

# EV SERIES ERV

## Installation, Operation and Maintenance Manual

EV450IN



Model: EV450IN shown

**⚠ WARNING**

Three phase motors are NOT suitable for use with solid state speed control.

Single phase EC motors are NOT suitable for use with solid state speed control. They already have speed control built into the motor electronics.

**⚠ AVERTISSEMENT**

Moteurs de trois phase ne convient pas pour utilisation avec regulateur de vitesse electronique.

Moteurs d'une phase de l'EC ne conviennent pas pour une utilisation avec regulateur de vitesse electronique. Ils ont déjà le contrôle de vitesse intégré dans le moteur électronique.

**⚠ WARNING****ARC FLASH AND ELECTRIC SHOCK HAZARD**

Arc flash and electric shock hazard. Disconnect all electric power supplies, verify with a voltmeter that electric power is off and wear protective equipment per NFPA 70E before working within electric control enclosure. Failure to comply can cause serious injury or death.

Customer must provide earth ground to unit, per NEC, CEC and local codes, as applicable.

Before proceeding with installation, read all instructions, verifying that all the parts are included and check the nameplate to be sure the voltage matches available utility power.

The line side of the disconnect switch contains live high-voltage.

The only way to ensure that there is NO voltage inside the unit is to install and open a remote disconnect switch and verify that power is off with a volt meter. Refer to unit electrical schematic. Follow all local codes.

**⚠ WARNING****RISK OF INJURY OR DAMAGE**

Motor may have a manual reset thermal protector. Disconnect power before servicing or resetting motor thermal protector. Use caution, motor may be hot. Allow the motor to cool before resetting the thermal protector.

If the motor thermal protector tripped, correct the issue that caused the motor to overheat (e.g. over motor rated amperage or locked rotor).

If the motor has a manual reset thermal protector, the red thermal protector reset button is located on the motor body, on or near the lead end of the motor. If the button does not reset, the motor may still be too hot. Allow the motor to fully cool to reset the thermal protector, you should feel or hear a click when the thermal protector resets while pushing the reset button.

**⚠ CAUTION****RISK OF ELECTRIC SHOCK OR EQUIPMENT DAMAGE**

Whenever electrical wiring is connected, disconnected or changed, the power supply to the ERV and its controls must be disconnected. Lock and tag the disconnect switch or circuit breaker to prevent accidental reconnection of electric power.

**⚠ CAUTION****RISK OF CONTACT WITH HIGH SPEED MOVING PARTS**

Disconnect all local and remote power supplies, verify with a voltmeter that electric power is off and all fan blades have stopped rotating before working on the unit.

Do not operate this unit with any cabinet panels removed.

**IMPORTANT**

This equipment is to be installed by following industry best practices and all applicable codes. Any damage to components, assemblies, subassemblies or the cabinet which is caused by improper installation practices will void the warranty.

**IMPORTANT**

This unit is intended for general ventilating and heating only. Do not use to exhaust hazardous or explosive materials and vapors. Do not connect this equipment to range hoods, fume hoods or collection systems for toxics.

**IMPORTANT**

This unit is for ventilating finished structures only. It is not to be used until after all construction has been completed and construction debris and dust are cleaned from the Occupied Space.

**SAVE THIS MANUAL**

**NOTICE**

This manual contains space for maintaining written records of unit maintenance and/or repairs. See Section 7.6 Maintenance Records. At the time the ERV is commissioned, a maintenance schedule should be developed by the user to incorporate monthly and seasonal maintenance and include start-up maintenance tasks as described in this manual.

**UNIT INFORMATION**

Record information as shown below.

In the unlikely event that factory assistance is ever required, information located on the unit label will be needed.

Locate the RenewAire unit label found on the outside of the unit.

NOTE: This information is for purposes of identifying the unit-specific option data from the Option Code.

Option Code:


E V 4 5 0 J I N   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -   -

Serial Number:




□ □ □ □ □ □ □ □

SO #:

□ □ □ □ □ □

 **NOTE:** This page is to be completed by the installing contractor. The completed document is to be turned over to the owner after start-up.

UNIT INFORMATION

 ETL LISTED CONFORMS TO UL STD 1812 Intertek 4000510		CERTIFIED TO CAN/CSA C22.2 No. 113		<h2>Energy Recovery Ventilator</h2>	
<b>⚠ WARNING ⚠ AVERTISSEMENT</b>					
 Danger of electric shock. Always disconnect power source before servicing. Do not install in a cooking area or make line-voltage electrical power connections directly between this unit and any appliance.		Danger de choc électrique. Toujours deconnecter la source d'alimentation avant les réparations. N'installez pas de zone de cuisine ou de ligne de tension les connexions d'alimentation électrique directement entre cette unité et tout.			
60 HZ 1-Phase <b>Motors Thermally Protected</b> / <b>Moteurs protégés thermiquement</b>					
Selected Voltage	MOTORS / MOTEURS (Qty) & HP	FLA	Unit		
115V	1@0.6	7.2	Minimum Circuit Amps	Maximum Overcurrent Protection Device	
-	-	-	9.0	15	
Voltage	(Qty) & CV	APC	Amp. Minimales de Circuit	Dispositif à maximum de protection contre les surintensités	
Option Code: EV450JIN--S11----ANT---L					
MODEL/MODELE: EV450IN					
JO#: I0XEA-0000					
Serial Number: A20 7887L					
 <b>RenewAire</b> Energy Recovery Ventilation				Label No.: T30137_000_003	

UNIT LABEL (TYPICAL)

# EV 450IN

INDOOR UNIT



Download specification at:  
[renewaire.com/specifications](http://renewaire.com/specifications)

## Energy Recovery Ventilator Standard



### SPECIFICATIONS

**Ventilation Type:**

Static plate, heat and humidity transfer

**Typical Airflow Range:** 200-540 CFM

**AHRI 1060 Certified Core:** One L85-G5

**Standard Features:**

Non-fused disconnect  
 24 VAC transformer/relay package  
 Cross-core differential pressure ports

**Filters:**

Total qty. 2, MERV 8: 14" x 20" x 2"

**Unit Dimensions & Weight:**

54 1/2" L x 16 3/8" W x 36 3/4" H  
 137-199 lbs., varies by option(s)

**Max. Shipping Dimensions & Weight (on pallet):**

62" L x 42" W x 22" H  
 250 lbs.

**Motor(s), choice of:**

Qty. 1, 0.6 HP (standard single phase)

Qty. 1, 0.5 HP (standard three phase)

**Options:**

Qty. 1, Variable Speed/ECM - Direct Drive Motors  
 (see EV450IN EC Motor submittal) -  
 0.5 HP, 120V/1Ph/60HZ,  
 0.5 HP, 208-230V/1Ph/60HZ

Fused disconnect

Integrated programmable controls -  
 enhanced, premium

Qty. 2, Factory mounted filter alarms -  
 both airstreams

Double wall construction

Exterior paint - white, custom colors

**Accessories:**

Filters - MERV 13, 2" (shipped loose)

Backdraft damper 10"

Wall cap 10" - galvanized, paintable galvanneal  
 Vibration isolation kit

Hanging bracket kit

Transition kit 10" - round, qty. 2

Flange kit - rectangular 12" x 8", 2 flanges

Solid state speed control kit - 115V, qty. 1,  
 208-230V, qty. 1

Digital time clock - wall mount (TC7D-W),  
 in exterior enclosure (TC7D-E)

Carbon dioxide sensor/control -  
 wall mount (CO2-W), duct mount (CO2-D)

IAQ sensor - wall mount (IAQ-W),  
 duct mount (IAQ-D)

Motion occupancy sensor/control -  
 ceiling mount (MC-C), wall mount (MC-W)

Smoke detector - duct mount (SD-D)

Louver with 10" round duct connection -  
 12" (W) x 12" (H)

Electric duct heater - RH series (1-11.5 kW);  
 EK series (1-175 kW);

designed for indoor ductwork installation only

**Note:** Indirect Gas-Fired Duct Furnace is not available on the EV450IN.

### ELECTRICAL DATA

HP	Volts	HZ	Phase	FLA	Min. Cir. Amps	Max. Overcurrent Protection Device
0.6	120	60	Single	7.2	9.0	15
0.6	208-230	60	Single	3.9-3.6	4.9	15
0.6	277	60	Single	3.5	4.4	15
0.5	208-230	60	Three	1.7-1.5	2.1	15
0.5	460	60	Three	0.8	1.0	15

### UNIT PERFORMANCE

Airflow CFM	ESP in H <sub>2</sub> O	Watts	
		1P	3P
225	1.25	335	181
375	0.89	464	333
420	0.75	518	394
480	0.50	584	472
500	0.43	600	491
540	0.25	640	540
575	0.00	690	610

**Note:** Watts is for the entire unit.

**Note:** Airflow performance includes effect of clean, standard filter supplied with unit.

Specifications may be subject  
 to change without notice.

# EV450IN Energy Recovery Ventilator Standard

## ABBREVIATIONS

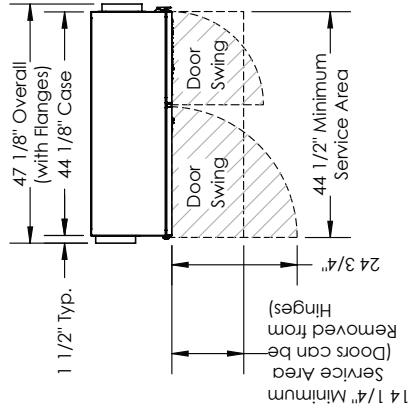
- EA: Exhaust Air to outside
- OA: Outside Air intake
- RA: Room Air to be exhausted
- FA: Fresh Air to inside

## INSTALLATION ORIENTATION

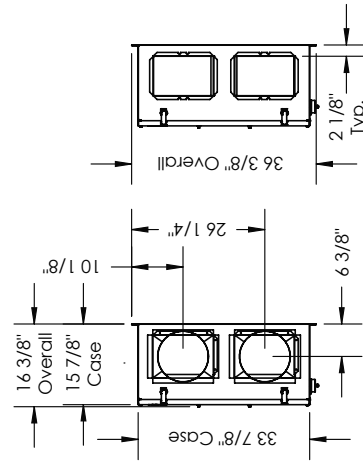
Unit may be installed in any orientation.

## NOTE

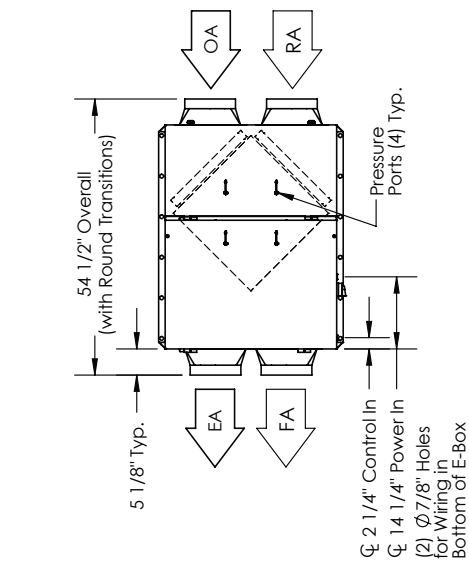
1. UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE ROUNDED TO THE NEAREST EIGHTH OF AN INCH.
2. SPECIFICATIONS MAY BE SUBJECT TO CHANGE WITHOUT NOTICE.



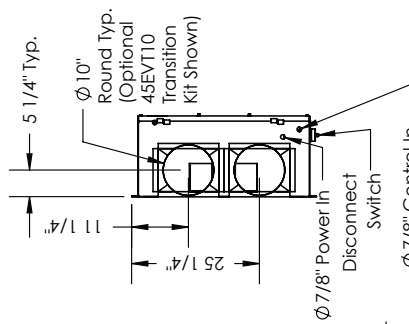
TOP VIEW



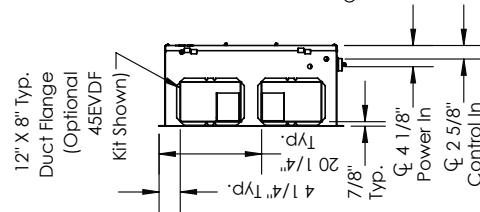
RIGHT VIEW



FRONT VIEW



LEFT VIEW



**AIRFLOW CONFIGURATION**  
Available as shown in dimension drawing.

**UNIT MOUNTING & APPLICATION**  
Can be mounted in any orientation. RA/EA airstream can be switched with OA/FA airstream.



Specifications may be subject to change without notice.

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## CONFIGURATION CODE

MODEL NUMBER	E	V	4	5	0	J	I	N	-	-																					
DIGIT NUMBER	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25						

<b>Digit 11:</b>	Wall Type
"S" = Single	
"D" = Double	

<b>Digit 12:</b>	Phase
"1" = Single Phase	
"3" = Three Phase	

<b>Digit 13:</b>	Voltage
"1" = 115V	
"4" = 460V	
"5" = 208-230V	
"9" = 277V	

<b>Digit 14:</b>	FA/EA Horsepower
"-" = Standard EV450 Motors	
"E" = EC Direct Drive Motors	

<b>Digit 19:</b>	Unit Control
"A" = Standard Unit Control Wiring	
"G" = Terminal Strip for EC Motors	

<b>Digit 20:</b>	Disconnect
"N" = Non-Fused (STANDARD)	
"F" = Fused	

<b>Digit 21:</b>	Unit Control Enhancements
"T" = Transformer with Isolation Relay (STANDARD)	
"1" = Enhanced Controls	
"2" = Premium Controls	
"3" = Enhanced Controls with BACNET License	
"4" = Premium Controls with BACNET License	

<b>Digit 22:</b>	Filter Options
"-" = None	
"F" = Filter Monitor Both Airstreams	

<b>Digit 23:</b>	Other Options
"-" = None (Reserved)	

<b>Digit 24:</b>	Paint and Customization
"-" = None	
"W" = White Paint	
"C" = Custom Paint	
"X" = Custom Unit	

<b>Digit 25:</b>	Safety Listing
"L" = Listed	
"N" = Non-Listed	

## \*NOTES:

Digit 6 "J" = G5 Core Type Digits 9,10, 15, 16, 17 & 18 are not used in these models.

<b>Restrictions:</b>
1: Voltage Codes "1" & "9" only available with Phase Code "1" (Single-Phase).
2: Voltage Codes "4" & "8" only available with Phase Code "3" (Three-Phase).
3: Motor Code "E-" (EC Motors) only available with Phase Code "1" (Single Phase)
4: Unit Control Code "G" (Terminal Strip) only available with Motor Code "E-".
5: Some units with Customization Code "X" are not safety listed.

## 1.0 OVERVIEW

### 1.1 DESCRIPTION

The EV450IN Energy Recovery Ventilator is a device for recovering both sensible energy (heat) and latent energy (moisture) from the Exhaust Air from an Occupied Space and injecting those energies into an incoming Outside Air stream. It accomplishes this task by forcing the two airstreams through enthalpic cores, where the energy exchange takes place. The two airstreams pass through the enthalpic cores at right angles and the airstreams never mix together. See Section 2.2 Enthalpic Cores in this manual.

Each ERV has two electric blowers, one for each airstream. Fan speeds can be either single speed, or they can have electronically commutated motors. There are a number of different control devices available to control the operation or speed of the unit fans.

There are two types of EV450 units, one for indoor installations and one for rooftop, or outdoor, installation. This manual is for the EV450IN, which is the indoor unit. For information on the outdoor version of this product, see the *EV450RT Installation and Operation Manual*.

These ERVs are commonly installed as part of an air handling system that provides heating and cooling of Supply Air. They can also be installed to operate as stand-alone devices when ducted directly to and from the Occupied Space.

Each unit has an integral 24 VAC power supply that is used internally and can also be used as a power source for other optional control devices.

The EV450IN units are low-maintenance, requiring periodic replacement of the air filters, and annual vacuuming of the enthalpic cores. See Section 7.0 Unit Maintenance in this manual.



**NOTE:** This unit is an Energy Recovery Ventilator, or ERV.

It is commonly referred to throughout this manual as an ERV.

### IMPORTANT

It is important to understand and use the equipment airstream terminology as it is used in this manual. The airstreams are defined as:

- OUTSIDE AIR (OA): Air taken from the external atmosphere and, therefore, not previously circulated through the system.
- FRESH AIR (FA): Air that is downstream of the enthalpic cores and is ready for conditioning or for return to the Occupied Space.
- RETURN AIR (RA): Air that is returned to the ERV from a conditioned space.
- EXHAUST AIR (EA): Air that is removed from a heating or cooling appliance or from the Occupied Space and discharged.

## 2.0 COMPONENT DESCRIPTIONS

### 2.1 CABINET

The cabinet for the EV450IN is made of 20 gauge galvanized steel and has 1" thick high-density, foil-backed insulation on the inside. Units are available in either single-wall or double-wall construction. Doors are hinged and are fitted with stainless steel machine screws through the faces to prevent accidental opening of the doors when the unit is in operation.

### 2.2 ENTHALPIC CORES

All EV450IN ERVs use a static-plate enthalpic core. The enthalpic cores transfer both latent and sensible energies between the airstreams. Gasketing is pre-installed on the cores and must be positioned to provide a proper air seal. For information on annual maintenance of the cores, see Section 7.0 Maintenance in this manual.



## 2.3 FAN/MOTOR ASSEMBLY

A single double-shafted motor with manual reset thermal protection directly drives two fans for quiet operation.

## 2.4 E-BOX

Every EV450IN is equipped with what is known as an "E-Box." High-voltage supply wiring and low-voltage control wiring is all terminated here. If optional integrated programmable controls are installed, an additional 24 VAC transformer is installed here to power both the controller and its dedicated sensors.

## 2.5 FILTERS

All EV450IN units come equipped with two MERV 8 14" x 20" x 2" (nominal) pleated filters. MERV 13 filters can be ordered as an accessory and are shipped loose.

- (2) 14" x 20" x 2" (nominal) pleated filters. Actual size: 13.5" x 19.5" x 1.75"
- Minimum recommended effectiveness: MERV 6.

## 2.6 FACTORY INSTALLED OPTIONS

All EV450IN units can be ordered with factory installed options. See Unit Configuration Code on page 7.

Options will have supplemental manuals shipped with the unit.

For EC Motor option, see *EC Motor Supplemental Manual*.

For Commercial Controls, see *Commercial Controls Supplemental Manual*.

For Filter Alarm, see *Filter Alarm Supplemental Manual*.

## 3.0 SHIPPING/RECEIVING/HANDLING

EV450IN units are boxed and palletized at the factory and then shipped by common carrier. Upon receipt by the installer, the shipment should be inspected for shipping damage, prior to unloading. Any discovered shipping damage should be immediately reported to the RenewAire sales rep and the damage must be recorded on the Bill Of Lading, prior to signing for acceptance of the shipment.

Place the EV450IN unit on a flat surface where it will be protected from the weather and incidental damage. Keep the unit boxed until ready for installation.

## 3.1 UNIT WEIGHTS AND DIMENSIONS

### 3.1.1 Unit Dimensions and Weight:

54 1/2" L x 36 3/4" W x 16 3/8" H

137-199 lbs., varies by option(s)

### 3.1.2 Maximum Shipping Dimensions and Weight:

62" L x 42" W x 22" H

250 lbs.

### 3.2 RIGGING AND CENTER OF GRAVITY

#### 3.2.1 EV450IN Hoisting Weights and COG

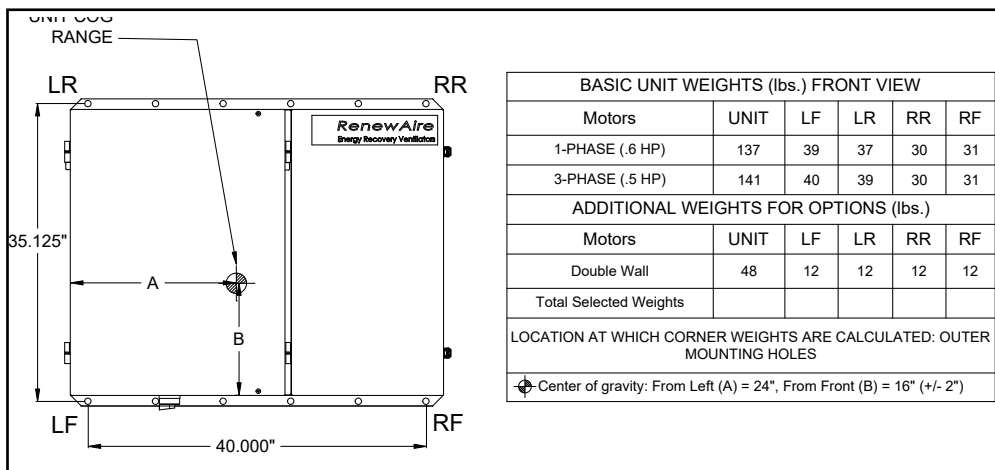


FIGURE 3.2.0 EV450IN WEIGHTS AND COG

### 3.3 RECEIVING

Upon receipt of the EV450IN, inspect the unit for obvious external damage. If damage is observed, take digital pictures and report the damage to your RenewAire rep. Note the damage on the carrier’s Bill of Lading. Depending on expected transport and storage conditions, the unit may have only the duct openings covered. Do not unbox the unit at this time. The unit will normally be moved to its final location while still boxed.

Once the unit is unboxed, prevent dirt and debris from entering the cabinet by covering any duct openings. Keep the duct openings covered until it is time to connect ductwork.

### 3.4 STORAGE

Units that must be stored prior to installation should be left on their boxes and protected from weather and physical damage. Units must be placed on a level surface to prevent wracking of the EV450IN. All access doors must be secured with all available hardware (door latches and securing bolts) and all openings into the cabinet must be sealed to prevent entry of dust, dirt and debris.

## 4.0 UNIT PLACEMENT

### 4.1 BEFORE YOU BEGIN

The EV450IN is designed for installation in a sheltered location, out of the weather. The preferred mounting location is to place the unit on a concrete floor, although it can also be suspended from a ceiling or other structural support. See Section 5.2, Suspended Mount, in this manual.

For all installations, maintain needed service clearances as shown on the dimensioned drawings located on pages 4–5 of this manual.

For all floor-mount installations, the unit should be set on its factory-provided base. Select a location that is central to the inside duct runs and close to both the exhaust duct (to the outside) and also to the fresh air duct (from the outside).

The exhaust outlet and the outside air inlet on the outside of the building should be at least 10’ apart to avoid cross-contamination. Comply with all local building codes in the positioning of the duct openings. Do not position the exhaust air outlet in a location where it will dump exhaust air into any enclosed or occupied space. The duct inlets and outlets should be screened against insects and vermin and should be shielded from the weather to prevent entry of rain or snow.

For maximum air performance minimize the number of elbows, and do not place elbows within 3' of the EV450IN's discharges. For applications where duct noise is a critical issue, use noise attenuating techniques such as duct isolation, insulation, and proper duct design per SMACNA or ASHRAE standards.

## 4.2 SERVICE CLEARANCES

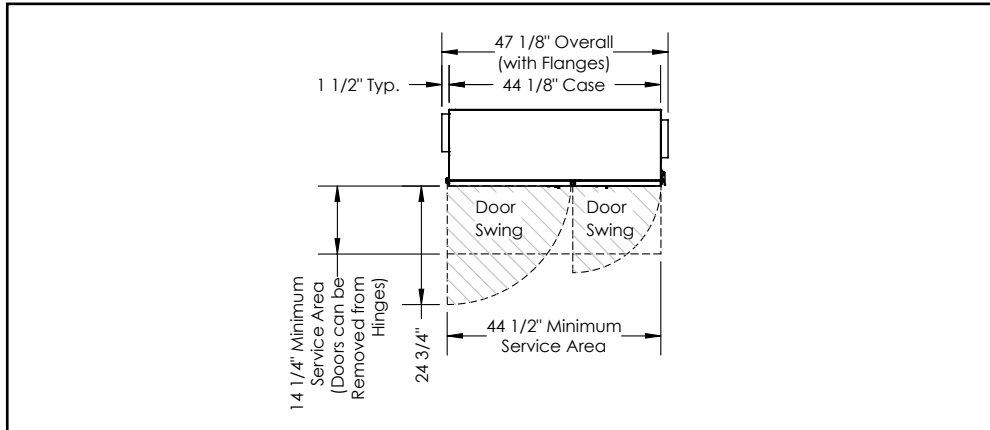


FIGURE 4.2.0 SERVICE CLEARANCES, TOP VIEW

## 4.3 SOUND ATTENUATION

Take these simple steps to attenuate noise from the unit.

### 4.3.1 Outside the Building

Exhaust velocity noise is the primary cause of unit-related noise outside the building. Size the exhaust duct and grille for less than 1000 feet per minute (FPM) air velocity. When practical, orient the exhaust air hood to point away from houses or public areas.

### 4.3.2 Ducts

Make sure the ductwork at the unit outlets is stiff enough to resist the flexure and resulting booming associated with system start-up and shut-off, as well as the turbulent flow conditions at the blower outlets.

In general, provide smooth transitions from the ERV's outlets to the duct. The ducts connecting to the outlets should be straight for a sufficient distance, with gradual transitions to the final duct size.

These guidelines are consistent with SMACNA recommended duct layout practices for efficient and quiet air movement. Follow SMACNA guidelines.

### 4.3.3 Radiated Noise

The outlet ducts can be significant sources of radiated sound as well. The FA and EA ducts (outlet ducts) should be insulated for sound control. This insulation should start at the unit. At a minimum the first ten feet of duct should be insulated. All parts of the FA and EA ducts located in the mechanical space should be insulated for sound control, both to minimize sound radiation out of these ducts and also to control sound radiation into the ducts.

### 4.3.4 Aerodynamic (Velocity) Noise

When sound attenuation is a design concern, the primary consideration is velocity noise at the unit's Fresh Air blower outlet. The average velocity at the blower outlets is 1100 FPM when the unit is operating at 600 CFM.

## 5.0 INSTALLATION

### 5.1 DUCTWORK

#### 5.1.1 Ducts to the Outside

Ducts from unit to the outside must be insulated with sealed vapor barrier on both inside and outside of the insulation or with closed-cell foam insulation. We recommend you use either:

8" x 12" insulated duct OR 10" I.D. flexible insulated duct

The exhaust outlet and fresh air inlet on the outside of the building should be at least ten feet apart to avoid cross-contamination. The exhaust outlet should not dump air into an enclosed space or any other structure. The inlets and outlets should be screened against insects and vermin and shielded from the weather to prevent the entry of rain or snow.

#### 5.1.2 Using Flex Duct to Connect EV450IN to Outside

When connecting 10" flexible insulated duct to the Exhaust Air and Outside Air ports on the unit use the Duct Adapter Kit accessory (45EVT10) (or fabricate equivalent). Duct need not be flexible, but must have continuous vapor barrier on both inner and outer face of insulation. Position the duct adapters over the openings. Install them with supplied self-drilling screws.

Keep insulated duct runs as short and direct as possible. Suspend or support duct per manufacturer's instructions.

#### **⚠ CAUTION**

Do not vent exhaust duct up through roof. Condensate will form in cold weather and run back into unit. Instead, slope duct slightly downhill to a horizontal-discharge wall cap, which will allow any condensate to drain to the outside.

NOTE: To prevent the entry of rain through the outside air inlet duct, observe the following:

1. velocity at face of inlet hood should not exceed 500 FPM;
2. inlet duct must be at least 10" inside diameter;
3. centerline length along duct from weather hood to unit inlet must be at least 48";
4. centerline of inlet hood must be at least 18" below the centerline of the unit inlet;
5. outlet duct must pitch downward to the outside with a slope of at least ¼" to the foot.

#### **⚠ CAUTION**

Tape both inner and outer vapor barriers of insulated duct to collars on duct adapters and on wall caps. This is critical to prevent migration of moisture into insulation. Build-up of moisture can result in failure of the duct system and/or frost in the insulation. Make sure any tears in the inner and outer vapor barriers are sealed.

### 5.1.3 Inside Ductwork System

Use 8" x 12" to 10" round transitions (45EVT10) accessory (or fabricate equivalent) to connect 10" duct to Room Air and Fresh Air Ports on unit. Position duct adapters over openings. Install with supplied self-drilling screws.

OR

Use 8" x 12" duct flange (45EVDF) accessory to connect 8" x 12" duct to Room Air and Fresh Air Ports on unit. Position duct adapters over openings. Install with supplied screws.

Or fabricate equivalent, by forming a flange on the first duct section and screw it to the EV450IN. Make sure appropriate duct sealant or tape is used to provide an air tight seal.

Most installations will not require complicated duct systems to provide good ventilation performance. If ventilating several spaces, evaluate whether the air in the spaces is regularly mixed by the heating/cooling system; if not, provide a room air pick-up and fresh air supply in each space. If air is regularly mixed by the heating/cooling system, one room air pick-up and one fresh air supply may be all that is needed.

#### 5.1.3.1 Connecting to an Existing Air-Circulation System

It is often convenient and effective to connect the Fresh Air duct from the EV450IN to a return duct of an existing heating/cooling system. This way, whenever the heating/cooling system is running, fresh air from the EV450IN is distributed throughout the area served by the heating/cooling system.

Connect the Fresh Air duct to a branch return duct at some distance from the heating/cooling system's air handler. This minimizes the amount of air that the air handler can pull through the EV450IN when outside air ventilation is not desired.

If the EV450IN is running when the main air handler is not, fresh air will flow into the space through the branch's return grille. Choose the return branch for your connection accordingly (see next paragraph).

#### 5.1.4 Ducting Fresh Air Directly into Space

In cold or hot weather, the fresh air will be somewhat cooler or warmer than the room air (though always much closer to room temperature than the outside air!). Avoid complaints by locating the Fresh Air supplies where they will not blow directly on occupants.

## 5.2 INSTALLING THE UNIT

### **⚠ CAUTION**

The EV450IN weighs approximately 199 lbs. It is the installer's responsibility to make sure that the screws or bolts used for securing the units are properly selected for the loads and substrates involved. Secure the EV450IN so that it cannot fall or tip in the event of accident, structural failure or earthquake.

Do not stand on the unit. Do not stack or store items on the unit when installed.

To avoid motor bearing damage and noisy and/or unbalanced blowers, keep drywall spray, construction dust, etc., out of unit.



**NOTE:** Ducts inside a building that are connected to the outside must be insulated with a sealed vapor barrier on both the inside and the outside of the insulation.

The EV450IN has integral flanges for mounting to a wall (Figure 5.2.0) or hanging from a ceiling (Figure 5.2.1).

Please note that the threaded rod, bolts, nuts, or other fasteners are not included. If hanger bolts or threaded rod are used each must be capable of carrying the weight of the unit and must be no less than 3/8" diameter.

A vibration isolator kit, 45VIB accessory, is available for hanging the unit and includes 4 rubber isolation mounts and eight washers. An hanging bracket kit, 45EVHB accessory, is available for hanging the unit from a ceiling with doors opening horizontally. The 45EVHB kit can also be used for floor mount legs. With all installations, adequate clearance for the filter access door latches must be provided.

If doors need to be removed for installation or services see figures 5.2.2 and 5.2.3 show the rubber door keepers. In order to remove doors these keepers must be removed.

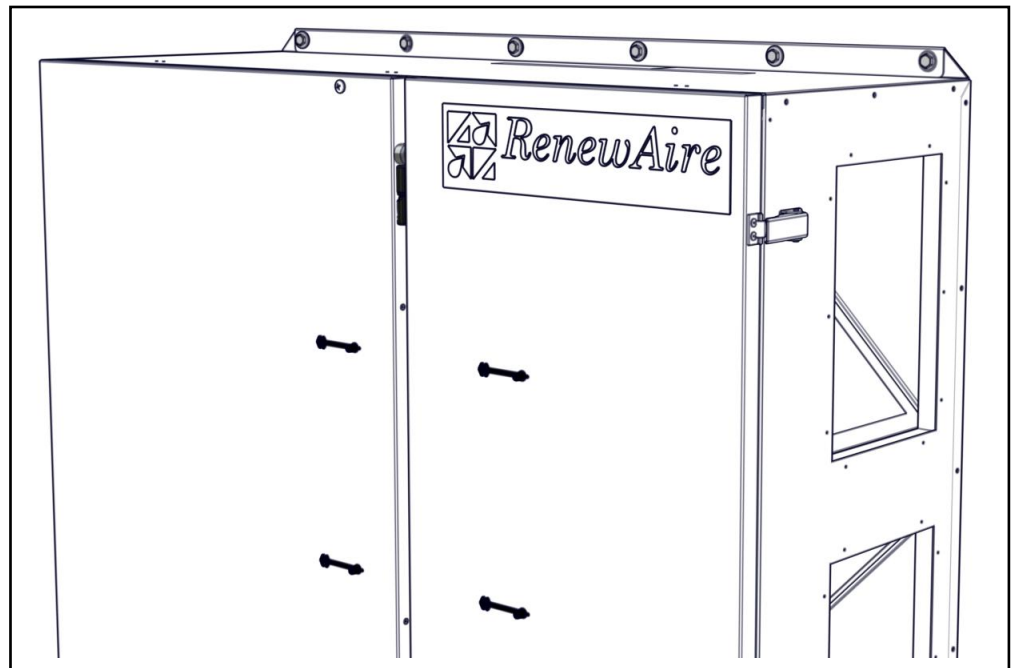


FIGURE 5.2.0 UNIT MOUNTED TO WALL USING INTEGRAL MOUNTING FLANGES

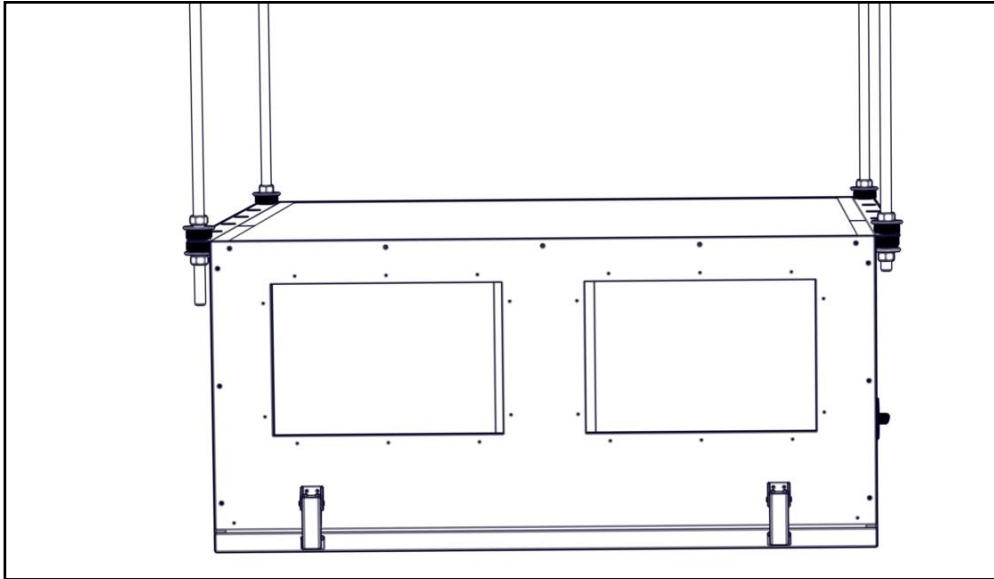


FIGURE 5.2.1 UNIT HUNG FROM CEILING USING INTEGRAL MOUNTING FLANGES

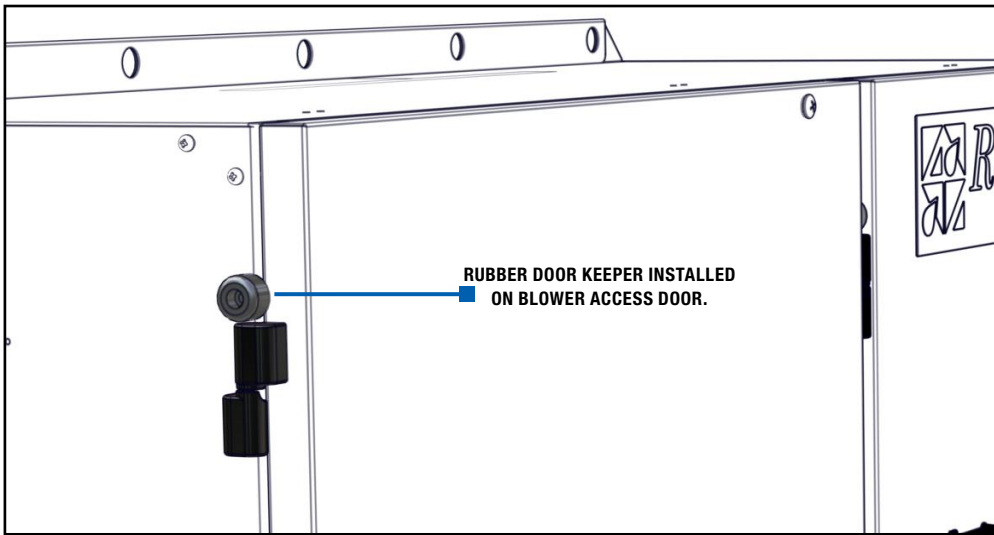


FIGURE 5.2.2 RUBBER DOOR KEEPER INSTALLED ON BLOWER ACCESS (LARGE) DOOR.

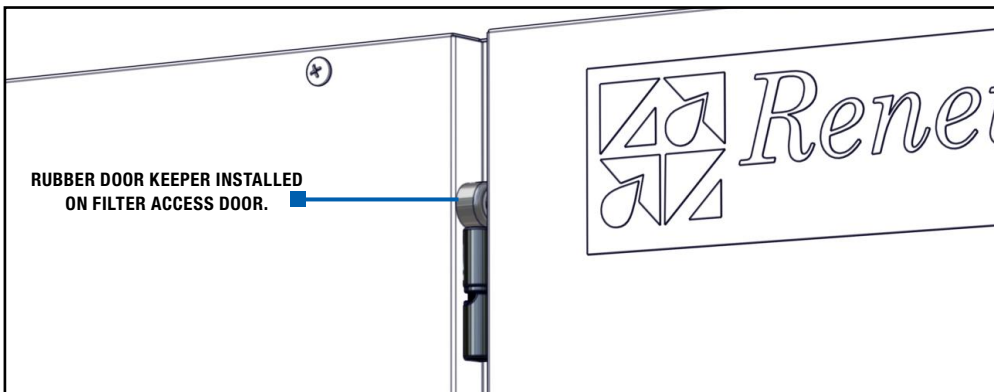



FIGURE 5.2.3 RUBBER DOOR KEEPER INSTALLED ON FILTER ACCESS (SMALL) DOOR.


### 5.3 ELECTRICAL REQUIREMENTS


#### 5.3.1 Electronically Commutated Motors

These ERVs may be ordered with factory-installed features including Electronically Commutated (EC) Motors. Consult the supplemental Installation and Operation Manual(s) for these features if supplied.

Electrical Options are identified on the Unit Label located near electrical box on the outside of the unit. Find the complete Unit Model Number in the lower left corner of the Unit Label. Use the configuration chart to determine motor power and voltage installed in your EV450IN.

 NOTE: Standard EV450IN with single phase original equipment motors are suitable for use with solid state speed control.

 NOTE: Le EV450IN avec moteurs d'équipement d'origine monophasés sont adaptés pour une utilisation avec regulateur de vitesse électronique.

 NOTE: If your unit is equipped with EC Motors, please refer to "EC Motor Supplemental Manual" for more detail.  
Use conduit, strain reliefs, etc. as required by code to secure the field wiring.

<b>⚠ CAUTION</b>
<p>Before bringing power to the unit check unit nameplate to confirm it matches the voltage and phase of the power you are supplying.</p> <p>Remember that your field connections need to be accessible for inspection.</p> <p>You must make sure to provide the correct voltage and phase power supply. Installing the incorrect voltage and phase will destroy the motor and possibly lead to injury!</p>

Follow these steps:

1. Confirm the voltage of the power supply matches the unit.
2. Remove both unit access panels, i.e., the larger motor door and small filter door.
3. Remove electrical box cover by removing two or three screws. Connect the units power field wiring to the terminals of the disconnect switch.
4. Connect service ground to ground wire pigtail.
5. Connect the control system to the pigtails in the control voltage compartment of the units electrical box. Make sure you are connecting the correct voltage, 24 VAC, to the control pigtails. See Wiring Schematics.

#### 5.3.2 Low Voltage Control System

This ERV is provided with a Class II 24 VAC power supply system that operates the unit's contactor for EV450IN. The ERV's 24 VAC Power Supply can also be used to power the externally-installed controls system: up to 8 VA of power is available.

The unit's power supply system includes an isolation relay so you can use external controls whose contact ratings are as low as 50 mA (1.2 VA). Also, it is possible to operate the isolation relay with 24 VAC power from an external source (with proper wiring connections).

A built-in circuit-breaker prevents damage to the transformer and other low-voltage components in the event of a short-circuit or overload. In extreme cases, the transformer itself is designed to fail safely.

Specifications:

- Nominal Output Voltage under load: 24 VAC
- Typical Output Voltage at no load: 29–31 V
- Minimum contact rating for connected control device: 50 mA (1.2 VA)
- Circuit Breaker Trip Point: 3 A



**⚠ CAUTION**

1. Connect only to components intended for use with 24 VAC power.
2. Do not undersize the low-voltage wires connected to this device. Observe the wire length and gauge limits indicated in this manual.
3. Do not overload this unit's 24 VAC power supply system. Confirm that the power requirements of devices you connect to this power supply system do not exceed 8 VA in total.
4. If an external source of 24 VAC power is used to control the unit, consult the wiring schematics and connect the external power only to the specified terminals in order to avoid damaging the unit or external controls. Connect only CLASS II power to the control terminals of this unit.
5. Unit is not equipped to receive analog signals (such as 1–10 vdc or 4–20 mA).

5.3.3 How to Reset the 24 VAC Circuit Breaker

If the transformer is subjected to an excessive load or a short circuit, the circuit breaker will trip to prevent the failure of the transformer. When it trips the circuit breaker's button pops up. Shut off the primary-side power to the unit, and remove the excessive load or the short. The circuit breaker can be reset about fifteen seconds after it trips by pressing in the button.

3.3.4 Limits of Power Output

If limits on wire gauge and length are observed, you may connect control devices that draw up to 8 VA to the blue and red wires. More than one device can be connected as long as total steady-state load does not exceed 8 VA.

Wire Gauge	#22	#20	#18	#16	#14	#12
Circuit Length	100'	150'	250'	400'	700'	1000'

"Circuit Length" is distance from ERV to Control Device.

Observe these limits to wire length and gauge in order to ensure reliable operation of the control system.

**⚠ CAUTION**

Be careful if the external control system provides 24 VAC power at its control output: make sure blue and red leads are separately capped and not connected to any other wires.

**NOTICE**

If primary-side voltage is 230 VAC, move black primary-side lead from transformer's "208 V" terminal to the transformer's terminal marked "240 V" ("230 V" in some units). Do not move the black primary-side lead that is connected to the transformer's "COM" terminal.

5.4 WIRING SCHEMATICS

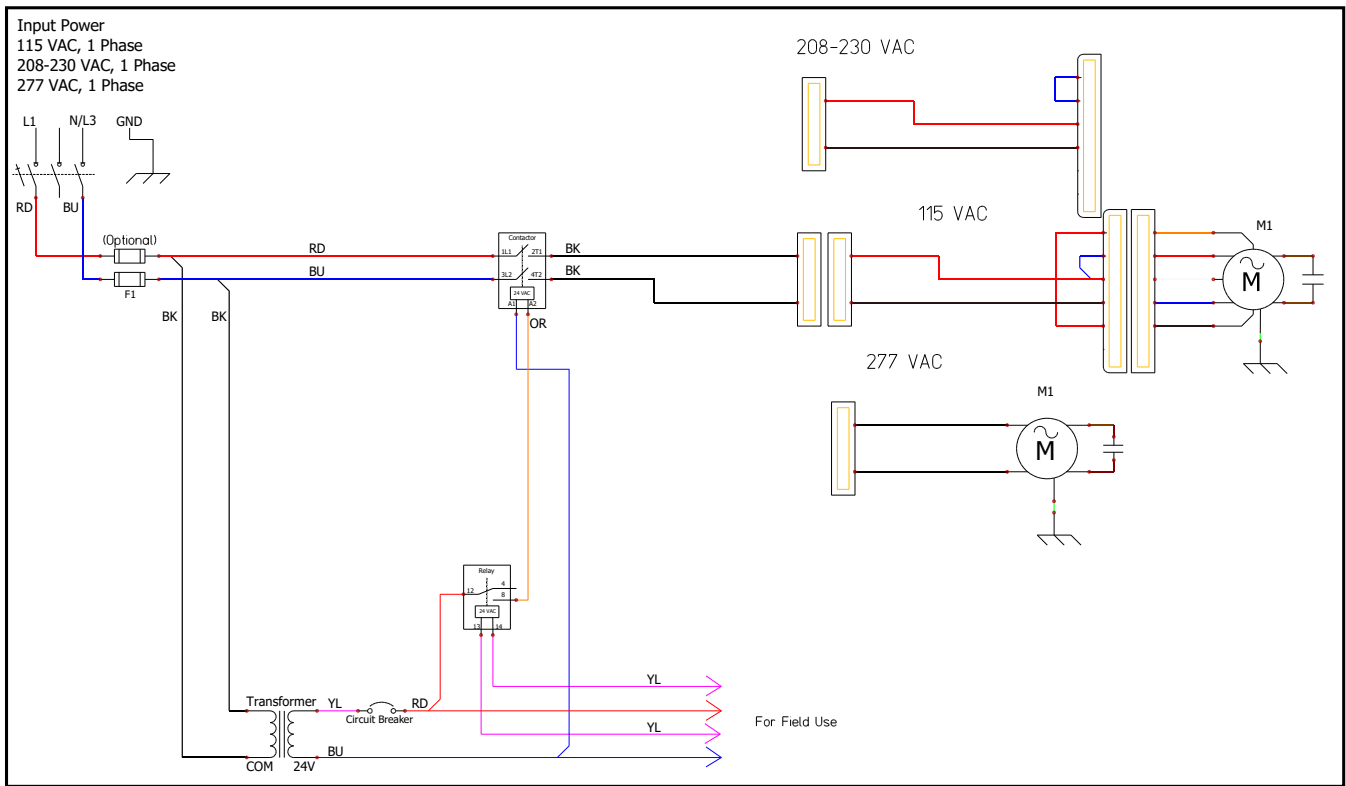


FIGURE 5.4.0 EV450 SINGLE PHASE UNIT POWER WIRING SCHEMATIC

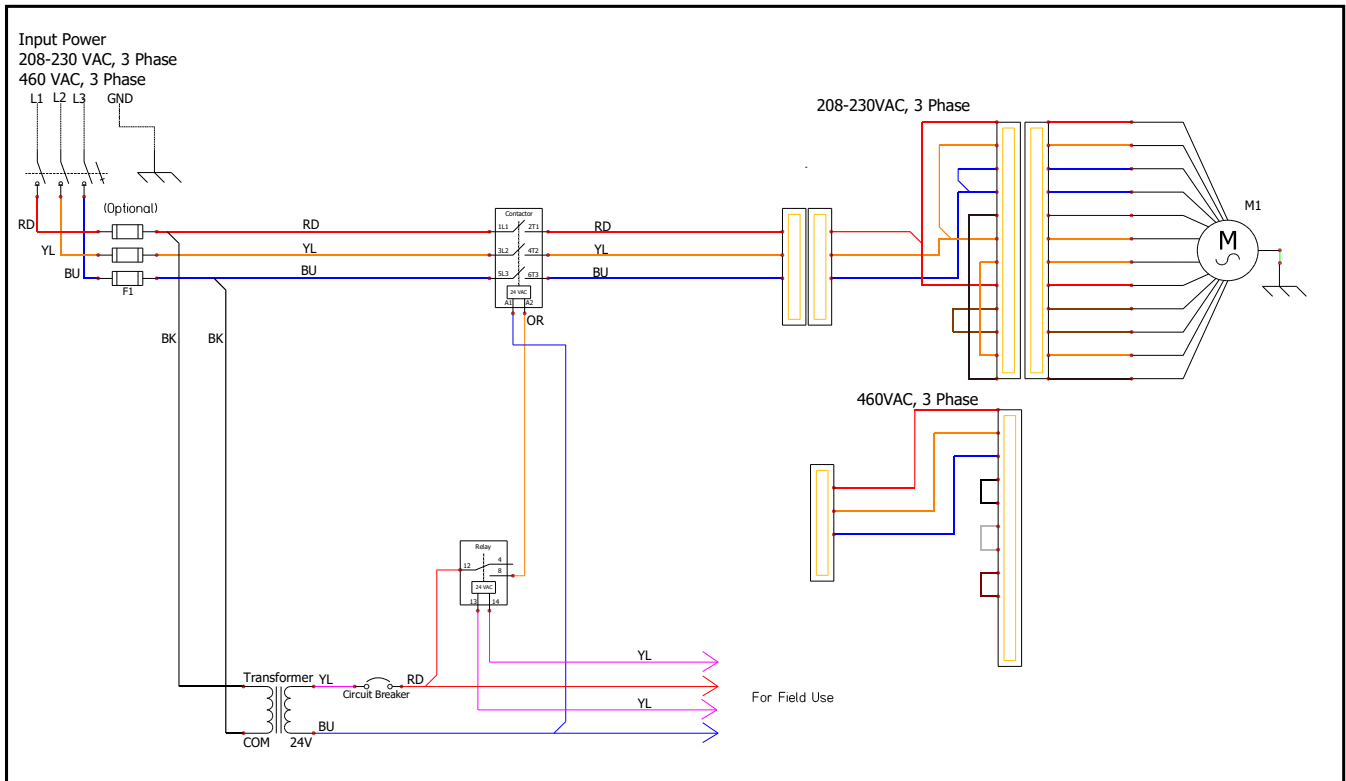


FIGURE 5.4.1 EV450 THREE PHASE UNIT POWER WIRING SCHEMATIC

### 5.5 EXTERNAL CONTROL CONNECTIONS

#### 5.5.1 Single 2-Wire Control, Unpowered

Use the schematic shown in Figure 5.5.0; if the control requires no power to operate and acts like a simple on/off switch. The control must not supply any power to the ERV unit.

- Connect the blue lead to one yellow lead.
- Connect the control's contacts to the red lead and the remaining yellow lead.

Control on separate Power Supply, no power present at Control Output:

- Wire as shown for the Single 2-wire control.

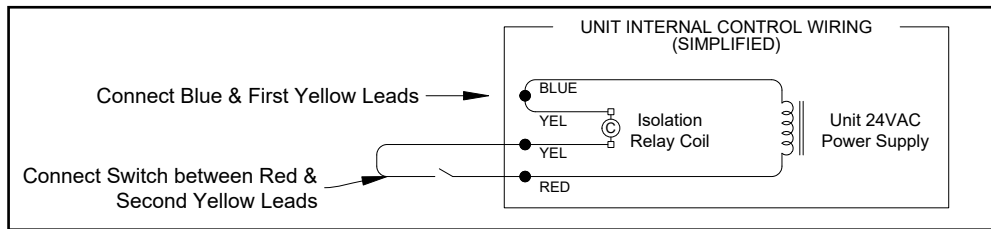


FIGURE 5.5.0 A SWITCH OR NON-POWERED CONTROL USING UNIT'S 24 VAC POWER SUPPLY

#### 5.5.2 Control Sending 24 VAC "ON" Signal

Use the schematic shown in Figure 5.5.1 if a 24 VAC "ON" signal is to be sent from an external power source to the ERV.

- Make sure the blue and red leads are separately capped and not connected to any other wires.

Now you safely can apply 24 VAC to the two yellow leads to operate the ERV's isolation relay.

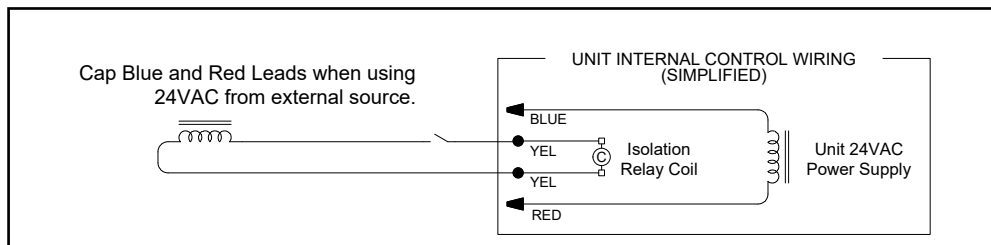


FIGURE 5.5.1 24 VAC FROM AN EXTERNAL SOURCE

#### 5.5.3 Control Operating on Unit's 24 VAC Power Supply

Use the schematic shown in Figure 5.5.2 if controls are operating on unit's 24 VAC power supply.

- 24 VAC power is available at the blue and red leads.
- Connect one of the yellow leads to the blue lead.
- Connect the switched output of the Control to the red lead to operate the ERV's isolation relay.

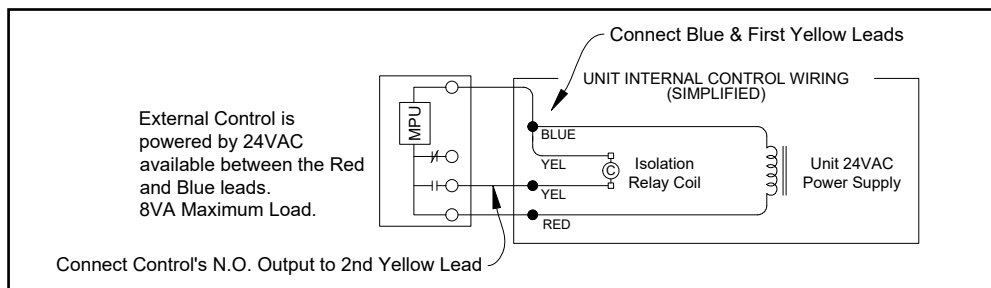


FIGURE 5.5.2 AN EXTERNAL CONTROL DEVICE USING UNIT'S 24 VAC POWER SUPPLY

**NOTE:** The simplified schematics below show only the relevant portions of the low-voltage control circuit in the ERV unit and representational external control approaches. See the complete unit schematics on the previous page.

**CAUTION**  
Make sure the control provides no voltage or current at its output terminals.

**CAUTION**  
Supply only 24 VAC (not VDC) from a Class II Power Source.

**CAUTION**  
External control system should not draw more than 8 VA.



**NOTE:** Any changes to unit low-voltage wiring should be made with the disconnect switch in the OFF position.

## 5.6 QUICK-START FOR TESTING CORRECT 3PH WIRING

All units that run on 3 phase power should be test-run immediately after high voltage wiring connections are made. This will verify that the three phases are properly connected, that the dampers will open and close properly and the fans are working properly.

For purposes of testing correct phase connections, the internal 24 VAC power supply will be used to power-up the fans and all external control devices will be disabled, when applicable.

## 6.0 OPERATION

### 6.1 PRINCIPLE OF OPERATION

The EV450IN has one basic purpose: to exhaust air from a structure and bring in fresh air from outside, while transferring heating or cooling energy from the exhaust air to the fresh air.

The EV450IN is a very simple device, and will accomplish this purpose as long as the blower is able to move air through the enthalpic core.

### 6.2 PRE-START-UP

#### 6.2.1 Verify Voltages

Using a voltmeter, test the input voltages as supplied to the disconnect switch. Refer to Digit 13 of the unit Configuration Code to find the rated voltage. The supplied voltage must be within +/- 10% of the rated voltage.

#### 6.2.2 Verify Transformer Wiring

Units with 230 VAC power source are shipped with the transformer wired for 208 VAC. If the unit is receiving 230 VAC, make sure the black primary-side wire on the transformer's 208 V terminal has been moved to the 230 V terminal.

#### 6.2.3 Inspect Filters

Clean filters must be installed prior to fan start-up.

#### 6.2.4 Inspect Foam Gasketing

Inspect the gasketing to make sure there are no gaps allowing air movement around the cores or filters.

#### 6.2.5 Inspect Fans

Prior to start-up, the fans should be rotated by hand to make sure that the impeller is not rubbing anywhere and that they turn freely.

#### 6.2.6 Inspect and Clean the Cabinet Interior

During the construction and installation phases of a project, dust, dirt and debris will often accumulate inside a unit. Thoroughly clean the inside of the unit by vacuuming and/or wiping metal surfaces with a damp rag.

#### 6.2.7 Inspect Ductwork Connections

Ducts attached to the ERV must be firmly attached, sealed and supported in accordance with installation instructions and SMACNA guidelines.

### 6.3 UNIT START-UP

#### 6.3.1 Fixed-Speed Units

Most fixed-speed units do not have any external controlling signals and only require turning on the disconnect switch, located on the E-Box. When the disconnect switch is turned ON, power is supplied to the motor contactors, causing the fans to run.

Some fixed-speed units are wired to receive an actuating signal from an external source. If there is an external actuating signal source, verify the type of signal and that it is wired according to the low-voltage wiring diagrams found in Section 5.5 of this manual. Turn on the disconnect switch and then turn ON the actuating device. Power is then applied to the motor contactors and the fans will begin running.

### 6.4 MEASURING AIRFLOW

Equipment Required:


- A magnehelic gauge or other device capable of measuring 0–1.0 in. water of differential pressure.
- 2 pieces of natural rubber latex tubing, 1/8" ID, 1/16" Wall works the best.


The individual differential static pressures (DP) are measured using the installed pressure ports located in the front of the units core access doors.

Do not relocate pressure ports.

Procedure:

- To read SCFM of Fresh Air (FA) install the “high” pressure side (+) of your measuring device to the Outside Air (OA) port and the “low” pressure side (-) to the Fresh Air (FA) port.
- To read SCFM of Room Air (RA) install the “high” pressure side (+) of your measuring device to the Room Air (RA) port and the “low” pressure side (-) to the Exhaust Air (EA) port.
- Use the reading displayed on your measurement device to cross reference the CFM output using the conversion chart.

 NOTE: The tubing should extend in the pressure port approx. 1".

 NOTE: These ports are carefully located on the unit to give the most accurate airflow measurement. Do not relocate pressure ports.

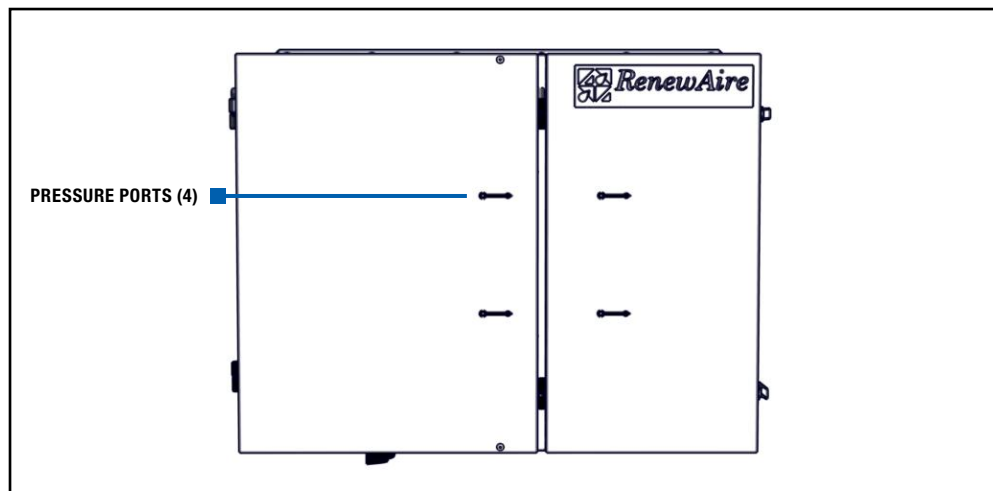



FIGURE 6.4.0 AIRFLOW DIAGRAM, EV450IN

 NOTE: Make sure clean filters are installed before balancing airflow. Dirty or clogged filters reduce airflow through the unit.

DIFFERENTIAL STATIC ACROSS CORE DSP VS. CFM												
EV450IN	DP (H <sub>2</sub> O)	DSP	0.20	0.25	0.30	0.35	0.40	0.45	0.50	0.55	0.60	0.65
Fresh Air (FA)	CFM	190	230	275	315	360	400	445	485	530	570	
Room Air (RA)	CFM	190	230	275	315	360	400	445	485	530	570	

6.4.1 Filter Pressure Drop

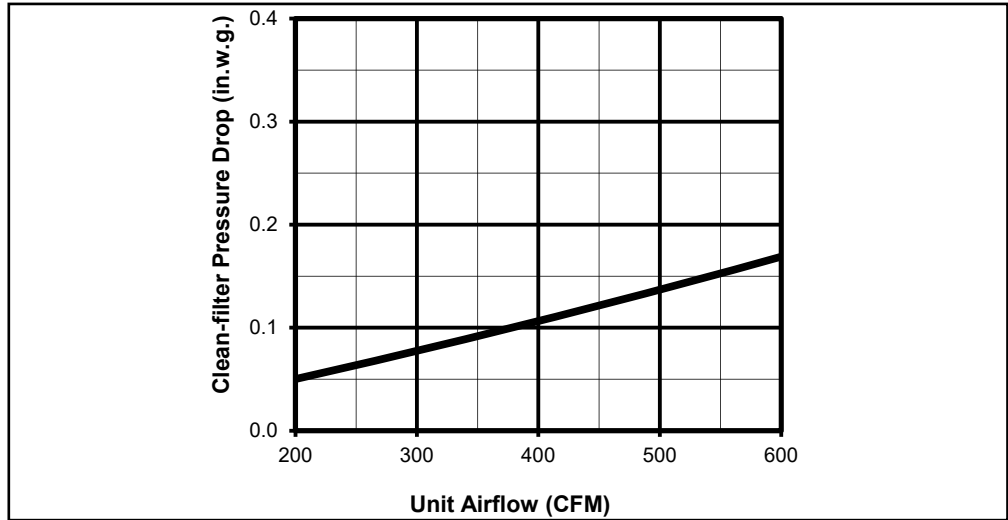


FIGURE 6.4.1 INITIAL PRESSURE DROP OF MERV 8 FILTERS, SUPPLIED WITH THIS UNIT

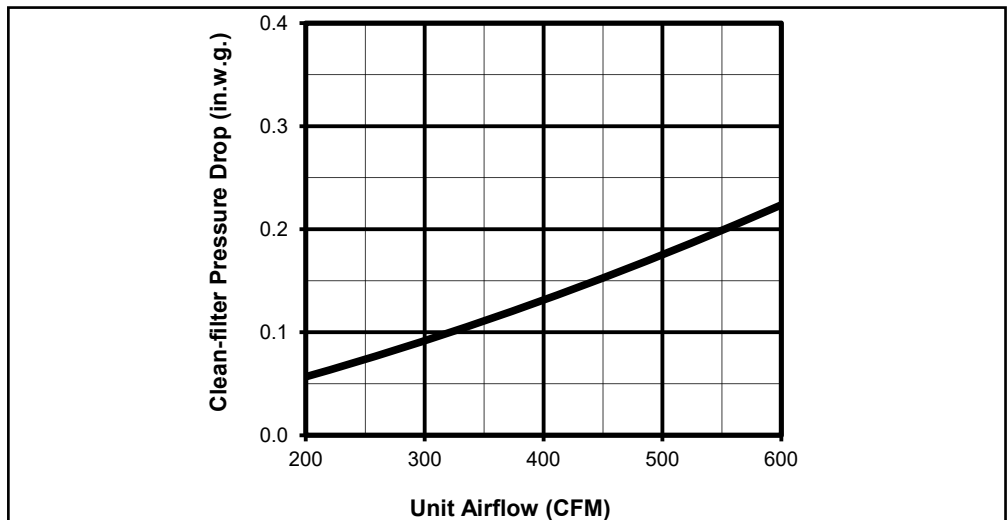


FIGURE 6.4.2 INITIAL PRESSURE DROP OF MERV 13 FILTERS, AVAILABLE AS AN ACCESSORY

6.5 NORMAL OPERATION

A wide variety of control schemes may be selected by the engineer, installer, or owner to meet the ventilation needs of the facility. These may include timer clocks, occupancy sensors, dehumidistats (for cool-weather operation), carbon dioxide sensors, and others. DDC systems may also control the unit. Most control schemes will operate the unit only when needed.

Continuous operation is acceptable in virtually all conditions. Unit will not be damaged by continuous operation as long as air flow occurs. Blower motors may overheat if filters become completely blocked due to lack of maintenance. Motors are thermally protected. With continuous operation, some external frosting may occur in very cold weather (see Section 6.6).

## 6.6 EXTREME COLD OPERATION

EV450IN units are capable of operating without internal frosting at temperatures down to -10°F, with indoor humidity below 40%. The units can operate under more severe conditions occasionally with little or no impact on their performance. At lower humidities, they can operate at still lower outside temperatures without freezing the enthalpic cores.

Some condensation or even frost may form on the outside of the unit or drip off the cabinet during very cold conditions, especially if the unit runs continuously. Exterior condensation during extreme cold conditions can be reduced or prevented by periodically cycling the unit OFF for several minutes to allow the cabinet to warm up.

## 7.0 MAINTENANCE

RenewAire ERVs are built to operate with minimal maintenance. After unit commissioning, the primary areas of attention are the air filters and annual vacuuming of the enthalpic cores. See section 5.2 if doors need to be removed for servicing.

### 7.1 MAINTENANCE 24 HRS. AFTER START-UP

24 hours after unit start-up:

- In new installations, check the air filters since they will often collect dust, dirt and debris at time of start-up.

### 7.2 MAINTENANCE 30 DAYS AFTER START-UP

After 30 days of operation:

- Tighten all electrical connections.
- Check the air filters as part of the normal monthly maintenance.

### 7.3 MAINTENANCE SCHEDULE

Experience on the part of the service person is the most important issue in establishing a maintenance schedule. There will be times of the year when frequent inspection of the filters will be required, such as spring and summer when there may be pollen, dust, dirt or debris from budding trees and bushes that can clog the filters. Also see Section 7.7 Maintenance Records in this manual.

#### **⚠ WARNING**

Danger of injury from un-guarded blower in unit. Disconnect power to unit before opening door. Danger of injury if unit starts unexpectedly. Switch power off at service disconnect. Lock-out/tag-out the disconnect.

### 7.4 FILTERS

Inspection and replacement of air filters is the most frequent maintenance issue. For units that do not have filter air pressure differential sensors, filters must be visually inspected monthly, as a minimum. If a filter looks discolored or dirty, REPLACE IT! When installing new filters, DO NOT USE filter sprays. Residue from the filter spray could migrate to the enthalpic core media and damage the cores.

For units that have filter air pressure differential sensors, a dirty filter alarm will occur on the connected alarm or control device.

Filter cleanliness and replacement is the most important and frequent maintenance issue. Dirty filters will cause an immediate reduction in operating efficiency of the ERV. Normally, filters should be inspected and changed when they are dirty. Paper filters are not to be cleaned, they are to be replaced.

In general, if a filter looks dirty, replace it. The best indication of dirty filters is to check the pressure drop across the filter banks with an optional filter monitor. If it is not possible to check the pressure drop, the rule of thumb would be to change the filters every two months.

## 7.5 FAN MOTOR

The motor needs no lubrication. If necessary vacuum clean the blower wheels at the same time you clean the face of the enthalpic core (annually).

## 7.6 ENTHALPIC CORE

### ⚠ CAUTION

#### RISK OF DAMAGE TO ENTHALPIC CORES

Whenever working within the ERV cabinet, protect the enthalpic cores from accidental damage. The core media is subject to damage from dropped tools or other foreign objects

### 7.6.1 Enthalpic Core Maintenance

The enthalpic core media is a fibrous material that must be kept clean at all times. As a minimum, cores should be cleaned once per year.

- DO NOT WASH OR ALLOW THE ENTHALPIC CORES TO GET WET.
- DO NOT EXPOSE THE ENTHALPIC CORES TO HIGH HEAT OR FLAMES.
- DO NOT DIRECT COMPRESSED AIR AT THE CORE MEDIA.
- DO NOT REMOVE THE ENTHALPIC CORES FROM THE ERV UNLESS NECESSARY.
- USE CAUTION WHEN WORKING AROUND THE ENTHALPIC CORES. DO NOT DROP TOOLS OR OTHER OBJECTS ON THE CORES, DO NOT BUMP OR TWIST THE CORES.

To access enthalpic cores for cleaning, remove the air filters.

To clean enthalpic cores, all exposed surfaces must be vacuumed with an attachment having long, soft bristles. The greatest buildup of dirt and dust will normally be on the leading 1–2 inches of the inlet side (closest to the air filters).

### 7.6.2 Enthalpic Core Removal

Before removing enthalpic cores, switch the main disconnect to OFF. Open the door to the Energy Recovery Module and simply pull the core straight out of its guides.

### 7.6.3 Enthalpic Core Replacement

Cores have foam gasketing on one end of each core. The core should be reinstalled so that the foam gasketing is toward the back of the ERV and the core label is facing toward the front.

### ⚠ WARNING

#### RISK OF INJURY OR DAMAGE.

Motor may have a manual reset thermal protector. Disconnect power before servicing or resetting motor thermal protector. Use caution, motor may be hot. Allow the motor to cool before resetting the thermal protector.

If the motor thermal protector tripped, correct the issue that caused the motor to overheat (e.g. over motor rated amperage or locked rotor).

If the motor has a manual reset thermal protector, the red thermal protector reset button is located on the motor body, on or near the lead end of the motor. If the button does not reset, the motor may still be too hot. Allow the motor to fully cool to reset the thermal protector, you should feel or hear a click when the thermal protector resets while pushing the reset button.



**7.7 MAINTENANCE RECORDS**

<b>MAINTENANCE LOG</b>					
<b>ENTER DATES OF SERVICE</b>					
<b>OA FILTER CHANGE</b>	<b>RA FILTER CHANGE</b>	<b>INSPECTION/ CLEANING</b>	<b>CLEAN CORE</b>	<b>CLEAN BLOWERS</b>	<b>INITIALS</b>

**MISCELLANEOUS SERVICE NOTES**

<b>DATE</b>	<b>SERVICE</b>	<b>INITIALS</b>

## 7.8 SERVICE PARTS

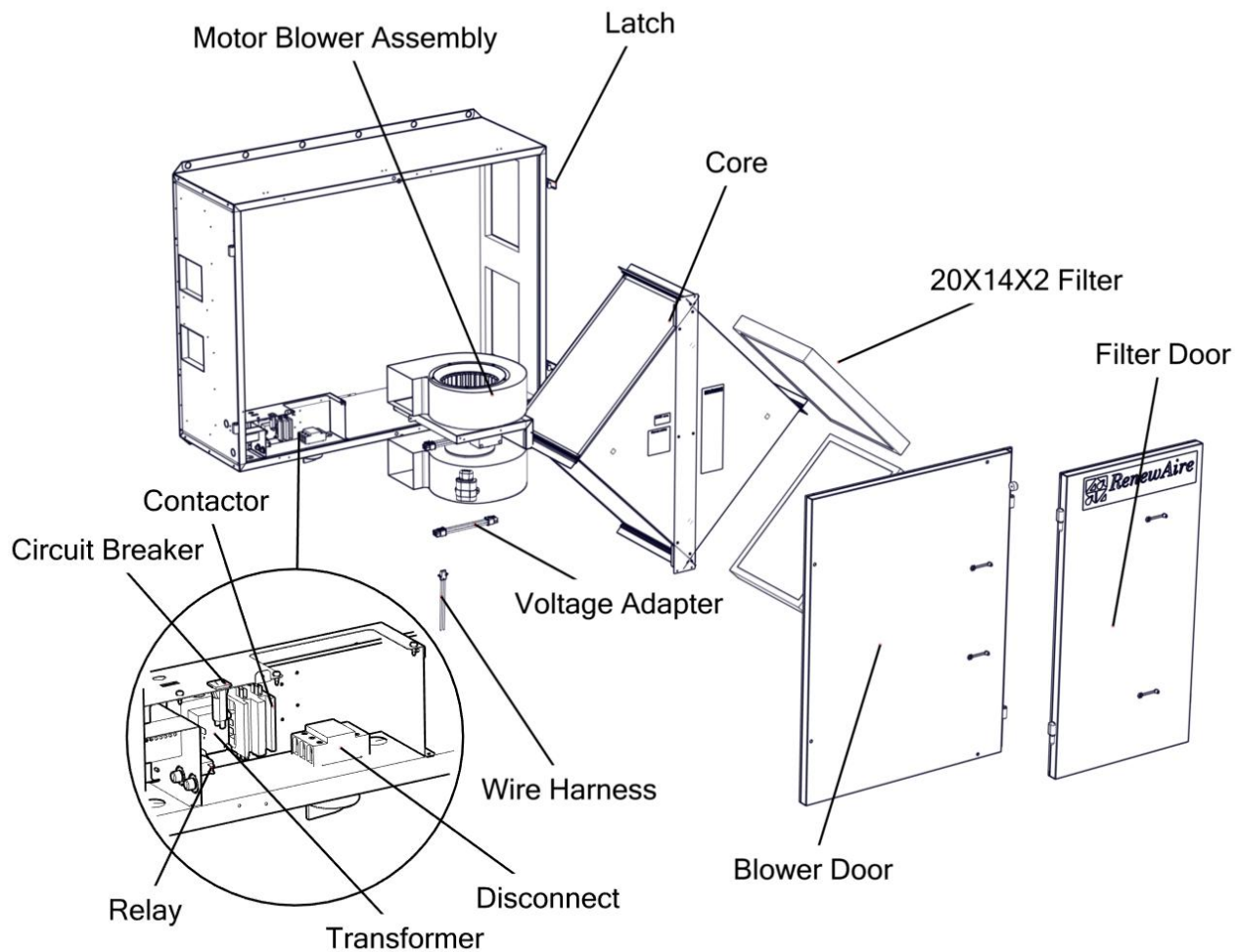


FIGURE 7.8.0 SERVICE PARTS, EV450IN

## 8.0 TROUBLESHOOTING

If problems occur with a RenewAire ERV, the primary resources for troubleshooting are the unit as-built wiring schematics and the Sequence Of Operation (SOO) for each control scheme.

## 9.0 FACTORY ASSISTANCE

In the unlikely event that you need assistance from the factory for a specific issue, make sure that you have the information called for in the Unit Information page in the front of this manual. The person you speak with at the factory will need that information to properly identify the unit.

**To contact RenewAire Customer Service:**

Call 800-627-4499

Email: [RenewAireSupport@RenewAire.com](mailto:RenewAireSupport@RenewAire.com)



## About RenewAire

For over 30 years, **RenewAire** has been a pioneer in enhancing indoor air quality (IAQ) in commercial and residential buildings of every size. This is achieved while maximizing sustainability through our fifth-generation, static-plate, enthalpic-core **Energy Recovery Ventilators (ERVs)** that optimize energy efficiency, lower capital costs via load reduction and decrease operational expenses by minimizing equipment needs, resulting in significant energy savings. Our ERVs are competitively priced, simple to install, easy to use and maintain and have a quick payback. They also enjoy the industry's best warranty with the lowest claims due to long-term reliability derived from innovative design practices, expert workmanship and **Quick Response Manufacturing (QRM)**.

As the pioneer of static-plate core technology in North America, RenewAire is the largest ERV producer in the USA. We're **committed to sustainable manufacturing** and lessening our environmental footprint, and to that end our Waunakee, WI plant is 100% powered by wind turbines. The facility is also one of the few buildings worldwide to be LEED and Green Globes certified, as well as having achieved ENERGY STAR Building status. In 2010, RenewAire joined the Soler & Palau (S&P) Ventilation Group in order to provide direct access to the latest in energy-efficient air-moving technologies. For more information, visit: [renewaire.com](http://renewaire.com)

201 Raemisch Road | Waunakee, WI | 53597 | 800.627.4499 | [RenewAire.com](http://RenewAire.com)