, and 140.

***Clearances listed apply to when the protective shield is installed on the first 10 feet (3 meters) of tube extending from the burner cabinet. The bottom clearances from that point are the same as those for a straight tube with a level reflector (configuration A). The protective shield is not available for unit sizes 175 and 200.

Heater Location—Continued

Clearances—Continued

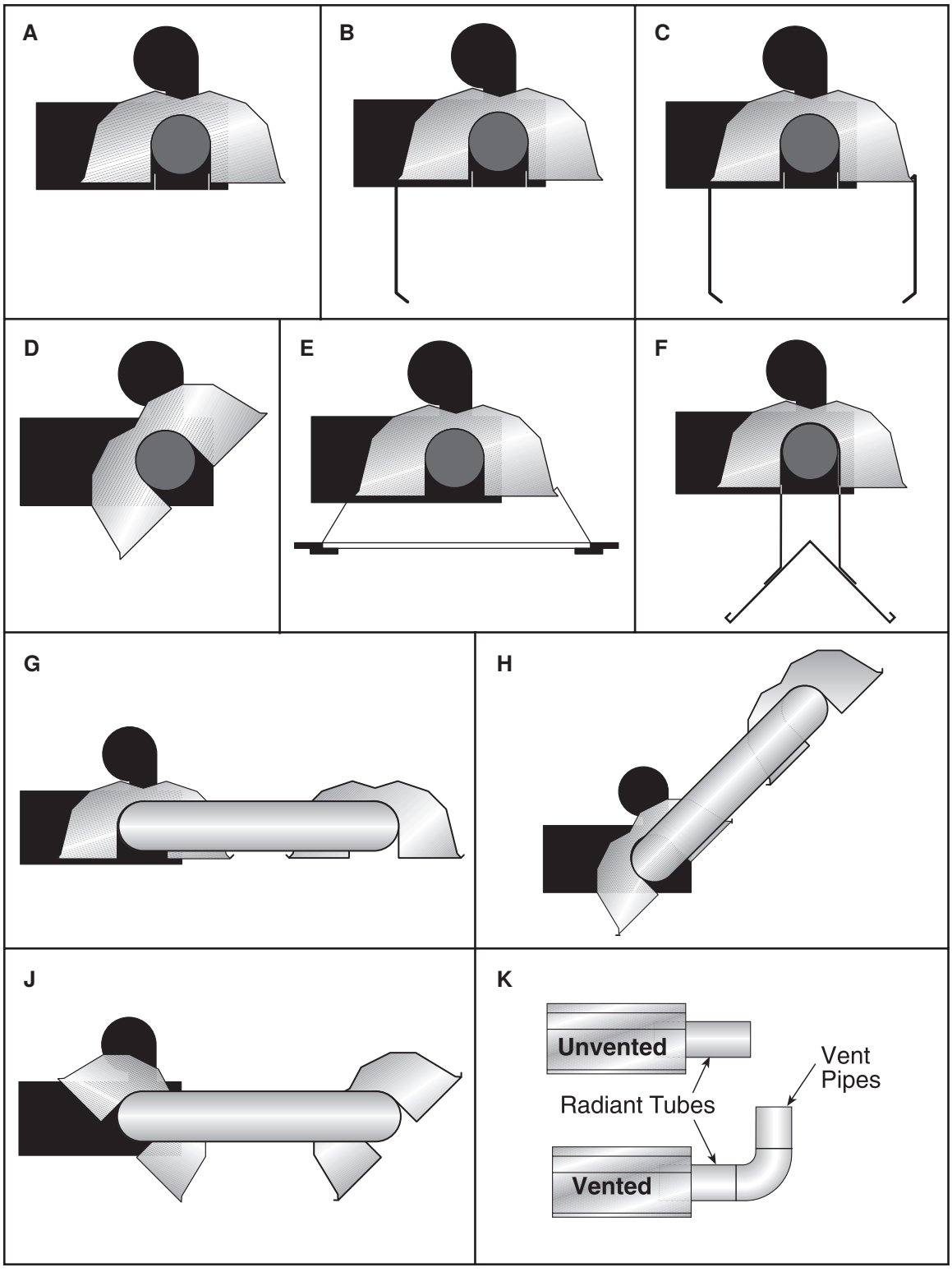


Figure 4. Tube and Reflector Configuration

Halogenated Hydrocarbons

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

⚠ CAUTION ⚠

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

Mounting Height Requirements

⚠ DANGER ⚠

In aircraft storage and servicing areas, heaters shall be installed at least 10 feet (3 meters) above the upper surface of wings or of engine enclosures of the highest aircraft housed in the hangar. The measurement shall be made from the wing or engine enclosure (whichever is higher from the floor) to the bottom of the heater.

⚠ WARNING ⚠

The vent pipe and internal heater surfaces that are accessible from outside the heater may cause burns if touched. Suspend the heater a minimum of 8 feet (2.4 meters) above the floor.

NOTE: 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.

Table 3. Recommended Minimum Mounting Heights

Intended Heating Type	Unit Size (MBTUh)							
	40	60	80	100	115, 125	140, 150	175	200
	Feet (Meters)							
Space	8–10 (2.4–3)	10–12 (3–3.6)	12–15 (3.6–4.5)		15–20 (4.5–6)	20–25 (6–7.6)	25 (7.6)	
Spot	8 (2.4)	9 (2.7)	11 (3.3)	12 (3.7)	15 (4.6)	20 (6.1)	23 (7)	25 (7.6)

Weights

Table 4. Weights

Component	Tube Assembly Length (Feet)						
	10	20	30	40	50	60	70
	Pounds (kg)						
Straight tube assembly with aluminum reflectors*	52 (24)	86 (39)	120 (55)	161 (73)	206 (94)	240 (109)	281 (128)
Straight tube assembly with stainless steel reflectors*	66 (30)	113 (53)	152 (69)	208 (95)	265 (121)	304 (138)	360 (164)
U-tube with aluminum reflectors	19 (8.7)						
U-tube with stainless steel reflectors	20 (9.1)						
L-tube	6 (2.8)						
Model VZ burner cabinet	18 (8.2)						
Model VZH burner cabinet	28 (12.7)						
Model VZT burner cabinet	19 (8.6)						

*Package includes reflectors, brackets, and hardware.

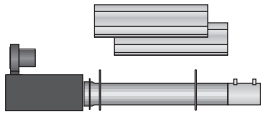
SYSTEM CONFIGURATIONS

Systems are shipped disassembled and are comprised of a burner cabinet and a tube assembly. Refer to the following tables and figures for system configuration and assembly details.

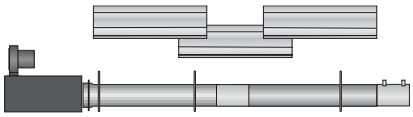
NOTE: The *burner* tube is the tube connected to the burner cabinet. Additional tubes in the assembly are hereafter referred to as *extension* tubes.

Straight Tube Configurations

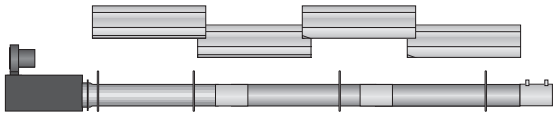
More than one tube assembly package may be combined to configure the desired tube length.



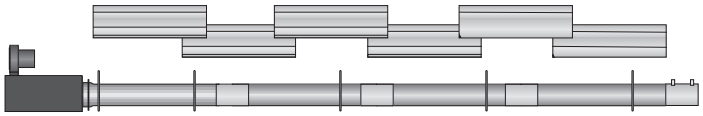
10-FOOT (3-METER)



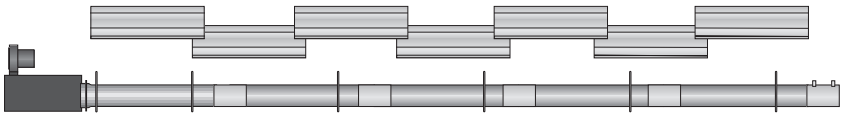
20-FOOT (6.1-METER)



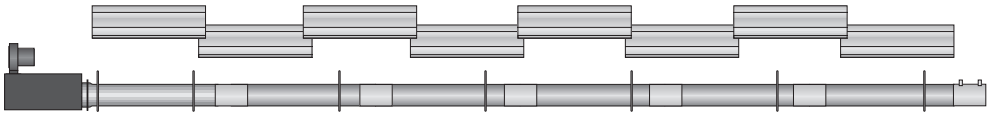
30-FOOT (9.1-METER)



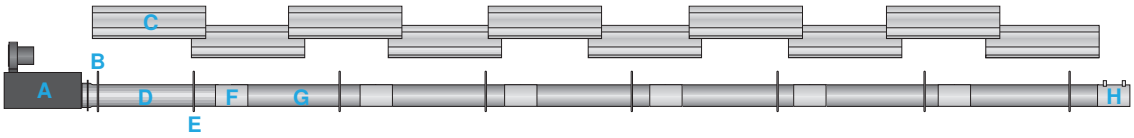
40-FOOT (12.2-METER)



50-FOOT (15.2-METER)



60-FOOT (18.3-METER)



70-FOOT (21.3-METER)

A = BURNER CABINET
B = SUSPENSION BRACKET WITH CLAMP
C = REFLECTOR
D = BURNER TUBE
E = SUSPENSION BRACKET
F = COUPLING
G = EXTENSION TUBE
H = VENT ADAPTER

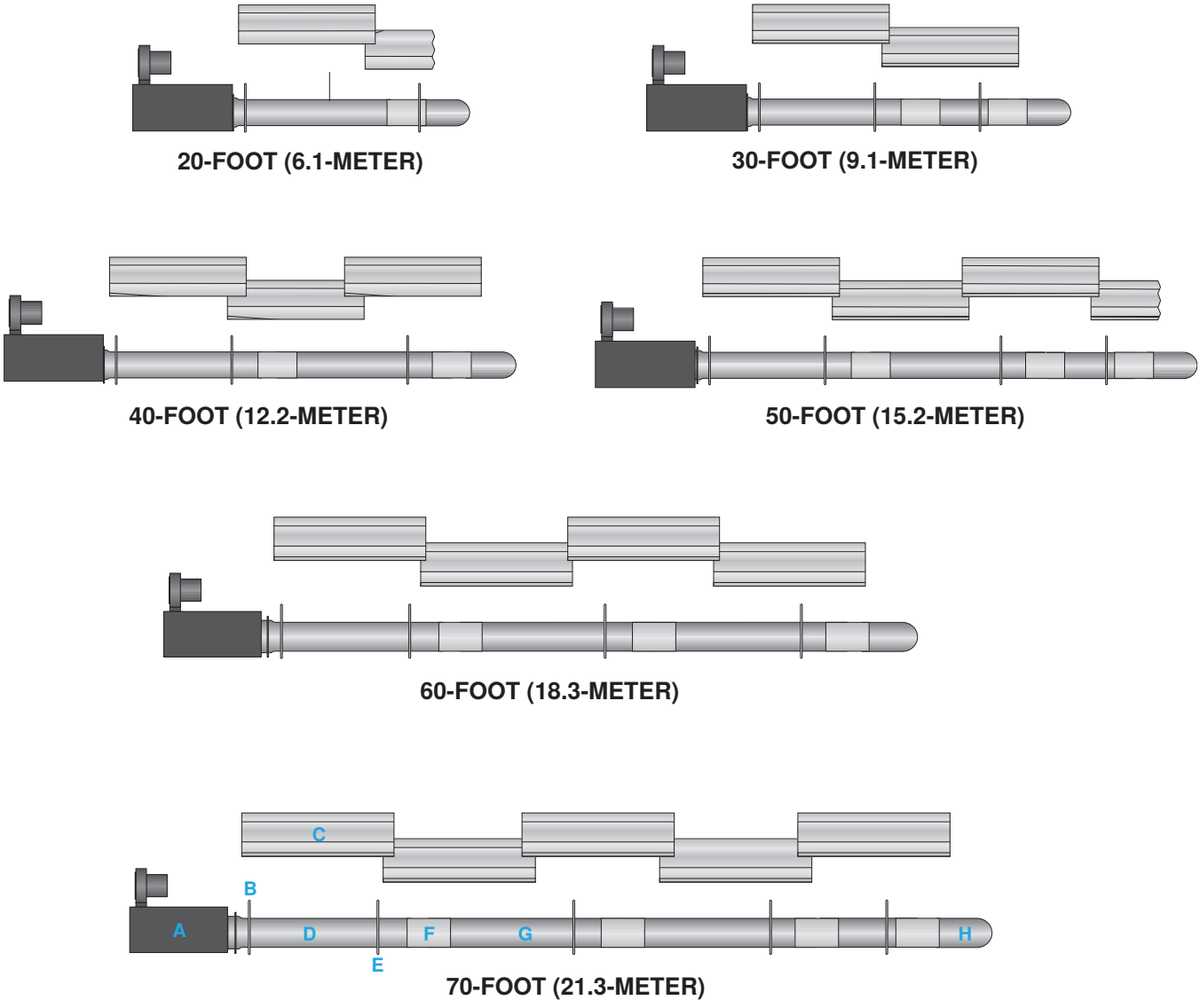
Figure 5. Straight Tube Configurations

U-Tube Configurations

U-tubes may be used to produce a variety of configurations. Contact Reznor support for further details.

⚠ CAUTION ⚠

30-, 50-, and 70-foot U-tube configurations require 5-foot extension tube sections—10-foot extension tubes must be cut. U-tubes are not approved for use on unit size 40. For unit sizes 60 and 80, a minimum of 10 feet (3 meters) is required between the burner and the U-tube—minimum 15 feet (4.5 meters) for unit sizes 100–200.



A = BURNER CABINET
B = SUSPENSION BRACKET WITH CLAMP
C = REFLECTOR
D = BURNER TUBE
E = SUSPENSION BRACKET
F = COUPLING
G = EXTENSION TUBE
H = U-TUBE

Figure 6. U-Tube Configurations

L-Tube Configurations

L-tubes may be used to produce a variety of configurations. Contact Reznor support for further details.

⚠ CAUTION ⚠

For unit sizes 40–80, a minimum of 10 feet (3 meters) is required between the burner and the L-tube—minimum 15 feet (4.5 meters) for unit sizes 100–200.

INSTALLATION

⚠ DANGER ⚠

- **If the tube assembly must pass through the building structure, ensure that adequate sleeving and a fire stop is installed to prevent a fire or scorching.**
- **DO NOT locate the gas or electric supply lines directly over the path of the flue products from the heater.**

⚠ WARNING ⚠

Edges are sharp. Wear protective gear during installation and maintenance.

NOTE: For optional tube assembly components such as reflector side extensions, protective shields, or protective grilles, refer to the instructions provided with the option. Propane or high-elevation conversion may be done either before or after heater installation (refer to ADJUSTMENTS section).

Unpacking and Inspection

If, upon removing any heater component from its crate, the component 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.

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 5**) 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 shipped-separate option package.

Table 5. Field-Installed Options	
Option	**Description**
CC1	Vent cap, 4- or 6-inch
CC17	Vent terminal, 4-inch, Tjernlund
CC26	Vent terminal kit
CD28	Reflector side extension kit
CK53	Steel hanger kit
CK54	Stainless steel hanger kit
CK55	Steel turnbuckle kit
CK56	Stainless steel turnbuckle kit
CL22	Thermostat, two-stage, digital
CL83	Thermostat, programmable, WIFI-enabled, 2H/2C
CM1	Thermostat guard with locking cover
DE1	Outside combustion air kit, with steel hardware
DE2	Outside combustion air kit, with stainless steel hardware
DJ20	High-elevation conversion kit
DL2	Propane conversion kit (models VZ and VZH)
DN7	Protective grille kit
DO3	Protective (lower clearance) shield kit
IRT1	Transformer relay for multiple unit control

Tube Assembly

1. Align tubes on saw horses—burner tube and, if required, any extension tubes, U-tubes, and L-tubes. Ensure that offset mounting hole on burner tube flange is on top and that weld seams are on bottom.

NOTE: Turbulators are comprised of one tabbed section (PN 03051502) and one or more connector section(s) (PN 03051501). Turbulators are NOT USED on the following units: model VZ unit sizes 125, 150, 175, and 200, model VZH unit sizes 125, 150, and 175, and model VZT unit sizes 175 and 200.

2. Install turbulator(s) as required (refer to **Table 6** for applicability and to **Table 7** for quantity):
   a. Interlock turbulator sections as shown in **Figure 7** and slide assembly into extension tube. String may be used as shown to position turbulator.
   b. Fold tab around downstream end of tube as shown in **Figure 7** to secure turbulator**.**

Table 6. Turbulator Applicability								
Model	**Unit Size (MBTUh)**							
	40	**60**	**80**	**100**	**115**	**125**	**140**	**150**
	Turbulator Location							
VZ	Burner tube	1st extension tube		2nd extension tube	2nd extension tube	—	3rd extension tube	—
VZH					—		—	
VZT	—		1st extension tube	2nd extension tube	—	2nd extension tube	—	3rd extension tube

Table 7. Turbulator Quantity								
Model	**Unit Size (MBTUh)**							
	40	**60**	**80**	**100**	**115**	**125**	**140**	**150**
	No. of Turbulator Connector Sections*							
VZ	3**	4	4	1	3	—	1	—
VZH				2	—		—	
VZT	—	—				3		2
*Connector sections are connected to one (1) tabbed section.								
**Installed as follows: from the exhaust end of the tube, one tabbed section, two connector sections, and one stainless steel connector section (PN 03051505).								

Tube Assembly—Continued

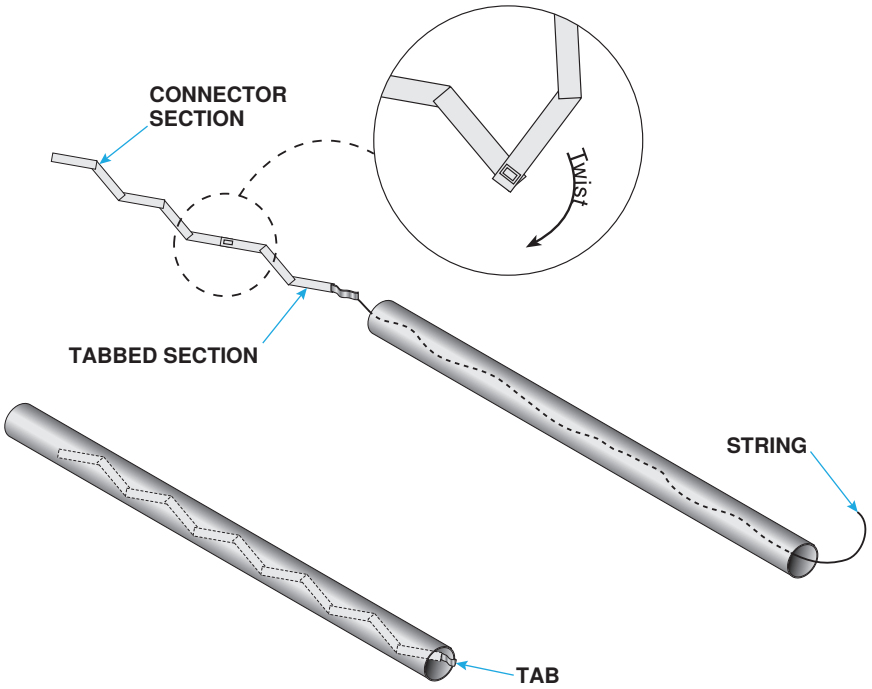


Figure 7. Turbulator Installation

NOTE: Swirlers are comprised of one tabbed section (PN 03051506) and one or more connector section(s) (PN 03051507). Swirlers are NOT USED on the following units: model VZ unit sizes 40–115 and 140, model VZH unit sizes 40–100, and model VZT unit sizes 80–150.

3. Install swirler(s) as required (refer to **Table 8** for applicability and to **Table 9** for quantity):
   a. Interlock swirler sections as shown in **Figure 8** and slide assembly into extension tube. String may be used as shown to position swirler.
   b. Fold tab around downstream end of tube as shown in **Figure 8** to secure swirler.

Table 8. Swirler Applicability

Unit Size (MBTUh)		
125	**150, 175**	**200**
Swirler Location*		
2nd extension tube	3rd extension tube	4th extension tube

*The swirler may be installed in the last downstream extension tube if the tube assembly is extended 10 feet beyond the minimum tube length. For additional details, refer to the **APPENDIX: SWIRLER CONFIGURATIONS**.

Table 9. Swirler Quantity

Model	Unit Size (MBTUh)			
	125	150	175	200
	No. of Swirler Connector Sections*			
VZ	4	2	3	2
VZH				—
VZT	—	—	2	1

*Connector sections are connected to one (1) tabbed section.

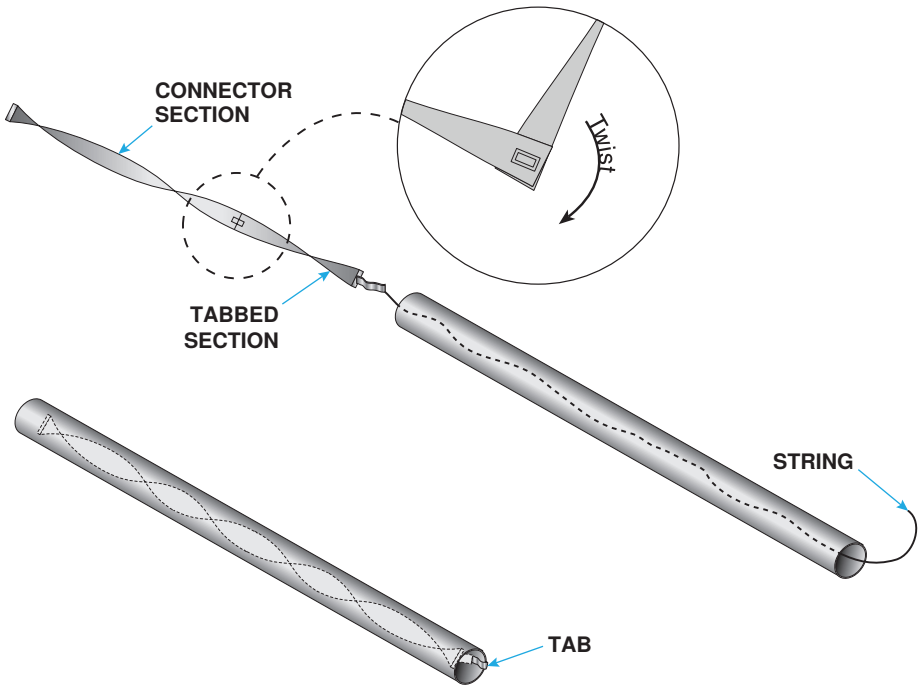


Figure 8. Swirler Installation

NOTE: Couplings will slide over turbulator and swirler tabs.

4. Install coupling(s):
   a. Close coupling—tabs positioned beneath guide rails (see **Figure 9**, DETAIL A).
   b. Slide wide end of coupling lock bar into end of coupling opposite tabs until snug (see **Figure 9**, DETAIL B).
   c. Slide each tube into coupling until end of each rests against internal pins of coupling.
   d. Rotate coupling so that coupling lock bar is at 2 or 10 o'clock position.
   e. Tighten coupling lock bar—tap with hammer as necessary—until positioned as shown in **Figure 9**, DETAIL C. DO NOT OVERTIGHTEN.
   f. Repeat steps 4a through 4e for each coupling.

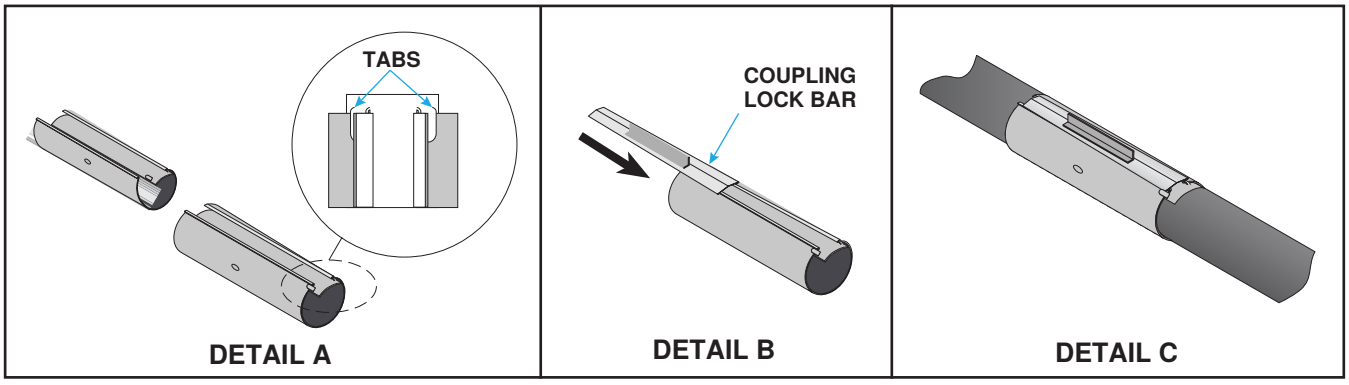


Figure 9. Coupling Installation

5. Install vent adapter (see **Figure 5**) with seam on top and seal joint using high-temperature (≥550°F (≥288°C)) silicone sealant to prevent leakage of condensation. Refer to **Vertical Venting** section for exceptions to use of vent adapter.

Suspension Bracket and Reflector Installation

⚠ CAUTION ⚠

The suspension bracket with clamp must be within 4 inches (10 cm) of the burner tube flange. For model VZH, another suspension bracket with clamp needs to be installed as the second bracket downstream from the burner cabinet.

1. With tube assembly still on saw horses, mark positions of suspension brackets. The first bracket must be within 4 inches (10 cm) of the burner tube flange. The second bracket must be 7 feet, 6 inches (2 meters, 29 cm) from the first. The remaining brackets must be evenly-spaced at 10-foot (3-meter) intervals (refer to **SYSTEM CONFIGURATIONS** section).
2. Install suspension bracket with clamp on burner tube as shown in **Figure 10**. Tighten clamp using bolt, flat washer, and hex nut torqued to 120 inch-pounds. For model VZH, ensure that this assembly is also used as second bracket downstream from burner cabinet.

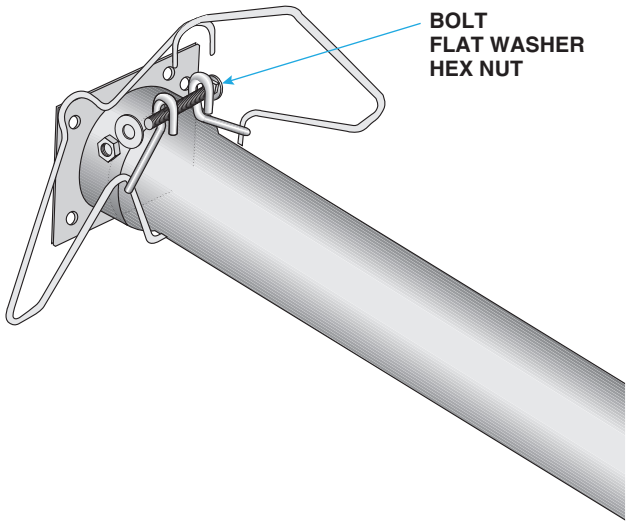


Figure 10. Installation of Suspension Bracket with Clamp

3. Slide remaining suspension brackets on to tube assembly and position them in accordance with marks made in step 1.
4. For U-tube installations, install U-tube support bracket as shown in **Figure 11**.

⚠ DANGER ⚠

FIRE HAZARD: Reflectors MUST NOT come in contact with tubes.

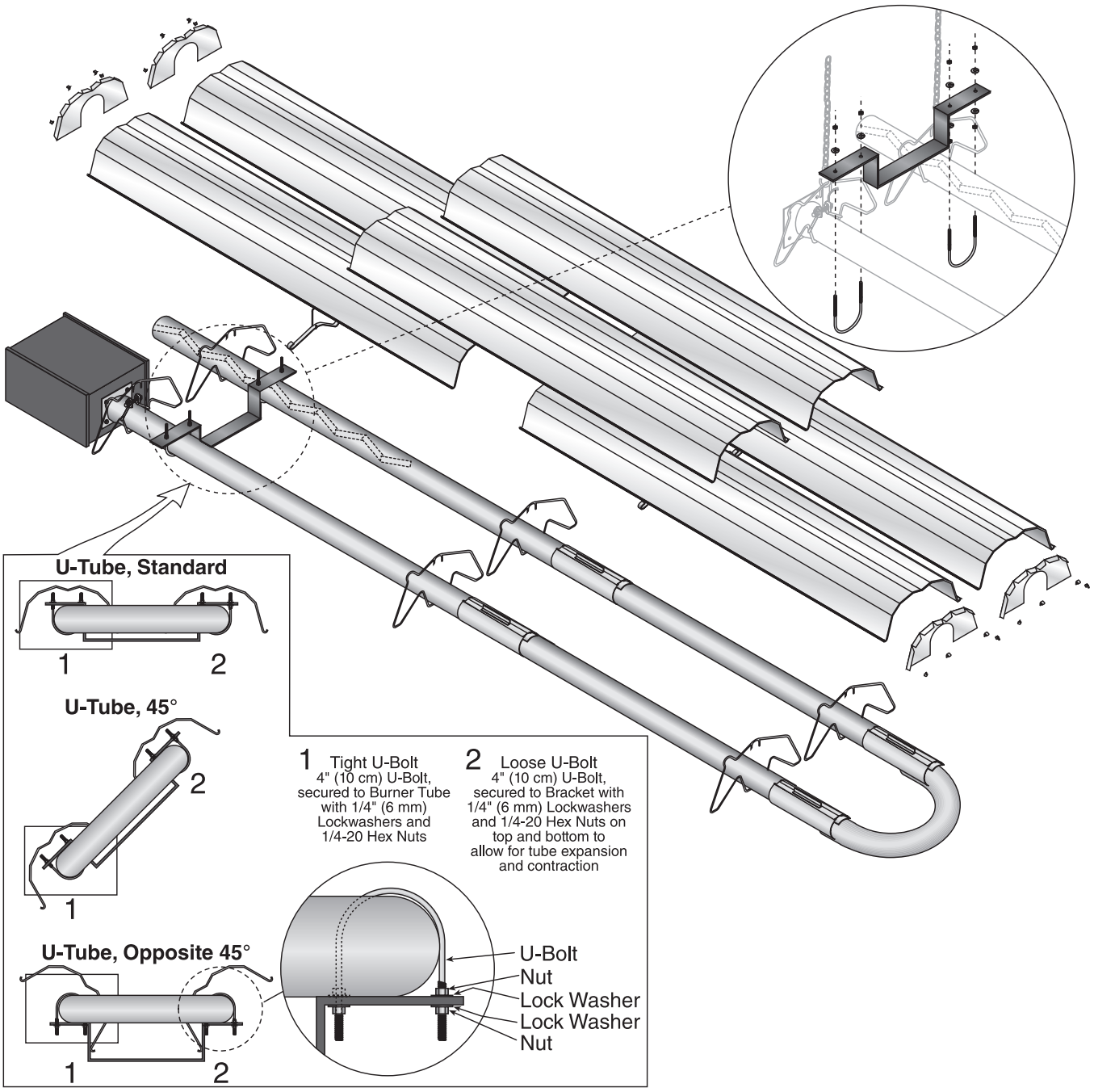


Figure 11. Installation of U-Tube Support Bracket

5. Install reflectors over all tubes except U-tubes (for L-tubes, refer to **APPENDIX: L-TUBE REFLECTORS**):
   a. Slide first reflector through first suspension bracket as shown in **Figure 12**. Reflector must slide at least 2 inches (4 cm) through suspension bracket with clamp next to burner cabinet.

Suspension Bracket and Reflector Installation—Continued

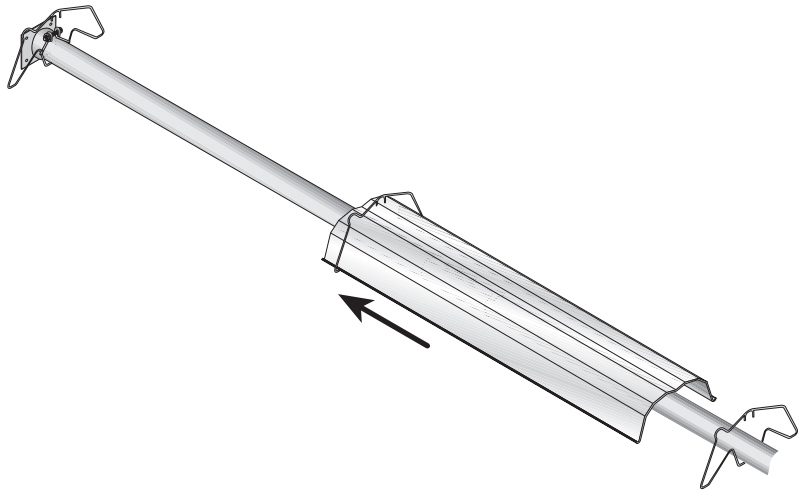


Figure 12. Reflector Installation

b. Install reflector support strap assembly (support strap, tube clamp, and screws, see **Figure 13**) in middle of reflector to secure reflector to tube. Tighten screws.

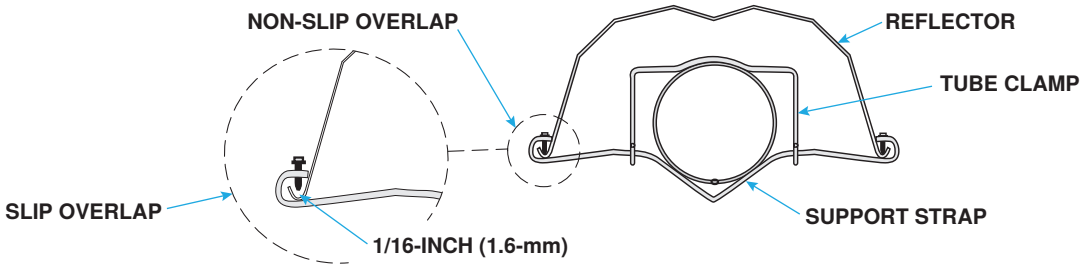


Figure 13. Reflector Support Strap Installation

NOTE: Reflector joints and end caps are held together using U-clips. Where impact and/or wind might be a factor, field-supplied pop rivets or sheet metal screws may be used.

⚠ CAUTION ⚠

Reflectors must overlap a minimum of 6 inches (16 cm). The installation of reflectors must allow for expansion and contraction through the use of slip overlaps at every third overlap. A slip overlap is created by loosening the reflector support strap screws 1/16-inch (1.6-mm). To create a non-slip overlap, tighten the screws.

c. Slide second reflector through suspension brackets and overlap first reflector at least 6 inches (16 cm). Install reflector support strap assembly within overlap and secure support strap using non-slip overlap (see **Figure 13**).

d. Install remaining reflectors and support straps using non-slip overlaps (tightened screws) for every two-out-of-three overlaps and slip overlaps (loose screws, see **Figure 13**) for every third overlap. Secure reflectors together using U-clips where suspension bracket occurs inside non-slip overlap.

6. Install end caps and secure using U-clips as shown in **Figure 14**.

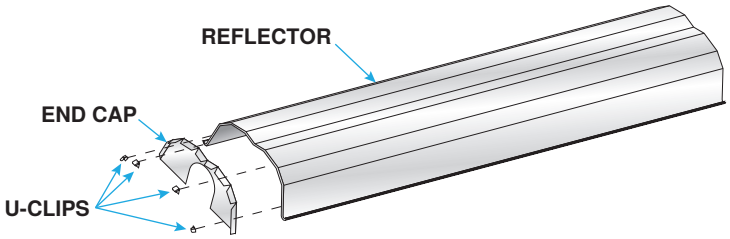


Figure 14. End Cap Installation

Heater Suspension

⚠ DANGER ⚠

- **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.**
- **Suspension hardware must have a minimum working load of 75 pounds (33 kg). DO NOT use gas or electric lines to support the heater.**
- **When installed, tubular radiant heaters must be able to expand, must be level, and must be restricted from too much lateral sway.**
- **The burner cabinet must be level for proper operation. DO NOT place or add additional weight to a suspended heater.**
- **The heater is meant for stationary mounting in all situations and should not be suspended from any structure that may become mobile or from any organic structures such as trees. In the event that suitable roof steelwork is unavailable, install additional steelwork to enable vertical hangers to be installed for suspending the heater.**
- **Heaters should be suspended at a height that has been determined to be most efficient for the application (refer to Mounting Height Requirements section).**
- **Clearances to combustibles must be observed (refer to Clearances section).**

⚠ CAUTION ⚠

- **To allow for expansion, the chain length between the suspension point and the heater, including S-hook(s) and turnbuckle(s) (if used), MUST BE a minimum of 12 inches.**
- **One chain link consists of two loops. When cutting chain, ensure that the entire two-loop link is removed.**

NOTE: If using a suspension kit—hanger kit (option CK53 or CK54) and/or turnbuckle kit (option CK55 or CK56)—refer to the instructions provided with the kit.

1. To allow for expansion, determine minimum length of suspension hardware in accordance with **Table 10**.

Table 10. Length of Field-Supplied Suspension Hardware

Tube Assembly Length	Typical Expansion	Dimension X (See Figure 15)
Feet (Meters)	Inches (cm)	
10 (3) to 50 (15.2)	±1 (±3)	12 (31)
51 (15.5) to 60 (18.3)	±2 (±5)	18 (46)
61 (18.6) to 70 (21.4)	±3 (±8)	24 (61)

Heater Suspension—Continued

2. Using hoist, lift, or sufficient personnel to support tube assembly, connect each suspension bracket to each building or structure suspension point using S-hooks in accordance with **Figure 15** or **Figure 16**.

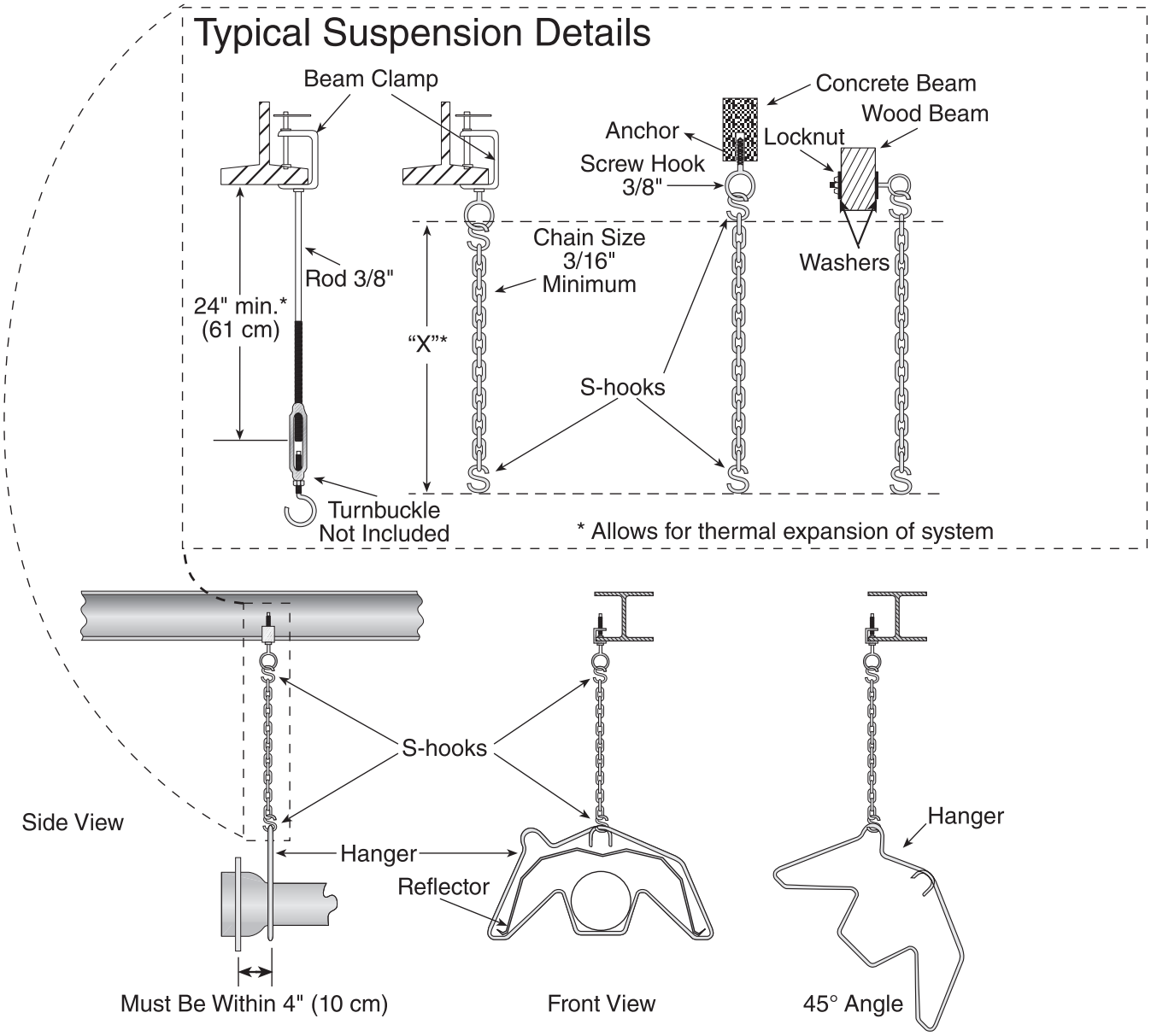


Figure 15. Typical Indoor Heater Suspension

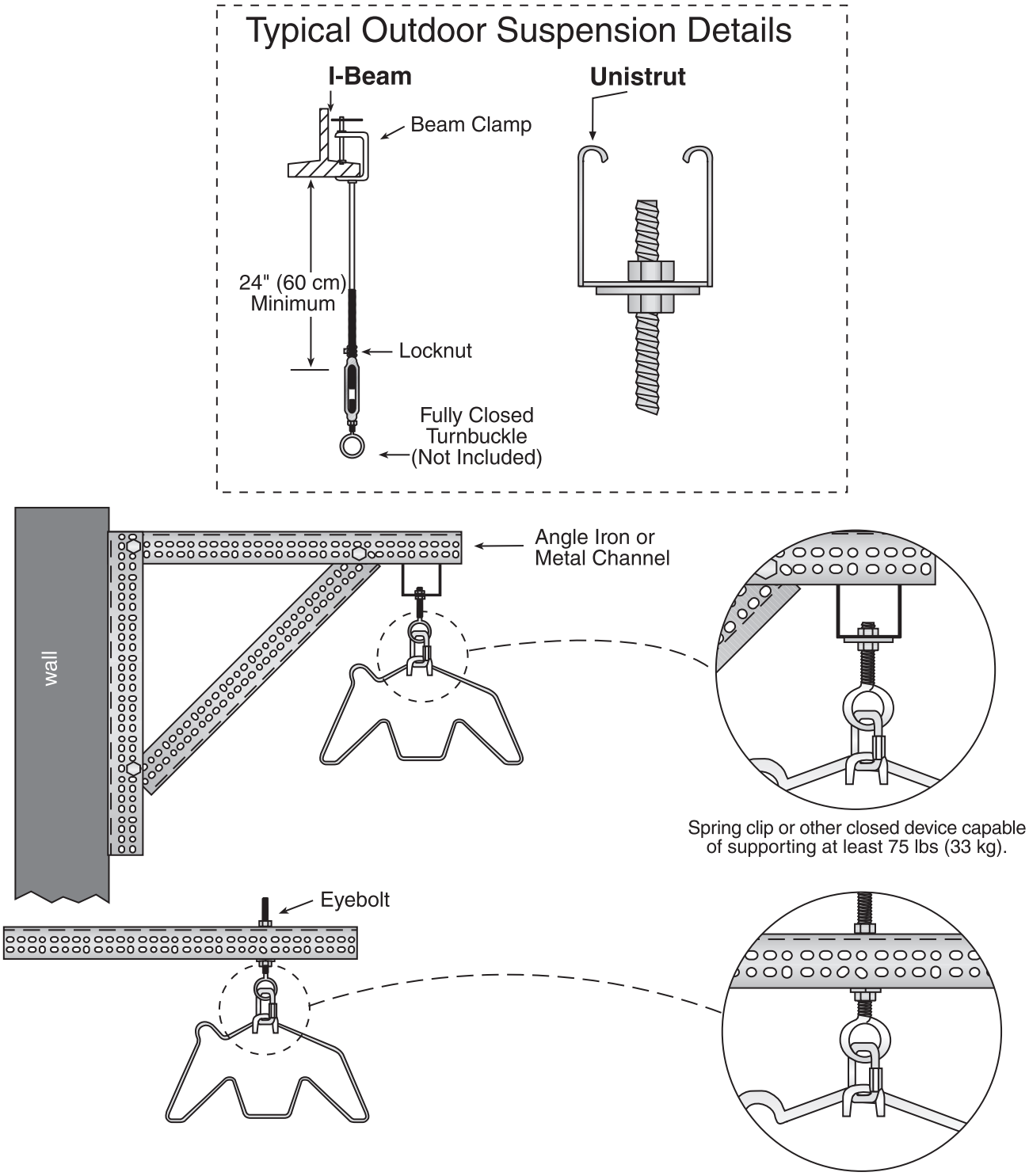


Figure 16. Typical Outdoor Heater Suspension (Model VZH Only)

Heater Suspension—Continued

NOTE: Model VZH is shipped with a suspension bracket attached to the exhaust end of the cabinet in an upside-down position.

3. For model VZH, reverse orientation of suspension bracket (see **Figure 2**) on burner cabinet so that single hole is on top.

NOTE: Models VZ and VZT are shipped with the blower and motor assembly separate (not installed).

4. For models VZ and VZT, install blower and motor assembly on top of burner cabinet as shown in **Figure 17**:
   a. Secure blower and motor assembly using blower gasket and four #10-32 locknuts.
   b. Install combustion air inlet collar if connecting outside air inlet.
   c. Plug blower cord into receptacle (see **Figure 1** or **Figure 3**) on rear of burner cabinet.
5. Suspend burner cabinet in accordance with steps 1 and 2 and connect to tube assembly using gasket, bolts, and lockwashers as shown in **Figure 17**. Torque bolts to 120 inch-pounds. For model VZH, connect additional S-hook and suspension hardware to suspension bracket on burner cabinet.
6. Adjust heater suspension hardware as necessary:
   a. Use level to ensure that burner cabinet is level and that all turnbuckles, threaded rods, and/or chains are plumb.
   b. For vented heaters, ensure that tube assembly has slight downward slope (approximately 1/2 inch from end-to-end) ***away from*** burner cabinet. For unvented heaters, ensure that tube assembly has slight downward slope (approximately 1/2 inch from end-to-end) ***toward*** burner cabinet.

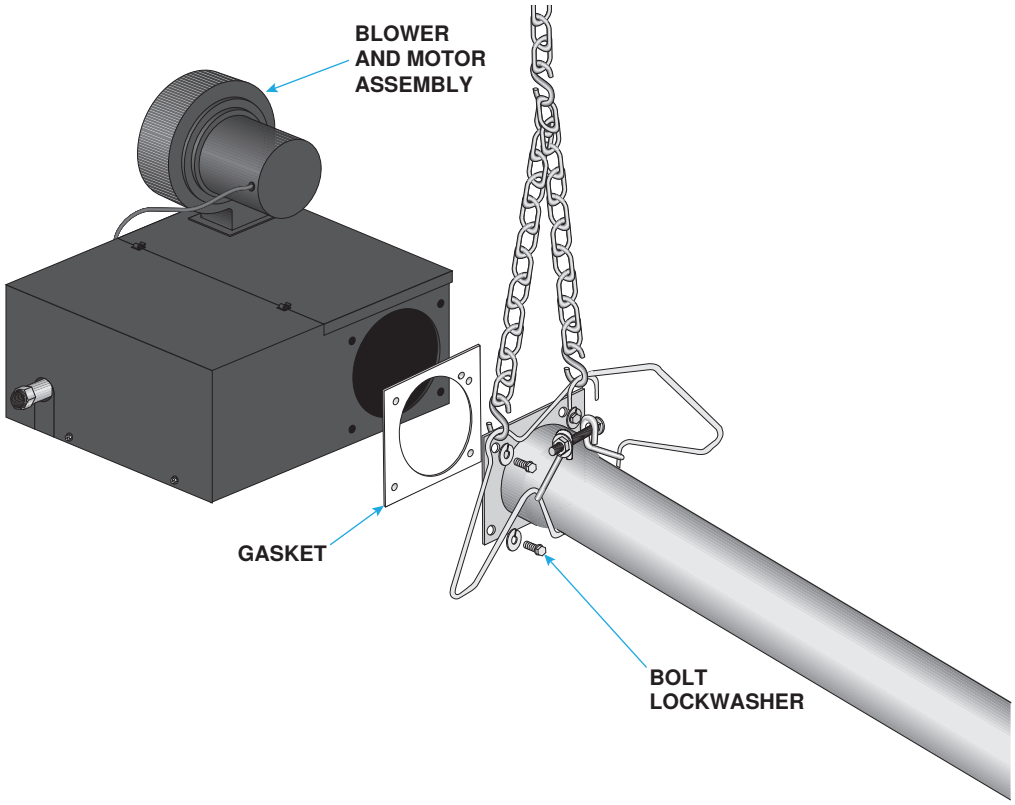


Figure 17. Burner Cabinet and Tube Assembly Connection (Model VZ Shown)

Vent Connections

⚠ DANGER ⚠

- **All Category III vent joints MUST BE secured using #8 × 3/8 sheet metal screws and MUST BE sealed using high-temperature (≥550°F (≥288°C)) silicone sealant.**
- **For all Category III venting, the installer MUST perform a leak test on the complete venting system. A soap and water solution is recommended.**

The heater is a Category I or III vented appliance. Refer to the rating plate for the vent category.

Venting General Requirements

- The heater must be vented in accordance with this manual and with the *National Fuel Gas Code* (NFPA 54/ANSI Z223.1, latest revision) in the US, with the *Natural Gas and Propane Installation Code* (CSA B149.1, latest revision) in Canada, and with any state, provincial, or local codes that may apply. Any portion of vent pipe passing through a combustible wall must have an approved thimble to conform with these codes.
- Maintain a 6-inch (15-cm) minimum clearance around all single-wall flue pipe.
- Vent pipe must be sloped downward away from the heater 1/2 inch (1 cm) for every 20 feet (6 meters).
- The heater may be individually vented or common vented. When venting vertically, a maximum of four heaters can be commonly vented. When venting horizontally, a maximum of two heaters can be commonly vented.

Vent Material Recommendations

- **For Category I venting:** field-supplied Type B double wall vent—only or used as a continuous section passing through the outside wall or roof or outside of the building.
- **For Category I and III venting:** 4-inch OD porcelain-coated tubing or 4- or 6-inch OD heat-treated aluminized tubing or field-supplied Type C single wall corrosion-resistant galvanized steel (minimum 26-gauge) pipe.

Vent/Combustion Air Duct Length Requirements

⚠ CAUTION ⚠

Recommended vent length is <20 feet (<6 meters). If vent length is >20 feet (>6 meters), condensation will form in vent pipe and insulation and additional sealing measures (high-temperature silicone at all seams) are required.

Table 11. Vent/Combustion Air Duct Length Requirements

Vent Length		Maximum Combustion Air Duct Length*
Minimum	Maximum*	
Feet (Meters)		
2 (0.6)	45 (13.7)	45 (13.7)

*The total vent length + outside air duct length + any extensions to minimum heat exchanger lengths cannot exceed 65 feet (19.8 meters). Subtract 15 feet (4.6 meters) of maximum allowed vent or duct length per vent elbow if more than two elbows are used.

Vent Connections—Continued

Vent Terminal Requirements

⚠ DANGER ⚠

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

⚠ WARNING ⚠

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

⚠ CAUTION ⚠

Products of combustion from a horizontal vent terminal 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 terminal or install a vertical vent.

Table 12. Minimum Clearance Requirements for Horizontal Vent Terminal

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.	

- The 14-inch vent terminal may be used only in noncombustible walls.
- The 4-inch Tjernlund vent terminal or equivalent must be used for 4-inch vents in either combustible or noncombustible walls. The 6-inch Tjernlund vent terminal or equivalent must be used for 6-inch common vents in either combustible or noncombustible walls. Follow the manufacturer's instructions for proper installation.

Unvented Units

⚠ DANGER ⚠

- **The use of optional outside combustion air is not recommended with unvented heaters. If exhaust fans are used to supply ventilation air, an interlock switch must be used to prevent the heater from coming on when the fans are off. This may be done using a pressure switch.**
- **Heaters installed unvented MUST BE interlocked with sufficient building exhaust.**

- The heater may be installed unvented in accordance with building ventilation codes and with the **Clearances** section if sufficient ventilation is provided in the amount of 4 CFM (US) or 3 CFM (Canada) per 1,000 BTUh firing rate.
- A turndown-type vent terminal (see **Figure 18**) with a screen and without a backdraft flap must be installed at the exhaust end of the tube.

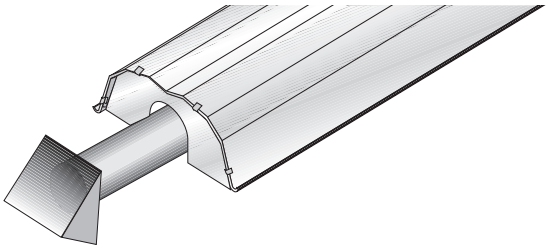


Figure 18. Vent Terminal for Unvented Unit

Vertical Venting

- Vertical venting must be installed in accordance with the **Venting General Requirements**, **Vent Material Recommendations**, **Vent/Combustion Air Duct Length Requirements**, and **Vent Terminal Requirements** sections.
- Refer to the **Common Venting** section for common venting (one vent for more than one appliance) requirements.

Table 13. Vertical Venting Specifications

Category I	Category III
Unit sizes 40 and 60	Unit sizes 80–200
4-inch (10-cm) vent pipe	4-inch (10-cm) vent pipe
Not required to be gas tight—pressure inside vent system is negative—leak test is not required	Vent shall not extend <2 feet (0.6 meter) above highest point where it passes through flat roof of building
Length of horizontal portion of vent pipe must be <75% of vertical portion of vent pipe (i.e., if vertical vent section length is 10 feet (3 meters), horizontal vent section length must be ≤7 feet 6 inches (≤2.3 meters))	Length of horizontal portion of vent pipe is >75% of vertical portion of vent pipe (i.e., vertical vent section length is 10 feet (3 meters) and horizontal vent section length is >7 feet 6 inches (>2.3 meters))
Horizontal portion of vent pipe can be Type-B double-wall or Type C single-wall vent pipe with upward slope from heater of at least 1/4 inch (6.3 mm) per foot	Vent pipe must be single-wall corrosion-resistant (minimum 26-gauge)
Install field-supplied B-to-C adapter in place of vent adapter when using Type B vent pipe for horizontal section	Continuous section of Type B vent pipe may be used only to pass through roof or outside of building—not permitted to be used inside space
Vent must terminate at least 5 feet (1.5 meters) above vent connection on heater	
Category I common vertical venting is not permitted	4-inch vent cap required for 4-inch single or common vent

Vent Connections—Continued

Vertical Venting—Continued

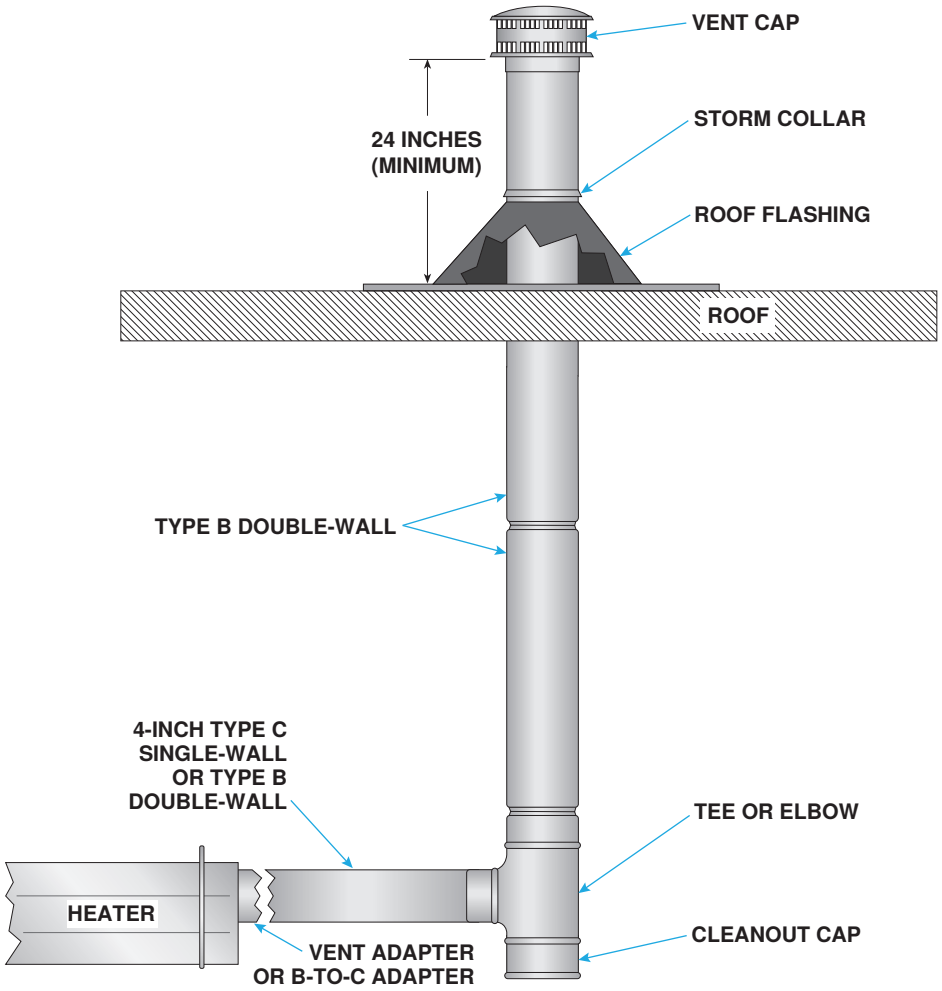


Figure 19. Category I Vertical Venting (Unit Sizes 40 and 60)

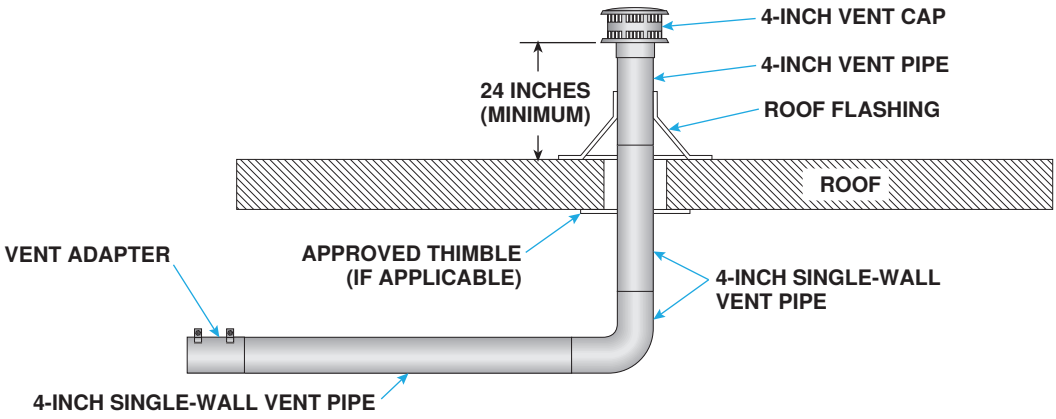


Figure 20. Category III Vertical Venting (Unit Sizes 80–200)

Horizontal Venting

NOTE: All horizontal venting is Category III. Follow the vent material manufacturer's instructions for proper installation.

- Horizontal venting must be installed in accordance with the **Venting General Requirements**, **Vent Material Recommendations**, **Vent/Combustion Air Duct Length Requirements**, and **Vent Terminal Requirements** sections.
- Refer to the **Common Venting** section for common venting (one vent for more than one appliance) requirements.
- Vent pipe must be single-wall corrosion-resistant (minimum 26-gauge).
- A continuous section of Type B vent pipe may be used only to pass through the outside wall or outside of the building—not permitted to be used inside the space.

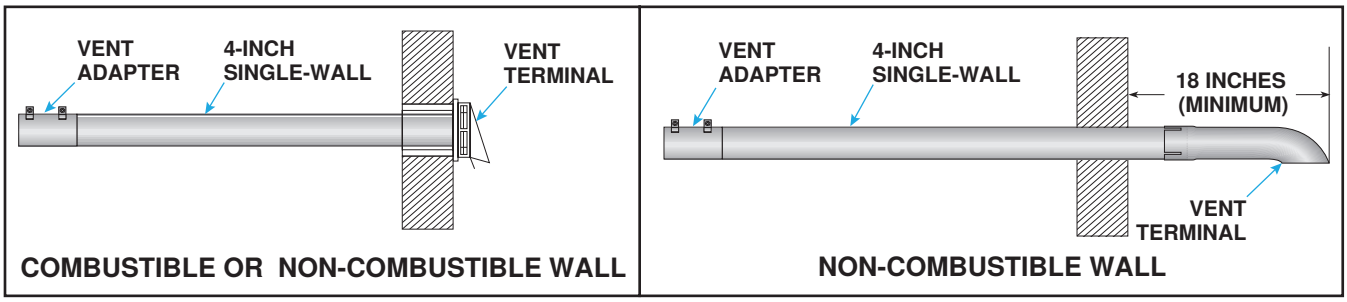


Figure 21. Horizontal Venting

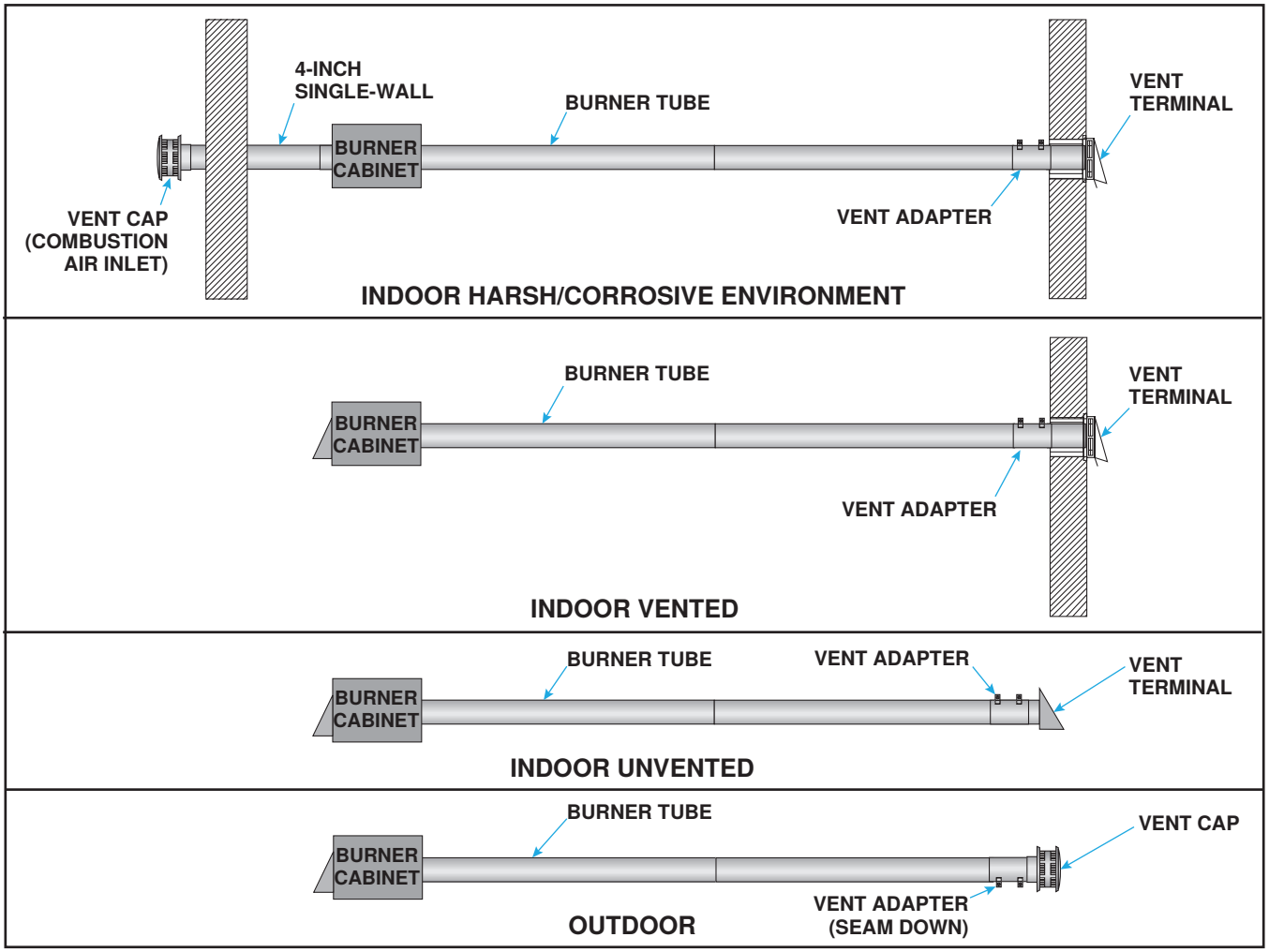
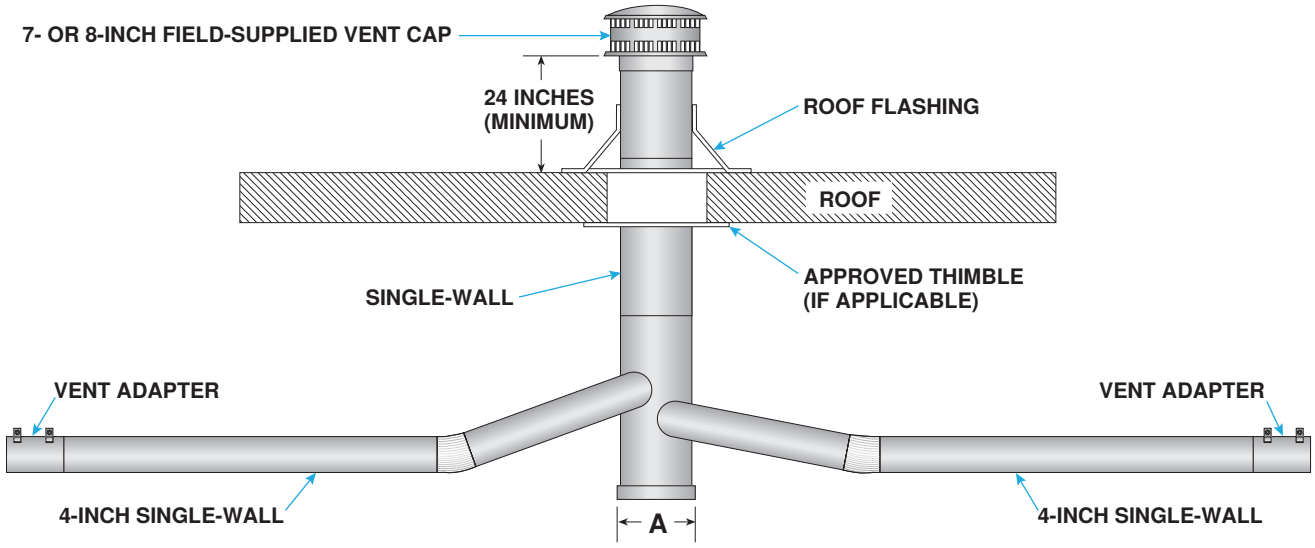


Figure 22. Model VZH Horizontal Venting Options

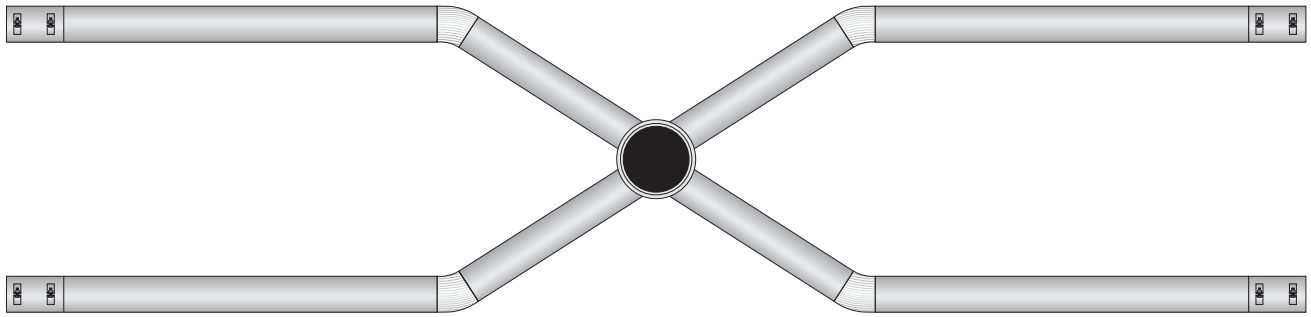
Vent Connections—Continued

Common Venting

Table 14. Common Venting Specifications	
Vertical	**Horizontal**
Maximum of four heaters with same BTU output and controlled by common thermostat may be vented through roof	Maximum of two heaters with same BTU output and controlled by common thermostat may be vented through side wall
Common stack connections must be positioned to avoid direct opposition to combustion gas streams—area of common stack dimension A (see **Figure 23**) must equal sum of open area of individual vents	Continuous section of Type B vent pipe may be used only to pass through outside wall or outside of building—not permitted to be used inside space for Category III venting
Continuous section of Type B vent pipe may be used only to pass through roof or outside of building—not permitted to be used inside space for Category III venting	



SIDE VIEW



TOP VIEW

Figure 23. Category III Common Vertical Venting

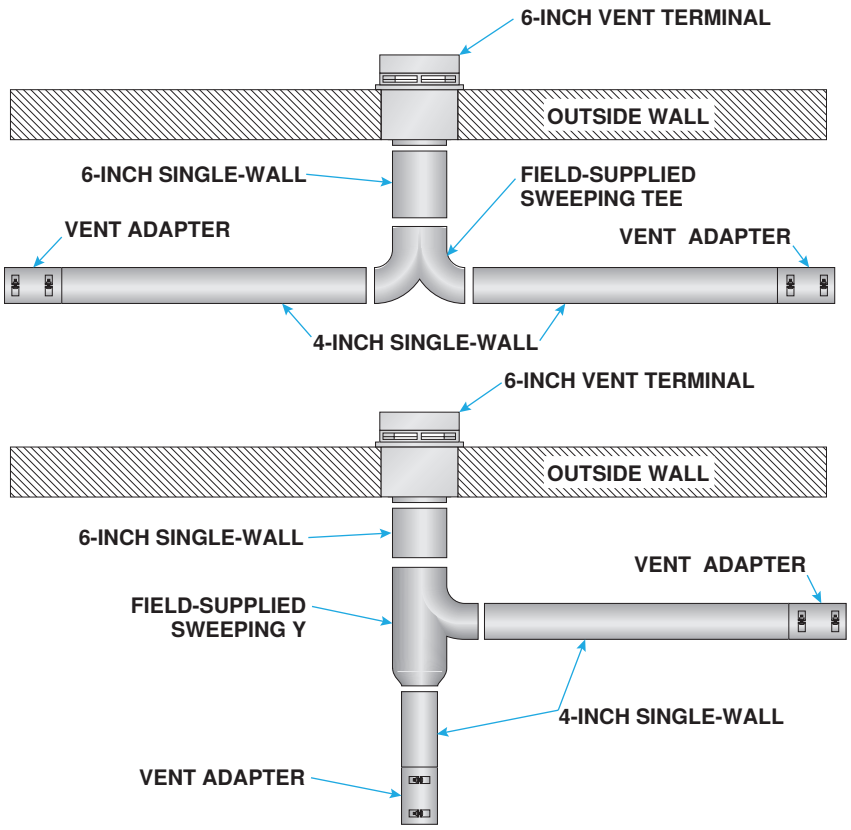


Figure 24. Category III Common Horizontal Venting

Combustion Air Connections

⚠ CAUTION ⚠

- **IMPORTANT: If the building has a slight negative pressure or if corrosive contaminants such as halogenated hydrocarbons are present in the air, an outside supply of combustion air to the heater is required.**
- **Seal all combustion air pipe joints.**
- **The use of optional outside combustion air is not recommended with unvented heaters.**
- **The air supply duct may have to be insulated to prevent condensation on the outer surface.**
- **The combustion air terminal must maintain a minimum distance of 3 feet (93 cm) from the vent termination for both vertical and horizontal venting. A vertical combustion air terminal must not extend >1-foot higher above the roof than a vertical vent terminal.**
- **Heaters with a common combustion air pipe must be controlled by a common thermostat.**

Installations That Require Outside Combustion Air

For installations that require outside combustion air, make connections in accordance with **Figure 25** or **Figure 26**. Use either field-supplied piping or option DE1 or DE2 (refer to **Table 5**) and either an optional or field-supplied vent cap. Connect to the combustion air inlet flange on the blower for models VZ and VZT or to the combustion air inlet collar on the side of the burner cabinet for model VZH.

Combustion Air Connections—Continued

Installations That Require Outside Combustion Air—Continued

NOTE: Field-supplied flex hose with hose clamps or option DE1 or DE2 is recommended for connecting to the unit, but solid pipe is acceptable.

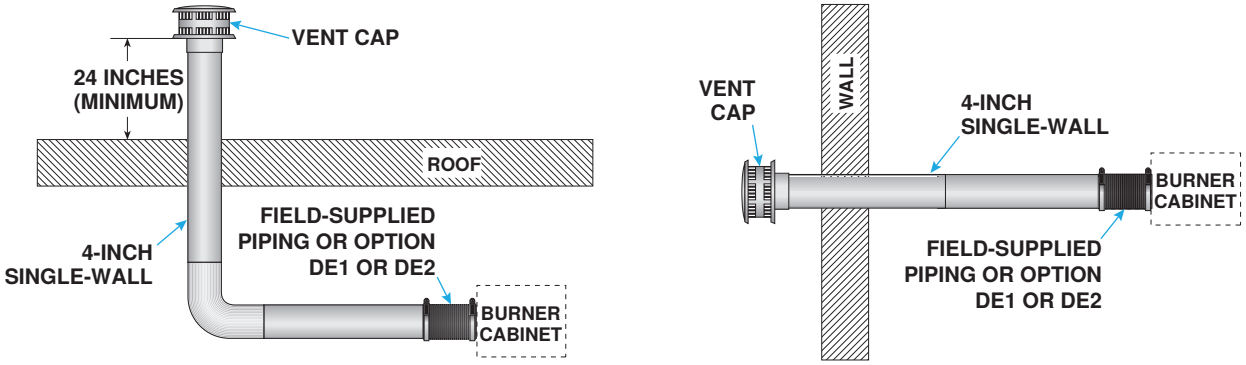


Figure 25. Combustion Air Connections for One Heater

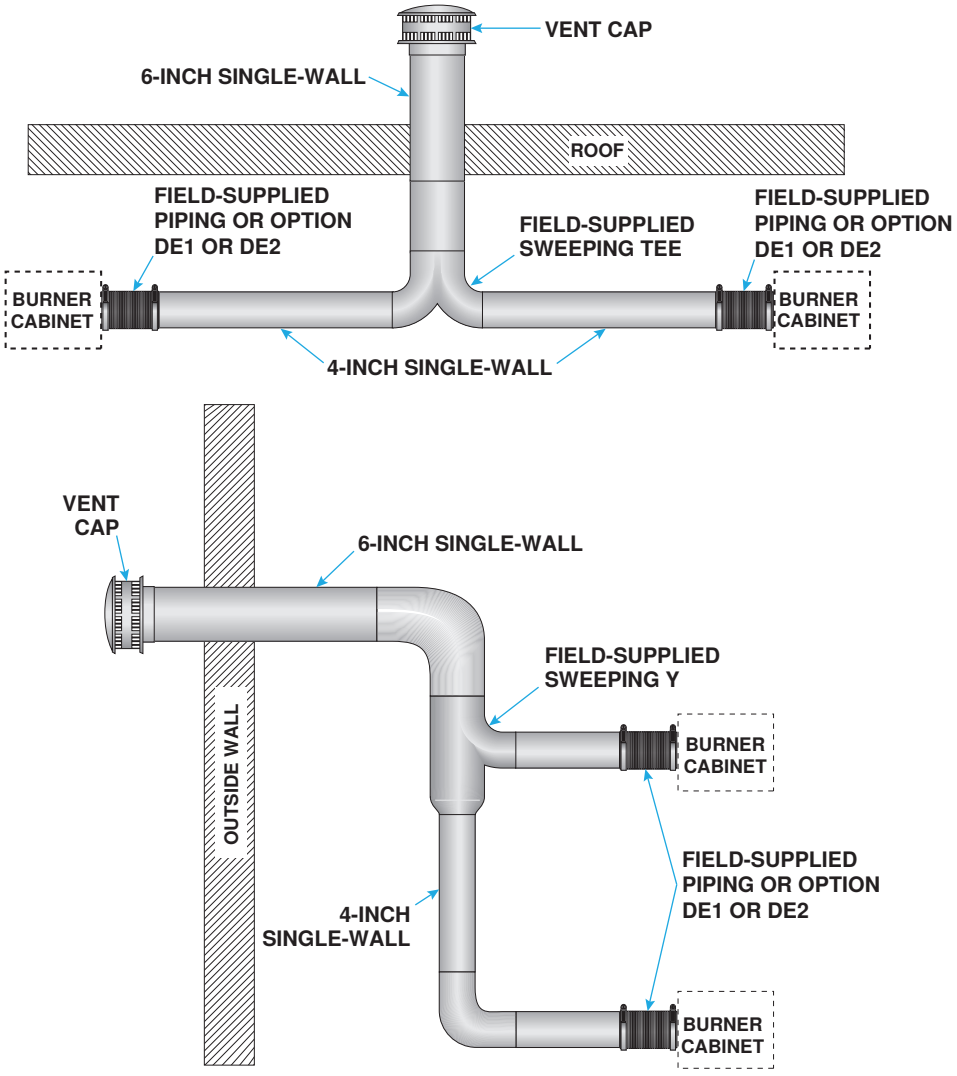


Figure 26. Combustion Air Connections for Two Heaters

Installations That Do Not Require Outside Combustion Air

For model VZ and VZT installations that do not require outside combustion air, no alterations are needed. For model VZH installations that do not require outside combustion air, install the combustion air inlet hood as follows:

1. Remove and save screws and nut shown in **Figure 27**.
2. Position combustion air inlet hood over combustion air inlet collar as shown in **Figure 27**) and align flange holes.
3. Secure hood to burner cabinet using existing screws and nut.

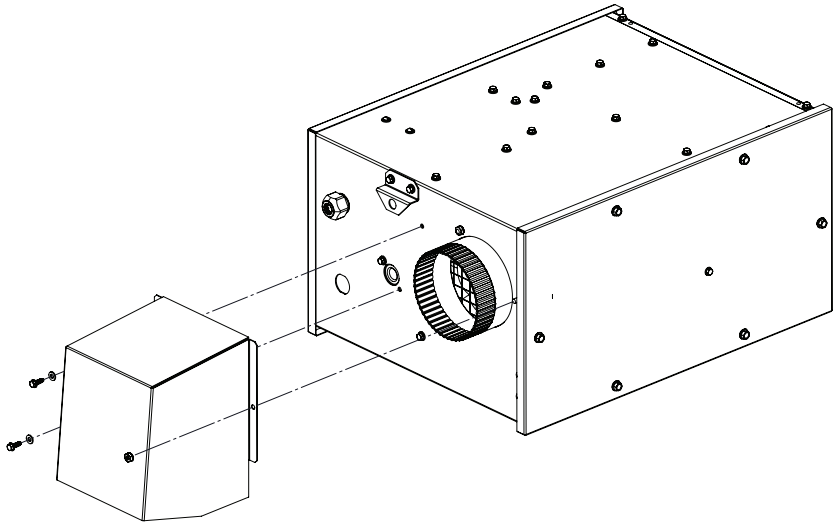


Figure 27. Combustion Air Inlet Hood Installation (Model VZH)

Piping Connections

⚠ CAUTION ⚠

Ensure that all high-pressure testing of the gas line is completed before connecting the gas supply to the heater.

Gas Supply Pressure

- The unit is equipped for a maximum gas supply pressure of 1/2 psi, 3.5 kPa, or 14 IN WC for natural gas or propane. The minimum supply pressure, as measured while the unit is operating at full fire, is 4.6 IN WC (unit sizes 40–150) or 5 IN WC (unit sizes 175 and 200) for natural gas or 11 IN WC for propane.
- Supply pressure higher than 1/2 psi requires the installation of an additional service regulator external to the unit.
- **Pressure testing supply piping:** For test pressures ***above*** 1/2 psi, disconnect the heater and manual valve from the gas supply line to be tested and cap or plug the supply line. For test pressures ***below*** 1/2 psi, before testing, close the manual valve on the heater.

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.**

Piping Connections—Continued

Gas Supply Piping—Continued

- All piping must be in accordance with requirements outlined in the *National Fuel Gas Code* (ANSI/Z223.1, latest edition) or the *Natural Gas and Propane Installation Code* (CSA B149.1, latest edition).
- Gas supply piping installation shall conform with good practice and with local codes.
- Support gas piping with pipe hangers, metal strapping, or other suitable material. Do not rely on the heater to support the gas pipe.
- Variables for sizing gas supply lines are listed in **Table 15**. When sizing supply lines, consider the possibility of future expansion and increased requirements. Refer to the *National Fuel Gas Code* for additional information on line sizing.

Table 15. Gas Supply Line Sizes

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

Supply Piping Connections

⚠ DANGER ⚠

- **FIRE OR EXPLOSION HAZARD: Expansion of the radiant pipe occurs with each firing cycle causing the burner to move with respect to the gas line. This can result in a gas leak.**
- **The heater expands and contracts in use, so it is essential to provide flexibility in the final gas connection. In the US, use the stainless steel flexible gas connector provided with the unit that complies with the *Standard for Connectors for Gas Appliances* (ANSI Z21.24/CSA 6.10, latest revision). In Canada, use the optional Type 1 rubber flexible gas connector that complies with the *Standard for Elastomeric Composite Hose and Hose Couplings for Conducting Propane and Natural Gas* (CAN/CGA 8.1, latest revision).**

⚠ CAUTION ⚠

Take care when making gas connections to the heater not to apply excessive turning force to the internal controls. Hold the gas connection pipe nipple securely with a pipe wrench when tightening the flexible gas connector.

NOTE: The gas meter and service MUST BE large enough to handle all burners being installed plus any other connected load. The gas supply to the unit MUST BE sufficient to adequately handle a maximum pressure drop of 1/2 IN WC.

1. See **Figure 28**, which shows potential incorrect flexible gas connector installation positions. Ensure that connector is not installed in any of these positions.

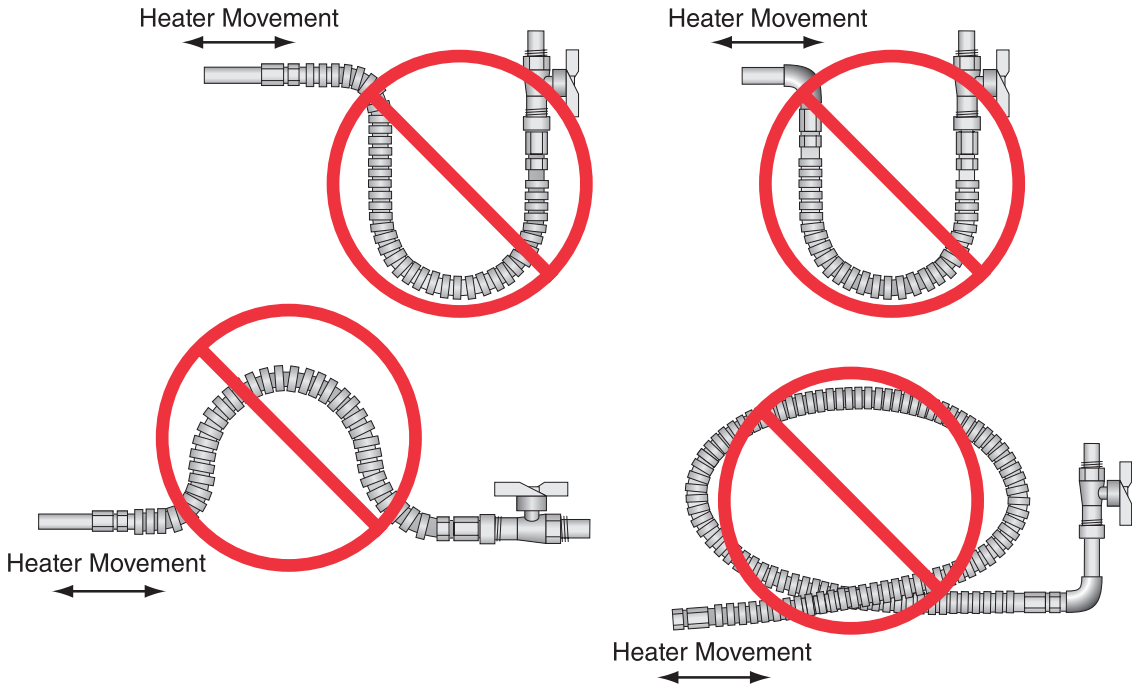


Figure 28. Flexible Gas Connector—Incorrect Installation

⚠ CAUTION ⚠

A field-supplied pressure regulator is required if the gas supply pressure exceeds 14 IN WC.

2. Immediately upstream of appliance and close to heater, install field-supplied connections as shown in **Figure 29**. Plugged 1/8-inch NPT tap on manual shutoff valve provides connection for supply line pressure test gauge.
3. Install flexible gas connector with shutoff valve in U-configuration as shown in **Figure 29**. Care must be taken to observe pipe bend diameter of 12 inches (30 cm) and pipe displacement distance of 3 inches (8 cm), which is for cold condition and may reduce when unit is fired.
4. Leak-test all connections by brushing on leak-detecting solution. Bleed trapped air from gas lines as needed.

Piping Connections—Continued

Supply Piping Connections—Continued

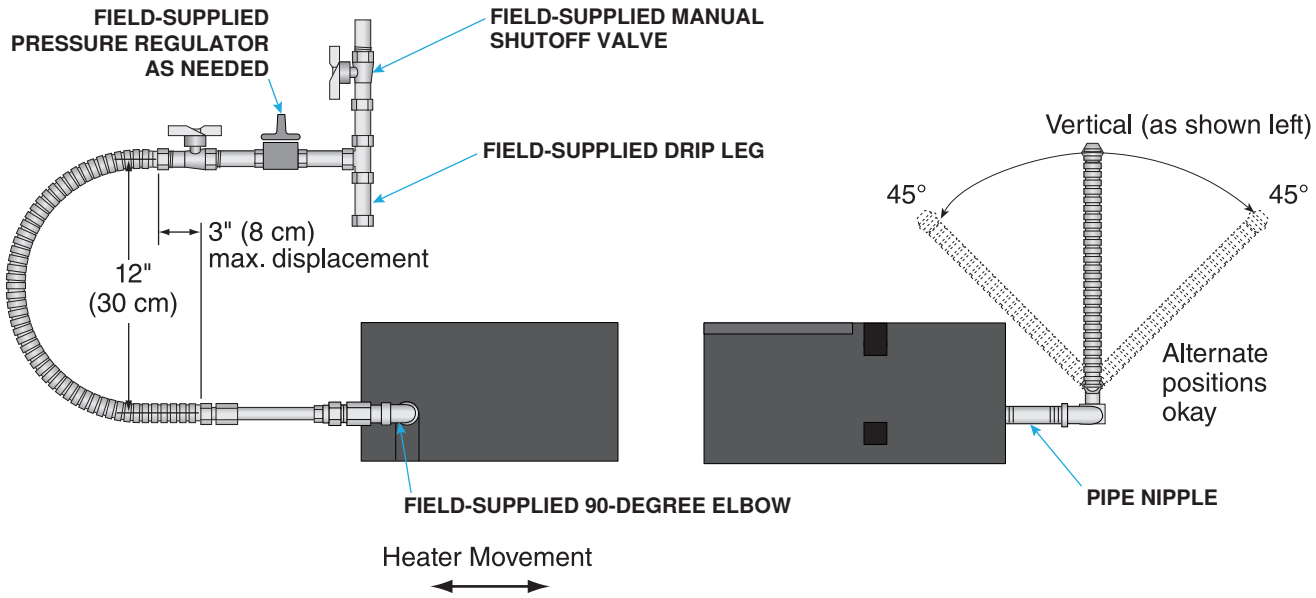


Figure 29. Flexible Gas Connector—Correct Installation

Electrical Connections

⚠ DANGER ⚠

- **Electrical shock can cause personal injury or death. Before making electrical connections, switch OFF the main electrical disconnect. There may be more than one disconnect switch. Lock out and tag the switch(es) using a suitable warning label.**
- **This appliance must be electrically grounded.**
- **120VAC supply is present at each burner when the thermostat is switched OFF. When servicing the heater, ensure that the electric supply is isolated from the mains supply.**

⚠ CAUTION ⚠

- **Ensure that all wiring is in accordance with the wiring diagram provided with the unit.**
- **All electrical wiring and connections, including electrical grounding MUST BE made by a qualified electrician in strict accordance with the *National Electric Code* (ANSI/NFPA No. 70, latest edition) or, in Canada, the *Canadian Electric Code* (Part 1, CSA C.22.1). In addition, the installer should be aware of any local ordinances or gas company requirements that might apply.**
- **If any of the original wire supplied with the appliance must be replaced, it MUST BE replaced with wiring material having a temperature rating of at least 220°F (105°C) and 600V.**

Supply Wiring Connection

Check the rating plate on the heater for the supply voltage and current requirements and ensure that all wiring is in accordance with the wiring diagram provided with the unit. Run the supply wiring through the supply wiring entrance (see **Figure 1**, **Figure 2**, or **Figure 3**) and connect to the internal wire bundle using wire nuts—black (live) to L, white (neutral) to N, and green (ground) to Gnd—as shown in **Figure 30**. Use a field-supplied BX or Romex connector for models VZ and VZT or field-supplied liquid-tight conduit and conduit connector for model VZH.

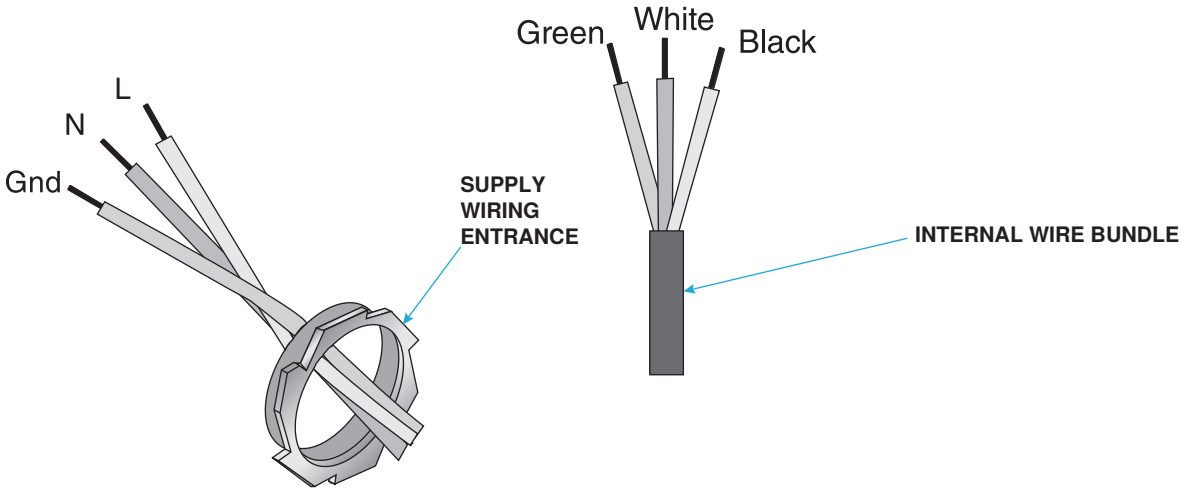


Figure 30. Supply Wiring Connection

Control Wiring Connections

Run any control wiring through the supply wiring entrance (see **Figure 30**) and connect using wire nuts. Ensure that all wiring is in accordance with the wiring diagram provided with the unit. Connect thermostat(s) as follows:

- **Line voltage thermostat:** For models VZ and VZH, install the line voltage thermostat (maximum five burner cabinets per thermostat) in accordance with the thermostat manufacturer's instructions and connect wiring in accordance with **Figure 31** or **Figure 32**.

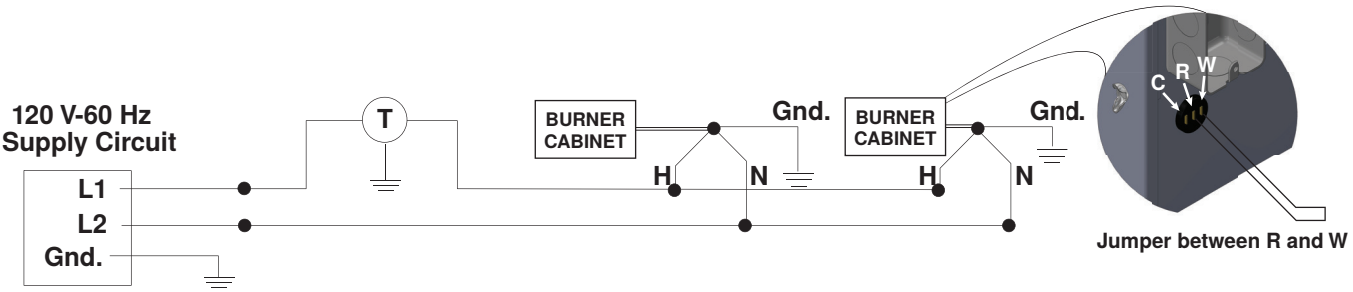


Figure 31. Model VZ Line Voltage Thermostat Wiring

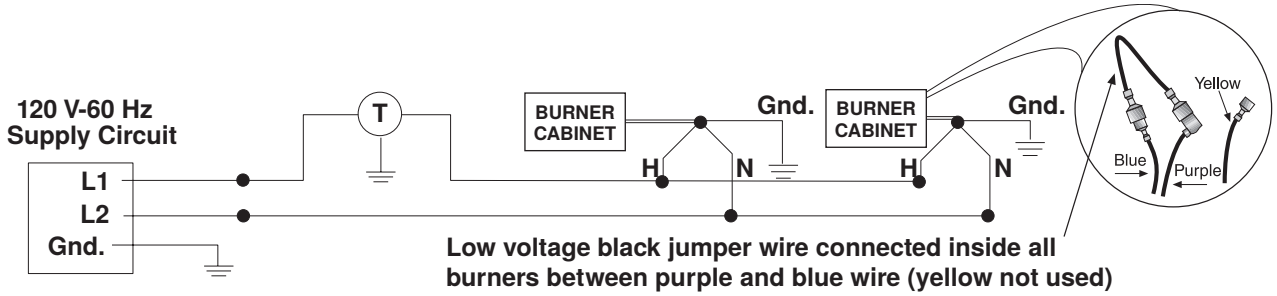


Figure 32. Model VZH Line Voltage Thermostat Wiring

Electrical Connections—Continued

Control Wiring Connections—Continued

- **Low voltage thermostat:** Install the low voltage thermostat in accordance with the thermostat manufacturer's instructions. Terminals R and C on the terminal strip provide 24V to the thermostat. For model VZ, connect wiring in accordance with **Figure 33**. For model VZH, connect wiring in accordance with **Figure 34**. For model VZT, connect wiring in accordance with **Figure 35**. For connecting multiple burner cabinets (up to eight), a separate transformer relay (option IRT1) must be installed. Refer to the manufacturer's installation instructions provided with the transformer relay and to the wiring diagrams in the replacement parts manual found at **www.reznorhvac.com**.

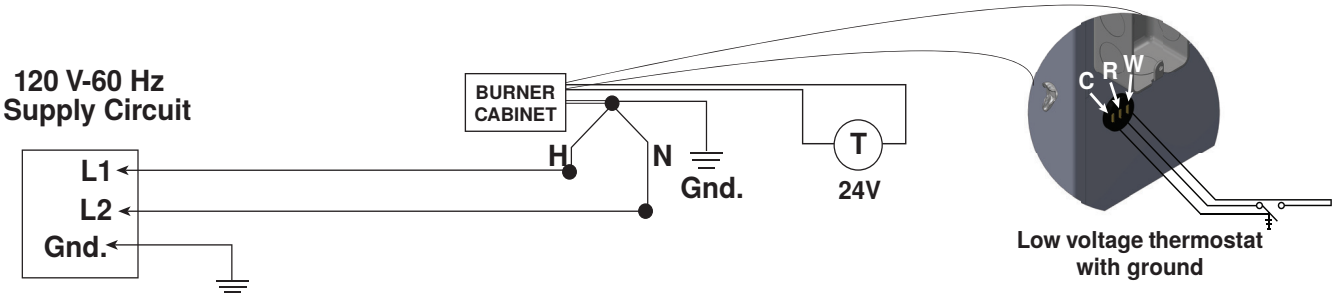


Figure 33. Model VZ Low Voltage Thermostat Wiring

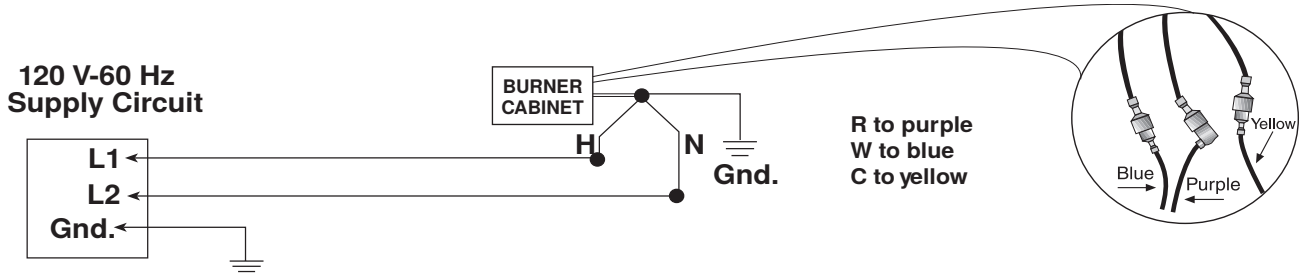


Figure 34. Model VZH Low Voltage Thermostat Wiring

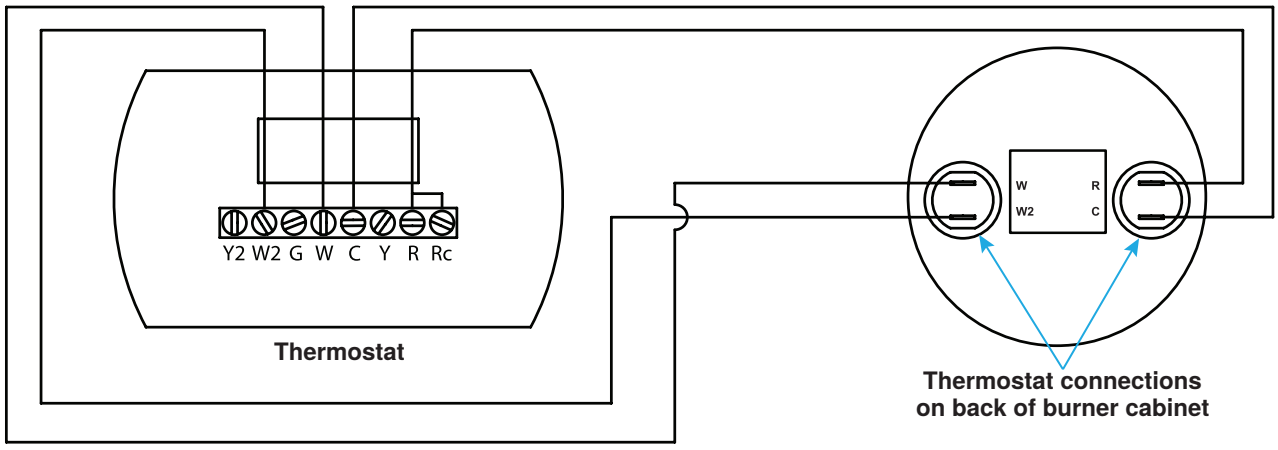


Figure 35. Model VZT Low Voltage Two-Stage Thermostat Wiring

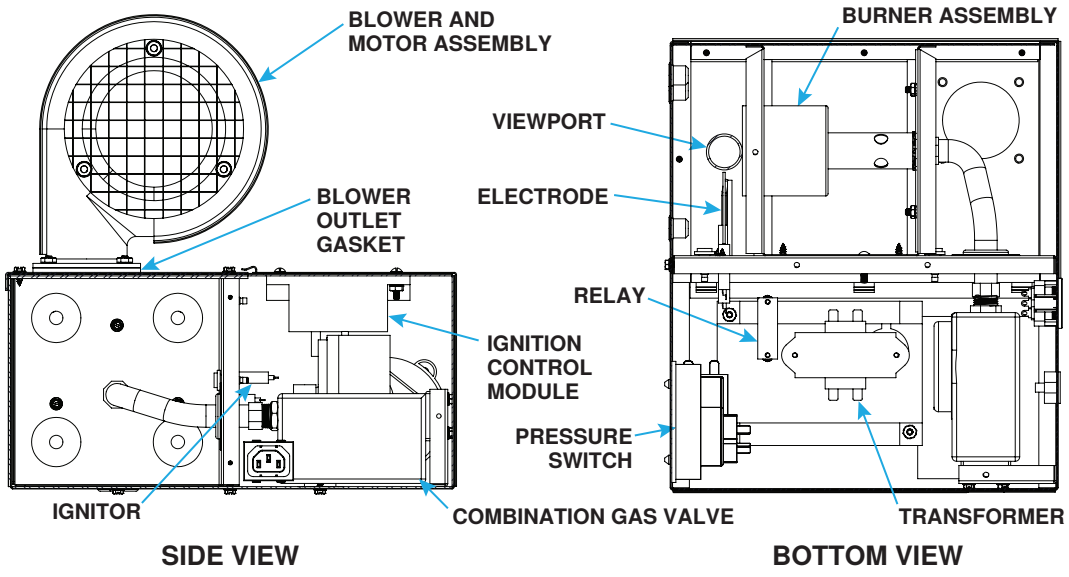


Figure 36. Model VZ Components

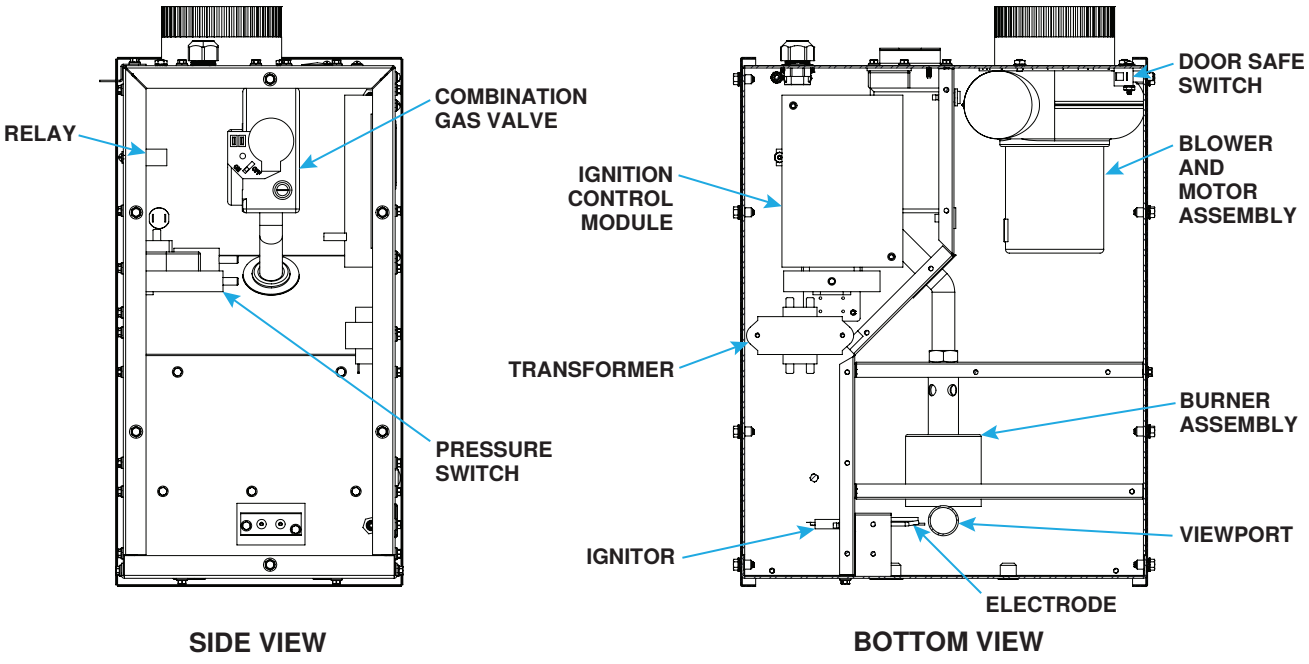


Figure 37. Model VZH Components

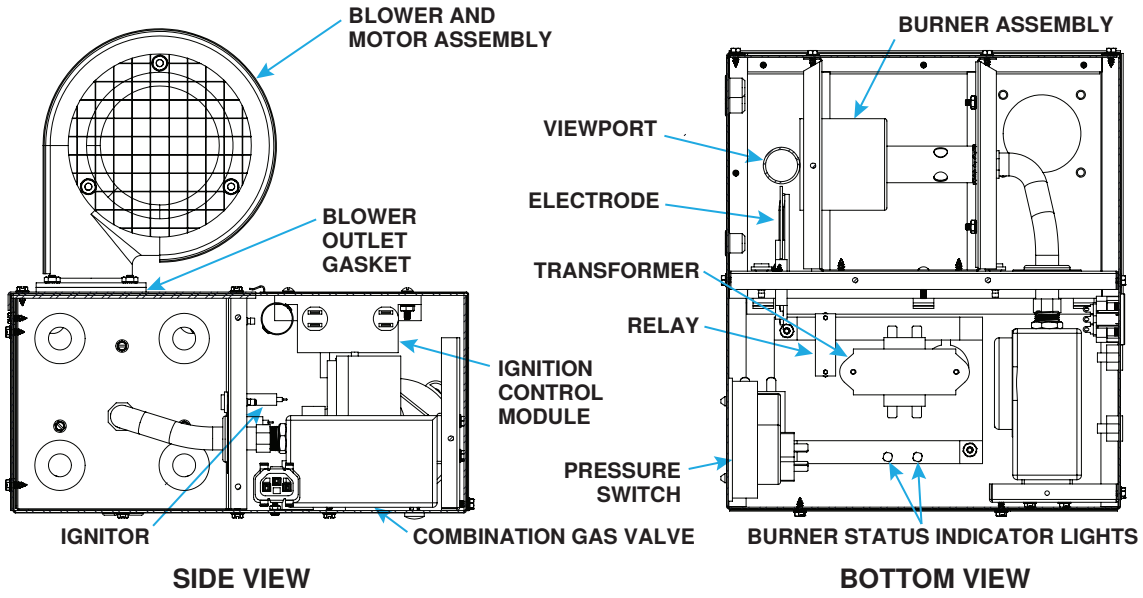


Figure 38. Model VZT Components

Pressure Switch

The pressure switch is a pressure-sensitive switch that monitors air pressure to ensure that proper combustion airflow is available. If the sensing pressure is outside the pressure switch setpoint, the switch functions to shut off the burner.

Combination Gas Valve

⚠ WARNING ⚠

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

The combination gas valve is powered by the 24V control circuit and is a diaphragm-type valve that is factory-set to provide regulated gas flow.

Ignition Control Module

The ignition control module controls the operation of the combination gas valve and ignition system. The display's codes are listed and described in the **Troubleshooting Using Ignition Control Module** section.

Door Safe Switch (Model VZH)

The door safe switch prevents the heater from operating when the burner cabinet's access door panel is open.

⚠ CAUTION ⚠

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

⚠ 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 that automatically lights the burner. Do not try to light the burner by hand.**
- **Before operating, smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.**
- **WHAT TO DO IF YOU SMELL GAS:**
  a. **Do not try to light any appliance.**
  b. **Do not touch any electrical switch; do not use any phone in your building.**
  c. **Leave the building immediately.**
  d. **Immediately call your gas supplier from a phone remote from the building. Follow the gas supplier's instructions.**
  e. **If you cannot reach your gas supplier, call your fire department.**
- **Should overheating occur, or the gas supply control system fail to shut off the flow of gas, turn off the combination 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.**
- **For vented systems, failure to provide proper venting will result in a health hazard that could cause serious personal injury or death.**
- **Never restrict or otherwise alter the supply of combustion air to any heater. Maintain the vent or vent/combustion air system in a structurally-sound and proper operating condition.**

Pre-Startup Checklist

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

- ❑ Check to ensure that installation has been carried out in accordance with these instructions.
- ❑ Check to ensure that electrical and gas supplies are isolated.
- ❑ Open burner cabinet access door and ensure that all internal components are secure and that all connections are securely made.
- ❑ Check suspension—unit must be secure and level.
- ❑ Check to ensure that clearances from combustibles are in accordance with **Table 2.**
- ❑ Check vent system to ensure that it is installed in accordance with **Vent Connections** section.
- ❑ Check 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—verify that fusing or circuit breakers are adequate for load use.
- ❑ Check polarity—verify that line voltage exists between black (live) wire and earth ground.

Startup

1. Close manual shutoff valve to turn OFF gas.
2. Turn OFF electric power.
3. Wait 5 minutes for unburned gases to vent from heater.
4. Ensure that combination gas valve is open and open manual shutoff to turn ON gas.
5. Turn ON electric power.
6. Set thermostat to desired temperature—burner should light automatically.

Sequence of Operation

Table 16. Sequence of Operation

Action	Result
Turn up thermostat	Thermostat calls for heat
	Blower motor energizes
As blower motor approaches nominal running RPM, pressure switch closes	Ignition control module activates
Ignition control module opens combination gas valve after 45-second pre-purge period	Spark igniter energizes
Flame is established	Sparking sequence ceases
	For model VZT, burner operates on low- or high-fire depending on demand sensed by thermostat—during low-fire operation, low-fire burner status indicator light is illuminated—during high-fire operation, both low- and high-fire burner status indicator lights are illuminated
If flame is not established during ignition sequence . . .	Ignition control module closes combination gas valve and purge period begins
	Ignition control module will try two additional ignition attempts with purge periods in between trials
	If ignition is not established, ignition control module locks out*
If flame extinguishes during operation . . .	Ignition control module closes combination gas valve and purge period begins
	Ignition control module will try two additional ignition attempts with purge periods in between trials
	If ignition is not re-established, ignition control module locks out for 1 hour or until reset*
When thermostat is satisfied . . .	All power to unit is shut OFF

*After lockout, the ignition control module can be reset by turning down the thermostat for 5 seconds and then raising it again to the desired temperature or by disconnecting and then reconnecting power to the unit.

Post-Startup Checklist

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

- ❑ With unit in operation, measure manifold (outlet) gas pressure in accordance with **Measure and Adjust Manifold Gas (Outlet) Pressure** section.
- ❑ Check operation of flame safeguard: with heater running normally, shut off gas supply—heater should attempt to re-light and then lock out.
- ❑ Turn unit OFF and ON—pausing 2 minutes between each cycle—observe for smooth ignition.
- ❑ Place literature bag that contains Limited Warranty, this manual, and any control or optional information in accessible location near heater.

Shutdown

1. Set thermostat to lowest setting.
2. Turn OFF electric power.
3. Turn OFF manual shutoff gas valve.

ADJUSTMENTS

High-Elevation and Propane Conversion

NOTE: Deration is necessary to compensate for low atmospheric pressure at high elevations (>2,000 feet (>610 meters)). This requires replacing the burner orifice (refer to instructions provided with option DJ20). To convert a natural gas unit for use with propane, refer to the instructions provided with option DL2.

Measure and Adjust Manifold Gas (Outlet) Pressure

⚠ CAUTION ⚠

Before attempting to measure or adjust the manifold gas pressure, ensure that the gas supply (inlet) pressure is within the specified range for the gas being used—both when the heater is in operation and when it is on standby. Incorrect inlet pressure could cause excessive manifold gas pressure immediately or at some time in the future. Always check the rating plate for the minimum gas supply (inlet) pressure.

NOTE: Models VZ and VZH have a single-stage combination gas valve. Model VZT has a two-stage combination gas valve.

Measure and adjust as necessary the manifold gas (outlet) pressure as follows:

1. Remove burner cabinet panel(s) for access:
   a. For models VZ and VZT, disconnect combustion air piping from blower if unit is connected to outside combustion air, unplug blower motor power cable, and remove top blower panel with blower and motor assembly attached.
   b. For model VZH, remove side panel.
2. Close combination gas valve to prevent gas flow to burner.

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

3. Connect manometer to outlet pressure tap on combination gas valve (see **Figure 39**).

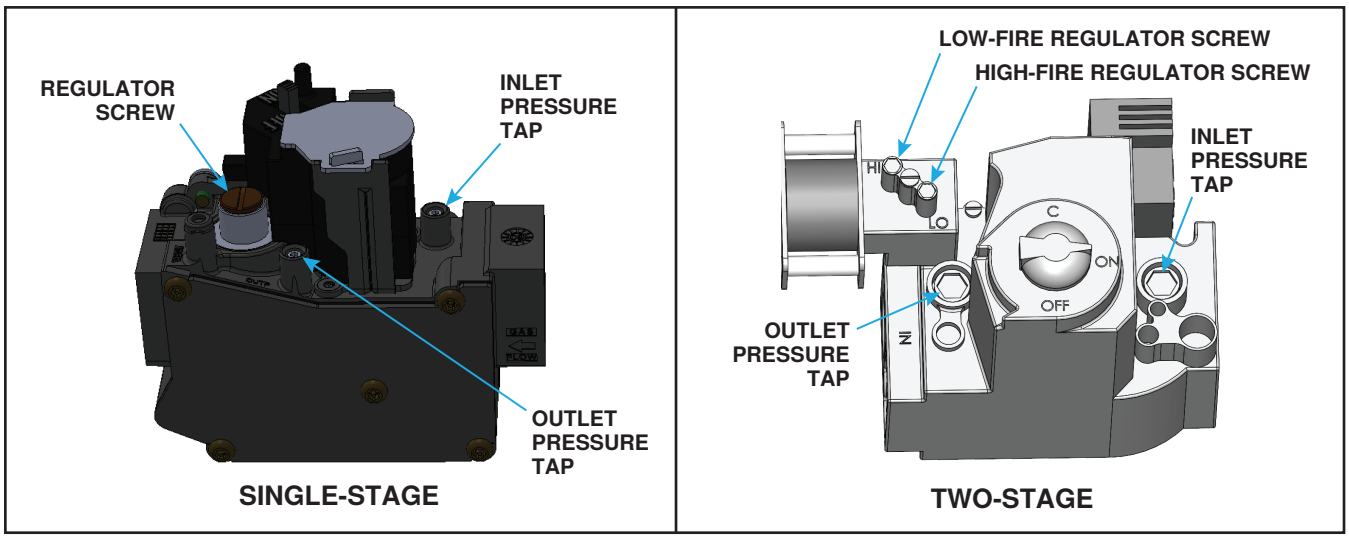


Figure 39. Combination Gas Valve

ADJUSTMENTS—CONTINUED

Measure and Adjust Manifold Gas (Outlet) Pressure—Continued

4. Open combination gas valve and operate heater.
5. To measure low-fire pressure on model VZT, disconnect wire from HI terminal on valve. Be sure to reconnect wire.

⚠ CAUTION ⚠

DO NOT bottom out the regulator screw on the combination gas valve. This can result in unregulated manifold pressure, which can cause excess overfire and burner and/or tube damage.

6. Observe manometer gauge to measure outlet pressure of gas valve. If manometer reading does not indicate that valve outlet pressure is in accordance with **Table 17**, remove cap from regulator screw(s) (see **Figure 39**) and adjust pressure by turning regulator screw IN (clockwise) to increase pressure or OUT (counterclockwise) to decrease pressure.
7. When manometer reading indicates that outlet pressure is in accordance with **Table 17**, disconnect manometer and install cap(s) on regulator screw(s).
8. Re-install panel(s) removed in step 1. For models VZ and VZT, reconnect combustion air piping to blower if unit is connected to outside combustion air and plug in blower motor power cable.

Table 17. Required Manifold (Outlet) Gas Pressure

Model	Gas Type	Burner Setting	Unit Size (MBTUh)									
			40	60	80	100	115	125	140	150	175	200
			Gas Manifold Pressure (IN WC)									
VZ	Natural gas	—	3.5									
	Propane		10.5									
VZH	Natural gas	—	3.5				—	3.5	—	3.5		—
	Propane		10.5					10.5		10.5		
VZT	Natural gas	Low-fire	—		1.7	1.6	—	1.7	—	1.8		
		High-fire			3.3			3.4		3.5	3.7	3.9

MAINTENANCE

⚠ WARNING ⚠

- **Turn OFF the gas and electrical power supply and allow heater to cool before performing any service or maintenance.**
- **Edges are sharp. Wear protective gear during installation and maintenance.**
- **Eye protection is recommended when cleaning the unit.**

⚠ CAUTION ⚠

- **When any service is completed, ensure that the unit is reassembled correctly so that no unsafe conditions are created.**
- **When re-lighting, always follow the lighting instructions on the heater.**
- **If any of the original wire supplied with the appliance must be replaced, it MUST BE replaced with wiring material having a temperature rating of at least 220°F (105°C) and 600V.**
- **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:

- ❑ Check for any flammable objects, liquids, or vapors in heater's vicinity and Immediately remove them if present.
- ❑ Check to ensure that all clearances to combustibles are observed (refer to **Clearances** section).
- ❑ Inspect reflectors for sagging, damage, and incorrect installation and clean as necessary using damp cloth.
- ❑ Inspect vent pipe using flashlight to ensure that it is free from obstructions, cracks, gaps in sealed areas, and corrosion—clean as necessary and remove any carbon deposits or scale using wire brush.
- ❑ Inspect combustion air inlet using flashlight to ensure that it is free from obstructions, cracks, gaps in sealed areas, and corrosion—clean as necessary.
- ❑ Inspect tubes for cracks, sagging, bending, and incorrect installation—clean or replace as necessary.
- ❑ Leak test gas line (refer to **Supply Piping Connections** section).
- ❑ Inspect burner viewport to ensure that it is clean and free of cracks or holes—clean or replace as necessary.
- ❑ Using compressed air or vacuum cleaner, clean all dirt, lint, and grease from blower and motor assembly.
- ❑ Inspect burner assembly to ensure that it is free of scale, dust, and lint accumulation and clean as necessary—remove any obstructions from burner orifice.
- ❑ Inspect electrode for cracked or eroded ceramic and excessive carbon residue—clean or replace as necessary.
- ❑ Ensure that spark gap is 1/8 inch (3.2 mm).
- ❑ Check gas valve to ensure that gas flow is being shut off completely in accordance with **Combination Gas Valve Maintenance** section.
- ❑ Check thermostat to ensure that there is no exposed wire or damage—replace as necessary.
- ❑ Check for any damaged wiring and replace as necessary—ensure that all wiring connections are sound.
- ❑ Check for any damaged suspension hardware and replace as necessary.
- ❑ Ensure that all safety labels are readable—replace as necessary.

Maintenance Procedures

Refer to **Figure 36**, **Figure 37**, or **Figure 38** for component locations.

Maintenance Procedures—Continued

Burner Assembly Maintenance

1. Turn OFF electric and gas.
2. Remove burner cabinet panel(s) for access:
   a. For models VZ and VZT, disconnect combustion air piping from blower if unit is connected to outside combustion air, unplug blower motor power cable, and remove top blower panel with blower and motor assembly attached.
   b. For model VZH, remove side panel.
3. Inspect and clean burner—remove any carbon buildup, scale, dust, lint, and/or any foreign material using stiff bristle brush.
4. Check ignition system for deterioration. Ensure that lead connectors are secure to prevent incorrect sparking of electrode and that spark gap is 1/8 inch (3.2 mm). Check electrode for dirt or damaged—clean or replace as necessary.
5. Re-install panel(s) removed in step 2. For models VZ and VZT, reconnect combustion air piping to blower if unit is connected to outside combustion air and plug in blower motor power cable.
6. Turn ON electric and gas and check for proper operation.

Blower and Motor Assembly Maintenance

1. Turn OFF electric and gas.
2. For units connected to outside combustion air, disconnect combustion air piping from unit.
3. For models VZ and VZT, remove external blower and motor assembly:
   a. Unplug blower motor power cable.
   b. Remove and save four locknuts that secure blower and motor assembly and remove assembly.
4. For model VZH, remove integral blower and motor assembly:
   a. Remove side panel and unplug blower motor wiring harness.
   b. Remove and save four screws that secure blower and motor assembly and remove assembly.
5. Using soft brush, remove any dust from blower scroll, from around motor, and from impeller. Ensure that impeller rotates freely.
6. Re-install blower and motor assembly using existing hardware.
7. Reconnect blower motor power cable/wiring harness. For model VZH, re-install side panel.
8. For units connected to outside combustion air, reconnect combustion air piping to unit.
9. Turn ON electric and gas and check for proper operation.

Combination Gas Valve Maintenance

⚠ WARNING ⚠

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

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

1. Remove burner cabinet panel(s) for access:
   a. For models VZ and VZT, disconnect combustion air piping from blower if unit is connected to outside combustion air, unplug blower motor power cable, and remove top blower panel with blower and motor assembly attached.
   b. For model VZH, remove side panel.
2. Close manual shutoff valve to prevent flow to combination gas valve.

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

3. Connect manometer to 1/8-inch outlet pressure tap on combination gas valve.
4. Open manual shutoff and combination gas valves.
5. Use finger to fully block main burner orifice for several seconds.
6. Observe manometer with orifice blocked. If ***any*** pressure is indicated, combination gas valve is leaking and must be replaced before heater is restored to operation.
7. Re-install panel(s) removed in step 1. models VZ and VZT, reconnect combustion air piping to blower if unit is connected to outside combustion air and plug in blower motor power cable.

Ignition Control Module Replacement

1. Turn OFF electric and gas.
2. For models VZ and VZT, open hinged access door. For model VZH, remove side panel.
3. Unplug ignition control module wiring harness.
4. Remove and save screws that secure ignition control module and remove control module.
5. Install replacement ignition control module and secure using existing screws.
6. Plug in ignition control module wiring harness.
7. For models VZ and VZT, close hinged access door. For model VZH, re-install side panel.
8. Turn ON electric and gas and check for proper operation.

Pressure Switch Replacement

1. Turn OFF electric and gas.
2. For models VZ and VZT, open hinged access door. For model VZH, remove side panel.
3. Unplug pressure switch wiring harness.
4. Disconnect pressure switch tubing.
5. Remove and save screws that secure existing pressure switch and remove switch.
6. Install replacement pressure switch and secure using existing screws.
7. Reconnect pressure switch tubing and wiring harness.
8. For models VZ and VZT, close hinged access door. For model VZH, re-install side panel.
9. Turn ON electric and gas check for proper operation.

TROUBLESHOOTING

General Troubleshooting

Table 18. General Troubleshooting

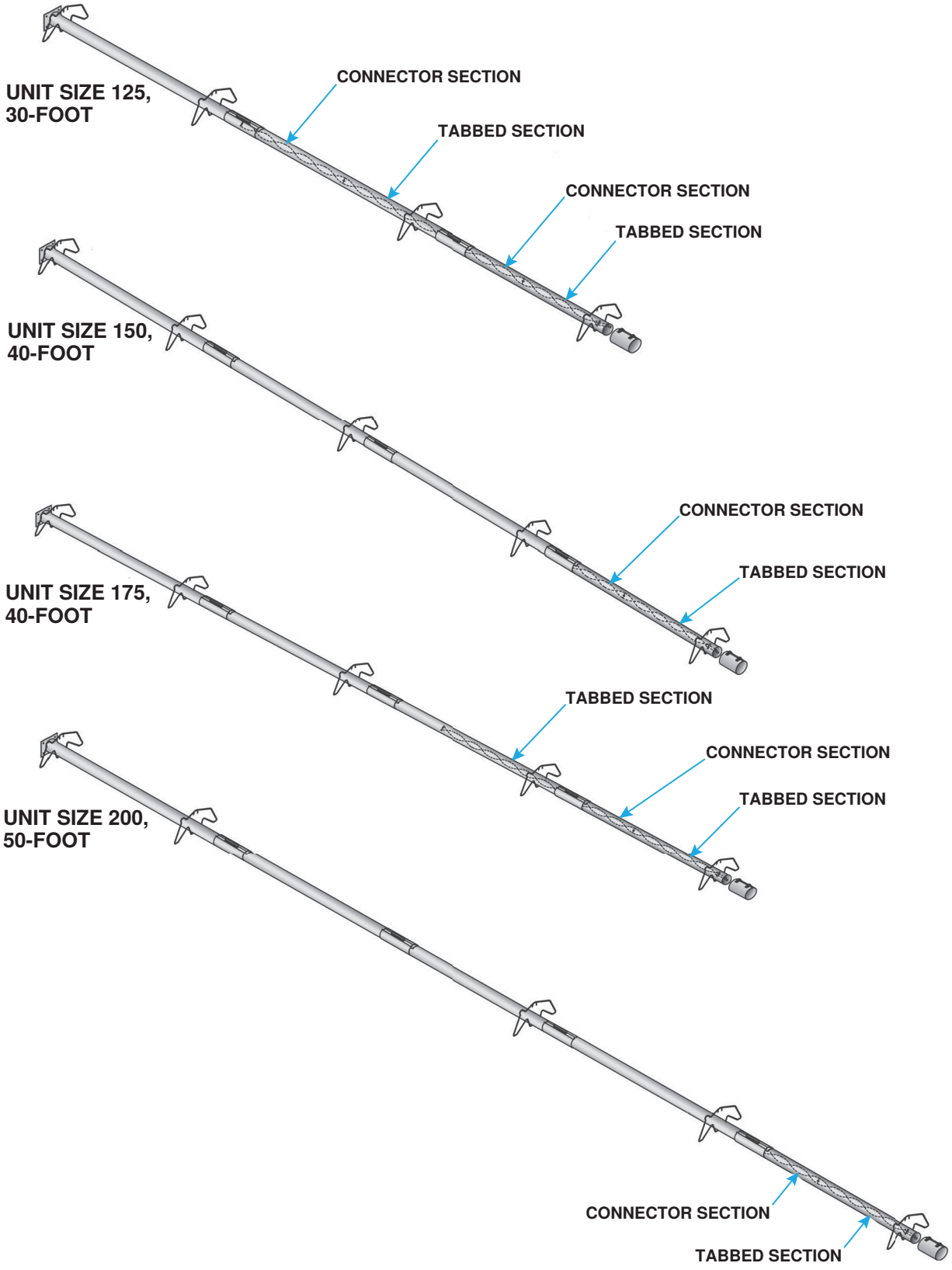
Symptom	Probable Cause	Remedy
A. With thermostat turned up, blower does not turn ON	1. Obstructed blower	Remove blower obstruction
	2. No 120V at burner	Ensure that 120V is available at burner
	3. Faulty relay wiring or wiring to burner	Ensure that relay wiring and wiring to burner are sound
	4. Faulty thermostat wiring	Ensure that thermostat wiring is sound
	5. Faulty thermostat	Replace thermostat
	6. Failed blower motor bearings or faulty motor	Replace blower motor
B. No spark at ignitor	1. Obstructed vent pipe	Remove vent pipe obstruction
	2. Obstructed combustion air inlet	Remove combustion air inlet obstruction
	3. Incorrect spark gap	Ensure that spark gap is 1/8 inch (3.2 mm)
	4. Loose or damaged pressure switch tubing	Tighten, repair, or replace pressure switch tubing
	5. Faulty ignitor wiring	Ensure that ignitor wiring is sound
	6. Faulty ignitor	Replace ignitor
	7. Faulty wiring between blower motor and transformer	Remove blue and yellow wires from transformer: • If there is no 24V at transformer secondary and no 120V at black and white transformer leads, ensure that wiring between blower motor and transformer is sound—if 120V is present at black and white transformer leads, replace transformer • If 24V is present at transformer secondary, reconnect blue and yellow transformer wires and connect jumper wire across pressure switch—if there is spark, replace pressure switch—if there is no spark replace ignition control module
	8. Faulty transformer	
	9. Faulty pressure switch	
	10. Faulty ignition control module	
C. Burner does not light	1. Air in gas line	Purge air from gas line
	2. Combination gas valve set to OFF	Ensure that combination gas valve is set to ON
	3. Incorrect gas supply pressure	Ensure that supply pressure is in accordance with **Gas Supply Pressure** section
	4. Incorrect manifold gas (outlet) pressure	Ensure that pressure is in accordance with **Measure and Adjust Manifold Gas (Outlet) Pressure** section
	5. Loose wiring connection	Ensure that all wiring connections are sound
	6. No spark	Ensure that spark gap is 1/8 inch (3.2 mm)
		Check transformer—replace as necessary
		Check ignition control module—replace as necessary
D. Burner lights but does not remain ON	1. Dirty or damaged electrode	Clean or replace electrode as necessary
	2. Loose wiring connection or incorrect polarity	Ensure that all wiring connections are sound
	3. Faulty ignition control module	Check ignition control module—replace as necessary
E. Burner does not turn OFF when call for heat ends	1. Faulty ground wire	Ensure continuity of ground wire
	2. Faulty thermostat	Replace thermostat
F. Model VZT burner status indicator light(s) not functioning properly	1. Faulty bulb	Replace bulb
	2. Faulty thermostat wiring	Ensure that thermostat wiring is sound
	3. Faulty thermostat	Replace thermostat
	4. Faulty combination gas valve	Check combination gas valve—replace as necessary
	5. Faulty ignition control module	Check ignition control module—replace as necessary

Troubleshooting Using Ignition Control Module

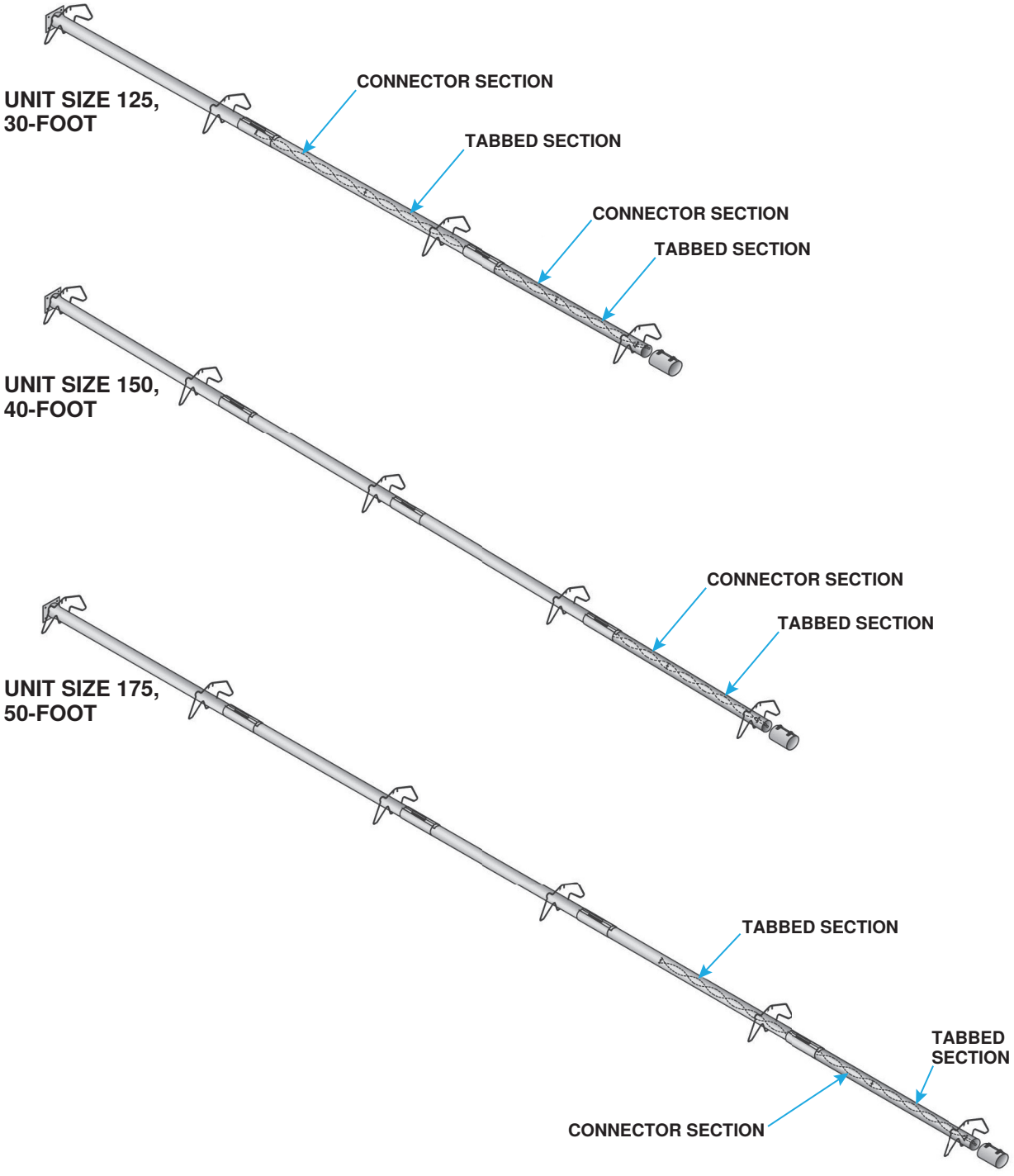
Table 19. Troubleshooting Using Ignition Control Module

LED Status	Indication
Steady ON	Internal control failure—replace module
Two flashes	Flame without call for heat
Three flashes	Lockout from three ignition trials

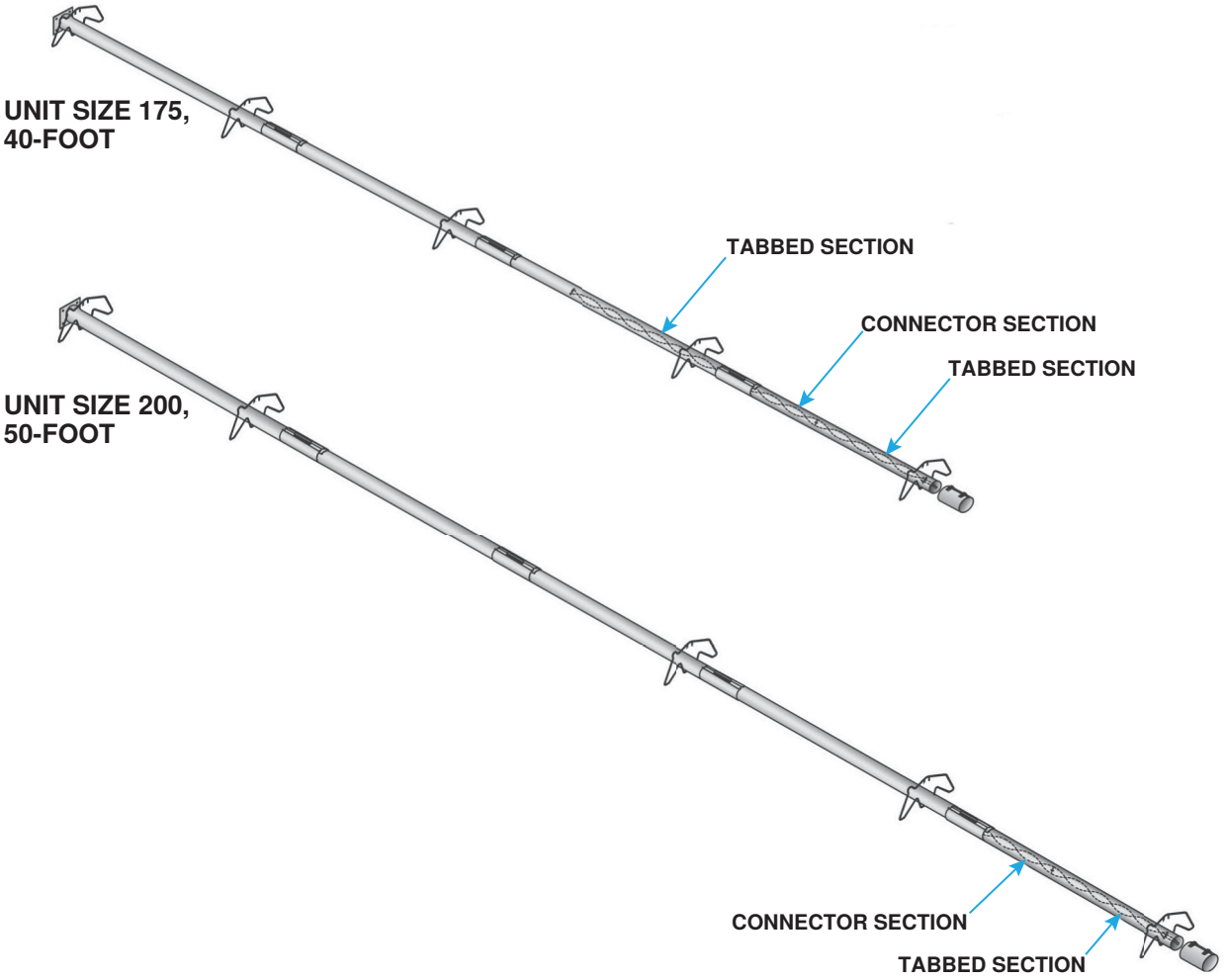
APPENDIX: SWIRLER CONFIGURATIONS



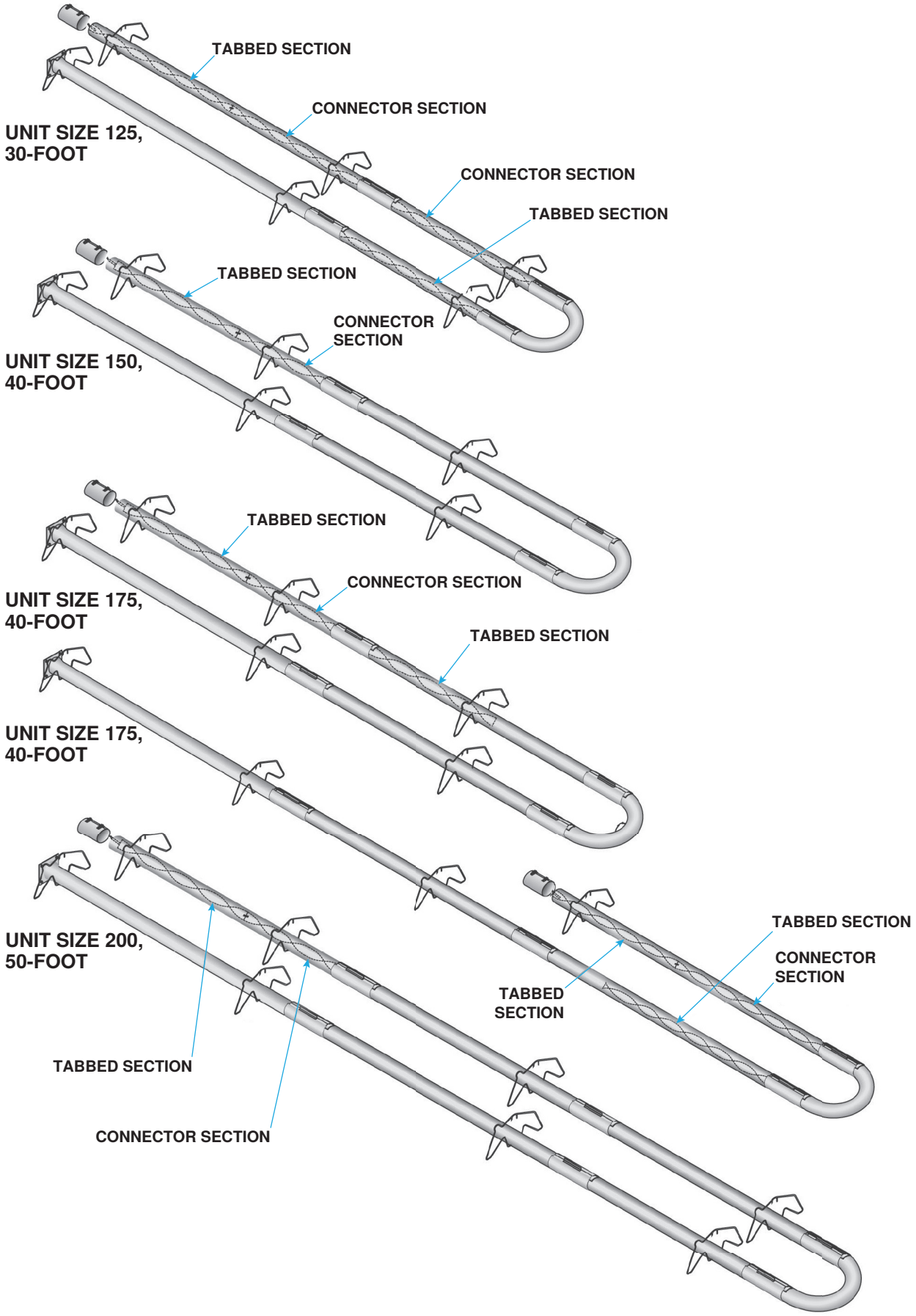
Model VZ Straight Tube Swirlers



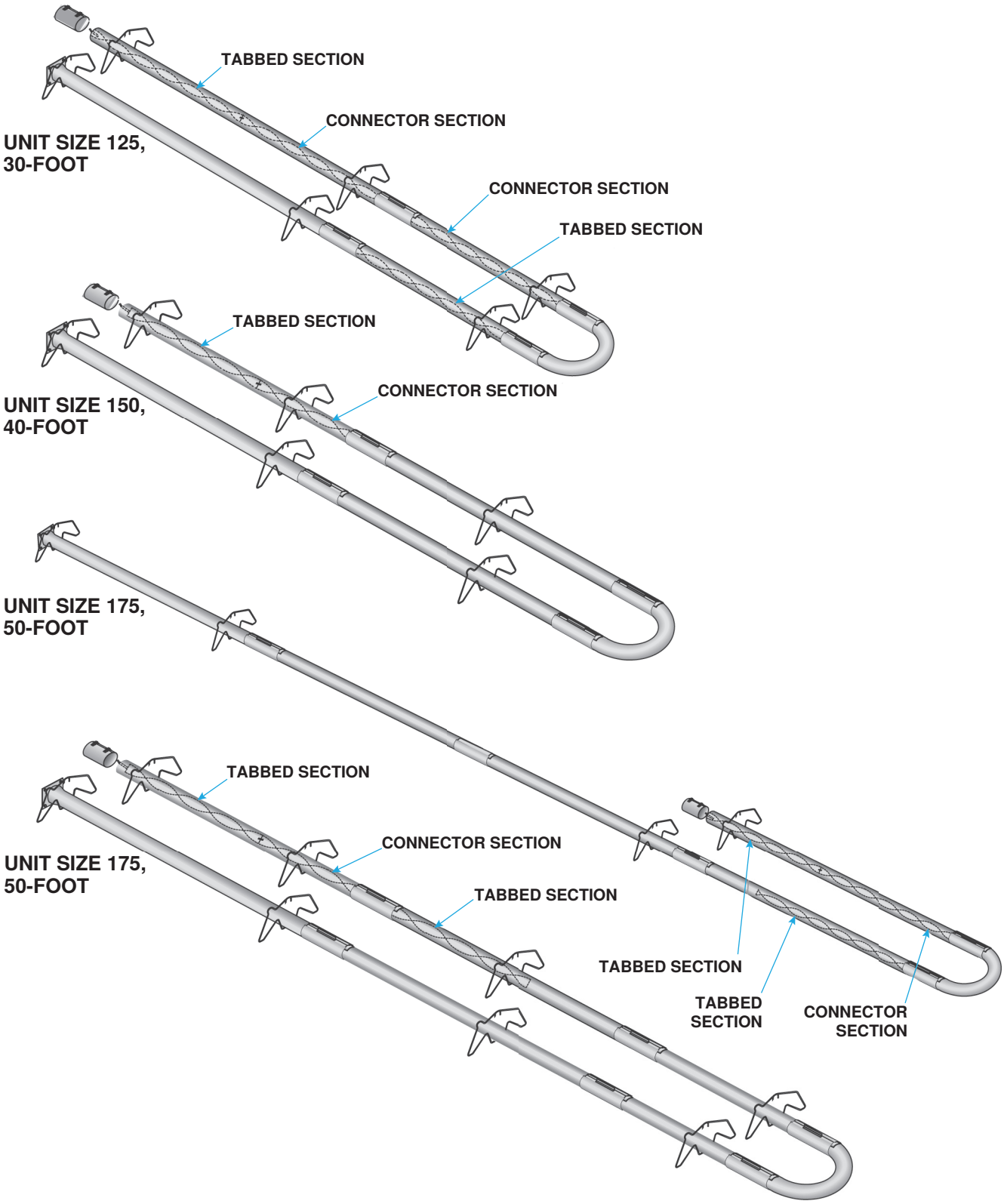
Model VZH Straight Tube Swirlers



Model VZT Straight Tube Swirlers

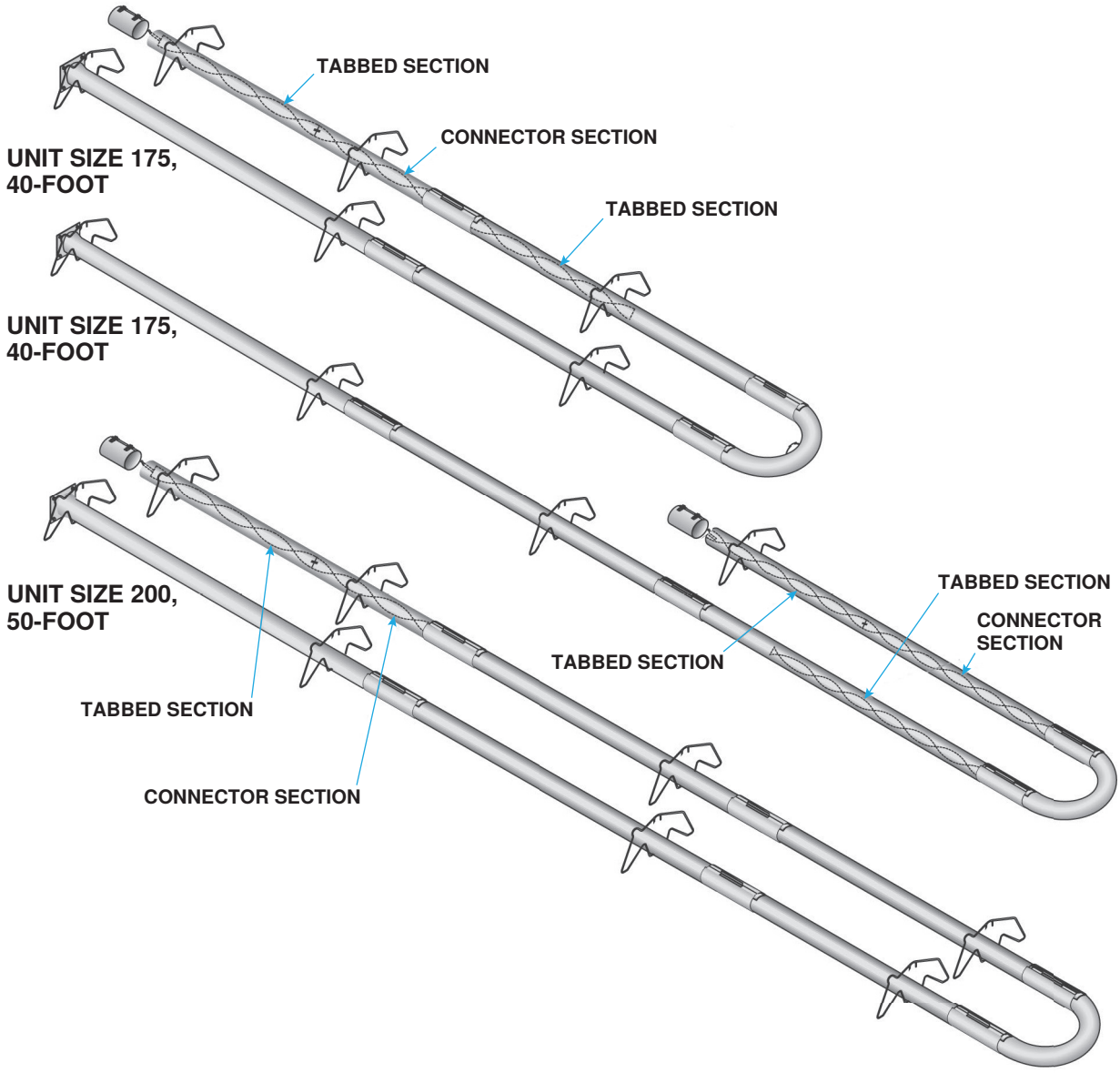


Model VZ U-Tube Swirlers



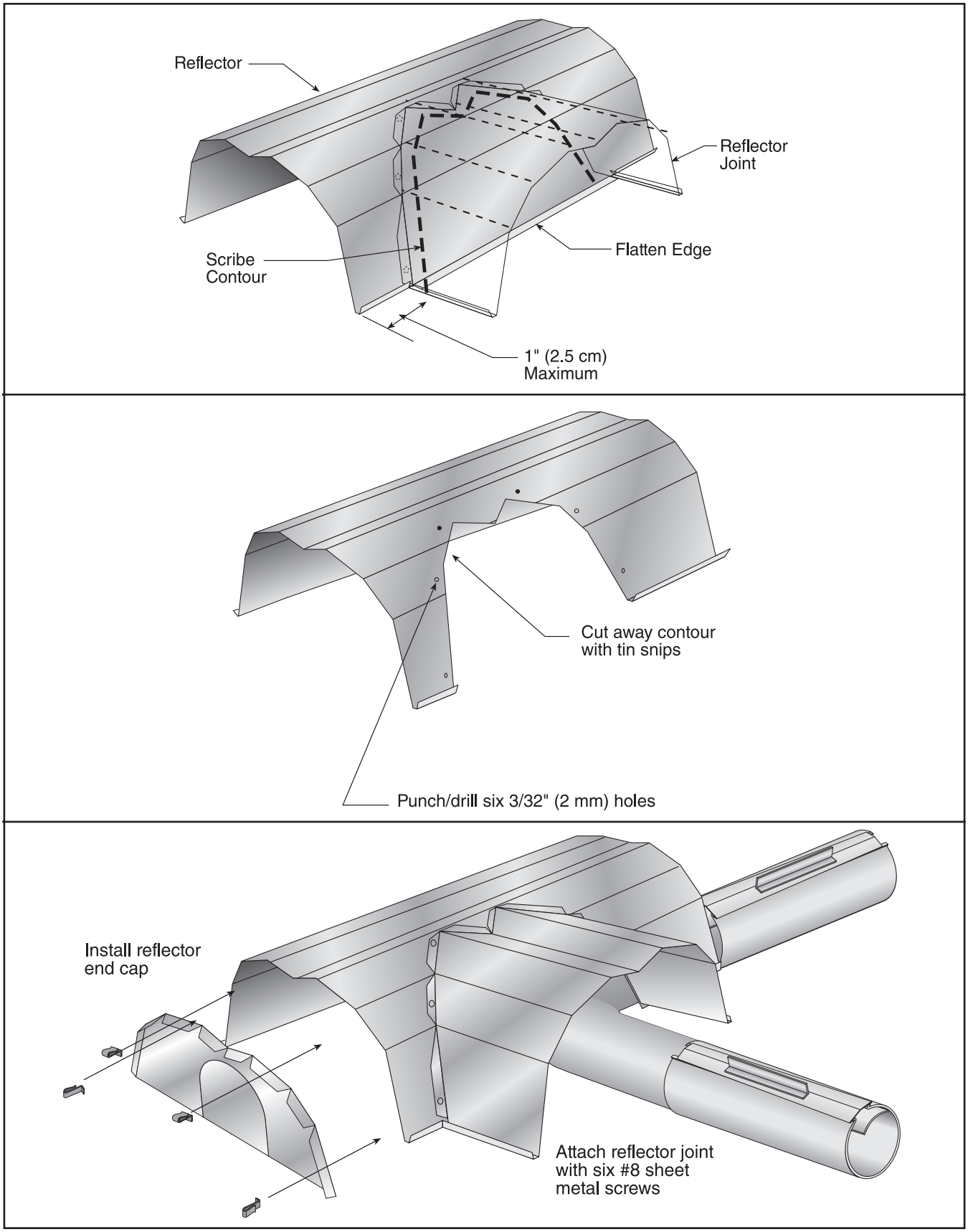
Model VZH U-Tube Swirlers

APPENDIX: SWIRLER CONFIGURATIONS—CONTINUED



Model VZT U-Tube Swirlers

APPENDIX: L-TUBE REFLECTORS



INSTALLATION RECORD (TO BE COMPLETED BY INSTALLER)

For service or repair, contact the Installer. For additional assistance, contact the Distributor. For more information, contact your Factory Representative.

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

For more information on Reznor HVAC products:

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

Specifications and illustrations subject to change without notice or incurring obligations.
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