Indoor ERV

Energy Recovery Ventilators

Installation, Operation and Maintenance Instructions Manual

VENMAR CES
Dedicated Outdoor Air Solutions

Capacity: 700 to 4,000 cfm
Model: ERV1000i, ERV1500i, ERV2000i, ERV3000i

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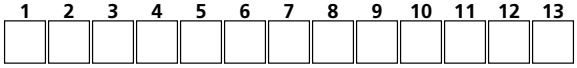
Nomenclature

ERV1000i Nomenclature (700–1,400 cfm)



1. FROST CONTROL
D– Recirc defrost[1]
E – Exhaust only[2]
V– VSD frost prevention, no wall control compatibility
W– VSD frost prevention
C – Non-defrost
N– Non-defrost, no wall control compatibility[3]

2. VOLTAGE/SPEED
A– 120/1/60 - two-speed[4]
B – 208–120/1/60 - two-speed[4/5]
C – 230–120/1/60 - two-speed[4/5]
D– 208/3/60 - one-speed[4]
E – 230/3/60 - one-speed[4]
F – 460/3/60 - one-speed[4]

3. INTERNAL PROTECTION
1 – 1" insulation, single wall
2 – 1" insulation, double wall

4. SENSOR CONTACTS
D– Dirty filter contacts
W– Wheel rotation sensor[6]
B – Dirty filter contacts and wheel rotation sensor[6]
X– No contacts, no sensor

5. EXTERNAL FINISH
S – Standard galvanized package
W– White prepaint package

6. OUTSIDE AIR DAMPER
1 – Insulated motorized[7]
2 – Insulated spring return[7]
3 – Non-insulated motorized[8]
4 – Non-insulated spring return[8]
5 – No damper

7. DOOR FASTENERS
S – Standard filter door c/w screws
D– Deluxe filter door c/w ¼ turn fasteners

8. EXTERNAL DISCONNECT
F – Fused disconnect switch[9]
N– Non-fused disconnect switch[9]
X– No disconnect switch

9. FILTRATION
S – Supply filter
E – Exhaust filter
B – Supply and exhaust filters
X– No filtration

10. FREE COOLING
S – Setpoint for enthalpy controller
D– Differential enthalpy controller
T – Thermostat (dry bulb)
X– No free cooling controller

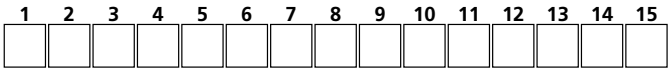
11. LOW SPEED
L – Reduced low speed
N– Normal low speed
X– No low speed

12. CASSETTE ACCESS
R – Reverse cassette access
S – Standard cassette access

13. ENERGY RECOVERY
1 – Aluminum wheel, no purge
2 – Aluminum wheel c/w purge

Notes:
1 When ordering recirc defrost, you must order an insulated outside air damper. Recirc defrost option includes recirculation dry contacts for unoccupied mode. Includes exhaust backdraft.
2 Outside air damper required.
3 No damper required.
4 Single-phase motors are available with low speed options 'L' or 'N'. Three-phase motors are only available with low speed option 'X'.
5 Requires a neutral wire with L1 and L2.
6 Units ordered with the wheel rotation sensor option must include a frost control option other than 'V' or 'N'.
7 This option is for recirc defrost units only.
8 This option cannot be ordered on recirc defrost units.
9 Fused/non-fused disconnect switch is field installed.

ERV1500i Nomenclature (800–2,000 cfm)



1. FROST CONTROL
D– Recirc defrost[1]
E – Exhaust only[2]
V– VSD frost prevention, no wall control compatibility
W– VSD frost prevention
M– Preheat - 8 kW, two-stage[3]
O– Preheat - 8 kW, four-stage[3]
P – Preheat - 8 kW, SCR[3]
Q– Preheat - 14 kW, two-stage[3]
R – Preheat - 14 kW, four-stage[3]
S – Preheat - 14 kW, SCR[3]
T – Preheat - 20 kW, two-stage[3]
U– Preheat - 20 kW, four-stage[3]
Y – Preheat - 20 kW, SCR[3]
C – Non-defrost
N– Non-defrost, no wall control compatibility[4]

2. VOLTAGE/SPEED
A– 120/1/60 - one-speed
B – 208–120/1/60 - one-speed[5]
C – 230–120/1/60 - one-speed[5]
D– 208/3/60 - one-speed
E – 230/3/60 - one-speed
F – 460/3/60 - one-speed
G– 575/3/60 - one-speed
H– 208–120/1/60 - two-speed[5]
I – 230–120/1/60 - two-speed[5]
N– 208/3/60 - VFD[6]
O– 230/3/60 - VFD[6]
P – 460/3/60 - VFD[6]
Q– 575/3/60 - VFD[6]

3. INTERNAL PROTECTION
1 – 1" insulation, single wall
2 – 1" insulation, double wall

4. SENSOR CONTACTS
D– Dirty filter contacts
W– Wheel rotation sensor[7]
B – Dirty filter contacts and wheel rotation sensor[7]
X– No contacts, no sensor

5. EXTERNAL FINISH
S – Standard galvanized package
W– White prepaint package

6. OUTSIDE AIR DAMPER
1 – Insulated motorized
2 – Insulated spring return
3 – No damper

7. EXHAUST AIR DAMPER[8]
1 – Backdraft (low leak)
2 – Non-insulated motorized (low leak)
3 – Insulated motorized (low leak)
4 – No damper

8. DOOR FASTENERS
S – Standard blower door and filter door c/w metal handles and screws
D– Deluxe blower door and filter door c/w polyamide handles and ¼ turn fasteners

9. EXTERNAL DISCONNECT
F – Fused disconnect switch[9]
N– Non-fused disconnect switch[9]
X– No disconnect switch

10. EXHAUST DISCHARGE
E – End exhaust discharge
T – Top exhaust discharge
S – Side exhaust discharge

11. SUPPLY DISCHARGE
D– Down supply discharge
E – End supply discharge
T – Top supply discharge

12. RETURN AIR
B – Bottom return air
E – End return air
T – Top return air

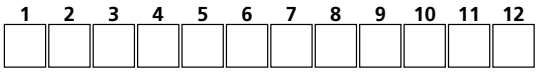
13. FILTRATION
S – Supply filter
E – Exhaust filter
B – Supply and exhaust filters
X– No filtration

14. FREE COOLING
S – Setpoint enthalpy controller
D– Differential enthalpy controller
T – Thermostat (dry bulb)
X– No free cooling controller

15. ENERGY RECOVERY
1 – Aluminum wheel, no purge
2 – Aluminum wheel c/w purge

Notes:
1 When ordering recirc defrost, you must order outside air and exhaust air dampers. Recirc defrost option includes recirculation dry contacts for unoccupied mode.
2 Outside air damper required.
3 120/1/60, 208/1/60 and 230/1/60 voltages are not available with preheat frost control options.
4 No dampers required.
5 Requires a neutral wire with L1 and L2.
6 All VFD options include one controller per motor.
7 Units ordered with the wheel rotation sensor option must include a frost control option other than 'V' or 'N'.
8 Exhaust air damper must be field installed in exhaust duct.
9 Fused/non-fused disconnect switch is field installed.

ERV2000i Nomenclature (1,200–2,800 cfm)



1. FROST CONTROL
D – Recirc defrost[1]
E – Exhaust only[2]
V – VSD frost prevention, no wall control compatibility
W– VSD frost prevention
C – Non-defrost
N – Non-defrost, no wall control compatibility[3]

2. VOLTAGE/SPEED
B – 208–120/1/60 - one-speed[4]
C – 230–120/1/60 - one-speed[4]
D – 208/3/60 - one-speed
E – 230/3/60 - one-speed
F – 460/3/60 - one-speed
G – 575/3/60 - one-speed
N – 208/3/60 - VFD[9/10]
O – 230/3/60 - VFD[9/10]
P – 460/3/60 - VFD[9/10]

3. INTERNAL PROTECTION
1 – 1" insulation, single wall
2 – 1" insulation, double wall

4. SENSOR CONTACTS
D – Dirty filter contacts
W– Wheel rotation sensor[5]
B – Dirty filter contacts and wheel rotation sensor[5]
X – No contacts, no sensor

5. EXTERNAL FINISH
S – Standard galvanized package
W– White prepaint package

12. ENERGY RECOVERY
1 – Aluminum, no purge
2 – Aluminum wheel c/w purge

11. CASSETTE ACCESS
R – Reverse cassette access
S – Standard cassette access

10. FREE COOLING
S – Setpoint enthalpy controller
D – Differential enthalpy controller
T – Thermostat (dry bulb)
X – No free cooling controller

9. FILTRATION
S – Supply filter
E – Exhaust filter
B – Supply and exhaust filters
X – No filtration

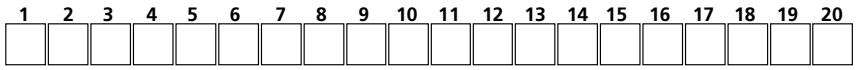
8. EXTERNAL DISCONNECT
F – Fused disconnect switch[8]
N – Non-fused disconnect switch[8]
X – No disconnect switch

7. DOOR FASTENERS
S – Standard filter door c/w screws
D – Deluxe filter door c/w ¼ turn fasteners

6. OUTSIDE AIR DAMPER
1 – Insulated motorized[6]
2 – Insulated spring return[6]
3 – Non-insulated motorized[7]
4 – Non-insulated spring return[7]
5 – No damper

Notes:
1 When ordering recirc defrost, you must order outside air and exhaust air dampers. Recirc defrost option includes recirculation dry contacts for unoccupied mode. Includes exhaust backdraft.
2 Outside air damper required.
3 No dampers required.
4 Requires a neutral wire with L1 and L2.
5 Units ordered with the wheel rotation sensor option must include a frost option other than 'V' or 'N'.
6 This option is for recirc defrost units only.
7 This option cannot be ordered on recirc defrost units.
8 Fused/non-fused disconnect switch is field installed.
9 All VFD options include one controller per motor.
10 Minimum motor size is 1 hp.

ERV3000i Nomenclature (2,000–4,000)



1. FROST CONTROL
D – Recirc defrost[1]
E – Exhaust only[2]
V – VSD frost prevention, no wall control compatibility
W – VSD frost prevention
M – Preheat - 20 kW, two-stage[3]
O – Preheat - 20 kW, four-stage[3]
P – Preheat - 20 kW, SCR[3]
Q – Preheat - 30 kW, two-stage[3]
R – Preheat - 30 kW, four-stage[3]
S – Preheat - 30 kW, SCR[3]
T – Preheat - 40 kW, two-stage[3]
U – Preheat - 40 kW, four-stage[3]
Y – Preheat - 40 kW, SCR[3]
A – Preheat w/ unocc. recirc - 20 kW, two-stage[1/3/4]
B – Preheat w/ unocc. recirc - 20 kW, four-stage[1/3/4]
F – Preheat w/ unocc. recirc - 20 kW, SCR[1/3/4]
G – Preheat w/ unocc. recirc - 30 kW, two-stage[1/3/4]
H – Preheat w/ unocc. recirc - 30 kW, four-stage[1/3/4]
I – Preheat w/ unocc. recirc - 30 kW, SCR[1/3/4]
J – Preheat w/ unocc. recirc - 40 kW, two-stage[1/3/4]
K – Preheat w/ unocc. recirc - 40 kW, four-stage[1/3/4]
L – Preheat w/ unocc. recirc - 40 kW, SCR[1/3/4]
C – Non-defrost
N – Non-defrost, no wall control compatibility[5]

2. VOLTAGE/SPEED
B – 208–120/1/60 - one-speed[6]
C – 230–120/1/60 - one-speed[6]
D – 208/3/60 - one-speed
E – 230/3/60 - one-speed
F – 460/3/60 - one-speed
G – 575/3/60 - one-speed
H – 208–120/1/60 - two-speed[6]
I – 230–120/1/60 - two-speed[6]
N – 208/3/60 - VFD[7]
O – 230/3/60 - VFD[7]
P – 460/3/60 - VFD[7]
Q – 575/3/60 - VFD[7]

3. INTERNAL PROTECTION
1 – 1" insulation, single wall
2 – 1" insulation, double wall

4. SENSOR CONTACTS
D – Dirty filter contacts
W – Wheel rotation sensor[8]
B – Dirty filter contacts and wheel rotation sensor[8]
X – No contacts, no sensor

5. EXTERNAL FINISH
S – Standard galvanized package
W – White prepaint package

6. OUTSIDE AIR DAMPER
1 – Non-insulated motorized (low leak)
2 – Insulated motorized (low leak)
3 – Insulated spring return (low leak)
4 – No damper

7. EXHAUST AIR DAMPER[9]
1 – Backdraft (low leak)
2 – Non-insulated motorized (low leak)
3 – Insulated motorized (low leak)
4 – No damper

8. DOOR FASTENERS
S – Standard blower door and filter door c/w metal handles and screws
D – Deluxe blower door and filter door c/w polyamide handles and ¼ turn fasteners

9. EXTERNAL DISCONNECT
F – Fused disconnect switch[10]
N – Non-fused disconnect switch[10]
X – No disconnect switch

10. OUTSIDE AIR INTAKE
E – End outside air intake
T – Top outside air intake
S – Side outside air intake

11. EXHAUST DISCHARGE
E – End exhaust discharge
S – Side exhaust discharge
T – Top exhaust discharge

12. SUPPLY DISCHARGE
D – Down supply discharge
E – End supply discharge
T – Top supply discharge

13. RETURN AIR
B – Bottom return air
E – End return air
T – Top return air

14. MEF FILTRATION
S – MEF supply filter
E – MEF exhaust filter
B – MEF supply and exhaust filters
X – No MEF filtration

15. HEF FILTRATION
H – High efficiency supply filter
X – No HEF filtration

16. FREE COOLING
S – Setpoint enthalpy controller
D – Differential enthalpy controller
T – Thermostat (dry bulb)
X – No free cooling controller

17. BLOWER ISOLATION
R – Rubber blower isolation
S – Spring blower isolation

18. ENERGY RECOVERY
1 – Aluminum wheel, no purge
2 – Aluminum wheel c/w purge

19. HEATING
H – Hot water
S – Steam heat
X – No heat

20. COOLING
C – Chilled water[11]
D – Dx cooling[11]
X – No cooling

Notes:
1 When ordering recirc defrost or unoccupied recirc, you must order outside air and exhaust air dampers. Recirc defrost option includes recirculation dry contacts for unoccupied mode.
2 Outside air damper required.
3 208/1/60 and 230/1/60 voltages are not available with preheat frost control options. 30 and 40 kW preheat frost control options are not available with 208–230/3/60 voltages.
4 Unoccupied recirc is not available with side outside air intake option.
5 No dampers required.
6 Requires a neutral wire with L1 and L2.
7 All VFD options include one controller per motor.
8 Units ordered with the wheel rotation sensor option must include a frost control option other than 'V' or 'N'.
9 Exhaust air damper is supplied loose and must be field installed in exhaust duct.
10 Fused/non-fused disconnect switch is field installed.
11 A maximum of 2,650 cfm is allowed for cooling applications.

Safety Considerations

Warning, Caution and Important notes appear throughout this manual in specific and appropriate locations to alert Installing Contractors and maintenance or service personnel of potential safety hazards, possible equipment damage or to alert personnel of special procedures or instructions that must be followed as outlined below.

⚠ WARNING

Identifies an instruction which, if not followed, might cause serious personal injuries including possibility of death.

CAUTION

Identifies an instruction which, if not followed, might severely damage the unit, its components, the assembly or final installation.

IMPORTANT

Indicates supplementary information needed to fully complete an instruction or installation.

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

General Information

The indoor Energy Recovery Ventilators (ERVs) are intended for installation within a suspended ceiling space or mechanical room. These ventilators provide 100% outside air ventilation as well as energy recovery between the exhaust and supply airstreams. The Energy Recovery Ventilators (ERVs) use an enthalpy wheel for total energy recovery providing superior efficiency in hot and humid climates. These models are also effective in cold climates and use various types of frost control or frost prevention to ensure operation when the outside temperatures are extremely low.

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, enthalpy wheel, insulation and structures. File a claim with the shipping company if the unit is damaged.

System Requirements

Consult local building codes and National Electrical Code for special installation requirements. See Appendix H for more electrical data information.

The unit should be installed to allow easy access for maintenance. See Appendix B for minimum clearance required between front access and any obstruction to allow for removal of components (fans, filters, enthalpy wheel). The front of the unit is defined in relation to the inlet ports and outlet ports on the unit. See Appendix C for port location and overall dimensions. Unit components are shown in Appendix 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. Do not mount units in an area where exposure to 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 [2,438 mm] to avoid outside cross contamination.

Mount Unit

Ceiling Mount (ERV1000i and ERV2000i only)

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 overall dimension drawings in Appendix C. 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).

IMPORTANT

The manufacturer recommends that the ERV1500i and ERV3000i be floor mount only.

Floor Mount

The unit 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).

Make Duct Connections

Port locations, labels and sizes for the units are shown in Appendix C. 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. Ensure that the fasteners used to make duct connection do not interfere with fans or dampers in the unit.

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

Duct Design Considerations

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 Figure 1.

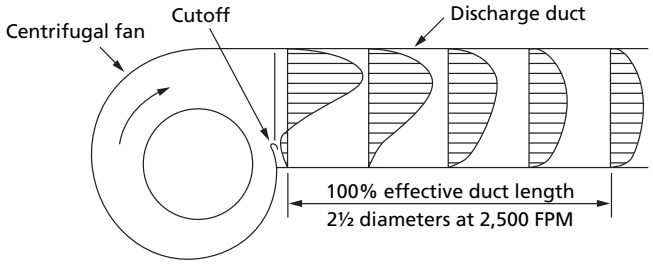


Figure 1: Duct design

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 Table 1 for the effect of undersized equivalent duct diameter.

Table 1: Duct Design Effectiveness

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

IMPORTANT

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]

Install Access Panels

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

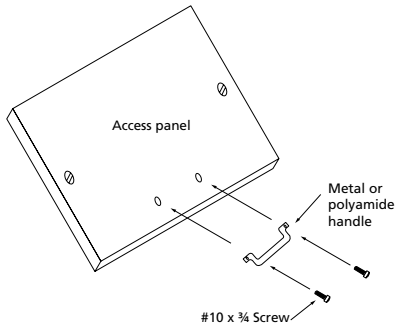


Figure 2: Access panel

Remove All Internal Packaging

Remove access panels and all packaging from the unit. Note that there is packaging for wheel support during shipping (ERV1000i and ERV2000i). Removal of all this packaging is critical.

Systems Integration

Forced Air System

When the ERV 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 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, as shown in Figure 3.

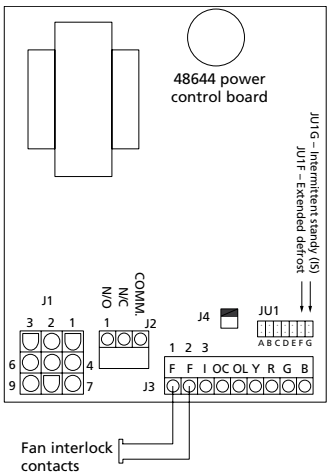


Figure 3: Forced air system integration

Fresh air from the ERV should be introduced into the return duct of the air handler at a point no less than 6 feet [1,829 mm] upstream of the air handler. The duct connection for return air to the ERV should be made on the return air duct at least 2 feet [610 mm] 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.

Backdraft Damper

A backdraft gravity damper is supplied with recirculation defrost units to be installed in the exhaust air outlet duct. This damper is necessary to prevent air from entering the building through the exhaust duct when the unit is in recirculation defrost mode.

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 personal injury of others.

Electrical Requirements

Location of wire connections required are shown in Appendix C.

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).

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

- Low-Com-High
  - Makes dry contact for speed setting.
- Wall control
  - Four-wire LVT 24 gauge minimum (12 VDC).
- Occupied (or night setback) timer/sensor
  - Needs dry contact to operate. 24 VAC required when timer is used. Do not use with Xtra wall control.
- Enthalpy control
  - 24VAC.
- Remote fan control
  - Requires single pole, double throw switch.
- Dirty filter sensor
  - Makes dry contact.
- Low temperature control
  - Makes dry contact.
- Wheel rotation sensor
  - Makes dry contact.
- CO_2 ventilation control
  - Makes dry contact.
- Unoccupied recirc contacts
  - 24 VAC.
- Smoke detector
  - Makes dry contact.

For more information on the controls available for the outdoor energy recovery ventilators, see the following Appendix E references:

- Wall Control Connection
- Occupied Timer/Sensor Connection
- Enthalpy Control
- Remote Fan Control
- Dirty Filter Sensor
- Wheel Rotation Sensor used as Low Temperature Control (Wheel Failure)
- Wheel Rotation Sensor
- CO_2 Ventilation Control
- Unoccupied Recirc Contacts
- Smoke Detector

Frost Control

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.

Preheat Frost Prevention

Preheat frost prevention is an outdoor air temperature controlled function that allows for continuous ventilation by ensuring a minimum entering air temperature (into the enthalpy wheel) of 5°F [–15°C]. There are three fixed kW capacity options available. For preheat capacity requirements, please use applicable ASHRAE formulas. Preheat frost prevention can have two-stage, four-stage or SCR control.

VSD (Variable Speed Drive) Frost Prevention

This variable speed frost prevention option is an exhaust air temperature controlled function that allows for continuous ventilation by reducing the enthalpy wheel rotational speed. The rotational speed and therefore effectiveness of the enthalpy wheel, is modulated to maintain an exhaust air temperature of 33°F [1°C]. This modulation maintains the wheel operating temperature at conditions that prevent frost formation. Special consideration must be given to applications where supply air is being heated, as the heating capacity maximum condition will be during the frost prevention cycle.

Sequence of Operation

IMPORTANT

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

Before start-up, check the unit for obstructive packaging, objects near or in blowers, dampers, enthalpy wheel, 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 and High modes. Use a wall control or the dry contact switching to run fan speeds as shown in Appendix E, Wall Control Connection and Remote Fan Control.

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, internal defrost damper (if equipped) and closes 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 (factory installed jumper removed/unoccupied mode) – Both fans are off, defrost damper (if equipped) opens recirculation opening.
- Power connected, enthalpy control contacts closed, unit ventilating – Wheel stops rotating, fans stay on set speed, defrost damper (if equipped) is closed.
- Power connected, enthalpy control contacts closed, unit not in ventilation mode – Wheel does not rotate, fans come on low speed (if equipped), if unit is single speed, it will come on that speed on a call for low or high, defrost damper (if equipped) is closed (recirculation defrost only).

Airflow Balancing

For proper 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.

Another method of airflow balancing is to measure the pressure drop across the enthalpy wheel and correlate it to an airflow.

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. For belt drive units, adjust the motor sheave for the best fan speed. 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 and maintenance procedures.

Quarterly maintenance (every three months) should include:

Air Filters

The standard medium efficiency filters and optional high efficiency filters (ERV3000i only) are disposable and should be replaced every three months. More frequent replacement may be required under extremely dirty operating conditions. For filter specifications see Appendix A.

Filter Service

To remove the exhaust filters in the ERV1000i and ERV2000i, 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.

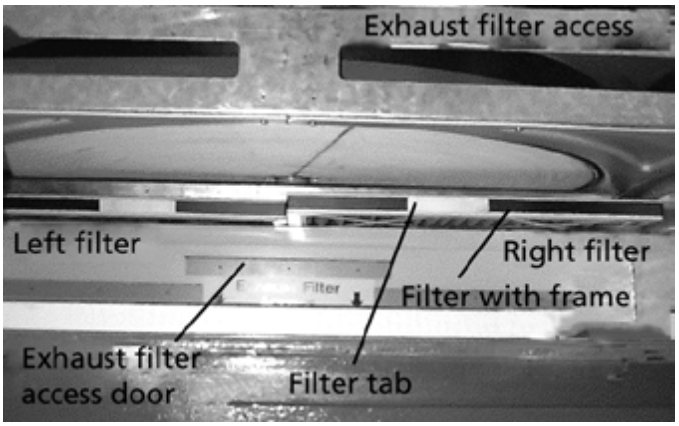


Figure 4: Filter access – ERV 1000i and ERV2000i

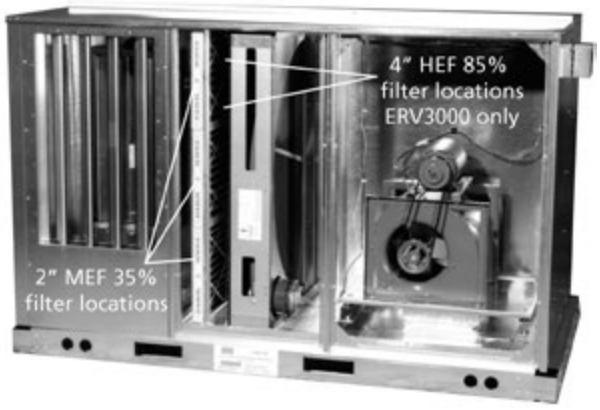


Figure 5: Filter access – ERV1500i and ERV3000i

To replace the ERV1500i and ERV3000i filters, remove the enthalpy wheel access door. Grasp the filter frame at the left and right edges and pull straight out. The filter frame will slide completely out of the unit. Slide the filters up and out the top of the frame. Slide the new filters into the frame and slide the frame back into the unit. Replace the enthalpy wheel access door.

Figure 6: Replace filters – ERV1500i and ERV3000i

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.

Annual Maintenance

⚠ WARNING

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

Annual maintenance should include:

Air Filters

Replace medium efficiency filters. Replace high efficiency filters in the ERV3000i. For more detail on replacing filters, see the Air Filters section under Quarterly Mainteance.

Interior of Unit

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

Enthalpy Wheel

No cleaning of the enthalpy wheel is required, it is self-cleaning due to the opposing airflows. If the enthalpy wheel needs to be cleaned, use low pressure air or vacuum. Wash the cassette panels with a soft cloth and mild cleaning solution. Visually inspect the cassette brush seals, perimeter seal and drive belt for proper operation.

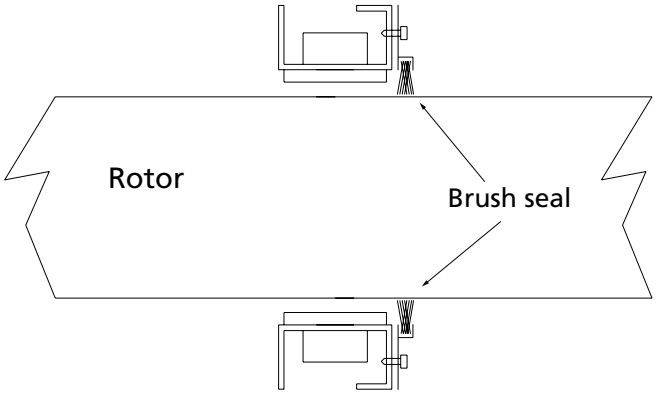


Figure 7: Cassette brush seals

Fans

Blower wheels and fan housing should be checked for dirt buildup. 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.

Testing and Replacement of the Damper Actuator

After disconnecting the power from the unit, determine if the actuator 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 actuator 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.

Motor and Blower Removal

Disconnect the four-wire service connector between the motor and the control box (#1, Figure 8). Loosen the two front bolts (#2, Figure 8). Remove the two back bolts (#3, Figure 8). Slide the fan assembly away from the discharge opening and lift out of the unit.

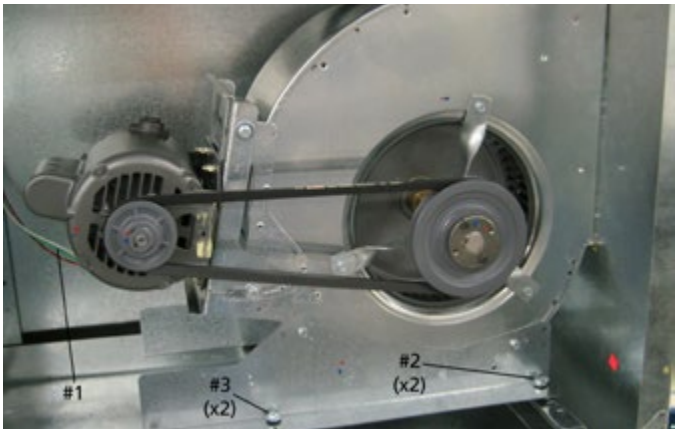


Figure 8: Supply fan (ERV2000 shown)

Motor and Blower Service

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

The belt tension is adjusted by positioning the rotating motor base plate (see Figure 10). 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 in Figure 9. When the belt is grasped as shown, a total deflection of approximately 1" [25 mm] 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.

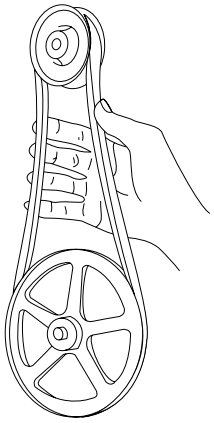


Figure 9: Belt tension adjustment

Loosen the two pivot bolts (#1, Figure 10). Loosen the two adjustment bolts (#2, Figure 10). 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.

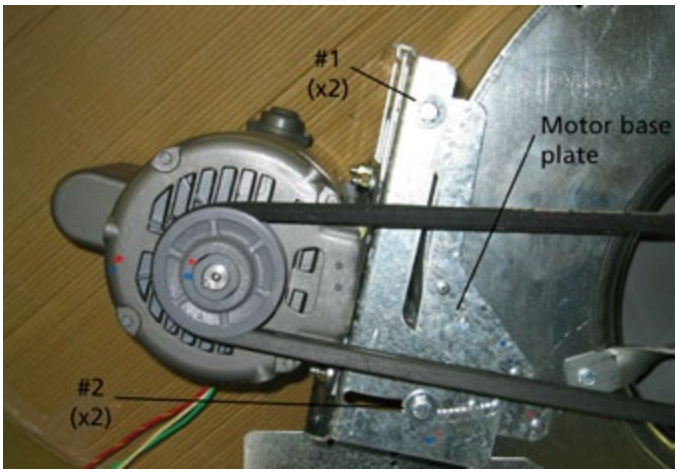


Figure 10: Motor (ERV2000 shown)

Cassette Removal

After disconnecting the power from the unit, open the service door for the cassette access. Disconnect the service connector between the motor and the control box. Remove the exhaust filters and slide the cassette out of the unit. Take care not to damage the rotor face or any of the cassette seals. Proper support must be provided so the cassette is not dropped.

Cassette Service

⚠ WARNING

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

Perimeter Seal Replacement

CAUTION

When handling the enthalpy wheel, ensure not to damage the face of the wheel.

To replace the perimeter seal, the enthalpy wheel must be removed from the frame. Disconnect the service connector to the drive motor of the enthalpy wheel cassette. Remove the cassette from the unit and stand the assembly on the floor. Remove the dust cap (#1, Figure 11) from the bearing on the drive motor side of the cassette. Remove the bolt (#2, Figure 11) from the end of the wheel shaft with a socket or wrench on the drive motor side. Repeat this procedure for the other side of the cassette assembly. Remove the four bolts (#3, Figure 11) with a socket or wrench. Remove the beam and bearing assembly from the end of the wheel shaft. Loosen the four Nyloc nuts (#1, Figure 12) holding the drive motor using a socket or wrench. Rotate the drive motor in the slots to loosen the drive belt and remove the belt. Lift the enthalpy wheel out of the frame with assistance and set aside. Remove the perimeter seal halves (#4, Figure 11) from the cassette frame assembly. Install the two new perimeter seal halves by pressing them into place, cutting to the correct length as necessary. The perimeter seals are non-adjustable. Complete the installation by reversing the above procedure.

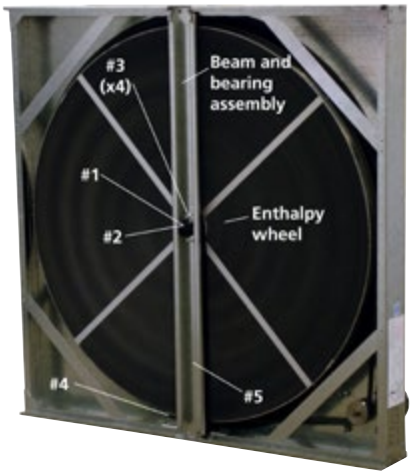


Figure 11: Cassette and drive

Face Seal Replacement and Adjustment

CAUTION

When handling the enthalpy wheel, ensure not to damage the face of the wheel.

To replace the face seals, the cassette assembly must be removed from the unit. Disconnect the service connector to the drive motor of the enthalpy wheel cassette. Remove the cassette from the unit and stand up on the floor. Remove the screws holding the face seals (#5, Figure 11). Replace the two seals (supply and exhaust sides), cutting to length as required. Adjust the seals in the slots so that the brush just touches the face of the wheel. Complete the installation by reversing the above procedure.

Enthalpy Wheel Drive Belt Replacement and Tensioning Adjustment

The enthalpy wheel drive belt can be tightened by only sliding the cassette assembly part way out of the unit. Disconnect the service connector to the drive motor of the enthalpy wheel cassette. Slide the cassette assembly out of the unit enough to access the drive motor. Loosen the four Nyloc nuts (#1, Figure 12) holding the drive motor using a socket or wrench. Rotate the drive motor to loosen the belt and replace the belt if necessary. Rotate the drive motor in the slots to tighten the drive belt. Secure the motor in its new location by tightening the four Nyloc nuts. (#1, Figure 12). Complete the installation by reversing the above procedure.

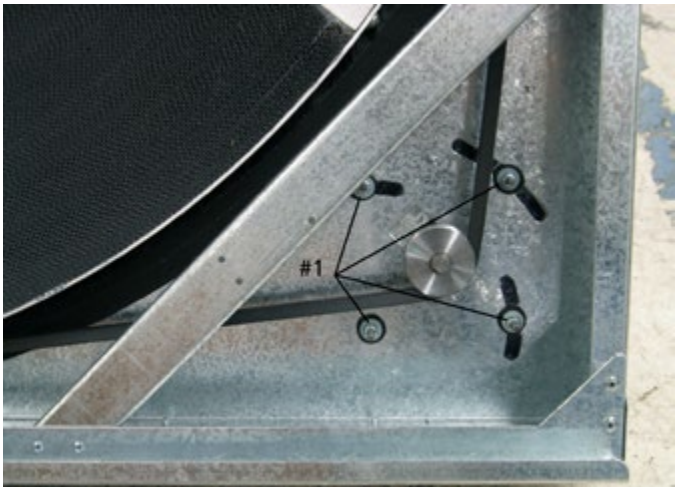


Figure 12: Tension adjustment

Appendix A: Equipment Data

Table A1: Indoor ERV Equipment Data – ERV1000i, ERV1500i, ERV2000i, ERV3000i

	ERV1000i	**ERV1500i**	**ERV2000i**	**ERV3000i**
Shipping weight	525 lbs [239 kg]	600 lbs [273 kg]	725 lbs [330 kg]	1,185 lbs [539 kg]
Net weight	500 lbs [227 kg]	575 lbs [261 kg]	700 lbs [318 kg]	1,160 lbs [527 kg]
Shipping dimensions (L x W x H)	74.00" x 44.00" x 28.00" [1,880 x 1,118 x 711 mm]	55.75" x 42.75" x 49.83" [1,1416 x 1,086 x 1,266 mm]	94.00" x 52.00" x 36.00" [2,388 x 1,321 x 914 mm]	89.00" x 49.88" x 55.50" [2,261 x 1,267 x 1,410 mm]
Ductwork				
Location	Ends of unit	See Figure C2	Ends of unit	See Figure C4
Size (W x H)				
In ports	8" x 20" [203 x 508 mm]	See Figure C2	12" x 26" [305 x 660 mm]	See Figure C4
Out ports (fans)	8" x 12" [203 x 305 mm]	See Figure C2	10" x 14" [254 x 356 mm]	See Figure C4
Fans				
Supply				
Impeller (forward centrifugal)	10.75" diameter x 5.50" wide [273 x 140 mm]	9.50" diameter x 7.12" wide [241 x 181 mm]	12.75" diameter x 7.00" wide [324 x 178 mm]	11.6" diameter x 10.8" wide [295 x 274 mm]
High speed	1,100 RPM	1,532 RPM	1,200 RPM	1,440 RPM
Motor (standard)	½ HP, two-speed	¾ HP, one-speed	1½ HP, one-speed	3 HP, one-speed
Exhaust				
Impeller (forward centrifugal)	10.75" diameter x 5.50" wide [273 x 140 mm]	9.50" diameter x 7.12" wide [241 x 181 mm]	12.75" diameter x 9.00" wide [324 x 229 mm]	11.6" diameter x 10.8" wide [295 x 274 mm]
High speed	1,100 RPM	1,532 RPM	1,200 RPM	1,440 RPM
Motor (standard)	½ HP, two-speed	¾ HP, one-speed	2 HP, one-speed	3 HP, one-speed
Filters				
Supply	16" x 20" x 1" disposable 2 MEF [406 x 508 x 25 mm]	20" x 20" x 2" disposable 2 MEF [508 x 508 x 51 mm]	24" x 24" x 2" disposable 2 MEF [610 x 610 x 51 mm]	16" x 20" x 2" disposable 3 MEF [406 x 508 x 51 mm] 16" x 20" x 4" disposable 3 HEF [406 x 508 x 102 mm]
Exhaust	16" x 20" x 1" disposable 2 MEF [406 x 508 x 25 mm]	20" x 20" x 2" disposable 2 MEF [508 x 508 x 51 mm]	24" x 24" x 2" disposable 2 MEF [610 x 610 x 51 mm]	16" x 20" x 2" disposable 3 MEF [406 x 508 x 51 mm]
Defrost cycle (if equipped)				
Activation, Stage 1	5°F [–15°C]	5°F [–15°C]	5°F [–15°C]	5°F [–15°C]
Recirculation	6 minutes	6 minutes	6 minutes	6 minutes
Ventilation	30 minutes	30 minutes	30 minutes	30 minutes
Activation, Stage 2	N/A	N/A	N/A	N/A
Recirculation	Preheat required	Preheat required	Preheat required	Preheat required
Ventilation	Below –21°F [–30°C]	Below –21°F [–30°C]	Below –21°F [–30°C]	Below –21°F [–30°C]
Backdraft damper				
Size (recirculation defrost)	20.00" x 8.00" [508 x 203 mm]	14.00" x 17.50" [356 x 445 mm]	12.00" x 26.00" [305 x 660 mm]	14.00" x 17.50" [356 x 445 mm]

Appendix B: Typical Installation and Minimum Distance Requirements

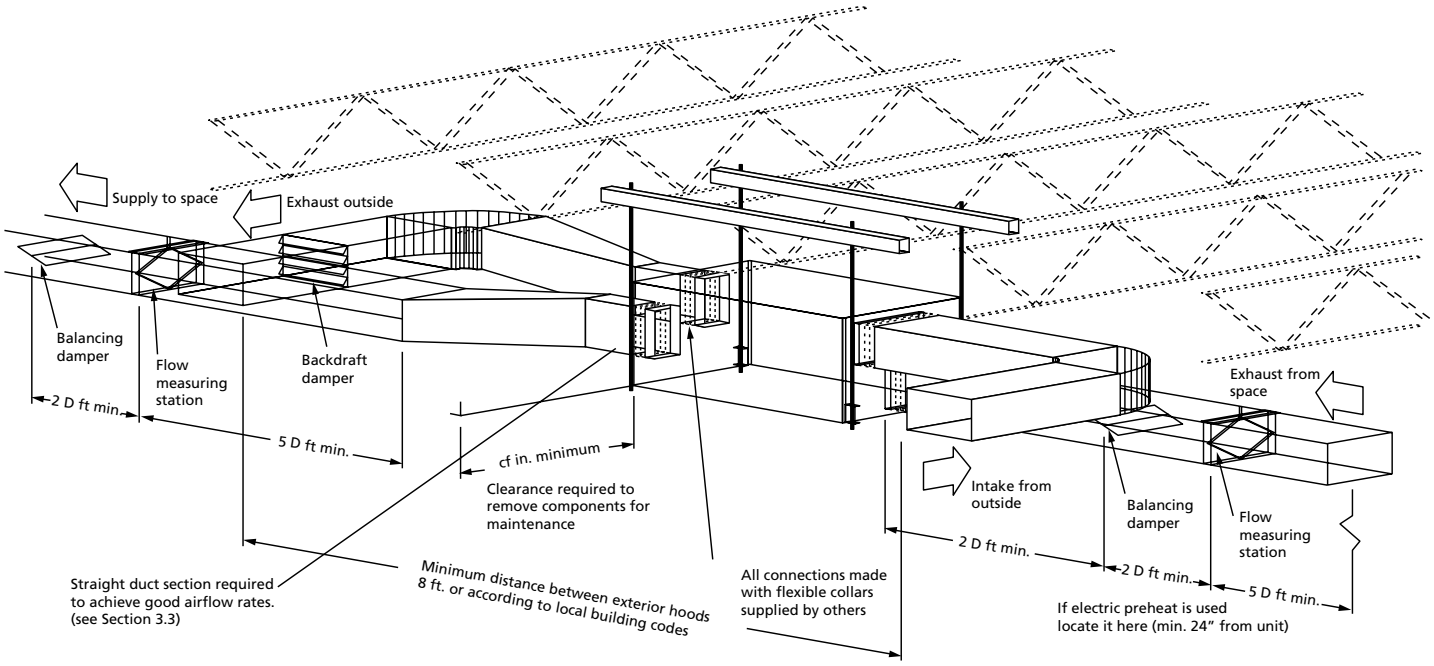


Figure B1: Indoor ERV minimum distance requirements

D – Equivalent round duct diameter for determining minimum lengths.
8" x 20" [203 x 508 mm] duct
D = 13.5" [343 mm]

Cf – Front clearance required for maintenance. See table below.
12" x 26" [305 x 660 mm] duct
D = 19.0" [483 mm]

Table B1: Minimum Clearance Required for Access

	ERV1000i	**ERV1500i**	**ERV2000i**	**ERV3000i**
Front clearance (Cf)	42" [1,067 mm]	42" [1,067 mm]	48" [1,219 mm]	48" [1,219 mm]
Back clearance	24" [610 mm] required for simplified access to service exhaust fan	24" [610 mm] required for simplified access to service exhaust fan	24" [610 mm] required for simplified access to service exhaust fan	30" [762 mm] required for simplified access to service exhaust fan

Appendix C: Dimensional Drawing

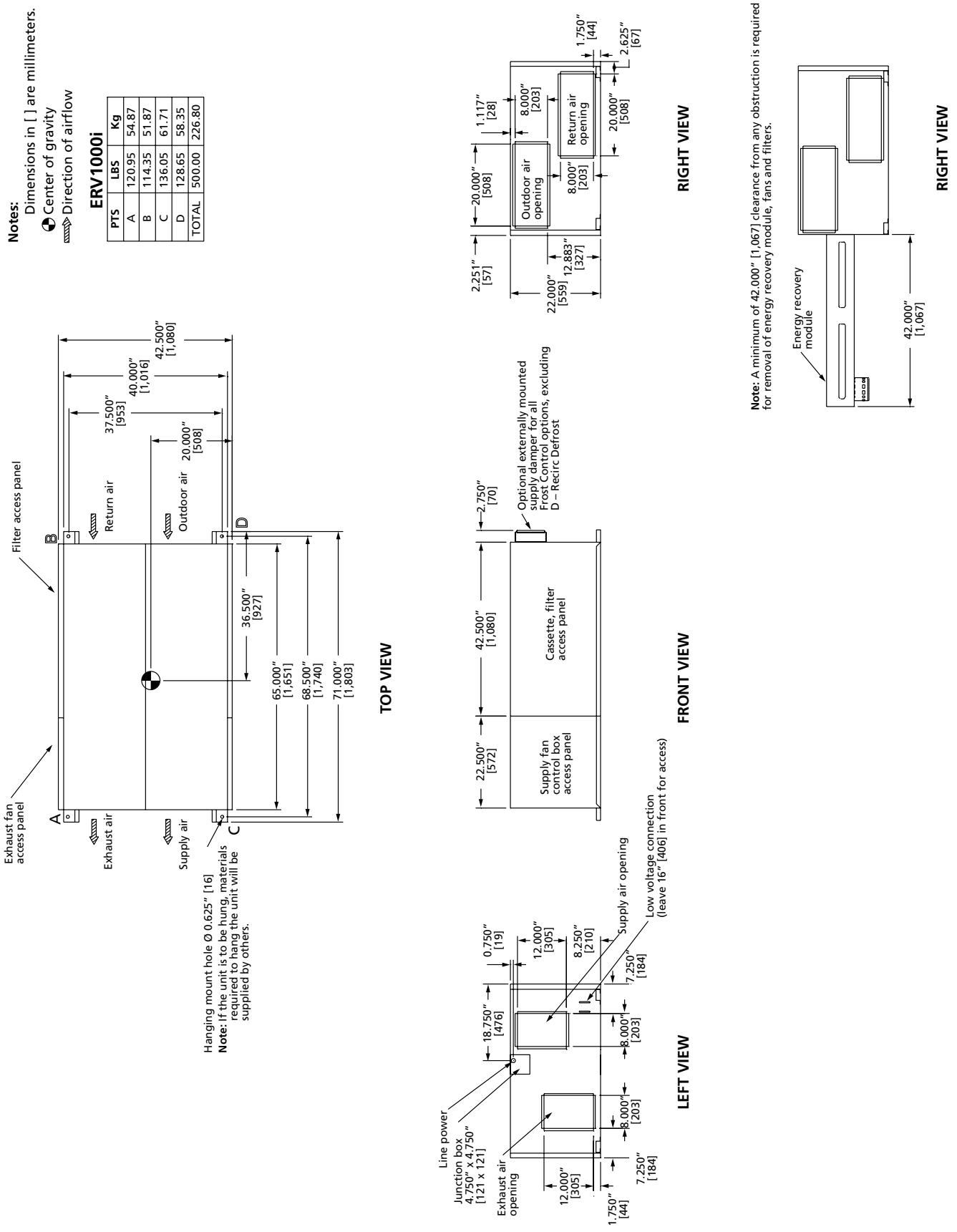
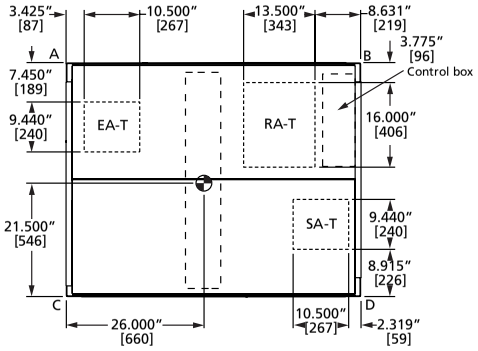


Figure C1: ERV1000i unit dimensional drawing

Figure C2: ERV1500i unit dimensional drawing



TOP VIEW

ERV1500i Corner Weights		
PTS	**LBS**	**KG**
A	143	64.9
B	149	67.6
C	124	56.2
D	129	58.5
Total	545	247.2

Notes:

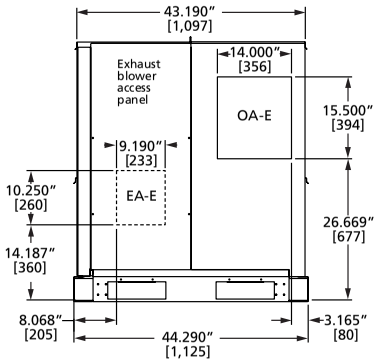
Dimensions in [ ] are millimeters.

Center of gravity

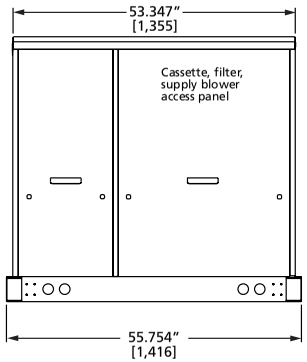
------ Optional

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

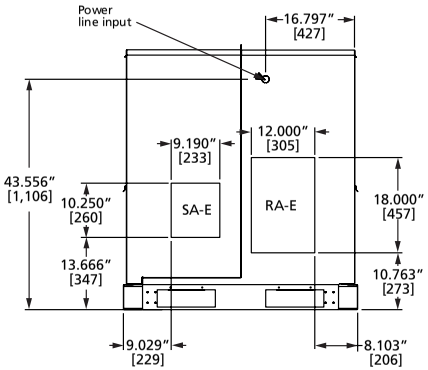
Note: A minimum of 42.000″ [1,067] clearance from any obstruction is required for removal of energy recovery module, fans and filters.



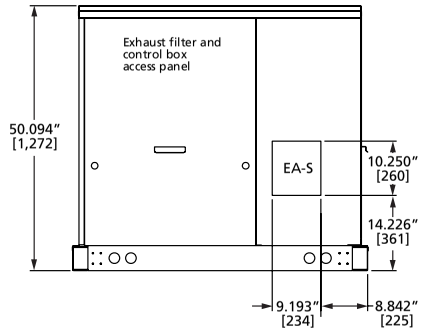
LEFT VIEW



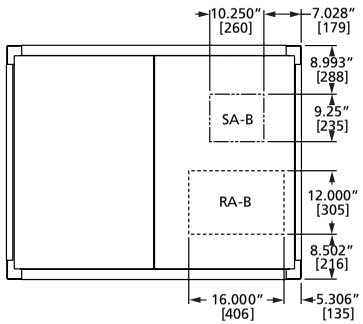
FRONT VIEW



RIGHT VIEW

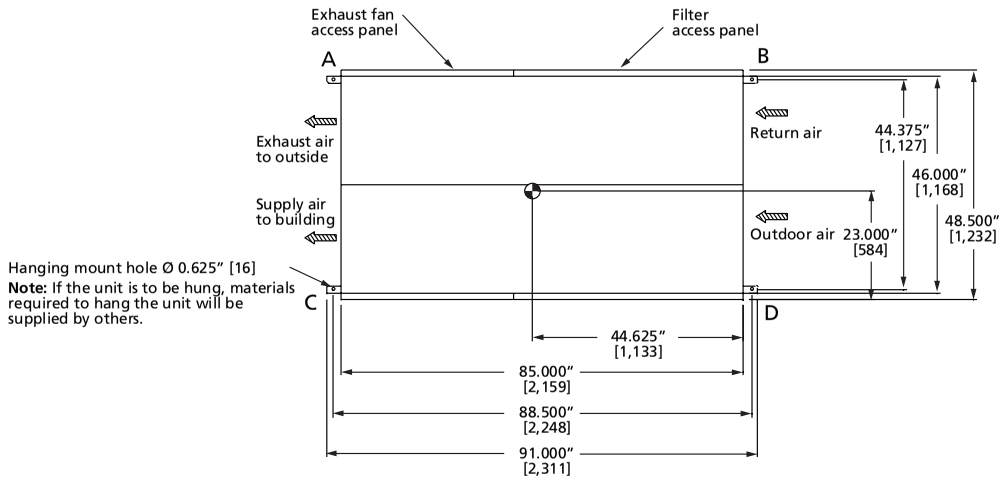


BACK VIEW



BOTTOM VIEW

Figure C3: ERV2000i unit dimensional drawing



TOP VIEW

Notes:

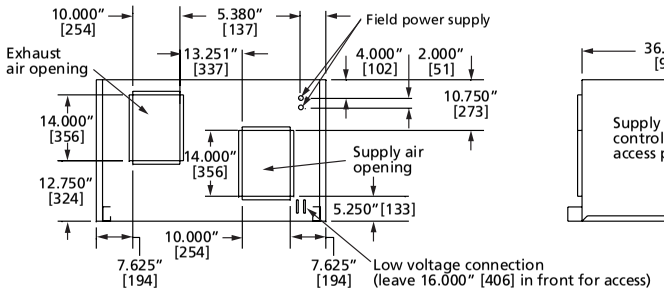
Dimensions in [ ] are millimeters.

Center of gravity

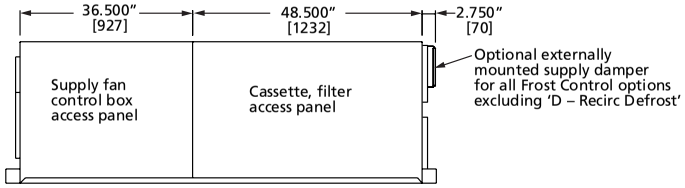
Direction of airflow

ERV2000i

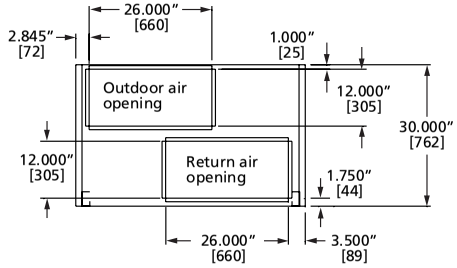
PTS	LBS	Kg
A	173.73	78.80
B	158.22	71.76
C	192.62	87.37
D	175.43	79.57
Total	700.00	317.52



LEFT VIEW

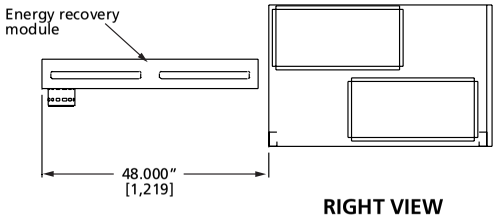


FRONT VIEW



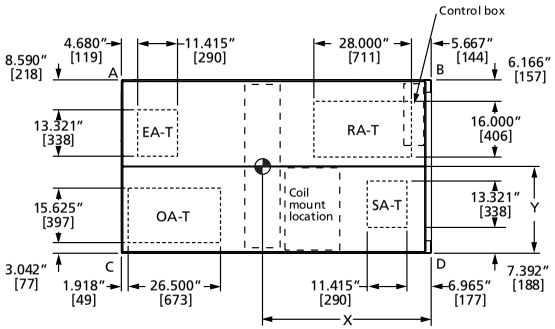
RIGHT VIEW

A minimum of 48.000" [1,219] clearance from any obstruction is required for removal of energy recovery module, fans and filters.



RIGHT VIEW

Figure C4: ERV3000i unit dimensional drawing



TOP VIEW

Variable Corner Weight Values ERV3000i											Variable Dim. Values			
	A		B		C		D		Total Weights		Y		X	
Corner weight value	LBS	KG	LBS	KG	LBS	KG	LBS	KG	LBS	KG	IN	MM	IN	MM
No coils	266	120.7	215	97.5	275	124.7	223	101.2	979	444.1	24.5	622	47.9	1,217
With Dx only	246	111.6	222	100.7	269	122.0	243	110.2	1,057	479.4	23.8	605	46.5	1,181
With chilled H_2O	246	111.6	222	100.7	269	122.0	243	110.2	1,054	478.1	23.8	605	46.5	1,181
With hydronic	248	112.5	221	100.2	269	122.0	241	109.3	1,052	477.2	23.9	607	46.7	1,186
With steam	250	113.4	221	100.2	269	122.0	239	108.4	1,036	469.9	24.0	610	46.9	1,191
Dx and hydronic	237	107.5	220	99.8	271	122.9	251	113.9	1,130	512.6	23.3	592	45.9	1,166
Dx and steam	239	108.4	220	99.8	270	122.5	249	112.9	1,114	505.3	23.4	594	46.0	1,168
Chilled and hydronic	237	107.5	220	99.8	271	122.9	251	113.9	1,127	511.2	23.3	592	45.9	1,166
Chilled and steam	239	108.4	220	99.8	270	122.5	249	112.9	1,111	503.9	23.4	594	46.0	1,168

Notes:

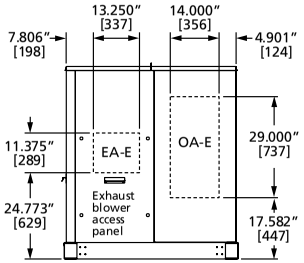
Dimensions in [ ] are millimeters.

Center of gravity

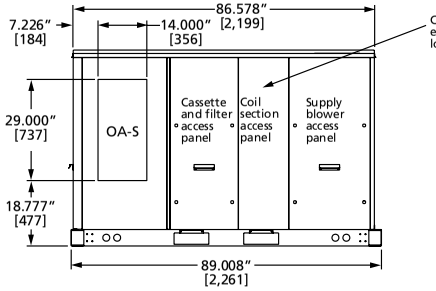
------ Optional

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

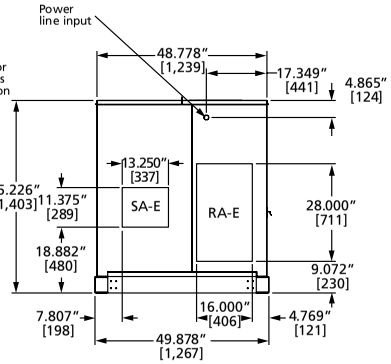
Note: A minimum of 48.000″ [1,219] clearance from any obstruction is required for removal of energy recovery module, fans and filters.



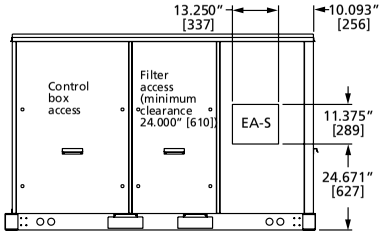
LEFT VIEW



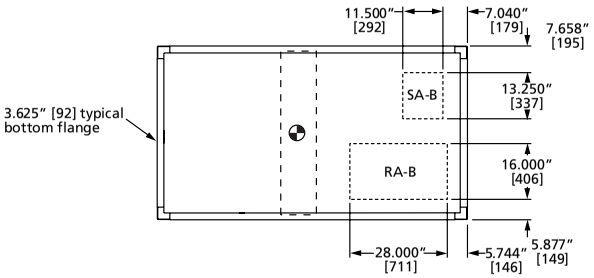
FRONT VIEW



RIGHT VIEW

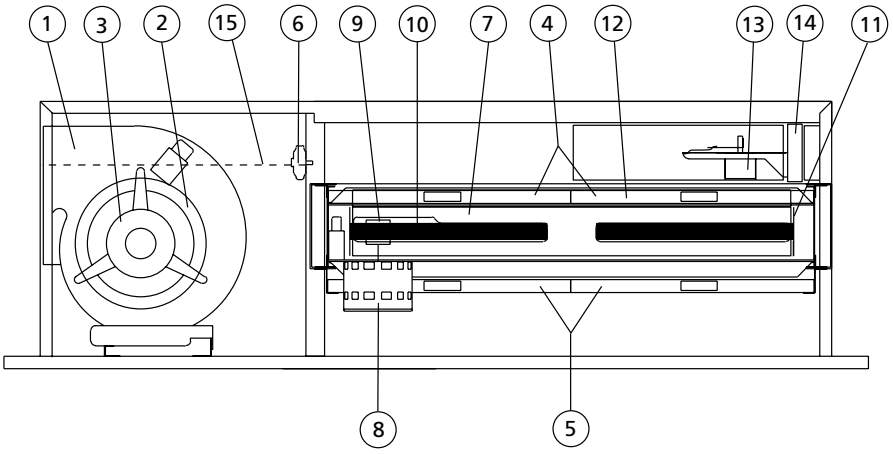


BACK VIEW



BOTTOM VIEW

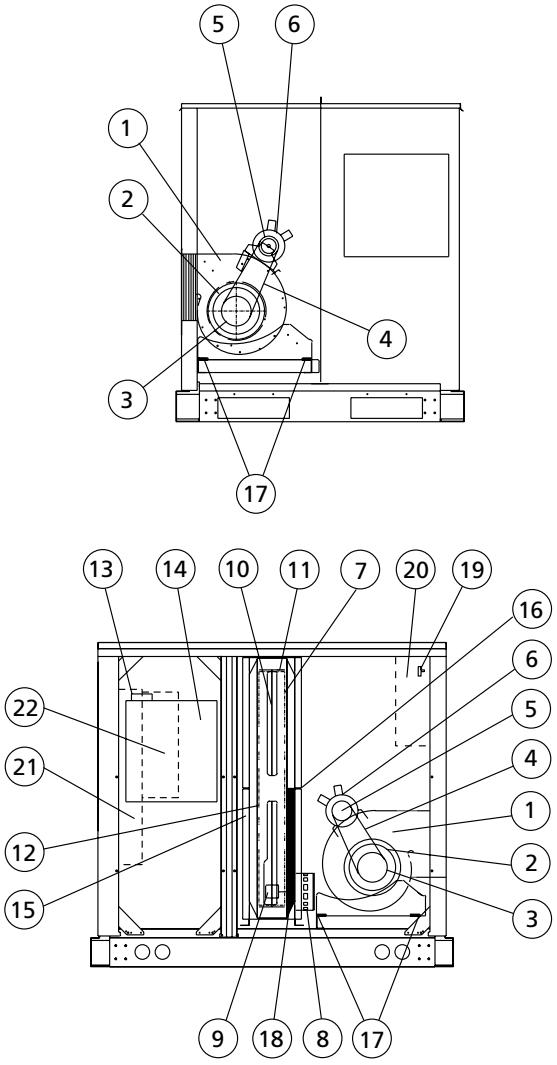
Appendix D: Components



Item	Description
1	Housing
2	Fan
3	Fan motor
4	Supply filter set – two per set
5	Exhaust filter set – two per set
6	Pressure differential switch (dirty filter)
7	Enthalpy wheel
8	Wheel drive motor
9	Wheel drive pulley
10	Wheel drive belt
11	Wheel perimeter seal
12	Wheel wiper seal
13	Defrost damper actuator
14	Defrost damper
15	Control box

Note: Some unit components listed above are optional. Consult the unit nomenclature for standard and optional components.

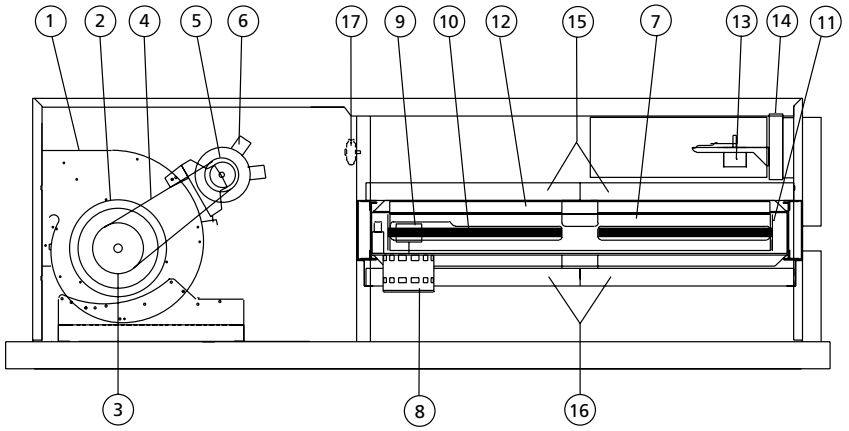
Figure D1: ERV1000i unit components



Item	Description
1	Housing
2	Fan
3	Fan pulley
4	Belt
5	Adjustable sheave
6	Fan motor
7	Enthalpy wheel
8	Wheel drive motor
9	Wheel drive pulley
10	Wheel drive belt
11	Wheel perimeter seal
12	Wheel wiper seal
13	Defrost damper actuator
14.	Defrost damper
15	Supply filter set - 2/set
16	Exhaust filter set - 2/set
17	Fan isolation
18	Purge section
19	Pressure differential switch (dirty filter)
20	Control box
21	Preheater
22	Preheat outdoor air damper

Note: Some unit components listed above are optional. Consult the unit nomenclature for standard and optional components.

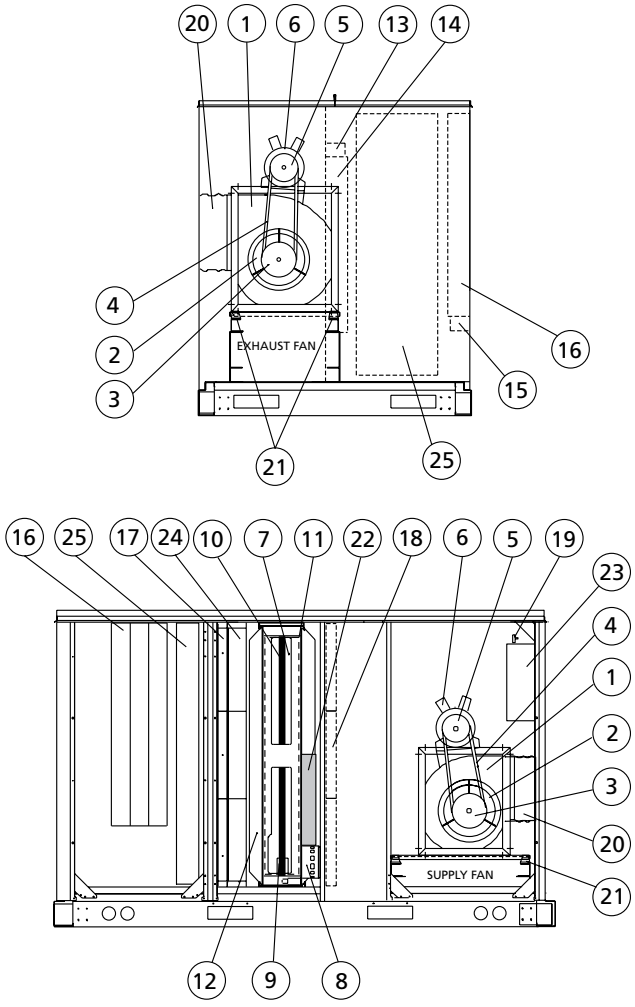
Figure D2: ERV1500i unit components



Item	Description
1	Housing
2	Fan
3	Fan pulley
4	Belt
5	Adjustable sheave
6	Fan motor
7	Enthalpy wheel
8	Wheel drive motor
9	Wheel drive pulley
10	Wheel drive belt
11	Wheel perimeter seal
12	Wheel wiper seal
13	Defrost damper actuator
14	Defrost damper
15	Supply filter set – two per set
16	Exhaust filter set – two per set
17	Pressure differential switch (dirty filter)

Note: Some unit components listed above are optional. Consult the unit nomenclature for standard and optional components.

Figure D3: ERV2000i unit components



Item	Description
1	Housing
2	Fan
3	Fan pulley
4	Belt
5	Adjustable sheave
6	Fan motor
7	Enthalpy wheel
8	Wheel drive motor
9	Wheel drive pulley
10	Wheel drive belt
11	Wheel perimeter seal
12	Wheel wiper seal
13	Defrost damper actuator
14	Defrost damper
15	Outdoor air damper actuator
16	Outdoor air damper
17	Primary supply filter set – three per set
18	Exhaust filter set – three per set
19	Pressure differential switch (dirty filter)
20	Blower flex connector
21	Fan isolation
22	Purge section
23	Control box
24	Secondary supply filter set – three per set
25	Preheater

Note: Some unit components listed above are optional. Consult the unit nomenclature for standard and optional components.

Figure D4: ERV3000i unit components

Appendix E: Terminal Control Diagrams

Wall Control Connection

Two 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.

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 four-wire connection to the unit as shown below. Without the wall control, fans can be operated with dry contacts or a switch as in Figure E5.

IMPORTANT

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 wall control.

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.

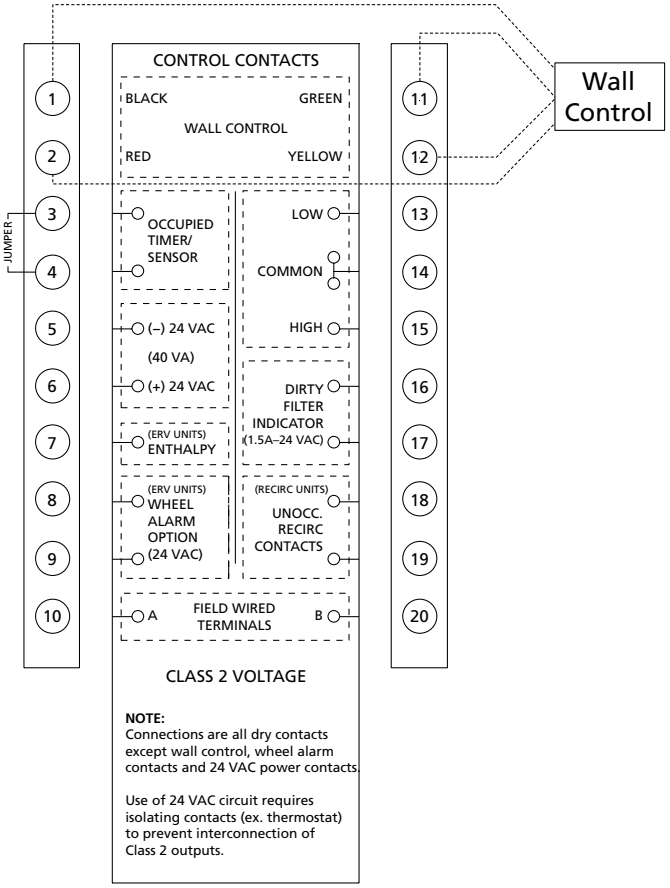


Figure E1: Wall control connection

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.

IMPORTANT

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 wall control.

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.

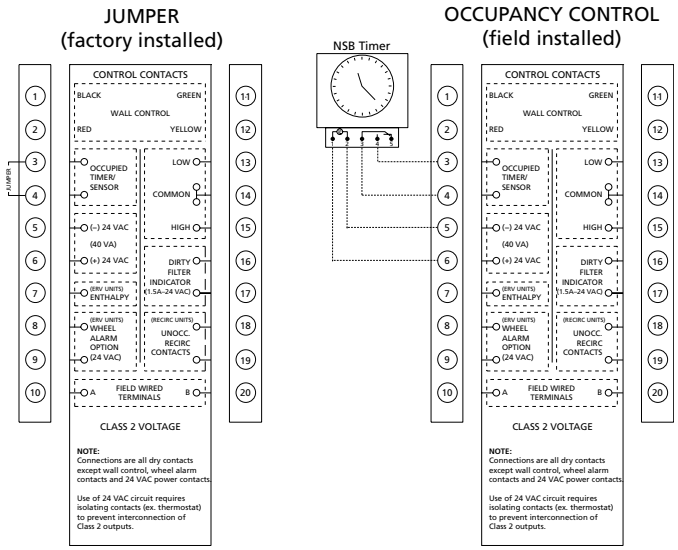


Figure E2: Occupied timer/sensor connection

Enthalpy Control

Energy Recovery Ventilators (ERVs) can be controlled by an enthalpy controller that switches between free cooling and AC unit cooling. When free cooling is possible, the ERV will ventilate without energy recovery (the enthalpy wheel stops) on a call for cooling. The ventilation rate is not affected. If the unit is not operating, enthalpy control contact will initiate low speed ventilation. The enthalpy control must be connected in conjunction with a cooling thermostat control to prevent free cooling from initiating in heating seasons as shown below.

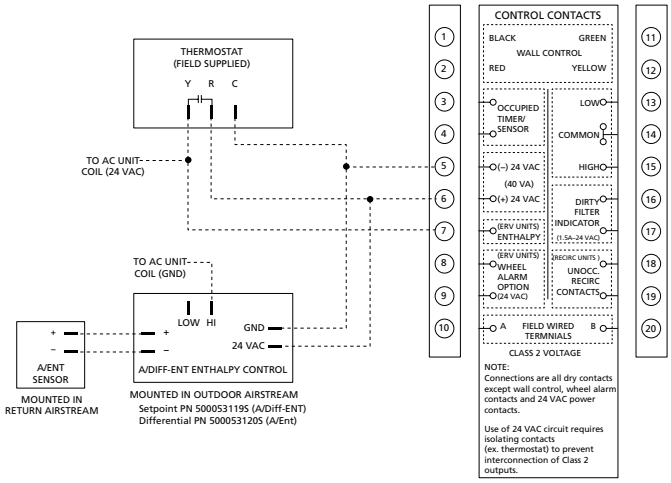


Figure E3: Setpoint/differential enthalpy control

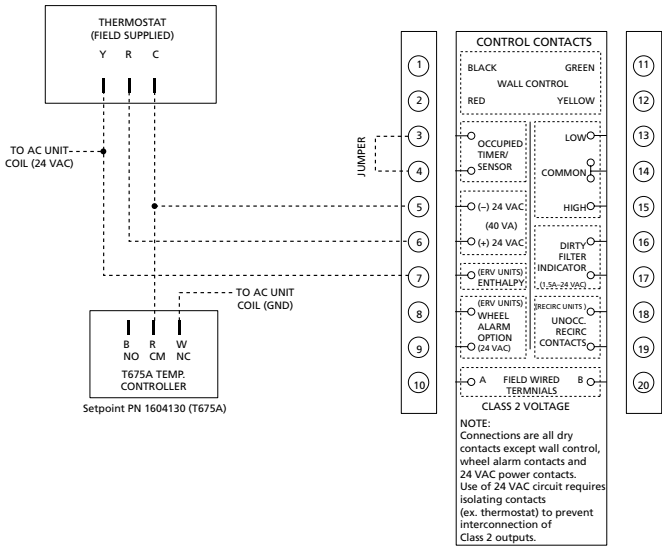


Figure E4: Thermostat (dry bulb) control

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. Figure E5represents 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.

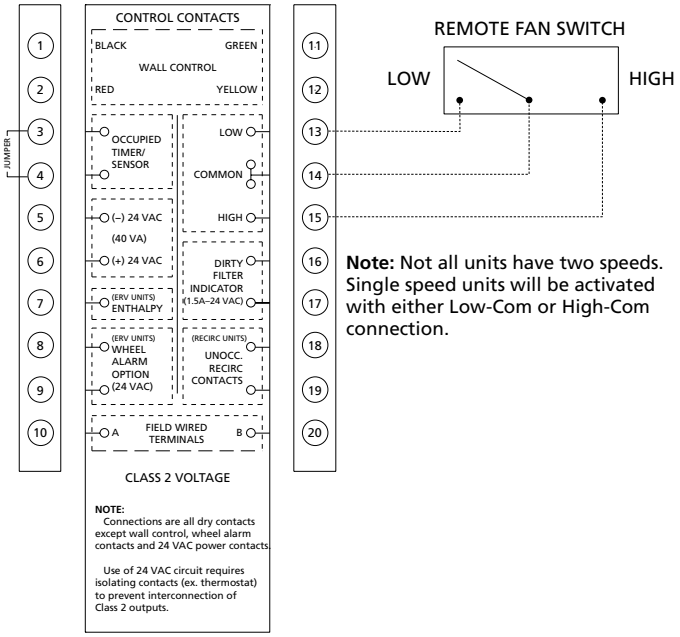


Figure E5: Remote fan control

Dirty Filter Sensor

The ERVs 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 in Figure E6.

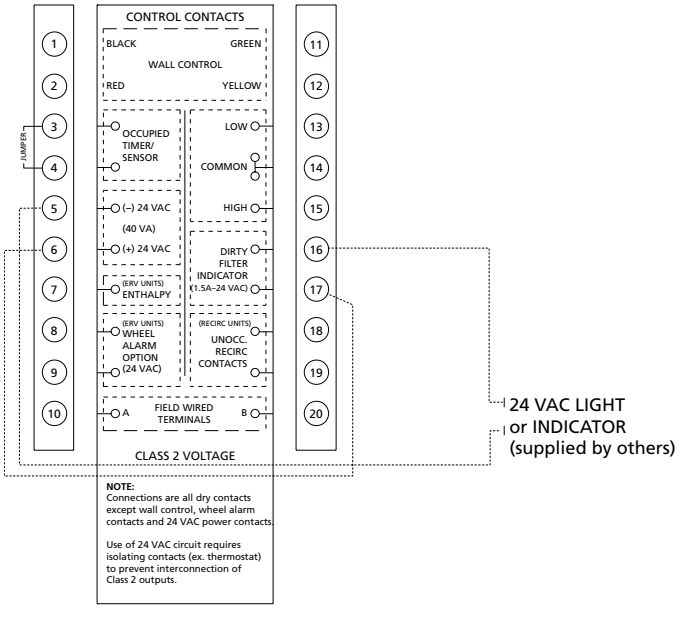


Figure E6: Dirty filter sensor

Wheel Rotation Sensor used as Low Temperature Control (Wheel Failure)

ERVs can be equipped with a wheel rotation sensor board but must be ordered with a control board. On power up of the unit, the wheel rotation sensor board's relay coil is activated and closes the 'NO' set of contacts that are wired to the 'Occ/Unocc' control terminals on the unit. In this condition, the unit is allowed to operate in a normal occupied state. When a wheel rotation failure occurs, the relay coil is de-activated and opens the contacts that are wired to the 'Occ/Unocc' control terminals. In this condition, the unit is in an unoccupied state. The fans are de-energized and the outdoor air dampers will close.

The wheel rotation sensor board has jumpers that can be used to set the time duration (one, two, four or eight minutes) for the alarm to be activated after the wheel failure. This alarm can be used to turn on an alarm light (see Figure E9) or to protect downstream coils from freezing in below zero conditions.

IMPORTANT

The wheel rotation sensor option must be ordered with a unit control board for wall control compatibility. The wheel rotation sensor option cannot be ordered with a non-defrost unit.

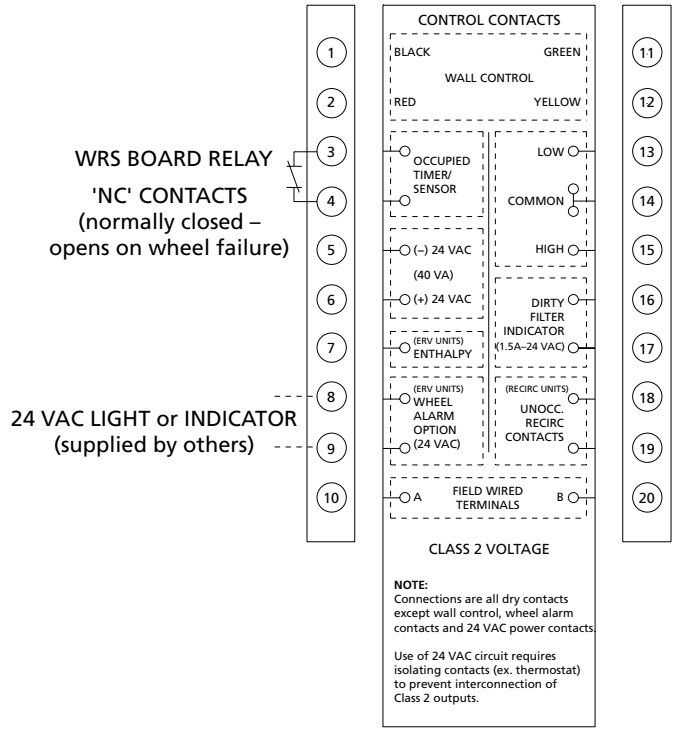


Figure E7: Wheel rotation sensor used as low temperature control

Wheel Rotation Sensor

ERVs can be equipped with a wheel rotation sensor option. This option cannot be ordered for a non-defrost unit. This option cannot be used in conjunction with a digital wall control and must be ordered with a control board. With the wheel rotating, the wheel rotation sensor board activates the relay coil and closes the 'NO' (normally open) set of contacts across the occupied/timer sensor contacts (Pin 3 and 4), allowing the unit to operate. If the wheel rotation stops (unless in an enthalpy state, defrost mode or unoccupied condition), the contacts will be open and cause the motors to shut down and the dampers (optional) to close.

IMPORTANT

If the wheel rotation sensor board shuts the unit down, the only procedure to re-start the unit is to turn the power off and then back on again.

A set of 24 VAC wheel alarm contacts are available on the terminals to power a light or indicator. The drawing below shows the wiring necessary to power the 24 VAC light or indicator.

CAUTION

The wheel rotation sensor printed circuit board has 120 VAC wired to two terminals. Improper wiring or handling of the circuit board could damage the board, the unit or cause personal injury.

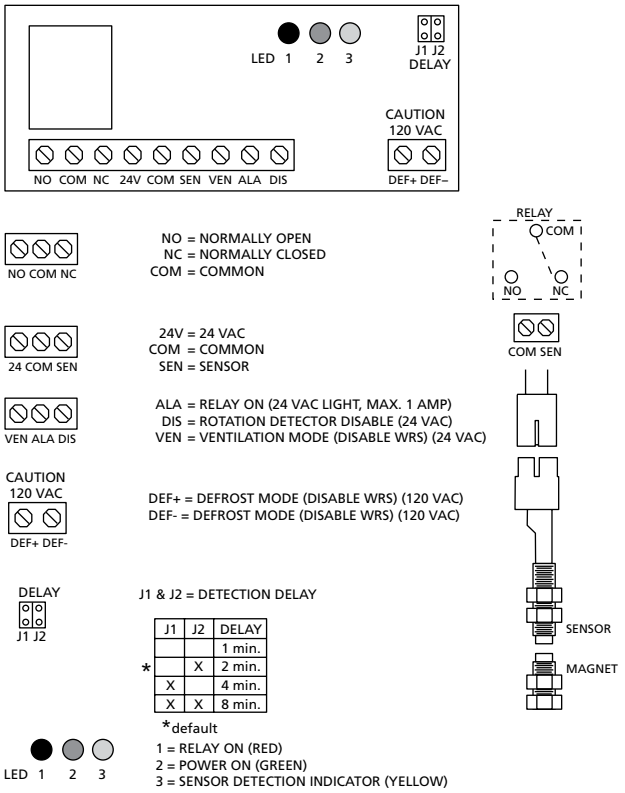


Figure E8: Wheel rotation sensor board

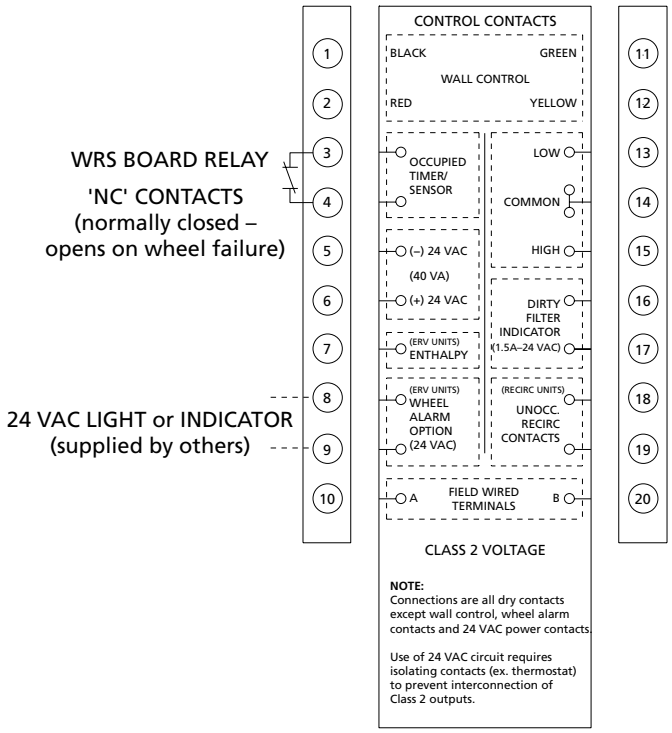


Figure E9: Wheel rotation alarm

CO_2 Ventilation Control

ERVs 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.

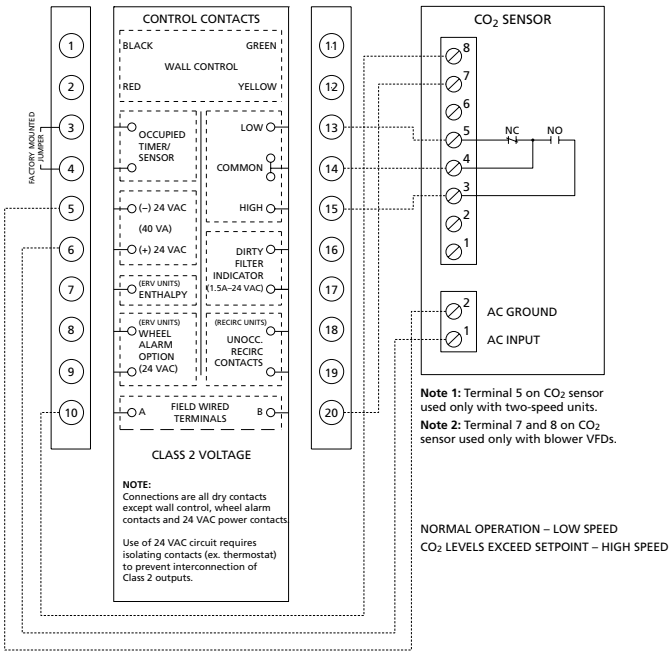


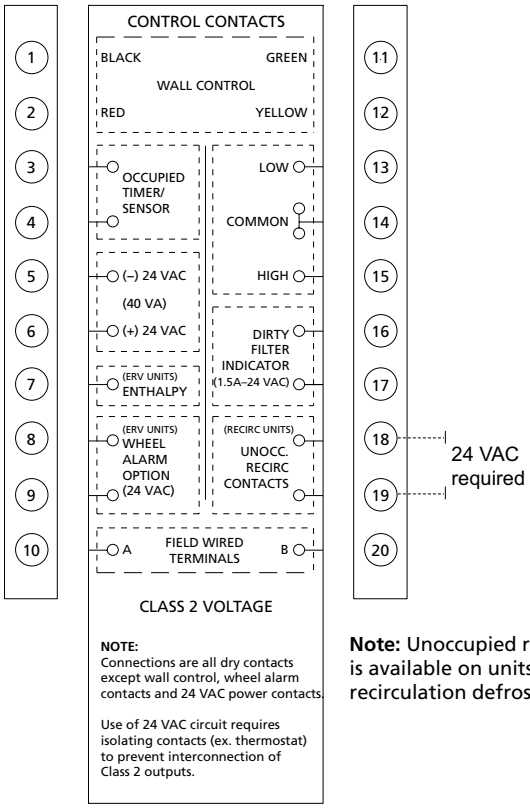
Figure E10: CO_2 ventilation control

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.

IMPORTANT

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.



Note: Unoccupied recirculation is available on units with recirculation defrost option only.

Figure E11: Unoccupied recirc contacts

Smoke Detector

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

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

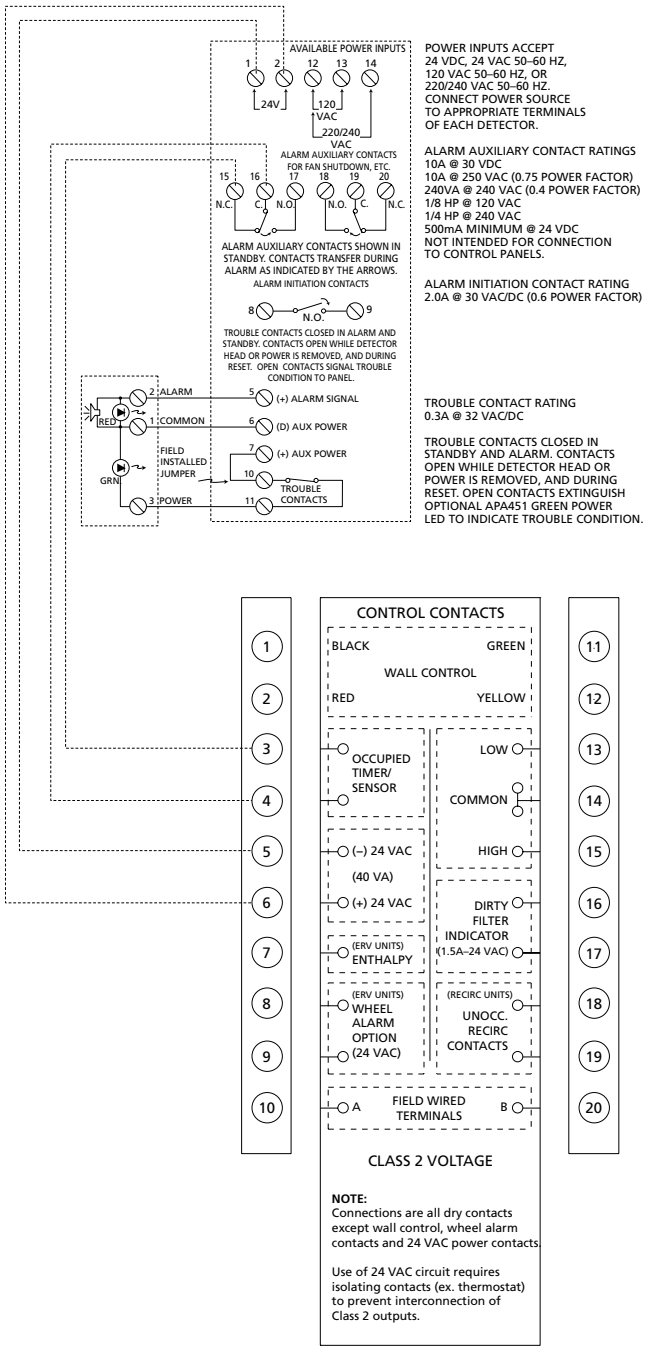


Figure E12: Smoke detector

Appendix F: Added Pressure Drop Charts

Table F1: Added Pressure Drop for High Efficiency Filters

Airflow (CFM)	Resistance (in. w.g.)
2,000	0.28
2,100	0.29
2,200	0.30
2,300	0.32
2,400	0.34
2,500	0.36
2,600	0.38
2,650	0.39
2,700	0.40
2,800	0.45
2,900	0.47
3,000	0.49
3,100	0.52
3,200	0.55
3,300	0.59
3,400	0.61
3,500	0.63
3,600	0.65
3,700	0.68
3,800	0.72
3,900	0.75
4,000	0.77

Appendix G: Troubleshooting

Table G1: Troubleshooting – ERV100i, ERV1500i, ERV2000i, ERV3000i

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 postheat module.
Unit makes an annoying noise.	Blower wheel out of alignment.	Remove the motor/blower assembly.
		Adjust blower wheel.
	Enthalpy wheel wiper seal not functioning properly.	Check for proper seal operation.
Enthalpy wheel freezing.	Imbalance of supply and exhaust air.	Check filters and heat exchanger for blockage. Check balance of airflows.
	Defrost damper not functioning.	Check for operation of damper actuator.
	Preheater not functioning.	Check the operation of the electric preheater controls.
Enthalpy wheel not running.	Enthalpy control contacts closed.	Check jumper wiring for proper operation.
	Electrical supply interrupted.	Check unit circuit breaker. Check two-wire service connector on motor.
	Drive motor capacitor.	Check capacitor connections. Check motor operation with a new capacitor.
	Drive motor failure.	Check the drive motor.
	Drive motor relay in control box.	Check relay wiring. Check relay operation.
	Drive belt.	Check for drive belt derailment off drive pulley or failure.
	Drive pulley.	Check for securely fastened pulley on motor shaft.
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 a new capacitor.
	Fan motor failure.	Check fan motor.
	Fan motor contactor in control box.	Check contactor wiring. Check contactor operation.
	Fan drive belt.	Check for failure. Check for proper tension.
	Fan drive pulleys.	Check for securely fastened pulley(s) on motor or fan shaft(s). Set screw setting at 100 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).	Check connection to motor.
	Motor wiring incorrect.	
Damper will not open.	Electrical supply interrupted.	Check wiring on damper actuator.
		Check three-wire service connector on control box.
	Defrost relay in control box.	Check relay wiring. Check relay operation.
	Electronic control board.	Test the defrost 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.

Appendix H: Electrical Data

Table H1: Blower Motor Full Load Amperage (FLA) – ERV1000i

HP	Voltage						
	120/1/60	208/1/60	230/1/60	208/3/60	230/3/60	460/3/6	575/3/60
½	7.7	3.6	3.6	3.0	3.0	1.5	N/A

Table H2: Blower Motor Full Load Amperage (FLA) – ERV1500i, ERV2000i, ERV3000i

HP	Voltage						
	120/1/60	208/1/60	230/1/60	208/3/60	230/3/60	460/3/6	575/3/60
½	9.0	4.5	4.0	1.8	2.2	1.1	0.9
¾	11.0	5.4	6.0	2.7	2.7	1.4	1.1
1.0	14.0	6.8	7.0	3.1	3.0	1.5	1.2
1.5	20.4	10.2	10.2	4.5	4.4	2.2	1.8
2.0	28.0	14.0	14.0	6.0	5.8	2.9	2.3
3.0	31.0	17.8	17.0	19.0	8.2	4.1	3.3
5.0	N/A	22.0	22.0	14.1	12.8	6.6	5.2

Table H3: 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	460/3/6	575/3/60
	4.2	2.4	2.2	2.4	2.2	1.1	0.9

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

Table H4: Electric Preheat Frost Prevention Full Load Amperage (FLA)

kW	Voltage			
	208/3/60	230/3/60	460/3/60	575/3/60
8	22.2	20.1	10.1	8.0
14	38.9	35.2	17.6	14.1
20	55.6	50.3	25.1	20.1
30	N/A	N/A	37.7	30.2
40	N/A	N/A	50.3	40.2

Electric postheaters range from 1 to 40 kW and actual FLA values of individual heaters will vary based upon the size, temperature rise and voltage. Consult the factory for actual FLA values. All electric heaters require three-phase voltage.

Minimum Current Ampacity (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 = _____

Maximum Overcurrent Protection (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 MCA = _____
Actual MOP (from Table H5) = _____

⚠ WARNING

All units equipped with electric postheaters require two-point power connections

CAUTION

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

Finding the Actual MOP Value

From the calculated MOP value, select the next smallest value of protection from Table H5 to get the actual MOP value (maximum value of overcurrent device).

IMPORTANT

If this method leads to an actual MOP value being smaller than the calculated total MCA, then a larger value must rather be selected, such that the actual MOP is at least equal to the calculated total MCA.

Table H5: 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	1,000

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VCES-ERV-IOM-3B (PN 207406)
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