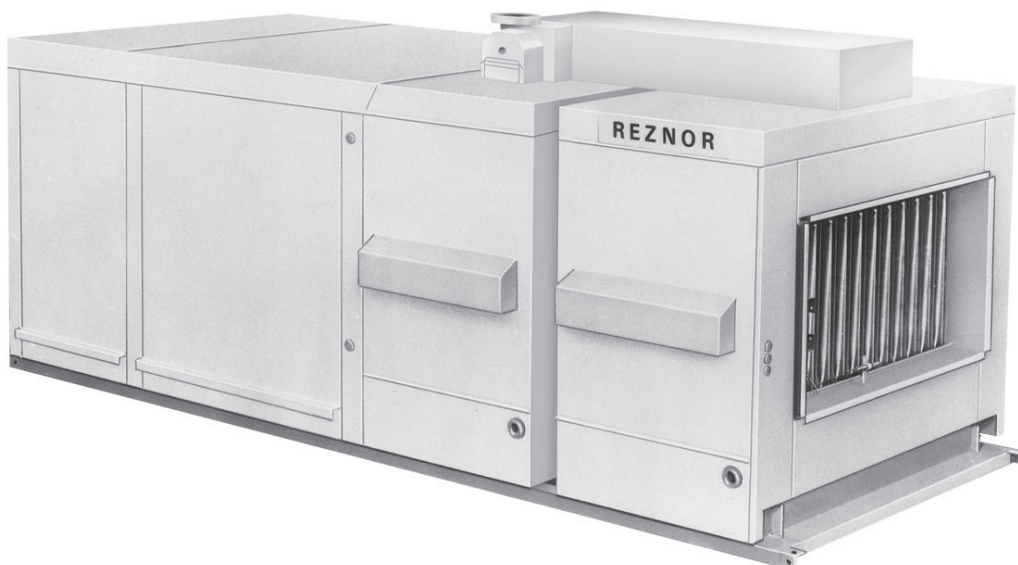


GAS-FIRED AIR HANDLER INSTALLATION, OPERATION, AND MAINTENANCE

DISCONTINUED MODELS PGBL AND RGBL



⚠ DANGER ⚠

FIRE OR EXPLOSION HAZARD

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

WHAT TO DO IF YOU SMELL GAS

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

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

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1.0 General

1.1 Hazard Labels and Notices

There are warning labels on the unit and throughout this manual. For your safety, read the definitions below and comply with all boxes labeled **CAUTION**, **WARNING**, and **DANGER** during installation, operation, maintenance, and service of this heater.

Definitions of HAZARD INTENSITY LEVELS used in this Manual

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.

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, above.

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: To ensure safety, follow lighting instructions located on the outlet box cover. See Hazard Levels, above.

1.2 General Installation Information

1.3 Warranty

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. The instructions in this manual apply to Reznor® Models PGBL, CRGBL, RPBL, and RPDBL.

Refer to the limited warranty form in the "Literature Bag".

WARRANTY: Warranty is void if.....

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

1.4 Installation Codes

The duct furnaces in the Reznor® models covered in this manual are design-certified to ANSI and CSA standards by the Canadian Standards Association. The duct furnaces in Models PGBL, CRGBL, RPBL and RPDBL are approved for installation in the United States. The duct furnaces in Models PGBL, RPBL and RPDBL are approved for installation in Canada. All furnaces are approved for use with either natural gas or propane. The type of gas for which the furnace is equipped and the correct firing rate are shown on the rating plate attached to the unit. Electrical characteristics are shown on the unit rating plate.

These units must be installed in accordance with local building codes. In the absence of local codes, in the United States, the unit must be installed in accordance with the National Fuel Gas Code NFPA/ANSI Z223.1 (latest edition). A Canadian installation must be in accordance with the CSA B149.1 Natural Gas and Propane Installation Code. 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 NFPA No. 409 (latest edition), Standard for Aircraft Hangars; in public garages in accordance with NFPA No. 88A (latest edition), Standard for Parking Structures; and for repair garages in accordance with NFPA No. 88B (latest edition), Standard for Repair Garages. In Canada, installations in aircraft hangars, repair garages, and parking garages should be in accordance with the requirements of the enforcing authorities and in accordance with CSA B149 codes.

2.0 Furnace Location

2.1 General Requirements and Recommendations

Location must comply with the clearances listed in Paragraph 4.1.2. 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.

There are a variety of factors, such as system application, building structure, dimensions, and weight, that contribute to selecting the location. If equipped with an outside air hood, it is recommended that the inlet to the hood not be facing into the prevailing wind.

Read the installation information in this manual and select a location that complies with the requirements.

CAUTION: Do not locate an indoor Model PGBL unit where it may be exposed to water spray, rain, or dripping water.

2.0 Furnace Location (cont'd)

2.1 General (cont'd)

FIGURE 1 - Package Arrangements by Model and Size

Package Configurations

Key: Blower Cabinet  Furnace Section 		
<u>Model/Size</u> PGBL 400 CRGBL 400 RPBL 400  	<u>Model/Sizes</u> PGBL 800 CRGBL 500, 600, 700, 800 RPBL 500, 600, 700, 800   	<u>Model/Size</u> RPDBL 800    
<u>Model/Sizes</u> PGBL 1200 CRGBL 1050, 1200 RPBL 1050, 1200    	<u>Model/Sizes</u> RPDBL 1000, 1200, 1400, 1600      	

2.2 Combustion Air Requirements

2.2.2 Combustion Air Requirements for Indoor Model PGBL

2.2.1 Hazards of Chlorine

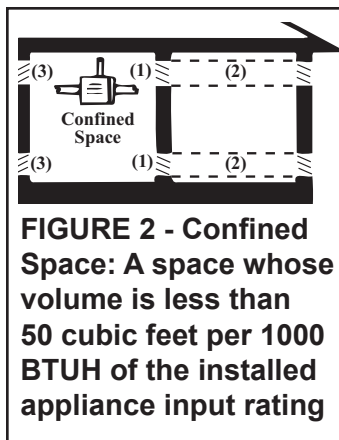
The presence of chlorine vapors in the combustion air of gas-fired heating equipment presents a potential corrosion hazard. Chlorine will, when exposed to flame, precipitate from the compound, usually freon or degreaser vapors, and go into solution with any condensation that is present in the heat exchanger 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 the furnace with regard to exhausters or prevailing wind direction. Remember, chlorine is heavier than air. This fact should be kept in mind when determining installation locations of heating equipment and building exhaust systems.

The duct furnaces in this packaged system are designed to take combustion air from the space in which the furnace is installed. Combustion air enters through the screened air intakes located in each furnace section access door. The air that enters into the combustion process is then vented to the outdoors. Sufficient air must enter the equipment location to replace the air exhausted through the vent system. Modern construction methods involve the greater use of insulation, improved vapor barriers and weather stripping, with the result that buildings generally are much tighter structurally than they have been in the past. The combustion air supply for gas-fired equipment can be affected by these construction conditions because infiltration that would have existed in the past may not be adequate. Extensive use of exhaust fans aggravates the situation. In the past the filtration of outside air assumed in heat loss calculations (one air change per hour) was assumed to be sufficient. However, current construction methods may now require the introduction of outside air through wall openings or ducts.

Requirements for combustion air and ventilation air depend upon whether the unit is located in a confined or unconfined space. An "unconfined space" is defined as a space whose volume is not less than 50 cubic feet per 1000 BTUH of the installed appliance. Under all conditions, enough air must be provided to ensure there will not be a negative pressure condition within the equipment room or space. A positive seal must be made in all return-air connections and ducts. Even a slight leak can create a negative pressure condition in a confined space and affect combustion.

WARNING: Model PGBL indoor unit is designed to take combustion air from the space in which the furnace is installed and is not designed for connection to outside combustion air intake duct. Use of outside air ducts voids the warranty and could cause hazardous operation. See Hazard Levels, page 2.



2.2.3 Combustion Air for Outdoor Models

3.0 Uncrating and Preparation

3.2 Preparing for Installation

Shipped-Separate Components

Indoor Furnace Located in a Confined Space

Do not install a unit in a confined space without providing wall openings leading to and from the space. Provide openings near the floor and ceiling for ventilation and air for combustion as shown in **FIGURE 2**, depending on the combustion air source as noted in Items 1, 2 and 3.

Add total BTUH of all appliances in the confined space and divide by figures below for square inch free area size of each (top and bottom) opening.

- 1. Air from inside the building** - openings 1 square inch free area per 1000 BTUH. Never less than 100 square inches free area for each opening. See (1) in **FIGURE 2**.
- 2. Air from outside through duct** - openings 1 square inch free area per 2000 BTUH. See (2) in **FIGURE 2**.
- 3. Air direct from outside** - openings 1 square inch free area per 4000 BTUH. See (3) in **FIGURE 2**.

NOTE: For further details or other methods on supplying combustion air to confined space, see National Fuel Gas Code ANSI Z223.1a (latest edition).

The combustion air inlet is a carefully designed screened opening located on the side of each furnace section on or just above the control access panel.

On power-vented models, the flue opening located directly above the air intake is designed to discourage recirculation of combustion products.

3.1 Uncrating and Inspecting

This furnace was test operated and inspected at the factory prior to crating and was in operating condition. If the furnace has incurred any damage in shipment, document the damage with the transporting agency and immediately contact an authorized Reznor distributor. If you are an authorized Distributor, follow the FOB freight policy procedures as published by Reznor for Reznor products.

Check the rating plate for the gas specifications and electrical characteristics of the furnace to be sure that they are compatible with the gas and electric supplies at the installation site.

Read this booklet and become familiar with the installation requirements of your particular model. If you do not have knowledge of local requirements, check with the local gas company or any other local agencies who might have requirements concerning this installation.

Before beginning, make preparations for necessary supplies, tools, and manpower. Check to see if there are any field-installed options that need to be assembled to the furnace prior to installation.

Some gas control options will 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.

Controls	Option AG	Shipped-Separate Components
Heating	7	Thermostat, P/N 48033
Gas Control	10	Thermostat, P/N 91919
Options	11	Thermostat, P/N 93435
Makeup Air	3, 8	Control Switch, P/N 29054
Gas Control	9	Remote Temperature Selector, P/N 48042
Options		Control Switch, P/N 29054
(If an optional remote console is ordered, the control switch is mounted on the console.)	15	Remote Temperature Selector, P/N 115848 Stage-Adder Module, P/N 115849 (one furnace - 1; two furnaces - 3; three furnaces - 5) Control Switch, P/N 29054
	16	Remote Temperature Selector, P/N 115848 Stage-Adder Module, P/N 115849 (one furnace - 1; two furnaces - 3; three furnaces - 5) Remote Display Module, P/N 115852 Control Switch, P/N 29054
	17, 19, 23	Remote Temperature Selector, P/N 115848 Stage-Adder Module, P/N 115849 (two furnaces - 1; three furnaces - 2; four furnaces - 3) Control Switch, P/N 29054
	18, 20, 24	Remote Temperature Selector, P/N 115848 Stage-Adder Module, P/N 115849 (two furnaces - 1; three furnaces - 2; four furnaces - 3) Remote Display Module, P/N 115852 Control Switch, P/N 29054
	39, 41	Remote Temperature Selector, P/N 174849

3.0 Uncrating and Preparation (cont'd)

3.2 Preparing for Installation (cont'd)

4.0 Dimensions and Clearances

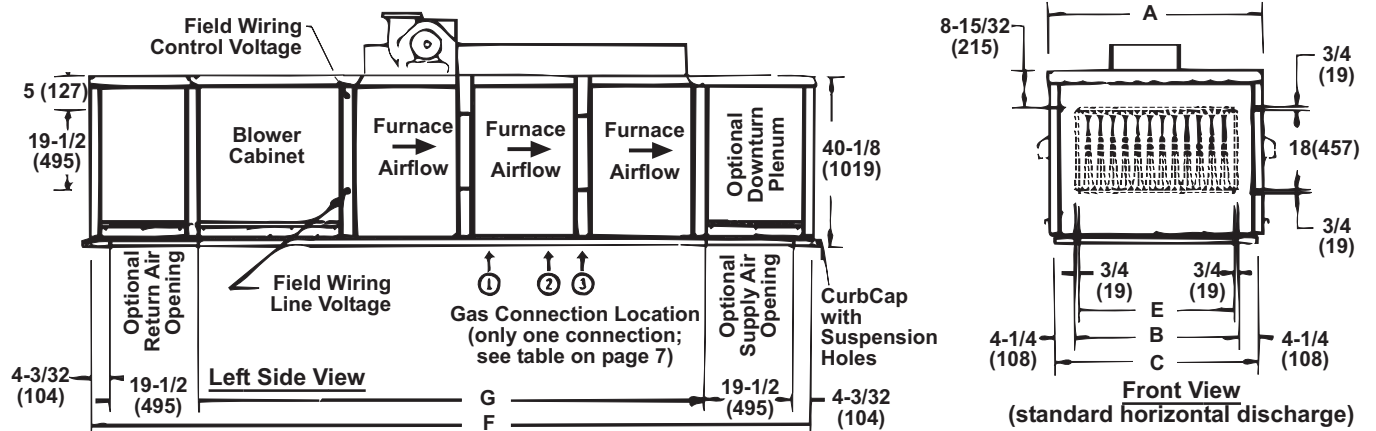
Shipped-Separate Components (cont'd)

Before beginning installation, be sure that any other shipped-separate options ordered are available at the site. Other shipped-separate options could include a gas shutoff valve, a thermostat, an optional control switch, a remote console, a gas supply regulator, a vertical vent extension, a screened outside air hood, a roof curb, and/or a disconnect switch. If ordered with an evaporative cooling module, the module is shipped separately. If ordered with a cooling coil module, the module is shipped separately. A drain and fill or freeze kit and a water hammer arrestor are shipped-separate options for an evaporative cooling module.

4.1 Dimensions

4.1.1 Dimensions of Model PGBL

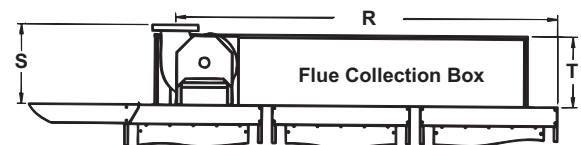
FIGURE 3 - Dimensions of Indoor Model PGBL (inches $\pm 1/8$ /mm ± 3) (See Key to Dimensions on page 7.)



Downturn Note: To provide complete information, the drawings and dimensions illustrate both the indoor and outdoor system with and without an optional downturn plenum cabinet. Indoor installations requiring vertical discharge will most often have a field-fabricated downturn nozzle instead of the factory-installed plenum cabinet.

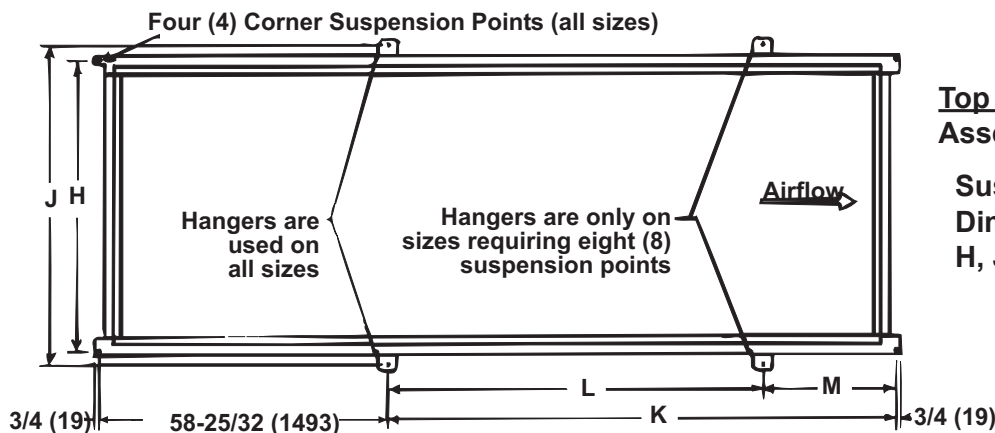
Top View of Furnace Sections (Vent Dimensions N, P, R, S, T)

Top Left Side View



Top View of Curb Cap Assembly

Suspension Dimensions H, J, K, L, M



Dimension Key for Figure 3, PGBL Dimensions (page 6)	
A	Width of Cabinet
B	Width of Optional Downturn Plenum Opening; Width of Standard Horizontal Air Inlet Opening; Discharge Air and Width of Optional Return Air (Bottom) Opening
C	Width of the Curb Cap
E	Width of Standard Horizontal Discharge Air Opening
F	Overall Length of Inside of Curb Cap
G	Distance between Optional Return Air Bottom Opening and Optional Downturn Plenum Discharge Air Opening (Dimensions with downturn apply to Option AQ5 or AQ8; do not apply to field-attached cooling coil cabinet with downturn plenum.)
N	Length of Flue Collection Box
P	Distance from Control Side to Vent Connection Centerline
R	Distance from the Discharge End of the Cabinet Top to Vent Connection Centerline

PGBL		A	B	C	E
400, 800, 1200	inches	58-7/8	47-5/8	56-1/8	45-1/2
	mm	1495	1210	1426	1156

PGBL Size	with Downturn Opt AQ5 or AQ8		F	G	Suspension Dimensions					No. of Hangers
					H	J	K	L	M	
400	No	inches	83-1/2	-	54-3/8	59-1/2	27-1/8	-	-	6
		mm	2121	-	1381	1513	689	-	-	
	Yes	inches	107-1/2	60-5/16	54-3/8	59-1/2	51-1/4	-	-	6
		mm	2731	1532	1381	1513	1302	-	-	
800	No	inches	109-1/2	-	54-3/8	59-1/2	53-1/4	-	-	6
		mm	2781	-	1381	1513	1353	-	-	
	Yes	inches	133-1/2	86-5/16	54-3/8	59-1/2	-	50-1/4	27	8
		mm	3391	2192	1381	1513	-	1277	686	
1200	No	inches	135-1/2	-	54-3/8	59-1/2	79-1/4	-	-	6
		mm	3442	-	1381	1513	2013	-	-	
	Yes	inches	159-1/2	112-5/16	54-3/8	59-1/2	-	76-1/4	27-1/8	8
		mm	4051	2853	1381	1513	-	1937	689	

PGBL Size	Vent Dimensions				
	N	P	R	S	T
400	14-1/16	17-15/16	7-15/16	8-7/8	8-3/4
	357	456	202	225	222
	14-1/16	17-15/16	31-15/16	8-7/8	8-3/4
	357	456	811	225	222
800	40-1/16	18-1/2	41-5/16	13-3/4	12-1/4
	1018	470	1049	349	311
	40-1/16	18-1/2	65-5/16	13-3/4	12-1/4
	1018	470	1659	349	311
1200	66-1/16	18-1/2	67-5/16	13-3/4	12-1/4
	1678	470	1710	349	311
	66-1/16	18-1/2	91-5/16	13-3/4	12-1/4
	1678	470	2319	349	311

Air Openings:		Dimensions
Standard Horizontal Air Inlet	inches	19-1/2 x B
	mm	495 x B
Optional Return Air Opening (bottom)	inches	19-1/2 x B
	mm	495 x B
Standard Horizontal Discharge Air Opening	inches	18 x E
	mm	457 x E
Optional Discharge Air Opening (with Downturn Plenum)	inches	19-1/2 x B
	mm	495 x B

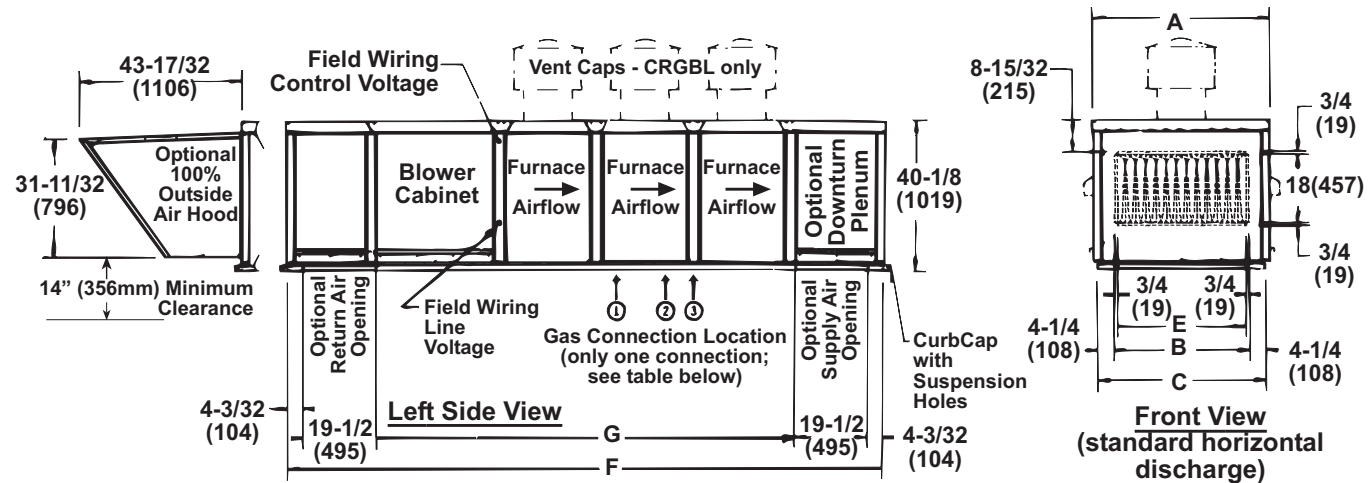
Approximate Gas Connection Location		
PGBL Size	Drawing Location (FIGURE 3)	Approximate Distance from inside Curb Cap on Blower End of System
400	①	7 ft + 5 to 6 inches (2.3 meters)
800	②	8 ft + 7 to 8 inches (2.7 meters)
1200	③	9 ft + 2 to 3 inches (2.8 meters)
The gas line is manifolded requiring only one supply connection. The gas connection is at curb cap "height" on the control side of the system.		

4.0 Dimensions and Clearances (cont'd)

4.1 Dimensions (cont'd)

4.1.2 Dimensions of Models CRGBL and RPBL

FIGURE 4 - Dimensions, Outdoor Models CRGBL and RPBL (inches ± 1/8; mm ± 3)



Dimension Key:

A	Width of Cabinet	G	Distance between Optional Return Air Bottom Opening and Optional Downturn Plenum Discharge Air Opening
B	Width of Optional Downturn Plenum Discharge Air Opening; Width of Standard Horizontal Air Inlet Opening; and Width of Optional Return Air (Bottom) Opening	H	Inside diameter of the vent cap collar
C	Width of the Curb Cap	J	Approx height between top of unit and bottom of vent cap
E	Width of Standard Horizontal Discharge Air Opening	K	Approximate height of the vent cap
F	Overall Length of Inside of Curb Cap		

CRGBL only

Model	Size		A	B	C	E	Vent Cap		
							H	J	K
CRGBL	500, 600	inches	47-1/8	36-5/8	45-1/8	34-1/2	10	3	11-13/16
		mm	1216	930	1146	876	254	76	300
	700, 1050	inches	53-3/8	42-1/8	50-5/8	40	12	12	14-1/8
		mm	1356	1070	1286	1016	305	305	359
RPBL	400, 800, 1200	inches	58-7/8	47-5/8	56-1/8	45-1/2	12	12	14-1/8
		mm	1495	1210	1426	1156	305	305	359
	500, 600	inches	47-1/8	36-5/8	45-1/8	34-1/2	None		
		mm	1216	930	1146	876			
	700, 1050	inches	53-3/8	42-1/8	50-5/8	40			
		mm	1356	1070	1286	1016			
	400, 800, 1200	inches	58-7/8	47-5/8	56-1/8	45-1/2			
		mm	1495	1210	1426	1156			

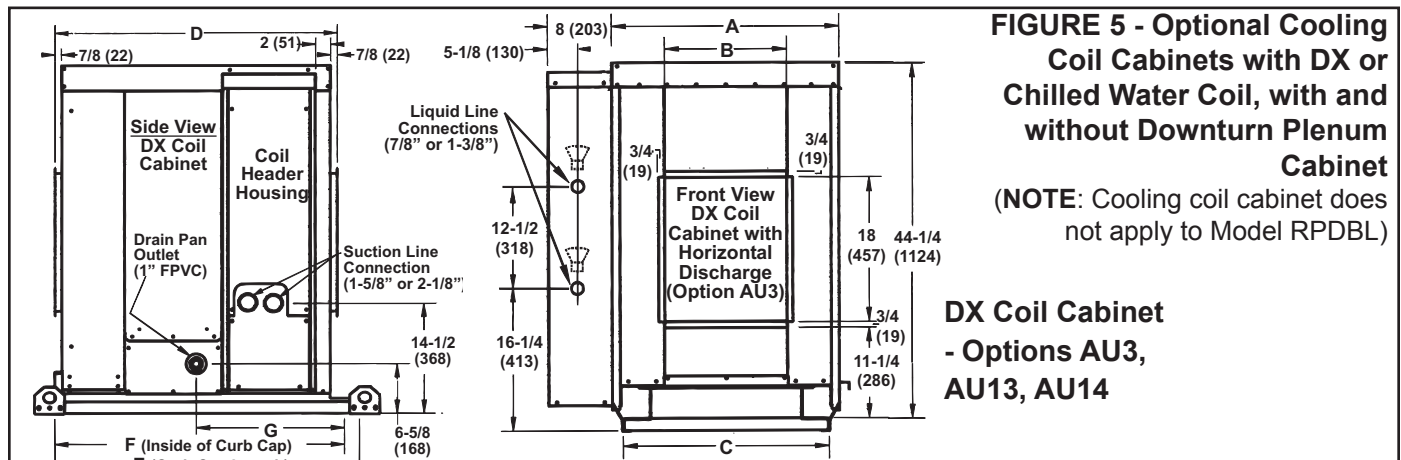
Air Openings:		inches	mm
Standard Horizontal Air Inlet		495 x B	19-1/2 x B
Optional Return Air Opening (bottom)		495 x B	19-1/2 x B
Standard Horizontal Discharge Air Opening		457 x E	18 x E
Opt Discharge Air Opening (w/Downturn Plenum)		495 x B	19-1/2 x B

Approximate Gas Connection Location		
Size	Drawing Location	Approximate Distance from inside Curb Cap on Blower End of System
400	①	7 ft + 5 to 6 inches (2.3 meters) The gas line is manifolded requiring only one supply connection.
500, 600, 700, 800	②	8 ft + 7 to 8 inches (2.7 meters) The gas connection is at curb cap
1050, 1200	③	9 ft + 2 to 3 inches (2.8 meters) "height" on the control side of the system.

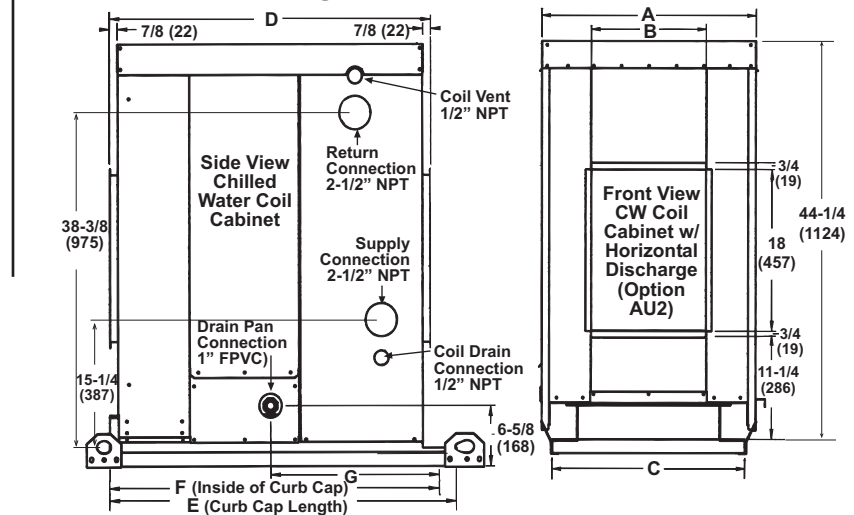
Models	Size	with Downturn Opt AQ5 or AQ8*	F*		G*	
			inches	mm	inches	mm
RPBL, CRGBL	400	No	83-3/4	2127	--	
		Yes	107-3/4	2737	60-5/16	1532
	500, 600, 700, 800	No	109-3/4	2788	--	
		Yes	133-3/4	3397	86-5/16	2192
	1050, 1200	No	135-3/4	3448	--	
		Yes	159-3/4	4058	112-5/16	2853

*Dimensions F and G listed here do not apply to system with field-attached cooling coil cabinet and downturn plenum (Option AU); see **FIGURE 5**.

4.1.3 Dimensions - Optional Cooling Coil Cabinet



Chilled Water Cooling Coil Cabinet - Opts AU2, AU11, AU12



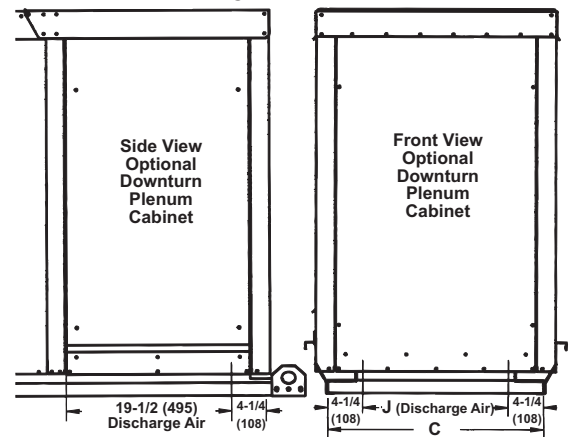
Dimensions (apply to all coil cabs)

PGBL, CRGBL or RPBL Size		500, 600	700, 1050	400, 800, 1200
A	inches	47-3/4	53-1/4	58-3/4
	mm	1213	1353	1492
B	inches	34-1/2	40	45-1/2
	mm	876	1016	1156
C	inches	45-1/8	50-5/8	56-1/8
	mm	1146	1286	1426
D	inches	56-3/8	62	67-3/8
	mm	1432	1575	1711
E	Without Downturn	inches	59-3/8	64-7/8
	mm	1508	1648	1788
	With Downturn	inches	83-3/8	88-7/8
	mm	2118	2257	2397
F	Without Downturn	inches	57-3/8	63
	mm	1457	1600	1737
	With Downturn	inches	81-3/8	87
	mm	2067	2210	2346
G	inches	29-1/8	31-7/8	34-5/8
	mm	740	810	879
J	inches	45-1/8	50-5/8	56-1/8
	mm	1146	1286	1426

NOTE: For the length of an outdoor system with a cooling coil cabinet, see the table on the right. Cooling coil cabinet is shipped separately and attached in the field. See page 14 for roof curb dimensions. Total length of an indoor system with a cooling coil cabinet depends on how the system is installed. If the blower/furnace is suspended, a special curb cap and a field-installed transition duct are required. Contact your Sales Representative to receive specific information. If an indoor system is mounted, add the cabinet length to the blower/furnace length on pages 6-7.

Downturn Plenum Cabinet (factory attached to the Cooling Coil Cabinet)

Discharge Damper Note: Optional two-position discharge dampers in Option AU12 or AU14 fit in the discharge air opening. The damper motor fits inside the downturn cabinet. See field wiring instructions in Paragraph 6.3.6.



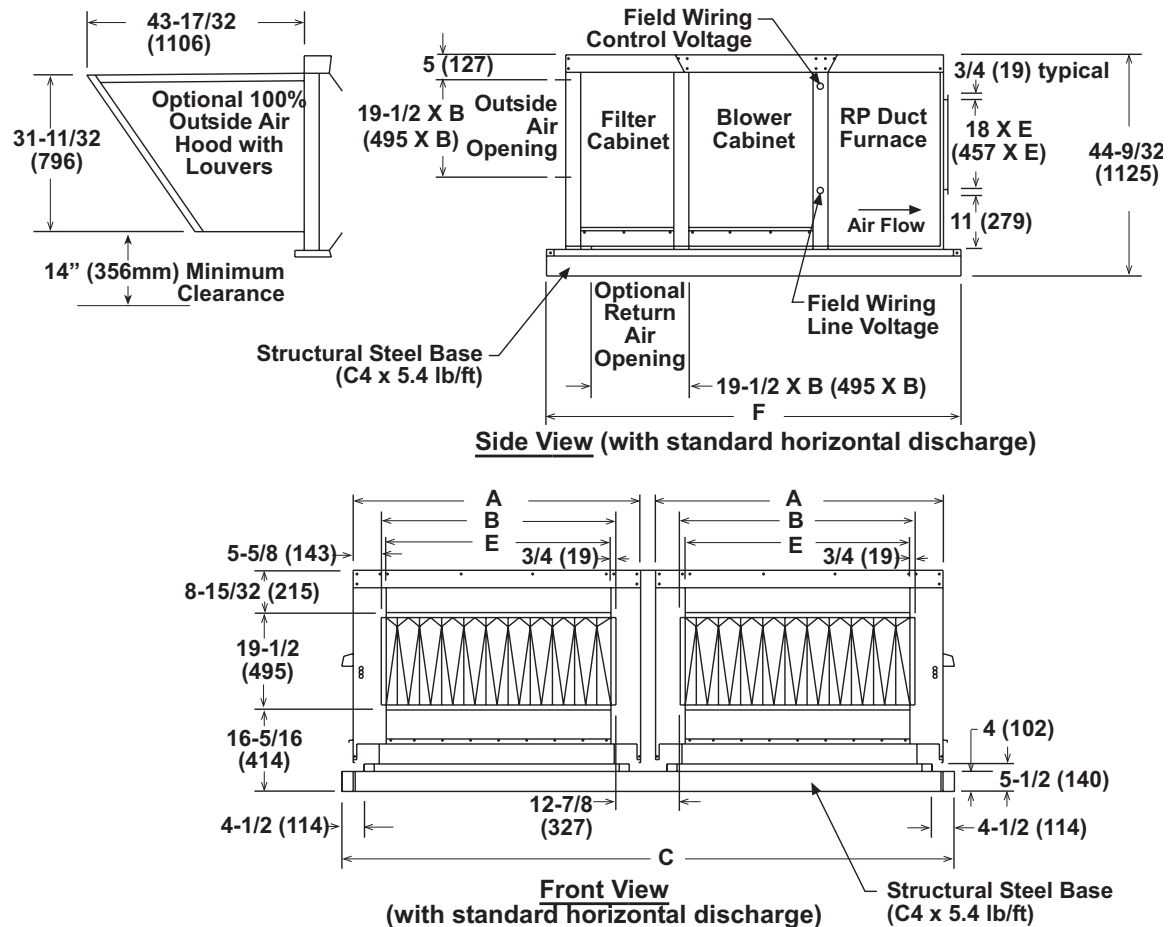
CRGBL, RPBL	Width of Cabinets (not curb)				Length of Cabinets (not curb)			
	w/Chilled Water Coil Cabinet		w/DX Coil Cabinet		w/Cooling Coil Cabinet only		w/Cooling Coil Cabinet w/Downturn	
	inches	mm	inches	mm	inches	mm	inches	mm
400	58-7/8	1495	66-7/8	1698	150-3/8	3820	173-1/2	4407
500, 600	47-1/8	1197	55-1/8	1400	165-3/8	4201	188-1/2	4788
700	53-3/8	1356	61-3/8	1559	171	4343	194-1/8	4931
800	58-7/8	1495	66-7/8	1698	176-3/8	4480	199-1/2	5067
1050	53-3/8	1356	61-3/8	1559	197	5004	220-1/8	5591
1200	58-7/8	1495	66-7/8	1698	202-3/8	5140	225-1/2	5728

4.0 Dimensions and Clearances (cont'd)

4.1 Dimensions (cont'd)

4.1.4 Dimensions of Model RPDBL

**FIGURE 6 -
Dimensions,
Outdoor
Model
RPDBL**



Key to Dimensions:

A = Width of Each Cabinet Section

B = Width of Each Standard Horizontal Air Inlet Opening
Width of Each Optional Bottom Discharge Air Opening w/Duct Flange
Width of Each Optional Return Air Bottom Opening

C = Overall Width of Outside of Structural Steel Base (illustrated) OR
Overall Width of Inside of Factory-Installed Curb Cap

E = Width of Standard Horizontal Discharge Air Opening

F = Overall Length of Outside of Structural Steel Base (illustrated) OR
Overall Length of Inside of Factory-Installed Curb Cap

Approximate Gas Connection Location

Height:	Base height on the control side of the system.
Distance:	Size 800 - approximately 7' 6" (2.3M) from the end of the base at the blower end of the system
	All other Sizes - approximately 8' (2.7M) from the end of the base at the blower end of the system

Dimensions (inches $\pm$ 1/8" / mm $\pm$ 3)

Model RPDBL	Furnace Sections		A	B	C (Width)		E	F (Length)			
					Structural steel base (w/o curb cap)	With factory- installed curb cap		w/horizontal discharge		w/factory-installed downturn plenum	
								w/o curb cap	w/curb cap (inside of cap)	w/o curb cap	w/curb cap (inside of cap)
800	2 (Size 400)	inches	58-7/8	47-5/8	122-11/16	116-3/4	45-1/2	83-3/4	83-1/16	107-3/4	107-1/16
		mm	1495	1210	3116	2965	1156	2127	2110	2737	2719
1000	4 (Size 250)	inches	47-1/8	36-5/8	100-11/16	94-3/4	34-1/2	109-3/4	109-1/16	133-3/4	133-1/16
		mm	1197	905	2557	2407	876	2788	2770	3397	3380
1200	4 (Size 300)	inches	47-1/8	36-5/8	100-11/16	94-3/4	34-1/2	109-3/4	109-1/16	133-3/4	133-1/16
		mm	1197	905	2557	2407	876	2788	2770	3397	3380
1400	4 (Size 350)	inches	53-3/8	42-1/8	111-11/16	105-3/4	40	109-3/4	109-1/16	133-3/4	133-1/16
		mm	1356	1070	2837	2686	1016	2788	2770	3397	3380
1600	4 (Size 400)	inches	58-7/8	47-5/8	122-11/16	116-3/4	45-1/2	109-3/4	109-1/16	133-3/4	133-1/16
		mm	1495	1210	3116	2965	1156	2788	2770	3397	3380

4.2 Clearances

Provide clearance to combustibles as shown in the table. Clearance to combustibles is defined as the minimum distance from the heater to a surface or object that is necessary to ensure that a surface temperature of 90°F above the surrounding ambient temperature is not exceeded. Clearance is also required to sides of the furnace for combustion air space and for convenient installation and burner control system service. Recommended minimum clearance from the bottom of the outside air hood to the mounting surface is 14" (356mm).

Models	Required Clearances
PGBL	Side Opposite Controls, Top, Flue Connection - 6" (152mm); Control Side - 56" (1422mm); Furnace Bottom - 6" (152mm)
CRGBL, RPBL, RPDBL	Control Side - 56"(1422mm); *Furnace Bottom - 0"
CRGBL	30' (9M) radius from the center of the vent cap to obstructions such as walls, parapets, or cupolas
* When installed on a roof curb on a combustible roof, the roof area enclosed within the curb must be either ventilated, left open, or covered with non-combustible material which has an "R" value of at least 5.0. See FIGURE 12A , page 15.	

5.0 Suspension and Mounting

Before installing, check the supporting structure to be sure that it has sufficient load-carrying capacity to support the weight of the unit. Properly suspending or mounting the unit is the responsibility of the installer. Indoor Model PGBL systems are designed for either suspension or mounting. Outdoor Models are designed for mounting on a roof or slab. All installed systems must be level.

5.1 Weights

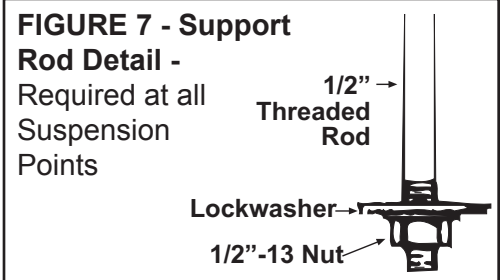
Net Weight (lbs)							
Model	400	500	600	700	800	1050	1200
PGBL*	849	--	--	--	1245	--	1565
RPBL	849	1104	1104	1184	1245	1476	1565
CRGBL	849	1104	1104	1184	1245	1476	1565
Model	800	1000	1200	1400	1600		
RPDBL	1810	2328	2328	2508	2650		

***INSTALLATION NOTES:** If installing as a makeup air system with an **evaporative cooling module**, the module is shipped separately and **must be mounted** (blower/furnace section may be either mounted or suspended). Follow the installation instructions included with the module; a field-supplied transition duct may be required. An evaporative cooling module ranges in weight from 375-520 lbs.

OR, if the system includes a **cooling coil cabinet**, the cabinet is shipped separately for field attachment. A cooling coil cabinet with a coil can weigh as much as 1020 lbs. If the system is mounted, provide sufficient support and attach according to the instructions in Paragraph 6.3.6. If the system is to be suspended, the cooling coil cabinet must be ordered with a special curb cap. Contact your Sales Representative or the factory for information about suspending a cooling coil cabinet. Installation may require a field-supplied transition duct.

5.2 Suspension - Applies to Model PGBL

This packaged system is equipped with a load-bearing curb cap which forms an integral part of the unit. The curb cap is welded at all joints and has suspension holes at each corner and hanger brackets on the sides. See **FIGURE 3** for suspension dimensions. Each suspension location requires a 1/2" threaded rod as illustrated in **FIGURE 7**.



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

5.0 Suspension and Mounting (cont'd)

5.3 Mounting - Indoor Model PGBL

Prior to installation, be sure that the method of support is in agreement with all local building codes. **NOTE: The curb cap is not designed to be placed directly on a flat surface.**

Whether the supports are being mounted directly on a surface or being placed "up" on additional structure, the horizontal length of the system should be supported by two 4x4 treated wooden rails. Cut the rails to the appropriate length (Dimension "A" in **FIGURE 8**).

Space the 4x4 wooden rails (See "B" Dimension, **FIGURE 5**) so that the curb cap "skirt" will fit over the edge of the boards with the rails setting inside the horizontal length of the curb cap. If the rails are being laid directly on a surface, position them as shown in **FIGURE 8**. Set the system on the rails, leaving the "ends" underneath open for ventilation.

If the rails are not placed directly on a surface, cross-supports should be placed underneath the rails at the ends of the unit and at all cabinet "joints" (between the blower cabinet and the furnace section, between each furnace section, and between the furnace and an optional downturn plenum cabinet). See **FIGURE 9**. The field-supplied, cross-support structure must be adequate for the weight of the unit. Cross-supports should run the entire width of the unit, supporting the 4x4 wooden rails at all recommended locations.

FIGURE 8 - Mounting Support Dimensions - inches (mm)

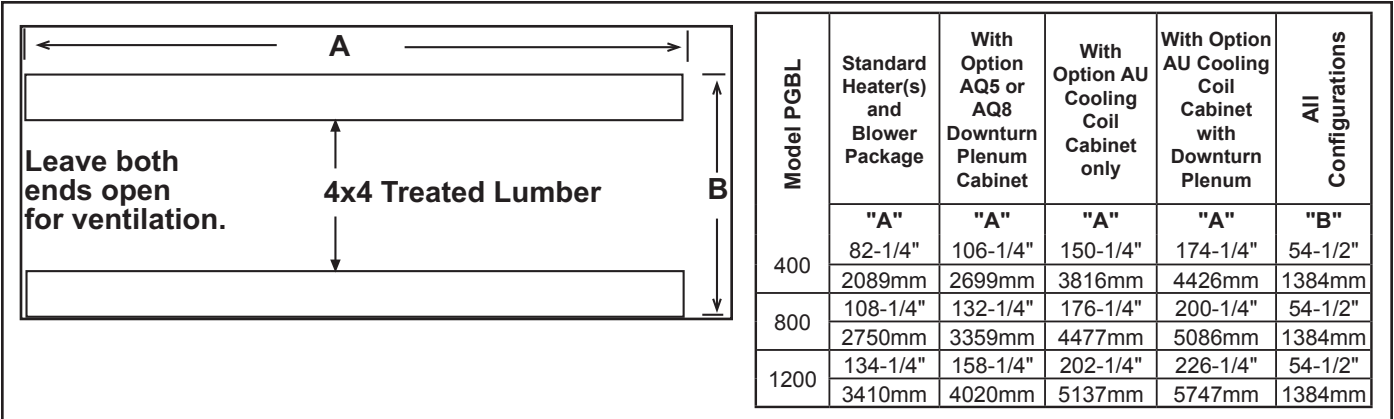
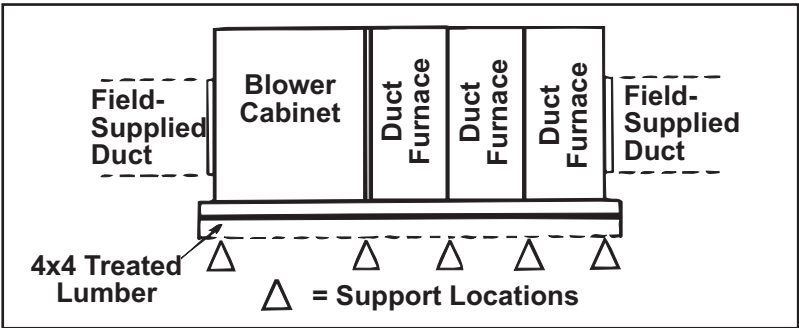


FIGURE 9 - Cross Support Locations for Model PGBL when the wooden 4x4 rails supporting the length of the system are supported by additional structure



WARNINGS: Do not close or block the openings under each end of a Model PGBL mounted on 4x4 treated wooden rails; the space under the furnace **MUST** be left open for ventilation.

If cross supports are used under the 4x4 rails, do not enclose the area under the furnace; leave open space for ventilation.

5.4 Mounting Outdoor Models RPBL, CRGBL, RPDBL

5.4.1 Rigging

Lifting holes are provided for rigging. Use spreader bars when lifting to prevent chains or cables from damaging the unit. If the unit is being mounted on a roof curb, apply caulking to the roof curb prior to lifting the unit to the roof and setting it on the curb. See **FIGURE 12A**, page 15. If the system includes an outside air hood, a cooling coil cabinet, or an evaporative cooling module, attach them *after* the system is in place.

5.4.2 Base Construction

Curb Cap Base - Model Series CRGBL and RPBL

Models CRGBL and RPBL are equipped with a load-bearing curb cap which forms an integral part of the unit. This curb cap is welded at all joints and has a "skirt" which fits over a roof curb to provide a weatherproof installation. Holes are provided at the curb cap corners for lifting the unit. These holes do not interfere with unit weatherproofing. **The curb cap is not designed to be placed directly on the roof surface.** The system may be mounted on an optional roof curb purchased with the unit, a field-supplied roof curb, or field-supplied supports. If the system has a downturn plenum and/or a bottom return air opening, a roof curb is recommended to provide a weatherproof installation as well as more workable clearances for ductwork.

Structural Steel Base - Model Series RPDBL

Model RPDBL systems have a structural steel base that is designed to sit directly on a flat surface (rails are not required). Holes are provided for lifting. Be sure that any supporting structure has sufficient load-carrying capacity to support the weight of the unit.

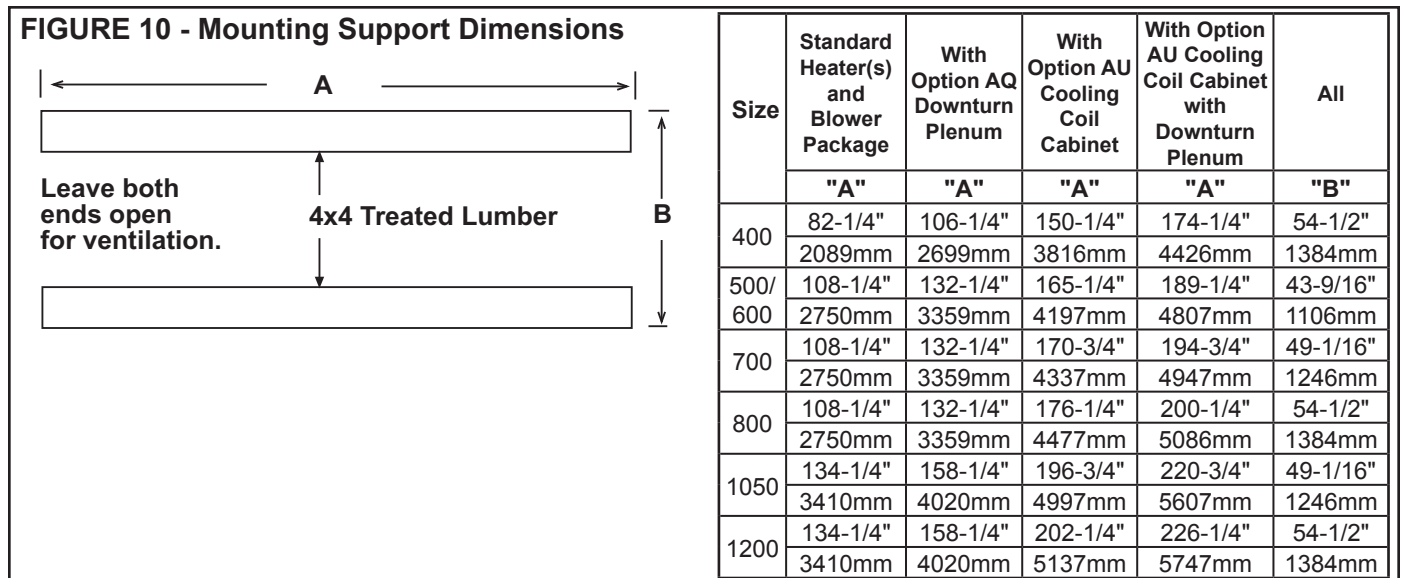
If ordered with a roof curb, a curb cap that will sit over the roof curb is welded to the structural steel base. When ordered with a curb cap for use with a roof curb, the base is not designed to be placed directly on the roof surface.

5.4.3 Mounting Outdoor Models on Field-Supplied Supports (without a roof curb) - Applies to Models CRGBL and RPBL

Prior to installation, be sure that the method of support is in agreement with all local building codes and is suited to the climate. If considering this type of installation in snow areas, it is recommended that the 4x4 wooden rails underneath the system be on cross-support structure at least 12" higher than the roof surface (see cross support locations in **FIGURE 11**, page 14).

Whether the supports are being mounted directly on the roof or being placed "up" on additional structure, the horizontal length of the system should be supported by two 4x4 treated wooden rails. Cut the rails to the appropriate length (Dimension "A") in **FIGURE 10**. (**NOTE:** Although dimensions are included for units with a downturn plenum cabinet, it is strongly recommended that a full roof curb be used on an installation with a downturn plenum cabinet and/or a bottom return air duct.)

Space the 4x4 wooden rails (See "B" Dimension, **FIGURE 10**) so that the curb cap "skirt" will fit over the edge of the boards with the rails setting inside the horizontal length of the curb cap.



If the rails are being laid directly on the roof, position them as shown in **FIGURE 10**. Set the system on the rails, leaving the "ends" underneath open for ventilation.

If the treated wooden rails are not being placed directly on the roof surface, cross-supports should be placed underneath the rails at the ends of the unit and at all cabinet "joints" (between the blower cabinet and the heater section and between the furnace and the optional downturn plenum cabinet). See **FIGURE 11**.

The field-supplied, weather-resistant cross-support structure must be adequate for the weight of the system, and all cross-supports should run the entire width of the system

5.0 Suspension and Mounting (cont'd)

5.4 Mounting Outdoor Models (cont'd)

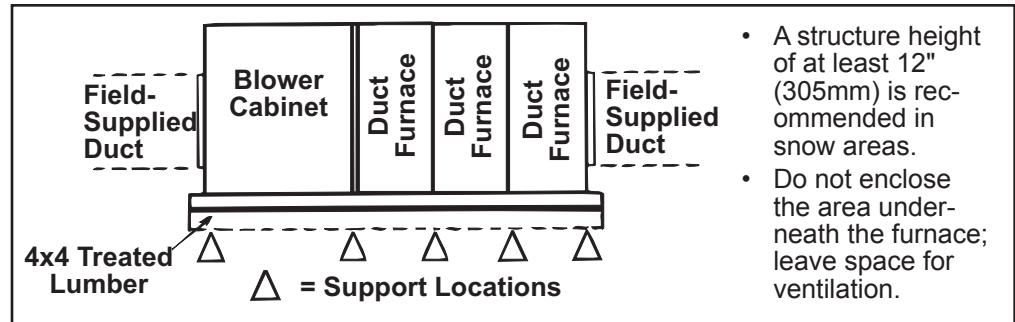
FIGURE 11 - Cross-Support Locations for Outdoor Systems when the wooden 4x4 rails supporting the length of the system are supported by additional structure

5.4.3 Mounting Outdoor Models on Field-Supplied Supports (without a roof curb) (cont'd)

supporting the 4x4 wooden rails at the recommended locations. Do not enclose the area under the furnace; leave space for ventilation.

WARNINGS: Do not close or block the openings under each end of a system mounted on 4x4 treated wooden rails; the space under the furnace **MUST** be left open for ventilation.

If cross supports are used under the 4x4 rails, do not enclose the area under the furnace; leave open space for ventilation.



5.4.4 Mounting on a Roof Curb - Applies to Outdoor Models RPBL, CRGBL, and RPDBL

Roof Curb Dimensions for Models RPBL and CRGBL

Size	400	500/600	700	800	1050	1200
Option CJ1 - Roof Curb for CRGBL and RPBL						
A	inches	82-1/4	108-1/4	108-1/4	108-1/4	134-1/4
	mm	2089	2750	2750	2750	3410
B	inches	54-1/2	43-9/16	49-1/16	54-1/2	49-1/16
	mm	1384	1106	1246	1384	1246
C*	inches	78-1/2	104-1/2	104-1/2	104-1/2	130-1/2
	mm	1994	2654	2654	2654	3315
D*	inches	50-13/16	39-13/16	45-5/16	50-13/16	45-5/16
	mm	1291	1011	1151	1291	1151
Wt	lbs	150	167	173	179	202
	kg	68	76	78	81	92
Option CJ2 - Roof Curb for CRGBL and RPBL with Factory-Installed Downturn Plenum, Option AQ5 or AQ8						
A	inches	106-1/4	132-1/4	132-1/4	132-1/4	158-1/4
	mm	2699	3359	3359	3359	4020
B	inches	54-1/2	43-9/16	49-1/16	54-1/2	49-1/16
	mm	1384	1106	1246	1384	1246
C*	inches	102-1/2	128-1/2	128-1/2	128-1/2	154-1/2
	mm	2604	3264	3264	3264	3924
D*	inches	50-13/16	39-13/16	45-5/16	50-13/16	45-5/16
	mm	1291	1011	1151	1291	1151
Wt	lbs	177	193	199	205	228
	kg	80	88	91	93	103

Size	400	500/600	700	800	1050	1200
Option CJ4 - Roof Curb for CRGBL and RPBL with Field-Installed** Cooling Coil Cabinet, Option AU2 or AU3						
A	inches	150-1/4	165-1/4	170-3/4	176-1/4	1 - 3/4
	mm	3816	4197	4337	4477	4997
B	inches	54-1/2	43-9/16	49-1/16	54-1/2	49-1/16
	mm	1384	1106	1246	1384	1246
C*	inches	146-1/2	161-1/2	167	172-1/2	193
	mm	3721	4102	4242	4382	4902
D*	inches	50-13/16	39-13/16	45-5/16	50-13/16	45-5/16
	mm	1291	1011	1151	1291	1151
Wt	lbs	227	231	243	255	271
	kg	103	105	110	116	123
Option CJ5 - Roof Curb for CRGBL & RPBL with Field-Installed** Cooling Coil Cabinet w/Downturn, Option AU11, AU12, AU13 or AU14						
A	inches	174-1/4	189-1/4	194-3/4	200-1/4	220-3/4
	mm	4426	4807	4947	5086	5607
B	inches	54-1/2	43-9/16	49-1/16	54-1/2	49-1/16
	mm	1384	1106	1246	1384	1246
C*	inches	170-1/2	185-1/2	191	196-1/2	217
	mm	4331	4712	4851	4991	5512
D*	inches	50-13/16	39-13/16	45-5/16	50-13/16	45-5/16
	mm	1291	1011	1151	1291	1151
Wt	lbs	253	257	269	280	296
	kg	115	117	122	127	134

*C and D are roof opening dimensions.

** Field installed means that the cooling coil cabinet with or without the downturn is factory assembled and shipped separately. The roof curb is sized to accommodate the complete length of the system. The shipped-separate cooling coil cabinet with or without a downturn must be lifted to the roof separately from the packaged system, set on the roof curb, and attached to the furnace section (see instructions in Paragraph 6.3.6).

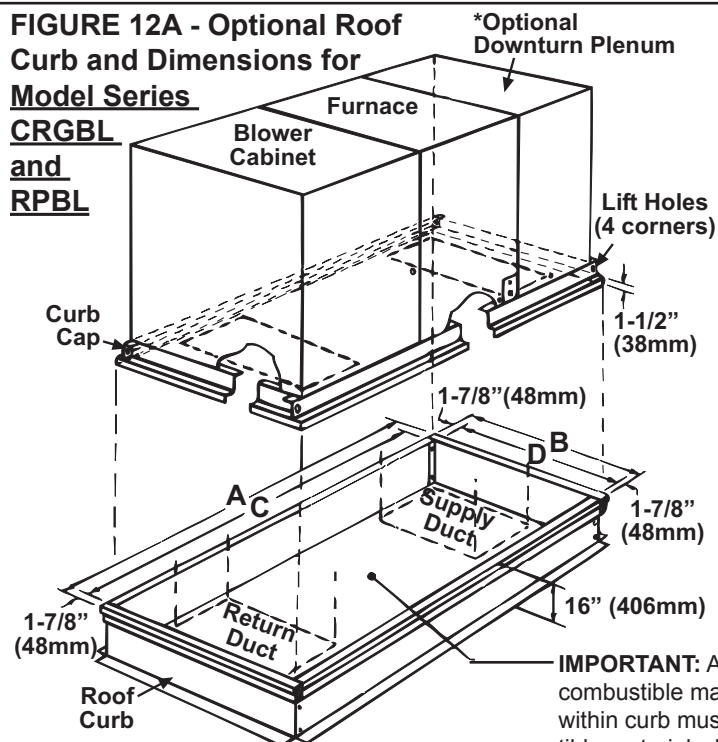
Roof Curb Dimensions for Model RPDBL

*C and D are roof opening dimensions.

See **FIGURE 12D**, page 16, for "G" and "H"

Size	800		1000/1200		1400		1600	
	inches	mm	inches	mm	inches	mm	inches	mm
Dimensions (inches) of Option CJ1 - Roof Curb for RPDBL								
A	116-1/4	2953	94-1/4	2445	105-1/4	2673	116-1/4	2953
B	82-9/16	2097	108-9/16	2757	108-9/16	2757	108-9/16	2757
C*	113	2870	91	2311	102	2591	113	2870
D*	79-5/16	2015	105-5/16	2675	105-5/16	2675	105-5/16	2675
Dimensions (inches) of Option CJ2 - Roof Curb for RPDBL with Factory-Installed Downturn Plenums, Opt AQ5 or AQ8								
A	116-1/4	2953	94-1/4	2445	105-1/4	2673	116-1/4	2953
B	106-9/16	2707	132-9/16	3361	132-9/16	3361	132-9/16	3361
C*	113	2870	91	2311	102	2591	113	2870
D*	103-5/16	2870	129-5/16	2591	129-5/16	3285	129-5/16	3285
G	60-5/16	1532	86-5/16	2192	86-5/16	2192	86-5/16	2192
H	47-5/8	1210	36-5/8	930	42-1/8	1070	47-5/8	1210

FIGURE 12A - Optional Roof Curb and Dimensions for Model Series CRGBL and RPBL



IMPORTANT: Top surface of curb **MUST** be sealed. See instructions below.

* Illustration is shown with an Option AQ5 or AQ8 downturn plenum. The system can have a variety of configurations which affect installation.

- If the system does not have a downturn plenum, the discharge is horizontal.
- Downturn plenum Options AQ5 and AQ8 are factory installed to be lifted to the roof and set on the roof curb as part of the packaged system.
- If the system has an Option AU2 or AU3 cooling coil cabinet, the discharge is horizontal. If the system has an AU11, AU12, AU13, AU14 cooling coil cabinet, there is a downturn plenum with vertical discharge. **Options AU2, AU3, AU11, AU12, AU13, and AU14 are not factory installed. Options AU2, AU3, AU11, AU12, AU13, and AU14 must be lifted to the roof separately from the packaged system, set on the roof curb, and attached to the furnace.**

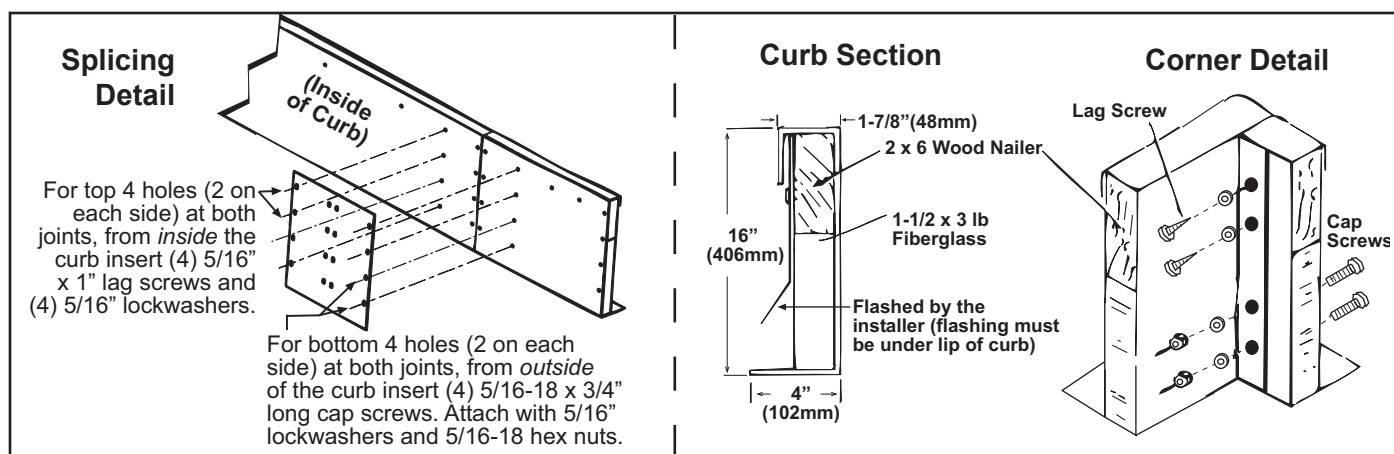
IMPORTANT: Area enclosed by the roof curb must comply with clearance to combustible materials. If roof is constructed of combustible materials, area within curb must be either ventilated, left open, or covered with non-combustible material which has an "R" value of at least 5.0. If area within curb is left open, higher radiated sound levels may result.

Roof Curb Assembly and Installation Instructions - Applies to all Outdoor Models

Curbs are shipped unassembled. Field assembly and mounting on the roof are the responsibility of the installer. All required hardware necessary to complete the assembly is supplied. Before installing roof curb, verify that the size is correct for the system being installed.

1. Position curb cross rails and curb side rails as illustrated in **FIGURE 12A**. If there are two side pieces to a side, fasten them with splice plates and hardware as illustrated in the splicing detail drawing (**FIGURE 12B**). Join the corners as illustrated in the corner detail (**FIGURE 12B**).
2. Check the assembly for squareness. Adjust the roof curb so that the diagonal measurements are equal within a tolerance of + or - 1/8".

FIGURE 12B - Roof Curb Assembly



5.0 Suspension and Mounting (cont'd)

5.4 Mounting Outdoor Models (cont'd)

5.4.4 Mounting on a Roof Curb - Applies to Outdoor Models RPBL, CRGBL, and RPDBL

Roof Curb Assembly and Installation Instructions (cont'd)

- Level the roof curb. To ensure a good weathertight seal between the curb cap and the roof curb, the roof curb must be leveled in both directions with no twist end to end. Shim level as required and secure curb to roof deck before proceeding with flashing.
- Install field-supplied flashing.
- Before placing the unit into position, apply furnished 1/4" x 1-1/4" foam sealant tape to top surface of curb, making good butt joint at corners. The unit must be sealed to the curb to prevent water leakage into the curb area due to blown rain and capillary action.

FIGURE 12C - Installed Curb

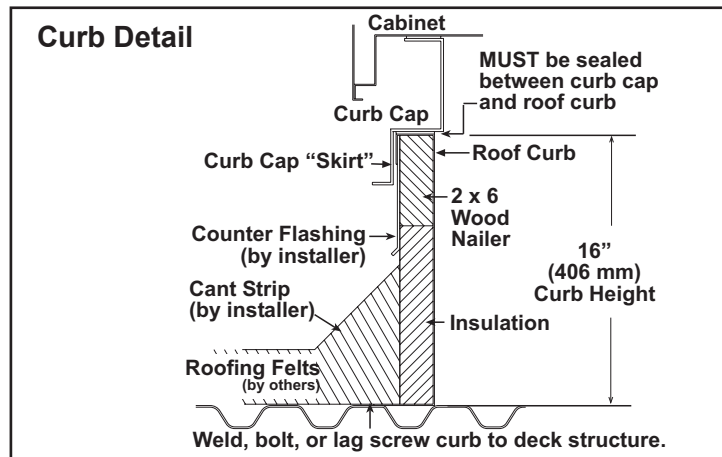
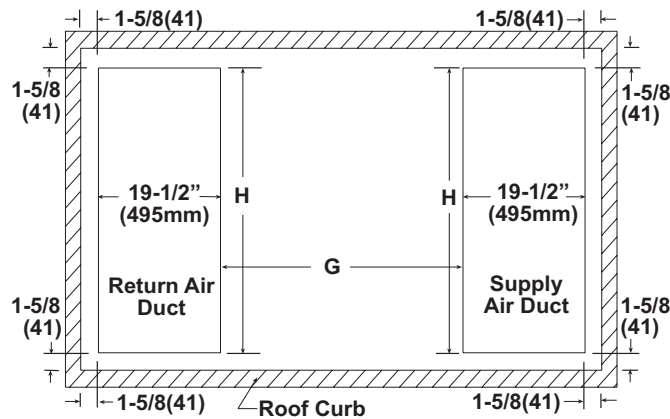


FIGURE 12D - Duct Opening Dimensions (inches and mm) in relation to Roof Curb CJ Option

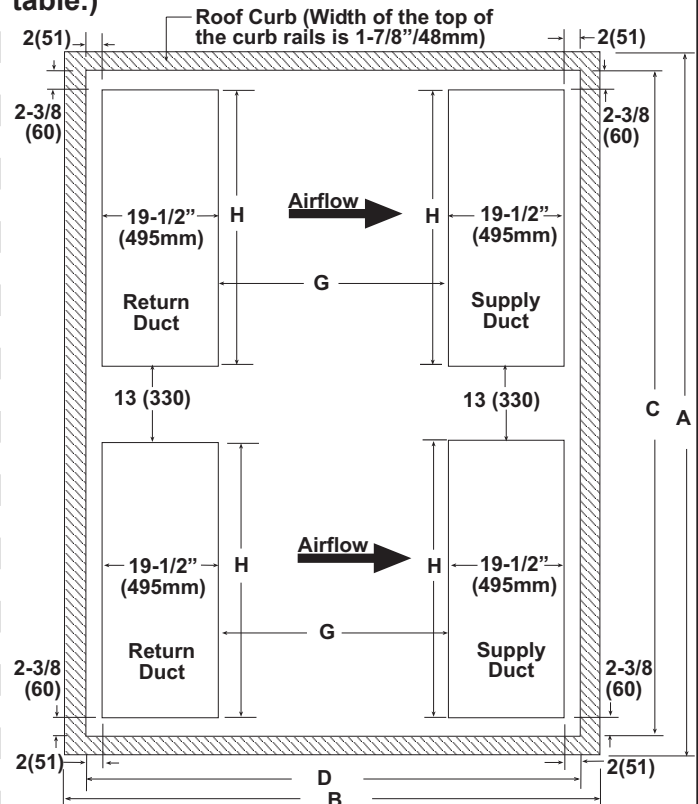
- 1-5/8" (41mm) is the measurement from the duct openings to the inside edge of the roof curb.
- Openings for ductwork should be 1" (25mm) larger than the duct size for installation clearance.

Models RPBL and CRGBL



CRGBL/ RPBL	H		G			
			With Downturn AQ5 or AQ8 (no cooling coil)		With Cooling Coil Cabinet with Downturn, Options AU 11, 12, 13, 14	
	inches	mm	inches	mm	inches	mm
400	47-5/8	1210	60-5/16	1532	127-17/32	3239
500, 600	36-5/8	930	86-5/16	2192	142-17/32	3620
700	42-1/8	1070	86-5/16	2192	148-1/32	3760
800	47-5/8	1210	86-5/16	2192	153-17/32	3900
1050	42-1/8	1070	112-5/16	2853	174-1/32	4420
1200	47-5/8	1210	112-5/16	2853	179-17/32	4560

Model RPDBL (See top of page 15 for dimension table.)



6.0 Mechanical

6.1 Gas Piping and Pressures

WARNING

This appliance is equipped for a maximum gas supply pressure of 1/2 psi, 3.5 kPa, or 14 inches water column. Supply pressure higher than 1/2 psi requires installation of an additional service regulator external to the unit.

PRESSURE TESTING SUPPLY PIPING

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

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

All piping must be in accordance with requirements outlined in the National Fuel Gas Code NFPA54/ANSI Z223.1 (latest edition) or CSA-B149.1 (latest edition) (See Paragraph 1). Gas supply piping installation should conform with good practice and with local codes.

Furnaces for natural gas are orificed for operation with gas having a heating value of 1000 (+ or - 50) BTUH per cubic ft. If the gas at the installation does not meet this specification, consult the factory for proper orificing.

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.

The National Fuel Gas Code requires the installation of a trap with a minimum 3" drip leg. Local codes may require a minimum drip leg longer than 3" (typically 6").

After all connections are made, disconnect the pilot supply at the control valve and bleed the system of air. Reconnect the pilot line and leak-test all connections by brushing on a leak-detecting solution.

WARNING: All components of a gas supply system must be leak tested prior to placing equipment in service. NEVER TEST FOR LEAKS WITH AN OPEN FLAME. Failure to comply could result in personal injury, property damage or death.

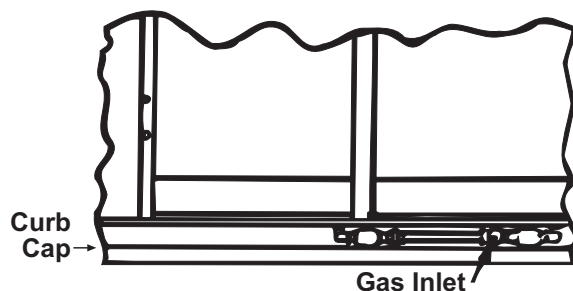
Gas Connection

These systems are composed of one, two, or three duct furnaces assembled in a series. When there are two or three furnace sections, the gas train is manifolded so that only one field connection is required. At the field connection, there is a factory installed adapter with a 1/8" N.P.T. plugged hole for connecting a pressure test gauge. Each furnace section has its own manual shutoff valve. The gas connection is piped along the bottom. See **FIGURE 17** for gas train manifold arrangement and connection location.

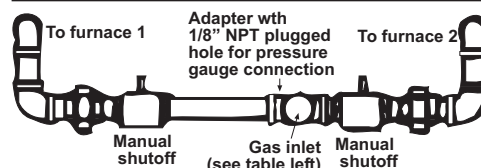
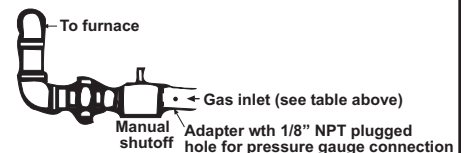
FIGURE 13 - Gas Supply Connection

Gas Connection Size (Not Gas Supply Line Size)

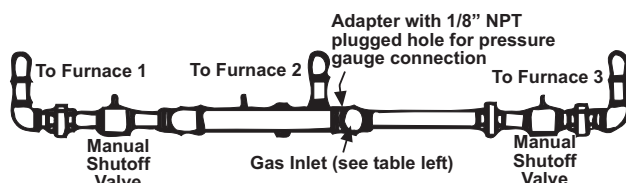
PGBL/CRGBL/ RPBL	400	500, 600, 700, 800, 1050, 1200
Natural Gas	1"	1-1/4"
Propane Gas	1"	1-1/4"
RPDBL	800, 1000, 1200	1400, 1600
Natural Gas	1-1/4"	2"
Propane Gas	1-1/4"	2"



PGBL, CRGBL, RPBL with 1 furnace section or RPDBL with 2 furnace sections (one on each side)



PGBL, CRGBL, RPBL with 2 furnace sections or RPDBL with 4 furnace sections (two on each side)



PGBL, CRGBL, RPBL with 3 furnace sections

6.0 Mechanical (cont'd)

6.2 Gas Piping and Pressures (cont'd)

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

Manifold or Orifice (Valve Outlet) Pressure Settings

Measuring manifold gas pressure cannot be done until the heater is in operation. It is included in the steps of the "Check-Test-Start" procedure in Paragraph 9. The following warnings and instructions apply.

For Natural Gas: When the heater leaves the factory, the combination valve is set so that the outlet gas pressure of a single-stage valve or high fire of a two-stage valve is regulated to 3.5" w.c. Low fire on a two-stage valve is set to 1.8" w.c. Inlet supply 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 the gas control option. Most units require a minimum of 5" w.c. of natural gas as stated above, but larger sizes with electronic modulation require a minimum of 6" w.c. natural gas supply pressure. Larger sizes with mechanical modulation require 7" w.c.

For Propane Gas: When the heater leaves the factory, the combination valve is set so that the outlet gas pressure of a single-stage valve or high fire of a two-stage valve is 10" w.c. Low fire on a two-stage valve is set to 5" w.c. Inlet pressure to the valve must be a minimum of 11" w.c. and a maximum of 14" w.c.

Before attempting to measure or adjust manifold gas pressure, the inlet (supply) pressure must be within the specified range for the gas being used both when the heater is in operation and on standby. Incorrect inlet pressure could cause excessive manifold gas pressure immediately or at some future time.

Instructions to Check Valve Outlet (Manifold) Pressure:

1) 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 in the valve. **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.

2) Open the valve and operate the heater. Measure the gas pressure to the manifold. To measure the low stage pressure on units equipped with a two-stage valve, disconnect the wire from the "HI" terminal on the valve. (Be sure to reconnect the wire.)

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

CAUTION: DO NOT bottom out the gas valve regulator adjusting screw. This can result in unregulated manifold pressure causing overfire and heat exchanger failure.

6.2. Venting

Specific Venting Requirements for Model PGBL Units (*read all before installing*)

Flue Collar

Size	Outlet
400	6" dia
800	8" dia
1200	8" dia

Instructions for Using "Tables of Permissible Vent Lengths for Model PGBL"

Vent Length TABLES 1A and 1B for PGBL 400 using either 6" or 7" diameter pipe

KEY: X = not applicable for this system

6.2.1 Venting Indoor Model PGBL Power Vented Units

DANGER: Failure to provide proper venting could result in death, serious injury, and/or property damage. This unit must be installed with a vent connection and proper vent to the outside of the building. Follow the installation codes listed in Paragraph 1 and the venting recommendations below.

Model PGBL indoor packaged system is equipped with a motorized vent exhauster and requires a field-installed horizontal or vertical vent system which terminates with a vent cap outside of the building.

1. Venter (Flue) Outlet

- If the pipe used in the vent run is larger than the diameter of the venter outlet (See Vent Length Tables), make the transition at the venter outlet.
- A minimum of 12" of straight pipe is required at the venter outlet (or transition fitting) before installing an elbow in the vent system. An elbow should never be attached directly to the venter.

2. Vent Pipe - Use only one of the flue pipe diameters listed in the Vent Length Tables for the furnace size being installed. The type of vent pipe required depends on **the construction of the building and the vent configuration.**

- If a **horizontal vent system runs through non-combustible construction**, use either minimum 26-gauge, single-wall vent pipe or vent pipe approved for a Category III appliance.
- If a **horizontal vent system runs through combustible construction**, use double-wall vent pipe that is approved for a Category III appliance.
- If **at least half of the equivalent length of the vent system is vertical and runs through non-combustible construction**, use either single-wall vent pipe, double-wall (Type B) vent pipe, or vent pipe approved for a Category III appliance.
- If **at least half of the equivalent length of the vent system is vertical and runs through combustible construction**, use either double-wall (Type B) vent pipe or double-wall vent pipe approved for a Category III appliance.

3. Vent Length Tables - Use the "Tables of Permissible Vent Lengths" (pages 19-20) as a guideline in designing an appropriate vent system. The tables list required vent pipe diameter and maximum vent length runs for systems with one, two, or three furnace sections. Since each vent system requires a vent cap, the vent cap is calculated into the tables.

Determine the requirements of the application (**See illustrated example in FIGURE 14 on page 21.**)

1) Determine overall venting system arrangement.

- ☐ Size of Unit - One, Two or Three Furnace Sections
- ☐ Total Horizontal Length
- ☐ Total Vertical Length
- ☐ Total Number of 90° Elbows (45° Elbow = 1/2 of 90°)

2) Determine required vent pipe diameter. There are two tables each for a system with one furnace section, a system with two furnace sections, and a system with three furnace sections -- a table with standard diameter vent pipe size for that model and a table with a larger-than-standard diameter vent pipe for that model. If the vent arrangement requires the use of the larger vent pipe size, the vent pipe diameter must be increased using a taper-type "enlarger" at the venter outlet.

3) If the proposed venting arrangement exceeds maximum values shown in the Tables, re-evaluate vent pipe routing for the possibility of a shorter system.

TABLE 1A - System with ONE Furnace Section (Size 400) with 6" Diameter Vent Pipe	Vertical Height		Maximum Horizontal Distance							
			Number of 90° Elbows							
			3		2		1		0	
	(ft)	(M)	ft	M	ft	M	ft	M	ft	M
0-39	0-12		5	1.5	20	6	35	10.7	X	
40-59	12.1-18		10	3	20	6	X		X	
60-79	18.1-24		10	3	X		X		X	
80-90	24.1-27		X		X		X		0	

6.0 Mechanical (cont'd)

6.2. Venting (cont'd)

Vent Length TABLES 1A and 1B for **PGBL 400** using either 6" or 7" diameter pipe (cont'd)

KEY: X = not applicable
for this system

6.2.1 Venting Indoor Model PGBL Power Vented Units (cont'd)

TABLE 1B - System with <u>ONE</u> Furnace Section (Size 400) with 7" Diameter Vent Pipe (Use a taper-type connection at the venter outlet to increase vent pipe diameter.)	Vertical Height		Maximum Horizontal Distance													
			Number of 90° Elbows													
			6		5		4		3		2		1		0	
	(ft)	(M)	ft	M	ft	M	ft	M	ft	M	ft	M	ft	M	ft	M
	0-9	0-2.9	10	3	30	9.1	50	15.2	70	21.3	90	27.4	110	33.5	X	
	10-29	3-8.9	20	6.1	40	12.2	60	18.3	75	22.9	90	27.4	110	33.5	X	
	30-39	9-11.9	25	7.6	45	13.7	60	18.3	75	22.9	90	27.4	100	30.5	X	
	40-49	12-14.9	25	9.1	45	13.7	60	18.3	65	19.8	80	24.4	90	27.4	X	
	50-59	15-17.9	25	7.6	45	13.7	60	18.3	65	19.8	70	21.3	80	24.4	X	
	60-79	18-24	15	4.6	40	12.2	45	13.7	50	15.2	50	15.2	60	18.3	X	
80-99	24.1-30	10	3	15	4.6	20	6.1	25	9.1	30	9.1	40	12.2	X		
100-119	30.1-36	X		X		X		10	3	15	4.6	20	6.1	X		
120-140	36.1-43	X		X		X		X		X		X		0		

Vent Length TABLES 2A and 2B for **PGBL 800** using either 8" or 10" diameter pipe

KEY: X = not applicable for this system

TABLE 2A - System with TWO Furnace Sections (Size 800) with 8" Diameter Vent Pipe							
Vertical Height		Maximum Horizontal Distance					
		Number of 90° Elbows					
		2		1		0	
(ft)	(M)	ft	M	ft	M	ft	M
0-9	0-2.9	10	3.0	35	10.7	X	
10-39	3-11.9	12	3.7	38	11.6	X	
40-79	12-24	15	4.6	40	12.2	X	
80-100	24.1-30	X		X		0	

TABLE 2B - System with TWO Furnace Sections (Size 800) with 10" Diameter Vent Pipe (Use a taper-type connection at the venter outlet to increase vent pipe diameter.)		Vertical Height		Maximum Horizontal Distance											
				Number of 90° Elbows											
				4		3		2		1		0			
(ft)	(M)	(ft)	(M)	ft	M	ft	M	ft	M	ft	M	ft	M	ft	M
0-4	0-1.4	40	12.2	70	21.3	90	27.4	120	36.6	X					
5-9	1.5-2.9	45	13.7	75	22.9	95	29.0	125	38.1	X					
10-19	3-5.9	50	15.2	80	24.4	100	30.5	120	36.6	X					
20-29	6-8.9	55	16.8	85	25.9	105	32.0	120	36.6	X					
30-39	9-11.9	60	18.3	90	27.4	110	33.5	110	33.5	X					
40-49	12-14.9	65	19.8	90	27.4	90	27.4	90	27.4	X					
50-79	15-24	70	21.3	70	21.3	70	21.3	70	21.3	X					
80-99	24.1-30	100	30.5	50	15.2	50	15.2	50	15.2	X					
100-119	30.1-36	30	9.1	30	9.1	30	9.1	30	9.1	X					
120-140	36.1-43	X		X		X		X		X					

Vent Length TABLES 3A and 3B for **PGBL 1200** using either 8" or 10" diameter pipe

KEY: X = not applicable for this system

TABLE 3A - System with THREE Furnace Sections (Size 1200) with 8" Diameter Vent Pipe							
Vertical Height		Maximum Horizontal Distance					
		Number of 90° Elbows					
		2		1		0	
(ft)	(M)	ft	M	ft	M	ft	M
0-4	0-1.4	5	1.5	25	7.6	X	
5-9	1.5-2.9	5	1.5	20	6.1	X	
10-19	3-5.9	X		15	4.6	X	
20-29	6-8.9	X		10	3.0	X	
30-39	9-11.9	X		5	1.5	X	
40-60	12-18.3	X		X		0	

TABLE 3B - System with THREE Furnace Sections (Size 1200) with 10" Diameter Vent Pipe (Use taper-type connection at the venter outlet to increase vent pipe diameter.)		Vertical Height		Maximum Horizontal Distance											
				Number of 90° Elbows											
				4		3		2		1		0			
(ft)	(M)	(ft)	(M)	ft	M	ft	M	ft	M	ft	M	ft	M	ft	M
0-4	0-1.4	40	12.2	70	21.3	90	27.4	120	36.6	X					
5-9	1.5-2.9	45	13.7	75	22.9	95	29.0	125	38.1	X					
10-19	3-5.9	50	15.2	80	24.4	100	30.5	120	36.6	X					
20-29	6-8.9	55	16.8	85	25.9	105	32.0	120	36.6	X					
30-39	9-11.9	60	18.3	90	27.4	110	33.5	110	33.5	X					
40-49	12-14.9	65	19.8	90	27.4	90	27.4	90	27.4	X					
50-79	15-24	70	21.3	50	15.2	50	15.2	50	15.2	X					
80-99	24.1-30	100	30.5	50	15.2	50	15.2	50	15.2	X					
100-119	30.1-36	30	9.1	30	9.1	30	9.1	30	9.1	X					
120-140	36.1-43	X		X		X		X		X					

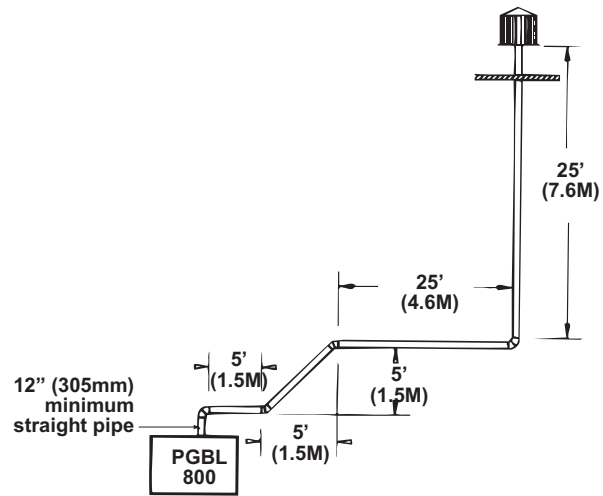
How to Apply the Tables to Determine Vent Pipe Size Needed for Vent System illustrated in FIGURE 14:

- 1) System Parameters for **Size 800** (two furnace sections) - use example shown in **FIGURE 9**
- 2) Select the Tables for a system with two furnace sections - **TABLES 2A and 2B**.
- 3) Determine which Table applies to the Application - Since the vent system arrangement in the example requires three elbows, the table for 8" diameter pipe (**TABLE 2A**) cannot be used because the maximum number of elbows allowed with 8" diameter pipe is two. **TABLE 2B** for 10" diameter pipe indicates that with three elbows and 30' of vertical pipe, up to 90' of horizontal pipe can be used. Since the example requires only a total of 25' of horizontal pipe, this system "fits" the parameters of **TABLE 2B**, and the pipe system can be installed as designed, using 10" diameter pipe.

FIGURE 14 - Venting System Example

Vent System Example (use with Tables)

Type of Unit	PGBL 800 (2 furnaces)
Horizontal Vent Run Length	5' + 5' + 15' = 25' 1.5M + 1.5M + 4.6M = 7.6M
Vertical Vent Run Length	5' + 25' = 30' 1.5M + 7.6M = 9.1M
Number of 90° Elbows	1 + 1/2 + 1/2 + 1 = 3



4. Vent System Joints - Vent system joints depend on the type of pipe being used (See No. 2 "Vent Pipe" requirements, page 19).

- If using single wall, 26-gauge or heavier galvanized pipe, secure slip-fit connections using sheetmetal screws or rivets. Seal pipe joints either with tape suitable for 550°F or high-temperature silicone sealant.
- If using Category III vent pipe, follow pipe manufacturer's instructions for joining pipe sections. When attaching Category III pipe to the venter outlet or the vent cap, make secure, sealed joints following a procedure that best suits the style of Category III pipe being used.
- If using double-wall (Type B) vent pipe (at least 1/2 of the equivalent length must be vertical), follow the pipe manufacturer's instructions for joining pipe sections. For joining double-wall pipe to the venter outlet collar, single-wall pipe, and/or the vent cap, follow the instructions in **FIGURES 15A, 15B, and 15C**.

FIGURE 15A - Attaching Double-Wall (Type-B) Vent Pipe to the Venter Outlet

A double-wall pipe run is allowed only if at least 1/2 of the vent length is vertical.

Figure 15A - STEP 1

Slide the double-wall pipe over the collar so that the collar is inside the inner pipe.



Figure 15A - STEP 2

To secure the connection, spaced equal distance around the pipe, drill and insert three 3/4" long sheetmetal screws through the pipe and into the collar. Do not over tighten the screws.



Fill inside the pipe, around the collar, with silicone sealant being sure there are no gaps.

FIGURE 15B - Attaching Double-Wall (Type B) Pipe to a Vent Cap

Figure 15B - STEP 1

Place a continual 3/8" bead of silicone sealant around the circumference of the vent cap collar. This will prevent any water inside the vent cap from running down the double-wall pipe.

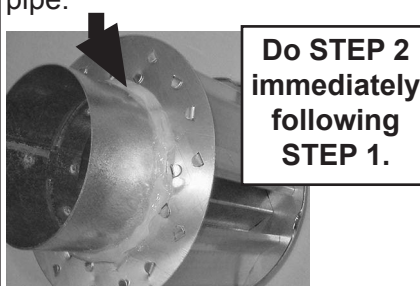


Figure 15B - STEP 2

Insert the collar on the vent cap inside the inner wall of the double-wall pipe. Insert as far as possible. Add additional silicone sealant to fully close any gaps between the vent cap and the double-wall pipe. This is necessary to prevent water from entering the double-wall pipe.



Figure 15B - STEP 3

Secure the vent cap to the double wall pipe by drilling and inserting a 3/4" long sheetmetal screw into the vent cap collar. Do not over tighten screw.



6.0 Mechanical (cont'd)

6.2. venting (cont'd)

6.2.1 Venting Indoor Model PGBL Power Vented Units (cont'd)

4. Vent System Joints (cont'd)

**FIGURE 15C - Attaching
Double-Wall (Type
B) Terminal Pipe to a
Single Wall Vent Pipe
Run**

Figure 15C - STEP 1

On the single-wall pipe, place a continual 1/4 inch bead of silicone sealant around the circumference.

**Do STEP 2 immediately after
STEP 1.**

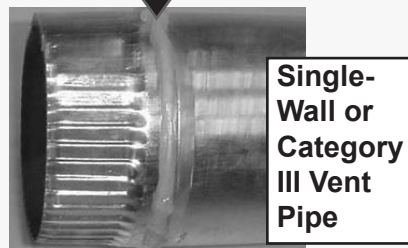


Figure 15C - STEP 2

Insert the pipe with the sealant into the inner pipe of the double-wall pipe until the bead of sealant contacts the inner pipe creating a sealed joint.

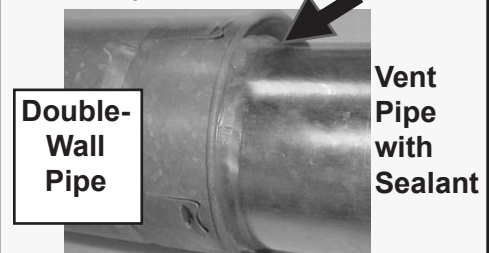
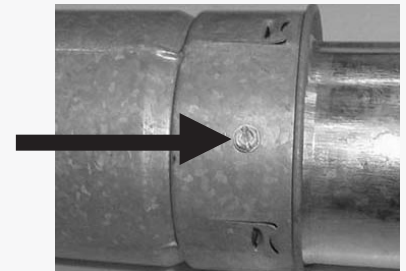


Figure 15C - STEP 3

Spaced equally around the double-wall pipe, drill three small holes below the sealant ring. Insert 3/4 inch long sheetmetal screws to secure the joint. Do not over tighten screws.



5. Vent System Support - Support horizontal runs every six feet (1.8M). Support vertical runs of type "B" double-wall or Category III vent pipe in accordance with the requirements of the pipe manufacturer. Support single-wall vertical pipe in accordance with accepted industry practices. Do not rely on the heater for support of either horizontal or vertical pipes. Use non-combustible supports on vent pipe.

6. Condensation - Single-wall vent pipe exposed to cold air or run through unheated areas must be insulated. Where extreme conditions are anticipated, install a means of condensate disposal.

7. Vent Terminal (Pipe and Vent Cap) - The vent system must be terminated with a suitable vent cap that is the same size as the vent run. Heaters approved for installation in the United States that are ordered with an optional vent cap and all heaters approved for installation in Canada have a vent cap shipped with the heater. If the "standard" size (Vent Length **TABLE 1A, 2A, or 3A**, pages 19-20) of vent pipe is used, install the vent cap provided. If a non-standard size (Vent Length **TABLE 1B, 2B, or 3B**, pages 19-20) of vent pipe is used, use of a Reznor vent cap in the size of the vent pipe is recommended.. A different style vent cap could cause nuisance problems or unsafe conditions.

See the illustrations in **FIGURES 16A or 16B** for requirements of vertical and horizontal vent termination. The vent terminal section may be either single-wall or double-wall

Horizontal Vent Terminal Clearances

NOTES: Maintain the required 12" (305mm) clearance from the wall to the vent terminal cap for stability under wind conditions.

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 drive-ways can protect masonry materials. If discoloration is an esthetic problem, relocate the vent or install a vertical vent.

Structure	Minimum Clearances for Horizontal Vent Termination Location (all directions unless specified)
Forced air inlet within 10 ft (3.1m)	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
	3 ft (0.9m) 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)
Grade (ground level)	7 ft (2.1m) above

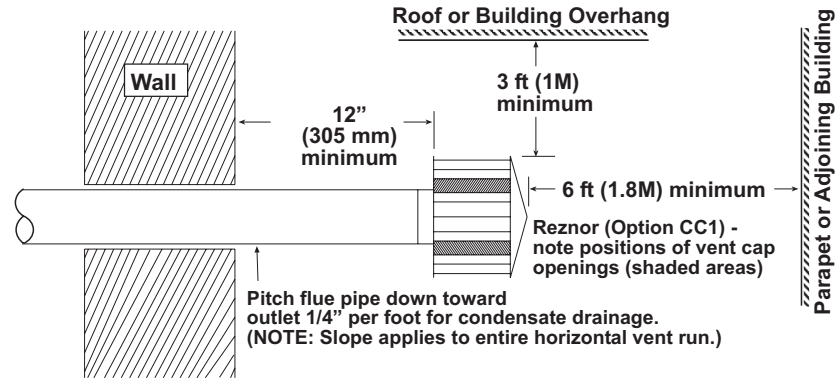
*Do not terminate the vent directly above a gas meter or service regulator.

vent pipe. If double-wall pipe is used in the vent terminal with a single-wall vent run, follow the instructions in **FIGURE 15B** to attach the vent cap and **FIGURE 15C** to connect the double-wall pipe to the single-wall vent pipe run.

FIGURE 16A - Horizontal Vent Terminal Arrangements

Single-Wall Terminal - Horizontal

Single-Wall Vent Run and Single-Wall Vent Terminal Applies to Non-Combustible Construction Only

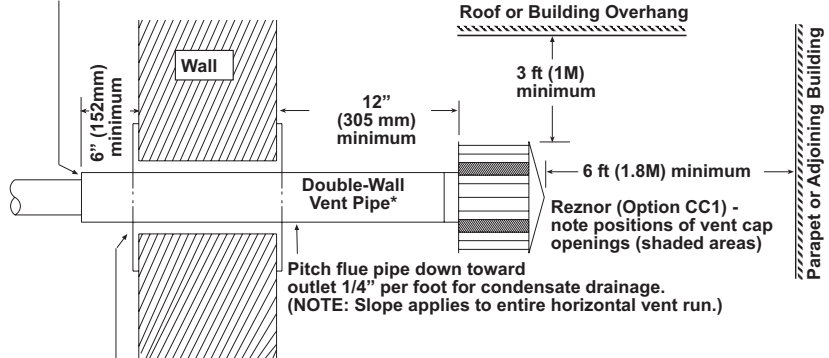


Single Wall applies to non-combustible construction only; combustible construction requires BOTH double-wall vent run and double-wall vent terminal.

Double-Wall Terminal - Horizontal

Single-Wall or Double-Wall Vent Run and Double-Wall Vent Terminal

*Follow the illustrated instructions in FIGURES 15B and 15C to join and seal a double-wall vent terminal section to a single-wall vent run and to the vent cap. If the construction is combustible, double-wall pipe is required for BOTH the vent run and the vent terminal.

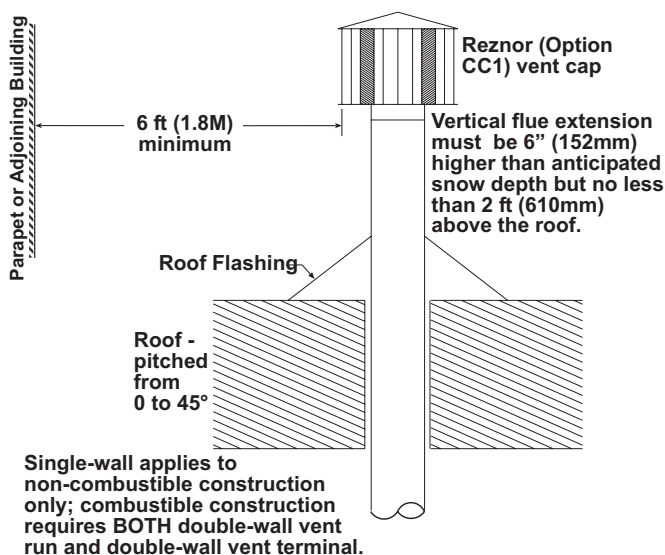


A clearance thimble is required when flue pipe extends through combustible materials. Follow the requirements of the thimble or double-wall pipe manufacturer.

FIGURE 16B - Vertical Vent Terminal Arrangements

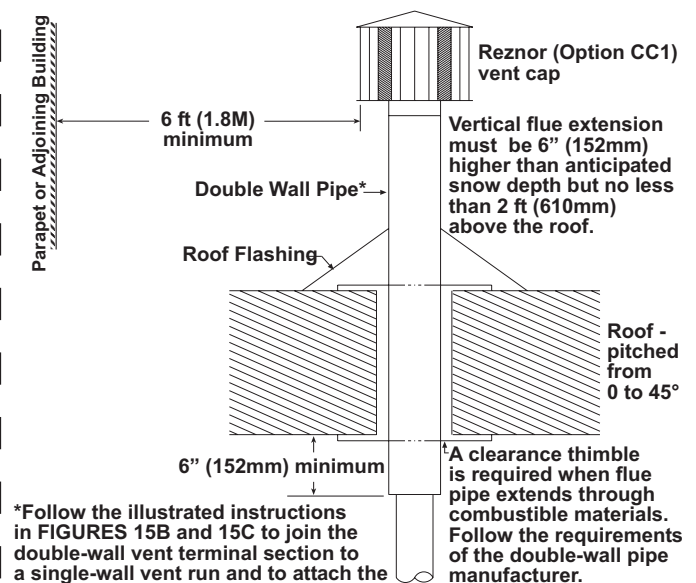
Single-Wall Terminal - Vertical

Single-Wall Vent Run and Single-Wall Vent Terminal Applies to Non-Combustible Construction Only



Double-Wall Terminal - Vertical

Single-Wall or Double-Wall Vent Run and Double-Wall Vent Terminal



*Follow the illustrated instructions in FIGURES 15B and 15C to join the double-wall vent terminal section to a single-wall vent run and to attach the vent cap. If construction is combustible, double-wall pipe is required for BOTH the vent run and vent terminal.

6.0 Mechanical (cont'd)

6.2 Venting (cont'd)

6.2.2 Venting Outdoor Model CRGBL Gravity-Vented Units

WARNING: For best operation, this gravity-vented furnace should be located on a roof or slab with at least 30 feet (9M) radius between the center of the vent cap and obstructions such as walls, parapets or cupolas. See Hazard Levels, page 2.

These gravity-vent systems have a balanced flue system in which combustion air enters through hooded intakes located in each furnace side panel and is discharged at the top of the furnace by means of an approved weather-protected gravity vent cap. Each furnace section requires a vent cap. All furnaces (except CRGBL Sizes 500 and 600) require an extension collar between the heater outlet and the vent cap. The vent cap and extension are supplied with the system and must be field installed. on each furnace section.

Model	Furnace Sections	Vent Cap		Extension	
		Size	P/N	Height	P/N
CRGBL 400	1	12"	61875	12"(305mm)	20524
CRGBL 500, 600	2	10"	61866	None	
CRGBL 700, 800	2	12"	61875	12"(305mm)	20524
CRGBL 1050, 1200	3	12"	61875	12"(305mm)	20524

Instructions for Installing Extensions and Vent Caps (See FIGURES 17A and 17B)

- 1. Unpacking** -- Gravity vent cap extension is packed inside the vent cap and must be removed before installing. Remove the extension from the inside of the cap.
- 2) Attach the extension to the furnace flue collar** --
 - a) With 3/8" centerline clearance holes at the bottom, wrap extension **around** flue collar on the top of the furnace.
 - b) Align holes in the extension with holes in the flue collar.
 - c) Secure with No. 10, 1/2" long sheetmetal screws.
- 3) Attach the vent cap to the extension** --
 - a) Position vent cap **into** top of extension. (See Important Requirement in FIGURE 17B.)
 - b) Align holes and push cap into extension.
 - c) Secure with No. 10, 1/2" long sheetmetal screws.

FIGURE 17A - Vent Cap Extension, P/N 20524

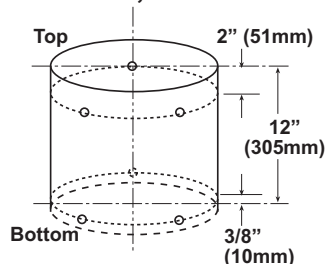
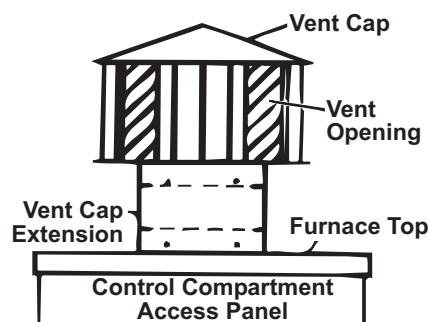


FIGURE 17B - Vent Cap Installation

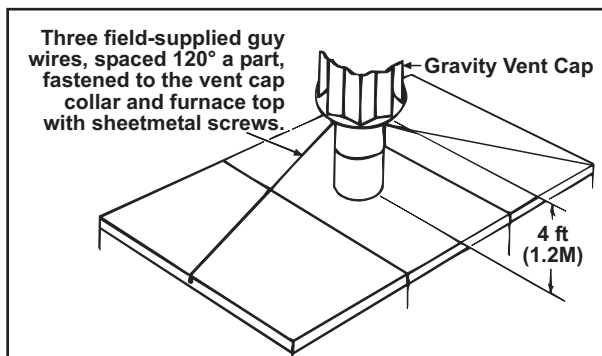
IMPORTANT REQUIREMENT: For proper operation, holes should be positioned so that the solid side panel of the cap faces the control compartment access panel side of the furnace.



Optional 4-foot Stack Extension (Option ZZ) for Outdoor, Gravity Vent Model CRGBL

FIGURE 18 - Optional Stack Extension applies only to Furnaces with Suffix "Z" in their Model No.

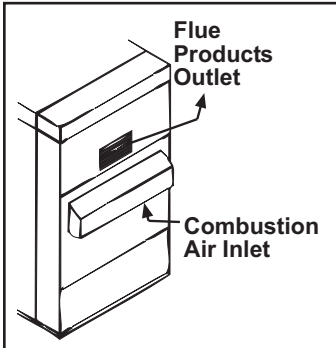
Outdoor, gravity-vented furnaces that are factory-built with Option ZZ are designed to release flue gases four feet (1.2M) above the top of each furnace. A field-provided 4-ft vent extension must be installed between the top of each furnace section and the bottom of the vent cap. (See FIGURE 18).



Furnaces with Option ZZ (factory-installed restrictor plus field-provided 4-ft stack) may be installed adjacent to fresh air inlet(s) when local code requires that release of flue gases be above an adjacent fresh air inlet that is not part of the furnace.

6.2.3 Venting Outdoor Power Vented Models RPBL and RPDBL

FIGURE 19 - Flue Outlet, Models RPBL and RPDBL



The screened flue gas and combustion air openings are located on the side of each furnace section just above the control access panel (**FIGURE 19**).

The positions of the openings discourage recirculation of combustion products and provide for furnace operation in all normal weather conditions.

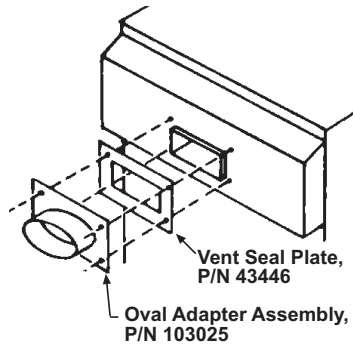
Install a power-vented furnace so that the flue discharge is **not** directed at fresh air inlets.

Optional Vertical Flue Discharge (Option CC3) for Model RPBL or RPDBL

These power vented furnaces are certified with four feet (1.2M) of vertical pipe attached as shown in **FIGURES 20A and 20B**. The distance is measured from the top of the unit to the bottom of the vent cap. The option package includes the 5" vent cap, the adapter assembly and the seal plate. (One package is required for each furnace section.) The vent pipe and supports are field supplied. **The straight pipe connecting the furnace to the 90° elbow must be at least 18" (457mm) in length.**

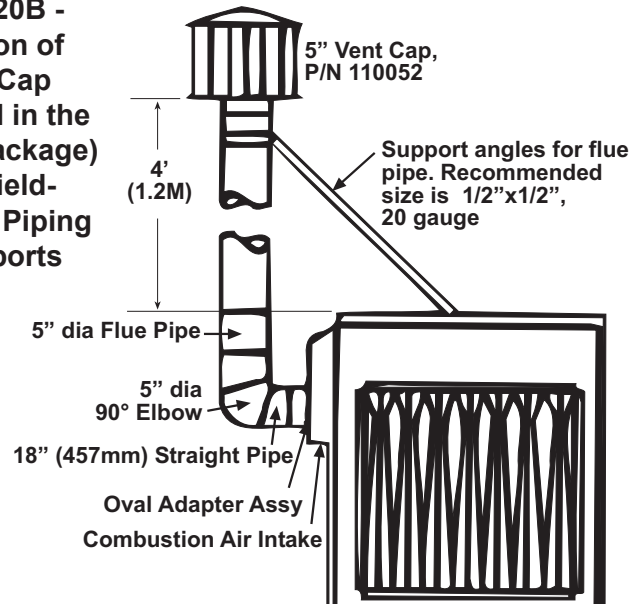
Optional vertical vent piping provides compliance with local codes that require either 10-ft (3M) horizontal or 4-ft (1.2M) vertical clearance between the flue outlet and fresh air intake of the heating system and/or the building.

FIGURE 20A - Installation of Adapter for Optional Vertical Flue Discharge (Option CC3, P/N 45021)



- 1) Remove and discard the louvered discharge grill.
- 2) Using venter seal plate as a template, drill holes. Use 3/8"-10 sheetmetal screws to attach both the venter seal plate and the oval adapter assembly.

FIGURE 20B - Installation of the Vent Cap (included in the option package) and the field-supplied Piping and Supports



6.3 Unit Inlet Air

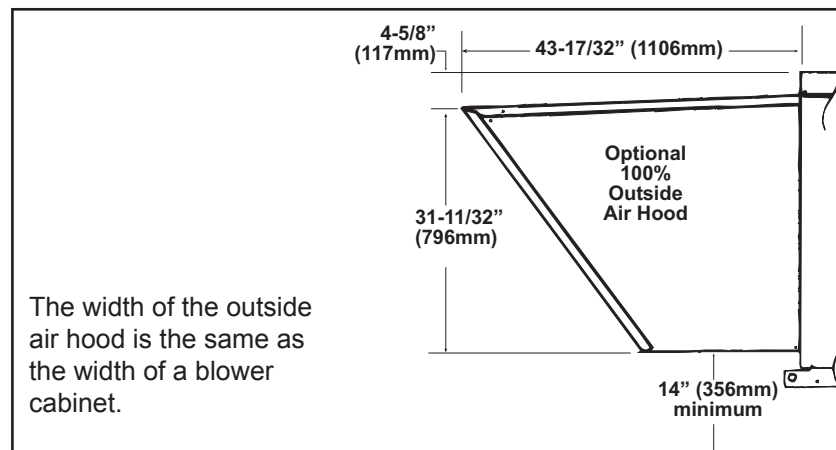
6.3.1 100% Outside Air Hood (outdoor models)

Outside air hood (Option AS2) is a weatherized, screened hood designed to be field assembled and installed around the horizontal inlet air opening of the blower cabinet. The air hood includes a louver assembly designed to help eliminate moisture from the inlet air. Complete installation instructions are packaged with the air hood option.

NOTE: Model RPDBL requires two outside air hoods.

FIGURE 21 - Dimensions of Optional Outside Air Hood

NOTE: Either a manufacturer designed optional air inlet hood as shown in **FIGURE 21** or an evaporative cooling module as shown in Paragraph 6.3.5 is required to ensure complete weather resistance.



6.0 Mechanical (cont'd)

6.3 Unit Inlet Air (cont'd)

6.3.1 100% Outside Air Hood (cont'd)

CAUTION: It is recommended that the inlet to the outside air hood NOT be facing into the prevailing wind. Allow 14" minimum clearance from the bottom of the air hood to the mounting surface.

Installation Instructions - 100% Outside Air Hood

Refer to **FIGURE 22**. All screw ends except those across the bottom should be inside the air hood.

To avoid possible damage, it is recommended that the outside air hood be installed after the system has been placed on the roof. The air hood should be installed before the heater is operated. Do not install the hood while the system (furnace or blower) is in operation.

1. Top Panel -- On the air inlet side of the blower cabinet, remove the factory-installed screws attaching the blower cabinet top. Slide the air hood top panel underneath the edge of the blower cabinet top. **The edge of the air hood top panel must be between the blower cabinet top and the end panel.** Reinsert all of the sheetmetal screws.

2. Side Panels -- Slide the air hood right side panel into the groove in the blower cabinet end panel. Be sure that the side panel is underneath and to the inside of the air hood top panel. Attach to the blower cabinet and the air hood top using the required number of sheetmetal screws. Repeat with the left side panel.

3. Bottom Panel -- Position the air hood bottom panel so that it is to the **inside** of the two side panels and **above** the factory-installed support angle. Attach to the side panels.

If the bottom panel does not rest tightly against the support angle, follow these instructions to adjust the position of the support angle:

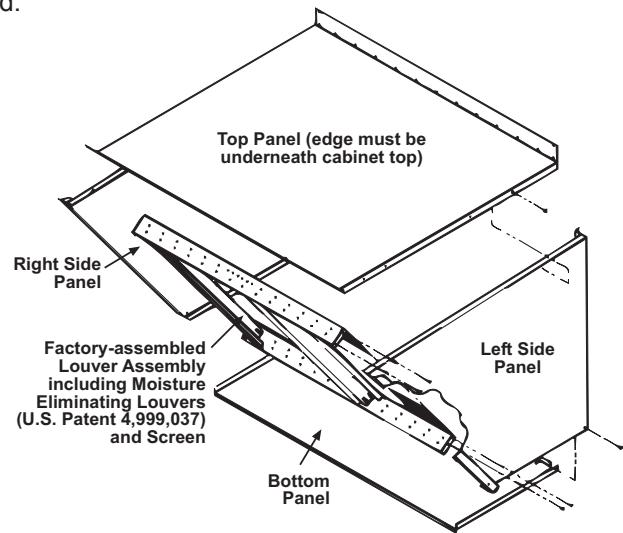
- Slightly loosen (do not remove the screws).
- Slide the support angle up so that it is against the bottom panel.
- Tighten the screws.

Attach the support angle to the air hood bottom panel. The bottom panel of the air hood and the support angle should be tight together; do not draw with the sheetmetal screws.

4. Louver Assembly -- With the intake screen toward the inside of the hood, position the pre-assembled vertical louver assembly in the inlet opening of the air hood. Using the remaining sheetmetal screws, attach the louver assembly to the air hood side panels using the holes provided.

**FIGURE 22 - Assembly Drawing of Option AS2
Outside Air hood**

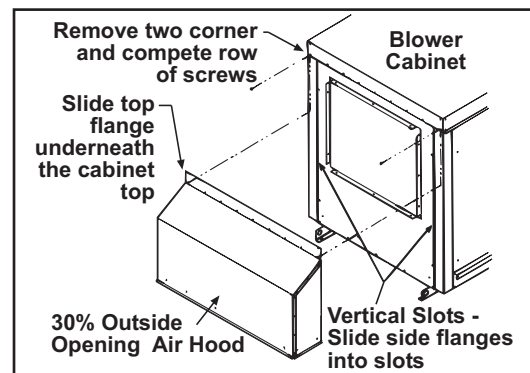
RPBL / CRGBL	RPDBL (requires 2)	Top Panel	Bottom Panel	Louver Assy
400, 800, 1200	800, 1600	100232	100239	103778
500, 600	1000, 1200	100230	100237	103776
700, 1050	1400	100231	100238	103777



6.3.2 Screened Air Hood for 30% Outside Air Opening, Part of Inlet Air Options AR6 and AR7

The outside air hood included in the air inlet options that have a 30% outside air opening (Option AR6 or AR7) is shipped separately for field installation. Instructions are packaged with the air hood.

**FIGURE 32 - Installation of Air
Hood on Cabinets with 30%
Outside Air Opening Options**



Installation Instructions - 30% Outside Air Hood (FIGURE 23)

1. On the inlet air side of the blower cabinet, remove the factory installed screws attaching the blower cabinet top.
2. Slide the air hood top flange underneath the lip of the blower cabinet top and the sides into the vertical slots. **The air hood flange must be between the blower cabinet top and the cabinet end panel.**
3. Reinsert all of the sheetmetal screws.

6.3.3 Optional Inlet Air Dampers and Controls

NOTE: Model RPDBL has two blower cabinets with dampers and controls in each cabinet.

FIGURE 24A - Control Locations for 100% Outside Air and 100% Return Air Damper Options

Damper controls are identified on the wiring diagram as AR Options.

The illustration in **FIGURE 24A** is intended to show location only of various air control accessories and does not represent suggested combinations of accessories.

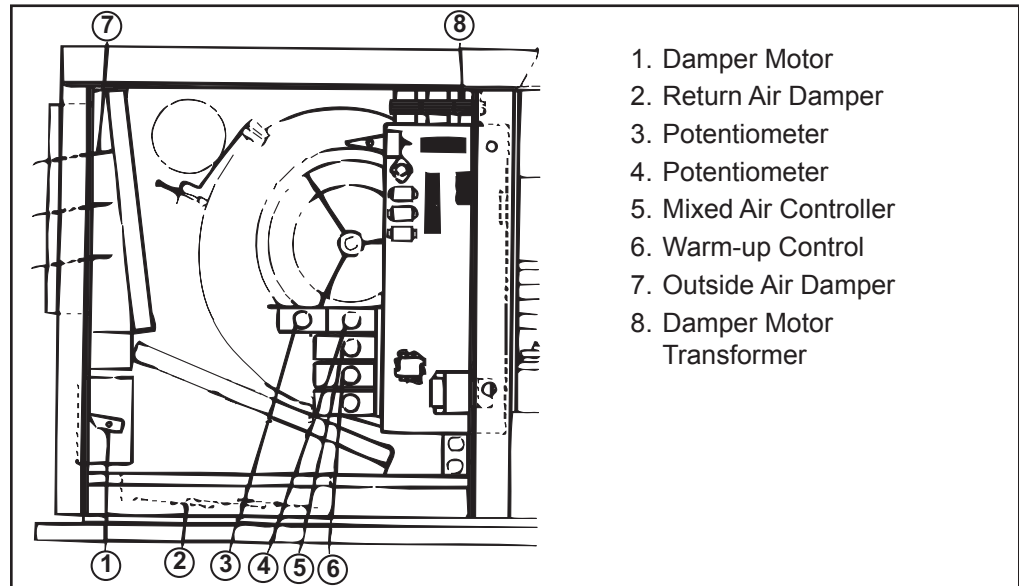


FIGURE 24B - Location of Controls for 30% Outside Air Hood and Damper Options (AR6 or AR7)

NOTE: See Paragraph 6.3.2.

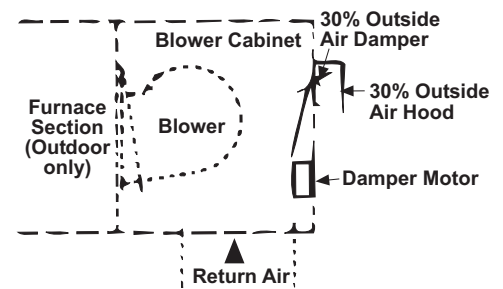
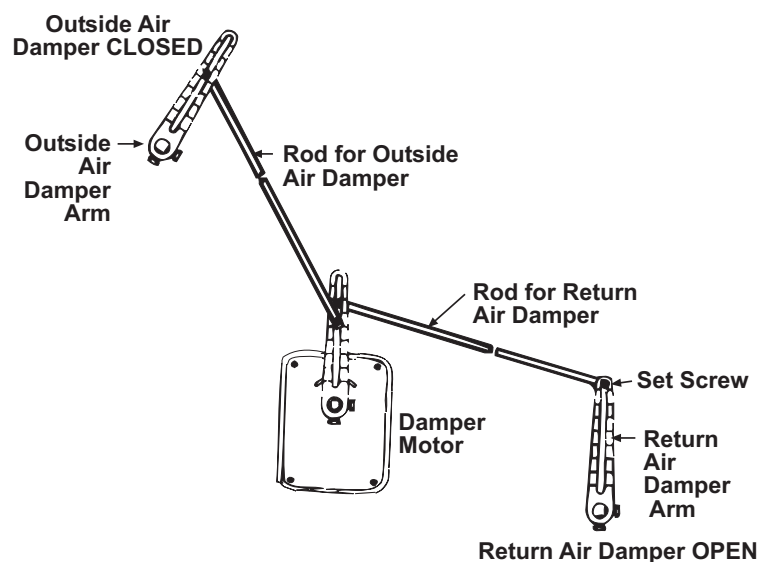


FIGURE 24C - Example of Outside Air and Return Air Damper Linkage

Inlet Air 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.



6.0 Mechanical (cont'd)

6.3 Unit Inlet Air (cont'd)

6.3.3 Optional Inlet Air Dampers and Controls (cont'd)

Pressure Null Switch (Used to control outside air dampers in Inlet Air Option AR23)

The pressure null switch used in Option AR23 is a Dwyer #1640-0 with a range of .01-.20" w.c. It is shipped separately for field installation. Refer to the following paragraphs and the manufacturer's installation instructions included with the switch.

Description and Application - The pressure null switch is a diaphragm operated differential pressure switch used in makeup air applications to control building pressure. It maintains a selected positive or negative pressure setpoint by changing the amount of outside air being introduced to the building through the modulating outside air dampers. As more pressure is required in the building, the pressure null switch activates the damper motor driving the outside air damper towards the full open position and the recirculated air damper towards the closed position. Conversely, as less pressure is required, the switch drives the dampers in the opposite direction.

Installation Instructions for Pressure Null Switch

1. Select an indoor location free from excessive vibration where oil or water will not drip onto the switch and where ambient temperature will be within a range of -30°F (dry air) to 110°F.
2. **Mount the switch with the diaphragm in a vertical plane.** The switch is position sensitive and is calibrated to operate properly when the diaphragm is vertical. Mount switch securely.
3. Connect the pressure taps on the top of the switch to sources of air pressure differential. Metal tubing with 1/4" O.D. is recommended, but any tubing system which will not unduly restrict the air flow may be used. To maintain a positive building pressure, vent the low pressure tap to the outdoors and allow the high pressure tap to monitor building pressure. To maintain a negative building pressure, reverse the functions of the high and low pressure taps. In either case, be sure that the outdoor vent is protected from the wind and screened from insects.
4. **Adjustment of the Switch** - The "HIGH" actuation point of the null switch is indicated on a calibrated scale secured to the transparent range screw enclosure. Building pressure is set by turning the adjustment screw. The "Low" actuation point is set by adjusting the span of the null by turning the span adjustment screw. The span range is .01 to .03" w.c.
5. See the wiring diagram included with the furnace to make electrical connections.

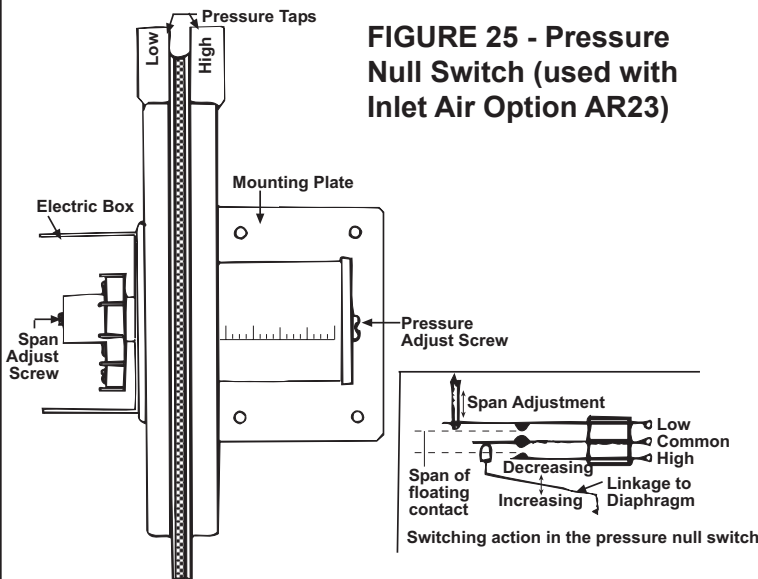


FIGURE 25 - Pressure Null Switch (used with Inlet Air Option AR23)

IMPORTANT: To eliminate shipping damage to the switch contacts, the manufacturer reduced the span adjustment to zero before shipping. The span should be adjusted prior to using the switch. (If the switch has been installed, disconnect the vent tube so that the null switch is in a neutral position.) Remove the electrical box cover and while observing the contacts, turn the span adjustment screw slowly in a clockwise direction. Continue turning the adjustment screw until you are able to see gaps between the common and both the low and high contacts. A minimum gap provides the greatest sensitivity. The wider the gap the lower the sensitivity.

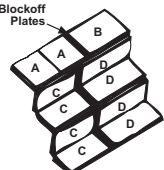
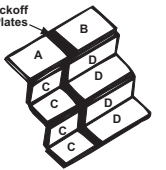
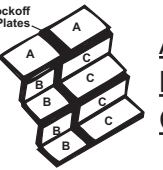
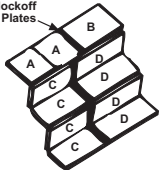
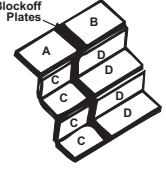
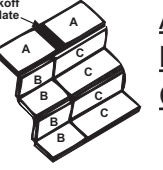
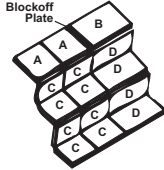
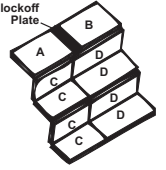
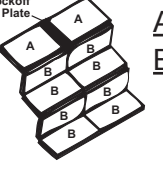
6.3.4 Optional Filter Rack and Filters

The system is equipped with a combination blower/filter cabinet. Filter rack and filters are optional equipment. Filters are available in 1" or 2", disposable, permanent, or pleated disposable styles.

Quantities and Sizes of Optional 1" or 2" Disposable Permanent Pleated Filters by Model and Size

CRGBL, RPBL, PGBL 400, 800, 1200	CRGBL and RPBL 500, 600	CRGBL and RPBL 700, 1050
(2) 16 x 16, (1) 16 x 25, (4) 12 x 25, (4) 12 x 30	(1) 16 x 25, (1) 16 x 20, (4) 12 x 20, (4) 12 x 25	(2) 16 x 25, (4) 12 x 30, (4) 12 x 20
(2) 16 x 16, (8) 12 x 16, (1) 16 x 25, (4) 12 x 26	(1) 16 x 20, (4) 12 x 20, (1) 16 x 25, (4) 12 x 26	(2) 16 x 25, (8) 12 x 26
(2) 16 x 16, (4) 12 x 25, (1) 16 x 25, (4) 12 x 32	(1) 16 x 20, (1) 16 x 25, (4) 12 x 20, (4) 12 x 25	(2) 16 x 25, (4) 12 x 32, (4) 12 x 20
RPDBL 800, 1600	RPDBL 1000, 1200	RPDBL 1400
(4) 16 x 16, (8) 12 x 25, (2) 16 x 25, (8) 12 x 30	(2) 16 x 25, (8) 12 x 20, (2) 16 x 20, (8) 12 x 25	(4) 16 x 25, (8) 12 x 20, (8) 12 x 30
(4) 16 x 16, (2) 16 x 25, (16) 12 x 16, (8) 12 x 26	(2) 16 x 20, (2) 16 x 25, (8) 12 x 20, (8) 12 x 25	(4) 16 x 25, (16) 12 x 26
(4) 16 x 16, (2) 16 x 25, (8) 12 x 25, (8) 12 x 32	(2) 16 x 20, (2) 16 x 25, (8) 12 x 20, (8) 12 x 25	(4) 16 x 25, (8) 12 x 20, (8) 12 x 32

FIGURE 26 - Filter Arrangements

Filter Arrangements for 1" or 2" Disposable Filters (Options AW2 and AW7)			
	A	16 x 16	
	B	16 x 25	
	C	12 x 25	
	D	12 x 30	
	PGBL, CRGBL, RPBL 400, 800, 1200; RPDBL 800, 1600 (2 sets)		
	A	16 x 20	
	B	16 x 25	
	C	12 x 20	
	D	12 x 25	
	PGBL, CRGBL, RPBL 500, 600; RPDBL 1000, 1200 (2 sets)		
	A	16 x 25	
	B	12 x 20	
	C	12 x 30	
	PGBL, CRGBL, RPBL 700, 1050; RPDBL 1400 (2 sets)		
	Filter Arrangements for 1" or 2" Disposable Pleated Filters (Options AW10 and AW11)		
	A	16 x 16	
	B	16 x 25	
	C	12 x 25	
	D	12 x 32	
	PGBL, CRGBL, RPBL 400, 800, 1200; RPDBL 800, 1600 (2 sets)		
	A	16 x 20	
	B	16 x 25	
	C	12 x 20	
	D	12 x 25	
	PGBL, CRGBL, RPBL 500, 600; RPDBL 1000, 1200 (2 sets)		
	A	16 x 25	
	B	12 x 20	
	C	12 x 32	
	PGBL, CRGBL, RPBL 700, 1050; RPDBL 1400 (2 sets)		
	Filter Arrangements for 1" or 2" Permanent Filters (Options AW8 and AW9)		
	A	16 x 16	
	B	16 x 25	
	C	12 x 16	
	D	12 x 26	
	PGBL, CRGBL, RPBL 400, 800, 1200; RPDBL 800, 1600 (2 sets)		
	A	16 x 20	
	B	16 x 25	
	C	12 x 20	
	D	12 x 26	
	PGBL, CRGBL, RPBL 500, 600; RPDBL 1000, 1200 (2 sets)		
	A	16 x 25	
	B	12 x 26	
	PGBL, CRGBL, RPBL 700, 1050; RPDBL 1400 (2 sets)		

PGBL, CRGBL, & RPBL	CFM	Filter Pressure Drops (" w.c.)					
		Disposable		Permanent		Pleated	
		1"	2"	1"	2"	1"	2"
400 1 Size 400 Furnace and 1 BL Blower	3300	0.01	0.02	0.02	0.03	0.04	0.03
	4000	0.02	0.03	0.04	0.05	0.09	0.06
	5000	0.03	0.04	0.06	0.08	0.15	0.10
	6000	0.05	0.06	0.08	0.12	0.21	0.14
	7000	0.06	0.08	0.11	0.16	0.28	0.19
	8000	0.08	0.10	0.15	0.21	0.37	0.25
	9000	0.11	0.13	0.19	0.26	0.46	0.31
	10000	N/A	N/A	0.23	0.33	0.57	0.39
	11000	N/A	N/A	0.28	0.40	0.69	0.47
	12000	N/A	N/A	0.34	0.48	0.82	0.56
500, 600 2 Size 250 or 300 Furnaces and 1 BL Blower	13000	N/A	N/A	0.40	0.56	N/A	N/A
	14000	N/A	N/A	0.46	0.65	N/A	N/A
	3700	0.02	0.04	0.03	0.04	0.09	0.06
	4000	0.04	0.05	0.04	0.06	0.12	0.08
	5000	0.06	0.08	0.07	0.10	0.18	0.12
	6000	0.08	0.12	0.10	0.14	0.25	0.17
	7000	0.10	0.16	0.14	0.20	0.35	0.23
	8000	N/A	N/A	0.18	0.25	0.46	0.31
700 2 Size 350 Furnaces and 1 BL Blower	9000	N/A	N/A	0.22	0.31	0.59	0.40
	10000	N/A	N/A	0.28	0.39	N/A	N/A
	11000	N/A	N/A	0.33	0.46	N/A	N/A
	12500	N/A	N/A	0.43	0.60	N/A	N/A
	5200	0.04	0.06	0.06	0.08	0.14	0.10
	6000	0.04	0.06	0.08	0.10	0.22	0.15
	7000	0.06	0.08	0.10	0.14	0.30	0.20
	8000	0.08	0.10	0.14	0.18	0.39	0.27
	9000	N/A	N/A	0.18	0.24	0.49	0.33
	10000	N/A	N/A	0.22	0.30	0.61	0.41
11000	N/A	N/A	N/A	0.26	0.36	N/A	N/A
	12000	N/A	N/A	0.32	0.42	N/A	N/A
	13000	N/A	N/A	0.38	0.50	N/A	N/A

PGBL, CRGBL, & RPBL	CFM	Filter Pressure Drops (" w.c.)					
		Disposable		Permanent		Pleated	
		1"	2"	1"	2"	1"	2"
800 2 Size 400 Furnaces and 1 BL Blower	5900	0.04	0.05	0.07	0.10	0.18	0.12
	6000	0.05	0.06	0.08	0.12	0.21	0.14
	7000	0.06	0.08	0.11	0.16	0.28	0.19
	8000	0.08	0.10	0.15	0.21	0.37	0.25
	9000	0.11	0.13	0.19	0.26	0.46	0.31
	10000	N/A	N/A	0.23	0.33	0.57	0.39
	11000	N/A	N/A	0.28	0.40	0.69	0.47
	12000	N/A	N/A	0.34	0.48	0.82	0.56
	13000	N/A	N/A	0.40	0.56	N/A	N/A
	6500	0.04	0.06	0.08	0.10	0.14	0.08
1050 3 Size 350 Furnaces and 1 BL Blower	7000	0.06	0.08	0.10	0.14	0.18	0.12
	8000	0.08	0.10	0.14	0.18	0.24	0.16
	9000	N/A	N/A	0.18	0.24	0.30	0.2
	10000	N/A	N/A	0.22	0.30	0.36	0.24
	11000	N/A	N/A	0.26	0.36	N/A	N/A
	12000	N/A	N/A	0.32	0.42	N/A	N/A
	13000	N/A	N/A	0.38	0.50	N/A	N/A
	7400	0.06	0.08	0.11	0.16	0.28	0.19
1200 3 Size 400 Furnaces and 1 BL Blower	8000	0.08	0.10	0.15	0.21	0.37	0.25
	9000	0.11	0.13	0.19	0.26	0.46	0.31
	10000	N/A	N/A	0.23	0.33	0.57	0.39
	11000	N/A	N/A	0.28	0.40	0.69	0.47
	12000	N/A	N/A	0.34	0.48	0.82	0.56
	13000	N/A	N/A	0.40	0.56	N/A	N/A
	7400	0.06	0.08	0.11	0.16	0.28	0.19
	8000	0.08	0.10	0.15	0.21	0.37	0.25

Filter Range

Disposable.....0 to 400 FPM

Pleated Disposable...0 to 500 FPM

Permanent.....0 to 600 FPM

Type of Filter	Average Efficiency	Average Arrestance
Disposable	1"	Less than 20%
	2"	Less than 20%
Permanent	1"	Less than 20%
	2"	Less than 20%
Pleated Disposable	1"	30% to 35%
	2"	30% to 35%

*Tested in accordance with ASHRAE 52-76 Test Standard.

RPDBL Size	CFM	Filter Pressure Drops (" w.c.)					
		Disposable		Permanent		Pleated	
		1"	2"	1"	2"	1"	2"
800 2 Size 400 Furnaces and 2 BL Blowers	6600	0.01	0.02	0.02	0.03	0.04	0.03
	8000	0.02	0.03	0.04	0.05	0.09	0.06
	10000	0.03	0.04	0.06	0.08	0.15	0.10
	12000	0.05	0.06	0.08	0.12	0.21	0.14
	14000	0.06	0.08	0.11	0.16	0.28	0.19
	16000	0.08	0.10	0.15	0.21	0.37	0.25
	18000	0.11	0.13	0.19	0.26	0.46	0.31
	20000	N/A	N/A	0.23	0.33	0.57	0.39
	22000	N/A	N/A	0.28	0.40	0.69	0.47
1000 4 Size 250 Furnaces and 2 BL Blowers	7400	0.02	0.04	0.03	0.04	0.09	0.06
	8000	0.04	0.05	0.04	0.06	0.12	0.08
	10000	0.06	0.08	0.07	0.10	0.18	0.12
	12000	0.08	0.12	0.10	0.14	0.25	0.17
	14000	0.10	0.16	0.14	0.20	0.35	0.23
	16000	N/A	N/A	0.18	0.25	0.47	0.31
	18000	N/A	N/A	0.22	0.31	0.59	0.40
	20000	N/A	N/A	0.28	0.39	N/A	N/A
1200 4 Size 300 Furnaces and 2 BL Blowers	8900	0.05	0.07	0.06	0.08	0.15	0.10
	10000	0.06	0.08	0.07	0.10	0.18	0.12
	12000	0.08	0.12	0.10	0.14	0.25	0.17
	14000	0.10	0.16	0.14	0.20	0.35	0.23
	16000	N/A	N/A	0.18	0.25	0.46	0.31
	18000	N/A	N/A	0.22	0.31	0.59	0.40
	20000	N/A	N/A	0.28	0.39	N/A	N/A
	1400 4 Size 350 Furnaces and 2 BL Blowers	10400	0.04	0.06	0.06	0.08	0.14
12000		0.04	0.06	0.08	0.10	0.22	0.15
14000		0.06	0.08	0.10	0.14	0.30	0.20
16000		0.08	0.10	0.14	0.18	0.39	0.27
18000		N/A	N/A	0.18	0.24	0.49	0.33
20000		N/A	N/A	0.22	0.30	0.61	0.41
22000		N/A	N/A	0.26	0.36	N/A	N/A
1600 4 Size 400 Furnaces and 2 BL Blowers		11800	0.04	0.05	0.07	0.10	0.18
	14000	0.06	0.08	0.11	0.15	0.28	0.19
	16000	0.08	0.10	0.15	0.21	0.37	0.25
	18000	0.11	0.13	0.19	0.26	0.47	0.31
	20000	N/A	N/A	0.23	0.33	0.57	0.39
	22000	N/A	N/A	0.28	0.40	0.69	0.47

6.0 Mechanical (cont'd)

Optional Dirty Filter Switch - All Models

6.3 Unit Inlet Air (cont'd)

6.3.4 Optional Filter Rack and Filters (cont'd)

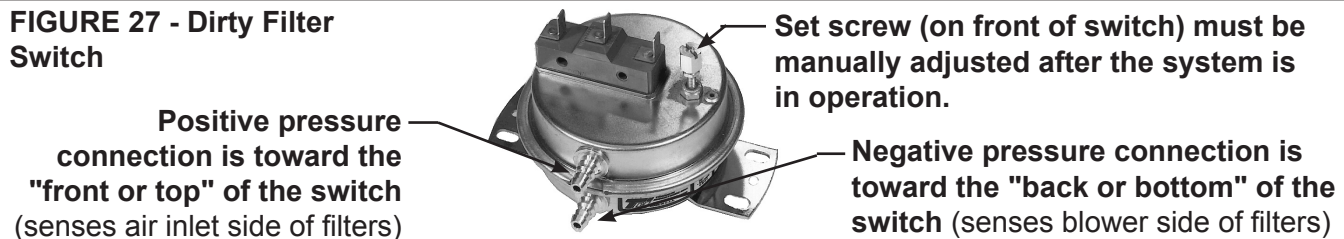
The optional dirty filter pressure switch is used to provide warning to the user by energizing an indicator light on an optional remote console. The light indicates that the filters are in need of cleaning or changing. The adjustable, single-pole/normally open differential switch closes when an increase in pressure differential above the setpoint, is sensed across the filter bank.

This switch is located in the furnace section. See **FIGURE 41**, Item 17. After the unit is started, before continuous operation, the dirty filter switch must be set.

Instructions for Setting Dirty Filter Switch

With clean filters in place, blower doors closed, and blower in operation, decrease the pressure setting by adjusting the set screw on the switch clockwise until the filter light is energized or the 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.

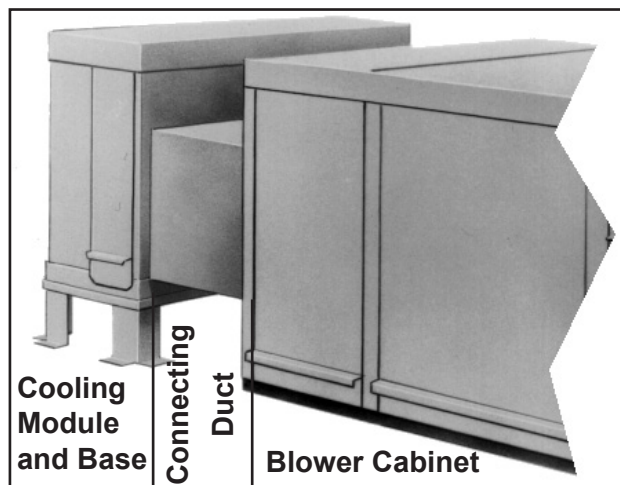
**FIGURE 27 - Dirty Filter
Switch**



6.3.5 Optional Evaporative Cooling Module - Applies to Model PGBL, CRGBL, and RPBL

**FIGURE 28 - Optional
Evaporative Cooling
Module is factory-
assembled for field
attachment to the
blower cabinet (duct
and base are shipped
knocked down for field
assembly)**

Evaporative cooling provides excellent comfort cooling at low initial equipment and installation costs and low operating and maintenance costs. Direct evaporative cooling works solely on the principle that water in direct contact with a moving airstream will eventually evaporate if the droplets have long enough exposure. This evaporative cooling module uses wetted rigid cellulose or glass fiber media to retain water in order to allow time for evaporation.



The evaporative cooling module for these systems is factory assembled but is not attached to the blower cabinet at the factory. It is shipped separately for field attachment to the system blower cabinet. The base support for the cooling module and the transitional ductwork between the cooling module and the blower cabinet inlet are shipped separately and must be field assembled and installed. Complete installation instructions including water and electrical connections are included with the evaporative cooling module package.

Included in the cooling module installation booklet is a preparation checklist. All items in that checklist should be consulted prior to beginning installation of the optional evaporative cooling module. Four of those items are listed below.

- ☐ Make certain the supporting platform is capable of handling the additional load of a full cooling module reservoir.

Weights of Evaporative Cooling Module - With Wet Media and Full Reservoir (lbs.)

Module with 6" rigid cellulose media (Opt AS3) 349 lbs

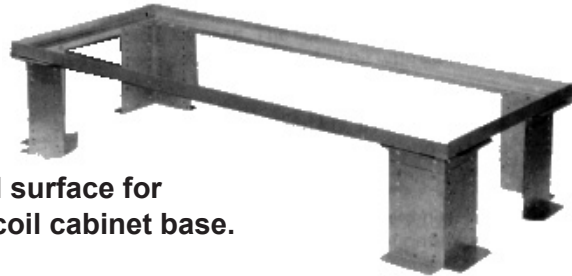
Module with 12" rigid cellulose media (Opt AS4) 431 lbs

Module with 6" rigid glass fiber media (Opt AS5) 420 lbs

Module with 12" rigid glass fiber media (Opt AS8) 514 lbs

- ☐ Make certain the surface is level and free of debris where cooling module will be mounted.
- ☐ Provide a weather-resistant, solid wood or metal base under legs of cooling module base.

FIGURE 29 - Field-Assembled Base for Optional Evaporative Cooling Module



Provide solid, level surface for mounting cooling coil cabinet base.

- ☐ Make certain that there will be adequate clearance between the bottom of the reservoir and the mounting surface to allow for drain and overflow pipe connections.

The optional evaporative cooling module is equipped with high efficiency pad media of either 6" or 12" rigid cellulose (**Option AS3 or AS4**) or 6" or 12" rigid glass fiber (**Option AS5 or AS6**). Six-inch media provides 68% efficiency; 12" media provides 90% efficiency. Efficiency values are stated at maximum allowable CFM without the addition of a moisture elimination pad with an inlet dry bulb temperature of 95°F and inlet wet bulb temperature of 65°F. The evaporative cooling efficiency is a function of inlet temperature and of face velocity through the media. The stated cooling efficiency will rise with the decrease of CFM and the increase of inlet temperature. Moisture elimination pads (Option ASA1) may be used on all units but are required on units with over 11,200 CFM (950 FPM). Instructions for field installation of the optional moisture elimination pad are included with the cooling module.

WARNING: Pump must never be operated without water in the reservoir. See Hazard Levels, page 2.

WARNING: Disconnect all power to the unit before doing any maintenance. Failure to do so can cause electrical shock, personal injury or death.

Evaporative Cooling Module Maintenance

NOTE: For troubleshooting information about the optional evaporative cooling module, refer to Form I-OPT-EC, installation manual shipped with the evaporative cooling module.

Instructions for Replacing Evaporative Cooling Media

Media -- Over time, excessive amounts of mineral deposits will begin to build up on the media. Annually, scale and dirt should be washed off the entering surface of the media. Remove the pad retainers and screen (See Steps 1-3 and 6-8 of Media Replacement Instructions). Clean the media using a garden hose, mild soap, and a **soft** bristled brush. When the media becomes too clogged with mineral deposits and dirt that it cannot be cleaned, the pads should be replaced. The average pad life expectancy is approximately three cooling seasons.

Select the correct replacement part numbers and order replacement media pads from your distributor. Follow the instructions below and remove and replace pads as shown in **FIGURES 30 and 31**.

1. Remove the three sheetmetal screws that hold the top pad retainer in place. Release the top pad retainer from the cooling module.
2. Remove the three sheetmetal screws that hold the bottom pad retainer in place. Release bottom pad retainer from the cooling module.
3. Disengage the screen retainers from the sides of the media.

6.0 Mechanical (cont'd)

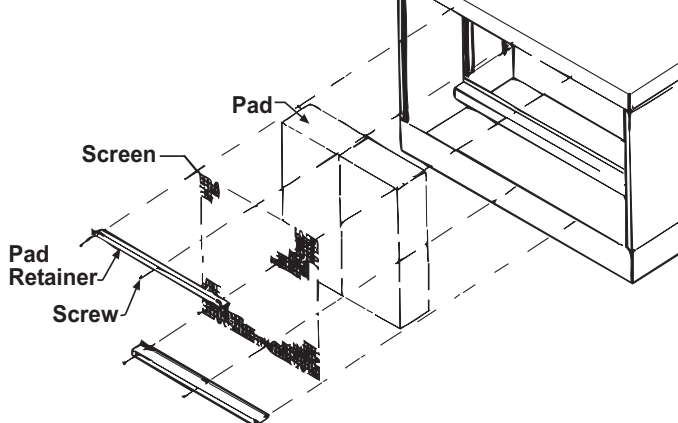
6.3 Unit Inlet Air (cont'd)

6.3.5 Optional Evaporative Cooling Module (cont'd)

Evaporative Cooling Module Maintenance (cont'd)

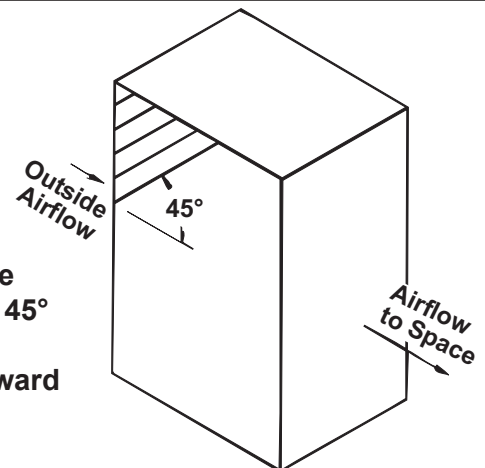
4. Disengage inlet screen from media pads and remove.
5. Slide all media pads horizontally away from the cooling module until clear of bottom reservoir pan. Dispose of properly.
6. Replace media by sliding media pads over both support rails until back stop is encountered. Media **must** be placed as shown in **FIGURE 31**.
7. Center screen on the incoming air side of the media.
8. Replace the two side screen retainers by fitting them between the side of the media pad and the side of the cooling module. The retainers should fit snugly, pinching the screen against the media pads.
9. Replace the bottom pad retainer by securing the retainer between the pad and the reservoir pan. Fasten with the three sheetmetal screws removed in Step 2.
10. Replace the top pad retainer by securing the retainer between the pad and top of the cooling module. Fasten with the three sheetmetal screws removed in Step 1.

FIGURE 30 - Removal and Replacement of Evaporative Cooling Module Media



Media Pad Sizes (inches)	Qty	Replacement Part No. (each)			
		Rigid Cellulose		Rigid Glass Fiber	
		6"	12"	6"	12"
48 x 12	4	107190	107194	107199	107201
48 x 8-5/8	1	107191	107195	107200	107202

FIGURE 31 - Media must be installed with 45° angle sloping downward toward the incoming outside air.



IMPORTANT: The media is made up of two different sheets of cooling material. Each sheet has its own unique angle. When replacing the cooling media, **BE CERTAIN** that the 45° angle slopes downward toward the incoming outside air (as illustrated above). If the media is not installed properly, water blowoff from the media pads will occur.

Water Feed Line and Distribution Piping

Annually, the water supply line and the water distribution line (either PVC pipe or water sock) should be flushed of debris and contaminants.

1. Remove the media pads following the instructions above.
2. Remove the water feed line from the downstream side of the ball valve and unscrew the water bleed line barbed hose fitting.
3. Force a fresh water supply up through the water inlet hose and thoroughly flush the distribution line.
4. Re-assemble, being careful to install media with air flow direction as shown in **FIGURE 31**.

Water Pump and Inlet Basket Screen (Does not apply to module with optional timed metering system.)

Annually, the pump and inlet basket should be removed, disassembled and cleaned.

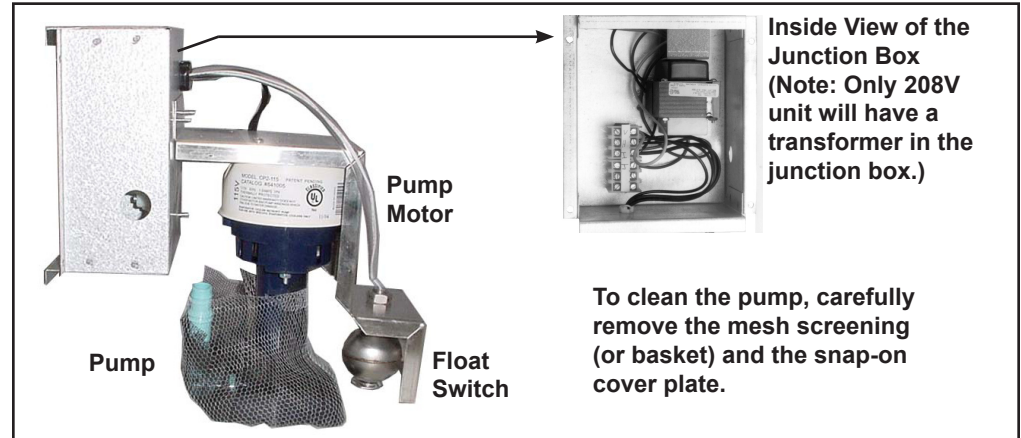
WARNING: Do not expose pump motor or any part of the electrical box to water. Evaporative cooling pump is NOT submersible.

1. Disconnect the power supply to the unit.
2. Remove the junction box door and disconnect the two power supply wires from the terminal block inside the junction box.
3. Disconnect the water feed line hose from the upstream side of the ball valve.

4. Unscrew the four sheetmetal screws holding the junction box to the cooling module. Remove the junction box-pump-float switch assembly.
5. Dislodge the inlet basket screen from the pump and clean any buildup of debris and dirt. Carefully remove the base cover plate from the bottom of the pump. Using a mild soap solution, wash all deposits from the inside of the pump and remove all debris from the impeller.
6. Reassemble the pump. Replace the parts in exact reverse order, being careful that everything is returned to its proper position.

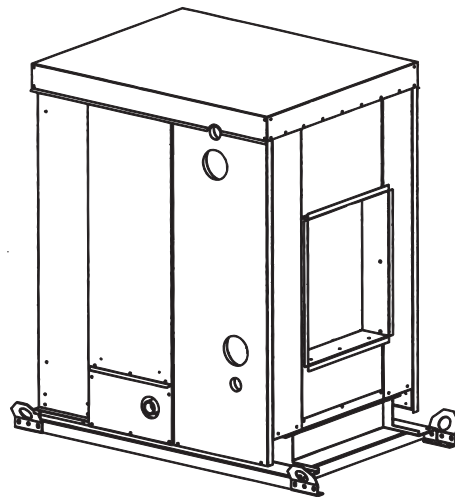
FIGURE 32 - Remove Junction Box, Pump and Float Switch as an Assembly

(NOTE: Applies to evaporative cooling module with float and pump control system only. Depending on date of manufacture, actual assembly may not appear exactly as in the photo.)



6.3.6 Optional Cooling Coil Cabinet, Option AU

FIGURE 33 - Optional Cooling Coil Cabinet is shipped separately for field attachment.



The optional cooling coil cabinet is shipped separately for attachment in the field. The cabinet includes either a chilled water or a refrigerant (DX) air conditioning coil. Cabinets alone have horizontal discharge but may have an attached downturn plenum for vertical discharge. If the downturn plenum is equipped with discharge dampers, field wiring including drilling holes and running wires is required. Cooling coil cabinet dimensions are on page 9.

(NOTE: If the system is being installed indoors, consult the factory regarding installation.)

WARNINGS: Do not attach the cooling coil cabinet before lifting the packaged blower/furnace system into position. Lift cooling coil cabinet separately. Do not attach the cooling coil cabinet while the furnace is in operation.

Using the parts shipped inside the cooling coil cabinet (see list top of page), follow the instructions to connect the coil cabinet to the furnace. In addition to normally required tools, a driver extension, a hammer, and bar or short length of 2x4 will be required. Silicone caulking must be field-supplied.

Factory-Supplied Parts for Attaching Optional Cooling Coil Cabinet

Description	Qty	400	500, 600	700	800	1050	1200
Top/Bottom Duct Connectors	2	106340, 47"	106338, 36"	106339, 41-1/2"	106340, 47"	106339, 41-1/2"	106340, 47"
Side Duct Connectors. 19-1/2"	2	106395	106395	106395	106395	106395	106395
#14 x 3/4" long Sheetmetal Screws	8	105171	105171	105171	105171	105171	105171
Left Side Filler Panel	1	172357	172357	172357	172357	172357	172357
Right Side Filler Panel	1	172358	172358	172358	172358	172358	172358
Top Filler Panel	1	172364	172362	172363	172364	172363	172364
Insulation - 1" x 42" x 9"	2	172546	172546	172546	172546	172546	172546
#10 x 1/2" long Sheetmetal Screws	>	(26) 11813	(24) 11813	(25) 11813	(26) 11813	(25) 11813	(26) 11813
Rubber Gasket Strip 3/32" x 1-1/8" x	1	106310 64-7/8"	103608 53-7/8"	103609 59-3/8"	103610 64-7/8"	103609 59-3/8"	103610 64-7/8"

6.0 Mechanical (cont'd)

6.3 Unit Inlet Air (cont'd)

6.3.6 Optional Cooling Coil Cabinet, Option AU (cont'd)

Instructions for Lifting and Attaching Cabinet (NOTE: If suspending cabinet, consult factory.)

1. **After** the blower/furnace packaged system is in place on the roof curb or mounting rails, use a 9/16" wrench or socket to remove the lifting lugs that are on the discharge end of the system.
2. Lift the cooling coil cabinet and position it with the inlet side next to the discharge opening of the furnace. Remove the lifting lugs that are on the cooling coil cabinet.
3. Slide the cooling coil cabinet so that the duct flanges of the furnace and the cooling coil cabinet butt together (See **FIGURE 34A**).
4. **Join the Duct Flanges**
 - a) Use the four "U" shaped duct connector pieces and the 3/4" screws to join the duct flanges. Attach one of the 19-1/2" (495mm) long side connectors to both the top and bottom duct connectors, being sure that the "U" in the metal is open to the inside. (See **FIGURE 34B**.)

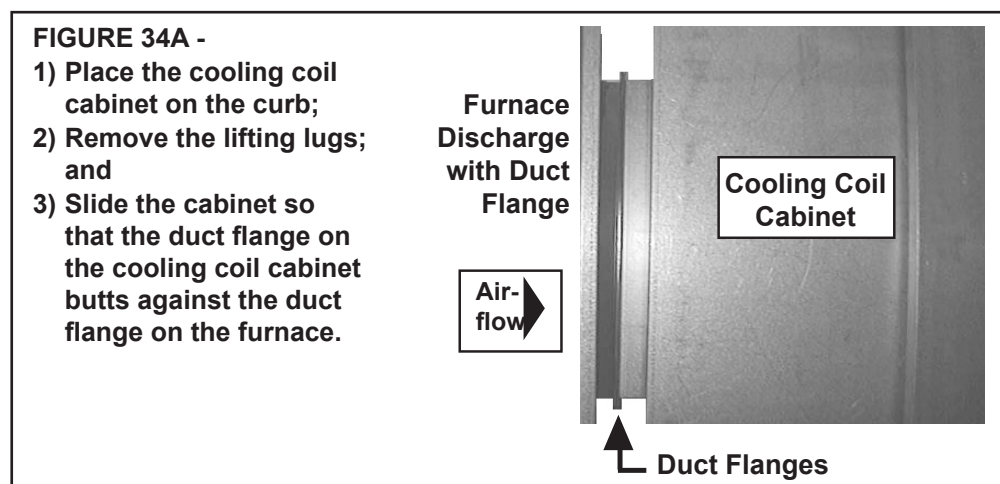


FIGURE 34B - Assemble top, bottom, and one side of the duct connector pieces using the 3/4" sheetmetal screws

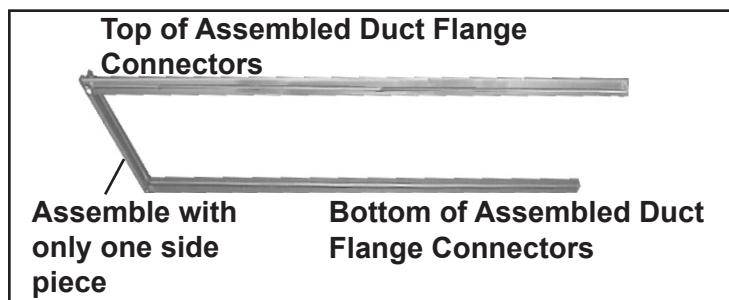
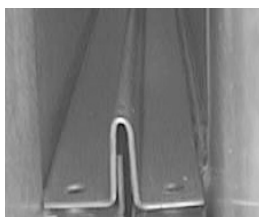


FIGURE 34C - The end of the top connector on the "open side" of the connector assembly.



- b) Position the assembled connectors so that the screw holes will be in the top piece at the open side (See **FIGURE 34C**). In this position, insert the assembled top and bottom connectors into the space between the furnace and the cooling coil cabinet.
Tap with a hammer, first on the side, then on the top, and last on the bottom of the assembled duct connector until it is seated over both duct flanges.
 - c) Position the remaining side connector. Use a driver extension to insert the screws that attach the side connector to the top and bottom connectors. See **FIGURE 34D**.
- 5. Wiring Instructions - Apply to Downturn Plenum Cabinet with Optional Discharge Dampers Only** - If installing an Option AU12 or AU14 cooling coil cabinet with a downturn plenum cabinet equipped with optional discharge dampers, the damper motor wires must be connected to the terminal blocks in the furnace electrical compartment. If the coil cabinet being installed does not include a downturn plenum with a discharge damper, skip Step 5 and proceed to Step 6.
- a) Drill three 7/8" holes as instructed below. Be sure all holes are free of burrs.
First Hole:
 - 1) Remove the control side door on the discharge plenum.

FIGURE 34D - Position the remaining side connector over the duct flanges. Attach to the top and bottom connectors with 3/4" screws creating a "U" shaped rectangular frame that joins the duct flanges on all four sides.



Top screws should be vertical.

Bottom screws should be horizontal.

- 2) Locate the discharge damper motor. Connected to the motor are three wires in lengths adequate to reach the furnace section.
- 3) Refer to **FIGURE 34E**. On the leg of the downturn plenum next to the cooling coil cabinet locate the mounting screw illustrated. Measure up 6" (152mm). At same centerline as the screw, drill the first 7/8" hole.

Second Hole:

- 1) Remove the cooling coil access panel(s).
- 2) Locate the coil blockoff plate. Measure up 4" (102mm) from the bottom of the blockoff plate. At that location, find the center point of the blockoff plate and drill a 7/8" hole. The hole should be approximately even with the hole drilled in the downturn plenum leg.

Third Hole:

On the cabinet leg on the entering air side of the cooling coil cabinet, measure up 10" (254mm) from the bottom pan. At that height, measure in 4" (102mm) from the edge and drill a 7/8" hole.

- b) On the outside of the furnace section (where the flanges were joined in Step 4), locate the three hole plugs. Remove the center plug exposing a 7/8" hole in the cabinet leg. See **FIGURE 34F**.

FIGURE 34E

- 3) Drill 7/8" Hole
- 2) Measure up 6" (152mm)
- 1) Locate Mounting Screw

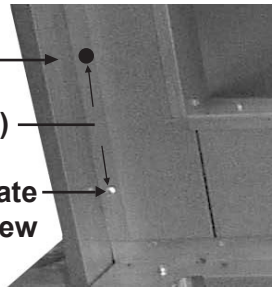


FIGURE 34F

On the furnace section, remove the center hole plug

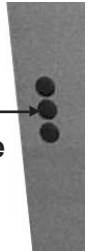
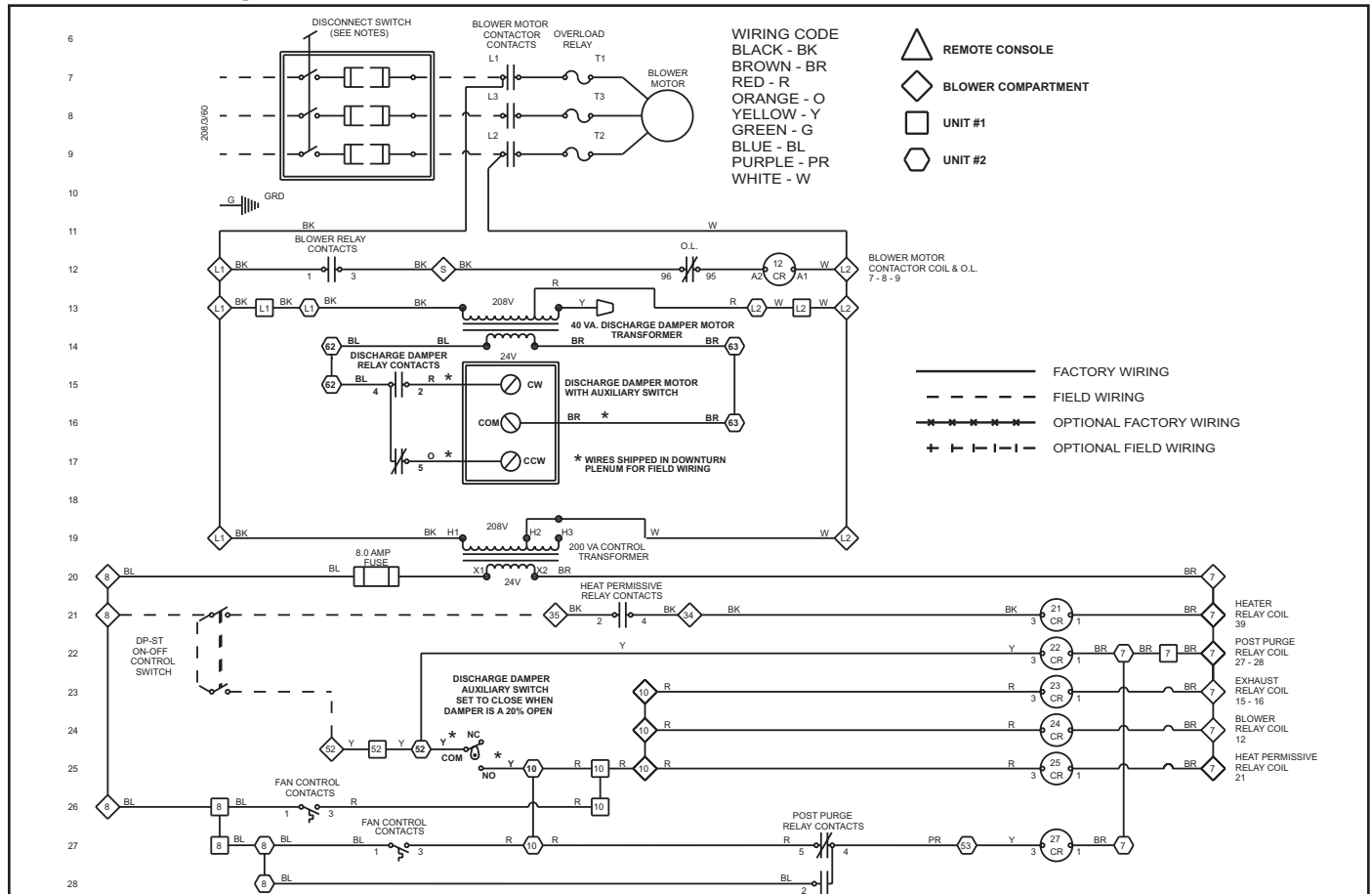


FIGURE 34G - Sample of a Partial Wiring Diagram showing Typical Field-Wiring Connections for Optional Discharge Damper



6.0 Mechanical (cont'd)

6.3 Unit Inlet Air (cont'd)

6.3.6 Optional Cooling Coil Cabinet, Option AU (cont'd)

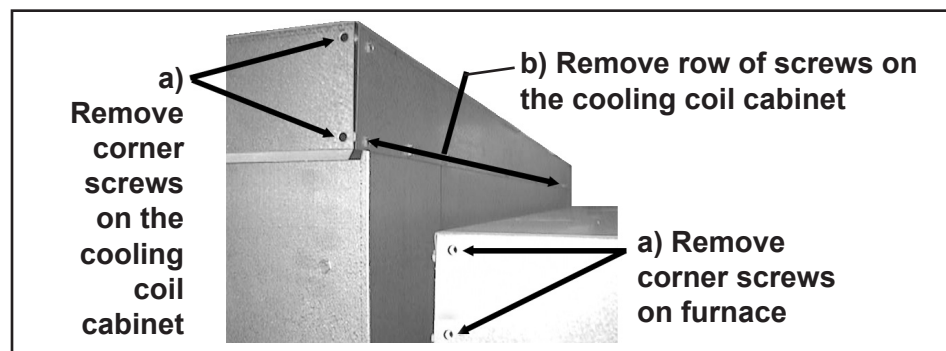
Instructions for Lifting and Attaching Cabinet (cont'd)

- c) Run the wires attached to the damper motor **1)** out through the hole in the discharge plenum leg into the cooling coil cabinet, **2)** through the blockoff plate, across the coil cabinet, **3)** out through the hole in the cooling coil cabinet leg, and **4)** into the furnace section.
- d) On the bottom of the electrical box in the furnace section, remove the hole plug that is below the terminal blocks. Route the damper motor wires up through the hole and into the electrical box. Attach according to the connections on the wiring diagram. Refer to sample in **FIGURE 34G**.

6. Prepare Cabinets to Install Filler Panels (See **FIGURE 34H**.)

- a) At the side corners of both the cooling coil cabinet and the furnace, remove the factory-installed screws that attach the cabinet tops.
- b) Across the edge of the cooling coil cabinet, remove the row of screws that attach the top.

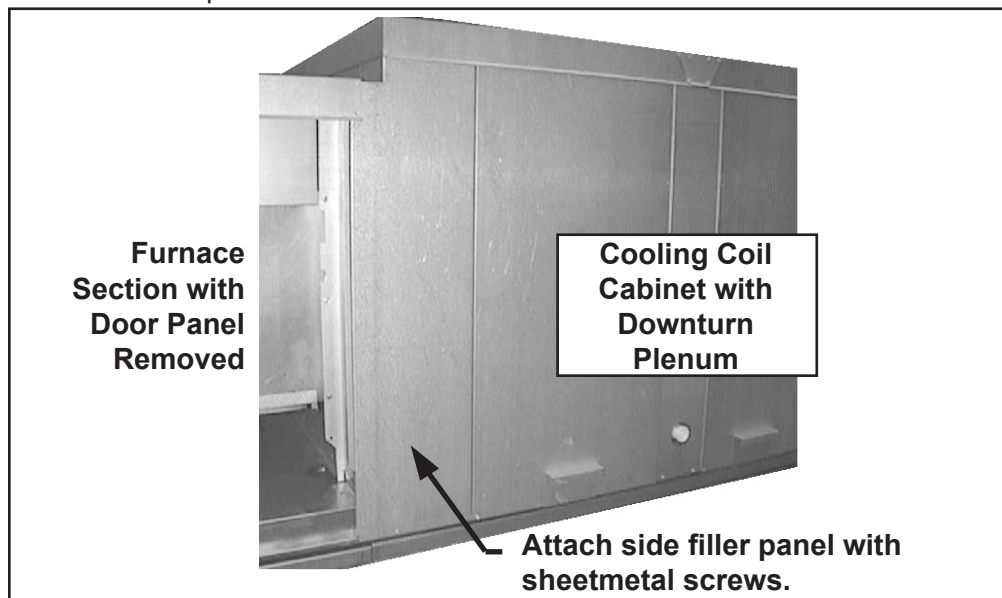
FIGURE 34H - To install side and top filler panels, remove screws from top corners of both cabinets and the entire row across the cooling coil cabinet.



7. Install the Cabinet Side Filler Panels (See **FIGURE 34J**.)

Place a piece of the supplied insulation against the inner panel of the cooling coil cabinet. Slide the filler panel into place and attach with 1/2" sheetmetal screws. Repeat on the other side. **NOTE:** It may be easier to slide the filler panels in place with the door panels removed.

FIGURE 34J - Side Filler Panel Installed



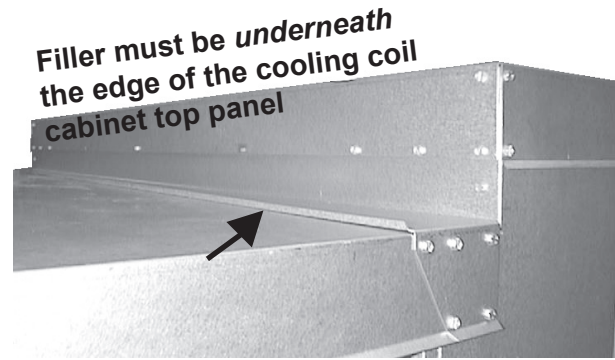
8. Install the Cabinet Top Filler Panel (See **FIGURE 34K**)

- a) Remove the backing from the gasket strip, and adhere it along the edge of the bottom of the top filler panel.
- b) Slide the filler panel underneath the edge of the cooling coil cabinet top (**NOTE:** The edge of the top panel may have to be pulled out slightly to slide the panel underneath.) The **filler panel must be between the cooling coil cabinet top and end panel** to prevent water from leaking into the cabinet. Attach with 1/2" screws.

9. Reinsert Screws and Apply Caulking

- a) Reinsert any remaining screws removed in Step 6. Check for gaps between the top and side filler panels; apply caulking as needed.
- b) Apply silicone caulking where the cooling cabinet curb cap meets the furnace curb cap.

FIGURE 34K - Top Filler Panel Installed



Before the top filler panel is attached, remove the backing and adhere the gasket strip along the bottom of the outside edge so that any gaps between the top filler panel and the top panel of the furnace section are sealed.

10. The cooling coil cabinet is installed. Follow the instructions provided by the cooling coil manufacturer to make cooling coil connections.

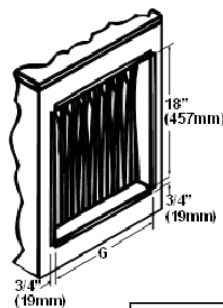
Cooling Coil Maintenance

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

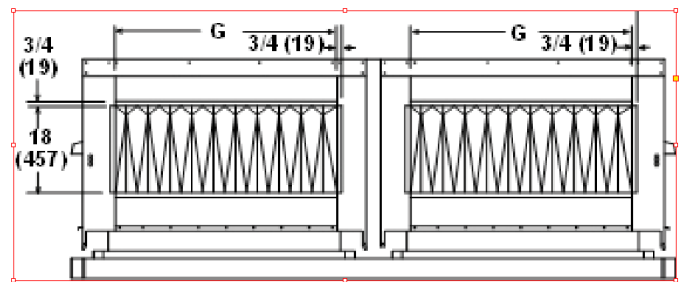
6.4 Duct Connections

FIGURE 35 - Discharge Duct Connection Dimensions - inches (mm)

Models PGBL, CRGBL, RPBL



Model RPDBL



PGBL	RPBL, CRGBL	RPDBL	G
	500, 600	1000, 1200	34-1/2 (876)
	700, 1050	1400	40 (1016)
400, 800, 1200	400, 800, 1200	800, 1600	45-1/2 (1156)

Model RPDBL - Attach a duct separately to each duct flange. Depending on the application, a tapered transition may then be made to a single supply duct or the dual supply ducts may be continued. **NOTE:** If the system is equipped with two-stage gas control Option AG 15, 16, 23, or 24, transition to a single supply duct is required.

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 (610mm) inches or wider, and over 48 (1219mm) inches in length, should be cross broken on top and bottom and should have standing seams or angle-iron braces. Joints should be S and drive strip, or locked.
- **Through Masonry Walls** - No warm air duct should come in contact with masonry walls. Insulate around all air duct through masonry walls with not less than 1/2" (1" is recommended) of insulation.

6.0 Mechanical (cont'd)

6.4 Duct Connections (cont'd)

Connecting and Installing Ducts (cont'd)

- **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, 2800 Shirlington Road, Suite 300, Arlington, VA 22206 (www.acca.org). 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" (152mm x 254mm) 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 36**.

FIGURE 36 - 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.
- (5) Drill and lock with sheetmetal screws.

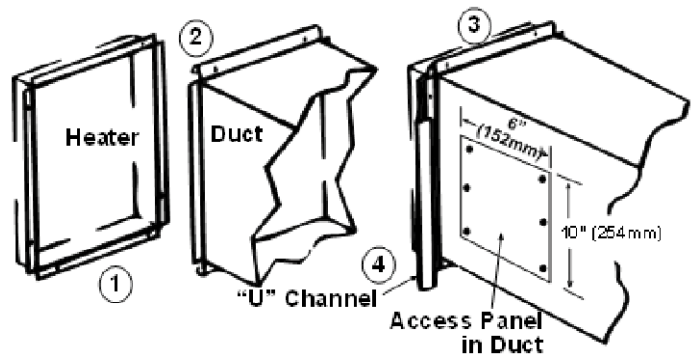
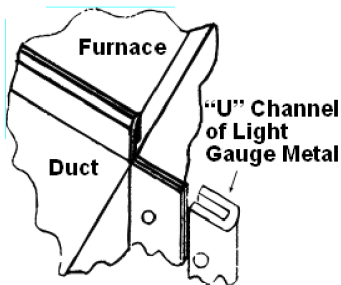


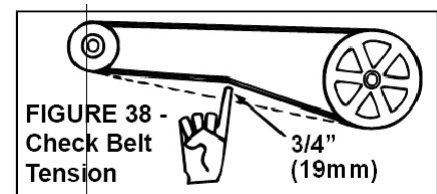
FIGURE 37 - Install "U" Channel on Sides of Duct Connection



- **Horizontal Discharge Duct Length** - A minimum horizontal duct run of 24" (610mm) 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 37**. On a Model RPDBL, attach a duct separately to each duct flange. (See Model RPDBL note in **FIGURE 35**, page 37.)

6.5 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". (See **FIGURE 38**.) After correct tension is achieved, re-tighten the locknut on the adjustment screw. Be sure that the belt is aligned in the pulleys.



Adjusting Blower Speed

The system is set at the factory for the RPM required to meet the CFM and external static pressure specified on the order. If estimated external static pressure is incorrect, or changes were made to the duct system, the blower RPM may have to be adjusted.

.Motors are equipped with adjustable pitch pulleys which permit adjustment of blower speed. **To make adjustments to units with less than a 5HP motor, follow these instructions.**

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 38**.) 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 electric and the gas. Light the heater following the instructions on the lighting instruction plate.
8. Check the motor amps with an amp meter. The maximum motor amp rating on the motor nameplate must not be exceeded.
9. When installation is complete, check for proper operation.

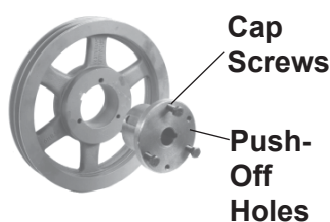
For units with 5 HP and larger motor, follow these instructions for adjusting RPM:

1. Turn off the gas and the electric power.
2. Slack off all belt tension by moving motor towards driven shaft until belts are free of grooves. For easiest adjustment, remove the belts from the grooves.
3. On the outer locking ring, locate the two locking screws that are directly across from each other. Loosen these two screws, but do not remove them. Do not loosen any other screws.
4. Adjust sheave to desired pitch diameter by turning the outer locking ring. One complete turn of the outer locking ring will result in .233" change in pitch diameter. To **decrease** blower speed, **increase diameter**; to **increase** blower speed, **decrease diameter**.

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

5. After completing adjustment, tighten both locking screws in the outer locking ring (loosened in Step 2.).
6. Replace belts and move motor away from the driven shaft to apply sufficient belt tension to prevent slippage. (See **FIGURE 38**.) 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. Be sure that the belts are aligned in the pulley grooves and are not angled from pulley to pulley.
7. Check motor amps with an amp meter. The maximum motor amp rating on the nameplate must not be exceeded.
8. When installation is complete, check for proper operation.

FIGURE 39 - Split Taper Bushing



Blower Pulley

Some blower pulleys require the use of a split taper bushing in the blower pulley. These split taper bushings must be loosened in order to remove the pulley. Follow these instructions to loosen the bushing:

- a) Notice that there are three cap screws in the bushing and two holes without screws, called push-off holes. (See **FIGURE 39**.)
- b) Remove the three cap screws.
- c) Put two of the cap screws into the two push-off holes. Tighten these two screws evenly until the pulley is loosened.
- d) Pulley may now be removed from the shaft.

6.0 Mechanical (cont'd)

6.5 Blowers, Belts, and Drives (cont'd)

Blower Bearings

The blower bearings on systems with less than a 10 HP motor (standard blower) are permanently lubricated cartridge ball bearings and do not require greasing.

The blower bearings on systems equipped with a 10-20 HP motor are pillow block ball bearings and are equipped with a grease fitting. These bearings should be lubricated twice a year with a high temperature, moisture-resistant grease (Type NLGI-1 or -2 standard grease is recommended). Be sure to clean the grease fitting before adding grease. Add grease with a handgun until a slight bead of grease forms at the seal. Be careful not to unseat the seal by overlubricating. **NOTE:** If unusual environmental conditions exist (temperatures below 32°F or above 200°F; moisture; or contaminants) or if unit is in continuous operation, more frequent service is required.

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

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.

Optional Variable Frequency Drive

If the system is equipped with an optional variable frequency drive, the motor will operate on speeds as determined by the electrical frequency. 60 hertz is maximum speed. Speeds must be within the temperature rise range approved for a Model SCE Series 6 heater which is 30-90°F.

Follow the variable frequency controller manufacturer's instructions that are packaged with the heater (in the owner's envelope) to program the variable frequency drive settings. The formula for motor speed is $N = 120 \times f/p$ where N is speed; f is frequency; and p is number of poles (3600 RPM motor has 2 poles; an 1800 RPM motor has 4 poles).

Example: 1800 RPM motor on 60Hz; $N = 120 \times 60/4 = 1800$
1800 is synchronous speed; assume 2% slip. Motor will run
between 1750 and 1790 RPM at full load depending on design.
Run the same motor at 45Hz ($120 \times 45/4 = 1350$). 1350 RPM
less 2% slip equals about 1300 RPM.

Motor Loads and Amps

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.

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.

Full Load Amps - Blower Motors (Open, Single Speed, Average)									
HP	1	1-1/2	2	3	5	7-1/2	10	15	20
115V/1	13.0	18.2	20.4	24.8	N/A				
208V/1	7.2	10.1	11.3	13.7	28.0				
230V/1	6.5	9.1	10.2	12.4	26.0	32.0	38.0		
208V/3	3.6	5.8	7.3	9.3	14.6	23.2	28.8	42.0	55.3
230V/3	3.2	5.2	6.6	8.4	13.2	21.0	26.0	38.0	50.0
460V/3	1.6	2.6	3.3	4.2	6.6	10.5	13.0	19.0	25.0
575V/3	1.3	2.1	2.6	3.4	5.3	8.4	10.4	15.2	20.0

7.0 Electrical Supply and Controls

7.1 General

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.

7.2 Supply Voltage and Wiring

Size of Field-Supplied Wire from Disconnect to Electrical Box for Connection to Motor Contactor or Starter

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 connection to the motor contactor or starter in the electrical box. All external wiring must be within approved conduit and have a minimum temperature rise rating of 60°C. Conduit from the disconnect switch must be run so as not to interfere with the service panels of the furnace.

Voltage/Phase	Motor HP	Wire Gauge	BX Cable
120/1	1	12	3/8"
	1.5 - 2	10	1/2"
	3	6	1"
208/1 & 230/1	1 - 2	14	3/8"
	3	10	1/2"
	5	8	1/2"
	7.5	6	1"
	10	4	1"
208/3 & 230/3	1 - 3	14	3/8"
	5	12	3/8"
	7.5	10	1/2"
	10	8	1/2"
	15	6	1"
	20	4	1"

Voltage/Phase	Motor HP	Wire Gauge	BX Cable
460/3	1 - 7.5	14	3/8"
	10	12	3/8"
	15	10	1/2"
	20	8	1/2"
575/3	1 - 7.5	14	3/8"
	10 - 20	10	1/2"

Refer to the wiring diagram to identify any optional controls. If the system has an optional convenience outlet (Option BC), a separate power supply is required.

Disconnect Switch

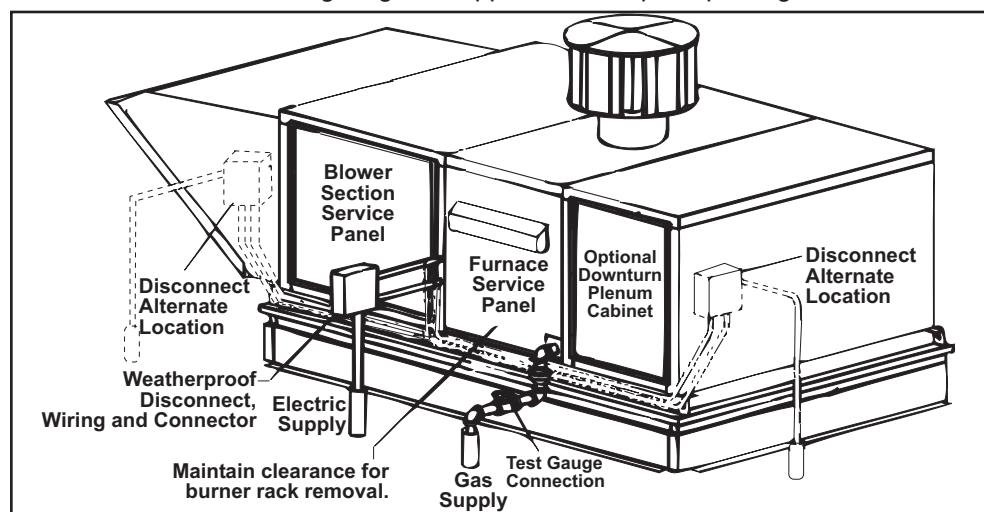
A disconnect switch is a required part of this installation. Switches are available, as options or parts, or may be purchased locally. When ordered as an optional component, the disconnect switch is shipped separately.

The disconnect switch may be fusible or non-fusible. When providing or replacing fuses in a fusible disconnect switch, use dual element time delay fuses and size according to 1.25 times the maximum total input amps. When installing, be careful that the conduit and switch housing are clear of furnace panels and inspection plates. Allow at least four feet (1.2M) of service room between the switch and removable panels. See **FIGURE 40** for suggested locations.

Specific wiring diagrams that include standard and factory-installed options are included with the heater. If the system has an optional convenience outlet (Option BC), a separate power supply is required. This circuit **MUST BE** on a ground fault breaker to meet requirements. All wiring to the convenience outlet must meet National Electrical Code ANSI/NFPA No. 70 (latest edition) and any local or utility codes that apply.

If the heater has field-installed options that require electrical connections, consult the instruction sheet and wiring diagram supplied in the option package.

FIGURE 40 - Disconnect Switch Locations



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

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 wires which must be 150°C. See Hazard Levels, page 2.

7.0 Electrical Supply and Controls (cont'd)

7.3 Thermostat, Other Optional Controls, and Control Wiring

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

A 24 volt thermostat must be used to actuate low voltage gas controls. A low voltage thermostat is equipped with a heat anticipator which levels out unit cycling for optimum temperature control. Set the anticipator at full load control amps. See chart below for amp ratings of optional controls.

24 Volt Controls - Approximate Ampere Rating

Single-Stage Valve	.6 amps	Fan Control	.12 amps
Two-Stage Valve.....	.6 amps	Time Delay Relay Heater	.1 amp
Maxitrol System.....	.5 amps	Relay Coil	.12 amps
Spark Ignition System.....	.1 amp	Motor Contactor Coil.....	.33 amps

Wiring between the thermostat and the heater must be suitable for a temperature rise rating of 60°C. Labeled thermostat leads are provided in the heater junction box for connection of thermostat wiring.

Thermostats should be located five feet above the floor on an inside wall, not in the path of warm or cold air currents and not in corners where air may be pocketed. Do NOT install on cold air walls. For specific connection details, refer to the instructions with the thermostat.

If more than one unit is cycled from one thermostat, separately activated relays must be substituted at unit thermostat connections.

CAUTION: Make sure the thermostat has an adequate VA rating for the total requirements. Add coil rating of all relays and match thermostat rating. See Hazard Levels, page 2.

There are a variety of optional controls available as part of the gas and air control options. Check the wiring diagram and literature supplied with the unit for operation of factory-installed optional controls. See **FIGURE 21**, page 24, for location of standard and optional controls.

Optional shipped-separate heating and makeup air controls could include a single or two-stage thermostat, system switches, selectrastat, freezestat, an automatic night set-back device, a Maxitrol temperature selector, a potentiometer, a pressure null switch, or a combination of these controls. Install controls according to the manufacturer's instructions packaged with the heater.

Control wires connected to a Selectrastat, a discharge air sensor, a remote temperature selector or sensor, an amplifier, or the valve must not be run close to or inside conduit with power or ignition wires. Doing so may cause the unit to function erratically or may destroy the amplifier. If shielded wires are used, shield must be insulated and grounded at the amplifier location only.

If the unit being installed includes an optional console, it is shipped separately for field installation. All consoles include indicator lights for the blower and burner. Consoles may include a dirty filter indicator light, a cooling indicator light, an on/off switch, a summer/off/winter switch, a heat/vent/cool switch, a potentiometer, a thermostat, and/or a Maxitrol temperature selector. Consoles are shipped separately for remote installation and may be either mounted on a wall or recessed.

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

Wiring Requirements for Maxitrol Systems

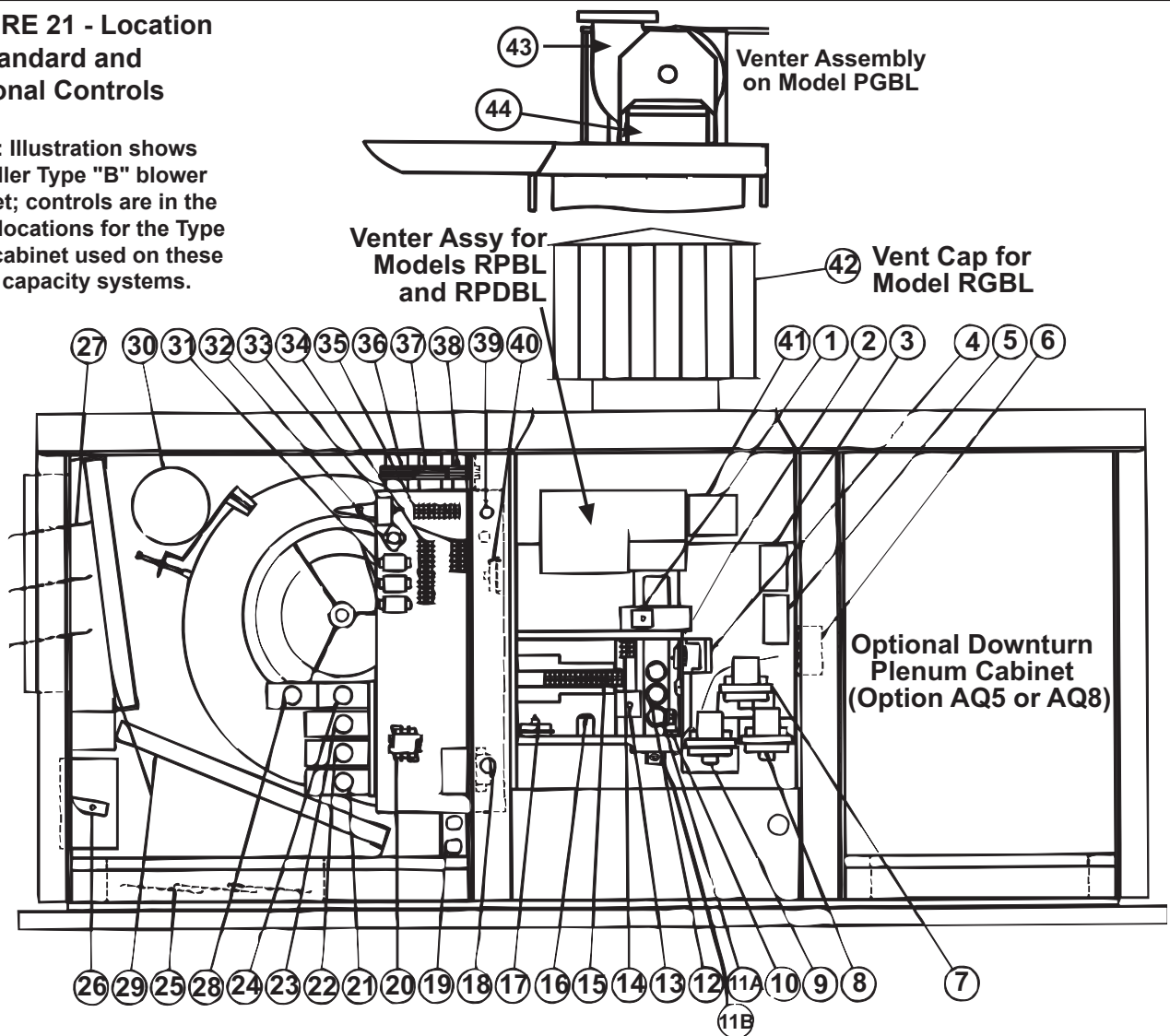
Remote Console

8.0 Controls

8.1 Control Locations

FIGURE 21 - Location of Standard and Optional Controls

NOTE: Illustration shows a smaller Type "B" blower cabinet; controls are in the same locations for the Type "BL" cabinet used on these larger capacity systems.



Key:

- | | | | |
|---|--|---|---|
| <p>1. Opt Auto Reset Freezestat</p> <p>2. Combustion Air Pressure Switch (outdoor power-vented models; for indoor models, see Item 44)</p> <p>3. Opt Discharge Air Firestat</p> <p>4. Ignition Controller</p> <p>5. Optional Maxitrol Discharge Air Sensor (Opt AG8 or AG9)</p> <p>6. Opt 2-Stage Controller (Opt AG3) or Maxitrol Amplifier (Opt AG7, 8, or 9)</p> <p>7. Opt Main Low Gas Pressure Switch</p> <p>8. Opt Pilot High Gas Pressure Switch</p> | <p>9. Opt Main High Gas Pressure Switch</p> <p>10. Time Delay Relay (power-vented)</p> <p>11A. Limit Control (disc type)</p> <p>11B. Limit Control (capillary type)</p> <p>12. Fan Control</p> <p>13. Opt Freezestat Time Delay Relay</p> <p>14. Line Voltage Terminal Block</p> <p>15. Low Voltage Terminal Block</p> <p>16. Freezestat Relay</p> <p>17. Opt Dirty Filter Pressure Switch</p> <p>18. Line Voltage Connection</p> | <p>19. Opt Convenience Outlet</p> <p>20. Blower Motor Contactor or Starter</p> <p>21. Opt High Ambient Limit Control and/or Opt AG41 and 42 Heat Stage Controls (2 or 4)</p> <p>22. Opt Outside Air or Return Air Controller</p> <p>23. Opt Mixed Air Controller</p> <p>24. Opt Potentiometer</p> <p>25. Opt Return Air Dampers</p> <p>26. Opt Damper Motor</p> <p>27. Opt Outside Air Damper</p> <p>28. Opt Potentiometer</p> <p>29. Opt Filters</p> <p>30. Blower Motor</p> <p>31. Opt Control Relays (as required, 8 maximum)</p> | <p>32. Auto Reset Reverse Flow Limit</p> <p>33. Opt Return Air Firestat</p> <p>34. Low Voltage Terminal Strip</p> <p>35. Line Voltage Terminal Strip</p> <p>36. Control Transformer</p> <p>37. Control Transformer (as required)</p> <p>38. Opt Damper Motor Transformer</p> <p>39. Low Voltage Connection</p> <p>40. Opt Air Proving Switch</p> <p>41. Venter Assembly (RPBL)</p> <p>42. Vent Cap (gravity-vented)</p> <p>43. Venter Assembly (PGBL)</p> <p>44. Combustion Air Pressure Switch (indoor power-vented models; for outdoor models, see Item 2)</p> |
|---|--|---|---|

8.2 Fan Control

1. A fan control provides for the following control of the blower.

(a) After the gas valve opens, there is a time delay of blower operation to prevent the discharge of cold air.

8.0 Controls (cont'd)

8.2 Fan Control (cont'd)

- (b) Blower operation continues after the thermostat is satisfied as determined by the fan time delay.
2. To be sure that the blower can continue to operate, the power supply to the furnace **MUST NOT** be interrupted **except** when servicing the unit.
 3. 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.

For location, see **FIGURE 41**, Item 12. **Service NOTE:** To replace a fan control on units manufactured prior to 11/04, a replacement kit is required. Order P/N 209184.

8.3 High Temperature Limits

Each furnace is equipped with a non-adjustable high temperature limit switch which shuts off the gas in the event of motor failure, lack of air due to dirty filters, or restrictions at the inlet or outlet of the unit. See Paragraph 9, "Check Installation after Start-up", for checking operation of high temperature limit controls.

Effective with models manufactured beginning 1/97, the furnace farthest downstream in each system is also equipped with a linear-type limit control. The switch is mounted on a bracket on the bottom of the junction box with the capillary sensor extending across the discharge opening of the furnace.

For locations, see **FIGURE 41**, Items 11A and 11B.

8.4 Reverse Flow, Limit Control

The furnace is factory equipped with an automatic reset reverse flow limit control. This control is located in the blower compartment, mounted in the blower junction box adjacent to the blower inlet opening, and is wired in series with the main limit control mounted on the heat exchanger duct side. For location, See **FIGURE 41**, Item 32.

In case of belt breakage or motor failure, the limit control will be opened by the high temperatures caused by reverse flow from the heat exchanger to the blower compartment, thus breaking the circuit to the electric gas valve and preventing burner operation.

8.5 Combustion Air Proving Switch - PGBL and RPBL

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. For locations, see **FIGURE 41**, Items 2 and 44.

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.

Start-up Cold	-1.0" to -1.5" w.c.
Equilibrium	-.70" to -.80" w.c.
Factory Setpoint	-.58 ± .05" w.c.

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.

8.6 Optional High Ambient Limit Control

The optional high ambient limit control functions to shutoff the burner when the entering outside air reaches a set temperature. The temperature setting is field adjustable from 0-100°F. For location, see **FIGURE 41**, Item 21.

8.7 Gas Controls

8.7.1 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.

8.7.2 Optional Two-Stage Operation - Heating Only

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. The two-stage thermostat, thermostat installation instructions, and gas valve manufacturer's control specifications are included with the heater. Follow these instructions and the wiring diagram. Two-stage heating control is identified as Option AG11.

8.7.3 Optional Two-Stage Operation - Makeup Air

On systems with more than one furnace section, there are two methods of achieving multiple-stage makeup air operation. In addition, for each of these methods, there are two types of control mechanisms. Consult the wiring diagram on the furnace to identify the optional control system.

The first method, identified by **Options AG3, AG15, or AG16**, is comparable to the two-stage heating units. Instead of control from a two-stage room thermostat, the discharge air temperature is monitored and the two-stage gas valve is controlled by a two-stage ductstat. When the discharge air temperature drops to the setpoint, low fire is energized. If low fire cannot satisfy the ductstat setting, high fire is energized. Since the packaged systems may include two, three, or four furnace sections, and each section is equipped with a two-stage gas valve, the operation stages increase with the number of furnace sections. Set the ductstats as indicated in **TABLE 4A**.

The second method of multiple-stage makeup air operation is applicable only to systems that include two, three, or four furnace sections. On systems with two furnaces, this optional control system is identified as **Option AG4, AG17, or AG18**. On packaged systems with three furnace sections, this optional control method is identified as **Option AG5, AG19, or AG20**. On packaged systems with four furnace sections, this optional control method is identified as **Option AG5, AG23, or AG24**. Each furnace in the package is equipped with a single-stage gas valve. The single-stage gas valves are staged by two-stage ductstats. The furnaces are staged in sequence. This concept will achieve two-stage control on packaged systems with two furnaces, three-stage control on systems with three furnaces, and four-stage control on systems with four furnaces. Set the ductstats as indicated in **TABLE 4B**.

The two types of ductstat control mechanisms used in these multiple-stage systems are either --

- (1) the complete ductstat (including the sensor and temperature selector) is installed in the furnace discharge (Option AG3, AG4, and AG5) or
- (2) a sensing probe only is installed in the heater discharge with the sensing probe electrically connected to a remote electronic temperature selector. The remote electronic temperature selection option is available with or without a display module. Options AG15, 17, 19, and 23 do not have a display module; Options AG16, 18, 20 and 24 are identical with the addition of the display module.

Options AG3, AG4, AG5 installed in the heater discharge use a ductstat (See **FIGURE 42**) with an adjustable range from 60° to 110°F with a fixed differential of 2-1/2°. Due to different CFM settings and outside air temperatures, the average downstream outlet temperature may not match the ductstat setting exactly. After the installation is complete, re-adjust the setpoint of the ductstat(s) to achieve the desired average discharge air temperature. In general, makeup air applications are usually adjusted to discharge an outlet air temperature between 65°F and 75°F.

FIGURE 42 - Ductstat Control in Option AG3, AG4, and AG5

Factory set as listed in **TABLES A and B**.



8.0 Controls (cont'd)

8.7 Gas Controls (cont'd)

8.7.3 Optional Two- Stage Operation - Makeup Air (cont'd)

FIGURE 43 - Remote Temperature Selector (A); Stage-Adder Module (B); and Optional Display Module (C) for Ductstat in Makeup Air Control Options (Options AG 15, 16, 17, 18, 19, 20, 23, and 24)

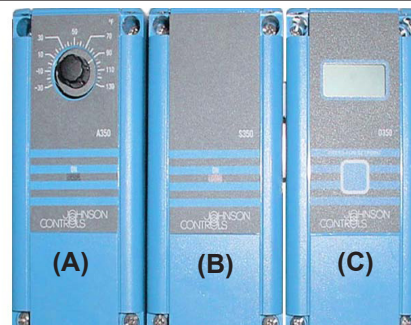
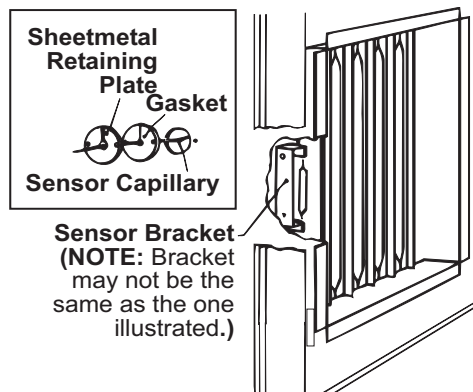


FIGURE 44 - Duct Temperature Sensor Location

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



Two-stage makeup air options that are controlled from a sensing probe with a remote electronic temperature selector have a temperature operating range to 130°F. The remote modules (**FIGURE 43**) are shipped separately for field installation. Follow the wiring diagram with the unit and the manufacturer's instructions for wiring and installing the remote modules. **CAUTION: Make sure heat/cool selector switch is set on "HEAT".**

Depending on the staging provided, there will be one module for selecting temperature and one to five stage-adder modules. The digital display module is optional.

See **TABLES 4A and 4B** for recommended settings and staging sequence of all two-stage makeup air options.

TABLE 4A - Recommended Settings for Staging Application - Options AG3, AG15, AG16

Option	No. of Furnaces	Ductstat Settings - Set each ductstat control (See FIGURE 42) in furnace "order"				Sequence of Staging with these settings				
		1st	2nd	3rd	4th					
AG3	1	70°F	--	--	--	66°F High Stage ► 70°F Low Stage ► 74°F Shutdown				
	2	70°F	64°F	--	--	60°F High Stage Both Furnaces ► 64°F Low Stage 2nd Furnace ► 68°F Shutdown 2nd furnace ► 70°F Low Stage 1st furnace ► 74°F Shutdown 1st furnace				
	3	70°F	66°F	62°F	--	58°F High Stage All Furnaces ► 62°F Low Stage 3rd Furnace ► 66°F Shutdown 3rd Furnace; Low Stage 2nd Furnace ► 70°F Shutdown 2nd furnace; Low Stage 1st Furnace ► 74°F Shutdown 1st Furnace				
	4	70°F	66°F	64°F	60°F	58°F High Stage All Furnaces ► 60°F Low Stage 4th Furnace► 64°F Shutdown 4th Furnace; Low Stage 3rd Furnace ► 66°F Shutdown 3rd Furnace; Low Stage 2nd Furnace ► 70°F Shutdown 2nd furnace; Low Stage 1st Furnace ► 74°F Shutdown 1st Furnace				
Options AG15 & AG16 - Adjust the setpoint and the differential of the temperature selector (Johnson #A350). Adjust the offset potentiometer on each of the stage adder modules (Johnson #S350). The settings listed below will provide the same sequence of staging as shown above for Option AG3. Follow the manufacturer's instructions provided. IMPORTANT: Set the temperature selector and each stage adder module to "HEAT". Follow the wiring diagram to obtain proper sequencing. Models RPDBL only - Temperature sensor is shipped separately for field installation.										
Option	No. of Furnaces	Temperature Selector (A350)		Stage Adder (S350) Offset Settings (Refer to FIGURE 43)						
		Setpoint	Differential							
AG15 & AG16	1	74°F	8°F	4°F	--	--	--	--	--	--
	2	74°F	14°F	10°F	6°F	4°F	--	--	--	--
	3	74°F	16°F	10°F	8°F	8°F	4°F	4°F	--	--
	4	74°F	14°F	10°F	8°F	6°F	4°F	4°F	4°F	4°F

Operation: The differential setting and offset degrees allow the controls to adapt to any adjustment in temperature selection (50-130°F).

TABLE 4B - Recommended Settings for Staging Application - Options AG4, AG5, AG17, AG18, AG19, AG20, AG22, AG23, AG24

Option	No. of Furnaces	Ductstat Settings - Set each Ductstat (See FIGURE 42) in furnace "order"				
		1st	2nd	3rd	Sequence of Staging with this setting	
AG4	2*	70°F	--	--	66°F Full Rate Both Furnaces ► 70°F Shutdown 1st Furnace ► 74°F Shutdown 2nd furnace	
AG5	3	70°F	64°F	--	60°F Full Rate Both Furnaces ► 68°F Shutdown 2nd & 3rd Furnace ► 74°F Shutdown 1st furnace	
Options AG17, AG18, AG19, AG20, AG23, AG24 - Adjust the setpoint and the differential of the temperature selector (Johnson #A350). Adjust the offset potentiometer on each of the stage adder modules (Johnson #S350). The settings listed below will provide the same sequence of staging as shown above for Option AG4. Follow the manufacturer's instructions provided. IMPORTANT: Set the temperature selector and each stage adder module to "HEAT". Follow the wiring diagram to obtain proper sequencing. Models RPDBL only - Temperature sensor is shipped separately for field installation.						
Option	No. of Furnaces	Temperature Selector (A350)		Stage Adder (S350) Offset Settings (Refer to illustrations in FIGURE 43)		
		Setpoint	Differential			
AG17 & AG18	2**	74°F	8°F	4°F	--	--
AG19 & AG20	3	74°F	10°F	6°F	6°F	--
AG23 & AG24	4	74°F	14°F	10°F	8°F	6°F
Operation: The differential setting and offset degrees allow the controls to adapt to any adjustment in temperature selection (50-130°F).						
*On Model RPDBL 800 a <i>single</i> ductstat is shipped separately for field mounting in the discharge duct.						
**On Model RPDBL 800 a <i>single</i> sensor and mounting bracket is shipped separately for field mounting in the discharge duct.						

8.7.4 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. AG39 and AG40 are available only on Model RPBL 400.

Installation Note: RPBL 400, 700, 800, 1050, and 1200 and RPDBL 800, 1400, and 1600 with electronic modulation gas controls require a minimum of 6" w.c. natural gas supply pressure.

Electronic Modulation between 50% & 100% Firing Rate (Opts 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.

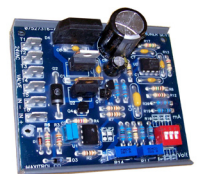
Each modulating valve is basically a regulator with electrical means of raising and lowering the discharge pressure. When no DC current is fed to this device, it functions as a gas pressure regulator, supplying 3.5" w.c. pressure to the main operating valve.

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. 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.

Computer Controlled Electronic Modulation between 50% and 100% Firing Rate (Option AG21)

With this option the furnace is equipped with a Maxitrol 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. Temperature selection is through the computer software.

FIGURE 45 - Maxitrol conditioner in Options AG21, AG40, and AG42



8.0 Controls (cont'd)

Electronic Modulation between 25% and 100% Firing Rate), Options AG39, AG40, AG41, AG42 - Available only on Model RPBL, natural gas

FIGURE 46 - Manifold Arrangement on Furnace with Optional Electronic Modulation between 25-100% Firing Rate

Description of Operation - furnace with Option AG39, AG40, AG41 or AG42

Combustion Air Pressure Switch Setting

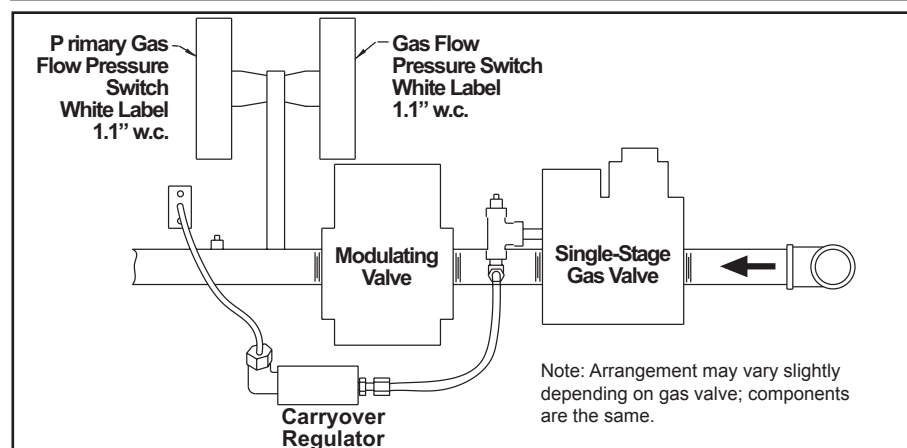
8.7 Gas Controls (cont'd)

8.7.4 Optional Electronic Modulation (cont'd)

A Model RPBL 400 equipped with electronic modulation Option AG39 has a 25%-100% firing range (4:1 turndown ratio). Option AG41 applies to Sizes 500, 600, and 800 with two furnaces and Size 1200 with three furnaces. The furnace closest to the blower is equipped with the electronic modulation option. The other furnace(s) have two-stage burner control from outside air temperature sensors identified as heat stage controllers. Option AG41 provides 6:1 turndown with two furnaces and 8:1 turndown with three furnaces.

The furnace with this type of electronic modulation will ignite at any input rate in the available range and will maintain average thermal efficiencies equal to or greater than the thermal efficiency at full fire. The following table applies to the furnace with the manifold illustrated in **FIGURE 46**.

Model RPBL	Maximum Turndown	MBH Input Range	Inlet Pressure to Modulating Valve (factory set)	Gas Supply Pressure Required
400	25%	100-400	4.4" w.c.	6" w.c.
500	28%	69-250	4.0" w.c.	5" w.c.
600	23%	69-300	4.0" w.c.	5" w.c.
800	25%	100-400	4.4" w.c.	6" w.c.
1200	25%	100-400	4.4" w.c.	6" w.c.



The gas train (**FIGURE 46**) in a furnace with this type of electronic modulation control includes a single-stage gas valve, a modulating valve, and two gas pressure switches. The burner rack is equipped with one flash carryover and a regulated gas lighter tube system. The carryover lighter tube receives its gas supply through the regulator, simultaneously with the gas to the burner. Control of the system is through a Maxitrol amplifier with a corresponding remote temperature dial.

The gas supply (6" w.c. required) 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 established, gas-flow from the single-stage valve goes to both the modulating valve and the regulated lighter tube system. **When the signal from the amplifier to the modulating valve requires less-than-high fire operation**, the modulating valve functions to lessen the gasflow 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 gear motor 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.

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 shown in the table.

w/AG 39, 40, 41, 42	Startup Cold	Equilibrium at Full Rate	Factory Setting
400	-1.2"w.c.±0.2	-0.95"w.c.±0.1	-.75"w.c.±0.5
500	-1.2"w.c.±0.2	-0.95"w.c.±0.1	-.75"w.c.±0.5
600	-1.2"w.c.±0.2	-0.95"w.c.±0.1	-.75"w.c.±0.5
800	-1.2"w.c.±0.2	-0.95"w.c.±0.1	-.75"w.c.±0.5
1200	-1.2"w.c.±0.2	-0.95"w.c.±0.1	-.75"w.c.±0.5

Sensor Location - Options AG39 and AG41

For the convenience of the installer, the duct temperature sensor is factory installed in the cabinet leg (See **FIGURE 44, page 46**). Although the sensor has a mixing tube, at this distance from the discharge it does not receive a true mix, so the temperature read by the sensor will be slightly higher than the actual air entering the ductwork. The system will provide comfort level heat if the selector is set slightly lower to compensate for this reading. The offset temperature will vary with the application. If a direct correlation of these two temperatures is required, move the duct sensor to a location in the ductwork about 10-12 feet (3 - 3.7M) from the furnace discharge.

Set Heat Stage Controllers - applies to Options AG41 and AG42 only

Systems with Option AG41 and AG42 have "heat stage controllers" that control operation of the "two-stage" furnace based on outside air temperature setpoints. Proper setpoints are important to ensure the modulating furnace ("Heat Stage 1") is always in control and avoids cycling. The proper setpoint for each controller must be determined from basic design information. Sizes 500, 600, and 800 with two furnace sections have two heat stage controllers; Size 1200 with three furnace sections has four heat stage controllers.

Follow the steps and example to determine appropriate setpoints. Follow the instructions to set the controllers.

Calculate the Setpoints with Two Furnace Sections - Use the following formulas to calculate the controller settings for Heat Stage 2 and Heat Stage 3 in a system with two furnace sections.

T_{SP} = Setpoints of Heat Stage Controllers (T_{SP2} and T_{SP3})

T_{SA} = Desired Supply Air Temperature

T_D = Design (minimum) Entering Air Temperature

Formulas for two furnace sections:

Setpoint for Heat **Stage 2**: $T_{SP2} = T_{SA} - 0.46 (T_{SA} - T_D)$

Setpoint for Heat **Stage 3**: $T_{SP3} = T_{SA} - 0.73 (T_{SA} - T_D)$

EXAMPLE : 3600 CFM, Power vented, 100% Outside Air, -10°F Outdoor Winter Design, 75°F Desired Supply Air

$$T_{SP2} = 75 - [.46 \times (75 - (-10))] = 75 - (.46 \times 85) = 35.9$$

$$T_{SP3} = 75 - [.73 \times (75 - (-10))] = 75 - (.73 \times 85) = 12.9$$

Set Stage Heat #2 Controller to 36°F

Set Stage Heat #3 Controller to 13°F

Calculate the Setpoints with Three Furnace Sections - Use the following formulas to calculate the controller settings for Heat Stage 2, Heat Stage 3, Heat Stage 4, and Heat Stage 5 in a system with three furnace sections.

T_{SP} = Setpoints of Heat Stage Controllers (T_{SP2} , T_{SP3} , T_{SP4} , T_{SP5})

T_{SA} = Desired Supply Air Temperature

T_D = Design (minimum) Entering Air Temperature

Formulas for three furnace sections:

Setpoint for Heat **Stage 2**: $T_{SP2} = T_{SA} - 0.30 (T_{SA} - T_D)$

Setpoint for Heat **Stage 3**: $T_{SP3} = T_{SA} - 0.49 (T_{SA} - T_D)$

Setpoint for Heat **Stage 4**: $T_{SP4} = T_{SA} - 0.65 (T_{SA} - T_D)$

Setpoint for Heat **Stage 5**: $T_{SP5} = T_{SA} - 0.82 (T_{SA} - T_D)$

EXAMPLE : 8850 CFM, Power vented, 100% Outside Air, -10°F Outdoor Winter Design, 75°F Desired Supply Air

$$T_{SP2} = 75 - [.30 \times (75 - (-10))] = 75 - (.30 \times 85) = 49.5$$

$$T_{SP3} = 75 - [.49 \times (75 - (-10))] = 75 - (.49 \times 85) = 33.3$$

$$T_{SP4} = 75 - [.65 \times (75 - (-10))] = 75 - (.65 \times 85) = 19.8$$

$$T_{SP5} = 75 - [.82 \times (75 - (-10))] = 75 - (.82 \times 85) = 5.3$$

Set Stage Heat #2 Controller to 49°F

Set Stage Heat #3 Controller to 33°F

Set Stage Heat #4 Controller to 20°F

Set Stage Heat #5 Controller to 5°F

Locate and Set the Heat Stage Controllers

1. In the inlet air section, locate the heat stage controllers. The same type of controller may also be used as the optional high ambient limit control (Option BN2) and as the mixed air controller that is part of certain air control options (Options AR12, AR13, AR15, and AR16). Identify the controllers marked Heat #2 and Heat #3 or Heat #2, Heat #3, Heat #4, and Heat #5.

2 Furnaces - Identify controllers marked Heat #2 and Heat #3; set as calculated above.

3 Furnaces - Identify controllers marked Heat #2, Heat #3, Heat #4, and Heat #5; set as calculated above.

2. Adjust each controller to the setpoint as determined in the calculation.

8.0 Controls (cont'd)

8.7 Gas Controls (cont'd)

8.7.4 Optional Electronic Modulation (cont'd)

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 and the special troubleshooting guide in **FIGURE 47**.

FIGURE 47 - Troubleshooting Guide for Checking Bypass Combustion Air Damper Safety Circuit on Model RPBL with Option AG39, AG40, AG41, or AG42

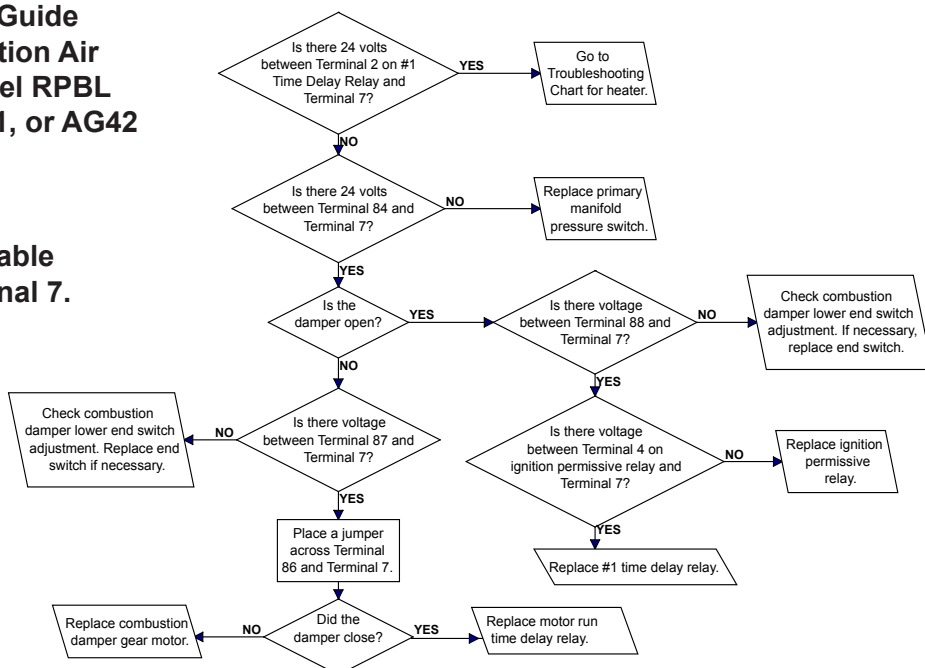
Symptom - Part 1:

Main burners are inoperative.

Assumes that 24 volts is available between Terminal 2 and Terminal 7.

General Instructions:

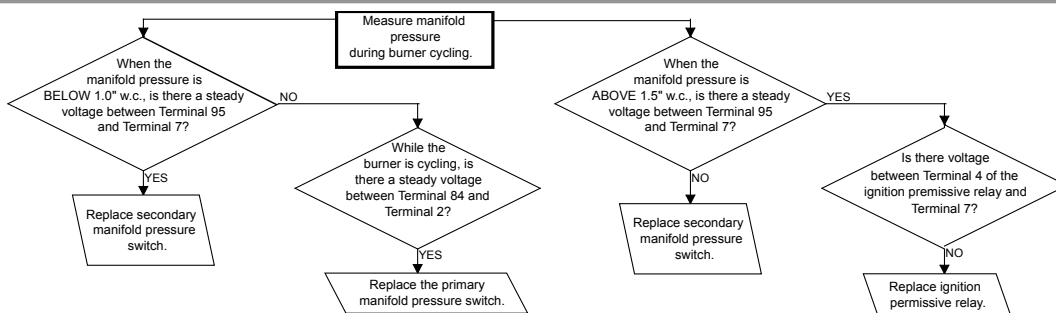
For each step, check to ensure that the wiring is not defective and that the wiring connections are secure.



Symptom - Part 2:

Steady call for heat - burner cycles.

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



Computer Controlled Electronic Modulation between 25% and 100% Firing Rate, Option AG40 and AG42

The furnace functions and is equipped in the same way as for Options AG39 and AG41 except that the temperature settings are selected through field-supplied computer software and there is no temperature selector or duct sensor.

The furnace is equipped with a Maxitrol signal conditioner (see **FIGURE 45**) 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.

8.8 Pilot and Ignition Systems

Ignition System - Natural gas units are equipped with a spark ignited intermittent safety pilot system that shuts off the pilot gas 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 has a 1-hour retry or requires manual reset 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; non-lockout spark pilot 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

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

FIGURE 48 - Ignition Controllers

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 horizontal, 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 10.2.2.

8.9 Burners, Orifices, and Carryover System

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.

All **natural gas burners** (except when equipped with electronic modulation Option AG39, AG40, AG41 or AG42; see Paragraph 8.7.4) 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 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.

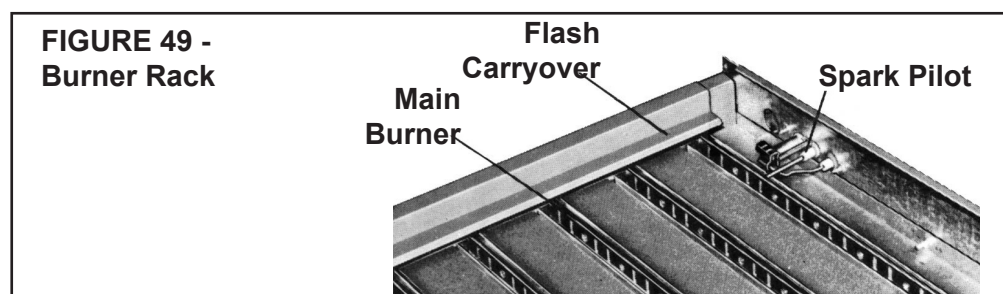


FIGURE 49 - Burner Rack

8.10 Burner Air Adjustment

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

Burner air shutters are required on propane gas units. Air shutters are not normally required on natural gas furnaces, but are available as Option AE2. Burner air shutters may require adjustment; follow the instructions below.

Before making any adjustments to the air shutters, allow the furnace to operate for about fifteen minutes with the air shutters open. The slotted screw on the end of the manifold bracket moves the air shutters and adjusts all burners simultaneously. Turning the screw clockwise opens the shutters; counterclockwise closes the shutters. After the furnace has been in operation for 15 minutes, close the air shutters observing the flame for yellow-tipping. Open the shutters until the yellow disappears. A limited amount of yellow-tipping is permissible for propane gas. Natural gas should not display any yellow-tipping.

When making the adjustment, close the air shutters no more than is necessary to eliminate the problem condition.

9.0 Check Installation and Start-Up

9.1 Check the installation prior to start-up:

- ☐ Verify suspension/mounting methods and clearances. See Paragraphs 4 and 5.
- ☐ Check the duct connection. See Paragraph 6.4.
- ☐ Check venting. See Paragraph 6.2. Be sure that flue discharge and combustion air openings are free of obstructions. Models PGBL & CRGBL - Be sure that the vent system or vent cap is installed properly. CRGBL - If ordered with Option ZZ, stack extension must be installed.
- ☐ Be sure electrical entrance and gas supply pipe openings are sealed.

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.
- ☐ Option AG41 or AG42 - set the heat stage controllers. See Paragraph 8.7.4.

Gas Supply Checks:

- ☐ Check piping for leaks and proper gas line pressure. Bleed gas lines of trapped air. See Paragraph 6.1.
 - 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 Checks:

- ☐ Check blower pulley and motor pulley to be sure they are secure to the shafts. Check belt tension and alignment. See Paragraph 6.5.
- ☐ Check the rotation of the blower. See Paragraph 6.5.
- ☐ With optional dampers - Check damper linkage. See Paragraph 6.3.3, **FIGURE 23B**.

9.2 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 - Models PGBL, RPBL, RPDBL

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 a unit equipped with a controller with lockout, if the pilot is not established within 120 seconds (approximately), the unit locks out for one hour, unless reset by interrupting the power to the control circuit (See Lighting Instructions).
6. Blower motor operates from fan time delay.
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 90 seconds (post purge).
8. To shut down, set thermostat to lowest setting. Blower motor remains on as determined by fan time delay.

Operating Sequence for Gravity-Vented Model CRGBL

1. Set the thermostat switch at its lowest setting.
2. Turn on power, main and pilot manual gas valves.
3. Set thermostat at desired setting.
4. On call for heat by the thermostat, the pilot gas valve and spark gap are energized 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. NOTE: 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 the lighting instruction plate on the furnace).
5. Blower motor operates from fan time delay.
6. Set the thermostat switch at lowest setting for shutdown. Blower motor remains on as determined by the fan time delay.

9.3 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 8.10. 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 6.1.
- ☐ With optional dirty filter switch - Set switch. See Paragraph 6.3.4.
- ☐ 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, 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 6.2 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. Indoor units installed in a confined space must be supplied with air for combustion as required by Code and in Paragraph 2.2.2 of this heater installation manual. CHECK THE COMBUSTION AIR/VENT SYSTEM FOR SOUNDNESS AND FUNCTION; MAINTAIN IT IN PROPER OPERATING CONDITION.

10.0 Maintenance and Service

10.1 Maintenance Schedule

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

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. When servicing, follow standard safety procedures as well as those specific instructions and warnings mentioned in this manual.

The following procedures should be carried out at least annually (See paragraphs listed and Paragraphs 10.2.1-10.2.6 for instructions).

- ☐ Inspect the filters. Clean or replace as needed. See Paragraph 6.3.4.
- ☐ Clean dirt and grease from all combustion air openings.
- ☐ Check the blowers and belts. Check belts for tension, wear, and alignment. Adjust or replace as needed. Clean dirt from blower and motor. See Paragraph 6.5.
- ☐ Check the gas valve to ensure that gas flow is being shut off completely.
- ☐ Clean the heat exchanger both internally and externally.
- ☐ Check the pilot burner and main burners for scale, dust, or lint accumulation. Clean as needed.
- ☐ Check the vent system; inspect all joints. Replace any parts that do not appear sound.
- ☐ Check the wiring for any damaged wire. Replace damaged wiring. (See Paragraph 7.0 for wiring requirements.)

CAUTION: When cleaning, wearing eye protection is recommended.

NOTE: Use only factory-authorized replacement parts.

10.2 Maintenance Procedures

10.2.1. Operating Gas Valve

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

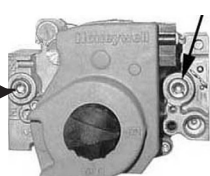
Remove external dirt accumulation and check wiring connections.

The combination gas valve must be checked annually to ensure that the valve is shutting off gas flow completely.

FIGURE 50 - Connect manometer to inlet pressure tap to check gas flow shutoff.

Single-Stage Valve

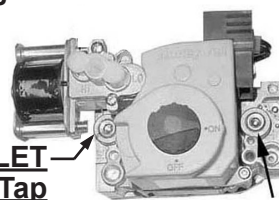
1/8" INLET Pressure Tap



1/8" Outlet Pressure Tap

Two-Stage Valve

1/8" INLET Pressure Tap



1/8" Outlet Pressure Tap

Instructions:

NOTE: Operational pressure settings and instructions for checking pressure settings are in Paragraph 6.1.

- 1) Locate the 1/8" FPT **INLET** pressure tap on the combination valve (See **FIGURE 50**).
- 2) With the manual valve turned off to prevent flow to the gas valve, connect a manometer to the 1/8" inlet pressure tap in the valve. **NOTE:** A manometer (fluid-filled gauge) with an inches water column scale is recommended.
- 3) With the field-installed manual valve remaining closed, observe the manometer for two to three minutes for an indication of gas pressure. No pressure should be indicated on the manometer.
If the manometer indicates a gas pressure, the field-installed manual gas valve must be replaced or repaired before the combination gas valve can be checked.
- 4) **If the manometer does not indicate gas pressure**, slowly open the field-installed manual gas valve. After the manometer's indicated gas pressure has reached equilibrium, close the manual shutoff valve. Observe the gas pressure.

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

10.2.2 Pilot and Main Burners

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

Burner Rack Removal Instructions

Instructions apply to all furnace sections.

1. Turn off the gas supply.
2. Turn off the electric supply.
3. Remove control access side panel.
4. Disconnect the pilot tubing and flame sensor lead (spark pilot).
5. Mark and disconnect electric valve leads.
6. Uncouple the union in the gas supply.
7. Remove sheetmetal 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:** If there is 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 Burner - 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 to clean. To re-assemble and replace, reverse the above procedures being careful not to create any unsafe conditions.

Cleaning Pilot and Main Burners

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". (Refer to **FIGURE 51.**) 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.

Pilot and 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. **Proper operation of the electronic spark ignition system requires a minimum flame signal of .2 microamps DC as measured by a microammeter.** 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, 2.

If no spark occurs, check the following:

- a) Voltage between Terminals TH and 7 on the ignition controller should be at least 20 volts and no higher than 32 volts. Refer to Troubleshooting (Paragraph 10.3) if no voltage is observed.

10.0 Maintenance and Service (cont'd)

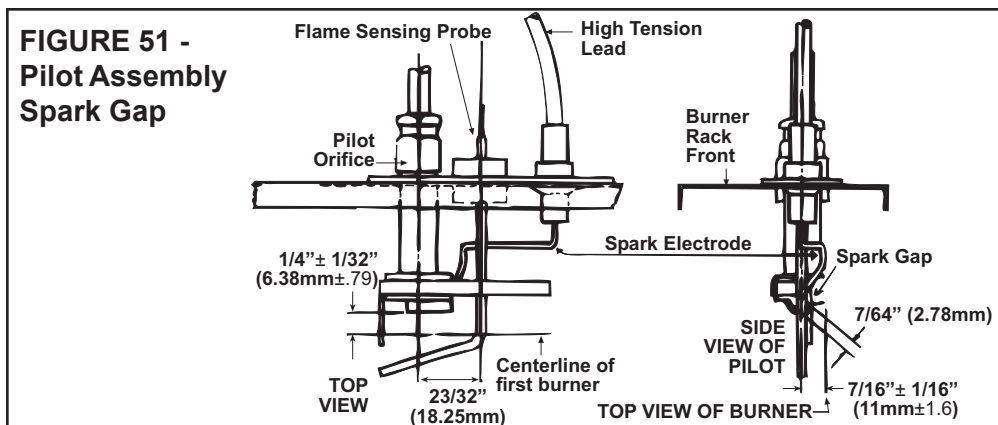
10.2 Maintenance Procedures (cont'd)

10.2.2 Pilot and Main Burners (cont'd)

b) Short to ground in the high tension lead and/or ceramic insulator.

c) Pilot spark gap should be approximately 7/64" (2.78mm).

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. (See controller illustration and replacement information on page 51.)

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

- 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.
- 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.

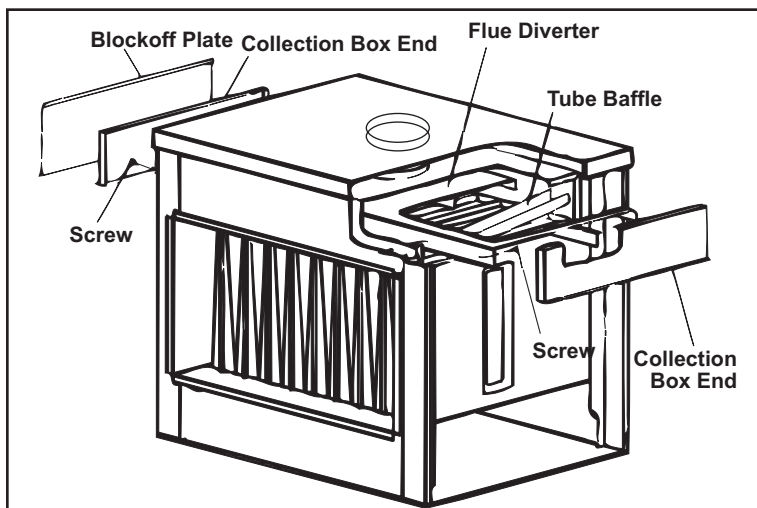
10.2.3 Cleaning the Heat Exchanger

NOTE: High efficiency furnaces manufactured prior to 3/95 have a "C" prefix in their model designation. All furnaces manufactured beginning 3/95 are designed for high efficiency and include these heat exchanger "V" baffles.

To clean the outer surfaces (circulating air side) of the heat exchanger, gain access by removing the inspection panels in the ductwork or remove the ductwork. Use a brush and/or an air hose to remove accumulated dust and grease deposits from the heat exchanger tubes and the baffles.

Gain access to the inner surfaces (combustion air side) of the heat exchanger by removing the burner rack and also following the appropriate instructions below. An air hose; an 18-24" long, 1/2" diameter furnace brush (or heavy wire with steel wool securely attached); a flashlight; and a mirror are needed. The required procedure depends on the date of manufacturer and whether or not the furnace is rated for high (80%) efficiency. Furnaces designed to provide high efficiency heating have "V" shaped baffles in the top of each heat exchanger tube. Follow these instructions to remove these baffles when cleaning the inner surfaces of the heat exchanger.

FIGURE 52 - Remove "V" Baffles to Clean Inner Surface of Heat Exchanger Tubes



Instructions to Remove Heat Exchanger "V" Baffles:
Outdoor, Gravity Vent Model CRGBL (See FIGURE 52)

- 1) Remove the ends of the flue gas collection box. On the control side of the furnace, remove the block-off plate to gain access to the collection box end.
- 2) Remove the flue diverter. Remove the screw at each end and slide the flue diverter out of the furnace.
- 3) Pull the "V" baffles out of the heat exchanger.

Outdoor, Power Vent Models

- 1) Remove the ends of the flue gas collection box. On the control side of the furnace, remove the venter assembly and the flue outlet duct to gain access to the collection box end.
- 2) **RPBL Sizes 500 and 600; RPDBL 1000 and 1200** - Remove one of the tube baffle retaining angles on each inside wall of the collection box. Each tube baffle angle has one screw.
RPBL Sizes 400, 700, 800, 1050 and 1200; RPDBL 800, 1400, and 1600 - Remove the inner baffle from the flue collection box. On the control side, align the inner baffle with the slot in the collection box edge. Pull the inner baffle until it clears the heat exchanger. Remove the screw at each end and slide the flue diverter out of the furnace.
- 3) Pull the "V" baffles out of the heat exchanger.

Indoor, Power Vent Model PGBL

- 1) Remove the ends of the "internal" flue gas collection box. On the control side of the furnace, remove the block-off plate to gain access to the collection box end.
- 2) Remove the flue diverter. Remove the screw at each end and slide the flue diverter out of the furnace.
- 3) Pull the "V" baffles out of the heat exchanger.

All Models - Clean the inner surfaces of the heat exchanger from beneath using the brush to "scrub" the tube walls to remove any accumulated dust, rust and/or soot. Clean the "V" tubes and re-assemble the heat exchanger and the furnace.

Check the furnace for proper operation.

10.2.4 Venter Motor

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

10.2.5 Blower, Belt, and Drive

Check blower pulley and motor pulley to be sure they are secure to the shaft. Check belt condition and belt tension (See Paragraph 6.5).

Blower Bearings

The blower bearings on models with less than a 10 HP motor (standard blower) are permanently lubricated cartridge ball bearings and do not require greasing.

The blower bearings on models equipped with a 10-20 HP motor are pillow block ball bearings and are equipped with a grease fitting. These bearings should be lubricated twice a year with a high temperature, moisture-resistant grease. (Type NLGI-1 or -2 standard grease is recommended.) Be sure to clean the grease fitting before adding grease.

Add grease with a handgun until a slight bead of grease forms at the seal. Be careful not to unseat the seal by overlubricating. **NOTE:** If unusual environmental conditions exist (temperatures below 32°F or above 200°F; moisture; or contaminants), more frequent lubrication is required.

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

10.2.6 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.

10.0 Maintenance and Service (cont'd)

10.3 Troubleshooting

TROUBLE	PROBABLE CAUSE	REMEDY
Venter motor will not start	1. No power to the furnace. 2. No 24-volt power to venter relay. 3. Venter relay defective. 4. Defective motor or capacitor.	1. Turn on power, check supply fuses or circuit breaker. 2. Turn up thermostat, check control transformer output. Check for loose or improper wire connections. 3. Replace. 4. Replace defective part.
Pilot will not light -- Venter operating	1. Manual valve not open. 2. Air in gas line. 3. Dirt in pilot orifice. 4. Gas pressure too high or too low. 5. Kinked pilot tubing. 6. Pilot valve does not open. 7. No spark: a) Loose wire connections b) Transformer failure. c) Incorrect spark gap. d) Spark cable shorted to ground. e) Spark electrode shorted to ground. f) Drafts affecting pilot. g) Ignition control not grounded. h) Faulty ignition controller. 8. Optional lockout device interrupting control circuit by above causes. 9. Faulty combustion air proving switch.	1. Open manual valve. 2. Bleed gas line. 3. Remove and clean with compressed air or solvent. 4. Adjust supply pressure. (See Paragraph 6.1). 5. Replace tubing. 6. If 24 volts available at the valve, replace valve. 7. a) Be certain all wires connections are solid. b) Be certain 24 volts is available. c) Maintain spark gap at 7/64". d) Replace worn or grounded spark cable. e) Replace pilot if ceramic spark electrode is cracked or grounded. f) Make sure all panels are in place and tightly secured to prevent drafts at pilot. g) Make certain ignition control is grounded to furnace chassis. h) If 24 volt is available to the ignition controller and all other causes have been eliminated, replace ignition control. 8. Reset lockout by interrupting control at thermostat. 9. Replace combustion air proving switch.
Pilot lights, main valve will not open	1. Manual valve not open. 2. Main valve not operating. a) Defective valve. b) Loose wire connections. 3. Ignition control does not power main valve. a) Loose wire connections. b) Flame sensor grounded. (Pilot lights - spark continues) c) Gas pressure incorrect. d) Cracked ceramic at sensor. e) Faulty ignition controller.	1. Open manual valve. 2. a) If 24 volt is measured at valve connections and valve remains closed, replace valve. b) Check and tighten all wiring connections. 3. a) Check and tighten all wiring connections. b) Be certain flame sensor lead is not grounded or insulation or ceramic is not cracked. Replace as required. c) Adjust gas pressure. (See Paragraph 6.1.) d) Replace sensor. e) See Paragraph 8.8. If all checks indicate no other cause, replace ignition controller. Do not attempt to repair the ignition controller. This device has no field replaceable parts.
No heat (Heater operating)	1. Dirty filters in blower system. 2. Incorrect manifold pressure or orifices. 3. Cycling on limit control. 4. Improper thermostat location or adjustment. 5. Belt slipping on blower 6. Blower set for too low temperature rise	1. Clean or replace filters. 2. Check manifold pressure (See Paragraph 6.1). 3. Check air throughput (See Paragraph 6.5). 4. See thermostat manufacturer's instructions. 5. Adjust belt tension 6. Slow down blower or increase static pressure
Cold air - On startup/ during operation	1. Fan control improperly wired 2. Defective fan control. 3. Incorrect manifold pressure. 4. Blower set for too low temperature rise.	1. Connect as per wiring diagram. 2. Replace fan control. 3. Check manifold line pressure (See Paragraph 6.1). 4. Slow down blower or increase static pressure. (See Paragraph 6.5.)
Motor will not run	1. Circuit open 2. Fan control inoperative 3. Contactor inoperative 4. Defective motor.	1. Check wiring and connections. 2. Replace fan control. 3. Replace contactor. 4. Replace motor.
Motor turns on and off while burner is operating	1. Defective fan control 2. Motor overload device cycling 3. 3-phase motor rotating in opposite direction	1. Replace fan control. 2. Check motor load against motor rating plate. Replace motor or overload device. 3. Interchange two legs of supply connections.
Motor cuts out on overload	1. Improper motor pulley adjustment 2. Improper static pressure on duct system 3. Low voltage	1. See instructions on air throughput (See Paragraph 6.5). 2. Adjust dampers in duct system. 3. Check power supply.

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INSTALLATION RECORD (TO BE COMPLETED BY INSTALLER)

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

For more information on Reznor HVAC products:

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

