

## INDOOR AND OUTDOOR PACKAGED SYSTEM INSTALLATION, OPERATION, AND MAINTENANCE

### INDOOR SEPARATED-COMBUSTION MODEL SSCBL OUTDOOR POWER-VENTED MODEL RPBL



SSCBL



RPBL

### ⚠ DANGER ⚠

#### FIRE OR EXPLOSION HAZARD

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

#### WHAT TO DO IF YOU SMELL GAS

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

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

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## GENERAL INFORMATION

- This unit 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.
- These packaged systems include duct furnaces that are design-certified to ANSI and CSA standards by the Canadian Standards Association and that are approved for installation in the United States and in Canada. The furnaces are approved for use with either natural gas or propane. The type of gas for which the furnace is equipped, the correct firing rate, and electrical requirements are shown on the unit's rating plate.

### References

<b>Table 1. Related Technical Manuals Available from Factory Distributor</b>		
Type	Form*	PN
Replacement parts	SC-SCE-SSCBL-SSCDBL	269822
	RP-HRPD-RPB-RPBL	263984
Control system guide	OPT-D19-D21-D22-D23	1042481
Maxitrol amplifier replacement kit installation	OPT-AG7,8,9,9H	262319
Outside air hood installation	RPB-RPBL-AS2	132901
30% screened air hood installation	OPT-AIR-HOOD	131794
Evaporative cooling module installation	OPT-AS3,4,5,8	160202
Ignition controller replacement kit installation	OPT-IGN-CNTRL	134704
Gas conversion	OPT-GC	143147

\*Also available at [www.reznorhvac.com](http://www.reznorhvac.com).

### Important Safety Information

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

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

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

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

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

## ⚠ DANGER ⚠

- **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.**
- **Improper installation, adjustment, alteration, service, or maintenance can cause property damage, injury, or death. Read these installation, operation, and maintenance instructions thoroughly before installing or servicing this equipment.**

## ⚠ WARNING ⚠

For your safety, read the warning labels on the unit.

### NOTES:

- Installation should be done by a qualified agency in accordance with the instructions in this manual and in compliance with all codes and requirements of authorities having jurisdiction.
- Read this manual and become familiar with the installation requirements of your particular furnace. 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.
- The instructions in this manual apply only to model SSCBL and RPBL units.

### Warranty

Refer to the limited warranty information on the warranty card in the owner's envelope. Warranty is void if:

- a. Furnaces are used in atmospheres containing flammable vapors or atmospheres containing chlorinated or halogenated hydrocarbons or any contaminant (silicone, aluminum oxide, etc.) that adheres to the spark ignition flame sensing probe.
- b. Wiring is not in accordance with the diagram furnished with the heater.
- c. Unit is installed without proper clearance to combustible materials or without proper ventilation and air for combustion.
- d. Furnace air throughput is not adjusted within the range specified on the rating plate.

### 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 NFPA/ANSI Z223.1 (latest edition), *National Fuel Gas Code*. A Canadian installation must be in accordance with CSA B149.1, *Natural Gas and Propane Installation Code*. 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.
- These gas-fired products are certified by ANSI Z83 family of standards governing the safe usage of heating equipment in the industrial/commercial marketplace. This includes using the heaters in makeup air applications to supply corridor pressurization in commercial buildings such as office structures and apartment complexes.
- The heaters are not certified as residential heating equipment and should not be used as such.
- **Clearances (model SSCBL):** Clearances from the heater and vent to combustible construction or material in storage must conform with the *National Fuel Gas Code* ANSI Z223.1 (latest edition) pertaining to gas-burning devices, and such material must not attain a temperature over 160°F (71°C) by continued operation of the heater.
- **Separated-combustion (model SSCBL):** The separated-combustion furnaces in model SSCBL are designed and manufactured in accordance with the ANSI definition of separated combustion, which reads, "Separated Combustion System Appliance: A system consisting of an appliance and a vent cap(s) supplied by the manufacturer, and (1) combustion air connections between the appliance and the outside atmosphere, and (2) flue gas connections between the appliance and vent cap, of a type(s) specified by the manufacturer but supplied by the installer, constructed so that, when installed in accordance with the manufacturer's instructions, air for combustion is obtained from the outside atmosphere and flue gases are discharged to the outside atmosphere." Separated-combustion units are designed to separate air for combustion and flue products from the environment of the building in which the unit is installed. Separated-combustion appliances are recommended for use in dust-laden and some corrosive-fume environments. As the definition states, all separated-combustion, power-vented equipment must be equipped with both combustion-air and exhaust piping to the outdoors.
- **Special installations in aircraft hangars and garages (model SSCBL):** Installations in aircraft hangars should be in accordance with NFPA No. 409 (latest edition), *Standard for Aircraft Hangars*; in public garages in accordance with NFPA No. 88A (latest edition), *Standard for Parking Structures*; and for repair garages in accordance with NFPA No. 88B (latest edition), *Standard for Repair Garages*. In Canada, installations in aircraft hangars, repair garages, and parking garages should be in accordance with the requirements of the enforcing authorities and in accordance with the CSA B149 code.

## GENERAL INFORMATION—CONTINUED

### Dimensions

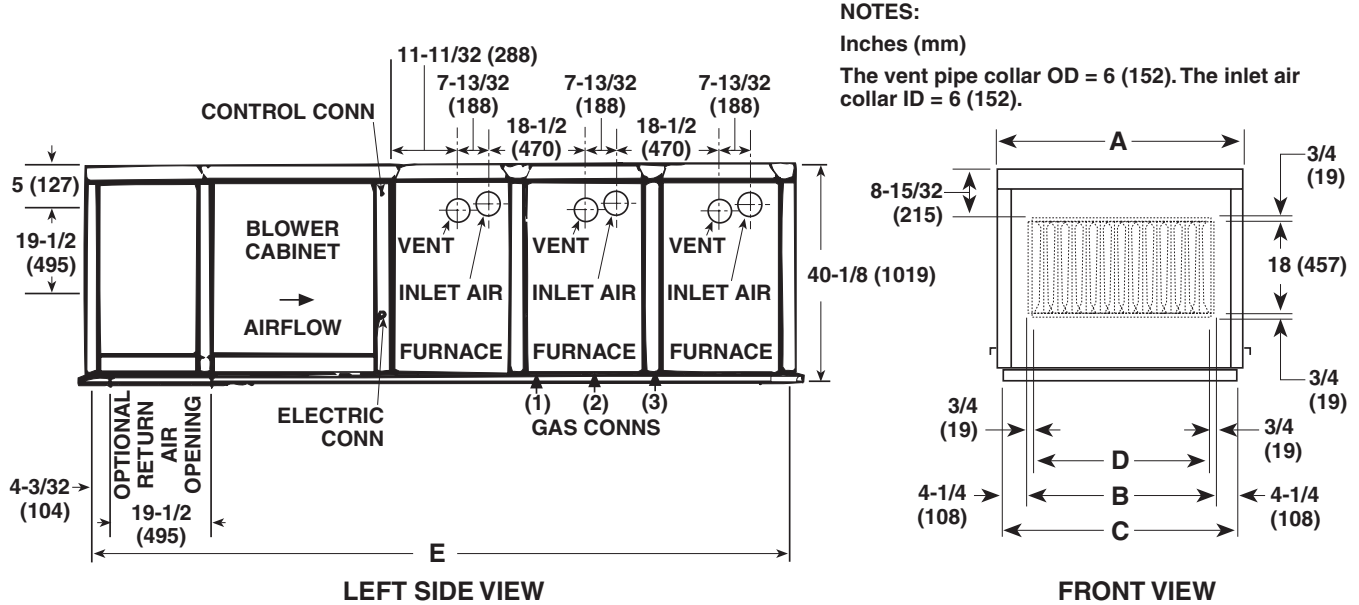
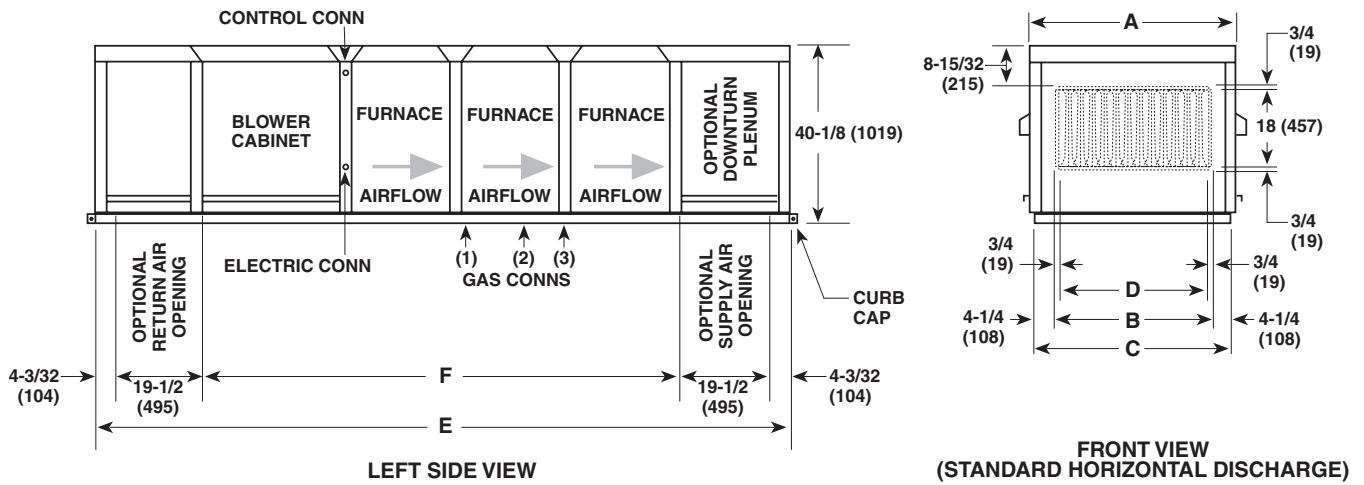


Figure 1. SSCBL Dimensions (Refer to Table 2)

Table 2. SSCBL Dimensions						
Dimension (See Figure 1)	Unit Size					
	400	500, 600	700	800	1050	1200
Inches (mm)						
A	58-7/8 (1495)	47-7/8 (1216)	53-3/8 (1356)	58-7/8 (1495)	53-3/8 (1356)	58-7/8 (1495)
B	47-5/8 (1210)	36-5/8 (930)	42-1/8 (1070)	47-5/8 (1210)	42-1/8 (1070)	47-5/8 (1210)
C	56-1/8 (1426)	45-1/8 (1146)	50-5/8 (1286)	56-1/8 (1426)	50-5/8 (1286)	56-1/8 (1426)
D	45-1/2 (1156)	34-1/2 (876)	40 (1016)	45-1/2 (1156)	40 (1016)	45-1/2 (1156)
E	83-1/2 (2121)	109-1/2 (2781)		135-1/2 (3442)		
Air Opening (See Figure 1)			Inches (mm)			
Horizontal air inlet opening			19-1/2 (495) × B			
Optional return air opening (bottom)						
Horizontal discharge air opening						
			18 (457) D			
Gas Connection Location* (See Figure 1)	Approximate Distance from Inside Curb Cap on Blower End of System			Unit Size		
1	89–90 pouces (2261–2286 mm)			400		
2	103–104 pouces (2616–2642 mm)			500, 600, 700, 800		
3	110–111 pouces (2794–2819 mm)			1050, 1200		
*The gas connection is at curb cap height on the control side of the system.						

## ⚠ CAUTION ⚠

**To ensure complete weather resistance, an outside air hood or evaporative cooling module is required for model RPBL units.**



**NOTES:**

Inches (mm)

Burner and control access shown left-hand side. Specify right-hand side for opposite access and connections.

**Figure 2. RPBL Dimensions (Refer to Table 3)**

Table 3. RPBL Dimensions						
Dimension (See Figure 2)	Unit Size					
	400	500, 600	700	800	1050	1200
Inches (mm)						
A	58-7/8 (1495)	47-1/8 (1216)	53-3/8 (1356)	58-7/8 (1495)	53-3/8 (1356)	58-7/8 (1495)
B	47-5/8 (1210)	36-5/8 (930)	42-1/8 (1070)	47-5/8 (1210)	42-1/8 (1070)	47-5/8 (1210)
C	56-1/8 (1426)	45-1/8 (1146)	50-5/8 (1286)	56-1/8 (1426)	50-5/8 (1286)	56-1/8 (1426)
D	45-1/2 (1156)	34-1/2 (876)	40 (1016)	45-1/2 (1156)	40 (1016)	45-1/2 (1156)
E	83-3/4 (2127)	109-3/4 (2788)			135-3/4 (3448)	
	107-3/4 (2737)*	133-3/4 (3397)*			159-3/4 (4058)*	
F	60-5/16 (1532)*	86-5/16 (2192)*			112-5/16 (2853)*	
<b>Air Opening (See Figure 2)</b>				<b>Inches (mm)</b>		
Standard horizontal air inlet opening				19-1/2 (495) × B		
Optional return air opening (bottom)						
Optional discharge air opening with downturn plenum						
Standard horizontal discharge air opening				18 (457) × D		
<b>Gas Connection Location** (See Figure 2)</b>		<b>Approximate Distance from Inside Curb Cap on Blower End of System</b>			<b>Unit Size</b>	
1		89–90 inches (2261–2286 mm)			400	
2		103–104 inches (2616–2642 mm)			500, 600, 700, 800	
3		110–111 inches (2794–2819 mm)			1050, 1200	
*With downturn plenum (option AQ5 or AQ8).						
**The gas connection is at curb cap height on the control side of the system.						

**Weights**

Table 4. Weights					
Unit Size					
400	500, 600	700	800	1050	1200
Net Weight (Pounds (kg))					
849 (385)	1104 (500)	1184 (537)	1245 (565)	1476 (670)	1565 (710)

## GENERAL INFORMATION—CONTINUED

### Clearances

Clearance to combustibles is defined as the minimum distance—from the heater to a surface or object—that is necessary to ensure that a surface temperature of 90°F (50°C) above the surrounding ambient temperature is not exceeded. For safety, adequate combustion air, and convenient installation and service, ensure that the clearances listed in [Table 5](#) are provided.

<b>Table 5. Clearances</b>		
Unit Surface	Model SSCBL	Model RPBL
	Minimum Clearance (Inches (mm))	
Top	6 (152)	—
Control side	56 (1422)	
Side opposite controls, to combustibles	6 (152)	—
Side opposite controls, for motor access	30 (762)	
Bottom	6 (152)	0 (0)*

\*When the unit is installed on a roof curb on a combustible roof, the roof area enclosed within the curb must be either ventilated, left open, or covered with noncombustible material that has an R-value of at least 5.0.

### Package Configurations

<b>Table 6. Package Configurations</b>		
Unit Size	No. of Furnace Sections	No. of Blower Cabinets
400	1	1
500, 600, 700, 800	2	
1050, 1200	3	

### Location

## ⚠ CAUTION ⚠

**Do not locate an indoor model SSCBL unit where it may be exposed to water spray, rain, or dripping water.**

- Select a location that complies with the requirements in this manual.
- There are a variety of factors, such as system application, building structure, dimensions, and weight, that contribute to selecting the location.
- The location must comply with the clearances listed in [Table 5](#).
- If the unit is equipped with an outside air hood, it is recommended that the inlet to the hood not be facing into the prevailing wind.

### 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.

## INSTALLATION

**NOTE: Before installation, make preparations for necessary supplies, tools, and manpower.**

### Uncrating/Unpacking

- This furnace was test-operated and inspected at the factory prior to crating and was in operating condition. If the furnace has incurred any damage in shipment, document the damage with the transporting agency and immediately contact an authorized Reznor® distributor. If you are an authorized Distributor, follow the FOB freight policy procedures.
- Check the rating plate for the gas specifications and electrical characteristics of the furnace to ensure that they are compatible with the gas and electric supplies at the installation site.

### Shipped-Separate Parts

- Check to see if there are any field-installed options that need to be connected to the furnace prior to installation.
- **Model SSCBL:** All model SSCBL installations require a vent/combustion air kit (option CC2 or CC6), which includes a concentric adapter box, for each duct furnace. Ensure that all of the factory-supplied and field-supplied parts needed for the vent/combustion air kit(s) are at the job site.
- Shipped-separate options could include a roof curb, a screened outside air hood, a gas shutoff valve, a [thermostat](#), a different control switch, a remote console, a manual fan switch, a vertical vent terminal, a vent extension, a gas supply regulator, and/or a disconnect switch.
- If ordered with either an evaporative cooling module or a DX or chilled water cooling coil module, the module is shipped separately. A drain and fill or freeze kit and a water hammer arrestor are shipped-separate options for an evaporative cooling module.
- Some gas control options will have parts either shipped loose with the heater or shipped separately. If the unit is equipped with any of the gas control options listed in [Table 7](#), ensure that these parts are available at the job site.

**Table 7. Shipped-Separate Parts for Gas Control Options**

Application	Option	Part(s)
Heating	AG7	<a href="#">Thermostat</a> (PN 48033)
	AG10	<a href="#">Thermostat</a> (PN 91919)
	AG11	<a href="#">Thermostat</a> (PN 93435)
Makeup air	AG3, AG8	Control switch (PN 29054)
	AG9	Control switch (PN 29054), remote temperature selector (PN 48042)
	AG15, AG17, AG19	Control switch (PN 29054), remote temperature selector (PN 115848), stage adder module(s) (PN <a href="#">115849</a> )
	AG39, AG41	Remote temperature selector (PN 174849)

NOTE: If an optional remote console is ordered, the control switch and temperature selector may be mounted on the console.

### Mounting Support Structure

#### ⚠ WARNING ⚠

**Before installation, check the supporting structure to ensure that it has sufficient load-carrying capacity to support the weight of the unit.**

#### ⚠ CAUTION ⚠

- **Before installing the curb, verify that the size is correct for the system being installed.**
- **Whether using an optional roof curb available with the system or a field-supplied curb, the curb must be secure, square and level.**
- **IMPORTANT: The area enclosed by the roof curb must comply with [Table 5](#). If the roof is constructed of combustible materials, the area within curb must be either ventilated, left open, or covered with non-combustible material that has an R-value of at least 5.0.**

## INSTALLATION—CONTINUED

### Mounting Support Structure—Continued

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#### NOTES:

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- Prior to installation, ensure that the method of support is in agreement with all local building codes and, for outdoor installations, is suited to the climate.
  - If the area within the curb is left open, higher radiated sound levels may result.
  - The system can have a variety of configurations that affect installation. If the system does not have a downturn plenum, the discharge is horizontal.
- 

#### *Curb Cap Base*

- Units are equipped with a load bearing curb cap that forms an integral part of the unit. The curb cap is welded at all joints.
- **Model SSCBL:** The curb cap has suspension holes at each corner and hanger brackets on the sides. Each suspension location requires a 1/2-inch threaded rod (refer to [Suspension \(Model SSCBL\)](#) section).
- **Model RPBL:** The curb cap has a skirt that fits over a roof curb to provide a weatherproof installation. Four holes are provided at the curb cap corners for lifting the unit. These holes do not interfere with unit weatherproofing. The curb cap is not designed to be placed directly on the roof surface. The system may be mounted on an optional roof curb purchased with the unit, a field-supplied roof curb, or field-supplied supports. If the system has a downturn plenum and/or a bottom return air opening, a roof curb is recommended to provide a weatherproof installation as well as more workable clearances for ductwork (refer to [Bottom Duct Connections \(Model RPBL\)](#) section).

#### *Optional Curb (Option CJ1, CJ2, CJ4, or CJ5) Assembly (Model RPBL)*

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#### NOTES:

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- Curbs are shipped unassembled. Field-assembly and mounting on the roof are the responsibility of the installer. All required hardware necessary to complete the assembly is provided.
  - The system can have a variety of configurations that affect installation. Option CJ1 is for a standard RPBL unit. Option CJ2 is for a unit with a factory-installed downturn plenum (option AQ5 or AQ8). Option CJ4 is for a unit with a field-installed cooling coil cabinet (option AU2 or AU3). Option CJ5 is for a unit with a field-installed cooling coil cabinet with a downturn plenum (option AU11, AU12, AU13, or AU14). [Figure 3](#) shows a unit with an option AQ5 or AQ8 downturn plenum. If the system does not have a downturn plenum, the discharge is horizontal.
  - Field installed means that the cooling coil cabinet, with or without the downturn, is factory-assembled and shipped separately. The roof curb is sized to accommodate the complete length of the system. The shipped-separate cooling coil cabinet, with or without a downturn, must be lifted to the roof separately from the packaged system, set on the roof curb, and connected to the furnace section.
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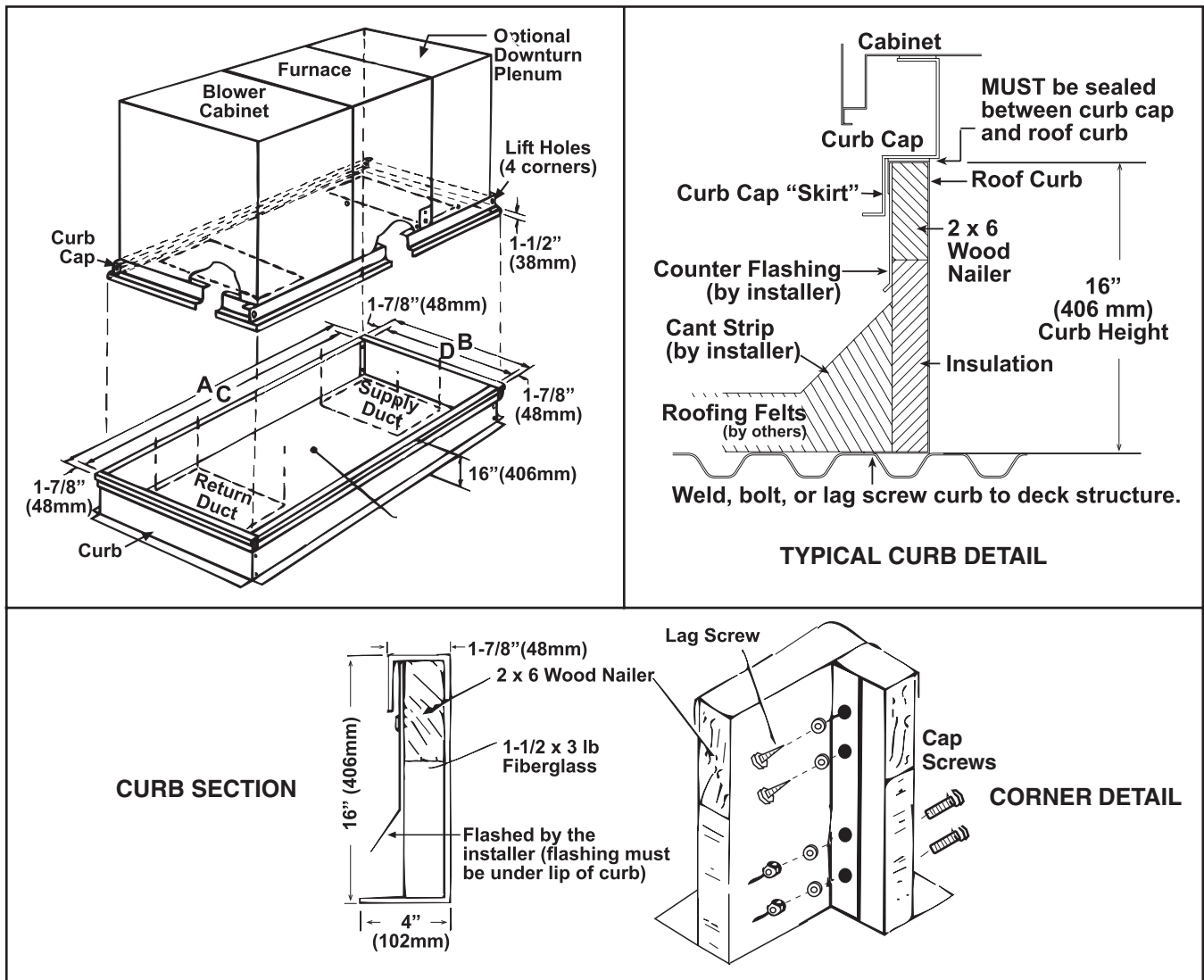


Figure 3. Optional Curb Assembly—Model RPBL (Refer to Table 8)

Table 8. Optional Curb Dimensions—Model RPBL							
Dimension (See Figure 3)	Option	Unit Size					
		400	500, 600	700	800	1050	1200
Inches (mm)							
A	CJ1	82-1/4 (2089)	108-1/4 (2750)			134-1/4 (3410)	
	CJ2	106-1/4 (2699)	132-1/4 (3359)			158-1/4 (4020)	
	CJ4	150-1/4 (3816)	165-1/4 (4197)	170-3/4 (4337)	176-1/4 (4477)	1-3/4 (4997)	202-1/4 (5137)
	CJ5	174-1/4 (4426)	189-1/4 (4807)	194-3/4 (4947)	200-1/4 (5086)	220-3/4 (5607)	226-1/4 (5747)
B	All	54-1/2 (1384)	43-9/16 (1106)	49-1/16 (1246)	54-1/2 (1384)	49-1/16 (1246)	54-1/2 (1384)
C*	CJ1	78-1/2 (1994)	104-1/2 (2654)			130-1/2 (3315)	
	CJ2	102-1/2 (2604)	128-1/2 (3264)			154-1/2 (3924)	
	CJ4	146-1/2 (3721)	161-1/2 (4102)	167 (4242)	172-1/2 (4382)	193 (4902)	198-1/2 (5042)
	CJ5	170-1/2 (4331)	185-1/2 (4712)	191 (4851)	196-1/2 (4991)	217 (5512)	222-1/2 (5652)
D*	All	50-13/16 (1291)	39-13/16 (1011)	45-5/16 (1151)	50-13/16 (1291)	45-5/16 (1151)	50-13/16 (1291)

\*Roof opening dimensions.

## INSTALLATION—CONTINUED

### Mounting Support Structure—Continued

#### Optional Curb (Option CJ1, CJ2, CJ4, or CJ5) Assembly (Model RPBL)—Continued

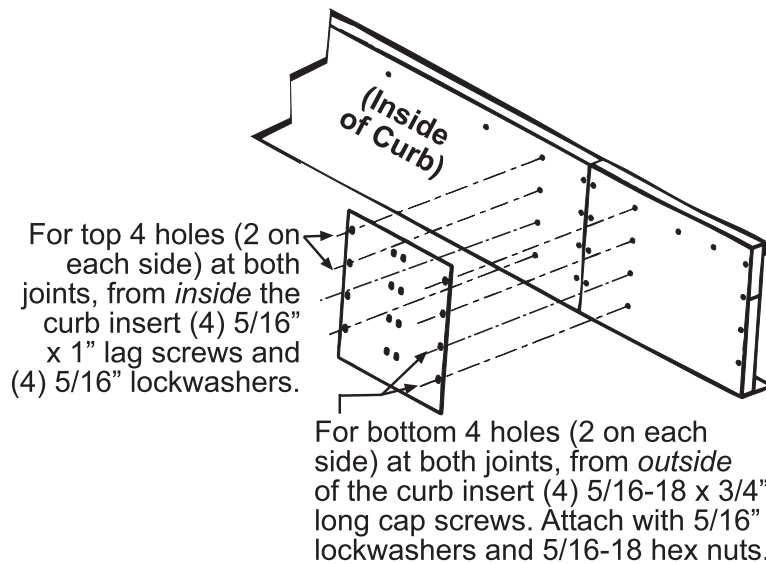
Table 9. Optional Curb Weights—Model RPBL						
Option	Unit Size					
	400	500, 600	700	800	1050	1200
	Pounds (kg)					
CJ1	150 (68)	167 (76)	173 (78)	179 (81)	202 (92)	208 (94)
CJ2	177 (80)	193 (88)	199 (91)	205 (93)	228 (103)	234 (106)
CJ4	227 (103)	231 (105)	243 (110)	255 (116)	271 (123)	282 (128)
CJ5	253 (115)	257 (117)	269 (122)	280 (127)	296 (134)	308 (140)

1. Position and connect cross rails and side rails as shown in [Figure 3](#).
2. If side has two side pieces, fasten them using splice plates and hardware as shown in [Figure 4](#).
3. Check assembly for squareness—adjust as necessary so that diagonal measurements are equal within  $\pm 1/8$ -inch ( $\pm 3$ -mm) tolerance.

### ⚠ CAUTION ⚠

**Curb must be leveled in both directions with no twist end-to-end to ensure good weather-tight seal between unit's curb cap and curb.**

4. Level curb as necessary using shims.
5. Secure curb to roof deck using hardware provided.
6. Install field-supplied flashing.



**Figure 4. Splicing Detail**

*Field-Supplied Support Assembly*

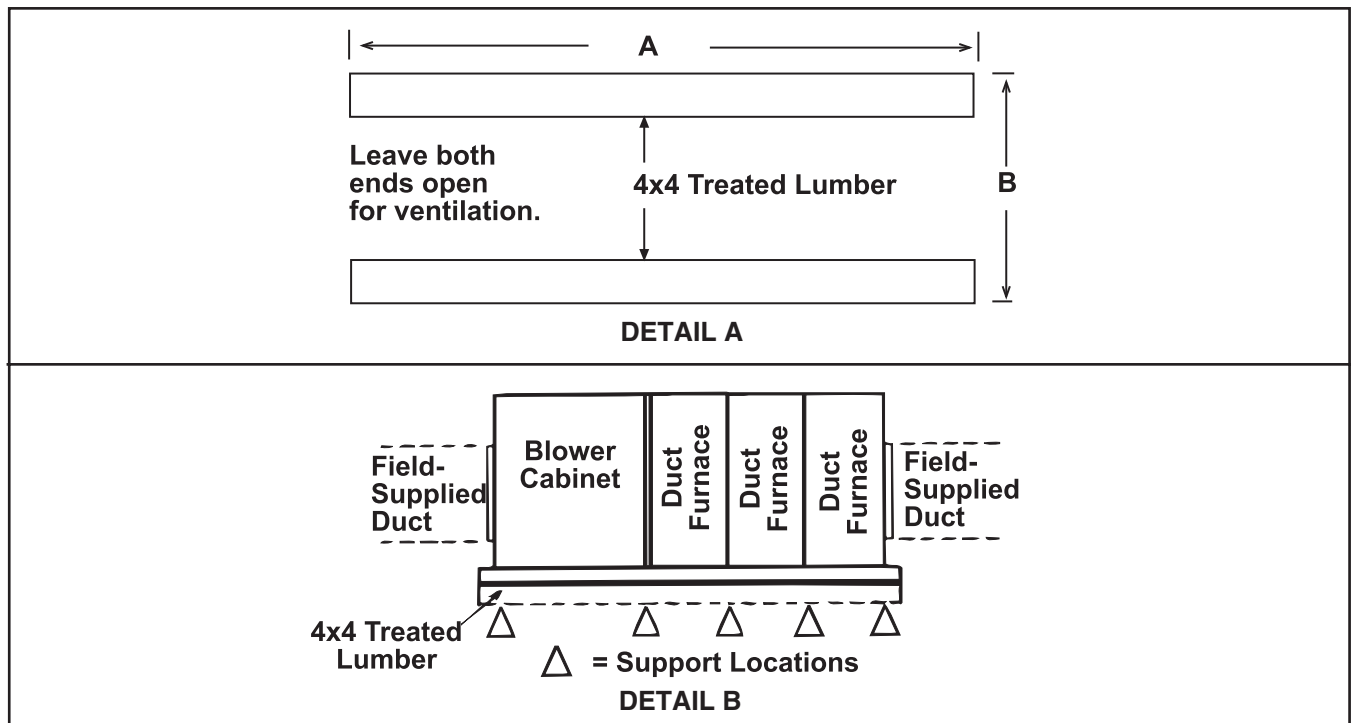
**⚠ WARNING ⚠**

**Do not close or block the openings under each end of a system mounted on 4 × 4 treated wooden rails. If cross supports are used under the 4 × 4 rails, do not enclose the area under the furnace. The space under the furnace **MUST** be left open for ventilation.**

**NOTES:**

- The field-supplied, cross-support structure must be adequate for the weight of the system. Cross-supports should run the entire width of the system to support the rails at the recommended locations (see [Figure 5](#), DETAIL A).
- Whether the supports are mounted directly on a surface or placed up on an additional structure, the horizontal length of the system should be supported by two 4 × 4 treated wooden rails.
- Model RPBL: If considering this type of installation in snow areas, it is recommended that the weather-resistant 4 × 4 wooden rails underneath the system be on a cross-support structure at least 12 inches higher than the roof surface.

1. Cut treated 4 × 4 wooden rails for length in accordance with dimension A (see [Figure 5](#), DETAIL A).
2. Space rails in accordance with dimension B (see [Figure 5](#), DETAIL A) so that curb cap skirt fits over edge of boards with rails sitting inside horizontal length of curb cap. If rails are being laid directly on roof, position them as shown in [Figure 5](#), DETAIL A).
3. If rails are not being placed directly on surface, install cross-supports underneath rails at ends of unit and at all cabinet joints (see [Figure 5](#), DETAIL B).



**Figure 5. Field-Supplied Support Assembly (Refer to [Table 10](#))**

## INSTALLATION—CONTINUED

### Mounting Support Structure—Continued

#### Field-Supplied Support Assembly—Continued

<b>Table 10. Field-Supplied Support Assembly Dimensions</b>							
Dimension (See Figure 5)	Configuration	SSCBL Unit Size					
		400	500, 600	700	800	1050	1200
		Inches (mm)					
A	Standard	82-1/4 (2089)	108-1/4 (2750)	108-1/4 (2750)	108-1/4 (2750)	134-1/4 (3410)	134-1/4 (3410)
	With cooling coil cabinet (option AU2 or AU3)	150-1/4 (3816)	176-1/4 (4477)	176-1/4 (4477)	176-1/4 (4477)	202-1/4 (5137)	158-1/4 (4020)
B	All	54-1/2 (1384)	43-9/16 (1106)	49-1/16 (1246)	54-1/2 (1384)	49-1/16 (1246)	54-1/2 (1384)
Dimension (See Figure 5)	Configuration	RPBL Unit Size					
		400	500, 600	700	800	1050	1200
		Inches (mm)					
A	Standard	82-1/4 (2089)	108-1/4 (2750)	108-1/4 (2750)	108-1/4 (2750)	134-1/4 (3410)	134-1/4 (3410)
	With cooling coil cabinet (option AU2 or AU3)	150-1/4 (3816)	165-1/4 (4197)	170-3/4 (4337)	176-1/4 (4477)	196-3/4 (4997)	202-1/4 (5137)
	With downturn plenum (option AQ5 or AQ8)*	106-1/4 (2699)	132-1/4 (3359)	132-1/4 (3359)	132-1/4 (3359)	158-1/4 (4020)	158-1/4 (4020)
	With cooling coil cabinet with downturn plenum (option AU11, AU12, AU13, or AU14)*	174-1/4 (4426)	189-1/4 (4807)	194-3/4 (4947)	200-1/4 (5086)	220-3/4 (5607)	226-1/4 (5747)
B	All	54-1/2 (1384)	43-9/16 (1106)	49-1/16 (1246)	54-1/2 (1384)	49-1/16 (1246)	54-1/2 (1384)

\*Although dimensions are included for units with a downturn plenum cabinet, it is strongly recommended that a full roof curb be used on an installation with a downturn plenum cabinet and/or a bottom return air duct.

### Mounting

Model SSCBL systems are designed for either suspension or mounting on rails. Model RPBL systems are designed for mounting only on rails or on a curb.

## ⚠ DANGER ⚠

**Use a suitable hoist to lift the unit (refer to [Weights](#) section). Lifting holes are provided for rigging. Use spreader bars when lifting to prevent chains or cables from damaging the unit.**

## ⚠ CAUTION ⚠

**All installed systems must be level.**

**NOTE: Properly suspending or mounting the unit is the responsibility of the installer.**

### Suspension (Model SSCBL)

## ⚠ WARNING ⚠

**Units must be level for proper operation. Do not place additional weight on or add additional weight to the suspended unit.**

The curb cap has suspension holes at each corner and six hanger brackets on the sides (see [Figure 6](#), DETAIL A for suspension dimensions). Each suspension point requires a 1/2-inch threaded rod (see [Figure 6](#), DETAIL B).

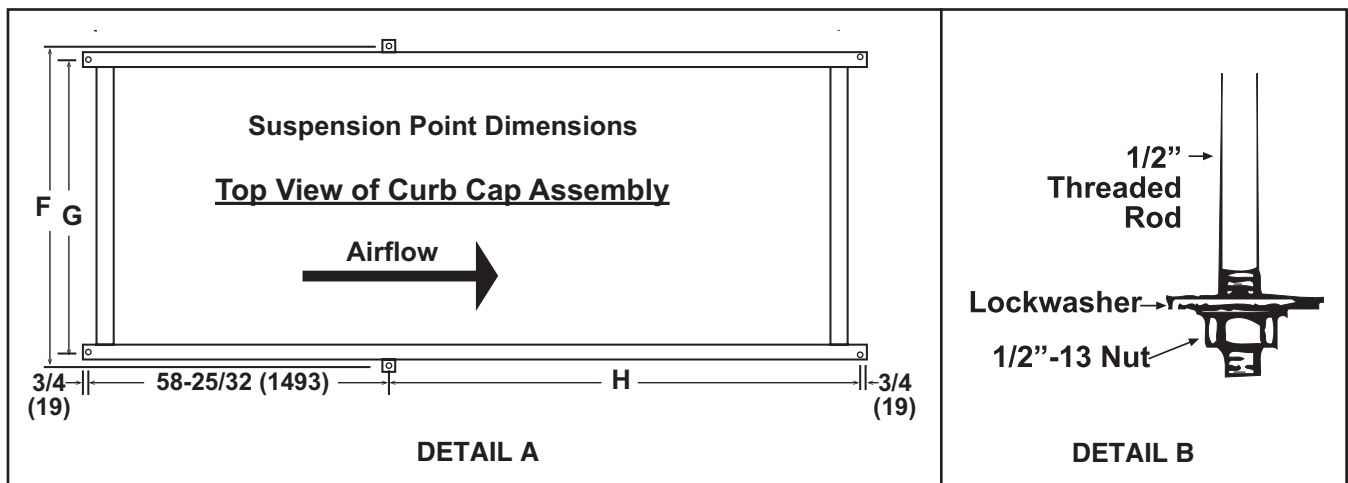


Figure 6. Suspension of Model SSCBL (Refer to Table 11)

Table 11. SSCBL Suspension Dimensions						
Dimension (See Figure 6)	Unit Size					
	400	500, 600	700	800	1050	1200
	Inches (mm)					
F	59-9/16 (1513)	48-9/16 (1233)	54-1/16 (1373)	59-9/16 (1513)	54-1/16 (1373)	59-9/16 (1513)
G	54-3/8 (1381)	43-3/8 (1102)	48-7/8 (1229)	54-3/8 (1381)	48-7/8 (1229)	54-3/8 (1381)
H*	27-3/32 (688)	53-3/32 (1352)			79-7/32 (2012)	

\*Does not apply to a system with a field-installed cooling coil cabinet (option AU2 or AU3).

**Mounting (Model SSCBL)**

Lift the unit using a suitable hoist and spreader bars and set it on the rails. Leave the ends open underneath for ventilation.

**Mounting (Model RPBL)**

**⚠ CAUTION ⚠**

**IMPORTANT:** To prevent damage from wind blown rain and capillary action, the top surface of the curb **MUST** be sealed using 1/4-inch x 1-1/4-inch sealant tape or two 1/4-inch beads of suitable sealant.

**NOTE:** If the system includes an outside air hood, a cooling coil cabinet, or an evaporative cooling module, install it after the unit is in place. Options AU2, AU3, AU11, AU12, AU13, and AU14 are not factory-installed and must be lifted to the roof separately from the packaged system, set on the roof curb, and attached to the furnace.

1. Apply furnished 1/4-inch x 1-1/4-inch foam sealant tape or two 1/4-inch beads of suitable sealant to top surface of curb, making good butt joints at corners.
2. Lift unit using suitable hoist and spreader bars and set it on curb or rails. If set on rails, leave ends open underneath for ventilation.

## INSTALLATION—CONTINUED

### Field-Installation of Cooling Coil Cabinet and Downturn Plenum

#### ⚠ WARNING ⚠

Do NOT install the cooling coil cabinet before lifting the packaged blower/furnace system into position. Lift the cooling coil cabinet separately. Do NOT install the cooling coil cabinet while the furnace is in operation.

#### NOTES:

- If the cabinet is being installed on an indoor model SSCBL, consult the factory regarding installation. If suspending the cabinet, consult the factory.
- The optional cooling coil cabinet is shipped separately for field-installation. The cabinet includes either a chilled water or a refrigerant (DX) air conditioning coil. Cabinets alone have horizontal discharge but may have an attached downturn plenum for vertical discharge.
- The total length of an indoor system with a cooling coil cabinet depends on how the system is installed. If the blower/furnace is suspended, a special curb cap and a field-installed transition duct are required. Contact your Sales Representative to receive specific information. If an indoor system is mounted, add the cabinet length to the blower/furnace length listed in [Table 2](#) or [Table 3](#).
- Optional two-position discharge dampers in option AU12 or AU14 fit in the discharge air opening. The damper motor fits inside the downturn cabinet.
- If the downturn plenum is equipped with discharge dampers, field wiring including drilling holes and running wires is required. Cooling coil cabinet dimensions are listed in [Table 12](#) and shown in [Figure 7](#).

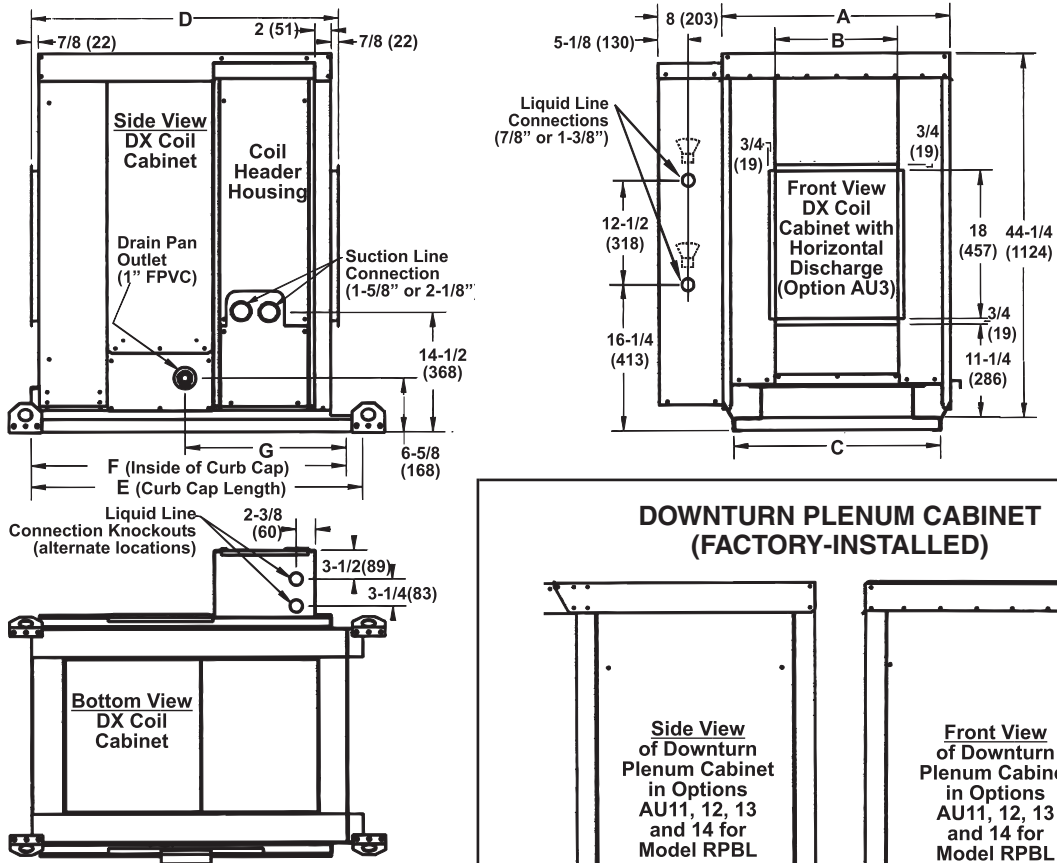
**Table 12. Cooling Coil Cabinet and Downturn Plenum Dimensions**

Dimension (See <a href="#">Figure 7</a> )	Unit Size		
	500, 600	700, 1050	400, 800, 1200
	Inches (mm)		
A	47-3/4 (1213)	53-1/4 (1353)	58-3/4 (1492)
B	34-1/2 (876)	40 (1016)	45-1/2 (1156)
C	45-1/8 (1146)	50-5/8 (1286)	56-1/8 (1426)
D	56-3/8 (1432)	62 (1575)	67-3/8 (1711)
E	59-3/8 (1508)	64-7/8 (1648)	70-3/8 (1788)
	83-3/8 (2118)**	88-7/8 (2257)**	94-3/8 (2397)**
F	57-3/8 (1457)	63 (1600)	68-3/8 (1737)
	81-3/8 (2067)**	87 (2210)**	92-3/8 (2346)**
G	29-1/8 (740)	31-7/8 (810)	34-5/8 (879)
H	45-1/8 (1146)	50-5/8 (1286)	56-1/8 (1426)

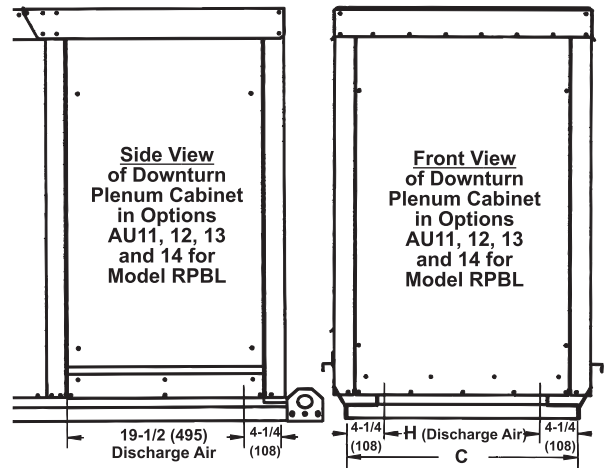
\*\*With downturn plenum (option AQ5 or AQ8).

Configuration	Cabinet Dimension	Unit Size					
		400	500, 600	700	800	1050	1200
		Inches (mm)					
With chilled water coil cabinet	Width	58-7/8 (1495)	47-1/8 (1197)	53-3/8 (1356)	58-7/8 (1495)	53-3/8 (1356)	58-7/8 (1495)
With DX coil cabinet		66-7/8 (1698)	55-1/8 (1400)	61-3/8 (1559)	66-7/8 (1698)	61-3/8 (1559)	66-7/8 (1698)
With cooling coil cabinet	Length	150-3/8 (3820)	165-3/8 (4201)	171 (4343)	176-3/8 (4480)	197 (5004)	202-3/8 (5140)
With cooling coil cabinet with downturn plenum		173-1/2 (4407)	188-1/2 (4788)	194-1/8 (4931)	199-1/2 (5067)	220-1/8 (5591)	225-1/2 (5728)

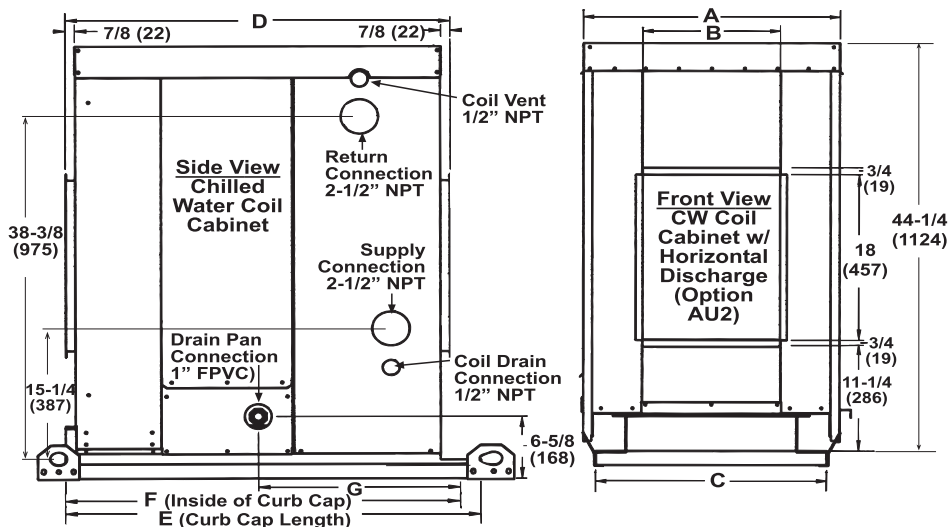
**DX COIL CABINET (OPTION AU3 FOR RPBL AND SSCBL AND OPTIONS AU13 AND AU14 FOR RPBL)**



**DOWNTURN PLENUM CABINET (FACTORY-INSTALLED)**



**CHILLED WATER COIL CABINET (OPTION AU2 FOR RPBL AND SSCBL AND OPTIONS AU11 AND AU12 FOR RPBL)**



**Figure 7. Cooling Coil Cabinet and Downturn Plenum Dimensions (Refer to Table 12)**

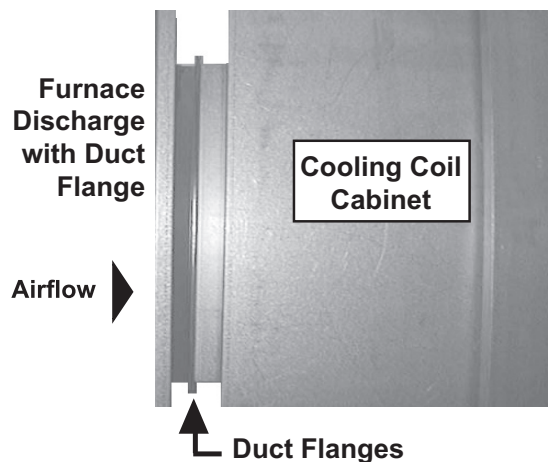
## INSTALLATION—CONTINUED

### Field-Installation of Cooling Coil Cabinet and Downturn Plenum—Continued

Using the parts shipped inside the cooling coil cabinet (refer to [Table 13](#)), follow the instructions to connect the coil cabinet to the furnace. In addition to normally-required tools, a driver extension, a hammer, and a bar or short length of 2 × 4 will be required. Silicone caulking must be field-supplied.

Table 13. Cooling Coil Cabinet Factory-Supplied Components				
Component	Description	Unit Size		
		500, 600	700, 1050	400, 800, 1200
PN (Quantity)				
Duct connector	Top/bottom, 36-inch	106338 (2)	—	
	Top/bottom, 41-1/2-inch	—	106339 (2)	—
	Top/bottom, 47-inch	—		106340 (2)
	Side, 19-1/2-inch	106395 (2)		
Filler panel	Left side	172357 (1)		
	Right side	172358 (1)		
	Top	172362 (1)	172363 (1)	172364 (1)
Rubber gasket strip	3/32 × 1-1/8 × 53-7/8	103608 (1)	—	
	3/32 × 1-1/8 × 59-3/8	—	103609 (1)	—
	3/32 × 1-1/8 × 64-7/8	—		106310 (1)
Insulation	1 × 42 × 9	172546 (2)		
Sheet metal screw	#10 × 1/2	11813 (24)	11813 (25)	11813 (26)
	#14 × 3/4	105171 (8)		

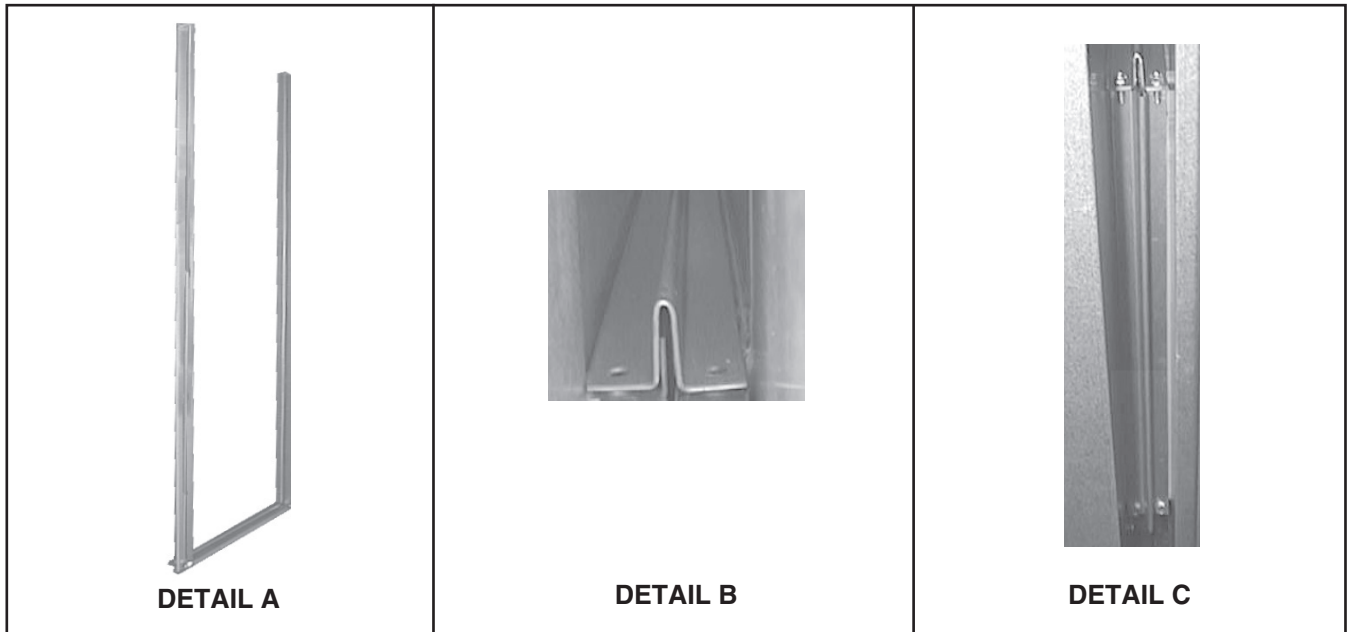
1. After blower/furnace packaged system is in place on roof curb or mounting rails, remove lifting lugs on discharge end of system using 9/16 wrench or socket.
2. Lift cooling coil cabinet and position it with inlet side next to discharge opening of furnace. Remove lifting lugs on cooling coil cabinet.
3. Slide cooling coil cabinet so that furnace duct flanges and cooling coil cabinet butt together (see [Figure 8](#)).



**Figure 8. Cooling Coil Cabinet Mounting Position**

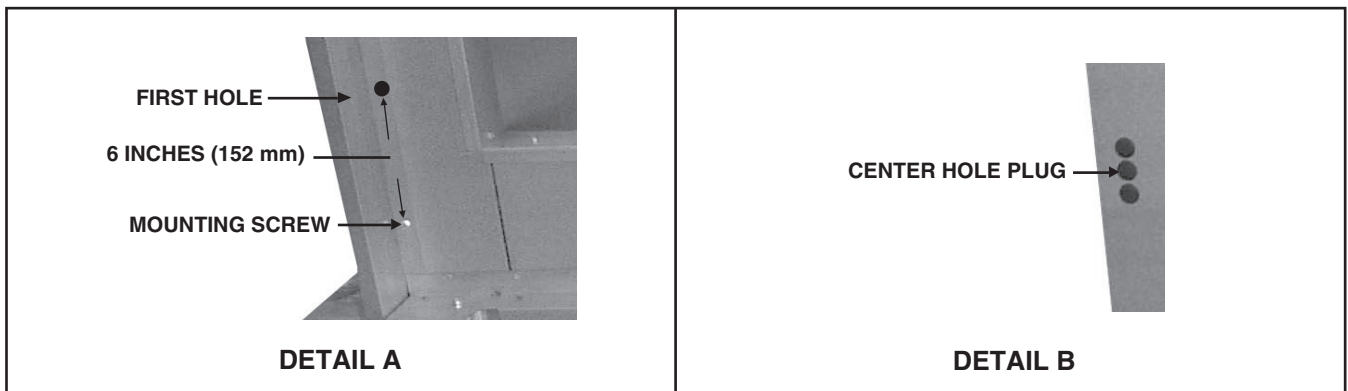
4. Join duct flanges:
  - a. Connect one side duct connector to both top and bottom duct connectors using #14 × 3/4 sheet metal screws (see [Figure 9](#), DETAIL A).
  - b. Install partially-assembled connectors with screw holes in top piece at open side (see [Figure 9](#), DETAIL B) into space between furnace and cooling coil cabinet. Tap with hammer—first on side, then on top, and lastly on bottom—until duct connector assembly is seated over both duct flanges.

- c. Install other side duct connector and use driver extension to install #14 × 3/4 sheet metal screws that secure side connector to top and bottom connectors (see **Figure 9**, DETAIL C). Ensure that top screws are vertical and bottom screws are horizontal and that U-shaped rectangular frame joins duct flanges on all four sides.



**Figure 9. Duct Connector Assembly**

- 5. If cabinet does not include downturn plenum with discharge damper, proceed to step 6. If installing an option AU12 or AU14 cooling coil cabinet with downturn plenum cabinet equipped with optional discharge dampers, connect damper motor wires to terminal blocks in furnace electrical compartment as follows:
  - a. Drill three 7/8-inch holes ensuring that all holes are free of burrs:
    - (1) Remove control side door on discharge plenum. Locate discharge damper motor with three wires long enough to reach furnace section.
    - (2) On leg of downturn plenum next to cooling coil cabinet locate mounting screw shown in **Figure 10**, DETAIL A and measure up 6 inches (152 mm). Drill first 7/8-inch hole at same center line as mounting screw.



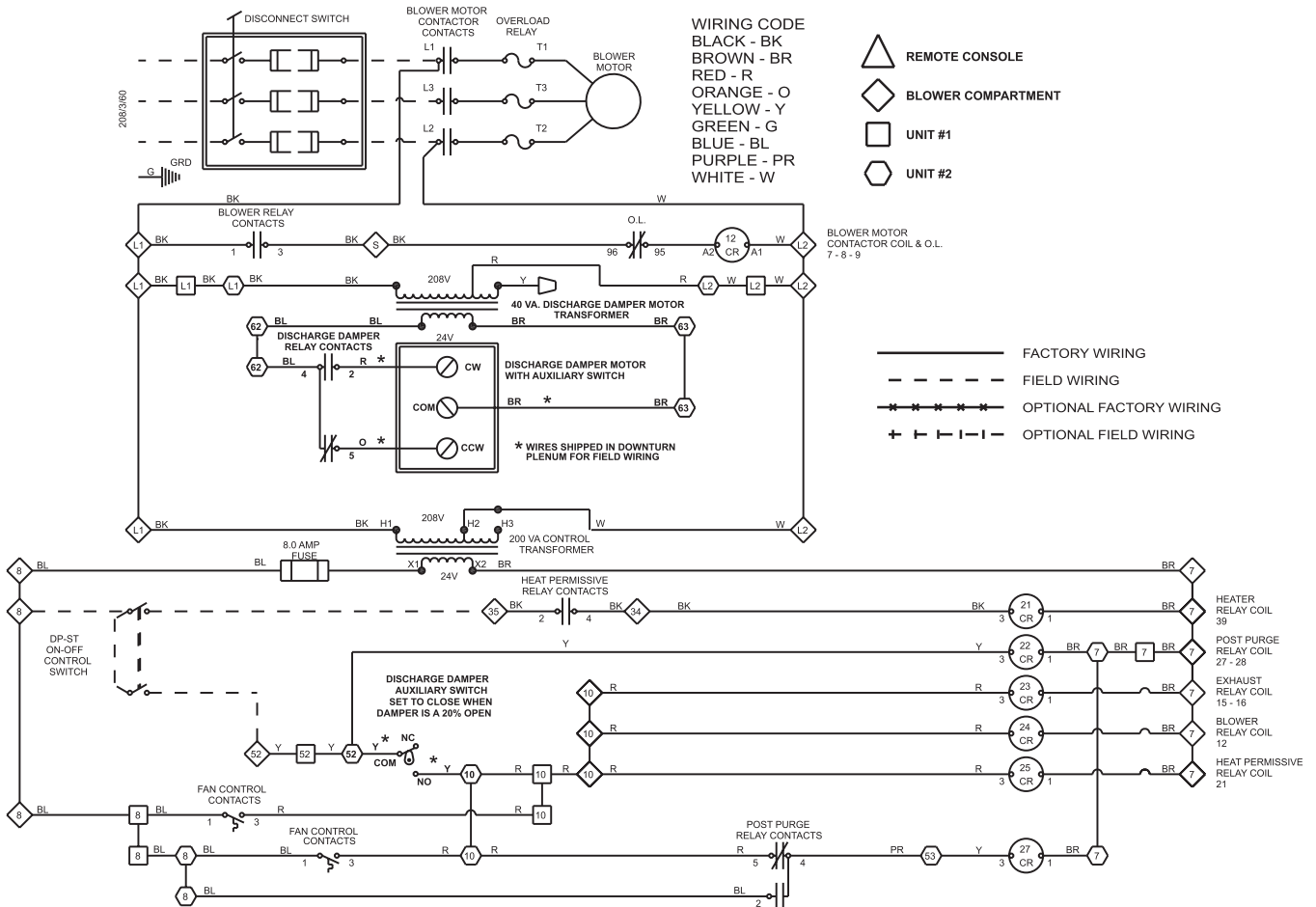
**Figure 10. Wiring Hole Locations**

- (3) Remove cooling coil access panel(s).

## INSTALLATION—CONTINUED

### Field-Installation of Cooling Coil Cabinet and Downturn Plenum—Continued

- (4) Locate coil blockoff plate and measure up 4 inches (102 mm) from bottom of blockoff plate. Drill second 7/8-inch hole at that location at center point of blockoff plate. Hole should be approximately even with first hole drilled in downturn plenum leg.
  - (5) On cabinet leg on entering air side of cooling coil cabinet, measure up 10 inches (254 mm) from bottom pan and then in 4 inches (102 mm) from edge. Drill third 7/8-inch hole at that location.
- b. On outside of furnace section where flanges were joined in step 4, locate three hole plugs and remove center plug to expose 7/8-inch hole in cabinet leg (see **Figure 10**, DETAIL B).
  - c. Run damper motor wires:
    - (1) Out through hole in discharge plenum leg into cooling coil cabinet.
    - (2) Through blockoff plate across coil cabinet.
    - (3) Out through hole in cooling coil cabinet leg.
    - (4) Into furnace section.
  - d. On bottom of electrical box in furnace section, remove hole plug below terminal blocks and route damper motor wires up through hole and into electrical box.
  - e. Connect wires in accordance with **Figure 11**.

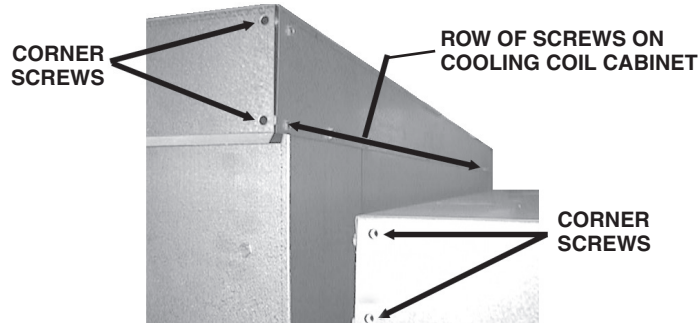


**Figure 11. Discharge Damper Wiring Connections**

6. Install filler panels:

a. Remove cabinet panels (see **Figure 12**):

- (1) At side corners of both cooling coil cabinet and furnace, remove factory-installed screws that secure cabinet tops.
- (2) Remove row of screws across edge of cooling coil cabinet that secure cabinet top.



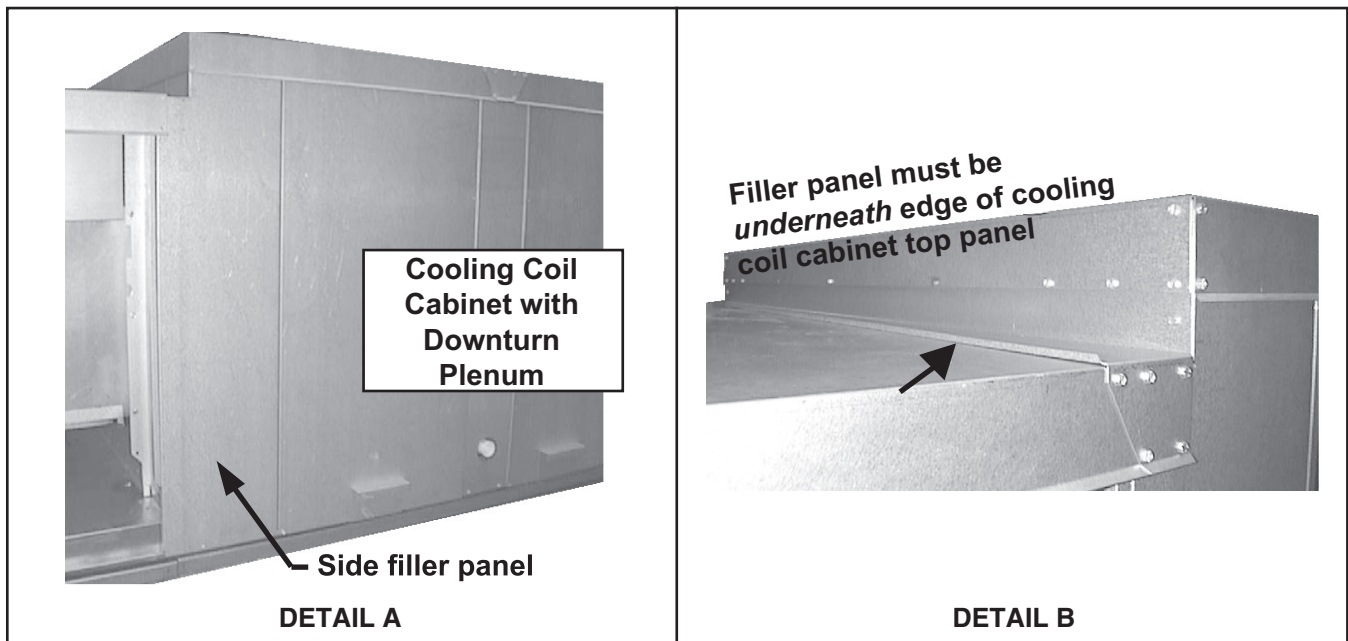
**Figure 12. Cooling Coil Cabinet Screw Removal**

b. Install side filler panels (see **Figure 13**, DETAIL A):

**NOTE: It may be easier to slide the filler panels in place with the door panels removed.**

- (1) Install piece of insulation against inner panel of cooling coil cabinet.
- (2) Slide filler panel into place and secure using #10 x 1/2 sheet metal screws. Repeat on other side.

c. Install top filler panel (see **Figure 13**, DETAIL B):



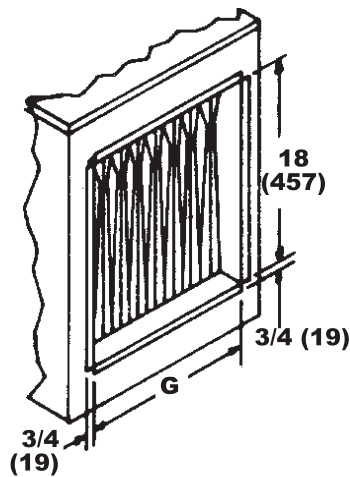
**Figure 13. Filler Panel Installation**

## INSTALLATION—CONTINUED

### Field-Installation of Cooling Coil Cabinet and Downturn Plenum—Continued

- (1) Remove backing from gasket strip and adhere it along edge of bottom of top filler panel.
  - (2) Slide top filler panel underneath edge of cooling coil cabinet top—edge of top panel may have to be pulled out slightly to slide panel underneath—panel must be between cooling coil cabinet top and end panel to prevent water from leaking into cabinet.
  - (3) Secure top filler panel using #10 × 1/2 sheet metal screws.
  - (4) Re-install any remaining screws removed in step 6a.
  - (5) Check for gaps and apply caulking as needed so that any gaps between top filler panel and furnace section top panel are sealed.
7. Apply silicone caulking where cooling cabinet curb cap meets furnace curb cap.
  8. Follow instructions provided by cooling coil manufacturer to make cooling coil connections.

### Duct Connections



**Figure 14. Duct Connection Dimensions (Refer to Table 14)**

<b>Table 14. Duct Connection Dimensions</b>		
<b>Unit Size</b>		
<b>500, 600</b>	<b>700, 1050</b>	<b>400, 800, 1200</b>
<b>Dimension G (Inches (mm))*</b>		
34-1/2 (876)	40 (1016)	45-1/2 (1156)

\*See Figure 14.

- **Inlet air (model RPBL):** Depending on how the unit was ordered, the blower cabinet can have a variety of outside air and return air inlets. Check the unit to be aware of the inlet air requirements for your installation.
- **Filters:** When ordered, a filter rack with a variety of filter options, is factory-installed in the blower cabinet. Refer to the replacement parts manual listed in [Table 1](#) for replacement filters. Refer to the [APPENDIX: FILTER PRESSURE DROPS](#) for filter pressure drop data.
- **Air opening dimensions:** Refer to [Table 2](#) or [Table 3](#).

### Requirements and Suggestions for Connecting and Installing Ducts

- **Type of ductwork:** The type of duct installation to be used depends in part on the construction type of the roof—whether wood or steel bar joist, steel truss, or pre-cast concrete—and the ceiling—whether hung, flush, etc.
- **Ductwork material:** Rectangular duct should be constructed of galvanized iron—not lighter than No. 26 US gauge—or aluminum—No. 24 B&S gauge.
- **Ductwork structure:** All duct sections 24 inches (610 mm) or wider and over 48 inches (1,219 mm) in length should be cross-broken on top and bottom and should have standing seams or angle-iron braces. Joints should be S and drive strip or locked.
- **Through masonry walls:** No warm air duct should come in contact with masonry walls. Insulate around all air duct through masonry walls with 1-inch (not less than 1/2-inch) of insulation.
- **Through unheated space:** Insulate all exposed warm air ducts passing through an unheated space with 1-inch (not less than 1/2-inch) of insulation.
- **Duct supports:** Suspend all ducts securely from adjacent buildings members. Do not support ducts from unit duct connections.
- **Duct sizing:** Proper sizing of the supply air ductwork is necessary to ensure a satisfactory heating installation. The recognized authority for duct size is the Air Conditioning Contractor's Association, 2800 Shirlington Road, Suite 300, Arlington, VA 22206 ([www.acca.org](http://www.acca.org)). A manual covering duct sizing in detail may be purchased directly from them.

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## ⚠ CAUTION ⚠

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To prevent possible motor overloading, ensure that the external duct system static pressure is within the limits shown on the rating plate and that the motor pulley and belt are properly adjusted.

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- **Access panels:** Install removable access panels (see [Figure 15](#)) on both the upstream and downstream sides of the furnace. The access panels must be accessible when the furnace is in service and should be a minimum of 6 × 10 inches (152 × 254 mm) in size so smoke or reflected light may be observed inside the casing to indicate the presence of leaks in the heat exchanger. Ensure that the access panels are installed in such a manner so as to prevent leakage.

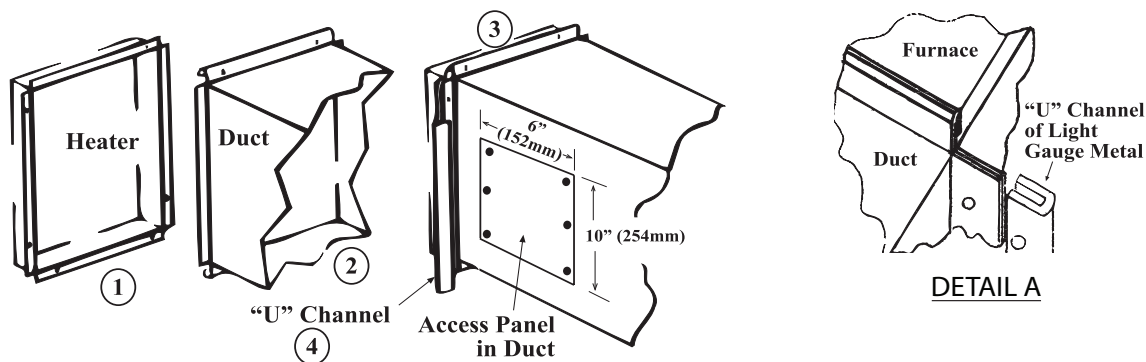


Figure 15. Connecting Ductwork to Furnace

- **Horizontal discharge duct length:** A minimum horizontal duct run of 24 inches (610 mm) is recommended before turns or branches are made in the duct system to reduce losses at the furnace outlet.

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## ⚠ CAUTION ⚠

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The joint where the supply air duct attaches to the furnace must be sealed securely to prevent air leakage into draft hood or burner rack area. Leakage can cause poor combustion and pilot problems, can shorten heat exchanger life, and can cause poor performance.

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## INSTALLATION—CONTINUED

### Duct Connections—Continued

#### Requirements and Suggestions for Connecting and Installing Ducts—Continued

- **Supply air duct/furnace horizontal connection:** The seal between the furnace and the duct must be mechanical using U-type flanges on the top and bottom of the connecting duct to ensure tight joints and an airtight fit. Refer to [Figure 15](#) and perform the following steps:
  - a. Ensure that flanges on the furnace (heat exchanger) turn out as shown.
  - b. Shape duct connection as shown: U-type on top and bottom and L-type on sides.
  - c. Slide U-channels over furnace top and bottom flanges making connection.
  - d. Form U-channels to seal sides (see DETAIL A) and drill and lock with sheet metal screws.
- **Bottom duct/furnace connection (model RPBL):** On outdoor models, insert ducts from below the roof deck through the roof opening into the heater. Form 1-inch (25-mm) flanges, fold over, and fasten with sheet metal screws inside the heater. Gain access to the unit by removing side panels from the blower and downturn plenum sections. Ducts must be attached and sealed to provide airtight connections.
- **Return air duct/furnace connection:** All return air ducts should be attached and sealed to the return air flanges to provide airtight connections.
- **Return air duct/grill size:** Ensure that return air ducting or grills have a free area equal to the size of the return duct connection.

#### Bottom Duct Connections (Model RPBL)

The blower section and optional downturn plenum have duct flanges for connection to return air and supply air ducts. Duct opening sizes and curb spacing are shown in [Figure 16](#).

**NOTE:** [Figure 16](#) shows dimensions for currently-manufactured curbs that are available from the system manufacturer. The measurement from the duct openings to inside edge of roof curb is 1-5/8 inches (41 mm). Duct openings should be 1 inch (25 mm) larger than the duct size for installation clearance.

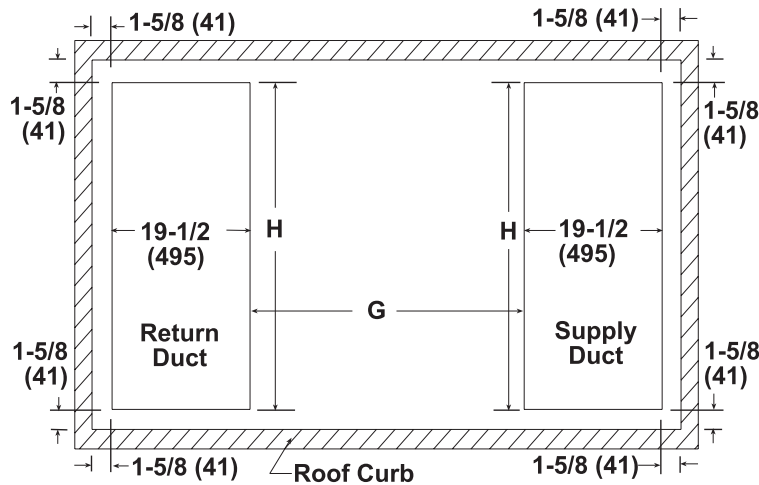


Figure 16. Bottom Duct Opening Dimensions—Model RPBL (Refer to [Table 15](#))

Table 15. Bottom Duct Opening Dimensions—Model RPBL							
Dimension (See <a href="#">Figure 16</a> )	Configuration	Unit Size					
		400	500, 600	700	800	1050	1200
		Inches (mm)					
G	With downturn plenum	60-5/16 (1532)	86-5/16 (2192)			112-5/16 (2853)	
	With cooling coil cabinet with downturn plenum	127-17/32 (3239)	142-17/32 (3620)	148-1/32 (3760)	153-17/32 (3900)	174-1/32 (4420)	179-17/32 (4560)
H	All	47-5/8 (1210)	36-5/8 (930)	42-1/8 (1070)	47-5/8 (1210)	42-1/8 (1070)	47-5/8 (1210)

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**⚠ CAUTION ⚠**

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**It is recommended that the inlet to the outside air hood NOT be facing into the prevailing wind. Allow a minimum clearance of 14 inches (356 mm) from the bottom of the air hood to the mounting surface.**

Option AS2 is a weatherized, screened hood designed to be field-assembled and installed around the horizontal inlet air opening of the blower cabinet. The air hood includes factory-assembled louvers designed to help eliminate moisture from the inlet air. Complete installation instructions are packaged with the air hood and are listed in [Table 1](#).

**Screened Air Hood for 30% Outside Air Opening (Model RPBL with Option AR6 or AR7)**

The outside air hood included in the air inlet options that have a 30% outside air opening (options AR6 and AR7) is shipped separately for field-installation. Complete installation instructions are packaged with the air hood and are listed in [Table 1](#).

**Evaporative Cooling Module (Option AS3, AS4, AS5, or AS8)**

The evaporative cooling module is factory-assembled, installed and wired. No additional roof mounting is necessary. Refer to the installation manual listed in [Table 1](#) to field-connect the water supply and to make necessary checks and adjustments before operating the cooling module.

**Discharge Air Temperature Sensor Installation**

1. Determine distance of sensor from unit:
  - a. Ensure that there is sufficient distance from outlet to have good mixture of discharge air temperature.

---

**NOTES:**

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- **According to the latest edition of AMCA Standard 201, in straight ducts, the air is typically well mixed a minimum of five equivalent duct diameters from the discharge of the unit with equivalent duct diameter defined as equal to the square root of  $4AB/3.14$  (A and B are duct cross-sectional dimensions).**
- **Locate the sensor a minimum of 96 inches (2,435 mm) from the outlet of the unit.**
- **If the length of the discharge duct is less than 8 feet (2.4 meters), a mixing vane is recommended for mixing the discharge air. Do not mount the sensor in the ductwork after a split in the supply as this will cause loss of control in the duct that does not house the sensor.**

- b. Refer to following formula for calculating sensor placement. This example assumes cross-sectional dimensions for supply ductwork of 24 × 12 inches (610 × 305 mm):

$$5 \text{ equivalent duct diameters} \times \sqrt{\frac{4 \times 12 \times 24}{3.14}} = 96 \text{ inches}$$

$$5 \text{ equivalent duct diameters} \times \sqrt{\frac{4 \times 305 \times 610}{3.14}} = 2435 \text{ millimeters}$$

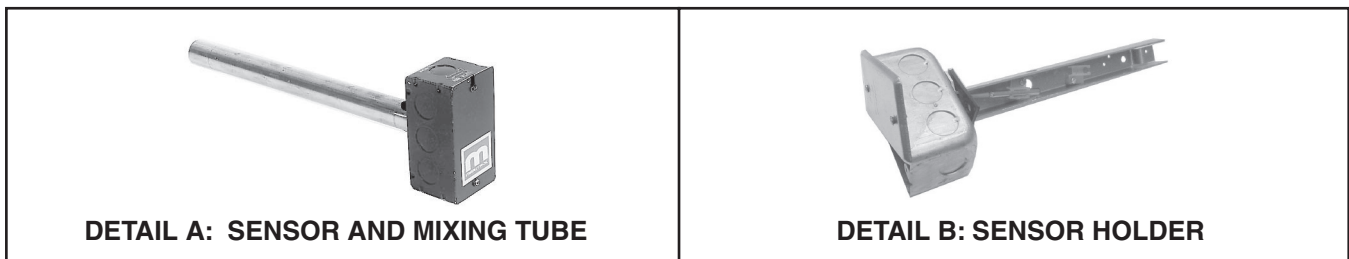
2. Determine orientation of sensor:
  - a. In horizontal ductwork, position sensor in top-middle of duct with sensor probe extending vertically down into center of air stream.
  - b. In vertical ductwork, position sensor in middle of duct that corresponds with top-middle of discharge outlet.

## INSTALLATION—CONTINUED

### Duct Connections—Continued

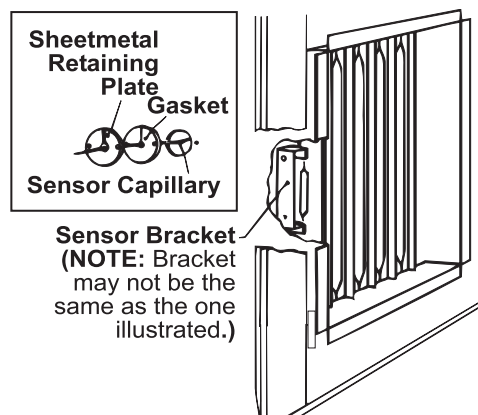
#### Discharge Air Temperature Sensor Installation—Continued

3. Secure sensor in ductwork:
  - a. Position of sensor in duct is also important—mixing tube shown in **Figure 17**, DETAIL A is 12 inches (305 mm) long and holder shown in **Figure 17**, DETAIL B extends 9-3/16 inches (233 mm) into ductwork.
  - b. For units with sensor holder, turn holder so that element is shielded from direct airflow and will sense air temperature as it flows through holes in holder.
  - c. At selected ductwork location, mark diamond-shaped hole—approximately 1 × 1 inch (25 × 25 mm—required for sensor holder or round hole required for mixing tube and cut hole no larger than necessary.
  - d. For units with sensor and mixing tube, slide mixing tube (see **Figure 17**, DETAIL A) into ductwork and attach sensor.
  - e. For units with sensor holder, push element into clip in holder (see **Figure 17**, DETAIL B), slide holder into ductwork, and position holder so that it shields sensor from direct airflow. Secure box portion of holder to ductwork using four field-supplied #6 sheet metal screws.



**Figure 17. Discharge Air Temperature Sensor and Holder**

- f. For units with option AG39 or AG41:
  - (1) Sensor is factory-installed in cabinet leg (see **Figure 18**). Remove access panel in ductwork adjacent to control compartment access panel.
  - (2) Element is retained by either spring clips or cable straps.
  - (3) Round gasket and metal retaining plate provide airtight seal for capillary and must be removed to remove element.



**Figure 18. Discharge Air Temperature Sensor Location (Options AG39 and AG41)**

4. Connect sensor wires:
  - a. For units with sensor holder:
    - (1) Determine where sensor wire should enter box and remove knockout.
    - (2) Secure field-supplied cable connector to box, connect sensor wire, and install box cover.
  - b. For all options, ensure that all sensor wires are connected in accordance with wiring diagram provided with unit.

### Venting/Combustion Air Connections (Model SSCBL)

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## ⚠ WARNING ⚠

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**Do not use an existing venting system. Each furnace section requires installation of the combustion air/vent system ordered with the unit (either option CC2 or CC6). Vent installation to be any listed vent system manufacturer. Do not intermix different vent system parts from different manufacturers in the same venting system.**

---

**NOTE: All model SSCBL installations require a vent/combustion air kit for each furnace section.**

---

- All separated-combustion, power-vented units **MUST BE** equipped with both combustion air and exhaust piping to the outdoors. The unique concentric adapter box designed for use with this heater allows for both combustion air and exhaust piping with only one horizontal or vertical penetration hole in the building.
- These instructions apply to installation and use of the concentric adapter and vent/combustion air kit (option CC2 or CC6) designed for use with all Reznor separated-combustion products. The systems illustrated in this manual are the only venting/combustion air systems approved for these separated-combustion units. Do not use this concentric adapter box with any other products.
- Installation should be done by a qualified agency in accordance with these instructions. The service agency installing this separated-combustion system is responsible for the installation.

#### ***Specific Venting Requirements: Piping***

All pipe is field-supplied. Requirements for both the vent pipe and the combustion air inlet pipe are as follows:

- **Vent pipe:** Vent pipe approved for a Category III appliance OR single-wall, 26-gauge or heavier galvanized (or a material of equivalent durability and corrosion resistance) vent pipe is required between the furnace section and the concentric adapter box. Double-wall (Type B) vent pipe is required for the vent terminal section. The length of vent pipe that extends through the box and runs concentric through the combustion air pipe must be one piece with no joints.
- **Combustion air pipe:** Sealed, single-wall galvanized pipe is recommended for combustion air.
- **Pipe length and diameter:** Vent pipe diameters and maximum indoor vent lengths apply to both horizontal and vertical vents. Pipe diameter and length requirements listed for the indoor sections of pipe—between the heater and the concentric adapter box—are listed in [Table 16](#).

---

**NOTE: Add all straight sections and equivalent lengths for elbows. The total length of the straight sections and elbows must not exceed the maximum length.**

---

- **Outdoor concentric pipes length and diameter:** The lengths of the outside (terminal) concentric pipes depend on the installation. The diameters are 8 inches (203 mm) for the inlet air pipe and 5 inches (127 mm) for the vent pipe.

## INSTALLATION—CONTINUED

### Venting/Combustion Air Connections (Model SSCBL)—Continued

#### *Specific Venting Requirements: Piping—Continued*

Diameter/Length	SSCBL Unit Size	
	500, 600	400, 700, 800, 1050, 1200
<b>Diameters (Inches (mm))</b>		
Vent pipe	6 (152)	
	7 (178)	
Inlet air pipe	6 (152)	
	7 (178)	
<b>Lengths (Feet (Meters))</b>		
Minimum	5 (1.5)	
Maximum, 6-inch pipe	50 (15)	30 (9)
Maximum, 7-inch pipe	70 (21)	
Equivalent straight length for 45-degree elbow	4 (1.2)	
Equivalent straight length for 90-degree elbow	8 (2.4)	

#### *Specific Venting Requirements: Venter Outlet and Combustion Air Inlet Connections*

### ⚠ DANGER ⚠

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

Each furnace section has both an inlet air and a venter outlet connection. Both are 6 inches (152 mm) in diameter for all unit sizes.

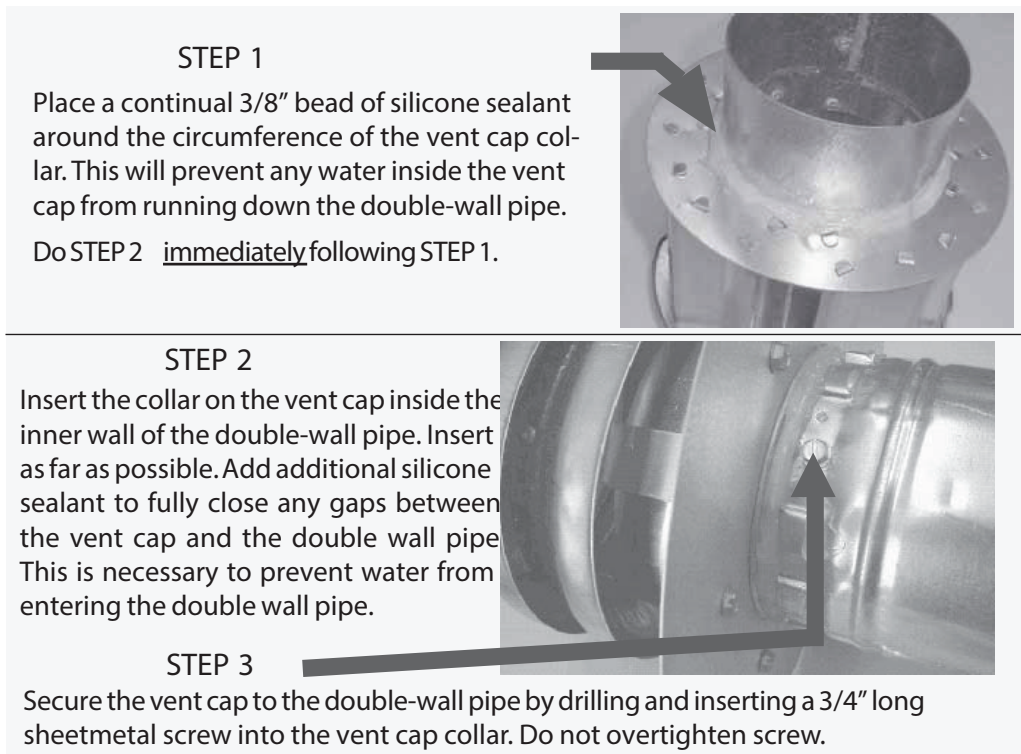
**NOTE: If using 7-inch pipe, use a tapered 6- to 7-inch enlarger to attach the vent pipe and a 7- to 6-inch reducer to attach the combustion air pipe.**

#### *Specific Venting Requirements: Joints and Sealing*

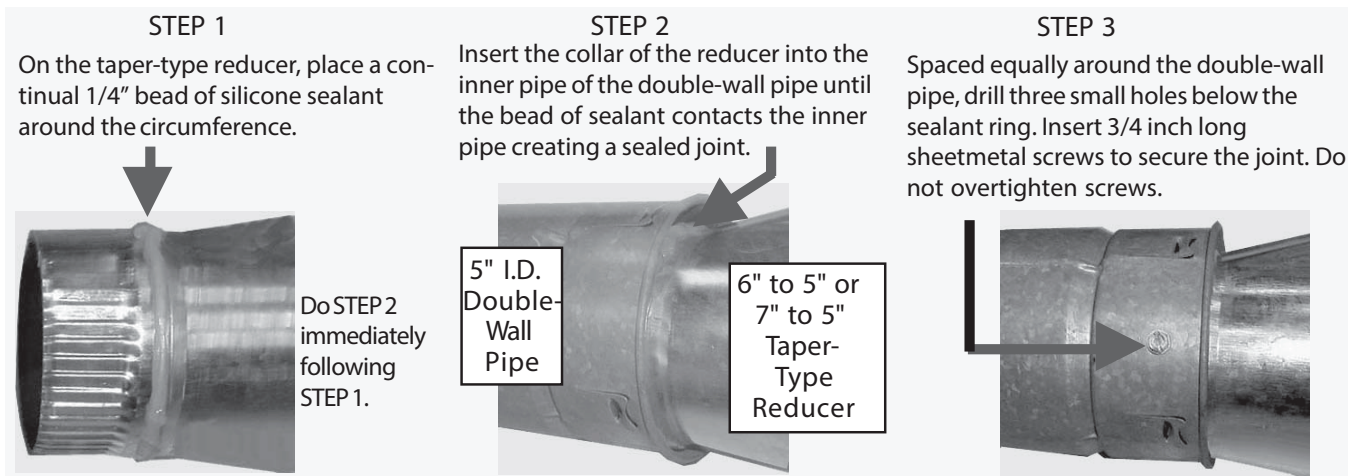
Seal pipe joints as follows:

- **To seal joints in Category III vent pipe:** Follow the pipe manufacturer's instructions for joining and sealing Category III vent pipe sections.
- **To seal joints in single-wall vent or combustion air pipe:** Secure slip-fit pipe connections using sheet metal screws or rivets. Seal all joints with aluminum tape or silicone sealant.
- **To seal the joint in the terminal section of double-wall vent pipe (allowed ONLY ABOVE the concentric pipes on a VERTICAL vent):** Follow the pipe manufacturer's instructions for joining and sealing double-wall vent pipe sections.
- **To seal the joint between the terminal section of double-wall vent pipe and the vent cap:** Follow the illustrated step-by-step instructions in [Figure 19](#).
- **To seal the joint between the terminal section of double-wall vent pipe and a single-wall or Category III vent pipe:** follow the illustrated step-by-step instructions in [Figure 20](#). Make this connection no more than 6 inches (152 mm) from the concentric adapter box.

**NOTE: Pipes and vent caps may not look exactly as shown in the illustrations. Instructions apply to both horizontal and vertical vent kits.**



**Figure 19. Joining Double-Wall (Type B) Pipe to Vent Terminal Cap (Horizontal or Vertical)**



**Figure 20. Joining Double-Wall (Type B) Pipe to Single-Wall or Category III Vent Pipe Using Tapered Reducer**

**Specific Venting Requirements: Support**

Support horizontal runs every six feet (1.8 meters). Support vertical runs of Type B double-wall or Category III vent pipe in accordance with the requirements of the pipe manufacturer. Support single-wall vertical pipe in accordance with accepted industry practices. Do not rely on the heater or the adapter box for support of either horizontal or vertical pipes. Use noncombustible supports on vent pipe.

**NOTE: The double-wall vent terminal pipe does not attach to the concentric adapter box and must be supported during installation.**

## INSTALLATION—CONTINUED

### Venting/Combustion Air Connections (Model SSCBL)—Continued

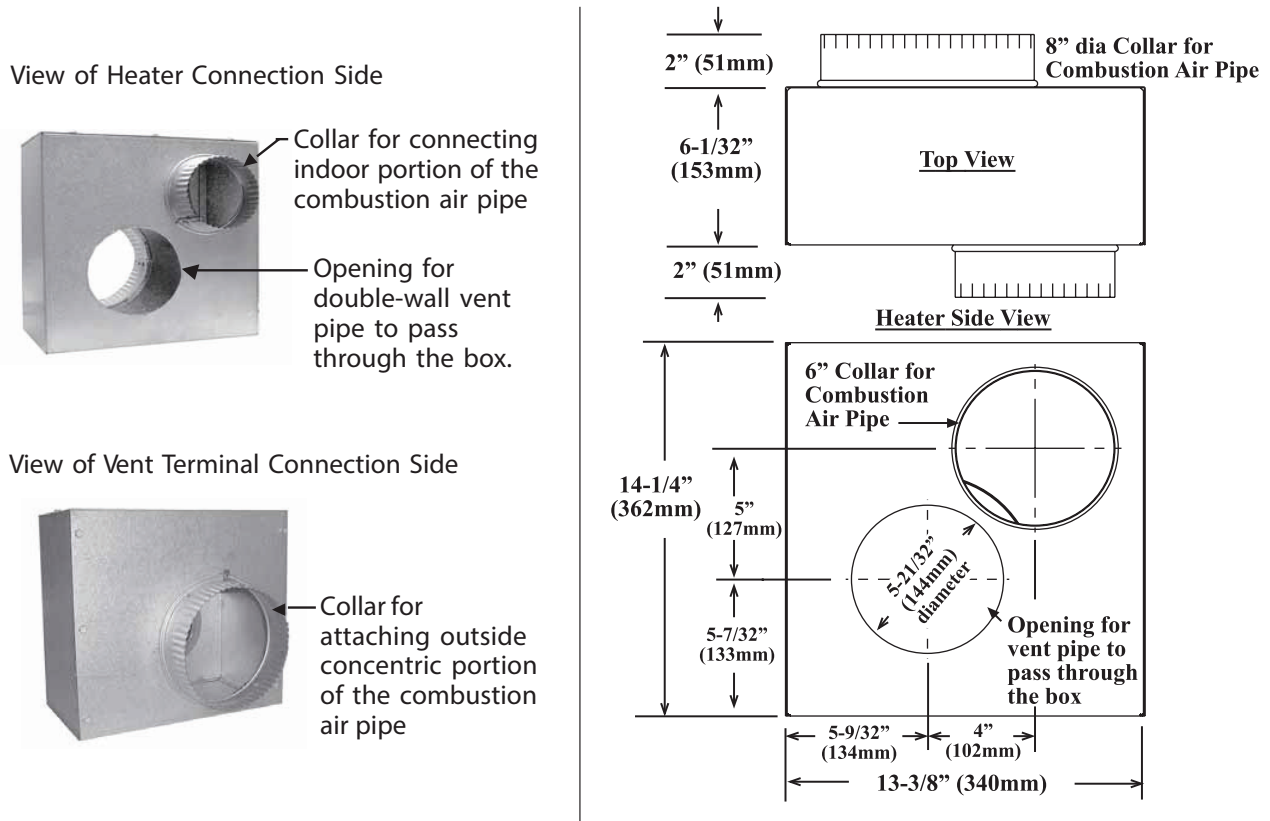
#### **Specific Venting Requirements: Clearance**

Do not enclose the vent pipe or place pipe closer than 6 inches (152 mm) to combustible material.

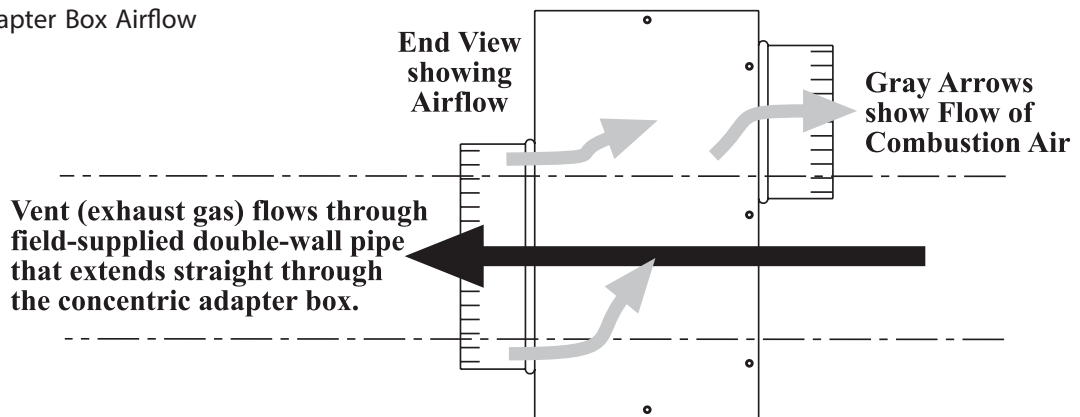
#### **Specific Venting Requirements: Concentric Adapter Box**

**NOTE: A concentric adapter box is required for each furnace section of a model SSCBL installation.**

The concentric adapter box (PN 205885) is included in the vent/combustion air kit. Installation instructions depend on whether the vent system is horizontal (option CC6) or vertical (option CC2). All separated-combustion installations require a concentric adapter box as shown in **Figure 21**.



#### Concentric Adapter Box Airflow

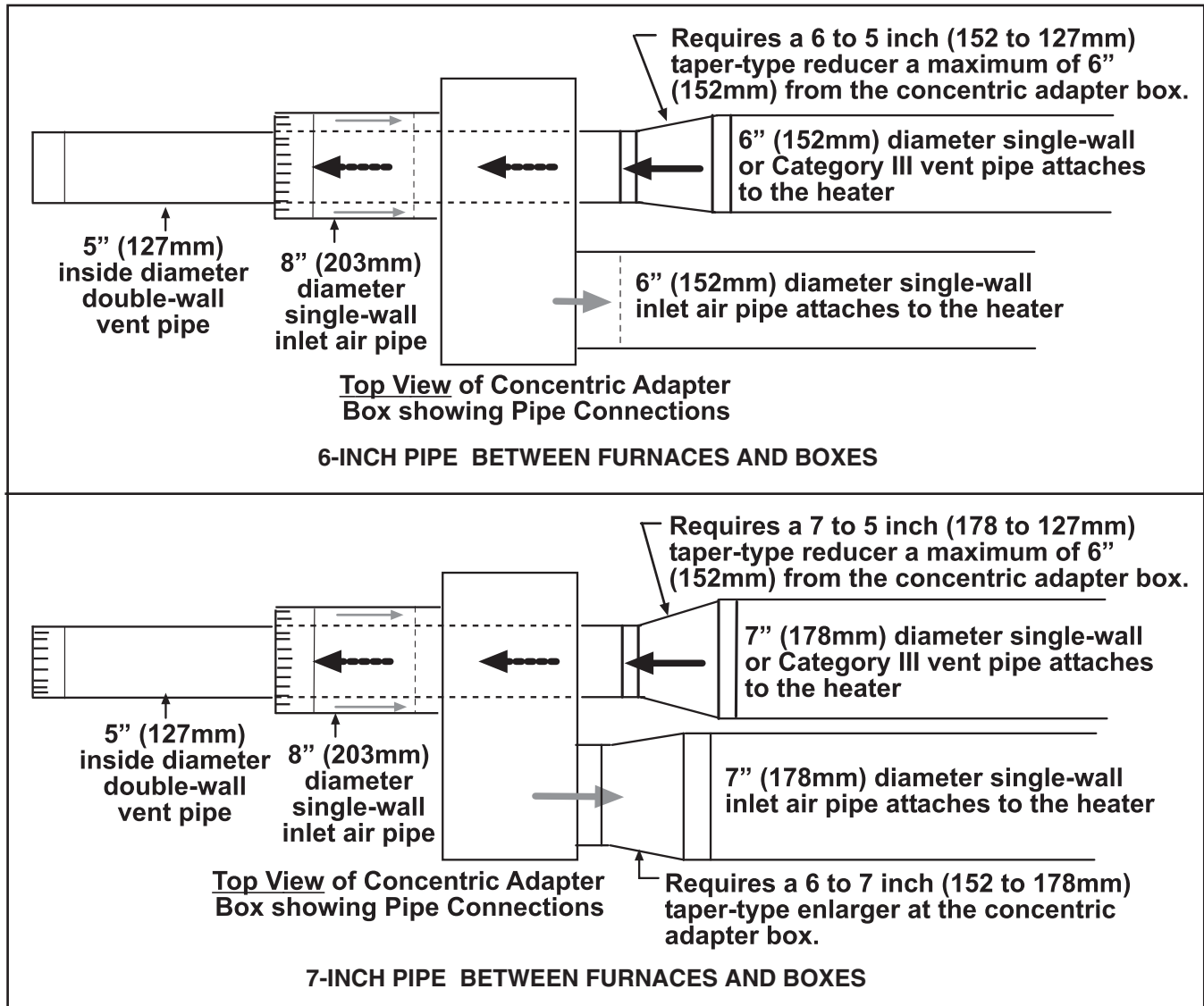


**Figure 21. Concentric Adapter Box**

**Specific Venting Requirements: Concentric Adapter Box Pipe Connections**

**NOTE: Do NOT make actual connections until after reading the instructions and length requirements for installing the vent/combustion air kit. The connection requirements are the same for both vertical and horizontal systems, but the length of the double-wall pipe will vary.**

When pipe diameters differ, depending on direction of airflow, join the pipes with either a tapered reducer or enlarger as shown in **Figure 22**.



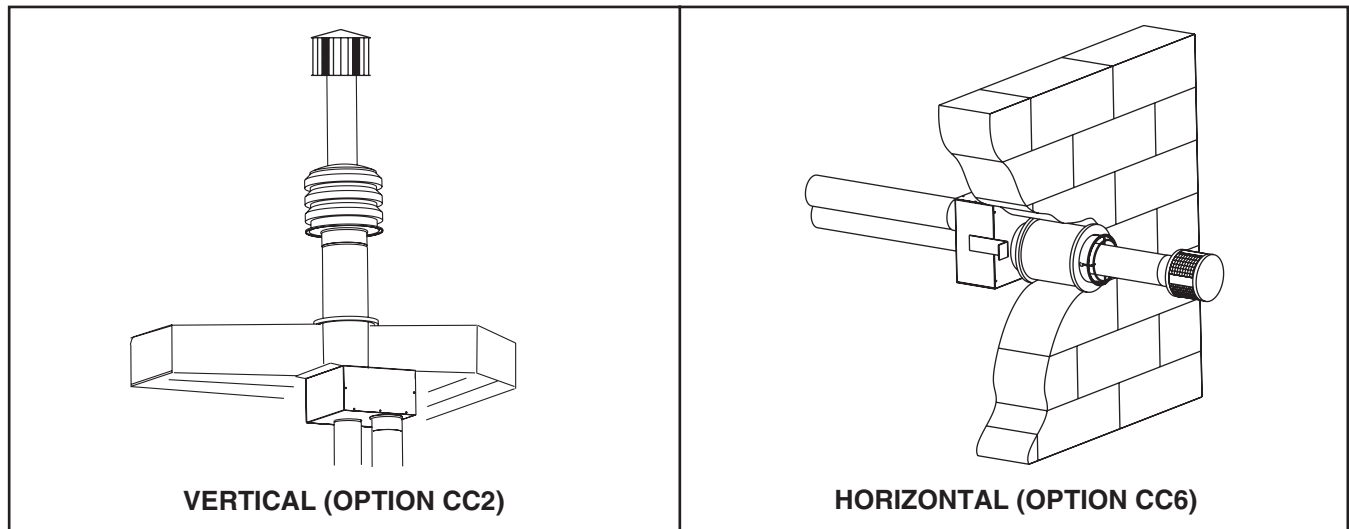
**Figure 22. Concentric Adapter Box Connections**

## INSTALLATION—CONTINUED

### Venting/Combustion Air Connections (Model SSCBL)—Continued

#### Vent Terminal Options

Vent terminal options CC2 (vertical vent configuration) and CC6 (horizontal vent configuration) are shown in [Figure 23](#).



**Figure 23. Horizontal and Vertical Venting Options**

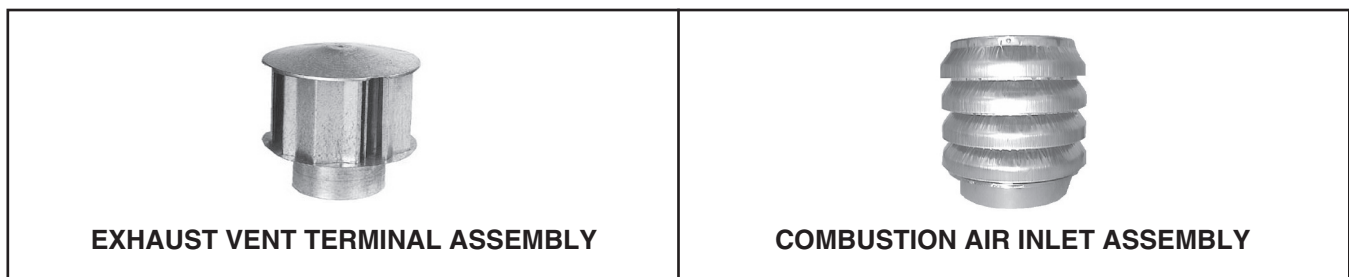
#### Vertical Vent Terminal (Option CC2) Installation

- Field-supplied components required for installation of the vertical vent kit are as follows:
  - a. Vent and combustion air piping in accordance with [Table 16](#)
  - b. Tapered vent pipe diameter reducers and/or increasers, as required
  - c. Thimble (not required if wall is of non-combustible construction)
  - d. Flashing
  - e. Sheet metal screws, tape, and sealant, as required
- Factory-supplied components for installation of the vertical vent kit are listed in [Table 17](#).

**Table 17. Vertical Vent Terminal/Combustion Air Package (Option CC2) Components**

PN	Description	Quantity
<a href="#">205896</a>	Kit package	1*
<a href="#">205885</a>	Concentric adapter box (see <a href="#">Figure 21</a> )	1
110052	Exhaust vent terminal assembly (see <a href="#">Figure 24</a> )	1
<a href="#">53330</a>	Combustion air inlet assembly (see <a href="#">Figure 24</a> )	1
<a href="#">207232</a>	Concentric adapter box bracket	2
<a href="#">53335</a>	High-temperature silicone sealant, tube	1

\*One (1) required for each furnace section.



**Figure 24. Option CC2 Components**

# ⚠ DANGER ⚠

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

1. Determine vent terminal location on roof:
  - a. If more than one vertical vent terminal is being installed, minimum spacing between vent center lines is determined by minimum outdoor design temperature (coldest outdoor condition at installation site). Refer to [Table 18](#) to ensure that location complies with minimum outdoor design temperature requirements.
  - b. Select location away from fresh air intakes, allowing space for concentric adapter box inside. Vent terminal must be located away from adjacent buildings as shown in [Figure 25](#).

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

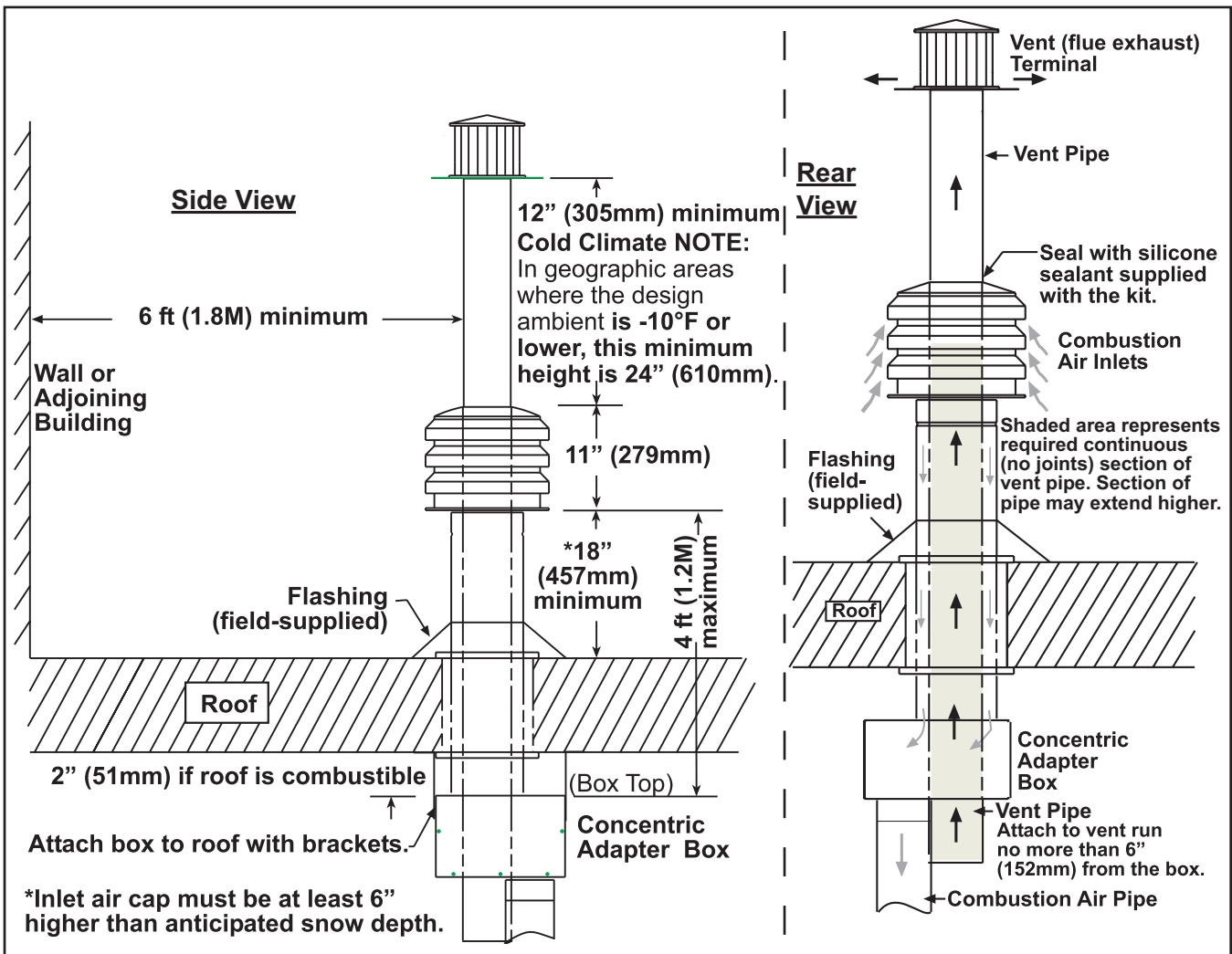


Figure 25. Option CC2 Installation

## INSTALLATION—CONTINUED

### Venting/Combustion Air Connections (Model SSCBL)—Continued

#### Vertical Vent Terminal (Option CC2) Installation—Continued

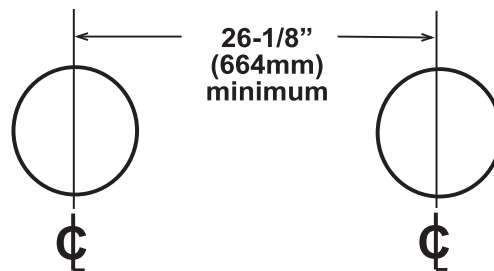
2. Install vent pipe and combustion air pipe runs:
  - a. Connect piping to heater in accordance with specifications listed in [Specific Venting Requirements: Piping](#) and [Specific Venting Requirements: Venter Outlet and Combustion Air Inlet Connections](#) sections.
  - b. Seal all joints in accordance with specifications listed in [Specific Venting Requirements: Joints and Sealing](#) section. Due to high temperature considerations, do not enclose exhaust pipe or place pipe closer than 6 inches (152 mm) to combustible material.
  - c. Extend piping runs close to roof at location selected in step 1 and support piping in accordance with specifications listed in [Specific Venting Requirements: Support](#) section.

---

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

---

3. Cut hole through roof for combustion air pipe.
  - a. Ensure that location and orientation of concentric adapter box are correct and mark and cut hole.
  - b. Ensure that hole accommodates 8-inch (203-mm) combustion air pipe. Thimble may be required depending on building construction and/or local codes. Larger diameter combustion air pipe serves as clearance for vent pipe on non-combustible construction.
  - c. When installing system with more than one furnace section, ensure that there is minimum of 26-1/8 inches (664 mm) between center lines of each terminal pipe. Prepare one hole per furnace with spacing as shown in [Figure 26](#).



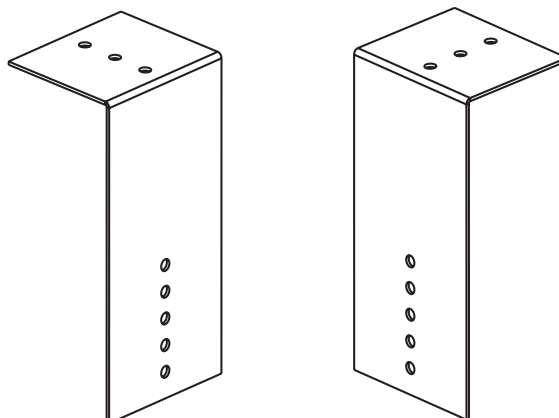
**Figure 26. Hole Spacing for Two or More Furnaces**

4. Secure longer angles on concentric adapter box brackets (see [Figure 27](#)) to concentric adapter box.

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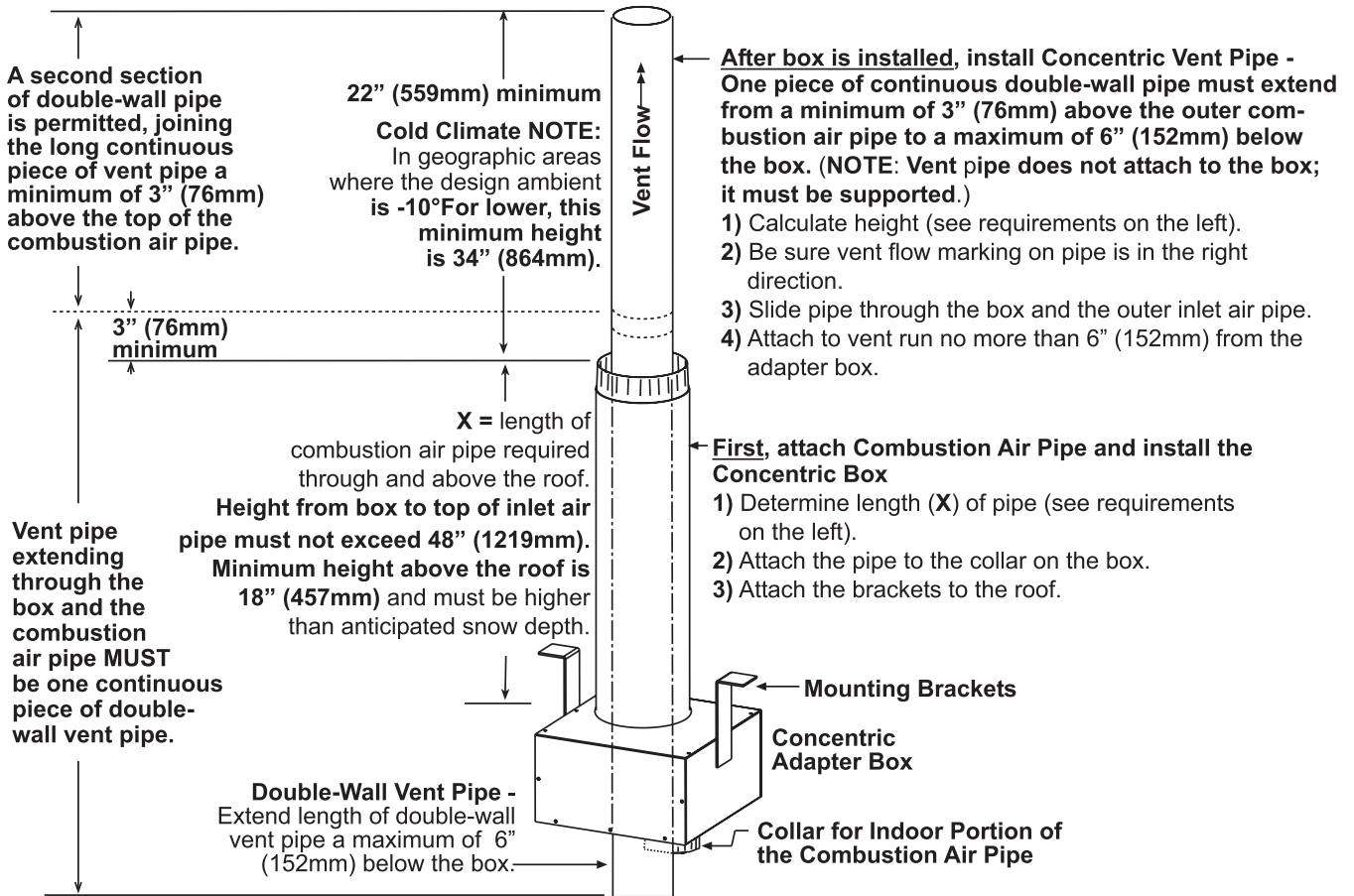
**NOTE: The longer angle of the concentric adapter box bracket has five 7/32-inch holes that allow the position of the bracket on the box to be adjusted. The shorter angle has three 7/32-inch holes that allow adjustment to construction.**

---



**Figure 27. Concentric Adapter Box Brackets**

5. Connect outside section of combustion air pipe to concentric adapter box (see [Figure 28](#)):
  - a. Determine length of combustion air pipe so that dimension X in [Figure 28](#) is equal to bracket length plus roof thickness and plus anticipated snow depth. Ensure that length of combustion air pipe does not exceed 48 inches (1,219 mm) or does not extend **less than** 18 inches (457 mm) above roof.
  - b. Secure inlet air pipe to collar of concentric adapter box using sheet metal screws. Seal joint and seam using tape or sealant.



**Figure 28. Combustion Air Pipe Installation**

6. Secure concentric adapter box to underside of roof (see [Figure 28](#)):

**⚠ CAUTION ⚠**

- If the roof is combustible, ensure that brackets are positioned to allow a 2-inch (51 mm) clearance between the concentric adapter box and the roof.
- If any holes are made in the concentric adapter box in error, ensure that they are sealed.

- a. Insert combustion air pipe through roof as shown in [Figure 29](#).
- b. Position concentric adapter box to match pipe runs and secure short angles of concentric adapter brackets (see [Figure 27](#)) to underside of roof using field-supplied hardware.
- c. Install field-supplied flashing around combustion air pipe on roof outside.

## INSTALLATION—CONTINUED

### Venting/Combustion Air Connections (Model SSCBL)—Continued Vertical Vent Terminal (Option CC2) Installation—Continued

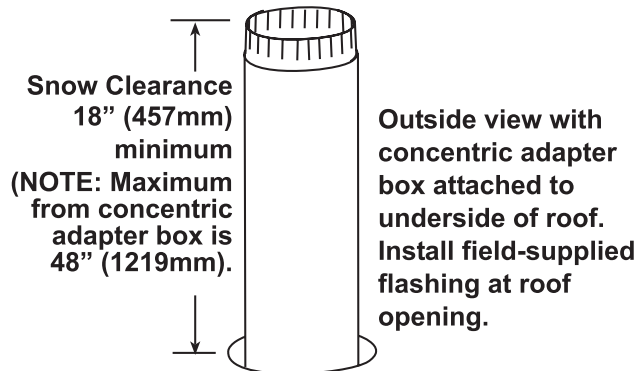


Figure 29. Combustion Air Pipe Through Roof

7. Install double-wall terminal vent pipe:

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

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- a. Refer to [Figure 28](#) to determine lengths of each pipe segment and to calculate total length required. Determine length by adding requirements:
  - (1) Starting at bottom, vent pipe can extend maximum of 6 inches (152 mm) below box
  - (2) Plus 6 inches (152 mm) through box
  - (3) Plus length of brackets above box
  - (4) Plus width of roof
  - (5) Plus height of outside combustion air pipe above roof
  - (6) Plus minimum of 3 inches (76 mm) beyond top of inlet air pipe
  - (7) Total is minimum length of vent pipe section—if actual piece of vent pipe is longer, extend it farther above combustion air pipe—do not extend it more than 6 inches (152 mm) below box
- b. Ensure that double-wall terminal vent pipe is in proper direction and slide end of pipe into box and out through combustion air pipe. Position vent pipe to lengths determined above.

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**NOTE: The double-wall vent pipe does not attach to the box. The installer must provide support.**

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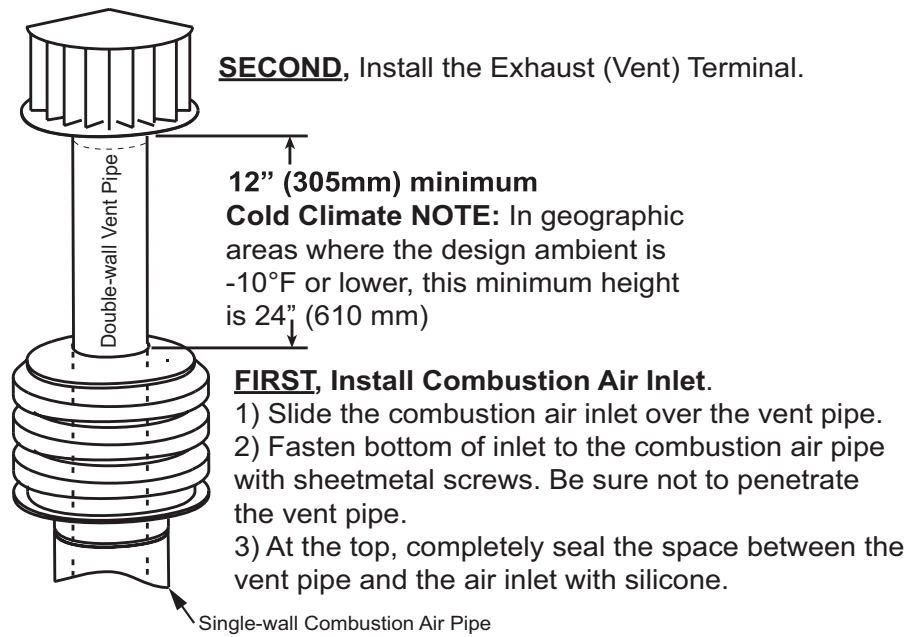
- c. Connect double-wall vent pipe to single-wall or Category III vent pipe run using tapered reducer in accordance with [Figure 19](#).
  - d. Seal completely around circumference of pipe and opening of box using silicone sealant.
8. Install combustion air inlet (see [Figure 30](#)):
- a. On outside, slide combustion air inlet over vent pipe and fasten collar to combustion air pipe using sheet metal screws.
  - b. Seal opening at top between vent pipe and combustion air inlet to prevent water leakage using silicone sealant.

---

**NOTE: A vent terminal is required for each furnace section.**

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9. Install exhaust vent terminal (see [Figure 30](#)) in accordance with [Figure 20](#).



**Figure 30. Combustion Air Inlet and Vent Terminal Installation**

10. Install indoor combustion air pipe:
  - a. Secure single-wall combustion air pipe run to collar on concentric adapter box using sheet metal screws. If using 7-inch piping, install tapered enlarger as shown in [Figure 22](#).
  - b. Seal pipe joints with tape or sealant.
11. Verify compliance with [Figure 25](#) and with all specific venting requirements listed above.

**Horizontal Vent Terminal (Option CC6) Installation**

- Field-supplied components required for installation of the horizontal vent kit are as follows:
  - a. Vent and combustion air piping in accordance with [Table 16](#)
  - b. Tapered vent pipe diameter reducers and/or increasers, as required
  - c. Thimble (not required if wall is of non-combustible construction)
  - d. Flashing
  - e. Sheet metal screws, tape, and sealant, as required
- Factory-supplied components for installation of the horizontal vent kit are listed in [Table 19](#).

PN	Description	Quantity
<a href="#">205883</a>	Kit package	1*
<a href="#">205885</a>	Concentric adapter box (see <a href="#">Figure 21</a> )	1
<a href="#">53316</a>	Assembly, screened exhaust (see <a href="#">Figure 31</a> )	1
<a href="#">205894</a>	Inlet guard (see <a href="#">Figure 31</a> )	1
<a href="#">37661</a>	Screw, sheet metal, #10-16 x 1/2	4
<a href="#">207232</a>	Concentric adapter box bracket	2
<a href="#">53335</a>	High-temperature silicone sealant, tube	1

\*One (1) required for each furnace section.

## INSTALLATION—CONTINUED

### Venting/Combustion Air Connections (Model SSCBL)—Continued

#### Vertical Vent Terminal (Option CC6) Installation—Continued

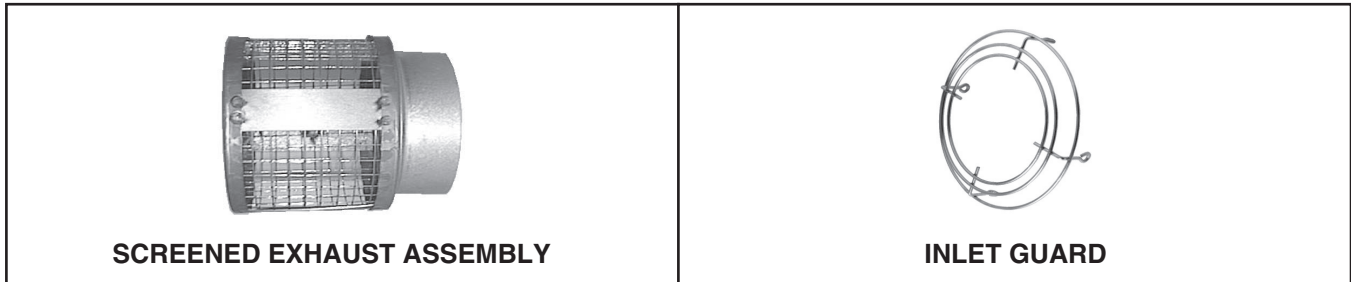


Figure 31. Option CC6 Components

### ⚠ DANGER ⚠

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

1. Determine vent terminal location on outside wall:

- a. Refer to [Table 16](#) to ensure that location complies with vent length requirements.
- b. For most applications, ensure that vent terminal is level with heater mounting height.
- c. Allow downward pitch of 1/4-inch per foot (6 mm per 305 mm) for condensate drain.

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

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

### ⚠ 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 ice.

### ⚠ CAUTION ⚠

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

- e. Refer to [Table 20](#) to ensure that location complies with minimum clearance requirements.

<b>Table 20. Minimum Clearance Requirements for Horizontal Vent Terminal</b>	
<b>Component/Structure</b>	<b>Minimum Clearance, All Directions Unless Specified (Feet (Meters))</b>
Forced air inlet within 10 feet (3.1 meters)*	3 (0.9) above
Combustion air inlet of another appliance	6 (1.8)
Mechanical air supply inlet to any building	Canada: 6 (1.8)
Any building opening (door, window, or gravity air inlet)	4 (1.2) horizontal and below
	1 (0.3) above
Gas meter,** electric meter, and relief equipment	US: 4 (1.2) horizontal
	Canada: 6 (1.8) horizontal
Gas regulator**	US: 3 (0.9) horizontal
	Canada: 6 (1.8) horizontal
Adjoining building or parapet	6 (1.8)
Adjacent public walkway	7 (2.1) above
Grade (ground level)	3 (0.9) above
*Does not apply to the inlet of a direct vent appliance.	
**Do not terminate the vent directly above a gas meter or service regulator.	

2. Install vent pipe and combustion air pipe runs:
  - a. Connect piping to heater in accordance with specifications listed in **Specific Venting Requirements: Piping** and **Specific Venting Requirements: Venter Outlet and Combustion Air Inlet Connections** sections.
  - b. Seal all joints in accordance with specifications listed in **Specific Venting Requirements: Joints and Sealing** section. Due to high temperature considerations, do not enclose exhaust pipe or place pipe closer than 6 inches (152 mm) to combustible material.
  - c. Extend piping runs close to wall location selected in step 1 and support piping in accordance with specifications listed in **Specific Venting Requirements: Support** section.
3. Cut hole through outside wall for combustion air pipe.
  - a. Ensure that outside wall construction thickness is between 1 inch (25 mm) minimum and 48 inches (1,219 mm) maximum.
  - b. Ensure that hole accommodates 8-inch (203-mm) combustion air pipe. Thimble may be required depending on building construction and/or local codes. Larger diameter combustion air pipe serves as clearance for vent pipe on noncombustible construction.
  - c. When installing system with more than one furnace section, ensure that there is minimum of 26-1/8 inches (664 mm) between center lines of each terminal pipe. Prepare one hole per furnace with spacing as shown in **Figure 26**.
4. Secure longer angles on concentric adapter box brackets (see **Figure 27**) to concentric adapter box.

---

**NOTE: The longer angle of the concentric adapter box bracket has five 7/32-inch holes that allow the position of the bracket on the box to be adjusted. The shorter angle has three 7/32-inch holes that allow adjustment to construction.**

---

5. Connect outside section of combustion air pipe to concentric adapter box (see **Figure 32**):
  - a. Determine length of combustion air pipe as follows:
    - (1) Bracket length from box to wall
    - (2) Plus wall thickness
    - (3) Plus 2 inches (51 mm) beyond wall
  - b. Secure inlet air pipe to collar of concentric adapter box using sheet metal screws. Seal joint and seam using tape or sealant.
6. Secure concentric adapter box to wall (see **Figure 32**):

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**⚠ CAUTION ⚠**

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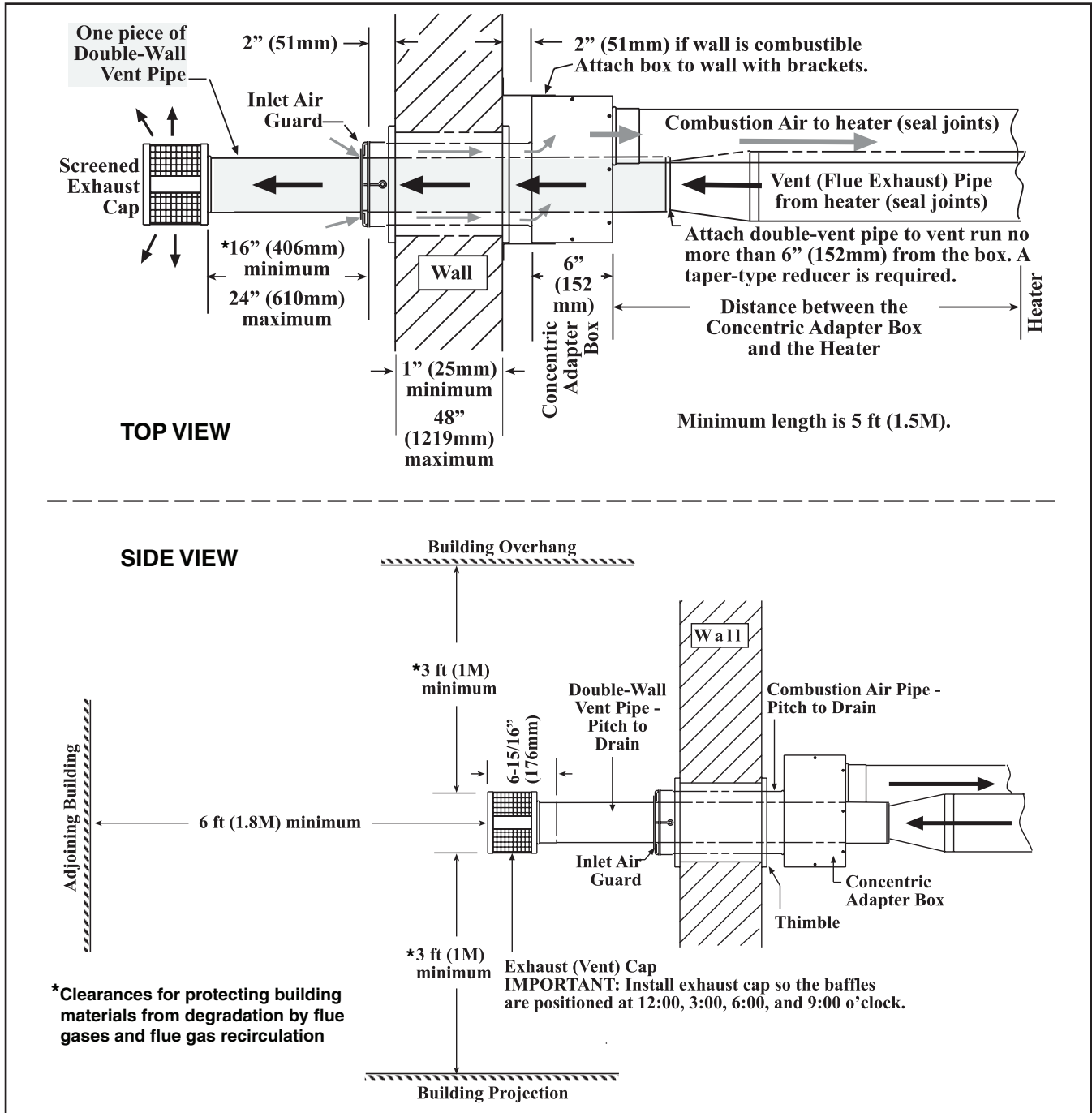
- **If the wall is combustible, ensure that brackets are positioned to allow a 2-inch (51 mm) clearance between the concentric adapter box and the wall.**
  - **If any holes are made in the concentric adapter box in error, ensure that they are sealed.**
-

## INSTALLATION—CONTINUED

### Venting/Combustion Air Connections (Model SSCBL)—Continued

#### Horizontal Vent Terminal (Option CC6) Installation—Continued

- a. Insert combustion air pipe out through wall.
- b. Secure short angles (see [Figure 27](#)) of concentric adapter box brackets to wall.
- c. Seal or flash inlet air pipe on outside using sealant and/or field-supplied flashing.



**Figure 32. Option CC6 Installation**

7. Install inlet guard:
  - a. Position inlet guard over end of combustion air pipe in accordance with [Figure 32](#).
  - b. Secure air inlet guard to inlet air pipe using four 1/2-inch-long screws provided.

---

**NOTE: If vent pipe is inserted from outside, the exhaust cap may be attached before the double-wall vent pipe is installed. If cap is attached first, ensure that the baffle strips are positioned correctly when attaching the vent terminal pipe to the vent run (refer to step 8d below).**

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8. Install double-wall terminal vent pipe:

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

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- a. Refer to [Figure 32](#) to determine lengths of each pipe segment and to calculate total length required. Transition to single-wall or Category III vent pipe run must be made maximum of 6 inches (152 mm) from heater side of box.
- b. Ensure that double-wall terminal vent pipe is in proper direction and slide end of pipe through box. Position pipe so that it will extend between 16–24 inches (406–610 mm) past end of combustion air pipe and no more than 6 inches (152 mm) out of box toward heater.

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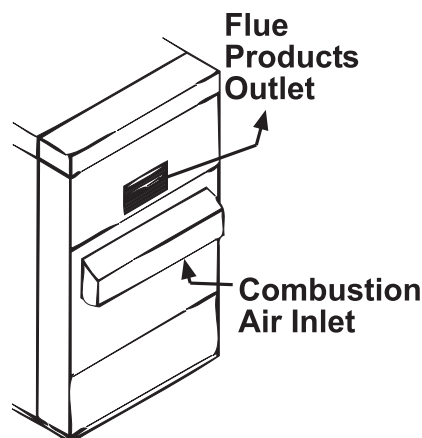
**NOTE: The double-wall vent pipe does not attach to the box. The installer must provide support.**

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- c. Connect 5-inch double-wall vent pipe to 6- or 7-inch single-wall or Category III vent pipe run using tapered reducer (see [Figure 20](#)).
  - d. Ensure that exhaust cap is aligned so that its baffle strips are positioned on horizontal and vertical center lines (see [Figure 32](#)). Install cap in accordance with [Figure 19](#).
  - e. Ensure that double-wall section of vent pipe has slight downward drop of 1/4-inch per foot (6 mm per 305 mm) toward vent terminal end.
  - f. Seal completely around circumference of pipe and opening of box using silicone sealant.
9. Install indoor section of combustion air pipe:
    - a. Secure single-wall combustion air pipe run to collar on concentric adapter box using sheet metal screws. If using 7-inch piping, install tapered enlarger as shown in [Figure 22](#).
    - b. Seal pipe joints with tape or sealant.
  10. Verify compliance with [Figure 32](#) and with all specific venting requirements listed above.

### Venting Connections (Model RPBL)

- Locate power-vented furnaces so that flue discharge is not directed at fresh air inlets. The screened flue gas and combustion air openings are located on the side of the furnace just above the control access panel (see [Figure 33](#)). The position of this opening discourages recirculation of combustion products and provides for furnace operation in all normal weather conditions.



**Figure 33. Flue Outlet and Combustion Air Inlet**

## INSTALLATION—CONTINUED

### Venting Connections (Model RPBL)—Continued

- **Optional vertical flue discharge (option CC3):** These power vented furnaces are certified with 4 feet of vertical pipe connected as shown in [Figure 34](#), DETAIL A. The distance is measured from the top of the unit to the bottom of the vent cap. The vent pipe and supports are field-supplied. Optional vertical vent piping provides compliance with local codes that require either 10-foot horizontal or 4-foot vertical clearance between the flue outlet and the fresh air intake of the heating system and/or building. The option package (PN 45021) includes the 5-inch vent cap, the adapter assembly, and the seal plate as shown in [Figure 34](#), DETAIL B. Remove and discard the louvered discharge grill. Attach venter seal plate and oval adapter assembly with sheet metal screws. Use venter seal plate as drill template.

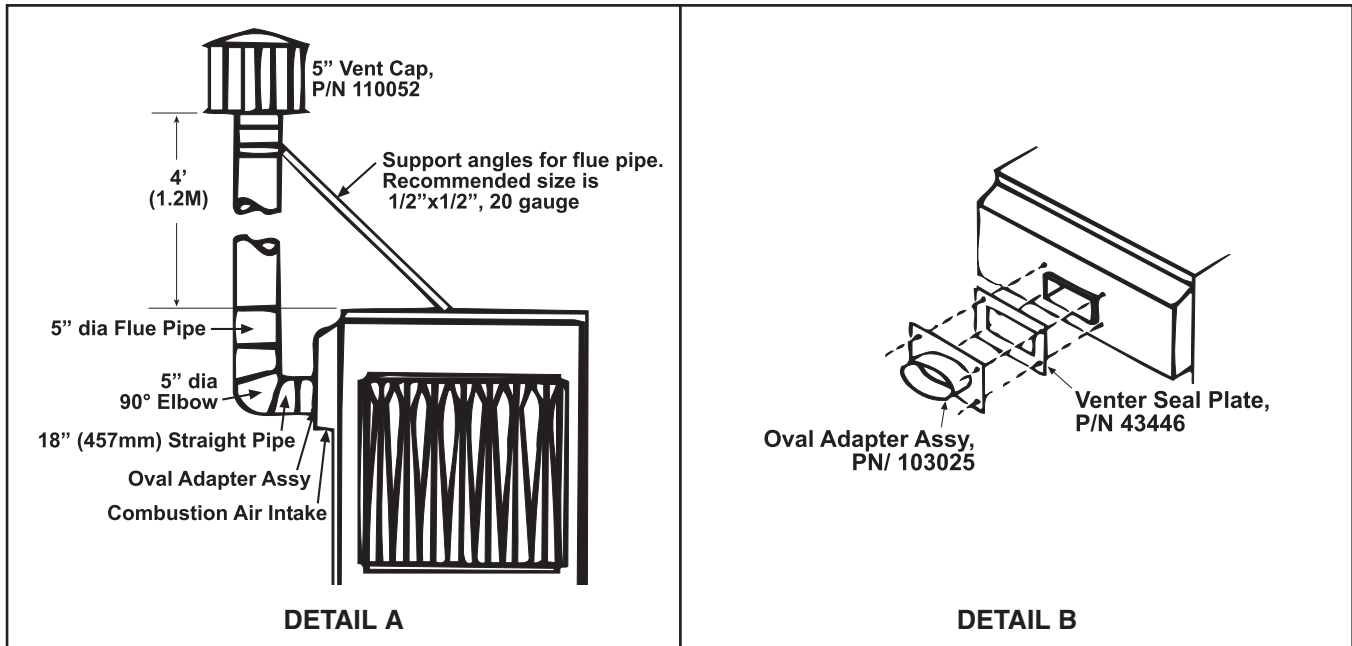


Figure 34. Optional Vertical Flue Discharge

### 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.

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#### NOTES:

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

#### PRESSURE TESTING SUPPLY PIPING

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

## Gas Supply Piping

### ⚠ DANGER ⚠

- All components of a gas supply system must be leak tested prior to placing equipment in service. NEVER TEST FOR LEAKS WITH AN OPEN FLAME. Failure to comply could result in personal injury, property damage, or death.
  - Pipe joint compounds (pipe dope) shall be resistant to the action of liquefied petroleum gas or any other chemical constituents of the gas being supplied.
- 
- All piping must be in accordance with requirements outlined in the *National Fuel Gas Code* ANSI/Z223.1 (latest edition) or the *Natural Gas and Propane Installation Code* CSA B149.1 (refer to [Installation Codes](#) section).
  - Gas supply piping installation should conform with good practice and with local codes.
  - The unit is orificed for operation with natural gas having a heating value of 1,000 (±50) BTU per cubic foot or with propane gas having a heating value of 2,550 (±100) BTU per cubic foot. Sizing of gas supply lines depends on piping capacity and is based on cubic feet per hour based on a 0.3 IN WC pressure drop, a 0.6 specific gravity for natural gas at 1,000 BTU per cubic feet, and a 1.6 specific gravity for propane at 2,550 BTU per cubic feet. If the gas at the installation does not meet this specification, consult the factory for proper orificing.
  - Variables for sizing gas supply lines are listed in [Table 21](#). When sizing supply lines, consider possibilities of future expansion and increased requirements. Refer to the *National Fuel Gas Code* for additional information on line sizing.

**Table 21. Gas Supply Line Sizes**

Length of Pipe (Feet)	Diameter of Pipe (Inches)									
	1		1-1/4		1-1/2		2		2-1/2	
	Natural Gas	Propane	Natural Gas	Propane	Natural Gas	Propane	Natural Gas	Propane	Natural Gas	Propane
Cubic Feet per Hour										
20	350	214	730	445	1100	671	2100	1281	3300	2013
30	285	174	590	360	890	543	1650	1007	2700	1647
40	245	149	500	305	760	464	1450	885	2300	1403
50	215	131	440	268	670	409	1270	775	2000	1220
60	195	119	400	244	610	372	1105	674	1850	1129
70	180	110	370	226	560	342	1050	641	1700	1037
80	170	104	350	214	530	323	990	604	1600	976
90	160	98	320	195	490	299	930	567	1500	915
100	150	92	305	186	460	281	870	531	1400	854
125	130	79	275	168	410	250	780	476	1250	763
150	120	73	250	153	380	232	710	433	1130	689
175	110	67	225	137	350	214	650	397	1050	641
200	100	61	210	128	320	195	610	372	980	598

### Supply Piping Connections

- Install a ground joint union and manual shutoff valve upstream of the unit control system. The 1/8-inch plugged tapping in the shutoff valve provides connection for the supply line pressure test gauge. The *National Fuel Gas Code* requires the installation of a trap with a minimum 3-inch drip leg. Local codes may require a longer drip leg, typically 6-inch (see [Figure 35](#), DETAIL A).
- Gas connection and manifold arrangements are shown in [Figure 35](#), DETAIL B. Gas connections sizes are listed in [Table 22](#).
- Seal the opening for the gas supply pipe with the grommet provided.
- After all connections are made, disconnect the pilot supply at the control valve and bleed the system of all air. Reconnect the pilot line and leak test all connections by brushing on a soap solution.

## INSTALLATION—CONTINUED

### Piping Connections—Continued

#### Supply Piping Connections—Continued

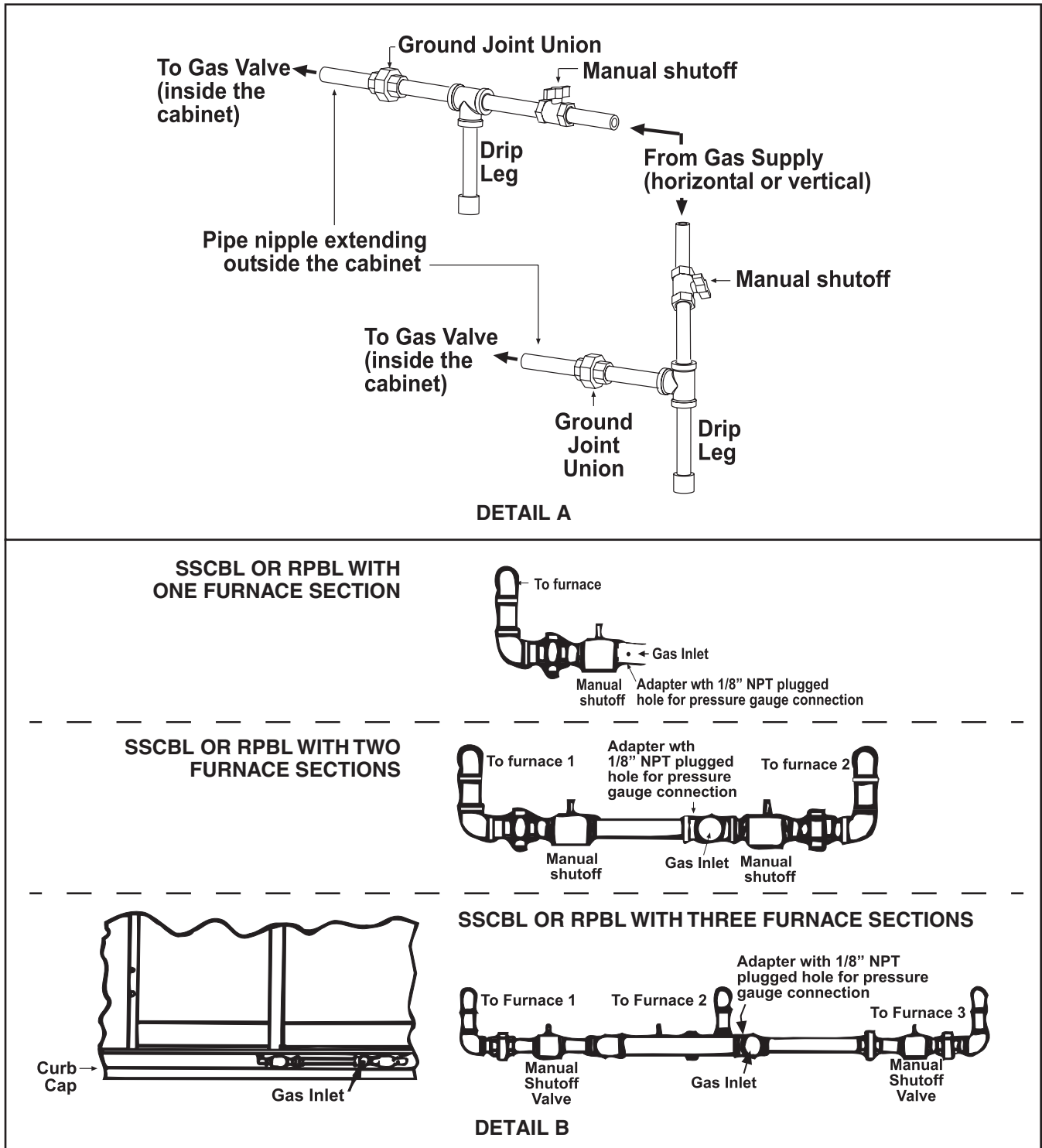


Figure 35. Gas Connections

Table 22. Gas Connection Sizes		
Gas Type	Unit Size	
	400	500–1200
Connection Size (Inches (mm))		
Natural gas	1 (25)	1-1/4 (32)
Propane		

NOTE: The above are not supply line sizes. They are gas connection sizes for a standard unit.

## Electrical Connections

### ⚠ CAUTION ⚠

- If any of the original wire as supplied with the appliance must be replaced, it must be replaced with wiring material having a temperature rating of at least 105°C, except for the sensor lead wires, which must be rated at 150°C.
- All external wiring must be within approved conduit and have a minimum temperature rise of 60°C.
- Keep electric and gas supply components clear of service panels.

**NOTE: Ensure that all wiring is in accordance with the wiring diagram provided with the unit. Electrical options are identified on this wiring diagram. Refer to separate instruction sheets for any optional equipment provided.**

- All electrical wiring and connections, including electrical grounding, MUST be made in accordance with local, state, and national codes and regulations and with the *National Electric Code* (ANSI/NFPA 70) or, in Canada, the *Canadian Electric Code*, Part 1 (CSA C.22.1).
- Check any local ordinances or gas company requirements that apply.
- Check the rating plate on the heater for the supply voltage and for current requirements. A separate line voltage supply with fused disconnect switch should be run directly from the main electrical panel to the unit, making connections in the junction box.
- **Convenience outlet:** When a convenience outlet (option BC) is included, a separate power supply must be provided to the receptacle. This circuit MUST BE on a ground fault breaker to meet requirements.
- **Disconnect switch:** A disconnect switch is a required part of this installation. Switches are available as options or parts or may be supplied locally. When ordered as an optional component, the disconnect switch is shipped separately. The disconnect switch may be fusible or non-fusible. When providing or replacing fuses in a fusible disconnect switch, use dual element time delay fuses and size according to 1.25 × maximum total input amps. When installing, ensure that the conduit and switch housing are clear of furnace panels and inspection plates. Allow at least 4 feet (1.2 meters) of service room between the switch and removable panels. Refer to [Table 23](#) for field-supplied wiring sizes—from disconnect to electrical box—for connection to the motor contactor or starter.

## INSTALLATION—CONTINUED

### Electrical Connections—Continued

Voltage/Phase	Motor HP	Wire Gauge	BX Cable Size (Inches)
208/1, 230/1	1–2	14	3/8
	3	10	1/2
	5	8	
	7.5	6	1
	10	4	
208/3, 230/3	1–3	14	3/8
	5	12	1/2
	7.5	10	
	10	8	1
	15	6	
460/3	1–7.5	14	3/8
	10	12	1/2
	15	10	
	20	8	
575/3	1–7.5	14	3/8
	10–20	10	1/2

#### **Control Wiring**

- Refer to [Table 24](#) for amp ratings of optional controls. Refer to [Table 25](#) for the recommended maximum length and minimum gauge of control wiring.
- There are a variety of optional controls (see [Figure 36](#)) available as part of the gas and air control options. Optional shipped-separate heating and makeup air controls could include a single or two-stage [thermostat](#), system switches, Selectrastat, freezestat, discharge temperature low limit, an automatic night setback device, a Maxitrol temperature selector, a potentiometer, a pressure null switch, or a combination of these controls. Install controls according to the manufacturer’s instructions packaged with the heater.

Control	Ampere Rating (Maximum Amps)
Fan control	0.12
Heater	0.14
RBM relay coil	2.00
Contactor coil	0.45
Spark ignition system	0.10
Maxitrol gas control system	0.51
Single-stage gas valve	0.60
Two-stage gas valve	0.60

Distance from Unit to Control (Feet (Meters))	Minimum Recommended Wire Gauge (AWG)	Total Wire Length (Feet (Meters))
75 (23)	#18	150 (46)
125 (38)	#16	250 (76)
175 (53)	#14	350 (107)

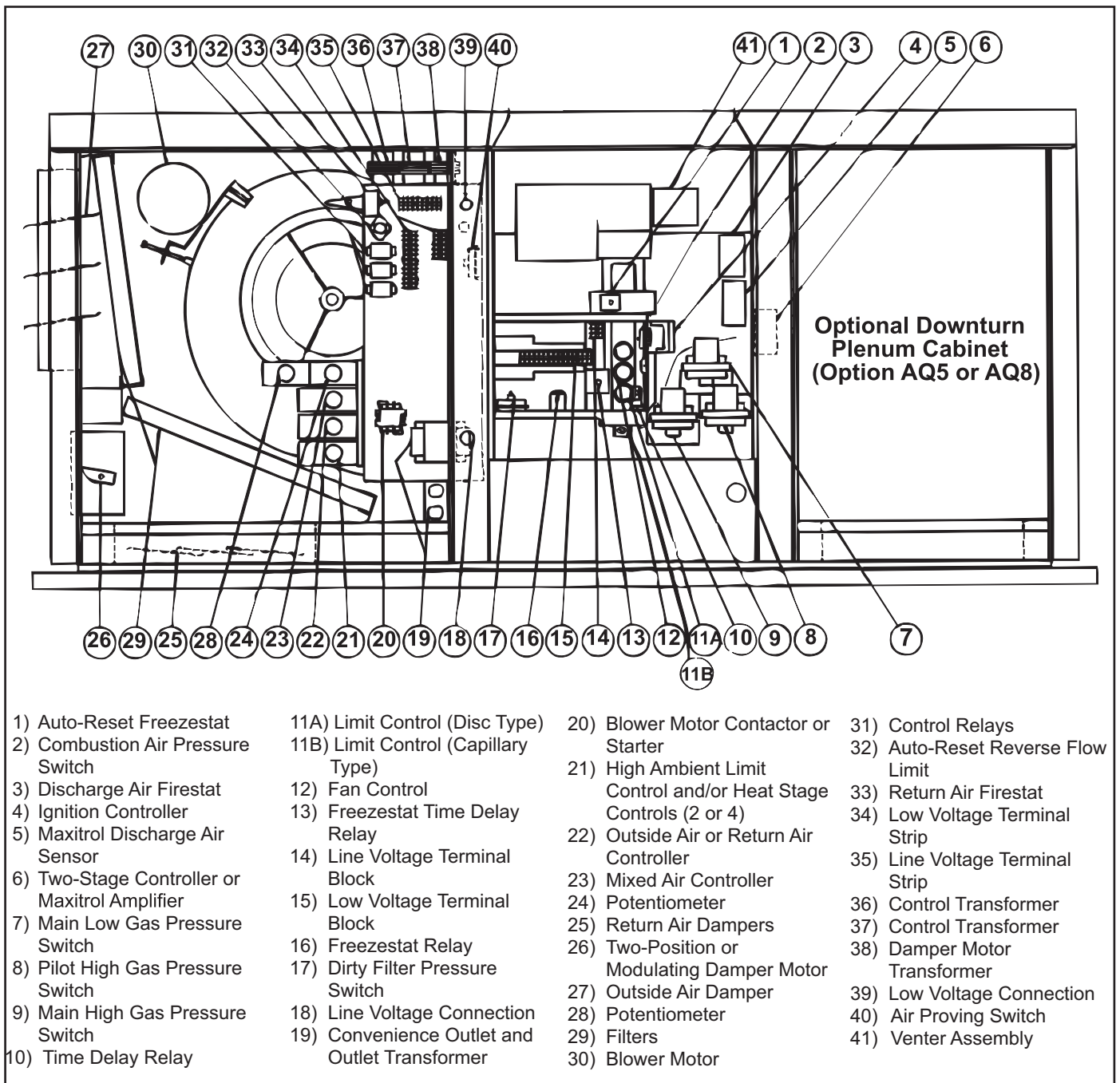


Figure 36. Typical Control Locations

## INSTALLATION—CONTINUED

### Electrical Connections—Continued

#### Control Wiring—Continued

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### ⚠ CAUTION ⚠

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Ensure that the **thermostat** has an adequate VA rating for the total requirements. Add the coil rating of all relays and match the **thermostat** rating.

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**NOTE:** If the low-voltage **thermostat** is equipped with a heat anticipator, set the anticipator at full load control amps.

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- **Thermostat:** A 24V **thermostat** must be used to actuate low voltage gas controls. If line voltage from the **thermostat** to the unit is desired, consult the factory representative. Thermostats should be located 5 feet (1.5 meters) above the floor on an inside wall, not in the path of warm or cold air currents and not in corners where air may be pocketed. Do NOT install on cold air walls. For specific connection details, refer to instruction packet with the **thermostat**. If more than one furnace is cycled from one **thermostat**, separately activated relays must be substituted at unit **thermostat** connections.
- **Remote console:** If the unit being installed includes an optional remote console, it is shipped separately for field installation. All consoles include indicator lights for the blower and burner. Consoles may include a dirty filter indicator light, a cooling indicator light, an ON/OFF switch, a summer/off/winter switch, a heat/vent/cool switch, a potentiometer, a **thermostat**, and/or a Maxitrol temperature selector. Consoles are shipped separately for remote installation and may be either mounted on a wall or recessed.
- **Maxitrol system:** Control wires connected to a Selectrastat, a discharge air sensor, a remote temperature selector or sensor, an amplifier, or the valve must not be run close to or inside conduit with power or ignition wires. Doing so may cause the unit to function erratically or may destroy the amplifier. If shielded wires are used, shield must be insulated and grounded at the amplifier location only.
- **Pressure null switch:**
  - a. Select indoor location free from excessive vibration where oil or water will not drip onto switch and where ambient temperature is  $-30^{\circ}\text{F}$  (dry air) to  $110^{\circ}\text{F}$ .
  - b. Mount switch with diaphragm in vertical plane. Switch is position-sensitive and is calibrated to operate properly when diaphragm is vertical. Mount switch securely.
  - c. Connect pressure taps on top of switch to sources of air pressure differential. Metal tubing with 1/4-inch OD is recommended, but any tubing system that does not unduly restrict air flow may be used. To maintain positive building pressure, vent low pressure tap to outdoors and allow high pressure tap to monitor building pressure. To maintain negative building pressure, reverse functions of high and low pressure taps. In either case, ensure that outdoor vent is protected from wind and is screened from insects.
  - d. Adjustment of switch: HIGH actuation point of switch is indicated on calibrated scale secured to transparent range screw enclosure. Building pressure is set by turning adjustment screw. LOW actuation point is set by adjusting span of null by turning span adjustment screw. Span range is 0.01 to 0.03 IN WC.
  - e. Refer to wiring diagram provided with unit to make electrical connections.

## CONTROLS

Control locations are shown in [Figure 36](#). For information on system controller options D19, D21, D22, and D23, refer to the control system guide listed in [Table 1](#).

### Thermostat

A [thermostat](#) is not standard equipment but is an installation requirement. Use either an optional [thermostat](#) available with the system or a field-supplied [thermostat](#). Install according to the [thermostat](#) manufacturer's instructions.

### Remote Console

A selection of remote consoles is available with certain appropriate combinations of controls factory mounted. All consoles include indicator lights for the blower and burner, an off/on system switch, and terminal block wiring.

### Combustion Air Proving Switch

## ⚠ DANGER ⚠

**Safe operation requires proper venting flow. Never bypass the combustion air proving switch or attempt to operate the unit without the venter running and proper flow in the vent system. Hazardous conditions could result.**

- The combustion air proving switch ensures that proper combustion airflow is available. The switch is a single-pole, double-throw switch that senses pressure caused by the flow of combustion air from the venter. The switch is designed to close when a decreasing pressure is sensed in the outlet duct of the gas collection box.
- At startup when the furnace is cold, the sensing pressure is at the most negative level. As the furnace and the flue system warm up, the sensing pressure becomes less negative. After the system has reached equilibrium (approximately 20 minutes), the sensing pressure levels off. If a restriction or if excessive flue length or turns cause the sensing pressure to become less than the switch setpoint, the pressure switch will function to shut off the main burners. The main burners will remain off until the system has cooled and/or the flue system resistance is reduced. Refer to [Table 26](#) for approximate water column negative pressure readings and combustion air proving switch setpoints for sea level operating conditions.

Unit Size	Factory Setpoint	Startup Cold	Equilibrium
<b>Units Without Option AG39, AG40, AG41, or AG42</b>			
All	-0.63 (±0.05) IN WC	-1.00 IN WC	-0.70 IN WC
<b>Units with Option AG39, AG40, AG41, or AG42</b>			
400, 500, 600, 800, 1200	-0.75 (±0.05) IN WC	-1.20 (±0.20) IN WC	-0.95 (±0.10) IN WC

### Blower Fan Control

**NOTE: To replace the blower fan control on units manufactured *before* NOV 2004, a replacement kit (PN [209184](#)) is required.**

The blower fan is controlled as follows:

- After the gas valve opens, there is a time delay of blower fan operation to prevent the discharge of cold air.
- Blower fan operation continues after the [thermostat](#) is satisfied, as determined by the fan time delay.
- To ensure that the blower fan can continue to operate, the power supply to the furnace **MUST NOT** be interrupted except for when servicing the unit.

**NOTE: If the customer wants the furnace off at night, the gas valve circuit **SHOULD BE OPENED** by a single-pole switch wired in series with the [thermostat](#). Some thermostats are provided with this feature. Multiple units controlled from a single [thermostat](#) are shut off in the same manner. For proper operation, ensure that the blower fan control is wired correctly.**

## CONTROLS—CONTINUED

### High Temperature Limit Control

Each furnace is equipped with a non-adjustable high temperature limit switch that shuts off the gas in the event of motor failure, lack of air due to dirty filters, or restrictions at the inlet or outlet of the unit. The furnace farthest downstream in each system is also equipped with a linear-type limit control. The switch is mounted on a bracket on the bottom of the junction box with the capillary sensor extending across the discharge opening of the furnace.

### Reverse Flow Limit Control (Model RPBL)

The furnace is factory-equipped with an automatic-reset reverse flow limit control. This control is located in the blower compartment, is mounted in the blower junction box adjacent to the blower inlet opening, and is wired in series with the main limit control mounted on the heat exchanger duct side. In case of belt breakage or motor failure, the limit control will be opened by the high temperatures caused by reverse flow from the heat exchanger to the blower compartment, thus breaking the circuit to the automatic electric gas valve and preventing burner operation.

### High Ambient Limit Control (Model RPBL)

The optional high ambient limit control functions to shut off the burner when the entering outside air reaches a set temperature. The temperature setting is field-adjustable from 0°F to 100°F.

### Airflow Proving Switch (Makeup Air with Option BW1)

The optional airflow proving switch ensures that the circulating air blower provides an adequate amount of airflow prior to the unit being fired. The switch is a single-pole/normally-open device that closes when an increase in pressure above the setpoint is sensed in the circulating air blower. The switch is located in the blower junction box. Contacts are set to close at 0.26 IN WC (maximum).

### Variable Frequency Drive

- When an optional variable frequency drive is ordered, the motor operates on two speeds as determined by the electrical frequency. High speed is used for cooling and low speed for heating. 60 Hertz is the maximum high speed. Maximum speed for low speed heating is the frequency that will provide the maximum temperature rise of the heater. Speeds must be within the temperature rise range of 30–90°F.
- Follow the variable frequency controller manufacturer's instructions that are packaged with the heater (in the owner's envelope) to program the variable frequency drive settings. The formula for motor speed is  $N = 120 \times f/p$  where  $N$  = speed,  $f$  = frequency,  $p$  = number of poles, a 3,600-rpm motor has two poles, and an 1800-rpm motor has four poles. For example, for an 1,800-rpm motor at 60Hz,  $N = 120 \times 60/4 = 1800$  (1,800 = synchronous speed, assume 2% slip).
- The motor will run between 1,750 and 1,790 rpm at full load depending on design. For the same motor run at 45Hz,  $120 \times 45/4 = 1350$  (1,350 rpm less 2% slip = about 1,300 rpm).

### Combination Gas Valve

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#### WARNING

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

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All furnaces are equipped with a 24V combination gas valve that includes the automatic electric ON/OFF valve controlled by the room [thermostat](#), the pressure regulator, the safety pilot valve, and the manual shutoff valve. The standard combination gas valve allows for single-stage control from a single-stage, 24V [thermostat](#).

### Optional Two-Stage Control (Heating Only Application)

The standard combination control valve is replaced with a two-stage combination gas control valve providing for low fire or high fire operation controlled by a two-stage [thermostat](#). The first stage (low fire) is factory-set (not field-adjustable). Both low fire and high fire stages are controlled by a Servo regulator that maintains constant gas input under wide variations in gas supply pressure. Refer to the instructions provided with the unit for gas valve specifications, wiring, and operating instructions.

## Optional Two-Stage Control (Makeup Air Application)

- On systems with more than one furnace section, there are two methods of achieving multiple-stage makeup air operation. In addition, for each of these methods, there are two types of control mechanisms. Consult the wiring diagram on the furnace to identify the optional control system: option AG3, AG4, AG5, AG15, AG17, or AG19.
- Option AG3 or AG15:** The first method is comparable to the two-stage heating units. Instead of control from a two-stage room thermostat, the discharge air temperature is monitored and the two-stage gas valve is controlled by a two-stage ductstat. When the discharge air temperature drops to the setpoint, low fire is energized. If low fire cannot satisfy the ductstat setting, high fire is energized. As the packaged system may include two or three furnace sections, and as each section is equipped with a two-stage gas valve, the operation stages increase with the number of furnace sections. Set the ductstat as indicated in [Table 27](#).
- Option AG4, AG5, AG17, or AG19:** The second method of multiple-stage makeup air operation is applicable only to systems that include two or three furnace sections. On systems with two furnaces, this optional control system is identified as option AG4 or AG17. On packaged systems with three furnace sections, this optional control method is identified as option AG5 or AG19. Each furnace in the package is equipped with a single-stage gas valve. The single-stage gas valves are staged by two-stage ductstats. The furnaces are staged in sequence. This concept will achieve two-stage control on packaged systems with two furnaces and three-stage control on systems with three furnaces. Set the ductstat as indicated in [Table 27](#).

**Table 27. Recommended Settings for Two-Stage Makeup Air Control**

Option	No. of Furnaces	Ductstat Setting*				Staging Sequence	Temperature Selector Setting**		
		1st	2nd	3rd	4th		Setpoint	Differential	Stage Adder Offset
AG3	1	70°F	—			66°F high stage→70°F low stage→74°F shutdown	—	—	—
	2	70°F	64°F	—		60°F high stage (both furnaces)→64°F low stage (furnace 2)→68°F shutdown (furnace 2)→70°F low stage (furnace 1)→74°F shutdown (furnace 1)			
	3	70°F	66°F	62°F	—	58°F high stage (all furnaces)→62°F low stage (furnace 3)→66°F shutdown (furnace 3), low stage (furnace 2)→70°F shutdown (furnace 2), low stage (furnace 1)→74°F shutdown (furnace 1)			
AG4	2	70°F	—			66°F full rate (both furnaces)→70°F shutdown (furnace 1)→74°F shutdown (furnace 2)	—	—	—
AG5	3	70°F	64°F	—		60°F full rate (both furnaces)→68°F shutdown (furnace 3 and 2)→74°F shutdown (furnace 1)			
AG15	1	—				—	74°F	8°F	4°F
	2	—				—	74°F	14°F	10°F, 6°F, 4°F
	3	—				—	74°F	16°F	10°F, 8°F, 8°F, 4°F, 4°F
AG17	2	—				—	74°F	8°F	4°F
AG19	3	—				—	74°F	10°F	6°F, 6°F

\*Set each ductstat control in furnace order.

\*\*Adjust the setpoint and the differential of the temperature selector (Johnson #A350). Adjust the offset potentiometer on each of the stage adder modules (Johnson #S350). Follow the manufacturer's instructions provided. **IMPORTANT:** Set the temperature selector and each stage adder module to HEAT. Follow the wiring diagram to obtain proper sequencing. **Operation:** The differential setting and offset degrees allow the controls to adapt to any adjustment in temperature selection (50–130°F).

### Optional Ductstat with Capillary Tubing (Option AG3, AG4, or AG5)

The makeup air control options with the complete two-stage ductstat installed in the heater discharge use a ductstat (see [Figure 37](#), DETAIL A) with an adjustable range between 0° and 100°F with a fixed differential of 2-1/2°. Due to different CFM settings and outside air temperatures, the average downstream outlet temperature may not match the ductstat setting exactly. After the installation is complete, re-adjust the setpoint of the ductstat(s) to achieve the desired average discharge air temperature. In general, makeup air applications are usually adjusted to discharge an outlet air temperature between 65°F and 75°F.

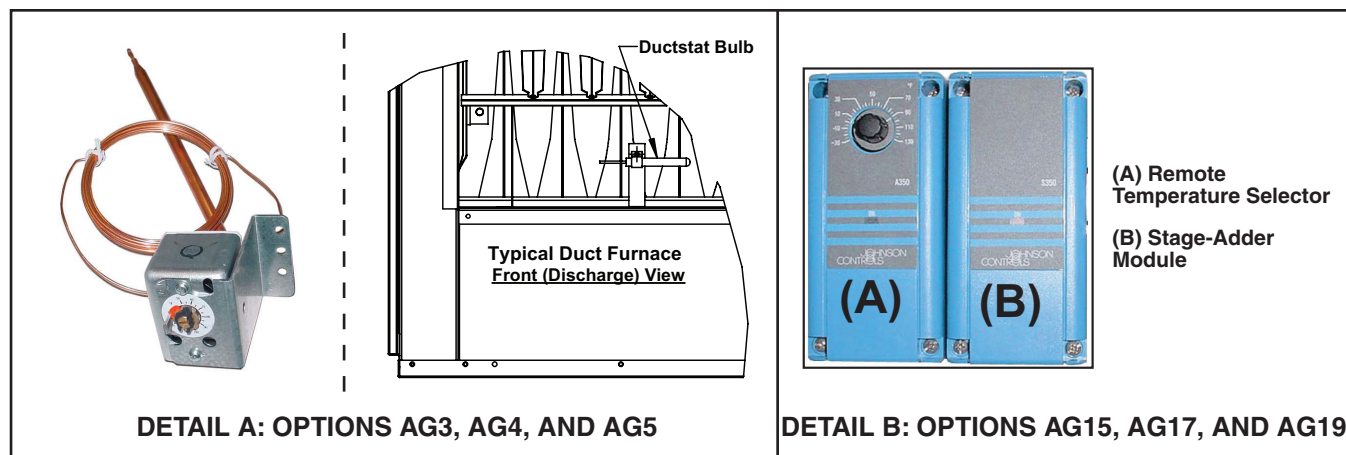
## CONTROLS—CONTINUED

### **Optional Ductstat with Remote Temperature Selector (Option AG15, AG17, or AG19)**

Two-stage makeup air options that are controlled from a sensing probe with a remote electronic temperature selector have a temperature operating range to 130°F. The sensing probe and remote modules (see [Figure 37](#), DETAIL B) are shipped separately for field installation. Follow the wiring diagram with the unit and the manufacturer's instructions for wiring and installing the remote modules. Depending on the staging provided, there will be one module for selecting temperature and one to five stage-adder modules. The digital display module is optional.

### **⚠ CAUTION ⚠**

**Ensure that the heat/cool selector switch on the remote temperature selector is positioned to *Heat*.**



**Figure 37. Ductstat Options**

### **Optional Electronic Modulation**

**NOTE: Unit sizes 400, 700, 800, 1050, and 1200 with electronic modulation require a minimum natural gas supply pressure of 6 IN WC.**

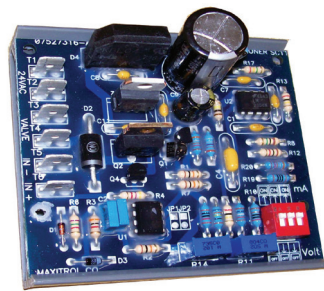
The type and capability of the electronic modulation system depends on the option selected. Electronic modulation options are identified by a suffix to the serial No. printed on the heater rating plate. AG7 is identified as MV-1, AG8 is identified as MV-3, AG9 is identified as MV-4, AG21 is identified as MV-A, AG39 is identified as MP-1, and AG40 is identified as MP-2. AG39 and AG40 are available only on unit size 400. AG41 is identified as MP3 and AG42 is identified as MP4. Both AG41 and AG42 apply only to unit sizes 500, 600, 800, and 1200.

### **Electronic Modulation Between 50% and 100% Firing Rate (Option AG7, AG8, or AG9)**

- Depending on the heat requirements established by the thermistor sensor, the burner modulates between 100% and 50% firing. The thermistor is a resistor that is temperature-sensitive in that as the surrounding temperature changes, the Ohms resistance changes through the thermistor. This change is monitored by the solid-state control center (amplifier) that furnishes varying DC current to the modulating valve to adjust the gas input.
- Each modulating valve is basically a regulator with the electrical means of raising and lowering the discharge pressure. When no DC current is fed to this device, it functions as a gas pressure regulator to supply 3.5 IN WC pressure to the combination gas valve.
- Refer to the wiring diagram provided with the furnace for proper wiring connections.
- Electronic modulation for heating that is controlled by a specially-designed room [thermostat](#) (60–85°F) is identified as option AG7.
- Electronic modulation for makeup air application that is controlled by a duct sensor and temperature selector (55–90°F) is identified as option AG8 or AG9. The temperature selector setting for option AG8 is on the amplifier (see [Figure 38](#)). Option AG9 has a remote temperature selector. Both systems are available with an [override thermostat](#).



AMPLIFIER



SIGNAL CONDITIONER

Figure 38. Maxitrol Amplifier and Signal Conditioner

**Computer-Controlled Electronic Modulation Between 50% and 100% Firing Rate (Option AG21)**

- With option AG21, the furnace is equipped with a Maxitrol signal conditioner (see [Figure 38](#)) that operates much the same way as the amplifier above to control the regulator valve. The signal conditioner accepts an input signal of either 4–20 milliamps or 0–10V from a customer-supplied control device such as a computer.
- With the dip switches on the conditioner positioned to ON, the conditioner accepts a 4–20 milliamp signal. With the dip switches on the conditioner positioned to OFF, the conditioner accepts a 0–10V signal. The conditioner converts the signal to the 0–20V DC current required to control the modulating valve.

**Electronic Modulation Between 25% and 100% Firing Rate (Options AG39, AG40, AG41, and AG42)**

**NOTE: Options AG39, AG40, AG41, and AG42 are available only with natural gas. A unit size 400 equipped with electronic modulation option AG39 has a 25–100% firing range (4:1 turndown ratio). Option AG41 applies to unit sizes 500, 600, and 800 with two furnaces and to unit size 1200 with three furnaces.**

- The furnace closest to the blower is equipped with the electronic modulation option. The other furnace(s) have two-stage burner control from outside air temperature sensors identified as heat stage controllers. Option AG41 provides 6:1 turndown with two furnaces and 8:1 turndown with three furnaces.
- The furnace will ignite at any input rate in the available range and will maintain average thermal efficiencies equal to or greater than the thermal efficiency at full fire.
- The gas train (see [Figure 39](#)) includes a single-stage gas valve, a modulating valve, and two gas pressure switches. The burner rack is equipped with one flash carryover and a regulated gas lighter tube system. The carryover lighter tube receives its gas supply through the regulator simultaneously with the gas to the burner. Control of the system is through a Maxitrol amplifier (see [Figure 38](#)) with a corresponding remote temperature dial.

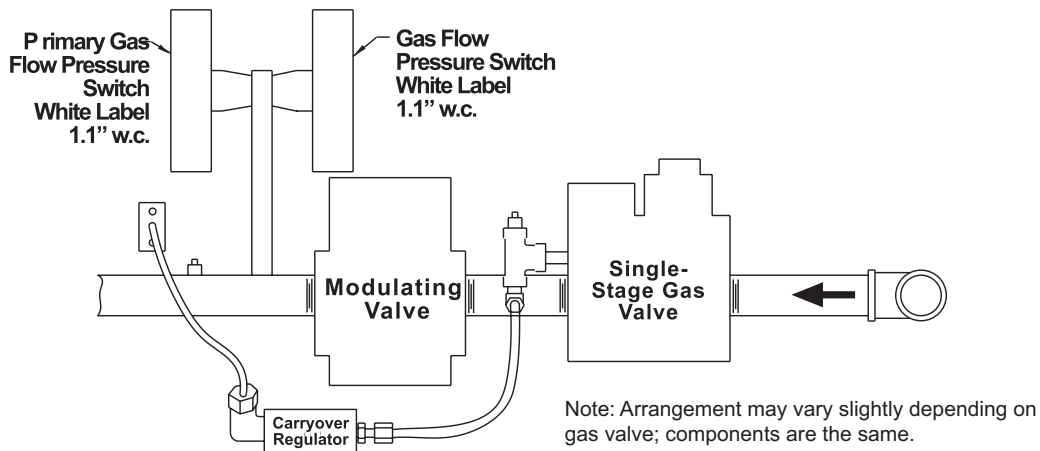


Figure 39. Typical Manifold Arrangement with Electronic Modulation

## CONTROLS—CONTINUED

### Optional Electronic Modulation—Continued

#### *Electronic Modulation Between 25% and 100% Firing Rate (Options AG39, AG40, AG41, and AG42)—Cont.*

- The gas supply (refer to pressure requirements in [Table 28](#)) connects to the single-stage gas valve. To compensate for additional pressure loss through the modulating valve, the single-stage gas valve has a custom outlet pressure setting higher than when it is used on a standard gas manifold. The pilot tubing connects to the pilot port on the single-stage gas valve.

**Table 28. Options AG39, AG40, AG41, and AG42 Pressure Requirements**

Unit Size	Maximum Turndown (%)	Input Range (MBH)	Factory-Set Inlet Pressure to Modulating Valve (IN WC)	Required Gas Supply Pressure (IN WC)
500	28	69–250	4.0	5.0
600	23	69–300	4.0	5.0
400, 800, 1200	25	100–400	4.4	6.0

- When the valve receives a call for heat from the amplifier and pilot is established, gas flow from the single-stage valve goes to both the modulating valve and the regulated lighter tube system. When the signal from the amplifier to the modulating valve requires less-than-high fire operation, the modulating valve functions to lessen the gas flow to the burner to reduce the input rate to that which is necessary to maintain the desired temperature. When the input rate is reduced enough to decrease the gas pressure to 1.1 IN WC, the primary gas pressure switch in the manifold activates the gear motor that controls the bypass damper in the venter/combustion air system. The bypass damper opens to divert some of the incoming air directly into the flue duct to reduce air flow through the burner. Safety switches monitor the position of the bypass damper. When the gas pressure rises to >1.1 IN WC, the bypass damper closes.
- **Sensor location for options AG39 and AG41:** For the convenience of the installer, the duct temperature sensor is factory-installed in the cabinet leg (see [Figure 18](#)). Although the sensor has a mixing tube, at this distance from the discharge it does not receive a true mix, so the temperature read by the sensor will be slightly higher than the actual air entering the ductwork. The system will provide comfort level heat if the selector is set slightly lower to compensate for this reading. The offset temperature will vary with the application. If a direct correlation of these two temperatures is required, move the duct sensor to a location in the ductwork about 10–12 feet (3–3.7 meters) from the furnace discharge. Refer to the [Discharge Air Temperature Sensor Installation](#) section for instructions on locating the sensor in the ductwork.
- This uniquely-designed modulation system requires combustion air pressure settings different from the standard system. Refer to [Table 26](#) for the approximate combustion air proving switch settings at sea-level operation and to [Figure 40](#) for troubleshooting.

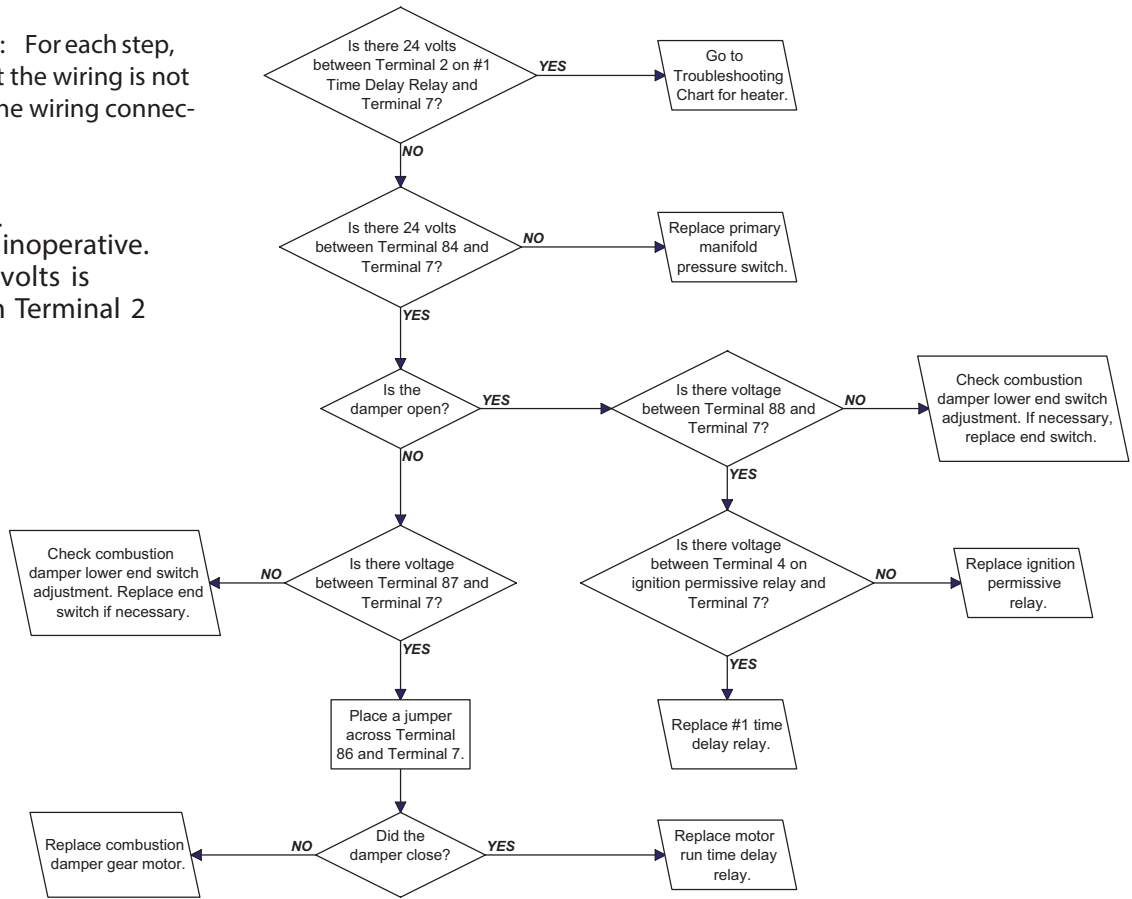
#### *Computer-Controlled Electronic Modulation Between 25% and 100% Firing Rate (Options AG40 and AG42)*

- The furnace is equipped with a Maxitrol signal conditioner (see [Figure 38](#)) that receives an input signal of either 4–20mA or 0–10V from a customer-supplied control device such as a computer.
- With the dip switches on the conditioner positioned to ON, the conditioner accepts a 4–20mA signal. With the dip switches on the conditioner positioned to OFF, the conditioner accepts a 0–10V signal. The conditioner converts the signal to the 0–20V DC current required to control the modulating valve. The furnace functions and is equipped in the same way as options AG39 and AG41 except that with computer control, the temperatures are selected through the software and there is no temperature selector or duct sensor.
- Refer to [Table 28](#) for pressure requirements and to [Figure 40](#) for troubleshooting.
- This uniquely-designed modulation system requires combustion air pressure settings different from the standard system. Refer to [Table 26](#) for the approximate combustion air proving switch settings at sea-level operation.

General Instructions: For each step, check to ensure that the wiring is not defective and that the wiring connections are secure.

**Symptom - Part 1:**

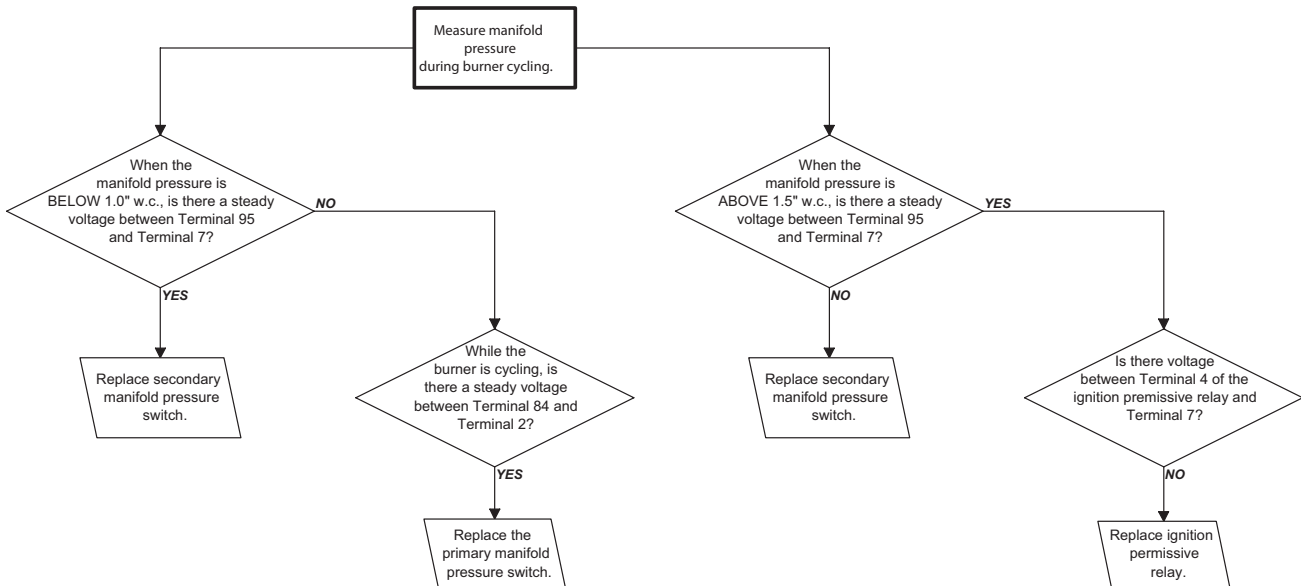
Main burners are inoperative. Assumes that 24 volts is available between Terminal 2 and Terminal 7.



**Symptom - Part 2:**

Steady call for heat - burner cycles.

Assumes that 24 volts is available between Terminals 11 and 7 and Terminals 2 and 7.



**Figure 40. Troubleshooting Guide for Checking Bypass Combustion Air Damper Safety Circuit on Units with Option AG39, AG40, AG41, or AG42**

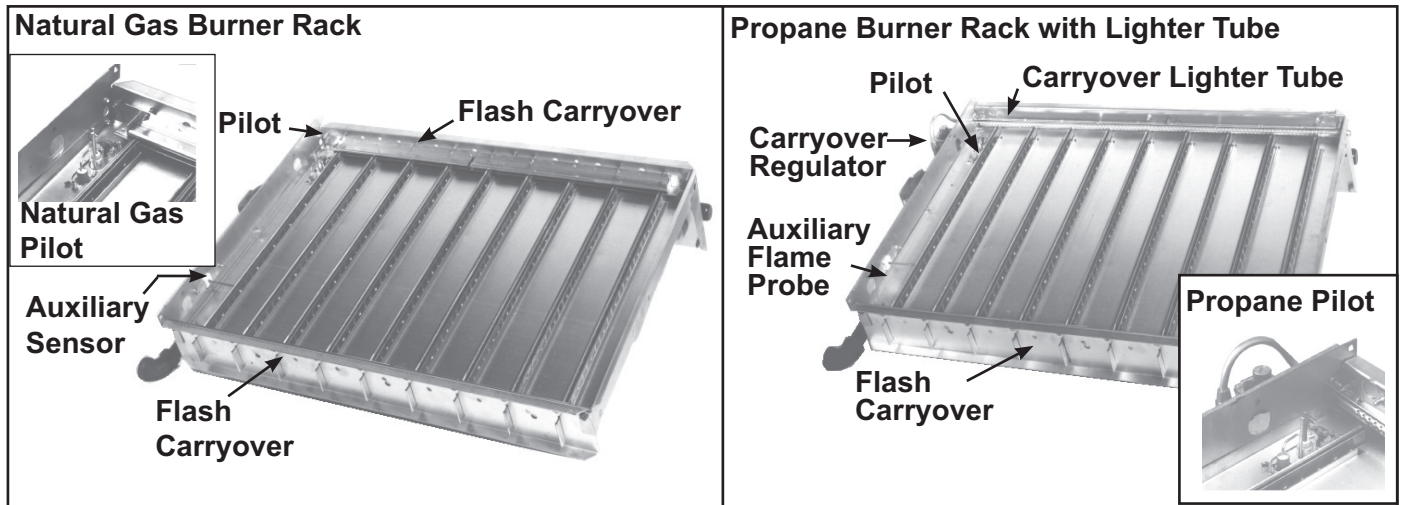
## CONTROLS—CONTINUED

### Pilot and Ignition Systems

#### ⚠ WARNING ⚠

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

- **Pilot:** The pilot (see [Figure 41](#)) is a vertical target type with lint-free feature. Pilot flame should be approximately 1-1/4" in length. Pilot gas pressure should be the same as supply line pressure (refer to [Gas Supply Pressure](#) section). Pilot gas is supplied through the combination valve; the pilot gas flow is controlled by an adjustment screw located in the valve body.



**Figure 41. Typical Burner Rack with Pilot**

- **Ignition system:** Natural gas units are equipped with a spark-ignited intermittent safety pilot system that shuts off pilot gas flow between heat cycles. Propane units (or as an option on natural gas units) require a lockout device that stops gas flow to the pilot if the pilot fails to light in 120 seconds. This lockout device has a 1-hour retry or requires a manual reset by interruption of the [thermostat](#) circuit. Refer to the wiring diagram provided with the unit for pilot system identification and for proper wiring. Spark pilot without lockout is designated as option AH2 or pilot with lockout is option AH3.
- **Ignition controller:** As part of the intermittent safety pilot system, the ignition controller provides high voltage spark to ignite pilot gas and also acts as the flame safety device. After ignition of the pilot gas, the ignition controller electronically senses the pilot flame. A low voltage DC electrical signal is imposed on the separate metal probe in the pilot assembly. The metal probe is electrically insulated from ground. The pilot flame acts as a conduction path to ground to complete the DC circuit and prove pilot flame. Proper operation of the electronic spark ignition system requires a minimum flame signal of 0.2 microamps, as measured by a microammeter. With pilot flame proven, the ignition controller energizes the main gas valve.

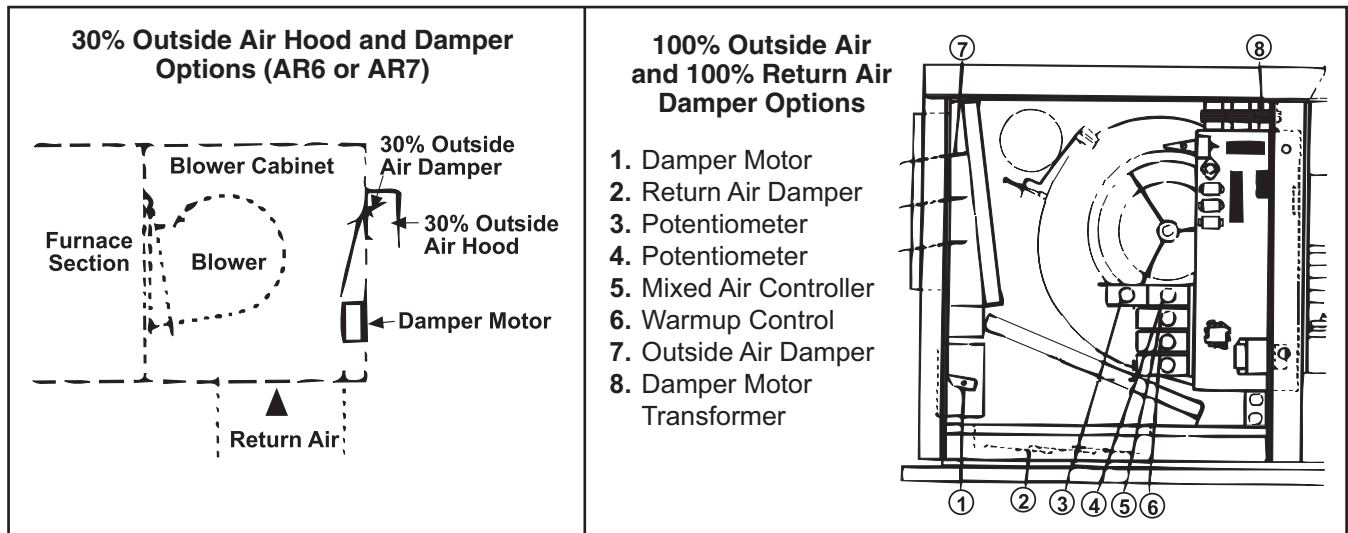
### Burners and Carryover System

- **Burners:** These duct furnaces have individually-formed steel burners with accurately die-formed ports to provide controlled flame stability without lifting or flashback with either natural or propane gas. All burners are lightweight and are factory-mounted in an assembly that permits all of the burners to be removed as a unit for inspection or service.
- Natural gas burner racks (except when equipped with electronic modulation option AG39, AG40, AG41, or AG42) are equipped with two flash carryovers. Natural gas burner racks on SSCBL units manufactured **before** 1997 had a gas lighter tube carryover and one flash carryover.
- Propane gas burners are equipped with one flash carryover and a regulated gas lighter tube system. The carryover lighter tube receives its gas supply through a regulator, simultaneously with the gas to the burner orifices.

- **Burner orifices:** Heaters are shipped with orifices of proper size and type for gas specified. Natural gas units do not require a carryover orifice.
- During regular service, check the main burner ports, the carryover assemblies, and the orifices for cleanliness.

### Dampers and Damper Controls

For information on damper control options (see [Figure 42](#)), refer to the wiring diagram provided with the unit. To adjust dampers, refer to the [Damper Linkage Adjustment](#) section.



**Figure 42. Damper Controls**

### Pressure Null Switch

The pressure null switch used to control outside air dampers in inlet air option AR23 is a Dwyer #1640-0 with a range of 0.01–0.20 IN WC. It is shipped separately for field installation—refer to the manufacturer’s installation instructions included with the switch. The pressure null switch is a diaphragm-operated differential pressure switch used in makeup air applications to control building pressure. It maintains a selected positive or negative pressure setpoint by changing the amount of outside air being introduced to the building through the modulating outside air dampers. As more pressure is required in the building, the pressure null switch activates the damper motor driving the outside air damper towards the full open position and the recirculated air damper towards the closed position. Conversely, as less pressure is required, the switch drives the dampers in the opposite direction. To adjust the switch, refer to the [Pressure Null Switch Adjustment](#) section.

### Dirty Filter Switch

The optional dirty filter pressure switch is used to provide warning to the user by energizing an indicator light on an optional remote console. The light indicates that the filters are in need of cleaning or changing. The adjustable, single-pole/normally-open differential switch closes when an increase in pressure differential above the setpoint, is sensed across the filter bank. The dirty filter switch is located in the furnace section. To adjust the dirty filter switch, refer to the [Dirty Filter Switch Adjustment](#) section.

## OPERATION

### ⚠ WARNING ⚠

**To ensure safety, follow the lighting instructions located on the outlet box cover.**

## OPERATION—CONTINUED

### Pre-Startup Checklist

- Ensure that suspension, mounting, clearances, and duct and venting connections are in accordance with **INSTALLATION** section.
- Ensure that flue discharge and combustion air openings are free from obstructions.
- Ensure that electrical entrances are sealed against the weather.
- Ensure that gas supply pipe openings are sealed.
- Ensure that electrical supply is in accordance with voltage rating on unit's rating plate.
- Ensure that all field wiring is in accordance with wiring diagram and that wire gauges are as required for electrical load.
- Ensure that fuses or circuit breakers are in place and are sized correctly.
- Ensure that clearances from combustibles are in accordance with **Clearances** sections).
- On units with option AG41 or AG42, ensure that heat stage controllers are set.
- Check blower pulley and motor pulley to ensure that they are secure to their shafts. Check belt tension and alignment. Check blower rotation (refer to **Belts, Blowers, and Drives** section).
- On units with optional dampers, ensure that damper linkage is in accordance with **Damper Linkage Adjustment** section.
- Check piping for leaks and proper gas line pressure and bleed trapped air from gas lines (refer to **Supply Piping Connections** section):
  - a. Turn OFF manual shutoff valve.
  - b. Turn ON gas supply.
  - c. Observe gas meter for movement or attach pressure gauge readable to 0.1 IN WC and, after turning gas ON for 10 seconds, turn OFF gas supply—no change in pressure should occur over 3-minute period.
  - d. If step c indicates leak, locate leak by brushing soapy solution on all fittings—bubbles will appear at any leaks.
  - e. Repair any leaks and repeat test.

### Startup

1. Close all panels tightly.
2. Turn ON electric and gas supply to furnace.
3. Adjust **thermostat** or ductstat so that call for heat exists.
4. Observe for complete sequencing of safety pilot and ignition (refer to **Table 29**).

<b>Table 29. Sequence of Operation</b>		
Step	Action	Observe
1	Set <b>thermostat</b> at its lowest setting	
2	Turn ON electric and main and manual gas valves	
3	Set <b>thermostat</b> at desired setting— <b>thermostat</b> calls for heat	Venter motor is energized after 15-second (approximate) time delay
		Venter flow switches from NC to NO contacts to energize pilot gas valve and spark gap to produce pilot flame on each operating cycle
		Sensing probe proves presence of pilot flame and energizes safety switch portion of control to de-energize spark gap and energize main valve
		Main gas ignites and unit fires at full rate
4	If flame is extinguished during main burner operation, safety switch closes main valve and recycles spark gap	On unit equipped with controller with lockout, if pilot is not established within 120 seconds (approximately), unit locks out for 1 hour unless reset by interrupting power to control circuit
		Blower motor operates from fan time delay
5	<b>Thermostat</b> is satisfied	Solenoid gas valve, pilot gas valve, and ignition controller de-energized
		Time delay relay keeps venter motor on for approximately 90 seconds (post-purge)
6	To shut down, set <b>thermostat</b> to lowest setting	Blower motor remains on as determined by fan time delay

## Post-Startup Checklist

- ❑ Observe burner flame at full fire. Natural gas flame should be about 1-1/2 inches in height with blue coloring. Propane gas flame should be approximately same height with blue coloring. Yellow tipping may appear on propane gas. If yellow extends beyond 1/2- to 3/4-inch, adjust air shutters (refer to [Burner Air Shutter Adjustment](#) section). If shutter adjustment does not reduce yellowing, check for gas leaks at control manifold or orifice fitting.
- ❑ Turn unit OFF and ON, pausing 2 minutes between each cycle. Observe to verify smooth ignition. On two-stage or modulating burner systems, manipulate temperature adjustment slowly up and down to see if control is sequencing or modulating properly. Raising temperature setting drives burner on or to full fire.
- ❑ Using manometer or slant gauge readable up to 14 IN WC, check orifice manifold for operating pressure on full fire. Natural gas should be 3.5 IN WC at this point. Propane gas should be 10 IN WC at this point. Variations from these pressures are not recommended as ignition and efficiency performance can be adversely affected by improper pressure adjustment (refer to [Measure and Adjust Manifold \(Outlet\) Gas Pressure](#) section).
- ❑ If system is equipped with optional dirty filter switch, refer to [Dirty Filter Switch Adjustment](#) section for instructions to set switch.
- ❑ Place owner's envelope containing Limited Warranty Card, this manual, and any optional information in accessible location near heater. Follow instructions on envelope.

## ⚠ DANGER ⚠

- **The gas burner in this gas-fired equipment is designed and equipped to provide safe, controlled, complete combustion. However, if the installation does not permit the burner to receive the proper supply of combustion air, complete combustion may not occur. The result is incomplete combustion, which produces carbon monoxide, a poisonous gas that can cause death.**
- **For SSCBL models, safe operation of separated-combustion, indirect-fired gas burning equipment requires a sealed, properly-operating vent system that vents all flue products to the outside atmosphere. FAILURE TO PROVIDE PROPER VENTING WILL RESULT IN A HEALTH HAZARD THAT COULD CAUSE SERIOUS PERSONAL INJURY OR DEATH.**
- **For SSCBL models, install either the horizontal (see [Figure 32](#)) or vertical (see [Figure 25](#)) combustion air/vent system using the concentric adapter provided. Always comply with the combustion air requirements in the installation codes and instructions.**
- **Combustion air at the burner should be regulated only by manufacturer-provided equipment. NEVER RESTRICT OR OTHERWISE ALTER THE SUPPLY OF COMBUSTION AIR TO ANY HEATER. CHECK THE COMBUSTION AIR/VENT SYSTEM FOR SOUNDNESS AND FUNCTION AND MAINTAIN IT IN PROPER OPERATING CONDITION.**

## ADJUSTMENTS

### Belts, Blowers, and Drives

#### *Checking and Adjusting Belt Tension*

- Proper belt tension is important to the long life of the belt and motor. A loose belt will cause wear and slippage. Too much tension will cause excessive motor and blower bearing wear. Check belt tension as shown in [Figure 43](#).
- If the belt cannot be depressed 3/4 inches (19 mm), as shown in [Figure 43](#), adjust the belt tension as follows:
  - a. Ensure that belt is aligned in pulley grooves properly and is not angled from pulley to pulley.
  - b. Loosen adjusting screw locknut on motor base and turn adjusting screw until belt can be depressed 3/4 inches (19 mm).
  - c. When correct belt tension is achieved, retighten adjusting screw locknut.

## ADJUSTMENTS—CONTINUED

### Belts, Blowers, and Drives—Continued

#### Checking and Adjusting Belt Tension—Continued

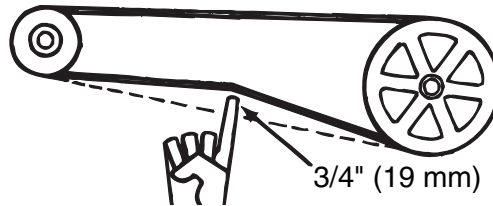


Figure 43. Checking Belt Tension

#### Adjusting Blower Speed

- Blower speed may be adjusted to achieve the desired outlet temperature as long as the adjustment is within the temperature rise and static pressure limits shown on the furnace rating plate. Motors are factory-set between maximum and minimum blower speeds.
- If the duct resistance is low, the blower may deliver too high an air volume. If the resistance is very low, the blower may deliver excess air to overload the motor, causing the overload protector to cycle the motor. Reducing the blower speed will correct these conditions. If ductwork is added to an installation, it may be necessary to increase the blower speed. Decreasing blower speed increases outlet temperature. Increasing blower speed decreases outlet temperature.
- The system is set at the factory for the RPM required to meet the CFM and external static pressure specified on the order. If estimated external static pressure is incorrect, or changes were made to the duct system, the blower RPM may have to be adjusted. Motors are equipped with adjustable pitch pulleys that permit adjustment of blower speed.
- Adjust the blower speed as follows:
  - To make adjustments to units with a <5-HP motor:
    - a. Shut OFF gas and electric power.
    - b. Loosen belt tension and remove belt.
    - c. For units with <5-HP motor:
      - (1) Loosen setscrew on side of pulley away from motor.
      - (2) To increase blower speed and decrease outlet temperature, turn adjustable half of pulley inward. To decrease blower speed and increase outlet temperature, turn adjustable half of pulley outward. One turn of pulley changes speed 8–10%.
      - (3) Tighten setscrew on flat portion of pulley shaft.
    - d. For units with ≥5-HP motor:
      - (1) Loosen but do not remove two locking screws that are directly across from each other on outer locking ring.
      - (2) Adjust sheave to desired pitch diameter by turning outer locking ring. One complete turn of outer locking ring results in 0.233-inch change in pitch diameter. Increase diameter to decrease blower speed or decrease diameter to increase blower speed.

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### ⚠ CAUTION ⚠

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**Sheaves should not be adjusted in either direction to the point where movable and stationary flanges are in contact.**

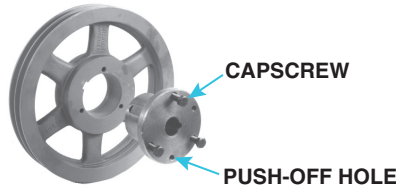
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- (3) After completing adjustment, tighten both locking screws on outer locking ring.
- e. Replace belt and adjust belt tension in accordance with [Checking and Adjusting Belt Tension](#) section.
- f. Turn ON gas and electric power and light heater in accordance with instructions on lighting instruction plate.
- g. Check motor amps using ammeter. Maximum motor amp rating on motor nameplate must not be exceeded.
- h. When adjustment is complete, check for proper operation.

- At final adjustment, amperes should not exceed motor nameplate amp rating. The installation must be adjusted to obtain a temperature rise within the range specified on the furnace rating plate.

**NOTE: Some blower pulleys require the use of a split taper bushing in the blower pulley. These split taper bushings must be loosened in order to remove the pulley.**

- If it is necessary to remove a blower pulley, follow these instructions to loosen the bushing:
  - a. Note that there are three capscrews in bushing and two holes without screws called push-off holes (see [Figure 44](#)). Remove three capscrews.
  - b. Insert two capscrews into two push-off holes and tighten evenly until pulley is loosened.
  - c. Pulley may now be removed from shaft.



**Figure 44. Split Taper Bushing**

### **Reversing Blower Rotation**

Each blower housing is marked for proper rotation. Rotation may be changed on single-phase motors by rewiring in the motor terminal box. Rotation may be changed on three-phase motors by interchanging two wires on the three-phase supply connections.

### **Motor Load and Amp Adjustment**

- Amps may be adjusted downward by reducing blower RPM or by increasing duct system static pressure. Use an ammeter to check blower motor amps.
- See the motor rating plate for exact motor specifications. Do not exceed the amp rating on the motor nameplate.
- Venter motor amps for a 115V or 575V unit = 1.5A. Venter motor amps for a 208V, 230V, or 460V unit = 0.8A.
- [Table 30](#), which lists the Full Load Amps (FLA) of blower motors (open) based on Horsepower (HP) and Voltage (V), can be used for sizing line wiring but should not be interpreted as the exact motor amps.

Voltage/Phase	HP								
	1	1-1/2	2	3	5	7-1/2	10	15	20
	FLA								
208V/1PH	7.2	10.1	11.3	13.7	28.0	—			
230V/1PH	6.5	9.1	10.2	12.4	26.0	32.0	38.0	—	
208V/3PH	3.6	5.8	7.3	9.3	14.6	23.2	28.8	42.0	55.3
230V/3PH	3.2	5.2	6.6	8.4	13.2	21.0	26.0	38.0	50.0
460V/3PH	1.6	2.6	3.3	4.2	6.6	10.5	13.0	19.0	25.0
575V/3PH	1.3	2.1	2.6	3.4	5.3	8.4	10.4	15.2	20.0

## ADJUSTMENTS—CONTINUED

### Adjust Heat Stage Controllers (Option AG41 or AG42)

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**NOTE: Unit sizes 500, 600, and 800 with two furnace sections have two heat stage controllers. Unit size 1200 with three furnace sections has four heat stage controllers.**

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Units with option AG41 and AG42 have heat stage controllers that control operation of the two-stage furnace based on outside air temperature setpoints. Proper setpoints are important to ensure that the modulating furnace (**Heat Stage 1**) is always in control and avoids cycling. The proper setpoint for each controller must be determined from basic design information as follows:

1. Calculate controller settings:

- a. For **Heat Stage 2** and **Heat Stage 3** in system with two furnace sections, use following formulas in which  $T_{SP}$  = setpoints of heat stage controllers ( $T_{SP2}$  and  $T_{SP3}$ ),  $T_{SA}$  = desired supply air temperature, and  $T_D$  = design (minimum) entering air temperature:

$$\text{Setpoint for heat stage 2: } T_{SP2} = T_{SA} - 0.46 (T_{SA} - T_D)$$

$$\text{Setpoint for heat stage 3: } T_{SP3} = T_{SA} - 0.73 (T_{SA} - T_D)$$

**EXAMPLE:** With 3,600 CFM, power-vented, 100% outside air,  $-10^{\circ}\text{F}$  outdoor winter design, and  $75^{\circ}\text{F}$  desired supply air:

$$T_{SP2} = 75 - [0.46 \times (75 - (-10))] = 75 - (0.46 \times 85) = 35.9$$

$$T_{SP3} = 75 - [0.73 \times (75 - (-10))] = 75 - (0.73 \times 85) = 12.9$$

Set Heat #2 controller to  $36^{\circ}\text{F}$

Set Heat #3 controller to  $13^{\circ}\text{F}$

- b. For **Heat Stage 2**, **Heat Stage 3**, **Heat Stage 4**, and **Heat Stage 5** in system with three furnace sections, use the following formulas in which  $T_{SP}$  = setpoints of heat stage controllers ( $T_{SP2}$ ,  $T_{SP3}$ ,  $T_{SP4}$ , and  $T_{SP5}$ ),  $T_{SA}$  = desired supply air temperature, and  $T_D$  = design (minimum) entering air temperature:

$$\text{Setpoint for heat stage 2: } T_{SP2} = T_{SA} - 0.30 (T_{SA} - T_D)$$

$$\text{Setpoint for heat stage 3: } T_{SP3} = T_{SA} - 0.49 (T_{SA} - T_D)$$

$$\text{Setpoint for heat stage 4: } T_{SP4} = T_{SA} - 0.65 (T_{SA} - T_D)$$

$$\text{Setpoint for heat stage 5: } T_{SP5} = T_{SA} - 0.82 (T_{SA} - T_D)$$

**EXAMPLE:** With 8,850 CFM, power-vented, 100% outside air,  $-10^{\circ}\text{F}$  outdoor winter design, and  $75^{\circ}\text{F}$  desired supply air:

$$T_{SP2} = 75 - [0.30 \times (75 - (-10))] = 75 - (0.30 \times 85) = 49.5$$

$$T_{SP3} = 75 - [0.49 \times (75 - (-10))] = 75 - (0.49 \times 85) = 33.3$$

$$T_{SP4} = 75 - [0.65 \times (75 - (-10))] = 75 - (0.65 \times 85) = 19.8$$

$$T_{SP5} = 75 - [0.82 \times (75 - (-10))] = 75 - (0.82 \times 85) = 5.3$$

Set Heat #2 controller to  $49^{\circ}\text{F}$

Set Heat #3 controller to  $33^{\circ}\text{F}$

Set Heat #4 controller to  $20^{\circ}\text{F}$

Set Heat #5 controller to  $5^{\circ}\text{F}$

2. Locate heat stage controllers marked **Heat #2** and **Heat #3** (for two furnaces) or **Heat #2**, **Heat #3**, **Heat #4**, and **Heat #5** (for three furnaces) in inlet air section.

---

**NOTE: The same type of controller may also be used as the optional high ambient limit control (option BN2) and as the mixed air controller that is part of air control options AR12, AR13, AR15, and AR16.**

---

3. Adjust each controller to setpoint as determined by calculation in step 1.

## Pressure Null Switch Adjustment

**NOTE: IMPORTANT: To eliminate shipping damage to the pressure null switch contacts, the manufacturer reduced the span adjustment to zero before shipping.**

The span should be adjusted prior to using the pressure null switch (see [Figure 45](#)) as follows:

1. If switch has been installed, disconnect vent tube so that switch is in neutral position.
2. Remove electrical box cover and, while observing contacts, turn span adjustment screw slowly in clockwise direction.
3. Continue turning adjustment screw until you are able to see gaps between common and both low and high contacts—minimum gap provides greatest sensitivity—wider gap provides lower sensitivity.

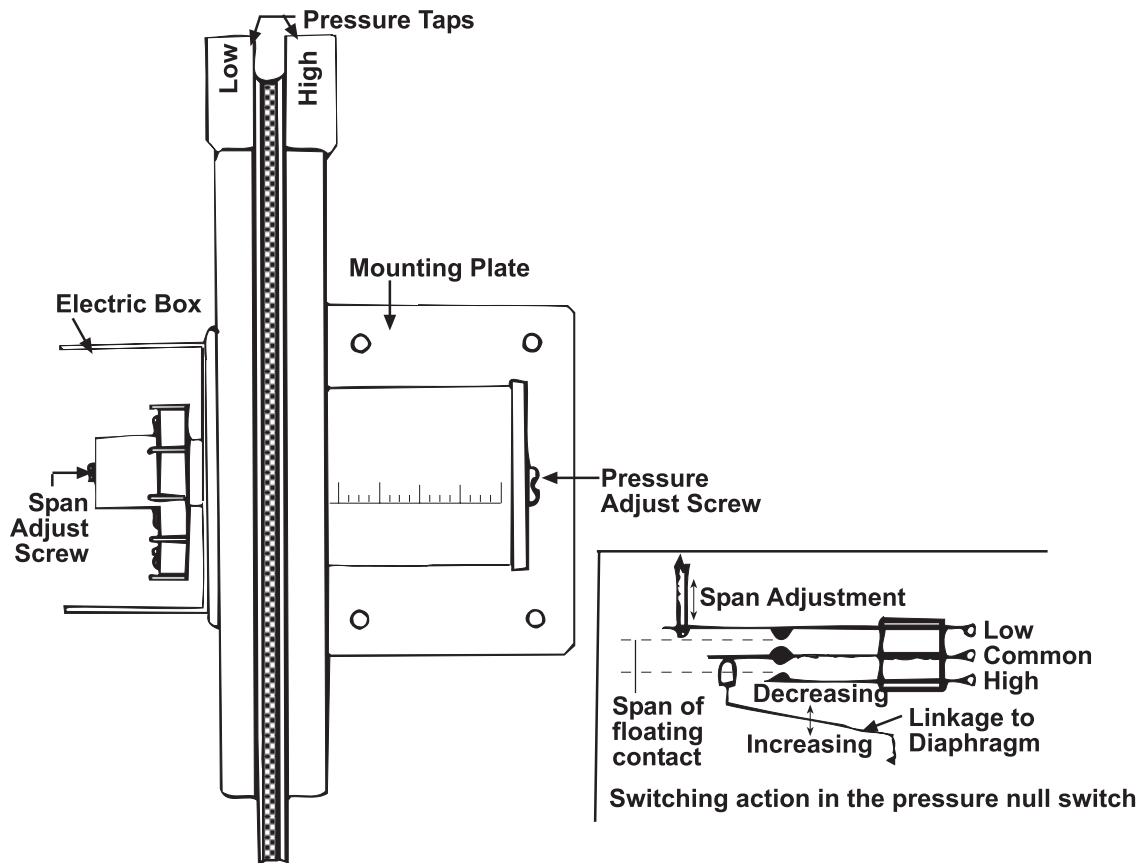


Figure 45. Pressure Null Switch Adjustment

## Measure and Adjust Manifold (Outlet) Gas Pressure

Measuring manifold gas pressure cannot be done until the heater is in operation (refer to [OPERATION](#) section).

- **For natural gas:** When the heater leaves the factory, the combination valve is set so that the outlet gas pressure of a single-stage valve or high fire of a two-stage valve is regulated to 3.5 IN WC. Low fire on a two-stage valve is set to 1.8 IN WC. Inlet supply pressure to the valve must be a minimum of 5 IN WC or as noted on the rating plate and a maximum of 14 IN WC.

**NOTE: Always check the rating plate for minimum gas supply pressure.**

- **Minimum natural gas supply pressure:** Requirements vary based on size of burner and the gas control option. Most units require a minimum of 5 IN WC natural gas as stated above, but sizes 400, 700, 800, 1050, and 1200 with electronic modulation require a minimum of 6 IN WC natural gas supply pressure.
- **For propane gas:** When the heater leaves the factory, the combination valve is set so that the outlet gas pressure of a single-stage valve or high fire of a two-stage valve is 10 IN WC. Low fire on a two-stage valve is set to 5 IN WC. Inlet pressure to the valve must be a minimum of 11 IN WC and a maximum of 14 IN WC.

## ADJUSTMENTS—CONTINUED

### Measure and Adjust Manifold (Outlet) Gas Pressure—Continued

#### **⚠ WARNING ⚠**

- Manifold gas pressure must never exceed 3.5 IN WC for natural gas or 10 IN WC for propane gas.
- Before attempting to measure or adjust manifold gas pressure, the inlet (supply) pressure must be 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 future time.

**NOTE: A manometer (fluid-filled gauge) is recommended rather than a spring-type gauge due to the difficulty of maintaining calibration of a spring-type gauge.**

1. With the manual valve (on the combination valve) positioned to prevent flow to the main burners, connect a manometer to the 1/8-inch pipe outlet pressure tap in the valve.
2. Open the valve and operate the heater. Measure the gas pressure to the manifold. To measure the low-stage pressure on units equipped with a two-stage valve, disconnect the wire from the HI terminal on the valve. Be sure to reconnect the wire.

#### **⚠ CAUTION ⚠**

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

3. Normally, adjustments to the factory-preset regulator should not be necessary. If adjustment is necessary, set pressure to correct settings by turning the regulator screw IN (clockwise) to increase pressure or OUT (counterclockwise) to decrease pressure. Consult the valve manufacturer's literature provided with the furnace for more detailed information.

#### **High Elevation (>2,000 Feet/609 Meters) Installations**

##### **NOTES:**

- High elevation (>2,000 feet/609 meters) application with this unit depends on the installation elevation and the heating value of the gas. At high elevations, the heating value of natural gas is always lower than the heating value at sea level.
- Deration is necessary to compensate for low atmospheric pressure at high elevations. Generally this will require obtaining the gas heating value from the local gas utility and replacing the burner orifices.

For high elevation (>2,000 feet/609 meters) installations that require orifice replacement, replace the burner orifices as follows:

1. Determine model number and rated input (BTUh) from unit's rating plate.
2. Determine appropriate orifice replacement (refer to [Table 31](#)) for installation elevation.
3. Unthread existing gas orifices from gas manifold.

#### **⚠ DANGER ⚠**

- Do not use Teflon tape or pipe joint compound on the orifice threads. The hole in the orifice may become blocked and may cause fire, explosion, property damage, carbon monoxide poisoning, personal injury, or death.
- Use only using factory-supplied orifices. Do not attempt to drill out orifices in the field. Improperly drilled orifices may cause fire, explosion, carbon monoxide poisoning, personal injury, or death.

- Thread replacement gas orifices into gas manifold. To prevent cross-threading, hand-tighten orifices into gas manifold until snug and then tighten one-half to one turn using wrench.

**⚠ DANGER ⚠**

**DO NOT use an open flame to check for gas leaks.**

- Check all connections for gas leaks using commercial leak-detecting fluid or rich soap and water solution. Leaks are indicated by presence of bubbles. If leak is detected, tighten connection. If leak cannot be stopped by tightening connection, replace part(s).

**Table 31. Burner Orifices**

Installation Elevation (Feet (Meters))	Installation Location	Unit Size	Natural Gas		Propane	
			Orifice Size	PN	Orifice Size	PN
0–2000 (0–610)	US	400, 600, 700, 800, 1050, 1200	#42	84437	1.45 mm	61652
		500	#44	11833	#55	11830
2001–3000 (611–915)	US	400, 600, 700, 800, 1050, 1200	#42	84437	#54	11834
		500	#45	38678	#55	11830
2001–4500 (611–1373)	Canada	400, 600, 700, 800, 1050, 1200	#43	11828	#54	11834
		500	#45	38678	#55	11830
3001–4000 (916–1220)	US	400, 600, 700, 800, 1050, 1200	#43	11828	#54	11834
		500	#45	38678	#55	11830
4001–5000 (1221–1525)	US	400, 600, 700, 800, 1050, 1200	#43	11828	#54	11834
		500	#45	38678	#55	11830
5001–6000 (1526–1830)	US	400, 600, 700, 800, 1050, 1200	#43	11828	1.35 mm	97360
		500	#46	16590	#56	39658
6001–7000 (1831–2135)	US	400, 600, 700, 800, 1050, 1200	#44	11833	1.35 mm	97360
		500	#47	84853	#56	39658
7001–8000 (2136–2440)	US	400, 600, 700, 800, 1050, 1200	#44	11833	#55	11830
		500	#47	84853	#56	39658
8001–9000 (2441–2745)	US	400, 600, 700, 800, 1050, 1200	#45	38678	#55	11830
		500	#48	40414	#56	39658
9001–10,000 (2746–3045)	US	400, 600, 700, 800	#46	16590	#55	11830
		500	#48	40414	#56	39658
		1050, 1200	#45	38678	#55	11830

**Conversion to LP (Propane)**

**⚠ DANGER ⚠**

**Conversion to LP (propane) gas must be performed by qualified service personnel using a factory-supplied conversion kit. Failure to use the proper conversion kit can cause fire, explosion, property damage, carbon monoxide poisoning, personal injury, or death.**

If LP (propane) conversion is required, convert the unit in accordance with form **OPT-GC** listed in **Table 1**. When conversion is complete, verify that the input rate is correct.

**Dirty Filter Switch Adjustment**

After the unit is started but before continuous operation, the dirty filter switch must be set as follows:

- With clean filters in place, blower doors closed, and blower operating, decrease pressure setting by adjusting setscrew on switch (see **Figure 46**) clockwise until indicator light is energized or setscrew is bottomed out.
- At that point, adjust setscrew three full turns counterclockwise or until setscrew is top-ended.
- At that setpoint, indicator light will be activated at approximately 50% filter blockage.

## ADJUSTMENTS—CONTINUED

### Dirty Filter Switch Adjustment—Continued

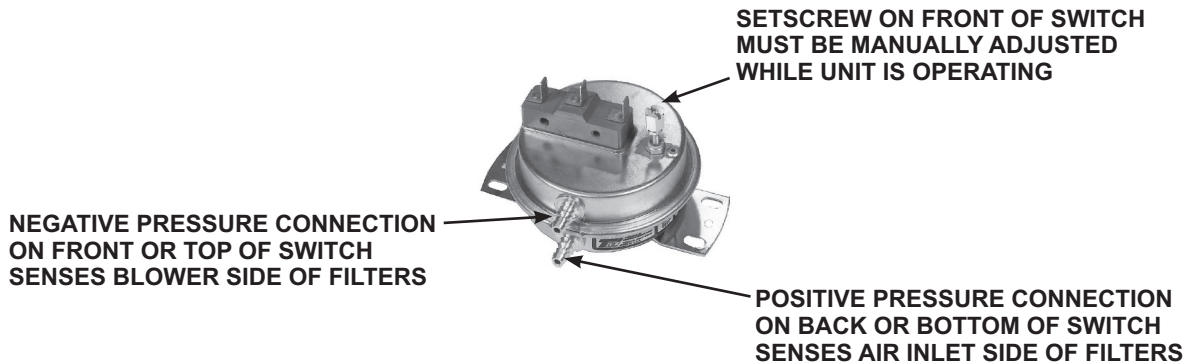


Figure 46. Dirty Filter Switch

### Burner Air Shutter Adjustment

**⚠ DANGER ⚠**

Failure to adjust air shutters according to directions could cause property damage, personal injury, and/or death.

#### NOTES:

- A limited amount of yellow-tipping is permissible for liquefied petroleum gases. Natural gas should not display any yellow-tipping.
- When making the adjustment, close the air shutters no more than is necessary to eliminate the problem condition.
- Air shutters are required on propane gas units but are optional on natural gas units. A slotted burner air adjustment screw on the end manifold bracket (see [Figure 47](#)) moves the air shutters and adjusts all burners simultaneously. Turn the adjustment screw clockwise to open the air shutter or counterclockwise to close the air shutter.
- After the furnace has been in operation for 15 minutes, close the air shutter until the flame turns yellow. Open the shutter until yellow disappears.

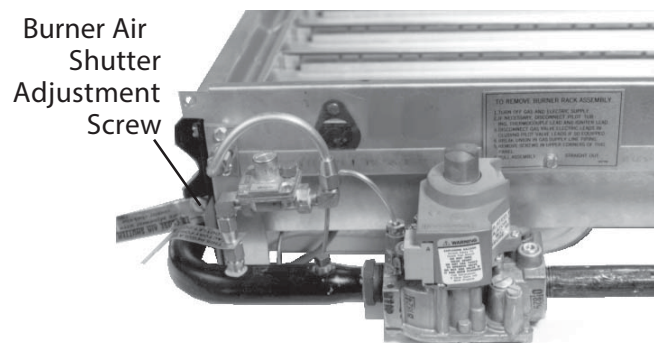


Figure 47. Burner Air Shutter Adjustment Screw

## Damper Linkage Adjustment

When units are equipped with dampers, the dampers are closed during shipment. When there are both return air and outside air dampers, the return damper linkage (see [Figure 48](#)) must be adjusted prior to use as follows:

1. Loosen setscrew on return air damper rod at damper arm.
2. Manually open return air dampers. While dampers are opening, damper rod and arm will automatically move to their correct positions.
3. Tighten setscrew.

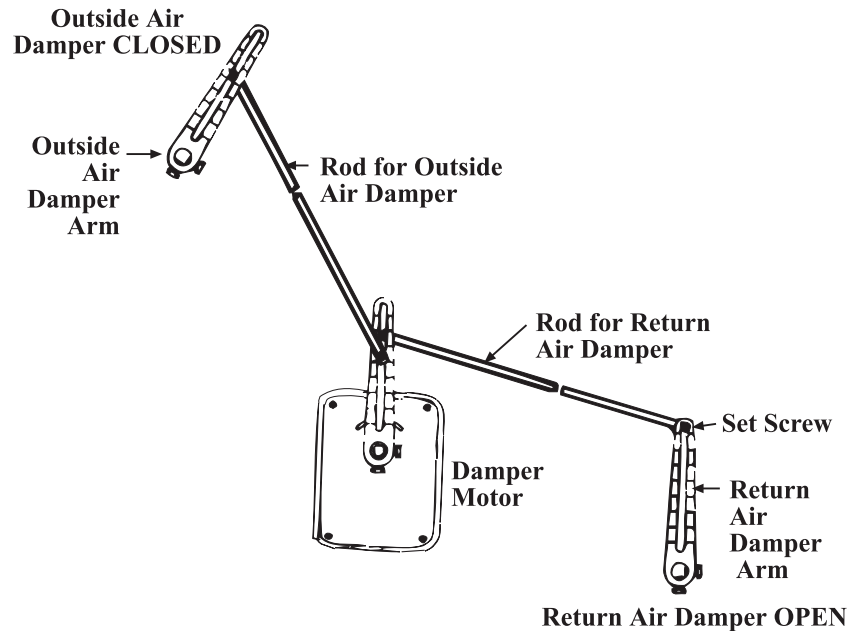


Figure 48. Damper Linkage

## MAINTENANCE

### ⚠ WARNING ⚠

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

### ⚠ CAUTION ⚠

When cleaning, wearing eye protection is recommended.

**NOTE: Use only factory-authorized replacement parts.**

This unit will operate with a minimum of maintenance. To ensure long life and satisfactory performance, a furnace that is operating under normal conditions should be inspected every 4 months. If the furnace is operating in an area where an unusual amount of dust, soot, or other impurities are present in the air, more frequent inspection is recommended.

## MAINTENANCE—CONTINUED

### 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 filters and clean or replace as necessary.
- Inspect blower and belt—check belt for tension, wear, and alignment (adjust or replace as needed) and clean dirt from blower and motor.
- Check gas valve to ensure that gas flow is being shut off completely.
- Clean heat exchanger both internally and externally.
- Check pilot burner and main burners for scale, dust, or lint accumulation and clean as necessary.
- Clean all dirt and grease from primary and secondary combustion air openings.
- Check flue products outlet and clean as necessary.
- Check vent cap in optional extended vent system and replace any parts that do not appear sound.
- Check vent/combustion air system, inspect all joints, and replace any parts that do not appear sound.
- Check main burner ports, carryover assemblies, and orifices for cleanliness.
- Check wiring for any damaged wire—replace damaged wiring (refer to **Electrical Connections** section for wiring requirements)

### Maintenance Procedures

#### Combination Gas Valve Maintenance

### ⚠ WARNING ⚠

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

Remove external dirt accumulation and check wiring connections. The combination gas valve must be checked annually as follows to ensure that the valve is completely shutting off gas flow.

1. Locate 1/8-inch FPT INLET pressure tap on combination gas valve (see **Figure 49**).

**NOTE: A manometer (fluid-filled gauge) with an inches water column scale is recommended.**

2. With field-installed manual valve closed to prevent flow to gas valve, connect manometer to 1/8-inch FPT INLET pressure tap (see **Figure 49**).

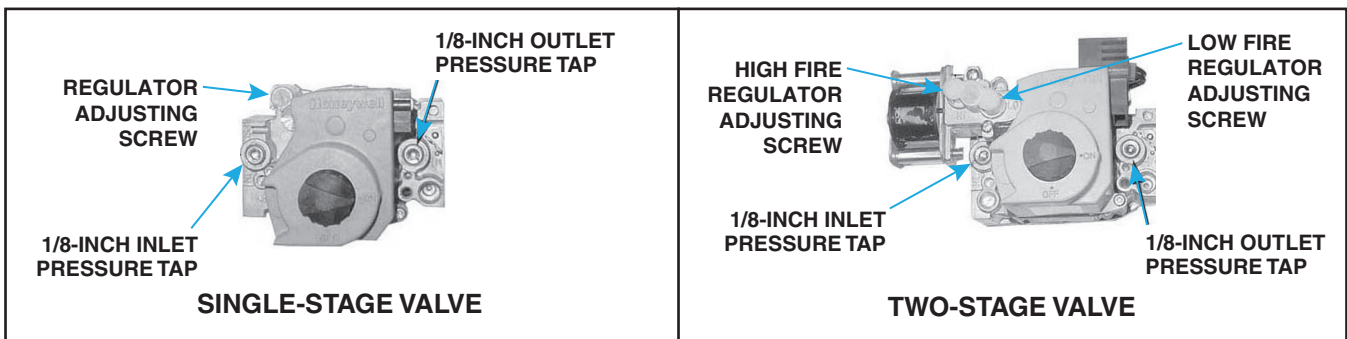


Figure 49. Combination Gas Valve Test Connections

3. With field-installed manual valve closed, turn up [thermostat](#) to fire unit and to allow unit to go through one trial for ignition.
4. Reset [thermostat](#) to shut OFF unit and observe manometer for 2 to 3 minutes for indication of gas pressure. No pressure should be indicated on manometer. If manometer indicates gas pressure, field-installed manual gas valve must be replaced or repaired before combination gas valve can be checked.
5. If manometer does not indicate gas pressure, slowly open field-installed manual gas valve. After manometer indicates that gas pressure has reached equilibrium, close manual shutoff valve.

---

**NOTE: Refer to [Gas Supply Pressure](#) section for operational pressure settings and instructions for checking pressure settings.**

---

6. Observe gas pressure on manometer. There should be no loss of gas pressure. If manometer indicates loss of gas pressure, replace combination gas valve before placing heater in operation.

### ***Burner Rack Maintenance***

Remove, disassemble, clean, reassemble, and re-install burner rack as follows:

1. Remove burner rack:
  - a. Turn OFF gas and electric supply.
  - b. Remove control access side panel.
  - c. Disconnect any pilot lines and flame sensor leads.
  - d. Mark and disconnect electric valve leads.
  - e. Uncouple union in gas supply.
  - f. Remove sheet metal screws in top corners of burner rack assembly.
  - g. Pull drawer-type burner rack out of furnace.
2. Disassemble burner rack:

---

**NOTE: Natural gas burner racks manufactured *before* 1997 may have a lighter tube carryover system. Break the lighter tube connection at the orifice and remove the supply tubing, the drip shield, and the lighter tube.**

---

- a. For natural gas burner rack, remove flash carryover system from manifold end of burner rack.
  - b. For propane gas burner rack:
    - (1) Break lighter tube connection at regulator and remove lighter tube orifice supply tubing.
    - (2) Remove retaining screws in drip shield and remove shield.
    - (3) Remove retaining screws and slide out lighter tube.
  - c. Pull main burners horizontally away from injection opening and lift out.
  - d. Remove manifold bracket screws and remove manifold.
  - e. Remove burner orifices.
  - f. Remove screws and lift out pilot burner.
3. Clean burner rack in accordance with instructions in [Cleaning Pilot and Burners](#) section.
  4. Replace burner orifices (refer to [Table 31](#)) as necessary.
  5. Re-assemble and re-install burner rack by reversing above steps, being careful not to create any unsafe conditions.

## MAINTENANCE—CONTINUED

### Maintenance Procedures—Continued

#### Cleaning Pilot and Burners

### ⚠ WARNING ⚠

To prevent injury when cleaning pilot and burners, wearing eye protection is recommended.

### ⚠ CAUTION ⚠

To prevent damage to pilot orifice, do not ream the orifice.

If the pilot flame appears short and/or yellow, check the pilot orifice for blockage caused by lint or dust accumulation.

1. Remove the pilot orifice and clean it using compressed air.
2. Check and clean the aeration slot in the pilot burner.
3. Clean the metal sensing probe and the pilot hood with an emery cloth and wipe off the ceramic insulator.
4. Check the spark gap (see [Figure 50](#)), which should be maintained to 7/64 inch for RPBL models or 0.100 inch for SSCBL models.
5. After the pilot is cleaned, blow away any dirt using compressed air.
6. Clean the main burners and burner orifices using compressed air.

### ⚠ CAUTION ⚠

When cleaning burner ports, do not use anything that might change the port size.

7. Use an air nozzle to blow out scale and dust accumulation from the burner ports. Alternate blowing compressed air through the burner ports and then through the venturi. Use a fine wire to dislodge any stubborn particles from the burner ports.
8. Clean the burner rack carryover systems using compressed air.

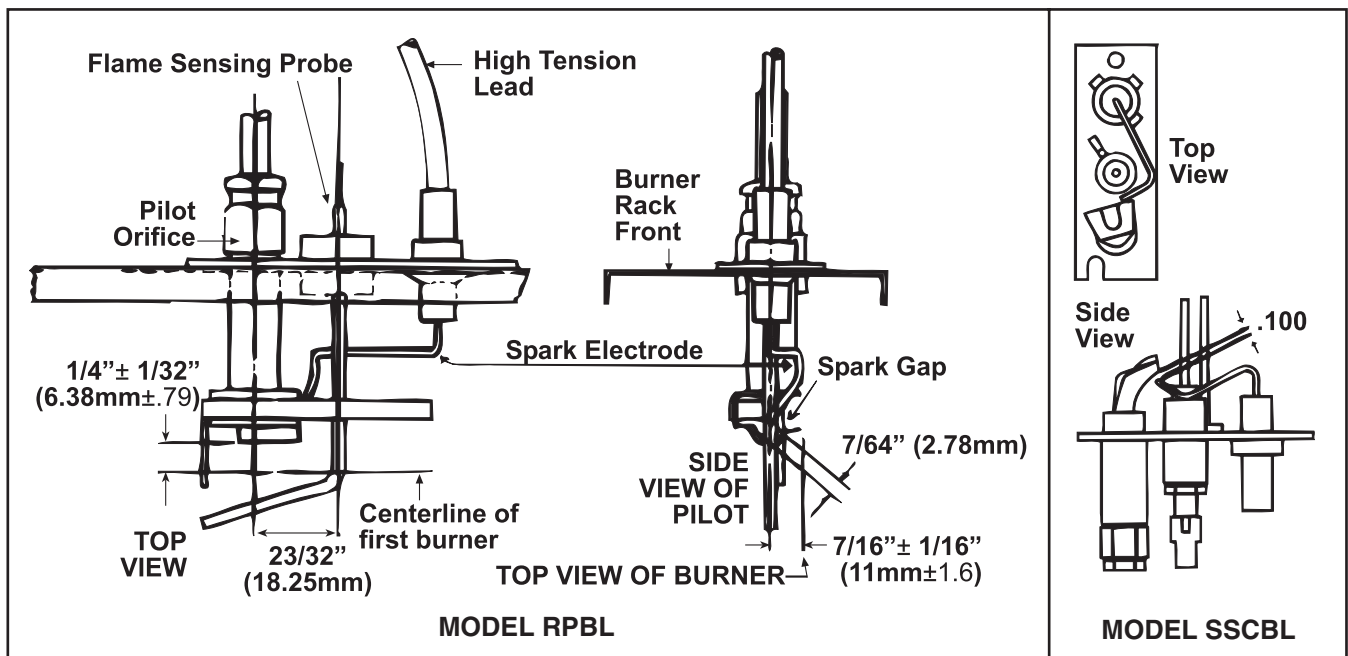


Figure 50. Pilot Assembly Spark Gap

**⚠ WARNING ⚠**

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

**NOTE: When checking for spark with the pilot burner assembly removed from the burner rack, the pilot assembly must be grounded to the heater for proper spark.**

1. If no spark occurs, check the following:
  - a. Using microammeter, measure voltage between terminals TH and 7 on ignition controller. Voltage should be at least 20V and no higher than 32V. Refer to **TROUBLESHOOTING** section if no voltage is observed.
  - b. Check for short to ground in high tension lead and/or ceramic insulator.
  - c. Verify that pilot spark gap (see **Figure 50**) is approximately 7/64 inch for RPBL models or 0.100 inch for SSCBL models.
  - d. If the above conditions are normal and no spark occurs, replace the ignition controller.

**NOTE: If replacing an earlier model of ignition controller (see **Figure 51**), order a replacement kit (PN **257472** for a unit with recycling gas control option AH2 or PN **257473** for a unit with gas control with lockout option AH3). Option codes are listed on the unit wiring diagram.**



RECYCLING IGNITION CONTROLLER FOR GAS CONTROL OPTION AH2, UTEC MODEL 1003-638A (PN **257009**): REPLACE WITH REPLACEMENT KIT (PN **257472**)



IGNITION CONTROLLER WITH LOCKOUT FOR GAS CONTROL OPTION AH3, UTEC MODEL 1003-514 (PN **257010**): REPLACE WITH REPLACEMENT KIT (PN **257473**)

**Figure 51. Obsolete Ignition Controllers**

2. If the main gas valve fails to open with a normal full-size pilot flame established, check the following:
  - a. If voltage between black and brown leads on main gas valve is 20–32 VAC and there is no main gas flow with built-in manual valve in FULL OPEN position, main valve is defective.
  - b. If there is no voltage between black and brown leads on main gas valve, check for disconnected or shorted flame sensor lead or flame sensor probe.
3. If the above conditions are normal and main gas flow is still off, the ignition controller is probably defective. Do not attempt to service the ignition controller as it does not contain any replaceable components.

## MAINTENANCE—CONTINUED

### Maintenance Procedures—Continued

#### *Blower Bearing Lubrication*

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### ⚠ CAUTION ⚠

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**If the blower is unused for more than 3 months, bearings with a grease fitting should be purged with new grease prior to startup.**

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**NOTE: If unusual environmental conditions exist—temperatures <32°F or >200°F, moisture, or contaminants—or if unit is in continuous operation, more frequent service is required.**

---

The blower bearings on systems with a <10-HP motor (standard blower) are permanently-lubricated cartridge ball bearings that do not require greasing. The blower bearings on systems equipped with a 10- to 20-HP motor are pillow block ball bearings that are equipped with a grease fitting. These bearings should be lubricated twice a year with a high-temperature, moisture-resistant grease (type NLGI-1 or -2 standard grease is recommended). Be sure to clean the grease fitting before adding grease. Add grease with a handgun until a slight bead of grease forms at the seal. Be careful not to unseat the seal by over-lubricating.

#### *Venter Motor Maintenance*

Power venter motors are permanently lubricated. No oiling is required.

#### *Cooling Coil Maintenance*

The cooling coil cabinet is designed with easily-removable panels on both sides of the cabinet to provide access for inspection and cleaning. Inspect the coil during routine maintenance and whenever the filters are changed. Check the cooling coil for build up of debris and clean as required.

#### *Heat Exchanger Cleaning*

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**NOTE: For cleaning the inner surfaces of the heat exchanger, an air hose, a long (18- to 24-inch) stiff brush of 1/2-inch diameter or heavy wire with steel wool securely attached, a flashlight, and a mirror are needed.**

---

1. Clean heat exchanger inner surfaces (combustion gas side):
  - a. Remove burner rack assembly in accordance with [Burner Rack Maintenance](#) section.
  - b. Clean inner surfaces using furnace brush or piece of heavy wire to which piece of steel wool is attached. Scrub tube walls to remove any accumulated dust, rust, and/or soot.
  - c. Install burner rack assembly in accordance with [Burner Rack Maintenance](#) section.
2. For unit size 400 only, clean heat exchanger outer surfaces (circulating air side):
  - a. Gain access by removing inspection panels in ductwork or remove ductwork.
  - b. For standard (not high CFM) furnaces, remove baffle screws (see [Figure 52](#)) and lift each airflow baffle slightly and slide forward. Remove all baffles from heat exchanger.
  - c. Remove accumulated dust and grease deposits from heat exchanger tubes and baffles using brush and/or air hose.
  - d. Reinstall airflow baffles removed in step 2b and secure using baffle screws.
  - e. Secure ductwork as necessary.
3. Check furnace for proper operation.

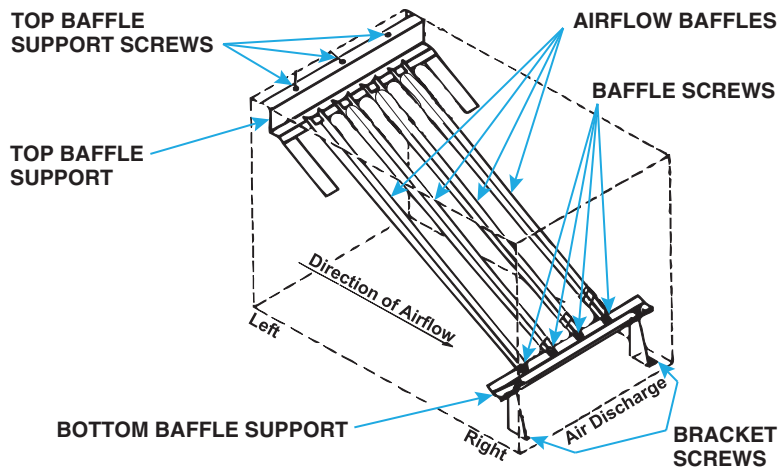


Figure 52. Airflow Baffles

## TROUBLESHOOTING

**NOTE: If the furnace is equipped with electronic modulation option AG39, AG40, AG41, or AG42, see Figure 40 for additional troubleshooting guidelines.**

Table 32. General Troubleshooting

Symptom	Probable Cause	Remedy
A. Venter motor will not start	1. No power to furnace	Turn ON power and check supply fuses or circuit breaker
	2. No 24V power to venter relay	Turn up <a href="#">thermostat</a> and check control transformer output Check for loose or improper wire connections
	3. Defective venter relay	Replace defective part
	4. Defective motor or capacitor	Replace defective part
B. Pilot will not light with venter operating	1. Manual valve not open	Open manual valve
	2. Air in gas line	Bleed gas line
	3. Dirt in pilot orifice	Remove pilot orifice and clean with compressed air or solvent
	4. Gas pressure too high or too low	Adjust gas pressure (refer to <a href="#">Measure and Adjust Manifold (Outlet) Gas Pressure</a> section)
	5. Kinked pilot tubing	Replace tubing
	6. Pilot valve does not open	If 24V power is available at valve, replace valve
	7. No spark	
	a. Loose wire connections	Ensure that all wires connections are solid
	b. Transformer failure	Ensure that 24V power is available
	c. Incorrect spark gap	Maintain spark gap at 7/64 inch for RPBL models or 0.100 inch for SSCBL models
	d. Spark cable shorted to ground	Replace worn or grounded spark cable
	e. Spark electrode shorted to ground	Replace pilot if ceramic spark electrode is cracked or grounded
	f. Drafts affecting pilot	Ensure that all panels are in place and are tightly secured to prevent drafts at pilot
	g. Ignition control not grounded	Ensure that ignition control is grounded to furnace chassis
	h. Faulty ignition controller	If 24V power is available to ignition controller and all other causes have been eliminated, replace ignition control
8. Optional lockout device interrupting control circuit due to above causes	Reset lockout by interrupting control at <a href="#">thermostat</a>	
9. Faulty combustion air proving switch	Replace combustion air proving switch	

## TROUBLESHOOTING—CONTINUED

<b>Table 32. General Troubleshooting—Continued</b>		
<b>Symptom</b>	<b>Probable Cause</b>	<b>Remedy</b>
C. Pilot lights but main valve will not open	1. Manual valve not open	Open manual valve
	2. Main valve not operating	
	a. Defective valve	If 24V power is available at valve connections and valve remains closed, replace valve
	b. Loose wire connections	Check and tighten all wiring connections
	3. Ignition control does not power main valve	
	a. Loose wire connections	Check and tighten all wiring connections
	b. Flame sensor grounded, pilot lights, and spark continues	Ensure that flame sensor lead is not grounded and that insulation or ceramic is not cracked; replace as required
	c. Incorrect gas pressure	Adjust gas pressure (refer to <a href="#">Measure and Adjust Manifold (Outlet) Gas Pressure</a> section)
D. Insufficient heat with heater operating	d. Cracked ceramic at sensor	Replace sensor
	e. Faulty ignition controller	If all checks listed in <a href="#">Spark Ignition System Maintenance</a> section indicate no other cause, replace ignition controller (do not attempt to repair ignition controller, which has no field-replaceable parts)
	f. Poor microamp signal	Adjust pilot regulator
	1. Dirty filters in blower system	Clean or replace filters
	2. Incorrect manifold pressure	Check manifold pressure (refer to <a href="#">Measure and Adjust Manifold (Outlet) Gas Pressure</a> section)
	3. Limit control cycling on	Check air throughput
	4. Improper <a href="#">thermostat</a> location or adjustment	Refer to <a href="#">thermostat</a> manufacturer's instructions
	5. Belt slipping on blower	Adjust belt tension (refer to <a href="#">Checking and Adjusting Belt Tension</a> section)
E. Cold air at startup or during operation	6. Fan control improperly wired	Ensure that wiring connections are in accordance with wiring diagram
	7. Defective fan control	Replace fan control
	8. Blower set for too low temperature rise	Decrease blower speed (refer to <a href="#">Adjusting Blower Speed</a> section) or increase static pressure
	4. Blower set for too low temperature rise	Decrease blower speed (refer to <a href="#">Adjusting Blower Speed</a> section) or increase static pressure
F. Motor will not run	1. Circuit open	Check wiring and connections
	2. Inoperative fan control	Replace fan control
	3. Fan control improperly wired	Ensure that wiring connections are in accordance with wiring diagram
	4. Inoperative contactor	Replace contactor
	5. Defective motor	Replace motor
G. Motor turns ON and OFF while burner is operating	1. Fan control heater element improperly wired	Ensure that wiring connections are in accordance with wiring diagram
	2. Defective fan control	Replace fan control
	3. Motor overload device cycling	Verify motor load against motor rating plate Replace motor or overload device
	4. Three-phase motor rotating in opposite direction	Interchange two legs of supply connections
H. Motor cuts out on overload	1. Improper motor pulley adjustment	Ensure that motor pulley is properly-adjusted (refer to <a href="#">Adjusting Blower Speed</a> section)
	2. Improper static pressure on duct system	Adjust dampers in duct system
	3. Low voltage	Check power supply

## APPENDIX: FILTER PRESSURE DROPS

Filter Pressure Drops				
Unit Size (Configuration)	CFM	Filter Type		
		Disposable	Permanent	Pleated
		Pressure Drop (IN WC)		
400 (one size 400 furnace + one blower)	3300	0.02	0.03	0.03
	4000	0.03	0.05	0.06
	5000	0.04	0.08	0.10
	6000	0.06	0.12	0.14
	7000	0.08	0.16	0.19
	8000	0.10	0.21	0.25
	9000	0.13	0.26	0.31
	10,000	—	0.33	0.39
	11,000	—	0.40	0.47
	12,000	—	0.48	0.56
500 (two size 250 furnaces + one blower)  600 (two size 300 furnaces + one blower)	3700	0.04	0.04	0.06
	4000	0.05	0.06	0.08
	5000	0.08	0.10	0.12
	6000	0.12	0.14	0.17
	7000	0.16	0.20	0.23
	8000	—	0.25	0.31
	9000	—	0.31	0.40
	10,000	—	0.39	—
	11,000	—	0.46	—
	12500	—	0.60	—
700 (two size 350 furnaces + one blower)	5200	0.06	0.08	0.10
	6000	0.06	0.10	0.15
	7000	0.08	0.14	0.20
	8000	0.10	0.18	0.27
	9000	—	0.24	0.33
	10,000	—	0.30	0.41
	11,000	—	0.36	—
	12,000	—	0.42	—
800 (two size 400 furnaces + one blower)	5900	0.05	0.10	0.12
	6000	0.06	0.12	0.14
	7000	0.08	0.16	0.19
	8000	0.10	0.21	0.25
	9000	0.13	0.26	0.31
	10,000	—	0.33	0.39
	11,000	—	0.40	0.47
	12,000	—	0.48	0.56
	13,000	—	0.56	—
1050 (three size 350 furnaces + one blower)	6500	0.06	0.10	0.08
	7000	0.08	0.14	0.12
	8000	0.10	0.18	0.16
	9000	—	0.24	0.2
	10,000	—	0.30	0.24
	11,000	—	0.36	—
	12,000	—	0.42	—
	13,000	—	0.50	—
1200 (three size 400 furnaces + one blower)	7400	0.08	0.16	0.19
	8000	0.10	0.21	0.25
	9000	0.13	0.26	0.31
	10,000	—	0.33	0.39
	11,000	—	0.40	0.47
	12,000	—	0.48	0.56
13,000	—	0.56	—	

## INSTALLATION RECORD (TO BE COMPLETED BY INSTALLER)

**Installer:**

Name \_\_\_\_\_  
Company \_\_\_\_\_  
Address \_\_\_\_\_  
Phone \_\_\_\_\_

**Distributor (company from which the unit was purchased):**

Company \_\_\_\_\_  
Contact \_\_\_\_\_  
Address \_\_\_\_\_  
Phone \_\_\_\_\_

**Model** \_\_\_\_\_ **Serial No.** \_\_\_\_\_ **Date of Installation** \_\_\_\_\_

**Specific installation notes (i.e., location, amps, gas pressure, temperature, voltage, adjustments, warranty, etc.):**

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

### **BUILDING OWNER OR MAINTENANCE PERSONNEL:**

**For service or repair:**

Contact the Installer listed above.

If you need additional assistance, contact the Distributor listed above.

For more information, contact your Factory Representative.

