



INSTALLATION FORM RGM 409

APPLIES TO: Models RBL, RBA, RBHA

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

GENERAL

Installation should be done by a qualified agency in accordance with the instructions in this manual and in compliance with all codes and requirements of authorities having jurisdiction. The instructions in this manual apply to the following models of Reznor® blower cabinets.

Model	Standard Characteristics
RBA	Indoor/outdoor, 1500-5000 CFM Range
RBHA	Indoor/outdoor, 1500-5000 CM, specially designed to accommodate circulating air temperatures up to 300°F
RBL	Indoor/Outdoor, 5000-15000 CFM Range

These blower cabinets are engineered for use with Reznor® duct furnaces when design considerations do not permit the use of a packaged system. The cabinets are weatherized with an integral curb cap base for outdoor installation, but may also be installed indoors. All blower cabinets have standard horizontal inlet and outlet air openings equipped with duct flanges. All models are available with an optional bottom air inlet. Model RBL is available with a downturn plenum which provides a bottom outlet for supply air. Model RBL and RBA are available with other various option selections. Model RBHA is designed specially for applications that require circulating air temperatures up to 300°F. The blower motor bearings and adjustable drive in a Model

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.**

RBHA are mounted in a weatherized housing external to the airstream. Before beginning installation, review the instructions in this booklet and become familiar with the particular style of blower cabinet being installed.

1. Uncrating

Immediately upon uncrating the unit, check for any damage that may have been incurred during shipment. If damage is found, file a claim with the transporting agency. This unit was inspected at the factory immediately prior to crating.

Check the blower cabinet plate to be sure that the electrical characteristics of the blower cabinet are compatible with the installation site.

Be sure all shipped-separate options for the installation are available. Check to see if there are field installed options that need to be assembled prior to installation. Field-installed options could include a roof curb, an outside air hood, an evaporative cooling module, a cooling module fill and drain kit, and/or a disconnect switch.

The "Owner's Envelope" shipped inside the blower cabinet includes instructions and warranty information.

2. Dimensions

Figure 1A - Model RBL (Indoor/Outdoor, 5000 - 15000 CFM Range)

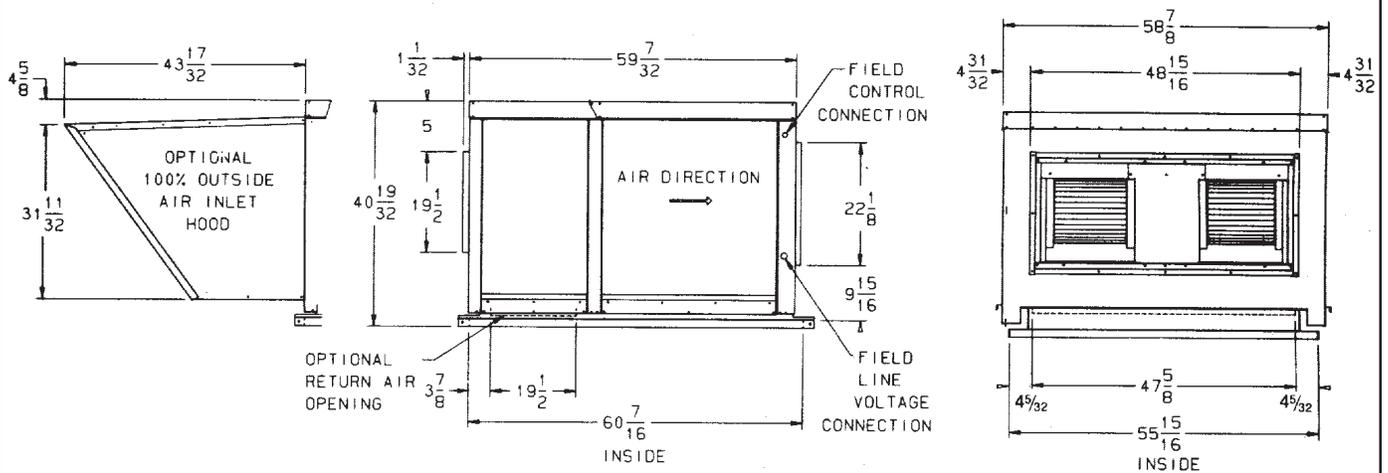
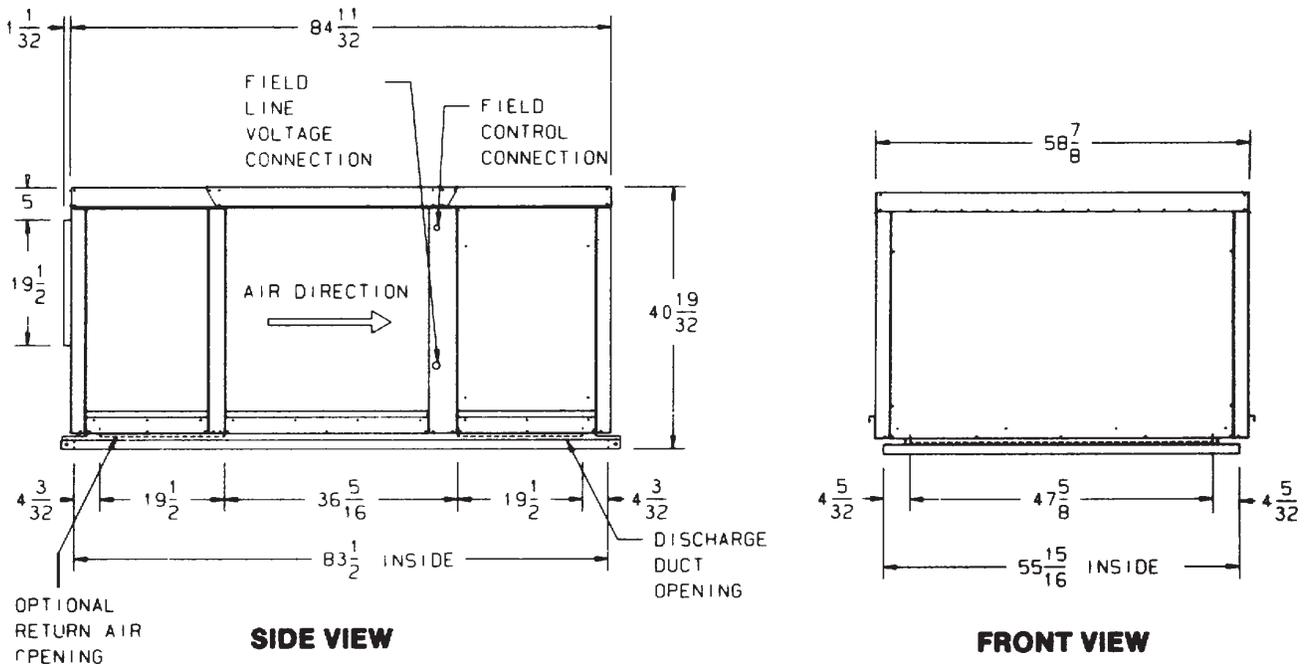


Figure 1B - Model RBL with Optional Downturn Plenum Cabinet



Model RBL Air Openings (with duct flange)	Dimensions (inches)
Standard Horizontal Inlet Air Opening	19-1/2 x 47-5/8
Optional Return Air Inlet (Bottom) Air Opening	19-1/2 x 47-5/8
Standard Horizontal Discharge Air Opening	22-1/8 x 48-15/16
Optional Discharge Air Opening with Downturn	19-1/2 x 47-5/8

Figure 2 - Model RBA (Indoor/Outdoor, 1500-5000 CFM Range)

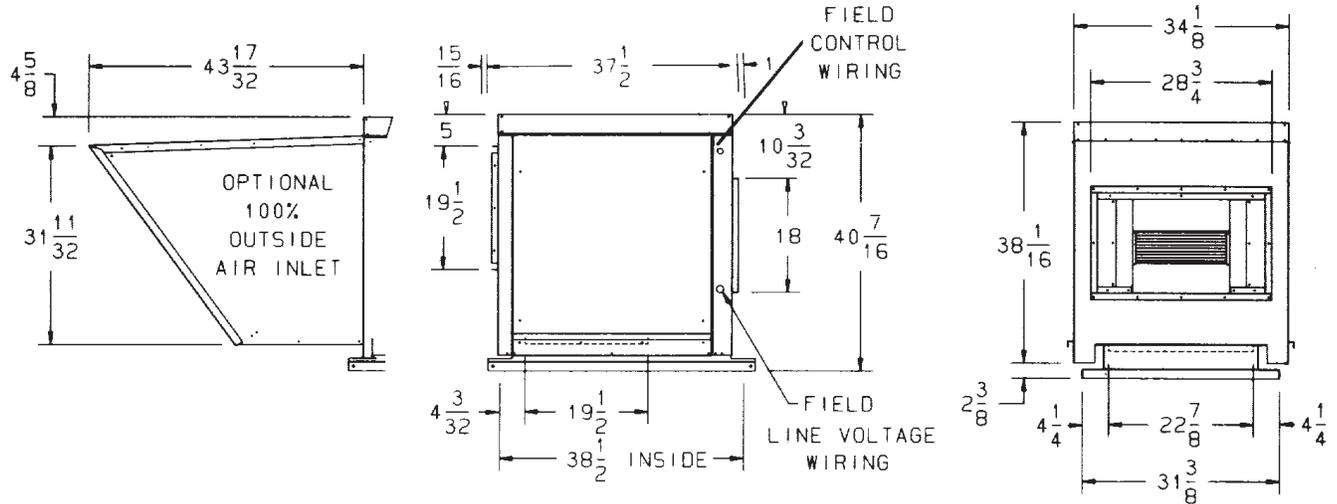
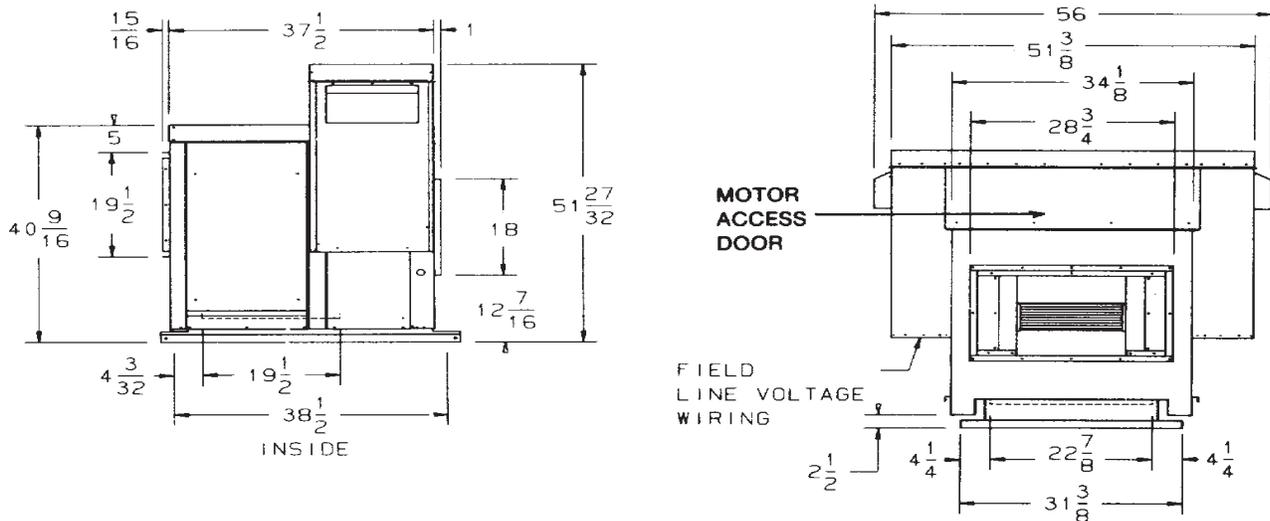


Figure 3 - Model RBHA (Indoor/Outdoor, 1500-5000 CFM Range, specially designed to accommodate circulating air temperatures up to 300°F)



Model RBA and RBHA

Air Openings (with duct flange)

Dimensions (inches)

Standard Horizontal Inlet Air Opening	19-1/2 x 22-7/8
Optional Return Air Inlet (Bottom) Air Opening	19-1/2 x 22-7/8
Standard Horizontal Discharge Air Opening	18 x 28-3/4

3. Suspending/Mounting

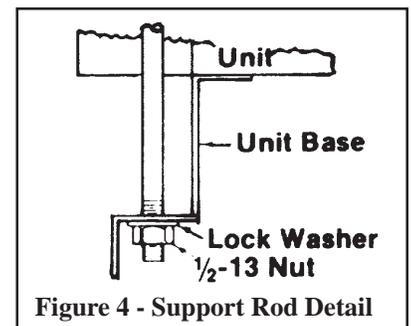
Before installing the blower cabinet, check the supporting structure to verify that it has sufficient load-carrying capacity to support the weight.

Model	New Weight (lbs)
RBA	212
RBHA	265
RBL	488

Depending on the building structure and its use, determine whether or not measures should be taken to reduce the effect of blower vibration and/or noise. Determining the need for and installing vibration isolation is the responsibility of the installer.

Suspending Indoor Cabinets

Blower cabinets may be suspended using field-furnished rod hangers. Insert 1/2" rods into the holes at the corners of the curb cap. Attach rods to the unit as illustrated in Figure 4.



3. Suspending/Mounting (cont'd)

Suspending Indoor Cabinets (cont'd)

Attach rods to the building structure. See Figure 5. Proper suspension of this cabinet is the responsibility of the installer.

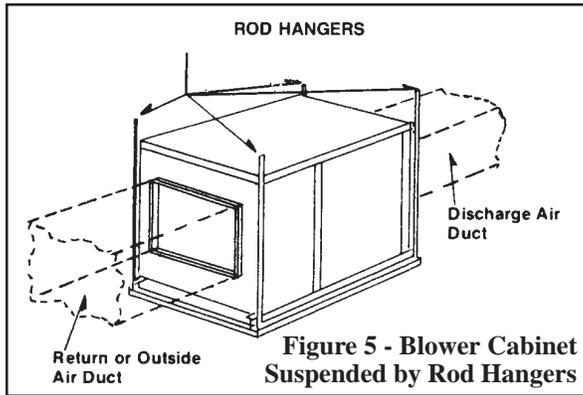


Figure 5 - Blower Cabinet Suspended by Rod Hangers

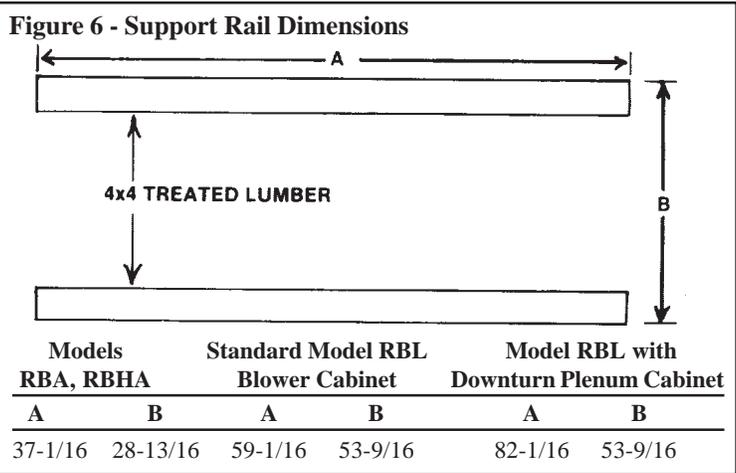
Mounting Outdoor Cabinets

Blower cabinets are equipped with a load bearing curb cap which forms an integral part of the unit. This curb cap is welded at all joints and has a "skirt" which fits over a roof curb to provide a weatherproof installation. Use the lifting lugs provided.

The blower cabinet may be mounted on an optional roof curb, a field-supplied roof curb, or field supplied supports. If the system has a downturn plenum and/or a bottom return air opening, a roof curb is recommended to provide a weatherproof installation as well as more workable clearances for ductwork. The blower cabinet curb cap is not designed to be placed directly on the roof surface. When positioning rooftop equipment, it is recommended that the air inlet does not face into the prevailing wind.

Mounting on Field Supplied Supports (without a roof curb) - Prior to installation, be sure that the method of support is in agreement with all local building codes and is suited to the climate. If considering this type of installation in snow areas, it is recommended that the 4x4 wooden rails underneath the unit be on cross-support structure at least 12" higher than the roof surface. Whether the supports are being mounted directly on the roof or being placed "up" on additional structure, the horizontal length of the unit should be supported by two 4x4 treated wooden rails. Cut the rails to the appropriate length (Dimension "A") in Figure 6. (NOTE: Although dimensions are included for units with a downturn plenum cabinet, it is strongly recommended that roof curb be used on an installation with a downturn plenum cabinet and/or a bottom return air duct.) Space the 4x4 wooden support rails (See "B" Dimension in Figure 6) so that the curb cap "skirt" will fit over the edge of the boards with the rail setting inside the horizontal length of the curb cap.

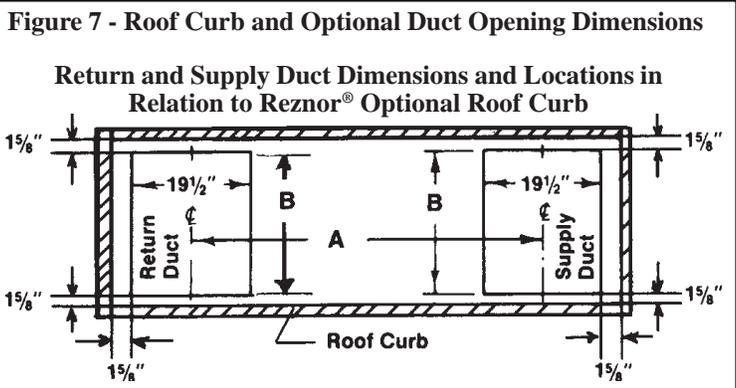
If the rails are being laid directly on the roof, position them as shown in Figure 6. Set the unit on the rails. NOTE: It is recommended that there be a minimum of 14" between the bottom of the inlet air hood (see Paragraph 11) and the mounting surface.



If the treated wooden rails are not placed directly on the roof surface, cross supports should be placed underneath the rails at the ends of the cabinet. The field-supplied, weather-resistant cross-support structure must be adequate for the weight of the unit and run the entire width of the cabinet supporting the 4x4 wooden rails.

Mounting on a Roof Curb - Whether using an optional roof curb available for the cabinet or a field-supplied curb, the curb must be square and level and a minimum height of 14". The top surface of the roof curb must be caulked with 1/4 x 1-1/4 sealant tape or 1/4" beads of suitable sealant. The cabinet must be sealed to the curb to prevent water leakage into the curb area due to windblown rain and capillary action. Except for the curb assembly details, the information and requirements in this section apply to both an optional curb and a field-supplied curb. See Figure 8 and curb installation instructions.

Bottom Duct Connections - Both the optional return air opening and the opening in the downturn plenum have duct flanges. Duct opening sizes and spacing in relation to an optional roof curb are shown in Figure 7.



1-5/8" is measurement from duct opening to inside edge of roof curb.

Dimensions	A	B
Standard RBL Cabinet	NA	47-5/8"
RBL with Downturn Plenum	55-13/16"	47-5/8"
RBA and RBHA Cabinet	N/A	22-7/8"

NOTE: Cut duct openings 1" larger than the duct size for installation clearance.

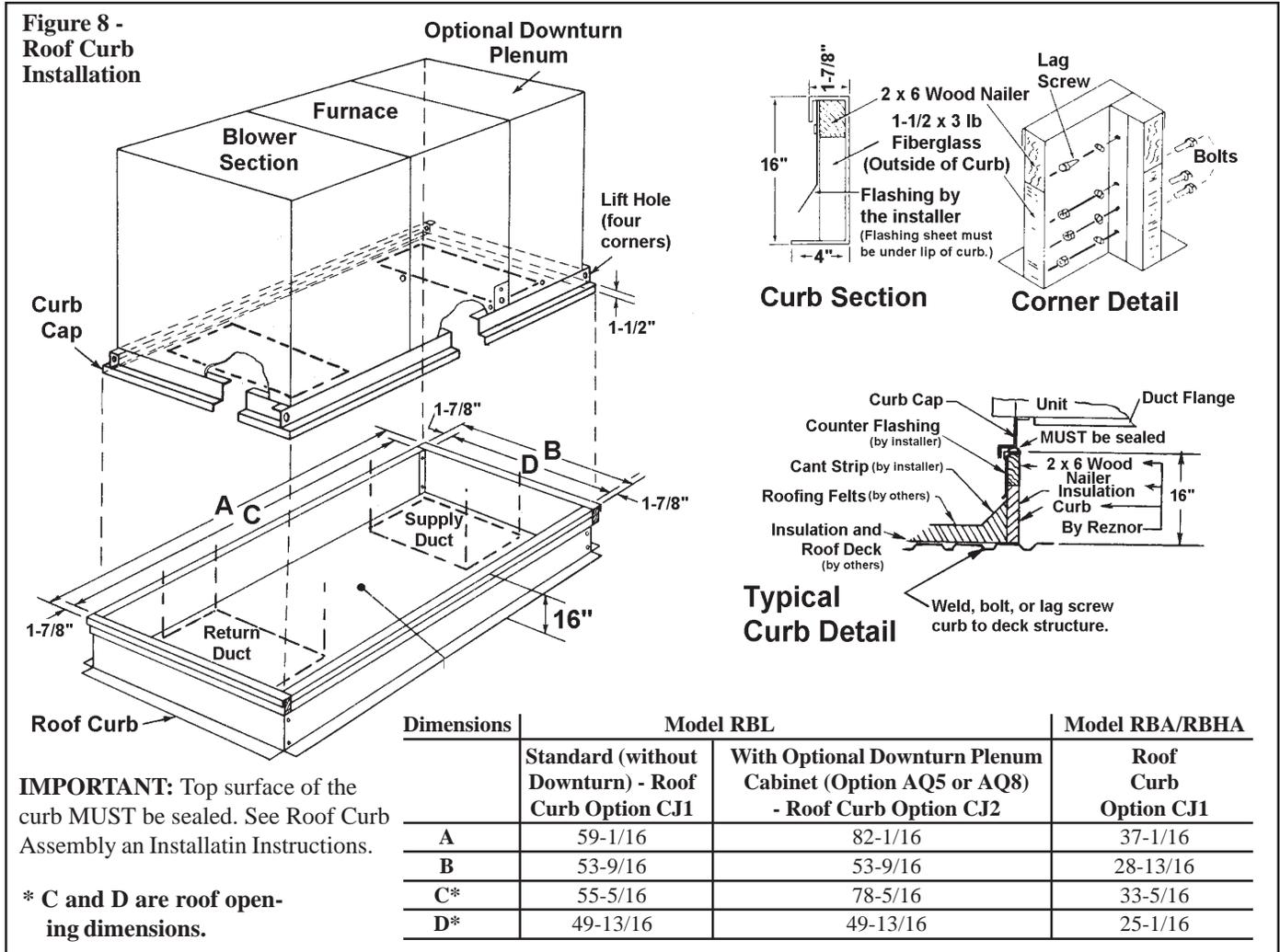
Reznor® Optional Roof Curb Installation Instructions (See Figure 8)

Curbs are shipped unassembled. Field assembly and mounting on the roof are the responsibility of the installer. Hardware to assemble the corners is supplied. Before installing the roof curb, verify that the size is correct for the cabinet being installed.

1. Position the curb cross rails and curb side rails as shown in Figure 8. Fasten curbing pieces at all corners with bolts and lag screws as shown in the Corner Detail illustration.
2. Check the assembly for squareness. Adjust the roof opening so that the diagonal measurements are equal within a tolerance of $\pm 1/8"$.
3. Level the roof curb. To ensure a good weathertight seal between the integral 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 (See Figure 8).
5. Before placing the unit on the curb, apply furnished $1/4 \times 1-1/4"$ foam sealant tape to the top surface of the curb, making good butt joint at the corners. The cabinet must be sealed to the curb to prevent water leakage into the curb area due to blown rain and capillary action.



4. Duct Connections

NOTES: For systems with a downturn cabinet, the type of duct installation to be used depends in part on the type of construction of the roof (whether wood joist, steel bar joist, steel truss, precast concrete) and the ceiling (whether hung, flush, etc.).

For cabinets without a downturn, a minimum horizontal duct run of 24 inches is recommended before turns or branches are made in the duct system, to reduce losses at the furnace outlet. Make certain return air ducting and grills have a free area equal to the return duct size connection. See Paragraph 2 for duct opening dimensions.

Suggestions for Installing Ducts

A. The type of duct installation to be used depends in part on the type of construction of the roof (whether wood joist, steel bar joist, steel truss, precast concrete) and the ceiling (whether hung, flush, etc.). Duct connections should be mechanical.

- B. Rectangular duct should be constructed of not lighter than No. 26 U.S. gauge galvanized iron or No. 24 B & S gauge aluminum.
- C. All duct sections 24 inches or wider, and over 48 inches in length, should be cross broken on top and bottom and should have standing seams or angle-iron braces. Joints should be S and drive strip, or locked.
- D. 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 inch of insulation.
- E. Insulate all exposed warm air ducts passing through an unheated space with at least 1/2 inch thickness of insulation.
- F. For optional bottom openings, insert ducts from below roof deck through roof opening into cabinet. Form 1" flanges, fold over, and fasten with sheet metal screws. Gain access by removing side panels from blower and downturn plenum sections.

4. Duct Connections (cont'd)

G. Duct Supports -- Suspend all ducts securely from adjacent buildings members. Do not support ducts from unit duct connections.

H. Duct Sizing -- Proper sizing of the warm air ductwork is necessary to ensure a satisfactory heating installation. The recognized authority for such information is the Air Conditioning Contractors Association, 1228 17th Street N.W., Washington, D.C. 20036. A manual covering duct sizing in detail may be purchased directly from them.

CAUTION: An external duct system static pressure not within the limits shown on the rating plate, or improper motor pulley or belt adjustment, may overload the motor. See Hazard Levels, page 1.

5. Electrical Supply and Connections

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

Check the plate on the cabinet for the supply voltage and current requirements. A separate line voltage supply with fused disconnect switch should be run directly from the main electrical panel, making connection to leads in the junction box. All external wiring must be within approved conduit and have a minimum temperature rise of 60°C. Conduit from the disconnect switch must be run so as not to interfere with the service panels of the cabinet. The unit must be electrically grounded in accordance with the national Electrical Code, ANSI/NFPA No. 70 (latest edition or CSA Standard C22.1 when installed, if an external electrical source is used.

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. See Hazard Levels, page 1.

If the installation includes field-installed options that require electrical connections, consult the instruction sheet and wiring diagram supplied in the option package. Optional shipped-separate controls could include system switches, potentiometer, a pressure null switch, or a combination of these controls. Install these according to the manufacturer's instructions packed with the cabinet.

Check the wiring diagram and literature supplied with the cabinet for operation of factory-installed optional controls. See Figure 9 for location of electrical connections and available standard and optional controls.

Disconnect Switch

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

The disconnect switch may be fusible or non-fusible. When installing, be careful that the conduit and switch housing are clear of cabinet panels. Allow at least four feet of service room between the switch and removable panels.

Control Wiring

Total Wire Length	Distance from unit to Control	Minimum Recommended Wire Size
150 ft	75 ft	#18 gauge
250 ft	125 ft	#16 gauge
350 ft	175 ft	#14 gauge

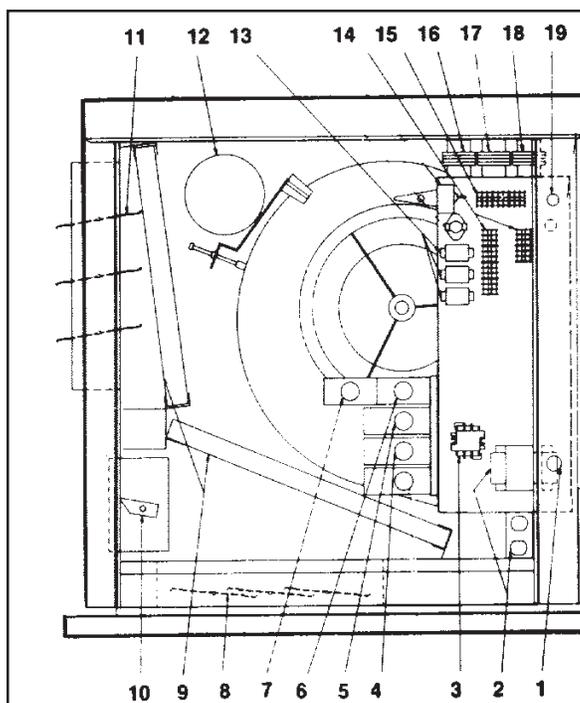
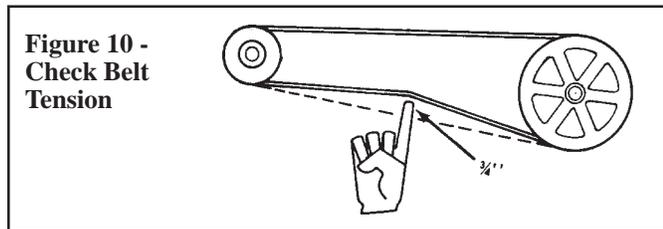


Figure 9 - Location of Electrical Connections and Standard and Optional Controls (Illustration shows a Model RBA; controls are in same location in RBL cabinet.)

1. Line Voltage Connection (field)
2. Optional Convenience Outlet and Convenience Outlet Transformer
3. Blower Motor Contactor or Starter
4. Optional Outside Air or Return Air Controller
5. Optional Mixed Air Controller
6. Optional Potentiometer
7. Optional Potentiometer
8. Optional Return Air Dampers
9. Optional Filters
10. Optional Two-Position or Modulating Damper Motor
11. Optional Outside Air Dampers
12. Blower Motor (Drive on opposite Side) - Available in Open, TEFC, Energy Efficient or Two-Speed
13. Optional Control Relays (as required - 8 maximum)
14. Low Voltage Terminal Strip
15. Line Voltage Terminal Strip
16. Control Transformer
17. Control Transformer (as required)
18. Optional Damper Motor Transformer
19. Low Voltage Connection (field)

6. Blowers, Belts and Drives

Check belt tension. Proper belt tension is important to the long life of the belt and motor. A loose belt will cause wear and slippage. Too much tension will cause excessive motor and blower bearing wear. Adjust the belt tension by turning the adjusting screw on the motor base until the belt can be depressed 3/4". (See Figure 10.) After correct tension is achieved, re-tighten the locknut on the adjustment screw. Be sure that the belt is aligned in the pulleys.



Adjusting Blower Speed

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

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

1. Loosen belt tension and remove the belt.
2. Loosen the set screw on the side of the pulley away from the motor.
3. **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%.
4. Tighten the set screw on the flat portion of the pulley shaft.
5. 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 10.) Re-tighten the lock nut on the adjusting screw. Be sure that the belts are aligned in the pulley grooves properly and are not angled from pulley to pulley.
6. Check the motor amps with an amp meter. The maximum motor amp rating on the motor nameplate must not be exceeded.

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

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

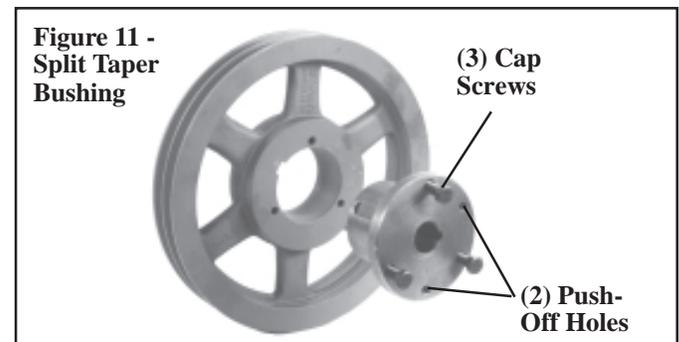
CAUTION: Sheaves should not be adjusted in either direction to the point where movable and stationary flanges are in contact.

4. After completing adjustment, tighten both locking screws in the outer locking ring (loosened in Step 2.).
5. Replace belts and move motor away from the driven shaft to apply sufficient belt tension to prevent slippage. (See Figure 10.) Proper belt tension is important to the long life of the belt and motor. A loose belt will cause wear and slippage. Too much tension will cause excessive motor and blower bearing wear. Be sure that the belts are aligned in the pulley grooves and are not angled from pulley to pulley.
6. Check motor amps with an amp meter. The maximum motor amp rating on the nameplate must not be exceeded.

Blower Pulley

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

- a) Notice that there are three cap screws in the bushing and two holes without screws, called push-off holes. (See Figure 11.)
- b) Remove the three cap screws.



- c) Put two of the cap screws into the two push-off holes. Tighten these two screws evenly until the pulley is loosened.
- d) Pulley may now be removed from the shaft.

Blower Bearings

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

The blower bearings on systems equipped with 10-20 HP motor are pillow block ball bearings and are equipped with a grease fitting. (NOTE: Units manufactured prior to 1/91 with a 10 HP motor may have permanently lubricated ball bearings.) These bearings should be lubricated twice a year with a high temperature, moisture-resistant grease. (Type NLGI-1 or -2 standard grease is recommended.) Be sure to clean the grease fitting before adding grease. Add grease with a handgun until a slight bead of grease forms at the seal. Be careful not to unseat the seal by overlubricating. NOTE: If unusual environmental conditions exist (temperatures below 32°F or above 200°F; moisture; or contaminants), more frequent lubrication is required.

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

Blower Rotation

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

7. Motors

Use an amp meter to check motor amps. The chart on the right lists full load amps for various HP and voltages. Amps may be adjusted downward by reducing blower RPM or by increasing duct system static pressure.

This chart can be used for sizing line wiring but should not be interpreted as the exact amps. See the motor rating plate for specific amps.

Full Load Amps - Blower Motors (Open)							
(Single Speed- Average Values)							
HP	115V 1PH	208V 1PH	230V 1PH	208V 3PH	230V 3PH	460V 3PH	575V 3PH
1/4	5.1	2.1	2.3	1.1	1.4	.75	N/A
1/3	5.3	3.2	2.8	1.4	1.6	.80	N/A
1/2	8.8	5.1	4.4	2.3	2.5	1.0	N/A
3/4	11.0	6.3	5.5	2.9	2.6	1.3	N/A
1	13.0	7.5	6.5	3.7	3.2	1.6	1.1
1-1/2	15.0	8.3	7.5	5.6	5.0	2.7	1.6
2	20.4	10.0	10.2	7.0	6.6	3.5	2.1
3		14.0	12.4	9.0	8.6	4.3	3.6
5		28.0	26.0	13.4	13.2	6.6	5.4
7-1/2		35.0	32.0	22.5	19.4	9.7	7.8
10		42.0	38.0	30.0	26.0	13.0	10.4
15				43.1	39.0	19.5	16.0
20				58.7	53.0	26.5	21.2

8. Filters - Models RBL and RBA Only

Filter racks and filters are optional equipment. Filters may be either 1" or 2" disposable, 1" or 2" permanent aluminum, or 1" or 2" pleated disposable.

Filter Pressure Drops (" w.c.)

Model	CFM	with Disposable Filters		with Permanent Aluminium Filters		with Disposable Pleated Filters	
		1"	2"	1"	2"	1"	2"
RBL	5000	.03	.04	.06	.08	.15	.10
	6000	.05	.06	.08	.12	.21	.14
	7000	.03	.08	.11	.16	.28	.19
	8000	.08	.10	.15	.21	.37	.25
	9000	.11	.13	.19	.26	.46	.31
	10000	N/A	N/A	.23	.33	.57	.39
	11000	N/A	N/A	.28	.40	.69	.47
	12000	N/A	N/A	.34	.48	.82	.56
	13000	N/A	N/A	.40	.56	N/A	N/A
	14000	N/A	N/A	.46	.65	N/A	N/A
RBA	1500	.01	.01	.04	.06	.07	.05
	2000	.01	.02	.06	.08	.13	.09
	2500	.02	.03	.10	.14	.20	.14
	3000	.03	.04	.14	.20	.34	.23
	3500	.04	.05	.20	.28	.40	.27
	4000	.05	.07	.26	.36	.52	.36
	4500	N/A	N/A	.32	.45	.66	.45
	5000	N/A	N/A	.39	.54	.82	.56

Disposable Filter Range -- 0 to 400 FPM

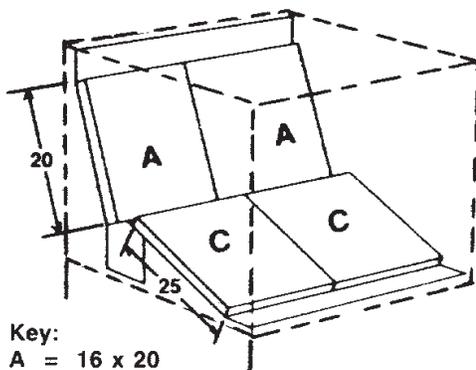
Pleated Filter Range -- 0 to 500 FPM

Permanent Aluminum Filter Range -- 0 to 600 FPM

Type of Filter		Average Efficiency	Average Arrestance
Disposable	1"	Less than 20%	75%
	2"	Less than 20%	80%
Permanent	1"	Less than 20%	53% to 60%
	2"	Less than 20%	64% to 67%
Pleated Disposable	1"	30% to 35%	90% to 93%
	2"	30% to 35%	90% to 93%

Filter Arrangement — Model RBA

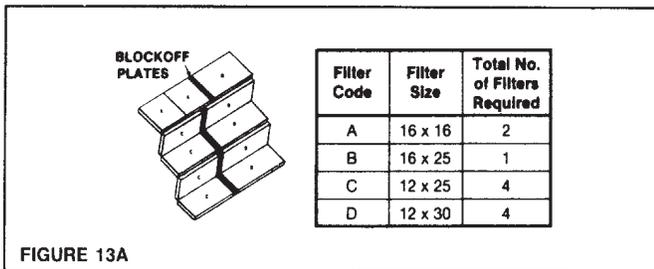
FIGURE 12 — Model RBA Filter Arrangement



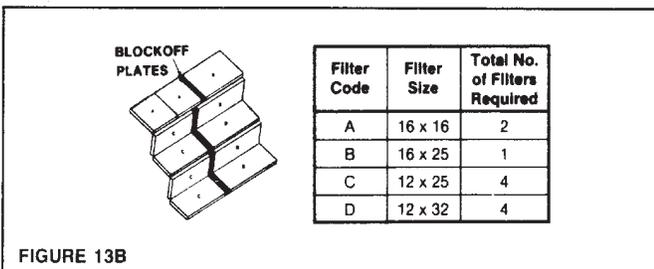
Key:
A = 16 x 20
C = 16 x 25

FILTER ARRANGEMENTS — Model RBL manufactured beginning 9/91.

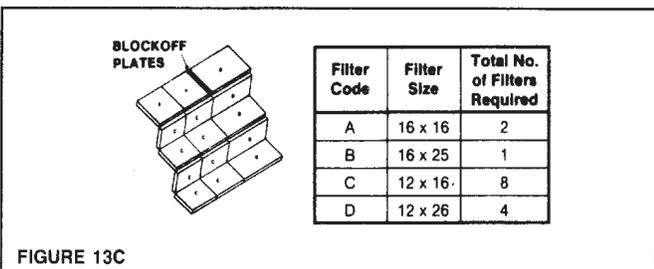
Filter Arrangements for 1" and 2" Disposable Filters (Options AW2 and AW7)



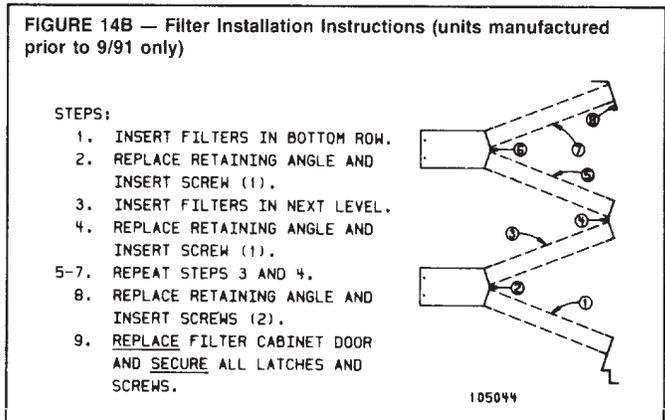
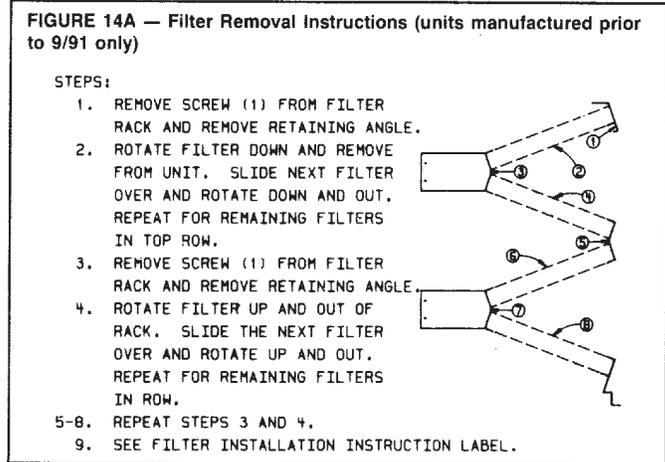
Filter Arrangements for 1" and 2" Disposable Pleated Filters (Options AW10 and AW11)



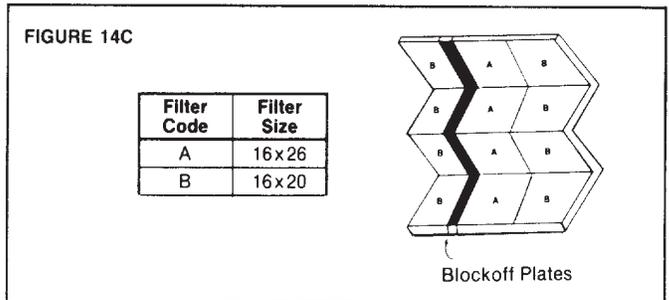
Filter Arrangements for 1" and 2" Permanent Filters (Options AW8 and AW9)



FILTER REMOVAL AND INSTALLATION INSTRUCTIONS — Applies to Model RBL manufactured prior to 9/91.



Filter arrangements on units manufactured prior to 9/91 are the same for all types of filters. See illustration in Figure 14C.



9. Check/Test/Start-Up - All Models

Be certain electrical supply matches voltage rating on unit (see rating plate).

- Check all field wiring against wiring diagram. Be sure wire gauges are as required for the electrical load. This information appears on the wiring diagram.
- Be certain that electrical entries are sealed against the weather.
- See that fuses or circuit breakers are in place and sized correctly.
- Check blower pulley and motor pulley to be sure they are secure to shafts. Check belt tension; see Paragraph 6.
- If the unit is equipped with outside air and return air dampers, adjust the damper linkage. See Paragraph 12.
- Close all panels tightly.
- Return this book to the "Owner's Envelope" for future reference.

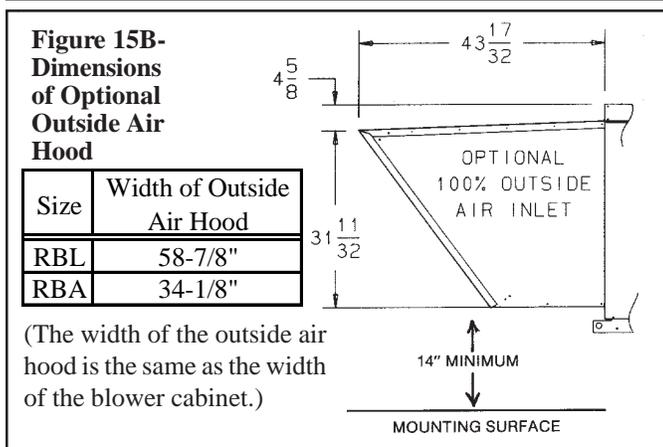
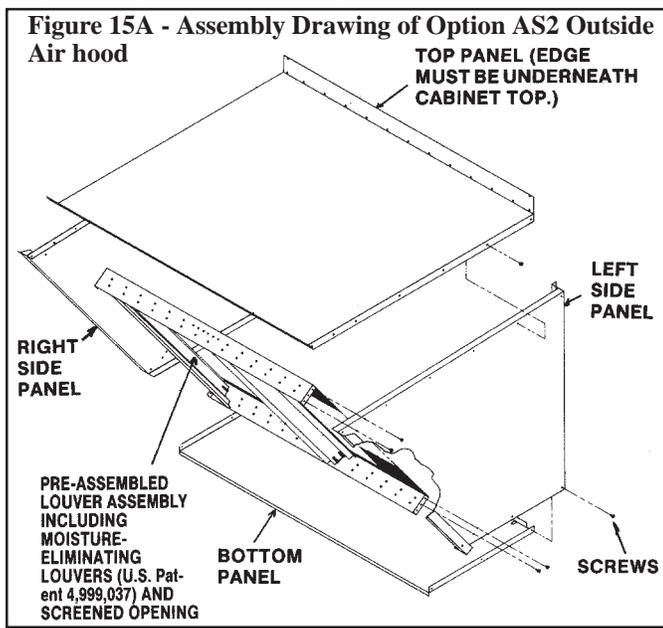
Optional Equipment

10. 100% Outside Air Hood (outdoor models)

Outside air hood (Option AS2) is a weatherized, screened hood designed to be field assembled and installed around the horizontal inlet air opening of the blower cabinet. The air hood includes a louver assembly (U.S. Patent 4,999,037) designed to help eliminate moisture from the inlet air. Complete installation instructions are packaged with the air hood option.

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.

NOTE: Either a manufacturer designed optional air inlet hood as shown in Paragraph 10 or an evaporative cooling module as shown in Paragraph 13 is required to ensure complete weather resistance.



Installation Instructions - 100% Outside Air Hood

Refer to Figure 15A. All screw ends except those across the bottom should be inside the air hood.

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

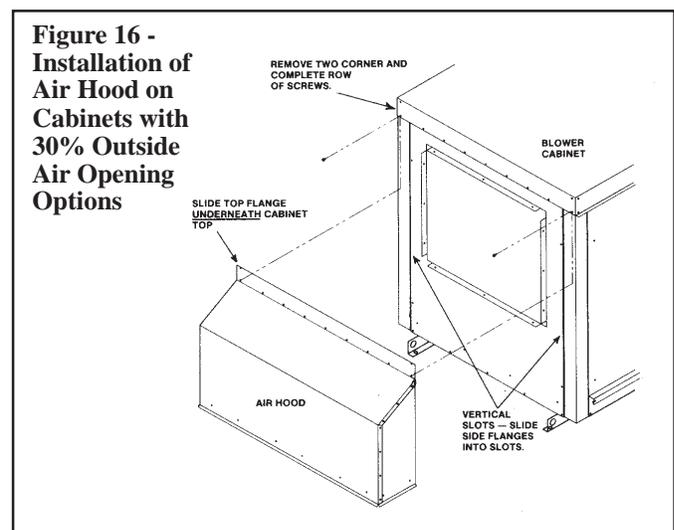
- 1. Top Panel** -- On the air inlet side of the blower cabinet, remove the factory-installed screws attaching the blower cabinet top. Slide the air hood top panel underneath the edge of the blower cabinet top. **The edge of the air hood top panel must be between the blower cabinet top and the end panel.** Reinsert all of the sheet metal screws.
- 2. Side Panels** -- Slide the air hood right side panel into the groove in the blower cabinet end panel. Be sure that the side panel is underneath and to the inside of the air hood top panel. Attach to the blower cabinet and the air hood top using the required number of sheet metal screws. Repeat with the left side panel.
- 3. Bottom Panel** -- Position the air hood bottom panel so that it is to the **inside** of the two side panels and **above** the factory-installed support angle. Attach to the side panels. If the bottom panel does not rest tightly against the support angle, follow these instructions to adjust the position of the support angle:
 - a) Slightly loosen (do not remove the screws).
 - b) Slide the support angle up so that it is against the bottom panel.
 - c) Tighten the screws.
 Attach the support angle to the air hood bottom panel. The bottom panel of the air hood and the support angle should be tight together; do not draw with the sheet metal screws.
- 4. Louver Assembly** -- With the intake screen toward the inside of the hood, position the pre-assembled vertical louver assembly in the inlet opening of the air hood. Using the remaining sheet metal screws, attach the louver assembly to the air hood side panels using the holes provided.

11. Screened Air Hood for 30% Outside Air Opening, Part of Inlet Air Options AR6 and AR7 (Outdoor models)

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

Installation Instructions - 30% Outside Air Hood

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



12. Optional Dampers and Controls (See Wiring Diagram supplied with unit.)

Figure 17A - Location of Controls for 30% Outside Air Hood and Damper Options (AR6 or AR7) - Outdoor Models only (See Paragraph 11 above)

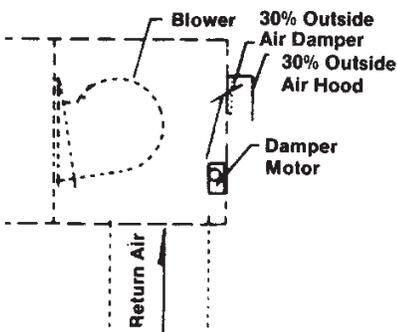
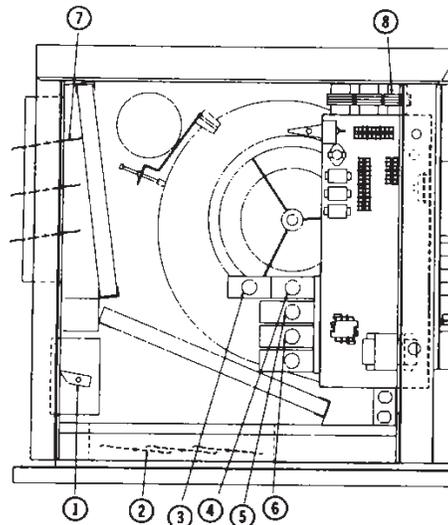


Figure 17B - Control Locations for 100% Outside Air and 100% Return Air Damper Options



1. Damper Motor
2. Return Air Damper
3. Potentiometer
4. Potentiometer
5. Mixed Air Controller
6. Warm-up Control
7. Outside Air Damper
8. Damper Motor Transformer

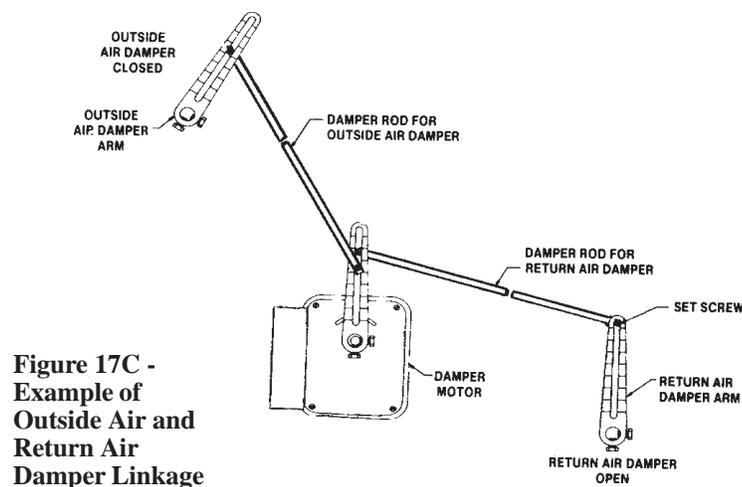


Figure 17C - Example of Outside Air and Return Air Damper Linkage

Damper Linkage -- When units are equipped with dampers, the dampers are closed during shipment. When there are **both** return air and outside air dampers, **the return damper linkage must be adjusted prior to use.**

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

NOTE: These illustrations are intended to show location only of various air control accessories and do not represent suggested combinations of accessories.

Pressure Null Switch (Used to control Outside Air Dampers in Inlet Air Option AR23)

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

Description and Application (See Figure 18, page 12) - The pressure null switch is a diaphragm operated differential pressure switch used in makeup air applications to control building pressure. It maintains a selected positive or negative pressure setpoint by changing the amount of outside air being introduced to the building through the modulating outside air dampers. As more pressure is required in the building, the pressure null switch activates the damper motor driving the outside air damper towards the full open position and the recirculated air damper towards the closed position. Conversely, as less pressure is required, the switch drives the dampers in the opposite direction.

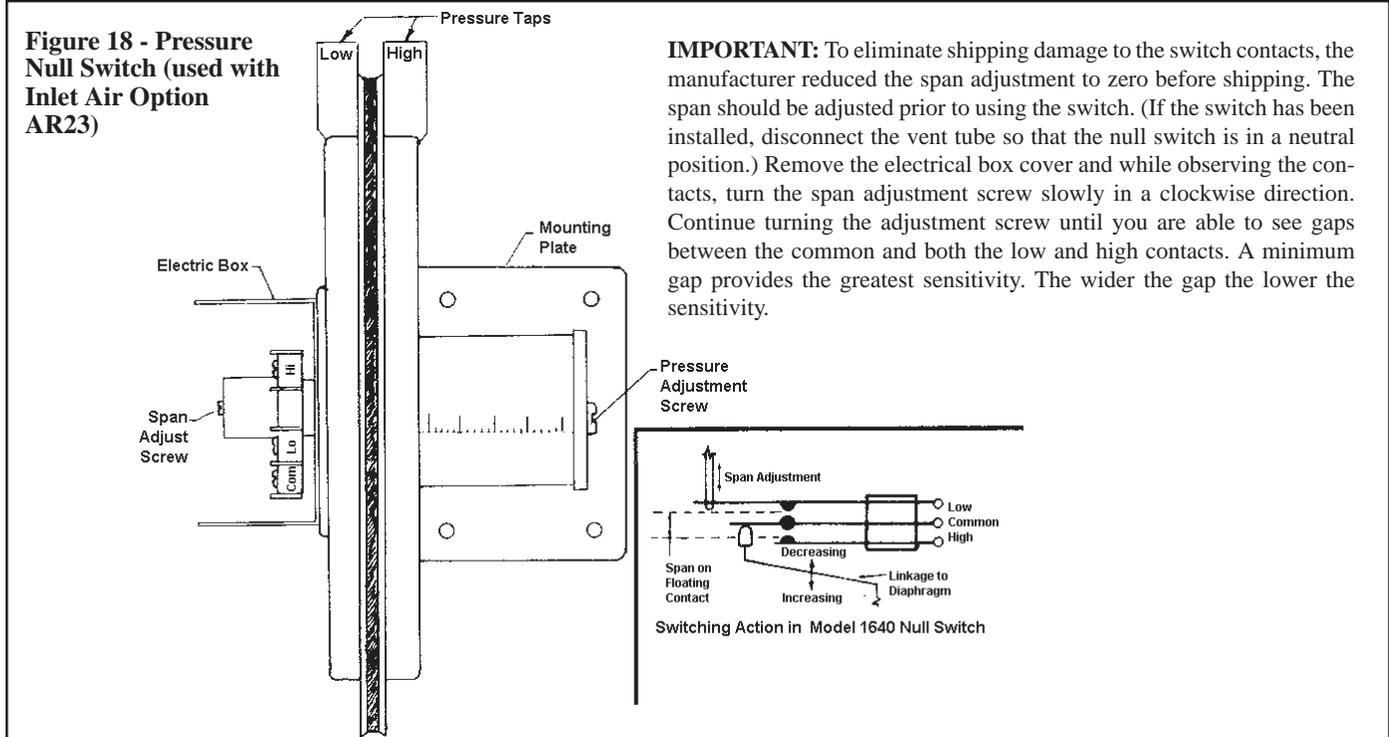
Installation Instructions for Pressure Null Switch

1. Select an indoor location free from excessive vibration where oil or water will not drip onto the switch and where ambient temperature will be within a range of -30°F (dry air) to 110°F.

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

Optional Equipment (cont'd)

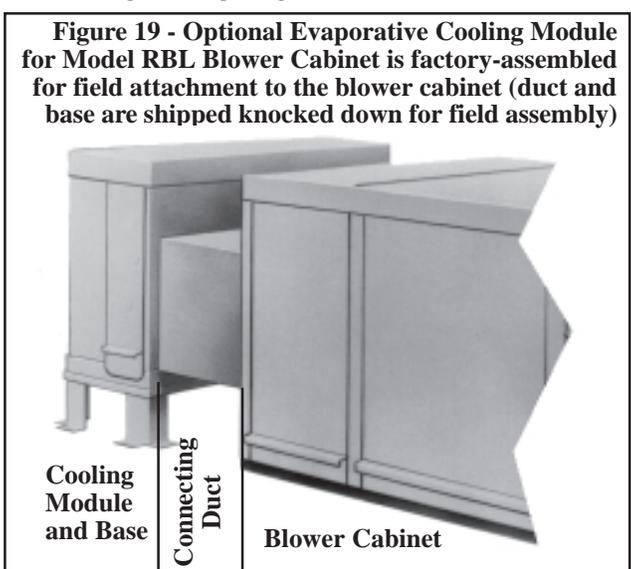
12. Optional Dampers and Controls (cont'd)



13. Optional Evaporative Cooling Module

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

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



Included in the cooling module installation booklet is a preparation checklist. All items in that checklist should be consulted prior

to beginning installation of the optional evaporative cooling module. Four of those items are listed below.

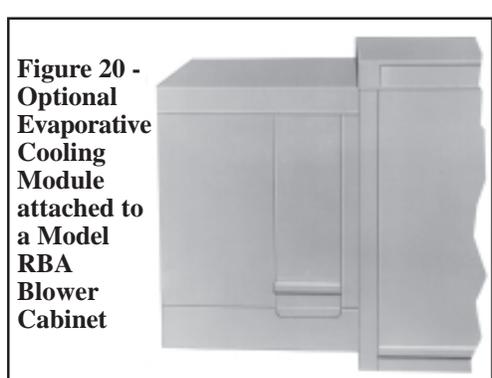
- Make certain the roof or platform is capable of handling the additional load of a full cooling module reservoir.

Weights of Optional Evaporative Cooling Module with Wet Media and a Full Reservoir for Model RBL

Module with 6" rigid cellulose media (Option AS3)	349 lbs
Module with 12" rigid cellulose media (Option AS4)	431 lbs
Module with 6" rigid glass fiber media (Option AS5)	420 lbs
Module with 12" rigid glass fiber media (Option AS6)	514 lbs

- Make certain the surface is level and free of debris where cooling module will be mounted.
- Do not mount directly on soft tar roofs where the legs could sink and tilt the cooler. Provide a weather-resistant, solid wood or metal base under cooling module support legs.
- Make certain that there will be adequate clearance between the bottom of the reservoir and the roof (or platform) to allow for drain and overflow pipe connections.

Model RBA - The evaporative cooling module for Model RBA is a factory installed cooling module as illustrated in Figure 20. Follow the instructions in this booklet for making water and drain connections and maintenance.



Media -- Both the factory-installed and the field-installed evaporative cooling modules are equipped with high efficiency pad media of either 6" or 12" rigid cellulose (**Option AS3 or AS4**) or 6" or 12" rigid glass fiber (**Option AS5 or AS6**). Six-inch media provides 68% efficiency; 12" media provides 90% efficiency. Efficiency values are stated at maximum allowable CFM without the addition of a moisture elimination pad with an inlet dry bulb temperature of 95°F and inlet wet bulb temperature of 65°F. The evaporative cooling efficiency is a function of inlet temperature and of face velocity through the media. The stated cooling efficiency will rise with the decrease of CFM and the increase of inlet temperature. Moisture elimination pad (Option ASA1) may be used on all units but is required on Model RBA with over 3200 CFM and Model RBL with over 11,200 CFM (950 FPM). Moisture elimination pads are factory installed in factory-installed cooling modules (Model RBA) and are shipped separately for field installation in evaporative cooling modules for RBL models. Installation instructions are included.

Supply and Drain Water Connections

Float Valve (Figure 21) - In a module with pump and float controls, a float valve maintains the appropriate water level in the reservoir.

Use a field-supplied 1/4" diameter tubing with a compression nut and tubing ferrule to connect the fresh water supply to the inlet of the float valve. See Figure 21. Place nut and ferrule over tubing and insert tubing into the float valve stem. Tighten nut securely.

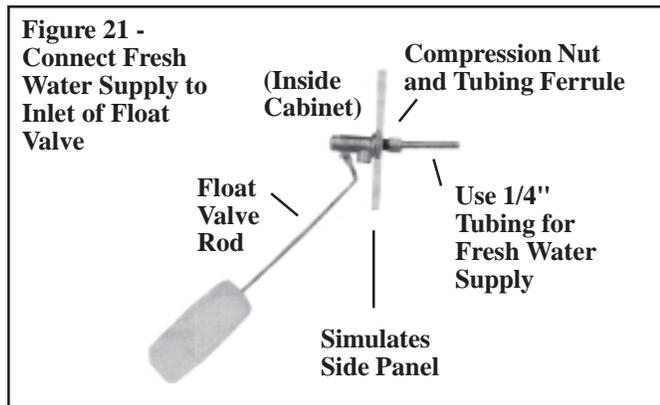


Figure 21 - Connect Fresh Water Supply to Inlet of Float Valve

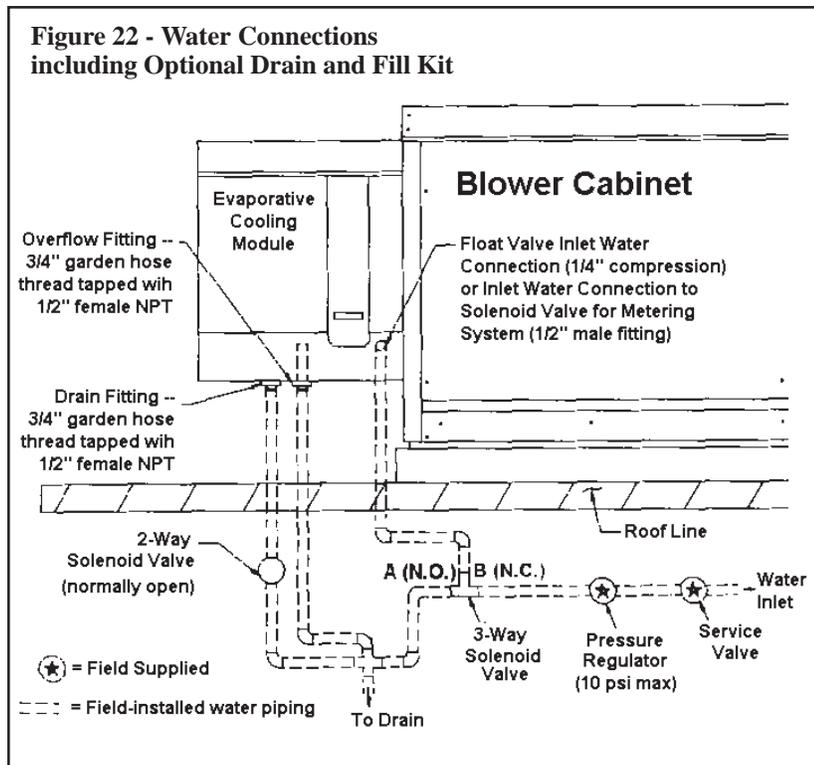


Figure 22 - Water Connections including Optional Drain and Fill Kit

AquaSaver® Timed Metering Control System - If the cooling module is equipped with an optional timed metering system, connect a 1/2" water line to the fitting on the side of the cooling module.

Due to various water pressures and installation conditions, the water supply line may bang abruptly when the solenoid valve in the AquaSaver system closes. This banging can be minimized by installing an optional water hammer arrestor in the supply line. When installing an optional water hammer arrestor, select an indoor (above 32°F) location, 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.

All Cooling Modules - A manual water shutoff valve should be installed upstream of the cooling module inlet, at a convenient non-freezing location, to allow the water supply to be turned on and off. 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.

WARNING: Water reservoir (outdoor systems) must be drained and pump motor turned off when outside temperature falls below 32°F. Pump must never be operated without water in the reservoir. See Hazard Levels, page 1.

All 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 a 3/4" garden hose thread and is tapped with a 1/2" female pipe thread for iron pipe.

An optional automatic fill and drain kit (Option CT) is available that will automatically release supply water to the cooling module when a call for cooling is made and drain all water from the reservoir when the cooling switch is deactivated or a cooling thermostat is satisfied. See Figure 22. Follow the instructions below if installing an optional fill and drain kit. Consult wiring diagram for electrical connections.

Instructions for Installing Optional Fill & Drain Kit

NOTE: Follow instructions included in the valve packages for attaching valves to the water line only. The remainder of the installation instructions with the valves does not apply to this type of application.

Water Line Connections (See Figure 22):

Supply (3-Way Valve) Connections - Connect the water supply line to "B" (normally closed). Connect the water drain line to "A" (normally open). Connect the middle outlet to supply the water to the cooling module reservoir.

Drain (2-Way Valve) Connections - Connect the drain pipe from the reservoir to "A". Connect the outlet side to "B" and connect into drain lines from the cooling reservoir and the supply valve.

Electrical Connections (requires black and white 14-gauge wire) - Refer to Wiring Diagram on the furnace:

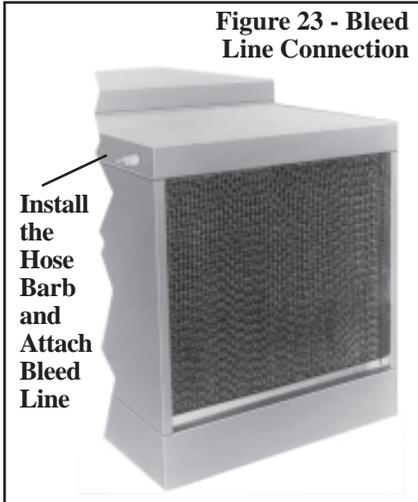
WARNING: Risk of electrical shock. Disconnect the power.

1. Refer to the wiring diagram for terminal connections. (NOTE: If kit is not ordered with the system, connections will not be shown on the diagram. Terminal connections are specific to each system. Contact the factory for terminal connections. Be prepared to provide all model information.)
2. Run field-supplied black wire from the electrical compartment (terminal on the wiring diagram) of the evaporative cooling module and connect to the black wire on both the 3-way and the 2-way valve.
3. Run field-supplied white wire from the electrical compartment (terminal on the wiring diagram) of the evaporative cooling module and connect to the white wire on both the 3-way and the 2-way valve.

13. Optional Evaporative Cooling Module (cont'd)

Bleed Line Connection (Does not apply to module with optional timed metering system.)

-- Shipped in the evaporative cooling module bottom pan, find a 1/4" I.D. x 1/2" N.P.T. nylon bleed line fitting (hose barb). Thread the fitting into the female adapter located opposite the pump/inlet side of the water distribution line. The hose barb will protrude from the side of the cabinet (See Figure 23). Attach a 1/4" I.D. hose to the barb and run the hose to the nearest drain.



Discharging a quantity of water by "bleed off" will limit 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 to occur. The minerals accumulate on the media, in the water lines, on the pump, and in the reservoir. Adequate bleed off is important to maintaining an efficiently operating evaporative cooling system.

Filling & Adjusting the Water Level in the Reservoir

Float and Pump Control System

-- Turn on the water supply. Check for good flow. When the float valve (Figure 21) shuts off the water supply, measure the water depth. The depth of the water should be approximately 3". It may be necessary to adjust the float valve to obtain the proper water level or to free the float valve from obstructions. To adjust the float valve, simply bend the rod upward to raise the water level or downward to decrease the water level.

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. Follow the instructions to adjust water flow. After the first week of operation, the water flow should be re-checked because the soaker hose weave will tighten slightly affecting the water flow.

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.

Float and Pump Control System

-- Using the ball valve, located in the middle of the length of hose running from the pump to the distribution line inlet (Figure 24), 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 min-

Figure 24 - Disconnect the power and use ball valve to adjust water flow



utes 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.

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.

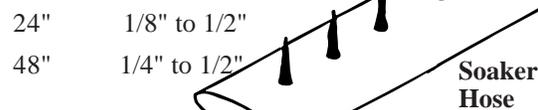
AquaSaver® Timed Metering Control System -- NOTE: Water flow and pad wetting time should be adjusted at maximum air flow and wet bulb depression to assure complete wetting of the media at the extreme operating conditions.

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 soaker hose (See Figure 25A) consistently along the entire hose 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 24, adjust the water flow depending on the pad height. See Figure 25A.

Figure 25A - Adjust Water Flow with the Ball Valve in Figure 24

Pad Height from Soaker Hose	A = Water rise
24"	1/8" to 1/2"
48"	1/4" to 1/2"



2) AquaSaver® Timer Adjustment - At any given temperature, the media pads should completely wet from top to bottom during the ON cycle. If the ON time is less than 45 seconds or greater than 90 seconds at 80°F, adjust the timer. Remove the junction box cover to access the timer adjustment screw (See Figure 25B).

Through the use of a bimetallic strip, the timer is temperature sensitive and automatically increases the ON time approximately one second for each 1°F rise above the 80° factory setting. The ON time will equal the setting for 80°F plus a second for each degree above 80.

Let the unit cycle a few times to verify that the water flow is correct and the soaker hose is operating properly to wet the media pads completely from top to bottom during the ON cycle.

Figure 25B - Junction Box with AquaSaver® Controls



- To **increase** the ON time, turn the adjustment screw **clockwise**; one complete turn will increase ON cycle by 12 to 14 seconds.
- To **decrease** the ON time, turn the adjustment screw **counterclockwise**; one complete turn will decrease ON cycle by 12 to 14

All Modules -- Check the reservoir for any water leaks. The reservoir was water tested, but if any small leaks are present, drain the reservoir and apply a waterproof silicone sealer around corners and welds.

Evaporative Cooling Module Maintenance

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

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

Select the correct replacement part numbers and order replacement media pads from your distributor. Follow the instructions below. Replace pads as shown in Figure 27.

Instructions for Replacing Evaporative Cooling Media

1. Remove the three sheet metal screws that hold the top pad retainer in place. Release the top pad retainer from the cooling module.
2. Remove the three sheet metal screws that hold the bottom pad retainer in place. Release bottom pad retainer from the cooling module.
3. Disengage inlet screen retainers from the sides of the media.
4. Disengage inlet screen from media pads and remove from cooling module.
5. Slide all media pads horizontally away from the cooling module until clear of bottom reservoir pan. Dispose of properly.
6. Replace media by sliding media pads over both support rails until back stop is encountered. Media **must** be placed as shown in Figure 27.
7. Center screen on the incoming air side of the media.
8. Replace the two side screen retainers by fitting them between the side of the media pad and the side of the cooling module. The retainers should fit snugly, pinching the screen against the media pads.
9. Replace the bottom pad retainer by securing the retainer between the pad and the reservoir pan. Fasten with the three sheet metal screws removed in Step 2.
10. Replace the top pad retainer by securing the retainer between the pad and top of the cooling module. Fasten with the three sheet metal screws removed in Step 1.

Figure 26 - Removal and Replacement of Evaporative Cooling Module Media

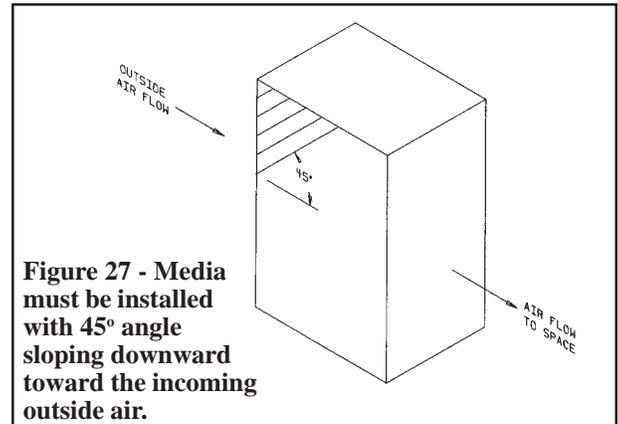
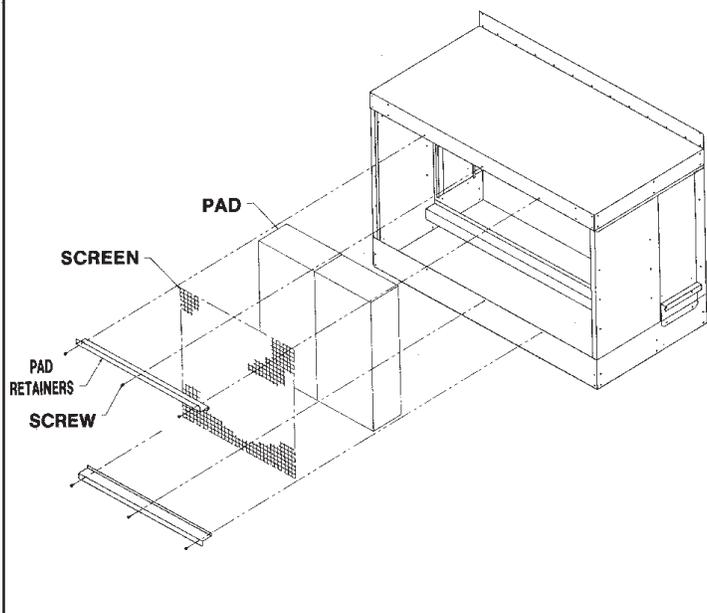


Figure 27 - Media must be installed with 45° angle sloping downward toward the incoming outside air.

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

Water Feed Line and PVC Distribution Piping -- Annually, the water supply line and PVC water distribution pipe should be flushed of debris and contaminants.

1. Remove the media pads following the media replacement instructions.
2. Remove the water feed line from the downstream side of the ball valve and unscrew the water bleed line barbed hose fitting.
3. Force a fresh water supply through the water inlet hose and thoroughly flush the distribution pipe.
4. Reassemble being careful to install media with air flow direction as shown in Figure 27.

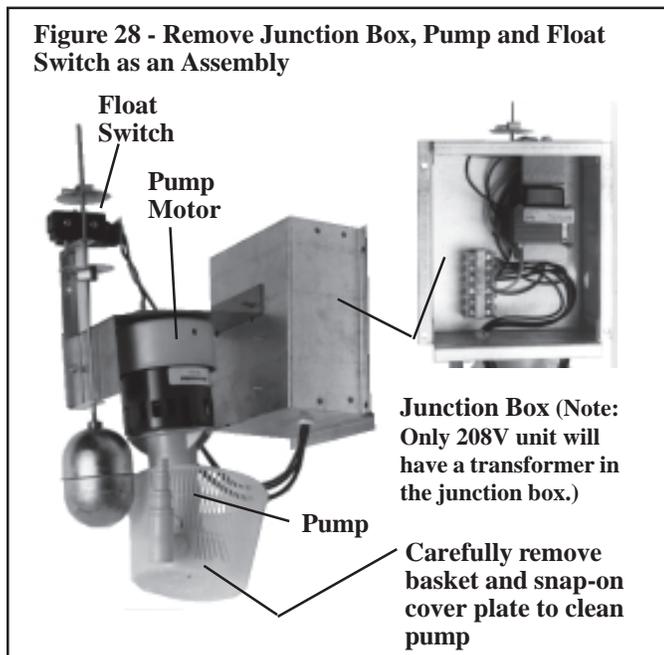
Water Pump and Inlet Basket Screen -- Annually, the pump and inlet basket screen should be removed, disassembled, and cleaned.

1. Disconnect the power supply to the unit.

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

2. Remove the service panel and the junction box door. Disconnect the two-line voltage power supply wires from the terminal block inside the junction box.
3. Disconnect the water feed line hose from the upstream side of the ball valve.
4. Unscrew the four sheet metal screws holding the junction box to the cooling module. Remove the junction box-pump-float switch assembly (See Figure 28, page 16).
5. Dislodge the inlet basket screen from the pump and clean any buildup of debris and dirt. Carefully remove the base cover plate from the bottom of the pump. Using a mild soap solution, wash all deposits from the inside of the pump and remove all debris from the impeller.
6. Reassemble the pump. Replace the parts in exact reverse order, being careful that everything is returned to its proper position.

13. Optional Evaporative Cooling Module (cont'd)



Troubleshooting Evaporative Cooling Module

WARNING: Disconnect the power before servicing the cooling module. Failure to do so can cause electrical shock, personal injury or death.

Problem	Probable Cause	Remedy
Pump does not run. Unit is calling for cooling (i.e. console control switch is in cooling position) and reservoir is full.	<ol style="list-style-type: none"> 1. Electrical connections 2. Electric float switch on pump 3. Dirty pump 4. Defective pump 	<ol style="list-style-type: none"> 1. Verify all electrical connections. See Wiring Diagram. 2. Check position of the actuators on the electric float switch. 3. Clean pump. See Figure 28. 4. Replace pump.
Required water level (3") not maintained	<ol style="list-style-type: none"> 1. Float valve 2. Optional drain and fill valves 3. Incorrect overflow pipe nipple - should be 3-1/2" 4. Drain leaking 	<ol style="list-style-type: none"> 1. Adjust float valve. See Filling and Adjusting Water Level. 2. Check valve for proper operation. See Figure 22. 3. Replace pipe nipple. 4. Tighten drain plug.
Water running off of media pads	<ol style="list-style-type: none"> 1. Excessive water flow 2. Media pads need cleaned or replaced. 	<ol style="list-style-type: none"> 1. Adjust ball valve in distribution line. See Adjust Water Flow. 2. Clean or replace media pads. See Evaporative Cooling Module Maintenance.
Water not distributing evenly	<ol style="list-style-type: none"> 1. Distribution line clogged 2. Holes in distribution line turned 3. Incorrect voltage to pump 	<ol style="list-style-type: none"> 1. Flush distribution line. See Evap Cooling Module Maintenance. 2. Check position of distribution line. Holes should be spraying upward. If not positioned with holes toward top, adjust position of PVC line. 3. Check voltage at pump terminal in cooling module junction box.
Media pads becoming clogged and discolored quickly (scale/salt deposits) and/or rapid deterioration of the float switch	<ol style="list-style-type: none"> 1. Bleed off line clogged 2. Excessive water flow 3. Inadequate bleed off 	<ol style="list-style-type: none"> 1. Clean bleed line. See Figure 23. 2. Reduce flow by adjusting ball valve in distribution line. See Filling and Adjusting Water Level. 3. A uniform build-up of minerals on the entering air face of the media indicates insufficient bleed off. Increase the rate until the mineral deposits dissipate.
Water blow off from media pads	<ol style="list-style-type: none"> 1. Media pads installed incorrectly 2. Requires moisture elimination pad (over 600 FPM) 3. Water level not 3 inches 	<ol style="list-style-type: none"> 1. Install media pads correctly. See Evap Cooling Module Maintenance. 2. Install moisture elimination pad. Consult factory. 3. See second problem listed above (Required water level)

Thomas & Betts