

FOR YOUR SAFETY

If you smell gas:

1. Open windows.
2. **DO NOT** try to light any appliance.
3. **DO NOT** use electrical switches.
4. **DO NOT** use any telephone in your building.
5. Leave the building.
6. Immediately call your local gas supplier after leaving the building. Follow the gas supplier's instructions.
7. If you cannot reach your gas supplier, call the Fire Department.

WARNING



Fire Hazard

Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

Failure to follow these instructions can result in death, injury or property damage.



HEATRITETM VST

Gas-Fired, Low Intensity Unitary Heater

Installation, Operation & Service Manual

**VST-80
VST-100
VST-125
VST-150**

WARNING

Improper installation, adjustment, alteration, service or maintenance can result in death, injury or property damage. Read the installation, operation and service manual thoroughly before installing or servicing this equipment.

Installation must be done by a contractor qualified in the installation and service of gas-fired heating equipment or your gas supplier.

Installer

Please take the time to read and understand these instructions prior to any installation. Installer must give a copy of this manual to the owner.

Owner

Keep this manual in a safe place to provide your serviceman with information should it become necessary.



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SECTION 1: HEATER SAFETY



Your Safety is Important to Us!

This symbol is used throughout the manual to notify you of possible fire, electrical or burn hazards.

Please pay special attention when reading and following the warnings in these sections

Installation, Service and Annual Inspection of heater must be done by a contractor qualified in the installation and service of gas-fired heating equipment.

Read this manual carefully before installation, operation or service of this equipment.

This heater is designed for heating nonresidential indoor spaces. Do not install in residential spaces. These instructions, the layout drawing, local codes and ordinances, and applicable standards that apply to gas piping, electrical wiring, venting, etc., must be thoroughly understood before proceeding with the installation.

Thin sheet metal parts, the aluminum reflector portion of the heater and the various venting components, have sharp edges. To prevent injury, the use of work gloves is recommended. The use of gloves will also prevent the transfer of body oils from the hands to the surface of the reflector.

Before installation, check that the local distribution conditions, nature of gas and pressure, and adjustment of the appliance are compatible.

1.1 Manpower Requirements

To prevent personal injury and damage to the heater, two persons will be required for installation.

SECTION 2: INSTALLER RESPONSIBILITY

The installer is responsible for the following:

- To install the heater, as well as the gas and electrical supplies, in accordance with applicable specifications and codes. VAL-CO. recommends the installer contact a local building inspector or Fire Marshal for guidance.
- To use the information given in a layout drawing and in the manual together with the cited codes and regulations to perform the installation.
- To install the heater in accordance with the Clearances to Combustibles.
- To furnish all needed materials not furnished as standard equipment.
- To plan location of supports.
- To provide access to burners for servicing on all sides, for burner removal.
- To provide the owner with a copy of this installation, operation and service manual.
- To never use heater as support for ladder or other access equipment and never hang or suspend anything from heater.
- To ensure there is adequate air circulation around the heater and to supply air for combustion, ventilation and distribution in accordance with local codes.
- To safely and adequately install heater using materials with a minimal working load of 75 lbs (33 kg).

2.1 Wall Tag

A laminated wall tag is available for the VST heater as a permanent reminder of the safety instructions and the importance of the required clearances to combustibles. Please contact VAL-CO. or your VAL-CO. independent distributor to obtain the wall tag. Affix the tag by peeling off the backing of the adhesive strips on the rear surface and position the tag on a wall near the VST heater (e.g. thermostat).

A copy of the wall tag (P/N 91037917) is illustrated on the back cover. For an immediate solution, you may affix this copy on the wall near the heater.

Know your model number and installed configuration. Model number and installed configuration are found on the burner and in the Installation, Operation and Service Manual. See Page 3, Figure 1 through Page 6, Figure 10. Write the proper clearance dimensions

in permanent ink according to your model number and configuration in the open spaces on the tag.

2.2 Corrosive Chemicals

CAUTION

Do not use heater in an area containing corrosive chemicals.

Avoid the use of corrosive chemicals to ensure a longer life of the burner, tubing and other parts.

Failure to follow these instructions can result in property damage.

VAL-CO. cannot be responsible for ensuring that all appropriate safety measures are undertaken prior to installation; this is entirely the responsibility of the installer. It is essential that the contractor, the subcontractor, or the owner identifies the presence of combustible materials, corrosive chemicals or halogenated hydrocarbons* anywhere in the premises.

** **Halogenated Hydrocarbons** are a family of chemical compounds characterized by the presence of halogen elements (fluorine, chlorine, bromine, etc.). These compounds are frequently used in refrigerants, cleaning agents, solvents, etc. If these compounds enter the air supply of the burner, the life span of the heater components will be greatly reduced. An outside air supply must be provided to the burners whenever the presence of these compounds is suspected. Warranty will be invalid if the heater is exposed to halogenated hydrocarbons.*

2.3 National Standards and Applicable Codes

All Appliances must be installed in accordance with the latest revision of the applicable standards and national codes. This refers also to the electric, gas and venting installation. Note: Additional standards for installations in Public Garages, Aircraft Hangars, etc. may be applicable.

SECTION 3: CRITICAL CONSIDERATIONS

3.1 Required Clearances to Combustibles

Clearances are the required distances that combustible objects must be away from the heater to prevent serious fire hazards. Combustibles are materials, which may catch on fire and include common items such as wood, paper, rubber, fabric, etc. **Maintain clearances to combustibles at all times for safety.**

Clearances for all heater models are located on the burner of the heater and on *Page 3, Figure 1 through Page 6, Figure 10* in this manual. Check the clearances on each burner for the model heater being installed to make sure the product is suitable for your application and the clearances are maintained. Read and follow the safety guidelines below:

- Keep gasoline or other combustible materials including flammable objects, liquids, dust or vapors away from this heater or any other appliance.
- Maintain clearances from heat sensitive material, equipment and workstations.
- Maintain clearances from vehicles parked below the heater.
- Maintain clearances from swinging and overhead doors, overhead cranes, vehicle lifts, partitions, storage racks, hoists, building construction, etc.
- In locations used for the storage of combustible materials, signs must be posted to specify the maximum permissible stacking height to maintain

NOTE: 1. All dimensions are from the surfaces of all tubes, couplings and elbows.
 2. Clearances B, C and D can be reduced by 50% after 25' (7.5 m) of tubing downstream from where the burner and burner tube connect.
 3. “-” indicates an unapproved application. VAL-CO. prohibits the installation of this heater for all unapproved applications.

⚠ WARNING



Fire Hazard

Some objects will catch fire or explode when placed close to heater.

Keep all flammable objects, liquids and vapors the required clearances to combustibles away from heater.

Failure to follow these instructions can result in death, injury or property damage.

required clearances from the heater to the combustibles. Signs must be posted adjacent to the heater thermostat. In the absence of a thermostat, signs must be posted in a conspicuous location.

- Consult local Fire Marshal, Fire Insurance Carrier or other authorities for approval of proposed installation when there is a possibility of exposure to combustible airborne materials or vapors.
- Hang heater in accordance to the minimum suspension requirements on *Page 11, Figure 12*.
- If the radiant tubes must pass through the building structure, be sure that adequate sleeving and fire stop is installed to prevent scorching and/or fire hazard.

FIGURE 1: STANDARD REFLECTOR

	Model	(inches)				(centimeters)			
		A	B	C	D	A	B	C	D
	VST-80	6	38	66	38	16	97	168	97
	VST-100	6	40	71	40	16	102	181	102
	VST-125	6	46	77	46	16	117	196	117
	VST-150	6	50	80	50	16	127	204	127

- NOTE:** 1. All dimensions are from the surfaces of all tubes, couplings and elbows.
 2. Clearances B, C and D can be reduced by 50% after 25' (7.5 m) of tubing downstream from where the burner and burner tube connect.
 3. “-” indicates an unapproved application. VAL-CO. prohibits the installation of this heater for all unapproved applications.

FIGURE 2: ONE SIDE REFLECTOR

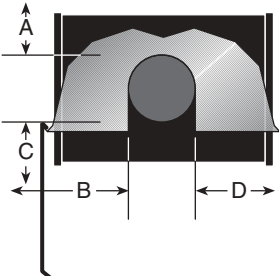
	Model	(inches)				(centimeters)			
		A	B	C	D	A	B	C	D
	VST-80	6	9	70	54	16	23	178	138
	VST-100	6	9	77	59	16	23	196	150
	VST-125	6	9	83	65	16	23	211	166
	VST-150	6	9	86	69	16	23	219	176

FIGURE 3: TWO SIDE REFLECTORS

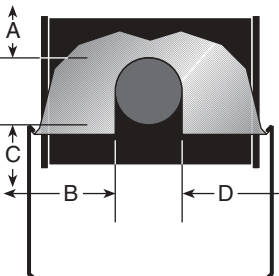
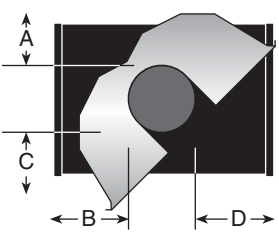
	Model	(inches)				(centimeters)			
		A	B	C	D	A	B	C	D
	VST-80	6	25	72	25	16	64	183	64
	VST-100	6	27	78	27	16	69	199	69
	VST-125	6	32	84	32	16	82	214	82
	VST-150	6	35	88	35	16	89	224	89

FIGURE 4: 45° TILT REFLECTOR

	Model	(inches)				(centimeters)			
		A	B	C	D	A	B	C	D
	VST-80	8	8	66	60	21	21	168	153
	VST-100	10	8	74	64	26	21	188	163
	VST-125	10	8	78	69	26	21	199	176
	VST-150	12	8	84	74	31	21	214	188

- NOTE:** 1. All dimensions are from the surfaces of all tubes, couplings and elbows.
 2. Clearances B, C and D can be reduced by 50% after 25' (7.5 m) of tubing downstream from where the burner and burner tube connect.
 3. “-” indicates an unapproved application. VAL-CO. prohibits the installation of this heater for all unapproved applications.

FIGURE 5: U-TUBE, STANDARD REFLECTOR

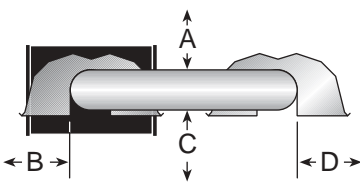
	Model	(inches)				(centimeters)			
		A	B	C	D	A	B	C	D
	VST-80	6	38	69	37	16	97	176	94
	VST-100	6	40	76	39	16	102	194	100
	VST-125	6	46	79	43	16	117	201	110
	VST-150	6	50	84	47	16	127	214	120

FIGURE 6: U-TUBE, FULL 45°

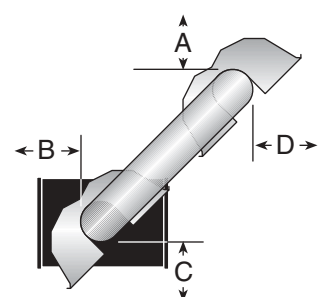
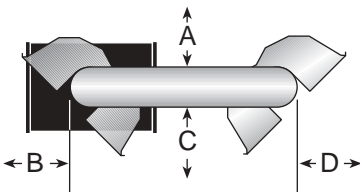
	Model	(inches)				(centimeters)			
		A	B	C	D	A	B	C	D
	VST-80	8	8	66	46	21	21	168	117
	VST-100	8	8	74	52	21	21	188	133
	VST-125	8	8	78	61	21	21	199	155
	VST-150	8	8	84	66	21	21	214	168

FIGURE 7: U-TUBE, OPPOSITE 45° REFLECTOR

	Model	(inches)				(centimeters)			
		A	B	C	D	A	B	C	D
	VST-80	8	60	66	22	21	153	168	56
	VST-100	10	64	74	22	26	163	188	56
	VST-125	10	70	78	22	26	178	199	56
	VST-150	12	74	84	22	31	188	214	56

- NOTE:** 1. All dimensions are from the surfaces of all tubes, couplings and elbows.
 2. Clearances B, C and D can be reduced by 50% after 25' (7.5 m) of tubing downstream from where the burner and burner tube connect.
 3. "-" indicates an unapproved application. VAL-CO. prohibits the installation of this heater for all unapproved applications.

FIGURE 8: 2-FOOT DECO GRILLE, 1-FOOT DECO GRILLE AND PROTECTIVE GRILLE

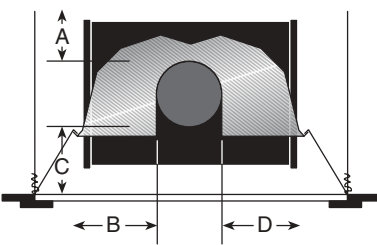
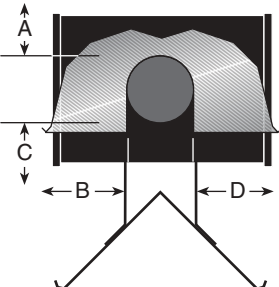
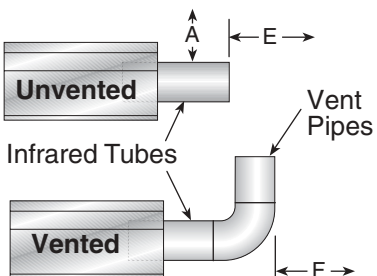
	Model	(inches)				(centimeters)			
		A	B	C	D	A	B	C	D
	VST-80	6	38	66	38	16	97	168	97
	VST-100	6	40	71	40	16	102	181	102
	VST-125	6	46	77	46	16	117	196	117
	VST-150	6	50	80	50	16	127	204	127

FIGURE 9: LOWER CLEARANCE SHIELD*

	Model	(inches)				(centimeters)			
		A	B	C	D	A	B	C	D
	VST-80	6	40	38	40	16	102	97	102
	VST-100	6	50	44	50	16	127	112	127
	VST-125	6	54	48	54	16	138	122	138
	VST-150	6	55	50	55	16	140	127	140

*When installed in the first 20' (6 m).

FIGURE 10: VENTING

	Model	(inches)			(centimeters)		
		A	E	F	A	E	F
	VST-80	20	24	18	51	61	46
	VST-100	20	24	18	51	61	46
	VST-125	20	24	18	51	61	46
	VST-150	20	30	18	51	77	46

SECTION 4: NATIONAL STANDARDS AND APPLICABLE CODES

4.1 Gas Codes

The type of gas appearing on the nameplate must be the type of gas used. Installation must comply with national and local codes and requirements of the local gas company.

United States: Refer to National Fuel Gas Code, ANSI Z223.1 - latest revision, (same as NFPA 54).

Canada: Refer to CAN/CGA B149.1 and B149.2: Installation Codes for Gas Burning Appliances.

4.2 Aircraft Hangars

Installation in aircraft hangars must be in accordance with the following codes:

United States: Refer to Standard for Aircraft Hangars, ANSI/NFPA 409 - latest revision.

Canada: Refer to Standard CAN/CGA B149.1 and B149.2.

- In aircraft storage and servicing areas, heaters shall be installed at least 10' (3 m) above the upper surface of wings or of engine enclosures of the highest aircraft which may be 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.
- In shops, offices and other sections of aircraft hangars communicating with aircraft storage or servicing areas, heaters shall be installed not less than 8' (2.4 m) above the floor.
- Suspended or elevated heaters shall be so located in all spaces of aircraft hangars that they shall not be subject to injury by aircraft, cranes, movable scaffolding or other objects. Provisions shall be made to assure accessibility to suspended heaters for recurrent maintenance purposes.

4.3 Public Garages

Installation in garages must be in accordance with the following codes:

United States: Standard for Parking Structures NFPA 88A - latest revision or the Standard for Repair Garages, NFPA 88B - latest revision.

Canada: Refer to CAN/CGA B149.1 and B149.2: Installation Codes for Gas Burning Appliances.

- Heaters must not be installed less than 8' (2.4m) above the floor. Minimum clearances to combustibles must be maintained from vehicles parked below the heater.
- When installed over hoists, minimum clearances to combustibles must be maintained from the upper most point of objects on the hoist.

4.4 Electrical

The heater must be electrically grounded in accordance with the following codes:

United States: Refer to National Electrical Code®, ANSI/NFPA 70 - latest revision. Wiring must conform to the most current National Electrical Code®, local ordinances, and any special diagrams furnished.

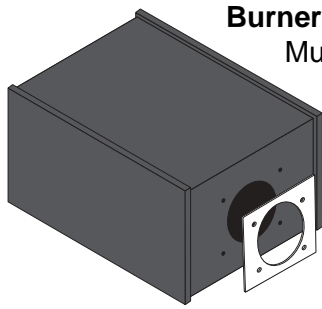
Canada: Refer to Canadian Electrical Code, CSA C22.1 Part 1 - latest revision.

4.5 Venting

The venting must be installed in accordance with the requirements within this manual and the following codes:

United States: Refer to NFPA 54/ANSI Z223.1 - latest revision, National Fuel Gas Code.

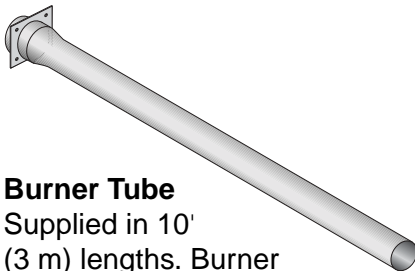
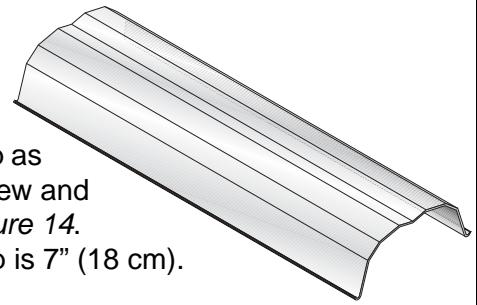
Canada: Refer to CAN/CGA B149.1 and B149.2: Installation Codes for Gas Burning Appliances

SECTION 5: MAJOR COMPONENTS**FIGURE 11: Major Component Descriptions****Burner with Tube Gasket**

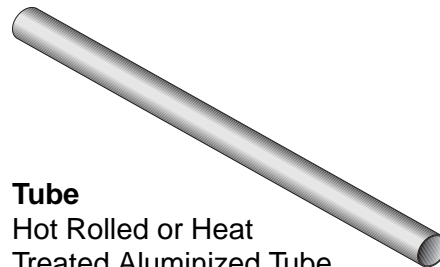
Must be installed with the flame observation window facing down.

Reflector (Aluminum or Stainless Steel)

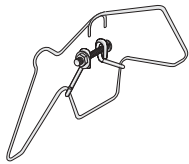
Alternate overlap as shown on overview and on Page 13, Figure 14. Minimum overlap is 7" (18 cm).

**Burner Tube**

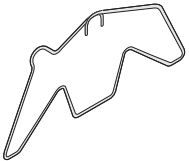
Supplied in 10' (3 m) lengths. Burner tube is always the first tube after the burner.

**Tube**

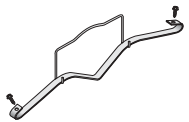
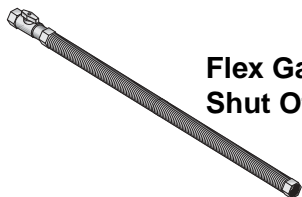
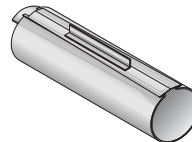
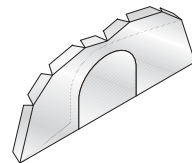
Hot Rolled or Heat Treated Aluminized Tube
Supplied in 10' (3 m) lengths.

**Tube and Reflector Hanger with Clamp Package**

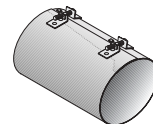
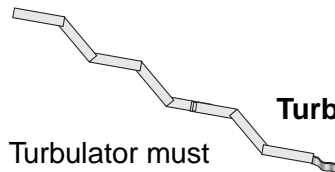
Position this hanger no more than 4" (10 cm) away from the burner.

**Tube and Reflector Hanger**

Suspend system from these hangers.

**Reflector Support Strap & Wire Form****Flex Gas Line with Shut Off Cock****Coupling Assembly with Lock****Reflector End Cap**

Punch out center section to accommodate tube.

**Vent Adapter****Turbulator**

Turbulator must be installed in the last standard section of tube. Turbulator is not required on the VST-125/150. For installation see Page 16, Section 6.4.

5.1 Standard Parts List

Table 1: Contents of VST Burner Carton

Part No.	Description	VST-80	VST-100	VST-125	VST-150
VST30XXXXX	VST Burner Assembly (Rate and Fuel Varies)	1	1	1	1
02568200	Gasket	1	1	1	1
VST30100NA	Installation, Operation and Service Manual	1	1	1	1
94273914	Hex Head Bolts 5/16-18 Rolok	4	4	4	4
96411600	Split Lock washer	4	4	4	4
91201708	Pipe Nipple (Black) 1/2" NPT x 4"	1	1	1	1
91317300	1/4" Quick Disconnect (Wire)	2	2	2	2
91412200	Flexible Gas Connector Assembly - 1/2" NPT	1	1	1	
91412203	Flexible Gas Connector Assembly - 3/4" NPT	-	-	-	1
03051503	Turbulator Adapter	1	1	-	-
03051504	Turbulator 2.5' (76 cm) Aluminized Steel	4	2	-	-
03051505	Turbulator 2.5' (76 cm) Stainless Steel	-	-	-	-

Table 2: Contents of Core and Extension Packages

Part No.	Description	Core Packages						Extension Packages			
		Hot Rolled			Aluminized			Hot Rolled		Aluminized	
		20' (6m)	30' (9m)	40' (12m)	20' (6m)	30' (9m)	40' (12m)	20' (6m)	30' (9m)	20' (6m)	30' (9m)
91409300	Tube, Hot Rolled Steel, 10' (3m)	1	2	3	-	-	-	2	3	-	-
91409408	Tube, HT Aluminized, 10' (3m)	-	-	-	1	2	3	-	-	2	3
03051101	Burner Tube, ALUMI-THERM® Steel, 10' (3m)	1	1	1	1	1	1	-	-	-	-
03051601	Burner Tube, HT ALUMI-THERM® Steel, 10' (3m)	-	-	-	-	-	-	-	-	-	-
01312700	Coupling Assembly	1	2	3	1	2	3	2	3	2	3
02750303	Standard Reflector, 8' (3.5m)	3	4	6	3	4	6	3	4	3	4
02750800	End Cap	2	2	2	2	2	2	-	-	-	-
03090100	Tube and Reflector Hanger	3	4	5	3	4	5	2	3	2	3
91907302	S-Hook	3	4	5	3	4	5	2	3	2	3
03050010	Reflector Support Package (Strap, Wire Form, Screws)	2	3	5	2	3	5	3	4	3	4
91107720	U-Clip Package	1	1	1	1	1	1	1	1	1	1
90502700	Vent Adapter	1	1	1	1	1	1	-	-	-	-
01318901	Tube Clamp Package	1	1	1	1	1	1	-	-	-	-
Part Number		CP20HRS	CP30HRS	CP40HRS	CP20ALUM	CP30ALUM	CP40ALUM	EXP20HRS	EXP30HRS	EXP20ALUM	EXP30ALUM

Table 3: VST Component Package Guide

Model	Tubing Length		Core Packages	
	Minimum	Maximum	Standard	Aluminized
VST-80	20' (6m)	-	CP20HRS	CP20ALUM
	-	30' (9m)	CP30HRS	CP30ALUM
VST-100	30' (9m)	-	CP30HRS	CP30ALUM
	-	40' (12m)	CP40HRS	CP40ALUM
VST-125	40' (12m)	-	CP40HRS	CP40ALUM
	-	50' (15m)	CP30HRS + EXP20HRS	CP30ALUM + EXP20ALUM
VST-150	50' (15m)	-	CP30HRS + EXP20HRS	CP30ALUM + EXP20ALUM
	-	60' (18m)	CP30HRS + EXP30HRS	CP30ALUM + EXP30ALUM

SECTION 6: HEATER INSTALLATION

WARNING

Suspension Hazard

Hang heater with materials with a minimum working load of 75 lbs (33 kg).

Failure of the supports can result in death, injury or property damage.

To ensure your safety, and comply with the terms of the warranty, all units must be installed in accordance with these instructions.

The gas or the electrical supply lines must not be used to support the heater.

Do not locate the gas or electric supply lines directly over the path of the flue products from the heater.

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

The heaters must be installed with clearances to combustibles as indicated on the rating plate and in this instruction manual.

The minimum and maximum gas inlet pressures must be maintained as indicated on the rating plate.

Typical installation configurations are shown in Figure 12.

FIGURE 12: Critical Hanger Placement

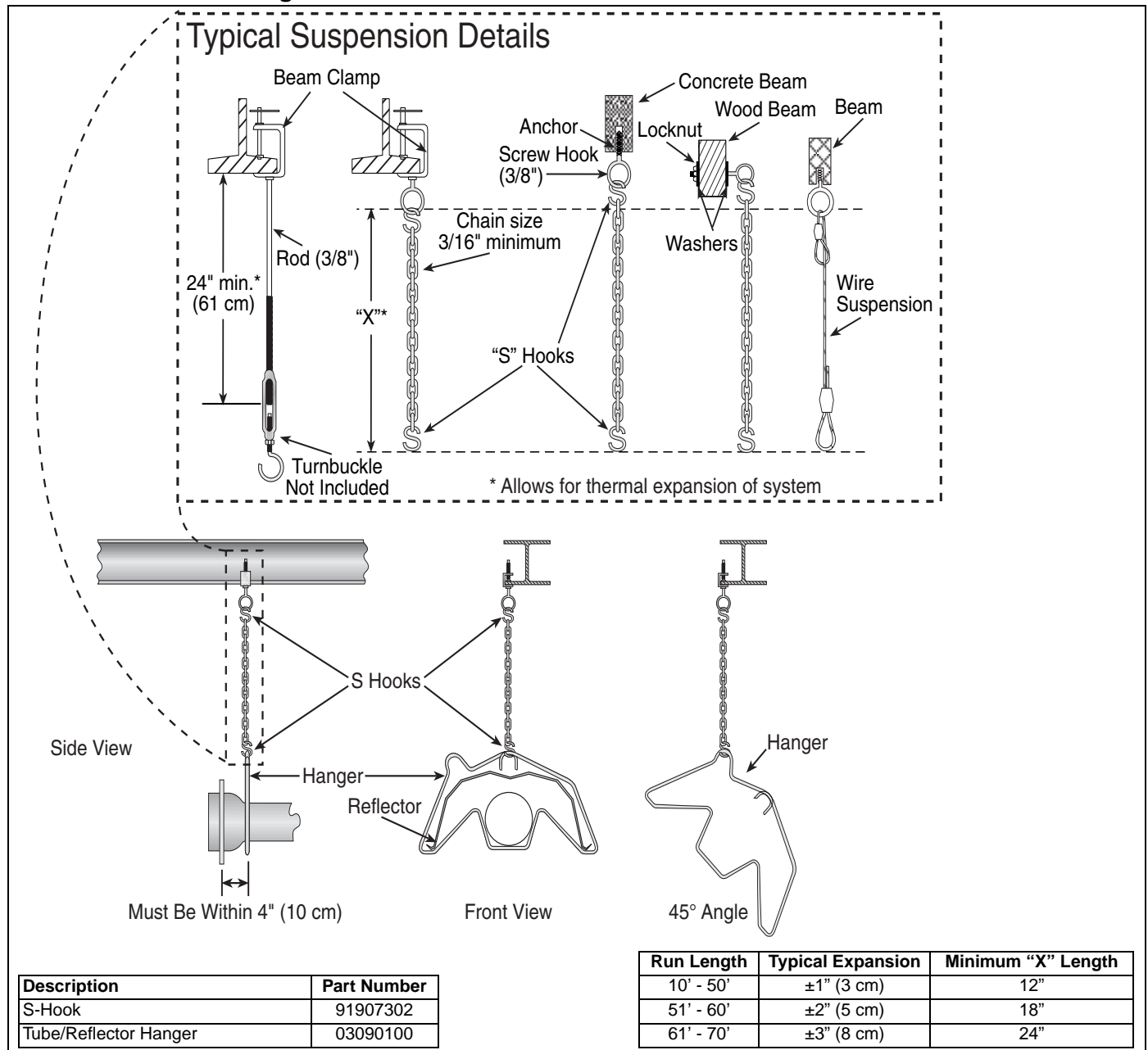


FIGURE 13: VST Linear Assembly Overview

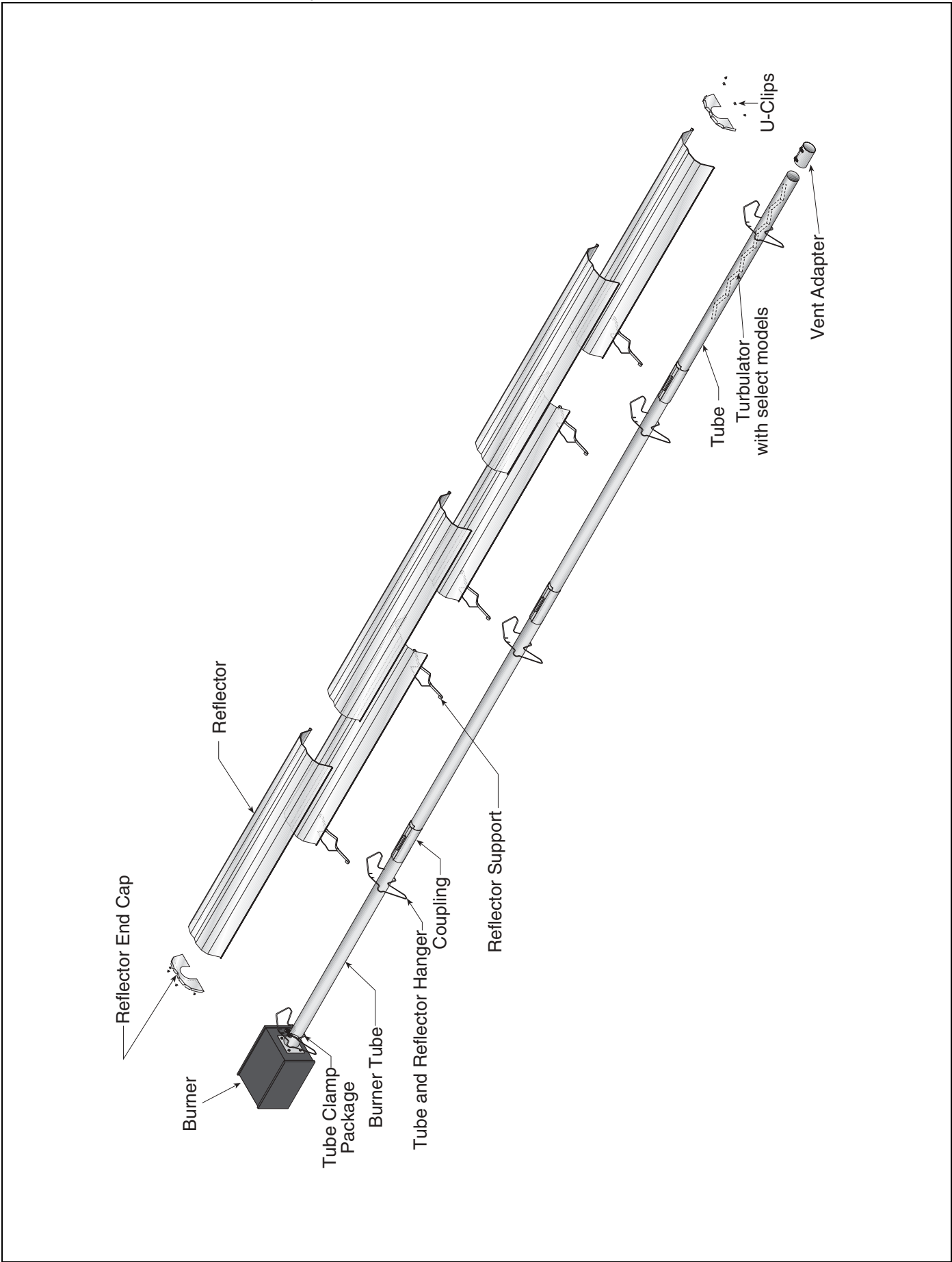
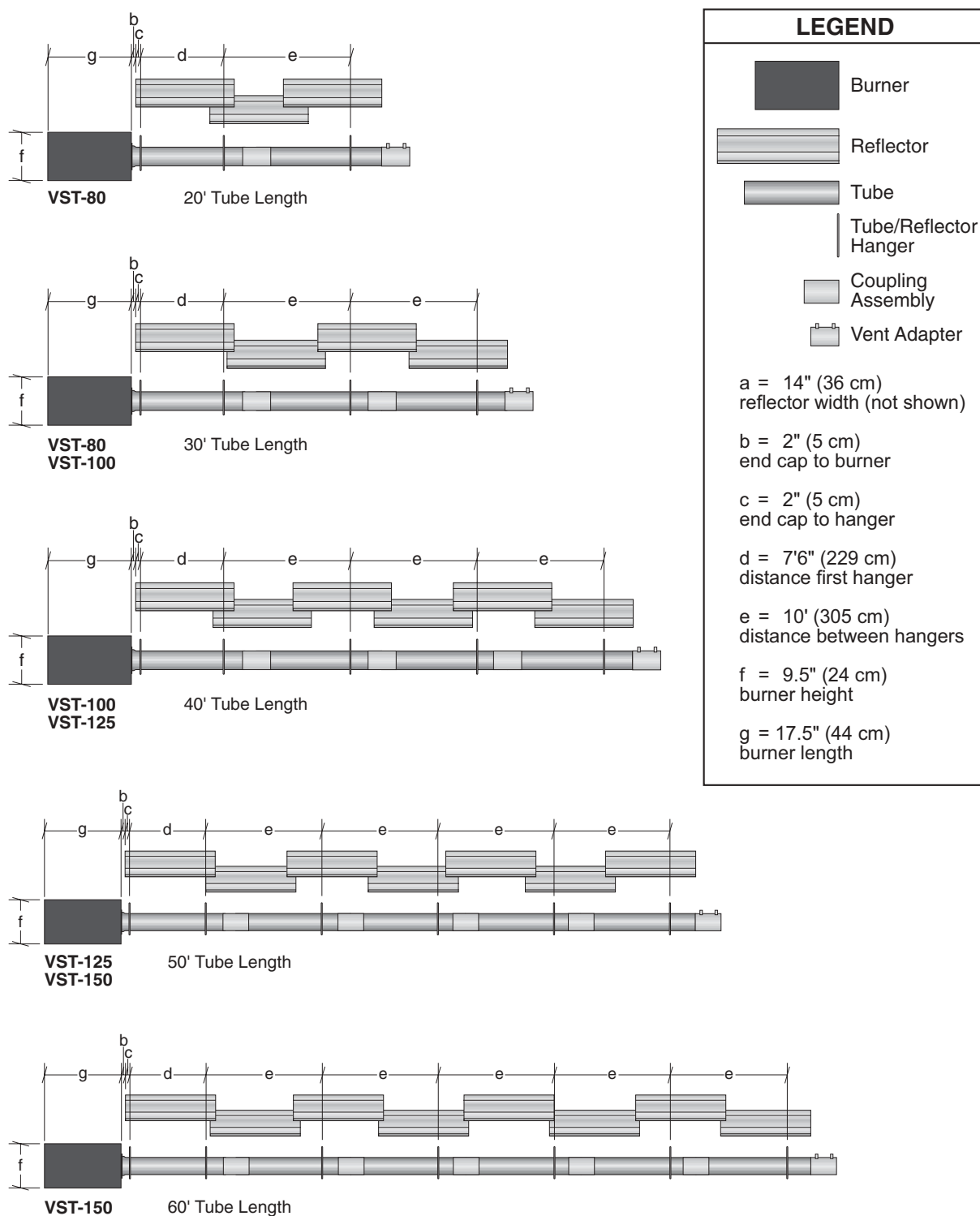
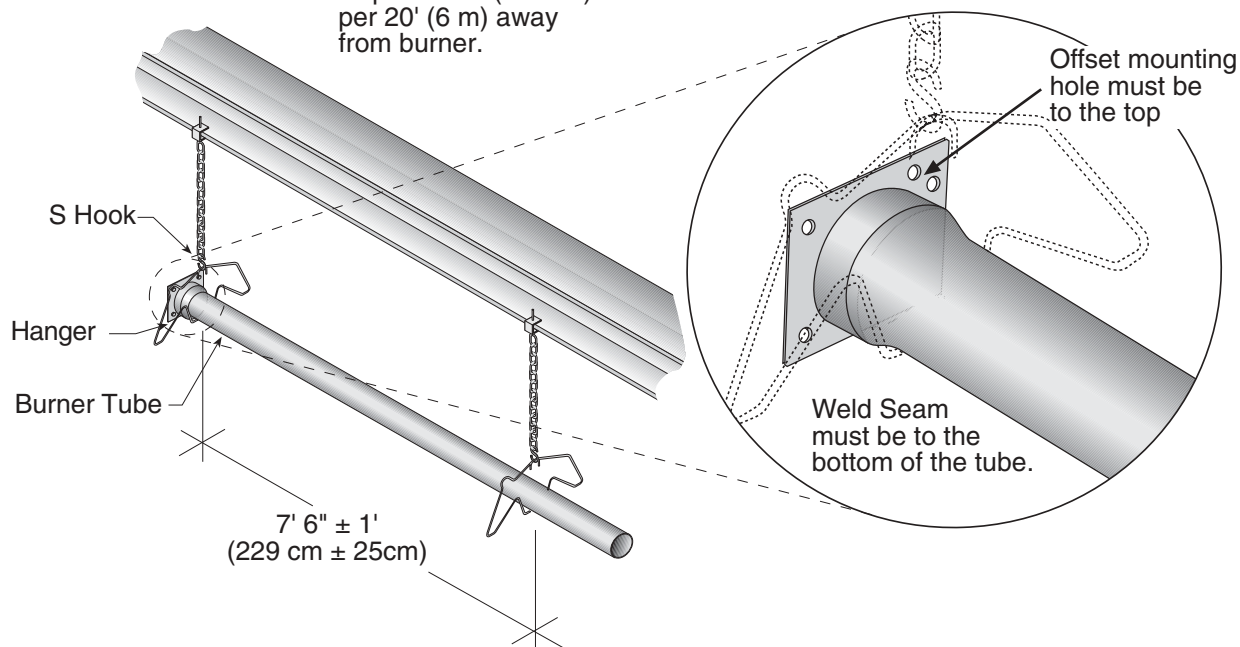


FIGURE 14: VST Linear Layout Overview

Step 6.1 Burner Tube Installation

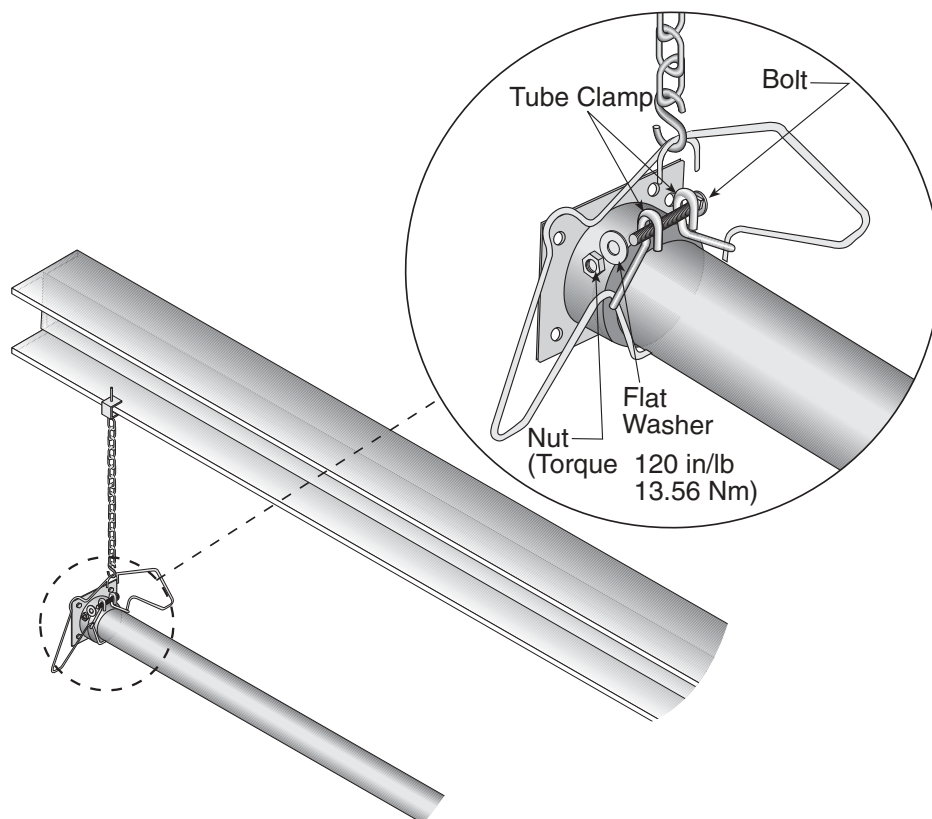
NOTE:

Tubing requires a downward slope of 1/2" (13 mm) per 20' (6 m) away from burner.

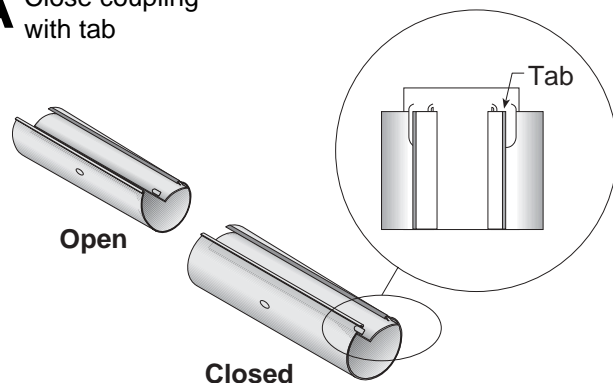
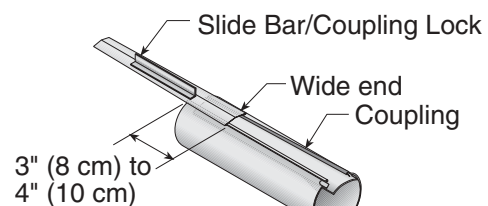
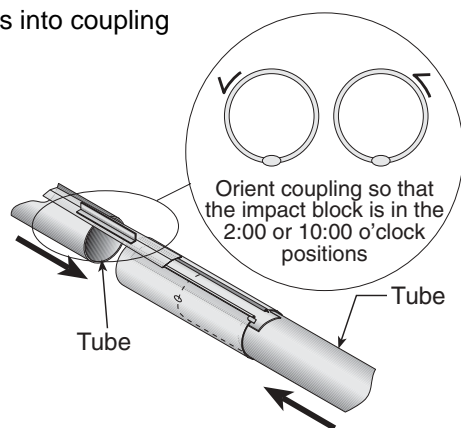
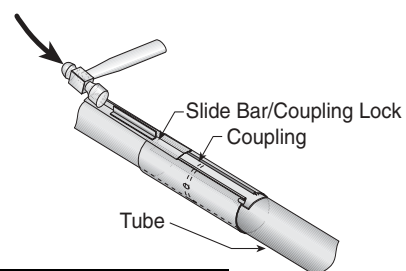


Description	Part Number
Burner Tube	03051XXX
S-Hook	91907302
Tube/Reflector Hanger	03090100

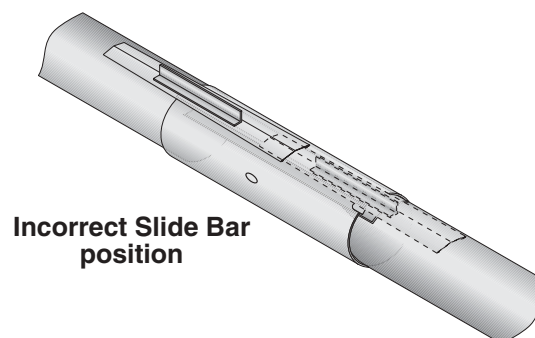
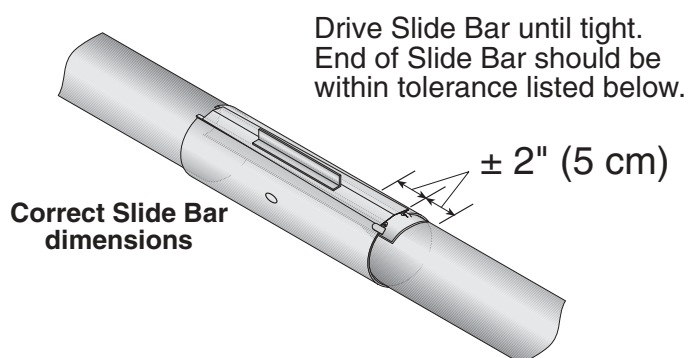
Step 6.2 Tube Clamp Package Installation



Description	Part Number
Tube Clamp Package	01318901
Tube Clamp	01396801
Bolt	97113940
Flat Washer	95211600
Nut	92113900

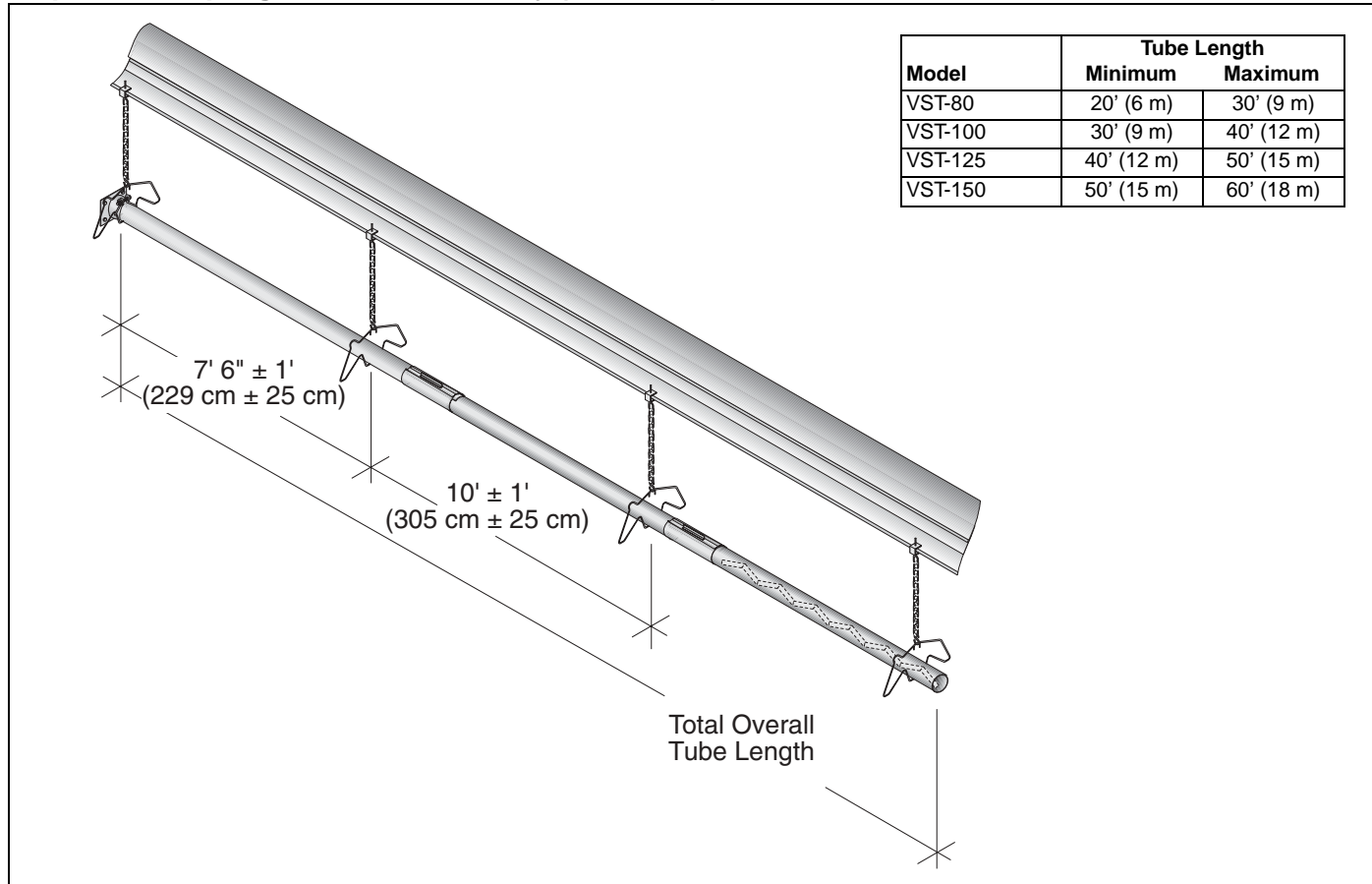
Step 6.3 Coupling and Tube Assembly**A** Close coupling with tab**B** Start Slide bar/Coupling Lock onto coupling**C** Insert tubes into coupling**D** Tighten coupling to join tubes

Description	Part Number
Coupling	01329600
Slide bar/Coupling Lock	01329700
Tube	91409XXX

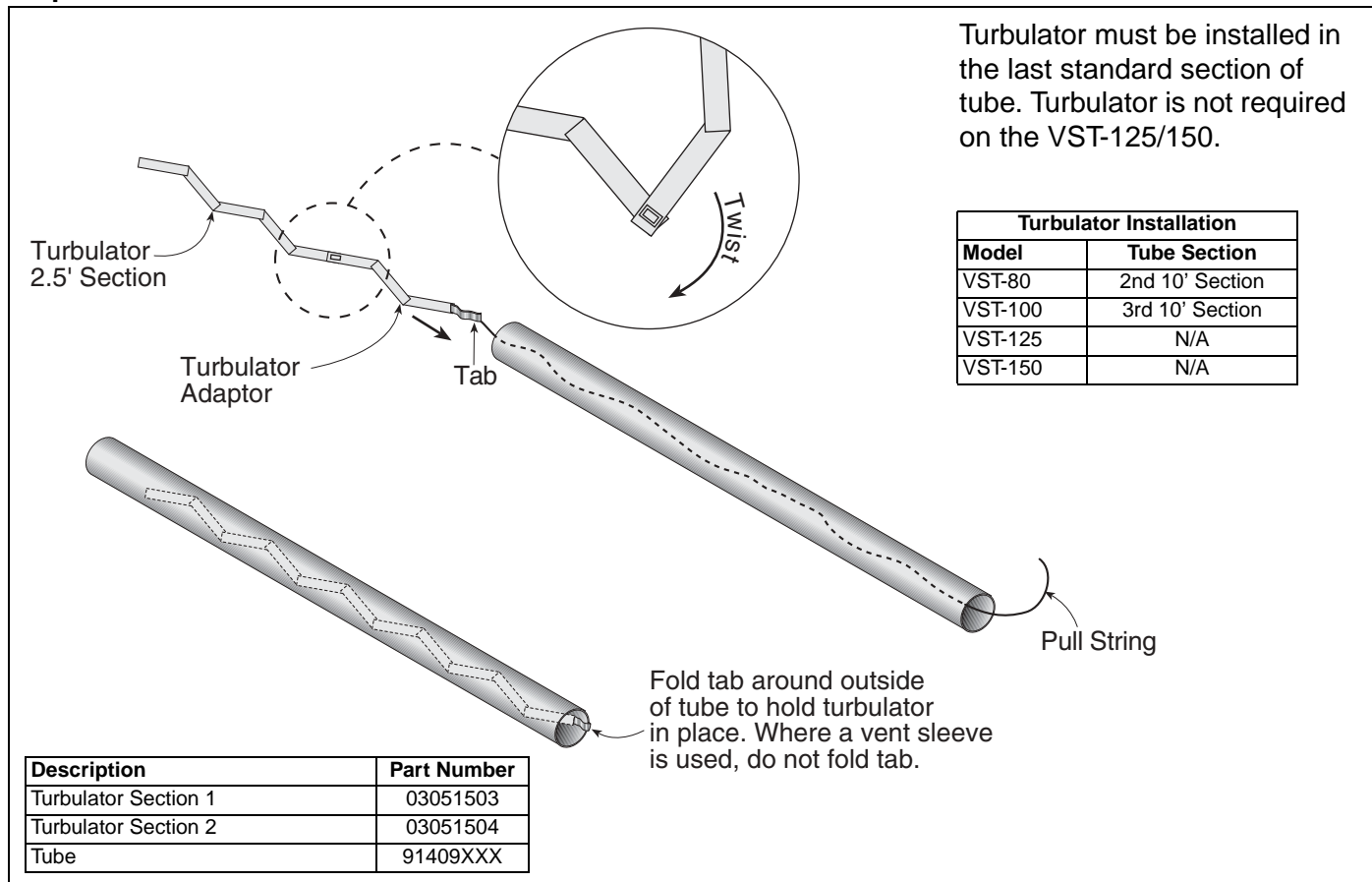
Step 6.3.1 Coupling and Tube Assembly (Continued)**Tighten slide bar as shown below**

- Repeat Step 6.3 A - D until all tubes are assembled, See Page 16, Section 6.3.2.

Step 6.3.2 Coupling and Tube Assembly (Continued)

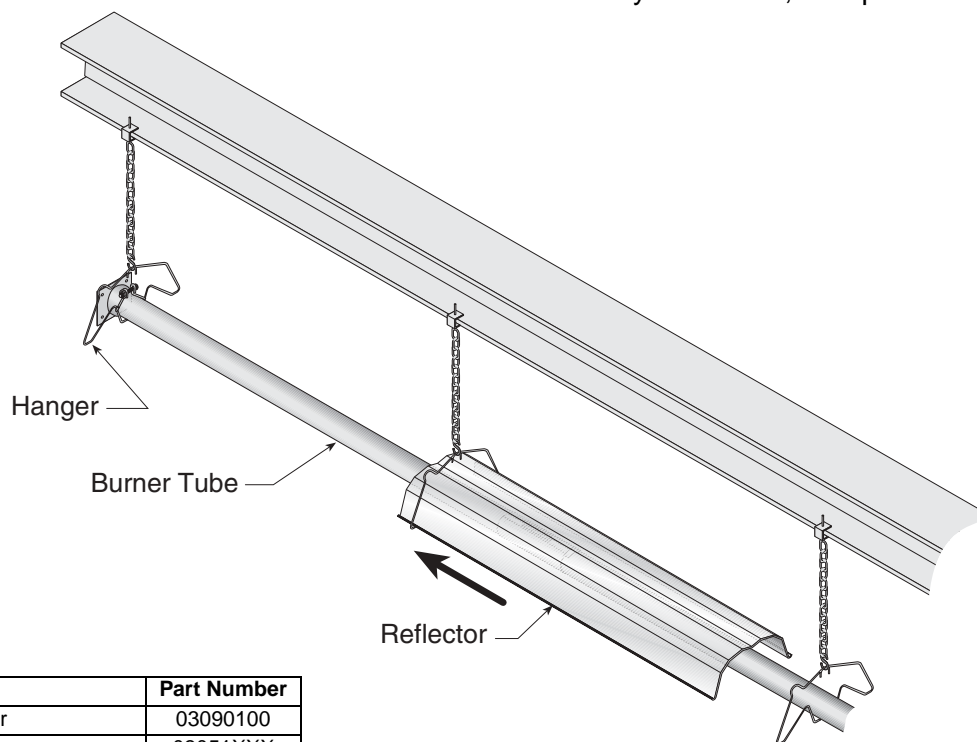


Step 6.4 Turbulator Installation



Step 6.5 Reflector Installation

NOTE: All tube surfaces must be covered by a reflector, except for a U-Tube.



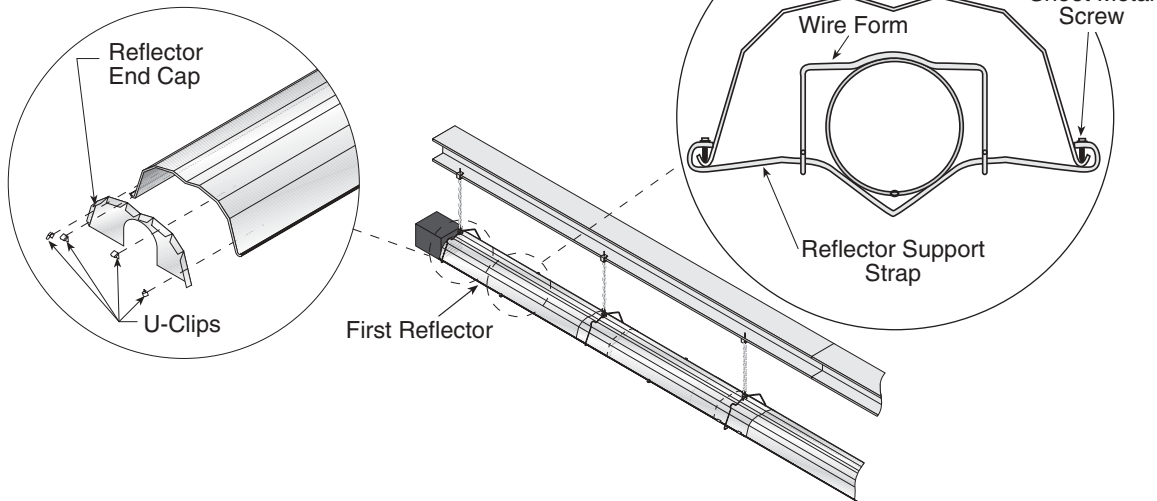
Description	Part Number
Tube/Reflector Hanger	03090100
Burner Tube	03051XXX
Reflector	02750303

Step 6.5.1 Reflector, U-Clip and Reflector Support Installation

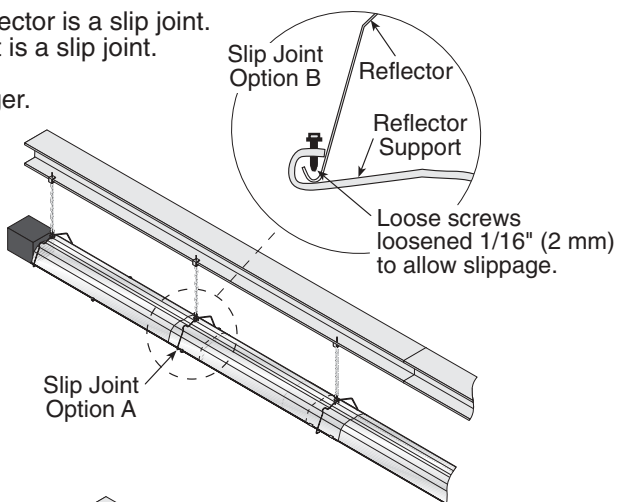
The pictorial drawings of the heater construction in *Section 6* are schematic only and provide a general guideline of where hangers, reflector supports and U-clips are to be installed.

To ensure proper expansion and contraction movement of the reflectors, a combination of U-clips and reflector supports are used. The positioning of reflector supports and U-clips depend on the individual installation. The following rules must be observed.

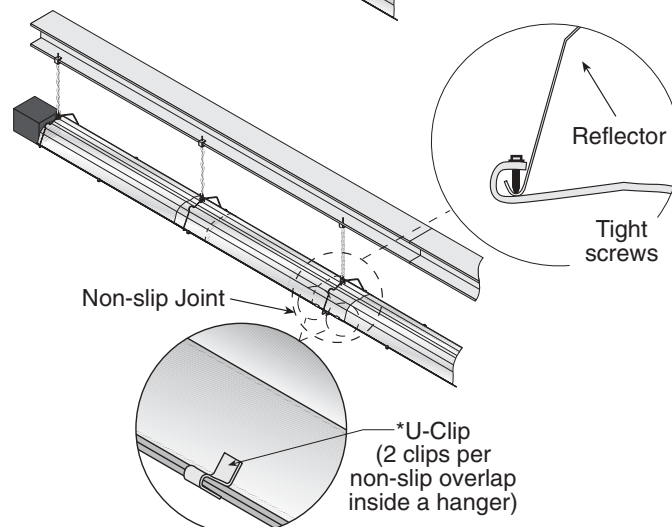
1. The first reflector after the burner must be affixed in the middle of the reflector with a reflector support and tight screws.



2. The joint at the first and second reflector is a slip joint. Thereafter, every third reflector joint is a slip joint. A slip joint is achieved by either:
 - a.) both reflectors lay inside a hanger. (no reflector support needed).
 - b.) using a reflector support with loose screws at the reflector overlap.

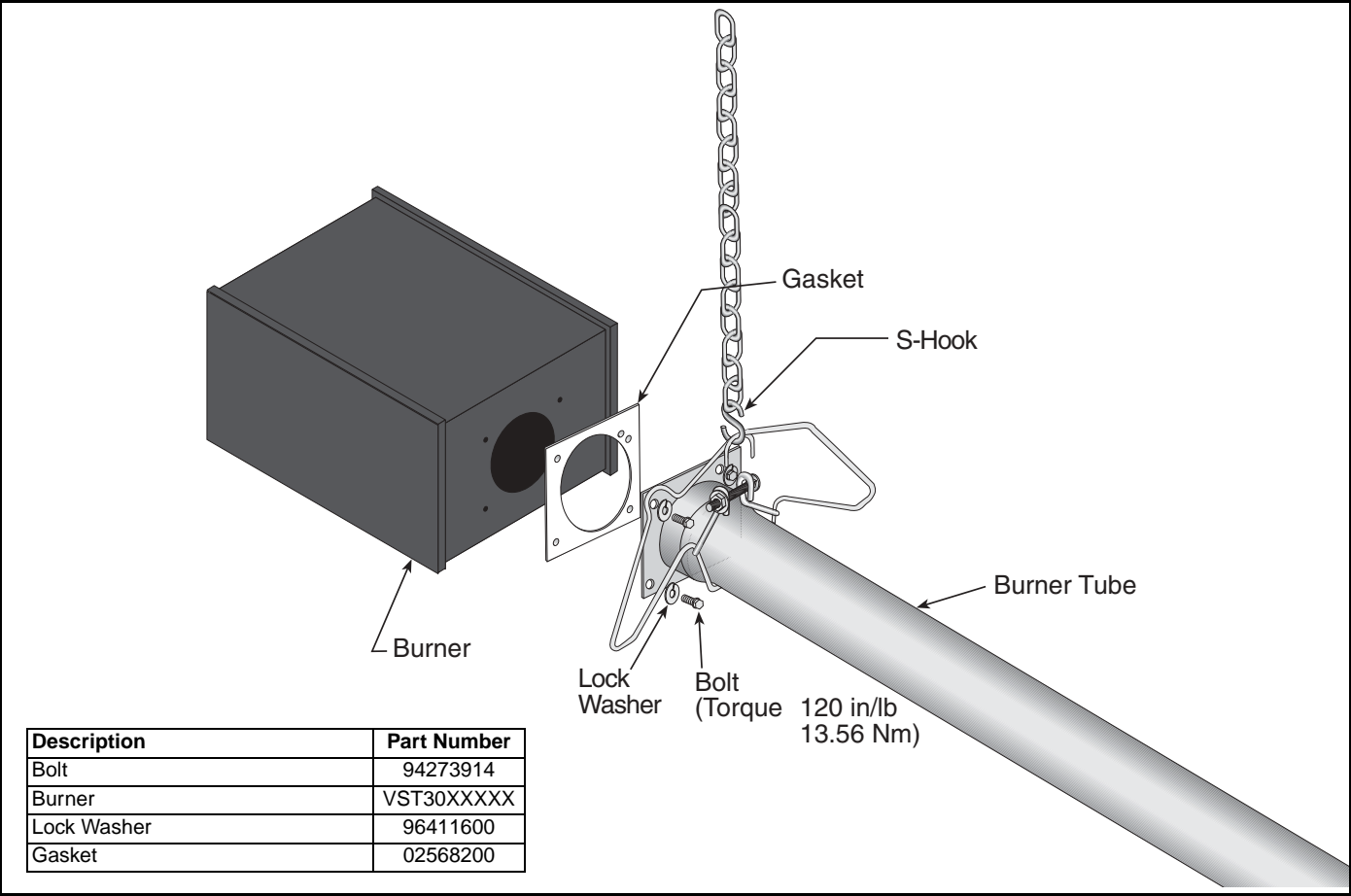


3. The remaining reflector overlaps require a non-slip joint connection. To affix the reflectors together in a non-slip overlap, use reflector supports and tight screws. *If both reflectors lay inside a hanger, U-clips or sheet metal screws may be used. This section of three reflectors joined together must be affixed to the tube with at least one reflector support with tight screws.



Description	Part Number
Reflector Support Package	03050010
Wire Form	91908004
Reflector Support Strap	03050000
Screw #8 x 3/4	94320812
U-Clip Package	91107720
Reflector End Cap	027508XX

Step 6.6 Burner Installation



SECTION 7: OPTIONAL HEATER ACCESSORIES

7.1 U-Tube Configuration

VST heaters are approved for optional U-Tube configurations.

The U-Tube may be installed in either a standard horizontal position, a full 45° position or in an opposite 45° position as shown on *Page 5, Figure 5 through Figure 7*. When using a U-Tube configuration, the following additional rules must be adhered to:

- A minimum of 10' (3 m) on VST-80 and a minimum of 15' (4.5 m) on VST-100/125/150 is required between the burner and the U-Tube.
- The correct turbulator (See *Page 16, Figure 6.4*) must be installed in the last standard section of tube.
- The burner must never be operated in a tilted position.
- The heater must be properly supported at all locations. See *Page 21, Figure 16*.

FIGURE 15: VST U-Tube Assembly Overview

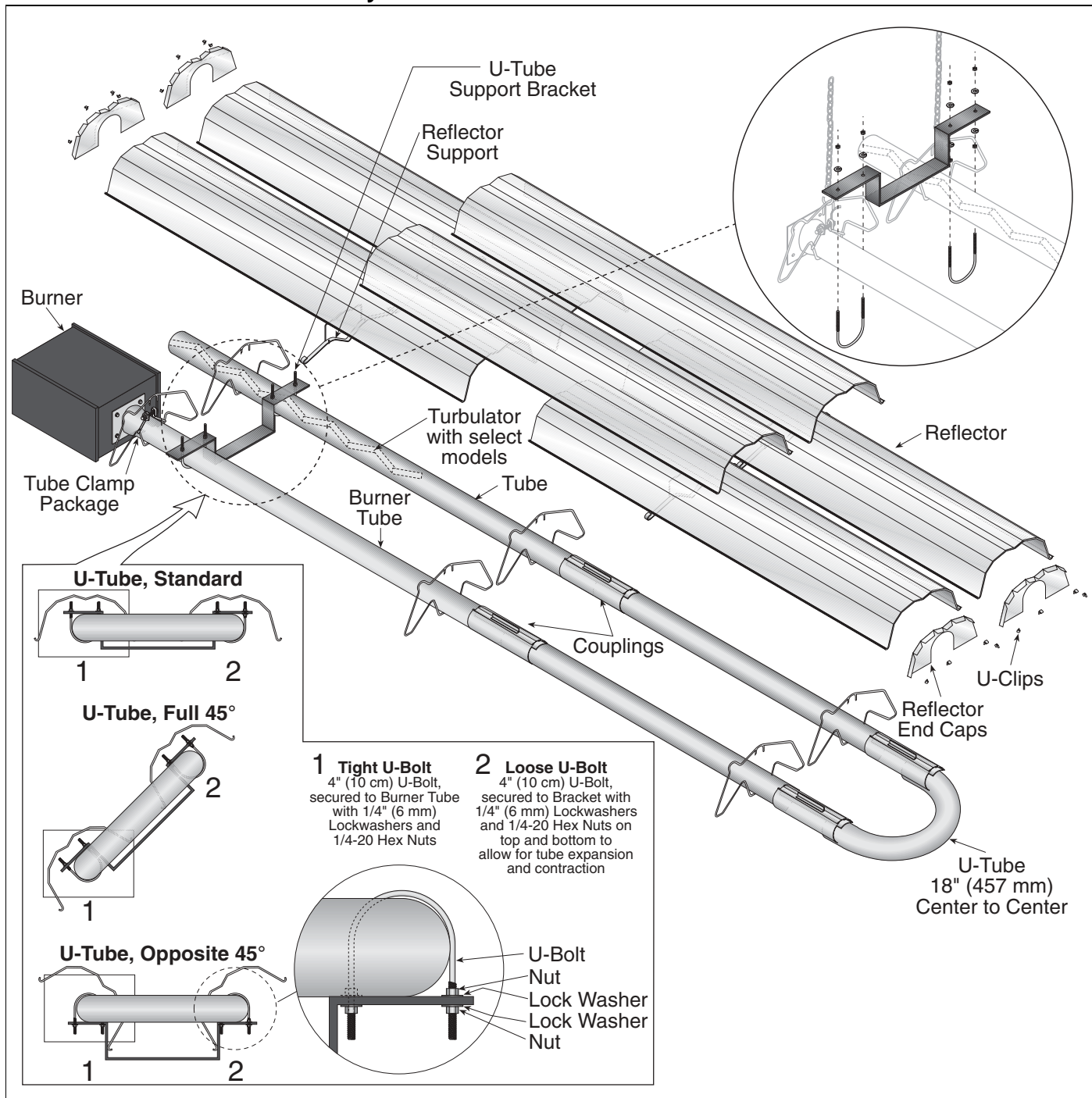
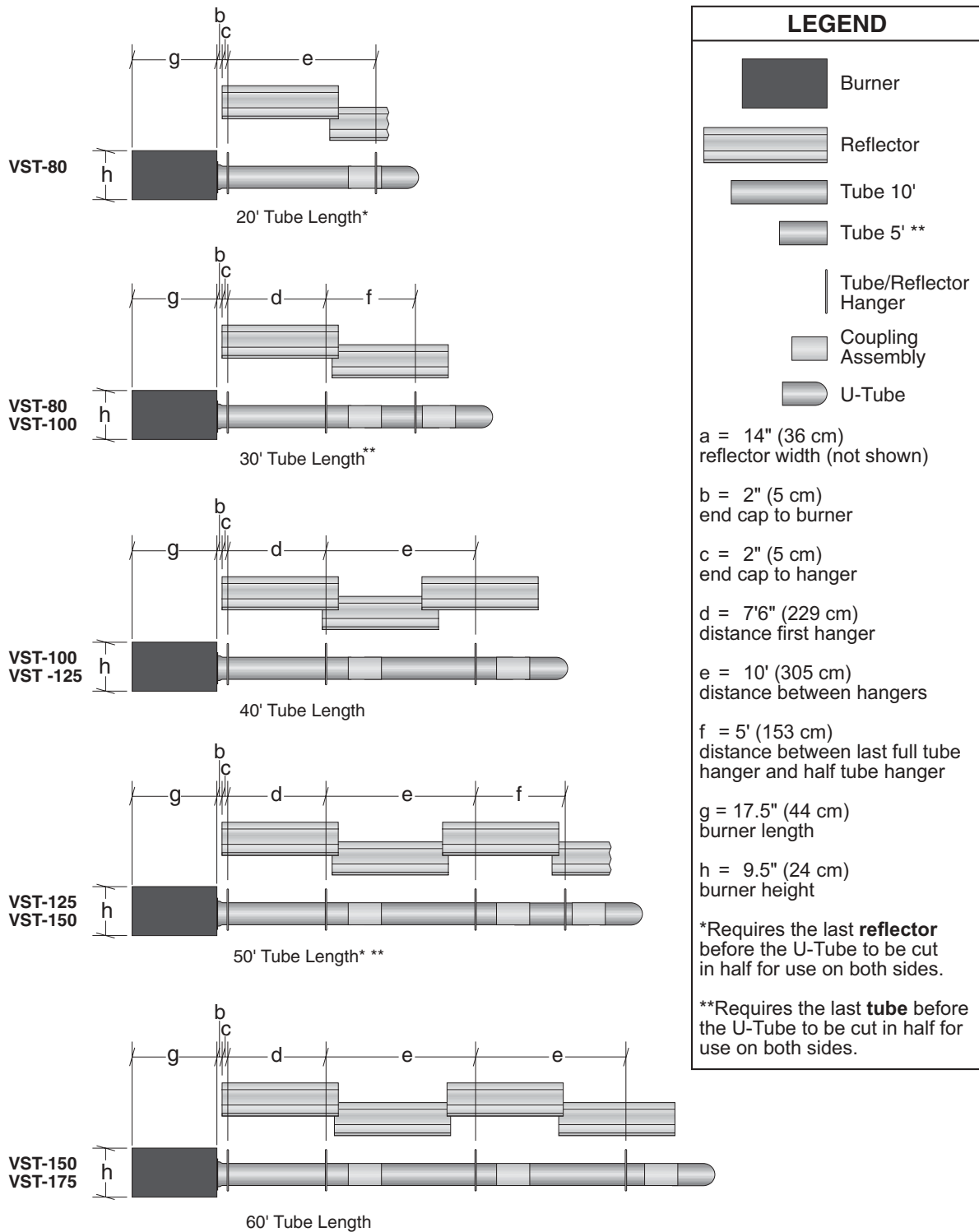
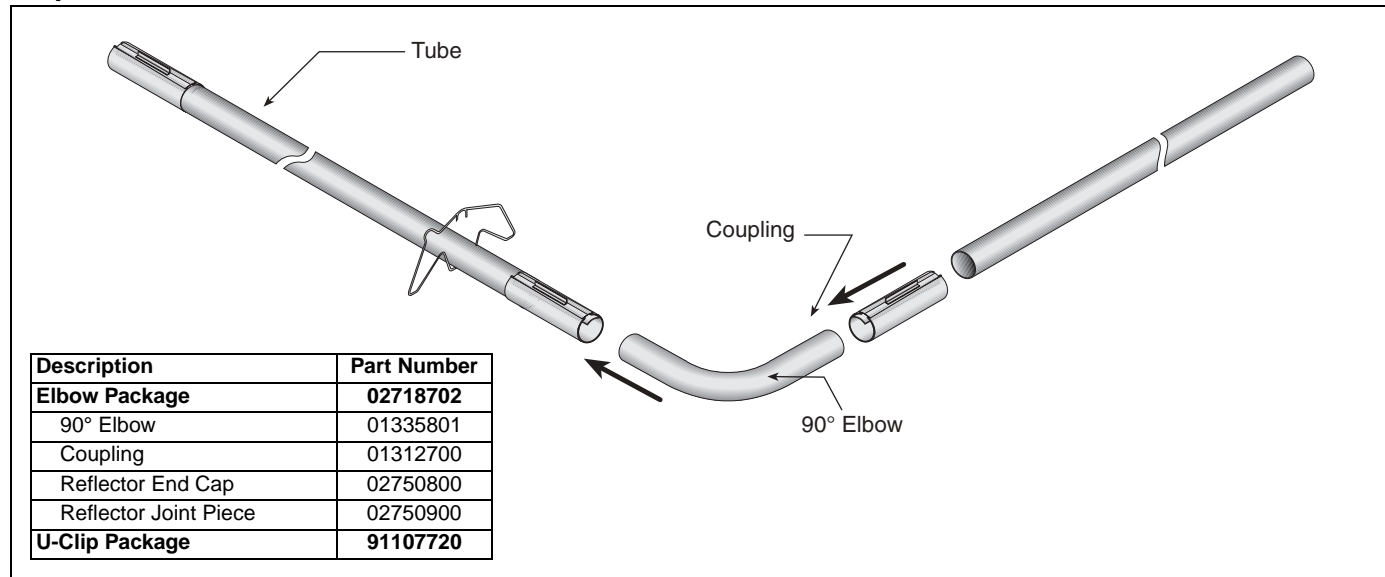


FIGURE 16: VST U-Tube Layout Overviews

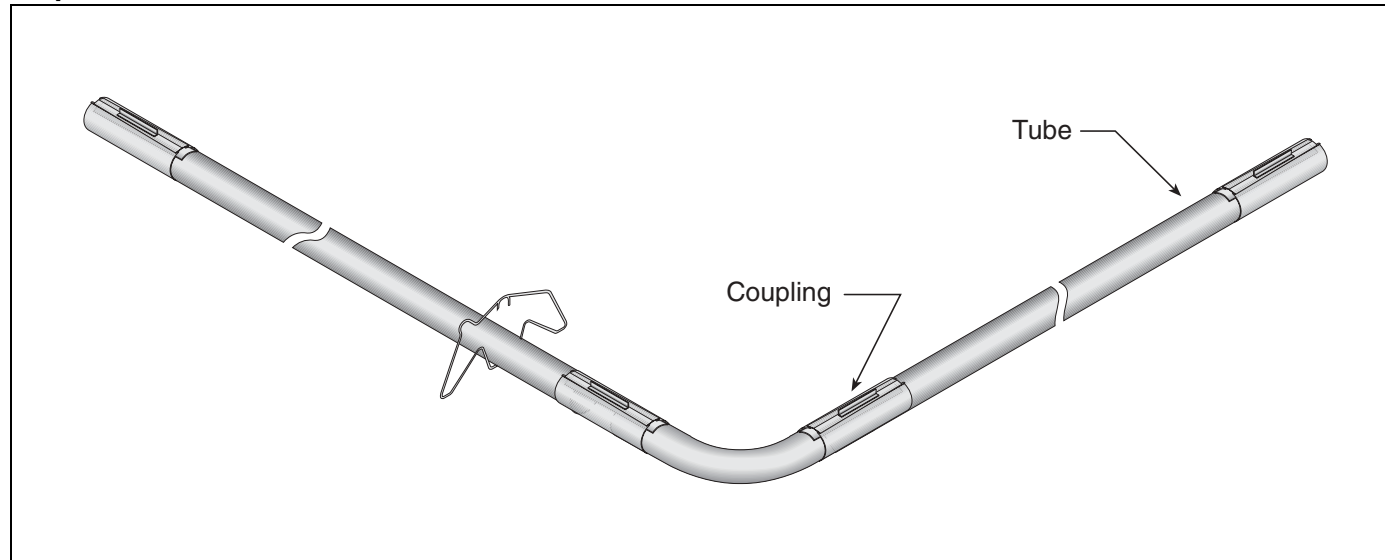


7.2 Elbow Package Configuration

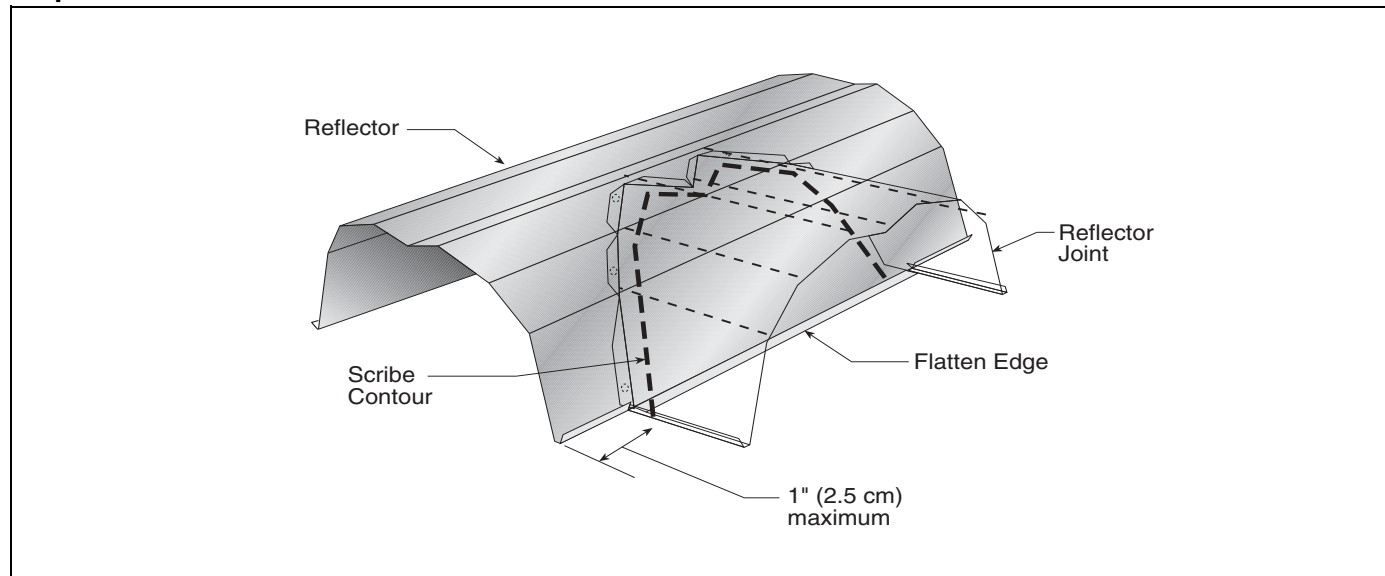
Step 7.2.1 Elbow Installation

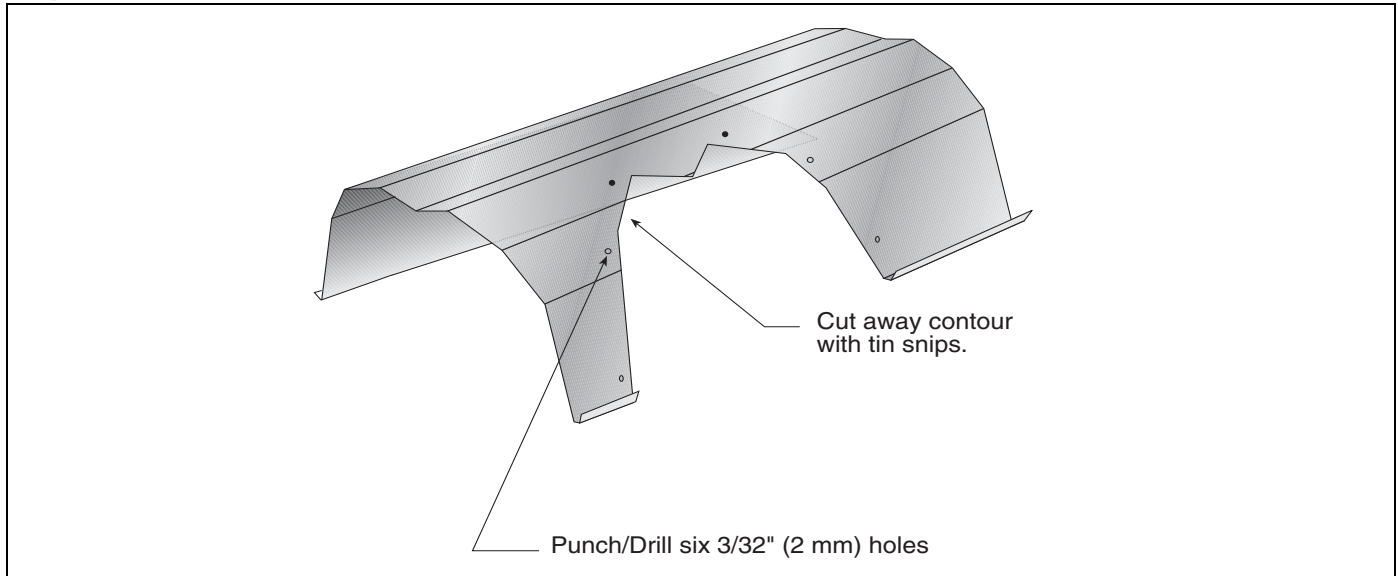
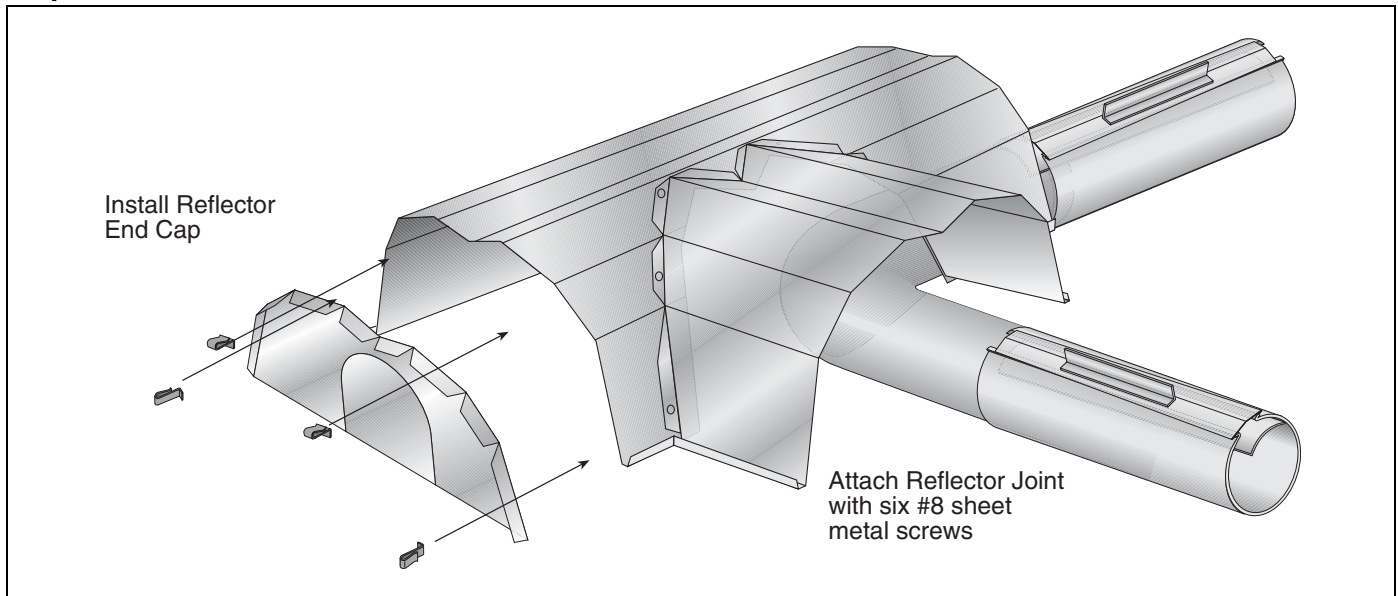
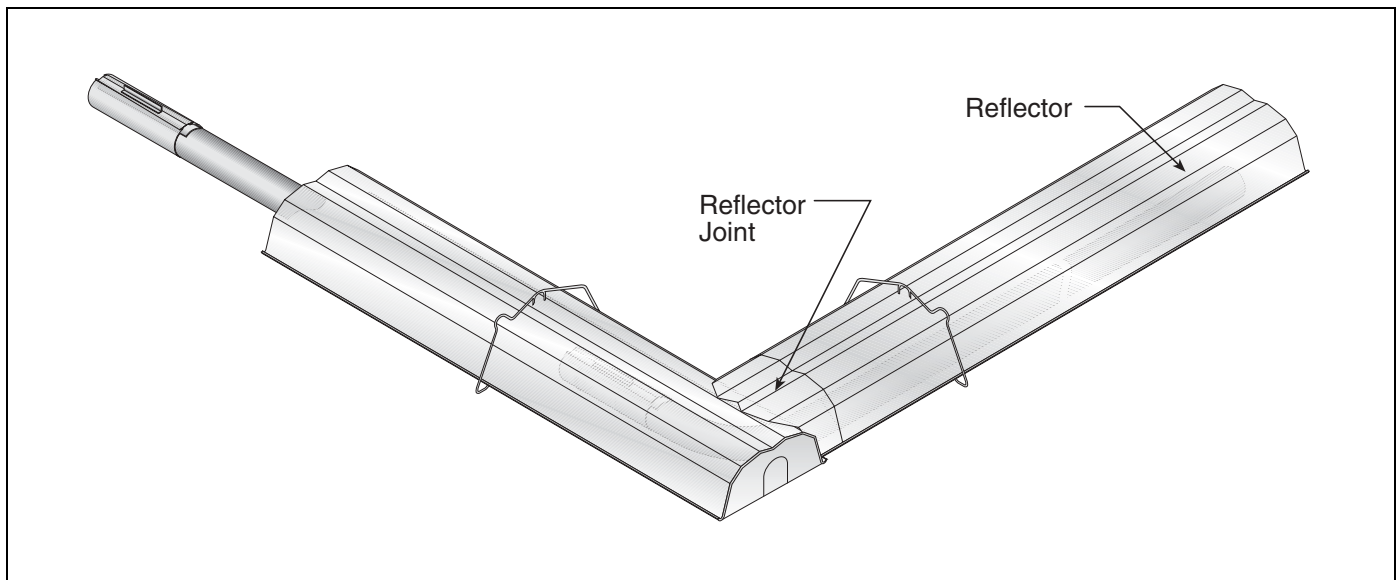


Step 7.2.2 Elbow Installation



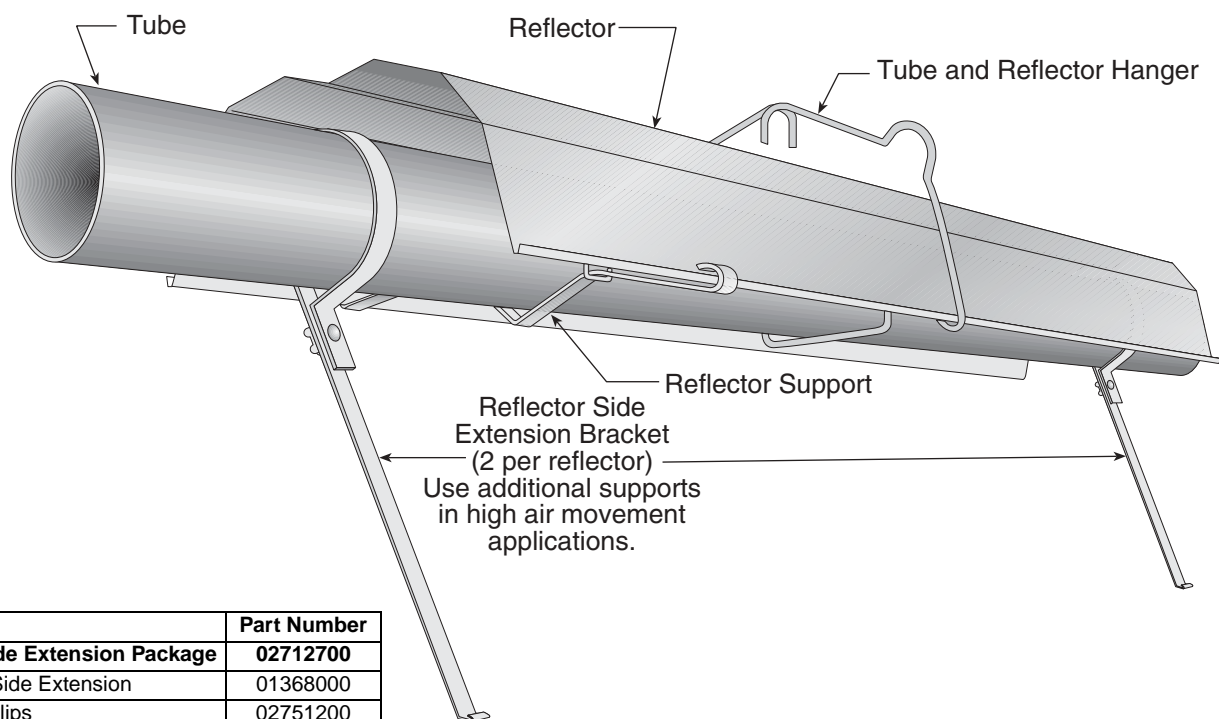
Step 7.2.3 Reflector Joint Installation



Step 7.2.4 Reflector Joint Installation**Step 7.2.5 Reflector Joint Detail****FIGURE 17: Reflector Joint Detail**

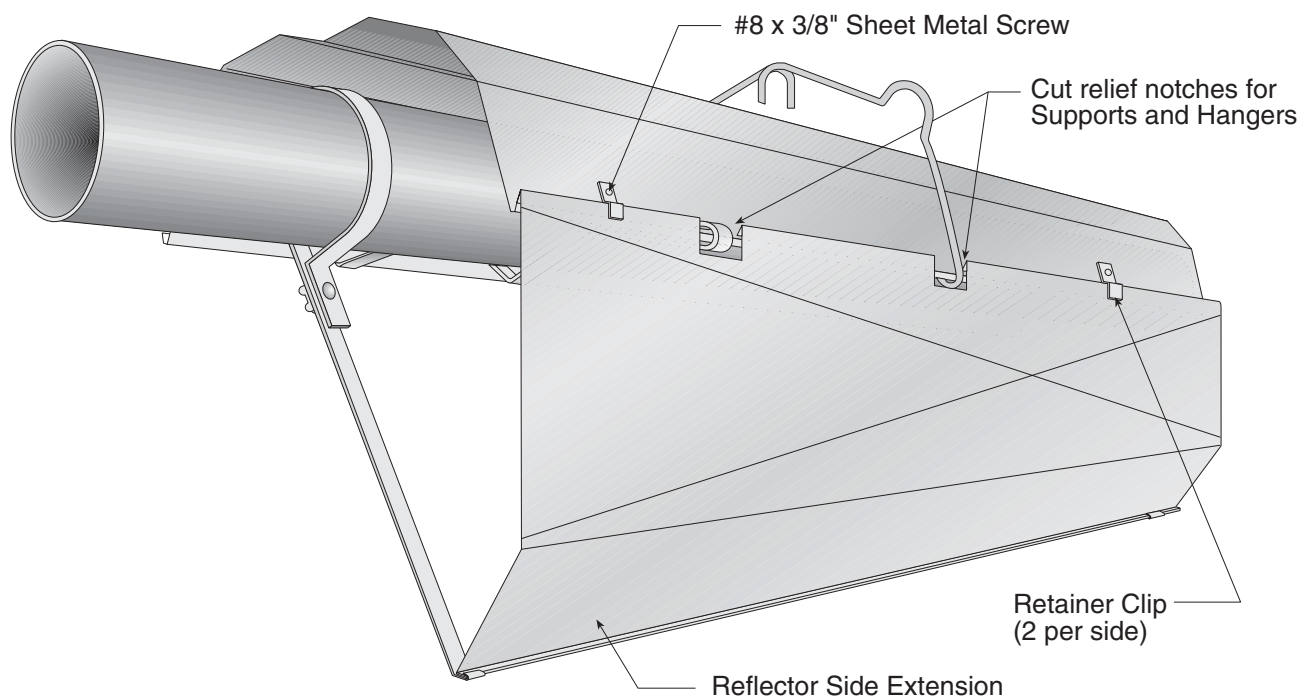
7.3 Reflector Side Extension

Step 7.3.1 Bracket Installation



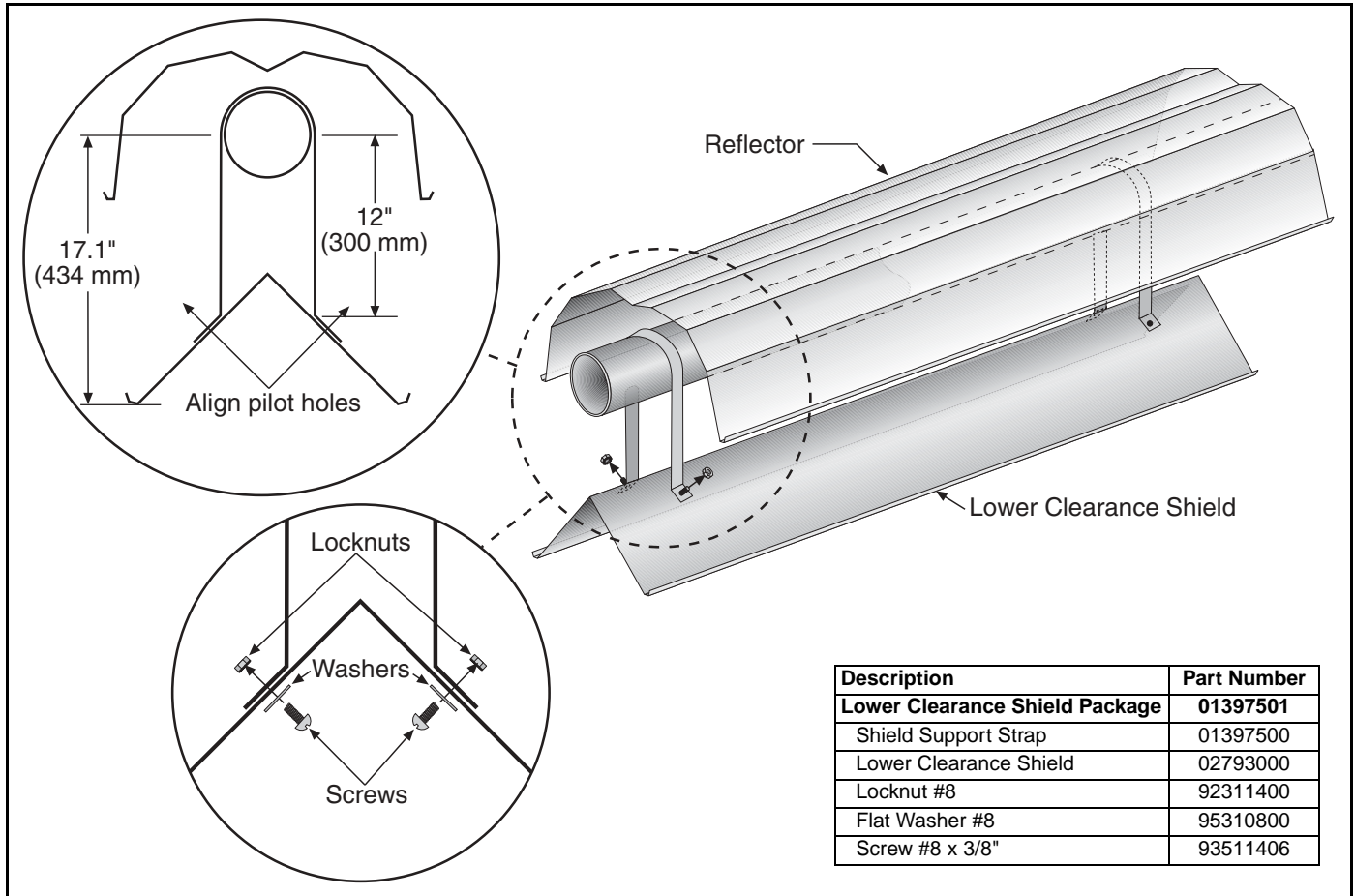
Description	Part Number
Reflector Side Extension Package	02712700
Reflector Side Extension	01368000
Retainer Clips	02751200
Sheet Metal Screws	94118106
Order Separately	
Reflector Side Extension	01329910

Step 7.3.2 Side Reflector Installation



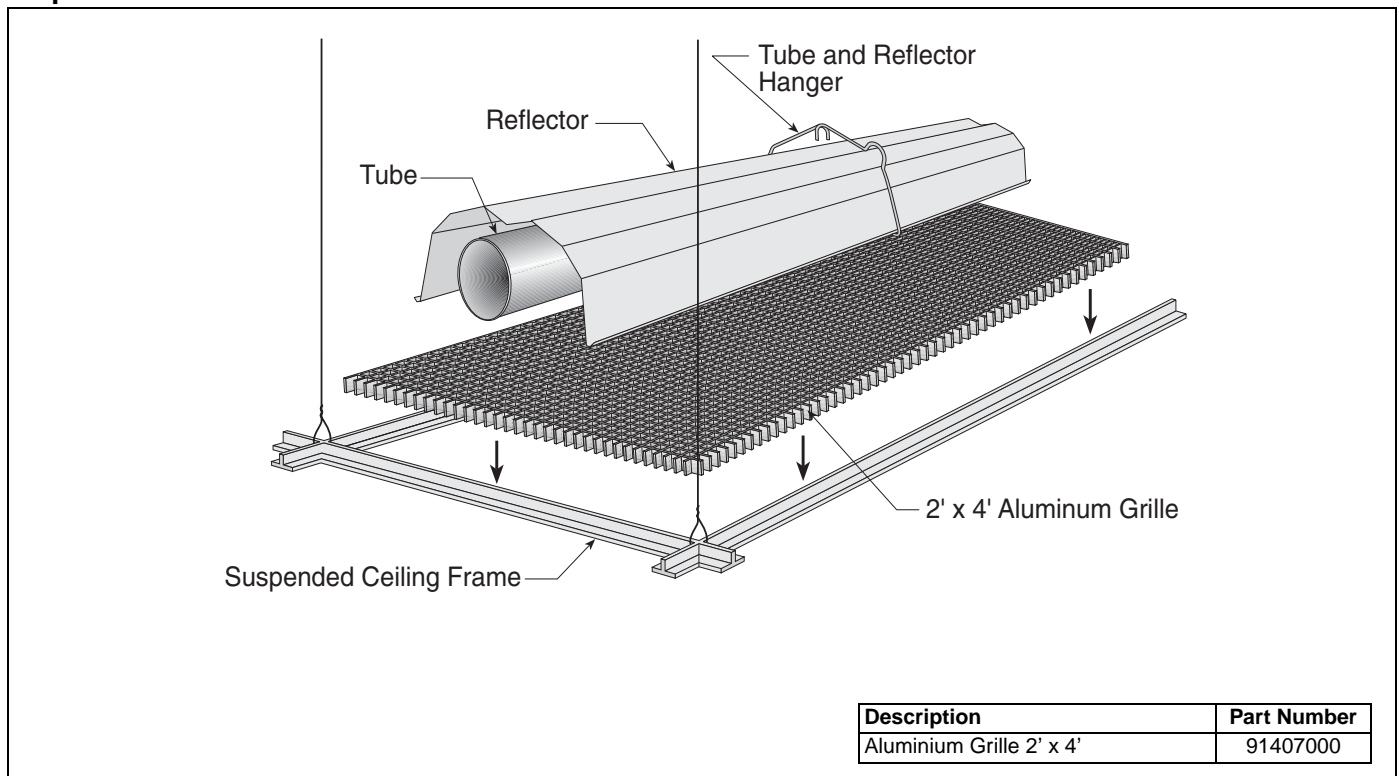
7.4 Lower Clearance Shield Installation

Step 7.4.1 Shield Support Strap Assembly

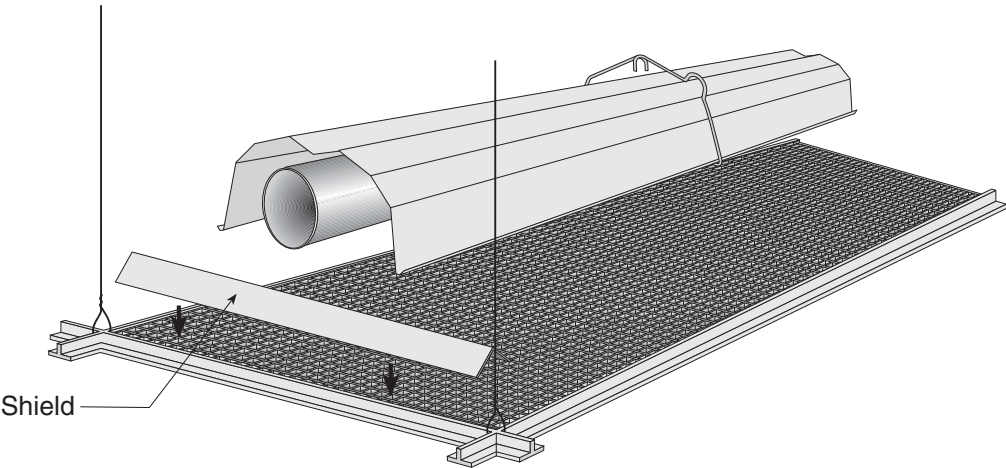


7.5 Two-Foot Decorative Grille Installation

Step 7.5.1 Grille Installation



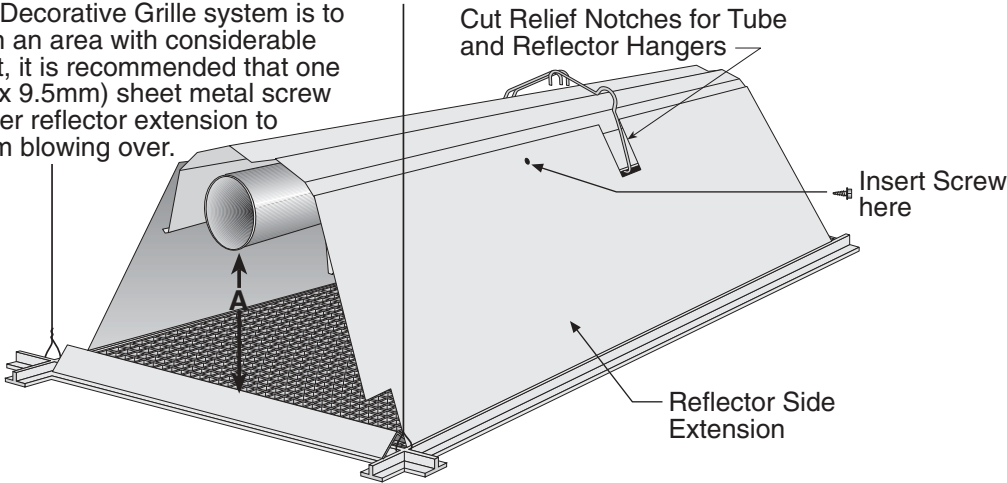
Step 7.5.2 Frame Shield Installation



Description	Part Number
Deco Grille Shield	01365900

Step 7.5.3 Reflector Side Extension Installation for Decorative Grilles

NOTE: If the Decorative Grille system is to be installed in an area with considerable air movement, it is recommended that one #8 x 3/8 (3.9 x 9.5mm) sheet metal screw be installed per reflector extension to prevent it from blowing over.

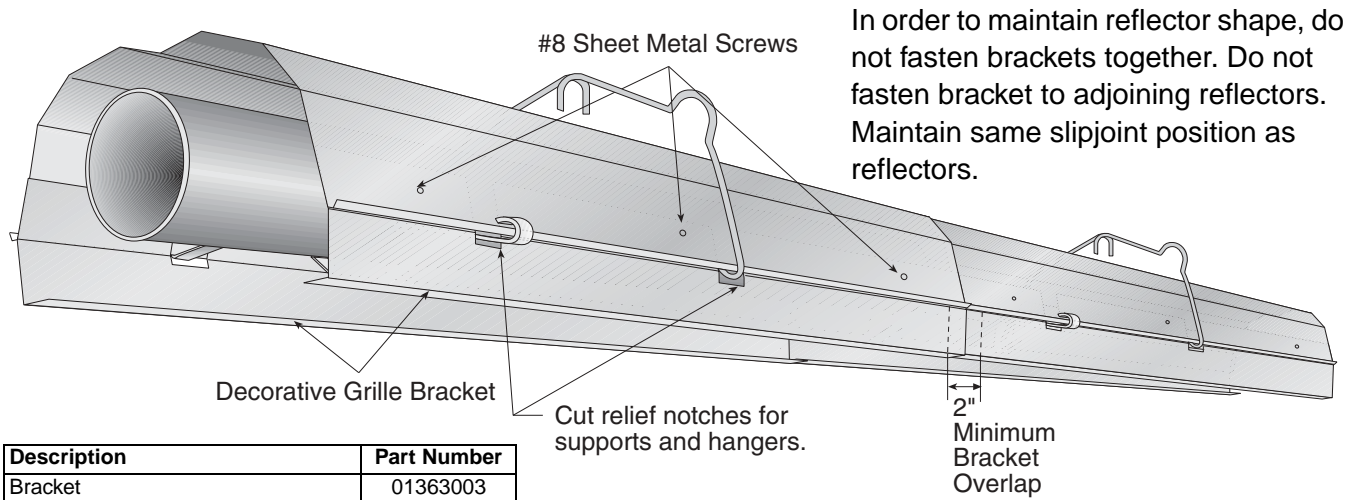


Distance "A"		Extension	
Minimum	Maximum	Part No.	Width
2" (4 cm)	6" (15 cm)	01370408	8" (20 cm)
6" (15 cm)	10" (26 cm)	01370412	12" (30 cm)
10" (26 cm)	14" (37 cm)	01370416	16" (40 cm)

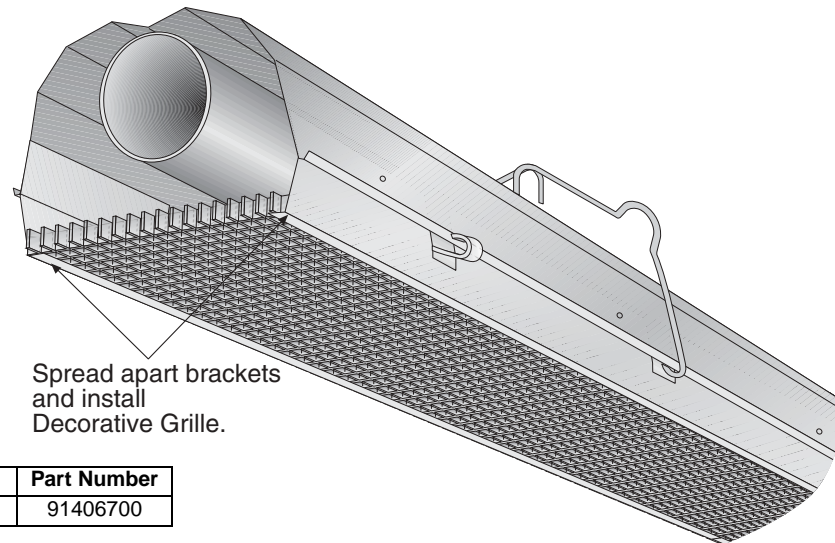
Description	Part Number
Reflector Side Extension	01370412

7.6 One-Foot Decorative Grille Installation

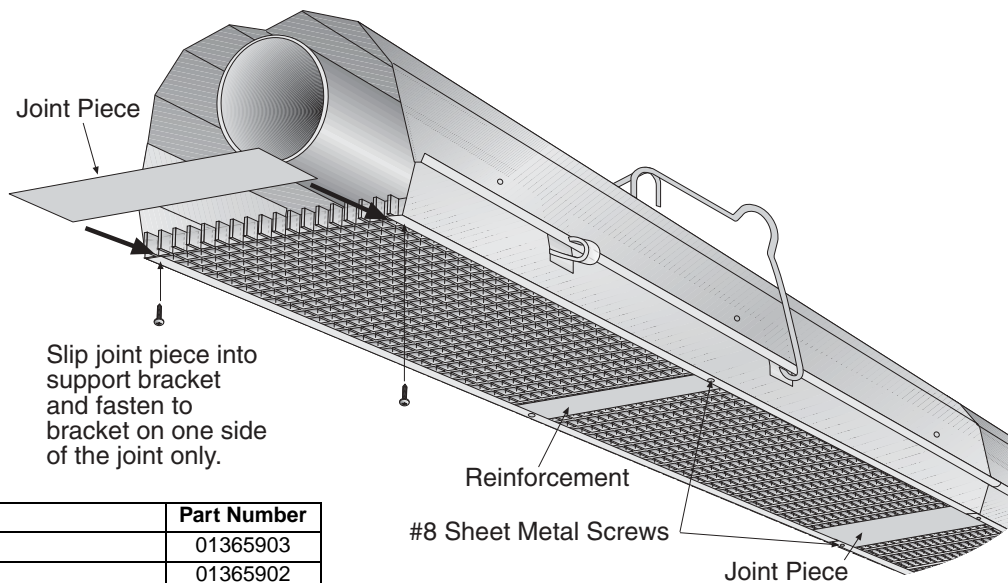
Step 7.6.1 One-Foot Decorative Grille Bracket



Step 7.6.2 Decorative Grille



Step 7.6.3 Joint Piece and Reinforcement



Step 7.6.4 End Piece and Reflector End Cap

Reflector End Cap

End Piece

Insert end piece between grille and brackets.

Fasten end piece to brackets using two #8 sheet metal screws and replace reflector end cap.

Description	Part Number
End Piece	01365901

Step 7.6.5 90° Elbow

Inside Corner

Grille Brackets

Joint Piece

Decorative Grille Brackets

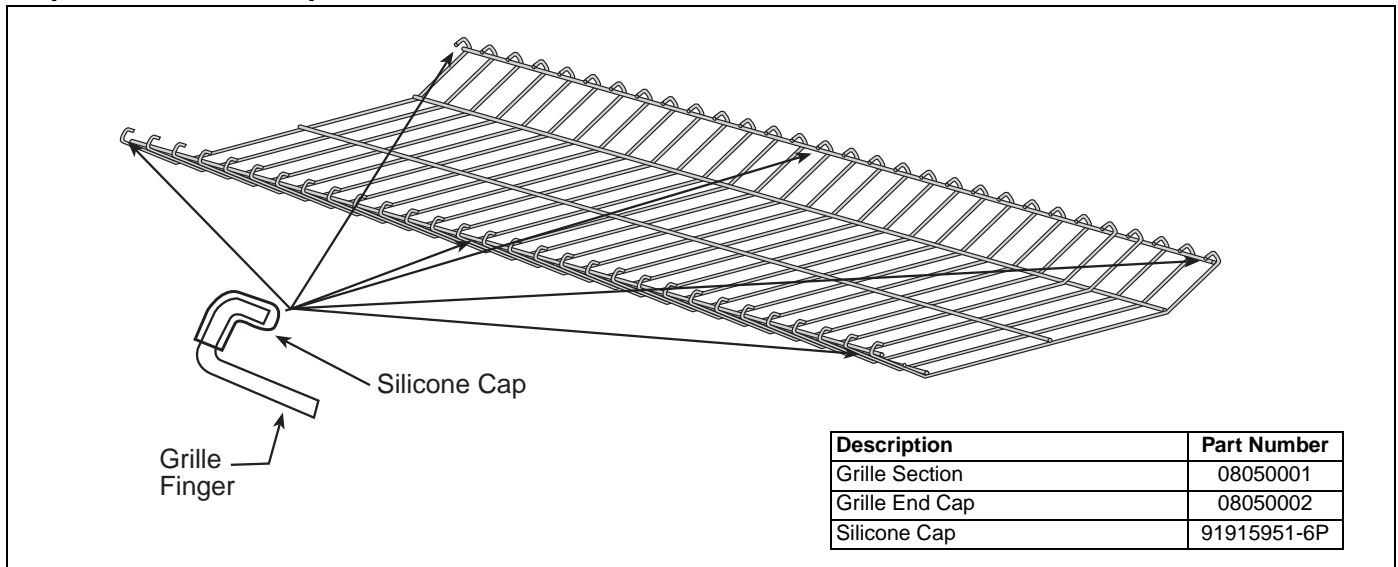
Cut grille bracket at reflector joint piece.

Joint Piece

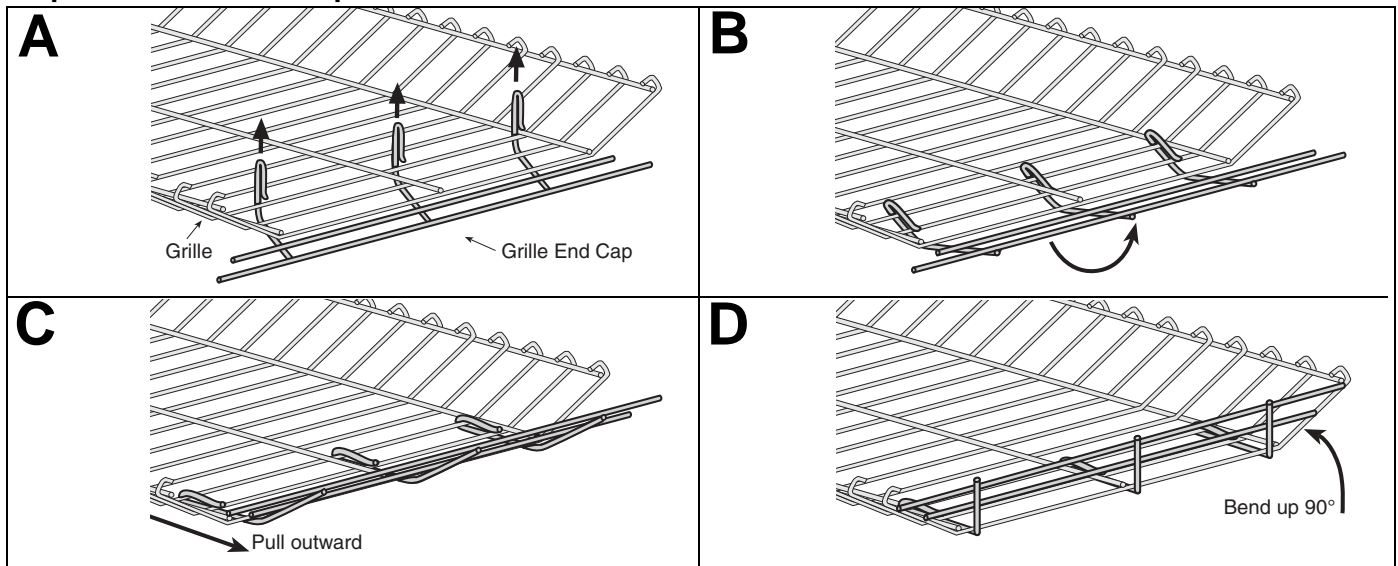
Insert End Piece between grille and brackets.

7.7 Protective Grille Installation

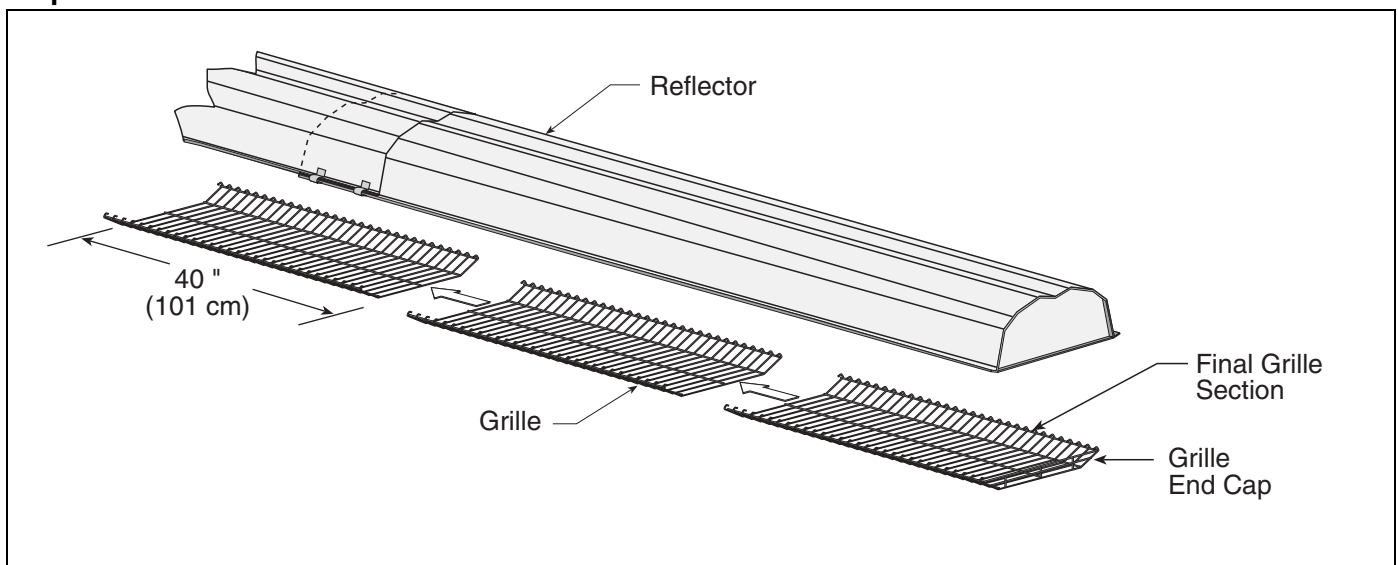
Step 7.7.1 Silicone Cap Installation




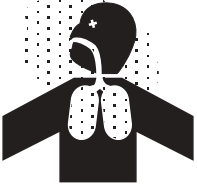
Step 7.7.2 Grille End Cap Installation



Step 7.7.3 Grille Installation



SECTION 8: VENTING

 WARNING	
	Carbon Monoxide Hazard
	Heaters installed unvented must be interlocked with sufficient building exhaust.
	Heaters must be installed according to the installation manual.
	Failure to follow these instructions can result in death or injury.

8.1 General Venting Requirements

This heater must be vented in accordance with the rules contained in this manual and with the following national codes and any local codes which may apply:

United States: Refer to ANSI Z223.1 - latest revision

Canada: Refer to CAN/CGA-B149.1 and B149.2

In brooder installations, affix Brooder Ventilation Wall Tag (P/N 91039300) adjacent to the heater thermostat. In the absence of a thermostat, the wall tag must be posted in a conspicuous location.

Exhaust end of heater will accept a 4" (10 cm) vent pipe using the vent adapter (P/N 90502700). To prevent leakage of condensation, install the vent adapter with the seam on top and seal the joint using a high temperature silicone sealant.

Any portion of vent pipe passing through a combustible wall or roof must be dual insulated (Type B) vent pipe and have an approved thimble (P/N 90505600) to conform with the above listed codes.

Vent pipe must be sloped downward away from the burner, 1/2" (1 cm) in 20' (6 m).

The VST heater may be individually vented or common vented. When venting horizontally, a maximum of two heaters can be commonly vented. *See Page 32, Section 8.4.* When vertically venting, a maximum of four heaters can be commonly vented. *See Page 33, Section 8.5.*

The heater may also be installed unvented in certain circumstances according to building ventilation codes. Refer to the above codes for further information. Unvented operation also requires compliance with the clearances to combustibles given on *Page 6, Figure 10.*

Vent must be at least 6' (2 m) from the combustion air opening of this unit, or any other appliance. Secure all joints with #8 x 3/8 sheet metal screws. Seal all joints with high temperature silicone sealant. Vent terminal must be beyond any combustible overhang.

8.1.1 Unvented Operation

Sufficient ventilation must be provided in the amount of 4 cfm per 1000 BTU/hr firing rate (United States); 3 cfm per 1000 BTU/hr firing rate (Canada).

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.

For additional information:

- United States: refer to ANSI Z223.1 (NFPA 54) - latest revision and local codes.
- Canada: CAN/CGA-B149.1 and B149.2 Installation codes - latest revision.

8.1.2 Horizontal Venting

In noncombustible walls only, vent terminal (P/N 02537801-1P) may be used.

For 4" (10 cm) vents in either combustible or noncombustible walls, use P/N 90502100 (Tjernlund VH1-4) or equivalent, insulated vent terminal. Follow the manufacturer's instructions for proper installation.

For 6" (15 cm) common vents in either combustible or noncombustible walls, use P/N 90502101 (Tjernlund VH1-6) or equivalent, insulated vent terminal. Follow the manufacturer's instructions for proper installation.

8.1.3 Vertical Venting

For 4" (10 cm), an approved vent cap (P/N 90502300) must be used.

For 6" (15 cm) common vent, an approved vent cap (P/N 90502302) must be used.

For common vertical venting of more than two heaters. *See Page 33, Section 8.5.*

8.1.4 United States Requirements

Vent terminal must be installed at a height sufficient to prevent blockage by snow, and building materials protected from degradation by flue gasses.

Vent must exit a building not less than 7' (2 m) above grade when located adjacent to public walkways.

Vent must terminate at least 3' (1 m) above any forced air inlet located within 10' (3 m).

Vent must terminate at least 4' (1.3 m) below, 4' (1.3 m) horizontally from, or 1' (.3 m) above any door, window, or gravity inlet into any building.

Vent terminal shall be located at least 1' (.3 m) from any opening through which vent gasses could enter a building.

8.1.5 Canadian Requirements

Vent terminal must not be installed less than 3' (1 m) from any building opening and at least 3' (1 m) above grade. Vent must be at least 6' (2 m) from the combustion air opening of this unit or any other appliance.

8.1.6 Length Requirements

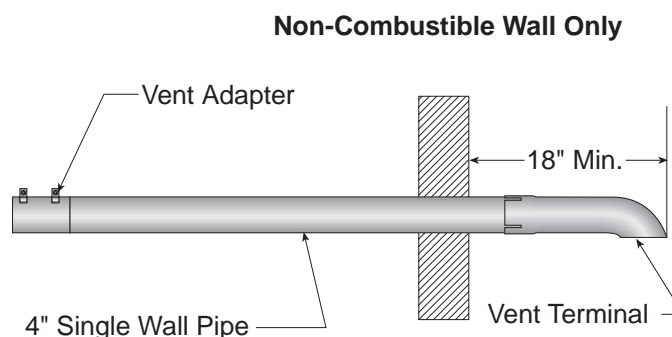
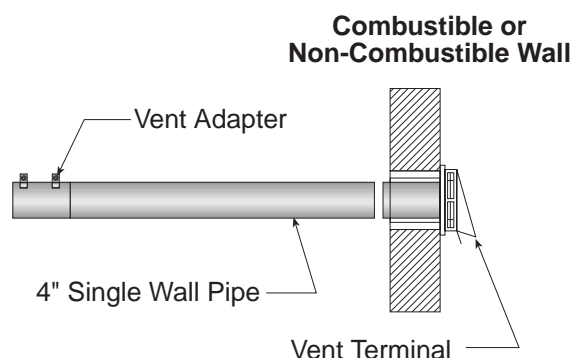
The maximum vent length allowed is 45' (13.7 m).
The maximum outside air supply duct length allowed is 45' (13.7 m).

Vent length should be limited to less than 20' (6 m). If using vent lengths greater than 20' (6 m), condensation will form in the vent pipe. Insulation and additional sealing measures will be required. Optional heat exchanger lengths are considered as vent length for length determination.

The total vent length, plus outside air duct length, plus any extensions to minimum heat exchanger lengths, cannot exceed 65' (19.8 m).

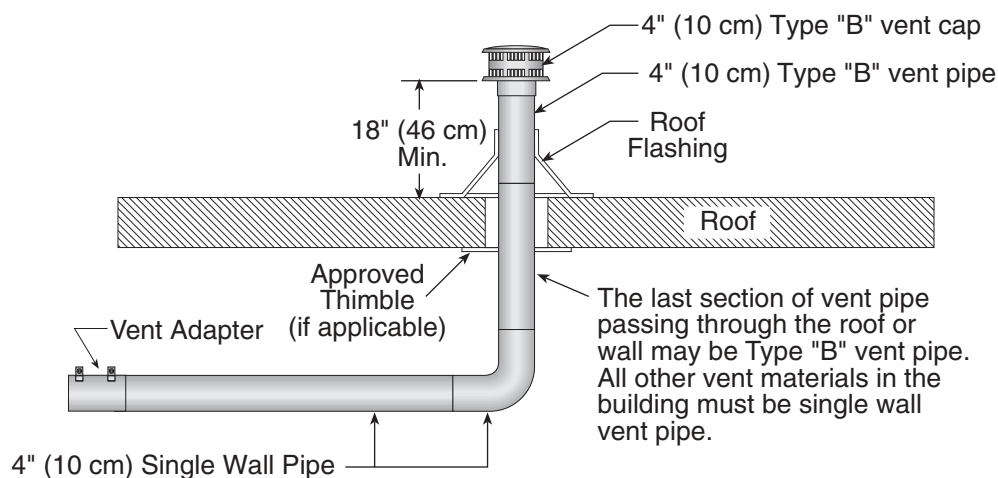
Subtract 15' (4.6 m) of maximum allowed vent or duct length per vent elbow if more than two are used.

8.2 Horizontal Ventilation 4" (10 cm) Pipe



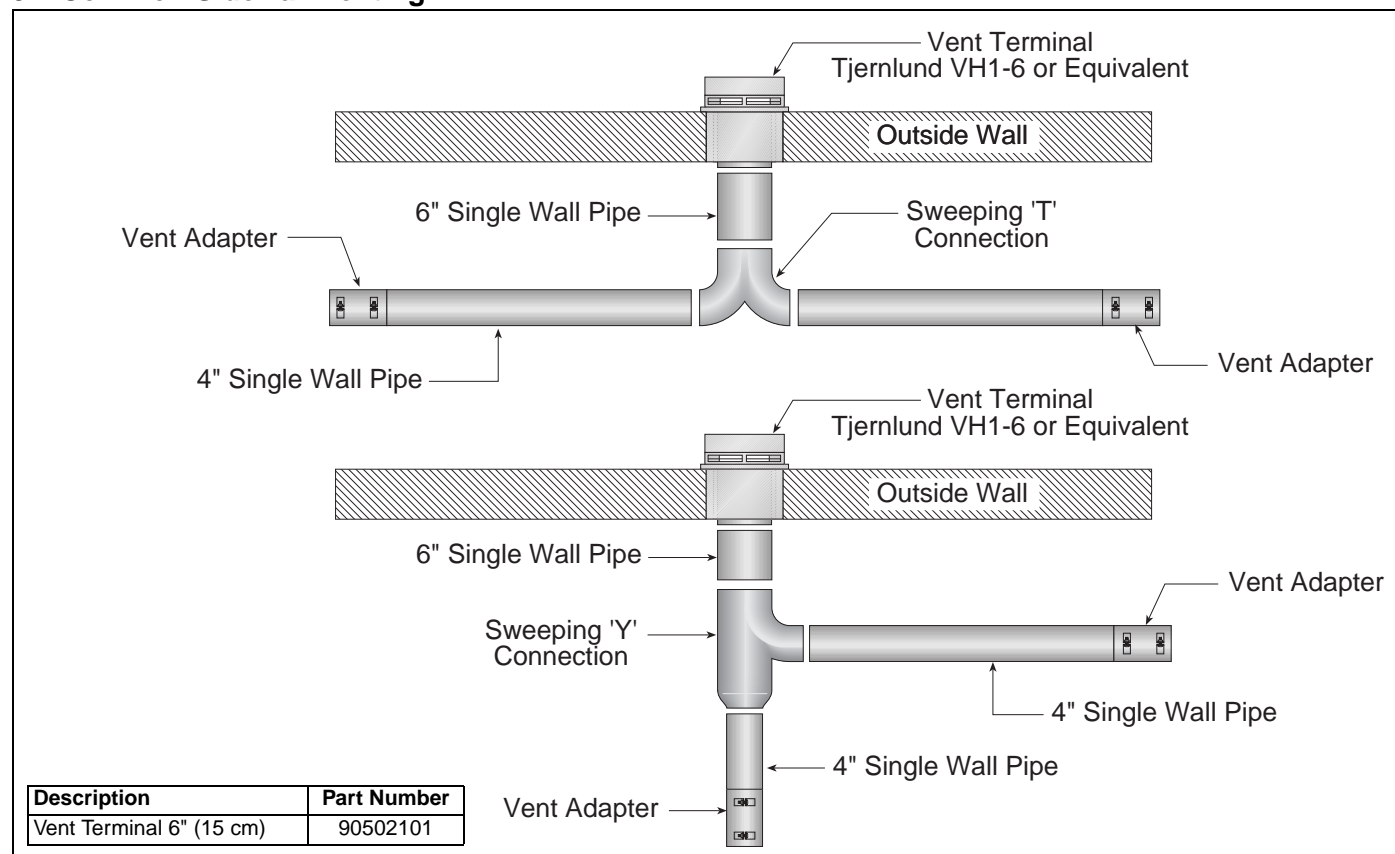
Description	Part Number
Vent Terminal (Comb. Wall)	90502100
Vent Terminal (Non-Comb Wall)	02537801-XX
Wall Thimble	90505600

8.3 Vertical Ventilation 4" (10 cm) Pipe



Description	Part Number
Vent Cap 4" (10 cm)	90502300

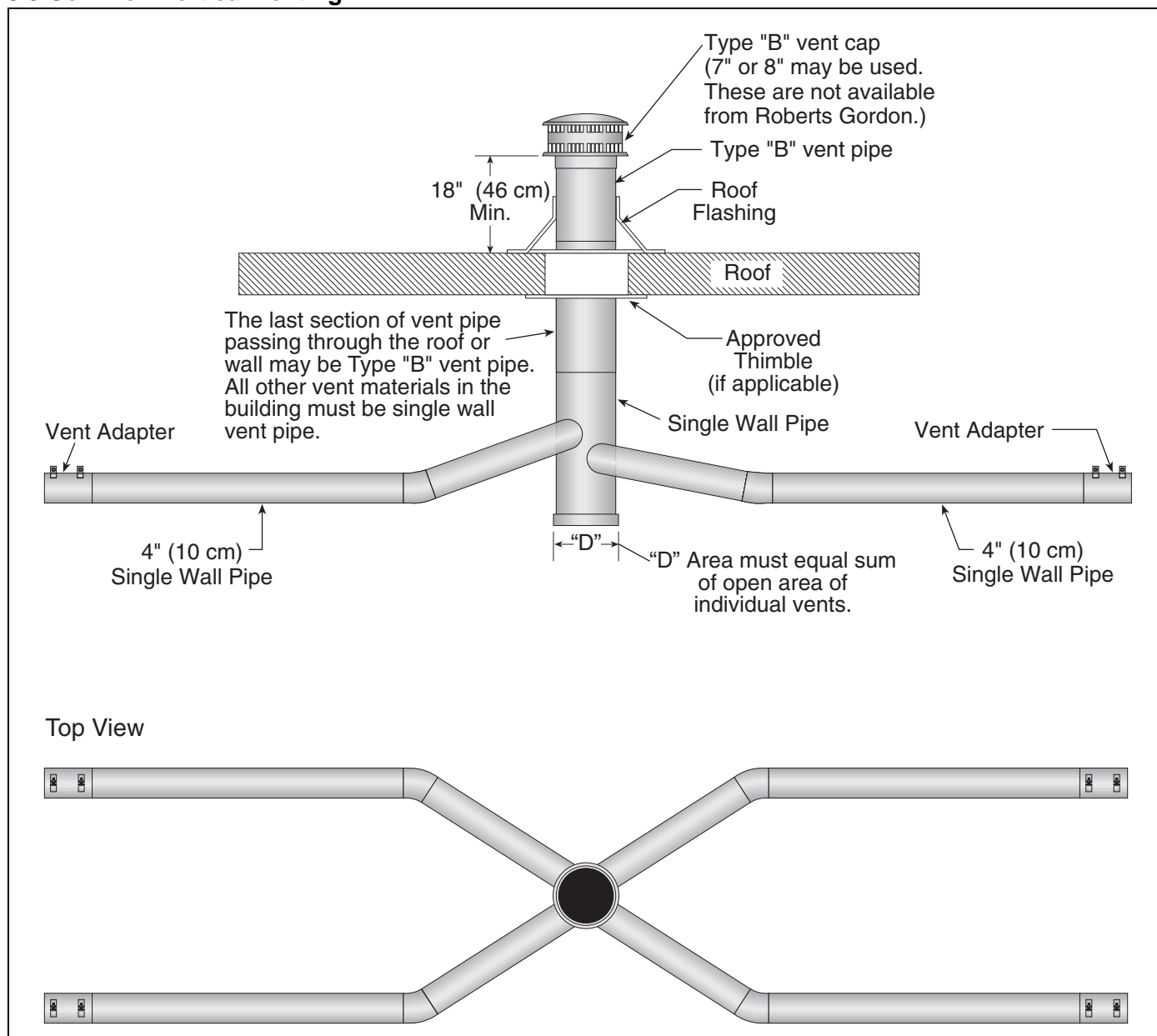
8.4 Common Sidewall Venting



Requirements:

- Maximum of 2 heaters can be commonly vented through a side wall.
- Heaters must be of the same BTU output.
- Heaters must be controlled by a common thermostat.

8.5 Common Vertical Venting



Requirements:

- Heaters must be controlled by a common thermostat.
- Connections to a common stack must be positioned to avoid direct opposition between streams of combustion gases.

8.6 Outside Combustion Air Supply

IMPORTANT: If the building has a slight negative pressure or corrosive contaminants such as halogenated hydrocarbons are present in the air, an outside combustion air supply to the heater is required.

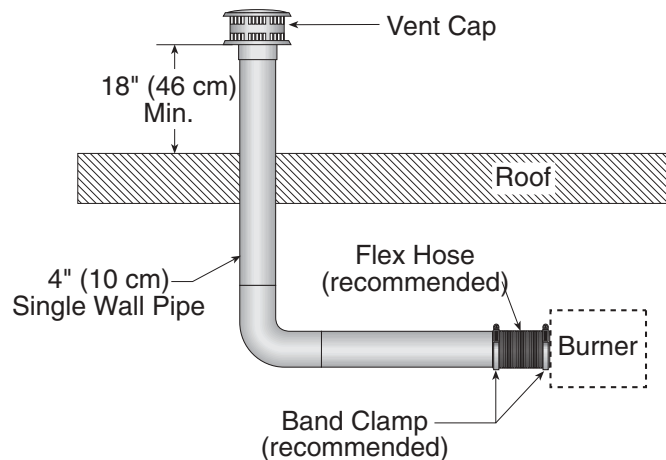
Use of optional outside combustion air is not recommended with unvented heaters.

The air supply duct may have to be insulated to prevent condensation on the outer surface. The outside air terminal must not be more than 1' (31 cm) above the vent terminal.

8.6.1 Length Requirements

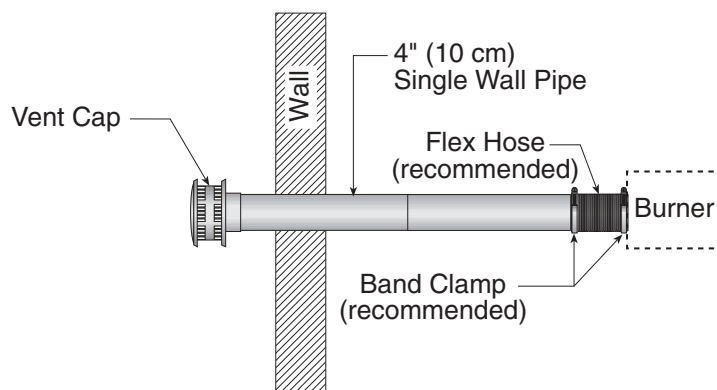
Follow the constraints listed on *Page 31, Section 8.1.6*.

8.6.2 Vertical Outside Air Supply for Single Heater Installation



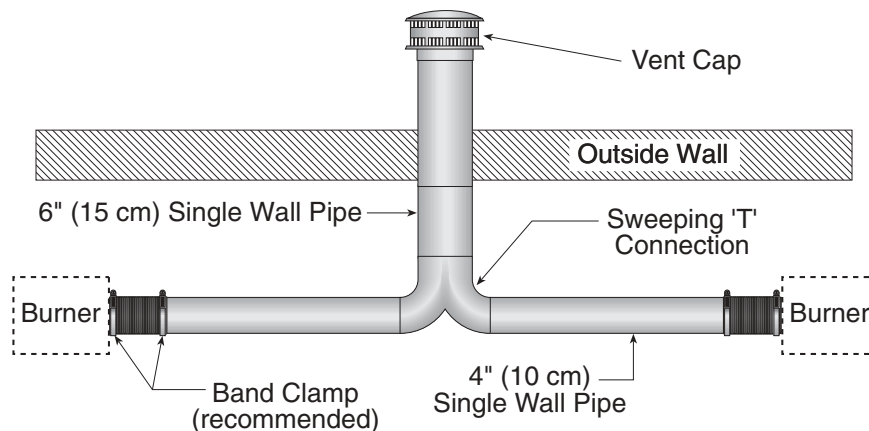
Description	Part Number
Vent Cap 4" (10 cm)	90502300

8.6.3 Horizontal Outside Air Supply for Single Heater Installation



Description	Part Number
Vent Cap 4" (10 cm)	90502300

8.6.4 Vertical Outside Air Supply for Double Heater Installation

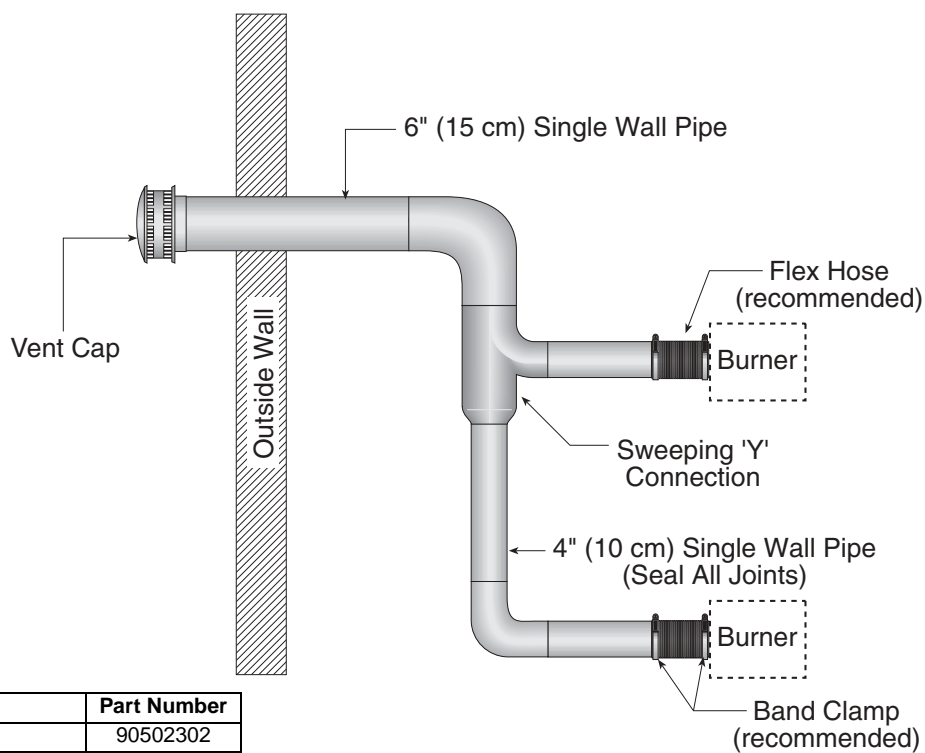


Description	Part Number
Vent Cap 6" (15 cm)	90502302

Requirements:

- Heaters must be controlled by a common thermostat.

8.6.5 Horizontal Outside Air Supply for Double Heater Installation



Description	Part Number
Vent Cap 6" (15 cm)	90502302

Requirements:

- Heaters must be controlled by a common thermostat.

SECTION 9: GAS PIPING

⚠ WARNING**Fire Hazard**

Tighten gas line fittings to connect gas supply according to *Figure 18*.

Flex gas line can crack when twisted.

Gas line moves during normal operation.

Failure to follow these instructions can result in death, injury or property damage.

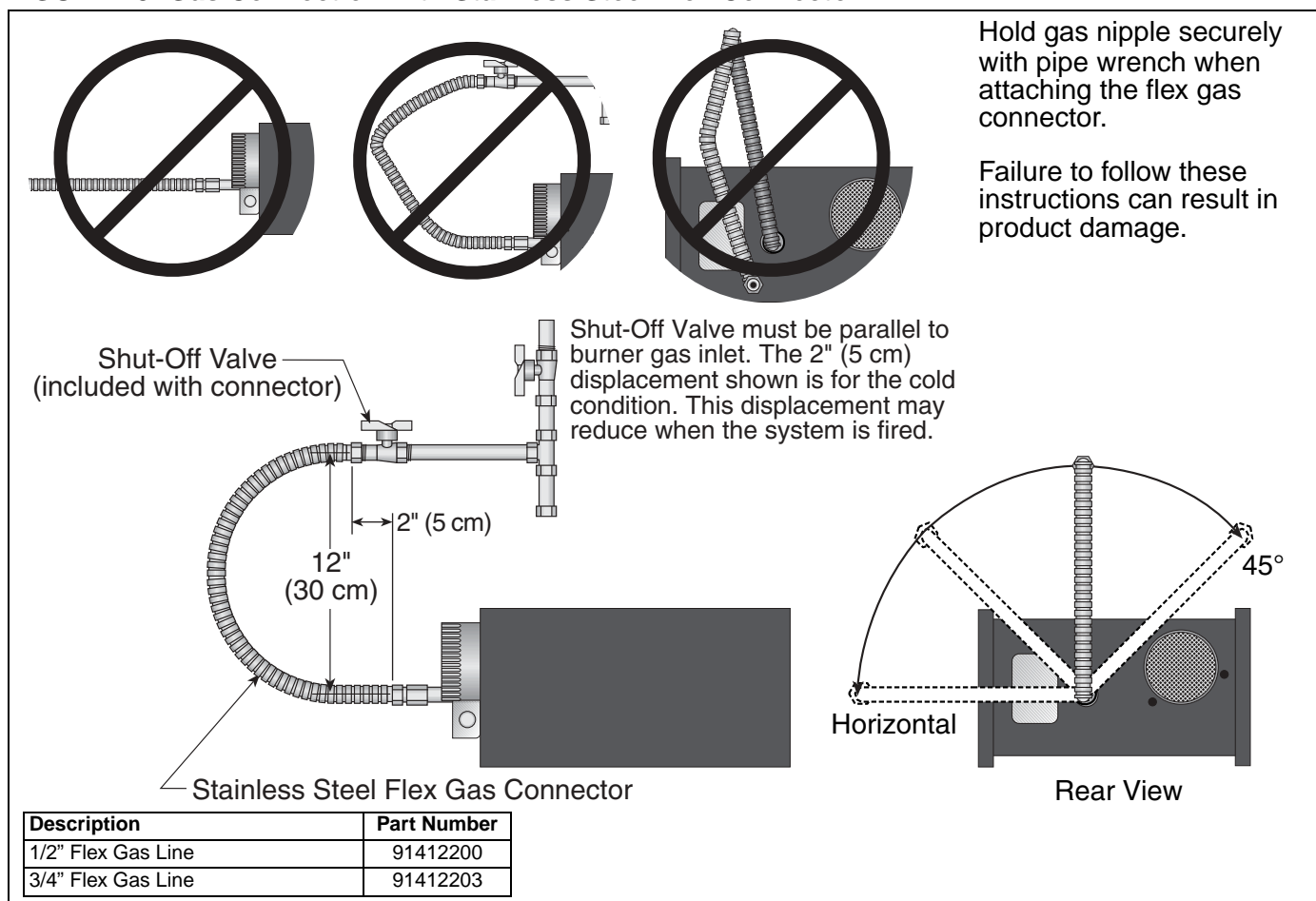
Install the flex gas connector as shown in *Figure 18*. The flex gas connector accommodates expansion of the heating system and allows for easy installation and service of the burner. Before connecting the burners to the supply system, verify that all high pressure testing of the gas piping has been completed.

There is an expansion of the tube with each firing cycle, this will cause the burner to move with respect to the gas line. This can cause a gas leak resulting in an unsafe condition if the gas connection is not made strictly in accordance with *Figure 18*.

Meter and service must be large enough to handle all the burners being installed plus any other connected load. The gas line which feeds the system must be large enough to supply the required gas with a maximum pressure drop of 1/2" w.c. When gas piping is not included in the layout drawing, the local gas supplier will usually help in planning the gas piping.

- **Do not high pressure test the gas piping with the burner connected. Failure to follow these instructions can result in property damage.**
- **Check the pipe and tubing ends for leaks before placing heating equipment into service. When checking for gas leaks, use a soap and water solution; never use an open flame.**

FIGURE 18: Gas Connection with Stainless Steel Flex Connector



SECTION 10: WIRING

⚠ WARNING**Electrical Shock Hazard**

Disconnect electrical power before servicing.

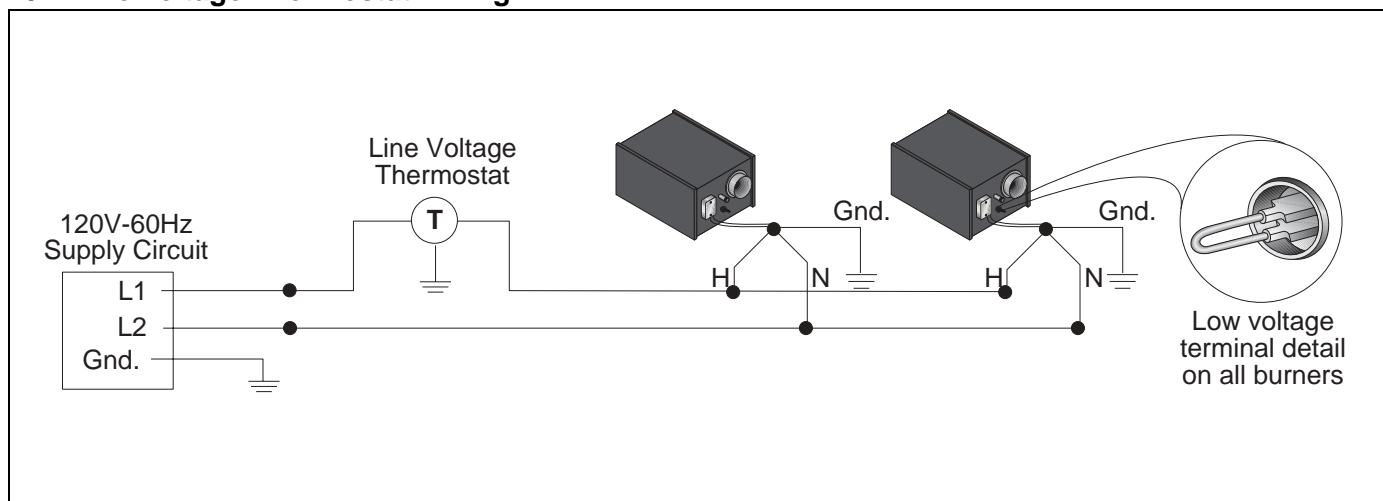
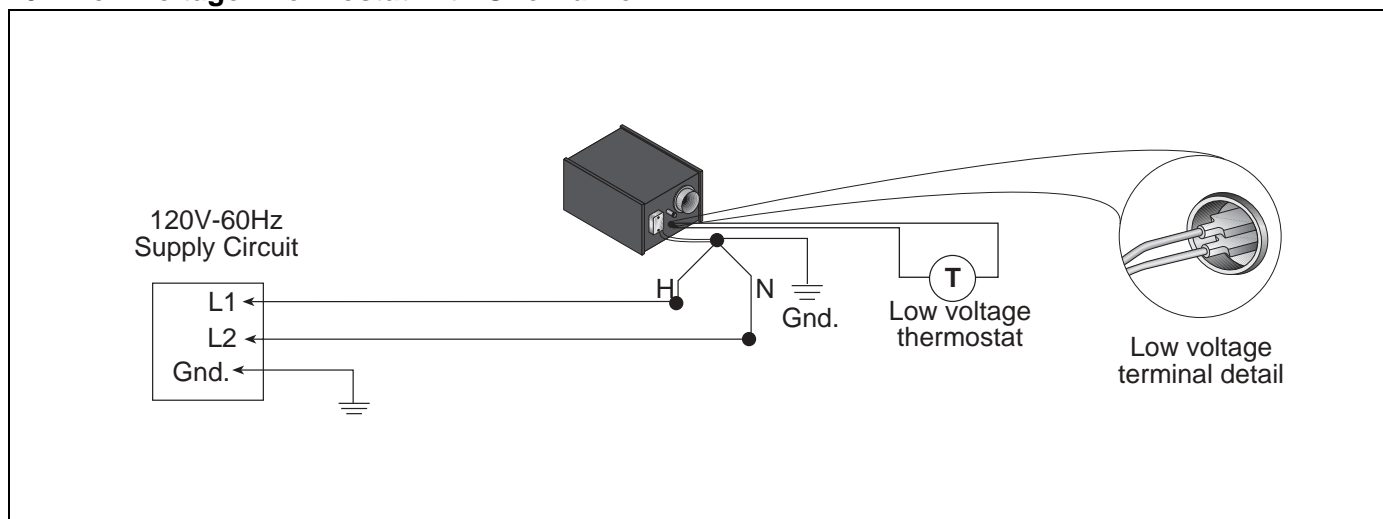
This appliance must be connected to a properly grounded electrical source.

Failure to follow these instructions can result in death or electrical shock.

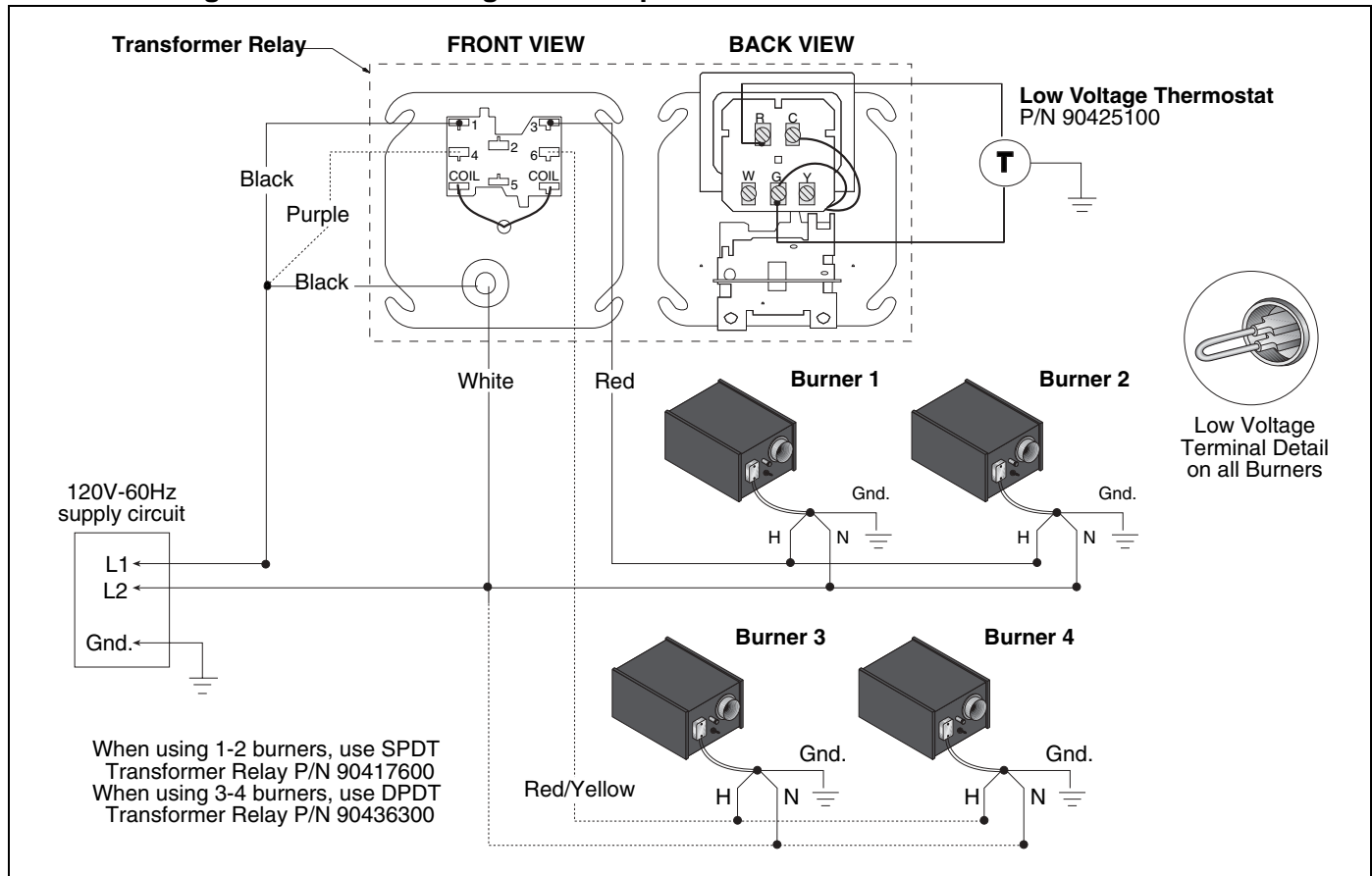
Heaters can be controlled using several methods. Normally thermostats are used to control the heaters but they can also be controlled by an Energy

Management System. *Section 10.1* below illustrates the connection for heaters controlled by a line voltage thermostat. **NOTE:** In order to use line voltage thermostats, the low voltage terminal located at the back of each burner must be connected as shown in the detail. For a single heater on a low voltage thermostat, *See Section 10.2* below. To control multiple heaters on one low voltage thermostat, *See Page 38, Section 10.3*. **NOTE:** In order to control multiple heaters on one low voltage thermostat, the low voltage terminals on each heater must be connected as shown in detail. Heaters must be grounded in accordance with applicable codes: United States: refer to National Electrical Code® ANSI/NFPA 70 - latest revision Canada: refer to Canadian Electrical Code CSA C22.1 Part I - latest revision.

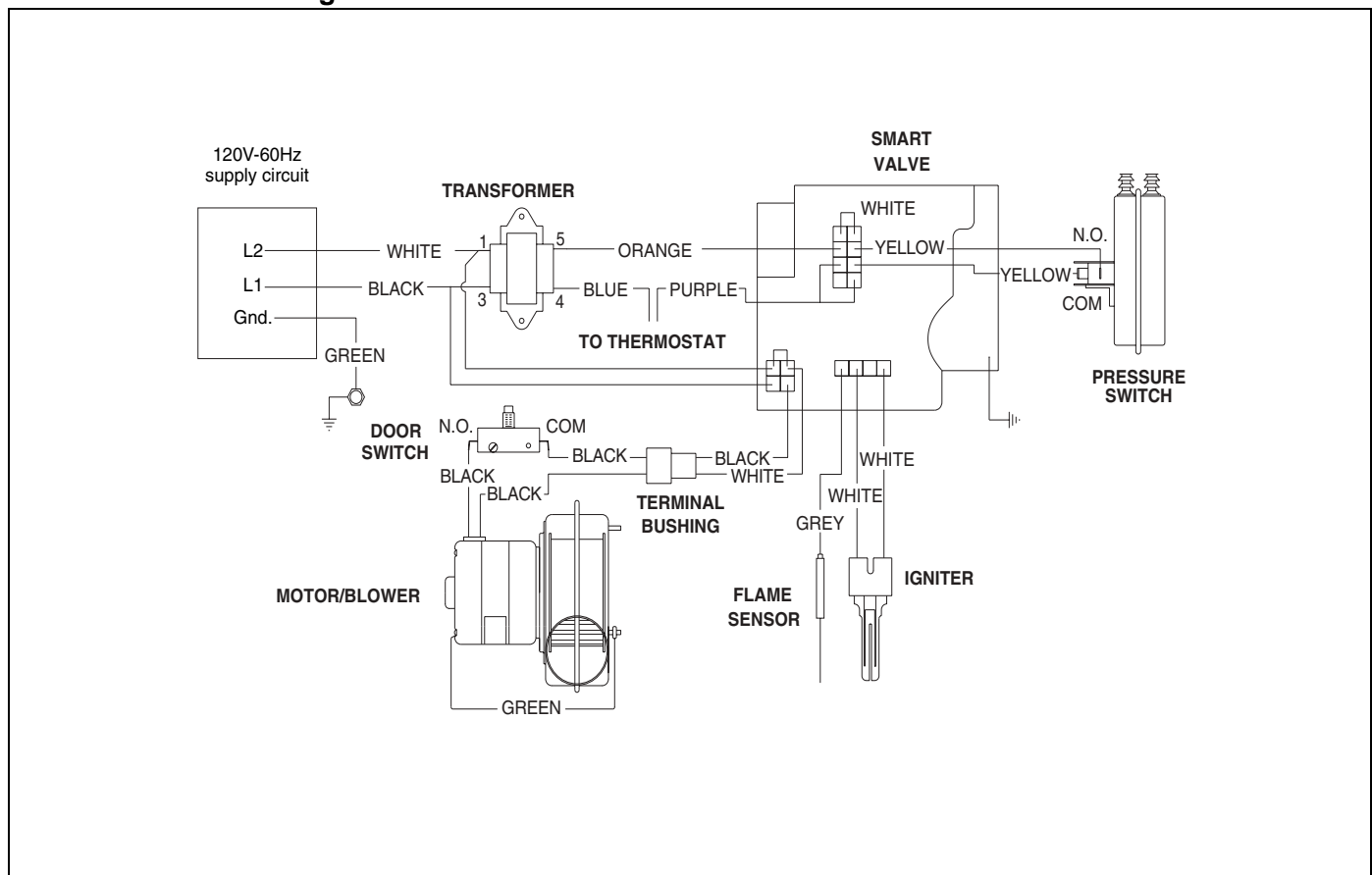
If any of the original internal wiring must be replaced, it must be replaced with wiring materials having a temperature rating of at least 105°C and 600 volts.

10.1 Line Voltage Thermostat Wiring**10.2 Low Voltage Thermostat with One Burner**

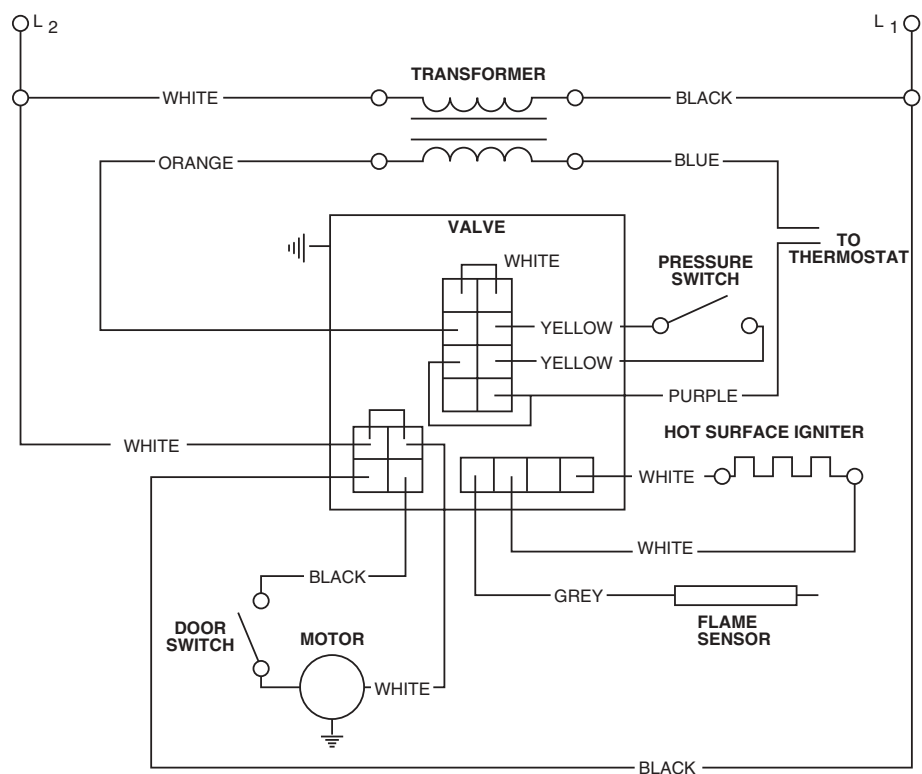
10.3 Low Voltage Thermostat Wiring with Multiple Burners



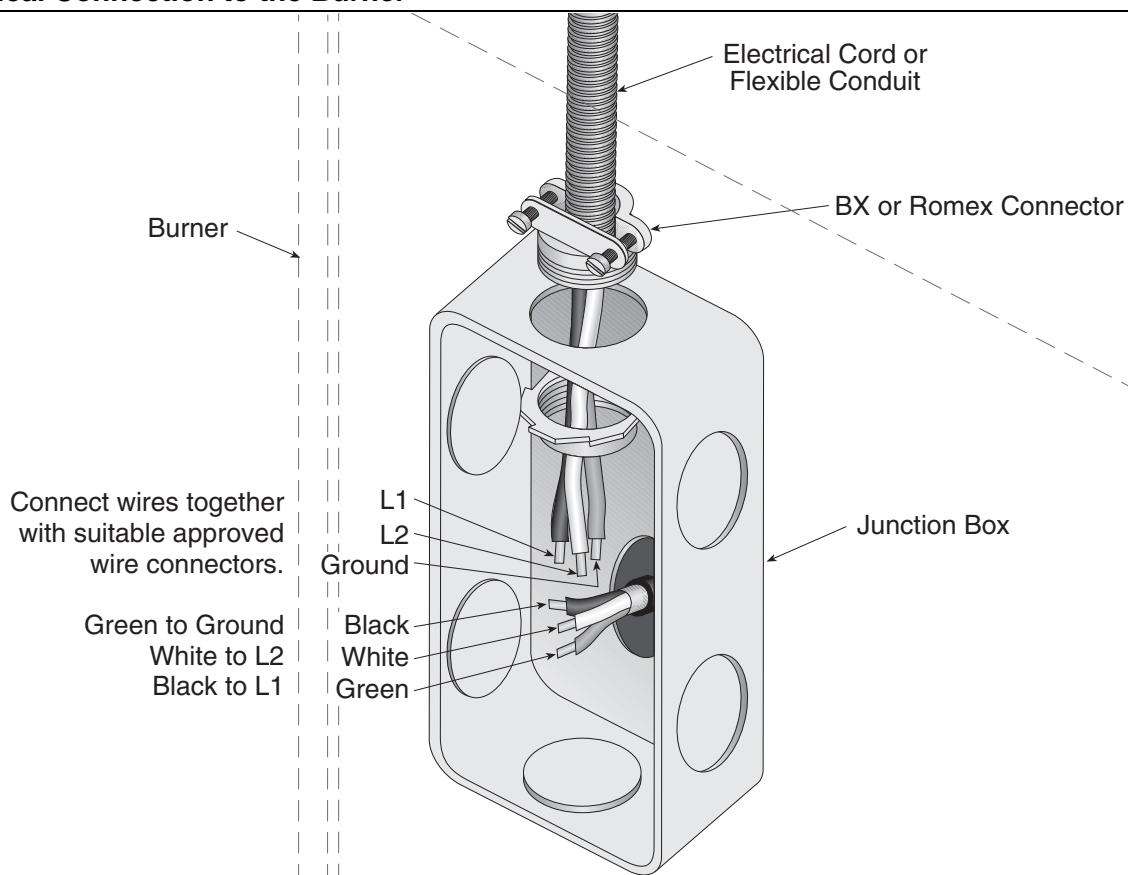
10.4 VST Internal Wiring



10.5 VST Ladder Diagram



10.6 Electrical Connection to the Burner



SECTION 11: OPERATION AND MAINTENANCE

The VST heater is equipped with a hot-surface ignition system.

11.1 Sequence of Operation

1. Turn the thermostat up. When the thermostat calls for heat, the SmartValve® II will energize. After a short period, power is supplied to the blower motor.
2. When the motor approaches nominal running RPM, the pressure switch closes and signals the ignition module/SmartValve® II.
3. The ignition module/SmartValve® II then energizes the hot-surface igniter for a timed warm-up period (approximately 45 to 60 seconds). After the warm-up period, the gas valve is energized.
4. If a flame is detected, the gas valve remains open and the igniter is de-energized. When the call for heat is satisfied, and the system control mechanism de-energizes the burner line voltage supply, the gas is turned off.
5. If no flame is detected by the flame sensing rod, the igniter is de-energized and the module/SmartValve® II will close and a purge period begins. After the purge, the module/SmartValve® II acts to power the igniter for a second warm-up period and a second trial for ignition period. If flame is still not established, a third purge, warm-up, and trial cycle begins. After four trials, the module/SmartValve® II will lockout for one hour or until reset.
6. If the flame extinguishes during operation, the igniter module will provide multiple trial sequences described in step 5. If ignition is not re-established, the module/SmartValve® II will lockout for one hour or until reset.
7. After lockout, reset by turning down thermostat for five seconds, and then raising it again to desired temperature, or by disconnecting power and then reconnecting.

11.2 To Shut Off Heater

Set thermostat to lowest setting.

Turn OFF electric power to heater.

Turn OFF manual gas valve in the heater supply line.

11.3 To Start Heater

Turn gas valve and electric power OFF and wait five minutes for unburned gases to vent from heater.

Turn ON main gas valve.

Turn ON electric power.

Set thermostat to desired temperature, burner should light automatically.

11.4 Pre-Season Maintenance and Annual Inspection

To ensure your safety and years of trouble-free operation of the heating system, service and annual inspections must be done by a contractor qualified in the installation and service of gas-fired heating equipment.

Disconnect gas and electric supplies before performing service or maintenance. Allow heater to cool before servicing.

Before every heating season, a contractor qualified in the installation and service of gas-fired heating equipment must perform a thorough safety inspection of the heater.

For best performance, the gas, electrical, thermostat connections, tubing, venting, suspensions and overall heater condition are some of the areas requiring inspection.

NOTE: Gas flow and burner ignition are among the first things that should be inspected.

Please see *Page 41, Section 11.5* for suggested items to inspect.

11.5 Maintenance Checklist

Installation, Service and Annual Inspection of the heater must be done by a contractor qualified in the installation and service of gas-fired heating equipment.

Read this manual carefully before installation, operation, or service of this equipment.

The Vicinity of the Heater	<p>Do not store or use flammable objects, liquids or vapors near the heater. Immediately remove these items if they are present.</p> <p><i>See Page 3, Section 3.</i></p>
Vehicles and Other Objects	<p>Maintain the clearances to combustibles.</p> <p>Do not hang anything from, or place anything on, the heater.</p> <p>Make sure nothing is lodged underneath the reflector, in between the tubes or in the decorative or protective grilles (included with select models).</p> <p>Immediately remove objects in violation of the clearances to combustibles.</p> <p><i>See Page 3, Section 3.</i></p>
Reflector	<p>Make sure there is no dirt, sagging, cracking or distortion.</p> <p>Do not operate if there is sagging, cracking or distortion.</p> <p>Make sure reflectors are correctly overlapped. <i>See Page 18, Section 6.5.1.</i></p> <p>Clean outside surface with a damp cloth.</p>
Vent Pipe	<p>Venting must be intact. Using a flashlight, look for obstructions, cracks on the pipe, gaps in the sealed areas or corrosion.</p> <p>The area must be free of dirt and dust.</p> <p>Remove any carbon deposits or scale using a wire brush.</p> <p><i>See Page 30, Section 8.</i></p>
Outside Air Inlet	<p>Inlet must be intact. Look for obstructions, cracks on the pipe, gaps in the sealed areas or corrosion.</p> <p>The area must be free of dirt and dust. Clean and reinstall as required.</p>
Tubes	<p>Make sure there are no cracks.</p> <p>Make sure tubes are connected and suspended securely.</p> <p><i>See Page 11, Section 6.</i></p> <p>Make sure there is no sagging, bending or distortion.</p> <p>Clean or replace as required.</p>
Gas Line	<p>Check for gas leaks. <i>See Page 36, Section 9.</i></p>

Burner Observation Window	Make sure it is clean and free of cracks or holes. Clean and replace as required.
Blower Scroll, Wheel and Motor	Compressed air or a vacuum cleaner may be used to clean dust and dirt.
Burner Cup and Orifice	Clear of obstructions (even spider webs will cause problems). Carefully remove any dust and debris from the burner.
Hot-Surface Igniter	Replace if cracked.
Thermostat	There should be no exposed wire or damage to the thermostat. <i>See Page 37, Section 10.</i>
Suspension Points	Make sure the heater is hanging securely. Look for signs of wear on the chain or ceiling. <i>See Page 11, Figure 12.</i>
Decorative and Protective Grille (optional)	The grille must be securely attached. Check that the side reflector extensions are installed correctly and secured in place if necessary (Decorative grille only). <i>See Page 25, Section 7.5 and Page 29, Section 7.7</i> Make sure shield is installed correctly and secured in place if necessary. (Decorative grille only.) <i>See Page 26, Section 7.5.2.</i>
Lower Clearance Shield (optional)	The lower shield must be securely attached. Inspect shield support straps and lower clearance shield anchor points. <i>See Page 25, Section 7.4.</i> Make sure shield is installed correctly and secured in place if necessary. <i>See Page 25, Section 7.4.</i>

SECTION 12: TROUBLESHOOTING

12.1 Honeywell SmartValve® II Troubleshooting

⚠ WARNING

Disconnect gas and electrical supplies before performing service or maintenance.

Failure to follow these instructions can result in death, injury or property damage.

This heater is supplied with the Honeywell Smart-Valve® II control system. This system is equipped with a diagnostic function that will assist in performing troubleshooting. The LED (Light Emitting Diode) indicator at the top of the SmartValve® II control will flash in various patterns to indicate status. The LED status indication chart provided below gives a summary of possible faults.

LED Status Indicates

Off	No power to the control
Bright-Dim	Normal Operation. This indication shows whenever the system is powered, unless some abnormal event has occurred.
2 Flashes	Pressure switch remains closed longer than 30 seconds after a call for heat begins (pressure switch stuck closed). The SmartValve® II checks the status of the pressure switch contacts and must see a change in the contact with every firing cycle. Placing a jumper at the switch out of sequence will result in a fault, with the LED indicator flashing 2 times.
3 Flashes	Pressure switch remains open longer than 30 seconds after combustion air blower is energized. Check for correct blower operation, blower intake obstructions, pressure switch tubing and wiring.
4 Flashes	Limit string open, 2" white jumper wire on valve is loose.
5 Flashes	Flame signal sensed out of proper sequence.

6 Flashes

System Lockout. Flame sensing circuit is not functioning properly. Perform the checks following the "Does the burner stay lit?" bubble in the troubleshooting flow chart on *Page 44, Section 12.2*.

⚠ WARNING**Electrical Shock Hazard**

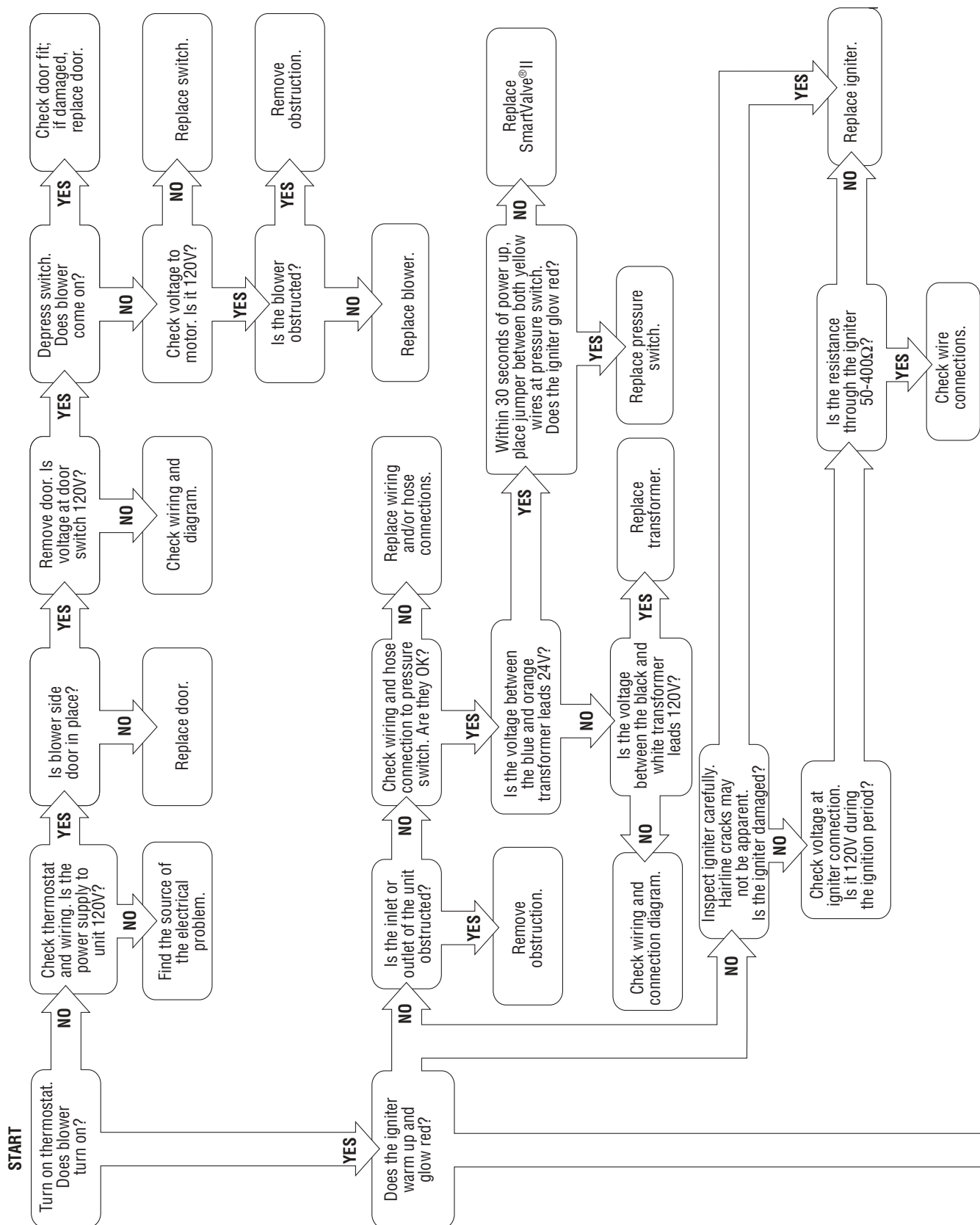
Do not disconnect ground leads inside heater.

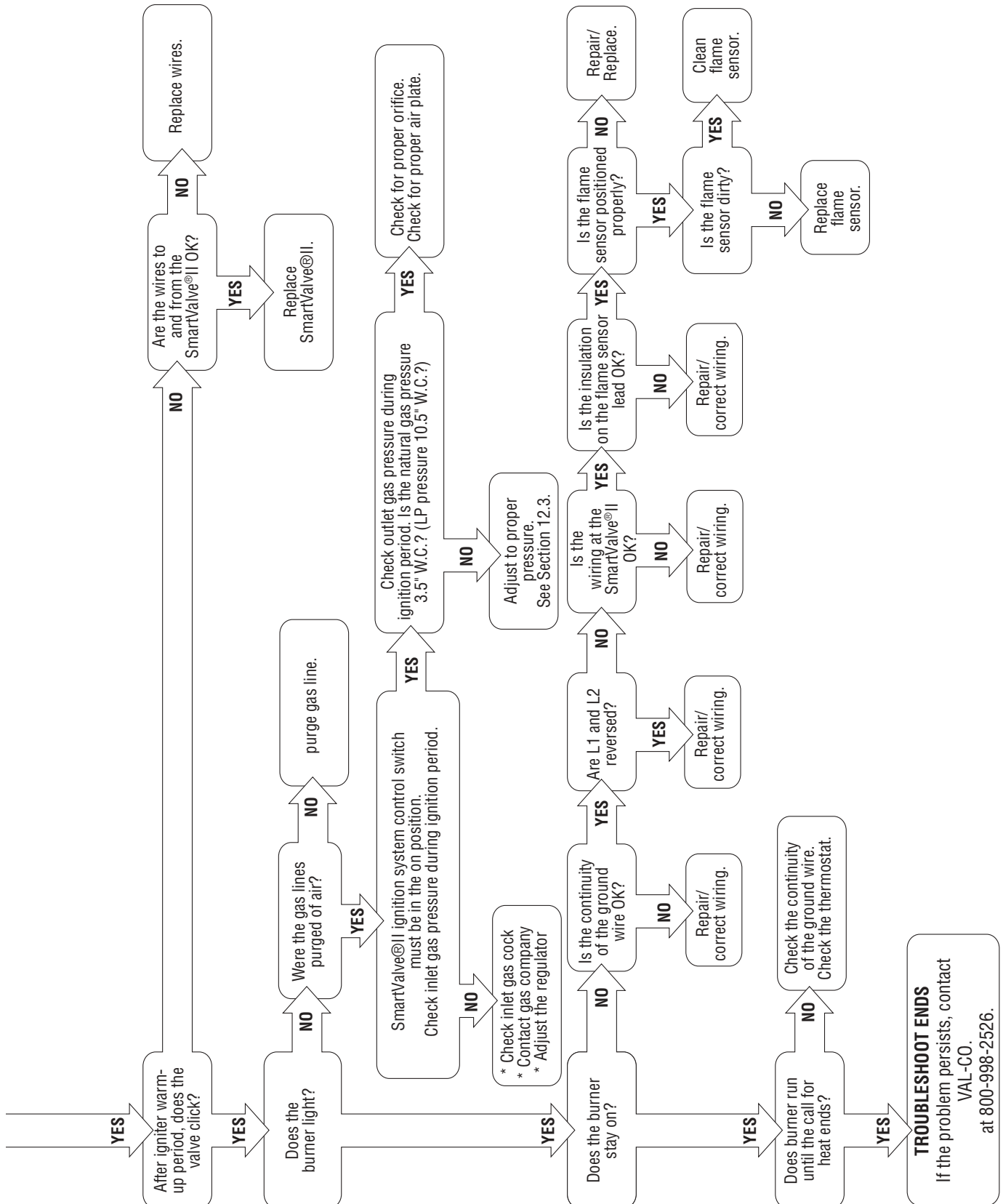
Do not interchange grounded and ungrounded leads on transformer or ignition module.

Failure to follow these instructions can result in death or electrical shock.

Page 46, Section 12.3 will provide the information needed to test the manifold gas pressure setting. *Page 44, Section 12.2* will guide you through several troubleshooting steps to determine possible problems with the systems.

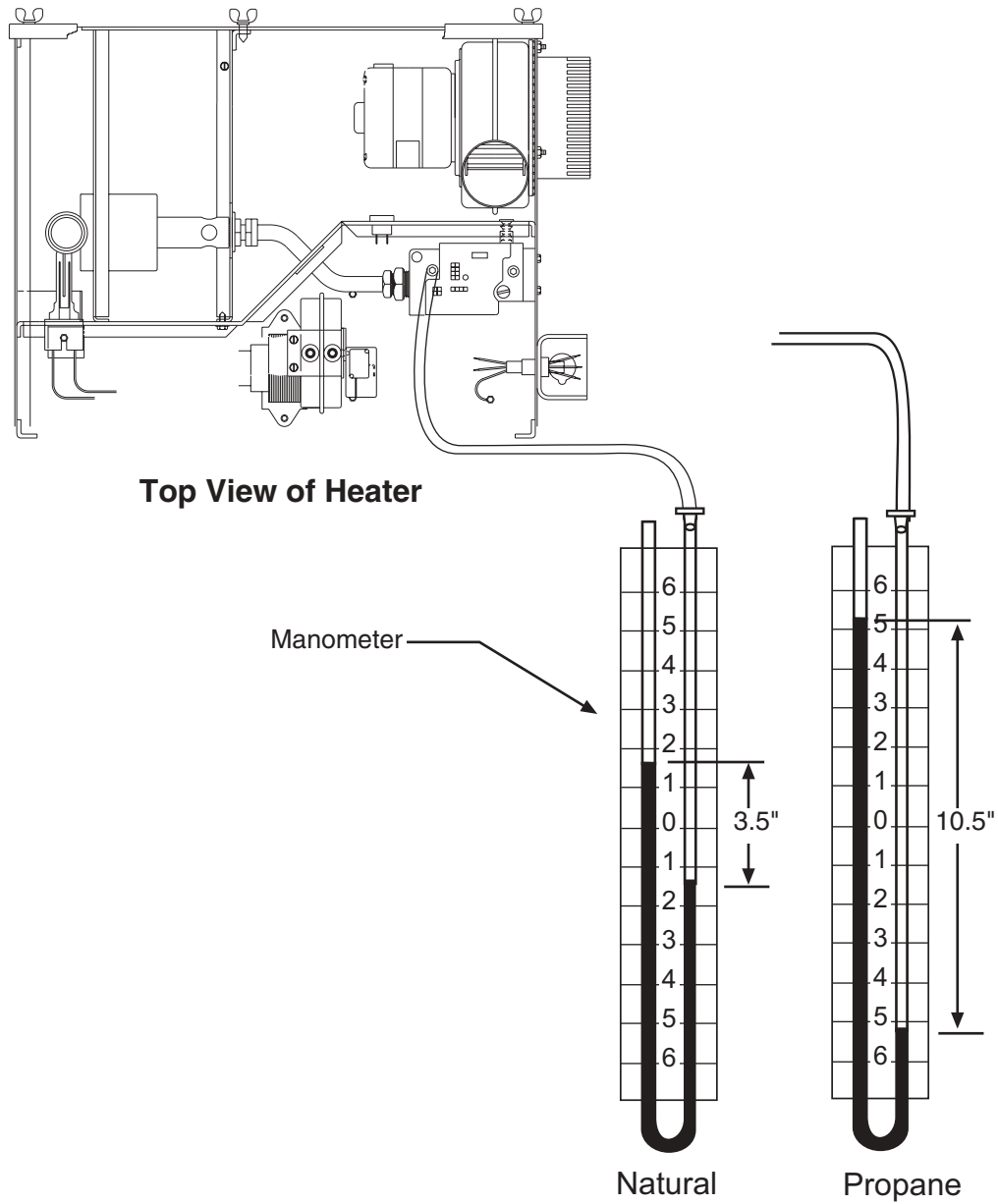
12.2 Troubleshooting Flow Chart



**TROUBLESHOOT ENDS**

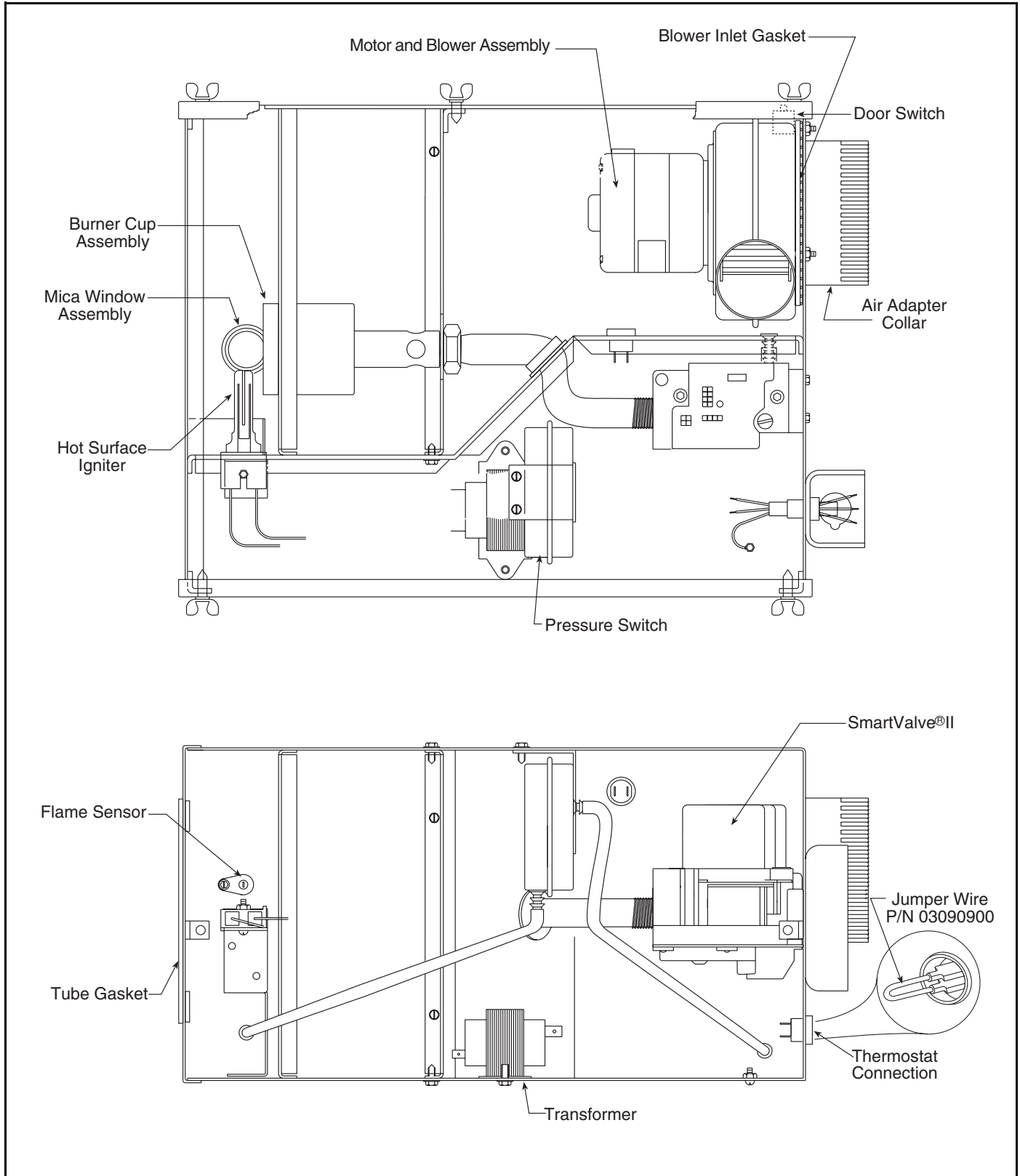
If the problem persists, contact
VAL-CO.
at 800-998-2526.

12.3 Manifold Gas Pressure Setting



SECTION 13: REPLACEMENT PARTS

Use only genuine VAL-CO. replacement parts.
 Use of parts not specified by VAL-CO. voids warranty.
 Failure to follow these instructions can result in property damage.



Description	Part Number
Gas Valve (Natural)	90068300
Gas Valve (LP)	90068302
Tube Gasket	02568200
Blower Inlet Gasket	03050900
Motor and Blower Assembly	90708600
Air Adapter Collar	91911700
Door Switch	90436800
Burner Cup Assembly	03020100
Hot Surface Igniter	90436603
Mica Window Assembly	02553203
Flame Sensor	90439300
Transformer	90436900K
Thermostat Connection	91317900
Jumper Wire	03090900
Pressure Switch:	
VST-80, 100	90439803
VST-150	90439804
VST-125	90439805

SECTION 14: GENERAL SPECIFICATIONS**14.1 Material Specification****14.1.1 Reflectors**

.024 Aluminum

14.2 Heater Specifications**14.2.1 Ignition**

Fully automatic hot-surface ignition with safety shut-off.

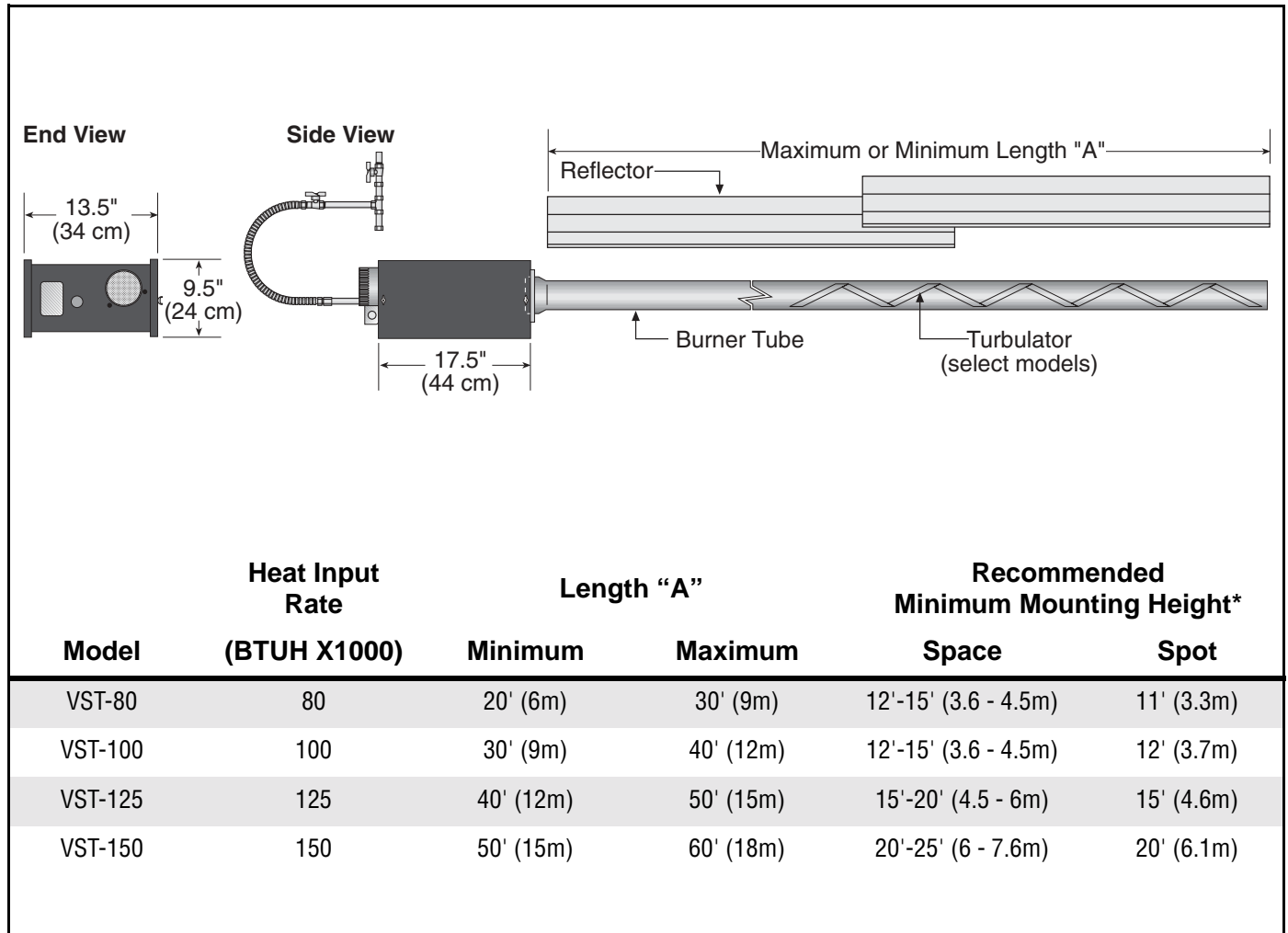
General Specifications for VST heaters are as follows:

14.3 Suspension Specifications

Hang heater with materials with a minimum working load of 75 lbs (33 kg). See Page 11, Figure 12.

14.4 Controls Specifications

Time switches, thermostats, etc. can be wired into the electrical supply. External controls supplied as an optional extra.



* See Page 3, Section 3 for clearances to combustibles.

GAS PRESSURE AT MANIFOLD:

Natural Gas: 3.5" w.c.

LP Gas: 10.5" w.c.

PIPE CONNECTION:

1/2" NPT (for VST-80, 100, 125)

3/4" NPT (for VST-150)

DIMENSIONS:

Vent Connection Size: 4" (10 cm)

Outside Air Connection Size: 4" (10 cm)

Refer to figure above for dimensional information.

GAS INLET PRESSURE:

Natural Gas:

for VST-80,100,125,150

4.6" w.c. Minimum

14.0" w.c. Maximum

LP Gas:

11.0" w.c. Minimum

14.0" w.c. Maximum

ELECTRICAL RATING (ALL MODELS):

120V - 60 Hz., 1.0 Amp (run) 5.0 Amp (Start)

Attach this information to a wall near the VAL-CO. heater.



People. Products. Solutions.

Read the Installation, Operation, and Service Manual thoroughly before installation, operation, or service.

Know your model number and installed configuration.

Model number and installed configuration are found on the burner and in the Installation, Operation and Service Manual.

Write the largest clearance dimensions with permanent ink according to your model number and configuration in the open spaces below.

OPERATING INSTRUCTIONS

1. STOP! Read all safety instructions on this information sheet.
2. Open the manual gas valve in the heater supply line.
3. Turn on electric power to the heater.
4. Set the thermostat to desired setting.

TO TURN OFF THE HEATER

1. Set the thermostat to off or the lowest setting.

IF THE HEATER WILL NOT OPERATE, TO ENSURE YOUR SAFETY, FOLLOW THESE INSTRUCTIONS TO SHUT DOWN YOUR HEATER

1. Set the thermostat to off or the lowest setting.
2. Turn off electric power to the heater.
3. Turn off the manual gas valve in the heater supply line.
4. Call your registered installer/contractor qualified in the installation and service of gas-fired heating equipment.

⚠ WARNING



Fire Hazard

Some objects can catch fire or explode when placed close to heater.

Keep all flammable objects, liquids and vapors the required clearances to combustibles away from heater.

Failure to follow these instructions can result in death, injury or property damage.

**Maintain _____ clearance
to the side and
_____ clearance below
the heater from vehicles
and combustible materials.**

VAL-CO.

210 East Main Street
P.O. Box 117
Coldwater, OH 45828-2526
Telephone: 800-998-2526
Fax: 419-678-2200

Installation Code: VAL-CO products are to be installed only in accordance with local laws, codes and regulations, and only by a contractor qualified in the installation and service of gas-fired heating equipment.

For optimum product performance and safety, installation, service and annual inspections must be completed by a contractor qualified in the installation and service of gas-fired heating equipment.

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