



Installation / Operation

Applies to: **PREEVA® Outdoor Air Handler Model RDH, Model REH, Model RHH, and Model RXH**



**Outdoor, Gas-Fired, Power Vented,
PREEVA® Model RDH**
(shown with field-installed inlet air hood, Option AS2)

- PREEVA® MODEL RDH - Outdoor, Gas-Fired Heat, Power Vented, Heating/Makeup Air (Cooling Optional)
- PREEVA® MODEL REH - Outdoor, Electric Heat, Heating/Makeup Air (Cooling Optional)
- PREEVA® MODEL RHH - Outdoor, High Efficiency Gas-Fired Heat, Power Vented, Heating/Makeup Air (Cooling Optional)
- PREEVA® MODEL RXH - Outdoor, Makeup Air (blower only) (Cooling Optional) (Hot Water Heat Optional)

WARNING:

FIRE OR EXPLOSION HAZARD

Failure to follow safety warnings exactly could result in serious injury, death, or property damage.

Be sure to read and understand the installation, operation, and service instructions in this manual.

Improper installation, adjustment, alteration, service, or maintenance can cause serious injury, death, or property damage.

- 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.
- Installation and service must be performed by a qualified installer, service agency, or the gas supplier.

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1.0 General

1.1 Application

The information in this manual applies to PREEVA® Outdoor Model RDH, Model REH, Model RHH, and Model RXH. Each model has unique features. Please read carefully to be sure of what applies to the model being installed.

1.2 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.

Definitions of Hazard Intensity Levels in this Manual

HAZARD INTENSITY LEVELS

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

Do not use this appliance if any part has been under water. Immediately call a qualified service technician to inspect the appliance and replace any gas control that has been under water.

WARNING—Models RDH and RHH:

Should overheating occur, or the gas supply fail to shut off, shut off the manual gas valve to the appliance before shutting off the electrical supply.

WARNING

Model RDH and Model RHH gas-fired appliances are not designed for use in hazardous atmospheres containing flammable vapors or combustible dust, in atmospheres containing chlorinated or halogenated hydrocarbons, or in applications with airborne silicone substances (see Hazard Levels, page 2).

1.3 General Installation Information

Model RDH and Model RHH are listed by ETL Testing Agency as conforming to ANSI Standards and certified to CSA Standards. Models REH and RXH are listed by ETL Testing Agency as conforming to CSA and UL Standards. All models are designed for commercial/industrial use.

The type of gas, the firing rate, and the electrical characteristics are on the unit rating plate. Check the rating plate to determine if the unit is appropriate for the intended installation.

WARNING

Installation of this system 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.

Control Manual: An installation of Model RDH, REH, RHH, or RXH with a digital controller requires a control instruction manual. The manual is shipped in the literature bag with this booklet.

- Orders with control Option DG1 or DG5 require **Form CP-PREEVA-DG, PN 254027**
- Orders with control Option D12B, D12C, D12D, D12E, or D12G require **Form CP-PREEVA-D12 B/C/D/E/F/G, PN 235267**

NOTE: All systems with reheat Option AU7 have an Option D12 digital control.

1.4 Warranty

Refer to the limited warranty information on the Warranty Form in the "Literature Bag".

Warranty is void if ...

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

1.5 Installation Codes

All installations must be in accordance with local building codes.

Gas-Fired Models RDH and RHH: In the absence of local codes, in the United States the unit must be installed in accordance with the National Fuel Gas Code NFPA54/ANSI Z223.1 (latest edition). A Canadian installation must be in accordance with the CSA B149.1 Natural Gas and Propane Installation Code. Both 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.

Commercial Makeup Air Installations: These gas-fired products are certified by ANSI Z83 family of standards governing the safe usage of heating equipment in the industrial/commercial marketplace. This includes using the heaters in makeup air applications to supply corridor pressurization in commercial buildings such as office structures and apartment complexes.

This product may be used for all makeup air applications except one or two family dwellings.

All Installations: Clearances from the heater and vent to combustible construction or material in storage must conform with the National Fuel Gas Code NFPA54/ANSI Z223.1 (latest edition) pertaining to gas-burning devices, and such material must not attain a temperature over 160°F by continued operation of the heater.

1.0 General (cont'd)

1.5 Installation Codes (cont'd)

Model RDH: If local code requires 4-ft (1.2M) vertical clearance between the flue outlet and the fresh air intake of the heating system or the building, install a vertical vent with an optional vent cap. (If the vent cap has not been ordered, contact your distributor). See Paragraph 6.3 for specific installation requirements.

California Warning Label: If a Model RDH or RHH gas-fired heater is being installed in the state of California, the installer MUST attach a warning label on the outside of the access door. The California Warning label is shipped in the literature bag along with this manual, the warranty form, and any other paperwork that applies.

Select a location on the heater access panel. Be sure the surface is clean and dry and affix the label.

Massachusetts Requirement: If a Model RDH or RHH gas-fired heater is being installed in the Commonwealth of Massachusetts, it must be installed by a licensed plumber or licensed gas fitter.

2.0 Location

Most of the outdoor units are designed to be set on a slab, on a roof curb, or on rails (**NOTE:** Model RHH is designed for curb mount only.) All units must be level. When selecting the location, check the following.

- Installation location must comply with local codes.
- Refer to the weights in Paragraph 5.1. Structure must support the weight.
- Comply with required clearances in Paragraph 4.1.
- Position the unit so that the outside air inlet will not be facing into the prevailing wind.
- Refer to the paragraph below on the hazards of chlorine.

Hazards of Chlorine (Models RDH and RHH): The presence of chlorine vapors in the combustion air of gas-fired heating equipment presents a potential corrosion hazard. Chlorine found usually in the form of freon or degreaser vapors, when exposed to flame will precipitate from the compound, and go into solution with any condensation that is present in the heat exchanger or associated parts. The result is hydrochloric acid which readily attacks all metals including 300 grade stainless steel. Care should be taken to separate these vapors from the combustion process. This may be done by wise location with regard to exhausters or prevailing wind directions. Chlorine is heavier than air. Keep these facts in mind when determining installation location of the heater in relation to building exhaust systems.

Model RDH, REH, RHH, and RXH units are shipped completely assembled. The heavy gauge unit base has a lifting hole at each corner. Use spreader bars when lifting to prevent chains or cables from damaging the cabinet.

Immediately upon receiving, check for any damage that may have been incurred during shipment. If damage is found, document the damage with the transporting agency and immediately contact your factory distributor. If you are an authorized Distributor, follow the FOB freight policy procedures.

Check the gas specifications and electrical characteristics of the unit to verify that they agree with the gas and/or electric supply at the installation site.

Review this booklet and become familiar with the installation requirements. Before beginning, make preparation for necessary supplies, tools, and manpower.

Field-Installed Parts: If installing a high efficiency Model RHH, components for field installation of a freeze-resistant condensate drain and trap are shipped separately.

	PN	Description
Required Parts Shipped Separately for Model RHH	271064	Condensate Drain Trap
	205037	1/2" Schedule 40 Tee
	105944	1/2" Schedule 40 Female Adapter
	105948	1/2 × 1/2" Nylon Hose Barb
	271183	36" length of pipe insulation (for insulating the drain hose)
	271184	36" length of pipe insulation (for insulating the 1/2" PVC drain)

Shipped-Loose or Shipped-Separate Optional Parts: Some control options have parts either shipped loose with the heater, shipped separately, or mounted on a shipped-separate remote console (if ordered). If your unit is equipped with any of the gas or air inlet control options in the table below, be sure these parts are available at the job site.

3.0 Receiving, Uncrating, and Preparing for Installation

TABLE 1- Shipped-Separate or Shipped-Loose Components for Factory-Installed Options

Factory-Installed Option	Option Parts Requiring Installation (parts are either shipped loose with the heater or shipped separately)
AG3, AG60	On/Off Control Switch, PN 39732 ; Discharge Air Sensor Holder, PN 115850 ; Discharge Air Sensor Holder Bracket, PN 213612
AG8	On/Off Control Switch, PN 29054 ; Sensor, PN 48041 ; Mixing Tube, PN 90323
AG9	On/Off Control Switch, PN 29054 ; Sensor, PN 48041 ; Mixing Tube, PN 90323 ; Remote Temperature Selector, PN 48042
AG9H	On/Off Control Switch, PN 29054 ; Sensor, PN 194261 ; Mixing Tube, PN 90323 ; Remote Temperature Selector, PN 194258
AG15, AG61	On/Off Control Switch, PN 39732 ; Remote Ductstat Temperature Selector, PN 115848 ; Stage Adder Module(s), PN 115849 ; Discharge Air Sensor Holder, PN 115850 ; Discharge Air Sensor Holder Bracket, PN 213612
AG16, AG62	On/Off Control Switch, PN 39732 ; Remote Temperature Selector, PN 115848 ; Stage Adder Module(s), PN 115849 ; Digital Temperature Display, PN 115852 ; Discharge Air Sensor Holder, PN 115850 ; Discharge Air Sensor Holder Bracket, PN 213612
DG1	Room Command Module, PN 211423
DG5	Room Command Module, PN 211424 ; Discharge Air Sensor Holder, PN 115850 ; Discharge Air Sensor Holder Bracket, PN 213612
AG58, D12B, D12C, D12D, D12E, D12G	Discharge Air Sensor Holder, PN 115850 ; Discharge Air Sensor Holder Bracket, PN 213612
GE10	Potentiometer, PN 16110
GE15	Pressure Null Switch, PN 88052
GE21	Enthalpy Sensor and Parts to install, PN 220686
GE22	Two Enthalpy Sensors and Parts to install, (2) PN 220686
AU7L, AU7R	Duct Humidity/Temperature Sensor, PN 206081 ; Mounting Bracket, PN 207499 NOTE: These will be factory installed if mixing box, Option MXB1, is ordered.

Field-Installed Accessories: If your unit was ordered with Option UV2, UVC lights in the cooling coil module, the bulbs and a box of parts are shipped in the blower compartment for field installation. Being careful not to touch the bulbs, verify the components with the instruction sheet included with the parts.

Before beginning installation, be sure that all shipped-separate options ordered are available at the site. Field-installed, shipped-separate options could include a roof curb, an outside air hood, a vent cap, an energy recovery unit, a VFD, a thermostat or other wall-mounted control, a remote console, a disconnect switch, a fill and drain or freeze protection kit, a water hammer arrestor, a firestat, and/or a smoke detector.

Storage and Startup: If this unit is going to be stored, take precautions to prevent condensate formation inside the electrical compartments and motors. To prevent damage to the unit, do not store sitting on the ground.

After the system has been moved to its installation site, remove all of the shipping brackets and check the blower for free movement. See the check lists in Paragraph 9.0 before starting the unit and completing the Startup Form.

4.0 Clearances and Dimensions

4.1 Clearances

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

TABLE 2A - Minimum Clearances from Combustible Material

Minimum Clearances to Combustibles—ALL Sizes of Models RDH, REH, RHH						
UOM	Control Side	Side Opposite Controls	Front	Rear	Top	Bottom
inches	20	6	48	18	6	0
mm	508	152	1219	457	152	0

TABLE 2B - Recommended Service Clearances

Recommended Service Clearances by Model and Size													
Model and Size				Control Side						Side Opposite Controls		Top	
RDH	REH	RHH	RXH	Control Side (Basic)		Control Side with Mixing Box		Control Side with Cooling Coil*		inches	mm	inches	mm
				inches	mm	inches	mm	inches	mm				
75/100	10A/20A/30A	—	000A	30	762	30	762	42	1067	6	152	18	457
125/150	15B/30B/60B	—	000B	34	864	34	864	52	1321	6	152	18	457
175/200/225	N/A	130/180	000C	30	762	30	762	42	1067	6	152	24	610
250/300	30D/60D/90D/120D	260	000D	42	1067	42	1067	58	1473	6	152	24	610
350/400A	40E/80E/120E	350	000E	52	1321	52	1321	66	1676	6	152	24	610

*Clearance is required for sliding out drain pan.

4.0 Clearances & Dimensions (cont'd)

4.2 Configurations and Dimensions

FIGURE 1 - Model RDH/REH/RHH/RXH Factory-assembled Configurations Depending on Option Selection and KEY to Dimensions A and C

NOTE: Dimensions A and C change with selection of factory-installed modules.

4.2.1 Model RDH, REH, RHH, or RXH (no heat only) with Horizontal Discharge

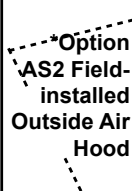
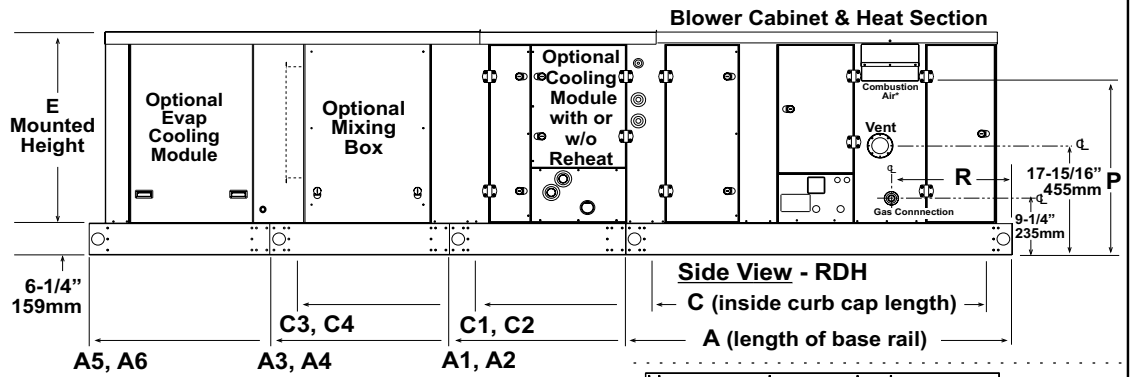
 <p>*Option AS2 Field-installed Outside Air Hood</p>	<p>*Field-installed hood (Option AS2) does not add length to the base of the system. The hood does add 42" (1066mm) to length of cabinet of RDH 75-150, REH 10A-60B, & RXH A&B; and 40-1/2" (1029mm) to length of cabinet of RDH 175-400A, RHH 130, 180, 260 & 350, REH 30D-120E, and RXH C-E. The evaporative cooling module, the mixing box, the coil cabinet, and the downturn plenum are mounted on the system base. (The evaporative cooling module is outside the curb cap.)</p>			
	Option ECC3 or ECC2 Evaporative Cooling Module	Option MXB1 Mixing Box with Variety of Inlet Air Options	Option AU Cooling Coil Module with a DX Coil with or without a Reheat Pump or a Chilled Water Coil	Blower and Heat Section (RDH, RHH, & REH); Blower only (RXH "no heat" only; for RXH with optional hot water heat, see page 39) Airflow →
ECC	MXB1	AU	BASIC	KEY to Dimension Codes A and C in FIGURE 2 & TABLE 3.
—	—	—	Basic	A, C
—	MXB1	—	Basic	A1, C1
ECCx	—	—	Basic	A1, C
—	—	AU 5 or 6 w/o Reheat	Basic	A1, C1
—	—	AU 7 with Reheat	Basic	A2, C2
ECCx	MXB1	—	Basic	A3, C1
—	MXB1	AU 5 or 6 w/o Reheat	Basic	A3, C3
—	MXB1	AU 7 with Reheat	Basic	A4 C4
ECCx	—	AU 5 or 6 w/o Reheat	Basic	A3, C1
ECCx	—	AU 7 with Reheat	Basic	A4, C2
ECCx	MXB1	AU 5 or 6 w/o Reheat	Basic	A5, C3
ECCx	MXB1	AU 7 with Reheat	Basic	A6, C4

TABLE 3 - Dimensions (inches and mm) of Model RDH, REH, RHH, or RXH (no heat only) with Horizontal Discharge (without an optional downturn plenum)

Dimensions (inches ±1/8)																
RDH	REH	RHH	RXH	A	A1	A2	A3	A4	A5	A6	B	C	C1	C2	C3	C4
75/100	10A/20A/40A	—	000A	60-13/16	88-9/16	113-9/16	116-5/16	141-5/16	144-1/16	169-1/16	33-3/4	53-9/16	81-5/16	106-5/16	109-1/16	134-1/16
125/150	15B/30B/60B	—	000B	60-13/16	88-9/16	113-9/16	116-5/16	141-5/16	144-1/16	169-1/16	43-3/4	53-9/16	81-5/16	106-5/16	109-1/16	134-1/16
175/200/225	N/A	130/180	000C	RDH/REH/RXH 76-1/2 RHH	RDH/REH/RXH 104-1/4 RHH	RDH/REH/RXH 129-1/4 RHH	RDH/REH/RXH 132 RHH	RDH/REH/RXH 157 RHH	RDH/REH/RXH 159-3/4 RHH	RDH/REH/RXH 184-3/4 RHH	33-3/4	RDH/REH/RXH 69-1/4 RHH	RDH/REH/RXH 97 RHH	RDH/REH/RXH 122 RHH	RDH/REH/RXH 124-3/4 RHH	RDH/REH/RXH 149-3/4 RHH
250/300	30D/60D/90D/120D	260	000D	86-1/2	114-1/4	139-1/4	142	167	169-3/4	194-3/4	50	79-1/4	107	132	134-3/4	159-3/4
350/400A	40E/80E/120E	350	000E	—	—	—	—	—	—	—	58	—	—	—	—	—
Dimensions (inches ±1/8)																
RDH	REH	RHH	RXH	D	E	F	G	H	J	K	L	M	N	P-RDH	R-RDH	X-REH
75/100	10A/20A/40A	—	000A	31-9/16	30-7/16	22-7/8	18-3/8	27	24	17-9/16	13-9/16	13-13/16	25-15/16	28-9/16	19	21-11/16
125/150	15B/30B/60B	—	000B	41-9/16	30-7/16	26-1/2	18-3/8	37	24	27-9/16	13-9/16	18-13/16	25-15/16	28-9/16	19	21-11/16
175/200/225	N/A	130/180	000C	31-9/16	39-11/16	22-7/8	18-3/8	27	33-1/4	20-3/4	22-13/16	12-5/16	30-9/16	37-13/16	26-3/4	N/A
250/300	30D/60D/90D/120D	260	000D	47-13/16	39-11/16	34-3/4	18-3/8	43-1/4	33-1/4	28-5/8	22-13/16	24-7/16	30-9/16	37-13/16	26-3/4	29-3/8
350/400A	40E/80E/120E	350	000E	55-13/16	39-11/16	45-13/16	18-3/8	51-1/4	33-1/4	38-5/16	22-13/16	27-13/16	30-9/16	37-13/16	26-3/4	29-3/8
Dimensions (mm ±3)																
RDH	REH	RHH	RXH	A	A1	A2	A3	A4	A5	A6	B	C	C1	C2	C3	C4
75/100	10A/20A/40A	—	000A	1545	2250	2885	2954	3589	3659	4294	857	1361	2065	2700	2770	3405
125/150	15B/30B/60B	—	000B	1545	2250	2885	2954	3589	3659	4294	1111	1361	2065	2700	2770	3405
175/200/225	N/A	130/180	000C	RDH/REH/RXH 1943 RHH	RDH/REH/RXH 2648 RHH	RDH/REH/RXH 3283 RHH	RDH/REH/RXH 3353 RHH	RDH/REH/RXH 3988 RHH	RDH/REH/RXH 4058 RHH	RDH/REH/RXH 4693 RHH	857	RDH/REH/RXH 1759 RHH	RDH/REH/RXH 2464 RHH	RDH/REH/RXH 3099 RHH	RDH/REH/RXH 3169 RHH	RDH/REH/RXH 3804 RHH
250/300	30D/60D/90D/120D	260	000D	2197	2902	3537	33791	4242	4312	4947	1270	2013	2329	3353	3423	4058
350/400A	40E/80E/120E	350	000E	—	—	—	—	—	—	—	1473	—	—	—	—	—
Dimensions (mm ±3)																
RDH	REH	RHH	RXH	D	E	F	G	H	J	K	L	M	N	P-RDH	R-RDH	X-REH
75/100	10A/20A/40A	—	000A	802	773	581	467	686	610	446	344	351	659	725	483	551
125/150	15B/30B/60B	—	000B	1056	773	673	467	940	610	700	344	478	659	725	483	551
175/200/225	N/A	130/180	000C	802	1008	581	467	686	845	527	580	313	777	960	679	N/A
250/300	30D/60D/90D/120D	260	000D	1214	1008	883	467	1099	845	728	580	621	777	960	679	746
350/400A	40E/80E/120E	350	000E	1418	1008	1164	467	1302	845	973	580	706	777	960	679	746

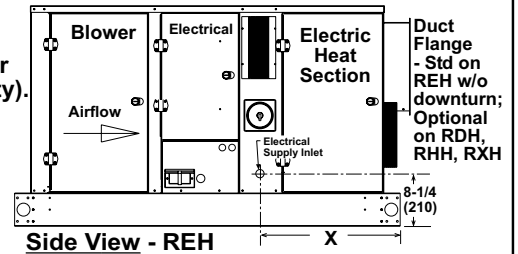
FIGURE 2 - Dimensions—Models RDH, REH, RHH, and RXH (no heat model only) with Horizontal Discharge (no Downturn Plenum)

NOTE: An optional evaporative cooling module (Option ECC) is always first and extends beyond the roof curb. It has no affect on inside curb length, Dimension C.



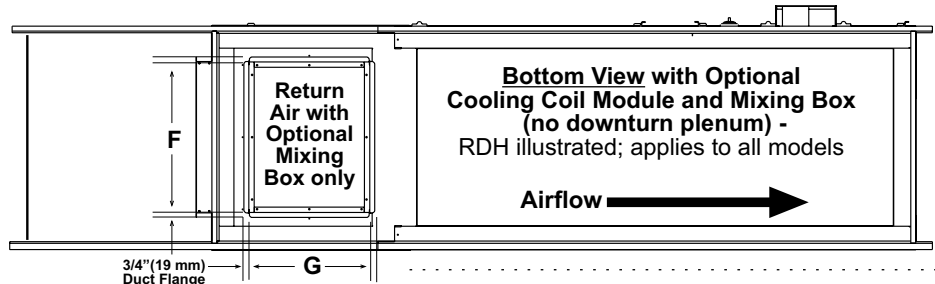
Side View of Optional Modules
Side View Dimensions A, C, and E are the same for Models RDH, REH, RXH (subject to option availability). Model RHH side dimensions are longer.

NOTE: Side view of "no heat" Model RXH is not illustrated but includes the blower section and the heat section cabinets less the heating components. Dimensions here apply to "no heat" RXH only. For RXH with hot water heat, see page 38.



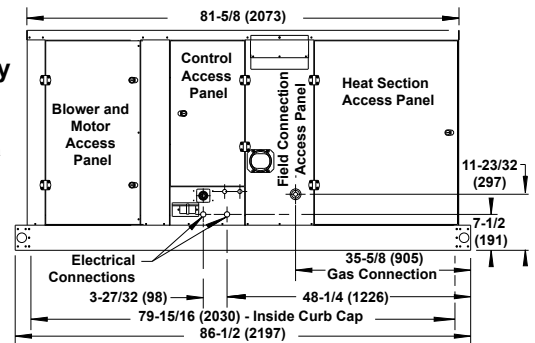
Dimensions Specific to each Module:

- Mixing Box (MXB), **FIGURE 22**, page 27.
- Evaporative Cooling Module (ECC), **FIGURE 25**, page 32.
- Chilled Water Cooling Coil Cabinet (AU6), **FIGURE 31**, page 35.
- DX Cooling Coil Cabinet (AU5), **FIGURE 32A**, page 36.
- DX Cooling Coil Cabinet w/Reheat (AU7), **FIGURE 32B**, page 36.
- Hot Water Heat Module for RXH, **FIGURE 36A** page 39.
- RDH Gas Heat, **FIGURE 2** top of page & **FIGURES 14A&B**, page 22.
- REH Electric Heat, **Side View** above.
- RHH High Efficiency Model, **Side View** center right and **FIGURE 15**, page 23, for heat section drain connection location.

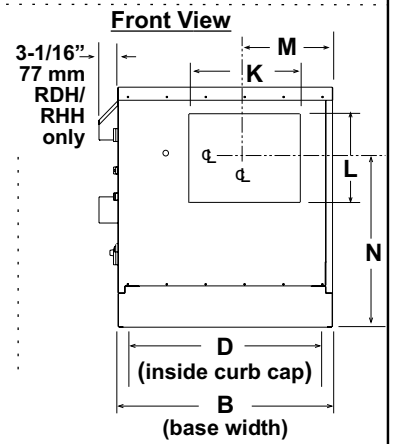
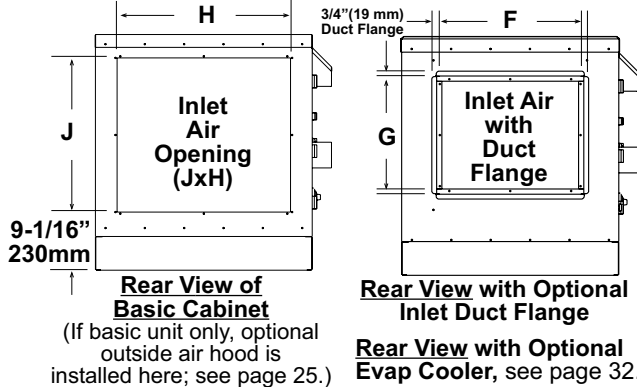


Side View - High Efficiency Model RHH

NOTE: Model RHH must be mounted on a roof curb. The area within the curb under the unit must be open.



Rear Views -(RDH shown; dimensions apply to all Models)



Other Dimensions:

- All Configurations **with** a Downturn Plenum (Option AQ), **FIGURE 4**, page 9.
- Outside Air Hood (Option AS2), **FIGURE 19A**, page 25.

4.0 Clearances & Dimensions (cont'd)

4.2 Configurations and Dimensions (cont'd)

FIGURE 3 - Models RDH, REH, RHH, and RXH (No Heat Only)—Factory-Assembled Configurations Depending on Option Selection and KEY to Dimensions A, C, and K

4.2.2 Model RDH, REH, RHH, or RXH (no heat) with Vertical Discharge


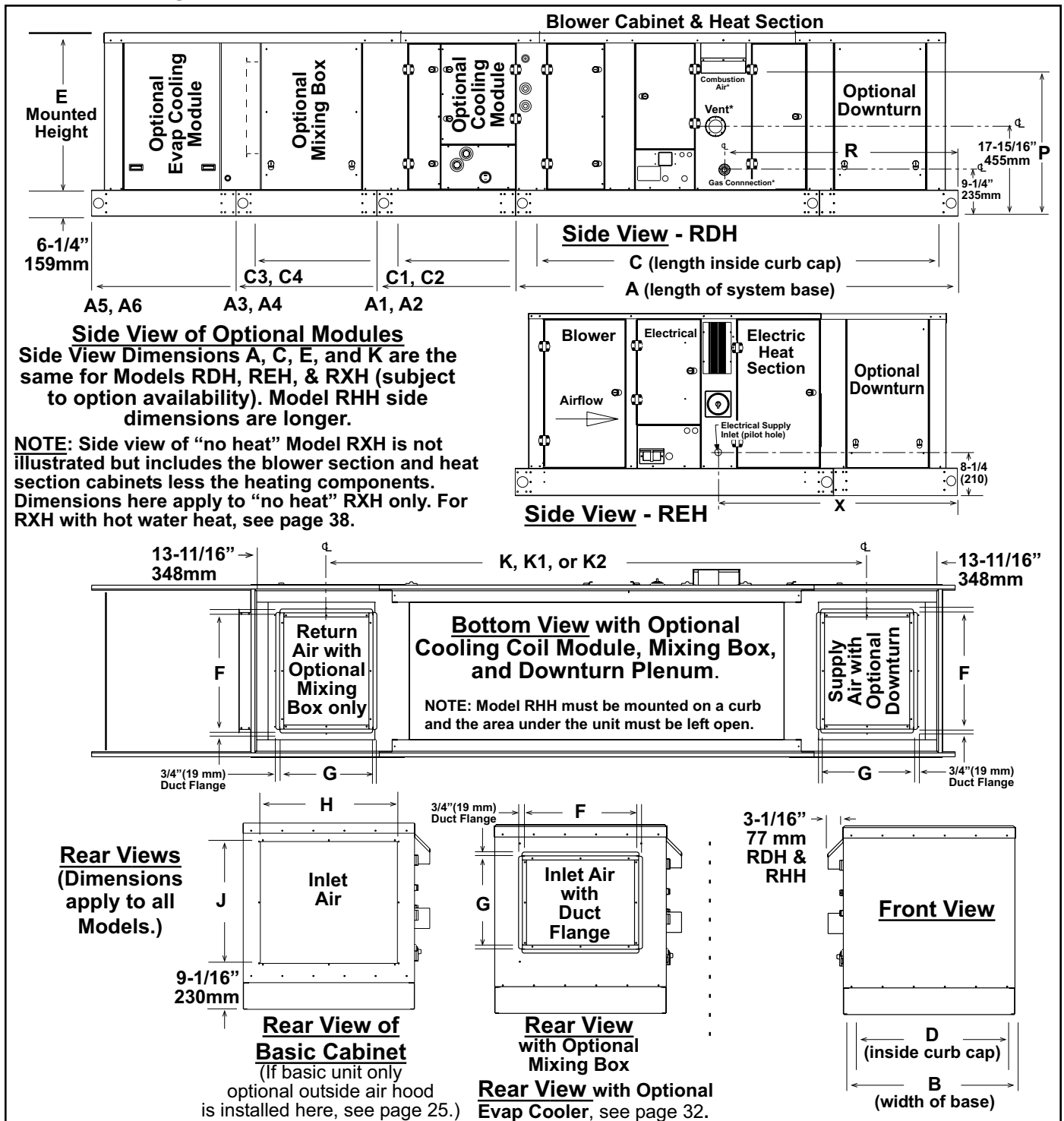
 <p>*Option AS2 Field-installed Outside Air Hood</p>		<p>*Field-installed hood (Option AS2) does not add length to the base of the system. The hood does add 42" (1066mm) to length of cabinet of RDH 75-150, REH 10A-60B, & RXH A&B; and 40-1/2" (1029mm) to length of cabinet of RDH 175-400A, REH 30D-120E, RHH 130, 180, 260 & 350, and RXH C-E. The evaporative cooling module, the mixing box, the coil cabinet, and the downturn plenum are mounted on the system base. (The evaporative cooling module is outside the curb cap.)</p>		
Option ECC3 or ECC2 Evaporative Cooling Module	Option MXB1 Mixing Box with Variety of Inlet Air Options	Option AU Cooling Coil Module with a DX Coil with or without a Reheat Pump or a Chilled Water Coil	Blower and Heat Section (RDH, REH, & RHH); Blower only (RXH "no heat" only; for RXH with optional hot water heat, see page 39)	Vertical Discharge with Downturn Plenum Option AQxx
ECC	MXB1	AU	BASIC	KEY to Dimension Codes A, C, & K in FIGURE 4 and TABLE 4.
—	—	—	Basic	A, C
—	MXB1	—	Basic	A1, C1, K
ECCx	—	—	Basic	A1, C
—	—	AU 5 or 6 w/o Reheat	Basic	A1, C1
—	—	AU 7 with Reheat	Basic	A2, C2
ECCx	MXB1	—	Basic	A3, C1, K
—	MXB1	AU 5 or 6 w/o Reheat	Basic	A3, C3, K1
—	MXB1	AU 7 with Reheat	Basic	A4, C4, K2
ECCx	—	AU 5 or 6 w/o Reheat	Basic	A3, C1
ECCx	—	AU 7 with Reheat	Basic	A4, C2
ECCx	MXB1	AU 5 or 6 w/o Reheat	Basic	A5, C3, K1
ECCx	MXB1	AU 7 with Reheat	Basic	A6, C4, K2

TABLE 4 - Dimensions (inches and mm) of Model RDH, REH, RHH, or RXH (no heat only) with a Downturn Plenum

Dimensions (inches ±1/8)																
RDH	REH	RHH	RXH	A	A1	A2	A3	A4	A5	A6	B	C	C1	C2	C3	C4
75/100	10A/20A/40A	—	000A	88-9/16	116-5/16	141-5/16	144-1/16	169-1/16	172-1/8	197-1/8	33-3/4	81-5/16	109-1/16	134-1/16	136-13/16	161-13/16
125/150	15B/30B/60B	—	000B	88-9/16	116-5/16	141-5/16	144-1/16	169-1/16	172-1/8	197-1/8	43-3/4	81-5/16	109-1/16	134-1/16	136-13/16	161-13/16
175/200/225	N/A	130/180	000C	RDH/REH/RXH 104-1/4	RDH/REH/RXH 132	RDH/REH/RXH 157	RDH/REH/RXH 159-3/4	RDH/REH/RXH 184-3/4	RDH/REH/RXH 187-1/2	RDH/REH/RXH 212-1/2	33-3/4	RDH/REH/RXH 97	RDH/REH/RXH 124-3/4	RDH/REH/RXH 149-3/4	RDH/REH/RXH 152-1/2	RDH/REH/RXH 177-1/2
250/300	30D/60D/90D/120D	260	000D	RHH 114-1/4	RHH 142	RHH 167	RHH 169-3/4	RHH 194-3/4	RHH 197-1/2	RHH 222-1/2	50	RHH 107	RHH 134-3/4	RHH 159-3/4	RHH 162-1/2	RHH 187-1/2
350/400A	40E/80E/120E	350	000E								58					
Dimensions (mm ±3)																
RDH	REH	RHH	RXH	A	A1	A2	A3	A4	A5	A6	B	C	C1	C2	C3	C4
75/100	10A/20A/40A	—	000A	2250	2954	3589	3659	4294	4372	5007	857	2065	2770	3405	3475	4110
125/150	15B/30B/60B	—	000B	2250	2954	3589	3659	494	4372	5007	1111	2065	2770	3405	3475	4110
175/200/225	N/A	130/180	000C	RDH/REH/RXH 2648	RDH/REH/RXH 3353	RDH/REH/RXH 3988	RDH/REH/RXH 4058	RDH/REH/RXH 4693	RDH/REH/RXH 4763	RDH/REH/RXH 5398	857	RDH/REH/RXH 2464	RDH/REH/RXH 3169	RDH/REH/RXH 3804	RDH/REH/RXH 3874	RDH/REH/RXH 4509
250/300	30D/60D/90D/120D	260	000D	RHH 2902	RHH 3607	RHH 4242	RHH 4312	RHH 4947	RHH 5017	RHH 5652	1270	RHH 2718	RHH 3423	RHH 4058	RHH 4128	RHH 4763
350/400A	40E/80E/120E	350	000E								1473					
RDH	REH	RHH	RXH	D	E	F	G	H	J	K	K1	K2	P-RDH	R-RDH	X-REH	
75/100	10A/20A/40A	—	000A	802	773	581	467	686	610	2073	2778	3413	725	1187	1255	
125/150	15B/30B/60B	—	000B	1056	773	673	467	940	610	2073	2778	3413	725	1187	1255	
175/200/225	N/A	130/180	000C	802	1008	581	467	686	845	RDH/REH/RXH 2473	RDH/REH/RXH 3432	RDH/REH/RXH 3813	960	1384	N/A	
250/300	30D/60D/90D/120D	260	000D	1214	1008	883	467	1099	845	RHH 2727	RHH 3432	RHH 4067	960	1384	1451	
350/400A	40E/80E/120E	350	000E	1418	1008	1164	467	1302	845				960	1384	1451	

FIGURE 4 - Dimensions—Model RDH, REH, RHH and RXH (no heat only) with a Downturn Plenum (bottom discharge)



NOTE: An optional evaporative cooling module (Option ECC) is always first and extends beyond the roof curb. It has no effect on inside curb length Dimension C or K.

Dimensions Specific to each Module:

- Mixing Box (MXB), **FIGURE 22**, page 27.
- Evaporative Cooling Module (ECC), **FIGURE 25**, page 32.
- Chilled Water Cooling Coil Cabinet (AU6), **FIGURE 31**, page 35.
- DX Cooling Coil Cabinet (AU5), **FIGURE 32A**, page 36.
- DX Cooling Coil Cabinet with Reheat (AU7), **FIGURE 32B**, page 36.
- Hot Water Heat Module for RXH, page 39, **FIGURE 36A**.

Other Dimensions:

- All Configurations with Horizontal Discharge (no downturn plenum), **FIGURE 2**, page 7.

- Outside Air Hood (Option AS2), **FIGURE 19A**, page 25.
- RDH Gas Heat, **FIGURE 4** above and **FIGURES 14A&B**, page 22.
- REH Electric Heat, **SIDE VIEW** in **FIGURE 4** above.
- RHH High Efficiency Model, **FIGURE 2**, page 7, but with length dimensions from TABLE 4 that include 27-1/2" (699) added for downturn plenum. See **FIGURE 15**, page 23, for heat section drain connection location.

5.0 Mounting and Lifting

TABLE 5 - Weights (lb and kg) of Basic System, Outside Air Hood and Factory-Installed Optional Modules

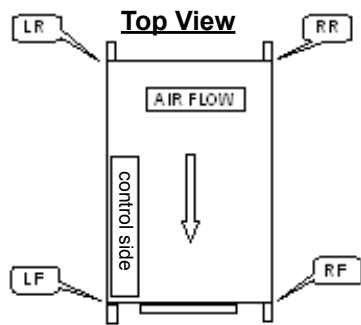
* Cooling coil cabinet module weight is estimated for heaviest coil. If more accurate information is needed, check with your distributor or Factory Representative who either has the specific information in the order specifications or has software to generate the information.

5.1 Weights

Before installing, check the supporting structure to be sure that it has sufficient load-bearing capacity to support the weight of the unit during installation and operation. Lifting and mounting are the responsibility of the installer.

Model RDH (gas-fired heat)	75	100	125	150	175	200	225	250	300	350	400A	
Model REH (electric heat)	10A, 20A, 40A	15B, 30B, 60B	N/A					30D, 60D, 90D, 120D	40E, 80E, 120E			
Model RHH (high efficiency gas-fired heat)	—		—		130 / 180			260	350			
Model RXH (no heat)	000A		000B		000C			000D	000E			
Approximate Net Weights—lb (does not include motor weight)												
Basic Gas Heat & Blower Section (Model RDH)	355	364	454	463	526	552	552	677	692	793	805	
Basic Electric Heat & Blower Section (Model REH)	364		462		N/A			692	804			
High Efficiency Gas Heat & Blower Section (RHH)	—		—		539 / 544			729	889			
Blower Section, no heat (Model RXH)	278		348		393			494	556			
Option AS2 Outside Air Hood (field-installed)	70		76		76			87	96			
Approximate Weights of Factory-Attached Modules—lb (add to weight of basic unit above)												
Optional Downturn Plenum	120		124		130			140	150			
Option AR8, On/Off Damper (no mixing box)	34		45		56			73	85			
Option MXB1 Mixing Box	146		166		166			201	219			
Cooling Coil Module with heaviest coil weight*	DX coil (without reheat pump)	4 row coil	214	252	256			329	365			
		6 row coil	235	280	284			373	418			
	DX coil (with reheat pump)	4 row coil	331	382	394			494	547			
		6 row coil	352	410	422			538	600			
	Chilled water (filled) (no reheat pump)	4 row coil	301	363	373			497	559			
		6 row coil	351	431	441			604	686			
Evaporative Cooling Module	with Dry Media	120		141		136			172	190		
	with Wet Media & 3" of Water (full sump)	262		263		218			279	272		
Hot Water Heat Module for RXH with HW2 only (does not include water weight)	with 4 row, 14 fpi coil		145	175	177			236	263			
Approximate Net Weights—kg (does not include motor weight)												
Basic Gas Heat & Blower Section (Model RDH)	161	165	206	210	239	250	250	307	314	360	365	
Basic Electric Heat & Blower Section (Model REH)	165		210		N/A			314	365			
High Efficiency Gas Heat & Blower Section (RHH)	—		—		244 / 247			331	403			
Blower Section, no heat (Model RXH)	126		158		178			224	252			
Option AS2 Outside Air Hood (field-installed)	32		34		34			39	44			
Approximate Weights (kg) of factory-attached modules (add to wt of basic unit above)												
Optional Downturn Plenum	54		56		56			63	68			
Option AR8, On/Off Damper (no mixing box)	15		20		25			33	39			
Option MXB1 Mixing Box	66		75		75			91	99			
Cooling Coil Module with heaviest coil weight*	DX coil (without reheat pump)	4 row coil	97	114	116			149	166			
		6 row coil	107	127	129			169	190			
	DX coil (with reheat pump)	4 row coil	150	173	179			224	248			
		6 row coil	160	186	191			244	272			
	Chilled water (filled) (no reheat pump)	4 row coil	137	165	169			225	254			
		6 row coil	159	195	200			274	311			
Evaporative Cooling Module	with Dry Media	54		64		62			78	86		
	with Wet Media & 76mm of Water (full)	119		119		99			127	123		
Hot Water Heat Module for RXH with HW2 only (does not include water weight)	with 4 row, 14 fpi coil		66	79	80			107	119			

FIGURE 5 - Corner Weight Locations



NOTES: If controls are on the right side, switch left and right side weights. Weights do not include the blower motor or any optional modules. For additional corner weights contact your distributor.

TABLE 6 - Approximate Corner Weights (lb & kg) of Basic Heat Module and Blower Section

RDH	75	100	125	150	175	200	225	250	300	350	400A
Approximate Corner Weights (lb)—Basic Heater & Blower only											
LR	77	79	98	100	114	117	120	147	150	172	174
RR	69	71	89	90	103	106	108	132	135	155	157
RF	101	104	129	132	150	154	157	193	197	226	229
LF	108	110	138	140	160	164	167	205	210	241	244
Approximate Corner Weights (kg)—Basic Heater & Blower only											
LR	35	36	45	46	52	53	54	67	68	78	79
RR	31	32	40	41	47	48	49	60	61	70	71
RF	46	47	59	60	68	70	71	87	89	102	104
LF	49	50	62	64	72	74	76	93	95	109	111
Approximate Corner Weights (kg)—Basic Heater & Blower only											
REH	10A, 20A, 40A	15B, 30B, 60B	30D, 60D, 90D, 120D	40E, 80E, 120E							
Approx Wt of Each Corner	lb	kg	lb	kg	lb	kg	lb	kg	lb	kg	
	74	34	92	42	131	59	149	68			

5.2 Mounting

Model RHH is designed to be mounted on a roof curb.

Model RDH, REH, and RXH outdoor systems are designed to be mounted on a roof or a cement slab. The system may be set directly on a slab without any additional support. When installed on a roof, either a manufacturer-designed roof curb, a manufacturer-designed roof curb adapter (required if replacing a Model RGB or RPB), a field-supplied roof curb, or other field-supplied support is required.

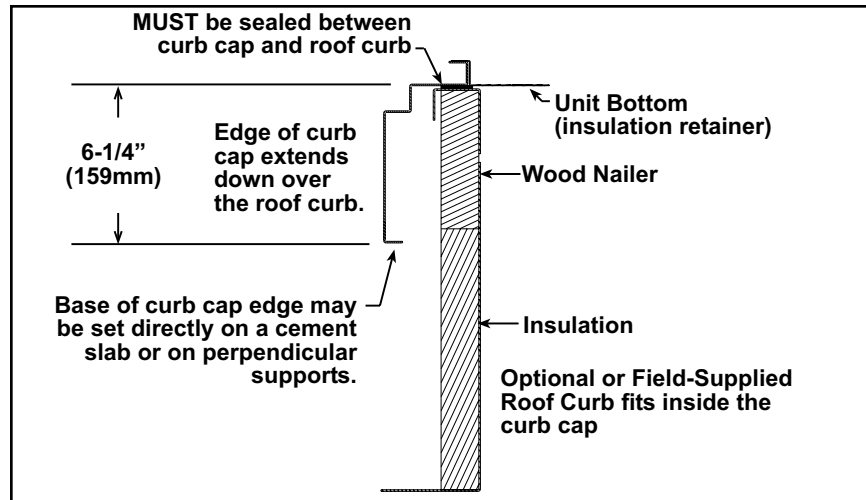
NOTE: A roof curb is recommended with a downturn plenum and/or bottom return air to provide a weatherproof installation.

5.2.1 Curb Cap Base

The system is equipped with a load-bearing curb cap which forms the integral part of the unit. The curb cap has bolted seams and is designed so that it may be set directly on a cement slab, on perpendicular supports, or over a roof curb.

FIGURE 6 - Curb Cap Base

NOTE: The curb cap on Models RDH, REH, RHH, and RXH will not fit on the same roof curb as a Model RGB/RPB. Contact your distributor about the availability of a curb adapter.

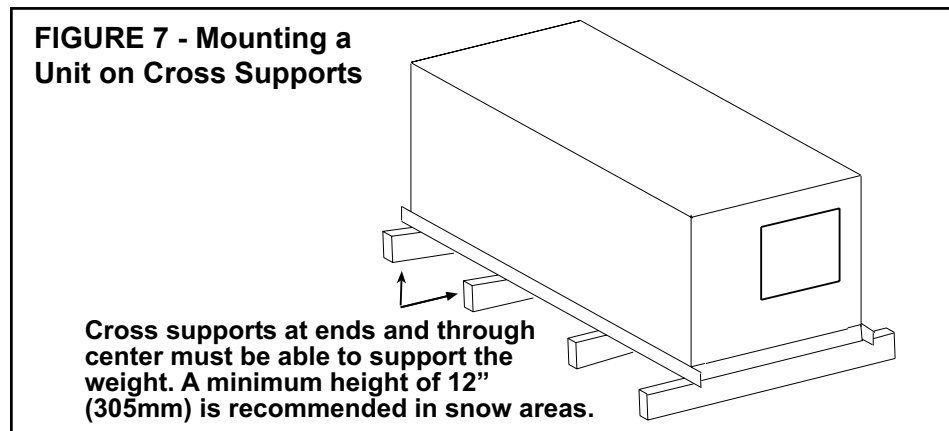


5.2.2 Mounting Without a Curb (does not apply to Model RHH)

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 an installation without a roof curb in snow areas, it is recommended that the support under the system be at least 12" (305mm) higher than the roof surface. **IMPORTANT NOTE:** If setting cross supports on the roof surface and not decking, be sure to have sufficient tread material under the supports to adequately spread the load and prevent "sinking" into the roofing material.

The field supplied, weather resistant, cross-support structure must be secure and adequate for the weight of the system (Refer to weights in Paragraph 5.1). See width dimensions in Paragraph 4.2.

FIGURE 7 - Mounting a Unit on Cross Supports



5.2.3 Mounting on a Roof Curb (see FIGURES 8 and 9, pages 12 and 14 and follow the instructions for the model being installed)

NOTE: If installing a Model RDH or REH unit to replace a Model RGB or RPB, install a curb adapter on the already installed roof curb. Follow the instructions provided with the adapter. Seal the top of the adapter before setting the new unit.

The Option CJ curb for a Model RDH, REH, RHH, and RXH unit is a 16" high, fully enclosed, insulated roof curb. If the application is sound sensitive, consider installing a field-supplied vibration isolation curb or specialty sound attenuation curb. Whether using the optional roof curb available with the system or a field-supplied curb, the curb must be secure, square, and level.

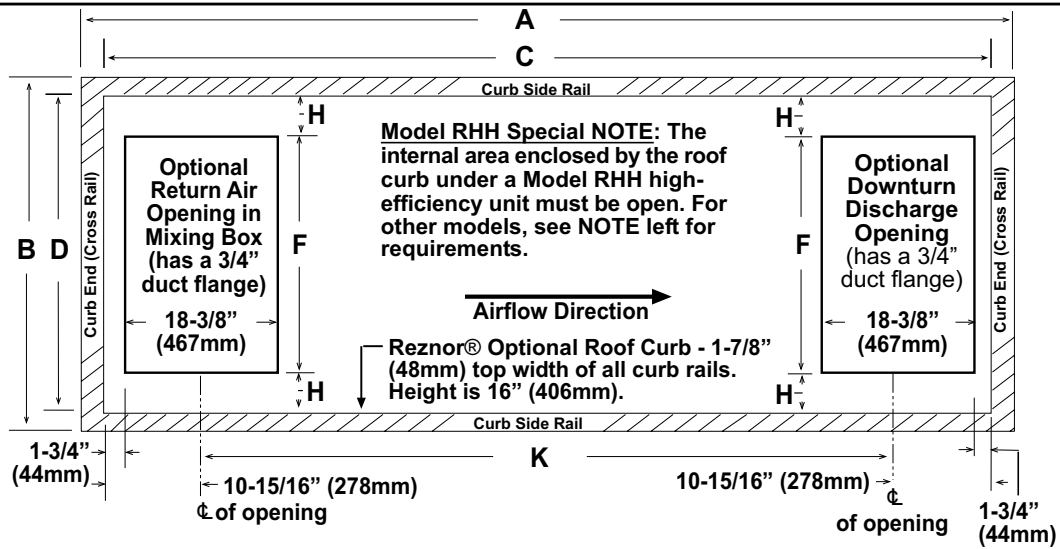
The top surface of the roof curb must be caulked with 1/4" x 1-1/4" sealant tape or two 1/4" beads of suitable sealant. The unit must be sealed to the curb to minimize sound transmission, prevent air leakage, and to prevent water leakage into the curb area due to wind blown rain and capillary action.

5.0 Mounting and Lifting (cont'd)

5.2 Mounting (cont'd) 5.2.3 Mounting on a Roof Curb (cont'd)

FIGURE 8 - Dimensions of Optional Roof Curbs

IMPORTANT Note—Models RDH, REH, and RXH with Hot Water Heat: The area enclosed by the roof curb must comply with clearance to combustible materials. If roof is constructed of combustible materials, the area 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. If the area within the curb is left open, higher radiated sound levels may result.



NOTE: If your installation includes an optional energy recovery module, a separate field-supplied roof curb is required for the energy recovery module.

TABLE 7A - Dimensions and Weights of Optional Roof Curbs for Model RDH, Model REH, and Model RXH without a hot water heat module (for a Model RXH with a hot water heat module, see TABLE 8A)

Configuration*	Option Code	RDH Size	REH Size	**RXH Size	Inches (±1/8)				mm (±3)				Weight	
					A	B	C	D	A	B	C	D	lb	kg
Basic Unit ONLY (blower and heat section) with horizontal discharge	CJ8A	75/100	10A/20A/40A	000A	51-13/16	29-13/16	48-1/16	26-1/16	1,316	757	1,221	662	90	41
		125/150	15B/30B/60B	000B	51-13/16	39-13/16	48-1/16	36-1/16	1,316	1,011	1,221	916	101	46
		175/200/225	N/A	000C	67-1/2	29-13/16	63-3/4	26-1/16	1,715	757	1,619	662	107	49
		250/300	30D/60D/90D/120D	000D	67-1/2	46-1/16	63-3/4	42-5/16	1,715	1,170	1,619	1,075	125	57
		350/400A	40E/80E/120E	000E	67-1/2	54-1/16	63-3/4	50-5/16	1,715	1,373	1,619	1,278	134	61
Basic unit PLUS 1: Either Downturn Discharge Plenum (AQ5 or AQ8); OR Mixing Box (MXB1) with horizontal discharge; OR Cooling Coil Cabinet without Reheat (AU5 or AU6) with horizontal discharge	CJ8B	75/100	10A/20A/40A	000A	79-9/16	29-13/16	75-13/16	26-1/16	2,021	757	1,926	662	120	54
		125/150	15B/30B/60B	000B	79-9/16	39-13/16	75-13/16	36-1/16	2,021	1,011	1,926	916	131	59
		175/200/225	N/A	000C	95-1/4	29-13/16	91-1/2	26-1/16	2,419	757	2,324	662	138	63
		250/300	30D/60D/90D/120D	000D	95-1/4	46-1/16	91-1/2	42-5/16	2,419	1,170	2,324	1,075	155	70
		350/400A	40E/80E/120E	000E	95-1/4	54-1/16	91-1/2	50-5/16	2,419	1,373	2,324	1,278	164	74
Basic unit PLUS 2: Down Discharge (AQ 5 or 8) AND Mixing Box OR Cooling Coil Cabinet without Reheat (AU 5 or 6); OR Mixing Box AND Cooling Coil Cabinet without Reheat (AU 5 or 6) with horizontal discharge	CJ8C	75/100	10A/20A/40A	000A	107-5/16	29-13/16	103-9/16	26-1/16	2,726	757	2,631	662	151	68
		125/150	15B/30B/60B	000B	107-5/16	39-13/16	103-9/16	36-1/16	2,726	1,011	2,631	916	162	73
		175/200/225	N/A	000C	123	29-13/16	119-1/4	26-1/16	3,124	757	3,029	662	168	76
		250/300	30D/60D/90D/120D	000D	123	46-1/16	119-1/4	42-5/16	3,124	1,170	3,029	1,075	186	84
		350/400A	40E/80E/120E	000E	123	54-1/16	119-1/4	50-5/16	3,124	1,373	3,029	1,278	195	88
Basic unit PLUS 3: Down Discharge Plenum (AQ5 or AQ8) AND Mixing Box (MXB1) AND Cooling Coil Cabinet without Reheat (AU5 or AU6)	CJ8D	75/100	10A/20A/40A	000A	135-1/16	29-13/16	131-5/16	26-1/16	3,431	757	3,335	662	181	82
		125/150	15B/30B/60B	000B	135-1/16	39-13/16	131-5/16	36-1/16	3,431	1,011	3,335	916	192	87
		175/200/225	N/A	000C	150-3/4	29-13/16	147	26-1/16	3,829	757	3,734	662	199	90
		250/300	30D/60D/90D/120D	000D	150-3/4	46-1/16	147	42-5/16	3,829	1,170	3,734	1,075	216	98
		350/400A	40E/80E/120E	000E	150-3/4	54-1/16	147	50-5/16	3,829	1,373	3,734	1,278	225	102
Basic unit PLUS 1: Cooling Coil Cabinet with Reheat (AU7) with horizontal discharge	CJ8E	75/100	10A/20A/40A	000A	104-9/16	29-13/16	100-13/16	26-1/16	2,656	757	2,561	662	149	68
		125/150	15B/30B/60B	000B	104-9/16	39-13/16	100-13/16	36-1/16	2,656	1,011	2,561	916	160	73
		175/200/225	N/A	000C	120-1/4	29-13/16	116-1/2	26-1/16	3,054	757	2,959	662	167	76
		250/300	30D/60D/90D/120D	000D	120-1/4	46-1/16	116-1/2	42-5/16	3,054	1,170	2,959	1,075	184	83
Basic unit PLUS 2: Cooling Coil Cabinet with Reheat (AU7) AND Down Discharge Plenum (AQ5 or AQ8) OR Mixing Box (MXB1) with horizontal discharge	CJ8F	75/100	10A/20A/40A	000A	132-5/16	29-13/16	128-9/16	26-1/16	3,361	757	3,266	662	180	82
		125/150	15B/30B/60B	000B	132-5/16	39-13/16	128-9/16	36-1/16	3,361	1,011	3,266	916	191	87
		175/200/225	N/A	000C	148	29-13/16	144-1/4	26-1/16	3,759	757	3,664	662	197	89
		250/300	30D/60D/90D/120D	000D	148	46-1/16	144-1/4	42-5/16	3,759	1,170	3,664	1,075	215	98
Basic unit PLUS 3: Cooling Coil Cabinet with Reheat (AU7) AND Down Discharge Plenum (AQ5 or AQ8) AND Mixing Box (MXB1)	CJ8G	75/100	10A/20A/40A	000A	160-1/16	29-13/16	156-5/16	26-1/16	4,066	757	3,970	662	210	95
		125/150	15B/30B/60B	000B	160-1/16	39-13/16	156-5/16	36-1/16	4,066	1,011	3,970	916	221	100
		175/200/225	N/A	000C	175-3/4	29-13/16	172	26-1/16	4,464	757	4,369	662	228	103
		250/300	30D/60D/90D/120D	000D	175-3/4	46-1/16	172	42-5/16	4,464	1,170	4,369	1,075	245	111
350/400A	40E/80E/120E	000E	175-3/4	54-1/16	172	50-5/16	4,464	1,373	4,369	1,278	254	115		

* See Configurations in Paragraph 4.2. **NOTE:** If there is an evaporative cooling module, the base of the unit under the evaporative cooling module extends beyond the end of the roof curb. An evaporative cooling module does not affect the length of the roof curb.

** Model RXH in Tables 7A and 7B apply to "no heat" model only. For roof curb for Model RXH with optional hot water heat module, see Tables 8A and 8B

TABLE 7B - Dimensions for Locations of Bottom Duct Openings as shown in FIGURE 8 for Models in TABLE 7A

NOTE: Duct openings should be 1" larger than the duct size for installation clearance.

Model and Size			Dimensions (inches ±1/8)					Dimensions (mm ±3)				
RDH	REH	RXH	F	H	K (with mixing box and down discharge)			F	H	K (with mixing box and down discharge)		
			With mixing box and/or down discharge	No cooling coil module	With a cooling coil module		With mixing box and/or down discharge	No cooling coil module	With a cooling coil module			
					No reheat	With reheat			No reheat	With reheat		
75/100	10A/20A/40A	000A	22-7/8	1-9/16	81-5/8	109-3/8	134-3/8	581	40	2073	2778	3413
125/150	15B/30B/60B	000B	26-1/2	4-3/4	81-5/8	109-3/8	134-3/8	673	121	2073	2778	3413
175/200/225	N/A	000C	22-7/8	1-9/16	97-3/8	125-1/8	150-1/8	581	40	2473	3178	3813
250/300	30D/60D/90D/120D	000D	34-3/4	3-3/4	97-3/8	125-1/8	150-1/8	883	96	2473	3178	3813
350/400A	40E/80E/120E	000E	45-13/16	2-1/4	97-3/8	125-1/8	150-1/8	1164	57	2473	3178	3813

TABLE 8A - Dimensions and Weights of Optional Roof Curbs for Model RXH with Optional Hot Water Heat Module (Option HW2)

Configuration*	Option Code	RXH with Optional Hot Water Heat Module	Inches (±1/8)				mm (±3)				Weight	
			A	B	C	D	A	B	C	D	lb	kg
Model RXH with Optional Hot Water Heat Module (HW2) and horizontal discharge	CJ8H	000A	68-5/8	29-13/16	64-7/8	26-1/16	1743	757	1648	662	115	52
		000B	68-5/8	39-13/16	64-7/8	36-1/16	1743	1,011	1648	916	127	58
		000C	84-3/8	29-13/16	80-5/8	26-1/16	2143	757	2048	662	134	61
		000D	84-3/8	46-1/16	80-5/8	42-5/16	2143	1,170	2048	1,075	153	69
		000E	84-3/8	54-1/16	80-5/8	50-5/16	2143	1,373	2048	1,278	153	69
Model RXH with Optional Hot Water Heat Module (HW2) PLUS 1: Either Downturn Discharge Plenum (AQ5 or AQ8); OR Mixing Box (MXB1) with horizontal discharge; OR Cooling Coil Cabinet without Reheat (AU5 or AU6) with horizontal discharge	CJ8J	000A	96-3/8	29-13/16	92-5/8	26-1/16	2448	757	2353	662	148	67
		000B	96-3/8	39-13/16	92-5/8	36-1/16	2448	1,011	2353	916	160	73
		000C	112-1/8	29-13/16	108-3/8	26-1/16	2848	757	2753	662	167	76
		000D	112-1/8	46-1/16	108-3/8	42-5/16	2848	1,170	2753	1,075	167	76
		000E	112-1/8	54-1/16	108-3/8	50-5/16	2848	1,373	2753	1,278	167	76
Model RXH with Optional Hot Water Heat Module (HW2) PLUS 2: Down Discharge (AQ 5 or AQ8) AND Mixing Box OR Cooling Coil Cabinet without Reheat (AU 5 or 6); OR Mixing Box AND Cooling Coil Cabinet without Reheat (AU 5 or 6) with horizontal discharge	CJ8K	000A	124-1/8	29-13/16	120-3/8	26-1/16	3153	757	3058	662	189	86
		000B	124-1/8	39-13/16	120-3/8	36-1/16	3153	1011	3058	916	201	91
		000C	139-7/8	29-13/16	136-1/8	26-1/16	3553	757	3458	662	208	94
		000D	139-7/8	46-1/16	136-1/8	42-5/16	3553	1170	3458	1075	227	103
		000E	139-7/8	54-1/16	136-1/8	50-5/16	3553	1373	3458	1278	237	108
Model RXH with Optional Hot Water Heat Module (HW2) PLUS 3: Down Discharge Plenum (AQ5 or AQ8) AND Mixing Box (MXB1) AND Cooling Coil Cabinet without Reheat (AU5 or AU6)	CJ8L	000A	151-3/4	29-13/16	148	26-1/16	3854	757	3759	662	185	84
		000B	151-3/4	39-13/16	148	36-1/16	3854	1011	3759	916	197	89
		000C	167-3/8	29-13/16	163-5/8	26-1/16	4251	757	4156	662	204	93
		000D	167-3/8	46-1/16	163-5/8	42-5/16	4251	1170	4156	1075	224	102
		000E	167-3/8	54-1/16	163-5/8	50-5/16	4251	1373	4156	1278	234	106
Model RXH with Optional Hot Water Heat Module (HW2) PLUS 1: Cooling Coil Cabinet with Reheat (AU7) with horizontal discharge	CJ8M	000A	121-1/4	29-13/16	117-1/2	26-1/16	3080	757	2985	662	222	101
		000B	121-1/4	39-13/16	117-1/2	36-1/16	3080	1011	2985	916	234	106
		000C	136-7/8	29-13/16	133-1/8	26-1/16	3477	757	3381	662	241	109
		000D	136-7/8	46-1/16	133-1/8	42-5/16	3477	1170	3381	1075	261	118
		000E	136-7/8	54-1/16	133-1/8	50-5/16	3477	1373	3381	1278	271	123
Model RXH with Optional Hot Water Heat Module (HW2) PLUS 2: Cooling Coil Cabinet with Reheat (AU7) AND Down Discharge Plenum (AQ5 or AQ8) OR Mixing Box (MXB1) with horizontal discharge	CJ8N	000A	148-7/8	29-13/16	145-1/8	26-1/16	3781	757	3686	662	219	99
		000B	148-7/8	39-13/16	145-1/8	36-1/16	3781	1011	3686	916	231	105
		000C	164-5/8	29-13/16	160-7/8	26-1/16	4181	757	4086	662	238	108
		000D	164-5/8	46-1/16	160-7/8	42-5/16	4181	1170	4086	1075	258	117
		000E	164-5/8	54-1/16	160-7/8	50-5/16	4181	1373	4086	1278	267	121
Model RXH with Optional Hot Water Heat Module (HW2) PLUS 3: Cooling Coil Cabinet with Reheat (AU7) AND Down Discharge Plenum (AQ5 or AQ8) AND Mixing Box (MXB1)	CJ8P	000A	176-3/4	29-13/16	173	26-1/16	4489	757	4394	662	252	114
		000B	176-3/4	39-13/16	173	36-1/16	4489	1011	4394	916	265	120
		000C	192-3/8	29-13/16	188-5/8	26-1/16	4886	757	4791	662	271	123
		000D	192-3/8	46-1/16	188-5/8	42-5/16	4886	1170	4791	1075	291	132
		000E	192-3/8	54-1/16	188-5/8	50-5/16	4886	1373	4791	1278	301	137

* See Configurations in Paragraph 4.2. **NOTE:** If there is an evaporative cooling module, the base of the unit under the evaporative cooling module extends beyond the end of the roof curb. An evaporative cooling module does not affect the length of the roof curb.

TABLE 8B - Dimensions for Locations of Bottom Duct Openings as shown in FIGURE 8 for Models in TABLE 8A

NOTE: Duct openings should be 1" larger than the duct size for installation clearance.

Model RXH	Dimensions (inches ±1/8)					Dimensions (mm ±3)				
	F	H	K (with mixing box & downturn)			F	H	K (with mixing box & downturn)		
	With hot water heat module	With mixing box and/or down discharge	No cooling coil module	With cooling coil module		With mixing box and/or down discharge	No cooling coil module	With cooling coil module		
No reheat				With reheat	No reheat			With reheat		
000A	22-7/8	1-9/16	98-7/16	126-3/16	151-3/16	581	40	2500	3205	3840
000B	26-1/2	4-3/4	98-7/16	126-3/16	151-3/16	673	121	2500	3205	3840
000C	22-7/8	1-9/16	114-3/16	141-15/16	166-15/16	581	40	2900	3605	4240
000D	34-3/4	3-3/4	114-3/16	141-15/16	166-15/16	883	96	2900	3605	4240
000E	45-13/16	2-1/4	114-3/16	141-15/16	166-15/16	1164	57	2900	3605	4240

5.0 Mounting and Lifting (cont'd)

5.2 Mounting (cont'd) 5.2.3 Mounting on a Roof Curb (cont'd)

TABLE 9A - Dimensions and Weights of Optional Roof Curbs for Model RHH (See FIGURE 8, page 12)

Configuration*	Option Code	RHH	Inches (±1/8)				mm (±3)				Weight	
			A	B	C	D	A	B	C	D	lb	kg
Model RHH and horizontal discharge	CJ8Q	130/180	77-1/2	29-13/16	73-3/4	26-1/16	1,969	757	1,873	662	125	57
		260	77-1/2	46-1/16	73-3/4	42-5/16	1,969	1,170	1,873	1,075	145	66
		350	77-1/2	54-1/16	73-3/4	50-5/16	1,969	1,373	1,873	1,278	155	70
Model RHH PLUS 1: Either Downturn Discharge Plenum (AQ5 or AQ8); OR Mixing Box (MXB1) with horizontal discharge; OR Cooling Coil Cabinet <u>without</u> Reheat (AU5 or AU6) with horizontal discharge	CJ8R	130/180	105-1/4	29-13/16	101-1/2	26-1/16	2,673	757	2,578	662	160	72
		260	105-1/4	46-1/16	101-1/2	42-5/16	2,673	1,170	2,578	1,075	180	82
		350	105-1/4	54-1/16	101-1/2	50-5/16	2,673	1,373	2,578	1,278	190	86
Model RHH PLUS 2: Down Discharge (AQ 5 or AQ8) AND Mixing Box OR Cooling Coil Cabinet <u>without</u> Reheat (AU 5 or 6); OR Mixing Box AND Cooling Coil Cabinet <u>without</u> Reheat (AU 5 or 6) with horizontal discharge	CJ8S	130/180	133	29-13/16	129-1/4	26-1/16	3,378	757	3,283	662	200	91
		260	133	46-1/16	129-1/4	42-5/16	3,378	1,170	3,283	1,075	220	100
		350	133	54-1/16	129-1/4	50-5/16	3,378	1,373	3,283	1,278	230	104
Model RHH PLUS 3: Down Discharge Plenum (AQ5 or AQ8) AND Mixing Box (MXB1) AND Cooling Coil Cabinet <u>without</u> Reheat (AU5 or AU6)	CJ8T	130/180	160-3/4	29-13/16	157	26-1/16	4,083	757	3,988	662	233	106
		260	160-3/4	46-1/16	157	42-5/16	4,083	1,170	3,988	1,075	253	115
		350	160-3/4	54-1/16	157	50-5/16	4,083	1,373	3,988	1,278	263	119
Model RHH PLUS 1: Cooling Coil Cabinet <u>with</u> Reheat (AU7) with horizontal discharge	CJ8U	130/180	130-1/4	29-13/16	126-1/2	26-1/16	3,308	757	3,213	662	196	89
		260	130-1/4	46-1/16	126-1/2	42-5/16	3,308	1,170	3,213	1,075	216	98
		350	130-1/4	54-1/16	126-1/2	50-5/16	3,308	1,373	3,213	1,278	226	102
Model RHH PLUS 2: Cooling Coil Cabinet <u>with</u> Reheat (AU7) AND Down Discharge Plenum (AQ5 or AQ8) OR Mixing Box (MXB1) with horizontal discharge	CJ8V	130/180	158	29-13/16	154-1/4	26-1/16	4,013	757	3,918	662	230	104
		260	158	46-1/16	154-1/4	42-5/16	4,013	1,170	3,918	1,075	250	113
		350	158	54-1/16	154-1/4	50-5/16	4,013	1,373	3,918	1,278	260	118
Model RHH PLUS 3: Cooling Coil Cabinet <u>with</u> Reheat (AU7) AND Down Discharge Plenum (AQ5 or AQ8) AND Mixing Box (MXB1)	CJ8W	130/180	185-3/4	29-13/16	182	26-1/16	4,718	757	4,623	662	263	119
		260	185-3/4	46-1/16	182	42-5/16	4,718	1,170	4,623	1,075	283	128
		350	185-3/4	54-1/16	182	50-5/16	4,718	1,373	4,623	1,278	293	133

* See Configurations in Paragraph 4.2. **NOTE:** If there is an evaporative cooling module, the base of the unit under the evaporative cooling module extends beyond the end of the roof curb. An evaporative cooling module does not affect the length of the roof curb.

TABLE 9B - Dimensions for Locations of Bottom Duct Connections as shown in FIGURE 8 for Model RHH

Important NOTE: To ensure proper operation of a Model RHH, the opening through the roof must be the same area as the inside dimension of the roof curb. **Inside area of the roof curb under a Model RHH must be open.**

Model RHH	Duct Location Dimensions (inches ±1/8)						Duct Location Dimensions (mm ±3)					
	F		H		K (w/mixing box & downturn)		F		H		K (w/mixing box & downturn)	
	With mixing box and/or down discharge	No cooling coil module	With cooling coil module	No reheat	With reheat	With mixing box and/or down discharge	No cooling coil module	With cooling coil module	No reheat	With reheat		
130/180	22-7/8	1-9/16	107-3/8	135-1/8	160-1/8	581	40	2727	3432	4067		
260	34-3/4	3-3/4	107-3/8	135-1/8	160-1/8	883	96	2727	3432	4067		
350	45-13/16	2-1/4	107-3/8	135-1/8	160-1/8	1164	57	2727	3432	4067		

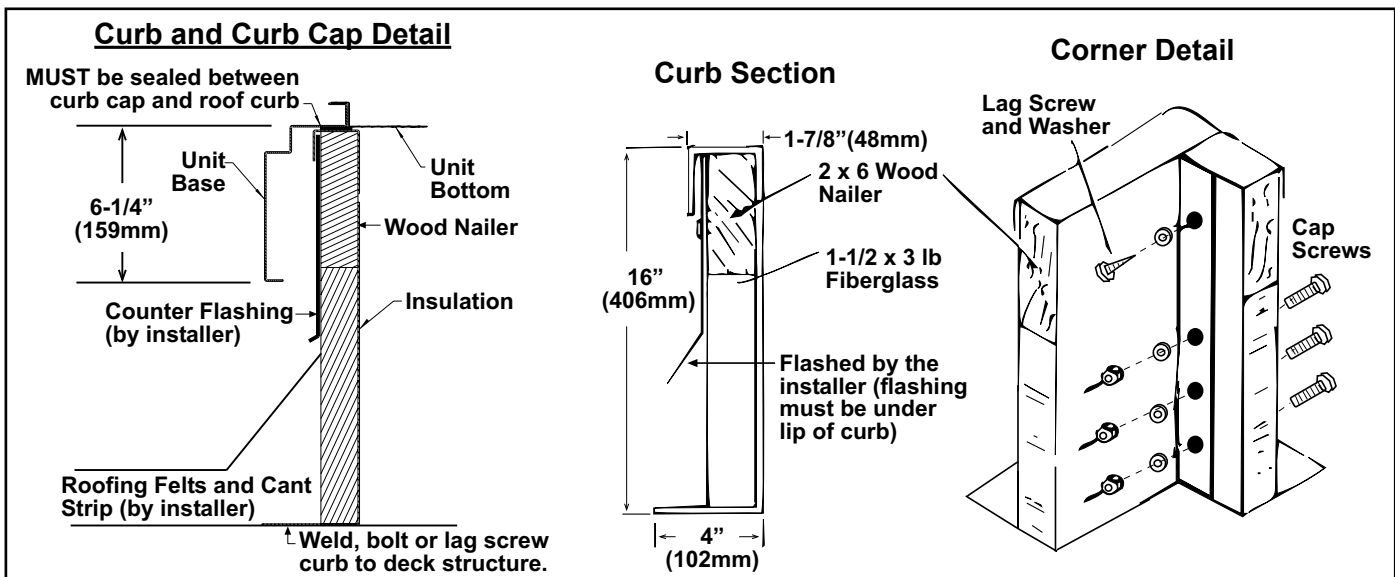
Roof Curb Assembly and Installation

Instructions (see layout in FIGURE 8 and illustrations in FIGURE 9)

Curbs are shipped unassembled. Field assembly and mounting on the roof are the responsibility of the installer. All hardware necessary to assemble the curb is supplied. Additional installation hardware must be field supplied.

IMPORTANT: Before installing roof curb, verify that the size is correct for the system being installed.

FIGURE 9 - Roof Curb Assembly



1. Position curb cross rails and curb side rails as illustrated in **FIGURE 8**, page 12. Using the hardware provided, join the corners as illustrated in the corner detail (**FIGURE 9**).
2. Check the assembly for squareness. Adjust the roof curb so that the diagonal measurements are equal within a tolerance of $\pm 1/8$ " (3mm).
3. Level the roof curb. To ensure proper condensate drainage and a weathertight seal between the system 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.
4. Install field-supplied flashing.
5. Before placing the unit on the curb, apply furnished $1/4$ " \times $1-1/4$ " 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.

5.3 Rigging and Lifting

NOTE: Apply gasketing to the roof curb prior to lifting the unit and setting it on the curb.

Lifting holes in the base are provided for rigging. If the circumstances require a rigging height that is less than 12 feet (3.7M), spreader bars are required. Lift with vertical force only.

Test lift the unit to be sure that it is secure. Lift the unit slowly, following safe lifting procedures. Failure to lift by the manufacturer's instructions could cause damage to the equipment and/or personal injury or death. The equipment manufacturer is not responsible for unsafe rigging or lifting procedures.

DANGER

To prevent injury, death, or equipment damage caused by inadequate or improper rigging, test lift the unit before attempting to place it on a roof. See Hazard Intensity Levels, page 2.

6.0 Mechanical

6.1.1 Gas Supply and Connections

NOTE: Gas conversion kits are available for changing units with 1-stage and 2-stage gas controls (Option AG1, AG2, AG3, AG15, and AG16) from natural gas to propane or propane to natural gas.

Gas conversion kits do not apply to a heater with a 2-speed venter control system (Option AG8, AG9, AG9H, AG40, AG58, AG60, AG61, AG62, DG1, DG5, D12B, and D12C) or with 8:1 modulation (Options AG58 or D12G).

Contact your distributor, representative, or the factory for information.

6.1 Gas Piping and Pressures—Models RDH and RHH

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

Pressure Testing Supply Piping:

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

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

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) Natural Gas and Propane Installation Code. Gas supply piping installation should conform with good practice and with local codes.

These units for use with natural gas are orificed for gas having a heating value of 1000 (± 50) BTU per cubic ft. If the gas at the installation does not meet this specification, consult the factory for proper orifice.

Pipe joint compounds (pipe dope) shall be resistant to the action of liquefied petroleum gas or any other chemical constituents of the gas being supplied.

Install a ground joint union and manual shutoff valve upstream of the unit control system. The $1/8$ " plugged tapping in the shutoff valve provides connection for supply line pressure test gauge. The National Fuel Gas Code requires the installation of a trap with a minimum 3" (76mm) drip leg. Local codes may require a longer drip leg, typically 6" (152mm). See **FIGURE 10**.

WARNING

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

6.0 Mechanical (cont'd)

TABLE 10A - Gas Connection Sizes

RDH	75, 100, 125, 150, 175, 200	225, 250, 300, 350, 400A
RHH	130 & 180	260 & 350
Natural Gas	1/2"	3/4"
Propane	1/2"	3/4"

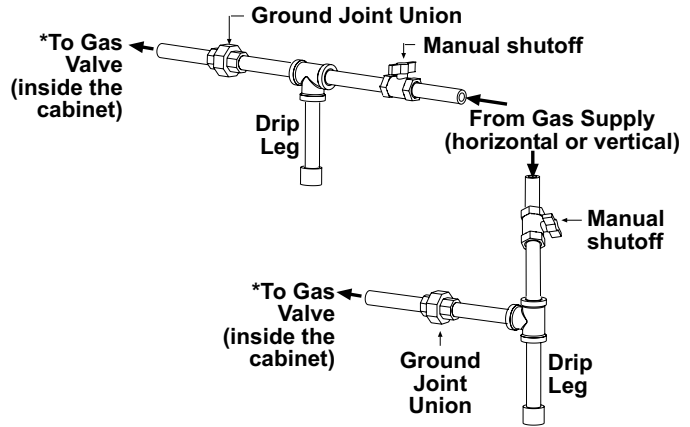
NOTE: These are not supply line sizes.

TABLE 10B - Sizing Gas Supply Lines

6.1 Gas Piping and Pressures—Models RDH and RHH (cont'd)

6.1.1 Gas Supply and Connections (cont'd)

FIGURE 10 - Gas Connection



*See gas connection location on dimension drawing, page 7 or page 9.

Capacity of Piping—Cubic Feet per Hour based on 0.3" w.c. Pressure Drop

Specific Gravity for Natural Gas: 0.6 (Natural Gas: 1000 BTU/Cubic Ft)

Specific Gravity for Propane Gas: 1.6 (Propane Gas: 2550 BTU/Cubic Ft)

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

Note: When sizing supply lines, consider possibilities of future expansion and increased requirements.

Refer to National Fuel Gas Code for additional information on line sizing.

6.1.2 Checking Burner Gas Pressure

NOTE: If unsure of the Gas Control Option Code (AG1, AG2, AG3, AG8, AG9, AG9H, AG15, AG16, AG40, AG58, AG60, AG61, AG62, DG1, DG5, D12B, D12C, or D12G), check the wiring diagram on the heater. All option codes affected by electrical power are listed on the bottom of the wiring diagram after the unit Model and Size.

Inlet Pressure (applies to all gas controls)

Before attempting to measure or adjust valve outlet gas pressure, the inlet (supply) pressure must be within the specified range both when the heater is in operation and on standby. Incorrect inlet (supply) pressure could cause excessive outlet gas pressure immediately or at some future time. If natural gas inlet (supply) pressure is too high, install a regulator in the supply line before it reaches the heater. If natural gas supply pressure is too low, contact your gas supplier.

Inlet pressure to the valve for natural gas must be a minimum of 5" w.c. or as noted on the rating plate and a maximum of 14" w.c. Inlet supply pressure to the valve for propane gas must be a minimum of 11" w.c. and a maximum of 14" w.c.

Manifold Pressure at the Burner Orifice

Measuring manifold gas pressure cannot be done until the heater is in operation. It is included in the "Check After Startup" steps, Paragraph 9.3. The procedure required depends on the type of gas control option:

- Single and Two Stage Options **AG1, AG2, AG3, AG15, AG16, AG60, AG61, AG62, DG1, DG5, D12C**—Follow **INSTRUCTIONS** starting below.
- Electronic Modulation (2:1 turndown) Options **AG8, AG9, AG9H**—Follow instructions on pages 17 and 18.
- Electronic Modulation (4:1 turndown) Options **AG40, D12B**—Follow instructions on pages 17 and 18.
- Electronic Modulation (8:1 turndown) Options **AG58, D12G**—Follow instructions on pages 18 and 19.

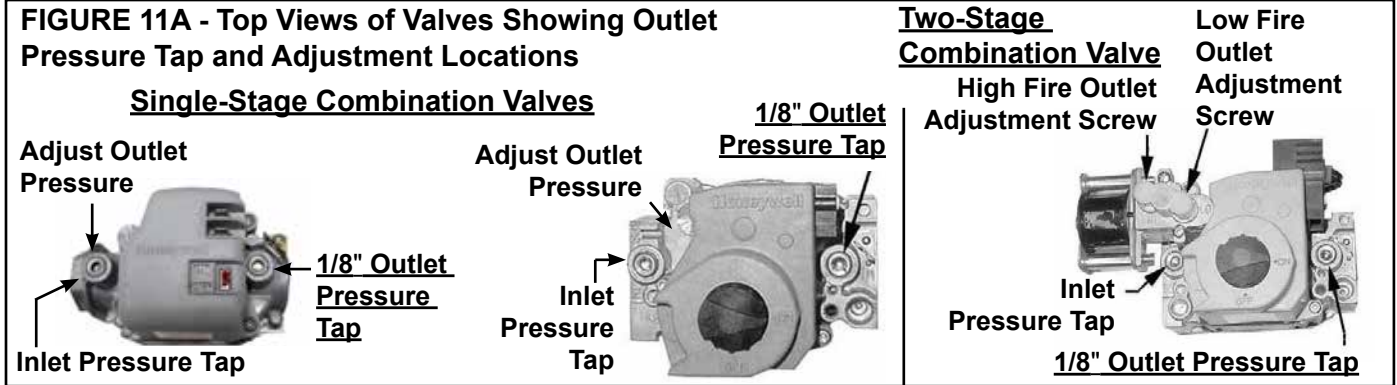
All gas pressure measurements should be done with a manometer (fluid-filled gauge) rather than a spring type gauge due to the difficulty of maintaining calibration. Use a water column manometer readable to the nearest tenth of an inch.

INSTRUCTIONS for single-stage and two-stage gas control options (Options AG1, AG2, AG3, AG15, AG16, AG60, AG61, AG62, DG1, DG5, D12C)

The outlet pressure is regulated by the combination single or two stage gas valve. The combination valve outlet pressure should be as shown in **TABLE 11**, page 20, (for the model size, gas type, gas control option, and altitude of the installation) or as noted on the rating plate.

1) Gas Valve Pressure Tap Locations

Locate the 1/8" outlet pressure tap on the single or two-stage valve (see **FIGURE 11A**). With the manual valve turned off to prevent flow to the gas valve, connect a manometer to the 1/8" outlet pressure tap in the valve. Both high-fire and low-fire outlet pressure can be checked at this pressure tap.



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

2) Measure Outlet Pressure and Adjust (if needed)

Open the manual valve and operate the heater.

Using the manometer connected to the valve, measure the outlet pressure of the single-stage gas valve or high fire on a two-stage valve. To measure low-stage pressure on units with a two-stage valve (Options AG2, AG3, AG15, AG16, AG60, AG61, AG62, DG1, DG5, and D12C), disconnect the wire from the "HI" terminal on the valve. Measure gas pressure with the manometer attached to the valve. Re-connect the wire.

Normally, when operating at the altitude indicated on the rating plate, adjustments to the factory settings should not be necessary. If adjustment is required, remove the cap from the adjustment screw on the single or two-stage valve. Adjust pressure setting by turning the regulator screw IN (clockwise) to increase pressure. Turn regulator screw OUT (counterclockwise) to decrease pressure. If an adjustment is made, turn up the thermostat. Cycle the burner once or twice to properly seat the adjustment spring in the valve. Re-check the pressure. When the outlet pressure is right for the installation, remove the manometer and replace the cap. Check for a leak at the pressure tap fitting.

WARNING

Valve outlet gas pressure must never exceed the value listed in TABLE 11 (or as shown on the rating plate).

INSTRUCTIONS for ELECTRONIC MODULATION Gas Control Options AG8, AG9, AG9H, AG40 and D12B

1) Gas Valve Pressure Tap Locations

The manifold includes a single-stage valve and a modulating valve (**FIGURE 11B**). Locate the outlet pressure tap just behind the orifice adapter (see **FIGURE 11A** above). To check high fire outlet pressure, connect a manometer to the outlet pressure tap just behind the orifice adapter.

To check low-fire (bypass pressure), locate the 1/4" NPT pressure tap just behind the orifice adapter as shown in **FIGURE 11C**. Connect a manometer to the 1/4" pressure tap.

FIGURE 11B - Top View of Modulating Valve in AG8, AG9, AG9H, AG40 and D12B

Modulating Valve in Options AG8, AG9, AG9H, AG40 and D12B—DO NOT adjust.



To ensure an accurate high fire reading at the single-stage valve, a minimum signal of 20VDC must be present at the modulating valve.

6.0 Mechanical (cont'd)

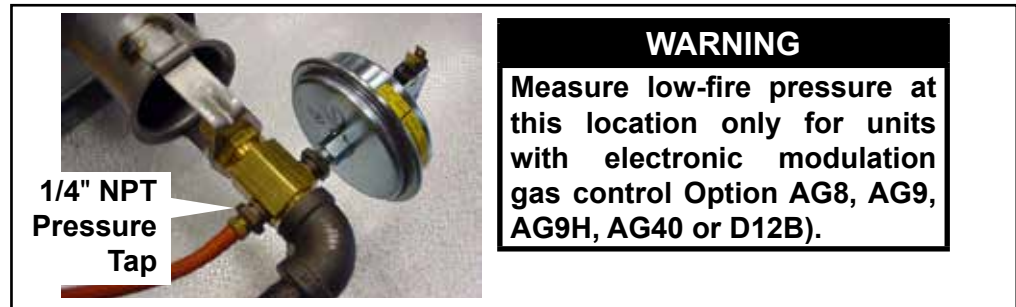
FIGURE 11C - Pressure Tap Location for Measuring Low Fire Outlet (Bypass) Pressure—Electronic Modulation Gas Control Options AG8, AG9, AG9H, AG40 and D12B

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

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

6.1 Gas Piping and Pressures—Models RDH and RHH (cont'd)

6.1.2 Checking Burner Gas Pressure (cont'd)



2) Measure High Fire Pressure and Adjust (if needed)

Open the manual valve and operate the heater.

Using the manometer connected to the single-stage valve, measure the outlet pressure. To ensure an accurate high-fire gas pressure reading at the single-stage valve, a minimum 20VDC signal **MUST** be present at the modulating gas valve.

Normally, when operating at the altitude indicated on the rating plate, adjustments to the factory settings should not be necessary. If adjustment is required, remove the cap from the adjustment screw on the single-stage valve. Adjust pressure setting by turning the regulator screw IN (clockwise) to increase pressure. Turn regulator screw OUT (counterclockwise) to decrease pressure. If an adjustment is made, turn up the thermostat. Cycle the burner once or twice to properly seat the adjustment spring in the valve. Re-check the pressure. When the outlet pressure is right for the installation, remove the manometer and replace the cap. Check for a leak at the pressure tap fitting.

WARNING
Valve outlet gas pressure must never exceed the value listed in TABLE 11 (or as shown on the rating plate).

3) Measure Low Fire (Bypass) Pressure

To measure low-fire (bypass pressure) on electronic modulation gas control Options AG8, AG9, AG9H, AG40 and D12B, disconnect one of the wire leads to the modulating valve. Measure the pressure with the manometer attached to the pressure tap just behind the orifice adapter (**FIGURE 11C**). Re-connect the wire.

DO NOT attempt to adjust the bypass (low-fire) pressure. If bypass pressure is incorrect (see **TABLE 11, page 20**), contact the factory.

INSTRUCTIONS for ELECTRONIC MODULATION Gas Control Options AG58 and D12G)

1) Measure the Manifold Pressure

Turn the manual valve in the gas line off.

Locate the manifold pressure tap; see **FIGURE 12**. Remove the bushing and connect a manometer to the 1/8" pressure tap.

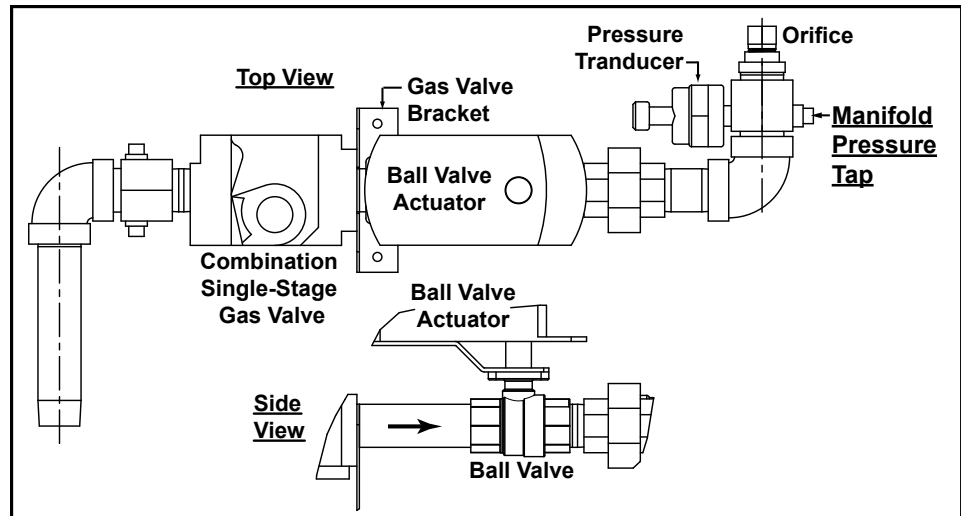
Turn on the manual gas valve. Operate the unit with a call for heat. Verify that the actuator has fully opened the ball valve (highest fire). The ball valve is fully open when the dash marks on the actuator are aligned with the gas piping. With the burner at highest fire, measure the manifold pressure. The manifold pressure should be 3.4" w.c. for natural gas or 10" w.c. for propane.

2) Adjust Pressure at the Single-Stage Valve (if needed)

Turn the manual gas valve off. On the single-stage gas valve (see **FIGURE 11A, page 17**), locate the 1/8" output pressure tap and attach a manometer.

Turn on the manual gas valve. Operate the unit with a call for heat. Check the outlet pressure of the valve with the burner at full fire. Pressure should be 3.5" w.c. for natural gas or 10" w.c. for propane. **If adjustment is necessary**, remove the cap from the adjustment screw. Set pressures to correct setting by turning the regulator screws IN (clockwise) to increase pressure. Turn regulator screws OUT (counterclockwise) to decrease pressure.

FIGURE 12 - Gas Manifold with Gas Control Options AG58 and D12G



After an adjustment is made, cycle the heat section. Re-check the outlet pressure of the valve and the manifold pressure. When pressure is correct for highest fire, remove the manometers and replace the caps. Check for a leak at the pressure tap fittings.

3) Lowest fire manifold pressure is regulated by the ball valve actuator in response to signals from the ignition control board. The ball valve was set at the factory and should not need to be checked at startup. For future reference, instructions for checking lowest fire pressure are in Form O-PREEVA included in the literature bag.

6.1.3 High Altitude Operation (Gas-Fired Model RDH or RHH being installed above 2000 ft (610M))

Adjustments for High Altitude Operation
(does not apply to Models RDH and RHH with Option AG58 or D12G)

NOTE: Altitude adjustment does NOT apply to Model RDH or RHH with Gas Control Option AG58 or D12G—Modulating gas control Options AG58 and D12G DO NOT require a gas pressure adjustment derate for high altitude. The patented control system works on a principle of safe, continuous gas and combustion air monitoring and adjustment. As the mass flow through the combustion system changes, due to the lower oxygen level at high altitude, the control system senses the change, automatically reducing the firing rate of the burner.

If the heater is being installed at an elevation above 2000 ft (610M), check the rating plate to verify that the heater is factory-equipped for the elevation at the installation site. **If the elevation on the rating plate matches the elevation of the installation site, field adjustment for high altitude is not required.**

If the rating plate does not match the elevation of the installation site, high altitude adjustment will need to be done as part of the startup procedure. (High altitude adjustment can only be done while the unit is operating.) During startup, follow the instructions in this section to adjust the valve outlet pressure.

FIGURE 13 - High Altitude (>6000ft/1830M) Pressure Switch Requirement



Above 6000 ft (1830M)	Switch PN	Label Color	Setting
RDH 75, 100	197031	Purple	0.35" w.c.
RDH 125	197032	Pink	0.45" w.c.
RDH 150	197029	Light Blue	0.60" w.c.
RDH 175-400 & RHH all Sizes	201160	Brown	1.05" w.c.

NOTE: If unit is above 6000 ft (1830M) elevation and the following conditions apply, installation of a high altitude pressure switch is required. If a replacement switch is needed, contact your distributor for the switch and follow the instructions below to install the high altitude pressure switch before starting the heater.

- Elevation on the rating plate is not above 6000 ft (1830M)
- Unit has a single or two-stage gas control (Option AG1, AG2, AG3, AG15, AG16, AG60, DG1, DG5, or D12C).

NOTE: If equipped with a two-stage control with a two-speed venter (Options AG8, AG9, AG9H, AG60, AG61, AG62, DG1, DG5, and D12C), there are two pressure switches. Only the high speed pressure switch needs to be changed.

Instructions for changing pressure switch:

1. If the unit is installed, turn off the gas and the power.
2. In the control compartment, locate the pressure switch that needs to be replaced. (**NOTE:** If there are two pressure switches, the high speed

switch to be replaced is toward the top of the unit.)

3. Mark and disconnect the two wires attached to the pressure switch.
4. Mark and disconnect the sensing tube(s) from the pressure switch.
5. Locate the two screws holding the switch mounting bracket. Remove the pressure switch. Save the screws.
6. Using the same screws, install the high altitude pressure switch. Attach sensing tube(s) and wires.
7. If installed, turn on the power and the gas.

6.0 Mechanical (cont'd)

Derate by Valve Outlet Pressure Adjustment if needed for High Altitude Operation

TABLE 11 - Valve Outlet Pressure Settings by Elevation, Gas Control Option, and Type of Gas for Models RDH and RHH

6.1 Gas Piping and Pressures—Models RDH and RHH (cont'd) 6.1.3 High Altitude Operation—Gas-Fired Model RDH or RHH being installed above 2000 ft (610M) (cont'd)

If the elevation on the rating plate does not match the elevation of the installation site, follow these instructions to adjust the valve.

Instructions for High Altitude Derate

1. Refer to **TABLE 11** and determine the required valve outlet pressure(s) for the elevation where the heater will be operating. If unsure of the elevation, contact the local gas supplier. If unsure of the type of gas control, check the option list on the unit wiring diagram.

Outlet Pressure Settings (inches w.c.) by Altitude for Installation in the UNITED STATES													
Altitude		Full Rate Outlet Pressure (Single-Stage & 2-Stage High Fire)—Applies to Options AG1, AG2, AG3, AG15, AG16, AG60, AG61, AG62, DG1, DG5, D12C, D12F		Full Rate Outlet Pressure with Electronic Modulation—Applies to Options AG8, AG9, AG9H, AG40, and D12B (measured at the outlet of the single-stage valve when there is a minimum of a 20VDC signal at the electronic modulating valve) NOTE: Options do not apply to SHH.		2-Stage Low-Fire Outlet Pressure—Applies to Options AG2, AG3, AG15, AG16		2-Stage Low-Fire Outlet Pressure with Venter Motor Controller—Applies to Options AG60, AG61, AG62, DG1, DG5, D12C		Factory-Set Bypass Pressure with Electronic Modulation—Applies to Options AG40 and D12B		Electronic Modulation Low-Fire Manifold Pressure—Applies to Options AG8, AG9, AG9H	
Feet	Meters	Natural Gas	Propane	Natural Gas	Propane	Natural Gas	Propane	Natural Gas	Propane	Natural Gas	Propane	Natural Gas	Propane
		0–2000	0–610	3.5	10.0	3.5	10.0	1.8	5.0	0.40	1.8	0.25	1.8
2001–3000	611–915	3.1	8.8	3.1	8.8	1.6	4.4	0.35	1.5	0.25	1.8	0.8	2.2
3001–4000	916–1220	3.0	8.5	3.0	8.5	1.5	4.2	0.34	1.4	0.25	1.8	0.8	2.1
4001–5000	1221–1525	2.8	8.1	2.8	8.1	1.5	4.1	0.32	1.4	0.25	1.8	0.7	2.0
5001–6000	1526–1830	2.7	7.7	2.7	7.7	1.4	3.9	0.31	1.3	0.25	1.8	0.7	1.9
6001–7000	1831–2135	2.6	7.4	2.6	7.4	1.3	3.7	0.30	1.3	0.25	1.8	0.7	1.8
7001–8000	2136–2440	2.5	7.1	2.5	7.1	1.3	3.5	0.28	1.2	0.25	1.8	0.6	1.8
8001–9000	2441–2745	2.4	6.7	2.4	6.7	1.2	3.4	0.27	1.1	0.25	1.8	0.6	1.7

Outlet Pressure Settings (inches w.c.) by Altitude for Installation in CANADA													
Altitude		Full Rate Outlet Pressure (Single-Stage & 2-Stage High Fire)—Applies to Options AG1, AG2, AG3, AG15, AG16, AG60, AG61, AG62, DG1, DG5, D12C, D12F		Full Rate Outlet Pressure with Electronic Modulation—Applies to Options AG8, AG9, AG9H, AG40, and D12B (measured at the outlet of the single-stage valve when there is a minimum of a 20VDC signal at the electronic modulating valve) NOTE: Options do not apply to SHH.		2-Stage Low-Fire Outlet Pressure—Applies to Options AG2, AG3, AG15, AG16, D12F		2-Stage Low-Fire Outlet Pressure with Venter Motor Controller—Applies to Options AG60, AG61, AG62, DG1, DG5, D12C		Factory-Set Bypass Pressure with Electronic Modulation—Applies to Options AG40, and D12B		Electronic Modulation Low-Fire Manifold Pressure—Applies to Options AG8, AG9, AG9H	
Feet	Meters	Natural Gas	Propane	Natural Gas	Propane	Natural Gas	Propane	Natural Gas	Propane	Natural Gas	Propane	Natural Gas	Propane
		0–2000	0–610	3.5	10.0	3.5	10.0	1.8	5.0	0.4	1.8	0.25	1.8
2001–4500	611–1373	2.8	8.1	2.8	8.1	1.5	4.1	0.3	1.4	0.25	1.8	0.7	2.0

2. Locate the 1/8" outlet pressure tap on the valve (**FIGURE 11A, page 17**). Turn the or switch knob on the top of the valve to "OFF". Connect a manometer to the 1/8" outlet pressure tap in the valve. Use a water column manometer that is readable to the nearest tenth of an inch. When making the adjustment, turn the adjustment screw IN (clockwise) to increase pressure or OUT (counterclockwise) to decrease.
3. **Single-Stage and Two-Stage High Fire Adjustment:** Turn the switch or knob on the top of the valve to "ON". Remove the cap from the pressure adjusting screw and adjust the outlet pressure to the full rate pressure selected from **TABLE 11**.
Two Stage Low Fire: Disconnect the wire from the "HI" terminal on the gas valve and check low fire pressure. To adjust, turn the low pressure regulator screw to achieve the "2-Stage Low Fire" pressure listed for the applicable gas control (**TABLE 11**). Re-connect the wire to the gas valve.
Electronic Modulation Options AG40 and D12B: The electronic modulation valve itself has no high fire adjustment. The only adjustment on the modulation valve is the low-pressure bypass setting which is factory set and does not require field adjustment for high altitude operation. However, if the elevation on the rating plate does not match the elevation of the installation, a full rate adjustment is required at the outlet of the combination valve. To make the full rate adjustment, adjust the outlet pressure of the combination gas valve when the modulating valve is fully open (there must be a minimum of a 20 VDC signal at the electronic modulating valve to ensure that it is fully open). Set the outlet pressure of the combination valve to the pressure shown in **TABLE 11**.
4. Turn up the thermostat. Cycle the burner once or twice to properly seat the adjustment spring in the valve. Re-check the pressure(s). When the outlet pressure(s) is right for the installation, remove the manometer and replace the cap. Check for a leak at the pressure tap fitting.

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

6.0 Mechanical (cont'd)

TABLE 13 - BTUH Inputs and Capacities by Altitude for Model RHH

(Does NOT apply to AG58 or D12G; see NOTE on page 19.)

6.1 Gas Piping and Pressures—Models RDH and RHH (cont'd)

6.1.3 High Altitude Operation—Gas-Fired Model RDH or RHH being installed above 2000 ft (610M) (cont'd)

BTUH Inputs and Capacities by Altitude for Model RHH										
Country	Altitude		RHH Size 130		RHH Size 180		RHH Size 260		RHH Size 350	
	Feet	Meters	Normal Input (BTU/HR)	Thermal Output Capacity (BTU/HR)	Normal Input (BTU/HR)	Thermal Output Capacity (BTU/HR)	Normal Input (BTU/HR)	Thermal Output Capacity (BTU/HR)	Normal Input (BTU/HR)	Thermal Output Capacity (BTU/HR)
United States	0-2000	0-610	131000	120520	175000	159,250	260,000	236,600	345,000	313,950
	2001-3000	611-915	123140	113289	164500	149,695	244,400	222,404	324,300	295,113
	3001-4000	916-1220	120520	110878	161000	146,510	239,200	217,672	317,400	288,834
	4001-5000	1221-1525	117900	108468	157500	143,325	234,000	212,940	310,500	282,555
	5001-6000	1526-1830	115280	106058	154000	140,140	228,800	208,208	303,600	276,276
	6001-7000	1831-2135	112660	103647	150500	136,955	223,600	203,476	296,700	269,997
	7001-8000	2136-2440	110040	101237	147000	133,770	218,400	198,744	289,800	263,718
	8001-9000	2441-2745	107420	98826	143500	130,585	213,200	194,012	282,900	257,439
	9001-10000	2746-3045	104800	96416	140000	127,400	208,000	189,280	276,000	251,160
Canada	0-2000	0-610	131000	120520	175000	159,250	260,000	236,600	345,000	313,950
	2001-4500	611-1373	117900	108468	157500	143,325	234,000	212,940	310,500	282,555

6.1.4 Optional Gas Pressure Safety Switches

If the manifold is equipped with optional high and/or low gas pressure switches, the switches protect against an upstream gas control malfunction that would cause an increase or decrease in the regulated gas pressure.

The low gas pressure switch is an automatic reset switch that is factory set to activate if the gas pressure is 50% of the minimum as stated on the unit rating plate.

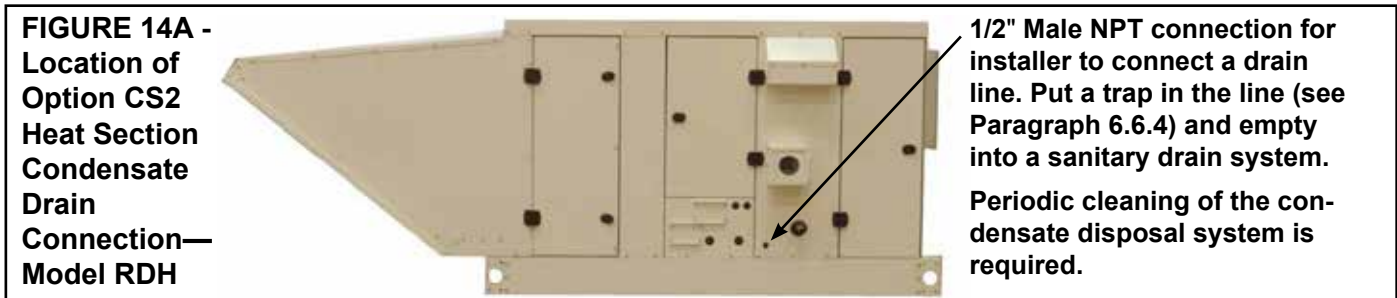
The high gas pressure switch is a manually reset switch that is set to activate if the gas pressure is 125% of the outlet pressure stated on the rating plate.

6.2 Heat Section Condensate Drain(s)—Models RDH and RHH

6.2.1 Heat Section Condensate Drain—Model RDH with Option CS2

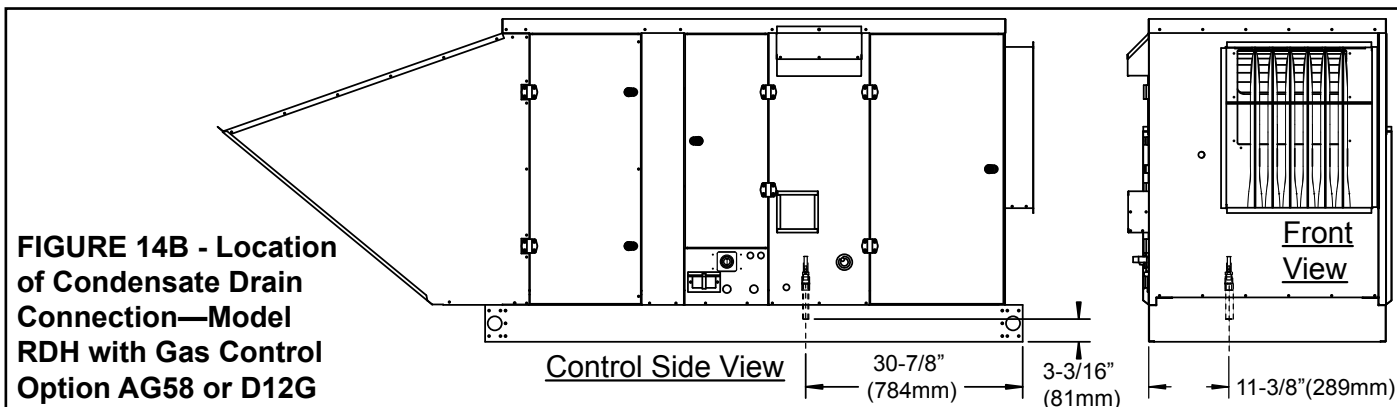
If Option CS2 was selected, the gas heat section is equipped with a condensate drain with a 3/8" PVC connection. See location in **FIGURE 14A**. This burner condensate drain is required when one or both of these situations exists:

- A cooling coil is installed upstream of the heat section.
- The temperature rise for a makeup air unit is equal to or less than 60°F.



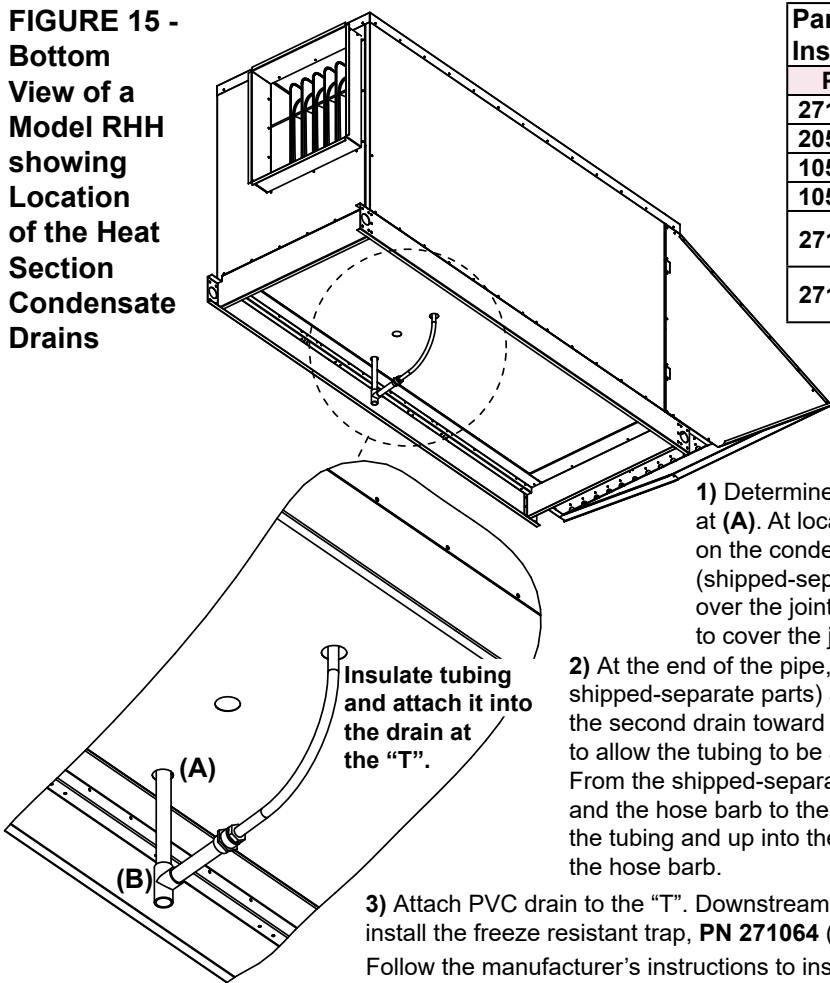
6.2.2 Condensate Drain—Model RDH with Option AG58 or D12G Modulating Gas Control

A Model RDH unit with modulating gas control Option AG58 or D12G requires a condensate drain from the vent area. The 1/2" PVC connection is underneath the unit; see **FIGURE 15**. Since this drain will be used during the heating season, the connection is under the unit and the drain should be run down through the inside of the roof curb and into the heated space. Put a trap in the line (see Paragraph 6.6.4) and empty it into a sanitary drain.



6.2.3 Heat Section Condensate Drains—Model RHH High Efficiency Unit

FIGURE 15 - Bottom View of a Model RHH showing Location of the Heat Section Condensate Drains



Parts Provided (Shipped Separately) for Installing Condensate Drains (Kit PN 273811)

PN	Description
271064	Freeze-Resistant Condensate Drain Trap
205037	1/2" Schedule 40 Tee
105944	1/2" Schedule 40 Female Adapter
105948	1/2 × 1/2" Nylon Hose Barb (male)
271183	36" length of pipe insulation (for insulating the drain hose)
271184	36" length of pipe insulation (for insulating the 1/2" PVC drain pipe)

Instructions for Installing Model RHH Heat Section Condensate Drains

NOTE: All PVC drain pipe is provided by the installer. Depending on the installation, a field-provided or optional heat tape may be needed.

1) Determine the length of field-provided 1/2" PVC pipe needed at (A). At location (A), connect the PVC pipe to the coupler on the condensate drain in the unit. Slide the pipe insulation (shipped-separate parts above) over the 1/2" PVC pipe and up over the joint at (A). Secure the insulation so that it will continue to cover the joint at (A). Cut off any excess.

2) At the end of the pipe, location (B), position the Schedule 40 tee (from shipped-separate parts) as illustrated and attach. Extend the tubing from the second drain toward the tee. Determine the length of PVC pipe needed to allow the tubing to be attached. Attach the length of PVC pipe to the tee. From the shipped-separate items, attach the female adapter to the pipe and the hose barb to the adapter. Slide the smaller piece of insulation over the tubing and up into the unit. Secure the insulation. Attach the tubing to the hose barb.

3) Attach PVC drain to the "T". Downstream from the "T", install the freeze resistant trap, PN 271064 (shown right). Follow the manufacturer's instructions to install and maintain the trap. Continue the line from the trap into a sanitary drain.
NOTE: Check codes to be certain that this is permitted—condensate from the heater has a pH of 6 (actual pH may vary depending on fuel and combustion air constituents).

Freeze Resistant Trap, PN 271064



6.3 Venting (Models RDH and RHH)

6.3.1 Venting—Model RHH

Model RHH has a high efficiency condensing heat section. The heat section vents through a Schedule 40 PVC pipe that extends from the side of the unit as shown in **FIGURE 16**. The vent must be terminated with an installer-provided 45° elbow of Schedule 40 PVC or CPVC vent pipe. **NOTE:** In Canada, all PVC vent pipe must be approved to ULC S636.

Attach the elbow in the orientation illustrated so that the flue products are directed downward.

FIGURE 16 - Terminate Vent with 45-Degree Schedule 40 PVC Elbow as Shown; Flue Products Must be Directed Downward



6.0 Mechanical (cont'd)

6.3 Venting—Models RDH and RHH (cont'd)

6.3.2 Venting Model RDH

A Model RDH vents through the screened “box” on the side of the heat section. If local code requires 4-ft (1.2M) vertical clearance between the flue outlet and the fresh air intake of the heating system or the building, install a vertical vent with an optional vent cap. The option package includes the vent cap only. The vent pipe is field supplied. The vent pipe should be the same size as the vent connection diameter listed below. Remove the cover shown in **FIGURE 17A** and follow the illustrated instructions in **FIGURE 17B**.

FIGURE 17A - Remove the Cover from the Flue Outlet

Remove the screened box cover on the vent outlet. The box is attached on each side with one screw. Remove the four screws and the cover making the vent pipe collar accessible.

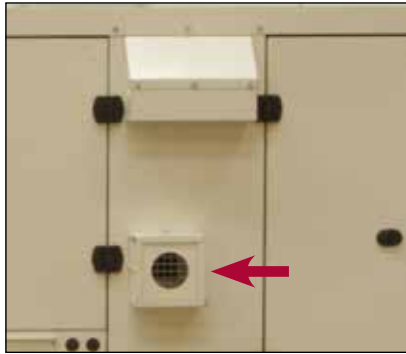
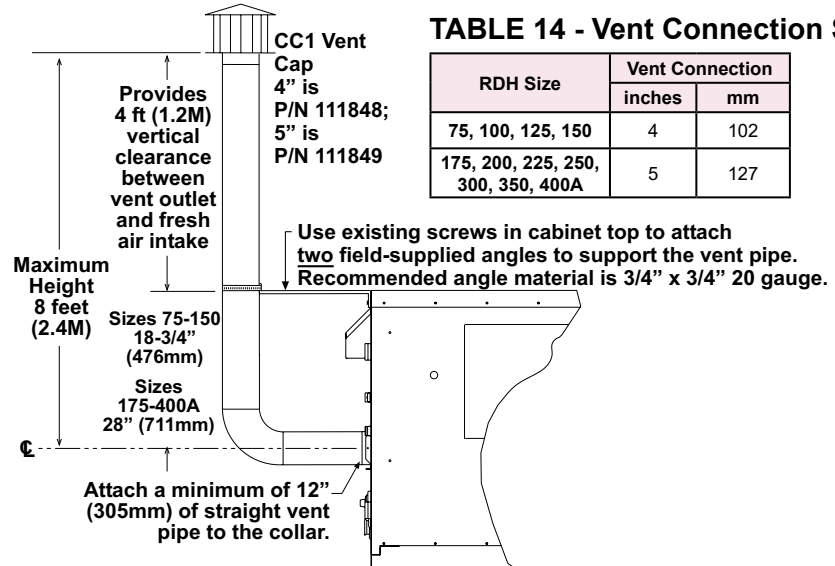


FIGURE 17B - Install a Vertical Vent Pipe and Cap—Maximum Height is 8 ft (2.4M)



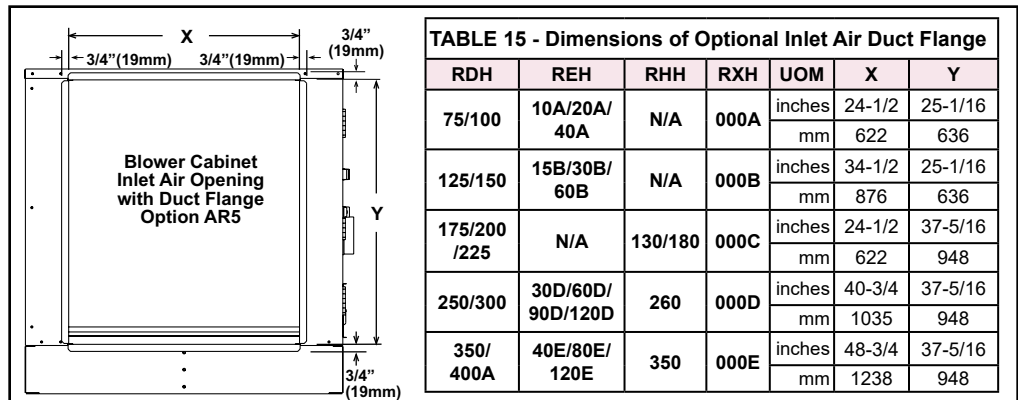
6.4 Unit Inlet Air (Supply Air) - Models RDH, REH, RHH, and RXH

Depending on how the unit was ordered, the blower can have a variety of factory-installed and/or field-installed inlets. The cabinet end can be full open with or without a screen; can have a factory-installed duct flange with or without a two-position damper, or a field-installed hood. The blower inlet can have or not have a filter rack with filters. Or, the blower cabinet inlet end can have an attached combination of modules including a mixing box with either one or two inlets with duct flanges and a variety of controls, a cooling coil module, and/or an evaporative cooling module.

6.4.1 Optional Inlet Duct Flange (factory-installed), Option AR5

Dimensions for attaching duct work are shown in **FIGURE 18A** and **TABLE 15**. The optional duct flange is 1-1/2" (38mm) long with a 3/4" (19mm) wide flange on all sides. The inlet air duct should be attached and sealed. Duct work must have a free area equal to the duct connection.

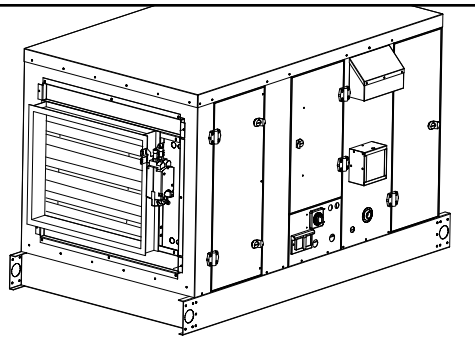
FIGURE 18A - Optional Inlet Air Duct Flange on the Blower Cabinet, Option AR5



6.4.2 Optional Two-Position Damper (factory installed), Option AR8—Models RDH, REH, RHH, RXH (requires Option AS2 Hood)

The illustration in **FIGURE 18B** shows a two-position damper attached directly to the blower cabinet. If ordered with a cooling coil module, the damper will be attached to the inlet air end of the cooling coil module. Weight added is in **TABLE 5**, page 10.

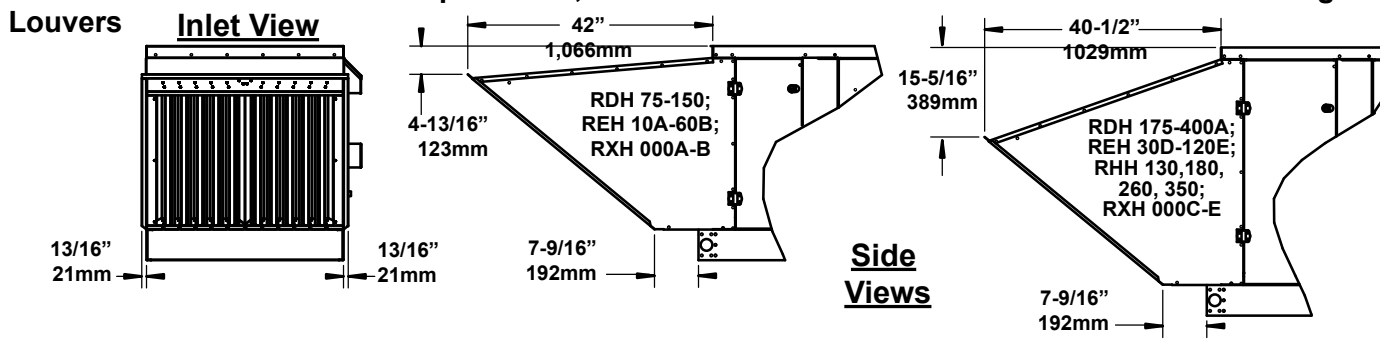
**FIGURE 18B -
Model RDH unit
with Option AR8,
On/Off Damper
(no mixing box)**



**6.4.3 Screened Outside
Air Hood for 100%
Outside Air Opening,
Option AS2**

The outside air hood is a weatherized, screened hood designed to be field assembled and installed around the horizontal inlet air opening of the mixing box, a cooling coil cabinet, or the blower cabinet. The hood includes moisture-eliminating louvers. A parts list and illustrated instructions are included with the option package.

FIGURE 19A - Dimensions of Option AS2, Screened Outside Air Hood with Moisture Eliminating Louvers



Installation Instructions

Follow the illustrated instructions in **FIGURE 19B**. 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 blower is operated. Do not install the hood while the system is in operation. Installation of larger sizes requires at least two persons. All screw ends should be inside the hood.

**FIGURE 19B - Outside
Air Hood Assembly
STEPS**

**STEP 1 - Attach top of outside
air hood. Prepare to attach sides.**

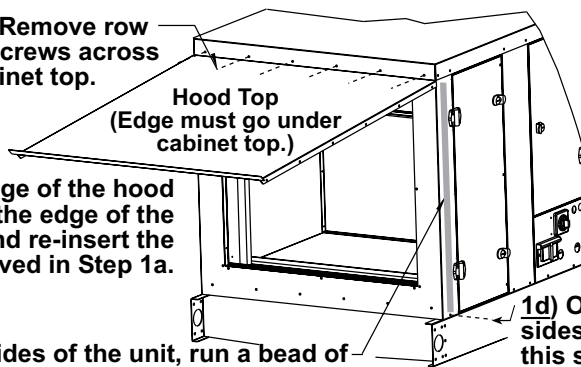
CAUTION: It is recommended that the inlet to the outside air hood NOT be facing into the prevailing wind. Allow 14" minimum clearance from the bottom of the air hood to the mounting surface.

1a) Remove row of screws across cabinet top.

1b) Slide the edge of the hood top under the edge of the cabinet top and re-insert the screws removed in Step 1a.

1c) On BOTH sides of the unit, run a bead of silicone down the cabinet post behind the hinges.

1d) On BOTH sides, remove this screw. (Save the screws.)



**STEP 2 - Attach sides of outside
air hood.**

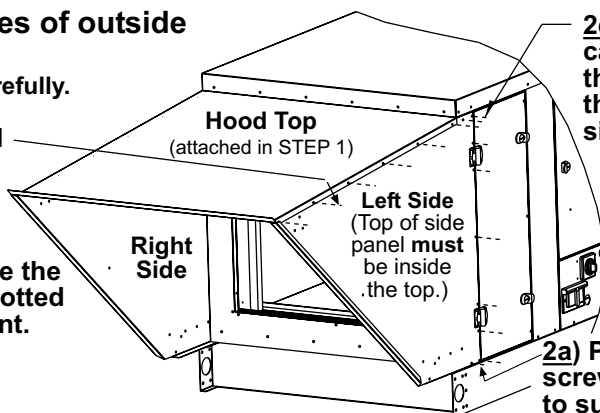
NOTE: Select screws carefully.

2b) Position side panel over the cabinet and inside the hood top. Attach the side of the hood to the top with sheetmetal screws. Use the 1/2" screws with the slotted head and standard point.

2c) Attach the side of the hood to the cabinet with self-tapping screws. Use the 1/2" hex head/no slot screws with the drill point. Use all the holes (each side requires eight screws).

2d) Repeat the procedure to install the other side.

2a) Position the side, and reinsert the screw removed in STEP 1d). Continuing to support the side panel, go to STEP 2b).



6.0 Mechanical (cont'd)

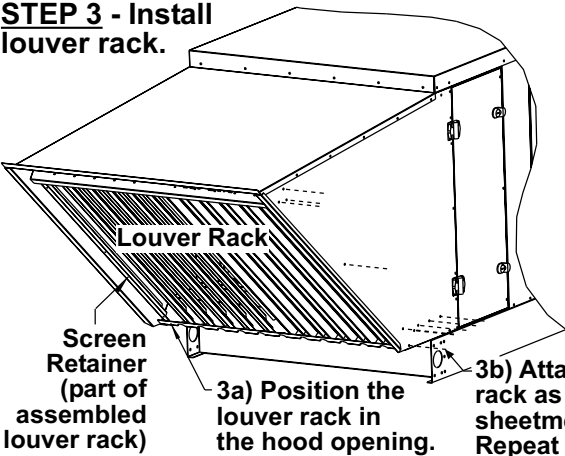
6.4 Unit Inlet Air (cont'd)

6.4.3 Screened Outside Air Hood, Option AS2 (cont'd)

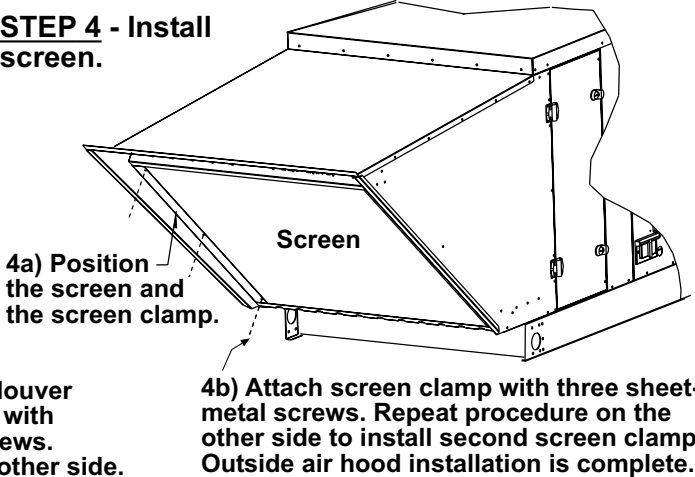
FIGURE 19B - Outside Air Hood Assembly STEPS (cont'd)

INSTALLATION NOTE: If the installation includes damper control Option GE21 or GE22 that requires field installation of a sensor in the outside air inlet, attach the sensor and connect the wires **before STEP 3** below. See Instructions on page 29.

STEP 3 - Install louver rack.



STEP 4 - Install screen.



6.4.4 Optional Filter Rack and Filters

Filter rack and filters are factory-installed optional equipment. Depending on which option was ordered, filters may be 2" disposable, 2" or 4" pleated disposable, or 2" permanent.

TABLE 16 - Filter Quantity and Sizes
(Quantity and width and height dimensions apply to all type and thickness of filters.)

RDH Sizes	75, 100	125, 150	175, 200, 225	250, 300	350, 400A
REH Sizes	10A, 20A, 40A	15B, 30B, 60B	N/A	30D, 60D, 90D, 120D	40E, 80E, 120E
RHH Sizes	N/A	N/A	130, 180	260	350
RXH Sizes	000A	000B	000C	000D	000E
Filters (Qty) W x H (inches)	(2) 16 x 25	(2) 20 x 25	(2) 16 x 16; (2) 16 x 20	(3) 16 x 16; (3) 16 x 20	(1) 16 x 16; (2) 20 x 20; (3) 16 x 20

If the system does not have an optional cooling coil module, the vertical filter rack is located in the entering air side of the blower cabinet. If the system has an optional draw-through cooling coil module, the filter rack is located in the entering air side of the cooling coil module.

TABLE 17 - Inlet Air Filter Pressure Drops

Pressure Drops for Clean Factory-Installed Filters by Type and Size ("w.c.)																		
Size	CFM	Disposable	Permanent Aluminum	Pleated Disposable		Size	CFM	Disposable	Permanent Aluminum	Pleated Disposable		Size	CFM	Disposable	Permanent Aluminum	Pleated Disposable		
		2"	2"	2"	4"			2"	2"	2"	4"			2"	2"	2"	4"	
RDH 75, 100; REH 10A, 20A, 40A; RXH 000A	569	0.0	0.0	0.0	0.0	RDH 175, 200, 225; RHH 130, 180; RXH 000C	1329	0.1	0.0	0.1	0.0	RDH 350, 400A; REH 40E, 80E, 120E; RHH 350; RXH 000E	2657	0.1	0.0	0.1	0.0	
	1000	0.1	0.0	0.1	0.0		1650	0.1	0.0	0.1	0.0		3300	0.1	0.0	0.1	0.0	
		1500	0.1	0.0	0.1		0.1	2000	0.1	0.0	0.1		0.1	3500	0.1	0.0	0.1	0.1
								3000	0.1	0.1	0.2		0.1	4000	0.1	0.0	0.1	0.1
								3500	0.2	0.1	0.2		0.2	4500	0.1	0.1	0.1	0.1
1898	0.1	0.1	0.2	0.1	4000	0.2	0.1	0.3	0.2	5000	0.1		0.1	0.2	0.1			
RDH 125, 150; REH 15B, 30B, 60B; RXH 000B	949	0.0	0.0	0.0	0.0	4271	0.2	0.1	0.3	0.2	5500		0.2	0.1	0.2	0.1		
						1898	0.1	0.0	0.1	0.0	6000		0.2	0.1	0.2	0.1		
	1250	0.1	0.0	0.1	0.0	2050	0.1	0.0	0.1	0.0	6500		0.2	0.1	0.2	0.2		
						2500	0.1	0.0	0.1	0.0	7000		0.2	0.1	0.3	0.2		
	1500	0.1	0.0	0.1	0.0	3000	0.1	0.0	0.1	0.1	7400		0.2	0.1	0.3	0.2		
						3500	0.1	0.0	0.1	0.1	7593		0.3	0.1	0.3	0.2		
	2000	0.1	0.0	0.1	0.1	4000	0.1	0.1	0.1	0.1								
						4500	0.1	0.1	0.2	0.1								
2500	0.1	0.1	0.2	0.1	5000	0.2	0.1	0.2	0.1									
					5500	0.2	0.1	0.2	0.2									
2847	0.2	0.1	0.2	0.1	5694	0.2	0.1	0.3	0.2									

6.4.5 Optional Mixing Box (Factory-Installed)—RDH, REH, RXH

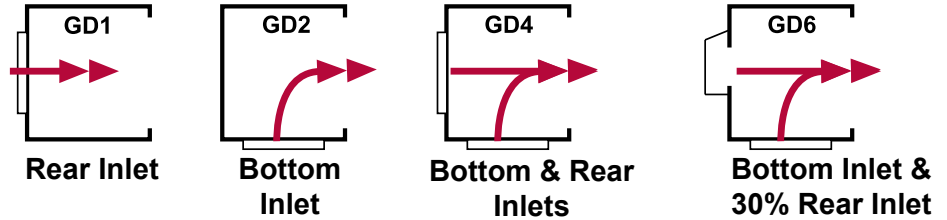
6.4.5.1 Mixing Box Configurations

If installation includes an Option MXB1 mixing box, it is factory installed in one of the configurations illustrated in **FIGURE 20**.

All mixing box inlet air openings have a duct flange (see dimensions in **FIGURE 22**). All inlet air ducts should be attached and sealed. Return air duct must have a free area equal to the return duct connection. See mixing box configurations in **FIGURE 20**.

FIGURE 20 - Option MXB1 Mixing Box Configurations

Side Views—Arrows represent inlet airflow.



Adjust the Damper Linkage (Option GD4)

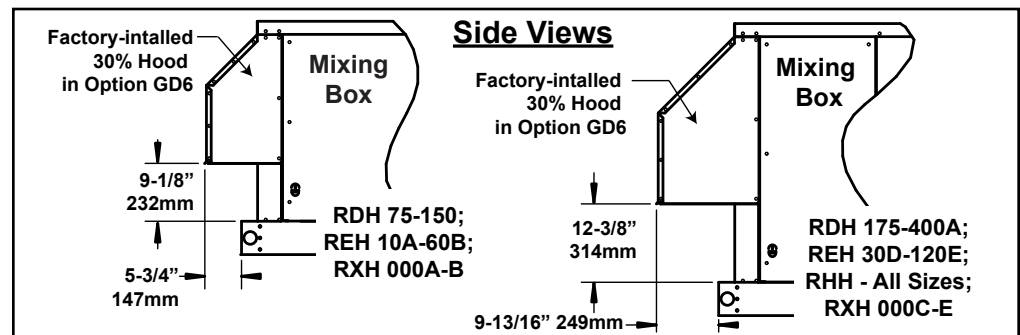
When a mixing box has both an outside air and a return air damper, both dampers are closed for shipping. The linkage for the return air damper must be adjusted prior to use. Follow instructions to adjust damper linkage.

- | | | | |
|---|--|--|--|
| 1) Open the door on the side of the mixing box. | 3) Manually open the return air dampers. While the dampers are | opening, the damper rod and arm will automatically move to its correct position. | 4) Tighten the setscrew. Close the door. |
| 2) Loosen the setscrew on the return air damper | | | |

6.4.5.2 Mixing Box Dimensions

The 30% outside air hood is installed on the mixing box at the factory when air inlet Option GE1 or GE2 is ordered.

FIGURE 21 - Dimensions of 30% Outside Air Hood in Mixing Box Configuration Option GD6



Duct flange connections are the same size for all mixing box configurations: D × 18-3/8" (467mm) opening with 3/4" (19mm) flanges.

Rear inlet side may have a factory-attached evaporative cooling module or a field-installed outside air hood.

FIGURE 22 - Mixing Box Dimensions

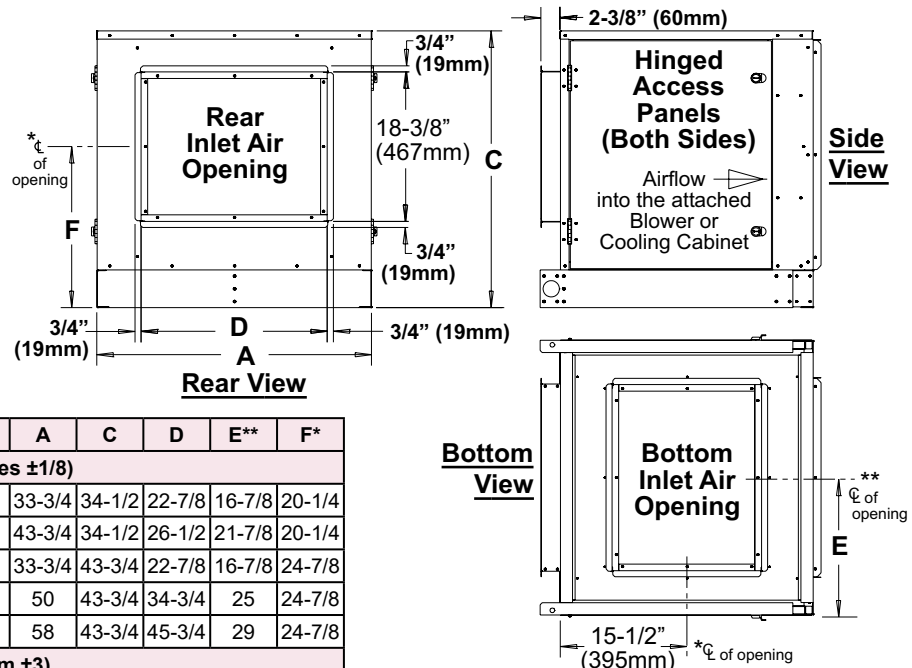


TABLE 18 - Mixing Box Dimensions

RDH	REH	RHH	RXH	A	C	D	E**	F*
Dimensions (inches ±1/8)								
75/100	10A/20A/40A	N/A	000A	33-3/4	34-1/2	22-7/8	16-7/8	20-1/4
125/150	15B/30B/60B	N/A	000B	43-3/4	34-1/2	26-1/2	21-7/8	20-1/4
175/200/225	N/A	130/180	000C	33-3/4	43-3/4	22-7/8	16-7/8	24-7/8
250/300	30D/60D/90D/120D	260	000D	50	43-3/4	34-3/4	25	24-7/8
350/400A	40E/80E/120E	350	000E	58	43-3/4	45-3/4	29	24-7/8
Dimensions (mm ±3)								
75/100	10A/20A/40A	N/A	000A	857	877	581	430	515
125/150	15B/30B/60B	N/A	000B	1111	877	673	557	515
175/200/225	N/A	130/180	000C	857	1112	581	430	633
250/300	30D/60D/90D/120D	260	000D	1270	1112	883	636	633
350/400A	40E/80E/120E	350	000E	1473	1112	1164	738	633

*Centerline of opening is at 1/2 of 18-3/8" = 9-3/16" (1/2 of 467mm = 233.5)

**Centerline of opening is at 1/2 of D.

Dimension E applies to location of opening for all configurations.

6.0 Mechanical (cont'd)

6.4 Unit Inlet Air (cont'd)

TABLE 19 - Air Inlet and Damper Controls by Mixing Box Option

6.4.5.3 Mixing Box Damper and Control Options

Depending on the control option ordered (identified on the wiring diagram), the mixing box may or may not have dampers. Depending on the configuration and controls, dampers may be outside air only or outside and return air with manual or motorized control. Damper motor may be 2-position, 3-position, or modulating and may be controlled by unit operation, unit operation and a damper position dial (potentiometer), discharge temperature, mixed inlet air temperature, building pressure, or a building automation system.

Motorized dampers always close on shutdown.

Mixing Box Configuration (see FIGURE 20)	Air Inlet Control Option (Check wiring diagram.)	Opening and Dampers	Damper Motor Function (damper position)	Dampers Controlled by
Option GD6	GE1	30% Outside and 100% Return Air	30% outside air maximum; 100% return air (no damper)	Manual damper
	GE2		2-position (open/closed) 30% outside air damper; 100% return air (no damper)	System control (switch or field-supplied time clock)
Option GD1 or GD2	GE3	100% Outside Air Opening only with Dampers	2-position (open or closed)	Unit operation.
	GE4		3-position (2 open positions or closed)	Unit operation with damper "stop" set by unit-mounted adjustable damper dial (potentiometer)
Option GD4	NONE	100% Outside Air and Return Air Openings but no factory-installed dampers or controls		
	GE5	100% Outside and 100% Return Air Openings, both with Dampers	None	Damper controlled by manual quadrant
	GE6		2-position (outside air open or return air open)	System control (switch or field-supplied time clock)
	*GE7			Return air temperature provides warm-up or cool-down by delaying opening of outside air damper
	GE8		3-position (2 mixed positions or return air only)	Unit operation with damper "stop" set by unit-mounted adjustable damper dial (potentiometer)
	GE10			Unit operation with damper "stop" set from remote adjustable damper dial (potentiometer); requires installation of shipped-separate potentiometer; follow manufacturer's instructions
	GE11		Modulates outside air and return air dampers to provide mixture of outside and return air in response to control	Discharge air temperature
	GE12			Discharge air temperature with unit-mounted adjustable damper dial (potentiometer) set to always provide minimum amount of outside air
	*GE13			Discharge air temperature plus return air temperature setting to provide warm-up or cool-down by delaying opening of outside air damper
	*GE14			Discharge air temperature plus return air temperature providing warm-up or cool-down by delaying opening of outside air damper and with unit-mounted adjustable damper dial (potentiometer) set to always provide minimum amount of outside air after delay
	GE15			Building pressure; requires installation of shipped-separate pressure null switch; see page 29 and follow manufacturer's instructions
	GE16			DDC control from field-supplied automated building system
	GE21			Applies to PREEVA® systems with optional cooling operation; outside air damper is controlled by enthalpy (heat content in lb of air) using an economizer logic module. On a call for low stage cooling if the enthalpy of outdoor air becomes low, the outdoor air damper opens to reduce the cooling load in the building. As enthalpy of outdoor air increases, the outdoor air damper closes to a preset minimum condition. During economizer operation, the mechanical cooling is operated by stage 2 cooling on the space thermostat. The economizer is automatically locked out during heating and holds the outdoor air damper at the minimum position setting. Enthalpy sensor is shipped separately for field installation in the outside air inlet. See instructions beginning on page 29.
	GE22			Applies to PREEVA® systems with optional cooling. In cooling mode, both outside air and return air dampers are modulated by enthalpy (heat content in lb of air) using an economizer logic module. On a call for low cooling if the outdoor air enthalpy is lower than the return air enthalpy, the outdoor air damper proportions open. If the outdoor air enthalpy is higher than the return air enthalpy, the outdoor air damper closes to minimum position. If outdoor air enthalpy and return air enthalpy are equal, the outdoor air damper proportions open. During economizer operation, the mechanical cooling is operated by stage 2 cooling on the space thermostat. The economizer is automatically locked out during heating and holds the outdoor air damper at the minimum position setting. Enthalpy sensors are shipped separately for field installation in the return air duct and the outside air inlet. See instructions beginning on page 29.

*GE7 provides ASHRAE Cycle I; GE14 provides ASHRAE Cycle II; GE13 provides ASHRAE Cycle III.

**Pressure Null Switch
(Field installed to
control Outside Air
Dampers in Option
GE15)**

The pressure null switch used in Option GE15 is a Dwyer #1640-0 with a range of 0.01–0.20" w.c. It is shipped separately for field installation. Refer to the following paragraphs and the manufacturer’s installation instructions included with the switch.

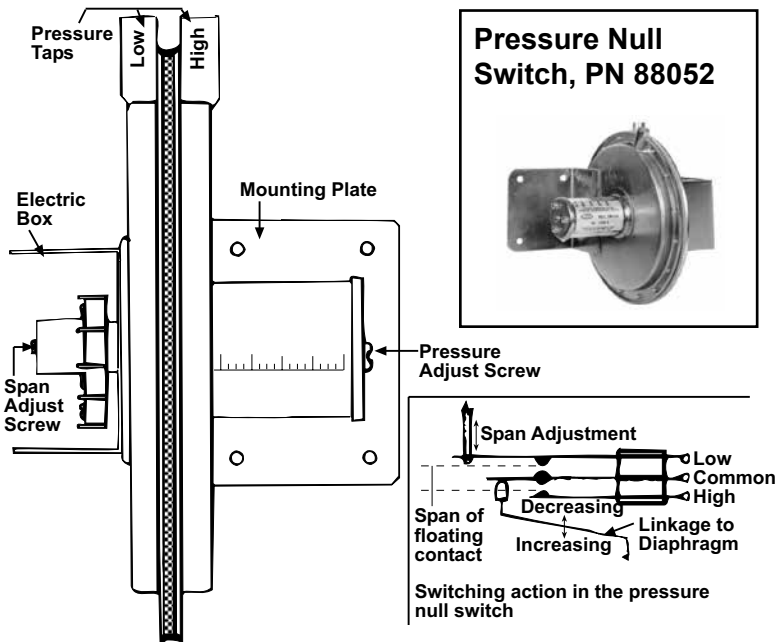
Description and Application: The pressure null switch is a diaphragm operated differential pressure switch used in makeup air applications to control building pressure. It maintains a selected positive or negative pressure setpoint by changing the amount of outside air being introduced to the building 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.

**Pressure Null Switch
Installation Instructions**

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 securely with the diaphragm in a vertical plane to ensure proper operation.
3. Connect the pressure taps on the top of the switch to sources of air pressure differential. Metal tubing with 1/4" OD 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 0.01–0.03" w.c.
5. See the wiring diagram included with the furnace to make electrical connections.

**FIGURE 23 - Pressure Null Switch
(used with Inlet Air Option GE15)**

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.



**Enthalpy Sensor(s) -
Field installed to
control dampers in
economizer Options
GE21 and GE22)**

Option GE21 requires installation of one sensor; Option GE22 requires installation of two sensors. A system with Option GE21 includes one field-installed parts bag. A system with Option GE22 includes two field-installed parts bags. Locate the parts bag(s) shipped inside the unit. Check components against the list below.

**TABLE 20 -
Components in each
Enthalpy Sensor
Parts Bag, PN 220686
(Option GE21 requires
one parts bag; Option
GE22 requires two.)**

Qty	Component Description	PN
1	Enthalpy Sensor, Honeywell #C7400A1004	196290
1	Blue Wire Assy, 18 ga x 72" with terminals	220621
1	Purple Wire Assy, 18 ga x 72" with terminals	220620
2	Screws, #6 x 3/4" long	110650
2	5/8" Strain Relief, Heyco #SR6N-4	100392
4	Stick-on Wire Retainers, Cable Fast-Fastex #8511-29-00	142678
2	Plastic Wire Ties	20913

6.0 Mechanical (cont'd)

Enthalpy Sensor(s) Installation

Instructions:

NOTE: Attach the outside air sensor when installing the outside air hood; see **FIGURE 19B**, pages 25 and 26.

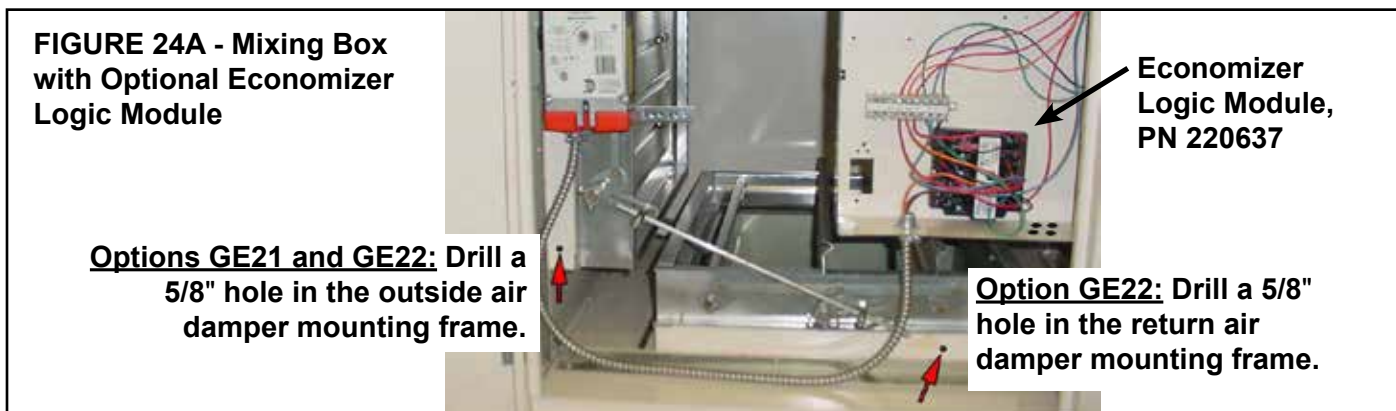
6.4 Unit Inlet Air (cont'd)

6.4.5.3 Mixing Box Damper and Control Options (cont'd)

1. Turn off the power (RDH, REH, RHH, RXH) and the gas (RHH and RDH).
2. Install the **Outside Air Enthalpy Sensor—Option GE21 and Option GE22**

- a) **Attach the Sensor to the Outside Air Hood:** On the same side as the electrical box in the mixing box, position the sensor on the inside of the side of the outside air hood (see **FIGURE 19B**, pages 25 and 26). The sensor may be mounted in any orientation but must be located so that it is exposed to freely circulating air and must be protected from rain, snow, and direct sunlight. Position the sensor in a central location on the side of the hood and attach with the two screws provided.
- b) **Wire the Sensor:** Connect the two wires to the sensor as shown on the wiring diagram. Drill a 5/8" hole in the outside air damper mounting frame as illustrated in **FIGURE 24A**. Insert the strain relief bushing. Bring the wires through the opening and route them to the bottom of the electrical box. Use the stick-on wire holders to prevent the wires from interfering with the damper operation. Insert a strain relief bushing in a hole in the bottom of the electrical box and route the wires through. Make connections at the economizer logic module as shown on the wiring diagram.

Installation of Option GE21 control is complete. Refer to **FIGURES 24B and 24C** to set the enthalpy control (economizer logic module). If installing a return air sensor (Option GE22), continue to Step 3.



3. Install the **Return Air Enthalpy Sensor** in the Return Air Duct (Option GE22)

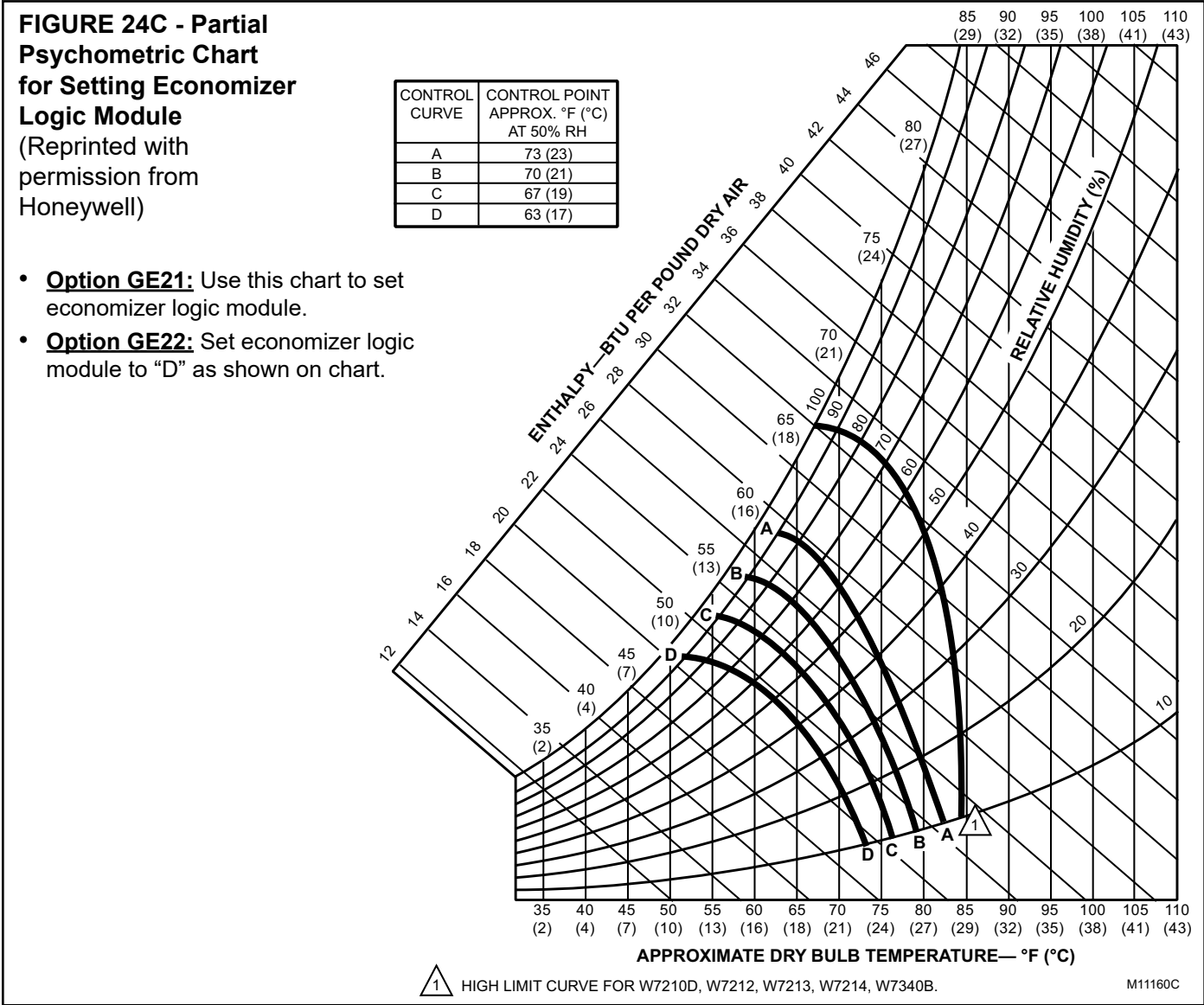
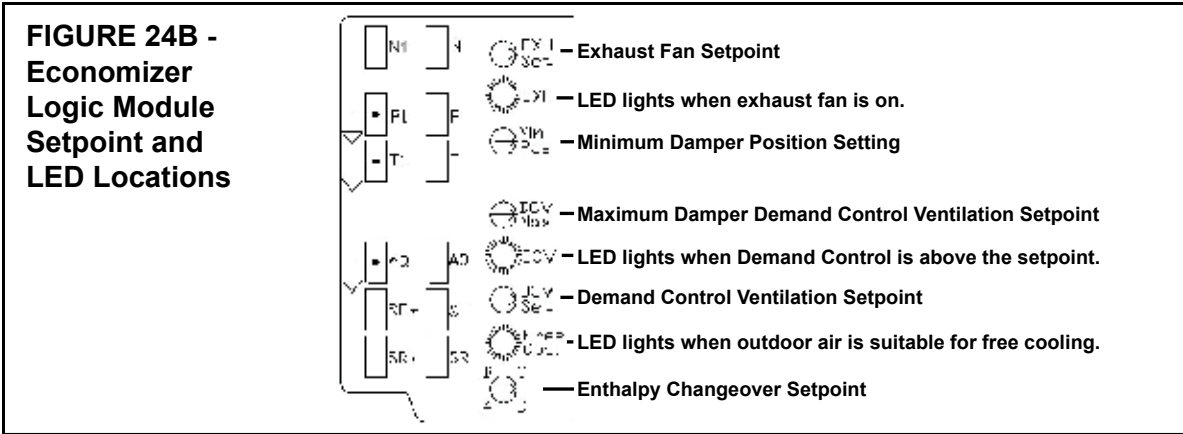
- a) **Attach the Sensor:** On the same side as the electrical box in the mixing box, position the sensor on the inside of the return air duct. The sensor may be mounted in any orientation but must be located so that it is exposed to freely circulating air. Position the sensor in a central location on the side of the duct and attach with the two screws provided.
- b) **Wire the Sensor:** Connect the two wires to the sensor as shown on the wiring diagram. Drill a 5/8" hole in the return air damper mounting frame as illustrated in **FIGURE 24A**. Insert the strain relief bushing. Bring the wires through the opening and route them to the bottom of the electrical box. Use the stick-on wire holders and the wire ties to prevent the wires from interfering with the damper operation. Insert a strain relief bushing in a hole in the bottom of the electrical box and route the wires through. Make connections at the economizer logic module as shown on the wiring diagram.

Installation of Option GE22 control is complete. Refer to **FIGURES 24B and 24C** to set the economizer logic module.

Operating Sequence with Economizer Option

On a call for low stage cooling

1. The blower motor is energized.
2. With the outdoor enthalpy less than the return air enthalpy:
 - a) The stage 1 and 2 cool circuits are locked out.
 - b) Dampers are positioned by the economizer and mixed air sensor.
3. With outdoor air enthalpy higher than the return air enthalpy:
 - a) The stage 1 cool circuit is energized.
 - b) Dampers are positioned for minimum outside air.
 - c) On a call for high stage cooling, the stage 2 and 3 circuits are staged appropriately.



- **Option GE21:** Use this chart to set economizer logic module.
- **Option GE22:** Set economizer logic module to “D” as shown on chart.

6.5 Optional Evaporative Cooling Module (factory-installed)

6.5.1 Supply and Drain Water Connections

The evaporative cooling module is factory-installed as the “entering air” cabinet on the system base. The evaporative cooling module must be connected to a water supply and to a drain.

Depending on how it was ordered, the cooler has either a recirculating float and pump water control system (Option ECD2) or an AquaSaver microprocessor timed water control system (Option ECD1). All coolers are equipped with 12" cellulose or glass fiber media and may have optional 1" or 2" aluminium pre-filters.

6.0 Mechanical (cont'd)

CAUTION: Water reservoir must be drained and pump motor turned off when outside temperature falls below 32°F (0°C). Pump must never be operated without water in the reservoir. See Hazard Levels, page 2.

6.5 Optional Evaporative Cooling Module (factory installed) (cont'd)

Follow these instructions to field connect the water supply and make necessary checks and adjustments before operating the evaporative cooling module.

NOTE: See TABLE 5, page 10 for evaporative cooling module weights.

Water Supply: Connect the water supply to the 1/2" NPT male connection on the control side of the evaporative cooling module. See location in FIGURE 25. Install a manual water shutoff valve upstream of the cooling module inlet at a convenient non-freezing location. If necessary, install a bleed line between the manual valve and the cooling module to allow drainage of the line between the shutoff valve and the cooling module.

Fill and Drain Kits (Field-Installed): If the module has a pump and float water control system and is ordered with a fill and drain kit (Option CT1, CT2, or CT3), refer to the illustration in FIGURE 26, page 33, to install the automatic fill and drain valves. Refer to the system wiring diagram to make wiring connections.

FIGURE 25 - Evaporative Cooling Module Dimensions and Water Connection Locations

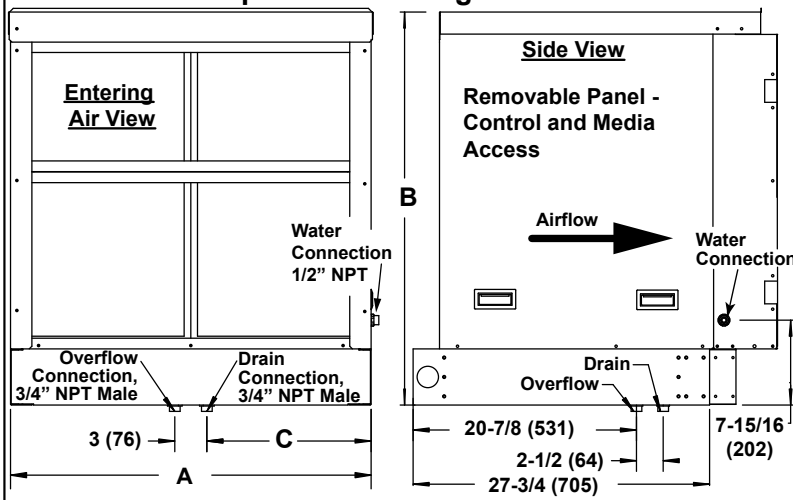


TABLE 21 - Evaporative Cooling Module Dimensions

RDH	REH	RHH	RXH	A	B	C
Dimensions (inches)						
75/100	10A/20A/40A	N/A	000A	33-3/4	34-1/2	15-3/8
125/150	15B/30B/60B	N/A	000B	43-3/4	34-1/2	20-3/8
175/200/225	N/A	130/180	000C	33-3/4	43-3/4	15-3/8
250/300	30D/60D/90D/120D	260	000D	50	43-3/4	23-1/2
350/400A	40E/80E/120E	350	000E	58	43-3/4	27-1/2
Dimensions (mm)						
75/100	10A/20A/40A	N/A	000A	857	876	391
125/150	15B/30B/60B	N/A	000B	1111	876	518
175/200/225	N/A	130/180	000C	857	1111	391
250/300	30D/60D/90D/120D	260	000D	1270	1111	597
350/400A	40E/80E/120E	350	000E	1473	1111	699

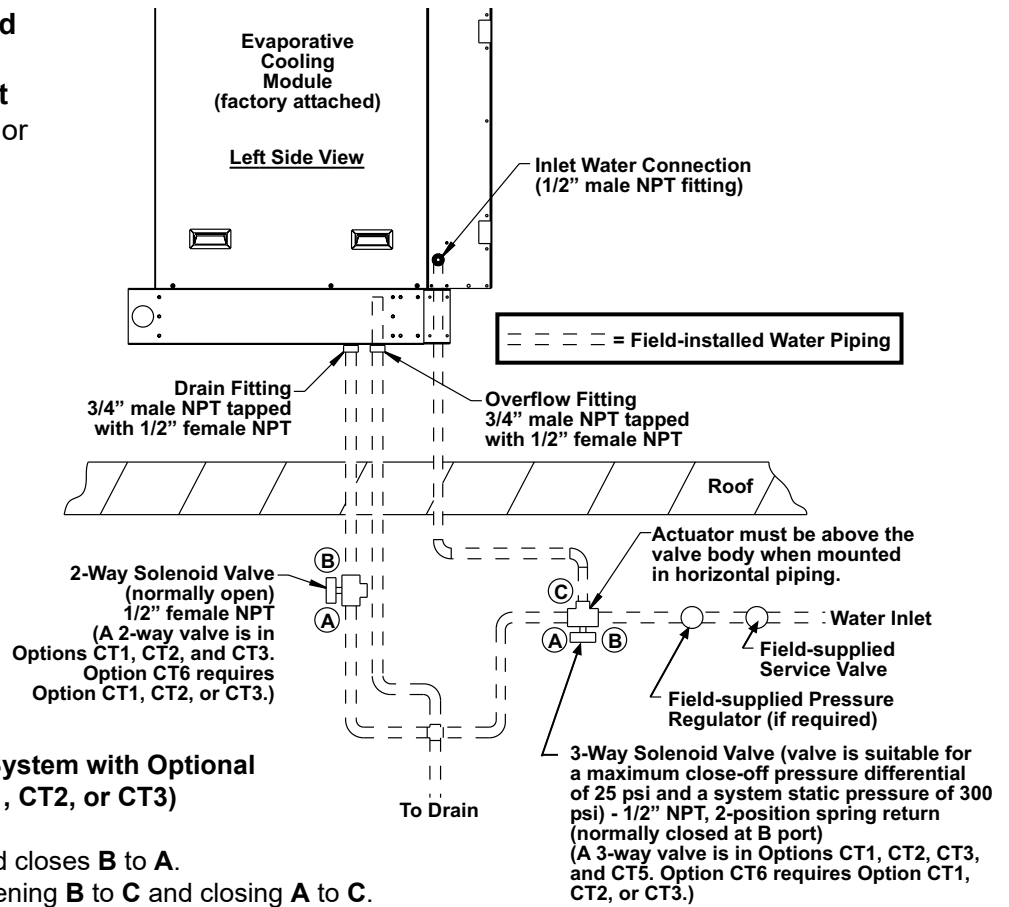
Freeze Protection: If a freeze protection option was ordered, the fill valve will not operate at subfreezing temperature. **NOTE:** On an evaporative cooling module with a recirculating pump and float water control system, freeze protection is only available if an optional fill and drain kit is field installed. See **Operating Sequence Section** in FIGURE 26, page 33.

Overflow and Drain: All evaporative cooling modules are equipped with an overflow and drain fitting. The fittings are in the cabinet bottom and come complete with a lock nut and a sealing gasket. Check these fittings for tightness before installing the overflow and drain piping. The drain and overflow fitting will accommodate 3/4" NPT fittings and are also tapped with a 1/2" female pipe thread for iron pipe.

Bleed Off: If the module has a recirculating pump and float water control system, it has a bleed off hose. The bleed off hose is attached to a tee in the fill line and must drain into the overflow drain. Make sure that the end of the bleed off line extends into the overflow drain. Adequate bleed off is important to maintaining an efficiently operating system by lessening the concentration of undesirable minerals in the water being circulated through the cooling module. Minerals buildup because evaporation only releases "pure water vapor" causing the concentration of contaminants in the water to increase as the evaporation process continues. The minerals accumulate on the media, in the water lines, on the pump, and in the reservoir.

Water Hammer Arrestor: If the cooling module is equipped with an AquaSaver timed metering system, the operation of the solenoid valve in the water line is controlled by the timer. Due to various water pressures and installation conditions, the water supply line may bang abruptly when the solenoid valve closes. This banging can be minimized by installing an optional water hammer arrestor (Option ECB1) in the supply line. When

FIGURE 26 - Field-Installed Optional Fill and Drain Valves for Pump and Float System (Option CT1, CT2, or CT3) and Freeze Protection Kits (Option CT5 for AquaSaver and Option CT6 for Pump and Float System)



Sequence of Operation with Optional Fill and Drain and/or Freeze Protection Kits

Applies to: Float and Pump System with Optional Fill and Drain Kit (Option CT1, CT2, or CT3)

- 1) Call for cooling.
- 2) 2-way valve is energized and closes B to A.
- 3) 3-way valve is energized opening B to C and closing A to C.
- 4) During no call for cooling, valves return to normal state.

Applies to: AquaSaver Timed Water System with Optional Freeze Protection (Option CT5)

- 1) Call for cooling.
- 2) 3-way valve is energized opening B to C and closing A to C.
- 3) If outside air temperature drops below freeze protection controller setting, 3-way valve is de-energized and AquaSaver 24V solenoid valve remains energized for eight minutes to allow complete system water drainage.
- 4) During no call for cooling, 3-way valve returns to normal state.

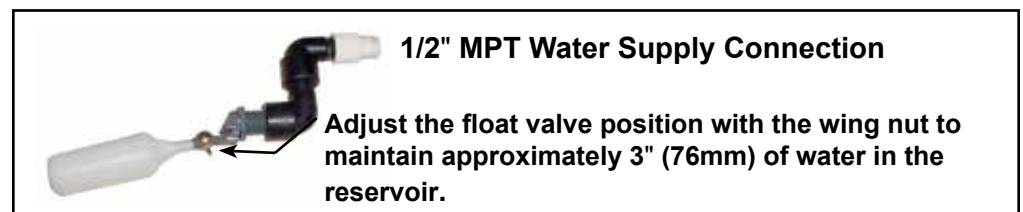
Applies to: Float and Pump System with Optional Fill and Drain Kit (Option CT1, CT2, or CT3) and Freeze Protection (Option CT6)

- 1) Call for cooling.
- 2) 2-way valve is energized and closes B to A.
- 3) 3-way valve is energized opening B to C and closing A to C.
- 4) If outside air temperature drops below freeze protection controller setting, valves return to normal state.
- 5) During no call for cooling, valves return to normal state.

installing an optional water hammer arrestor, select an indoor location (above 32°F), either horizontal or vertical, in line with and as close to the solenoid valve as possible. Follow the manufacturer's instructions to install and maintain the water hammer arrestor.

Recirculating Float and Pump Control System: Turn on the water supply and check for good flow. When the float valve (**FIGURE 27**) shuts off the water supply, measure the water depth. The depth of the water should be approximately 3" (76mm). If necessary, adjust the position of the float valve with the wing nut to obtain the proper water level.

FIGURE 27 - Float Valve, PN 216553



6.0 Mechanical (cont'd)

6.5 Optional Evaporative Cooling Module (factory installed) (cont'd)

WARNING

Adjust ball valve only when the power is disconnected from the system. Failure to do so can cause electrical shock, personal injury, or death.

FIGURE 28 - Remove side door and locate ball valve (illustration below is from the rear). Both water flow control systems have a ball valve in the water line.



6.5.2 Adjusting Water Flow Over Pads

Proper water flow over the evaporative cooling media is critical to extend the life and maintain the efficiency of the pads. Read the warnings and follow the instructions that apply.

CAUTION: Do not flood the media pads with extreme quantities of water for long periods as this will cause premature breakdown of the media. An even flow from top to bottom of the media with the least amount of water is all that is required to assure maximum efficiency and media life span. More water does not provide more evaporation or more cooling.

Adjusting Water Flow with a Float and Pump Control System: Using the ball valve, located in the length of hose running from the pump to the distribution line inlet (see **FIGURE 28**), adjust the valve handle to allow the flow to completely dampen the media pads from top to bottom.

Operate the unit watching the water flow. After 15 minutes with the blower in operation, the water should have completely dampened the pads but should not be flowing off the entering side of the media. If water is flowing off the entering side of the media, turn the system off, disconnect the power, and reduce the entering water flow.

Adjusting Water Flow with a Timed Metering Control System: NOTE: Water flow and pad wetting time should be adjusted at maximum airflow and wet bulb depression to assure complete wetting of the media at the extreme operating conditions.

In addition to adjusting water flow, the timing of the water on/off cycle can be adjusted. Adjustments are correct when **1)** the water rises from the holes in the sprinkler pipe consistently along the entire pipe length, **2)** the media pads wet evenly after a few "ON" cycles (no dry spots or dry streaks), and **3)** a slight amount of excess water collects at the drain at the completion of the "ON" cycle.

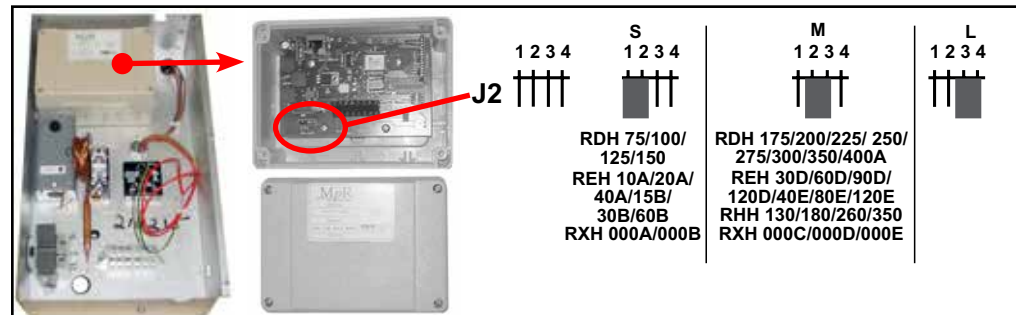
1) AquaSaver Water Flow Adjustment: Using the ball valve illustrated in **FIGURE 28**, adjust the water flow so that the water rises above the distribution pipe as illustrated in **FIGURE 29**.

FIGURE 29 - Timed Water System—Use the ball valve in FIGURE 28 to adjust the rise from the distribution (sprinkler) pipe in the evaporative cooling module.

RDH Size	REH Size	RHH	RXH Size	A = Water rise from PVC Sprinkler Pipe
75/100/ 125/150	10A/20A/40A/ 15B/30B/60B	N/A	000A/ 000B	1/8" to 1/2" (3 to 13 mm)
175/200/ 225/250/ 350/400A	30D/60D/90D/ 120D/40E/80E/ 120E	130/180/ 260/350	000C/ 000D/ 000E	1/4" to 1/2" (6 to 13 mm)

2) AquaSaver Timer Adjustment: At any given temperature, the media pads should completely wet from top to bottom during the ON cycle. The microprocessor has three preset timing settings based on media size. The appropriate setting is selected by changing the position of the suitcase jumper at J2 on the microprocessor. Remove the cover to check the setting (see **FIGURE 30**).

FIGURE 30 - AquaSaver Microprocessor Control, PN 205044, in the Junction Box



If the jumper is at the appropriate location, replace the cover. If the jumper needs to be moved, move it to the appropriate setting. The setting will go into effect when the power

is restored. Check the “ON” timing; the media pads should be wet from top to bottom during the ON cycle.

If the preset timing is not suitable for the application, follow the instructions supplied with the microprocessor to change the calibration of the “ON” and/or “OFF” cycle.

All Evaporative Cooling Modules: Check the reservoir for any water leaks. If any small leaks are present, drain the reservoir. Dry and apply a waterproof silicone sealer around corners and welds.

6.6 Optional Cooling Coil Module (Factory-Installed)

6.6.1 Cooling Coil Module General

The draw-through cooling coil module is factory assembled to the entering air side of the system blower cabinet. Depending on which options were ordered, it will house either a single, dual, or 1/3-2/3 circuit DX cooling coil or a chilled water coil with 1/4, 1/2, 3/4, or full circuiting. A DX coil will accommodate the refrigerant specified on the order, either R410A, R134a, or R407c. Verify that the correct refrigerant was specified. If the coil was ordered for the incorrect refrigerant, contact your distributor or the factory for revised capacity ratings and appropriate distributor nozzle(s). Distributor nozzles may be changed in the field by a qualified technician.

If a cooling module was ordered with an optional reheat section (Option AU7L or AU7R), the reheat circuit is factory charged with R410A refrigerant.

DANGER (Applies to Optional Reheat Circuit)

The reheat circuit contains R410A high pressure refrigerant. Hazards exist that could result in personal injury or death. Installation, maintenance, and service should only be performed by an HVAC technician qualified in R410A refrigerant and using proper tools and equipment. **DO NOT USE** service equipment or tools designed for R22 refrigerant.

IMPORTANT: Do not release refrigerant to the atmosphere! If required service procedures include the adding or removing of refrigerant, the service technician must comply with all federal, state and local laws. The procedures discussed in this manual should only be performed by a qualified HVAC technician.

The split air-conditioning system requires a field-supplied condensing coil. Follow the instructions provided by the condensing coil manufacturer to make the piping connections. If equipped with a multi-circuit coil, before making connections, blow dry nitrogen into the circuit to determine which distributor goes with which suction line (see connection dimensions in **FIGURE 31** for chilled water or **FIGURE 32A or 32B** for DX coil).

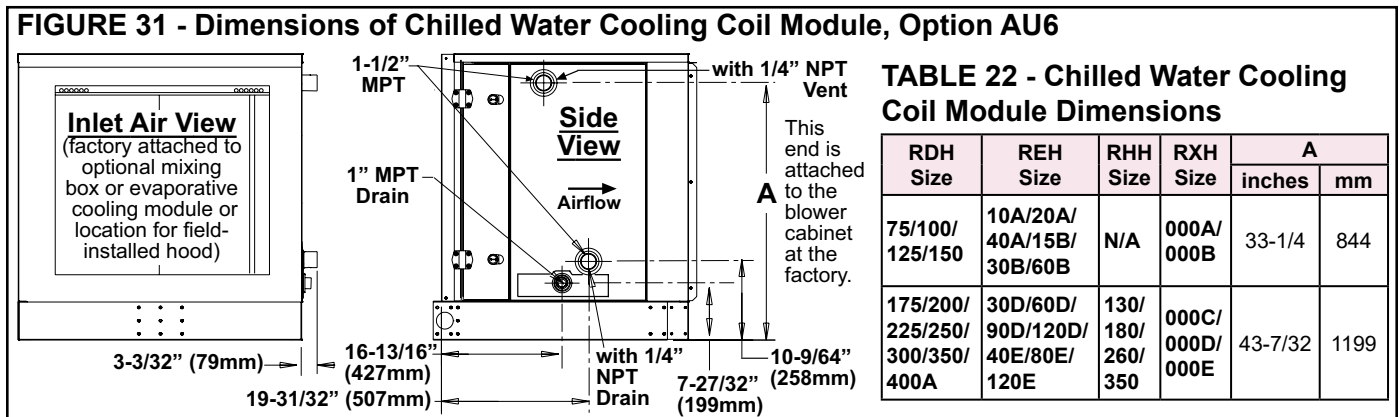
NOTE: If ordered with a Model MASA condensing unit, follow the instructions in Form I-COND (shipped with the condensing unit) for connecting the split system.

The coil module drain trough has an exterior 1" NPT connection. Connect the drain into a sanitary drain system. The condensate trough and drain requires periodic cleaning.

Cooling control depends on which system control was ordered. If digital heating/cooling controls were ordered, see Paragraph 8.3 and the control instruction form for information. If the cooling module was ordered with optional reheat (Option AU7L or AU7R), the reheat circuit is factory charged with R410A refrigerant.

Condensing related controls such as thermal expansion valves and hot gas bypass may have been ordered with the unit (R410-A only) or may be supplied locally.

6.6.2 Cooling Coil Module Dimensions



6.0 Mechanical (cont'd)

6.6 Optional Cooling Coil Module (factory installed) (cont'd)

6.6.2 Cooling Coil Module Dimensions (cont'd)

FIGURE 32A - Dimensions of DX Cooling Coil Cabinet without Reheat, Option AU5

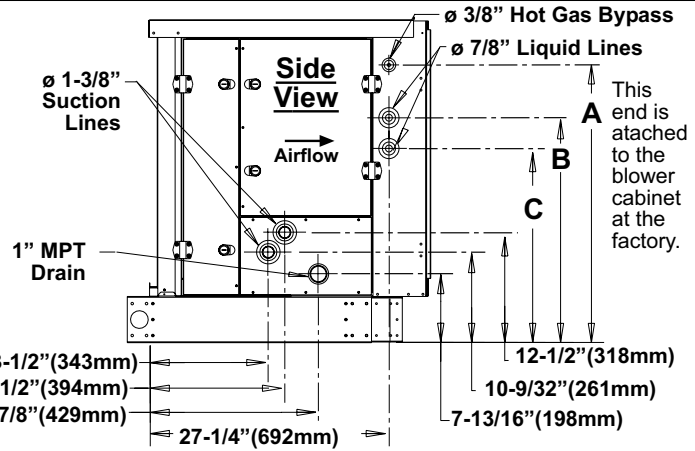
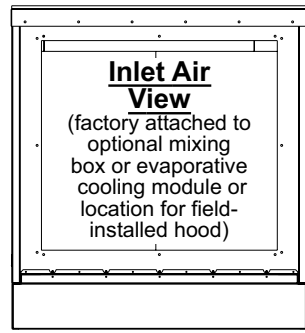


TABLE 23A - Dimensions of DX Cooling Coil Cabinet without Reheat (inches and mm)

Model RDH	Model REH	Model RHH	Model RXH	A			B			C		
				Dimensions (inches)			Dimensions (mm)					
75/100/125/150	10A/20A/40A/15B/30B/60B	—	000A/000B	31-9/16	25-9/16	22-1/16	801	649	560			
175/200/225/250/300/350/400A	30D/60D/90D/120D/40E/80E/120E	All	000C/000D/000E	40-13/16	34-13/16	23-5/16	1037	884	592			

FIGURE 32B - Dimensions of DX Cooling Coil Cabinet with Reheat, Option AU7

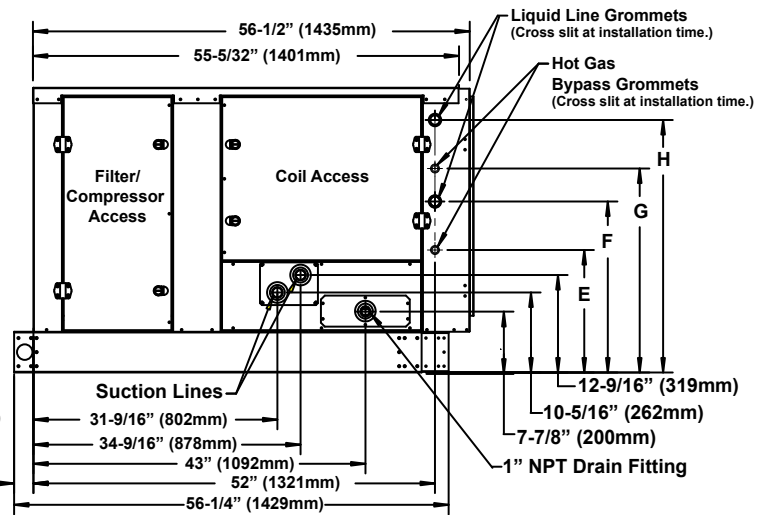
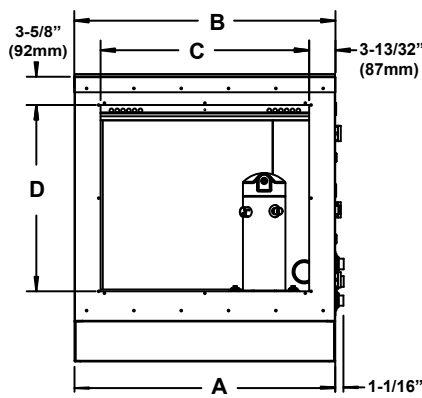


TABLE 23B - Dimensions of DX Cooling Coil Cabinet with Reheat (inches and mm)

Model RDH Size	Model REH Size	Model RHH	Model RXH	A								B								C							
				Dimensions (inches)								Dimensions (mm)															
75/100	10A/20A/40A	N/A	000A	33-3/4	33-13/16	27	24	15-3/4	22	26-1/4	32-1/2	857	859	686	610	400	559	667	826								
125/150	15B/30B/60B	N/A	000B	43-3/4	43-13/16	37	24	15-3/4	22	26-1/4	32-1/2	1111	1113	940	610	400	559	667	826								
175/200/225	N/A	130/180	000C	33-3/4	33-13/16	27	33-1/4	17-3/4	24	30-1/4	36-1/2	857	859	686	845	451	610	768	927								
250/300	30D/60D/90D/120D	260	000D	50	50-5/32	43-1/4	33-1/4	17-3/4	24	30-1/4	36-1/2	1270	1274	1099	845	451	610	768	927								
350/400A	40E/80E/120E	350	000E	58	58-5/32	51-1/4	33-1/4	17-3/4	24	30-1/4	36-1/2	1473	1503	1302	845	451	610	768	927								

6.6.3 Ultra-Violet Light, Option UV2

If the cooling module was ordered with an optional ultra-violet light, the fixture is factory installed but the bulb and other components are shipped in the blower compartment for field installation. Follow the instructions on the option installation form shipped in the parts bag. Option UV2 ultra-violet light requires its own power supply and disconnect switch.

CAUTION: Do not touch bulb glass without gloves. Oil from fingerprints will permanently etch bulb and weaken structure. Clean bulb after handling.

WARNING

Do not use UVC lights for service lighting. Never expose eyes or skin to ultra-violet light from any source.

6.6.4 Cooling Module Condensate Drain

A removable drain pan with a 1" NPT drain connection is located below the coil cabinet (see **FIGURE 31** or **FIGURE 32A** or **B**). When connecting the drain line, provide a means of disconnecting the line at or near the cabinet connection to allow the drain pan to be removed for cleaning.

Ensure the system is level and **install a trap in the drain** (see **FIGURE 33A**). Pitch the drain line at least 1/2" (13mm) for every 10 feet (3M) of horizontal run. Drain lines must not interfere with drain pan or access panels. An obstruction in the drain or a poorly designed drain can cause the condensate pan to overflow which could result in unit or building damage.

Drain Trap

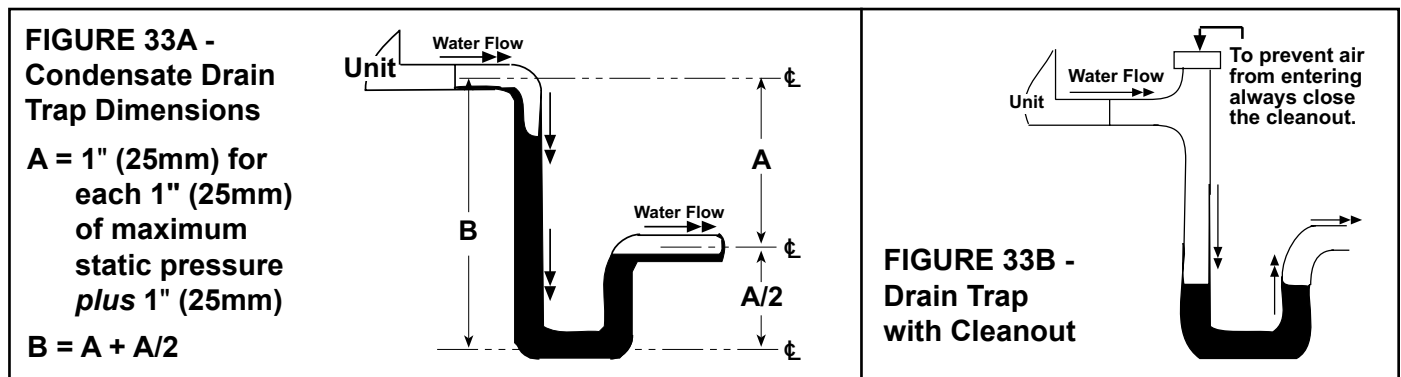
If the installation or local code requires, run drain into a waste water system.

The design of the drain trap is important. Since the condensate drain pan is on the blower inlet side, there is a negative pressure at the drain relative to the ambient. The trap height must account for this static pressure difference. Maximum negative static can be determined by reading the negative pressure at the blower inlet and adding 0.2" w.c. to allow for dirty filters.

If dimension "B" is not tall enough, the water seal will not hold and air will be drawn through the drain pipe into the system. If the outlet leg of the trap is too tall, water will back up into the drain pan. As condensate forms during normal operation, the water level in the trap rises until there is a constant outflow. **FIGURE 33A** illustrates the appropriate dimensions for trapping a negative pressure system.

Improper trap design accounts for some condensate drainage system failures, but incorrect use and maintenance of condensate drain traps can also cause problems. The combination of airborne particles and moisture in the air handler can result in algae formation in the drain pan and traps. The traps must be cleaned regularly to avoid blockage that can slow or stop water flow, resulting in backup into the system.

If the drains have a cleanout opening (**FIGURE 33B**), be sure to close the opening after cleaning.



Condensate Drain Use

Seasonal Usage: At the beginning of the cooling season, inspect and clean the entire cooling coil cabinet including the condensate drain pan. Thoroughly clean dirt, algae, grease, and other contaminants. Inspect condensate drain pans, traps, and piping; fill traps with water to ensure proper operation. During a winter shutdown of the cooling system, it may be desirable to disconnect and remove all water from the trap and drain to prevent freeze damage. If local building codes permit, trap may be filled with an anti-freeze solution. Or piping may be designed with freeze plugs or other freeze protection methods (such as a heat tape).

Year Round Usage: Climates or applications with cooling requirements year round require more frequent inspections of the cooling coil cabinet and condensate drains.

6.7 Optional Energy Recovery Module (Field-Installed)— RDH, REH, RHH, and RXH

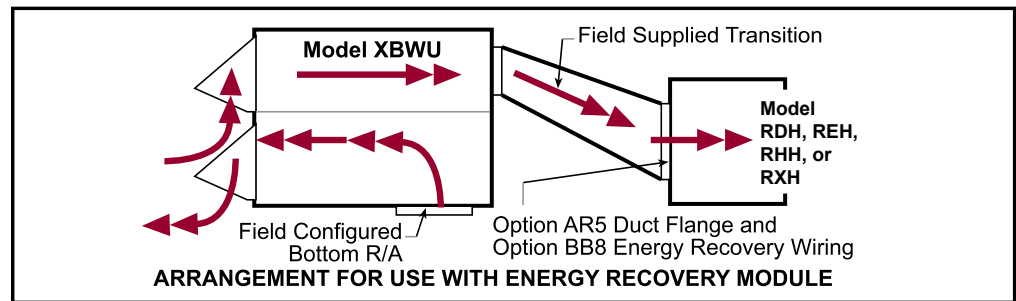
If the system is ordered with a Model XBWU energy recovery module, the module is shipped separately for field installation. The unit should have been ordered with a duct flange (Option AR5) and with the optional wiring needed (Option BB8).

The transition duct is field supplied. The roof curb for the energy recovery module is for the energy recovery module only and is either optional with the module or field supplied. Follow the installation instructions with the energy recovery module and the wiring diagram on the unit.

6.0 Mechanical (cont'd)

FIGURE 34 - Field-Installed Optional Energy Recovery Module, Option XBWU

6.7 Optional Energy Recovery Module (field-installed)—RDH, REH, RHH, and RXH (cont'd)



6.8 Unit Discharge—RDH, REH, RHH, and RXH

Depending on which model and which options were ordered, there is a horizontal opening with no duct flange (RDH, RHH, or RXH), a horizontal opening with a duct flange (RDH, RHH, RXH, or REH), or a downturn plenum with bottom opening with a duct flange with or without dampers (RDH, RHH, RXH, or REH). Model REH units are for ducted systems only and require a factory-installed duct flange or a downturn plenum.

6.8.1 Optional Downturn Plenum (factory-installed)

If ordered with a downturn plenum, the unit has a bottom opening with a duct flange. See the opening dimensions in **FIGURE 4**, page 9. See **FIGURE 8**, page 12, for the opening dimensions in relation to an optional roof curb.

If ordered with a damper, the damper closes the discharge opening when the unit is not operating.

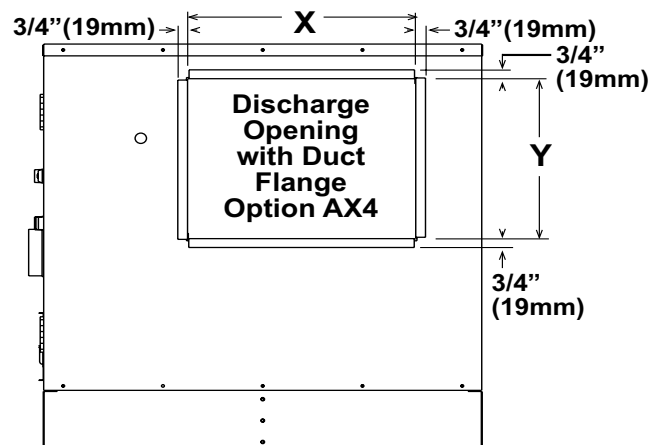
6.8.2 Horizontal Discharge Duct Flange for REH, RDH, and RXH without a hot water heat module

Dimensions for attaching duct work are shown below in **FIGURE 35**. The discharge duct flange extends horizontally 4" (102mm) from the end of the cabinet and has a 3/4" (19mm) wide flange on all sides. Requirements and recommendations are listed in Paragraph 6.8.4 for sizing and attaching duct work.

NOTE: Model REH with horizontal discharge always has a factory-installed duct flange. Duct flange is optional on Models RDH, RHH, and RXH.

FIGURE 35 - Dimensions of Horizontal Discharge Duct Flange on REH, RDH, RHH, & RXH without a hot water heat module (for RXH with a hot water heat module, see Paragraph 6.8.3)

RDH	REH	RHH	RXH (no heat)	UOM	X	Y
75, 100	10A, 20A, 40A	N/A	000A	inches	17-9/16	13-9/16
				mm	446	345
125, 150	15B, 30B, 60B	N/A	000B	inches	27-9/16	13-9/16
				mm	700	345
175, 200, 225	N/A	130, 180	000C	inches	20-3/4	22-13/16
				mm	527	580
250, 300	30D, 60D, 90D, 120D	260	000D	inches	28-5/8	22-13/16
				mm	727	580
350, 400A	40E, 80E, 120E	350	000E	inches	38-5/16	22-13/16
				mm	973	580



6.8.3 Hot Water Heat Module (RXH Only)

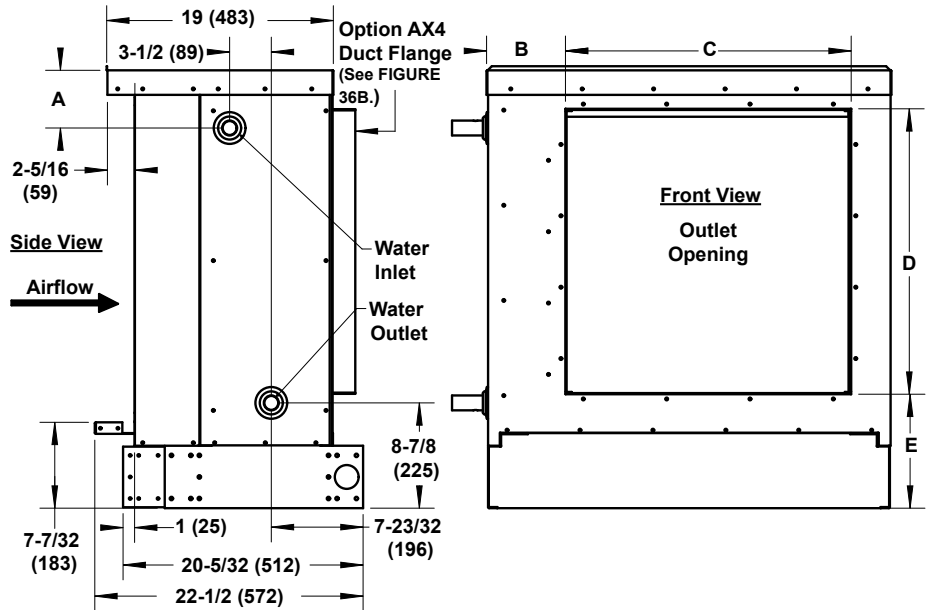
The optional hot water heat module is factory-installed on the unit base at the discharge end of a Model RXH. The module was either ordered with a factory-installed coil or the coil is field-supplied for installation at the job site. Controls are field supplied.

Dimensions: The cabinet height and width are the same as the RXH (see Paragraph 4.2). See **FIGURE 36A** for length and water connection dimensions. For system length, add the length of the module to the RXH length in Paragraph 4.2.

FIGURE 36A - Dimensions of Hot Water Heat Module, Option HW2 (inches (mm))

TABLE 25A - Dimensions

RXH	000A	000B	000C	000D	000E	
A	inches	4-27/32		4-1/8		
	mm	123		105		
B	inches	6-5/8		6-7/8		
	mm	168		175		
C	inches	24	34	24	40	48
	mm	610	864	610	1016	1219
D	inches	24		34		
	mm	610		864		
E	inches	9-9/16	8-27/32	8-3/8		
	mm	243	225	213		



Horizontal Discharge Duct Flange for Model RXH with a hot water heat module (for Model RXH without a hot water heat module, see Paragraph 6.8.2). Optional duct flange is factory-installed. See dimensions for connecting duct work in **FIGURE 36B**. See duct connection requirements in Paragraph 6.8.4.

FIGURE 36B - Option AX4, Discharge Duct Flange on Model RXH with Optional Hot Water Heat Module

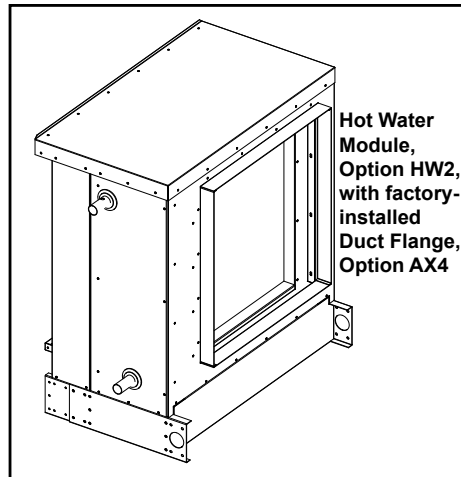


TABLE 25B - Dimensions of Discharge Duct Flange on Model RXH with an Optional Hot Water Heat Module

RXH with Option HW2		H	W
000A	inches	23-3/4	23-15/16
	mm	603	608
000B	inches	23-3/4	33-15/16
	mm	603	862
000C	inches	33-3/4	23-15/16
	mm	857	608
000D	inches	33-3/4	39-15/16
	mm	857	1014
000E	inches	33-3/4	47-15/16
	mm	857	1218

6.8.4 Requirements and Recommendations for Connecting and Installing Duct Work

- **Type of Duct Work:** 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.).
- **Duct Work Material:** Rectangular duct should be constructed of not lighter than No. 26 U.S. gauge galvanized iron or No. 24 B & S gauge aluminum.
- **Duct Work Structure:** All duct sections 24 inches (610mm) or wider, and over 48 inches (1219mm) 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 ducts through masonry walls with not less than 1/2" (1" is recommended) of insulation.
- **Through Unheated Space:** Insulate all exposed warm air ducts passing through an unheated space with at least 1/2" (1" is recommended) of insulation.
- **Duct Supports:** Suspend all ducts securely from adjacent buildings members. Do not support ducts from unit duct connections.
- **Duct Sizing:** Proper sizing of the supply air duct work is necessary to ensure a satisfactory heating installation. The recognized authority for such information is the Air

6.0 Mechanical (cont'd)

6.8 Unit Discharge— RDH, REH, RHH, and RXH

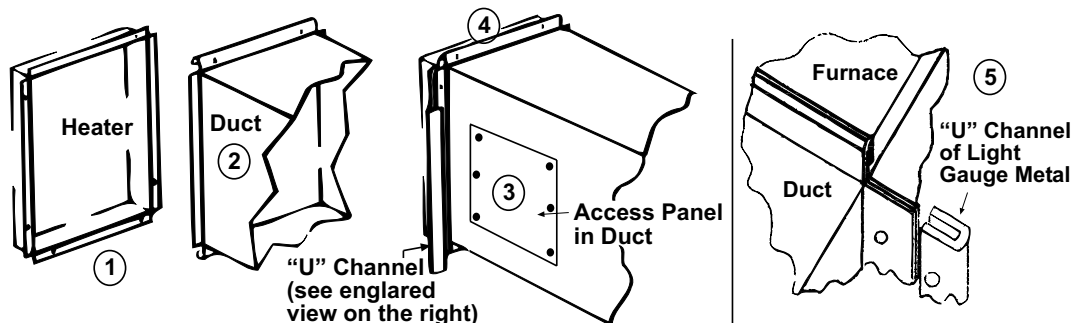
6.8.4 Requirements and Recommendations for Connecting and Installing Duct Work (cont'd)

Conditioning Contractors Association (www.acca.org), 2800 Shirlington Road, Suite 300, Arlington, VA 22206. 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 Panel (See FIGURE 37):** The duct work should have a removable access panel. This opening must be accessible when the furnace is in service and should be large enough to view smoke or reflected light, to detect the presence of leaks in the heating equipment, and to check for hot spots on the heat exchanger due to poor air distribution or lack of sufficient air (cfm). The cover for the opening must be attached in such a manner as to prevent leakage.
- **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.
- **Discharge Air Horizontal Connection (See FIGURE 37):** The seal between the heater 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. Fasten "U" channels with sheetmetal screws.
- **Bottom Duct Connection:** To minimize sound and vibration transmission, use a flexible duct connection. Duct must be attached and sealed to provide air tight connection.

**FIGURE 37 -
Connecting
Discharge
Duct Work**



(1) If the heater has an optional duct flange, the flanges turn out as shown. (2) Shape duct connection as shown with "U" on top and bottom and "L" on sides. (3) Provide for sealed access panel in the duct work. This opening must be accessible when the furnace is in service and should be large enough to view smoke or reflected light, to detect the presence of leaks in the heating equipment, and to check for hot spots on the heat exchanger due to poor air distribution or lack of sufficient air (cfm). The cover for the opening must be attached in such a manner as to prevent leakage. (4) Slide "U" channels over top and bottom flanges on the heater. (5) Form field-supplied "U" channels over side connections to seal. Drill and lock with sheetmetal screws.

CAUTION: Joint where supply air duct attaches to the furnace must be sealed securely to prevent air leakage. Leakage can cause poor combustion, shorten heat exchanger life, and cause poor performance. See Hazard levels, page 2.

6.8.5 Discharge Air Sensor for Makeup Air Application

All gas or electric control options for makeup air (except AG40) include a discharge air sensor that requires field installation in the discharge duct. (Sensor is field-supplied with Option AG40.)

Options AG3, AG15, AG16, AG58, AG60, AG61 and AG62 are analog controls. Options AG3 and AG60 have a unit mounted ductstat with a capillary sensor that will fit in the holder in **FIGURE 38**. Options AG16, AG58, AG60, AG61 and AG62 include sensors that require duct mounting using the holder in **FIGURE 38** and field wiring. Follow the instructions below to attach the holder and the sensor.

Sensors in Options DG5, D12B, D12C, D12D, D12E, and D12G are digital and require duct mounting using the holder in **FIGURE 38** and field wiring. Digital control inputs are low-current, resistance-based signals. For optimum temperature control performance the analog and digital inputs (zone sensors, discharge air sensors, etc.) connected to

FIGURE 38 - Discharge Air Sensor Holder, PN 115850, used in Makeup Air Installations



the main digital controller should be routed to the unit in one of the following manners:

- In separate conduits, isolated from 24 VAC controls and line voltage power to the unit, **OR**
- If the main controller sensor wires are to be run in the same conduit as the 24 VAC control wiring, the sensor wiring must be completed using shielded cable and bundled separately from the 24 VAC control wiring. The shield must be drained at the unit and taped on the opposite end.

See **TABLE 26A** for wire gauge and length requirements of digital control signal wiring.

NOTE: Sensor wire supplied with the FX05 digital controller is 22AWG. There is no sensor wire supplied with the FX06 controller; it must be field-supplied.

Maximum Sensor Wire Length for less than 1°F Signal Error		
Wire Gauge	Maximum Sensor Wire Length (Digital Control)	
AWG	Feet	Meters
14	800	244
16	500	152
18	310	94
20	200	61
22	124	38

TABLE 26A - Digital Control Signal Wire Gauge and Length

TABLE 26B - Sensor Data for Johnson A99 Series Temperature Sensors used in DG and D12 Options (Resistance VS Temperature)

°F	°C	Ohms
-40	-40	613
-31	-35	640
-22	-30	668
-13	-25	697
-4	-20	727
5	-15	758
14	-10	789
23	-5	822
32	-0	855
41	5	889
50	10	924
59	15	960
68	20	997
77	25	1035
86	30	1074
95	35	1113
104	40	1153
113	45	1195
122	50	1237
131	50	1279
140	60	1323
149	65	1368
158	70	1413
167	75	1459
176	80	1506
185	85	1554
194	90	1602
203	95	1652
212	100	1702
221	105	1753
230	110	1804
239	115	1856
248	120	1908

Instructions for Installing Discharge Air Sensor in the Duct Work

1. Installation requires the discharge air sensor holder including the box cover.
2. Determine a location in the duct work to install the sensor. Select a location a sufficient distance from the outlet to provide a good mixture of discharge air temperature. If installing Options AG3 or AG60 with a capillary sensor, determine the location based on the length of the capillary tubing.

If installing wiring to the sensor, select a location a sufficient distance from the outlet to provide a good mixture of discharge air temperature. According to the latest edition of AMCA Standard 201, in straight ducts, the air is typically well mixed a minimum of five equivalent duct diameters from the discharge of the unit with equivalent duct diameter defined as equal to the square root of $4AB/3.14$. "A" and "B" are the duct cross-sectional dimensions.

Example: Supply duct work cross-sectional dimension is 24" x 12" (610mm x 305mm).

$$5 \times \sqrt{\frac{4 \times 12 \times 24}{3.14}} = 96" \qquad 5 \times \sqrt{\frac{4 \times 305 \times 610}{3.14}} = 2435\text{mm}$$

Solution: Locate the sensor a minimum of 96" (2435mm) from the outlet of the unit.

NOTE: If the length of the discharge duct is less than 8 ft (2.4M), a mixing vane is recommended for mixing the discharge air.

Do not mount the sensor in the duct work after a split in the supply as that will cause loss of control in the duct that does not house the sensor.

3. The position of the sensor holder is important. The holder will extend 9-3/16" (233mm) into the duct work.

In horizontal duct work, locate the sensor assembly in the top, middle of the duct with the sensor probe extending vertically down into the center of the airstream.

In vertical duct work, locate the sensor assembly in the middle of the side of the duct that corresponds with the top middle of the discharge outlet.

Turn the holder so that the element will be shielded from direct airflow and will sense the air temperature as it flows through the holes in the holder.

At the selected location in the duct work, mark the diamond-shaped hole required for the sensor holder. Cut the hole no larger than required, approximately 1" x 1" (25mm x 25mm).

4. The procedure for installing the sensor and attaching the holder depends on whether the sensor is a capillary or an electrical sensor. Follow the instructions that apply.

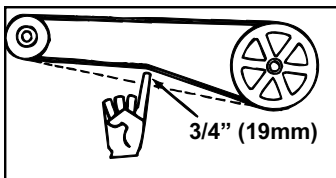
Capillary Sensor (Option AG3 and AG60): Locate the sensor capillary and run it out through the hole in the discharge panel of the heater. Determine where the sensor capillary should enter the box and remove the knockout. Put the capillary

6.0 Mechanical (cont'd)

6.8 Unit Discharge— RDH, REH, RHH, and RXH

6.8.5 Discharge Air Sensor for Makeup Air Application (cont'd)

6.9 Blowers, Belts, and Drives (RDH, REH, RHH, RXH)



**FIGURE 39 - Check Belt
Tension**

6.9.2 Adjusting Blower Speed

through the hole and secure the bulb to the clip in the holder. Slide the holder into the duct work. Using four field-supplied No. 6 sheetmetal screws, attach the box portion of the holder to the duct work. Attach the cover on the box.

Sensor with Wire (Options AG15, AG16, AG58, AG61, AG62, DG5, D12B, D12C, D12D, D12E, and D12G and field-supplied sensor for Option AG40):

Push the element into the clip in the holder. Determine where the sensor wire should enter the box and remove the knockout. Slide the holder into the duct work. Using four field-supplied No. 6 sheetmetal screws, attach the box portion of the holder to the duct work. Attach a field-supplied cable connector to the box, connect the sensor wire, and attach the box cover.

If sensor is digital, follow the wiring instructions above. To test the accuracy of the sensor, measure the ohms. Refer to **TABLE 26B** (left) to determine the corresponding temperature.

6.9.1 Belts and Belt Tension

Check belt tension. Proper belt tension is important to the long life of the belt and motor. A loose belt will cause wear and slippage. Too much tension will cause excessive motor and blower bearing wear. Adjust the belt tension by turning the adjusting screw on the motor base until the belt can be depressed 3/4" (19mm) (see **FIGURE 39**). After correct tension is achieved, re-tighten the locknut on the adjustment screw. Be sure that the belt is aligned in pulleys.

Linked Belts: If the belt needs tightening, the recommended method of tightening the belt length is to count the number of links and remove one link for every 24. (A link is made up of two joining sections of belt. For easier removal of links, turn the belt inside out. But be sure to turn it back before installing. If belt is removed or replaced, be sure to align directional arrows on the belt to the proper drive rotation.) The belt tension should be checked after the first 24 hours of running at full load and at regular maintenance inspections. Be sure that the belt is aligned in the pulleys.

Solid Belts: Adjust the belt tension by turning the adjusting screw on the motor base until the belt can be depressed 3/4" (19mm) (see **FIGURE 39**). After correct tension is achieved, re-tighten the locknut on the adjustment screw. Be sure that the belt is aligned in the pulleys.

The blower speed may be adjusted to achieve the desired outlet temperature, as long as the adjustment is within the temperature rise and the static pressure limits shown on the furnace rating plate. Motors are factory set between maximum and minimum blower speeds.

If the duct resistance is low, the blower may deliver too high an air volume. If the resistance is very low, the blower may deliver excess air volume to overload the motor, causing the overload protector to cycle the motor. Reducing the blower speed will correct these conditions. If duct work is added to an installation, it may be necessary to increase the blower speed. Decreasing blower speed will increase outlet temperature; increasing blower speed will decrease outlet temperature.

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

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

1. Turn off the gas (RDH & RHH) and the electric power (RDH, REH, RHH, RXH).
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**, turn the adjustable half of the pulley inward. **To decrease the blower speed**, 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 39**). Retighten 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 power (RDH, REH, RHH, RXH) and the gas (RDH & RHH). Set the control to call for heat.
8. Check the motor amps with an ammeter. The maximum motor amp rating on the motor nameplate must not be exceeded.

When service is complete, check for proper operation.

6.9.3 Blower 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.

6.9.4 Optional Variable Frequency Drive (VFD)

If ordered with a VFD, it may be either factory or field installed. If field-installed, follow the manufacturer's instructions and refer to the wiring diagram on the unit. Minimum ambient temperature for a VFD is 18°F. Maximum distance from the unit is 50 feet.

When an optional VFD is ordered, the motor operates on two speeds as determined by the electrical frequency. High speed is used for cooling and low speed for heating. 60 hertz is the maximum high speed. Maximum speed for low speed heating is the frequency that will provide the maximum temperature rise of the heater.

Maximum allowable temperature rise for a Model RDH is 70°F with an aluminized heat exchanger or 100°F with a stainless steel heat exchanger. (**NOTE:** If equipped with modulating gas control Option AG40, AG58, D12B, or D12G and a stainless steel heat exchanger, a maximum temperature rise of 120°F is permitted).

Model RHH has a maximum 70° temperature rise with an optional 120°.

Follow the VFD controller manufacturer's instructions that are packaged with the heater (in the owner's envelope) to program the VFD settings. The formula for motor speed is $N=120xf/p$ 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 1:

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.

Example 2:

Run the same motor at 45Hz ($120 \times 45/4 = 1350$). 1350 RPM less 2% slip equals about 1300 RPM.

7.0 Electrical Supply and Wiring

7.2 Supply Wiring

NOTE: If the system has an optional convenience outlet or UVC light, both of those options require a separate 115 volt power supply.

TABLE 27A - Supply Wiring Size—Models RDH, RHH, and RXH

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 utility company requirements that apply.

Check the rating plate on the heater for the supply voltage and the current requirements. A separate line voltage supply with fused disconnect switch should be run directly from the main electrical panel to the unit, making connections in the electrical compartment. Supply wiring enters the cabinet either on the control side below the electrical compartment door or in line directly below through the base. **Seal all electrical entrance openings with field-supplied bushings.**

Before turning on the power, check and tighten all electrical terminals.

Field-Supplied Wiring Size—Models RDH, RHH, and RXH								
Voltage/Phase	115/1		208–230/1		208–230/3		460/3	575/3
Motor HP's	1/4–1/2	1	1–1-1/2	1/4–3	5	1/4–5	1/2–5	
Wire Gauge	14	12	14	14	12	14	14	
BX Cable	3/8"	3/8"	3/8"	3/8"	3/8"	3/8"	3/8"	

TABLE 27B - Supply Wiring Size—Model REH

Field-Supplied THHN, THWN or THWN-2 Wiring and Conduit Minimum Size for Model REH														
Voltage/Phase	208/1				230/1									
kW	10	15	20	30	10	15	20	30						
Ampacity	74	96	119	164	78	104	130	182						
75°C Wire Gauge	#4	#3	#1	#2/0	#4	#2	#1	#3/0						
Conduit Trade Size	1	1	1-1/4	1-1/2	1	1	1-1/4	2						
Voltage/Phase	208/3								230/3					
kW	20	30	40	60	80	90	120	20	30	40	60	80	90	120
Ampacity	66	92	118	142	184	205	267	74	104	134	161	209	233	305
75°C Wire Gauge	#4	#3	#1	#1/0	#3/0	#4/0	300kcmil	#4	#2	#1/0	#2/0	#4/0	250kcmil	350kcmil
Conduit Trade Size	1	1-1/4	1-1/2	1-1/2	2	2	2-1/2	1	1-1/4	1-1/2	2	2	2-1/2	3
Voltage/Phase	460/3								575/3					
kW	20	30	40	60	80	90	120	20	30	40	60	80	90	120
Ampacity	37	52	67	81	105	117	153	31	44	56	67	88	98	128
75°C Wire Gauge	#8	#6	#4	#4	#2	#1	#2/0	#10	#8	#6	#4	#3	#3	#1
Conduit Trade Size	3/4	3/4	1	1	1-1/4	1-1/2	2	1/2	3/4	3/4	1	1-1/4	1-1/4	1-1/2

7.2.1 Supply Voltage

The electric supply to the unit must meet stringent requirements for the system to operate properly. Voltage supply should be within ±10% or as stated on the rating plate. Maximum imbalance on a 3-phase system is 2%. Follow instructions below to check.

7.0 Electrical (cont'd)

7.2 Supply Wiring (cont'd)

CAUTION: If this unit is allowed to operate on an electric supply that is not within the specified tolerances, the product warranty shall be void (see Hazard Levels, page 2).

NOTE: These requirements and procedures would also apply to compressors on the condensing unit.

7.2.2 Supply Wiring Options

WARNING (Models RDH and RHH): If you turn off the power supply, turn off the gas.

7.2.1 Supply Voltage (cont'd)

If the power supply is not within these tolerances, contact the power company prior to operating the system.

Check Voltage Supply: See voltage use range on the rating plate. Measure (and record) each supply leg voltage at all line disconnect switches. Readings must fall within the allowable range.

Check Voltage Imbalance (applies to units with optional reheat compressor): In a 3-phase system, excessive voltage imbalance between phases will cause compressor motor to overheat and eventually fail. Maximum allowable imbalance is 2%. To determine voltage imbalance, use recorded voltage measurements taken above in the following formula.

Key:	V1, V2, V3 = line voltages as measured
	$VA \text{ (average)} = \frac{V1 + V2 + V3}{3}$
	VD = line voltage (V1, V2, or V3) that deviates farthest from average (VA)
Formula:	$\% \text{ Line Voltage Imbalance} = \frac{[100 \times (VA - VD)]}{VA}$

Reheat Compressor Wiring (applies to units with optional reheat compressor): A 3-phase scroll compressor must be phased correctly or compressor will operate in reverse. **Since there is a chance of unknowingly connecting the power in such a way as to cause compressor rotation in reverse, it is important to check this on startup.**

CAUTION: Be sure to connect pressure gauges to the suction and discharge lines before startup so that compressor rotation can be checked immediately. Scroll compressors will be destroyed if operated in the wrong direction (see Hazard Levels, page 2).

Before initial startup, connect refrigerant pressure gauges to the compressor suction and discharge lines. At startup, initiate a call for reheat, and observe the gauges. **If the suction pressure rises and discharge pressure drops, the compressor is operating in reverse and should be shut down.** (After several minutes of operation in reverse, the compressor's internal protector will trip. If a compressor is repeatedly allowed to restart and run in reverse, the compressor will be permanently damaged.) **Turn off the power and switch the 3-phase line voltage wiring connections before restarting the unit.**

Blower Motor Wiring: Check rotation of the blower. If rotation is not correct, three-phase motor may be reversed by interchanging two wires on the 3-phase supply connection.

Disconnect Switch: A disconnect switch is available as optional equipment or may be supplied locally. When installing the disconnect switch, be careful that the conduit and switch housing are clear of all service doors. Allow at least four feet (1.2M) of service room between the disconnect switch and any service panels. When providing or replacing fuses in a fusible disconnect switch, use dual element time delay fuses and size 1.25 times the maximum total input amps.

DANGER

To prevent injury or death due to electrocution or contact with moving parts, lock an open disconnect switch (see Hazard Levels, page 2).

Optional On/Off Switch, Option BA6: The unit may be equipped with a cabinet-mounted non-fusible, lockable, service on/off switch. The switch is conveniently located on the control side of the unit.

Optional Phase Loss or Low/High Voltage Protection, Opt BF15 or BF14: A 3-phase system may be equipped with an optional phase loss protection device. Option BF15 is an auto-reset control that shuts down the unit on phase loss or phase reversal. Option BF14 performs the same function but will also shut down the unit on high or low voltage condition.

7.3 Unit Wiring Requirements and Wiring Diagrams

Each unit has a custom wiring diagram in the control compartment. All optional electrical components ordered with the unit are shown on the wiring diagram. Codes for options ordered are listed across the bottom of the diagram. To identify option codes, see list in **APPENDIX**, page 64.

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.

7.4 Control Wiring

7.4.1 Control Wiring Requirements

The heater is equipped with a low voltage (24V) control circuit. Control wiring connected to a thermostat, a switch, a discharge air temperature 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.

TABLE 28 - 24V Field Control Wiring Length/Gauge	Total Wire Length	Distance from Unit to Control	Minimum Recommended Wire Gauge
	150ft (46M)	75ft (23M)	18
	250ft (76M)	125ft (38M)	16
	350ft (107M)	175ft (53M)	14

IMPORTANT (but does not apply to ignition control board used with modulating controls AG58 and D12G): When using a multimeter to troubleshoot the 24 volt circuit, place the meter's test leads into the 5 or 9 pin connectors located on the ignition control board (**FIGURE 52**, page 58). Do not remove connectors or terminals from the electrical components. Doing so can result in misinterpreted readings due to the ignition control board's fault mode monitoring circuits.

TABLE 29 - Maximum Digital Control Sensor Wire Length for less than 1°F Signal Error		
Wire Gauge	Maximum Sensor Wire Length (Digital Control)	
AWG	Feet	Meters
14	800	244
16	500	152
18	310	94
20	200	61
22	124	38

Digital Control Signal Wiring Recommendations and Requirements

For optimum temperature control performance the manufacturer recommends that the analog and digital inputs (zone sensors, discharge air sensors, etc.) connected to the main controller (used in heating/cooling control DG and D12 Options) be routed to the unit in one of the following manners:

- 1) In separate conduits, isolated from 24 VAC controls and line voltage power to the unit, **OR**
- 2) If the digital sensor wires are to be run in the same conduit as the 24 VAC control wiring, the sensor wiring must be completed using shielded cable and bundled separately from the 24 VAC control wiring. The shield must be drained at the unit and taped on the opposite end.

See **TABLE 29** (left) for digital control sensor wire gauge and length requirements.

7.4.2 Analog or Digital Controls

Type of control varies with option selection (identified on the unit wiring diagram). Control may be analog or digital depending on option selected. Option EG1, EG2, AG1, AG2, AG3, AG15, AG16, AG58, AG60, AG61, and AG62 controls are analog; Option DG1, DG5, D12B, D12C, D12D, D12E, and D12G controls are digital. Option AG40 is designed for digital control from a field-supplied source. Optional controls are identified on the wiring diagram supplied with the heater. **NOTES:** All systems with reheat Option AU7 have an Option D12 digital control.

Digital Control Systems have a Programmable Unit-Mounted Control and a Room Command Module

If using a digital control system, the unit is factory equipped with a programmable controller.

Digital control Options DG1 and DG5 also include a room command module. The type of room command module depends on whether the control system has a discharge or a room temperature controlled setpoint. A room command module with an adjustable room temperature setpoint (45°F–95°F) included with Option DG1 control systems is illustrated in **FIGURE 40A**, page 46. A room command module with a discharge air setpoint included with Option DG5 the control systems is shown in **FIGURE 40B**. The discharge air setpoint can be adjusted $\pm 6^\circ$. Discharge temperature controls may also have an optional room-mounted override sensor.

IMPORTANT: The digital controller inputs are low-current, resistance-based signals. See special wiring recommendations above for digital sensor wiring.

Digital control Options D12B, D12C, D12D, D12E, and D12G do not include a room command module. The space temperature sensor module with adjustable setpoint control and room override illustrated in **FIGURE 40C** is available as an option.

7.0 Electrical (cont'd)

7.4 Control Wiring (cont'd)

7.4.2 Analog or Digital Controls (cont'd)

Digital Control Systems (cont'd)

If ordered with an optional expansion card, a digital control system will provide weekday and weekend scheduling of start/stop operation or interface to a field-supplied Johnson N2 or Lonmark building automation system.

See the control instruction manual for additional information.

FIGURE 40A - Room Command Module, PN 211423, Sensing Space Temperature for Digital Controls, Option DG1



FIGURE 40B - Room Command Module, PN 211424, Sensing Discharge Temperature for Digital Controls, Option DG5



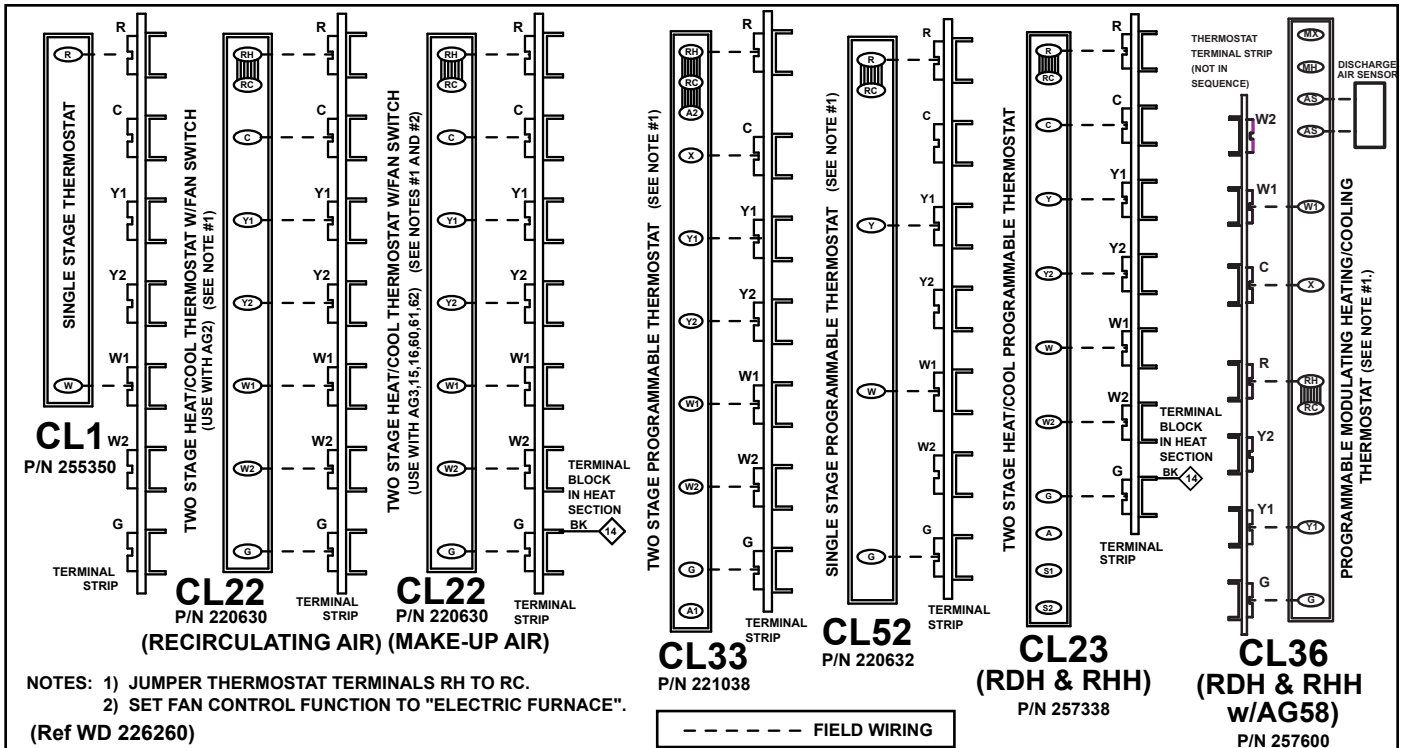
FIGURE 40C - Room Command Module, Option CL67, PN 260599 Sensing Discharge Temperature for Digital Controls, Options D12B, D12C, D12D, D12E, D12G



Analog Control System Requires an Optional or Field-Supplied Thermostat

If using an analog control system, use either an optional or a field-provided low-voltage (24V) thermostat. (A thermostat is not supplied.) Install the thermostat according to the manufacturer's instructions. Depending on the control system option, select either a single-stage or two-stage thermostat.

FIGURE 41 - 24V Single-Stage and Two-Stage Thermostat Wiring



7.5 Electrical Operating Components

7.5.1 High Temperature Limit Control—RDH/RHH

All units are equipped with a temperature activated auto reset capillary-type limit control. The control is factory set and is non-adjustable. If the setpoint is reached, the limit control will interrupt the electric supply to the gas valve. This safety device provides protection in the case of motor failure or lack of airflow due to a restriction at the inlet or outlet.

CAUTION: The auto reset limit control will continue to shut down the heater until the cause is corrected. Never bypass the limit control; hazardous conditions could result (see Hazard Intensity Levels, page 2).

7.5.2 Reverse Airflow Limit Control—RDH/RHH

All units are equipped with a temperature activated auto reset reverse airflow limit control. The control is factory set and is non-adjustable. If the setpoint is reached, the limit control will interrupt the electric supply to the gas valve. This safety device provides protection in the case of motor failure or lack of airflow due to a restriction at the outlet.

7.5.3 Combustion Air Pressure Switch (Air Proving Switch)—RDH/RHH

NOTE: Above 6000 ft (1830 M) elevation, a high altitude pressure switch may be required. See Paragraph 6.1.3.

The combustion air proving switch is a pressure switch that monitors air pressure to ensure that proper combustion airflow is available. The switch is a single pole/normally open device which closes when a negative pressure is sensed in the venter housing. On startup when the heater is cold, the sensing pressure is at the most negative level, and as the heater and flue system warm up, the sensing pressure becomes less negative. After the system has reached equilibrium (about 20 minutes), the sensing pressure levels off.

If a restriction or excessive flue length or turns cause the sensing pressure to be outside the switch setpoint, the pressure switch will function to shut off the main burner. The main burner will remain off until the system has cooled and/or the flue system resistance is reduced.

TABLE 30 lists the switch setpoints for sea level operating conditions.

Models equipped with two-speed venter motor operation have two combustion air proving switches. When the venter is operated at high speed, the “high speed” combustion air proving switch monitors the combustion airflow to ensure adequate airflow for safe and efficient operation. During low speed venter operation, when fuel gas input rate is reduced, a second “low speed” combustion air proving switch monitors the combustion airflow to ensure adequate air flow for safe and efficient operation.

DANGER

Models RDH and RHH proper venting flow. NEVER bypass combustion air proving switch(es) or attempt to operate the unit without the venter running and proper flow in the vent system. Hazardous conditions could result. See Hazard Levels, page 2.

TABLE 30A - Model RDH Pressure Switch Settings

RDH Size	High Speed				Low Speed	
	Applies to ALL gas control options EXCEPT AG58 & D12G		Applies to gas control options AG58 & D12G		Applies only to units with gas controls using 2-speed venter*	
	Switch PN	Setting (" w.c.)	Switch PN	Setting (" w.c.)	Switch PN	Setting (" w.c.)
75	197030	0.40	N/A		205442	0.20
100	197030	0.40	N/A		205444	0.30
125	196388	0.50	N/A		205444	0.30
150	197028	0.65	N/A		205444	0.30
175	201158	1.10	197029	0.60	197030	0.40
200	201158	1.10	197078	0.80	197030	0.40
225	201158	1.10	197078	0.80	197030	0.40
250	201158	1.10	207171	0.70	197030	0.40
300	201158	1.10	207171	0.70	197030	0.40
350	201158	1.10	197078	0.80	197030	0.40
400A	201158	1.10	207171	0.70	197030	0.40

*Gas control options with 2-speed venter are AG8, AG9, AG9H, AG40, AG60, AG61, AG62, DG1, DG5, D12B, and D12C.

TABLE 30B - Model RHH Pressure Switch Settings

RHH Size	High Speed			
	Applies to ALL gas control options EXCEPT AG58 & D12G		Applies to gas control options AG58 & D12G	
	Switch PN	Setting (" w.c.)	Switch PN	Setting (" w.c.)
130	201161	1.30	201160	1.05
180	201161	1.30	201160	1.05
260	201159	1.40	201160	1.05
350	221228	2.30	201160	1.05

7.5.4 Blower Motor (RDH/REH/RHH/RXH) and Venter Motor (RDH and RHH)

Use an ammeter to check blower motor amps. Amps may be adjusted downward by reducing blower RPM or by increasing duct system static pressure (see Paragraph 6.9.2.).

TABLE 31 lists full load amps of open-type blower motors by HP and voltage. This chart can be used for sizing line wiring but should not be interpreted as the exact motor

7.0 Electrical (cont'd)

7.5 Electrical Operating Components (cont'd)

**TABLE 31 - FLA of
Single Speed, Open
Dripproof Motors**

7.5.4 Blower Motor (RDH/REH/RHH/RXH) and Venter Motor (RDH and RHH) (cont'd)

amps. See the motor rating plate for exact motor specifications. Do not exceed amp rating on the motor nameplate.

Full Load Amps—Blower Motors (Open) Single Speed (Average Values)									
HP	1/4	1/3	1/2	3/4	1	1-1/2	2	3	5
115V 1PH	4.6	6.0	8.2	11.0	13.0	15.0	24.6	N/A	N/A
208V 1PH	2.3	3.0	4.1	5.5	7.5	7.8	12.3	13.7	25.5
230V 1PH	2.3	3.0	2.3	5.4	6.5	7.5	12.3	12.4	23.0
208V 3PH	1.1	1.9	2.5	2.9	4.0	5.6	7.0	9.0	13.4
230V 3PH	1.4	1.6	3.0	2.6	3.7	5.0	6.6	8.6	13.2
460V 3PH	0.75	0.80	1.5	1.3	2.0	2.8	3.5	4.3	6.6
575V 3PH	N/A	N/A	.90	1.0	1.4	2.0	2.6	3.6	5.4

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.

7.5.5 Electrical Heating Elements—Model REH

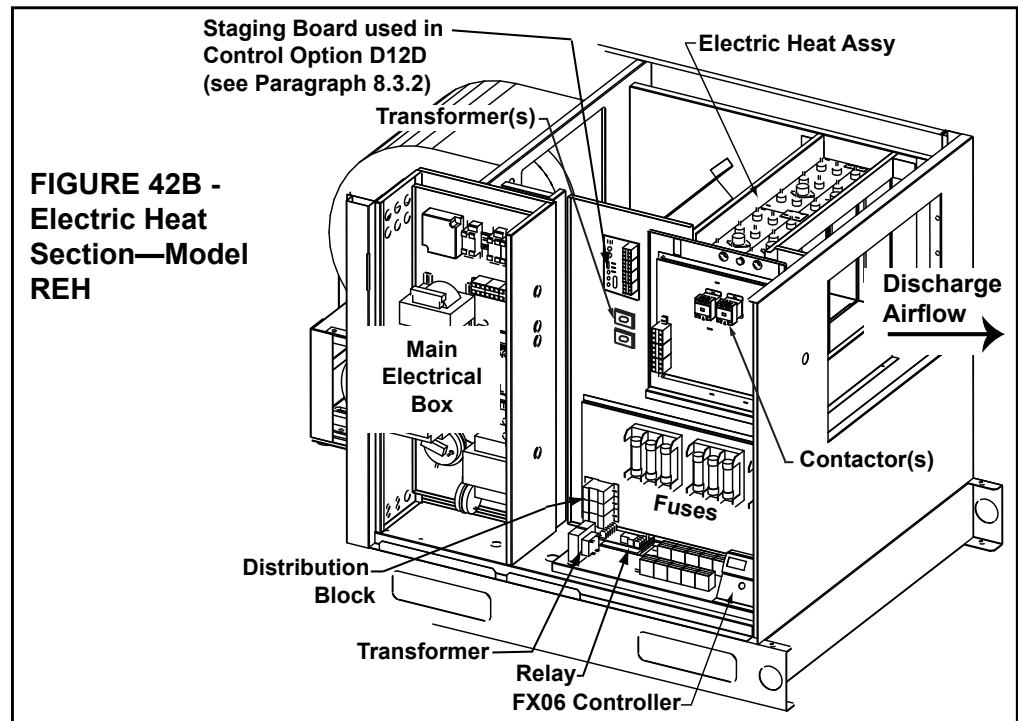
**FIGURE 42A - Sample
of one Electric Heating
Element in the Electric
Heat Assembly**



Electric heating modules in Model REH are made up of two to six 5kw or three to twelve 10 kw heating elements depending on size and voltage of the unit. The elements are bracketed together to make up the electric heat section assembly.

The electric heat section has either heating only analog controls (Option EG1 or EG2) or digital heating/cooling controls (Option D12E or D12D). With Option EG1, operation of the heating elements is controlled by a single stage thermostat. With Option EG2, the heat section provides two-stages of heat in response to a two-stage thermostat. Digital control is either two stage (Option D12E) or modulating (Option D12D).

See Paragraph 8.3.2 and the control instruction form (CP-PREEEVA-D12 B/C/D/E/F/G) for digital control information.



7.6 Other Optional Electrical Components

Optional electrical components ordered with the unit are identified on the wiring diagram. For a list of wiring diagram option codes and descriptions, see **APPENDIX**, page 65.

7.6.1 Convenience Outlet, Option BC2—RDH, REH, RHH, RXH

If the unit is equipped with a convenience outlet, it will have an externally accessible, weatherproof 115 volt, duplex, ground fault outlet on the control side of the cabinet. **A separate 115 volt power supply is required.**

7.6.2 Reheat Module (Options AU7L and AU7R) Compressor—RDH, REH, RHH, RXH



Compressor - Reheat circuit is charged at the factory with R410A Refrigerant

The compressor in the optional reheat module is a high efficiency hermetic scroll type that is factory charged with R410A refrigerant. The compressor has a low pressure cutoff (LPCO) switch for protection against damage due to a loss of charge. This protection prevents short cycling on the internal overload (IOL) which can pump the oil out of the compressor. The compressor also has a manual reset high pressure cutout (HPCO).

TABLE 32 - Reheat Compressor

Compressor Model	ARI Tonnage	208/240V 1 PH		208/240V 3 PH		460V 3 PH		575V 3 PH	
		RLA	LRA	RLA	LRA	RLA	LRA	RLA	LRA
ZP29K5	2.4	14.1	77.0	9.0	71.0	5.6	38.0	3.8	36.5
ZP57K3	4.8	30.1	158.0	20.5	155.0	9.6	75.0	7.6	54.0

NOTE: See Operation/Maintenance Form O-PREEVA (in the Literature Bag), for additional information on compressor maintenance and R410A refrigerant.

IMPORTANT: Do not release refrigerant to the atmosphere! If required service procedures include the adding or removing of refrigerant, the service technician must comply with all federal, state and local laws. The procedures discussed in this manual should only be performed by a qualified HVAC technician.

DANGER

This reheat circuit contains R410A high pressure refrigerant. Hazards exist that could result in personal injury or death. Installation, maintenance, and service should only be performed by an HVAC technician qualified in R410A refrigerant and using proper tools and equipment. DO NOT USE service equipment or tools designed for R22 refrigerant.

Modulating Reheat, Option AUR1

With modulating reheat, a sensor monitors the air temperature as it leaves the reheat coil. Based on a potentiometer setpoint and the sensor signal, the board will open or close a refrigerant bypass valve. Changing the amount of refrigerant hot gas being added to the refrigerant liquid before it enters the pre-cool coil will “modulate” the function of the pre-cool and reheat coils to provide the desired leaving air temperature.

7.6.3 Remote Console for Controls—RDH, REH, RHH, RXH



If the system includes an optional control console, it is shipped separately for field installation. A selection of remote consoles is available with a variety of combinations of factory-mounted controls. All consoles include burner and blower indicator lights and may include a dirty filter indicator light (see below); a cooling on indicator light; an on/off switch; a summer/winter/off control switch; a heat/vent/cool system switch; and/or a potentiometer for damper control. The thermostat or room command module may also be mounted on the console. Depending on the console selected, it may be 10-3/4" (273mm) or 15-3/4" (400mm) in length. All consoles are 7-5/8" (194mm) high and 2-5/8" (67mm) deep. Consoles may be flush or recess mounted. If recessing (not using the mount ring) subtract 7/8" (22mm) from the height and width.

Wire the controls on the remote console according to the wiring diagram. Refer to **TABLE 28** on page 45 for minimum control wire gauge by length.

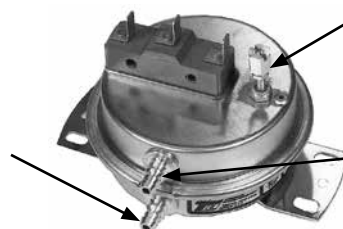
Dirty Filter Switch: If there is a dirty filter indicator light on the console, there is a dirty filter switch in the unit. After the unit is started, before continuous operation, the dirty filter switch must be set.

Instructions for Setting Dirty Filter Switch (FIGURE 43)

With clean filters in place; all doors closed (except electrical compartment); and the blower opening, increase the pressure setting by adjusting the setscrew on the switch clockwise until the filter light is energized or the screw is bottomed out. At that point, adjust the setscrew three full turns counter clockwise or until the screw is top ended. At that setpoint, the filter light will be activated at approximately 50% filter blockage.

FIGURE 43 - Dirty Filter Switch, PN 105507—Must be Set Prior to Continuous Operation)

Positive pressure connection is toward the “back or bottom” of the switch (senses air inlet side of filters)



Set screw (on front of switch) must be manually adjusted after the system is in operation.

Negative pressure connection is toward the “front or top” of the switch (senses blower side of filters)

7.0 Electrical (cont'd)

7.6.4 Firestat, Option BD4 or BD5—RDH, REH, RHH, RXH

7.6 Other Optional Electrical Components (cont'd)



Option BD4 (factory-installed) or Option BD5 (field-installed) 200°F firestat is **PN 42782**. Firestat Option BD4 is factory installed in the mixing box to sense the temperature of the return air. Firestat Option BD5 is shipped separately for field installation in the discharge duct work.

The firestat will shutdown the unit if temperature setpoint is reached. Comply with local building codes.

7.6.5 Discharge Temperature Low Limit (Freezestat), Option BE2—RDH, REH, RHH, RXH



Limit control, **PN 211480**, is factory installed to monitor the temperature of the discharge air. Setpoint of automatic reset control is adjustable.

NOTE: Not needed with digital controls; standard function of the digital controller.

7.6.6 High Ambient Limit Control (burner cutoff), Option BN2—RDH, REH, RHH, RXH



The high ambient limit control monitors the temperature of the outside air and activates to shutoff the burner if the setpoint is reached. The control has an adjustable setpoint and resets automatically. **PN is 126170.**

7.6.7 Exhaust Fan Interlock Relay, Option BG9—RDH, REH, RHH, RXH



A DPDT plug-in relay is installed for coordination of unit operation with the operation of the building exhaust fan. Plug-in relay **PN is 211411; socket PN is 211415.**

7.6.8 Smoke Detector, Option SA1—RDH, REH, RHH, RXH



This photoelectric smoke detector is shipped separately to be installed in the discharge duct work. Follow installation instructions supplied with the control and the wiring on the unit wiring diagram. Comply with local building codes. PN of the device is **159553.**

8.0 Controls and Operation

8.1 Gas Valve—Model RDH and Model RHH

Gas-fired furnaces are equipped with a 24-volt combination valve which includes the automatic electric on-off valve the pressure regulator, the safety pilot valve, and the manual shutoff valve. Valve on/off function is controlled by the room thermostat or digital controller.

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).

8.2 Analog Controls for Heating or Heating/Makeup Air

8.2.1 Single-Stage Operation—Recirculated Heating Only (Option AG1 applies to Model RDH and Model RHH; Option EG1 applies to Model REH)

The single-stage gas valve on Models RDH and RHH allows for single-stage control from a single-stage, 24-volt thermostat. On Model REH, the heating elements are controlled by a single-stage, 24-volt thermostat.

The thermostat can either be selected as an option or be field supplied. Follow the thermostat manufacturer's instructions for installation. Make wire connections according to the wiring diagram.

On Models RDH and RHH, a two-stage combination gas control valve provides for low fire (70%) or high fire (100%) operation controlled by a two-stage thermostat. First stage (low fire) is factory set. Both high and low stages are controlled by a Servo regulator, maintaining constant gas input under wide variations in gas supply pressure. See instructions packed with the unit for specific gas valve specifications, wiring, and operating instructions.

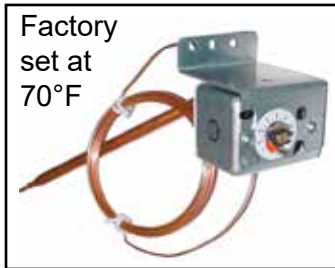
On a Model REH, staging of heat from the heating elements is controlled by the two-stage thermostat.

A two-stage thermostat can either be selected as an option or be field supplied. Follow the thermostat manufacturer's instructions and the wiring diagram.

8.2.2 Two-Stage Operation—Recirculated Heating Only (Option AG2 applies to Model RDH and Model RHH; Option EG2 applies to Model REH)

8.2.3 Two-Stage Operation—Makeup Air Heating Only Application (Option AG3, AG15, or AG16)

FIGURE 44A - Unit-mounted Ductstat, PN 211481, in Options AG3 and AG60



Two-stage makeup air units are equipped with a two-stage gas valve, but instead of control from a two-stage room thermostat, the outlet air temperature is monitored and controlled by a two-stage ductstat. When the discharge air temperature drops to the setpoint, factory-set low fire is energized. If low fire (70%) cannot satisfy the ductstat setting, high fire (100%) is energized.

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

Depending on the option selected, the factory-installed sensor is either field-connected by capillary tubing to the unit-mounted ductstat (**FIGURE 44A**) or electrically connected to a remote electronic temperature selector (**FIGURE 44B**). The remote temperature selector with stage adder is available with or without a display module.

Optional Unit-Mounted Ductstat with Capillary Tubing (Option AG3): The control illustrated in **FIGURE 44A** has an adjustable range from 50° to 120°F with a fixed differential of 2-1/2°F. Due to different CFM settings and outside air temperatures, the average downstream outlet temperature may not match the ductstat setting exactly. After the installation is complete, adjust the setpoint of the ductstat to achieve the desired average outlet air temperature.

Optional Ductstat with Electronic Remote Setpoint Module (Options AG15 and AG16): The factory-installed sensing probe must be field-wired to a remote temperature selector. The temperature selector has an operating range to 120°F. Follow the wiring diagram with the unit and the manufacturer’s instructions for wiring and installation. **CAUTION:** Be sure heat/cool selector switch is set at “Heat” position. There will be one module for selecting temperature and one-stage adder module. The optional digital display module is only in Option AG16 (see **FIGURE 44B**).

FIGURE 44B - Remote Temperature Selector, Stage-Adder Module, and Optional Display Module for Ductstat Control in Two-Stage Makeup Air Control Options (Option AG15, AG16, AG61, and AG62)

- (A) Temperature Selector, PN 115848;
- (B) Stage Adder, PN 115849;
- (C) Display Module, PN 115852



8.2.4 Constant Discharge Air Temperature with Maintained Thermal Efficiency—Makeup Air Heating Only Application (Options AG60, AG61, AG62)

Two-Speed Venter System in Options AG60, AG61, and AG62: A proprietary electronically controlled venter system provides the correct quantity of combustion air to maintain an overall average of 81% thermal efficiency through a range of gas inputs from 100 to 33 percent for natural gas and through a gas input range of 100 to 40 percent for propane gas. The venter’s low speed operation is controlled by an electronic board (**FIGURE 45**) and a two-stage ductstat (either **FIGURE 44A** or **44B**).

The proprietary electronically controlled venter system always operates at high speed during pre-purge and post-purge periods. Speed selection occurs after there is a call for burner ignition.

Optional Unit-Mounted Ductstat with Capillary Tubing (Option AG60): Uses the unit-mounted control shown in **FIGURE 44A** with an adjustable range from 0° to 120°F. Due to different CFM settings and outside air temperatures, the average downstream outlet temperature will be constant but may not match the ductstat setting exactly. After the installation is complete, adjust the setpoint of the ductstat to achieve the desired outlet air temperature.

FIGURE 45 - Venter Speed Control Board in Control Options AG8, AG9, AG9H, AG40, AG58, AG60, AG61, AG62, DG1, DG5, D12B or D12C



8.0 Controls and Operation (cont'd)

8.2 Analog Controls for Heating or Heating/Makeup Air (cont'd)

FIGURE 46 - Maxitrol Signal Conditioner, PN 134170 used in Option AG40



FIGURE 46B - Amplifier in Options AG8 (PN 260864); AG9 and AG9H (PN 260863 for both)



8.3 Digital Controls for Heating/Cooling, Makeup Air, and Dehumidification—Models RDH, REH, RHH, and RXH

FIGURE 47 - Programmable Digital Controller, Johnson Controls FX05 used in all DG Options



For explanation on the settings and functions of the FX05 programmable control, see Form CP-PREEVA-DG with FX05.

8.2.4 Constant Discharge Air Temperature with Maintained Thermal Efficiency (cont'd)

Optional Ductstat with Electronic Remote Setpoint Module (Options AG61 and AG62): The factory-installed sensing probe must be field-wired to the 0-120°F remote temperature selector illustrated in **FIGURE 44B**.

The remote modules are shipped separately for field installation. Follow the wiring diagram with the unit and the manufacturer's instructions for wiring and installation.

CAUTION: Be sure heat/cool selector switch is set at "Heat" position.

There will be one module for selecting temperature and one-stage adder module.

The optional digital display module is used only in Option AG62 (see **FIGURE 44B**).

8.2.5 Modulation Gas Control with Field Supplied Digital Control Optional Modulation Gas Control with Field-Supplied Controller (Option AG40):

The programmable digital controller is not supplied. The unit is equipped with a Maxitrol signal conditioner (**FIGURE 46**) that accepts an input signal of either 4–20 milliamps or 0-10 volts from a field-supplied controller and converts it to the 0–20 volt DC current required to control the modulating valve. Temperature selection or building management is controlled by customer-supplied software.

8.2.6 Optional Electronic Modulation Electronic Modulation between 50% and 100% Firing Rate (Options AG8, AG9 & AG9H)

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 control systems for makeup air applications controlled by a field-installed duct sensor (see Paragraph 6.7.3) and temperature selector (55–90°F) are identified as either Option AG8 or Option AG9 & AG9H. The temperature selector setting for Option AG8 is on the amplifier; Option AG9 & AG9H has a remote temperature selector. Both systems are available with an override thermostat.

8.3.1 Optional Digital Heating/Cooling/Makeup Air Controls, Options DG1 or DG5—Model RDH only

Application NOTES: Options DG 1 does not apply to units with reheat pump (dehumidification), Option AU7L or AU7R. Model RDH with Option AU7 requires D12B, D12C, or D12G; see Paragraph 8.3.2.

Digital control systems (Option DG1) has a unit-mounted, factory-wired, 24 volt, DDC programmable controller (**FIGURE 47**); a venter speed control board (**FIGURE 45**); and a room command module (either **FIGURE 48A or 48B**).

The two DG control sequences include a wall-mounted Fan/Heat/Cool/Auto Switch.

Option DG1: Room control with 2-stage gas heating and 3-stage cooling control. The wall mount interface allows the user to adjust the space setpoint from 45°F to 95°F and select the unit mode. Unit modes are Cool Only, Heat Only, Fan Only, Auto Mode, and Off.

Option DG5: Room control with 2-stage gas heating and 3-stage cooling control. The wall mount interface allows the user to adjust the discharge air temperature $\pm 6^\circ\text{F}$ from the factory-mounted controller setpoint and select unit mode. Unit modes are Cool Only, Heat Only, Fan Only, Auto Mode, and Off.

The heating and cooling equipment will cycle to maintain the active heating discharge or space temperature setpoint, based upon the unit mode and time of day schedule.

Unit Control Points (Control Options DG1 and DG5)	Analog Inputs	Digital Inputs	Digital Outputs	Analog Outputs
	1) Space Temperature/Discharge Air Temperature	1) Dirty Filter	1) Fan	1) Modulating Gas Valve
	2) Space Temperature Setpoint (45–90°F) or (±6°F Warmer/Cooler)	2) Temporarily Unoccupied Override	2) Heat Stage 1 3) Heat Stage 2	2) Not Used
	3) Outdoor Air Temperature	3) Occupied/Unoccupied	4) Cool Stage 1	—
	4) Mode Slider—Heat, Cool, Auto, Fan, Off	4) Air Proving/Phase Loss	5) Cool Stage 2	
5) Boost Mode		6) Cool Stage 3		

Two-Speed Venter System in Options DG1 and DG5 (also applies to modulation Option AG40 with field-supplied control)

A proprietary electronically controlled venter system provides the correct quantity of combustion air to maintain an overall average of 81% thermal efficiency through a range of gas inputs from 100 to 25 percent for natural gas and through a gas input range of 100 to 40 percent for propane gas. The venter’s low speed operation is controlled by an electronic board (**FIGURE 45**, page 51) and a gas pressure switch that senses outlet gas pressure. The venter is operated at a reduced voltage when the outlet gas pressure is below 1.7 inches w.c. for natural gas units and for propane units when the outlet gas pressure is below 5.0 inches w.c.

The proprietary electronically controlled venter system always operates at high speed during prepurge, postpurge, and the ignition periods. Speed selection occurs after flame is proven.

Sequence of Operation

Options DG1 is a space temperature control. Option DG5 is a discharge air temperature control. With all four options, a wall-mounted sensor and setpoint dial controls the functionality. With discharge air temperature control (DG5), the wall sensor is disabled and a discharge sensor is used to control the temperature. The wall unit shown in **FIGURE 48A** is used with Option DG1; it has a 45°F to 95°F adjustment dial to set the desired space temperature. The wall unit shown in **FIGURE 48B** is used with Option DG5; it has a ±6°F warmer/cooler adjustment dial for the discharge air temperature setpoint. Both wall units have a mode slider and an unoccupied mode override button. The slider selects the functionality of the unit: Cool Only, Heat Only, Fan Only, Auto Mode, Off.

The dial value will be the working heating or cooling setpoint depending on the mode. In the **auto mode**, the dial is the midpoint value between the cooling and heating setpoint. Example: (variable DB = 2°F default) If the dial is set to 72°F, the cooling and heating setpoints for unit operation are 70°F and 74°F respectively.

Mode Slider Function

Cool Only: The unit will allow only the cooling to function. There is an adjustable parameter “OC” outdoor ambient temperature lockout setting below which mechanical cooling will not be allowed to operate.

Heat Only: The unit will allow only the heating to function. There is an adjustable parameter “OH” outdoor ambient temperature setting above which heating will not be allowed to operate.


Fan Only: The unit will allow only the fan to run. The fan will run only in occupied mode if the external contact is closed (Binary input #3). If the contact is open, the fan will not run.

Auto Only: The unit will be allowed to provide heating and cooling, providing the outdoor ambient conditions are met. The heating setpoint and cooling setpoint are controlled by “HSP” and “CSP” settings and the setpoint dial (warmer/cooler adjust or the Setpoint dial setting), and the value of DB.

Off: The unit will shut down all functionality – neither heating, cooling nor fan will be allowed to operate.

Note: Hold the Enter key on the controller for 15 seconds to access the variable screens. (SUO should appear.) Use the down arrow to go to SSI. Press the enter button. If the value is ON, the sensor with the setpoint overlay is active. If the value is OFF, the sensor with the warmer/cooler adjust should be used. Use the up/down arrows to toggle between ON/OFF and press the enter button to save. This setting can also be changed in CommPro (nciWallStatSelect). See the control instruction manual for more information.


FIGURE 48A - Room Command Module, PN 211423, in Option DG1



Push Button

Provides on-off and heat/vent/cool mode selection; room temperature selection; and has a push button for unoccupied override.

FIGURE 48B - Room Command Module, PN 211424, in Option DG5



Push Button

Provides on-off and heat/vent/cool mode selection; adjusts discharge air temperature ±6°; and has a push button for unoccupied override.

8.0 Controls and Operation (cont'd)

8.3 Digital Controls for RDH, REH, RHH, and RXH (cont'd)

8.3.1 Optional Digital Heating/Cooling/Makeup Air Controls, Options DG1 and DG5—Model RDH only (cont'd)

Fan Operation

When the slide is not in the OFF position and the unit is in the Occupied Mode based upon the input, the fan will run continuously. In the Unoccupied Mode, the fan will only run on a call for heating or cooling. The fan will be off if the slide is in the OFF mode. Upon a call for the fan to run, if the air proving switch does not make after 180 seconds, the unit shuts down. Turn the unit FX05 controller OFF then ON, or press the UP and Down arrows simultaneously for 5 seconds, to reset the alarm condition. When the unit is locked out, heating and cooling functions will be disabled. Control will display a flashing “AP”.

If cooling or heating operations are energized and fan proof is lost for three seconds, the cooling or heating functions will be shut down, fan will be de-energized, and “AP” will flash on the display.

In the unoccupied mode, when the slider switch is moved to the OFF position, or the call for heating or cooling ends, the fan will run for an additional 30 seconds before shutting off. This fan delay time is adjustable using variable “Fod”.

Occupied Mode

Unit will control to the Occupied Setpoints.

Cooling or Heating Slider Mode & Dial Setpoint (Option DG1): The dial setting is the working heating or cooling setpoint.

Auto Slider Mode & Dial Setpoint (Option DG1): The dial setting is the midpoint for the working heating and cooling setpoint. The actual setpoint is adjusted by a value of “db” (deadband) which has a default value of 2°F.

The cooling setpoint = dial setting + db = 72°F + 2°F = 74°F

The heating setpoint = dial setting + db = 72°F - 2°F = 70°F

Auto, Cooling, or Heating Slider Mode, & Warmer/Cooler Dial (Option DG5):

The value HSP or CSP in the controller becomes the active heating and cooling setpoint basis. The warmer/cooler adjusts the setpoint by ±6°F.

“HSP”, default 68°F

“CSP”, default 72°F

The cooling setpoint = dial setting + CSP = +6°F + 72°F = 78°F

The cooling setpoint = dial setting + CSP = -6°F + 72°F = 66°F

The heating setpoint = dial setting + HSP = +6°F + 68°F = 74°F

The heating setpoint = dial setting + HSP = -6°F + 68°F = 62°F

Note: When variable SSI = ON, Room Command Module with setpoint scale should be used (DG1). When SSI = OFF, Room Command Module with warmer/cooler scale should be used (DG5).

Unoccupied Mode

Unit will control to the Unoccupied Temperature Setpoints. The unoccupied setpoints are the working Heating Setpoint minus the value of “UoU” which has a default of 10°F and the working Cooling Setpoint plus the value of “UoU”.

Auto Slider Mode & Dial Setpoint (Option DG1):

The cooling setpoint = dial setting + db + UoU = 72°F + 2°F + 10°F = 84°F

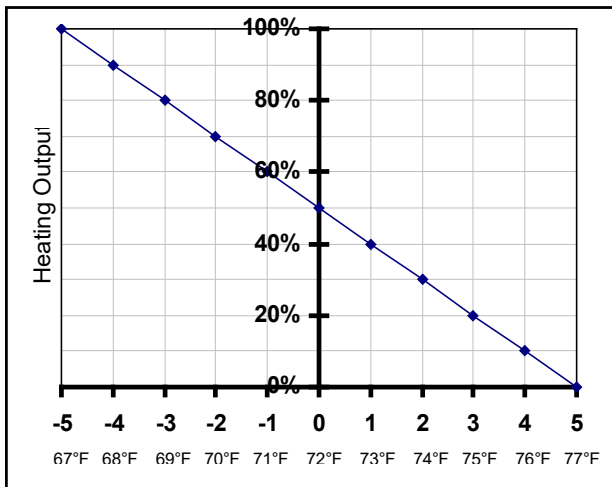
Boost Mode: Unit will add an adjustable amount BOU (nciBoostModeOffset) (default 5°F) to the working heating setpoint and subtract from the working cooling setpoint. Boost Mode will only operate in Heating Only or Cooling Only modes. Boost is not available in Auto Mode.

Example: Cooling Slider Mode & Dial Setpoint:

The cooling setpoint = dial setting + BOU = 72°F - 5°F = 67°F

Heating Operation: The unit will initiate heating if the temperature sensed at the space sensor or discharge falls below the “HSP” setpoint by the value of the heating proportional band, “HPB” (Default value 5°F). When it does, full heating turns on (high fire). The analog output will modulate to 100% full fire for 180 seconds to

Temperature Difference From Setpoint and Heating Output



ensure proper burner ignition. With modulating control, the gas valve will then modulate to a position, linearly with the proportional band, “HPB”. For staged control (Option DG1 or DG5), the unit will switch to low fire when the heating output required from the proportional band is less than the SSO (5% default) for 30 seconds. The unit switches back to high fire if the gas signal calls for 90% capacity or “SSH” value. Heating will completely turn off when the space or discharge air temperature is above HSP + deadband “HDB”.

Example: Heating will enable when

$$Temperature < WHSP - HSP - HDB < 72^{\circ}F - 5^{\circ}F - 0^{\circ}F < 67^{\circ}F$$

So, when the space temperature drops below 67°F, the signal to the gas valve is 100% and the burner ignites. After the 180 seconds, if the temperature is 72°F, the signal to the gas valve will be 50%.

Heating is disabled when the ambient temperature is above the lockout value “oH” (default 62°F).

Cooling Operation: The unit will initiate cooling if the temperature sensed at the space sensor (discharge air sensor) climbs above the WCSP into the Cooling

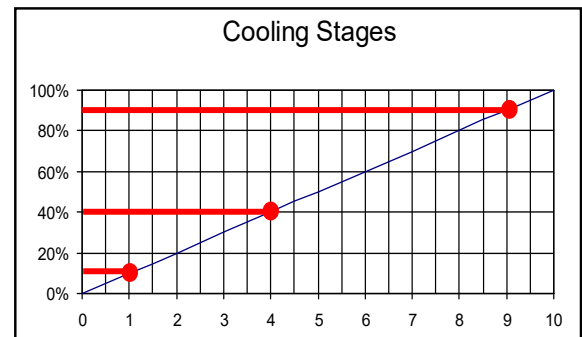
proportional band, CPB. The cooling stages are based on C1, C2, and C3 values.

Example: If the working cooling setpoint (WCSP) is 72°F, stage 1 cooling turns on when space temp (discharge air temp) increases to 73°F (10% of the 10°F CPB). Stage 2 turns on when space temp increases to 76°F (40% of the 10°F CPB). Stage 3 turns on when the space temperature increases to 81°F (90% of the 10°F CPB).

As the space temperature moves back towards WCSP, stage 3 turns off at 40% call for cooling, stage 2 turns off at 10% call for cooling, and stage 1 turns off at 5% cooling call.

There is a non-adjustable minimum 240 second interstage time delay. In addition, cooling ambient temperature lockout values prevent individual stages from being enabled until the outside air temperature is above oC, oC2, and oC3 values.

Compressor inter-stage delay time and compressor minimum on time are controlled by the nciClgStgTime which is defaulted at 240 seconds. This means that if stage 1 has just begun, stage 2 cannot start for 240 seconds. Once stage 1 has begun, it must run for 240 seconds before it will be turned off.



8.3.2 Optional Digital Heating/Cooling/Dehumidification (Reheat) Controls, Options D12B, D12C, D12D, D12E, D12G—Applies to RDH, REH, RHH, or RXH (Required with All Dehumidification Units, Option AU7)

These digital control options are for neutral air control and can have an optional space reset control. These are the only control options that apply to RDH, REH, RHH, and RXH units with dehumidification (Option AU7L or AU7R).

The programmable controller (**FIGURE 49**) used with these options has a built-in time clock card for energy savings and better management of the specific application. If equipped with the optional serial communication card, the controller is compatible with either the LON or N2open BAS protocol.

If your unit was ordered with either Option D12B, D12C, D12D, D12E, or D12G, refer to Form CP-PREEVA-D12 B/C/D/E/F/G in the Literature Bag, for more detailed information on these four digital control systems.

The microprocessor unit (Model FX06, **FIGURE 49**) in control Options D12B, D12C, D12D, D12E, and D12G is custom programmed for the PREEVA® models. Control features include:

- Custom 3-step control sequence of cooling and dehumidification (reheat) control
- Modulation or 2-stage gas heat control
- SCR control or two stage electric heat
- Fully integrated outdoor ambient lockouts based on outdoor dry bulb/dewpoint or enthalpy

8.0 Controls and Operation (cont'd)

8.3 Digital Controls (cont'd)



FIGURE 49 - FX06 in D12B, D12C, D12D, D12E, and D12G

NOTE: For explanation on the settings and functions of the FX06 programmable control, see Form CP-PREEVA-D12 B/C/D/E/F/G. If the unit being installed has a special FX07 controller, contact your Representative or the factory for control information.)

Digital Control (FX06) Applications by Control Option Code

8.3.2 Optional Digital Heating/Cooling/Dehumidification (Reheat) Controls, Options D12B, D12C, D12D, D12E, D12G (cont'd)

- Alarm and equipment shutdown features
- Service/Commissioning Test Mode
- Integrated timer functions for cooling and heating

There are four buttons that can be used for adjusting setpoints, viewing unit status, and enabling unit test or shutdown modes. The controller display will indicate unit status (on, off, or alarm), discharge air temperature, outdoor air temperature, dewpoint, and enthalpy. When equipped with a wall-mounted sensor (Option CL67), space temperature will be displayed.

When the unit is called to operate, the main blower will run continuously in occupied mode and intermittently in unoccupied mode. The unit operates based on the four **Discharge Air Temperature Setpoints** listed below:

1. Standard (Neutral) Heating Discharge Air Temperature Setpoint
2. Space Heating Discharge Air Temperature Setpoint
3. Standard (Neutral) Cooling Discharge Air Temperature Setpoint
4. Space Cooling Discharge Air Temperature Setpoint

The heating and cooling equipment will cycle to maintain the active discharge air temperature setpoint for occupied and unoccupied modes. Heating and cooling may be locked out of operation based upon outdoor air temperature and enthalpy conditions. If equipped with reheat, the control will also activate the dehumidification circuit to maintain a neutral discharge air temperature setpoint and related dewpoint based upon outdoor air and space conditions.

Option D12B—applies to RDH: Control is factory programmed for electronic modulation gas heating, with 3-stage cooling, and with or without optional dehumidification (reheat). Space reset control is optional.

Option D12G—applies to RDH and RHH: Control is factory programmed for electronic deep modulation gas heating, with 3-stage cooling, and with or without optional dehumidification (reheat). Space reset control is optional.

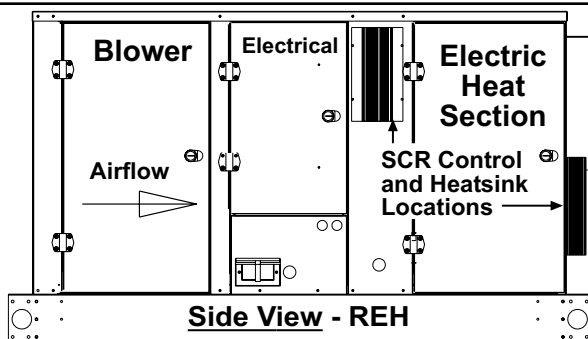
Option D12C—applies to RDH, RHH, and RXH (no heat): Control can be factory programmed for two-stage gas heating, with 3-stage cooling, and with or without optional dehumidification (reheat). Space reset control is optional.

Option D12E—applies to REH: Control is factory programmed with neutral air control for 2-stage electric heat, with 3-stage cooling, and with or without optional dehumidification (reheat). Space reset control is optional. **NOTE:** Option D12D is not recommended for makeup air applications.

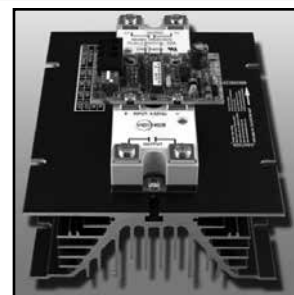
Option D12D—applies to REH: Control is factory programmed with recirculating control for electric heat with SCR modulation, with 3-stage cooling, and with or without optional dehumidification (reheat). Space reset control is optional.

Model REH units with Option D12D have additional controls to provide the electric heat modulation. Depending on their size (amp draw), REH units with Option D12D are equipped with one or two SCR power controllers. To provide comfort level heating in response to the system controller, the SCR controllers cause modulation of specified

FIGURE 50 - Locations of the SCR Power Controls with Heatsinks used on Model REH with Modulating Heat Control Option D12D



SCR Power Control and Heatsink in Option D12D (one or two required depending on amps)



WARNING

The heatsink on the SCR power controllers is HOT to the touch.

DANGER

High voltages are present on the terminals of the SCR power controller(s).

heating elements while other elements are turned on and off or staged. Depending on size, staging is controlled either by the FX06 controller or an additional staging module.

All of the D12 options include an outside air relative humidity transmitter. Depending on whether the unit includes a mixing box, the sensor is either factory-mounted in the mixing box or shipped separately for field installation in the inlet duct. The sensor sequences compressor operation based on outdoor dewpoint. It is recommended for humid and temperate climates.

FIGURE 51 - Optional Space Mounted Accessories with Digital D12 Control Options



Option CL67, PN 260599, Space Temperature Sensor, has adjustable setpoint control and unoccupied override. Follow the instructions included with the sensor and the wiring diagram to install.



Option CL47, Room Dehumidistat, is shipped separately for field installation. The relative humidity inputs control reheat operation. Follow the instructions included with the control and the wiring diagram to install. **NOTE:** Applicable with reheat (Option AU7 or AU8) only.

Option RB2A, PN 223125, Remote User Interface, provides access to all the same functions as the FX06 controller except Test Mode.

Display Lights	
Symbol and 01 - 08	
Unit ON/OFF	Alarm
Comp #1 ON	Reheat ON
Comp #1 ON	Not Used
Stg #1 Heat ON	Not Used
Stg #1 Heat ON	Not Used

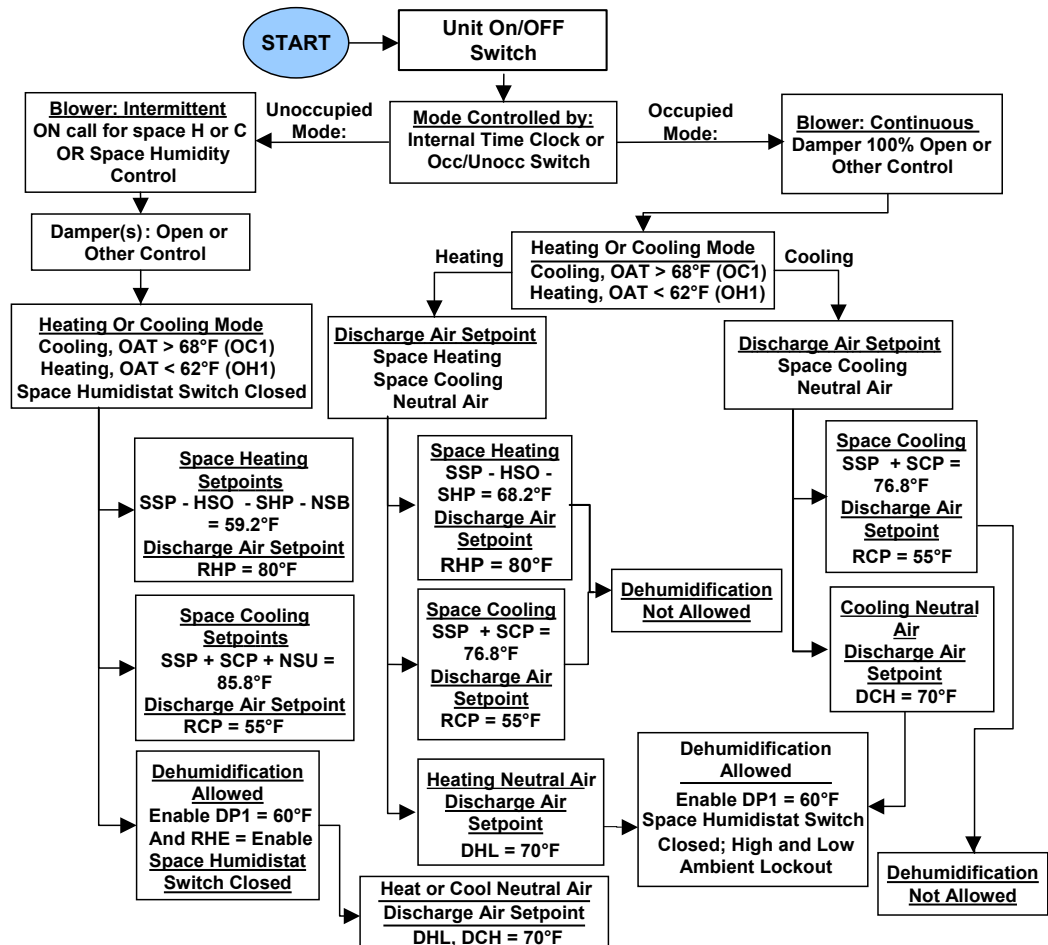


“ESC or Move Back”
Push for Menu

“OK” or “Enter”
Push to Select/Accept

“Scroll Buttons”

Sequence of Operation with Default FX06 Settings (in D12 Options)



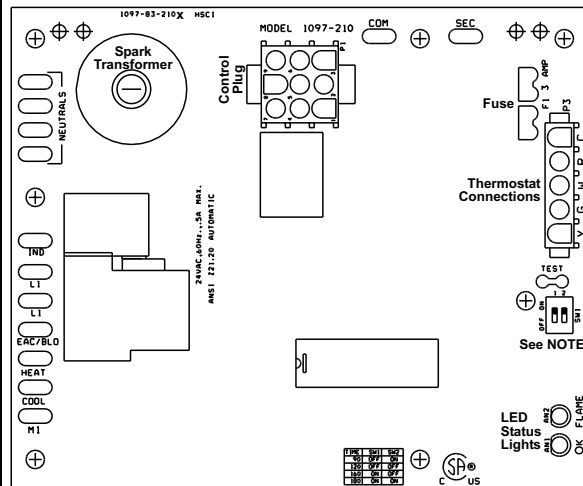
8.0 Controls and Operation (cont'd)

8.4 Ignition Systems—Model RDH and Model RHH

This furnace is equipped with a direct spark integrated control module (circuit board). The module monitors the safety devices and controls the operation of the venter motor and the gas valve between heat cycles. There is one of two control modules depending on the gas control option.

8.4.1 Ignition Control Module used in all control options EXCEPT Option AG58 and Option D12G

FIGURE 52 - DSI Integrated Control Module (circuit board)



Control Status—Green LED Codes

- Steady ON... Normal Operation, No call for heat
- Fast Flash.... Normal Operation, Call for heat
- 1 Flash..... System Lockout, Failed to detect or sustain flame
- 2 Flashes Pressure switch did not close within 30 seconds of venter motor
- 3 Flashes High limit switch open
- 4 Flashes Pressure switch is closed before venter motor is energized
- Steady OFF . Blown Fuse, No Power, or Defective Board

Flame Status—Yellow LED Codes

- Steady ON... Flame is sensed
- Slow Flash... Weak flame (current below 1.0 microamps $\pm 50\%$)
- Fast Flash.... Undesired Flame (valve open and no call for heat)

NOTE: Set “blower off” dip switch setting to 45 seconds for makeup air application. Refer to the table on the module for the appropriate settings.

NOTE: Abnormal Heat Cycle Functions and Ignition System Fault Models for this ignition controller are explained in the Operation/Maintenance/Service Manual, Form O-PREEVA.

Normal Heat Cycle Operating Sequence

1) Call for Heat: The heating/cooling system controller calls for heat. The ignition system circuit board checks to see that the limit switch is closed and the pressure switch is open. If the limit switch is open, the circuit board responds as defined in the “Abnormal Heat Cycle, Limit Switch Operation”. If the pressure switch is closed, the circuit board will do four flashes on the green LED and wait indefinitely for the pressure switch to open. If the pressure switch is open, the circuit board proceeds to prepurge.

2) Prepurge: The circuit board energizes the venter motor and waits for the pressure switch to close. If the pressure switch does not close within 30 seconds of the venter motor energizing, the circuit board will do two flashes on the green LED. The circuit board will leave the venter motor energized indefinitely as long as the call for heat remains and the pressure switch is open.

When the pressure switch is proven closed, the circuit board begins the prepurge time. If flame is present any time while in prepurge, the prepurge time is restarted. If flame is present long enough to cause lockout, the circuit board responds as defined in “Fault Modes, Undesired Flame”.

The ignition system circuit board runs the venter motor for a 20 second prepurge time, then proceeds to the ignition trial period.

3) Ignition Trial Period: The ignition system circuit board energizes the spark and main gas valve. The venter remains energized. If flame is sensed during the first 16 seconds, the spark is de-energized. If flame has not been sensed during the first 16 seconds, the control de-energizes the spark output and keeps the gas valve energized for an additional one second flame proving period. If flame is not present after the flame proving period, the control de-energizes the gas valve and proceeds with ignition re-tries as specified in “Abnormal Heat Cycle, Ignition Retry”. If flame is present, the circuit board proceeds to steady heat.

4) Steady Heat: Circuit board inputs are continuously monitored to ensure limit and pressure switches are closed, flame is established (sensor on both burner sections), and the system controller call for heat remains. When the call for heat is removed, the ignition system circuit board de-energizes the gas valve and begins postpurge timing.

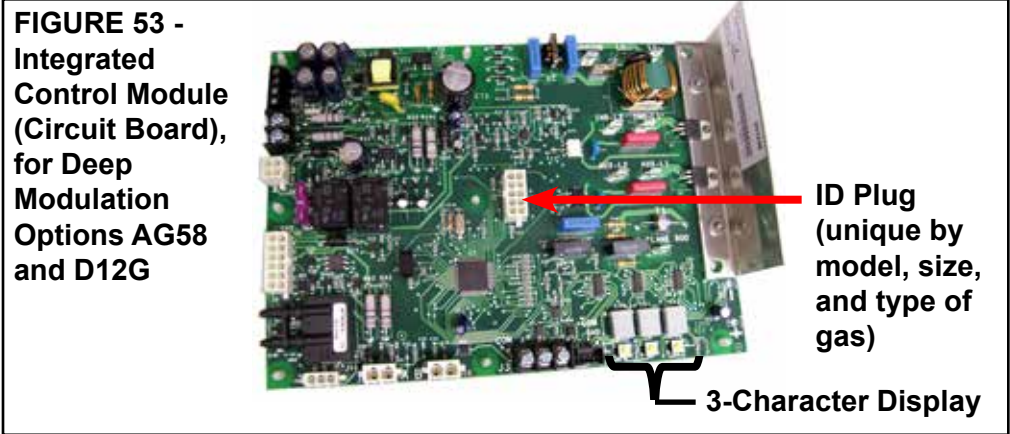
5) Post Purge: The venter motor output remains on for a 45 second postpurge period after the system controller is satisfied.

8.4.2 Ignition Control Module used in Deep Modulation Control Options AG58 and D12G

IMPORTANT: The control module is PN 260252 for all sizes of Model RDH and PN 260917 for all sizes of RHH heat sections. However, the ID plug on each board is unique for each model, size, and type of gas. A replacement board will require either a new ID plug or reuse of the ID plug from the board being replaced.

NOTE: Operating and Lockout Error Codes displayed on the ignition controller 3-character display (**FIGURE 53**) are listed in Troubleshooting Paragraph in the Operation/Maintenance/Service Manual, Form O-PREEVA.

Integrated Control Module for Gas Control Options AG58 and D12G: The control module is located in the control compartment with an additional board to control spark that is attached to the removable shield on the end of the burner. Except for the



replaceable parts shown, do not attempt to disassemble either board. Each heating season check the lead wires for insulation deterioration and good connections.

If replacement is required, these boards must be replaced with identical parts.

The control has a built-in, self-diagnostic capability. The control continuously monitors its own operation and the operation of the heat section including direct spark ignition, safety and modulating valves, and venter motor speed. The 3-digit display on the control indicates the current system state, warnings, failures, and test modes.

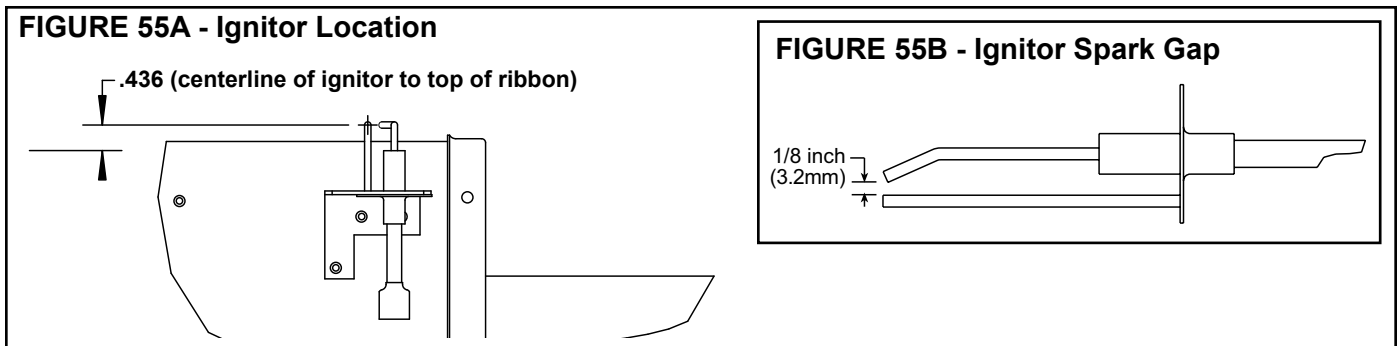
LED 3-Character Display (displayed on power up)	
Display Info (example only)	Description
RDH	Furnace series or model name
400	Heat Section Size
nAt or LP	Fuel type
1.01	Software version



CAUTION: Due to high voltage on the spark wire and electrode, do not touch when energized (see Hazard Levels, page 2).

8.4.3 Ignitor Location

Proper location of the ignitor to the burner is shown in **FIGURE 55A**. Ignitor spark gap is shown in **FIGURE 55B**. The ignitor is the same for all gas control options.



9.0 Commissioning and Startup

9.1 General

Assumptions: All connections are made; actual startup is imminent. Site is clean; all excess supplies, scraps, and debris have been removed. Clean filters are in place. Doors are open for checks.

Warnings and checks apply to all units unless indicated.

DANGER

To prevent injury or death due to electrocution or contact with moving parts, lock disconnect switch open when doing checks prior to startup. See Hazard Levels, page 2.

9.2 Checklist Prior to Startup

Important NOTE: When the unit is started for the first time, complete the startup form on page 64. Keep with the unit for future reference.

9.2.1 All Systems Checklist Prior to Startup:

- Check clearances. All clearances must be as illustrated in Paragraph 4.1.
- Verify the electrical supply matches the unit (refer to the rating plate).
- Check the wiring for loose connections or damaged wire. Tighten connections. Replace damaged wiring (see Paragraph 7.0 or the wiring diagram for replacement wiring requirements).
- Check field wiring and controls against the wiring diagram. Be sure that wire gauges are as required for the electrical load. All field wiring must be compliance with the National Electric Code and local regulations.
- Be certain that the electrical entrances are sealed against the weather.
- Check that fuses or circuit breakers are in place and sized correctly.
- Be certain optional manual reset controls (firestat and high gas pressure switch) are reset.
- If any changes are required to factory settings, be sure they have been made (refer to control instructions shipped with the unit).
- IMPORTANT: Before applying power, check blower pulley, blower wheel, and motor pulley to be sure they are secure to the shafts. Check blower and pulleys for free movement.** Check belt tension and alignment (Paragraph 6.9).
- Verify the removal of all shipping supports.
- Check discharge duct connection (Paragraph 6.8.4).
- Check gas piping for leaks and proper supply gas pressure (6.0" w.c. minimum / 14.0" w.c. maximum). Bleed gas lines of trapped air.
 - 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 0.1" 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 the leak. Repair and repeat tests.
- Be sure that both flue discharge and combustion air openings are free of obstructions.
- If installed in California, verify that California Warning Label is displayed (see Paragraph 1.4).
- Model RDH equipped with Option CS2, verify that the burner condensate drain is connected, the trap is full, and that the line empties into a sanitary drain (Paragraphs 6.2.1 & 6.6.4).
- Model RDH equipped with modulating gas control AG58 or D12G, verify that the vent area condensate drain which exits from the bottom of the unit, is connected, the trap is full, and that it empties into a sanitary drain (Paragraphs 6.2.2 & 6.6.4).
- Model RHH, verify that the Heat section and vent area condensate drains which exit from the bottom of the unit, are connected, the trap is full, and that the line empties into a sanitary drain (Paragraphs 6.2.2 & 6.6.4).
- If the installation has a mixing box with two dampers, adjust damper linkage (Paragraph 6.4.5.1).

9.2.2 Gas Heat (RDH and RHH) Checklist Prior to Startup

9.2.3 Mixing Box Damper (if equipped)

9.2.4 Cooling (if equipped) Checklist Prior to Startup:

9.3 Startup Warnings and Checklist

- Verify that the condensate drain(s) are connected and properly trapped (see Paragraphs 6.2 and 6.6.4).
- Verify that the refrigerant circuits are charged with the appropriate refrigerant and leak tested according to the condensing unit instructions.

CAUTION: If equipped with a cooling module with reheat, the crankcase heater must be allowed to warm up for at least 24 hours prior to startup. Disable cooling controls before turning on power to warmup crankcase heaters (see Hazard Levels, page 2).

- Close and latch the doors.
IMPORTANT: If equipped with digital controls, when turning on the main controller for the first time, be sure to push and hold the Function Key for five seconds. This should cause the first LED to light. If the LED light is lit, the controller will remain on and allow for remote control even after a power outage. If the LED light is not lit, it will be necessary on restart the controller at the unit after a power outage.
- Read and follow the preparation instructions below on power supply voltage phasing. When ready, turn on the power. Turn on the gas.

Power Supply Voltage Phasing
Because it is possible to unknowingly connect 3-phase power in such a way as to cause the blower and, if there is an optional reheat compressor, the scroll compressor to rotate in reverse, it is very important to check this on startup.

Blower Rotation: Check rotation on startup. If blower rotation is not correct, reverse by interchanging two wires on the 3-phase supply connection to the blower motor.

Check Reheat Compressor (If Equipped): Connect refrigerant pressure gauges to the suction and discharge lines of the compressor and an electric meter to the power supply.

CAUTION: Be sure to connect pressure gauges to the suction and discharge lines before system startup so that compressor rotation can be checked immediately. A scroll compressor will be destroyed if allowed to operate in the wrong direction (see Hazard Levels, page 2).

Adjust the controller so that a call for reheat exists. Immediately at startup, observe the gauges. If the suction pressure rises and discharge pressure drops, the compressor is operating in reverse and must be shut down. Turn off the power and switch the 3-phase line voltage wiring connections before restarting the unit.

IMPORTANT NOTE: If allowed to operate for several minutes in reverse, the compressor's internal protector will trip. If a compressor is repeatedly allowed to restart and run in reverse, the compressor will be permanently damaged.

- Check heat operation.

WARNINGS

For your safety, read before operating. If you do not follow these instructions exactly, a fire or explosion may result causing property damage, personal injury, or death.

- RDH and RHH: These appliances do not have a pilot. They are equipped with an ignition device which automatically lights the burner. Do not try to light the burner manually
- Before operating, smell all around the appliance area for gas. Be sure to smell next to the floor because some gas is heavier than air and will settle on the floor.

WHAT TO DO IF YOU SMELL GAS

- Do not try to light any appliance.
- Do not touch any electrical switch; do not use any phone in your building.
- Leave your 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 your fire department.

9.0 Commissioning and Startup (cont'd)

9.3 Startup Warnings and Checklist (cont'd)

- RDH and RHH: Use only your hand to turn the gas control ON/OFF knob on the gas valve. Never use tools. If the valve ON/OFF knob will not turn by hand, do not try to repair it. Call a qualified service technician. Force or attempted repair may result in a fire or explosion.
- RDH and RHH: Should overheating occur, or the gas supply fail to shut off, turn off the manual gas valve to the appliance before shutting off the electrical supply.
- Do not use this appliance if any part has been under water. Immediately call a qualified service technician to inspect the appliance and to replace any part of the control system and any gas control which has been under water.

Adjust the control so that a call for heat exists. Observe for complete sequencing.

Operating Instructions and Heating Sequence of Operation—Gas-Fired Models RDH and RHH

1. Set thermostat at lowest setting.
 2. Turn off all electric power to the appliance.
 3. This appliance is equipped with an ignition device which automatically lights the burner. Do not try to light the burner by hand. Open the door and locate the gas control (ON/OFF) knob on the gas valve.
 4. Turn the gas control knob clockwise to "OFF".
 5. Wait five (5) minutes to clear out any gas. Then smell for gas, including near the floor. **If you smell gas, STOP!** and follow the steps in the **WARNINGS** printed above or on the Operating Label on the heater. If you do not smell gas, proceed to the next step.
 6. Turn the gas control knob counterclockwise to "ON".
 7. Close and latch access door.
 8. Turn on the electric power to the heater.
 9. Set thermostat or other control to the desired setting.
- NOTE:** If the appliance does not operate, follow the instructions "To Turn Off Gas to Appliance" printed below (and on the Operating Label on the heater) and call your service technician.
10. Control calls for heat, energizing the venter motor.
 11. Venter pressure switch closes, firing the unit.
 12. Burner flame is sensed and in 30 seconds after the gas valve is energized, the blower motor is energized.
 13. If the flame is extinguished during the main burner operation, the integrated control system closes the main valve and must be reset by interrupting power to the control circuit (see lighting instructions on the heater).

TO TURN OFF GAS TO THE APPLIANCE

- 1) Set thermostat to lowest setting
- 2) If service is to be performed, turn off all electric power to the appliance.
- 3) Open the access door.
- 4) Turn the gas control knob clockwise to "OFF". Do not force.
- 5) Close and latch the door.

DANGER

The gas burner in Models RDH and RHH is designed 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 indirect-fired gas burning equipment requires a 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.

Operating and Heating Sequence—Electric Heat Model REH

Turn on power to the unit

- Outside air dampers open
- Damper end switch closes energizing the blower motor
- Unit is controlled by FX06 controller (with sensors in outside and discharge air)
- Temperature control staging is based on sensor setpoints and inputs

Heating Sequence—Model REH:

- 1) On a call for heat from the FX06 controller, the blower energizes
- 2) Supply air switch closes and the first stage of electric heat is energized
- 3) Subsequent staging is controlled by the FX06 controller (Option D12E) or by the FX06 controller with modulation control from the SCR power controller (Option D12D)

- Models RDH and RHH:** With the unit in operation, measure valve outlet gas pressure. If operated at high altitude, adjust outlet gas pressure for altitude if required.
See information and instructions in Paragraph 6.1.2 and 6.1.3.
- Models RDH and RHH:** 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.
- If the system is equipped with an optional dirty filter switch, set the switch. Follow the instructions in Paragraph 7.6.3.
- If the system is equipped with a reheat pump, check the refrigerant subcooling and superheat.

Instructions for Checking and Adjusting the Subcooling of an Isolated Circuit acceptable subcooling readings range from 14° to 18°F (7.8° to 10°C).

Measure and record temperature and pressure of the liquid line at the condenser coil outlet.

STEP 1) Record Measurements: Temperature = _____ °F (°C) and Pressure = _____ psig

STEP 2) From **Temperature/Pressure Conversion Chart, APPENDIX, page 66**, convert Measured Pressure (STEP 1) to _____ °F (°C)

STEP 3) Subtract Measured Temperature (STEP 1) from Temperature from Conversion Chart (STEP 2)
_____ °F (°C) - _____ °F (°C) = _____ °F (°C) degrees of Subcooling

Instructions for Checking and Adjusting the Superheat of an Isolated Circuit (Superheat should be in the 8° to 12°F (4.5° to 6.7°C) range.):

Measure and record temperature (insulate probe from surrounding air temperature) and pressure in the suction line at the compressor inlet.

STEP 1) Record Measurements: Temperature = _____ °F (°C) and Pressure = _____ psig

STEP 2) From **Temperature/Pressure Conversion Chart, APPENDIX, page 66**, convert Measured Pressure (STEP 1) to _____ °F (°C)

STEP 3) Subtract Measured Temperature (STEP 1) from Temperature from Conversion Table (STEP 2)
_____ °F (°C) - _____ °F (°C) = _____ °F (°C) degrees of Superheat

- Place "Literature Bag" containing Limited Warranty, this booklet, the operation manual, and any optional information including the digital control instructions in an accessible location near the heater. Follow the instructions on the envelope.
- IMPORTANT:** After at least 8 hours but no longer than a week of operation, recheck the blower wheel, all set screws, blower pulley, motor pulley, and belt tension. Make any required adjustments.

APPENDIX

STARTUP FORM

Fill out the applicable sections and keep for future reference.

Job Name:		Contractor Contact:	
Street Address		Contractor Phone:	
City, State, Zip		Model #	
Date:		Serial #	
Contractor:		Tag:	

Start-Up Checklist

NOTE: See Paragraph 9.0 for complete list.

General Checks	Reference
NOTE: Checks may not apply depending on option selection.	
<input type="checkbox"/> Inspect unit for damage.	Paragraph 3.0
<input type="checkbox"/> Verify shipping brackets are removed.	
<input type="checkbox"/> Check fuses/breakers for correct sizing. (Check rating plate for electrical requirements.)	
<input type="checkbox"/> Check clearances.	Paragraph 4.1
<input type="checkbox"/> Check all condensate connections. Fill all traps.	Paragraph 6.2 & Paragraph 6.6
<input type="checkbox"/> Verify air filters are installed.	
<input type="checkbox"/> Inspect dampers.	
<input type="checkbox"/> Tighten all screws on pulleys and fans.	Paragraph 6.9
<input type="checkbox"/> Check and tighten all electrical terminals.	
<input type="checkbox"/> Seal electrical entrances.	
<input type="checkbox"/> Check optional dirty filter switch.	Paragraph 7.6.3
<input type="checkbox"/> Check for manual resets (firestat, high gas pressure switch).	
<input type="checkbox"/> Verify all copper tubing is isolated and does not rub.	
<input type="checkbox"/> Verify crankcase heater energized 24 hrs before startup.	

Blower Assembly	
<input type="checkbox"/> Fan alignment	Motor HP: _____ Name Plate Amps: _____
<input type="checkbox"/> Belt tension	Motor Make/Amps: L1 L2 L3
<input type="checkbox"/> VAV controls	_____

Gas Heating Section	<input type="checkbox"/> LP	<input type="checkbox"/> Natural Gas
<input type="checkbox"/> Leak test gas piping		
<input type="checkbox"/> Purge air from lines		
<input type="checkbox"/> Check Inlet Gas Pressure	Maximum:	14" w.c. for both natural gas and LP
Actual Gas Inlet Pressure: _____	Minimum:	As listed on the unit rating plate
<input type="checkbox"/> Check Manifold Pressure (As listed on the rating plate.)		
Actual Manifold Gas Pressure: _____		

Electric Heating Section		
Heater Number and Amps:		
1		
2		
3		
4		
5		
6		

Reheat Compressor Data						
Outdoor Air Conditions:			Dry Bulb: _____		Wet Bulb: _____	
Circuit	L1	L2	L3	Name Plate RLA	Head Pressure PSIG	Suction Pressure PSIG
Reheat						

Wiring Diagram Option Identification

The Option Codes for these electrical options are shown on the wiring diagram. Custom diagram lists only the options ordered.

Option Code	Brief Description
AG1	Analog Heating Control, 1-Stage
AG2	Analog Heating Control, 2-Stage
AG3	Analog Heating/Makeup Air, 2-Stage unit-mounted ductstat
AG15	Analog Heating/Makeup Air, 2-Stage remote ductstat w/dial
AG16	Analog Heating/Makeup Air, same as AG15 with display
AG40	Analog Heating/Makeup Air, converts to digital for field supplied BMS
AG58	Analog Heating/Makeup Air, electronic modulation 8:1 turndown
AG60	Analog Heating/Makeup Air, same as AG3 plus 33% low fire
AG61	Analog Heating/Makeup Air, same as AG15 plus 33% low fire
AG62	Analog Heating/Makeup Air, same as AG61 with display
AK1	115/1 Supply Voltage
AK2	208/1 Supply Voltage
AK3	230/1 Supply Voltage
AK5	208/3 Supply Voltage
AK6	230/3 Supply Voltage
AK7	460/3 Supply Voltage
AK8	575/3 Supply Voltage
AL2	1/4 HP 1725 RPM open dripproof motor
AL3	1/3 HP 1725 RPM open dripproof motor
AL4	1/2 HP 1725 RPM open dripproof motor
AL5	3/4 HP 1725 RPM open dripproof motor
AL6	1 HP 1725 RPM open dripproof motor
AL7	1-1/2 HP 1725 RPM open dripproof motor
AL8	2 HP 1725 RPM open dripproof motor
AL9	3 HP 3600 RPM open dripproof motor
AL10	5HP 3600 RPM open dripproof motor
AL19	1/4 HP 1725 RPM totally enclosed motor
AL20	1/3 HP 1725 RPM totally enclosed motor
AL21	1/2 HP 1725 RPM totally enclosed motor
AL22	3/4 HP 1725 RPM totally enclosed motor
AL23	1 HP 1725 RPM totally enclosed motor
AL24	1-1/2 HP 1725 RPM totally enclosed motor
AL25	2 HP 1725 RPM totally enclosed motor
AL26	3 HP 3600 RPM totally enclosed motor
AL27	5 HP 3600 RPM totally enclosed motor
AN2	Contact, IEC
AN10	Motor Starter with Overloads
AR8	On/Off Damper (no mixing box)
AU7	Cooling Coil Cabinet with DX Coil and Reheat Pump
AUR1	Modulating Reheat
BA6	Disconnect Switch, flush-mounted, lockable, non-fusible
BC2	Convenience Outlet (requires separate power supply)
BD4	Firestat, 200°F
BD5	Firestat, 200°F (field-installed)
BE2	Low Limit, Discharge Temperature
BF14	Phase Loss/Low Voltage Protection, with AK5, AK6, AK7 only
BF15	Phase Loss/Phase Reversal Protection, 3-phase only
BG7	Plugin DPDT Relay, specified operation
BG9	Plugin DPDT Relay, Exhaust Fan Interlock
BHB1	Time Clock Card, with DG 1, 2, 5, 6
BHB2	N2 Card, with DG 1, 2, 5, 6 and D12 B, C, D, E, F, G
BHB3	LonMark Card, with DG 1, 2, 5, 6 and D12 B, C, D, E, F, G
BN2	Limit Control, High Ambient (burner cutoff)
BP2	Gas Pressure Safety Switch, High
BP3	Gas Pressure Safety Switch, Low
BP4	Gas Pressure Safety Switches, High and Low
CL1	Thermostat, 1-stage heat, 24V, 40-80°F
CL3	Thermostat, 1-stage heat, 24V, 40-90°F
CL8	Thermostat, 2-stage heat/cool, 24V, 40-90°F, non-programmable
CL33	Thermostat, 2-stage heat/cool, 24V, programmable
CL36	Thermostat, Modulating Heat/cool with 3-stage cooling

Option Code	Brief Description
CL52	Thermostat, 1-stage heat/cool, 24V, 45-88°F, programmable 5/2 day
CL67	Space Temperature Sensor/Override, with D12 B, C, D, E
CT1	Evap Cooler Fill & Drain Kit, 120/1 with AK1, AK7, AK8
CT2	Evap Cooler Fill & Drain Kit, 208/1 with AK2, AK5
CT3	Evap Cooler Fill & Drain Kit, 240/1 with AK3, AK6
CT5	Evap Cooler Freeze Protection, AquaSaver controls
CT6	Evap Cooler Freeze Protection, with CT 1, 2, or 3
D12B	Digital Control w/FX06, Neutral Air/Discharge Air Temp Control (applies to RDH with or without reheat)
D12C	Digital Control w/FX06, Space Temp Cntrl, w/Discharge Air Reset (applies to RDH with or without reheat)
D12D	Digital Control w/FX06, Neutral Air/Discharge Air Temp Control (applies to REH with SCR (modulating) heating control and 3-stage cooling with or without reheat)
D12E	Digital Control w/FX06, Recirculating Air Temp Control (applies to REH with 2-stage heating and 3-stage cooling with or without reheat) (not recommended for makeup air)
DF12	Digital Control w/FX06, Space Temperature, 2-stage heating/3-stage cooling (applies to RHH)
D12G	Digital Control w/FX06, Gas-fired electronic modulation with 8:1 turndown; 3-stage cooling; with or without reheat; discharge air temperature control
DG1	Digital Control w/FX05, Space Temperature, 2-stage heating/3-stage cooling (applies to RDH without reheat)
DG5	Digital Control w/FX05, Discharge Air Temperature, 2-stage htg/3-stage clng (applies to RDH without reheat)
ECD1	Evap Cooler AquaSaver meter water flow system
EG1	Analog Heating Control, 1-stage thermostat
EG2	Analog Heating Control, 2-stage thermostat
GE3	Damper Control, Outside air, 2-position motor
GE5	Damper Control, Outside air, 3-position motor
GE6	Damper Control, Outside & Return, 2-position motor
GE7	Damper Control, Outside & Return, 2-position mtr w/warmup
GE8	Damper Control, Outside & Return, 3-position, unit potentiometer
GE10	Damper Control, Outside & Return, 3-position, remote potentiometer
GE11	Damper Control, Outside & Return, modulating, mixed air
GE12	Damper Control, Outside & Return, modulating, mixed air w/min
GE13	Damper Control, Outside & Return, modulating, mixed air w/warmup
GE14	Damper Control, Outside & Return, mod, mixed air w/min & warmup
GE15	Damper Control, Outside & Return, modulating, building pressure
GE16	Damper Control, Outside & Return, modulating, BMS control
GE21	Damper Control, Outside & Return, modulating, enthalpy
GE22	Damper Control, Outside & Return, modulating, dual reference enthalpy
SA1	Duct Photoelectric Smoke Detector
T4 XX	Thermal Expansion Valve (R410A only)
UV2	Germicidal Lamp
VFD1	Variable Frequency Drive
VFD2	Variable Frequency Drive (requires field installation)

Pressure/Temperature Chart for Checking Superheat and Subcooling

NOTE: If equipped with a cooling coil cabinet with dehumidification, the dh circuit is factory charged with R410A refrigerant.

NOTE: Information in this chart was taken from the Temperature Pressure Chart printed in Form IC-2-04 by the Sporlan Valve Company, Washington, MO 63090

Pressure/Temperature Chart for Checking Superheat & Subcooling					
Saturation Temperature		Pressure (psig) by Refrigerant			
(°F)	(°C)	R22	R410A	R407C	R134a
0	-17.8	24.0	48.2	18.9	6.5
5	-15.0	28.3	55.0	22.8	9.1
10	-12.2	32.8	62.3	27.1	12.0
15	-9.4	37.8	70.2	31.8	15.1
20	-6.7	43.1	78.7	36.9	18.4
25	-3.9	48.8	87.8	42.4	22.1
30	-1.1	54.9	97.5	48.4	26.1
35	1.7	61.5	107.9	54.8	30.4
40	4.4	68.6	118.9	61.7	35.0
45	7.2	76.1	130.7	69.1	40.0
50	10.0	84.1	143.3	77.1	45.4
55	12.8	92.6	156.6	106.0	51.2
60	15.6	101.6	170.7	116.2	57.4
65	18.3	111.3	185.7	127.0	64.0
70	21.1	121.5	201.5	138.5	71.1
75	23.9	132.2	218.2	150.6	78.6
80	26.7	143.7	235.9	163.5	86.7
85	29.4	155.7	254.6	177.0	95.2
90	32.2	168.4	274.3	191.3	104.3
95	35.0	181.9	295.0	206.4	113.9
100	37.8	196.0	316.9	222.3	124.1
105	40.6	210.8	339.9	239.0	134.9
110	43.3	226.4	364.1	256.5	146.3
115	46.1	242.8	389.6	274.9	158.4
120	48.9	260.0	416.4	294.2	171.1
125	51.7	278.1	444.5	314.5	184.5
130	54.4	297.0	474.0	335.7	198.7
135	57.2	316.7	505.0	357.8	213.5
140	60.0	337.4	537.6	380.9	229.2
145	62.8	359.1	571.7	405.1	245.6
150	65.6	381.7	607.6	430.3	262.8
155	68.3	405.4	645.2	456.6	281.0

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INSTALLATION RECORD—to be completed by the installer

Installer:

Name _____
Company _____
Address _____

Phone _____

Distributor (company from which the unit was purchased):

Company _____
Contact _____
Address _____

Phone _____

Model _____ **Serial No.** _____ **Date of Installation** _____

SPECIFIC INSTALLATION NOTES: (i.e. Location, CFM, HP, Static Pressure, Amps, Gas Pressure, Temperature, Voltage, Adjustments, Warranty, etc.)

BUILDING OWNER OR MAINTENANCE PERSONNEL:

For service or repair

- Contact the installer listed above.
- If you need additional assistance, contact the Distributor listed above.
- For more information, contact your Factory Representative.

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