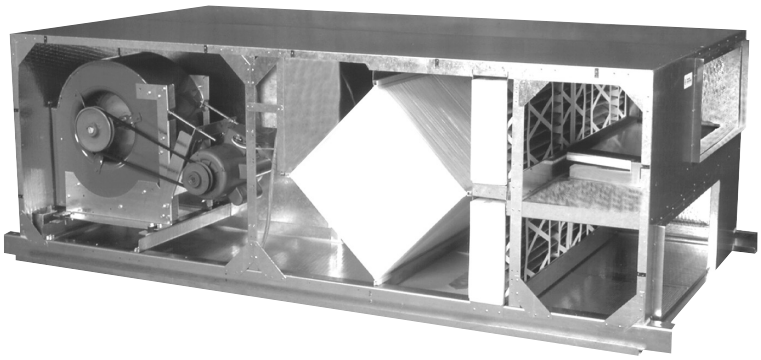
VENMAR®
Cost-effective ventilation for people

Heat Recovery Ventilator

HRV2000i/e

Installation, Operation and Maintenance Instructions



HRV2000i

HRV2000e

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Safety Considerations

Hazards may exist within this equipment because it contains electrical and powerful moving components. Only qualified service personnel should install or service this equipment. Untrained personnel can perform basic maintenance such as maintaining filters. Observe precautions marked in literature and on labels attached to the unit. Follow all safety codes.

WARNING

Disconnect the main power switches to the unit before performing service or maintenance. Electric shock can cause personal injury.

General Information

HRV2000i

This indoor ventilator is intended for installation within a suspended ceiling space or mechanical room.

HRV2000e

This rooftop ventilator is intended for installation on a rooftop with a factory supplied or field supplied roofcurb.

These ventilators provide 100% outdoor air ventilation and heat recovery between the exhaust and supply airstreams. The Heat Recovery Ventilator (HRV) uses a flat plate heat exchanger which may be more suited to some applications requiring stringent cross contamination control.

These models are effective in cold climates and use various types of frost control or frost prevention to ensure operation when outside temperatures are extremely low.

See Appendix A for more detailed equipment data.

Installation

Check Equipment

Move the unit to its installation location and remove packaging. See Appendix A for unit weight and specifications.

Inspection

Inspect the equipment, exterior and interior, for damage. Ensure that there is no damage to the internal components such as fans, motors, dampers, flat plate heat exchangers, insulation, drains and structures. File a claim with the shipping company if the unit is damaged.

System Requirements

Consult National Electrical Code and local building codes for special installation requirements. Note additional requirements in Appendix A and in the Start Up Section.

The unit should be installed to allow easy access for maintenance. Appendix C and D show minimum clearance requirements between front access and any obstruction to allow for removal of components (fans, filters, flat plate heat exchangers). The front of the unit is defined in relation to the inlet ports and outlet ports on the unit. Port location and overall dimensions shown in Appendix C and D.

In cold climates with -5°F [-20°C] design, the unit must be mounted in a dry area (not exceeding 30% RH) to avoid water condensation on the cabinet during winter operation. Alternatively, accommodation must be made for condensation on the cabinet exterior. Heat recovery models should be mounted in a heated space to prevent drain lines from freezing. Do not mount units in an area where exposure to hot chimneys, electrical panels or other hazards will occur.

A mounting location close to an exterior wall will minimize the length of insulated ductwork required. Appendix B illustrates ductwork through exterior partitions. These should be separated by a minimum of 8 feet [2438mm] to avoid outside cross contamination.

Mount Unit

Indoor Installation - Ceiling Mount (HRV2000i)

The unit must be mounted level and may be hung with threaded rod (field supplied) through the protruding frame at the base of the unit. Hole centers are shown in the dimension drawings in Appendix C. Do not block access to panels as indicated above. Rubber or seismic vibration isolation may be required in some regions (field supplied and specified).

Outdoor Installation - Surface Mount (HRV2000e)

The unit may be secured to a metal or wooden curb fastened to the floor. If securing the unit to the curb is required, fasteners and isolators may be used at the mounting points on the frame protruding from the unit (all mounting hardware is field supplied and specified).

Space is required beneath the heat recovery model to make drain connections.

Roofcurb

Care must be exercised in locating the roof opening. The HVAC system should cross enough roof supports to safely distribute the weight of the system over the roof. For HRV2000e air duct sizes see Appendix E.

Remove curb from packaging. Assemble and install accessory roofcurb in accordance with instructions shipped with the curb. See Appendix E for curb dimensions and typical installation. Install cant strip, flashing, and roof felt as per Appendix E.

IMPORTANT

The gasketing of the unit to the roofcurb is critical for a watertight seal. Install the gasket with the roofcurb as shown in Appendix E. An improperly applied gasket can result in water leaks and poor unit performance.

Ductwork must be attached to the roofcurb, not to the unit.

The roofcurb for the HRV2000e should be level to ensure proper drainage. Use the unit frame as a reference for leveling. Consult with local authorities or your local building code for minimal intake hood height from the roof. This code will determine the height of the roofcurb. See Appendix D for unit dimensions.

Ductwork Information

Make Duct Connections

Locations, sizes and labels of the ports for the units are shown in Appendix C and D.

A section of straight duct approximately 36" [914mm] long (10" x 14" [254 x 356mm]), minimum 3 duct diameter long must be used immediately after the fans to achieve good fan performance. Transitions (field supplied) may be required to make connection with ductwork that is properly sized for minimum noise and pressure loss. Both duct connections to outside must be insulated to avoid condensation and heat loss (HRV2000i). A continuous integral vapor barrier must be used over the duct insulation.

Airflow rate balancing dampers are recommended for both supply and exhaust ducts to allow for adjustment of airflows.

Flexible connectors should be installed close to the unit in the duct leading to occupied spaces to minimize noise transmission. All ports have 1" [25mm] flanges to facilitate duct connection. Ensure that the fasteners used to make duct connection do not interfere with fans or dampers in the unit.

Electric preheat, if used as frost prevention (HRV2000i), must be installed in the outdoor air duct at a minimum distance from the unit port of 24" [610mm].

Field Fabricate Ductwork

On vertical discharge units, secure all ducts to the roofcurb and building structure. **Do not secure ductwork to the unit.** For duct size requirements, see Appendix D or E. Insulate and weatherproof all external ductwork, joints and roof openings with counter flashing and mastic in accordance with applicable codes. Ductwork running through roof decks must comply with local fire codes. Ducts passing through unconditioned spaces must be insulated, sealed and covered with a vapor barrier. Flexible connectors should be installed close to the unit in the duct leading to occupied spaces to minimize noise transmission.

Drain Connections

Drain fittings are packaged inside the unit, fastened to the drain pan. **These require field installation and need to be sealed with silicone to prevent leaking.** Four connections must be made at the bottom of the unit, which will accept four 3/4" [19mm] NPT couplers (field supplied). Drain fittings provided with the unit will accept a 3/4" [19mm] NPT coupler.

A water trap must be provided in the drain line to prevent sewer gases from entering the unit. Ensure adequate slope to the drain line to allow for good drainage (1/4"/foot [6mm/305mm] recommended minimum). See Appendix G.

Drain lines must be field fabricated and supplied. Do not solder connections when they are attached to the unit because high temperatures may damage the plastic fittings on the unit.

NOTE: Consult local building code for plumbing requirements in your area.

Rigging and Placing The Unit

Location

Maintain clearance around and above the unit to provide proper airflow and service access. The fresh air intake hood must be positioned away from sources of contamination such as chimneys, exhaust vents, etc.

Positioning the fresh air intake opposite to the prevailing winds will reduce entry of snow or moisture during periods of high winds.

IMPORTANT

The hoods for this unit (HRV2000e) are not installed from the factory and must be installed on site. They can be installed prior to rigging the unit or after the unit is installed. Hoods are shipped on top of the unit. When rigging the unit, make sure that the hoods are secured and are not damaged by the spreader bars. See Appendix F for installing the hoods.

Spreader bars are required to **prevent damage to roof flange**. Rollers may be used to move the unit across a roof. Lifting holes are provided in the base rails as shown in Appendix F. For weights and overall dimensions see Appendix C and D.

Install Hoods

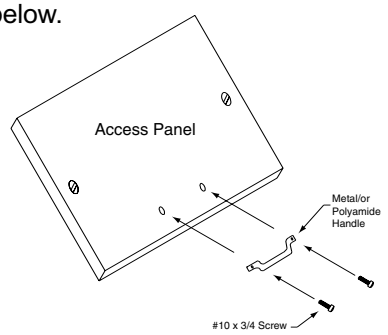
Intake and exhaust hoods for these models are shipped separately from the unit. To install hoods, see Appendix F. A quick connect for the damper motor is provided to connect to the main body of the unit. Make sure that all the screws are secured to maintain proper support and to keep the seals watertight.

Install Access Panel Handles

IMPORTANT

Securing door fasteners too tightly has negative effects on the door gasket and should be avoided.

Handles for access panels are provided but must be installed on site. Handles and fasteners are secured inside the unit. Remove from packaging and install according to the drawing below.

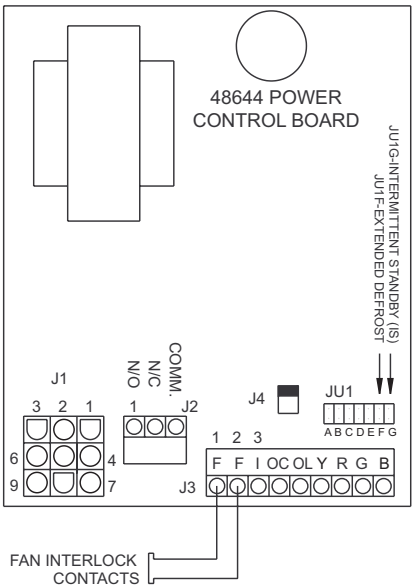


Access Panel

Systems Integration

Forced Air System

When the heat recovery ventilator is installed in conjunction with a forced-air system, the air handler and the network of ducts associated with it are used to distribute fresh air inside the building. If this type of system is used, the main fan of the air handler must operate continuously when the unit is on. **Fan Interlock** (see diagram below) can be connected in the unit control box to the integrated control board terminals **J3-1** and **J3-2**. The controller makes relay contact between these terminals when the unit is operating.



Fan Interlock

Fresh air from the heat recovery ventilator should be introduced into the return duct of the air handler at a point no less than 6 feet [1829mm] upstream of the air handler. The duct connection for return air to the HRV should be made on the return air duct at least 2 feet [610mm] upstream of the fresh air duct connection.

Separate Systems

Select locations for exhaust grilles and supply diffusers to provide effective ventilation and avoid short circuiting airflows through the space. Adjustable dampers should be provided at every grille and diffuser to make balancing of the system possible.

Exterior Hoods (Field Installed - HRV2000e)

The outside air intake hood must be positioned away from sources of contamination. It should also be a minimum of 8 feet [2438mm] from the exhaust hood or according to local building code to prevent cross contamination.

A screen grid is recommended to prevent intake of debris and pests. It should be removable in cold climates where frost blockage may occur.

Backdraft Damper (HRV2000i)

A backdraft gravity damper is supplied with defrost units to be installed in the exhaust air to outside duct. This damper is necessary to prevent air from entering the building through the exhaust duct when the unit is in frost control mode. The size of the damper is 12" x 26" [305 x 660mm] for the 2000 cfm units. Mount the damper in the exhaust air to outside duct as shown in Appendix B.

Make Electrical Connections

WARNING

Unit cabinet must have an uninterrupted, unbroken electrical ground to minimize the possibility of personal injury if an electrical fault should occur. Failure to follow this warning could result in the installer being liable for the personal injury of others.

Location of wire connections required are shown in Appendix C and D.

Power Supply

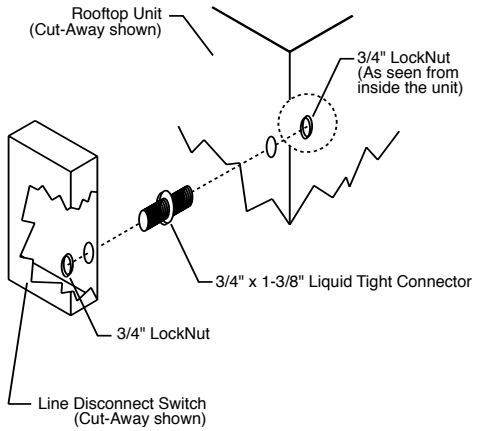
Units are available in all voltages and phases. Please see Appendix H for Electrical Data. These units may, or may not, have a factory supplied disconnect switch. If disconnect is field supplied, provide a disconnect per the NEC. Use copper conductors only.

All field wiring must comply with NEC and local requirements. In Canada, electrical connections must be in accordance with CSA C22.1 Canadian Electrical Code Part One.

Field Connection

A high voltage connection (shown below) is located on the outside of the unit with knockout (See Appendix C and D). A wiring diagram is located on the control box lid inside the unit.

NOTE: If field installing a disconnect switch, a liquid tight fitting must be installed to connect the disconnect switch through the unit line voltage knockout.



High Voltage Field Connection

Electrical Data

For more specific information including MCA, MOP and HP options, see Appendix H.

Start Up

Controls

A low voltage remote control wiring interface is provided on the unit. The installer must provide wiring for the controls that may be supplied optionally. The control connections are either 24 VAC or 12 VDC as described below. Consult Appendix I for further reference. Terminals are available for the following controls:

I-1 Wall Control Connections
Terminals labeled: "Black, Red, Green, Yellow"
12 VDC circuit, requires 4-wire LVT-24 gauge wire minimum
Wall Control required

I-2 Occupied Timer/Sensor Connection
Terminals labeled: "Occupied Timer/Sensor"
Make with a dry contact to allow unit operation. Programmed operation can be achieved with a timer. **Do not use these terminals if an Xtra or AquaAir wall control is being used.**

I-3 24 VAC Power Connection
Terminals labeled: "24 VAC (+/-), 40 VA"
24 VAC control transformer connection point. Can be used in conjunction with optional control devices.

I-4 Remote Operating Switch Connection
Terminals labeled: "Low, Common and High"
Make a dry contact across Low and Common or High and Common for desired speed. Single speed units will activate with either Low or High made with Common.

I-5 Dirty Filter Sensor Connection
Terminals labeled: "Dirty Filter Indicators"
Connection through these two terminals is made when filters are dirty. Circuit capacity is 1.5A, 24 VAC. Light, alarm or other device can be connected.

I-6 Unoccupied Recirc Contacts Connection
Terminals labeled: "Unocc Recirc Contacts"
24 VAC, applied for supply fan recirculation. Requires recirculation defrost option.

Optional Controls Connections
See Appendix I for more information on the following:

I-7 CO_2 Ventilation Control Connection

I-8 Low Temperature Control Connection

I-9 Smoke Detector Control Connection

Frost Control

The unit functions are controlled by integrated controls including exhaust only or recirculation defrost (optional). In cold temperatures, defrost cycles will remove frost from the flat plate heat exchanger to maintain proper operation. This removal of frost occurs when a damper closes the outside air port and allows room air to pass through the flat plate heat exchanger. Each unit has different frost control requirements and the schedules are shown in Appendix A.

Recirculation Defrost
Recirculation defrost is a temperature initiated time-based cycle which will de-energize the exhaust fan and the wheel drive motor, close the outdoor air damper and circulate return air through both sides of the wheel. If recirculation is in operation, it will run approximately 15% of the time, only when the outdoor air temperature falls below 5°F [-15°C]. Please note that if the indoor relative humidity is expected to be 30% or less, please contact a Venmar CES Representative or use the Venmar Select™ Software as frost control may not be required.

Exhaust Only Defrost
Exhaust only defrost is a temperature initiated time-based cycle which will de-energize the supply fan, close the outdoor air damper and exhaust return air through the exhaust side of the wheel as it continues to rotate. If exhaust only is in operation, it will run approximately 15% of the time, only when the outdoor air temperature falls below 5°F [-15°C]. Please note that if the indoor relative humidity is expected to be 30% or less, please contact a Venmar CES Representative or use the Venmar Select™ Software as frost control may not be required.

Sequence of Operation

Before start-up, check the unit for obstructive packaging, objects near or in blowers, dampers, flat plate heat exchangers, etc. Once installation is complete, check all modes of operation to ensure that the unit is working properly. Close the doors and check for operation on 'LOW-COM-HIGH'. Use a wall control or the dry contact switching to run fan speeds, see Appendix I-1 and I-3.

Unit check points:

___ Power connected, no ventilation call: Both fans are off, frost control damper (if equipped) closes off fresh air from outside. External hood dampers (if equipped, are closed).

___ Power connected, low speed call (if equipped): Both fans on low speed, frost control damper closes (if equipped) recirculation opening. External hood dampers (if equipped) are open. If unit is single speed, it will come on that speed on a call for low or high.

___ Power connected, occupied timer/sensor connection open (unoccupied mode): Both fans are off, frost control damper (if equipped) opens recirculation opening. External hood dampers (if equipped) are closed.

___ Power connected, recirculation defrost option is factory installed: Recirc contacts are closed, exhaust fan is de-energized, supply fan runs and recirculation damper closes.

Airflow Balancing

For maximum performance the unit must operate with equal supply and exhaust flow rates. Flow Measuring Stations (FMS) and magnehelic gauges can be used to measure and compare supply flow with exhaust flow. Appendix B shows proper installation of the FMS in the "exhaust from space" and "supply to space" ducts for measuring exhaust and supply flows respectively.

It is important to locate the FMS in the "warm side" ductwork as described above to minimize the effect of differences in air density, especially when balancing during extremely cold outside conditions. Air density variations can effect the FMS by more that 15%.

The FMS should be located downstream from straight sections of duct and not immediately after fans or obstructions that will cause turbulent flow. Appendix B illustrates the minimum distance from fan elbows for best operation.

Flow control dampers should be installed downstream from the FMS so flow through the FMS is not disturbed. Dampers can then be adjusted to equalize flow rated in the ducts.

Setting Flow Rate

Flow rates should be balanced with units operating on high speed. A damper must be used to establish the minimum duct pressure required so fans do not operate in overload regions. See Appendix J and K for airflow performance charts. Set the dampers to establish the minimum duct pressure required. Further adjust the dampers to reduce flow to the desired, balanced rate.

System Service

Quarterly Maintenance

WARNING

Disconnect the main power switch to the unit before performing service or maintenance. Electric shock can cause personal injury.

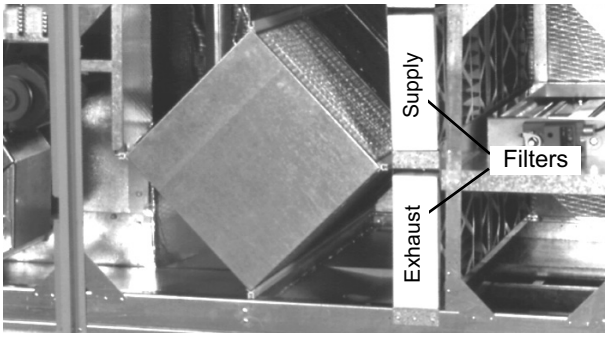
Quarterly maintenance should occur every three months and include:

Air Filters

The standard medium efficiency filters are disposable and should be replaced every 3 months. More frequent replacement may be required under extremely dirty operating conditions. Replacement filters must be identical or equivalent to original equipment in order to avoid problems with excessive pressure drop, rigidity and filtration efficiency. For filter size specifications see Appendix A.

Filter Service

Remove the filter access door. The filters can be removed simply by sliding them forward out along the filter tracks. There are two filters per airstream.



Filter Access

Drain Pans and Interior of Unit

With the filters removed from the unit, the foil-faced insulation surfaces and drain pans should be wiped clean with a soft cloth and mild cleaning solution. Also ensure that the drain fittings are free from dirt and are draining freely.

Annual Maintenance

WARNING

Disconnect the main power switch to the unit before performing service or maintenance. Electric shock can cause personal injury.

Air Filters

The standard medium efficiency filters are disposable and should be replaced every 3 months. More frequent replacement may be required under extremely dirty operating conditions. Replacement filters must be identical or equivalent to original equipment in order to avoid problems with excessive pressure drop, rigidity and filtration efficiency. For filter size specifications see Appendix A.

Drain Pans and Interior of Unit

Wash the foil-faced insulation surfaces and wipe the drain pans with a soft cloth and mild cleaning solution. Check the drain fittings to ensure that they are draining freely.

Flat Plate Heat Exchanger

CAUTION

The flat plate heat exchanger must be correctly positioned when replaced in unit. Failure to do so may result in damage to the exchanger. Follow instructions on the flat plate heat exchanger label.

Remove the flat plate heat exchangers by sliding them out from the tracks holding them in place.

The flat plate heat exchanger must be handled with care. It is recommended that they be washed once a year following the season of most intense use, in order to ensure maximum efficiency of the plastic or aluminum partitions. Allow the flat plate heat exchangers to soak for 3 hours in warm water and mild soap. Rinse under a heavy stream of water. When replacing the flat plate heat

exchanger sections, make sure the flutes on the heat exchanger are positioned in the supply airstream. Failure to do so will result in low airflow on the exhaust airstream due to system pressure trapping or holding condensate in the flutes.

CAUTION

Hot water and strong cleaning agents could damage the polypropylene flat plate heat exchangers.

Fans

The blower wheels and fan housing should be checked for dirt build-up. If they are dirty, it will be necessary to remove the blower assembly to clean the dust out through the fan mouth.

System Operation Check

Verification of all control modes should be checked to ensure proper operation. Refer to Start Up Section.

Motor and Blower Removal

WARNING

Disconnect the main power switch to the unit before performing service and maintenance procedures.

Disconnect the 4 wire service connector between the motor and the control box (#1, Figure 1). Loosen the two front bolts (#2, Figure 1). Remove the two back bolts (#3, Figure 1). Slide the fan assembly away from the discharge opening and lift out of the unit.

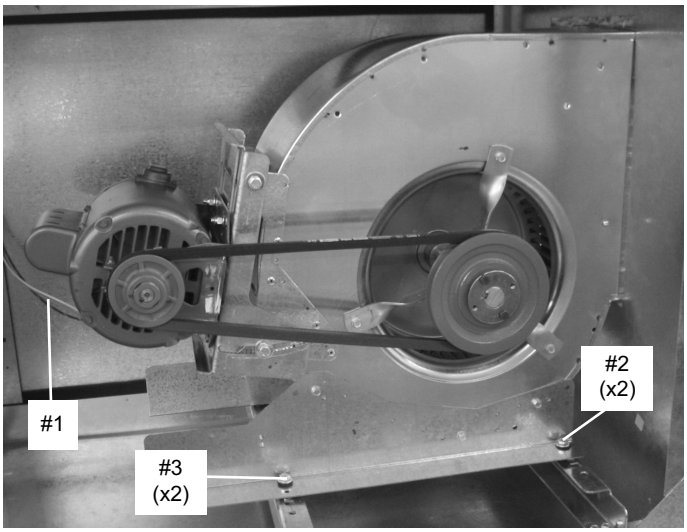
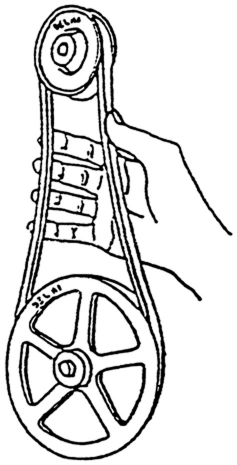


Figure 1: Supply Fan

Motor and Blower Service

The belt tension is adjusted by positioning the rotating motor base plate (see Figure 2). Set adjustment for proper belt tension. The fan RPM can be adjusted to achieve the design airflow by setting the adjustable sheave on the motor shaft. The pulley set screw torque setting is 110 in.lbs to 130 in.lbs.

Belt Tension Adjustment



Excessive belt tension is the number one cause of blower bearing failure. Proper belt tension and pulley alignment are essential for trouble free operation. A simple "Rule of Thumb" for checking belt tension is illustrated on the left. When the belt is grasped as shown, a total deflection of approximately 1" [25mm] should be attained. Insufficient deflection indicates that the belt is too tight, which may result in noise from excessive vibration, premature bearing failure and short belt life. Tight belts may overload a motor that would otherwise be adequate.

Loosen the two pivot bolts (#1, Figure 2). Loosen the two adjustment bolts (#2, Figure 2). Rotate the motor and base plate to achieve the maximum belt deflection as described above. Tighten the drive belt side adjustment bolt. Adjust the motor plate so that the sheave and pulley faces are parallel and the belt is aligned. Tighten the remaining adjustment bolt and the two pivot bolts.

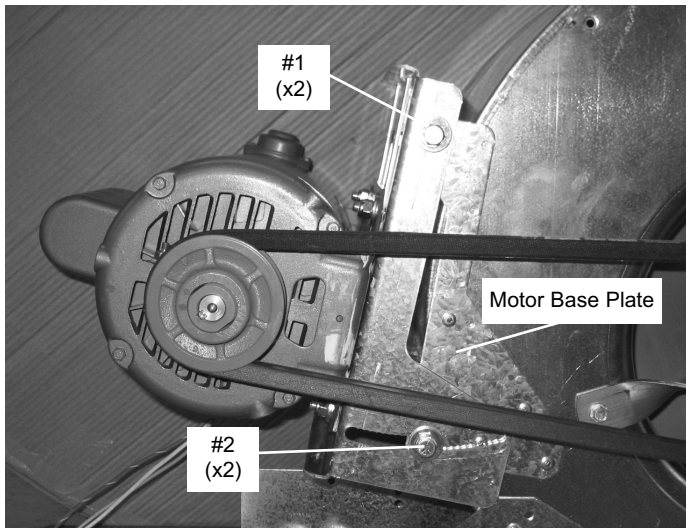


Figure 2: Motor

Appendix A

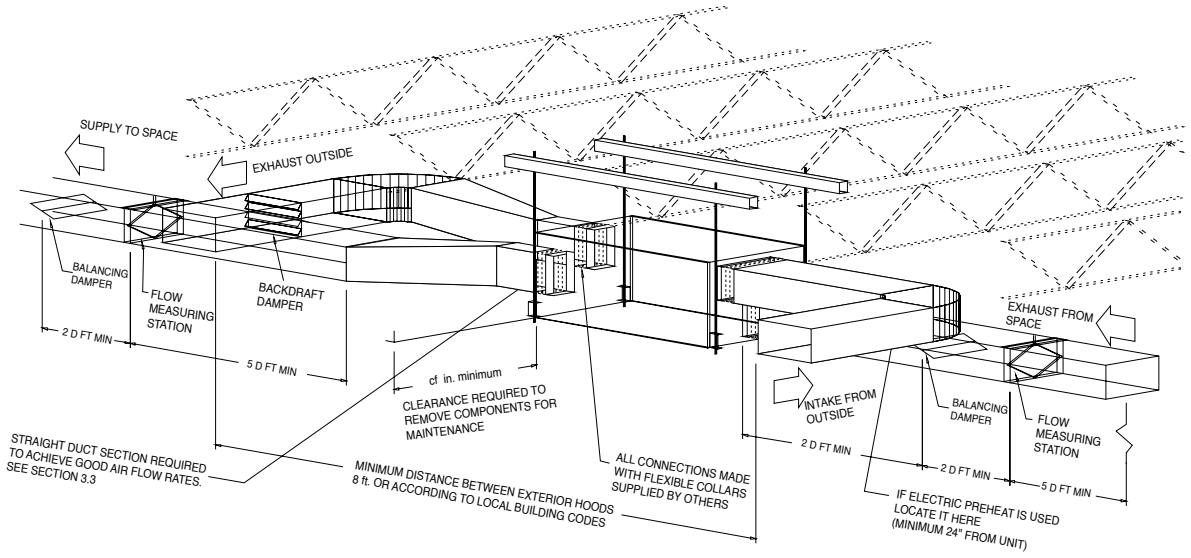
Equipment Data

	HRV2000i		HRV2000e	
Shipping weight **Net weight**	750 lbs [341 kg] 700 lbs [318 kg]		750 lbs [341 kg] 730 lbs [332 kg]	
Shipping dimensions l x w x h	94" x 52" x 36" [2388 x 1321 x 914mm]		89" x 49" x 36" [2261 x 1245 x 914mm]	
Openings				
location	ends of unit		ends of unit (field installed)	
size w x h				
- supply inlet	12" x 26" [305 x 660mm] port		36" x 21" [914 x 533mm] hood	
- exhaust outlet	10" x 14" [254 x 356mm] port		17.5" x 16" [445 x 406mm] hood	
Fans (standard)				
Supply				
impeller (fwd centrifugal)	12.75" dia x 7.0" width [324 x 178mm]		12.75" dia x 7.0" width [324 x 178mm]	
high speed	1200 rpm		1200 rpm	
motor	1.5 HP, 2 speed		1.5 HP, 1 speed	
Exhaust				
impeller (fwd centrifugal)	12.75" dia x 7.0" width [324 x 178mm]		12.75" dia x 9.0" width [324 x 229mm]	
high speed	1200 rpm		1200 rpm	
motor	1.5 HP, 2 speed		2 HP, 1 speed	
Filters				
Supply: quantity 2 MEF optional 2 HEF	12" x 24" x 4" disposable [305 x 610 x 102mm]		12" x 24" x 4" disposable [305 x 610 x 102mm]	
Exhaust: quantity 2 MEF	12" x 24" x 4" disposable [305 x 610 x 102mm]		12" x 24" x 4" disposable [305 x 610 x 102mm]	
Frost Control Cycle (if equipped)	Standard Frost Control	Extended Frost Control	Standard Frost Control	Extended Frost Control
Activation, stage 1	23°F [-5°C]		23°F [-5°C]	
recirculation	6 min. (defrost)	10 min. (defrost)	6 min. (defrost)	10 min. (defrost)
ventilation	32 min. (vent)	28 min. (vent)	32 min. (vent)	28 min. (vent)
Activation, stage 2	-22°F [-30°C]		-13°F [-25°C]	
recirculation	6 min. (defrost)	10 min. (defrost)	6 min. (defrost)	10 min. (defrost)
ventilation	19 min. (vent)	15 min. (vent)	19 min. (vent)	15 min. (vent)
Drain Connections quantity ... size (NPT)	4 - 3/4" outside thread NPT 3/4" inside thread fit required		4 - 3/4" outside thread NPT 3/4" inside thread fit required	

Appendix B

Typical Installation

Typical Indoor Installation



LEGEND

"D" - equivalent round duct diameter for determining minimum lengths

"Cf" - front clearance required for maintenance.

8" x 20" [203 x 508mm] duct D = 13.5" [343mm]

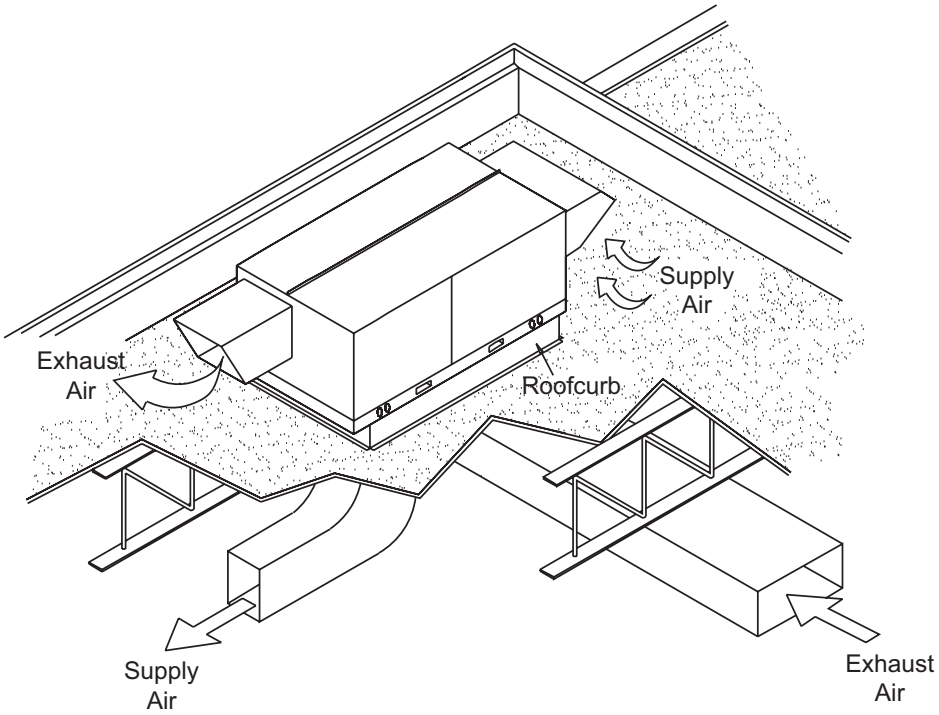
12" x 26" [305 x 660mm] duct D = 19.0" [483mm]

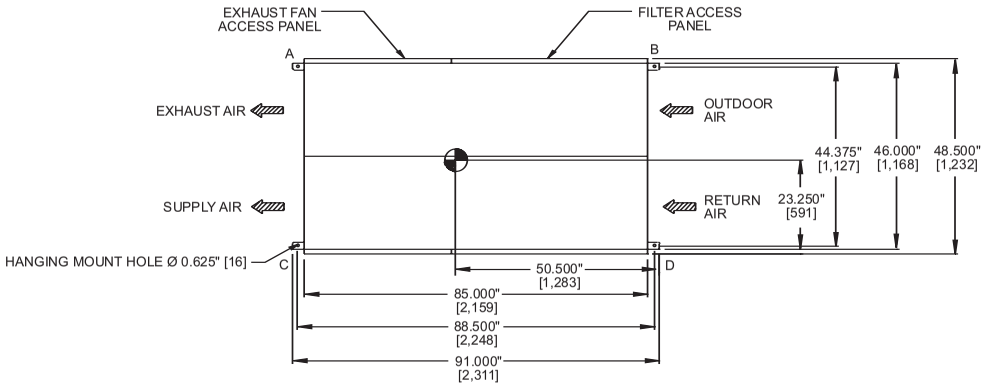
Minimum clearance required for access:

Front Clearance: 28" [711mm]

Back Clearance: No clearance required but 24" [610mm] for simplified access to service exhaust fan

Typical Outdoor Installation





TOP VIEW

NOTES:

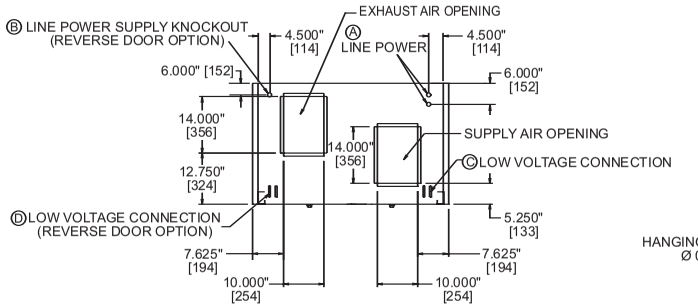
Dimensions in [ ] are millimeters

Center of gravity

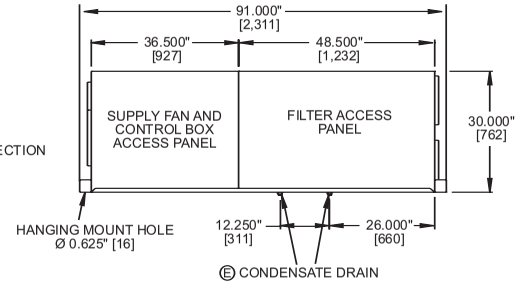
Direction of airflow

HRV2000i		
PTS	LBS	Kg
A	186.22	84.47
B	149.35	67.74
C	202.24	91.73
D	162.19	73.57
TOTAL	700.00	317.50

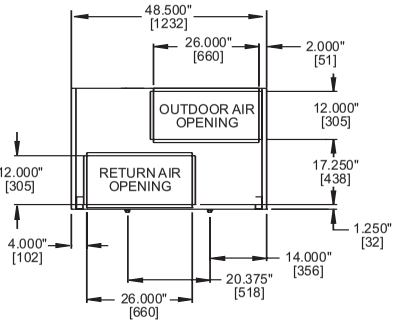
CONNECTION TABLE		
		CONNECTION SIZES
Ⓐ	Line power supply knockout	7/8 or 1 1/8
Ⓑ	Line power supply knockout (reverse door option)	7/8 or 1 1/8
Ⓒ	Low voltage connection	
Ⓓ	Low voltage connection (reverse door option)	
Ⓔ	Condensate drain fitting (4x)	3/4" NPT



LEFT SIDE VIEW



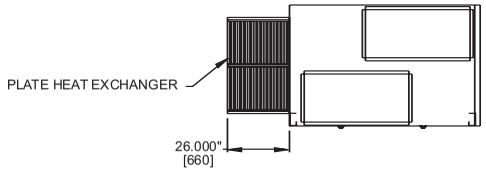
FRONT VIEW



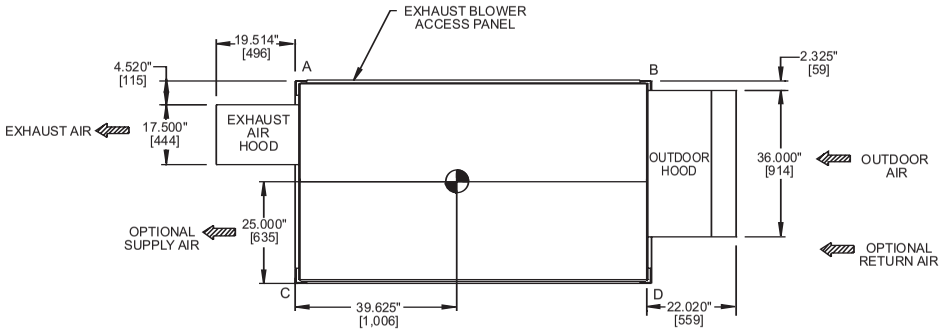
RIGHT SIDE VIEW

NOTE: A minimum of 12.000" [305] clearance from any obstruction is required for power hook-up, low voltage remote connection and control panel access.

NOTE: A minimum of 26.000" [660] clearance from any obstruction is required for removal of plate heat exchangers, fans and control box access.



RIGHT SIDE VIEW



TOP VIEW

NOTES:

Dimensions in [ ] are millimeters

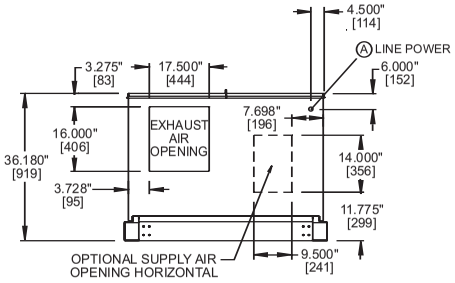
Center of gravity

Direction of airflow

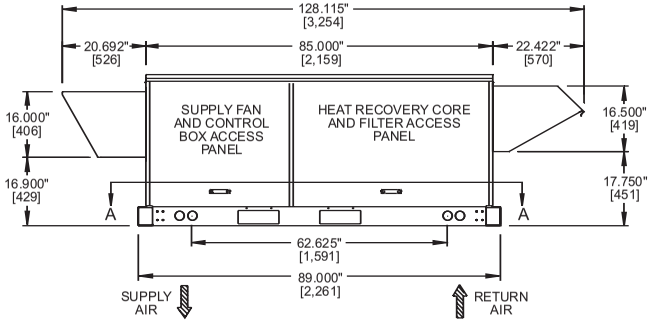
On vertical discharge units, ductwork is to be attached to accessory roofcurb only. Horizontal discharge units, field supplied flanges to be attached to horizontal discharge openings, and ductwork to be attached to the flanges.

HRV2000e POLY CORE			HRV2000e ALUMINUM CORE		
PTS	LBS	Kg	PTS	LBS	Kg
A	202	92	A	212	96
B	162	74	B	170	77
C	203	92	C	213	97
D	163	74	D	171	78
TOTAL	730	331	TOTAL	766	348

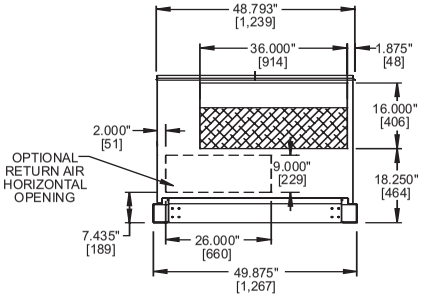
CONNECTION TABLE		
		CONNECTION SIZES
Ⓐ	Line power supply knockout	7/8" or 1 1/8"
Ⓑ	Condensate drain fitting (4x)	3/4" NPT



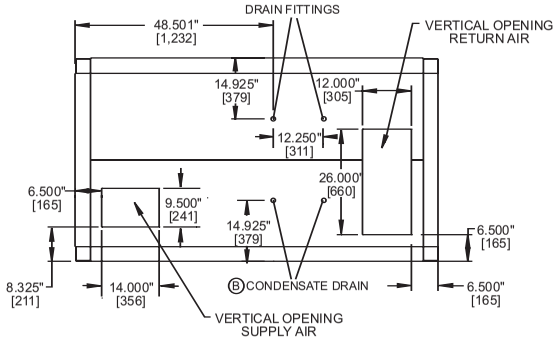
LEFT SIDE VIEW



FRONT VIEW

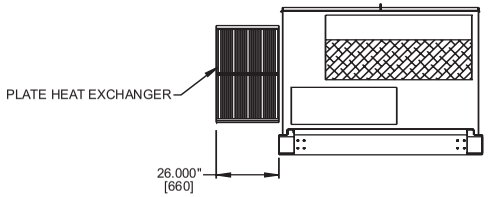


RIGHT SIDE VIEW



VIEW OF BOTTOM FROM ABOVE
SECTION AA

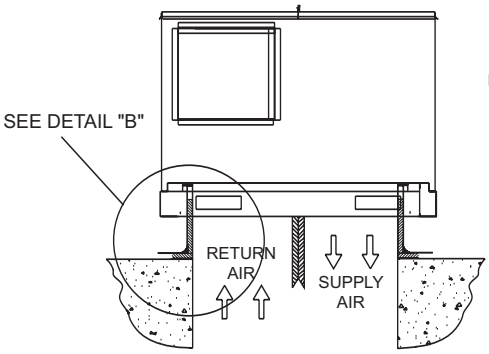
NOTE: A minimum of 26" [660] clearance from any obstruction is required for removal of plate heat exchangers, fans, filters and control box access.

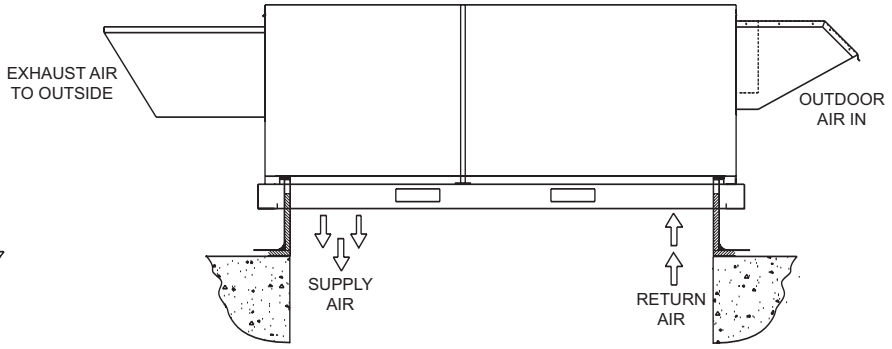


RIGHT SIDE VIEW

Appendix E

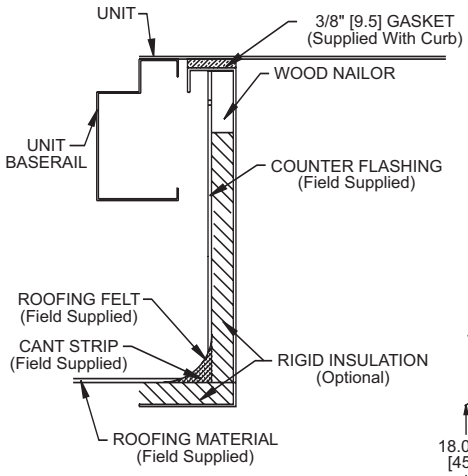
HRV2000e Roofcurb

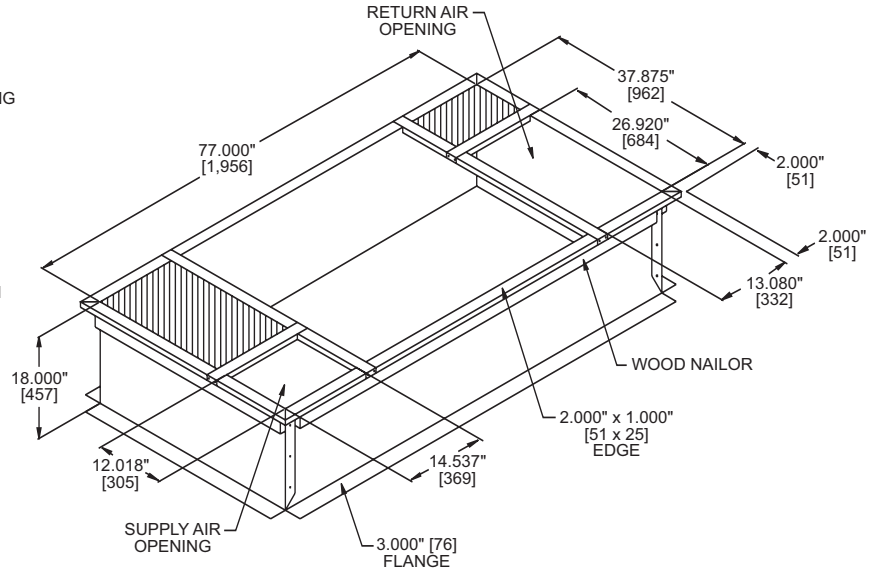




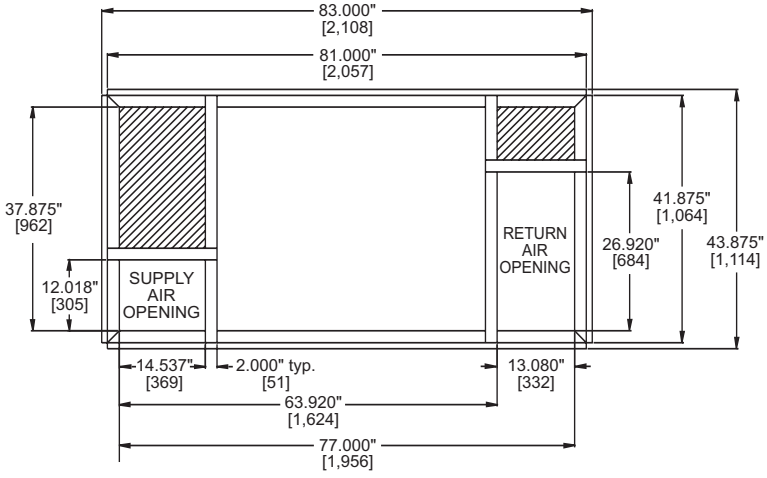
NOTE: Dimensions in [ ] are millimeters

DETAIL "B"





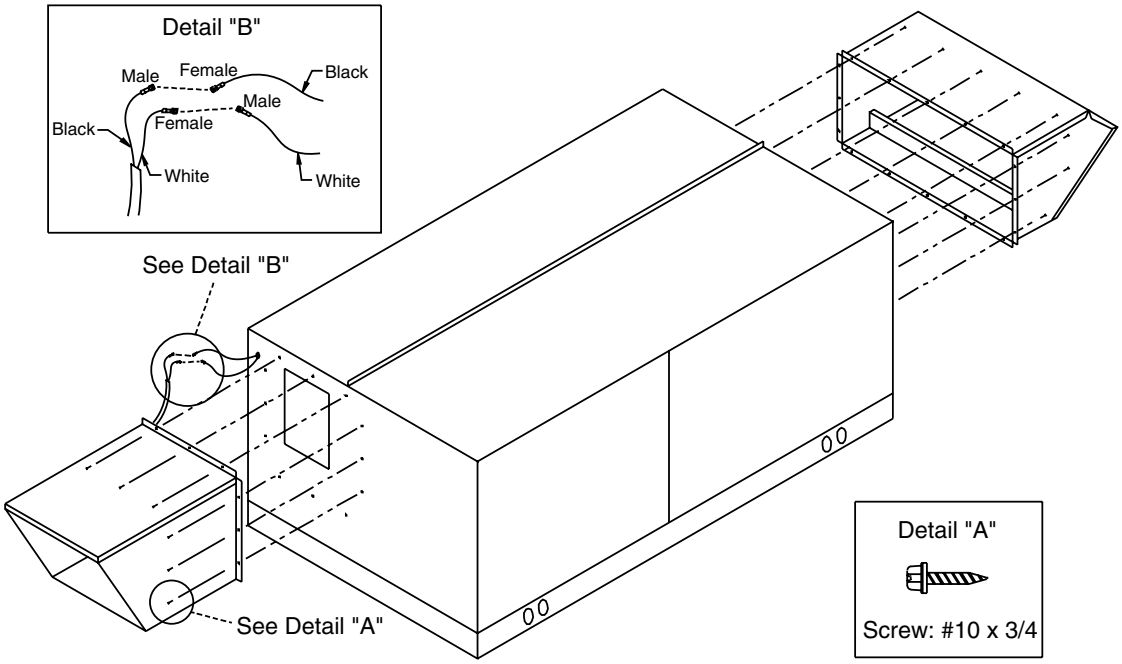
TOP VIEW OF CURB



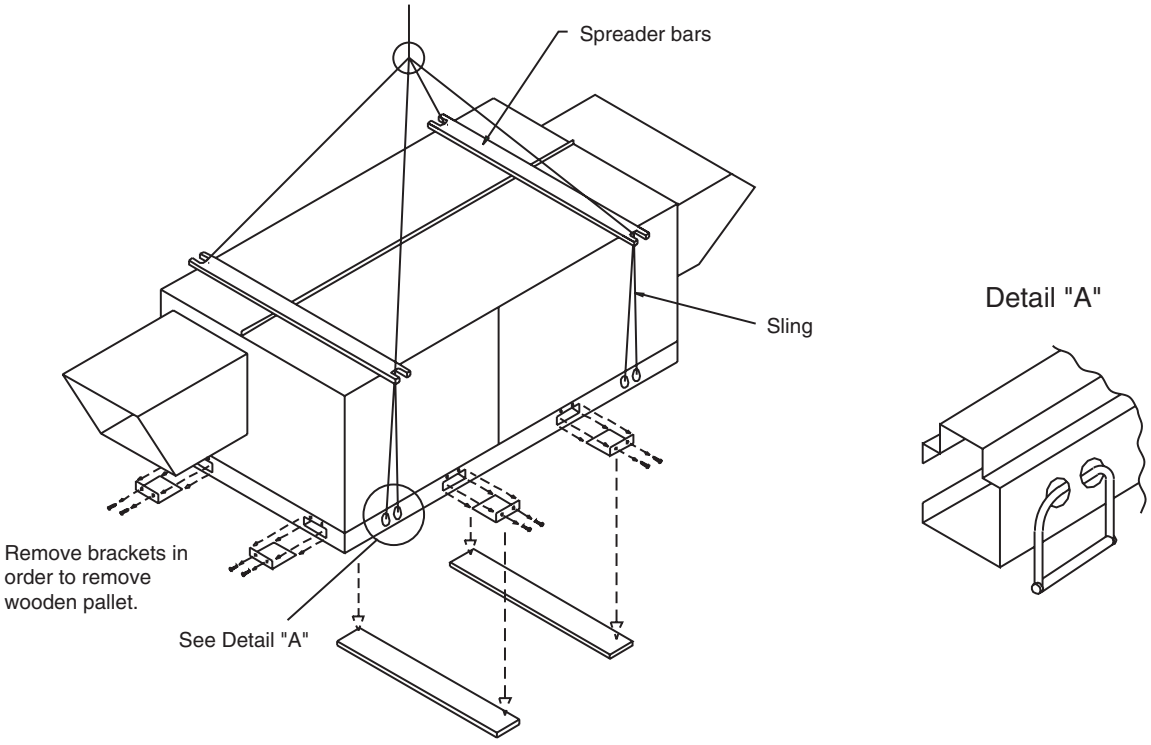
Appendix F

Installing The Hoods and Rigging The Unit

Installing The Hoods



Rigging The Unit

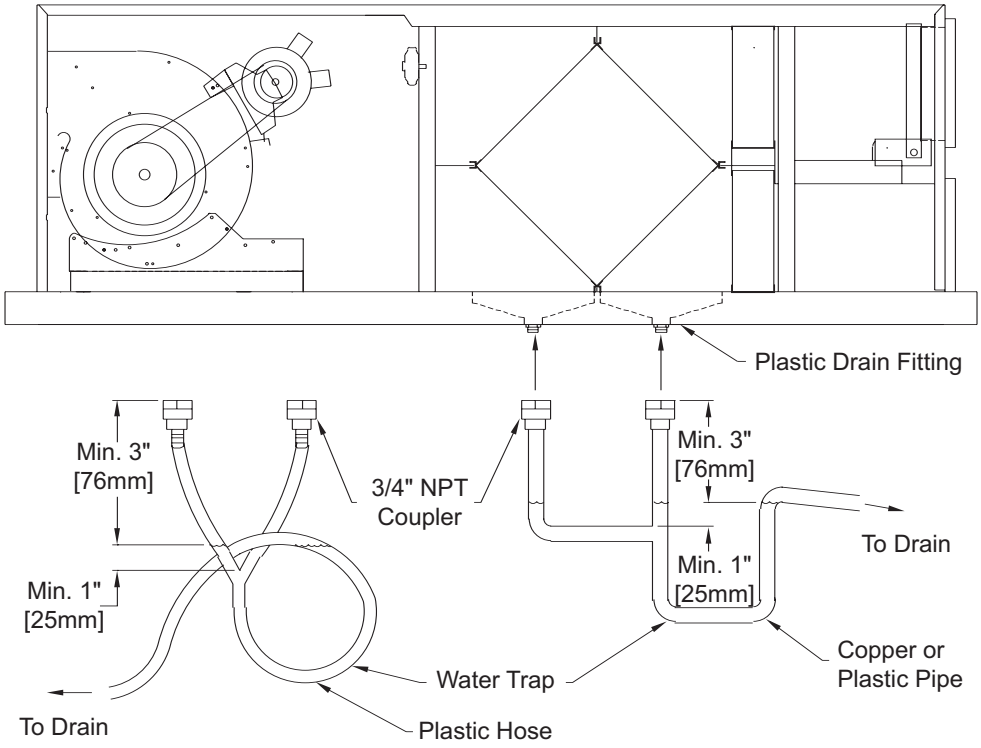


NOTE: Remove all packaging before beginning to rig the unit onto the installed roofcurb.

Appendix G

Drain Connections

HRV2000i/e



NOTE: All hose, pipe and couplers to be supplied by others.

Appendix H

Electrical Data

ODP Motor Medium Efficiency

Blower Motor Full Load Amperage (FLA) HRV2000i/e							
HP	VOLTAGE						
	120/1/60	208/1/60	230/1/60	208/3/60	230/3/60	460/3/6	575/3/60
1/2	9.0	4.5	4.0	1.8	2.2	1.1	0.9
3/4	11.0	5.4	5.5	2.5	2.6	1.3	1.0
1.0	12.6	6.2	6.3	3.4	3.4	1.7	1.4
1.5	18.0	7.8	7.5	5.0	5.0	2.5	2.0
2.0	20.4	10.0	10.2	6.4	6.0	3.0	2.4
3.0	31.0	16.8	15.5	10.6	10.6	4.8	3.4
Wheel Drive Motor and Controls Full Load Amperage (FLA)							
Voltage	120/1/60	208/1/60	230/1/60	208/3/60	230/3/60	460/3/60	575/3/60
	N/A	2.4	2.2	2.4	2.2	1.1	0.9

NOTE: The blower motor FLA values shown above are for **one motor only.**

MCA Calculation

1.25 x _____ FLA of larger HP motor or compressor = _____

1.25 x _____ Heater FLA = + _____

Sum of all other motors FLA = + _____

Wheel drive motor and standard controls FLA = + _____

Indirect gas heater FLA = + _____

Calculated Total MCA = _____

MOP Calculation

2.25 x _____ FLA of larger HP motor or compressor = _____

Electric heater FLA = + _____

Sum of all other motors FLA = + _____

Wheel drive motor and standard controls FLA = + _____

Indirect gas heater FLA = + _____

Calculated Total MOP = _____

Actual MOP = _____

(from Standard Overcurrent Protection Chart)

NOTES: MOP - Maximum overcurrent protection
MCA - Minimum current ampacity

Finding the Actual MOP Value

From the calculated MOP value, select the next smallest value of protection from the *Standard Overcurrent Protection* chart below to get the Actual MOP value (maximum value of overcurrent device).

Standard Overcurrent Protection

3	40	250
4	45	300
5	50	350
6	60	400
7	70	450
8	80	500
9	90	600
10	100	650
12	110	700
15	125	750
20	150	800
25	175	850
30	200	900
35	225	1000

WARNING

All units equipped with electric post-heaters require two point power connections.

CAUTION

All electrical installations and wiring require correct wire gauge sizing and protection according to local building codes.

Appendix I

Terminal Control Diagrams

I-1: Wall Control Connection

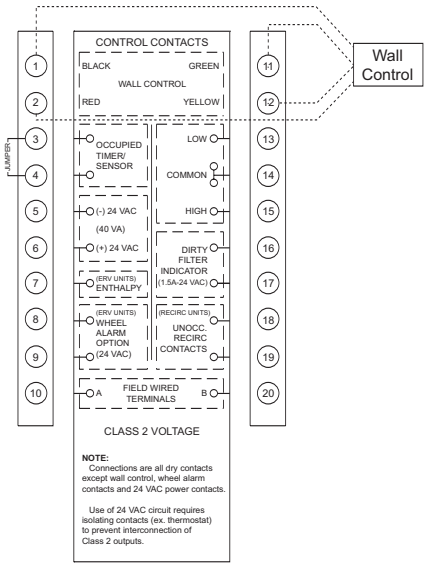
Three types of remote wall controls are available:

1. **Standard Wall Control** with fan switch and dehumidistat control.
2. **Xtra Wall Control** with fan mode selection, dehumidistat control and maintenance indicator.
3. **AquaAir Wall Control** with fan mode selection, dehumidistat control and high speed recirculation mode.

The remote wall controls work with the integrated electronic controls within the unit to control ventilation sequences. Each wall control above has different features and will require 4-wire connection to the unit as shown below. Without the wall control, fans can be operated with dry contacts or a switch as in control diagram H-4.

NOTE: All controls accessories (Ex. Night setback timer, CO_2 controller, enthalpy controller, smoke detector or wheel rotation sensor) intended to provide a contact closure for occupancy control across terminals 3 and 4 cannot be used in conjunction with the Xtra or AquaAir wall controls.

If a wall control is required in addition to any of these options, only the Standard wall control may be used. Without these options, a factory installed jumper across terminals 3 and 4 must be installed.



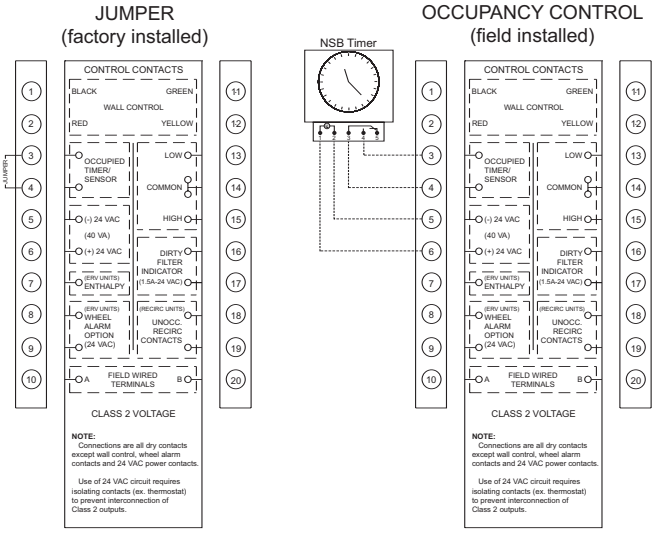
I-2: Occupied Timer/Sensor Connection

Occupancy control is achieved by connection to the terminal interface shown below. These terminals require a dry contact which could be provided by a number of types of controls such as a timer, light sensor, occupancy sensor, building management system or other. **The unit will not operate unless these contacts are closed!!**

The drawing below shows a factory installed jumper and programmable timer option.

NOTE: All controls accessories (Ex. Night setback timer, CO_2 controller, enthalpy controller, smoke detector or wheel rotation sensor) intended to provide a contact closure for occupancy control across terminals 3 and 4 cannot be used in conjunction with the Xtra or AquaAir wall controls.

If a wall control is required in addition to any of these options, only the Standard wall control may be used. Without these options, a factory installed jumper across terminals 3 and 4 must be installed.

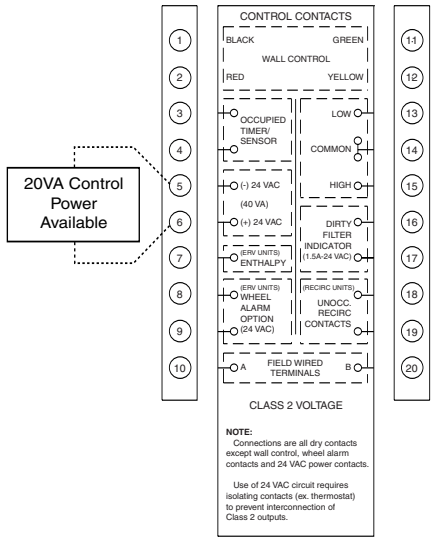


Terminal Control Diagrams

I-3: 24 VAC Power Connection

A 24 Volt, 20VA, power source is available using the connections shown.

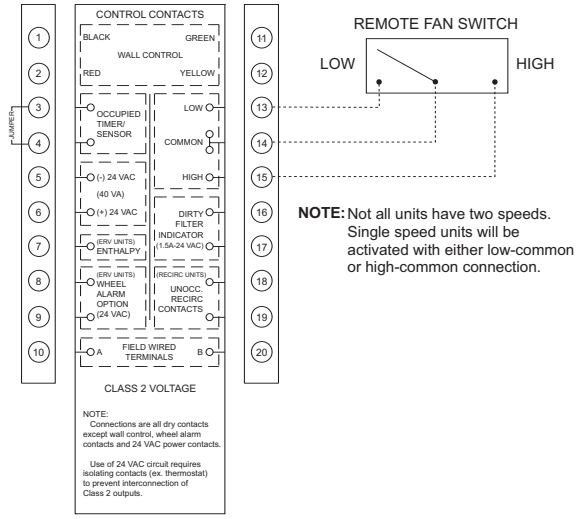
24 VAC POWER CONNECTION



I-4: Remote Fan Control

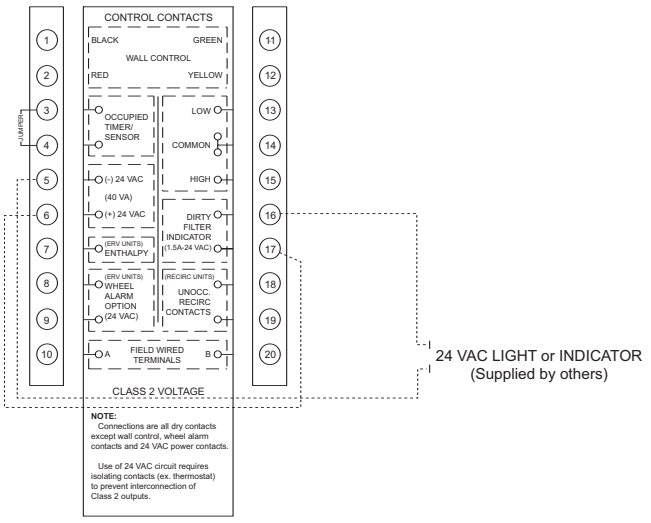
Remote fan control can be achieved by connecting dry contact controls to the terminal interface at terminals labeled: LOW - COM - HIGH **(Not all units have two speeds)**. Placing a jumper across the 'LOW' and 'COM' terminals will put the unit in low speed ventilation or placing a jumper across the 'HIGH' and 'COM' terminals will put the unit into high speed. **DO NOT** jumper all three terminals together. These controls could also be the following: SPDT switch, dehumidistat, CO_2 sensor, light sensor, heat sensor, timer, building management system, etc. The drawing below represents a switch connected to the unit.

CAUTION: Do not use a wall control and remote fan switch at the same time. Damage to the unit may occur.



I-5: Dirty Filter Sensor

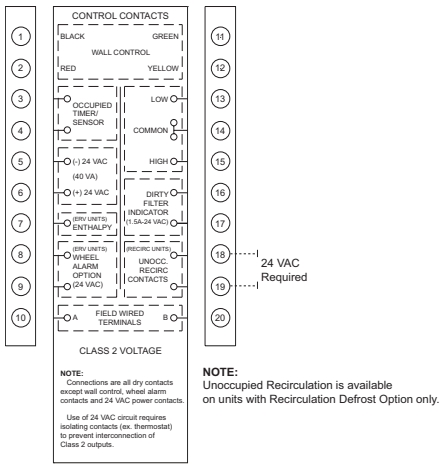
The HRVs can be equipped with dirty filter sensors which monitor the pressure across the filters and close the contacts when the filters become restricted with dirt. Connections on the terminal interface labeled "Dirty Filter Indicator" provide the dry contact and may be connected as shown below.



I-6: Unoccupied Recirc Contacts

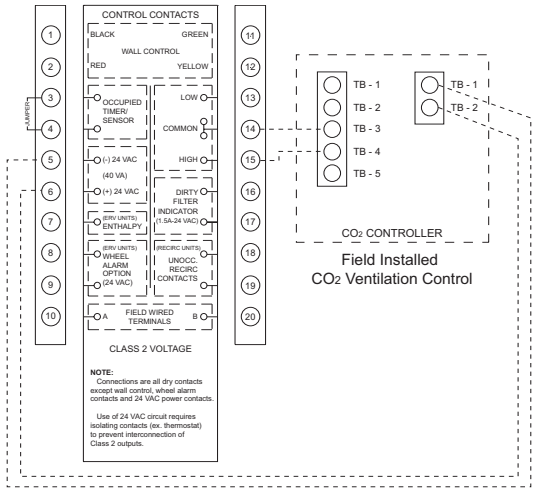
On recirc defrost units, an unoccupied recirc control can be achieved by connection to the terminal interface shown below. These terminals require a 24 VAC signal which could be provided by a timer, thermostat or other. Closure of these terminals will cause the unit to go into a 'recirc mode' where the supply fan runs on high speed and the exhaust fan stops.

NOTE: Although these contacts are intended for use during unoccupied periods, they are still active during an occupied condition. Therefore, the 24 VAC signal should be applied such that it is disabled during occupied periods, preventing the unit from going into a recirc condition unnecessarily.



I-7: CO_2 Ventilation Control

HRVs can be controlled by a CO_2 controller that can be connected to fan control LOW-COM-HIGH **(Not all units have two speeds)**. As the CO_2 levels exceed acceptable limits, the dry contact across HIGH-COM is closed, raising high speed fan ventilation.

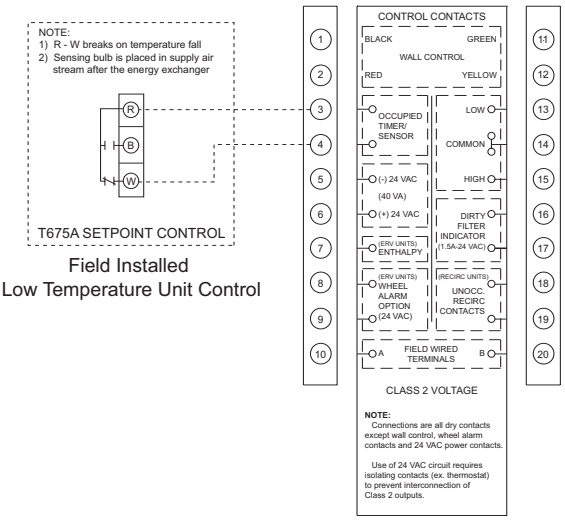


I-8: Low Temperature Control

The fans of the HRV can be controlled using a setpoint low temperature controller. If the supply air discharge temperature falls below the setpoint on the low temperature controller, the contacts between R-W would break. This will de-energize the fans and close the outside air damper.

NOTE: An Xtra or AquaAir wall control cannot be used with a low temperature control.

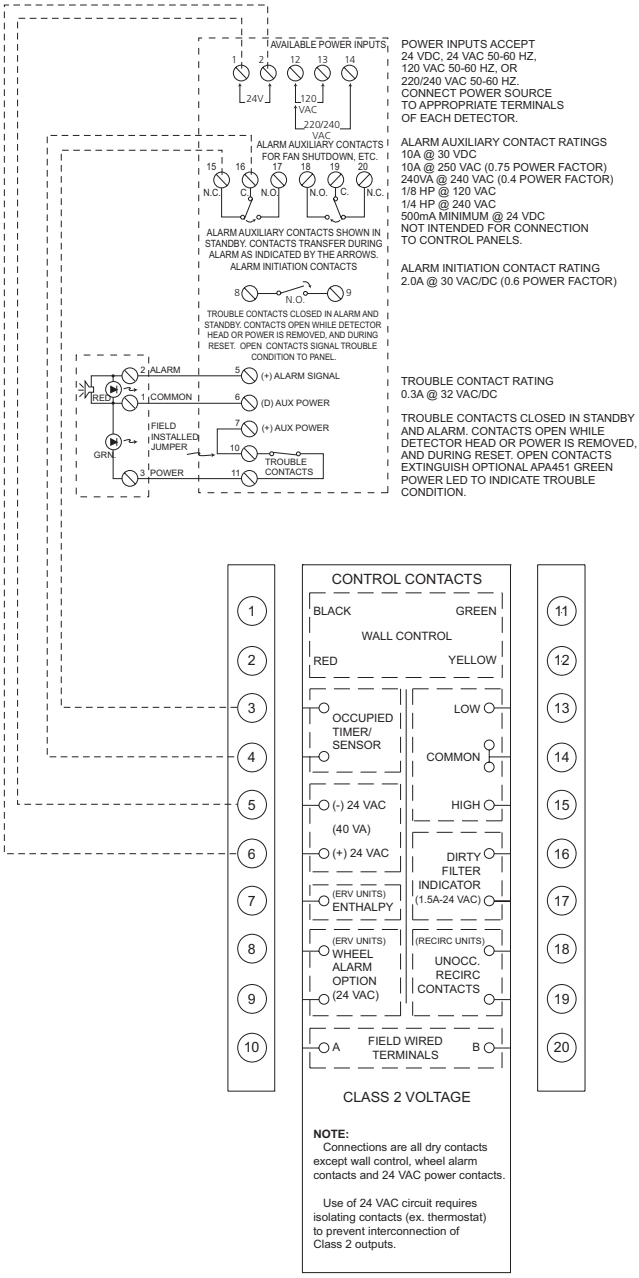
NOTE: The remote bulb sensor must be placed downstream of the supply air fan discharge.



I-9: Smoke Detector

Locate in a normally occupied area of premises. Recommended for compliance to NFPA-90A and IMC code 606.

HRVs can be equipped with a duct mount smoke detector which will monitor the air when passing through the duct system into the HRV. When sufficient smoke is detected, an alarm condition is activated. By connecting the occupied timer/sensor contacts to the N/C alarm auxiliary contacts on the duct sensor, an alarm condition will open the auxiliary contact and stop operation of the HRV.



Appendix J

Supply Airflow Performance

HRV2000i Fan Performance - Supply (in. wg.)																			
Airflow	0.0		0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		HP
(cfm)	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	Fan Pulley
1200			380	0.30	540	0.40	660	0.50	760	0.59	850	0.69	930	0.79	980	0.88	1030	0.98	**1/2**
1300			460	0.37	580	0.48	680	0.58	770	0.69	920	0.79	1007	0.90	1061	1.00	1115	1.11	
1400	380	0.34	510	0.45	615	0.56	700	0.68	780	0.79	991	0.90	1085	1.02	1143	1.13	1201	1.24	**3/4**
1500	750	0.42	850	0.54	875	0.66	975	0.78	1060	0.90	1125	1.02	1200	1.14	1225	1.26	1250	1.38	
1600	825	0.50	900	0.63	975	0.76	1025	0.89	1100	1.02	1160	1.14	1225	1.27	1275	1.40	1350	1.53	**1.0**
1700	850	0.59	925	0.73	1000	0.87	1075	1.00	1125	1.14	1200	1.28	1260	1.41	1310	1.55	1375	1.69	
1800	900	0.69	975	0.84	1025	0.98	1100	1.13	1160	1.27	1225	1.41	1275	1.56	1340	1.70	1390	1.85	**1.5**
1900	940	0.80	1000	0.95	1075	1.10	1150	1.25	1200	1.41	1250	1.56	1300	1.71	1375	1.87	1425	2.02	
2000	975	0.91	1050	1.07	1100	1.23	1175	1.39	1225	1.55	1275	1.71	1325	1.87	1390	2.04	1450	2.20	**2.0**
2100	1020	1.03	1075	1.20	1125	1.37	1200	1.53	1260	1.70	1300	1.87	1360	2.04	1400	2.21	1475	2.38	
2200	1050	1.15	1100	1.33	1175	1.51	1225	1.69	1275	1.86	1340	2.04	1390	2.22	1450	2.39	1483	2.57	**3.0**
2300	1090	1.29	1150	1.47	1200	1.66	1250	1.84	1300	2.03	1375	2.21	1425	2.40	1460	2.58	1490	2.77	
2400	1125	1.43	1175	1.62	1230	1.82	1280	2.01	1350	2.20	1400	2.39	1450	2.59	1490	2.78	1525	2.97	
2500	1150	1.58	1210	1.78	1275	1.98	1310	2.18	1360	2.38	1425	2.58	1460	2.78	1510	2.98			
2600	1210	1.73	1250	1.94	1300	2.15	1350	2.36	1380	2.57	1460	2.78	1500	2.99					
2700	1225	1.89	1300	2.11	1350	2.33	1390	2.55	1440	2.76	1475	2.98							
2800	1275	2.06	1310	2.29	1360	2.51	1430	2.74	1470	2.96									

IMPORTANT NOTE: Pressure Drop

When the high efficiency filter option is used, filter pressure drop must be added to the ESP of the system. See the "Pressure Drop for H.E. Filters" chart below for pressure drops.

HRV2000e Fan Performance - Supply (in. wg.)																			
Airflow	0.0		0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		HP
(cfm)	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	Fan Pulley
1200					798	0.19	868	0.28	944	0.38	1026	0.47	1059	0.56	1140	0.65	1201	0.75	**1/2**
1300			773	0.16	840	0.26	887	0.36	953	0.46	1047	0.56	1108	0.66	1185	0.76	1243	0.86	
1400	404	0.13	794	0.24	880	0.34	930	0.45	995	0.56	1060	0.67	1154	0.78	1228	0.88	1283	0.99	**3/4**
1500	492	0.20	813	0.32	897	0.43	947	0.55	1016	0.67	1078	0.78	1199	0.90	1270	1.01	1322	1.13	
1600	566	0.29	854	0.41	922	0.53	989	0.66	1052	0.78	1105	0.90	1242	1.03	1311	1.15	1360	1.27	**1.0**
1700	631	0.38	893	0.51	942	0.64	1023	0.77	1076	0.90	1127	1.03	1283	1.17	1350	1.30	1397	1.43	
1800	690	0.48	918	0.62	998	0.76	1047	0.90	1100	1.04	1157	1.17	1324	1.31	1388	1.45	1433	1.59	**1.5**
1900	745	0.59	976	0.74	1044	0.88	1073	1.03	1122	1.18	1182	1.32	1363	1.47	1425	1.62	1468	1.76	
2000	796	0.71	1009	0.86	1070	1.02	1096	1.17	1153	1.33	1210	1.48	1401	1.63	1462	1.79	1502	1.94	**2.0**
2100	843	0.84	1042	1.00	1092	1.16	1154	1.32	1183	1.48	1245	1.65	1438	1.81	1497	1.97	1535	2.13	
2200	889	0.97	1088	1.14	1114	1.31	1179	1.48	1206	1.65	1280	1.82	1474	1.99	1531	2.16	1568	2.33	**3.0**
2300	932	1.12	1150	1.29	1177	1.47	1204	1.65	1241	1.83	1313	2.00	1509	2.18	1565	2.36	1600	2.54	
2400	973	1.27	1176	1.46	1202	1.64	1240	1.83	1274	2.01	1346	2.20	1544	2.38	1598	2.57	1632	2.75	
2500	1012	1.43	1218	1.63	1240	1.82	1275	2.01	1307	2.20	1377	2.40	1577	2.59	1631	2.78	1663	2.98	
2600	1050	1.60	1258	1.80	1277	2.00	1310	2.21	1339	2.41	1408	2.61	1610	2.81					
2700	1087	1.78	1297	1.99	1312	2.20	1343	2.41	1371	2.62	1439	2.83							
2800	1122	1.97	1335	2.19	1347	2.40	1376	2.62	1401	2.84									

IMPORTANT NOTE: Pressure Drop

When the high efficiency filter option is used, filter pressure drop must be added to the ESP of the system. See the "Pressure Drop for H.E. Filters" chart below for pressure drops.

Pressure Drop for H.E. Filters			
Airflow cfm	Resistance in. wg.	Airflow cfm	Resistance in. wg.
800	0.16	1800	0.49
900	0.19	1900	0.54
1000	0.22	2000	0.59
1100	0.25	2100	0.63
1200	0.28	2200	0.68
1300	0.30	2300	0.72
1400	0.33	2400	0.77
1500	0.36	2500	0.81
1600	0.40	2600	0.85
1700	0.45	2700	0.90
		2800	0.95

Appendix K

Exhaust Airflow Performance

HRV2000e Fan Performance - Exhaust With Damper (in. wg.)																			
Airflow	0.0		0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		HP
(cfm)	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	Fan Pulley
1200	703	0.27	821	0.35	921	0.43	1006	0.51	1102	0.59	1192	0.67	1222	0.75	1281	0.83	1345	0.91	**1/2**
1300	766	0.34	845	0.43	940	0.51	1047	0.60	1128	0.69	1214	0.77	1265	0.86	1322	0.95	1376	1.03	
1400	825	0.43	887	0.52	977	0.61	1076	0.71	1148	0.80	1241	0.89	1307	0.99	1362	1.08	1437	1.17	**3/4**
1500	879	0.52	934	0.62	1042	0.72	1095	0.82	1184	0.92	1265	1.02	1329	1.12	1401	1.22	1463	1.32	
1600	931	0.64	969	0.74	1078	0.85	1154	0.96	1234	1.06	1299	1.17	1361	1.28	1430	1.38	1500	1.49	**1.0**
1700	980	0.76	1035	0.88	1102	0.99	1205	1.10	1259	1.22	1321	1.33	1394	1.44	1454	1.56	1535	1.67	
1800	1026	0.91	1074	1.03	1174	1.15	1254	1.27	1295	1.39	1361	1.51	1425	1.63	1482	1.74	1570	1.86	**1.5**
1900	1071	1.07	1098	1.19	1202	1.32	1291	1.44	1317	1.57	1388	1.70	1448	1.82	1516	1.95	1604	2.08	
2000	1113	1.24	1197	1.38	1240	1.51	1351	1.64	1384	1.78	1443	1.91	1482	2.04	1550	2.17	1637	2.31	**2.0**
2100	1154	1.44	1217	1.58	1296	1.72	1380	1.86	1417	2.00	1478	2.14	1516	2.28	1583	2.42	1670	2.56	
2200	1194	1.65	1293	1.80	1323	1.95	1417	2.09	1452	2.24	1512	2.39	1548	2.53	1615	2.68	1702	2.83	**3.0**
2300	1232	1.89	1319	2.04	1376	2.20	1452	2.35	1486	2.50	1545	2.66	1580	2.81	1646	2.96			
2400	1270	2.15	1343	2.31	1411	2.47	1487	2.63	1519	2.79	1578	2.95							
2500	1306	2.43	1378	2.59	1446	2.76	1521	2.93											
2600	1341	2.73	1413	2.90															
2700																			
2800																			

HRV2000e Fan Performance - Exhaust Without Damper (in. wg.)																			
Airflow	0.0		0.2		0.4		0.6		0.8		1.0		1.2		1.4		1.6		HP
(cfm)	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	RPM	BHP	Fan Pulley
1200	525	0.21	796	0.28	867	0.35	957	0.42	1048	0.49	1110	0.56	1101	0.63	1123	0.71	1188	0.78	**1/2**
1300	599	0.26	818	0.34	888	0.42	974	0.50	1073	0.57	1127	0.65	1147	0.73	1166	0.80	1229	0.88	
1400	664	0.33	841	0.41	928	0.50	1020	0.58	1099	0.66	1154	0.74	1213	0.83	1207	0.91	1268	0.99	**3/4**
1500	724	0.41	882	0.49	949	0.58	1042	0.67	1151	0.76	1209	0.85	1238	0.94	1247	1.03	1306	1.12	
1600	779	0.49	903	0.59	1016	0.68	1095	0.78	1179	0.87	1210	0.97	1270	1.06	1286	1.16	1344	1.25	**1.0**
1700	830	0.59	958	0.69	1036	0.79	1148	0.89	1207	0.99	1232	1.09	1293	1.20	1323	1.30	1380	1.40	
1800	878	0.70	981	0.81	1092	0.91	1166	1.02	1228	1.13	1266	1.23	1371	1.34	1359	1.45	1415	1.55	**1.5**
1900	924	0.82	1061	0.94	1145	1.05	1203	1.16	1262	1.27	1367	1.39	1395	1.50	1395	1.61	1450	1.73	
2000	968	0.96	1089	1.08	1160	1.20	1223	1.32	1297	1.44	1390	1.55	1432	1.67	1429	1.79	1483	1.91	**2.0**
2100	1010	1.11	1143	1.24	1200	1.36	1259	1.49	1346	1.61	1428	1.74	1468	1.86	1463	1.98	1516	2.11	
2200	1050	1.28	1195	1.41	1257	1.54	1294	1.67	1383	1.80	1464	1.93	1504	2.06	1496	2.19	1549	2.32	**3.0**
2300	1088	1.46	1208	1.60	1292	1.73	1331	1.87	1420	2.01	1500	2.14	1538	2.28	1529	2.42	1580	2.55	
2400	1126	1.66	1254	1.80	1329	1.94	1366	2.09	1455	2.23	1535	2.37	1572	2.51	1560	2.66	1611	2.80	
2500	1162	1.88	1289	2.02	1366	2.17	1401	2.32	1490	2.47	1570	2.62	1605	2.77	1591	2.91			
2600	1197	2.11	1325	2.26	1401	2.42	1435	2.57	1523	2.73	1603	2.88							
2700	1231	2.36	1360	2.52	1435	2.68	1468	2.84											
2800	1264	2.64	1394	2.80	1469	2.97													

Appendix L

Trouble Shooting Chart

Problem	Cause	Solution
Unit will not turn on.	Occupied timer contacts open.	Check external wiring. Check the wiring in the control box. Check the control board for power.
Unit will not turn off.	External terminal strip wiring.	Check if high or low speed control contacts are closed on the terminal strip.
Air from supply diffusers too cold.	Imbalance of supply and exhaust air.	Check filters and heat exchanger for blockage. Check balance of airflows. Install post heat module.
Unit makes an annoying noise.	Blower wheel out of alignment.	Remove the motor/blower assembly (see Service Section). Adjust blower wheel.
Heat exchanger freezing up.	Imbalance of supply and exhaust air.	Check filters and heat exchanger for blockage. Check balance of airflows.
	Frost control damper not functioning.	Check for operation of damper actuator.
	Pre-heater not functioning.	Check the heat module circuit breaker.
Motor and blower not functioning.	Electrical supply interrupted.	Check unit circuit breaker. Check four wire service connector on each motor.
	Fan motor capacitor.	Check capacitor connections. Check motor operation with new capacitor.
	Fan motor failure.	Check fan motor.
	Fan motor relay in control box.	Check relay wiring. Check relay operation.
	Fan drive belt.	Check for failure.
	Fan drive pulleys.	Check for securely fastened pulley(s) on motor or fan shaft(s).
Only supply fan will turn on.	Unit is in frost control mode. (recirc units)	Wait until unit is out of frost control mode. Frost control relay is not working.
Only exhaust fan will turn on.	Unit is in frost control mode. (exhaust units) Motor wiring incorrect.	Check Molex connection to motor.
Damper will not open.	Electrical supply interrupted.	Check wiring on damper actuator. Check three wire service connector on control box.
	Frost control relay in control box.	Check relay wiring. Check relay operation.
	Electronic control board.	Test frost control on control board.
	Thermistor.	Test the thermistor operation.
Damper opens when it should be closed.	Wires are reversed.	Reverse wires #2 and #3 on damper actuator.
Low exhaust airflow in the winter season.	Heat exchanger flutes are positioned in the exhaust airstream.	Remove flat plate heat exchanger sections and re-position the flute side of the heat exchanger into the supply airstream.

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