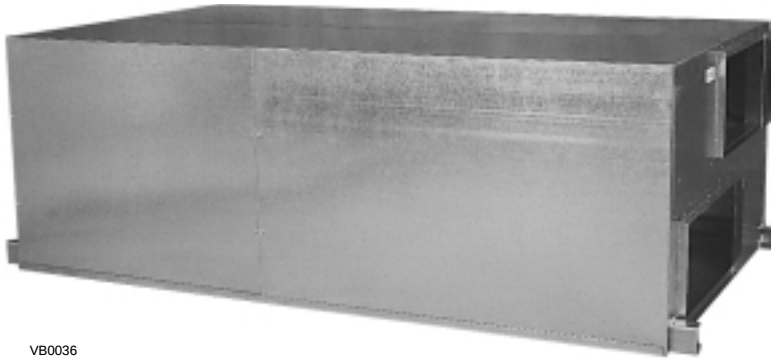
20LCi and w20LCi Heat and Energy Recovery Ventilators

Installation, Operation and Service Instructions



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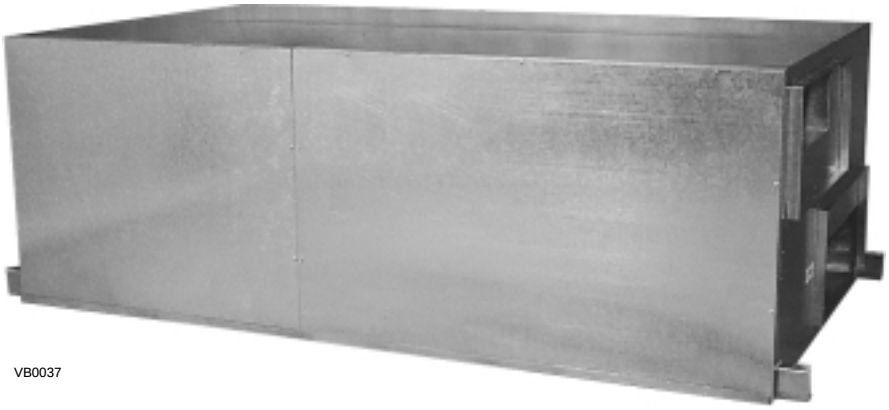
HRV 20LCi



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ERV w20LCi

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Contents

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

2 General Specifications

These ceiling series are a successful solution to ventilation and indoor air quality problems. Intended for installation within a suspended ceiling space or mechanical room, these ventilators provide 100% outdoor air ventilation. This series consists of commercial interior heat and energy recovery ventilators.

HRV 20LCi

This ventilator tranfers the heat from the exhaust airstream to the supply airstream. The Heat Recovery Ventilator (HRV) uses a flat plate heat exchanger which may be more suited to some applications requiring stringent cross contamination control.

ERV w20LCi

This ventilator provides energy recovery between the exhaust and supply airstreams. The Energy Recovery Ventilator (ERV) uses an enthalpy wheel for total energy recovery providing superior efficiency in hot and humid climates.

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

See Appendix A for more detailed equipment data.

3 Installation

3.1 Check Equipment

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

Remove all internal packaging (ERV w20LCi only)

Remove access panels and remove all packaging from the unit. Note that there is packaging for the wheel support during shipping. Removal of all this packaging is critical.

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 or enthalpy wheel, insulation, drains (if applicable) 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 (page 7). Also, see Appendix C for more electrical data information.

The unit should be installed to allow easy access for maintenance. Appendix D and E show minimum clearance requirements between front access and any obstruction to allow for removal of components (fans, filters, flat plate heat exchangers or enthalpy wheel). 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 D and E.

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 model (20LCi) 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 partition 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.

3.2 Mount 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.

Ceiling Mount

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

Floor Mount

These units may be secured to the floor using isolation/vibration pads. The pads may be located on each corner of the unit's frame (all mounting hardware is field supplied and specified).

Space is required beneath the heat recovery model (20LCi) to make drain connections.

3.3 Ductwork Information

Make Duct Connections

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

For HRV 20LCi only: 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.

For all models: 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. 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.

For HRV 20LCi only: All ports have 1" (25mm) flanges to facilitate duct connection.

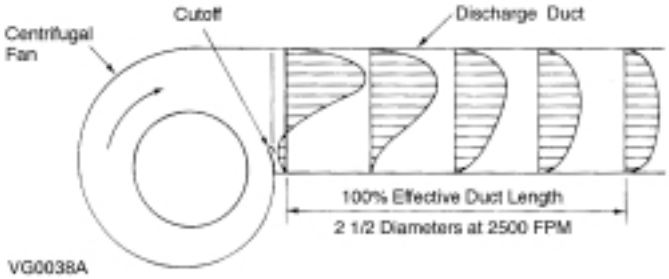
For all models: Ensure that the fasteners used to make duct connection do not interfere with fans or dampers in the unit.

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

Ductwork Design Consideration

The discharge ductwork immediately downstream from the fan is critical for successful applications. Poorly designed ductwork can degrade fan performance and contributes to excessive pressure drop and noise.

When designing ductwork in the field, it is important to use a straight discharge duct of the correct dimensions to obtain maximum fan performance. The straight section of ductwork helps the airflow to develop a uniform velocity profile as it exits the fan and allows the velocity pressure to recover into static pressure. See the figure below.



For 100% recovery of velocity pressure into static pressure, the straight portion of the discharge duct must be at least 2.5 times the discharge diameter to the length of the straight portion of ductwork.

As an example of how to size the straight portion of duct, assume the fan has a 13.5" x 9.5" discharge outlet = 0.89 ft^2.

Refer to this table for the effect of undersized equivalent duct diameter.

	No Duct	12% Effective Duct	25% Effective Duct	50% Effective Duct	100% Effective Duct
Pressure Recovery	0%	50%	80%	90%	100%

NOTE:

This information is referenced from AMCA Fans and Systems Publication 201-90.

Calculate Equivalent Duct Diameter

The equivalent duct diameter of the fan outlet:

$= (4ab \div \pi)^{0.5}$

$= \left(4 \times \frac{13.5 \times 9.5}{\pi}\right)^{0.5}$

$= 12.75 = \sim 13$

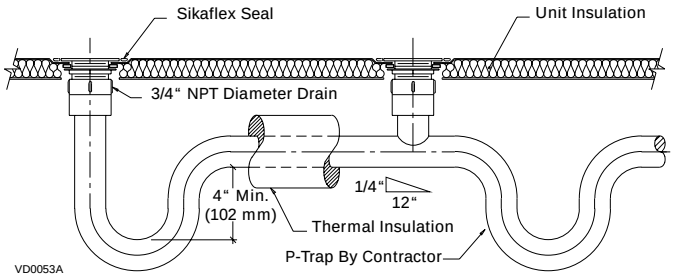
So the straight duct length required would be:

$= 2.5 \times 13$

= 32.5" long (2.7 feet)

3.4 Install Drain Line For Condensate (For HRV 20LCi unit only)

This unit requires a drain line because condensate occurs during heating seasons. The 3/4" NPT (19mm) drain connections are located at the bottom of the unit. Make sure that the drain connection is tight before installing the unit. This unit must have an external trap for the condensate drainage. The drain trap must be at least 4" (102mm) deep and be protected against freeze up. Do not use pipe smaller than the unit connection.



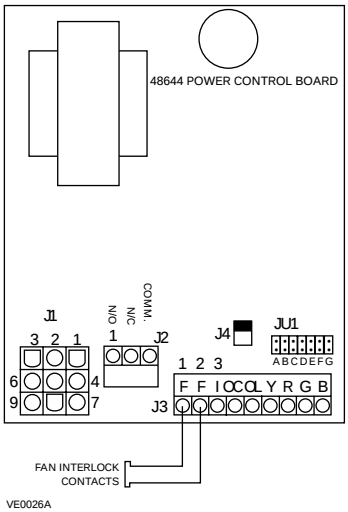
Drain Lines

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

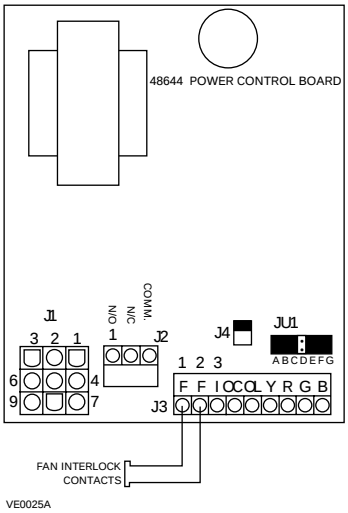
3.5 Systems Integration

Forced Air System

When the heat recovery (or the energy 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 following diagrams) can be connected in the unit control box to the integrated control board terminals **J3-1** and **J3-2** (for low voltage Class II circuit only). The controller makes relay contact between these terminals when the unit is operating.



Fan Interlock for HRV 20LCi



Fan Interlock for ERV w20LCi

Fresh air from the heat recovery (or energy 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 stale air to the unit 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 grills 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)

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

A backdraft gravity damper is supplied with defrost (or recirculation 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 defrost (or recirculation defrost) mode. The size of the damper is 12" x 26" (305 x 660mm). Mount the damper in the exhaust air to outside duct as shown in Appendix B.

3.6 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.

Elecrical requirements

Location of wire connections required are shown in Appendix D and E. Units are available in 208/230 volts, 1 phase. Please see Appendix C for electrical data.

For ERV w20LCi only

A junction box or disconnect switch must be field supplied where line voltage connections are made. Consult the local building electrical codes for the proper selection of power disconnect device(s).

For HRV 20LCi only: Power Supply

This unit may or may not have a factory installed disconnect switch. If disconnect is field supplied, provide a disconnect per 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.

High Voltage Field Connection

A high voltage connection is located on the outside of the unit with knockout. See Appendix D and E. A wiring diagram is located on the control box cover inside of the unit.

Electrical Data

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

4 Start Up

4.1 Controls And Defrost

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 optional wall controls require a four wire LVT-24 gauge (or equivalent). This control is 12VDC. Other terminals are 24VAC or dry contact control. Terminals are available for the following controls:

LOW-COM-HIGH

Makes dry contact for speed setting

Wall Control

4-wire LVT-24 gauge minimum (12VDC)

Occupied Timer/Sensor

24VAC, needs dry contact (Do not use with Venta, Supra, Basic or Electro controls)

Remote Fan Control (control wiring option)

24VAC (requires single pole, double throw switch)

Unoccupied Recirc Contacts (with recirculation option only)

Makes dry contact

Defrost

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 (HRV unit) or from the enthalpy wheel (ERV unit) 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 (HRV unit) or through the enthalpy wheel (ERV unit). Each unit has different defrost requirements and the schedules are shown in Appendix A.

Exhaust Only

Supply fan is de-energized, exhaust fan is energized, exhausts return air to outdoors. There is no outdoor air ventilation for the duration of defrost. Also, on w20LCi units, the ERV enthalpy wheel maintains rotation.

Recirculation (Option)

Exhaust fan is de-energized, supply fan is energized and circulates return air through the flat plate heat exchanger (HRV unit) or through the enthalpy wheel (ERV unit) and back to the building. There is no outdoor air ventilation for the duration of defrost. The ERV enthalpy wheel stops rotating.

Controls

For more information on the controls available on the 2000 cfm ventilators, see the following Appendix H references:

H-1 Wall Control Connection

H-2 Occupied Timer/Sensor Connection

H-3 Remote Fan Control

H-4 Unoccupied Recirc Contacts

4.2 Sequence Of Operation

IMPORTANT

On ERV unit only, on initial power up, the unit will perform a system check and operate at high speed for 5 seconds.

Before start-up, check the unit for obstructive packaging, objects near or in blowers, dampers, flat plate heat exchangers (HRV unit) or enthalpy wheel (ERV unit), 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' (HRV unit) or on LOW, OFF and HIGH modes (ERV unit). Use a wall control or the dry contact switching to run fan speeds, see Appendix H-1 and H-3.

Unit check points:

___ Power connected, no ventilation call - Both fans are off, defrost damper (if equipped) closes off fresh air from outside.

___ Power connected, low speed call (if equipped) - Both fans on low speed, defrost damper closes (if equipped) recirculation opening. If unit is single speed, it will come on that speed on a call for low or high.

___ Power connected, high speed call. Both fans on high speed, defrost damper (if equipped) closes recirculation opening. If unit is single speed, it will come on the speed on a call for low or high.

___ Power connected, occupied timer/sensor connection open (unoccupied mode) - Both fans are off, defrost damper (if equipped) opens recirculation opening.

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

4.3 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 extreme cold outside conditions. Air density variations can affect 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. See Appendix B which illustrates minimum distances 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.

For ERV unit only:

Another method of airflow balancing is to measure the pressure drop across the enthalpy wheel and correlate it to an airflow. See Appendix G for Enthalpy Wheel Pressure Drop Chart.

Setting Flow Rate

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

5 Service

5.1 Quarterly Maintenance

WARNING

Disconnect power to the unit before performing maintenance procedures.

Quarterly maintenance should include:

Air Filters

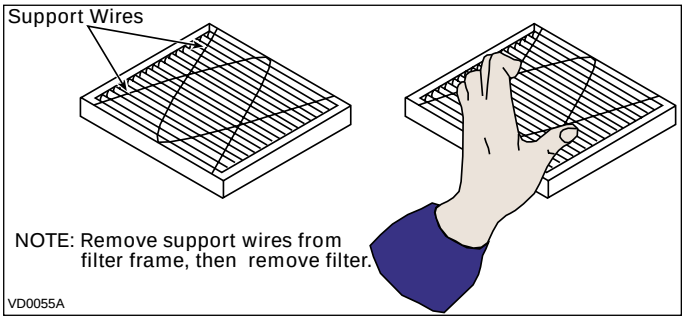
The standard medium efficiency filters are disposable and should be replaced every 3 months. More frequent replacement may be required under extremely dirty operating conditions. For filter specifications see Appendix A.

Filter Service for HRV unit (20LCi)

To remove the filters, first 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.

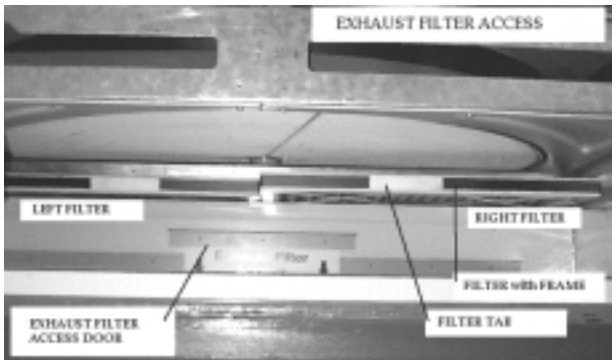
Filter Service for ERV unit (w20LCi)

To replace the filters, you must remove the support wires from the filter frame before removing the filter, as shown.



ERV Exhaust Filter Service (w20LCi)

To remove the exhaust filters in the ERV w20LCi, remove the screw holding the filter access door and slide the exhaust filter access door down to the bottom of the unit. The filters are set in frames and can be removed by pulling on the filter tabs and sliding them forward and out of the unit. First, the right filter must be removed, then the left filter must slide over to where the right filter was, then pull it forward and out of the unit as shown below.



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HRV 20LCi 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.

ERV w20LCi Cassette Panels and Interior of Unit

Remove the filters from the unit. Wipe the foil-faced insulation surfaces and cassette panels with a soft cloth and mild cleaning solution.

5.2 Annual Maintenance

WARNING

Disconnect power to the unit before performing maintenance procedures.

Air Filters

Replace filters.

HRV 20LCi 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.

ERV w20LCi Interior of Unit

Wash the foil-faced insulation surfaces with a soft cloth and mild cleaning solution.

HRV 20LCi Flat Plate Heat Exchanger

Remove the flat plate heat exchanger by sliding it out from the tracks holding it in place.

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.

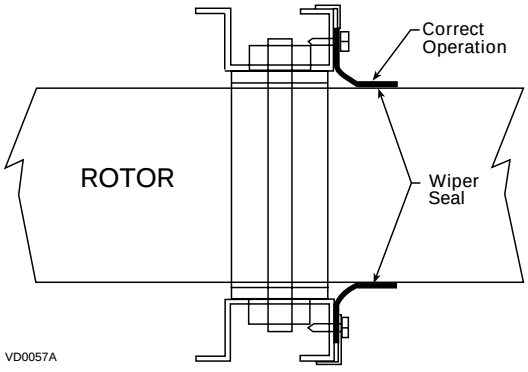
The flat plate heat exchanger must be handled with care. It is recommended that they be washed once a year following the season of most intense use, in order to ensure maximum efficiency of the plastic or aluminum partitions. Allow the flat plate heat exchangers to soak for 3 hours in warm water and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

CAUTION

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

ERV Enthalpy Wheel (w20LCi)

No cleaning of the enthalpy wheel is required. The wheel is self-cleaning due to the opposing airflows. If the enthalpy wheel is cleaned; use compressed air, low pressure steam or non-polarized solvents. Wash the cassette panels (See Figure 3 in Section 5.8) with a soft cloth and mild cleaning solution. Visually inspect the cassette wiper seals (shown below), perimeter seal, and drive belt (See Figure 4 in Section 5.8) for proper operation.



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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.

5.3 Testing And Replacement Of The Damper Actuator (ERV only)

After disconnecting the power from the unit, determine if the damper is defective. Disconnect the 24V power source. Connect the actuator directly to a 24V power source with an appropriate cable. If the damper operates correctly, the problem is either in the wiring connections or main circuit board.

If the damper does not work, it must be replaced. Take out the two mounting screws to remove the assembly. Install a new actuator assembly, connect all linkages and test for proper operation.

5.4 Motor and Blower Removal

1. Disconnect power from the unit.
2. Disconnect the 4-wire service connector between the motor and control box.
3. Remove the fan assembly by loosening the back two 3/8" x 1 1/2" (10 x 38mm) bolts and removing the front two 3/8" x 1 1/2" (10 x 38mm) bolts. The fan base is slotted and will slide forward on the rails and out of the cabinet.

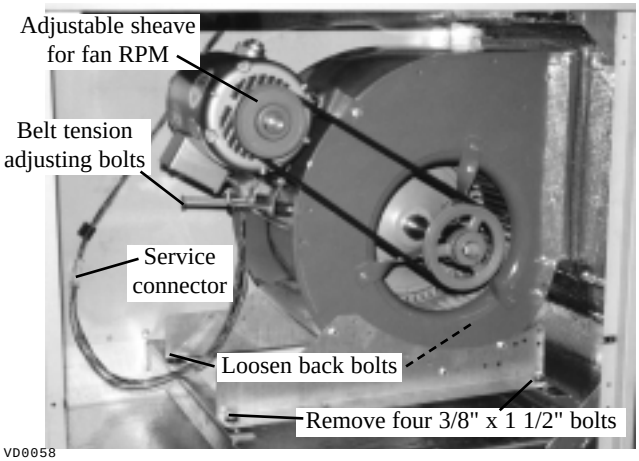

Figure 1: Typical Motor and Blower

5.5 Motor and Blower Service

Belt tension is adjusted by two 5/16" (8mm) bolts. Set adjustment nuts to the proper belt tension. Belt size A-46.

5.6 Adjusting Belt Tension

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 here. When the belt is grasped as shown, a total deflection of approximately 1" (25mm) (1/2" (13 mm) each side) should be easily attained. Insufficient deflection indicates that the belt is too tight, resulting in noise from excessive vibration, premature bearing failure and short belt life. Tight belts may overload a motor that would otherwise be adequate. Fan RPM can be adjusted to achieve the desired airflow by setting the adjustable sheave on the motor shaft (See Figure 1). Pulley set screw torque setting 110 in•lbs to 130 in•lbs.

5.7 Cassette Removal (ERV only)

After disconnecting the power from the unit, remove the access door and the filters located above the wheel shown below. Disconnect the drive motor harness (See Figure 5). Slide the panel located below the cassette (with the label "Exhaust Filter Access") downward until it clears the cassette beam (See Figure 2). Pull the cassette out partway (approximately 1/3).

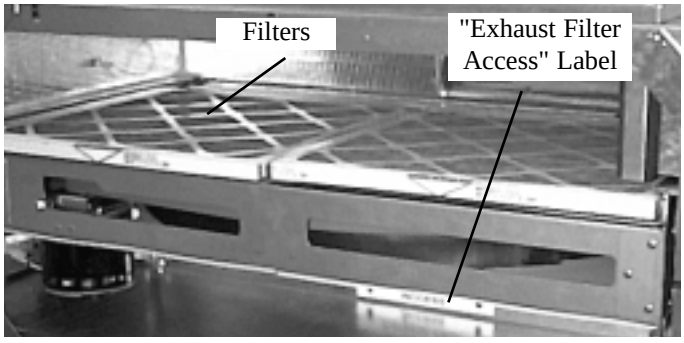

Figure 2: Cassette

5.8 Cassette Service (ERV only)

To replace or adjust the wiper seal, remove the five #8 type B screws as shown below.

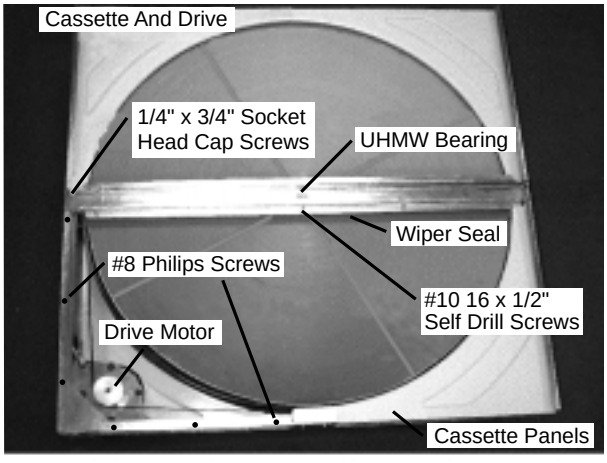

Figure 3: Cassette and Drive

To replace the UHMW bearing, remove the four 1/4" x 3/4" (6 x 19mm) socket head cap screws. Lift the cassette support beam off of the cassette and the bearing can then be pushed out of the beam after removing the #6 type B screws that hold the bearing in place.

To access the cassette drive area, loosen the left side 1/4" x 3/4" (6 x 19mm) socket head cap screws and remove the bottom left cassette panel by prying it up and away from the Velcro tabs.

To remove the drive pulley, gently slide the drive belt up and off of the pulley, being careful not to kink the belt in any way. Loosen the pulley set screw and slide the pulley off of the drive motor shaft.

To remove the drive belt, remove the four 1/4" x 3/4" (6 x 19mm) socket head cap screws and lift the cassette support beam off of the cassette. Remove the other three cassette panels by prying it up and away from the Velcro tabs. Slide the belt up and off of the rotor.

To remove the perimeter seal, locate the Velcro seam and pull apart. The seal can then be pulled away from the rotor by prying the two Velcro surfaces apart as shown below.

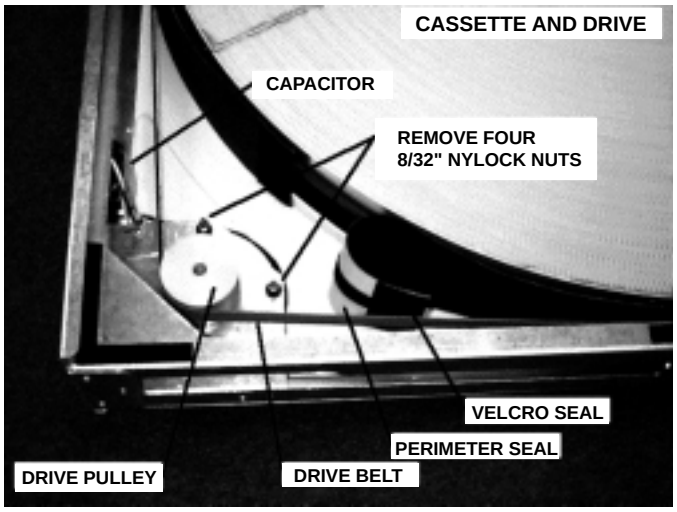

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Figure 4: Cassette Drive Close-Up

To remove the drive motor, remove the four 11/32" (8mm) nylock nuts and disconnect the motor wiring from the capacitor.

5.9 Belt Tension Adjustment/Replacement (ERV only)

After disconnecting the power from the unit, remove the access door and the filters located above the wheel (See Figure 2). Disconnect the drive motor harness shown below. Slide the panel located below the cassette (with the label "Exhaust Filter Access") downward until it clears the cassette beam (See Figure 2). Pull the cassette out partway (approximately 1/3). To adjust the belt tension, the lower left plastic panel on top of the cassette must be removed.

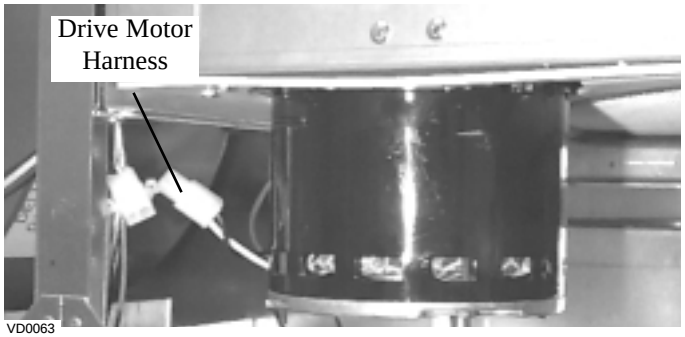

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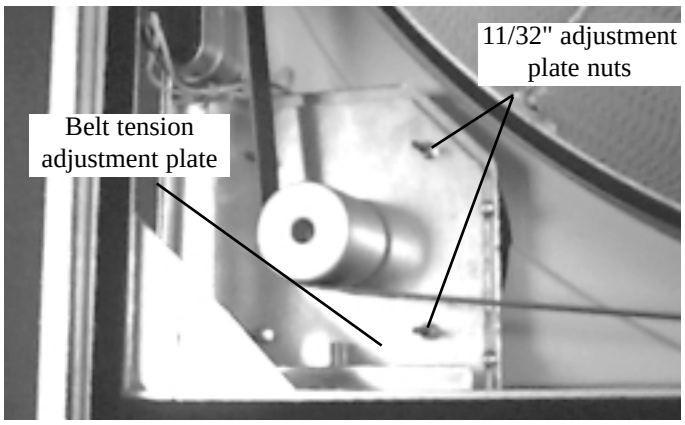
Figure 5: Drive Motor Harness

Loosen the four 11/32" adjustment plate nuts (shown below) two or three turns.



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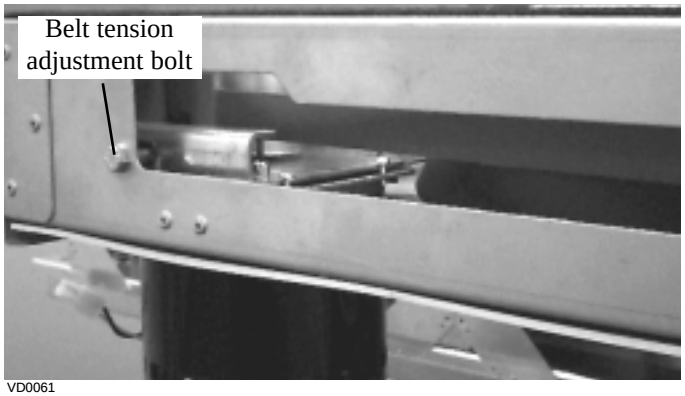
Turn the belt tension adjustment bolt (shown below) clockwise to tighten or counterclockwise to loosen.



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Adjust the tension as required. Tighten the adjustment plate nuts to secure the belt tension adjustment plate in place. Re-fasten the cassette metal panel and re-connect the power harness to the cassette motor. Push the cassette back into place.

NOTE:

The belt tension is factory set and should only be adjusted when replacing the belt or when the belt de-rails.

See Appendix I for more trouble shooting information

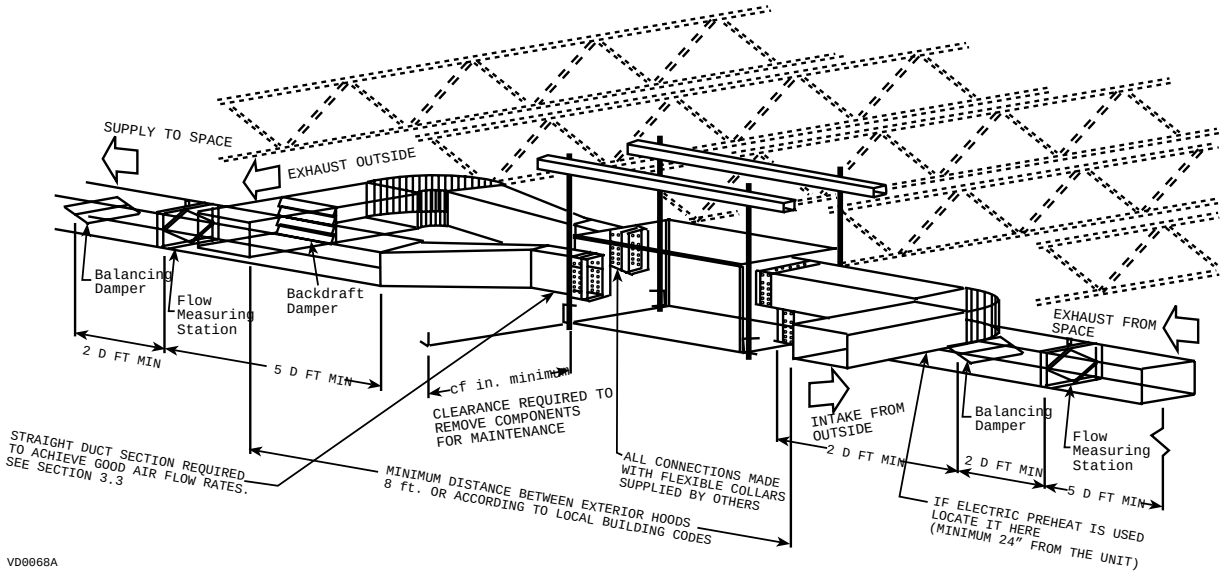
Appendix A

Equipment Data

	HRV 20LCi		ERV w20LCi
Shipping weight	750 lbs (341 kg)		725 lbs (330 kg)
Net weight	700 lbs (318 kg)		700 lbs (318 kg)
Shipping dimensions	94" x 52" x 36"		94" x 52" x 36"
l x w x h	2388 x 1321 x 914mm		2388 x 1321 x 914mm
Openings			
location	ends of unit		ends of unit
size w x h			
- supply inlet	12" x 26" (305 x 660mm)		12" x 26" (305 x 660mm)
- exhaust outlet	10" x 14" (254 x 356mm)		10" x 14" (254 x 356mm)
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 speeds (standard) 2 HP, 1 speed (optional)		1.5 HP, 2 speeds (standard) 2 HP, 1 speed (optional)
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 speeds (standard) 2 HP, 1 speed (optional)		1.5 HP, 2 speeds (standard) 2 HP, 1 speed (optional)
Filters			
Supply: quantity 2 MEF	12" x 24" x 4" disposable (305 x 610 x 102mm)		24" x 24" x 2" disposable (610 x 610 x 51mm)
Exhaust: quantity 2 MEF	12" x 24" x 4" disposable (305 x 610 x 102mm)		24" x 24" x 2" disposable (610 x 610 x 51mm)
Defrost Cycle (if equipped)	Standard	Extended	Standard
activation, stage 1	23°F (-5°C)		5°F (-15°C)
recirculation	6 min. (defrost)	10 min. (defrost)	6 minutes
ventilation	32 min. (vent)	28 min. (vent)	30 minutes
activation, stage 2	-22°F (-30°C)		N/A
recirculation	6 min. (defrost)	10 min. (defrost)	preheat required
ventilation	19 min. (vent)	15 min. (vent)	below -21°F (-30°C)
Drains			
quantity ... size (NPT)	2 - 3/4" outside thread NPT 3/4" inside thread fit required		N/A
Backdraft Damper			
size (recirculation defrost)	12.00" x 26.00" (305 x 660mm)		12.00" x 26.00" (305 x 660mm)

Appendix B

Typical Installation and Minimum Distance Requirements



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:

	HRV 20LCi	ERV w20LCi
front clearance - Cf	28" (711mm)	48" (1219mm)
back clearance	none required but 24" (610mm) for simplified access to service exhaust fan	none required but 24" (610mm) for simplified access to service exhaust fan

Appendix C

Electrical Data

Motor HP	208/1/60		230/1/60	
	MCA	MOP	MCA	MOP
1 1/2	22.38	31.88	21.25	30.25
2	30.70	43.90	30.25	43.25

NOTE: Based on full load motor consumption. Values shown are for the complete unit and include both motors.

Selection With Different Size Supply And Exhaust Motors

For different motor HP:

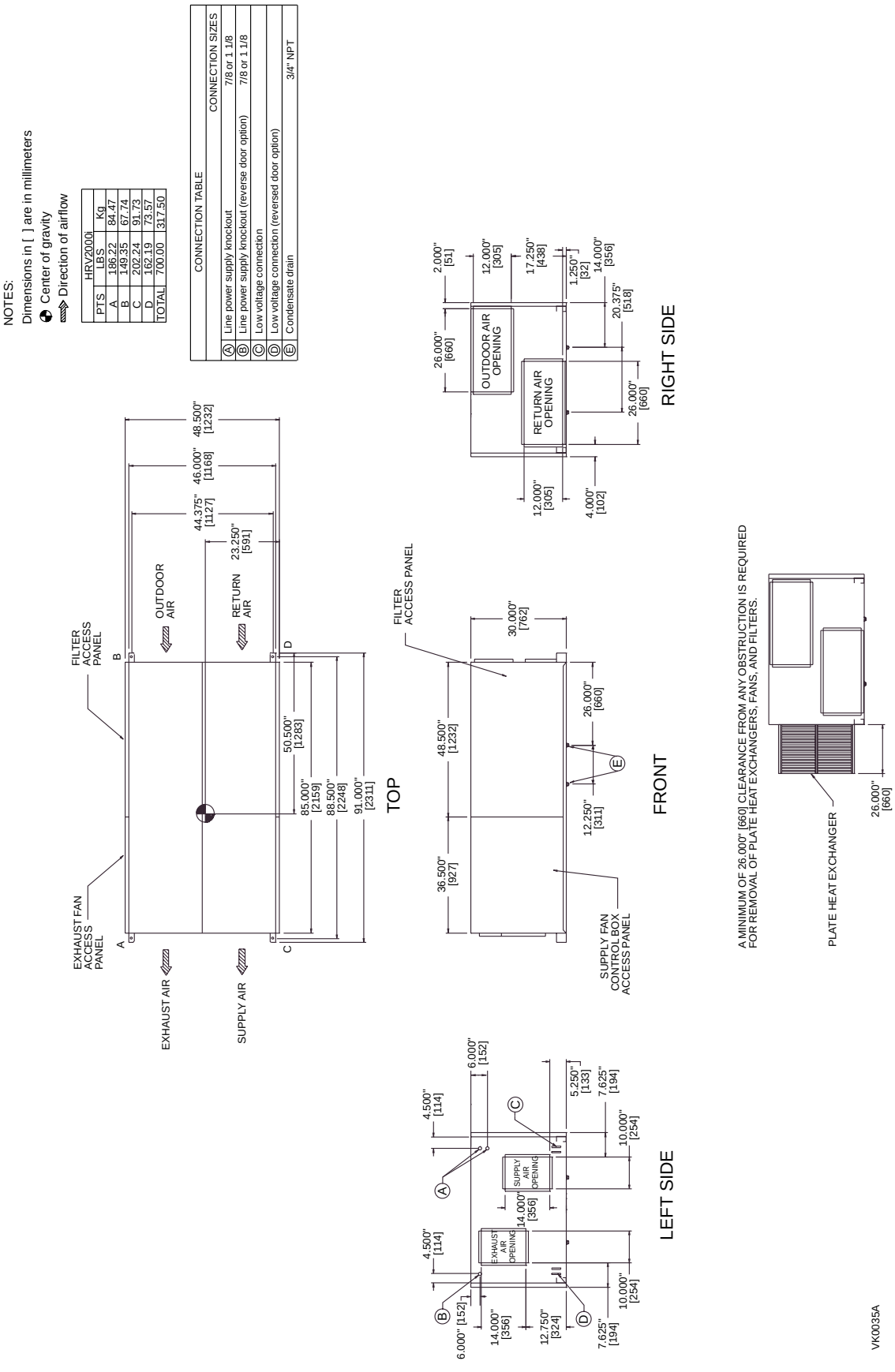
1) Select the MCA and MOP for each motor.
2) Add the two numbers together and divide by 2.

Example:

	208/1/60	
	MCA	MOP
1 1/2 HP motor	22.38	31.88
2 HP motor	30.70	43.90
Total	53.08	75.78
Real value	**26.54**	**37.89**

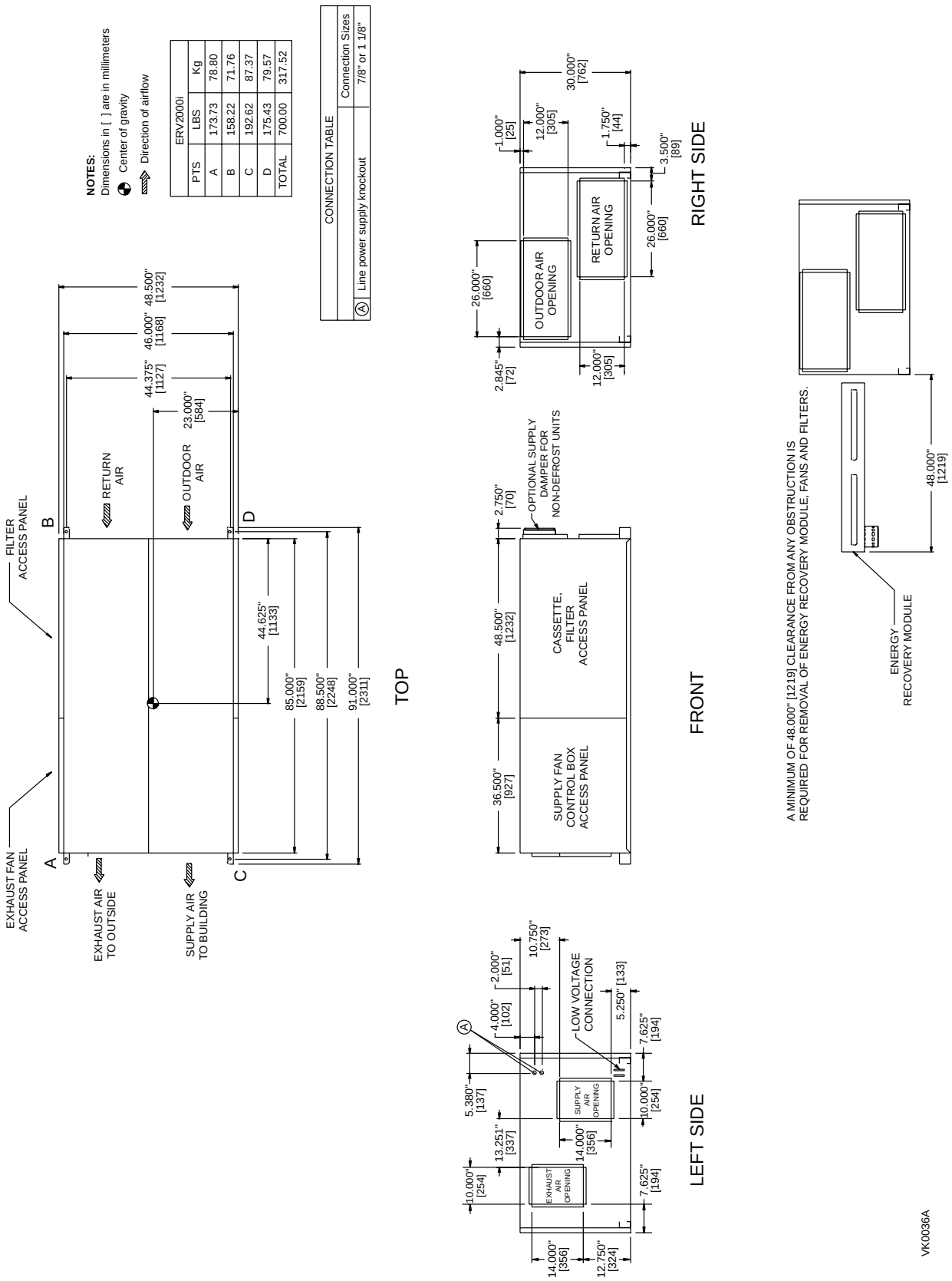
Appendix D

HRV 20LCi Dimensions



Appendix E

ERV w20LCi Dimensions



Appendix F

Airflow Performances

HRV 20LCi 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
1300																	1115	1.11	
1400													1085	1.02	1143	1.13	1201	1.24	
1500											1125	1.02	1200	1.14	1225	1.26	1250	1.38	
1600									1100	1.02	1160	1.14	1225	1.27	1275	1.40	1350	1.53	**1.5**
1700									1125	1.14	1200	1.28	1260	1.41	1310	1.55	1375	1.69	
1800							1100	1.13	1160	1.27	1225	1.41	1275	1.56	1340	1.70	1390	1.85	
1900					1075	1.10	1150	1.25	1200	1.41	1250	1.56	1300	1.71	1375	1.87			
2000			1050	1.07	1100	1.23	1175	1.39	1225	1.55	1275	1.71	1325	1.87					
2100	1020	1.03	1075	1.20	1125	1.37	1200	1.53	1260	1.70	1300	1.87							
2200	1050	1.15	1100	1.33	1175	1.51	1225	1.69	1275	1.86									
2300	1090	1.29	1150	1.47	1200	1.66	1250	1.84											
2400	1125	1.43	1175	1.62	1230	1.82													**2.0**
2500	1150	1.58	1210	1.78	1275	1.98													
2600	1210	1.73	1250	1.94															
2700	1225	1.89																	

ERV 20LCi Supply and Exhaust (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
1400																	950	1.04	
1500															912	1.04	958	1.15	
1600													883	1.03	931	1.15	977	1.27	
1700											850	1.02	900	1.14	947	1.27	993	1.39	**1.5**
1800											874	1.12	924	1.25	971	1.39	1016	1.52	
1900									839	1.09	891	1.23	940	1.37	986	1.51	1030	1.65	
2000							796	1.06	849	1.20	899	1.35	947	1.49	992	1.64	1035	1.79	
2100					775	1.01	831	1.16	885	1.31	935	1.47	982	1.62	1028	1.77	1071	1.93	
2200					798	1.11	853	1.27	905	1.43	955	1.59	1002	1.75	1047	1.91			
2300			755	1.05	813	1.22	868	1.39	919	1.55	967	1.72	1013	1.89					
2400			773	1.16	830	1.33	882	1.51	923	1.68	980	1.86							
2500	738	1.09	798	1.27	853	1.45	905	1.63	955	1.82	1001	2.00							**2.0**
2600	758	1.20	816	1.38	870	1.57	921	1.76	969	1.95									
2700	784	1.31	841	1.51	894	1.70	945	1.90											
2800	807	1.43	863	1.63	915	1.84													

Appendix G

Enthalpy Wheel Pressure Drop Chart for ERV w20LCi Rotor

42'' Dia. cfm	4'' Depth fpm	Pressure Drop in W.G.
1200	286	0.13
1300	310	0.15
1400	334	0.17
1500	357	0.18
1600	381	0.19
1700	405	0.20
1800	429	0.21
1900	453	0.22
2000	477	0.24
2100	501	0.25
2200	524	0.26
2300	548	0.28
2400	572	0.29
2500	596	0.30
2600	620	0.32
2700	644	0.34
2800	668	0.35

Appendix H

Terminal Control Diagrams

H-1: Wall Control Connection

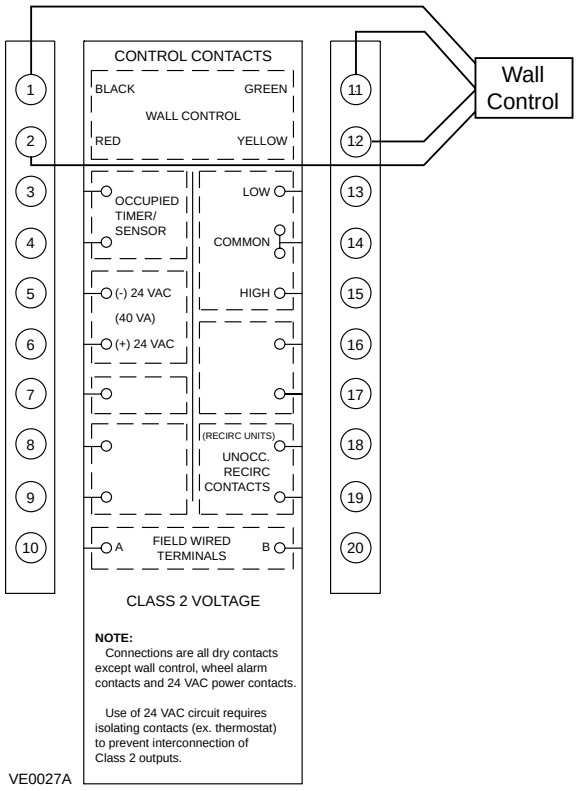
Two types of remote wall controls are available:

1. **Venta** or **Basic** with fan switch and dehumidistat control
2. **Supra** or **Electro** with fan mode selection, dehumidistat control, and maintenance indicator

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 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-3.

NOTE: An occupied timer or sensor device cannot be used with the Supra or Electro wall controls.

NOTE: The factory installed jumper across terminals 3 and 4 must be in place.

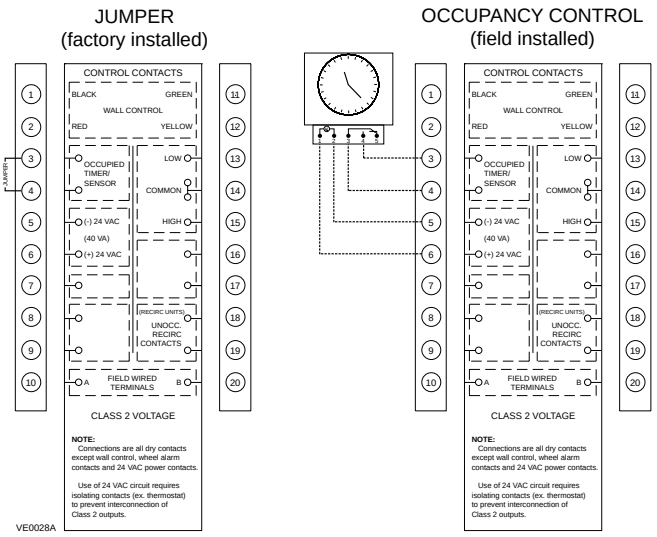


H-2: Occupied Timer/Sensor Connection

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: An occupied timer or sensor device cannot be used with the Supra or Electro wall controls.



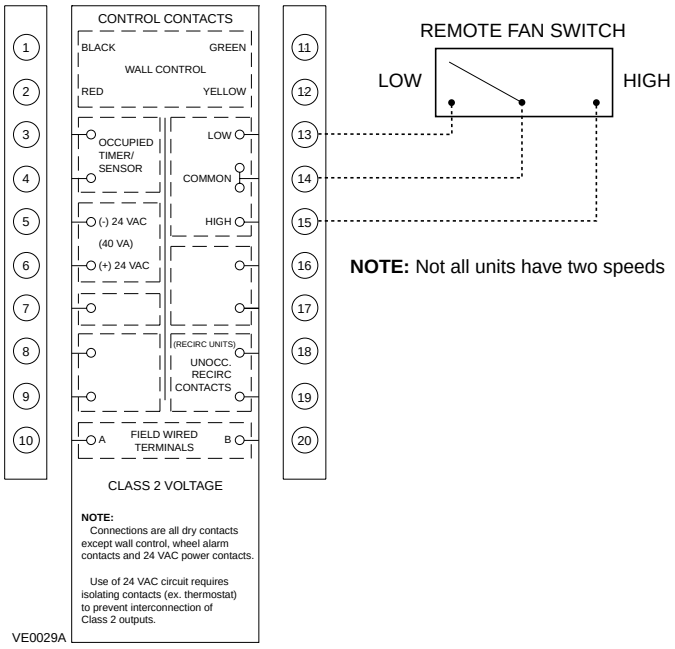
Appendix H Continued

Terminal Control Diagrams

H-3: 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 2 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.

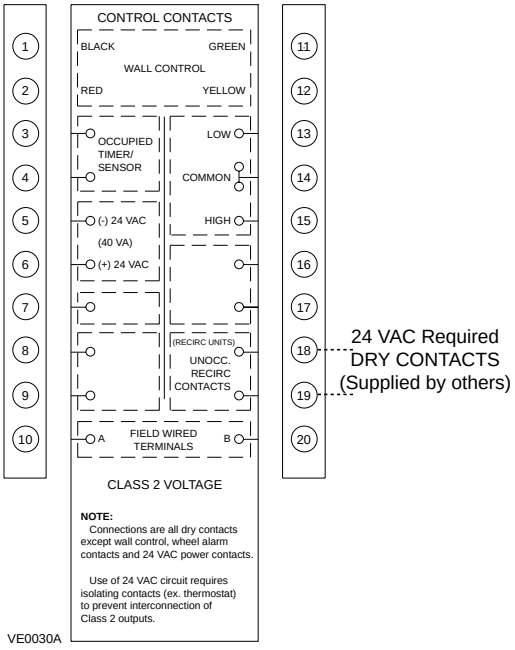
CAUTION: Do not use a wall control and remote fan switch at the same time. Damage to the unit may occur.



H-4: Unocupied Recirc. Contacts

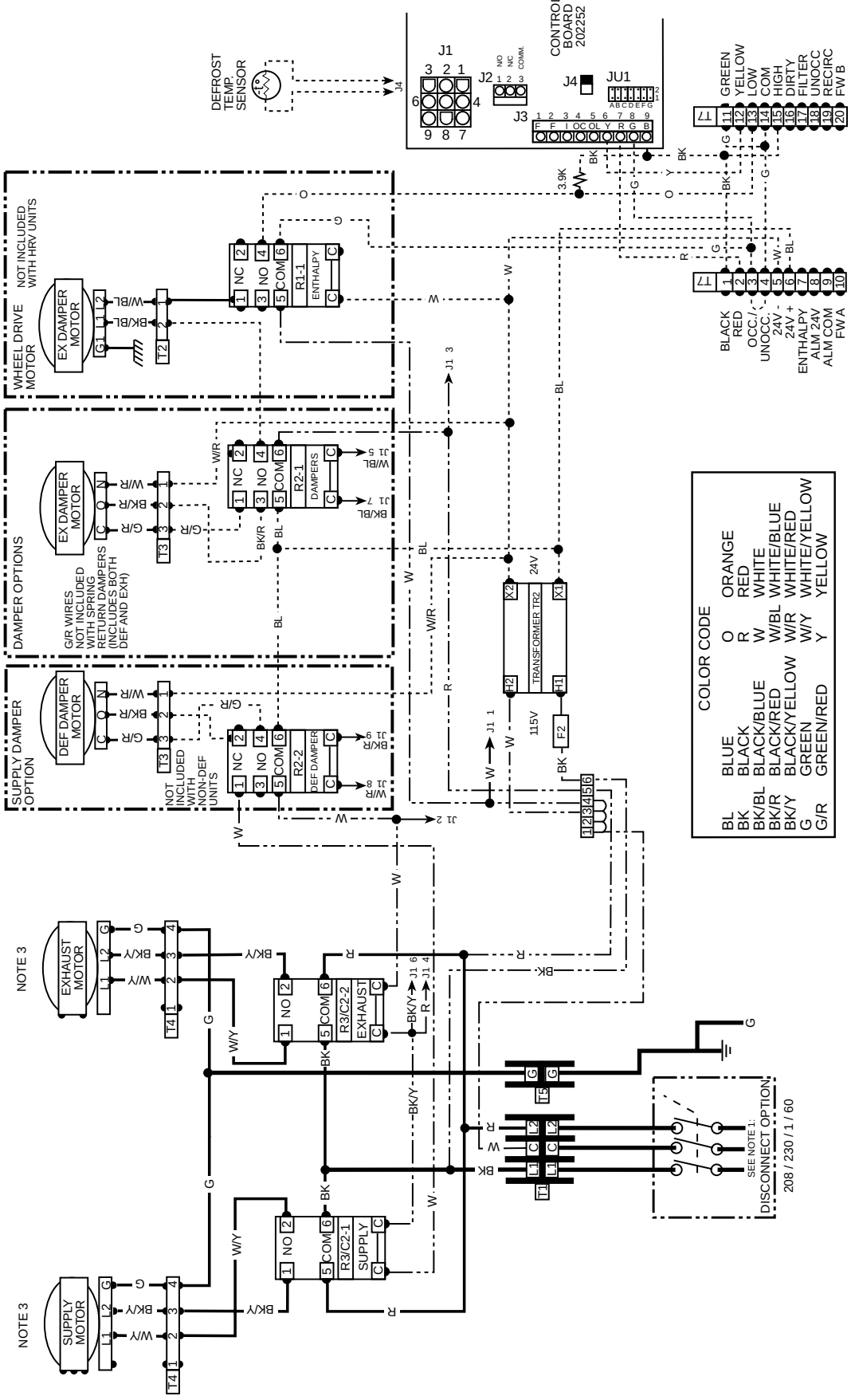
On recirc defrost units, an unoccupied recirc control can be achieved by connection to the terminal interface shown below. These terminals require a dry contact which could be provided by a timer, thermostat or other. Closure of these terminals will cause the unit to go into a 'recirc mode' where the 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 field supplied dry contacts should be installed such that they are disabled during occupied periods as to not cause the unit to go into a recirc condition unnecessarily.



Appendix I

Wiring Diagram for HRV 20LCi and ERV w20LCi (1 speed, exhaust defrost)



NOTES

1- 3 POLE DISCONNECTION SWITCH OPTIONAL. FIELD CONNECTIONS TO TERMINALS ON SWITCH. SINGLE PHASE REQUIRES A NEUTRAL WIRE WITH L1 & L2.

2- SUPPLY AND EXHAUST MOTORS MAY NOT BE EQUIPPED WITH "WIRED" T'STATS BUT MAY HAVE AUTO OVERLOADS. IF SO, CONNECTOR T2 IS ELIMINATED.

3- FOR SINGLE PHASE MOTORS WITH 2 HP, A CONTACTOR IS USED.

4- IF ANY OF THE ORIGINAL WIRE, AS SUPPLIED, MUST BE REPLACED, USE THE SAME OR EQUIVALENT WIRE.

5- THE FIELD WIRING MUST COMPLY WITH APPLICABLE CODES, ORDONNANCES AND REGULATIONS.

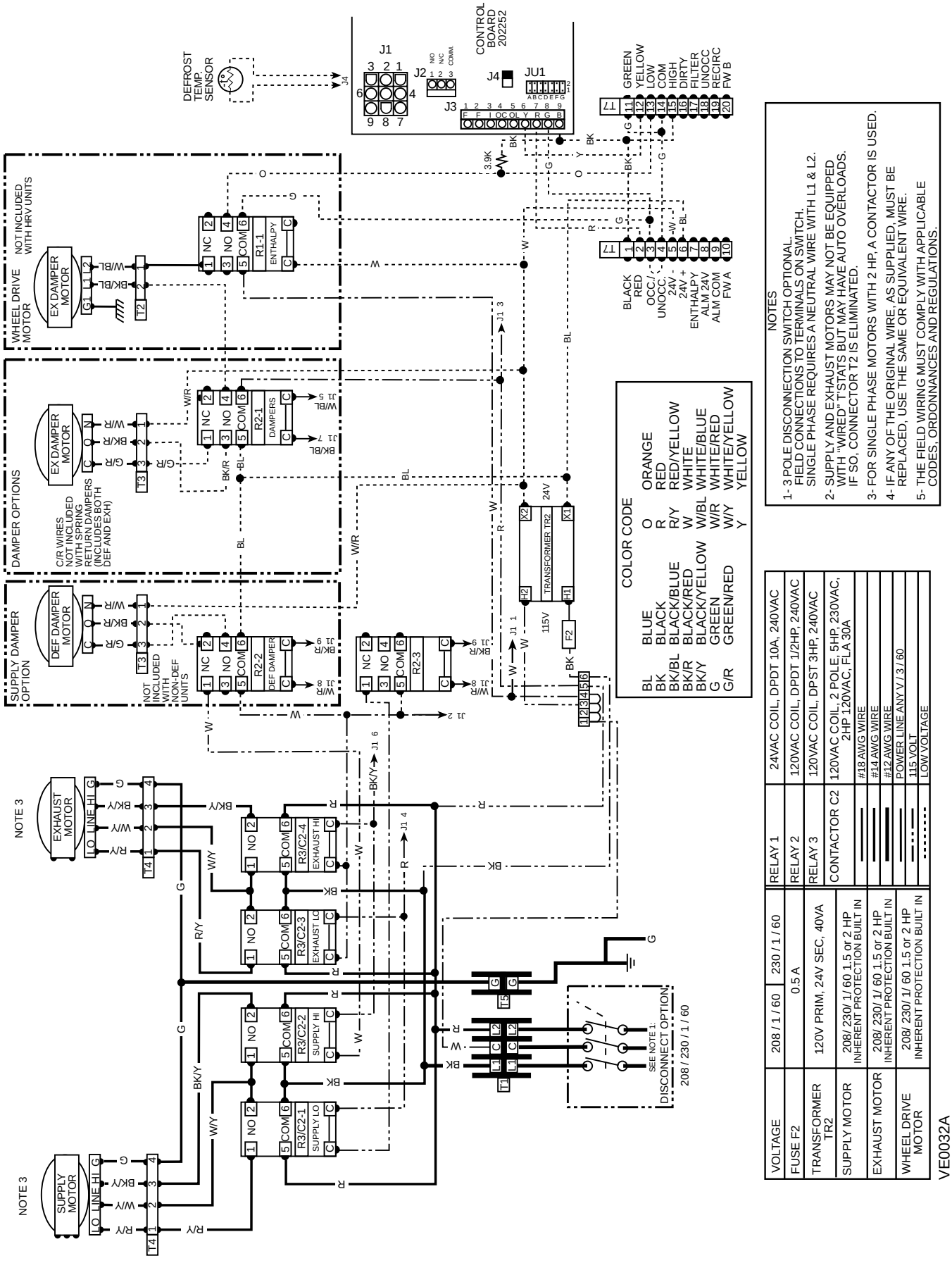
VOLTAGE	208 / 1 / 60	230 / 1 / 60
FUSE F2	0.5 A	
TRANSFORMER TR2	120V PRIM, 24V SEC, 40VA	
SUPPLY MOTOR	208/ 230/ 1/ 60 1.5 or 2 HP INHERENT PROTECTION BUILT IN	
EXHAUST MOTOR	208/ 230/ 1/ 60 1.5 or 2 HP INHERENT PROTECTION BUILT IN	
WHEEL DRIVE MOTOR	208/ 230/ 1/ 60 1.5 or 2 HP INHERENT PROTECTION BUILT IN	

RELAY 1	24VAC COIL, DPDT 10A, 240VAC
RELAY 2	120VAC COIL, DPDT 1/2HP, 240VAC
RELAY 3	120VAC COIL, DPST 3HP, 240VAC
CONTACTOR C2	120VAC COIL, 2 POLE, 5HP, 230VAC, 2HP 120VAC, FLA 30A
	#18 AWG WIRE
	#14 AWG WIRE
	#12 AWG WIRE
	POWER LINE ANY V / 3 / 60
	115 VOLT
	LOW VOLTAGE

VE0031A

Appendix I Continued

Wiring Diagram for HRV 20LCi and ERV w20LCi (2 speeds, exhaust defrost)



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2- SUPPLY AND EXHAUST MOTORS MAY NOT BE EQUIPPED WITH "WIRED" T'STATS BUT MAY HAVE AUTO OVERLOADS. IF SO, CONNECTOR T2 IS ELIMINATED.

3- FOR SINGLE PHASE MOTORS WITH 2 HP, A CONTACTOR IS USED.

4- IF ANY OF THE ORIGINAL WIRE, AS SUPPLIED, MUST BE REPLACED, USE THE SAME OR EQUIVALENT WIRE.

5- THE FIELD WIRING MUST COMPLY WITH APPLICABLE CODES, ORDONNANCES AND REGULATIONS.

VOLTAGE	208 / 1 / 60	230 / 1 / 60
FUSE F2	0.5 A	
TRANSFORMER TR2	120V PRIM, 24V SEC, 40VA	
SUPPLY MOTOR	208/ 230/ 1/ 60 1.5 or 2 HP INHERENT PROTECTION BUILT IN	
EXHAUST MOTOR	208/ 230/ 1/ 60 1.5 or 2 HP INHERENT PROTECTION BUILT IN	
WHEEL DRIVE MOTOR	208/ 230/ 1/ 60 1.5 or 2 HP INHERENT PROTECTION BUILT IN	

RELAY 1	24VAC COIL, DPDT 10A, 240VAC
RELAY 2	120VAC COIL, DPDT 1/2HP, 240VAC
RELAY 3	120VAC COIL, DPST 3HP, 240VAC
CONTACTOR C2	120VAC COIL, 2 POLE, 5HP, 230VAC, 2HP 120VAC, FLA 30A
	#18 AWG WIRE
	#14 AWG WIRE
	#12 AWG WIRE
	POWER LINE ANY V / 3 / 60
	115 VOLT
	LOW VOLTAGE

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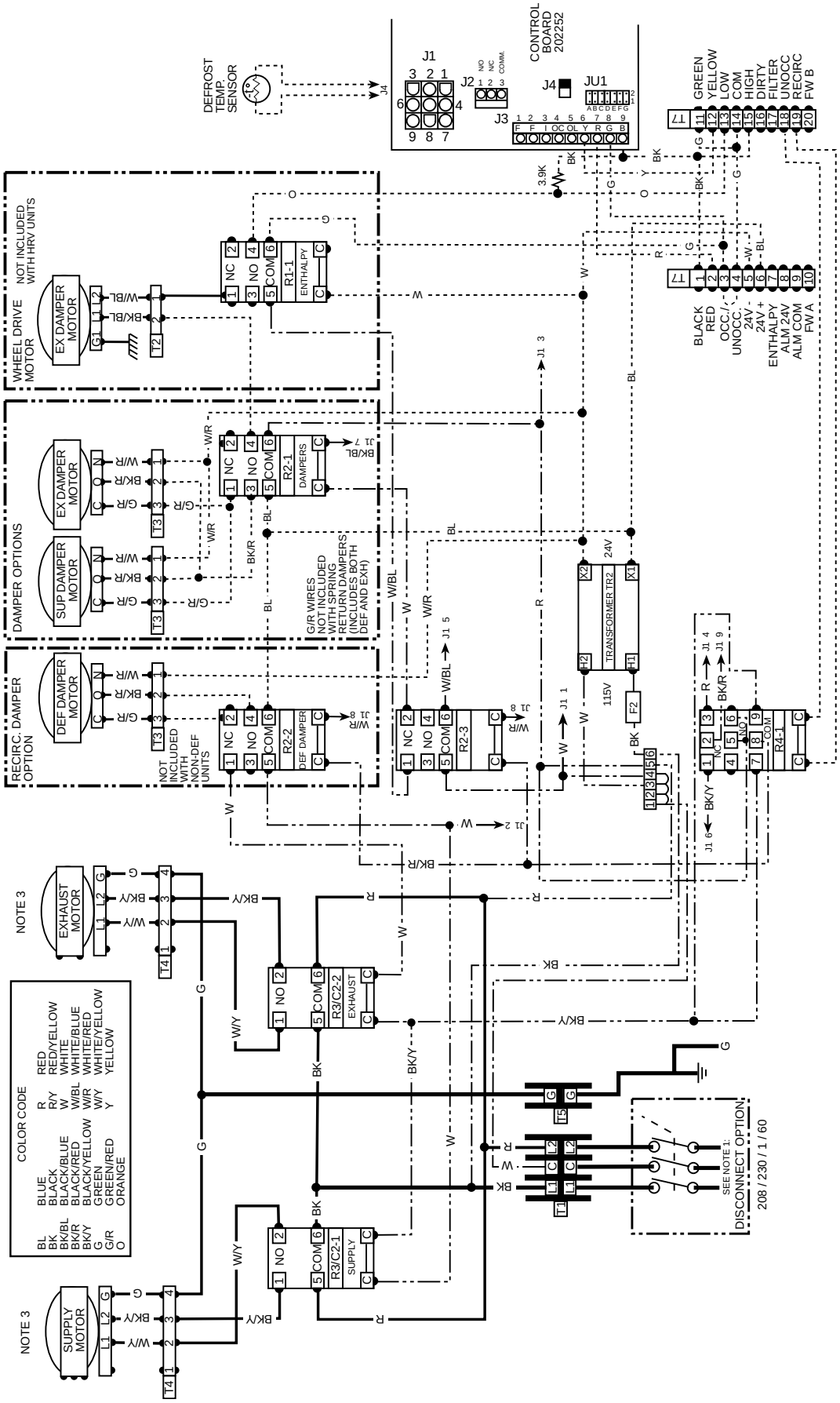
Appendix I Continued

Wiring Diagram for HRV 20LCi and ERV w20LCi (1 speed, recirculation defrost)



NOTES

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2- SUPPLY AND EXHAUST MOTORS MAY NOT BE EQUIPPED WITH "WIRED" T'STATS BUT MAY HAVE AUTO OVERLOADS. IF SO, CONNECTOR T2 IS ELIMINATED.

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5- THE FIELD WIRING MUST COMPLY WITH APPLICABLE CODES, ORDONNANCES AND REGULATIONS.

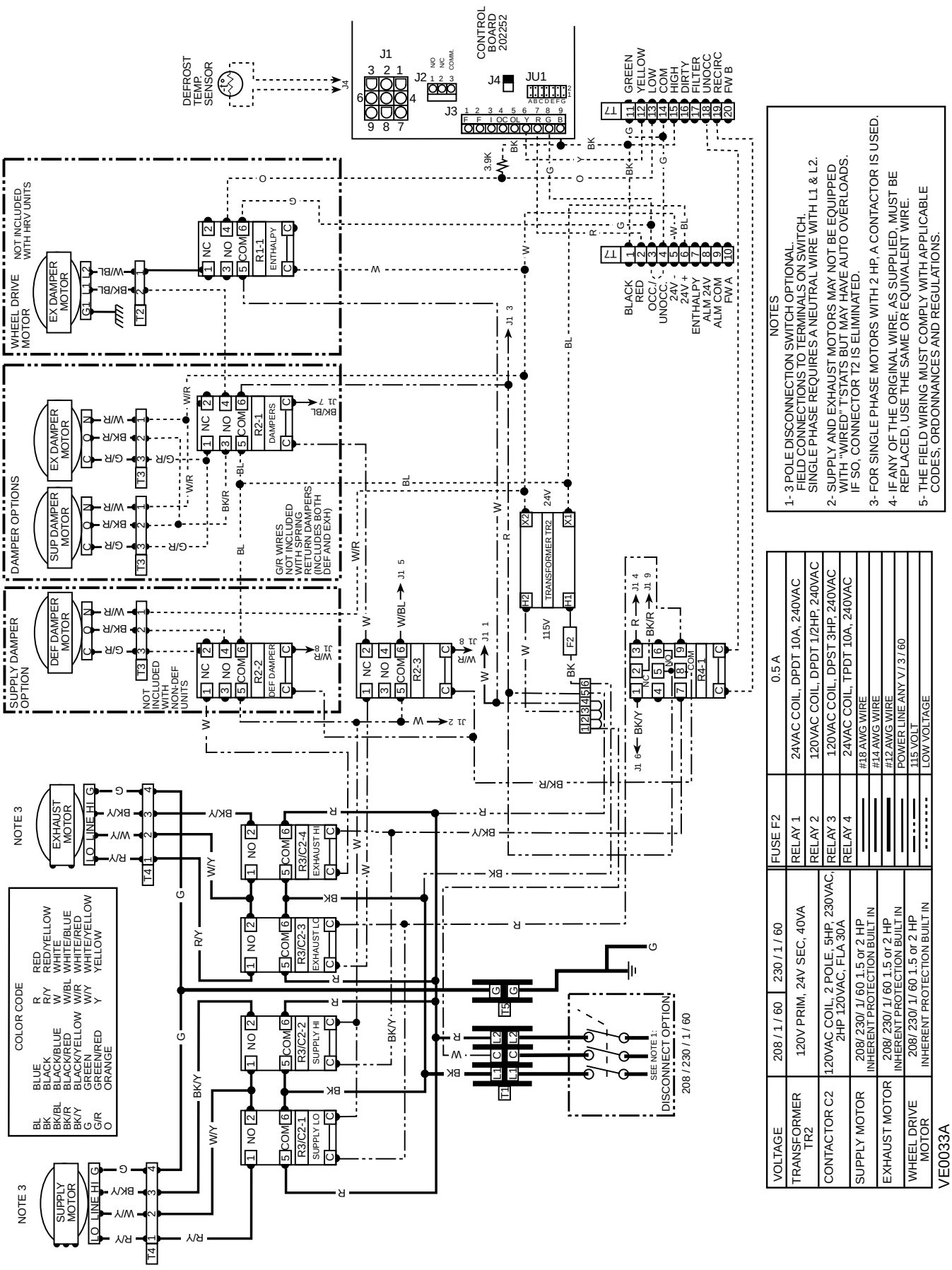
VOLTAGE	208 / 1 / 60	230 / 1 / 60
TRANSFORMER TR2	120V PRIM, 24V SEC, 40VA	
CONTACTOR C2	120VAC COIL, 2 POLE, 5HP, 230VAC, 2HP 120VAC, FLA 30A	
SUPPLY MOTOR	208/ 230/ 1/ 60 1.5 or 2 HP INHERENT PROTECTION BUILT IN	
EXHAUST MOTOR	208/ 230/ 1/ 60 1.5 or 2 HP INHERENT PROTECTION BUILT IN	
WHEEL DRIVE MOTOR	208/ 230/ 1/ 60 1.5 or 2 HP INHERENT PROTECTION BUILT IN	

FUSE F2	0.5 A
RELAY 1	24VAC COIL, DPDT 10A, 240VAC
RELAY 2	120VAC COIL, DPDT 1/2HP, 240VAC
RELAY 3	120VAC COIL, DPST 3HP, 240VAC
RELAY 4	24VAC COIL, TPDT 10A, 240VAC
	#18 AWG WIRE
	#14 AWG WIRE
	#12 AWG WIRE
	POWER LINE ANY V / 3 / 60
	115 VOLT
	LOW VOLTAGE

VE0034A

Appendix I Continued

Wiring Diagram for HRV 20LCi and ERV w20LCi (2 speeds, recirculation defrost)



NOTES

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2- SUPPLY AND EXHAUST MOTORS MAY NOT BE EQUIPPED WITH "WIRED" T'STATS BUT MAY HAVE AUTO OVERLOADS. IF SO, CONNECTOR T2 IS ELIMINATED.

3- FOR SINGLE PHASE MOTORS WITH 2 HP, A CONTACTOR IS USED.

4- IF ANY OF THE ORIGINAL WIRE, AS SUPPLIED, MUST BE REPLACED, USE THE SAME OR EQUIVALENT WIRE.

5- THE FIELD WIRING MUST COMPLY WITH APPLICABLE CODES, ORDONNANCES AND REGULATIONS.

VOLTAGE	208 / 1 / 60	230 / 1 / 60
TRANSFORMER TR2	120 V PRIM, 24V SEC, 40VA	
CONTACTOR C2	120VAC COIL, 2 POLE, 5HP, 230VAC, 2HP 120VAC, FLA 30A	
SUPPLY MOTOR	208/ 230/ 1/ 60 1.5 or 2 HP INHERENT PROTECTION BUILT IN	
EXHAUST MOTOR	208/ 230/ 1/ 60 1.5 or 2 HP INHERENT PROTECTION BUILT IN	
WHEEL DRIVE MOTOR	208/ 230/ 1/ 60 1.5 or 2 HP INHERENT PROTECTION BUILT IN	

FUSE F2	0.5 A
RELAY 1	24VAC COIL, DPDT 10A, 240VAC
RELAY 2	120VAC COIL, DPDT 1/2HP, 240VAC
RELAY 3	120VAC COIL, DPST 3HP, 240VAC
RELAY 4	24VAC COIL, TPDT 10A, 240VAC
	#18 AWG WIRE
	#14 AWG WIRE
	#12 AWG WIRE
	POWER LINE ANY V / 3 / 60
	115 VOLT
	LOW VOLTAGE

VE0033A

Appendix J

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. Enthalpy wheel wiper seal not functioning properly. (on ERV w20LCi only)	Remove the motor/blower assembly (see Service Section). Adjust blower wheel. Check for proper seal operation.
Heat exchanger freezing (on HRV 20LCi) or Enthalpy Wheel freezing (on ERV w20LCi)	Imbalance of supply and exhaust air. Defrost damper not functioning. Pre-heater not functioning.	Check filters and heat exchanger for blockage. Check balance of airflows. Check for operation of damper actuator. Check the heat module circuit breaker.
Enthalpy Wheel not running (on ERV w20LCi only).	Enthalpy control contacts closed. Electrical supply interrupted. Drive motor capacitor. Drive motor failure. Drive motor relay in control box. Drive belt. Drive pulley.	Check jumper wiring for proper operation. Check unit circuit breaker. Check two wire service connector on motor. Check capacitor connections, Check motor operation with a new capacitor. Check the drive motor. Check relay wiring. Check relay operation. Check for drive belt derailment off of drive pulley or failure. Check for securely fastened pulley on motor shaft.
Motor and blower not functioning.	Electrical supply interrupted. Fan motor capacitor. Fan motor failure. Fan motor relay in control box. Fan drive belt. Fan drive pulleys.	Check unit circuit breaker. Check four wire service connector on each motor. Check capacitor connections. Check motor operation with new capacitor. Check fan motor. Check relay wiring. Check relay operation. Check for failure. Check for securely fastened pulley(s) on motor or fan shaft(s). Set screw setting at 110 in • lbs to 130 in • lbs.
Only supply fan will turn on.	Unit is in recirc defrost. (recirc units)	Wait until unit is out of defrost. Defrost relay is not working.
Only exhaust fan will turn on.	Unit is in defrost (exhaust units) Motor wiring incorrect.	Check connection to motor.
Damper will not open.	Electrical supply interrupted. Defrost relay in control box. Electronic control board. Thermistor.	Check wiring on damper actuator. Check three wire service connector on control box. Check relay wiring. Check relay operation. Test the defrost on control board. Test the thermistor operation.
Damper opens when it be closed.	Wires are reversed.	Reverse wires #2 and #3 should on damper actuator.