



## **NOTICE:**

The information contained on the following page(s) was produced prior to May 1, 2014. On that date Reznor became part of Nortek, Inc.

References to any other company affiliations are no longer valid.

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This manual refers to Reznor brand products that have been discontinued for more than 10 years. Some replacement parts may no longer be available from our suppliers. Compatible parts may be substituted.

Please contact your Reznor Representative with specific questions.



**REZNOR**

# Indoor, Separated-Combustion Units

NOTE: Model Series SC units are not certified for residential use.

**INSTALLATION FORM RZ 406 (Version B)**  
 Obsoletes Form RZ 406 (Version A)

**APPLIES TO: Models SCA, SCB, SC, HSC, SCE**

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## FOR YOUR SAFETY

**If you smell gas:**

- 1. Open windows.**
- 2. Don't touch electrical switches.**
- 3. Extinguish any open flame.**
- 4. Immediately call your gas supplier.**


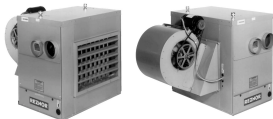



**The use and storage of gasoline or other flammable vapors and liquids in open containers in the vicinity of this appliance is hazardous.**

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

**WARNING: Gas-fired appliances are not designed for use in hazardous atmospheres containing flammable vapors or combustible dust, in atmospheres containing chlorinated or halogenated hydrocarbons, or in applications with airborne silicone substances. See Hazard Levels, Page 2.**

## GENERAL

The instructions in this manual apply to the following separated combustion products.

Model	Description
SCA 	Separated-Combustion, Fan-Type Unit Heater
SCB 	Separated-Combustion, Blower-Type Unit Heater
SC 	Separated-Combustion, Duct Furnace (Standard CFM)
HSC 	Separated-Combustion, Duct Furnace (High CFM)
SCE 	Separated-Combustion, Blower-Type Unit Heater with Blower Cabinet

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.

## General (cont'd)

Models SC, HSC, SCA, SCB, and SCE are design-certified by the Canadian Standards Association to ANSI Standards and approved to CAN/CGA Standards. All models are available for use with either natural or propane gas. The type of gas, the firing rate, and the electrical characteristics are on the unit rating plate.

These separated combustion units are designed and manufactured in accordance with the ANSI definition of separated combustion. That definition 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 or in buildings with negative pressure (up to .15" w.c.). As the definition states, all separated combustion, power-vented equipment must be equipped with both combustion air and exhaust piping to the outdoors.

## 1. Installation Codes

These units must be installed in accordance with local building codes. In the absence of local codes, in the United States, the unit must be installed in accordance with the National Fuel Gas Code (latest edition). A Canadian installation must be in accordance with the CAN/CGA B149.1 and B149.2 Installation Code for Gas Burning Appliances and Equipment. These codes are available from CSA Information Services, 1-800-463-6727. Local authorities having jurisdiction should be consulted before installation is made to verify local codes and installation procedure requirements.

### Special Installations (Aircraft Hangars/ Garages)

Installations in aircraft hangars should be in accordance with ANSI/NFPA No. 409 (latest edition), Standard for Aircraft Hangars; in public garages in accordance with ANSI/NFPA No. 88A (latest edition), Standard for Parking Structures; and for repair garages in accordance with ANSI/NFPA No. 88B (latest edition), Standard for Repair Garages. ANSI/NFPA-88 (latest edition) specifies overhead heaters must be installed at least eight feet above the floor. In Canada, installations in aircraft hangars should be in accordance with the requirements of the enforcing authorities, and in public garages in accordance with CAN/CGA B149 codes.

ANSI/NFPA 409 (latest edition) specifies a clearance of ten feet to the bottom of the heater from the highest surface of the top of the wing or engine enclosure of whatever aircraft would be the highest to be housed in the hangar, and a minimum clearance of eight feet from the floor in other sections of aircraft hangars, such as the offices, and shops which communicate with areas used for servicing or storage. The heaters must be located so as to be protected from damage by aircraft or other objects such as cranes and movable scaffolding. In addition, the heaters must be located so as to be accessible for servicing, adjustment, etc.

### All Installations

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 supplying 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 from the heater and vent to combustible construction or material in storage must conform with the National Fuel Gas Code ANSI Z223.1a (latest edition) pertaining to gas-burning devices, and such material must not attain a temperature over 160°F by continued operation of the heater.

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**WARNING: The Model SC duct furnace is not certified or approved for use in drying or process applications. If the SC duct furnace is to be used in a drying or process application, contact the factory for application guidelines and manufacturer's authorization. Without factory authorization, the warranty is void and the manufacturer disclaims any responsibility for the duct furnace and/or the application.**

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## HAZARD INTENSITY LEVELS

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**1. DANGER: Failure to comply will result in severe personal injury or death and/or property damage.**

**2. WARNING: Failure to comply could result in severe personal injury or death and/or property damage.**

**3. CAUTION: Failure to comply could result in minor personal injury and/or property damage.**

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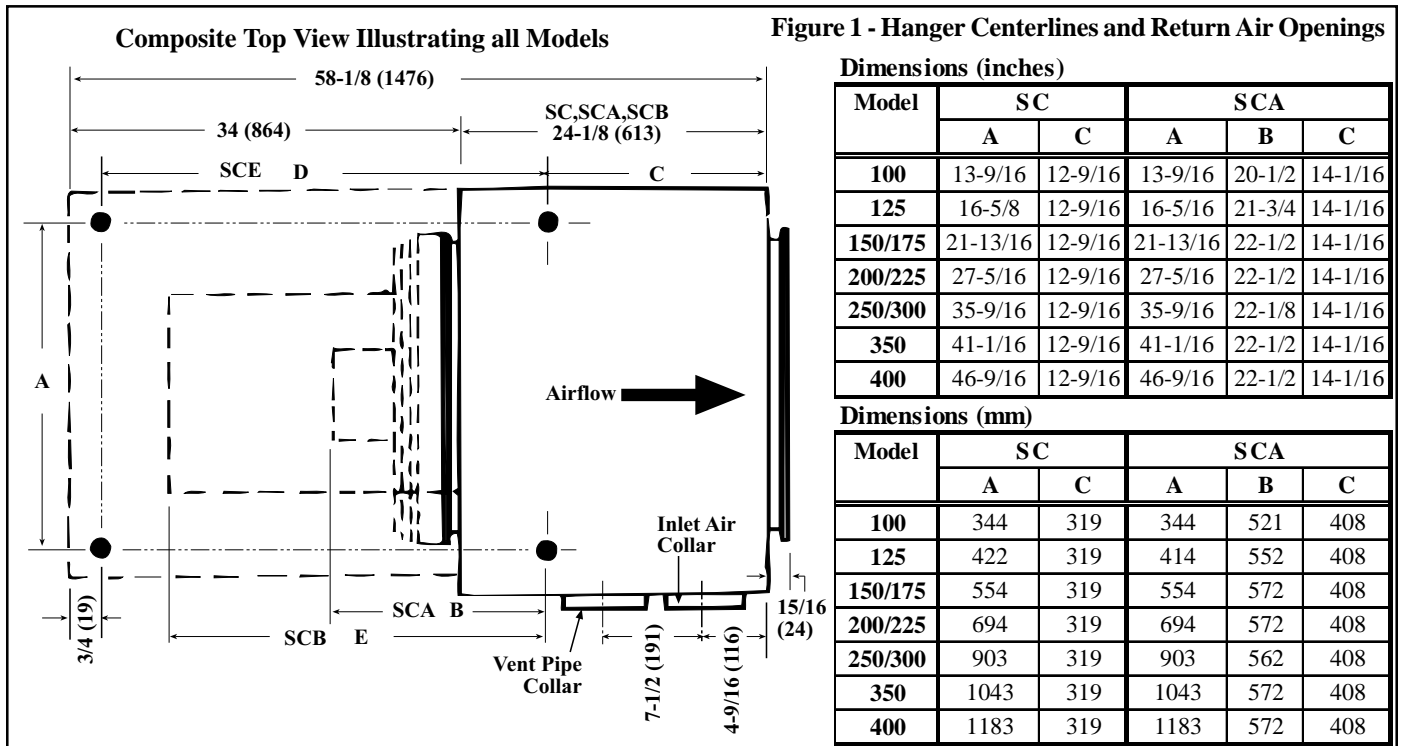
## 2. Warranty

Refer to the limited warranty information on the Warranty Card in the "Owner's Envelope".

### Warranty is void if ...

- Separated-combustion heaters 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.
  - Wiring is not in accordance with the diagram furnished with the heater.
  - Unit is installed without proper clearance to combustible materials.
  - SCA fan-type heater is connected to a duct system.
  - SC/HSC duct furnace air throughput is not adjusted to within the range specified on the rating plate.
  - SC/HSC duct furnace is installed in a process or drying application without factory authorization. (Any use in a process or drying application voids agency certification.)
-

### 3. Dimensions



**Dimensions (inches)**

Model		125	150/175	200/225	250/300	350	400
SCB	A	16-5/8	21-13/16	27-5/16	35-9/16	41-1/16	46-9/16
	C	17-1/16	18-3/8	17-1/16	17-1/16	18-3/8	17-1/16
	D	40-3/8	39	40-3/8	40-3/8	39	40-3/8
	E	26-5/8	28-7/8	28-5/8	26-5/8	28-7/8	28-5/8
SCE*	H	27-3/4	27-3/4	30-3/4	30-3/4	30-3/4	30-3/4
	W	17-3/4	23-1/4	28-3/4	37	42-1/2	48
SCE**	H	19-1/2	19-1/2	19-1/2	19-1/2	19-1/2	19-1/2
	W	17-3/8	22-7/8	28-3/8	36-5/8	42-1/8	47-5/8

**Dimensions (mm)**

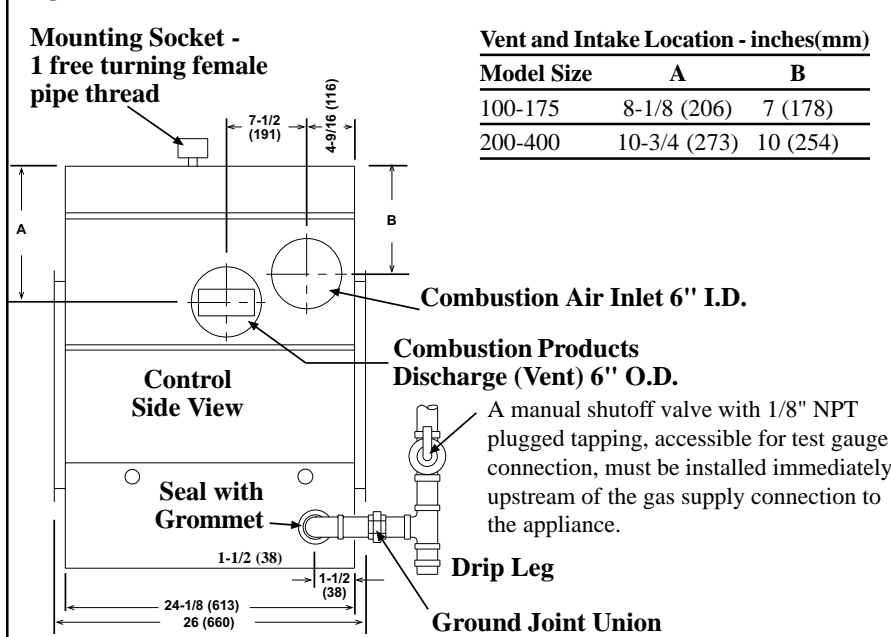
Model		125	150/175	200/225	250/300	350	400
SCB	A	422	554	694	903	1043	1183
	C	433	467	433	433	467	433
	D	1026	991	1026	1026	991	1026
	E	676	733	733	676	733	733
SCE*	H	705	705	781	781	781	781
	W	451	591	730	940	1080	1219
SCE**	H	495	495	495	495	495	495
	W	441	581	721	930	1070	1210

\* Dimensions for the standard horizontal return air connection for Model SCE.

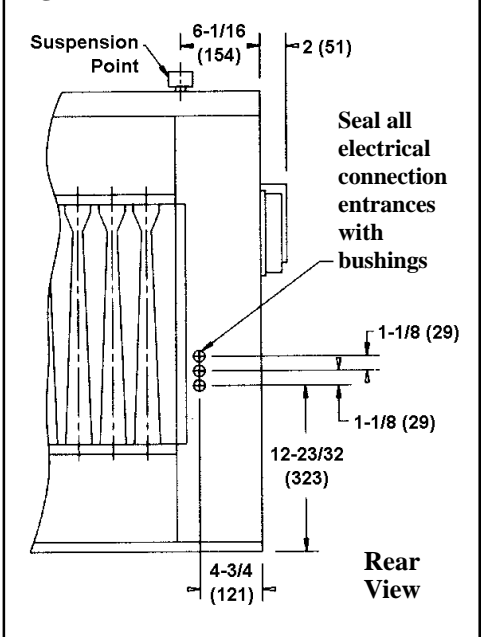
\*\* Dimensions for the optional horizontal return air connection with duct flanges and damper opening for Model SCE.

NOTE: For outlet duct dimensions, see Figure 8, Paragraph 8.

**Figure 2 - Gas Connection and Vent and Combustion Air Locations**



**Figure 3 - Electrical Connections**



## 4. Uncrating

The furnace is shipped completely assembled. Immediately upon uncrating, check the gas specifications and electrical characteristics of the unit to be sure that they agree with the gas and electric supply at the installation site.

Check the unit for any damage that may have been incurred during shipment. If damage is found, file a claim with the transporting agency. This unit was operated and inspected at the factory immediately prior to crating and was in operating condition at that time.

The bottom corners are fastened to the crate with angle clips. Remove the lag screws from the shipping clips. Remove the clips and return the bolts to the heater leg to support the corner leg and heater bottom. **Putting the bolts back in the heater is required for proper operation.**

To protect the unit during shipping, blower models have special supports that must be removed before installation. Follow these instructions to remove:

**Blower Support Legs** - Remove the blower support legs and screws.

**Motor Shipping Block** - Remove the wooden block located under the motor bracket. Find the two rubber pads shipped in the instruction envelope. Place these pads on the ends of the motor bracket bolts.

**Motor Shipping Plate** - Units that are equipped with motors of 1-1/2 HP or less have a metal shipping plate attached between the motor and the blower housing. The shipping plate must be removed and the plate and screws discarded. On units factory equipped with an optional belt guard, the belt guard must be removed to reach the shipping plate.

### Concentric Adapter Kit - Required for All Installations

The concentric adapter assembly and venting/combustion air kit (Option CC2 or CC6) is **required** on all separated combustion models. It is shipped in a separate carton. Be sure that the concentric adapter carton is at the installation site. (See parts list in Paragraph 13.)

### Options

Some gas control options have parts either shipped loose with the heater or shipped separately. If your unit is equipped with any of the following gas control options, be sure these parts are available at the job site.

<b>Heating Gas Control Option</b>	<b>Option AG7</b> Thermostat P/N 48033
<b>Makeup Air Gas Control Options</b>	<b>Option AG3</b> Control Switch, P/N 29054
<b>(If an optional remote console is ordered, the control switch and, if requested, the temperature selector are mounted on the console.)</b>	<b>Option AG9</b> Remote Temperature Selector, P/N 48042 Control Switch, P/N 29054
	<b>Option AG15</b> Remote Temperature Selector, P/N 115848 Stage Adder Module, P/N 115849 Control Switch, P/N 29054
	<b>Option AG16</b> Remote Temperature Selector, P/N 115848 Stage Adder Module, P/N 115849 Remote Display Module, P/N 115852 Control Switch, P/N 29054
	<b>Option AG39</b> Remote Temperature Selector, P/N 174849

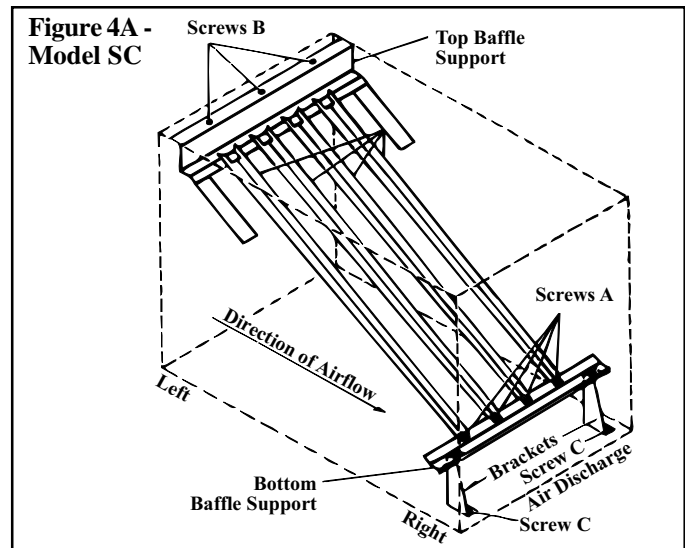
Before beginning installation, be sure that all other shipped-separate options ordered are available at the site, also. Depending on the model of heater, shipped-separate options could include a downturn nozzle, a KVA transformer, a shutoff valve, a condensate drain, a thermostat, a remote console, a manual fan switch, or high temperature vent sealing tape.

## 5. Instructions for Reversing Air Flow (Changing Directional Air Baffles) - Applies only to Duct Furnace Models SC and HSC

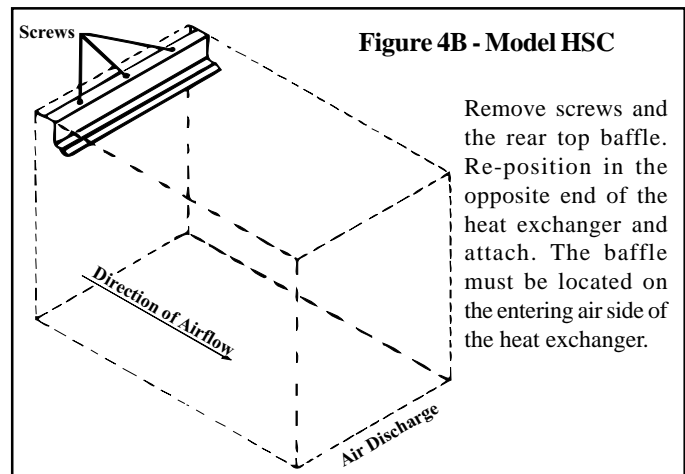
All furnaces are equipped with directional air baffles in the heat exchanger area. Facing the control compartment of the furnace, the standard direction of air flow is from left to right. If the installation requires air flow from right to left (when facing the control compartment), the position of the directional air baffles may be reversed. Refer to Figure 4A for an SC model or Figure 4B for an HSC Model and follow the instructions to reverse the direction of the airflow through the furnace.

### Instructions for Model SC (Figure 4A)

1. Remove screws "A". Lift each baffle slightly and slide forward, removing each completely from the heat exchanger.
2. Remove screws "B" and the rear top baffle support assembly. Re-position the assembly on the opposite end of the heat exchanger and attach.
3. Remove screws "C" and the assembled bottom baffle support and brackets. Plug the holes in the heat exchanger bottom by re-inserting the screws in the holes. Position the assembly on the opposite end of the heat exchanger and attach using field-supplied sheetmetal screws.
4. Re-install all of the individual baffles by reversing Step 1.



### Instructions for Models HSC (Figure 4B)



Reversal of the directional air baffles is complete, and the furnace must now be installed with the air flowing from right to left when facing the control compartment.

## 6. Clearances and Location

For safety and convenience, provide clearances as shown in the following table. Minimum clearances are also listed on the heater rating plate.

### Minimum Clearances - inches(mm)

Top	Sides		Bottom	
	Control Side	Side Opposite Controls	To Combustibles	To Non-Combustibles
6" (152)	6" (152) plus width of unit	6" (152)	6" (152)	0" (0)

**Unit Heater Location** - For best results, the heater should be placed with certain rules in mind. In general, a unit should be located from 8 to 12 ft (2.6 to 3.6M) above the floor. Units should always be arranged to blow toward or along exposed wall

surfaces, if possible. Where two or more units are installed in the same room, a general scheme of air circulation should be maintained.

Suspended heaters are most effective when located as close to the working zone as possible, and this fact should be kept in mind when determining the mounting heights to be used. However, avoid directing the discharged air directly on the room occupants.

Partitions, columns, counters, or other obstructions should be taken into consideration when locating the unit heater so that a minimum quantity of airflow will be deflected by such obstacles.

When units are located in the center of the space to be heated, the air should be discharged toward the exposed walls. In large areas, units should be located to discharge air along exposed walls with extra units provided to discharge air in toward the center of the area.

At those points where infiltration of cold air is excessive, such as at entrance doors and shipping doors, it is desirable to locate the unit so that it will discharge directly toward the source of cold air from a distance of 15 to 20 feet (4.5 to 6

**CAUTION: Do not locate the heater where it may be exposed to water spray, rain or dripping water.**

## 7. Suspension and Mounting

Before installing, check the supporting structure to be sure that it has sufficient load-carrying capacity to support the weight.

### Net Weight (lbs and kg)

Size		100	125	150-175	200-225	250-300	350	400
SC/ HSC	lbs	158	178	203	283	321	350	410
	kg	72	81	92	128	146	159	186
SCA	lbs	198	211	228	314	386	430	487
	kg	90	96	103	142	175	195	221
SCB	lbs	N/A	281	323	347	414	458	515
	kg	N/A	127	147	157	188	208	234
SCE	lbs	N/A	313	358	382	482	498	560
	kg	N/A	142	162	173	219	226	254

### Suspension - All Models

Model SCA and SCB unit heaters and Model SC and HSC duct furnaces have two-point suspension. Model SCE packaged furnace/blower cabinet has four-point suspension. See hanger centerline dimensions in Paragraph 3.

At each suspension point, the unit is factory-equipped with a free-turning, female, 1" NPT pipe hanger. Suspend by connecting the pipe hanger to a 1" threaded pipe. See suspension method on the left in Figure 5. As an alternative method, the factory-installed pipe hanger may be removed and the heater suspended as illustrated on the right in Figure 5.

**WARNING: Units must be supported level for proper operation. Do not place or add additional weight to the suspended unit. See Hazard Levels, page 2.**

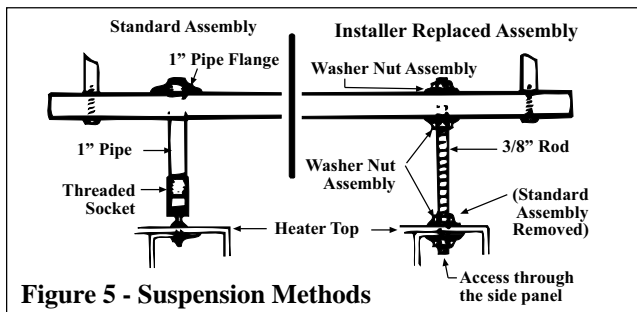


Figure 5 - Suspension Methods

### Mounting Supports (Model SC/HSC Duct Furnaces)

Most furnaces will be suspended. If the installation requires that the furnace be mounted, support feet are available to mount the heater and provide 6" (152mm) clearance. Figure 6 illustrates the support feet available from the manufacturer and an alternative field-fabricated support foot.

**WARNING: Do not support a Model SCE with four corner support legs. A Model SCE requires additional support as illustrated in Figure 7. Bottom clearance of 6" (152mm) to combustibles must be observed for all models.**

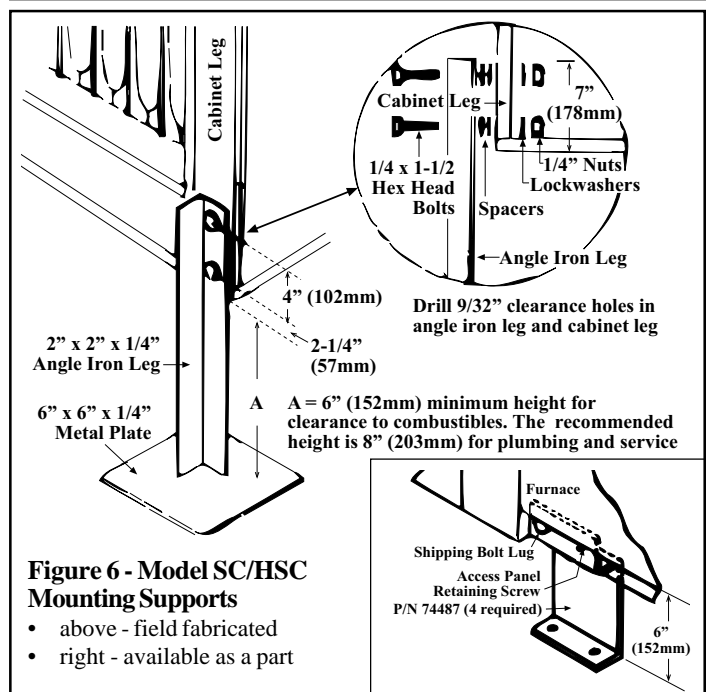


Figure 6 - Model SC/HSC Mounting Supports

- above - field fabricated
- right - available as a part

### Mounting Support (Model SCE)

Model SCE requires six support locations. See Figure 7.

Supports available from the manufacturer (P/N 74487) or field-fabricated legs as illustrated in Figure 6 may be used at the four corner support locations. Do not use this type of support at the center support locations (between the furnace and the blower section). At the center locations, a field-fabricated, angle-iron brace support must extend horizontally, jointly supporting a portion of both the furnace and the blower cabinet. All supports must be non-combustible.

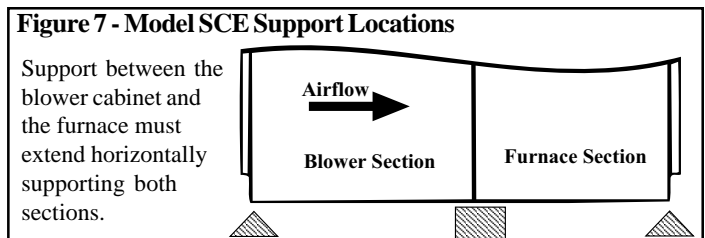


Figure 7 - Model SCE Support Locations

Support between the blower cabinet and the furnace must extend horizontally supporting both sections.

## 8. Optional Condensation Drain for Duct Furnaces (Applies to Model SC/HSC or SCE)

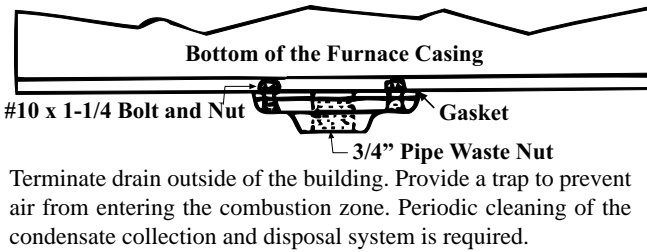
Model SC, HSC and SCE furnaces are certified for installation up-stream or downstream from a cooling coil. When installed downstream from a refrigeration system, condensation will form; and therefore, adequate provision must be made to dispose of condensate.

Periodic cleaning of the condensate collection and disposal system is required.

Install drain connection, Option CS1, on the furnace casing as illustrated in Figure 8.

NOTE: Requires a four-inch minimum clearance under the furnace if a 90° street elbow is used.

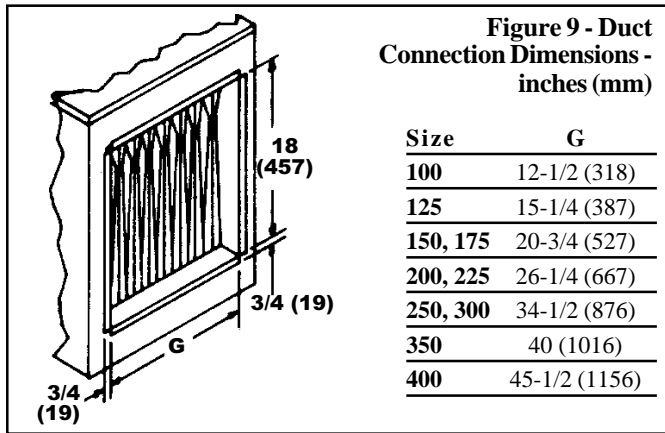
**Figure 8 - Option CS1, P/N 31765, Optional Condensate Drain Connection**



## 9. Duct Connections (Applies to Models HSC/SC, SCB, SCE)

Propeller fan type unit heater (Model SCA) is not designed or approved for installation with discharge ducts.

Models SCB and SCE are high static units and can be used with ducts. Remove factory-installed louver frame and louvers from SCB Models before adding ductwork.



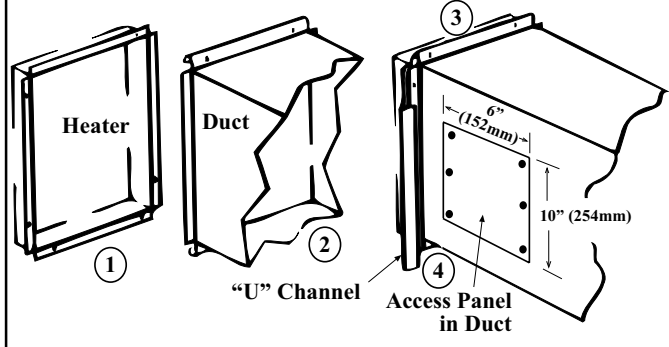
Make adjustments required to obtain a temperature rise and static pressure within the ranges specified on the heater rating plate. Blower connection and air flow requirements for Model SC/HSC duct furnaces are shown in Paragraphs 10 and 12.

### Requirements and Suggestions for Connecting and Installing Ducts

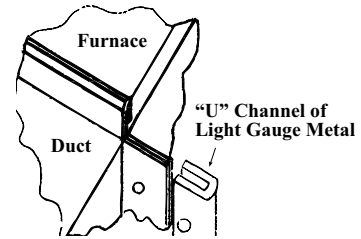
- Type of Ductwork** - The type of duct installation to be used depends in part on the type of construction of the roof (whether wood joist, steelbar joist, steel truss, pre-cast concrete) and the ceiling (whether hung, flush, etc.).
- Ductwork Material** - Rectangular duct should be constructed of not lighter than No. 26 U.S. gauge galvanized iron or No. 24 B & S gauge aluminum.
- Ductwork Structure** - All duct sections 24 inches or wider, and over 48 inches in length, should be cross broken on top and bottom

**Figure 10 - Connecting Supply Air Duct to the Furnace**

(1) Flanges on the furnace (heat exchanger) turn out as shown. (2) Shape duct connection as shown -- "U" on top and bottom; "L" on sides. (3) Slide "U" channels over furnace top and bottom flanges making connection. (4) Form "U" channels to seal sides. **Drill and lock with sheetmetal screws.**



**Figure 11 - Install "U" Channel on Sides of Duct Connection**



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 not less than 1/2" (1" is recommended) of insulation.
- Through Unheated Space** - Insulate all exposed warm air ducts passing through an unheated space with at least 1/2" (1" is recommended) 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 such information is the Air Conditioning Contractors Association, 1228 17th Street N.W., Washington, D.C. 20036. A manual covering duct sizing in detail may be purchased directly from them.

**CAUTION: An external duct system static pressure not within the limits shown on the rating plate, or improper motor pulley or belt adjustment, may overload the motor. See Hazard Levels, page 2.**

- Removable Panels** - The ducts should have removable access panels on both upstream and downstream sides of the furnace. These openings must be accessible when the furnace is in service and should be a minimum of 6" x 10" in size so smoke or reflected light may be observed inside the casing to indicate the presence of leaks in the heat exchanger. The covers for the openings must be attached in such a manner as to prevent leakage. See Figure 10.
- Horizontal Discharge Duct Length** - A minimum horizontal duct run of 24" is **recommended** before turns or branches are made in the duct system to reduce losses at the furnace outlet.
- Supply Air Duct/Furnace Horizontal Connection** - The seal between the furnace and the duct must be mechanical. Duct connection should be made with "U" type flanges on the top and bottom of the connecting duct. Slide the duct over the flanges of the heater giving an airtight fit. Provide "U" type channels for the side flanges to ensure tight joints. Use sheetmetal screws to fasten ducts and

"U" channels to the furnace flange. See Figure 11.

**CAUTION: Joints where supply air ducts attach to the furnace must be sealed securely to prevent air leakage into draffhood or burner rack area. Leakage can cause poor combustion, pilot problems, shorten heat exchanger life and cause poor performance. See Hazard levels, page 2.**

- **Return Air Duct/Furnace Connection** - All return air ducts should be attached and sealed to return air flanges to provide airtight connection.
- **Return Air Duct/Grill Size** - Make certain that return air ducting or grills have a free area equal to the return duct size connection.

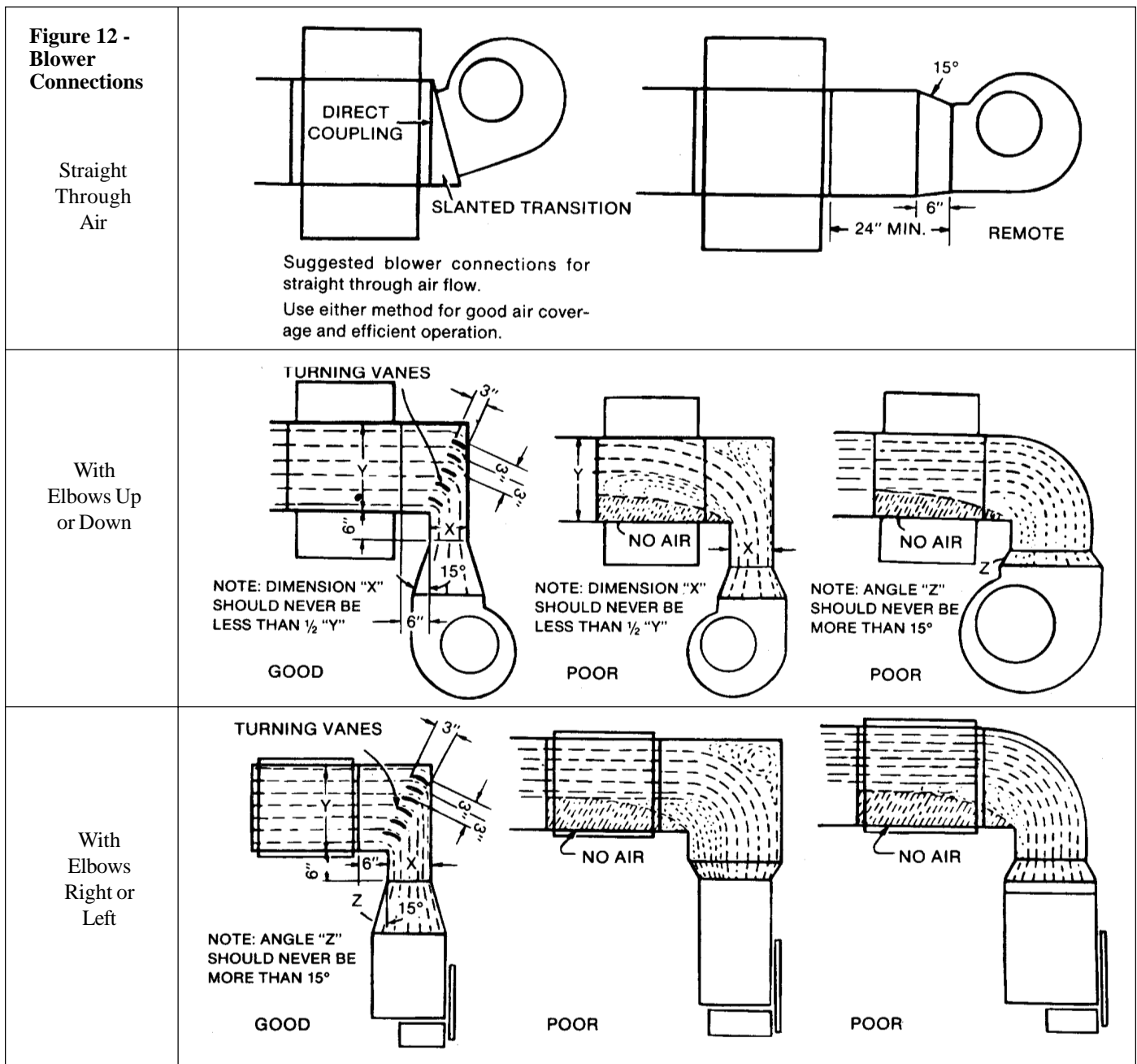
## 10. Duct Furnace Blower Connections (Applies to Model SC/HSC)

### Requirements

Proper air arrangement of blower and duct furnace with respect to angle of approach of the duct connection and the arrangement of the discharge opening of the blower are shown in Figure 12. Blowers should be bottom horizontal discharge when coupled to the duct furnace. When a top horizontal discharge blower is connected to the duct furnace, be sure that sufficient length of duct is provided to permit an even flow of air at the furnace. Or, insert baffles between the blower and the heater to assure an even flow of air across the heat exchanger.

**WARNING: The furnace must be installed on the positive pressure side of the air-circulating blower.**

**CAUTION: Abrupt angle approaches such as shown in Figure 12 can be detrimental to unit life. Be certain that ample air is directed at the base of the tube section by using turning vanes as shown. See Hazard Levels, page 2.**





# 11. Construction of a Bypass Duct - Applies to Models SC/HSC

When the CFM of air throughput is greater than desirable or permissible for the unit, a bypass duct may be constructed. Follow these instructions to determine the correct size of the bypass duct.

1) From the tables in Paragraph 12, find the pressure drop (P.D.) and the allowable CFM for the duct furnace that is being installed.

EX: Std Size SC250 @ 50°F Temperature Rise  
P.D. 36; CFM 2220

2) Subtract the allowable CFM from the actual CFM of the installation to determine how much air must be diverted through the bypass duct.

EX: Actual Blower CFM is 3000; 3000 minus allowable CFM of 2220 = 780

3) Go to the column in the bypass CFM chart that is closest to the pressure drop through the heater. Move down in that column until you find the CFM closest to the answer in Step 2).

EX: Go to P.D. column .35; move down to 830

4) Move to the left column to find out the required size of the bypass duct.

EX: Bypass Duct should be 3"

Bypass CFM									
" A " Width	Pressure Drop through the Furnace								
	.10	.15	.20	.25	.30	.35	.40	.45	.50
3"	490	530	610	700	780	830	900	960	1010
4"	630	750	870	980	1090	1160	1250	1310	1400
5"	850	1010	1190	1300	1410	1520	1640	1730	1810
6"	1050	1290	1480	1650	1800	1940	2090	2200	2320
7"	1250	1510	1760	1960	2180	2320	2500	2650	2800
8"	1490	1810	2100	2350	2560	2760	2940	3110	3290
9"	1700	2100	2400	2700	2970	3200	3400	3600	3800
10"	1920	2350	2760	3090	3650	4020	4300	4550	4800

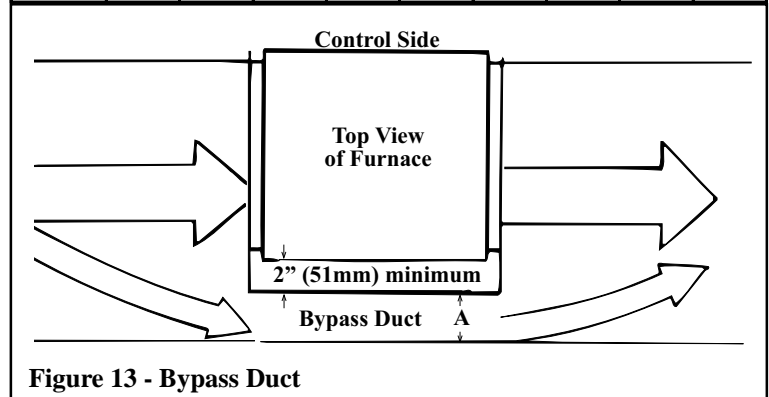


Figure 13 - Bypass Duct

# 12. Air Flow Requirements - Applies to Models SC/HSC

The duct furnace must be installed on the positive pressure side of the field supplied blower. The air throughput must be within the CFM range stated on the heater rating plate. The air distribution must be even over the entire heat exchanger. Turning vanes should be used in elbows or turns in the air inlet to ensure proper air distribution (See Paragraph 10). If it is determined that the blower CFM

is greater than allowed or desirable, see Paragraph 11 for instructions on determining the correct size of bypass duct required. To determine temperature rise, measure the inlet and outlet temperatures at points not affected by heat radiating from the heat exchanger. The following chart shows the approved temperature rise range with the required CFM and the internal pressure drop for each size. Maximum static pressure is 2" w.c.

## Model SC Series 6 (80% thermal efficient)

Size	100		125		150		175		200		225		250		300		350		400	
	CFM	P.D.	CFM	P.D.	CFM	P.D.	CFM	P.D.	CFM	P.D.	CFM	P.D.	CFM	P.D.	CFM	P.D.	CFM	P.D.	CFM	P.D.
30°F	2465	1.38	3085	1.39	3700	1.00	4320	1.49	4935	1.14	5555	1.48	6170	1.17	7400	1.61	8640	1.87	9875	1.87
40°F	1850	0.78	2310	0.78	2775	0.56	3240	0.81	3700	0.64	4165	0.83	4630	0.66	5555	0.91	6480	1.05	7400	1.05
50°F	1480	0.50	1850	0.50	2220	0.36	2590	0.52	2960	0.41	3330	0.53	3700	0.42	4440	0.58	5185	0.67	5925	0.67
55°F	1345	0.34	1680	0.41	2020	0.30	2355	0.43	2690	0.34	3030	0.44	3365	0.35	4040	0.48	4710	0.55	5385	0.55
60°F	1235	0.29	1540	0.34	1850	0.26	2160	0.36	2465	0.28	2775	0.37	3085	0.30	3700	0.40	4320	0.46	4935	0.46
70°F	1055	0.21	1320	0.25	1585	0.19	1850	0.26	2115	0.21	2380	0.27	2645	0.22	3175	0.30	3700	0.34	4230	0.34
80°F	925	0.16	1155	0.19	1385	0.14	1620	0.20	1850	0.17	2080	0.21	2315	0.20	2775	0.23	3240	0.26	3700	0.26
85°F	870	0.14	1085	0.18	1305	0.13	1525	0.18	1740	0.15	1960	0.19	2175	0.20	2610	0.22	3050	0.23	3485	0.23
90°F	820	0.12	1025	0.16	1235	0.12	1440	0.16	1645	0.13	1850	0.17	2055	0.18	2465	0.20	2880	0.21	3290	0.21

## Model HSC Series 6 (80% thermal efficient, high CFM)

Size	100		125		150		175		200		225		250		300		350		400	
	CFM	P.D.	CFM	P.D.	CFM	P.D.	CFM	P.D.	CFM	P.D.	CFM	P.D.	CFM	P.D.	CFM	P.D.	CFM	P.D.	CFM	P.D.
20°F	3700	1.08	4630	1.12	5555	0.85	6480	1.11	7405	1.02	8330	1.24	9255	0.90	11110	1.24	12960	1.24	14815	1.24
30°F	2465	0.48	3085	0.50	3700	0.38	4320	0.50	4935	0.45	5555	0.55	6170	0.40	7405	0.55	8640	0.55	9875	0.55
40°F	1850	0.27	2315	0.28	2775	0.21	3240	0.28	3700	0.25	4165	0.31	4630	0.22	5555	0.31	6480	0.31	7405	0.31
50°F	1480	0.17	1850	0.18	2220	0.14	2590	0.18	2960	0.16	3330	0.20	3700	0.14	4440	0.20	5185	0.20	5925	0.20
60°F	1230	0.13	1540	0.13	1850	0.11	2160	0.14	2465	0.12	2775	0.15	3085	0.11	3700	0.15	4320	0.15	4935	0.15
70°F	1055	0.10	1320	0.11	1585	0.10	1850	0.13	2115	0.10	2380	0.11	2645	0.09	3170	0.11	3700	0.11	4230	0.11
75°F	985	0.09	1230	0.10	1480	0.09	1725	0.11	1975	0.09	2220	0.10	2465	0.08	2960	0.10	3455	0.10	3950	0.10

# 13. Venting and Combustion Air

All separated combustion, power vented units MUST BE equipped with both combustion air and exhaust piping to the outdoors. The unique concentric adapter assembly 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.

**WARNING: Do not use an existing venting system. This heater requires installation of the combustion air/vent system ordered with the unit (either Option CC2 or Option CC6).**

Installation should be done by a qualified agency in accordance with these instructions. The qualified service agency installing this separated-combustion system is responsible for the installation.

**Hazards of Chlorine** - The presence of chlorine vapors in the combustion air of gas-fired 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 go into solution with any condensation that is present in the heat exchanger or associated parts. The result is hydrochloric acid which readily attacks all metals including 300 grade stainless steel. Care should be taken to separate these vapors from the combustion process. This may be done by wise location of unit vent terminal and combustion air inlet with regard to exhausters or prevailing wind directions. Remember, chlorine is heavier than air. This fact should be kept in mind when determining installation location of these heaters and building exhaust systems.

**WARNING: SC Series separated combustion units are not designed or approved for use in atmospheres containing flammable vapors or atmospheres highly laden with chlorinated vapors. See Hazard Levels, page 2.**

## Specific Venting Requirements (read all before installing)

### 1. Concentric Adapter Kit (ordered with the heater as either Option CC2 or CC6)

All Model SC Series installations require a concentric adapter kit. Each kit includes the concentric adapter box (See Figures 14, page 10), a vent terminal cap, and an inlet air guard or cap. Follow the instructions on pages 10-12 to install a horizontal vent/combustion air system (Option CC6). Follow the instructions on pages 12-14 to install a vertical vent/combustion air system (Option CC2).

The vent/combustion air systems illustrated in Figure 17E on page 12 or Figure 18E on page 14 are the only venting/combustion air systems approved for this heater.

### 2. Type of Pipe (field-supplied)

**Vent Pipe** - Use either vent pipe approved for a Category III appliance OR single-wall, 26-gauge or heavier galvanized (or a material of equivalent corrosion resistance) vent pipe.

**Combustion Air Inlet Pipe Between the Heater and the Concentric Adapter** - Sealed, single-wall galvanized pipe is recommended.

**Combustion Air Inlet Pipe Between the Adapter Box and the Combustion Air Inlet** - Pipes are installed concentrically; use single-wall galvanized pipe.

### 4. Joints/Seals

**In Pipe Runs** - Provide pipe as specified in Requirement No. 2 and make joints as follows:

- **Single wall, 26 gauge or heavier galvanized pipe**, secure slip-fit pipe connections using sheetmetal screws or rivets. Seal all joints. Seal combustion air pipe with pressure sensitive tape ordinarily used for warm-air ductwork. Wrap two full turns around each joint. Seal vent pipe with either tape suitable for 550°F (such as Option FA1, P/N 98266) or high-temperature (450°F) silicone sealant.
- **Category III vent pipe**, follow the pipe manufacturer's instructions for joining and sealing pipe sections.

**In Concentric Pipes (outdoor portion) From the Adapter Box to Air Inlet and Vent Terminal** - Follow the instructions for the concentric adapter kit.

**Joints Requiring Taper-type Connections (See Figure 15)** - When the diameter of the pipe in the inlet air or vent pipe run is different from the connections at either the heater or the concentric adapter box, the joint must be made with a taper-type pipe connector. When the diameter change is at the heater, install the connector at the collar or no more than 6" (152mm) from the heater. When the diameter change

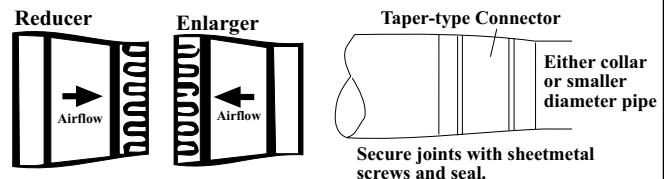
### 3. Pipe Diameter and Length

Maximum Pipe Length from Heater to Concentric Adapter - minimum length is 5 ft (1524 mm)					
Model Size	Pipe Diameter		Maximum Length	90° Elbow Equals*	45° Elbow Equals*
	Vent	Inlet Air			
100	6"	6"	40 ft	8 ft	4 ft
			12 M	2.4 M	1.2 M
125-300	6"	6"	50 ft	8 ft	4 ft
			15 M	2.4 M	1.2 M
350-400	6"	6"	30 ft	8 ft	4 ft
			9 M	2.4 M	1.2 M
200-400	7"	7"	70 ft	8 ft	4 ft
			21 M	2.4 M	1.2 M

\*Reduce maximum length by this amount for each elbow.

**Concentric Pipes (the vent pipe runs through the concentric adapter extending internally concentric through the outdoor portion of the combustion air pipe)** - Requires 8" combustion air pipe for the outdoor portion and a 5" vent pipe through the concentric adapter to the terminal. Refer to the installation instructions for the concentric adapter kit for length requirements.

**Figure 15 - When joining different pipe diameters, use taper-type pipe connectors**



# 13. Venting and Combustion Air (cont'd)

## Specific Venting Requirements (read all before installing) (cont'd)

### 4. Joints/Seals (cont'd)

#### Requiring Taper-type Connections (cont'd)

is at the concentric adapter box, install the connector no more than 6" (152mm) from the opening or collar on the concentric adapter box.

**When using 6" diameter pipe runs,** install a 6" to 5" taper-type reducer in the vent pipe run at the concentric adapter box. A taper-type connection is not required in the inlet air run.

**When using 7" diameter pipe runs,** at the heater, install a 6" to 7" enlarger for the vent pipe and a 7" to 6" reducer for the inlet air pipe. At the concentric adapter box, install a 7" to 5" reducer in the vent pipe run and a 6" to 7" enlarger for the inlet air pipe.

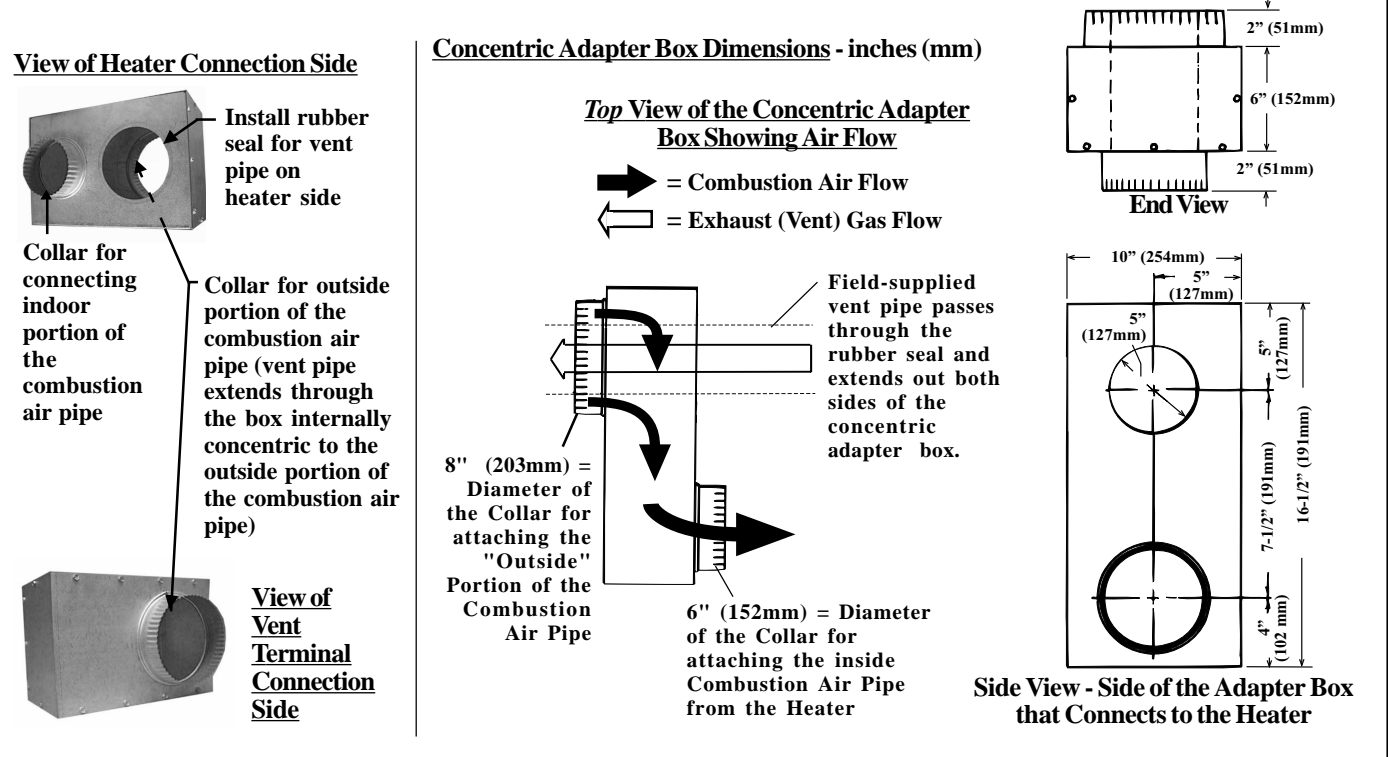
### 5. Clearance

Clearance from the vent pipe to combustibles is 6" (152mm). Do not enclose the vent pipe.

### 6. Support



Support horizontal runs every six feet (1829mm); do not rely on the heater or adapter box for support of either horizontal or vertical pipes. Use non-combustible supports on vent pipe.

**Figure 16 - Concentric Adapter Box in Options CC2 and CC6**



## Instructions and Requirements for Installing Horizontal Vent Terminal/Combustion Air Inlet Option CC6

Option CC6 Horizontal Vent Terminal/Combustion Air Package includes:

Qty	Description	P/N
1	Complete Horizontal Vent Kit (Same as Option CC6)	82131
1	Concentric adapter box (See Figure 16)	68404
1	Screened exhaust cap 	53316
1	Inlet guard 	124940
4	#10-16x1/2" lg screws (to attach the inlet guard)	37661
1	Rubber seal for vent pipe opening in the concentric adapter box	164493
1	Tube of high temperature (450°F) silicone sealant	53335

#### Field-supplied components:

- Thimble (a thimble is not required if wall is of non-combustible construction)
- Flashing
- Vent pipes (see requirements on page 9)
- Combustion air pipes (see requirements on page 9)
- Mounting brackets for concentric adapter box (or box may be installed flush, depending on building construction)
- Taper-type reducers and enlargers as required (see requirements on pages 9-10)

### Installation Instructions for Option CC6

**1. Determine the location on the outside wall for the vent terminal (applies to all horizontal vent kits).** In most applications, the terminal would be on a level with the heater mounting height. Allow 1/4" per foot downward pitch toward the terminal for draining of condensation.

The distance of the termination of the horizontal vent from adjacent public walkways, adjacent buildings, openable windows, and building openings must be in accordance with local codes or, in the absence of local codes,

must conform with National Fuel Gas Code. Local codes supersede all provisions in these instructions and in the National Fuel Gas Code. Minimum clearances for the horizontal vent terminal are as shown in the table on the right. Products of combustion can cause discoloration of some building finishes and deterioration of masonry materials. Applying a clear silicone sealant that is normally used to protect concrete driveways can protect masonry materials. If discoloration is an esthetic problem, relocate the vent or install a vertical vent.

Structure	Minimum Clearances for Vent Termination Location (all directions unless specified)
Forced air inlet within 10 ft (3M)	3 ft (0.9M) above
Combustion air inlet of another appliance	6 ft (1.8M)
Door, window, or gravity air inlet (any building opening)	4 ft (1.2M) horizontally
	4 ft (1.2M) below
	1 ft (305mm) above
Electric meter, gas meter * and relief equipment	4 ft (1.2M) horizontally
Gas regulator *	3 ft (0.9M)
Adjoining building or parapet	6 ft (1.8M)
Adjacent public walkways	7 ft (2.1M) above
Grade (ground level)	7 ft (2.1M) above

\*Do not terminate the vent directly above a gas meter or service regulator.

**WARNING: All vent terminals must be positioned or located away from fresh air intakes, doors and windows to preclude combustion products from entering occupied space. See Hazard Levels, page 2.**

**2. Prepare clearance hole** through the outside wall for an 8" diameter pipe. Outside wall construction thickness should be between 1" (25mm) minimum and 30" (762mm) maximum. The larger diameter combustion air pipe serves as clearance for the exhaust pipe on non-combustible construction. A thimble may or may not be required depending on wall construction and/or local codes.

**3. Prepare the concentric adapter box.**

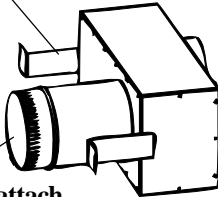
**3a) Determine whether field-supplied brackets are required.** The box must be positioned so that the distance from the outside of the wall to the box is a minimum of 12" (305mm). Maximum distance is 60" (1524mm). If brackets are used, box should be angled slightly to allow for downward pitch of pipes. If used, attach brackets securely; do not leave any unsealed holes in the adapter box.

If brackets are not used, position box tight against the wall.

**3b) Attach the outside portion of the combustion air pipe to the box.** Determine the length by measuring the bracket length (if brackets are used), plus the wall thickness, plus 2" (51 mm). The inlet pipe should extend beyond the outside wall approximately 2" (51mm). Comply with distance requirements in 3a. Attach the inlet air pipe to the collar of the concentric adapter with sheetmetal screws.

**17A**

Use field-supplied brackets or install flush to wall. Box should be a minimum of 12" (305mm) and maximum of 60" (1524mm) from the outside of the wall.



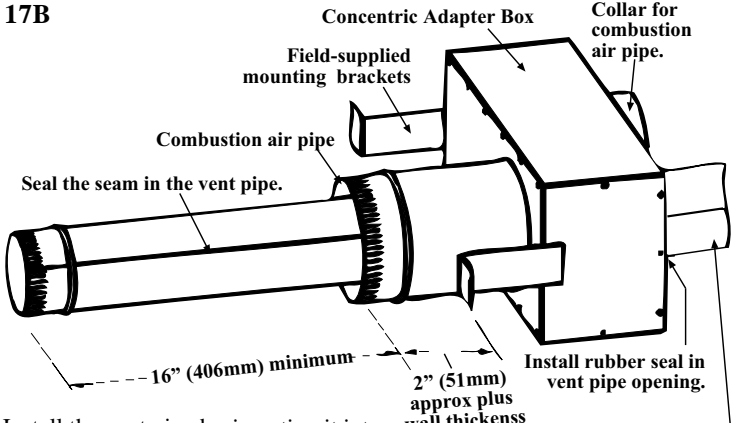
**Combustion Air Pipe - attach with sheetmetal screws**

Length of the inlet air pipe equals the length of field-supplied bracket (if used), plus wall thickness, plus 2" (pipe should extend beyond outside wall approximately 2")

**3c) Install the rubber seal and the vent pipe.** Locate the vent pipe opening (no collar) and place the rubber seal around and over the edge of the metal.

Determine the length of the section of vent pipe by adding the requirements. The vent pipe must extend a maximum of 6" (152mm) on the heater side; plus 6" (152mm)

**17B**



Install the vent pipe by *inserting it into the terminal side of the box and pushing it out through the seal* on the heater side.

NOTE: Be sure the flow direction is correct.

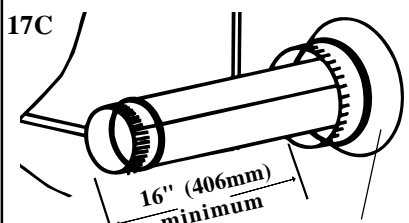
through the box; plus bracket length; plus the width of the wall; plus a minimum of 18" (457mm) on the outside (if the inlet air pipe extends recommended 2" (51mm) beyond the wall).

Lubricate the seal and pipe with liquid soap or a rubber lubricant. (Installation Tip: Spray cooking oil works well as a lubricant for this task.) Push the field-supplied vent pipe through the rubber seal. Push evenly using caution not to displace the seal from its position on the edge of the hole. If the rubber seal moves, slide the pipe out, reposition the seal, and slide the pipe through again. Position the vent pipe so that it extends through the combustion air pipe and protrudes a minimum of 16" past the end of the pipe. See Figure 17B. A maximum of 6" (152mm) of vent pipe should extend the heater side. Any time the pipe is re-positioned, re-check the seal to be sure that it has not rolled. Adjust the pipe and seal until the pipe is the correct length on each side of the box and the seal is over the edge of the hole and tight to the entire circumference of the pipe.

Worksheet - Determine Length of Vent Pipe through the Box		
	inches	mm
Heater Side (max)	+ 6	152
Width of Box	+ 6	152
Bracket Length	+ —	—
Width of Wall	+ —	—
Terminal Side (min)	+ 18	457
Length of Pipe	=	

**4. Attach the concentric adapter box to the wall.** Insert the vent pipe and combustion air pipe through the wall. Push the concentric adapter box flush against the inside wall or attach to the wall with the field-supplied brackets. Caulk or flash inlet air pipe on the outside wall. Flashing is field supplied.

**17C**



Flash or caulk the inlet air pipe on the outside wall.

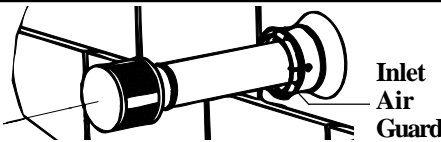
# 13. Venting and Combustion Air (cont'd)

## Installation Instructions for Option CC6 (cont'd)

First, attach the inlet air guard;  
Second, attach the vent cap

**IMPORTANT:** Install vent cap with baffles positioned on horizontal and vertical centerlines as illustrated.

17D



5. Slide the inlet guard over the end of the vent pipe and position it on the end of the combustion air pipe. See Figure 17D. Attach the guard to the inlet air pipe with the four 1/2" lg screws provided.

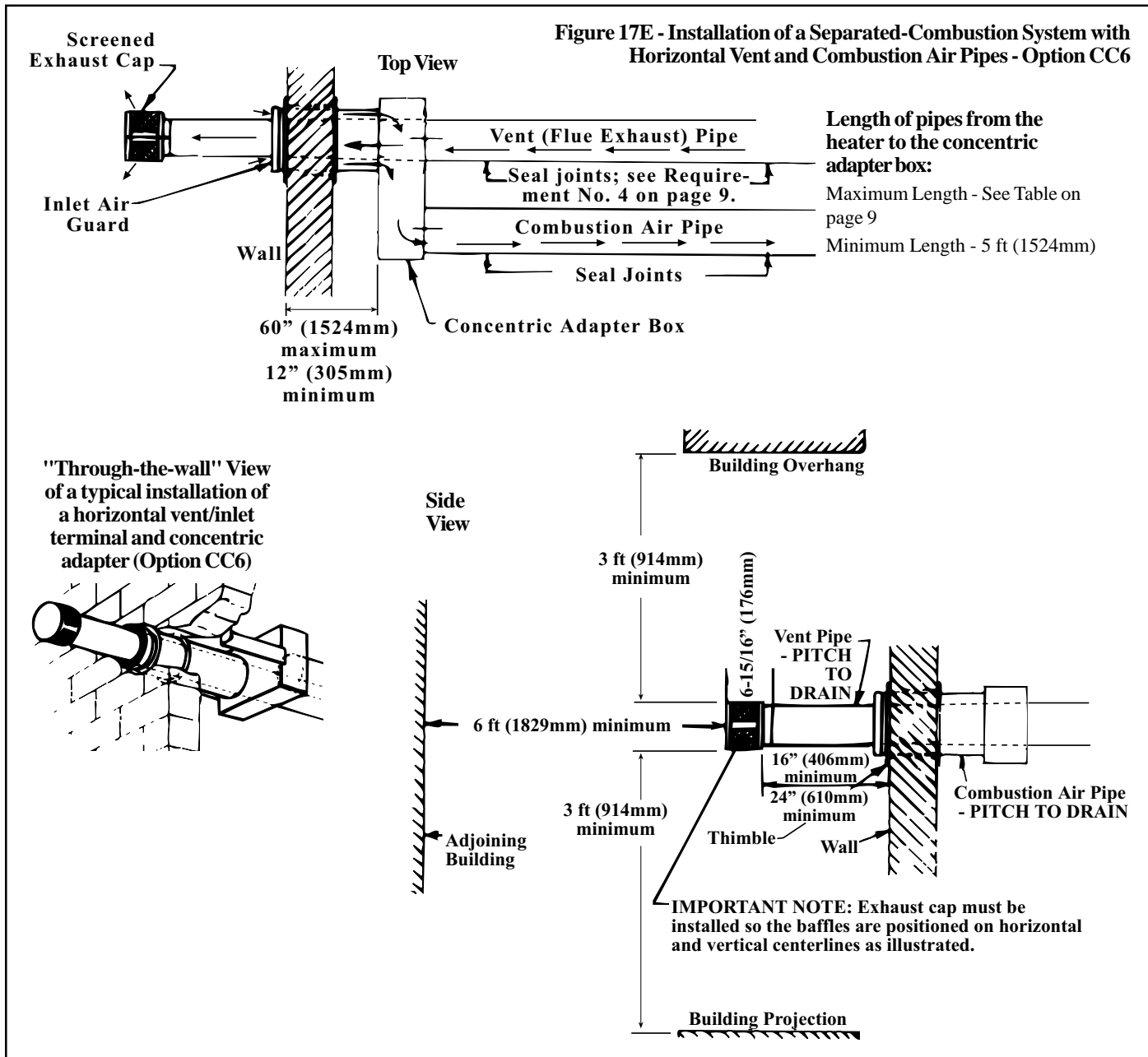
6. Position the vent cap on the end of the vent pipe. Align the cap so that its baffle strips are positioned on the horizontal and vertical centerlines (See Figure 17D). Attach the exhaust cap to the vent pipe with sheetmetal screws.

7. Horizontal vent terminal/combustion air inlet Option CC6 is installed and ready for connection to the heater. Refer to Figure 17E and verify compliance with all requirements illustrated.

8. Connect the Concentric Adapter Box to the Heater - Use the pipe specified and joints required for type of pipe. If collar or opening at the heater or adapter are different diameters from the pipe (use only diameters listed on page 9), make joint connection with field-supplied taper-type reducer or enlarger.



A minimum of 12" (305 mm) of straight pipe is required at the venter outlet. Due to the high temperature, do not enclose the exhaust pipe or place pipe closer than 6" (152 mm) to combustible material.

Installation of the horizontal vent and combustion air system on your separated-combustion unit is complete. Verify that all installation requirements are met. Continue to Paragraph 14.



# Instructions and Requirements for Installing a Vertical Vent Terminal/Combustion Air Inlet (Requires Concentric Adapter Kit, Option CC2)

Vertical Vent Terminal/Combustion Air Package (Option CC2) includes:

Qty	Description	P/N
1	<b>Complete Vertical Vent Kit (Same as Option CC2)</b>	<b>54444</b>
1	Concentric box assembly (See Figure 16)	68404
1	Exhaust terminal 	53326
1	Combustion air inlet 	53330
1	Rubber seal for vent pipe opening in the concentric adapter box	164493
1	Tube of high temperature (450°F) silicone sealant	53335

## Field-supplied components:

- Thimble (a thimble is not required if wall is of non-combustible construction)
- Flashing
- Vent pipes (see requirements on page 9)
- Combustion air pipes (see requirements on page 9)
- Mounting brackets for concentric adapter box (or box may be installed flush, depending on building construction)
- Taper-type reducers and enlargers as required (see requirements on pages 9 and 10)

## Installation Instructions for Option CC2

1. Determine the location for the vent terminal on the roof, allowing room for the concentric adapter box inside. A thimble may or may not be required depending on building construction and/or local codes. Prepare a hole through the roof for the 8" combustion air pipe. The air inlet pipe must be flashed or sealed to the roof. Flashing is to be supplied by the installer as required by roof construction and/or codes.

**WARNING: All vent terminals must be positioned or located away from fresh air intakes, doors and windows to preclude combustion products from entering occupied space. See Hazard Levels, page 2.**

### 2. Prepare the concentric adapter box.

2a) **Determine whether field-supplied brackets are required.** If used, attach brackets securely; do not leave any unsealed holes in the adapter box.

If brackets are not used, position box tight against the roof.

2b) **Attach the outside portion of the combustion air pipe to the box.** Determine the length of the combustion air pipe so that dimension "X" (Figure 18A) is equal to the roof thickness, plus snow depth and ridge or parapet clearance, but does not exceed 60" (1524 mm). Attach the combustion air pipe to the collar with sheetmetal screws.

2c) **Install the rubber seal and the vent pipe.** Locate the vent pipe opening and place the rubber seal around and over the edge of the metal.

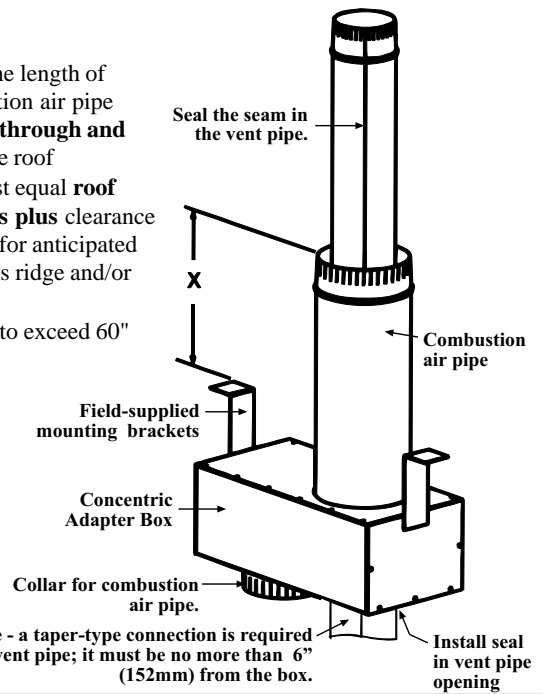
Determine the length of the section of vent pipe by adding the requirements. The vent pipe must extend a maximum of 6" (152mm) on the heater side; plus 6" (152mm) through the box; plus bracket length; plus the width of the roof; plus the

#### Worksheet - Determine Length of Vent Pipe through the Box

	+	inches	mm
Heater Side (max)	+	6	152
Width of Box	+	6	152
Bracket Length	+	—	—
Width of Roof	+	—	—
Inlet Pipe Height	+	—	—
Terminal Side (min)	+	22	559
Length of Pipe	=		

### 18A

"X" is the length of combustion air pipe required **through and above** the roof  
 "X" must equal **roof thickness plus clearance** required for anticipated snow plus ridge and/or parapet  
 "X" not to exceed 60"



length of the outer inlet air pipe; plus a minimum of 22" (559mm).

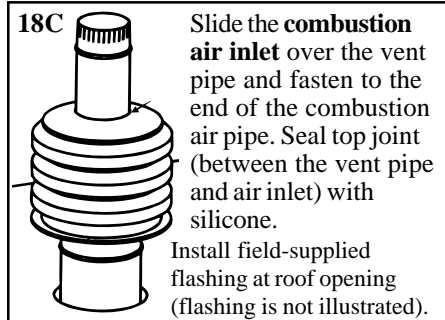
Lubricate the seal and pipe with liquid soap or a rubber lubricant. (Installation Tip: Spray cooking oil works well as a lubricant for this task.) Push the field-supplied vent pipe through the rubber seal. Push evenly using caution not to displace the seal from its position on the edge of the hole. If the rubber seal moves, slide the pipe out, re-position the seal, and slide the pipe through again.

Position the vent pipe so that it extends through the combustion air pipe and protrudes a minimum of 22" (559mm) past the end of the pipe. See Figure 18B.

A maximum of 6" (152mm) of vent pipe should extend out the heater side. Any time the pipe is re-positioned, re-check the seal to be sure that it has not rolled. Adjust the pipe and seal until the pipe is the correct length on each side of the box and the seal is over the edge of the hole and tight to the entire circumference of the pipe.

3. **Attach the concentric adapter.** Insert the vent pipe and combustion air pipe up through the roof and secure the adapter box. Flash the combustion air pipe to the outside of the roof as required.

4. **Slide the combustion air inlet over the vent pipe** and fasten collar to the end of the combustion air pipe with sheetmetal screws (See Figure 18C). Seal joint at top between vent pipe and combustion air inlet with

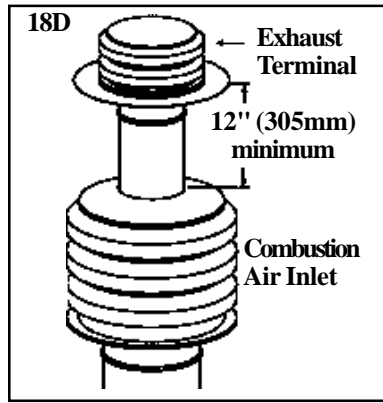


# 13. Venting and Combustion Air (cont'd)

silicone sealant to prevent water leakage.

5. Attach the exhaust terminal with sheet metal screws (See Figure 18D).

6. Vertical vent terminal/combustion air inlet is installed and ready for connection to the heater. Refer to Figure 18E and verify that all installation requirements are met.



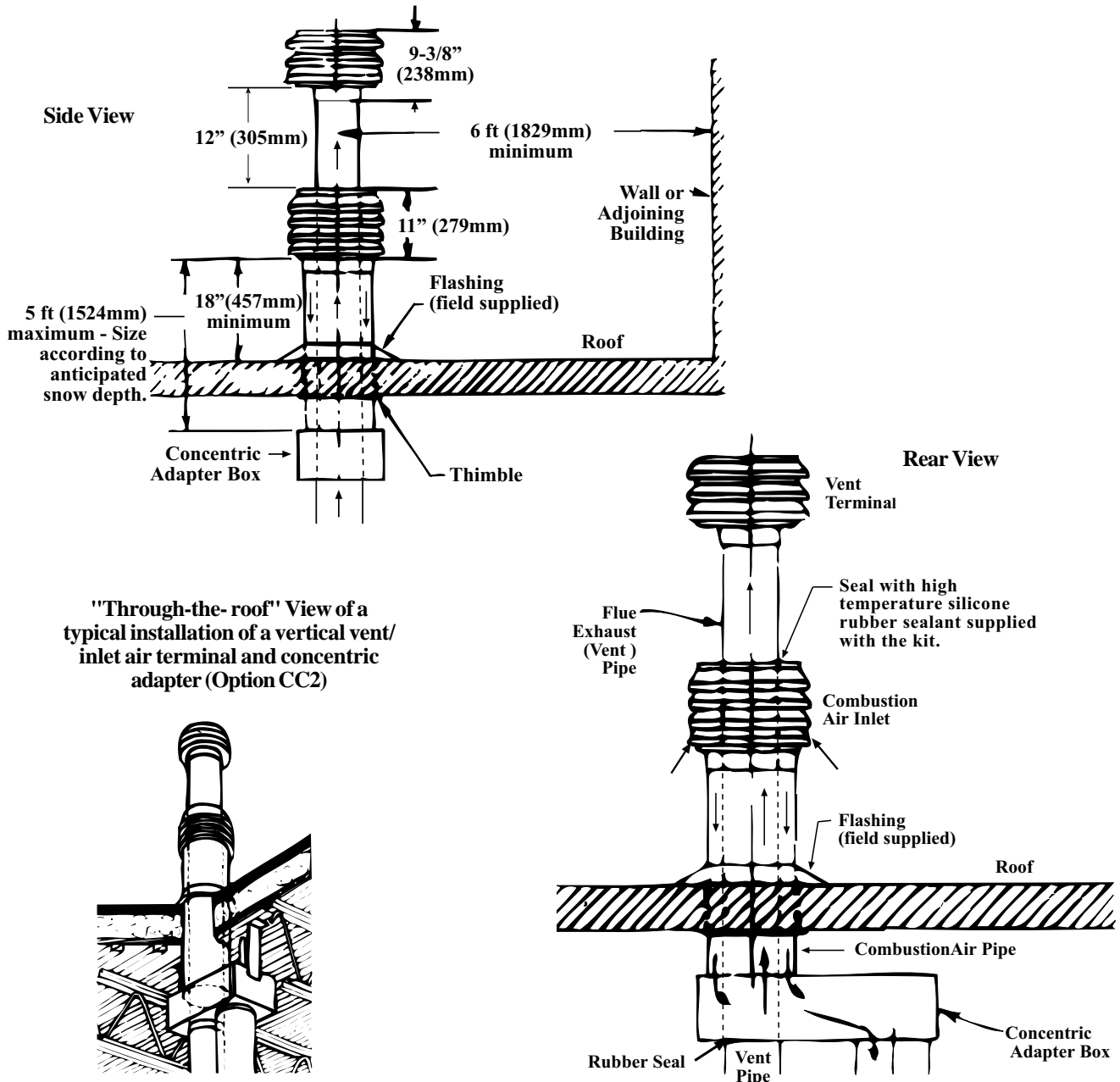
7. Connect Concentric Adapter Box to the Heater - Use the pipe specified and joints required for type of pipe. If collars at the heater or adapter are different diameters from the pipe (use only diameters allowed in the heater installation manual), make connection with field-supplied taper-type reducer or increaser.

A minimum of 12" (305 mm) of straight pipe is required at the venter outlet.

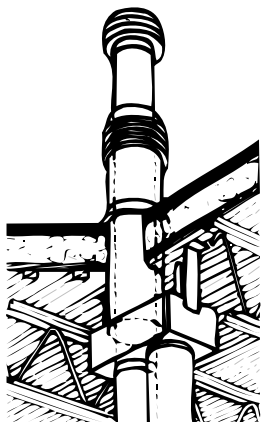
Due to the high temperature, do not enclose the vent pipe or place pipe closer than 6" (152 mm) to combustible material.

Installation of the vertical vent and combustion air system on your separated-combustion unit is complete.

Figure 18E - Installation of a Separated-Combustion System with Vertical Vent and Combustion Air Pipes (Option CC2)



"Through-the-roof" View of a typical installation of a vertical vent/inlet air terminal and concentric adapter (Option CC2)



# 14. Gas Piping and Pressures

## WARNING

This appliance is equipped for a maximum gas supply pressure of 1/2 pound, 8 ounces, or 14 inches water column. NOTE: Supply pressures higher than 1/2 pound require installation of an additional service regulator external to the unit.

### Pressure Testing Supply Piping

**Test Pressure Above 1/2 PSI:** Disconnect the heater and manual valve from the gas supply which is to be pressure tested. Cap or plug the supply line.

**Test Pressure Below 1/2 PSI:** Before testing, close the manual valve on the heater.

**WARNING: Manifold gas pressure must never exceed 3.5" w.c. for natural gas or 10" w.c. for propane gas.**

All piping must be in accordance with requirements outlined in the National Fuel Gas Code ANSI/Z223.1 (latest edition) or CAN/CGA B149.1 and B149.2 (See Paragraph 1.) Gas supply piping installation should conform with good practice and with local codes.

These separated-combustion units for natural gas are orificed for gas having a heating value of 1000 (±50) BTUH per cubic ft. If the gas at the installation does not meet this specification, consult the factory for proper orificing.

**Seal the opening for the gas supply pipe with the grommet provided.** 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.

Install a ground joint union and manual shutoff valve upstream of the unit control system. The 1/8" plugged tapping in the shutoff valve provides connection for supply line pressure test gauge. The National Fuel Gas Code requires the installation of a trap with a minimum 3" drip leg. Local codes may require a longer drip leg, typically 6" (See Figure 2, Paragraph 3).

**WARNING: All components of a gas supply system must be leak tested prior to placing the equipment in service. NEVER TEST FOR LEAKS WITH AN OPEN FLAME. See Hazard Levels, page 2.**

## Gas Connection (Standard Unit)

Model Size	100-250	300-400
Natural Gas	1/2"	3/4"
Propane Gas	1/2"	1/2"

NOTE: The above are gas connection sizes; not supply line sizes. 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.

## Manifold or Orifice Pressure Settings

Measuring manifold gas pressure cannot be done until the heater is in operation. It is included in the "Check-Test-Start" section, Paragraph 29. The following instructions apply.

**For Natural Gas:** High fire manifold gas pressure is regulated by the combination valve to 3.5" w.c. Inlet pressure to the valve must be a minimum of 5" w.c. or as noted on the rating plate and a maximum of 14" w.c. NOTE: Always check the rating plate for minimum gas supply pressure. Minimum supply pressure requirements vary based on size of burner and gas control option. Most units require a minimum of 5" w.c. as stated above, but Sizes 350 and 400 with electronic modulation require a minimum of 6" w.c. natural gas supply pressure.

**For Propane Gas:** High fire manifold gas pressure is regulated by the combination valve to 10" w.c. Inlet pressure to the valve must be a minimum of 11" w.c. and a maximum of 14" w.c.

**Instructions:** Before attempting to measure or adjust high fire 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 on standby. Incorrect inlet pressure could cause excessive manifold gas pressure immediately or at some future time. With the manual valve, on the combination valve, positioned to prevent flow to the main burners, connect a manometer to the 1/8" pipe outlet pressure tap on the valve. Open the valve and operate the heater to measure the manifold gas pressure. 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. Normally adjustments should not be necessary to the factory present regulator. If adjustment is necessary, set pressure to above settings by turning regulator screw IN (clockwise) to increase pressure. Turn regulator screw OUT (counterclockwise) to decrease pressure. Consult the valve manufacturer's literature provided with the heater for more detailed information.

## Sizing Gas Supply Lines

Capacity of Piping												
Cubic Feet per Hour based on 0.3" w.c. Pressure Drop												
Specific Gravity for Natural Gas -- 0.6 (Natural Gas -- 1000 BTU/Cubic Ft)												
Specific Gravity for Propane Gas -- 1.6 (Propane Gas -- 2550 BTU/Cubic Ft)												
Length of Pipe	Diameter of Pipe											
	1/2"		3/4"		1"		1-1/4"		1-1/2"		2"	
	Natural	Propane	Natural	Propane	Natural	Propane	Natural	Propane	Natural	Propane	Natural	Propane
20'	92	56	190	116	350	214	730	445	1100	671	2100	1281
30'	73	45	152	93	285	174	590	360	890	543	1650	1007
40'	63	38	130	79	245	149	500	305	760	464	1450	885
50'	56	34	115	70	215	131	440	268	670	409	1270	775
60'	50	31	105	64	195	119	400	244	610	372	1105	674
70'	46	28	96	59	180	110	370	226	560	342	1050	641
80'	43	26	90	55	170	104	350	214	530	323	990	604
90'	40	24	84	51	160	98	320	195	490	299	930	567
100'	38	23	79	48	150	92	305	186	460	281	870	531
125'	34	21	72	44	130	79	275	168	410	250	780	476
150'	31	19	64	39	120	73	250	153	380	232	710	433
175'	28	17	59	36	110	67	225	137	350	214	650	397
200'	26	16	55	34	100	61	210	128	320	195	610	372

Note: When sizing supply lines, consider possibilities of future expansion and increased requirements. Refer to National Fuel Gas Code for additional information on line sizing.



## 15. Electrical Supply and Connections

All electrical wiring and connections including electrical grounding must be made in accordance with the National Electric Code ANSI/NFPA No. 70 (latest edition) or, in Canada, the Canadian Electrical Code, Part I-C.S.A. Standard C22.1. Check any local ordinances or gas company requirements that apply.

Check the rating plate on the heater for the supply voltage and the 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. Refer to Figure 3, Paragraph 3. **Seal all electrical entrance openings with field-supplied bushings.**

A disconnect switch is available as optional equipment or may be supplied locally. When installing the disconnect switch, be careful that the conduit and switch housing are clear of all service panels. Allow at least four feet of service room between the disconnect switch and any removable service panels. When providing or replacing fuses in a fusible disconnect switch, use dual element time delay fuses and size 1.25 times the maximum total input amps.

The heater is equipped with a low voltage (24V) control circuit. See the typical wiring diagrams on pages 18 and 19; a specific wiring diagram can be found in the heater junction box.

See separate instruction sheets for any optional equipment provided. Optional equipment is identified on the wiring diagram supplied with the heater.

**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 sensor lead and optional bypass damper combustion air safety circuit (Opt AG39 or AG40) wires which must be 150°C. See Hazard Levels, page 2.**

## 16. Control Thermostat

A thermostat is not supplied with the furnace. Use either an optional or a field-provided low-voltage (24V) thermostat. Install the thermostat according to the manufacturer's instructions.

A low voltage thermostat is equipped with a heat anticipator which levels out unit cycling for optimum temperature control. Set the anticipator at 1.0 amps for standard controls. See chart below for amp ratings of optional controls.

**CAUTION: Control circuit amps should be within the anticipator amp rating of the thermostat used.**

### Ampere Rating of 24-Volt Controls

Fan Control .....	.12 amps
Time Delay Heater .....	.14 amps
RBM Relay Coil .....	.12 amps
Contactors Coil .....	.45 amps
Spark Ignition System .....	.1 amps
Maxitrol Gas Control System .....	.51 amps
Honeywell Gas Valve .....	.5 amps
White-Rodgers Gas Valve .....	.6 amps

Field Control Wiring - Length and Gauge		
Total Wire Length	Distance from Unit to Control	Minimum Recommended Wire Gauge
150'	75'	#18 gauge
250'	125'	#16 gauge
350'	175'	#14 gauge

## 17. Fan Control

A fan control is standard on unit heaters (Models SCA and SCB) and packaged systems (Model SCE). A fan control is optional on duct furnaces (Models SC and HSC) that require a field-supplied air handler. The fan control is identified on the Wiring Diagram as Option AP2.

- The fan control provides the following:
  - A 45-second delay of fan or blower operation to prevent the discharge of cold air.
  - Fan or blower operation as long as the unit is hot.
- The fan control provides additional safety by keeping the fan or blower in operation in the event that the gas valve fails to close when the thermostat is satisfied.
- To be sure that the fan or blower can continue to operate, the power supply to the furnace **MUST NOT** be interrupted **except** when servicing the unit.
- 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, be sure the fan control wiring is observed.

The fan control contains a built-in heater to control delay times. For proper operation, refer to the wiring diagram furnished with the furnace.

## 18. Limit Control

All models are equipped with an automatic, non-adjustable reset limit control that acts to interrupt the electric supply to the redundant main operating valve in case of motor failure or lack of airflow due to restrictions at the inlet or outlet.

## 19. Combustion Air Proving Switch

The combustion air proving switch ensures that proper combustion air flow is available. The switch is a single-pole, double-throw switch, which 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.

On start-up when the furnace is cold, the sensing pressure is at the most negative level, and 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 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. The table below gives approximate water column negative pressure readings and switch setpoints for sea level operating conditions.

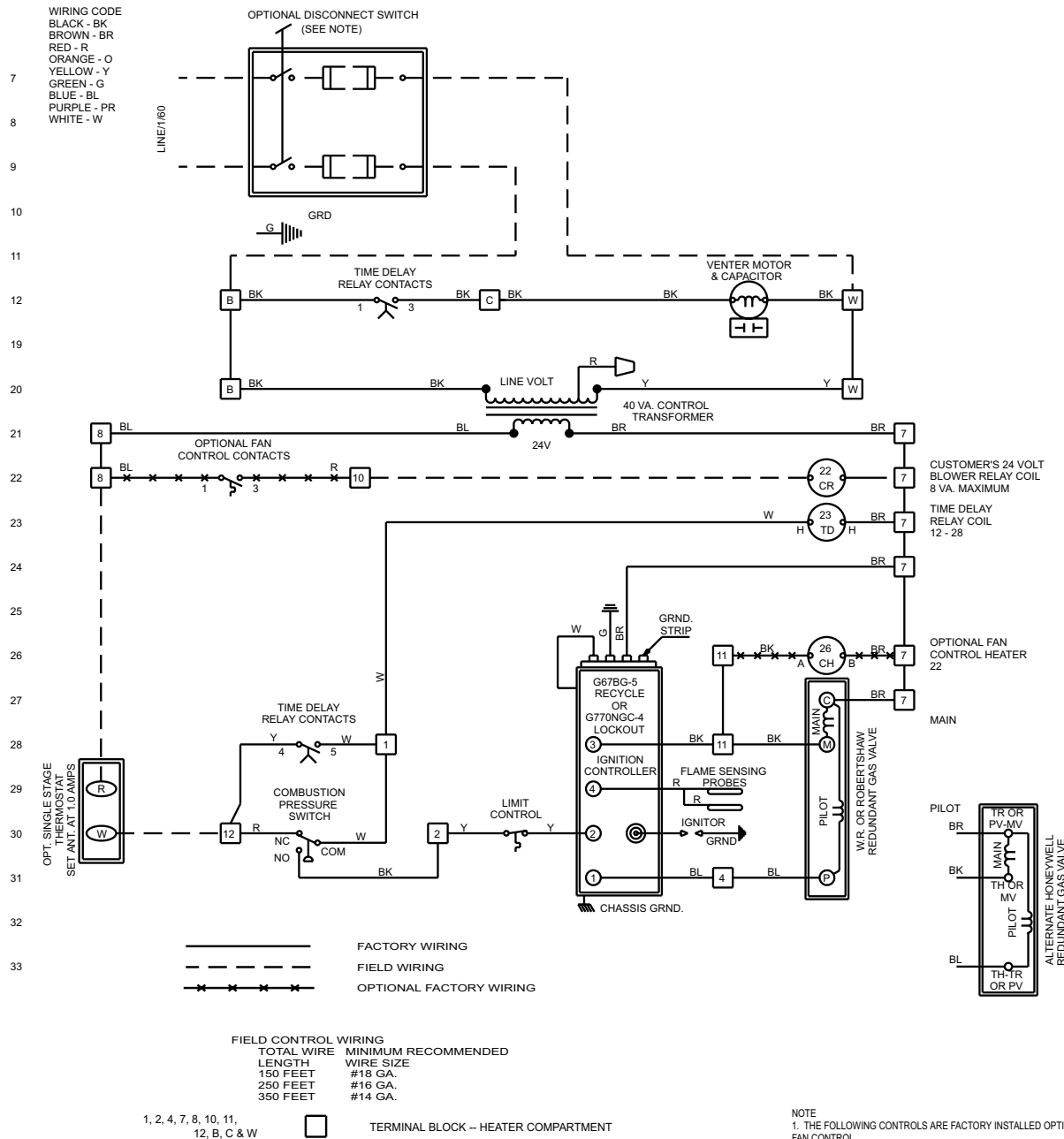
Startup Cold	Equilibrium	Factory Setpoint
-1.0" w.c.	-.70" w.c.	-.58 +or- .05" w.c.

NOTE: These settings apply to furnaces that are not equipped with air and gas modulation Option AG39. For pressure switch settings for units equipped with Option AG39, see Paragraph 25.

**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 condition could result. See Hazard Levels, page 2.**

# Typical Wiring Diagrams

Figure 19 - Model SC with Single-Stage Gas Control

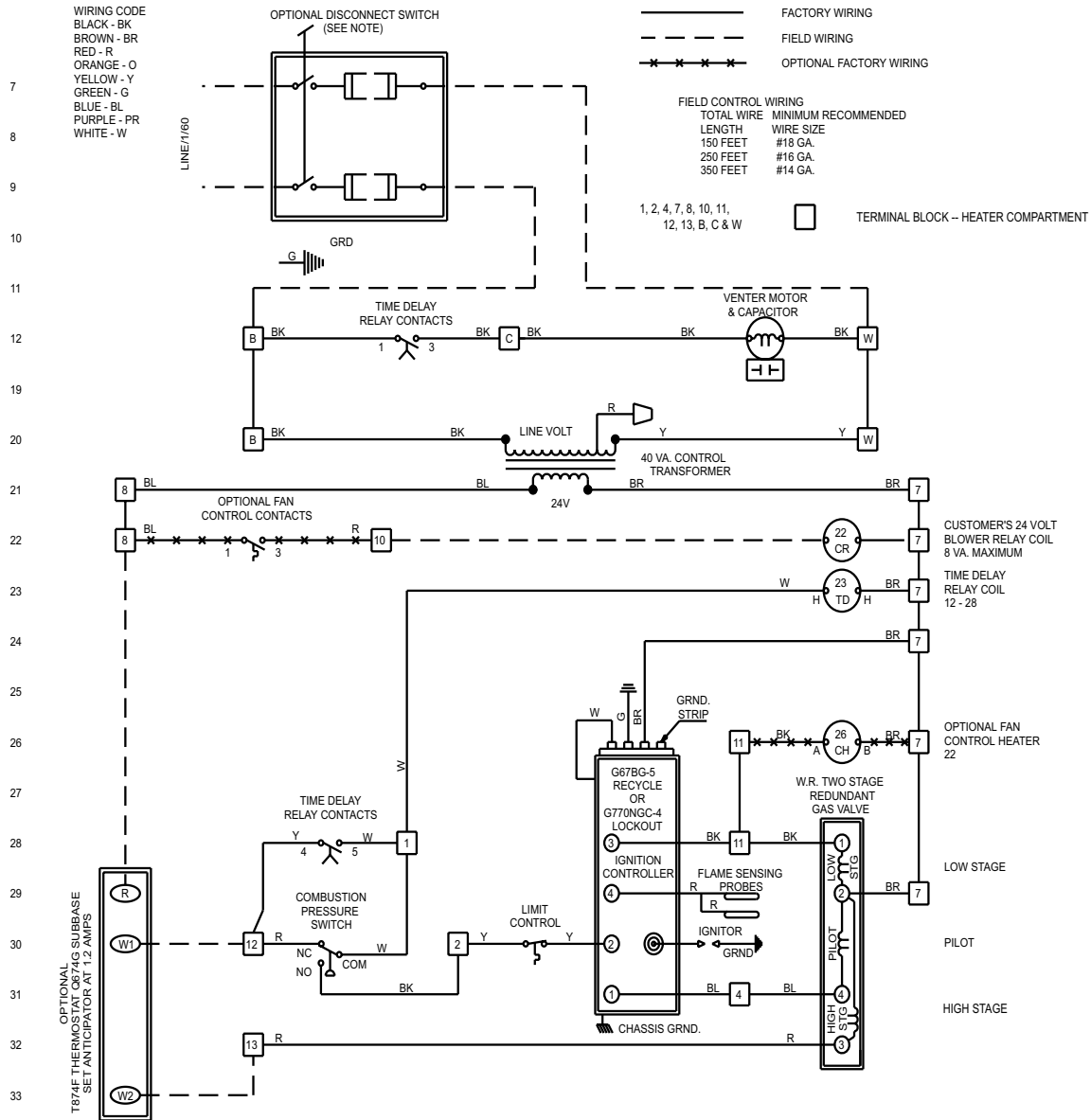


**OPERATING SEQUENCE**

1. SET THERMOSTAT AT LOWEST SETTING.
2. TURN ON POWER, MAIN AND PILOT MANUAL GAS VALVES.
3. SET THERMOSTAT AT DESIRED SETTING.
4. ON A CALL FOR HEAT BY THE THERMOSTAT
  - (A) THE VENTER MOTOR IS ENERGIZED AFTER A 15 SECOND (APPROX.) TIME DELAY.
  - (B) VENTER FLOW SWITCH SWITCHES FROM N.C. TO N.O. CONTACTS ENERGIZING THE PILOT GAS VALVE AND SPARK TO PRODUCE A PILOT FLAME ON EACH OPERATING CYCLE. THE SENSING PROBE PROVES THE PRESENCE OF THE PILOT FLAME AND ENERGIZES THE SAFETY PORTION OF THE CONTROL. THE SWITCH ACTION DE-ENERGIZES THE SPARK GAP AND ENERGIZES THE MAIN VALVE. THE MAIN GAS IGNITES AND UNIT FIRES AT LOW RATE.
  - (C) BLOWER MOTOR OPERATES FROM THE HEAT EXCHANGER TEMPERATURE.
5. IF THE FLAME IS EXTINGUISHED DURING MAIN BURNER OPERATION THE SAFETY SWITCH CLOSSES THE MAIN VALVE AND RECYCLES THE SPARK GAP. ON UNIT EQUIPPED WITH G770NGC-4 LOCKOUT CONTROL, IF PILOT IS NOT ESTABLISHED WITHIN 120 SECONDS (APPROX.) UNIT LOCKS OUT AND MUST BE RESET BY INTERRUPTING POWER TO CONTROL CIRCUIT (SEE LIGHTING INSTRUCTIONS).
6. SET THERMOSTAT AT LOWEST SETTING FOR SHUTDOWN.
  - (A) FAN CONTROL KEEPS THE BLOWER MOTOR ON WHILE UNIT IS HOT.

SC: AH2/AH3  
 WD 126093 REV. #3

**Figure 20 - Model SC with Two-Stage Gas Control**



**OPERATING SEQUENCE**

1. SET THERMOSTAT SWITCH AT "OFF" POSITION.
2. TURN ON POWER, MAIN AND PILOT MANUAL GAS VALVES.
3. SET THERMOSTAT SWITCH AT "AUTO" POSITION.
4. ON A CALL FOR HEAT BY THE LOW STAGE OF THERMOSTAT
  - (A) THE VENTER MOTOR IS ENERGIZED AFTER A 15 SECOND (APPROX.) TIME DELAY.
  - (B) VENTER FLOW SWITCH SWITCHES FROM N.C. TO N.O. CONTACTS ENERGIZING THE PILOT GAS VALVE AND SPARK GAP TO PRODUCE A PILOT FLAME ON EACH OPERATING CYCLE. THE SENSING PROBE PROVES THE PRESENCE OF THE PILOT FLAME AND ENERGIZES THE SAFETY PORTION OF THE CONTROL. THE SWITCH ACTION DE-ENERGIZES THE SPARK GAP AND ENERGIZES THE MAIN VALVE. THE MAIN GAS IGNITES AND UNIT FIRES AT LOW RATE.
  - (C) BLOWER MOTOR IS ENERGIZED FROM HEAT EXCHANGER TEMPERATURE.
5. ON A CALL FOR HEAT BY THE HIGH STAGE OF THERMOSTAT, THE UNIT FIRES AT FULL RATE.
6. IF THE FLAME IS EXTINGUISHED DURING MAIN BURNER OPERATION, THE SAFETY SWITCH CLOSSES THE MAIN VALVE AND RECYCLES THE SPARK GAP. ON UNIT EQUIPPED WITH G77ONGC-4 LOCKOUT CONTROL, IF PILOT IS NOT ESTABLISHED WITHIN 120 SECONDS (APPROX.), UNIT LOCKS OUT AND MUST BE RESET BY INTERRUPTING POWER TO CONTROL CIRCUIT (SEE LIGHTING INSTRUCTIONS).
7. SET THERMOSTAT SWITCH AT "OFF" POSITION FOR SHUTDOWN.
  - (A) FAN CONTROL KEEPS THE BLOWER MOTOR ON WHILE UNIT IS HOT.

- NOTE**
1. THE FOLLOWING CONTROLS ARE FACTORY INSTALLED OPTIONS:  
FAN CONTROL
  2. THE FOLLOWING CONTROLS ARE FIELD INSTALLED OPTIONS:  
DISCONNECT SWITCH AND THERMOSTAT
  3. DOTTED WIRING AND THE FOLLOWING CONTROLS ARE SUPPLIED AND INSTALLED BY OTHERS: STARTER COIL
  4. 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 DEGREES C., EXCEPT FOR SENSOR LEAD WIRE WHICH MUST BE 150 DEGREES C.
  5. LINE AND BLOWER MOTOR BRANCH CIRCUIT WIRE SIZE SHOULD BE OF A SIZE TO PREVENT VOLTAGE DROP BEYOND FIVE PERCENT OF SUPPLY LINE VOLTAGE.
  6. USE #14 GA. WIRE FOR LINE WIRING ON UNIT.
  7. USE #18 GA. WIRE FOR 24 VOLT CONTROL WIRING ON UNIT.
  8. ON 208/230V. UNITS THE CONTROL TRANSFORMER HAS A DUAL VOLTAGE PRIMARY. FOR 230V. UNITS USE BLACK AND YELLOW LEADS (CAP RED). FOR 208V. UNITS USE BLACK AND RED LEADS (CAP YELLOW). ON 115/460V. UNITS THE CONTROL TRANSFORMER IS A SINGLE VOLTAGE PRIMARY. FOR 115/460V. UNITS USE BLACK AND YELLOW LEADS.
  9. WHEN PROVIDING OR REPLACING FUSES IN THE FUSIBLE DISCONNECT SWITCH USE DUAL ELEMENTS TIME DELAY FUSES AND SIZE ACCORDING TO 1.25 TIMES THE MAXIMUM TOTAL INPUT AMPS.

SC: AH2/AH3-AG2-CL7  
 WD 126687 REV. #2

## 20. Motor Loads and Amps

**Models SCB and SCE** - Use an ammeter to check blower motor amps. The following chart lists full load amps for various HP and voltages of open-type blower motors. Amps may be adjusted downward by reducing blower RPM or by increasing duct system static pressure.

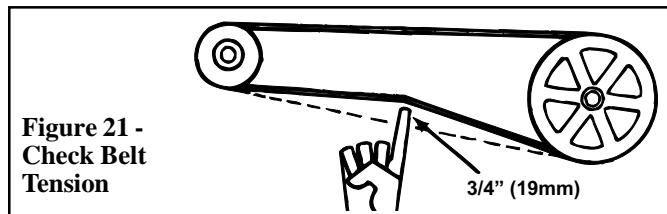
This chart can be used for sizing line wiring but should not be interpreted as the exact motor amps. See the motor rating plate for exact motor specifications. Do not exceed amp rating on the motor nameplate.

Full Load Amps - Blower Motors (Open) (Single Speed- Average Values)									
HP	1/4	1/3	1/2	3/4	1	1-1/2	2	3	5
115V 1PH	4.6	5.6	8.8	11.0	13.0	18.2	20.4	24.8	N/A
208V 1PH	2.5	3.1	5.1	6.1	7.2	10.1	11.3	13.7	28.0
230V 1PH	2.3	2.8	4.4	5.5	6.5	9.1	10.2	12.4	26.0
208V 3PH	1.7	1.8	2.2	2.9	3.6	5.8	7.3	9.3	14.6
230V 3PH	1.5	1.6	2.0	2.6	3.2	5.2	6.6	8.4	13.2
460V 3PH	.75	.80	1.0	1.3	1.6	2.6	3.3	4.2	6.6
575V 3PH	N/A	N/A	N/A	N/A	1.3	2.1	2.6	3.4	5.3

**Models HSC, SC, SCA, SCB and SCE** - Venter motor amps for a 115 volt or 575 volt unit are 1.5 amps; venter motor amps for a 208, 230 or 460 volt unit are .8 amps.

## 21. Blowers, Belts and Drives

Check 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. Adjust the belt tension by turning the adjusting screw on the motor base until the belt can be depressed 3/4" (19mm). (See Figure 21.) After correct tension is achieved, re-tighten the locknut on the adjustment screw. Be sure that the belt is aligned in pulleys.



### Adjusting Blower Speed

The blower speed may be adjusted to achieve the desired outlet temperature, as long as the adjustment is within the temperature rise and the 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 will increase outlet temperature; increasing blower speed will decrease outlet temperature.

**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.**

The belt drive on these units is equipped with an adjustable pulley which permits adjustment of the blower speed. Follow these instructions to adjust the blower speed.

1. Turn off the gas and the electric power.
2. Loosen belt tension and remove the belt.
3. Loosen the set screw on the side of the pulley away from the motor.
4. **To increase the blower speed, decreasing outlet temperature,** turn the adjustable half of the pulley inward. **To decrease the blower**

**speed, increasing the outlet temperature,** turn the adjustable half of the pulley outward. One turn of the pulley will change the speed 8-10%.

5. Tighten the set screw on the flat portion of the pulley shaft.
6. Replace the belt and adjust the belt tension. Adjust tension by turning the adjusting screw on the motor base until the belt can be depressed 3/4". (See Figure 21.) Re-tighten the lock nut on the adjusting screw. Be sure that the belts are aligned in the pulley grooves properly and are not angled from pulley to pulley.
7. Turn on the gas and electric. Light the heater following the instructions on the lighting instruction plate.
8. Check the motor amps with an ammeter. The maximum motor amp rating on the motor nameplate must not be exceeded.

When service is complete, check for proper operation.

### Blower Rotation

Each blower housing is marked for proper rotation. Rotation may be changed on single-phase motors by re-wiring in the motor terminal box. Three-phase motors may be reversed by interchanging two wires on the 3-phase supply connections.

## 22. Operating Valve

All furnaces are equipped with a 24-volt combination valve which 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 gas valve allows for single-stage control from a single-stage, 24-volt thermostat.

**WARNING: The operating valve is the prime safety shutoff. All gas supply lines must be free of dirt or scale before connecting the unit to ensure positive closure. See Hazard Levels, page 2.**

## 23. Optional 2-Stage Operation - Heating Only Application (Applies to Models SC, HSC, SCA, SCB, and SCE)

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. First stage (low fire) is factory set (not field adjustable). Both high and low stages are controlled by a Servo regulator, maintaining constant gas input under wide variations in gas supply pressure. See instructions packed with the unit for specific gas valve specifications, wiring, and operating instructions.

## 24. Optional 2-Stage Operation - Makeup Air Application (Applies to Models SC, HSC, SCE only)

Two-stage makeup air units are equipped with a two-stage gas valve, but instead of control from a two-stage room thermostat, the outlet air temperature is monitored and 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.

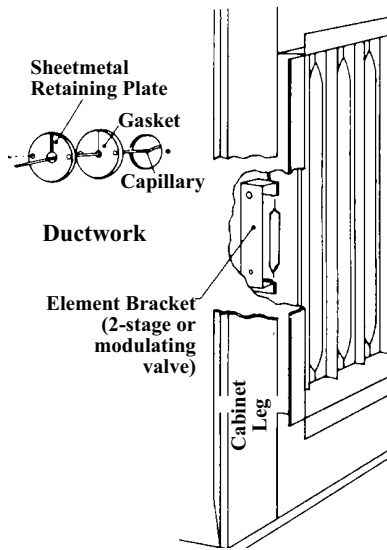
Makeup air applications are usually adjusted to discharge an outlet air temperature between 65°F and 75°F. In all applications, the allowable temperature rise of the furnace in the installation dictates the limits of the ductstat temperature setting.

Depending on the option selection, the factory-installed sensor is either field-connected by capillary tubing to the unit-mounted ductstat (Figure 23) or electrically connected to a remote electronic temperature selector (Figure 24). The remote temperature selector is available with or without a display module.

See Figure 22 for a general location of the factory-installed sensor with either the factory-mounted or the remote ductstat selector option.

## 24. Optional 2-Stage Operation - Makeup Air Application (Applies to Models SC, HSC, SCE only) (cont'd)

**Figure 22 - Duct Temperature Sensor Location**



1. Remove access panel in ductwork adjacent to control compartment access panel.
2. Element is retained by spring clips.
3. Round gasket and metal retaining plate provide airtight seal for capillary and must be removed to remove the element.

### Optional Ductstat with Capillary Tubing (Option AG3) -

The dial illustrated in Figure 23 has an adjustable range from 0° to 100°F with a fixed differential of 2-1/2°F. 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, adjust the setpoint of the ductstat to achieve the desired average outlet air temperature.

**Figure 23 - Ductstat Control in Options AG3, AG4, and AG5**

Factory set at 70°F



**Optional Ductstat with Electronic Remote Setpoint Module (Options AG15 and AG16) --** The field-installed sensing probe is field-wired to a remote temperature selector with a temperature operating range to 130°F. The remote modules and sensing probe are shipped separately for field installation. Follow the wiring diagram with the unit and the manufacturer's instructions for wiring and installation. **CAUTION:** Be sure heat/cool selector switch is set at "Heat" position. There will be one module for selecting temperature and one-stage adder module. The digital display module is optional. See Figure 24.

**Figure 24 - Remote Temperature Selector, Stage-Adder Module, and Optional Display Module for Ductstat in Two-Stage Makeup Air Control Options (Option AG15 or AG16)**



Selector Module

Adder Module

Display Module

## 25. Optional Electronic Modulation

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.

**Installation NOTE:** Sizes 350 and 400 with electronic modulation require a minimum of 6" w.c. natural gas supply pressure.

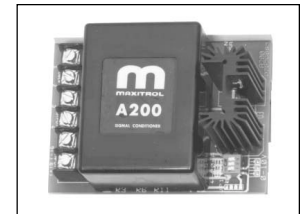
### 25A. Electronic Modulation between 50% and 100% Firing Rate (Options AG7, AG8, AG9)

Depending on the heat requirements as 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) which furnishes varying DC current to the modulating valve to adjust the gas input.

Each modulating valve is basically a regulator with 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, supplying 3.5" w.c. pressure to the main operating valve.

Refer to the wiring diagram supplied with the furnace for proper wiring connections. Electronic modulation for heating controlled by a specially designed room thermostat (60°-85°F) is identified as Option AG7 and is available on unit heater, duct furnace and packaged heater models. Electronic modulation control systems for makeup air applications controlled by a duct sensor and temperature selector (55-90°F) are identified as either Option AG8 or Option AG9. The temperature selector setting for Option AG8 is on the amplifier; Option AG9 has a remote temperature selector. Both systems are available with an override thermostat. Options AG8 and AG9 for makeup air applications apply to duct furnace and packaged systems.

### 25B. Computer Controlled Electronic Modulation between 50% and 100% Firing Rate (Option AG21)



With this option the furnace is equipped with a Maxitrol A200 signal conditioner which operates much the same way as the amplifier above to control the regulator valve. The conditioner accepts an input signal of either 4-20 milliamps or 0-10 volts from a customer-supplied control device such as a computer. With the dip switches on the conditioner in the "on" positions, the conditioner accepts a 4-20 milliamp signal. In the "off" positions, the conditioner accepts a 0-10V signal. The conditioner converts the signal to the 0 to 20 volt DC current required to control the modulating valve.

### 25C. Electronic Modulation between 20 to 28% and 100% Firing Rate, Option AG39 (patent pending) - Models SC and SCE only; not available on Size 350; available with natural gas only

Depending on the size, furnaces equipped with electronic modulation Option AG39 have a 20-28% turndown ratio. 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.

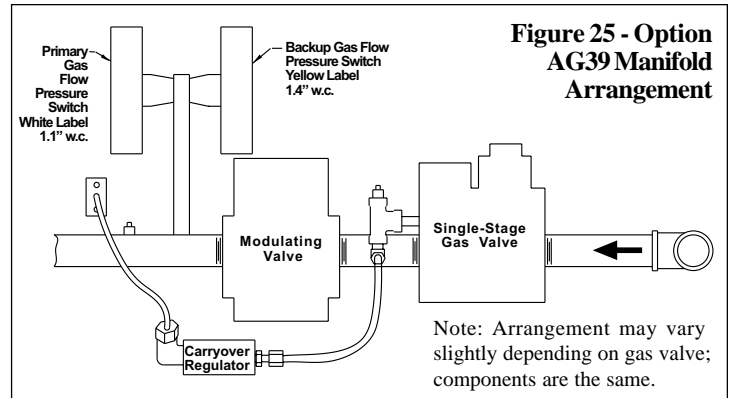
Model	Maximum Turndown %	MBH Input Range	Inlet Pressure to Modulating Valve (factory set)	Gas Supply Pressure Required
SC 100	20	20-100	3.8" w.c.	5" w.c.
SC/SCE 125	20	25-125	3.9" w.c.	5" w.c.
SC/SCE 150	27	40.3-150	3.7" w.c.	5" w.c.
SC/SCE 175	23	40.3-175	3.7" w.c.	5" w.c.
SC/SCE 200	26	51.8-200	3.9" w.c.	5" w.c.
SC/SCE 225	23	51.8-225	3.9" w.c.	5" w.c.
SC/SCE 250	28	69-250	4.0" w.c.	5" w.c.
SC/SCE 300	23	69-300	4.0" w.c.	5" w.c.
SC/SCE 400	25	100-400	4.4" w.c.	6" w.c.

Furnaces with Option AG39 have stainless steel burners, a stainless steel heat exchanger, and a stainless steel bottom pan. The gas train 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 #ES410A amplifier with a corresponding remote temperature dial (Maxitrol #ES410TD).

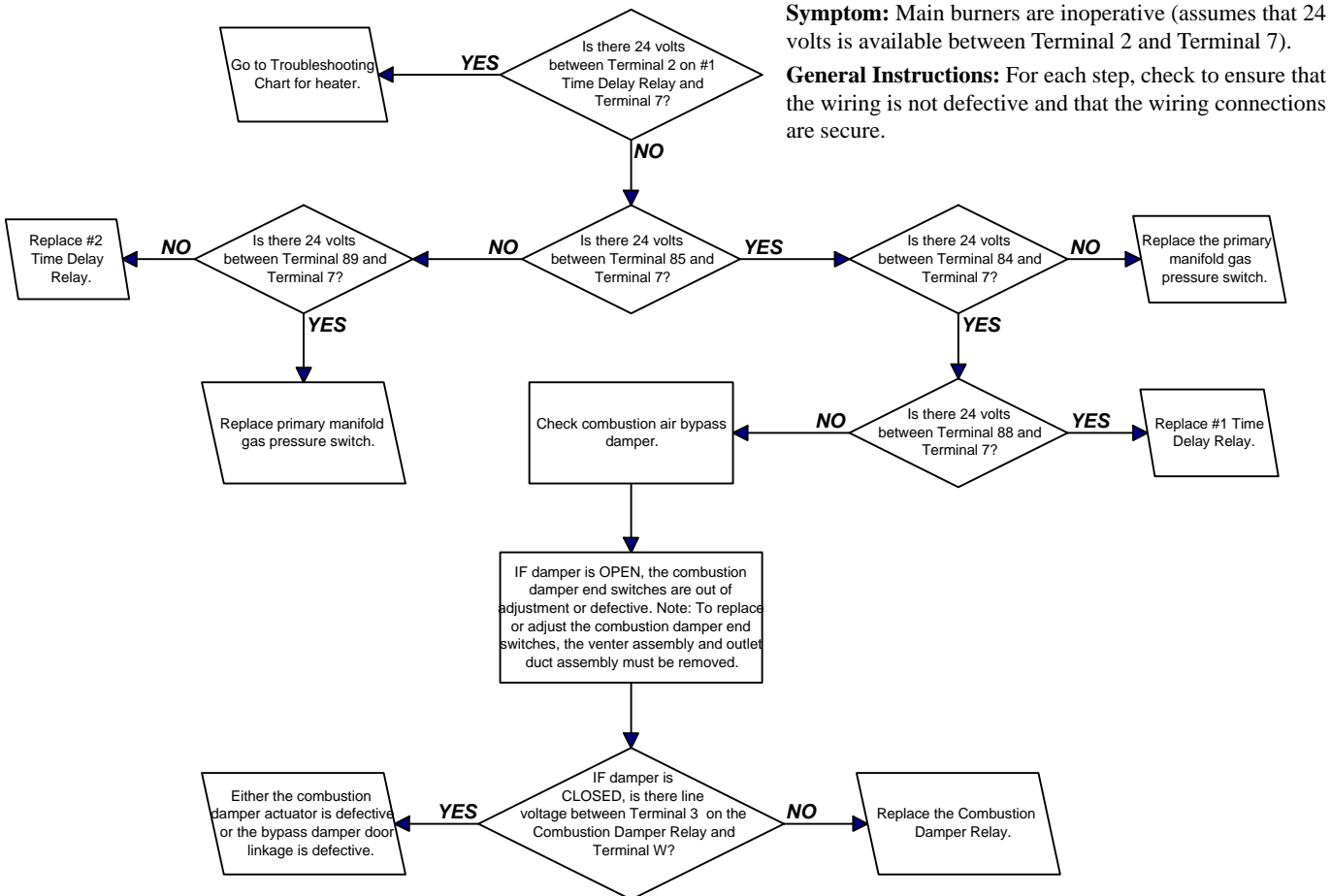
### Description of Operation of Option AG39

The gas supply 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. When the valve receives a call for heat from the amplifier and pilot is estab-

lished, 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 required to maintain the desired temperature. When the input rate is reduced enough to decrease the gas pressure to 1.1" w.c., the primary gas pressure switch in the manifold activates the solenoid that controls the bypass damper in the venter/combustion air system. The bypass damper opens diverting some of the incoming air directly into the flue duct, reducing airflow through the burner. Safety switches monitor the position of the bypass damper. When the gas pressure increases above 1.1" w.c., the bypass damper closes.



**Figure 26 - Troubleshooting Guide for Checking Bypass Combustion Air Damper Safety Circuit on Models SC and SCE with Option AG39 or AG40**





**25C. Electronic Modulation between 20 to 28% and 100% Firing Rate, Option AG39 (patent pending) - Models SC and SCE only; not available on Size 350; available with natural gas only (cont'd)**

**Combustion Air Pressure Switch Setting**

This uniquely designed modulation system requires combustion air pressure settings different from the standard system. The approximate settings for the combustion air proving switch at sea-level operation are:

Sizes w/AG39	Startup Cold	Equilibrium at Full Rate	Factory Setting
100-225	-1.3"w.c.±0.2	-1.05"w.c.±0.1	-1.0"w.c.±0.2
250-400	-1.2"w.c.±0.2	-0.95"w.c.±0.1	-.75"w.c.±0.5

**Sensor Location**

For the convenience of the installer, the duct temperature sensor is factory installed in the cabinet leg (See Figure 22, page 20). 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 higher to compensate for this reading. 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 M) from the furnace discharge.

**Wiring and Service**

For wiring, consult the wiring diagram attached to the furnace. All wires in the electrical box connecting the modulation controls must be 150°C.

This is a unique system which includes custom-built components and custom settings. If service is required, follow the general troubleshooting guide on page 27 and the special troubleshooting guide below.

**25D. Computer Controlled Electronic Modulation between 20-28% and 100% Firing Rate, Option AG40 (patent pending) - Model RP only; not available on Size 350; available with natural gas only**

With this option the furnace is equipped with a Maxitrol A200 signal conditioner (see illustration in Paragraph 25B) which accepts an input signal of either 4-20 milliamps or 0-10 volts from a customer-supplied control device such as a computer. With the dip switches on the conditioner in the "on" positions, the conditioner accepts a 4-20 milliamp signal. In the "off" positions, the conditioner accepts a 0-10V signal. The conditioner converts the signal to the 0 to 20 volt DC current required to control the modulating valve. The heater functions and is equipped in the same way as described in Paragraph 25C (Option AG39) except that with computer control the temperatures are selected through the software and there is no temperature selector or duct sensor.

**26. Pilot and Ignition Systems**

**Ignition System**  
 Natural gas units are equipped with a spark ignited intermittent safety pilot system that shuts off the pilot as flow between heat cycles. Propane units (or as an option on natural gas units) require a lockout device that stops the gas flow to the pilot if the pilot fails to light in 120 seconds. The lockout device requires manual set by interruption of the thermostat circuit. Refer to the wiring diagram supplied with the unit for pilot system identification and proper wiring. Pilot with lockout is Option AH3; spark pilot without lockout is Option AH2.

**Ignition Controller**

As part of the intermittent safety pilot systems, the ignition controller provides the high voltage spark to ignite the 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 completing the DC circuit and proving pilot flame. With pilot flame proven, the ignition controller energizes the main gas valve.

**CAUTION: Due to high voltage on pilot spark wire and pilot electrode, do not touch when energized. See Hazard Levels, page 2.**

**Pilot**

All pilots are 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 the supply line pressure. Pilot gas is supplied through the combination valve; the pilot gas flow is controlled by an adjustment screw located in the valve body. For maintenance, see Paragraph 35.

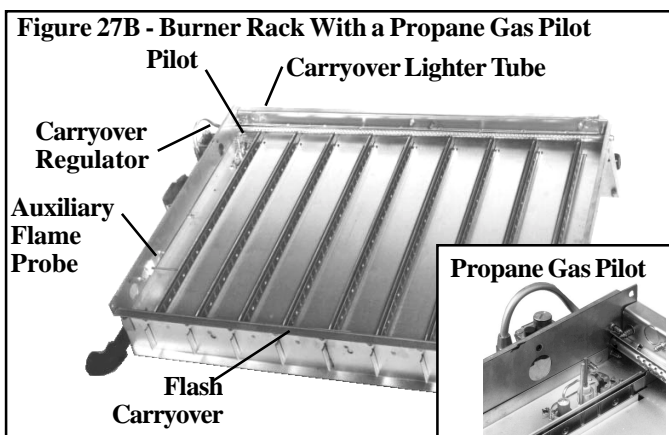
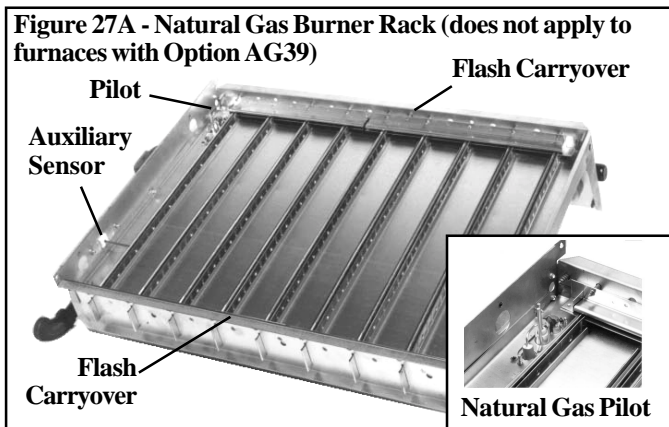
**27. Burners, Orifices, and Carryover System**

**Burners**

Individually formed steel burners capable of operating on either natural or propane gas are used in this heater. These burners have accurate, machine-formed ports to give controlled flame stability and operation without lifting or flashback. All burners are lightweight and factory mounted in an assembly which permits all of the burners to be removed as a unit for inspection or service.

**Burner Carryover Systems**

All natural gas burners (except when equipped with electronic modulation Option AG39 or AG40; see Paragraph 25) are equipped with two flash carryover systems, one on each end of the burner rack. (NOTE: A natural gas burner rack on furnaces manufactured prior to Series 6 had a gas lighter tube carryover and one flash carryover.)



All 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.

During regular service, check the main burner ports, the carryover assemblies, and the orifices for cleanliness.

### Burner Orifices

Heaters are shipped with orifices of proper size and type for gas specified. NOTE: Natural gas units have a dual flash carryover system and do not require a carryover orifice.

Model Size	Burner Orifices						Carryover Orifice	
	Qty	Natural Gas		Propane Gas		Propane Gas		
		Drill Size	P/N	Drill Size	P/N	Drill Size	P/N	
100	4	#41	11792	1.45 mm	61652	#70	9870	
125	5	#42	84437	1.45 mm	61652	#70	9870	
150	7	#44	11833	#55	11830	#65	9680	
175	7	#42	84437	1.45 mm	61652	#65	9680	
200	9	#43	11828	#55	11830	#65	9680	
225	9	#42	84437	1.45 mm	61652	#65	9680	
250	12	#44	11833	#55	11830	#59	10370	
300	12	#42	84437	1.45 mm	61652	#59	10370	
350	14	#42	84437	1.45 mm	61652	#56	9791	
400	16	#42	84437	1.45 mm	61652	#56	9791	

## 29. Check Installation and Start-Up

### Check the installation *prior to start-up*:

- Verify suspension/mounting methods and clearances. See Paragraphs 6 and 7.
- Verify that the bolts removed from the shipping clips were returned to the heater cabinet. See Paragraph 4.
- On units with ductwork, check connections. See Paragraph 8.
- Check venting. See Paragraph 13. Be sure that flue discharge and combustion air openings are free of obstructions. Be sure electrical entrance and gas supply pipe openings are sealed.
- Be sure electrical entrance and gas supply pipe openings are sealed.
- Be sure that all condensate drains are open. See Paragraph 9.

### Electrical Checks:

- Be certain the electrical supply matches voltage rating of the furnace. (Refer to the rating plate.)
- Check all field wiring against the wiring diagram. Be sure that wire gauges are as required for the electrical load.
- Check that fuses or circuit breakers are in place and sized correctly.

### Gas Supply Checks:

- Check piping for leaks and proper gas line pressure. Bleed gas lines of trapped air. See Paragraph 14.
  - a) Turn manual shutoff valve to off position.
  - b) Turn gas supply on.
  - c) Observe gas meter for movement, or
  - d) Attach pressure gauge readable to .1" w.c. and after turning gas on for ten seconds, turn gas supply off. No change in pressure should occur over a three-minute period.
  - e) If either c) or d) above indicate a leak, locate leak by brushing a soapy solution on all fittings. Bubbles will appear at a leak. Repair and repeat tests.

### Blower Model Checks:

- Check blower pulley and motor pulley to be sure they are secure to the shafts. Check belt tension and alignment. See Paragraph 18.
- Check the rotation of the blower. See Paragraph 18.
- Verify the removal of all shipping supports. See Paragraph 4.

## 28. Burner Air Shutters

Air shutters are required on propane units, optional on natural units. A slotted screw on the end of the manifold bracket moves air shutters and adjusts all burners simultaneously (See Figure 27). Turning the screw clockwise opens the air shutter; counterclockwise closes shutter.

After the furnace has been in operation for 15 minutes, close air shutter until the flame turns yellow. Open shutter until yellow disappears.

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

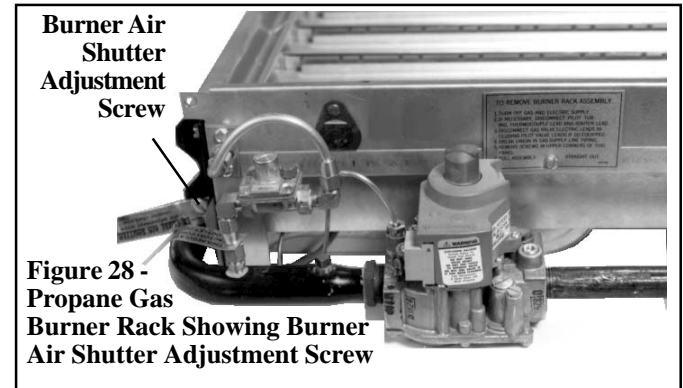


Figure 28 - Propane Gas Burner Rack Showing Burner Air Shutter Adjustment Screw

- Model SCE with optional dampers - Check damper linkage. See Paragraph 31.

### Start-Up

- Close all panels tightly. Turn electric and gas supply on to the furnace. Adjust the thermostat or ductstat so that a call for heat exists. Observe for complete sequencing of safety pilot and ignition.

### Operating Sequence

1. Set the thermostat switch at its lowest setting.
2. Turn on power.
3. Turn on the manual gas valves.
4. Set thermostat at desired setting.
5. Thermostat calls for heat
  - (a) The venter motor is energized after 15-second (approximate) time delay.
  - (b) Venter flow switches from N.C. to N. O. contacts, energizing the pilot gas valve and spark gap to produce a pilot flame on each operating cycle. The sensing probe proves the presence of the pilot flame and energizes the safety switch portion of the control. The switch action de-energizes the spark gap and energizes the main valve. The main gas ignites and the unit fires at full rate.
  - (c) If the flame is extinguished during main burner operation, the safety switch closes the main valve and recycles the spark gap. On unit equipped with a G770NGC-4 controller which includes lockout control, if the pilot is not established within 120 seconds (approximately), the unit locks out and must be reset by interrupting the power to the control circuit (See Lighting Instructions).
6. Fan control (optional on duct furnace models) senses heat exchanger temperature, energizing the blower or fan motor.
7. Thermostat is satisfied.
  - (a) Solenoid gas valve de-energized.
  - (b) Pilot gas valve de-energized.
  - (c) Ignition controller de-energized.
  - (d) Time delay relay keeps venter motor on for approximately one minute (post purge).
8. To shut down, set thermostat to lowest setting. Fan control keeps blower or fan on while unit is hot.



## 29. Check Installation and Start-Up (cont'd)

### Check installation *after* start-up:

- Observe burner flame at full fire. Natural gas flame should be about 1-1/2" in height with blue coloring. Propane gas flame should be approximately the same length with blue coloring. Yellow tipping may appear on propane gas. If yellow extends beyond 1/2 to 3/4", adjust air shutters. See Paragraph 28. If shutter adjustment will not reduce yellowing, check for gas leaks at the control manifold or orifice fitting.
- Turn the unit off and on, pausing two minutes between each cycle. Observe for 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 a manometer or slant gauge readable up to 14" w.c., check orifice manifold for operating pressure on full fire. Natural gas should be 3.5" w.c. at this point. Propane gas should be 10" w.c. at this point. Variations from these pressures are not recommended, as ignition and efficiency performance can be adversely affected by improper pressure adjustment. See Paragraph 14.
- Model SCE - If the system is equipped with an optional dirty filter switch, set the switch. Follow the instructions in Paragraph 31A.
- Place "Owner's Envelope" containing Limited Warranty Card, this booklet, and any optional information in an accessible location near the heater. Follow the instructions on the envelope.

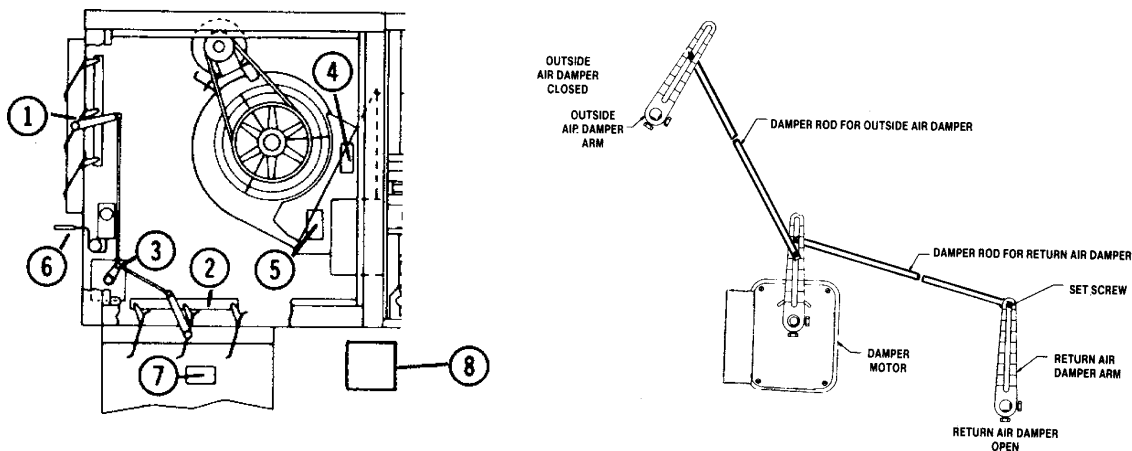
**DANGER: The gas burner in this gas-fired equipment is designed and equipped to provide safe and economically controlled complete combustion. However, if the installation does not permit the burner to receive the proper supply of combustion air, complete combustion may not occur. The result is incomplete combustion which produces carbon monoxide, a poisonous gas that can cause death. Safe operation of separated-combustion, indirect-fired gas burning equipment requires a sealed, properly operating vent system which vents all flue products to the outside atmosphere. FAILURE TO PROVIDE PROPER VENTING WILL RESULT IN A HEALTH HAZARD WHICH COULD CAUSE SERIOUS PERSONAL INJURY OR DEATH.**

Install either the horizontal or vertical combustion air/vent system illustrated in Paragraph 13 using the concentric adapter supplied. 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; MAINTAIN IT IN PROPER OPERATING CONDITION.**

## OPTIONAL EQUIPMENT

### 30. Optional Dampers and Controls (See Wiring Diagram supplied with unit) - Applies to Packaged System (Model SCE)

Figure 30 -  
Control  
Locations  
for Air  
Inlet/  
Damper  
Options



- |                       |                         |
|-----------------------|-------------------------|
| 1. Outside Air Damper | 5. Potentiometer        |
| 2. Return Air Damper  | 6. Mixed Air Controller |
| 3. Damper Motor       | 7. Warmup Control       |
| 4. Potentiometer      | 8. Remote Potentiometer |

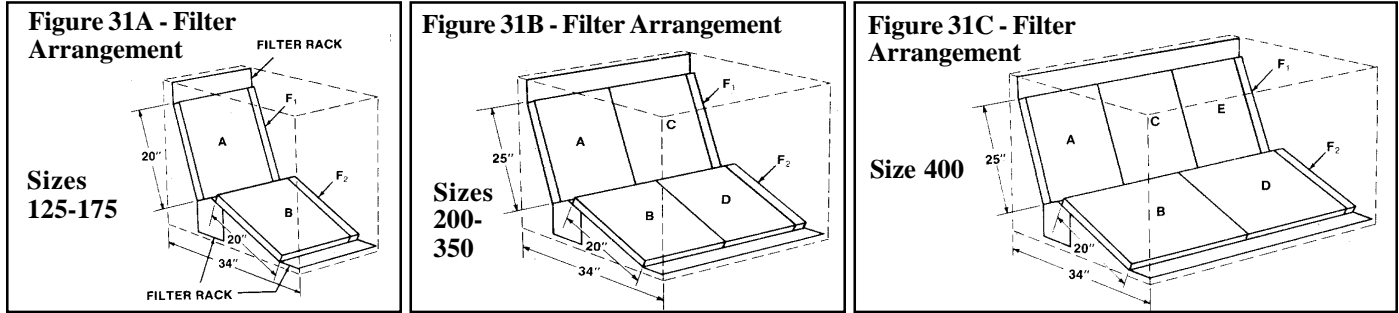
NOTE: The illustration is intended to show location only of various air control accessories and does not represent suggested combinations of accessories.

**Damper Linkage** -- 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 must be adjusted prior to use.**

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

# 31. Optional Filter Rack and Filters - Applies to Model SCE

Filter racks and filters are factory installed optional equipment; 1" disposable filters are provided. The filter rack is adaptable for using field-provided, 2" filters.



Filter and Filler Sizes for Indoor Models	Heater Size	Filters					Metal Fillers		Figure Reference for Qty of Filters and Fillers
		A	B	C	D	E	F1	F2	
	125	20x20	20x20	--	--	--	--	--	31A
	150, 175	20x25	20x25	--	--	--	13/16	13/16	
	200, 225	16x25	16x20	16x25	16x20	--	--	--	31B
	250, 300	20x25	20x20	20x25	20x20	--	--	--	
	350	20x25	20x25	20x25	20x20	--	4-13/16	--	
400	16x25	20x25	16x25	20x25	16x25	2-5/8	1-1/16	31C	

## 31A. Optional Dirty Filter Switch - Model SCE

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.

This switch is located in the furnace section. The switch setpoint must be manually set.

### Instructions for Setting Dirty Filter Switch

With clean filters in place, blower doors closed, and blower in operation, decrease pressure setting by adjusting set screw on switch clockwise until the filter light is energized or screw is bottomed out. At that point, adjust the set screw three full turns counterclockwise or until the screw is top-ended. At that setpoint the filter light will be activated at approximately 50% filter blockage.

# 32. Optional Downturn Nozzle Packages - Apply to Unit Heaters Only (Models SCA, SCB)

Unit heaters may be specified with optional downturn air nozzles to direct the discharge air. The nozzles are shipped separately for field assembly and installation. The horizontal louvers are removed from the heater and re-installed into the outlet of the downturn nozzle. Follow the instructions in Figure 32.

Option	CD2	CD3
Dimension X	13" (330mm)	23-1/2" (597mm)
Range of Air Deflection	25°-65°	50°-90°

**Downturn Nozzle Assembly and Installation Instructions:**

- Remove the louver frame assembly from the heater.
- Assemble the nozzle sides to the top using six #10x1/2" long sheetmetal screws. **If installing Option CD3**, assemble the second set of sides to the additional top. Bolt the two assemblies together extending the length of the nozzle.
- Position the nozzle top and sides assembly to the outlet flange of the heater. Mark and drill 9/32" diameter holes at points "A".
- Position the gasket between the nozzle top and the flange. Attach the nozzle assembly to the unit using 1/4" bolts and nuts.
- Mark and drill 9/32" diameter holes in the louver frame at points "B".
- Install the louver frame in the nozzle outlet using 1/4" bolts and nuts.

NOTE: Outlet nozzle options do not include louvers. Re-install standard horizontal louvers supplied with the unit in the nozzle outlet. Optional vertical louvers may be added for additional air pattern spread on a Model SCB heater with either CD2 or CD3 or a Model SCA heater with Option CD2. Do not install vertical louvers with Option CD3 on a Model SCA heater.

**Figure 32 - Optional Downturn Nozzles Apply to Models SCA 100-400 and SCB 125-400**

# SERVICE AND MAINTENANCE

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 four months. If the furnace is operating in an area where an unusual amount of dust or soot or other impurities are present in the air, more frequent inspection is recommended.

**WARNING: If you turn off the power supply, turn off the gas. See Hazard Levels, page 2.**

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

## 33. Vent/Combustion Air System

Check at least once a year. Inspect all joints, seams and terminal caps. Replace any defective parts.

## 34. Burner Rack Removal Instructions

1. Turn off the gas supply.
2. Turn off the electric supply.
3. Remove control access side panel.
4. Disconnect ignition and flame sensor leads.
5. Mark and disconnect electric valve leads.
6. Uncouple the union in the gas supply.
7. Remove sheet metal screws in the top corners of the burner rack assembly.
8. Pull "drawer-type" burner rack out of the furnace.

### To disassemble the burner rack:

1. Remove Carryover System --  
**Natural Gas** - remove the flash carryover system from the "manifold end" of the burner rack  
NOTE: Natural gas burner racks manufactured prior to Series 6 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.  
**Propane Gas** - break the lighter tube connection at the regulator and remove the lighter tube orifice supply tubing; remove the retaining screws in the drip shield and the shield; remove the retaining screws and slide out the lighter tube.
2. Pull main burners horizontally away from injection opening and lift out.
3. Remove manifold bracket screws and remove manifold.
4. Change main burner orifices, if necessary.
5. Remove screws and lift out pilot burner.

Follow the instructions in Paragraph 35 to clean. To re-assemble and replace, reverse the above procedures being careful not to create any unsafe conditions.

## 35. Cleaning Pilot and Burners

**CAUTION: When cleaning, wearing eye protection is recommended.**

In the event the pilot flame is short and/or yellow, check the pilot orifice for blockage caused by lint or dust accumulation. Remove the pilot orifice and clean with air pressure. DO NOT REAM THE ORIFICE. Check and clean the aeration slot in the pilot burner.

Clean the metal sensing probe and the pilot hood with an emery cloth and wipe off the ceramic insulator. Check the spark gap; spark gap should be maintained to .100". After the pilot is cleaned, blow any dirt away with compressed air.

Main burners may be cleaned using air pressure. Use an air nozzle to blow out scale and dust accumulation from the burner ports. Alternately blow through the burner ports and the venturi. Use a fine wire to dislodge any stubborn particles. Do not use anything that might change the port size.

Clean the burner rack carryover systems with air pressure.

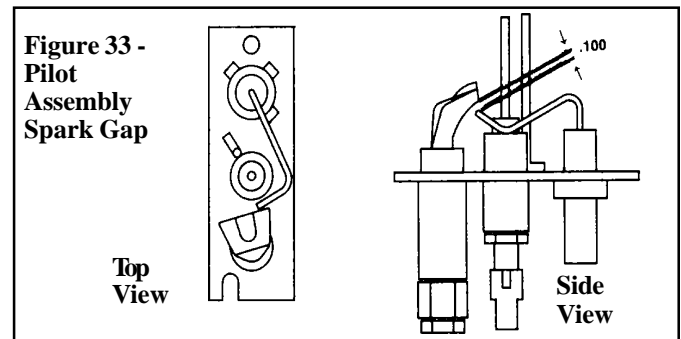
## 36. Spark Ignition System

The ignition controller provides the high voltage spark to ignite the pilot service and also acts as the flame safety device. After ignition of the pilot gas, the controller electronically senses the pilot flame. A separate solid metal probe in the pilot burner assembly is used to sense the flame. A low voltage DC electrical signal is imposed on the metal probe which is electrically insulated from ground. When the pilot flame impinges on the sensing probe, the flame acts as a conduction path to ground. This completes the DC circuit; the ignition controller responds by energizing the main gas valve.

**CAUTION: Due to high voltage on pilot spark wire and pilot electrode, do not touch when energized. See Hazard Levels, page 2.**

If no spark occurs, check the following:

- a) Voltage between blue and white terminals (non-lockout type pilot) and Terminals 2 and 5 (lockout type pilot) on the ignition controller should be at least 20 volts and no higher than 32 volts. Refer to Troubleshooting (Paragraph 41) if no voltage is observed.
- b) Short to ground in the high tension lead and/or ceramic insulator.
- c) Pilot spark gap should be approximately .100". (See Figure 33.)



**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.

If the above conditions are normal and no spark occurs, replace the ignition controller.

If the main gas valve fails to open with a normal full size pilot flame established, check for the following:

- a) If voltage between black and brown leads on the main gas valve is 20 to 32 VAC and there is no main gas flow with the built-in manual valve in FULL OPEN position, the main valve is defective.
- b) If there is no voltage between black and brown leads on the main gas valve, check for disconnected or shorted flame sensor lead or flame sensor probe.

When the above conditions are normal and the main gas flow is still off, the ignition controller is probably defective. Do not attempt to service the ignition controller; it does not contain any replaceable components.

## 37. Cleaning the Heat Exchanger

To clean the inner surfaces of the heat exchanger, remove the burner rack assembly (See Paragraph 34.) permitting access to the inside of the heat exchanger tubes.

Clean the tubes using a 1/2" diameter furnace brush. A mirror and flashlight are helpful in examining the narrow section of each tube. Remove any accumulated dust and soot.

### 38. Venter Motor

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

### 39. Air Circulation System

Check blower pulley and motor pulley to be sure they are secured to the shaft. Check belt condition and belt tension (See Paragraph 18).

### 40. Limit Control Check

With the heater on, completely block off the distribution air. The limit control should open within a few minutes, shutting off gas supply to the main burners.

## 41. Troubleshooting

**Reference:** If the furnace is equipped with electronic modulation Option AG39 or AG40, consult the troubleshooting chart on page 21.

TROUBLE	PROBABLE CAUSE	REMEDY
<b>Venter motor will not start</b>	<ol style="list-style-type: none"> <li>No power to the furnace.</li> <li>No 24-volt power to venter relay.</li> <li>Venter relay defective.</li> <li>Defective motor or capacitor.</li> </ol>	<ol style="list-style-type: none"> <li>Turn on power, check supply fuses or circuit breaker.</li> <li>Turn up thermostat, check control transformer output. Check for loose or improper wire connections.</li> <li>Replace.</li> <li>Replace defective part.</li> </ol>
<b>Pilot will not light -- Venter operating</b>	<ol style="list-style-type: none"> <li>Manual valve not open.</li> <li>Air in gas line.</li> <li>Dirt in pilot orifice.</li> <li>Gas pressure too high or too low.</li> <li>Kinked pilot tubing.</li> <li>Pilot valve does not open.</li> <li>No spark:               <ol style="list-style-type: none"> <li>Loose wire connections</li> <li>Transformer failure.</li> <li>Incorrect spark gap.</li> <li>Spark cable shorted to ground.</li> <li>Spark electrode shorted to ground.</li> <li>Drafts affecting pilot.</li> </ol> </li> <li>Ignition control not grounded.</li> <li>Faulty ignition controller.</li> <li>Optional lockout device interrupting control circuit by above causes.</li> <li>Faulty combustion air proving switch.</li> </ol>	<ol style="list-style-type: none"> <li>Open manual valve.</li> <li>Bleed gas line.</li> <li>Remove and clean with compressed air or solvent.</li> <li>Adjust supply pressure. (See Paragraph 14).</li> <li>Replace tubing.</li> <li>If 24 volt is available at the valve, replace valve.</li> <li> <ol style="list-style-type: none"> <li>Be certain all wires connections are solid.</li> <li>Be certain 24 volts is available.</li> <li>Maintain spark gap at .100".</li> <li>Replace worn or grounded spark cable.</li> <li>Replace pilot if ceramic spark electrode is cracked or grounded.</li> <li>Make sure all panels are in place and tightly secured to prevent drafts at pilot.</li> <li>Make certain ignition control is grounded to furnace chassis.</li> <li>If 24 volt is available to the ignition controller and all other causes have been eliminated, replace ignition control.</li> </ol> </li> <li>Reset lockout by interrupting control at thermostat.</li> <li>Replace combustion air proving switch.</li> </ol>
<b>Pilot lights, main valve will not open</b>	<ol style="list-style-type: none"> <li>Manual valve not open.</li> <li>Main valve not operating.               <ol style="list-style-type: none"> <li>Defective valve.</li> <li>Loose wire connections.</li> </ol> </li> <li>Ignition control does not power main valve.               <ol style="list-style-type: none"> <li>Loose wire connections.</li> <li>Flame sensor grounded. (Pilot lights - spark continues)</li> </ol> </li> <li>Gas pressure incorrect.</li> <li>Cracked ceramic at sensor.</li> <li>Faulty ignition controller.</li> </ol>	<ol style="list-style-type: none"> <li>Open manual valve.</li> <li> <ol style="list-style-type: none"> <li>If 24 volt is measured at valve connections and valve remains closed, replace valve.</li> <li>Check and tighten all wiring connections.</li> </ol> </li> <li> <ol style="list-style-type: none"> <li>Check and tighten all wiring connections.</li> <li>Be certain flame sensor lead is not grounded or insulation or ceramic is not cracked. Replace as required.</li> <li>Adjust gas pressure. (See Paragraph 14.)</li> <li>Replace sensor.</li> <li>See Paragraph 36. If all checks indicate no other cause, replace ignition controller. <b>Do not</b> attempt to repair the ignition controller. This device has no field replaceable parts.</li> </ol> </li> </ol>
<b>No heat (Heater Operating)</b>	<ol style="list-style-type: none"> <li>Dirty filters in blower system.</li> <li>Incorrect manifold pressure or orifices.</li> <li>Cycling on limit control.</li> <li>Improper thermostat location or adjustment.</li> <li>Belt slipping on blower</li> </ol>	<ol style="list-style-type: none"> <li>Clean or replace filters.</li> <li>Check manifold pressure (See Paragraph 14).</li> <li>Check air throughput (See Paragraph 12).</li> <li>See thermostat manufacturer's instructions.</li> <li>Adjust belt tension</li> </ol>
<b>Cold air On Startup</b>	<ol style="list-style-type: none"> <li>Fan control improperly wired</li> <li>Defective fan control.</li> </ol>	<ol style="list-style-type: none"> <li>Connect as per wiring diagram.</li> <li>Replace fan control.</li> </ol>
<b>During Operation</b>	<ol style="list-style-type: none"> <li>Incorrect manifold pressure.</li> <li>Blower set for too low temperature rise.</li> </ol>	<ol style="list-style-type: none"> <li>Check manifold line pressure (See Paragraph 14).</li> <li>Slow down blower or increase static pressure.</li> </ol>

*continued on page 28*

# SERVICE AND MAINTENANCE (cont'd)

## 41. Troubleshooting (cont'd)

TROUBLE	PROBABLE CAUSE	REMEDY
Motor will not run	<ol style="list-style-type: none"> <li>1. Circuit open</li> <li>2. Fan control inoperative</li> <li>3. Contactor inoperative</li> <li>4. Defective motor.</li> </ol>	<ol style="list-style-type: none"> <li>1. Check wiring and connections.</li> <li>2. Replace fan control.</li> <li>3. Replace contactor.</li> <li>4. Replace motor.</li> </ol>
Motor turns on and off while burner is operating (See below)	<ol style="list-style-type: none"> <li>1. Fan control heater element improperly wired.</li> <li>2. Defective fan control</li> <li>3. Motor overload device cycling</li> <li>4. 3-phase motor rotating in opposite direction</li> </ol>	<ol style="list-style-type: none"> <li>1. Connect as per wiring diagram.</li> <li>2. Replace fan control.</li> <li>3. Check motor load against motor rating plate. Replace motor or overload device.</li> <li>4. Interchange two legs of supply connections.</li> </ol>
Motor cuts out on overload	<ol style="list-style-type: none"> <li>1. Improper motor pulley adjustment</li> <li>2. Improper static pressure on duct system</li> <li>3. Low voltage</li> </ol>	<ol style="list-style-type: none"> <li>1. See instructions on air throughput (See Paragraph 12).</li> <li>2. Adjust dampers in duct system.</li> <li>3. Check power supply.</li> </ol>

### FOR SERVICE OR REPAIR, FOLLOW THESE STEPS IN ORDER:

**FIRST:** Contact the installer.

Name \_\_\_\_\_

Address \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Phone \_\_\_\_\_

**SECOND:** Contact the nearest distributor (See Yellow Pages). If no listing, contact Authorized Factory Representative, 1-800-695-1901 (Press 1).

**THIRD:** Contact: REZNOR®/Thomas & Betts Corporation  
 150 McKinley Avenue  
 Mercer, PA 16137  
 Phone: (724) 662-4400

Model No. \_\_\_\_\_

Unit Serial No. \_\_\_\_\_

Date of Installation \_\_\_\_\_

