

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

DISCONTINUED MODELS VCS, VCT, VPS, AND VPT



⚠ 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.

Important Safety Information

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

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

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

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

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

WARNING

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

CAUTION

- **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!**
-

GENERAL INFORMATION—CONTINUED

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.
- Correct turbulator or burner insert is missing or incorrectly installed.

Model Application

Table 1. Model Application			
Model	Burner	Tube Length (Feet)	Application
VCS	Single-stage	20–80	Harsh environment, indoor non-residential or outdoor
VCT	Low- and high-fire	20–70	
VPS	Single-stage	20–80	Indoor commercial/industrial
VPT	Low- and high-fire	20–70	

Certification

- These heaters are approved for use in the United States and Canada by the Canadian Standards Association (CSA). Models VCS and VCT are designed for outdoor or non-residential indoor spaces. Models VPS and VPT are designed for non-residential indoor spaces. Standard heaters are approved for installation elevations of 0–2,000 feet (0–610 meters) for the US and 0–4,500 feet (0–1,370 meters) for Canada. Conversion kits are available for installations above these elevations in the US.
- All models and unit sizes are available for use with natural gas. Unit sizes 60–170 are available for use with propane gas. Gas conversion kits are available for converting natural gas units to propane.
- The type of gas, the gas input rate, and the electrical supply requirements are shown on the heater rating plate. Check the rating plate to verify that the heater is appropriate for the installation site.

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/NFPA 54). A Canadian installation must be in accordance with the *Natural Gas and Propane Installation Code* (CSA B149). 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 No. 409, latest edition). Installations in public garages should be in accordance with the *Standard for Parking Structures* (ANSI/NFPA No. 88A, latest edition). Installations in repair garages should be in accordance with the *Standard for Repair Garages* (ANSI/NFPA No. 88B, latest edition). In Canada, installations in aircraft hangars should be in accordance with the requirements of the enforcing authorities, and in public garages, in accordance with the CSA B149 code.
- If the heater is being installed in the Commonwealth of Massachusetts, installation must be performed by a licensed plumber or licensed gas fitter.

Heater Location

NOTE: Models VCS and VCT, which have an IPx5 rating, are waterproof 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 heavily chemical-laden environments or areas where halogenated hydrocarbons are present. For mildly-corrosive environments, ducted clean fresh air is required for the warranty to remain valid. A wind/rain hood is required for outdoor installations.

⚠ CAUTION ⚠

- Model VPS and VPT 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 VPS or VPT heater where it may be exposed to water spray, rain, or dripping water.

Hazards of Chlorine

NOTE: Remember, chlorine is heavier than air. This fact should be kept in mind when determining the installation location of heaters and building exhaust systems.

The presence of chlorine vapors in the combustion air of heating equipment presents a potential corrosion hazard. Chlorine, found usually in the form of Freon or degreaser vapors, when exposed to flame will precipitate from the compound and form a solution with any condensation 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 with regard to exhausters or prevailing wind directions.

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 12 feet (3.7 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 2. Minimum and Recommended Mounting Heights

Suspension Bracket Configuration	Height	Unit Size (MBTUh)			
		60, 80	100, 125	150, 170	200
		Feet (Meters)			
Standard	Minimum	12 (3.7)	14 (4.3)	16 (4.9)	18 (5.5)
	Recommended	14 (4.3)	16 (4.9)	18 (5.5)	20 (6.1)
Angled	Minimum	10 (3.0)	12 (3.7)	14 (4.3)	16 (4.9)
	Recommended	11 (3.4)	13 (4.0)	15 (4.6)	17 (5.2)

Weights

To determine the actual weight of the system, add the collective weight of each component (refer to [Table 3](#)).

Table 3. Weights

Component	Description	Model			
		VCT	VCS	VPT	VPS
		Pounds (kg)			
Burner cabinet		38 (17.2)	34 (15.3)	29 (13.3)	25 (11.5)
Emitter tube with reflector	5-foot	7 (3.2)			
	10-foot	13 (5.9)			
Tube section	L-tube	10 (4.5)			
	U-tube	13 (5.9)			
Brackets and couplers		@3-10 (@2-5)			

GENERAL INFORMATION—CONTINUED

Dimensions

Refer to the **SYSTEM CONFIGURATIONS** section for tube assembly dimensions of specific systems. Burner cabinet dimensions are shown in **Figure 1**.

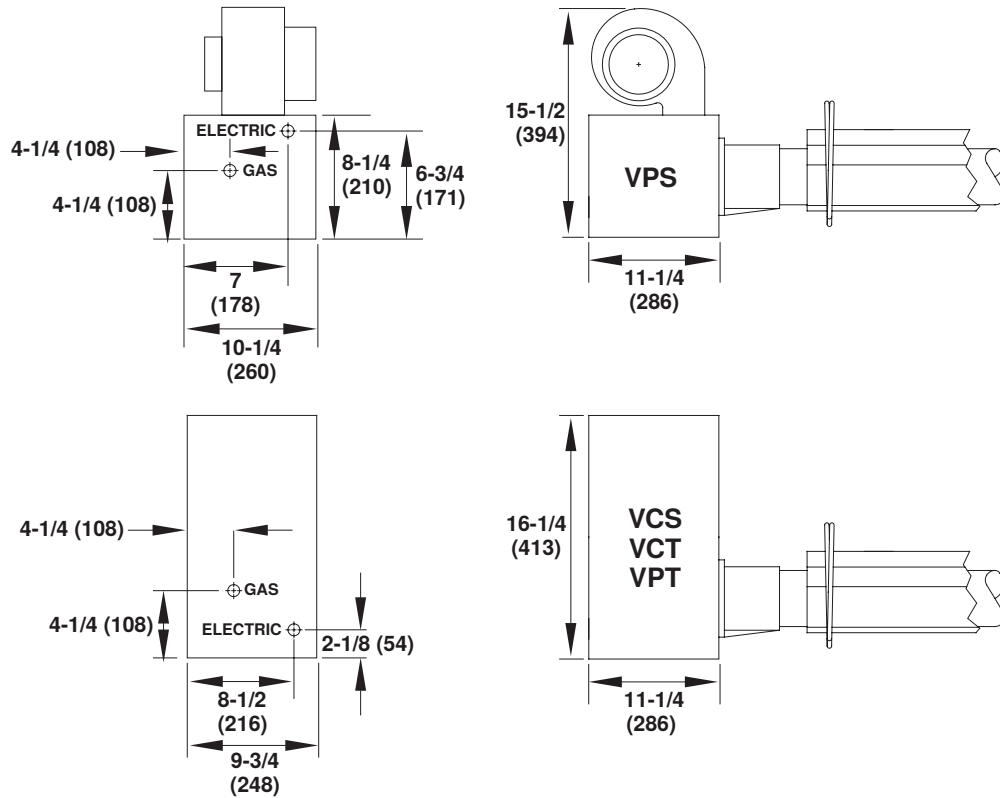


Figure 1. Dimensions

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 accessibility and for combustion/ventilation air.
- Minimum clearance from the heater must be maintained from vehicles parked below heater. 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 with 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 **Figure 2** and **Table 4**.

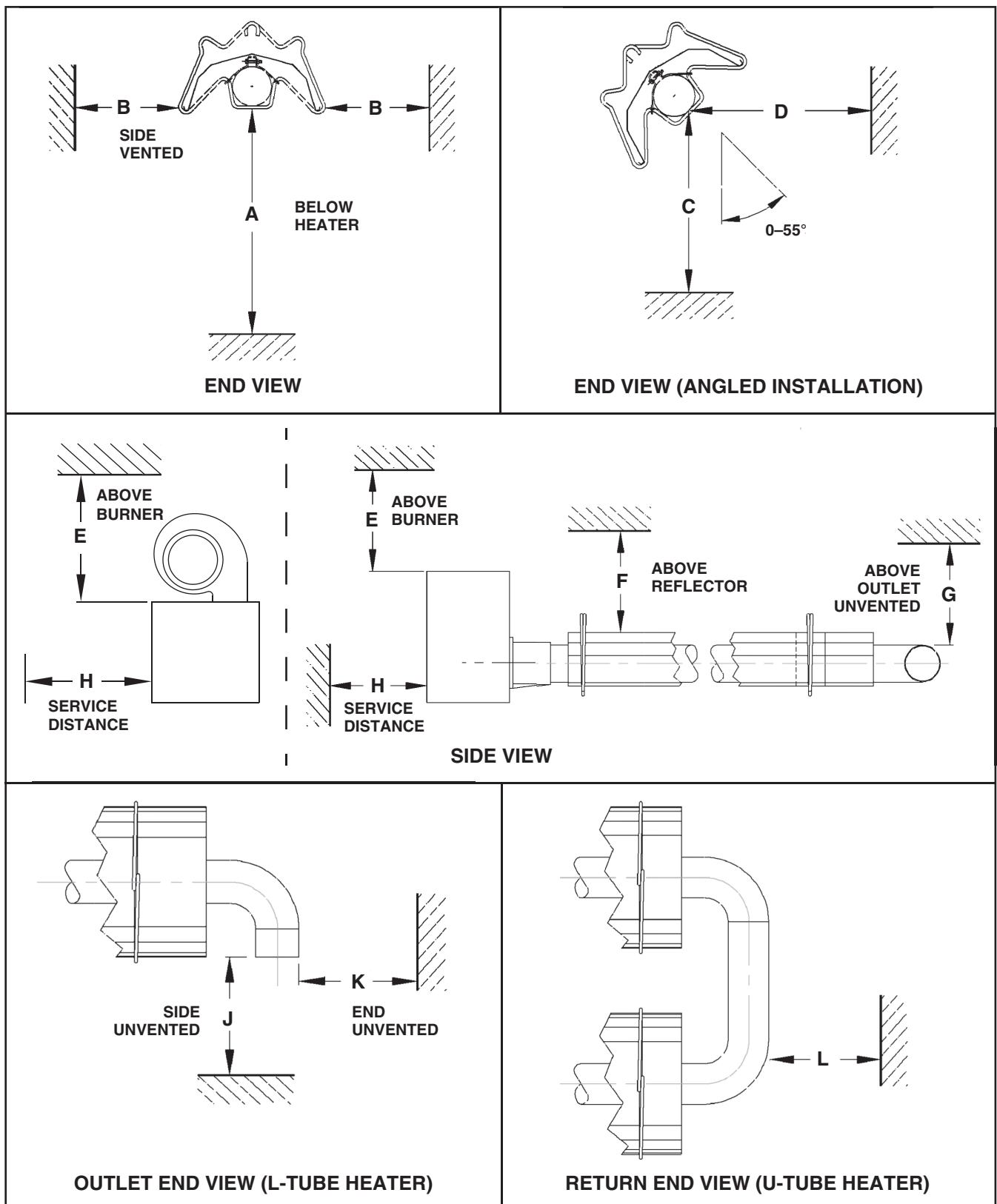


Figure 2. Clearances (Refer to [Table 4](#))

GENERAL INFORMATION—CONTINUED

Clearances—Continued

Table 4. Clearances												
Unit Size	Dimension (See Figure 2)											
	A	B	C	D	E	F	G	H	J	K	L	
	Inches (cm)											
60, 80	74 (188)	29 (74)	72 (183) @ 15° 68 (173) @ 25° 61 (155) @ 35° 53 (135) @ 45° 43 (110) @ 55°	20 (51)	8 (21)	22 (56)	12 (31)	41 (105)	8 (21)	12 (31)		
100		32 (82)									16 (41)	
125		39 (99)								47 (120)	20 (51)	18 (46)
150												
170, 200	86 (219)	48 (122)	82 (209) @ 15° 78 (199) @ 25° 71 (181) @ 35° 61 (155) @ 45° 50 (127) @ 55°	10 (26)*	11 (28)			48 (122)	20 (51)			
*With end caps installed.												

*With end caps installed.

SYSTEM CONFIGURATIONS

Refer to the following tables and figures for system configuration and assembly details.

NOTE: Bends must be fitted at a distance of at least 50% of the total heat exchanger length—e.g., for a 60-foot long heater, 30 feet is the closest to the burner a bend can be.

Table 5. Tube Arrangements						
Model	Unit Size (MBTUh)					
	60	80	100	125	150	170, 200
	See Figure 3					
VCS, VPS	S20, S30, S40, U20, U40	S30, S40, U40	S30, S40, S50, U40	S30, S40, S50, S60, U40, U60	S40, S50, S60, S70, U40, U60	S50, S60, S70, S80, U60, U80
VCT, VPT			S30, S40, U40	S30, S40, S50, U40	S40, S50, S60, U40, U60	S50, S60, S70, U60

NOTE: All models and unit sizes may be configured with one or two L-tubes or with a 5-foot tube section.

Table 6. Turbulator Applicability				
Tube Arrangement	Gas Type	Model	Unit Size (MBTUh)	Quantity
S20	NG or LP	All	60	3
S30	NG or LP	All	80, 100	3
			125	5
	LP		100	4
S40	NG or LP	All	125, 150	4
S50	NG	All	200	4
	LP	VCS, VCT, VPS	170	2
		VPT	200	2
U20	NG or LP	All	60	1
		VCS, VPS	80	3
U40	NG or LP	All	150	4

Table 7. Burner Insert Applicability (Natural Gas Units)				
Size	Tube Arrangement	Model	Unit Size (MBTUh)	Quantity
3-foot	S30, S40, S50, S60, U40, U60	VCS, VCT, VPS	125	1
	S30, S40, S50, U40, U60	VPT	125	
5-foot	S20	All	60	
	S30, S40, U40	All	60, 80, 100	
	S50	All	100	
	U20	VCT, VPT	60	
	U20	VCS, VPS	60, 80	

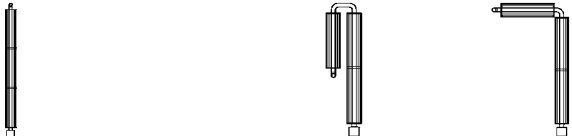
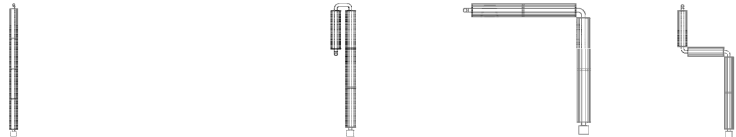
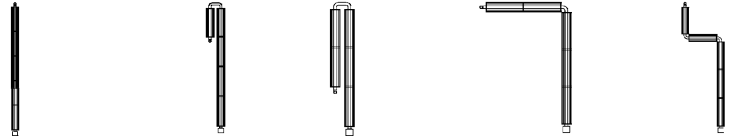
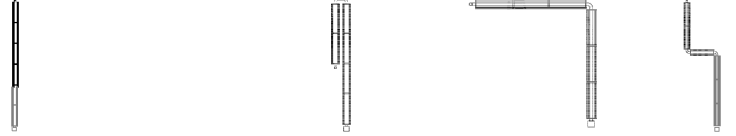
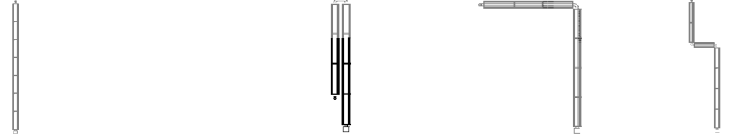
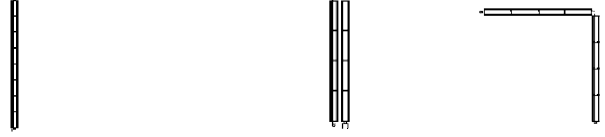
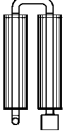
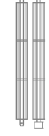
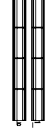
S20	
S30	
S40	
S50	
S60	
S70	
S80	
U20	
U40	
U60	
U80	

Figure 3. Tube Arrangements

SYSTEM CONFIGURATIONS—CONTINUED

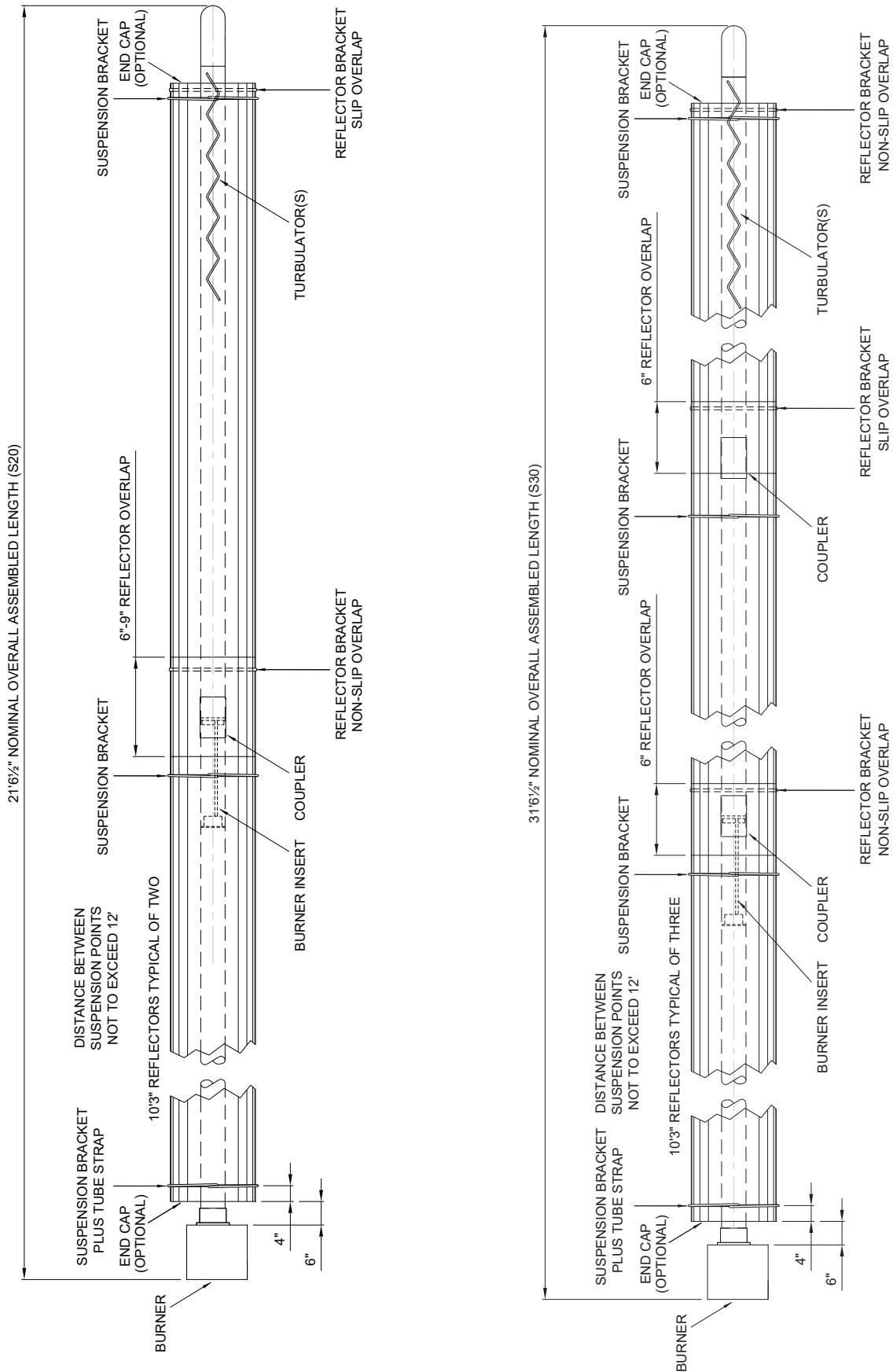


Figure 4. Assembly Overview—S20 and S30

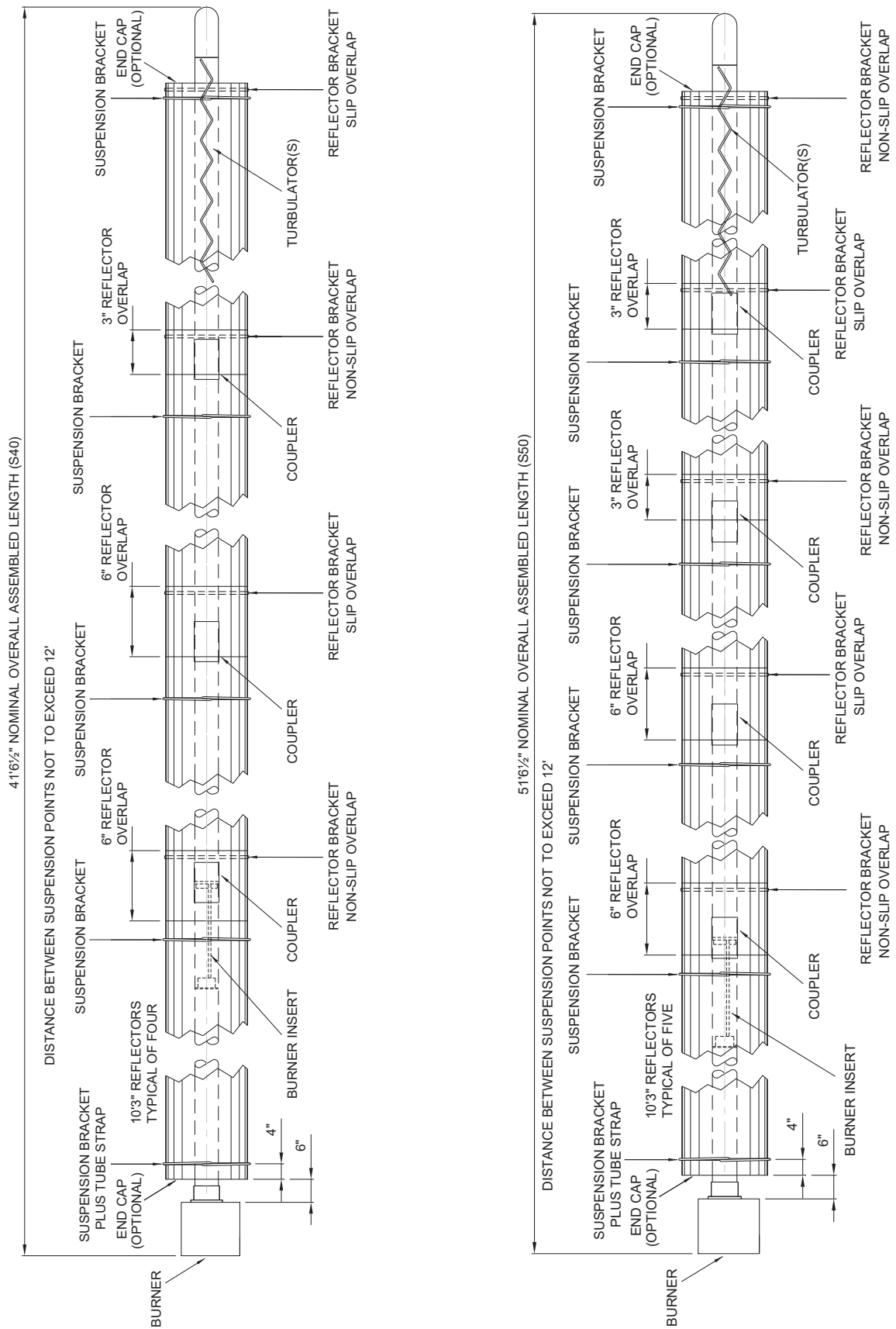


Figure 5. Assembly Overview—S40 and S50

SYSTEM CONFIGURATIONS—CONTINUED

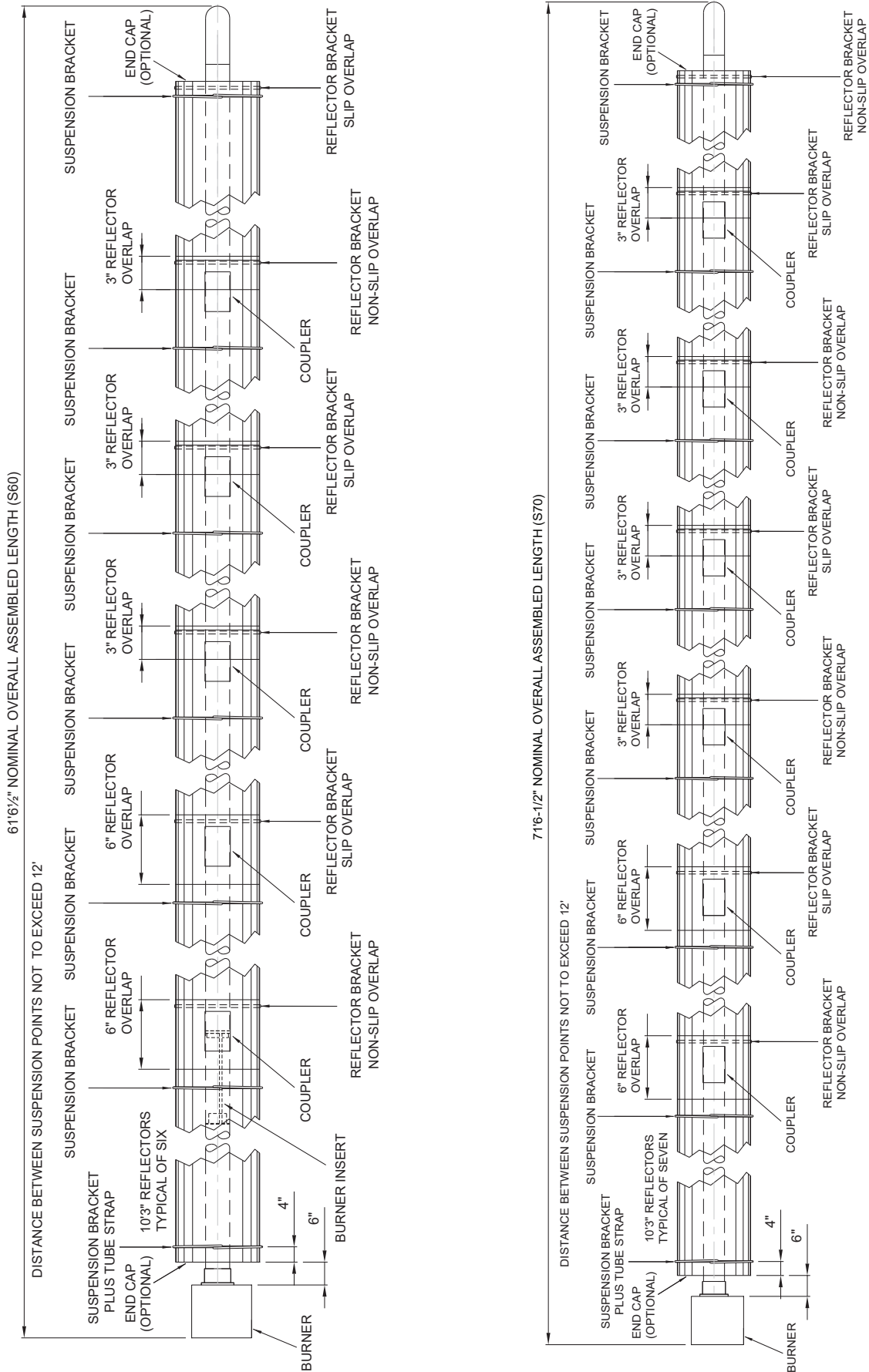


Figure 6. Assembly Overview—S60 and S70

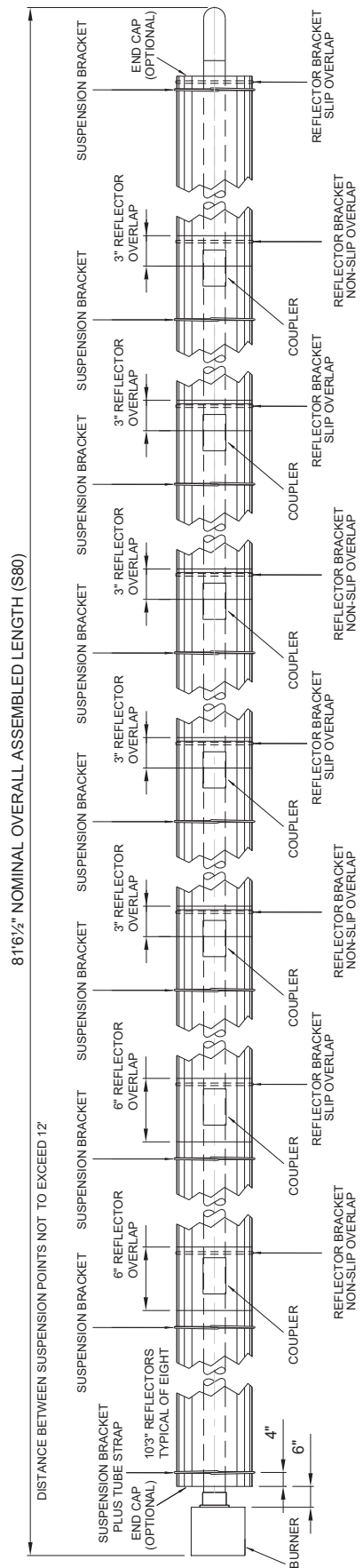


Figure 7. Assembly Overview—S80

SYSTEM CONFIGURATIONS—CONTINUED

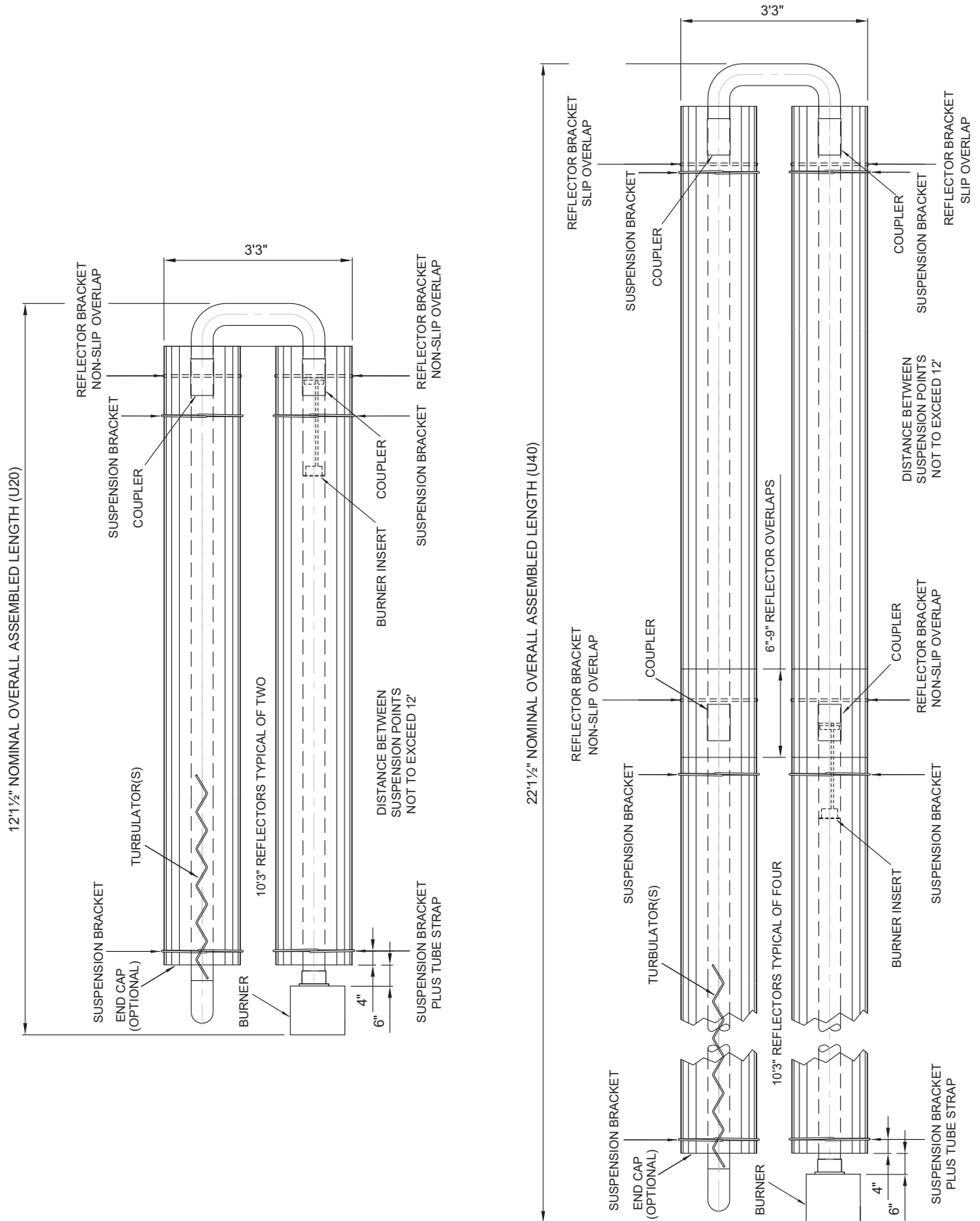


Figure 8. Assembly Overview—U20 and U40

INSTALLATION

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 8](#)) that need to be assembled/installed prior to unit installation. Ensure that all options ordered are at the installation site.

Table 8. Field-Installed Options

Option	Description
CC1	Vent cap
CC21	SST vent cap
CD27	Reflector end caps, quantity two (2)
CD37	SST reflector end caps, quantity two (2)
CE1	1/2-inch manual shutoff valve
CE2	3/4-inch manual shutoff valve
CE4	36-inch stainless steel flexible gas connector
CK11	Hanger kit, includes chain and S-hooks
CK31	SST hanger kit, includes chain and S-hooks
CK12–CK18, CK28	Turnbuckle kit to facilitate leveling system
CK32–CK37, CK39, CK40	SST turnbuckle kit to facilitate leveling system
CL1	Single-stage thermostat
CL22	Two-stage thermostat
CL5C	Single-stage line voltage thermostat
CM1	Locking cover for CL1 thermostat
CM1B	Locking cover for CL22 thermostat
DE1	Combustion air inlet adapter kit for model VPS unit size 200
DE2	Combustion air inlet adapter kit for models VCS, VCT, and VPT
DE5	Wind and rain hood kit for models VCS and VCT
DJ20	High-elevation conversion kit for installations at elevations >2000 feet
DL2	Propane conversion
NB00*	Straight tube assembly
NB1U*	Tube assembly with one (1) U-tube
NB1L*	Tube assembly with one (1) L-tube
NB2L*	Tube assembly with two (2) L-tubes
NBUL*	Tube assembly with one (1) U-tube and one (1) L-tube
RL20–RL80*	20- to 80-foot tube assemblies
TB1	Burner insert, 5-foot
TB2	Burner insert, 3-foot

*The tube assembly options contain tube kits that accommodate the selected length and configuration of the system. Tube kits consist of reflectors and bracket assemblies, tube assemblies (5- and 10-foot straight tubes, L-tubes, and U-tubes as required), and all necessary couplers, turbulators, and suspension brackets.

Heater Assembly

⚠ WARNING ⚠

Safety boots and protective gloves and eyewear are recommended.

Systems are shipped disassembled and are comprised of a burner cabinet and tube assemblies. Refer to the **SYSTEM CONFIGURATIONS** section for assembly details of specific systems.

⚠ CAUTION ⚠

Tube assemblies have one or two Calcoat tubes. The remaining tube(s) are of mild steel composition. To prevent tube damage, ensure that Calcoat tube(s) are arranged in accordance with **Table 9**.

Table 9. Tube Assembly Requirements

Model	Minimum Distance to Bend (Feet (Meters))	Calcoat Tube Configuration*
60, 80	10 (3.0)	First tube
100, 125	15 (4.6)	
150	20 (6.1)	
170, 200	25 (7.6)	First and second tubes

*The first tube is the one connected to the burner cabinet.

NOTE: For aesthetic reasons, it is advisable to position all emitter tube seams facing down and to install coupling fasteners so that they cannot be seen from beneath the heater.

- Position emitter tubes on saw horses and mark position of bracket centers. Ensure that distance to tube bend(s) is in accordance with **Table 9**. Calcoat and steel tubes **MUST BE** arranged in accordance with **Table 9**.
- Install turbulator strip(s) as required (refer to **Table 6** for applicability and quantity):
 - Interlock turbulator strip sections as shown in **Figure 10**, DETAIL A and slide connected sections into emitter tube(s). Add further strips to form required length.
 - Where heater configuration requires more than three turbulator strips and exhaust heat exchanger tube is adjacent to L- or U-tube, install turbulator strips as shown in **Figure 10**, DETAIL B.
 - Install turbulator strip into open end of last emitter tube only after it has been suspended and connected to previous emitter tube.

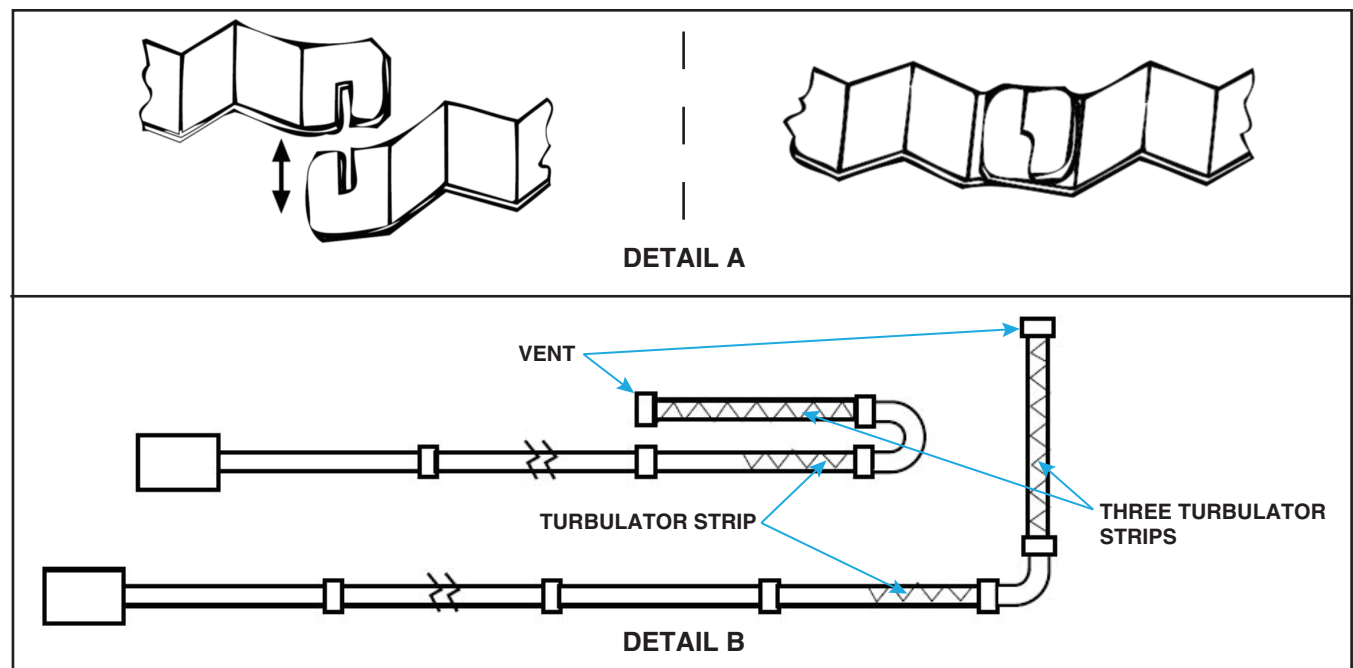


Figure 10. Turbulator Strip Installation

INSTALLATION—CONTINUED

Heater Assembly—Continued

3. Install burner insert(s) as required (refer to [Table 7](#) for applicability and quantity) into first emitter tube from where it is joined to second emitter tube as shown in [Figure 11](#).

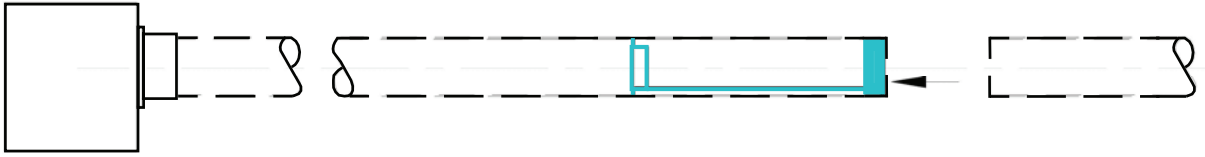


Figure 11. Burner Insert Installation

4. Install couplers to join emitter tubes and L- or U-tubes (see [Figure 12](#)):
 - a. Slide coupler over tube joint.
 - b. Moving between coupler pins or bolts, apply equal pressure to tighten each in turn. **DO NOT OVERTIGHTEN.**
 - c. Complete assembly by installing self-tapping retention zip screws.

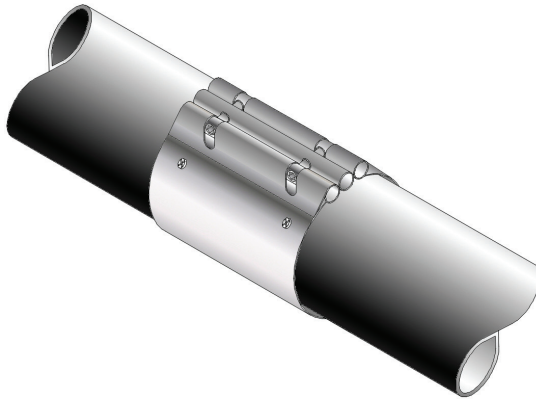


Figure 12. Typical Coupler

5. Install brackets:
 - a. Slide suspension brackets (see [Figure 13](#), DETAIL A) onto emitter tube assembly and position them in accordance with [SYSTEM CONFIGURATIONS](#) section.
 - b. Install tube strap (see [Figure 13](#), DETAIL B) on suspension bracket that will be closest to burner cabinet:
 - (1) Loosen tube strap nut and bolt.
 - (2) Position strap over emitter tube and hook both strap ends onto suspension bracket.
 - (3) Tighten nut and bolt.
 - c. Install reflector brackets (see [Figure 13](#), DETAIL C):
 - (1) Remove bracket nut and bolt.
 - (2) Position bracket over emitter tube and re-install nut and bolt hand-tightened—nut and bolt will be tightened after reflectors are installed as bracket positioning may need to be adjusted.

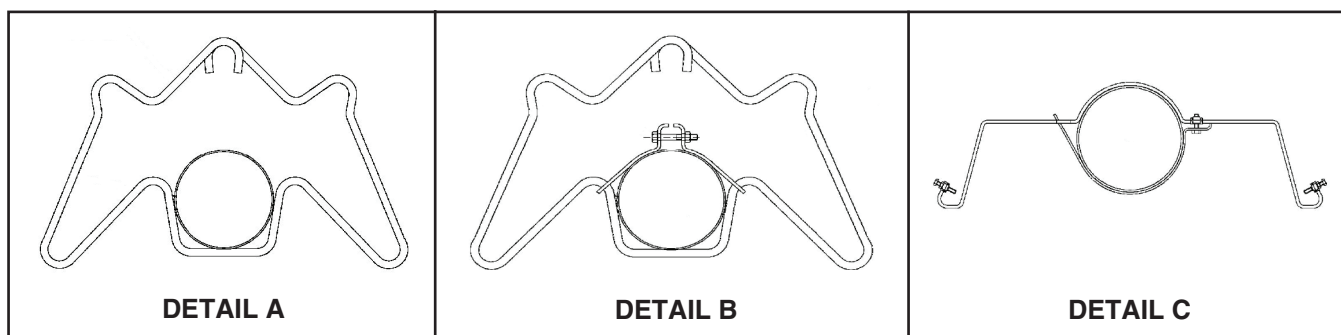


Figure 13. Bracket Installation

6. Install reflectors in accordance with SYSTEM CONFIGURATIONS section:
 - a. Remove protective plastic from reflector(s) and slide reflectors through suspension brackets until they overlap each other.
 - b. Secure reflectors by tightening screws (non-slip overlap) on reflector brackets installed in step 5c as shown in [Figure 14](#), DETAIL A.

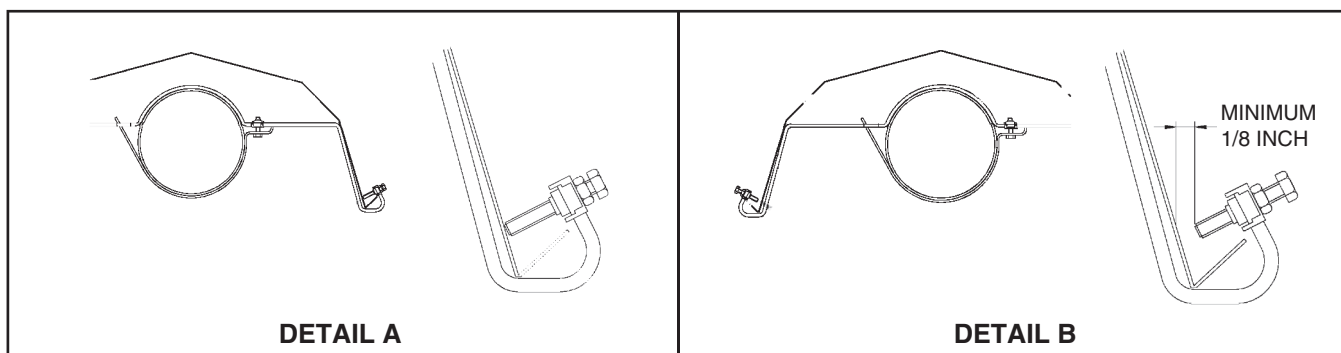


Figure 14. Non-Slip and Slip Reflector Bracket Overlaps

- c. For every other reflector bracket, create slip overlap by not tightening reflector bracket screws (see [Figure 14](#), DETAIL B) to allow reflector to float for adjustment.
- d. Alternate slip with non-slip overlaps over entire length of tube assembly as shown in [Figure 15](#).
- e. Install corner reflectors over L- and U-tube sections.

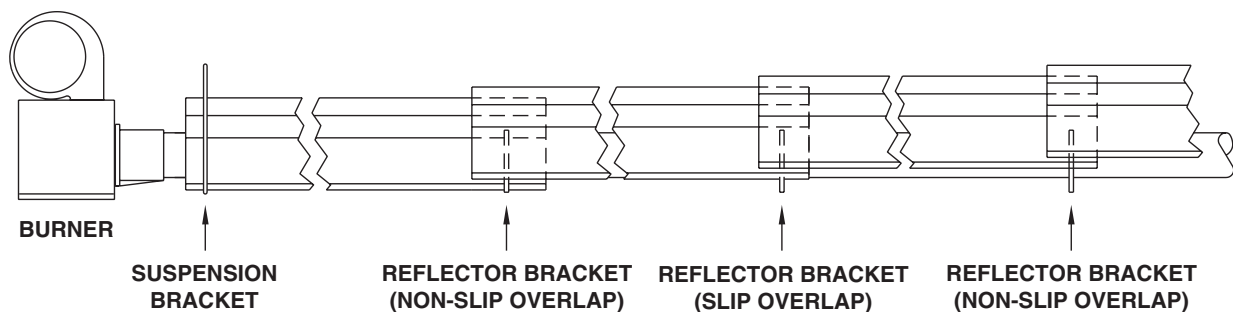


Figure 15. Typical Bracket Configuration

INSTALLATION—CONTINUED

Heater Assembly—Continued

7. Raise tube assembly into position and suspend from previously fixed chains in accordance with Heater Suspension section. Longer tube assemblies may be raised in more than one subassembly—final emitter tube connection may be made while tube assembly is suspended.
8. For unit size 200 units with S50 tube configuration, replace fan orifice plate with plate provided with each unit. Access fan as necessary in accordance with Fan and Motor Assembly Maintenance section.
9. Raise burner cabinet into position, suspend in accordance with Heater Suspension section, and connect to tube assembly.
10. For system configurations that require them, install end caps:
 - a. Position end cap beneath reflector with end cap flanges facing inward and secure using four Z-clips (see [Figure 16](#)).

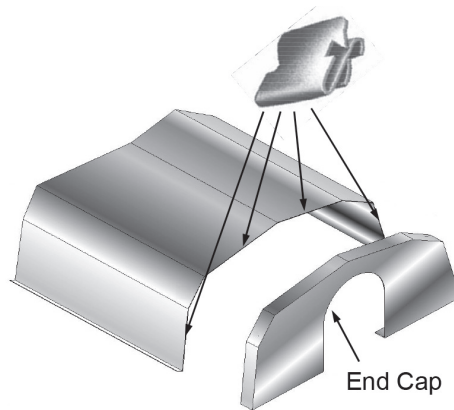


Figure 16. End Cap and Z-Clip

- b. For high wind/outdoor applications, use additional drill screws to secure end cap to reflector.

NOTE: Install end caps on either side of each L- and U-tube.

11. For unvented heaters, install 4-inch 90-degree elbow on end of tube assembly terminated with vent cap as shown in [Figure 17](#). Note that the vent cap may extend below the minimum heater mounting requirement of 8 feet (2.4 meters) above the floor.

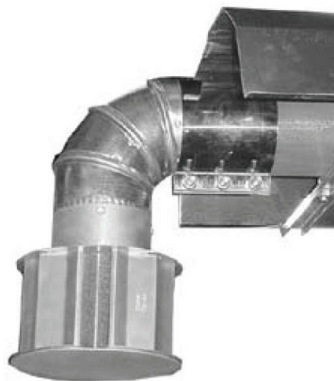


Figure 17. Vent Cap on Unvented Heater

Heater Suspension

⚠ DANGER ⚠

- When installed, tubular radiant heaters must be able to expand, must be level, and must be restricted from too much lateral sway.
- The heater must be level for proper operation. DO NOT place or add additional weight to a suspended heater.
- 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.
- Heaters should be suspended at a height that has been determined to be most efficient for the application (refer to [Hazards of Chlorine](#) 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.

NOTES:

- In the event that suitable roof steelwork is unavailable, install additional steelwork to enable vertical hangers to be installed for suspending the heater.
- The use of turnbuckles for heater suspension is recommended for convenience in leveling the system. Use either a Reznor turnbuckle kit or field-supplied steel, stainless steel, or malleable iron turnbuckles.
- Each straight tube must have at least one suspension point. The heaters are designed so that the tube suspension points can be adjusted slightly to adapt to the structure. Straight tubes downstream and adjacent to an L-tube or U-tube require two suspension points. The installer is responsible for installing the structure suspension points and for adequately supporting the weight of the heater. Suspension point hardware is field-supplied.

1. Cut chain (100 pounds (46 kg) working load) to determined lengths.
2. At each building suspension point, connect S-hook and chain length. If turnbuckles are used, connect turnbuckle to S-hook at suspension point or at heater.

⚠ CAUTION ⚠

Ensure that the burner cabinet mounting bracket has been installed properly—when packed, the bracket is reversed and must be turned to its correct position.

3. Connect S-hook to burner cabinet mounting bracket and suspend burner cabinet using turnbuckle and/or chain and S-hook, ensuring that turnbuckle and/or chain is plumb.
4. Connect S-hook to each suspension bracket on reflector/emitter tube assembly and suspend using turnbuckle and/or chain and S-hook, ensuring that turnbuckle and/or chain is plumb. Suspension bracket configurations are shown in [Figure 18](#).

INSTALLATION—CONTINUED

Heater Suspension—Continued

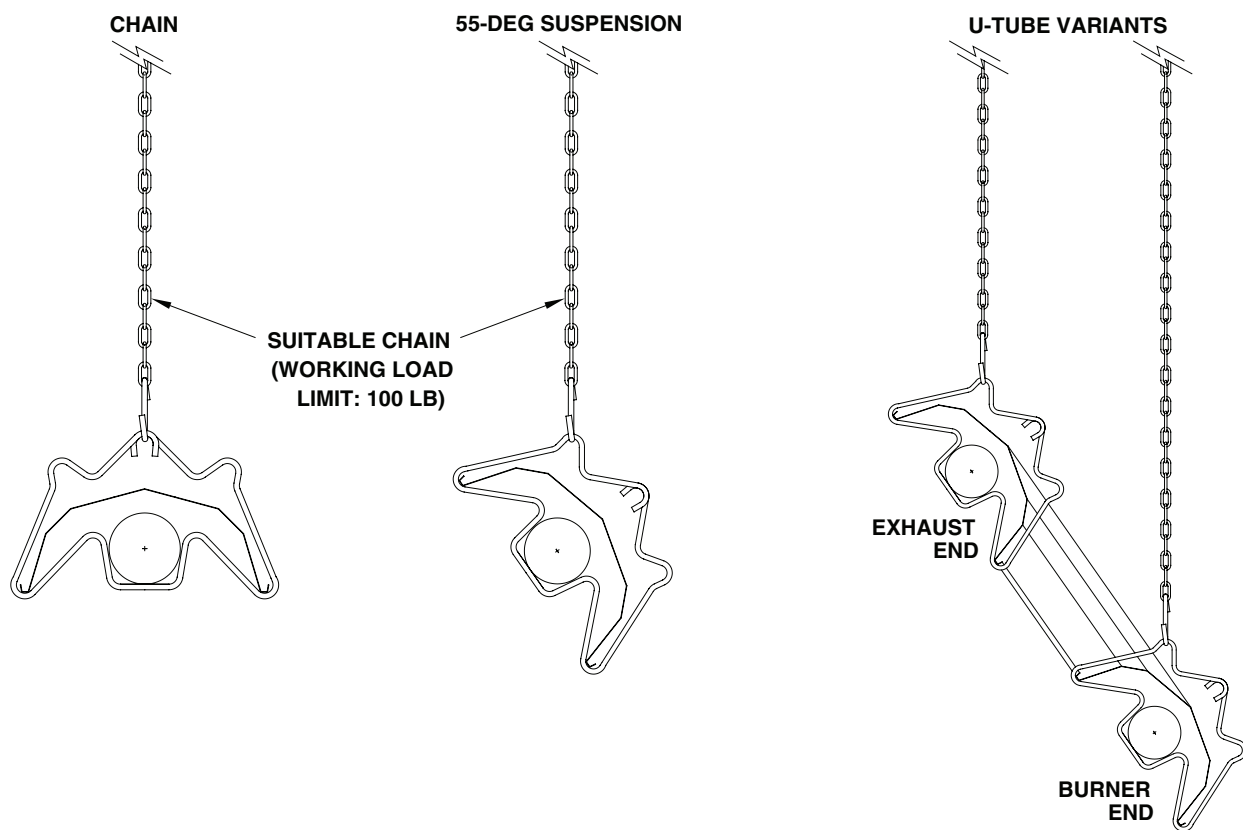


Figure 18. Suspension Bracket Configurations

5. Use level to ensure that heater is level and that all turnbuckles and/or chains are plumb. Adjust as necessary. For vented heaters, ensure that heater has slight downward slope (approximately 1/2 inch from end-to-end) away from burner. For unvented heaters, ensure that heater has slight downward slope (approximately 1/2 inch from end-to-end) toward burner.
6. Close all S-hooks using pliers or channel locks. Take care not to affect chain length. If reflectors are being angled, close S-hooks after reflectors have been angled.

Vent Connections

NOTE: Heaters may be installed unvented if governing building codes are met and consideration is properly given to the possibilities of condensation on cold surfaces. The installation shall meet the following requirements when unvented: natural or mechanical means shall be provided to supply and exhaust at least 4 CFM per 1,000 BTUh input and combustion gases shall not impinge on combustible materials.

Heaters can be installed with either vertical or horizontal vents. Use appropriate venting materials. All connections must be properly sealed. Heaters are certified as Category III for vertical and horizontal vent installations. For either a horizontal or vertical vent run, select vent pipe approved to UL standard 1738 for a Category III appliance or appropriately-sealed 26-gauge or heavier galvanized steel or equivalent single-wall pipe. Refer to [Table 10](#) for approved Category III vent manufacturers.

Table 10. Category III Vent Manufacturers		
Manufacturer	Model(s)	Diameter (Inches)
CaptiveAire Systems	2V-Type BH	—
Cheminee Lining E Inc.	IPP, HEP, HEPL, HEPLA, HEPL1, and HEPL2	6–48
Cleaver-Brooks Inc.	CBH, CBHL, CBHL2, CBHLA, and CBHL1	
DuraVent Inc.	FasNSeal fixed blade damper assembly	4–18 (ID)
	FasNseal special gas vent assembly	—
	FasNSeal W2 special gas vent system	
	FasNSmooth chimney liner system for use in masonry chimneys only	
	FasNSeal CVS special gas vent system and direct vented pellet system	
	S-Vent and PVP	4 and 5
ENERVEX Inc.	EPS and EPS-1	4–48
ECCO Manufacturing Division of ECCO Heating Products Ltd.	SGDW series	3–6
ICC Industrial Chimney Co.	VIC	4–24
Industrial Combustion LLC	ICH, ICHL, ICHLA, ICHL1, and ICHL2	4–48
Jeremias Inc.	DWKL, SWKL, DWFL, and SWFL	4–36
	DWGV double-wall, air-insulated, 1 inch between inner and outer pipe diameter	—
	DWGV1 double-wall, fiber-insulated, 1 inch between inner and outer pipe diameter	
	DWGV2 double-wall, fiber-insulated, 2 inches between inner and outer pipe diameter	
	SWG single-wall	4–12
Lifetime Chimney Supply LLC	Xi1, Xi2, and Xi4	5
METAL-FAB Inc.	CGSW, FCSSW, CG, FCS, FCG-1, and FCS-1	6–24 (ID)
	FCGSW, FCG, FCG-1, FCS-3 CORR/GUARD, and FCS-2 CORR/GUARD	6–36 (ID)
	CGSW, CG, FCG, 3CGSWHVK, and 4CGSWHVK	4 and 5
Noritz America Corporation	N-Vent	4 and 5
Rheem Sales Co. Inc.	RTG	3
Security Chimneys International Ltd.	Secure Seal Flex chimney lining system	3–12
Selkirk Corporation	Saf-T-CI and Saf-T C1	4, 5, and 6
	Saf-T-Vent	3–6 and 8
	EZ Seal	3–6
	SGV	3, 4, and 5
	CI Plus	6 and 8
	SC, DGV, EZ Seal Quick Kit, Sel-Vent, and Sel-Vent II	4
	IPS316, PS316, and G316	5 and 6
SFL Flue & Chimney	DEVON EPS and EPS-1	4–6
The Schebler Co.	SSD, ESW, eVent, and eVent PLUS	2 and 4–6
	eVent SD	4–6
Sunair Products	SADW-2V and SADW-V	4
Tokyo Gas Renovation Co. Ltd.	KP and KC	4 and 5
	N-Vent	3, 4, and 5
Van-Packer Co. Inc.	MW, CS, and CSplus	4–6 (ID)
Z-FLEX US Inc.	SVE and SVEII	3 and 4
	SVEIII	2, 3, and 4
	SVEIV single-wall and SVEIV double-wall	4, 5, and 6
	NovaVent single-wall and NovaVent double-wall	
	Z-VentBlu single-wall and Z-VentBlu double-wall	3, 4, and 5

Vertical Venting

All vertical vent piping (see [Figure 19](#)) must be adequately supported by the building structure, must be terminated with an approved terminal, and must be 4 inches in diameter. The maximum recommended vent length is 25 feet (7.6 meters) with a maximum of two elbows.

INSTALLATION—CONTINUED

Vent Connections—Continued

Vertical Venting—Continued

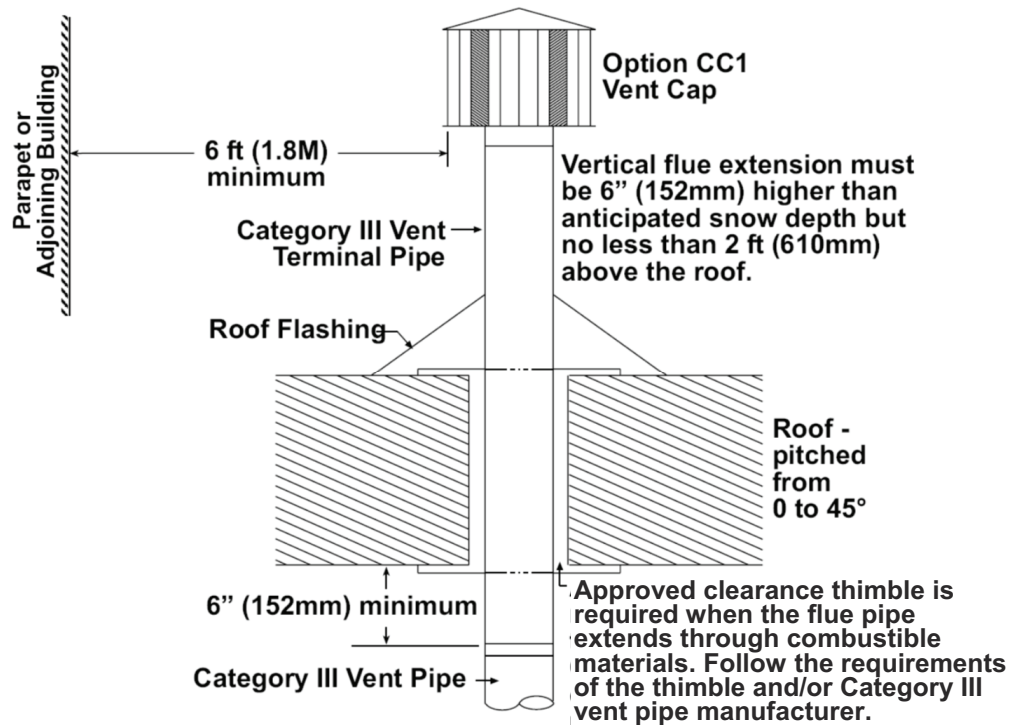


Figure 19. Vertical Vent

Horizontal Venting

⚠ DANGER ⚠

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

⚠ 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.

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

- Individual units may be vented horizontally (see [Figure 20](#)) through side walls and terminated with an approved terminal. An approved clearance thimble is required when the flue pipe passes through combustible materials. Follow the requirements of the thimble manufacturer.
- Vent runs of ≤ 12 feet (3.6 meters) may be of 4-inch (101 mm) vent pipe. Vent runs of > 12 feet (3.6 meters) must be of 6-inch (152 mm) vent pipe.
- The maximum recommended vent length is 25 feet (7.6 meters) with a maximum of two 90-degree elbows.
- Standard vent terminals must extend at least 6 inches (152 mm) from the wall and at least 24 inches (609 mm) from any combustible overhang to protect the building material from degradation by vent gases.
- Vent joints should be sealed and secured according to the vent manufacturer's instructions. Should condensation occur, the vent should be shortened or insulated.
- Refer to [Table 11](#) to ensure that the location complies with minimum clearance requirements.

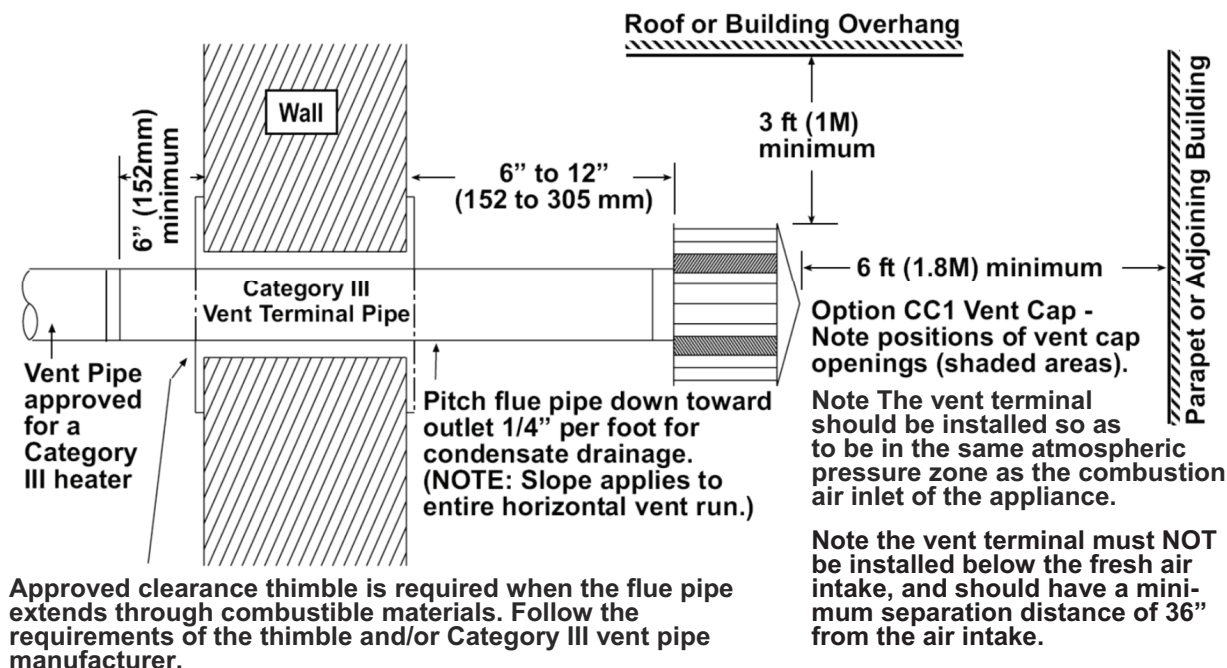


Figure 20. Horizontal Vent

Table 11. 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.	

INSTALLATION—CONTINUED

Vent Connections—Continued

Fresh Air Intake

⚠ DANGER ⚠

If the fresh air intake duct inlet is located above the roof, the underside of the inlet terminal must be at least 2 feet (0.61 meter) above roof level (or above projected the snow load) and at least 10 inches (254 mm) above any projection on the roof within 7 feet (2.1 meters) of the inlet.

- Whenever the heater is installed in locations where airborne dust or other pollutants are present, a fresh air supply must be ducted to the burner. The vent terminal must be at least 3 feet (0.91 meter) away from the air inlet and must be located higher than the inlet.
- The fresh air duct inlet must be located where it receives dust-free clean air. An inlet cap with bird screen must be fitted at the inlet of the duct. Intake pipe, fittings, and sealant are not furnished by the manufacturer.
- Connect a 4-inch (101-mm) diameter aluminum vent pipe from the fresh air to a flexible jointing piece connected to the air intake connection on the fan housing. Secure using hose clamps (see [Figure 21](#)).
- The maximum recommended length air duct is 25 feet (7.6 meters) with a maximum of two 90-degree elbows. The minimum length is 18 inches (456 mm).

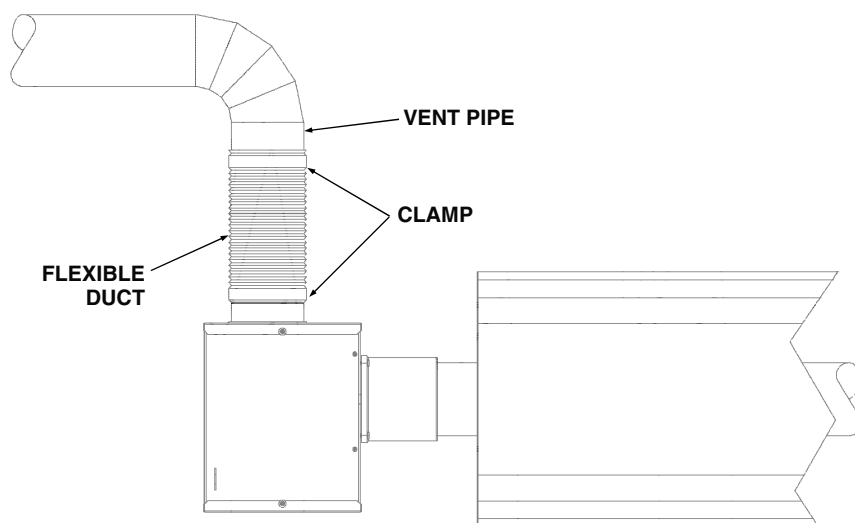


Figure 21. Fresh Air Instake Duct

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.

Table 12. Gas Supply Pressure								
Model	Unit Size (MBTUh)							
	60, 80, 100, 125, 150				170, 200			
	Gas Type							
	NG	LP	NG	LP	NG	LP	NG	LP
	Gas Supply Pressure (IN WC)							
	Minimum		Maximum		Minimum		Maximum	
VCS, VPS	5.0	11.0	14.0		7.0	11.0	14.0	
VCT, VPT	7.0							

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 the *Natural Gas and Propane Installation Code* (CSA-B149.1).
 - 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 13](#). 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 13. Gas Supply Line Sizes												
Length of Pipe (Feet)	Diameter of Pipe (Inches)											
	1/2		3/4		1		1-1/4		1-1/2		2	
	Gas Type											
	NG	LP	NG	LP	NG	LP	NG	LP	NG	LP	NG	LP
	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

INSTALLATION—CONTINUED

Piping Connections—Continued

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. Use only an agency-certified stainless steel flexible gas connector, certified for use on a radiant tube-type infrared heater—it must comply with the Standard for Connectors for Gas Appliances (ANSI Z21.24/CSA 6.10) or with the *Standard for Elastomeric Composite Hose and Hose Couplings for Conducting Propane and Natural Gas* (CAN/CGA 8.1).
- The correct installation allows for approximately 4 inches of movement due to expansion.

⚠ CAUTION ⚠

Take care when making gas connections to the heater not to apply excessive turning force to the internal controls.

- Gas supply piping and connections must be installed so that the minimum supply pressure is in accordance with [Table 12](#).
- The internal thread 1/2-inch NPT gas connection is on the back of the burner cabinet.
- Immediately upstream of the appliance gas inlet and close to the heater, install a union and manual shutoff valve as shown in [Figure 22](#). The plugged 1/8-inch NPT tap on the manual shutoff valve provides connection for a supply line pressure test gauge.
- It is essential to provide some flexibility in the final gas line connection by use of an approved flexible connector installed in a U-configuration as shown in [Figure 23](#). Use a length of 24 inches (610 mm) and a minimum internal diameter of 1/2 inch for heaters $\leq 150,000$ BTU/h and a length of 36 inches (914) and a minimum internal diameter of 3/4 inch for heaters $> 150,000$ BTU/h. Care must be taken to observe the pipe bend diameter of 12 inches (30 cm) and pipe displacement distance of 3 inches (7.62 cm) as shown in [Figure 23](#). In Canada, the *Natural Gas and Propane Installation Code* (CAN/CSA B149.1) requires a Type I hose connector certified to CAN/CGA-8.1 with a length of 36 ± 6 inches (90 ± 15 cm). Type I hose is field-supplied when required. In the US, use only a stainless steel connector that complies with the *Standard for Connectors for Gas Appliances* (ANSI Z21.24/CSA 6.10).
- Leak-test all connections by brushing on a leak-detecting solution. Bleed trapped air from gas lines as needed.
- If a 36-inch stainless flexible connector (option CE4) is ordered with the heater, it is shipped separately. Pressure drop values for option CE4 are listed in [Table 14](#).

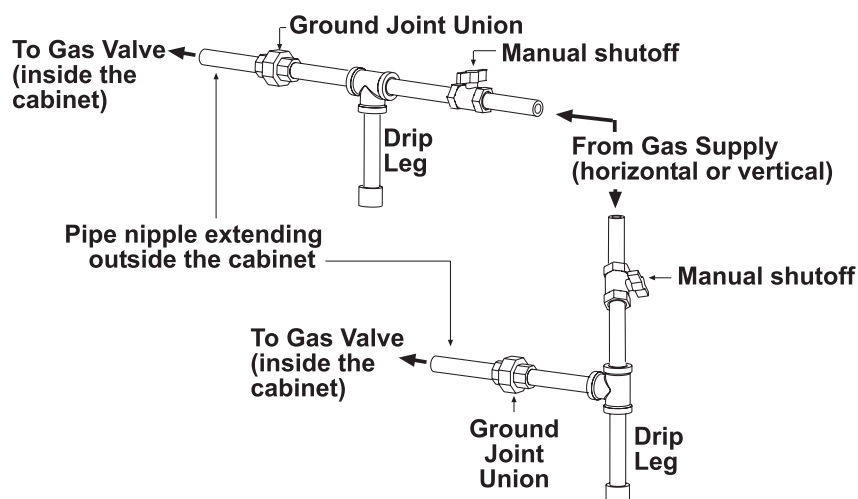
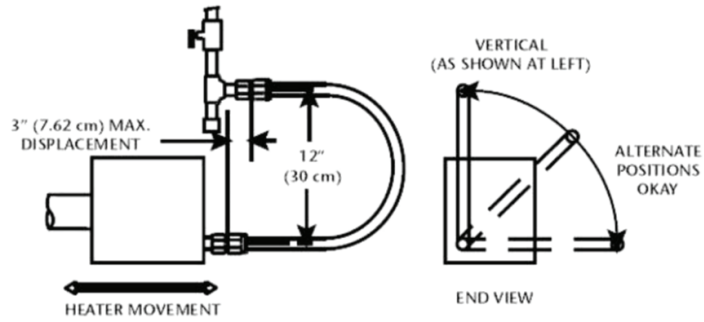


Figure 22. Gas Connections

CORRECT POSITIONS



INCORRECT POSITIONS

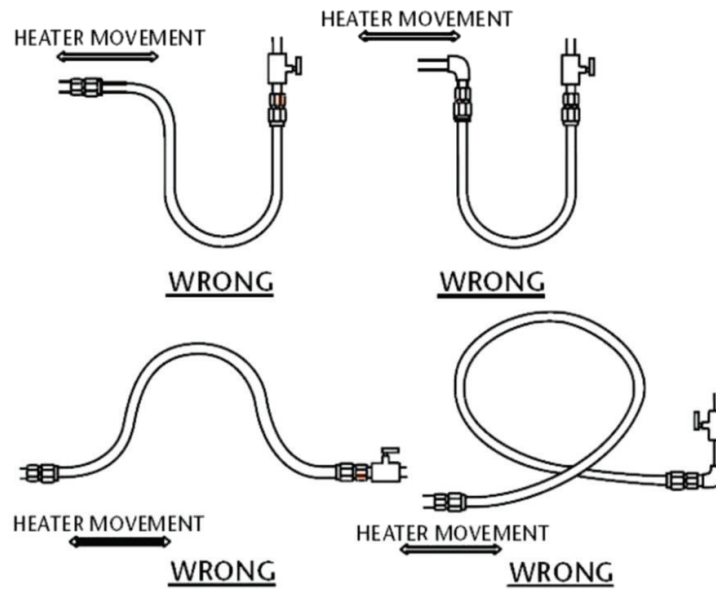


Figure 23. Flexible Gas Connection

Table 14. Pressure Drop Values for Option CE4						
Unit Size (MBTUh)						
60	80	100	125	150	170	200
Pressure Drop (IN WC)						
0.05	0.05	0.10	0.15	0.20	0.40	0.50

INSTALLATION—CONTINUED

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 ⚠

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).

NOTE: 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. Check the rating plate on the heater for the supply voltage and current requirements.
- Supply wiring: 120V, 60Hz, 1PH—black hot (live) wire, white neutral wire, and green ground wire. The POWER ON LED is permanently illuminated when the 120V/60Hz AC external supply is connected to the burner.
- Thermostat wiring: 18/4 class 2 thermostat cable, 18AWG, 100 feet maximum length. Install/wire an optional thermostat (available with the heater) or a field-supplied thermostat. Install/wire alternative controls in accordance with manufacturer's instructions.
- Multiple unit wiring (models VCT and VPT): Refer to the [APPENDIX: Multiple Unit Wiring Connections \(Models VCT and VPT\)](#).

CONTROLS

External controls may include field-supplied thermostat(s) and/or timer(s). Internal controls are a pressure switch, a combination gas valve, and an ignition controller.

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 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 pre-set at the factory to provide regulated gas flow.

Ignition Controller

The heater's ignition system is controlled by a control module that controls the operation of the fan motor and the combination gas valve. The display's codes are listed and described in the [Troubleshooting Using Ignition Controller](#) section.

OPERATION

DANGER

- For your safety, read before operating. If you do not follow these instructions exactly, a fire or explosion may result, causing property damage, personal injury, or loss of life.
- This appliance does not have a pilot. It is equipped with an ignition device 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.

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 4](#).
- ☐ 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 [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 L1 wire and earth ground.
- ☐ Remove, inspect, and re-install burner in accordance with [Burner Maintenance](#) section.

Startup

Start up the heater in accordance with [Table 15](#). To shut down the heater, ensure that the setting of any timer and/or thermostat are such that the heating system will be required to turn OFF. Switch OFF the electrical supply to the heater and the burner will stop and the fan will shut OFF.

OPERATION—CONTINUED

Startup—Continued

Table 15. Startup Sequence	
Action	Result
Ensure that settings of any time clock and thermostat are correct for unit operation and turn ON gas supply	—
Turn ON electrical supply to start heater	Observe correct startup sequence
	Fan runs and POWER ON LED illuminates
	Safe-start checks are carried out automatically
After fan has run up to full speed and satisfactory vent pressure condition has been established, spark ignition is energized	Ignition electrode produces spark
	Combination gas valve is energized
	BURNER ON LED illuminates or LOW FIRE and HIGH FIRE LEDs illuminate
If ignition is successful . . .	Flame sensing probe detects flame
	BURNER ON LED remains illuminated or LOW FIRE and HIGH FIRE LEDs remain illuminated
	Combination gas valve closes after approximately 15 seconds
If ignition is unsuccessful . . .	Spark ignition de-energizes
	Fan purges system for approximately 30 seconds
	Ignition is then attempted again
After three unsuccessful attempts at ignition . . .	Unit will lockout
	POWER ON LED remains illuminated
	Fan runs for 120 seconds and then stops
NOTE: To reset the system after lockout, turn OFF the electrical supply, wait 5 minutes, and then turn ON electrical supply. If repeated lockout occurs, investigate the cause.	

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.

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

1. Close combination gas valve to prevent gas flow to burner.
2. Connect manometer to 1/8-inch pipe outlet pressure tap on combination gas valve.

NOTE: A manometer (fluid-filled gauge) is recommended for measuring manifold gas pressure rather than a spring-type gauge, due to the difficulty of maintaining the calibration of a spring-type gauge.

3. Open combination gas valve and operate heater to measure manifold gas pressure.

⚠ CAUTION ⚠

DO NOT bottom out the gas valve regulator adjusting screw. This can result in unregulated manifold pressure, which can cause excess overfire and heat exchanger failure.

4. If manometer indicates that manifold gas pressure needs adjustment, set correct pressure in accordance with [Table 16](#) by turning regulator screw on combination gas valve IN (clockwise) to increase pressure or OUT (counterclockwise) to decrease pressure.
5. For models VCT and VPT, measure/adjust high-fire pressure followed by low-fire pressure.
6. Disconnect manometer from 1/8-inch pipe outlet pressure tap on combination gas valve.

Table 16. Required Manifold (Outlet) Gas Pressure															
Model	High-Fire or Low-Fire	Unit Size (MBTUh)													
		60		80		100		125		150		170		200	
		Gas Type													
		NG	LP	NG	LP	NG	LP	NG	LP	NG	LP	NG	LP	NG	LP
		Manifold Pressure (IN WC)													
VCS, VPS	—	3.9	5.5	3.5	5.2	4.5	8.0	4.3	7.6	4.0	7.0	3.3	6.1	3.3	—
VCT, VPT	High	3.9	5.5	3.5	5.2	4.5	8.0	4.3	7.6	4.0	7.0	3.3	6.1	4.0	—
	Low	2.6	3.5	2.3	2.9	3.0	4.4	2.7	4.6	2.1	3.3	1.9	3.6	2.5	
NOTE: Values listed for 0–2000 (0–610 meters) feet elevation in US and Canada. For units installed at elevations >2000 feet (>610 meters), refer to the gas conversion or high-elevation conversion manual found at www.reznorhvac.com .															

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 as indicated by fan running with POWER ON LED illuminated and BURNER ON LED extinguished.
- ☐ With unit in operation, check operation of pressure switch as follows:
 - a. Open access door.
 - b. Remove silicone tubes from pressure switch—burner should shut OFF within 4 seconds.
 - c. Replace tubes securely and ensure that heater ignites and operates normally.
 - d. Close access door.
- ☐ Turn unit OFF and ON, pausing 2 minutes between each cycle; observe for smooth ignition.
- ☐ Place literature bag that contains Limited Warranty, this manual, and any control or optional information in accessible location near heater.

⚠ DANGER ⚠

- **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.**

MAINTENANCE

WARNING

- If you turn OFF the electrical power supply, turn OFF the gas.
- 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).
- 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:

- ☐ Inspect burner/control compartment annually to determine if cleaning is necessary.
- ☐ Clean all dirt, lint, and grease from fan and motor assembly.
- ☐ Check burner for scale, dust, or lint accumulation and clean as necessary.
- ☐ Check gas valve to ensure that gas flow is being shut off completely.
- ☐ Inspect emitter tubes and brush any dust from exterior of tubes.
- ☐ Inspect reflectors and clean as necessary using mild detergent—this can significantly improve efficiency.
- ☐ Inspect fresh air inlet duct and vent to ensure that they are free from or liable to any blockage or obstruction.
- ☐ Clean all dirt, lint, and grease from combustion air opening.
- ☐ Replace any parts that do not appear sound.
- ☐ Check for any damaged wiring and replace as necessary.

Maintenance Procedures

Burner Maintenance

1. Remove gas and electric supply:
 - a. Shut OFF gas supply ahead of union at manual shutoff valve outside cabinet.
 - b. Disconnect electrical power/control connections.
 - c. Disconnect gas supply at union outside of cabinet using two wrenches.
2. For models VCS, VCT, and VPT with ducted combustion air, loosen hose clamp that secures flexible hose to fresh air inlet on side of burner cabinet and remove hose.
3. Loosen setscrew on burner support casting and remove burner from emitter tube.
4. Remove and save four screws that secure burner support casting to burner cabinet (see [Figure 24](#), DETAIL A) and remove burner assembly (see [Figure 24](#), DETAIL B).

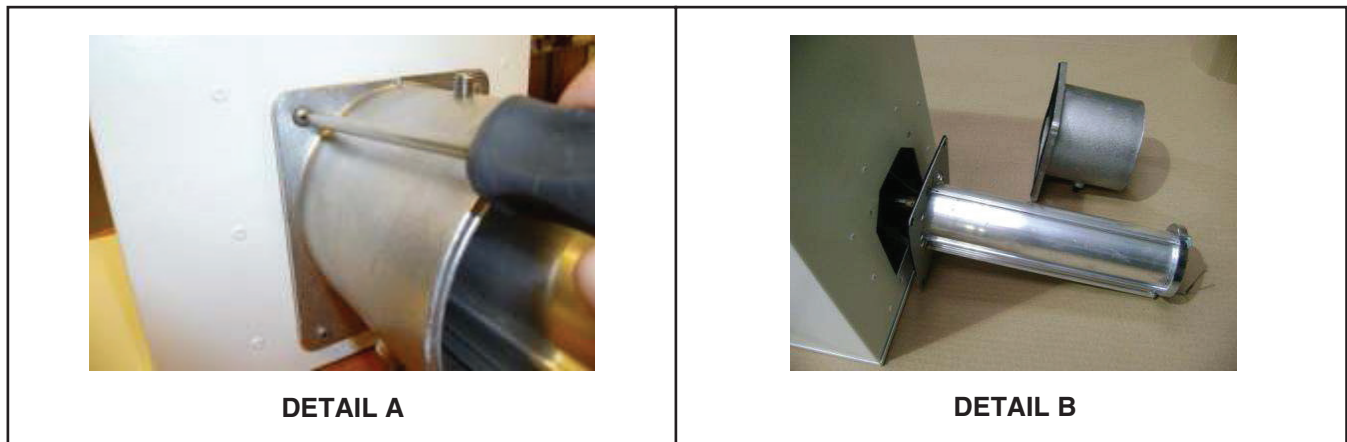


Figure 24. Burner Assembly Removal

5. Disconnect ignition, flame probe, and ground leads and pressure switch silicone tubes (see [Figure 25](#)) as necessary.

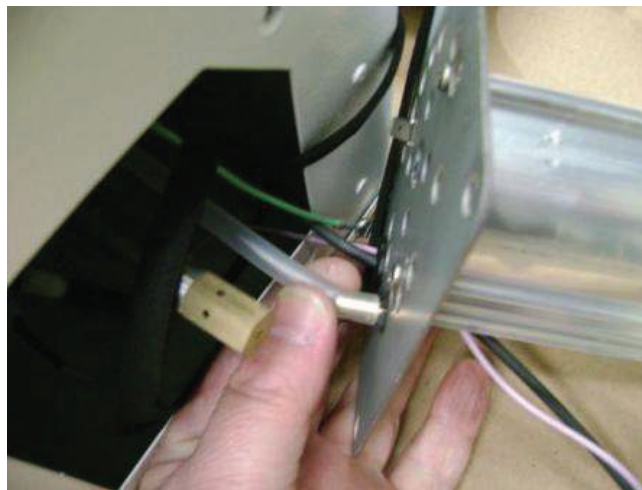


Figure 25. Burner Assembly Connections

6. Inspect and clean burner—remove any carbon buildup, scale, dust, lint, and/or any foreign material using stiff bristle brush.

MAINTENANCE—CONTINUED

Maintenance Procedures—Continued

Burner Maintenance—Continued

7. Check flame plate and inside burner head for contamination and clean as necessary. Replace flame plate as necessary ensuring that five holes on outer ring are aligned properly (see **Figure 26**, DETAIL A).
8. Inspect gas injector and replace if contaminated or blocked using approved thread sealant.
9. Check igniter assembly for deterioration. Replacement at each service is advised to ensure continued reliability. Ensure that lead connectors are secure to prevent incorrect sparking of electrode and ensure that spark gap is in accordance with **Figure 26**, DETAIL B).

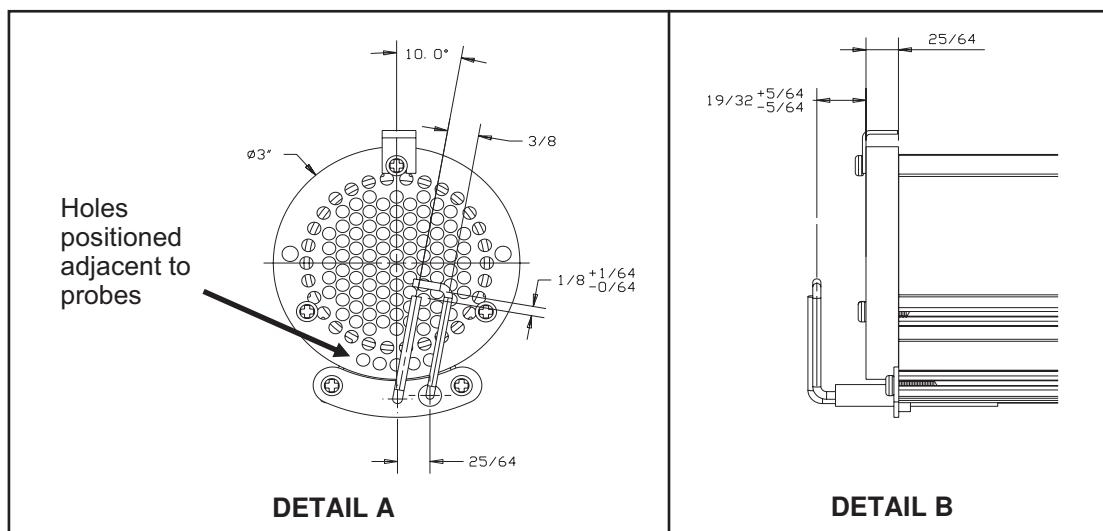


Figure 26. Flame Plate and Ignitor Spark Gap

10. Clean interior of emitter tubes using industrial vacuum cleaner or long pole with scraper as necessary.
11. Reconnect ignition, flame probe, and ground leads and pressure switch silicone tubes as necessary. Replace gasket(s) as necessary.
12. Position burner support casting and burner assembly so that wiring leads are not pinched and secure burner support casting to burner cabinet using four screws removed in step 4.
13. Re-install burner in emitter tube and tighten setscrew on burner support casting.
14. For models VCS, VCT, and VPT with ducted combustion air, connect flexible hose to fresh air inlet on side of burner cabinet and secure using hose clamp.
15. Reconnect gas supply at union outside of cabinet and leak test connection using leak detecting solution. If leak is detected, tighten connection. If leak cannot be stopped by tightening connection, replace part(s).
16. Turn ON electric and gas.
17. Check for proper operation.

Fan and Motor Assembly Maintenance

1. Turn OFF gas and disconnect electric power.
2. For model VPS with ducted combustion air, loosen hose clamp that secures flexible hose to fan and remove hose.
3. For models VCS, VCT, and VPT, remove fan and motor assembly:
 - a. Remove fan compartment panel.
 - b. Mark and disconnect fan leads. Pull cable through to fan compartment.
 - c. Remove and save four screws that secure fan and motor assembly and remove assembly with mounting bracket.

4. For model VPS, remove fan and motor assembly:
 - a. Mark and disconnect fan leads.
 - b. Remove and save screws that secure fan and motor assembly and remove assembly.
5. Remove fan orifice plate.
6. Using soft brush, remove any dust from fan scroll, from around motor, and from impeller. Ensure that impeller rotates freely.
7. Reconnect fan electrical leads and re-install fan and motor assembly using existing screws. For model VPS with ducted combustion air, re-install ducted air connections. For models VCS, VCT, and VPT, re-install fan compartment panel.
8. Turn ON electric and gas.
9. 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. Close manual shutoff valve to prevent flow to combination gas valve.

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

2. Connect manometer to 1/8-inch outlet pressure tap on combination gas valve.
3. Open manual shutoff and combination gas valves.
4. Use finger to fully block main burner orifice for several seconds.
5. Observe manometer with orifice blocked. If any pressure is indicated, combination gas valve is leaking and must be replaced before heater is restored to operation as follows:
 - a. Remove burner assembly in accordance with [Burner Maintenance](#) section.
 - b. Ensure that access door is open.
 - c. For models VCS, VCT, and VPT:
 - (1) Remove and save two screws from base of injector tube (see [Figure 27](#), DETAIL A). Note ground wire connection.
 - (2) Mark and disconnect gas valve wiring connections.
 - (3) Remove and save four screws that secure gas valve inlet plate (see [Figure 27](#), DETAIL B) to burner cabinet and remove plate.
 - (4) Remove gas valve and remove jet carrier and gas inlet from existing gas valve. Install jet carrier and gas inlet on replacement valve.
 - (5) Install replacement gas valve, re-install two existing screws in base of injector tube, and reconnect valve wiring.
 - (6) Re-install gas valve inlet plate and secure using four existing screws.

MAINTENANCE—CONTINUED

Maintenance Procedures—Continued

Combination Gas Valve Maintenance—Continued



Figure 27. Combination Gas Valve Removal—Models VCS, VCT, and VPT

d. For model VPS:

- (1) Disconnect silicone tubes from pressure switch.
- (2) Remove and save two screws that secure front of gas valve (see [Figure 28](#), DETAIL A).
- (3) Remove and save four screws that secure rear panel on burner cabinet (see [Figure 28](#), DETAIL B).
- (4) Mark and disconnect gas valve wiring connections.
- (5) Remove jet carrier and gas inlet from existing gas valve. Install jet carrier and gas inlet on replacement valve.
- (6) Install replacement gas valve and reconnect valve wiring.
- (7) Re-install rear panel on burner cabinet and secure using four existing screws.
- (8) Re-install two existing screws that secure front of gas valve.
- (9) Re-install silicone tube on pressure switch.

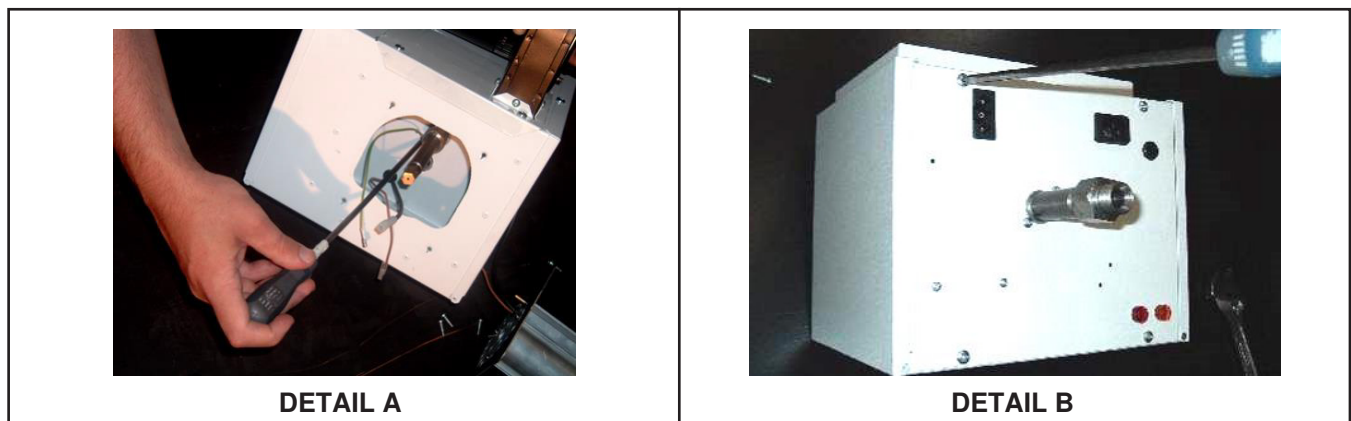


Figure 28. Combination Gas Valve Removal—Model VPS

- e. Re-install burner assembly in accordance with [Burner Maintenance](#) section.
 - f. Set burner pressure in accordance with [Measure and Adjust Manifold Gas \(Outlet\) Pressure](#) section.
 - g. Ensure that access door is closed.
6. Turn ON electric and gas.
 7. Check for proper operation.

Ignition Controller Replacement

1. Turn OFF gas and disconnect electric power.
2. Open access door.
3. Mark and disconnect ignition controller wiring harness leads and disconnect spark lead from controller.
4. Loosen/remove retaining screws and remove ignition controller. For model VPS, controller is located on access door.
5. Install replacement ignition controller and install/tighten retaining screws.
6. Reconnect spark lead from ignition controller and controller wiring harness leads.
7. Close access door.
8. Turn ON electric and gas.
9. Check for proper operation.

Pressure Switch Replacement

1. Turn OFF gas and disconnect electric power.
2. Open access door.
3. Disconnect silicone tubes from pressure switch.
4. Mark and disconnect pressure switch wiring.
5. For models VCS, VCT, and VPT, remove and save two screws that secure electrical panel (see [Figure 29, DETAIL A](#)) and remove panel to access and remove pressure switch mounting screws. It may be necessary to partially disconnect panel wiring to access pressure switch mounting screws.
6. For model VPS, remove and save two screws that secure pressure switch to back panel (see [Figure 29, DETAIL B](#)).



Figure 29. Pressure Switch Removal

7. Remove existing pressure switch, secure replacement pressure switch using existing two mounting screws, and re-install any panel(s) that has been removed.
8. Reconnect pressure switch wiring and two silicone tubes.
9. Close access door.
10. Turn ON electric and gas.
11. Check for proper operation.

TROUBLESHOOTING

General Troubleshooting

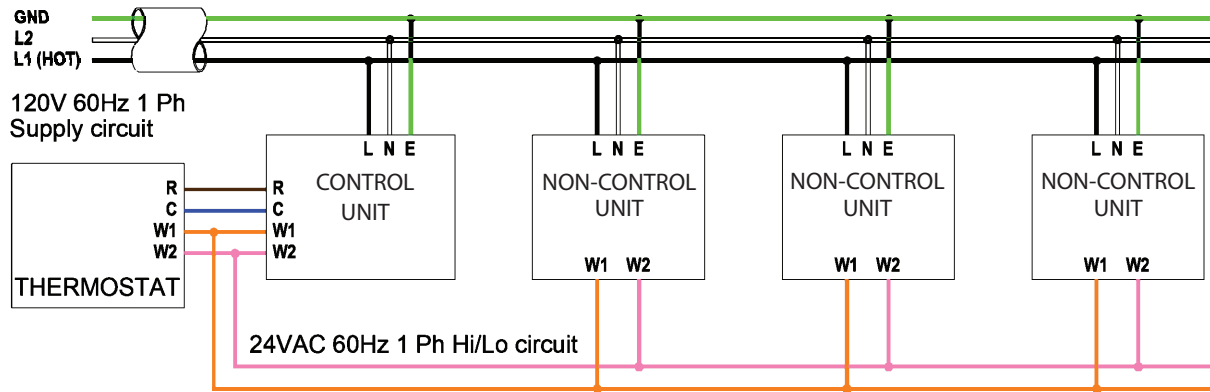
Table 17. General Troubleshooting		
Symptom	Probable Cause	Remedy
POWER ON LED not illuminated	Gas and/or electric supply not enabled	Ensure that gas and electric supplies are enabled
	Incorrect setting of external timer or thermostat	Ensure that any external timer or thermostat is set to call for heat
	Incorrect electric supply voltage	Ensure that electric supply voltage is 120VAC/60Hz
	Loose wiring connection	Ensure that all wiring connections are sound
	Blown fuse(s)	Replace fuse(s)
	Faulty LED	Replace LED
	Faulty transformer	Replace transformer
	Faulty external timer or thermostat	Replace external timer or thermostat
Fan does not run	No power to fan	Ensure that there is power to fan
	Incorrect electric supply voltage	Ensure that electric supply voltage is 120VAC/60Hz
	Loose wiring connection	Ensure that all wiring connections are sound
	Incorrect pressure switch operation	Ensure that pressure switch is operating properly—replace as necessary
	Faulty relay(s)	Replace relay(s)
	Faulty transformer	Replace transformer
	Faulty ignition controller	Replace ignition controller
	Faulty fan or fan motor	Replace fan or fan motor
BURNER ON, LOW FIRE, or HIGH FIRE LED not illuminated after purge period	Incorrect electric supply voltage	Ensure that electric supply voltage is 120VAC/60Hz
	Loose wiring connection	Ensure that all wiring connections are sound
	Faulty connection of pressure switch silicone tube(s)	Ensure that pressure switch silicone tube connection is sound
	Obstructed air inlet/outlet or emitter tube(s)	Ensure that air inlet/outlet and emitter tube(s) are unobstructed
	Incorrect pressure switch operation	Ensure that pressure switch is operating properly—replace as necessary
	Faulty LED	Replace LED
	Faulty transformer	Replace transformer
	Faulty ignition controller	Replace ignition controller
BURNER ON, LOW FIRE, or HIGH FIRE LED does not remain illuminated after 15 seconds	Loose wiring connection	Ensure that all wiring connections are sound
	No spark	Ensure that spark gap is 7/64 ($\pm$ 1/64) inch
		Check ignition controller—replace as necessary
		Check transformer—replace as necessary
	Combination gas valve set to OFF	Ensure that combination gas valve is set to ON
	Incorrect manifold gas pressure	Ensure that pressure is in accordance with Measure and Adjust Manifold Gas (Outlet) Pressure section
	Incorrect gas supply pressure	Ensure that supply pressure is in accordance with Gas Supply Pressure section
	Dirty flame sensor probe	Clean flame sensor probe
	Faulty connection of pressure switch silicone tube(s)	Ensure that pressure switch silicone tube connection is sound
	Obstructed air inlet/outlet or emitter tube(s)	Ensure that air inlet/outlet and emitter tube(s) are unobstructed

Troubleshooting Using Ignition Controller

Table 18. Troubleshooting Using Ignition Controller	
Display Status	Indication
Steady OFF	No control power
Steady ON	Power applied, control OK
One flash	Combustion pressure switch open with blower ON
Two flashes	Combustion pressure switch closed with blower OFF
Three flashes	Lockout from three ignition trials
Four flashes	Lockout from five flame losses
Five flashes	Control hardware fault detected
Six flashes	Lockout from five pressure switch losses

APPENDIX: MULTIPLE UNIT WIRING CONNECTIONS (MODELS VCT AND VPT)

Multiple Unit Wiring Connections—via Control Unit Power



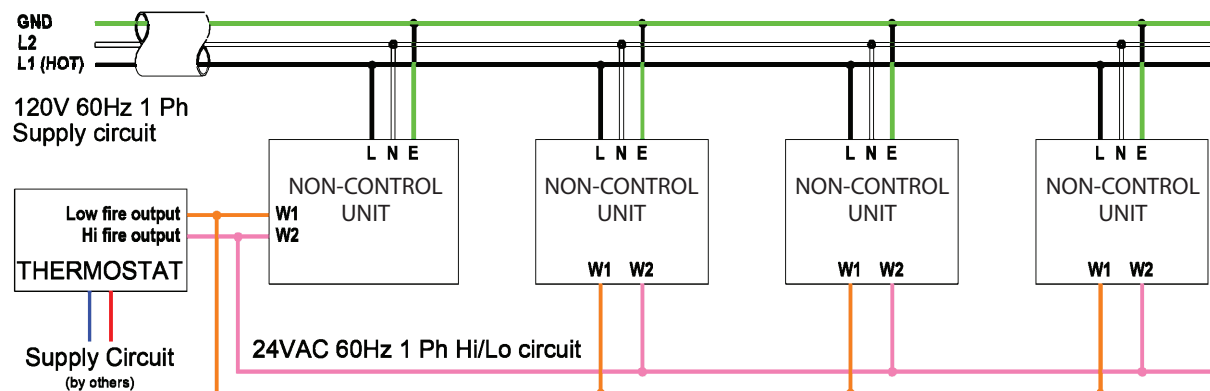
Multiple Unit Wiring Schematic—via Control Unit Power

- Multiple burners can be controlled via one main burner. In this scenario the main burner is known as the control unit and any additional burners are known as non-control units.
- The external two-stage thermostat is connected to the control unit and is powered via the internal transformer. The total burner load for the control unit is 20VA, and each additional non-control unit is 1.6VA. The thermostat chosen to control the multiple heaters **MUST NOT** have a power requirement exceeding the spare capacity shown in the table below:

Spare Capacity for Thermostat		
System Configuration	Total Burner Load	Spare Capacity
Control unit with one non-control unit	21.6VA	18.4VA
Control unit with three non-control units	24.8VA	15.2VA
Control unit with five non-control units	28.0VA	12.0VA
Control unit with seven non-control units	31.3VA	8.8VA

Multiple Unit Wiring Connections—via Independently-Controlled Relay

NOTE: If the thermostat has an independent power supply, all units in the zone to be controlled **MUST** be non-control units.



Multiple Unit Wiring Schematic—via Independently-Controlled Relay

- The maximum number of non-control units per thermostat is dependent on the maximum power output of the thermostat selected. Each non-control unit is rated at 1.6VA/24VAC/60Hz.
- The external two-stage thermostat is powered via its own power supply and must output to each non-control unit—24VAC for low-fire to terminal W1 and 24VAC for high-fire to terminals W1 and W2. Refer to the thermostat manufacturer's literature for details.

INSTALLATION RECORD (TO BE COMPLETED BY INSTALLER)

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

For more information on Reznor HVAC products:

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

