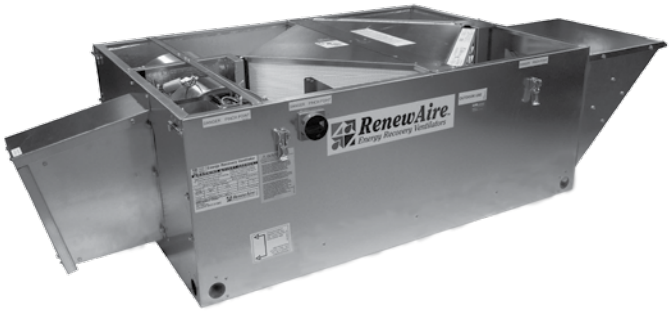
RenewAire
Energy Recovery Ventilation

4510 Helgesen Drive, Madison, WI 53718
(608) 221-4499, (800) 627-4499, Fax: (608) 221-2824
support@renewaire.com www.renewaire.com

INSTALLATION AND OPERATION MANUAL

EV450RT



NOTE: Disconnect Switch and 24V Transformer Standard

⚠WARNING

RISK OF FIRE, ELECTRIC SHOCK, OR INJURY. OBSERVE ALL CODES AND THE FOLLOWING:

1. Before servicing or cleaning the unit, switch power off at disconnect switch or service panel and lock-out/tag-out to prevent power from being switched on accidentally. More than one disconnect switch may be required to de-energize the equipment for servicing.
2. This installation manual shows the suggested installation method. Additional measures may be required by local codes and standards.
3. Installation work and electrical wiring must be done by qualified professional(s) in accordance with all applicable codes, standards and licensing requirements.
4. Any structural alterations necessary for installation must comply with all applicable building, health, and safety code requirements.
5. This unit must be grounded.
6. Danger of severe injury to bystanders and damage to unit or property if high winds move this unit. Secure this unit to the building!
7. Sufficient air is needed for proper combustion and exhausting of gases through the flue (chimney) of fuel burning equipment that might be installed in the area affected by this equipment. If this unit is exhausting air from a space in which chimney-vented fuel burning equipment is located, take steps to assure that combustion air supply is not affected. Follow the heating equipment manufacturer's requirements and the combustion air supply requirements of applicable codes and standards.
8. Use the unit only in the manner intended by the manufacturer. If you have questions, contact the manufacturer.
9. This unit is intended for general ventilating only. Do not use to exhaust hazardous or explosive materials and vapors. Do not connect this unit to range hoods, fume hoods or collection systems for toxics.
10. When cutting or drilling into wall or ceiling, do not damage electrical wiring and other hidden utilities.

CAUTION

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

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AHRI CERTIFIED™
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Air-to-Air ERV
AHRI Standard 1060
Energy Recovery COMPONENT is certified. Actual performance in packaged equipment may vary.

Placement of the EV450RT

The EV450RT is designed for installation on a roof or other outside location.

Select a location that is central to the inside duct runs, and close to any other air handler to which the unit will be connected.

⚠WARNING

The unit's fresh air inlet should be at least 10' away from any exhaust, such as dryer vents, chimneys, furnace and water heater exhausts, or other sources of contamination or carbon monoxide. Do not locate the fresh air inlet where vehicles may be serviced or left idling. Never locate the unit inside a structure.

⚠WARNING

Danger of damage or severe injury if high winds move this unit. Secure unit to structure. Observe local code requirements at a minimum.

CAUTION

The EV450RT weighs approximately 170 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 EV450RT so that it cannot fall or tip in the event of accident, structural failure or earthquake.

RenewAire strongly recommends that you secure rooftop units properly to the building structure. Strong winds, tornados, and hurricanes can and do displace or remove rooftop equipment from rails or curbs. When this happens, the equipment, adjacent roof structure, and even vehicles parked near the building can be damaged, and rain typically enters the building. The equipment is put out of service and the collateral damage can be very expensive.

CAUTION

Provide Adequate Service Access for Maintenance
The EV450RT will require regular filter and core inspections. Install the EV450RT where you can remove the doors for cleaning the core and replacing the filters, and where you can get at the wiring for installation and service.

Ducting

Basic Requirements

- Always connect an RA and an FA duct to each Rooftop unit.
- With Rooftop units, the RA and FA ducts cannot be interchanged.
- With RTV units, both ducts are inside the building. In other units, such as the RTR/RTF and RTEC/RTH, that utilize the optional roof adapter, at least one of the ducts is outside and must be weatherized.
- Any weatherized duct must be thermally insulated to prevent condensation on the inside or outside of the duct. The duct lining must be vapor-sealed, and the duct exterior must be rain tight.

CAUTION

Tape both inner and outer vapor barriers of insulated duct to collars on duct adapters. 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.

Duct Layout Options

The duct system for the ERV can be either:

- Wholly separate from the building's ductwork (stand-alone);
- Wholly dependent on the building's ducts; or
- A hybrid of the two.

Stand-alone systems don't rely on the operation of the building's heating and air conditioning system to distribute the fresh air. Because ventilation delivery is the system's only requirement, it can be designed for maximum ventilation effectiveness.

Systems that rely on the existing air distribution system are less expensive to install. In addition, the fresh air is always passed through the heating or cooling equipment for further tempering to room conditions.

Connecting Ducts to Unit

The basic unit has a Room Air (RA) inlet and Fresh Air (FA) outlet on the underside of the unit. The nominal duct size for connection to the underside of the unit is 10" x 10".

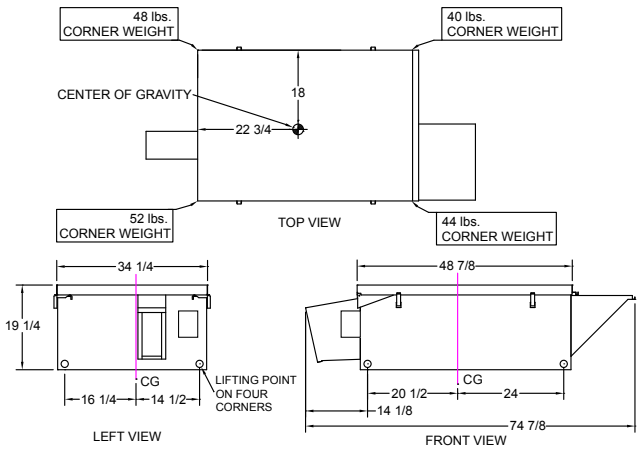
See Accessories on page 6 for available Curb or Adapters, which are usually used to complete the installation. It is important to connect the ducts to the correct Curb and/or Adapter compartment.

EV450RT Airflow Performance

Airflow CFM	ESP in. H20	Watts 1P	Watts 3P	Temp EFF%	Total EFF% Winter/Summer
240	1.00	425	243	80	75/66
338	0.85	474	313	77	71/61
380	0.75	496	345	75	69/59
450	0.50	534	412	73	66/56
500	0.25	563	461	71	64/54
550	0.00	593	516	70	62/52
600	-0.25	623	572	68	60/50

Rigging Information

There are pairs of rigging holes at each lower corner of the unit. Use slings or shackles at all four corners. Spreader bars are recommended in order to avoid damage to the unit.



Sound Attenuation

General Practices

Take these simple steps to attenuate noise from the unit.

Outside the building:
The exhaust hood is the primary source of noise outside the building. When practical, orient the exhaust air hood to point away from houses or public areas.

At the Curb:
Cut the holes in the roof deck to fit closely around the duct(s) passing through the roof deck. Seal all gaps around the duct(s) at the roof deck.

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.

Radiated Noise

The EV450RT is insulated with high-density fiberglass. This provides significant attenuation of radiated sound from the unit itself.

The outlet ducts can be significant sources of radiated sound as well. The FA duct 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 RA ducts located in a mechanical space with noise-generating equipment also should be insulated for sound control, both to minimize sound radiation out of the FA duct, and also to control sound radiation into both ducts.

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 outlet is 2800 FPM when the unit is operating at 450 CFM. The average velocity at the Exhaust Hood outlet is 1370 FPM when the unit is operating at 450 CFM.

Power Supply

- Remove both access panels to the electrical box.
- Two 7/8" holes or knock-outs are provided in the bottom of the unit. These may be used to bring power into the unit through a curb, where allowed.
- It is also possible to bring wiring into the unit through the sides of the unit. This is allowed only in the area below the electrical boxes' inner wall, and above the bottom panel. This area is marked on the unit. (See below).
- Use conduit, strain reliefs, etc. as required by code to secure the field wiring.

⚠WARNING

Danger of Electrical Shock when servicing an installed unit.

ALWAYS DISCONNECT POWER SOURCE BEFORE SERVICING! More than one disconnect switch may be required.

Proper Wiring Size Selection and Wiring Installation are the Responsibility of the Electrical Contractor.

CAUTION

Before bringing power to the unit check unit nameplate to confirm it matches the voltage and phase of the power you are supplying.

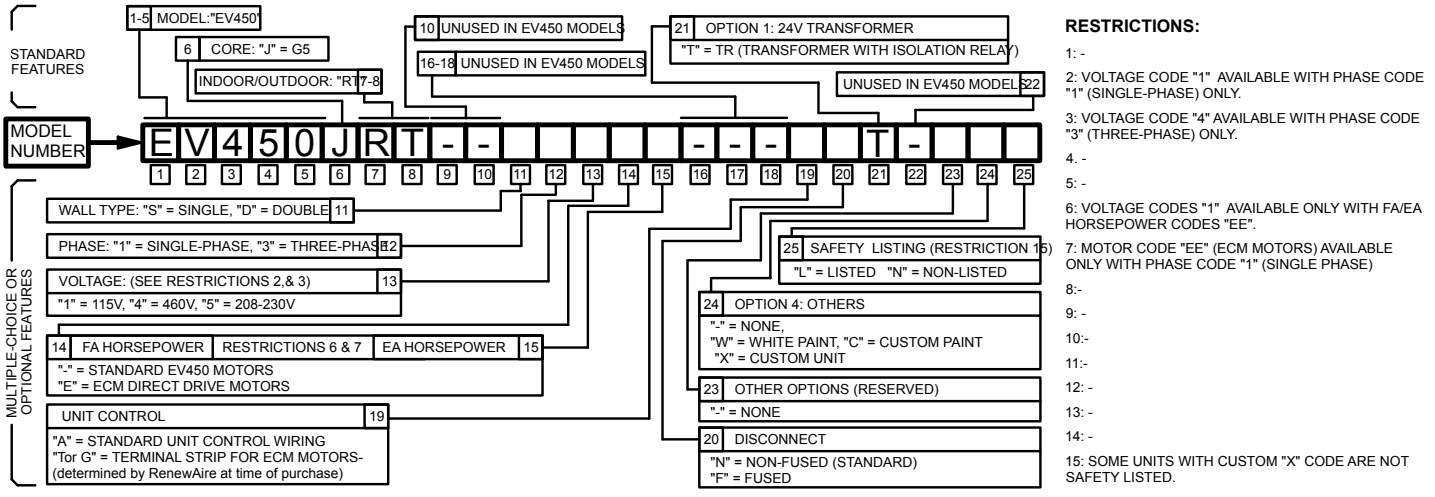
Remember that your field connections need to be accessible for inspection.

CAUTION

All field-connected wire in the unit, including control circuit wire, must have a minimum insulation rating of 300V for units supplied with 115, 208, or 230V power; 600V for units supplied with 460V power.

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 key below to determine motor power and voltage installed in your EV450RT:

EV450RT Product Configuration Chart



RESTRICTIONS:

1: -

2: VOLTAGE CODE "1" AVAILABLE WITH PHASE CODE "1" (SINGLE-PHASE) ONLY.

3: VOLTAGE CODE "4" AVAILABLE WITH PHASE CODE "3" (THREE-PHASE) ONLY.

4. -

5: -

6: VOLTAGE CODES "1" AVAILABLE ONLY WITH FA/EA HORSEPOWER CODES "EE".

7: MOTOR CODE "EE" (ECM MOTORS) AVAILABLE ONLY WITH PHASE CODE "1" (SINGLE PHASE)

8:-

9: -

10:-

11:-

12: -

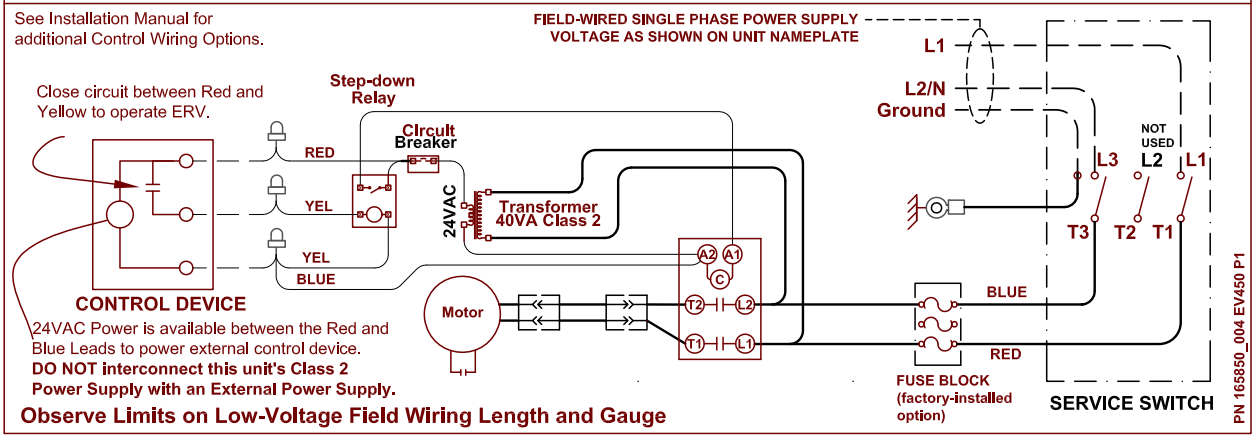
13: -

14: -

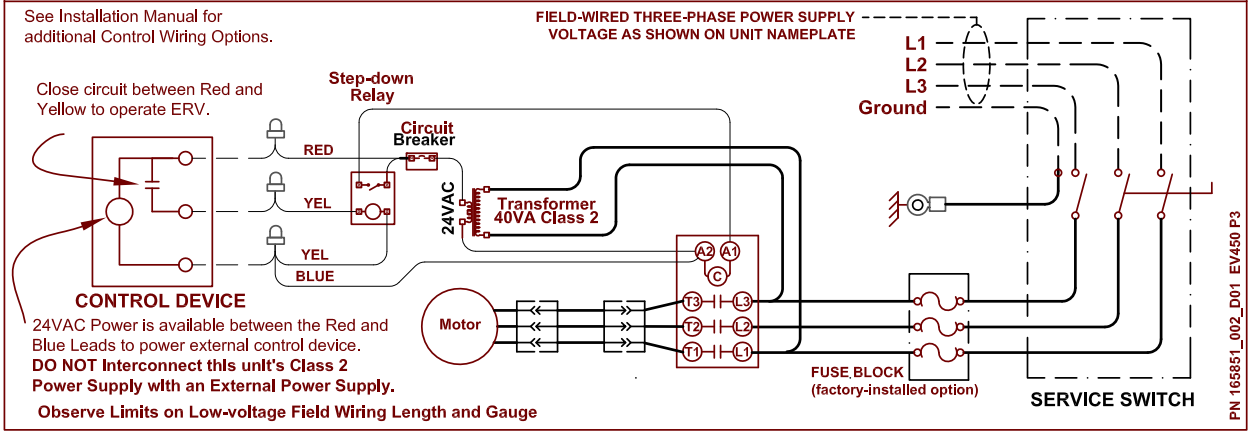
15: SOME UNITS WITH CUSTOM "X" CODE ARE NOT SAFETY LISTED.

EV450RT Wiring Schematics

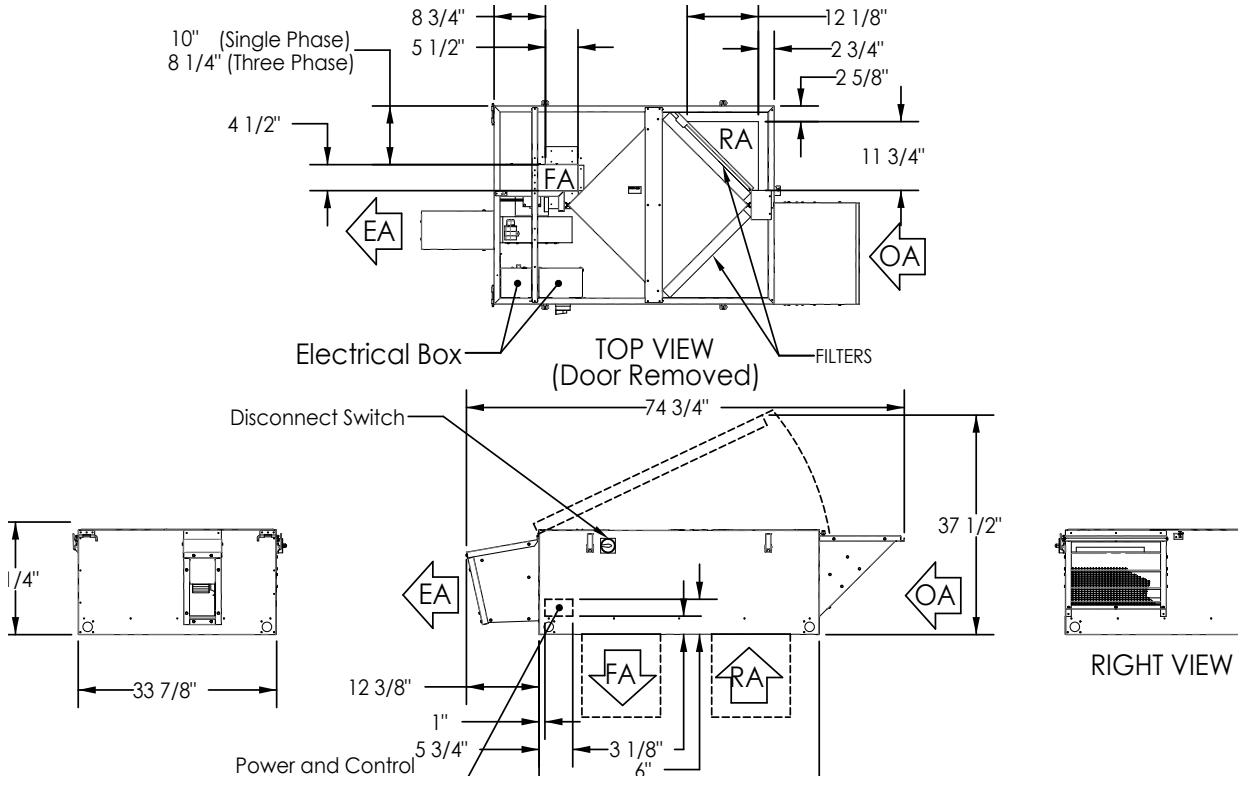
EV450 P1 WIRING SCHEMATIC



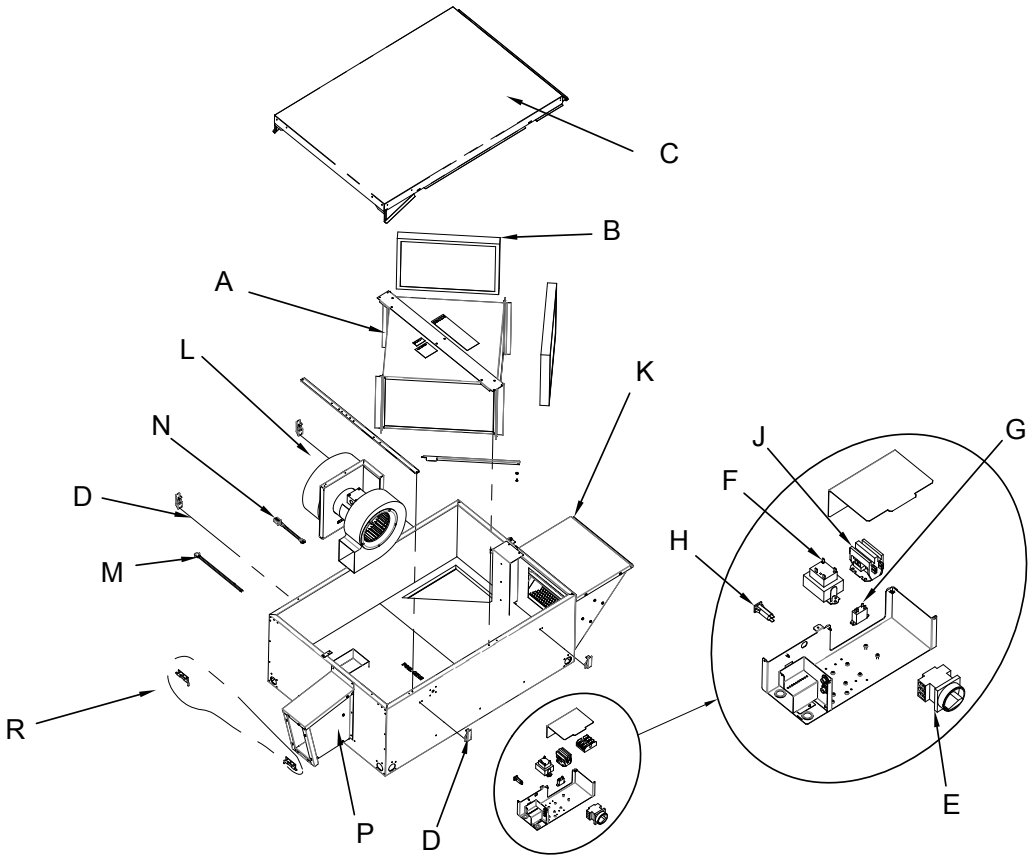
EV450 P3 WIRING SCHEMATIC



EV450RT Dimensions



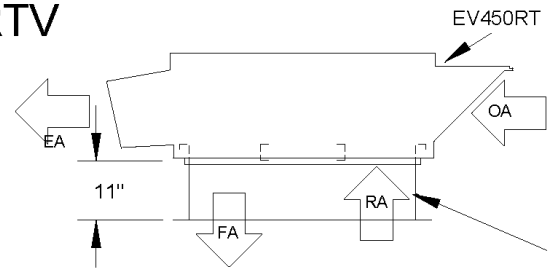
EV450RT Replacement Parts



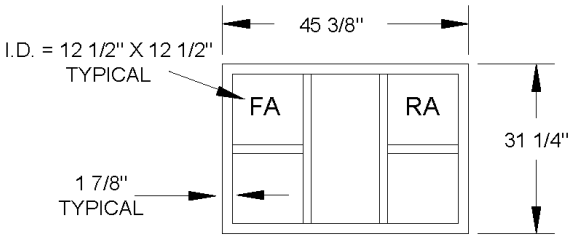
A	CORE
B	FILTERS
C	DOOR ASSEMBLY
D	DRAW LATCH
E	DISCONNECT SWITCH
F	TRANSFORMER
G	ISOLATION RELAY
H	CIRCUIT BREAKER
J	CONTACTOR
K	INTAKE HOOD
L	MOTOR BLOWER ASSEMBLY
M	WIRE HARNESS
N	VOLTAGE ADAPTER
P	EXHAUST HOOD
R	HINGE SET

EV450RT Accessories

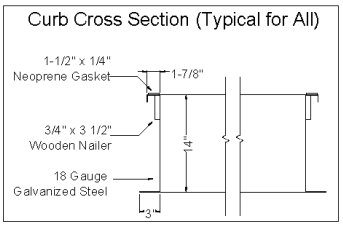
RTV



EV450RT WITH STANDARD ROOF CURB
(45CURB)

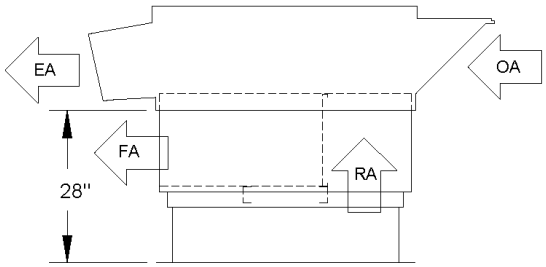


TOP VIEW
STANDARD ROOF CURB (14" HIGH)

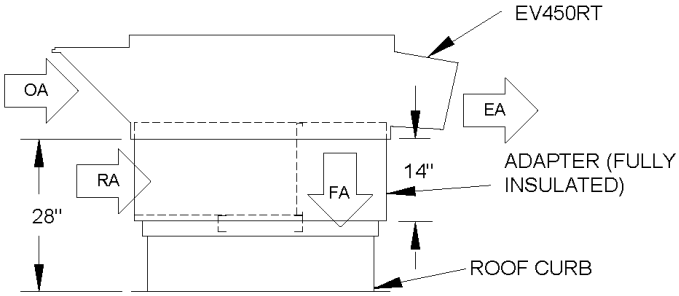


Standard Roof Curb Shown (available option). Curbs for sloped roofs or metal roofing are available on a custom basis from RenewAire or from local curb fabricators.

RTR/RTF



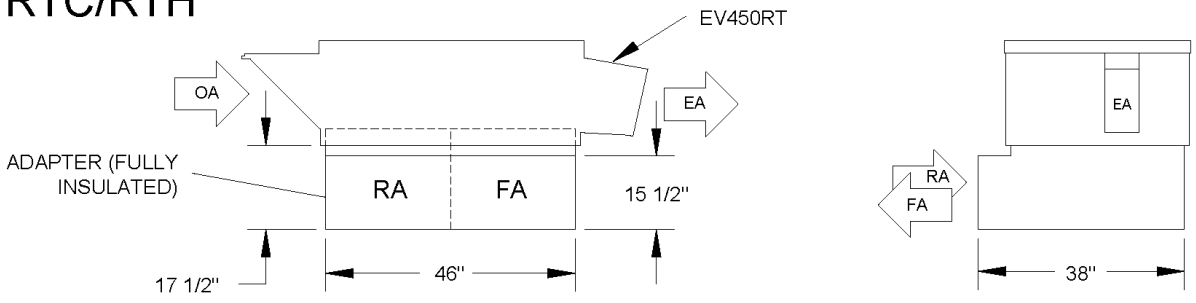
EV450RT WITH ADAPTER
(45RTRF) AND CURB (45CURB)
IN RTR CONFIGURATION



EV450RT WITH ADAPTER
(45RTRF) AND CURB (45CURB)
IN RTF CONFIGURATION

For horizontal connection of either the Fresh Air duct or the Return Air duct, stack the optional RTF/RTR Adapter on the Standard Roof Curb. **Duct openings to be field cut into adapter.** Opening location and size is flexible.

RTC/RTH



EV450RT WITH ADAPTER (45RTCH)

The RTH/RTC Adapter allows horizontal connection of both the Fresh Air and the Return Air ducts. It is also possible to connect the adapter directly to the return plenum of most Rooftop Units (openings must be cut into RTU). **Duct openings to be field cut into adapter.** Opening location and size is flexible.

EA: Exhaust Air to outdoors
OA: Outdoor Air intake
RA: Room Air to be exhausted
FA: Fresh Air to inside

Electrical Specifications

NOTE: If your unit is equipped with ECM Motors, please refer to "ECM Motor Manual Supplement for RenewAire Light Commercial Units" for more detail.

Use conduit, strain reliefs, etc. as required by code to secure the field wiring.

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 the left to determine motor power and voltage installed in your EV450IN.

⚠WARNING

Danger of Electrical Shock when servicing an installed unit.

ALWAYS DISCONNECT POWER SOURCE BEFORE SERVICING! More than one disconnect switch may be required.

Proper Wiring Size Selection and Wiring Installation are the Responsibility of the Electrical Contractor.

CAUTION

Before bringing power to the unit check unit nameplate to confirm it matches the voltage and phase of the power you are supplying.

Remember that your field connections need to be accessible for inspection.

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, 24VAC, to the control pigtails. See Control Wiring Schematics.

CAUTION

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!

24VAC Power Supply Provided with this ERV Unit

This ERV is provided with a Class II 24VAC power supply system that operates the unit's contactor(s) for EV450 and HE1X. The ERV's 24VAC Power Supply can also be used to power the externally-installed controls system: up to 8VA of power is available.

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

CAUTION

1. Connect only to components intended for use with 24VAC 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 24VAC power supply system. Confirm that the power requirements of devices you connect to this power supply system do not exceed 8VA in total.
4. If an external source of 24VAC 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 1-10vdc or 4-20mA).
6. Unit is not equipped to communicate directly with Building Management Systems (such as BACNET, LONWORKS, etc.). However, the unit can be controlled by powered or non-powered contacts operated by any kind of control system.

Specifications

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

How to Reset the 24VAC 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.

NOTE: *INSTALLING CONTRACTOR:*
If primary-side voltage is 230VAC, move black primary-side lead from transformer's "208V" terminal to the transformer's terminal marked "240V" ("230V" in some units).

Do not move the black primary-side lead that is connected to the transformer's "COM" terminal.

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

OBSERVE THESE LIMITS TO WIRE LENGTH AND GAUGE, in order to ensure reliable operation of the control system.						
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.						

Control Wiring Schematics

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 elsewhere in this manual.

CAUTION

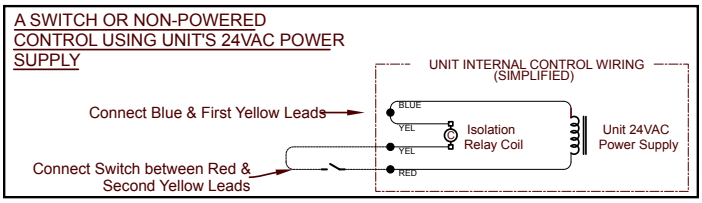
Be careful if the external control system provides 24VAC power at its control output: make sure blue and red leads are separately capped and not connected to any other wires.

A. **Single 2-wire Control:** Use schematic below 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.** Install jumper (provided) between terminals 2 & 3. Connect the control's contacts to terminals 1 & 4 to operate the ERV's isolation Relay.

Control on separate Power Supply, no power present at Control Output: Wire as shown for the Single 2-wire control.

CAUTION

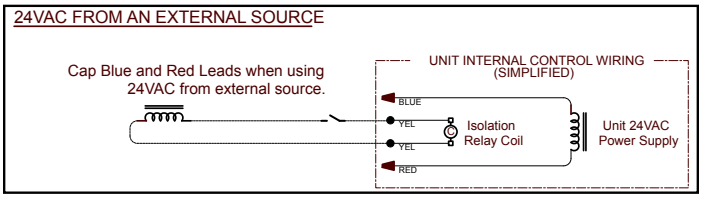
Make sure the control provides no voltage or current at its output terminals.



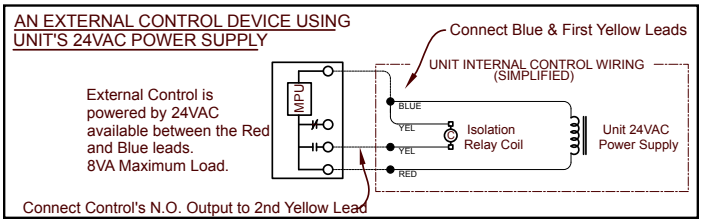
B. **Control Sending 24VAC "On" Signal (from an external power source) to ERV:** Make sure jumper is NOT installed between Terminals 2 & 3. Now you safely can apply 24VAC to the Terminals 3 & 4 to operate the ERV's isolation relay.

CAUTION

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



C. **Control operating on Unit's 24VAC Power Supply:** 24VAC power is available at the Terminals 1 & 2. CAUTION: external control system should not draw more than 8VA. Install jumper (provided) between terminals 2 & 3. Connect the switched output of the Control to Terminal 4 to operate the ERV's isolation relay.



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Maintenance

SUMMARY MAINTENANCE REQUIREMENTS

Change Filters
Inspect Blower
General Cleaning and Inspection
Clean Energy Exchange Cores

CHANGING THE FILTERS

Inspect and/or replace filters every two or three months when the unit is in regular use, or as needed.

- Turn off unit completely! Lock-out and tag-out the unit disconnect switch.
- Open the Door. The door is secured with turn-type latches or draw latches, plus one Phillips-head securing screw. Keep the securing screw. NOTE: Always replace securing screw when reinstalling door.
- Remove and dispose of all (2) filters. Replace all (2) filters. NOTE: See chart for information on the initial resistance of the filters originally supplied with this unit. If replacement filters have higher resistance, the airflow of the system will be lower.
- Close door; reinstall securing screw.

Blower Inspection

Inspect Blowers every time you change the filters.

- Confirm bearings are still secure to blower shaft. It should not be possible to move the blower shaft back and forth along its length.
- Confirm blower wheel is not rubbing against the blower inlet or housing.

GENERAL CLEANING AND INSPECTION

Perform general cleaning and inspection when changing filters.

- Remove dust from blower wheels periodically.
- Remove paper, leaves, etc. from inlet and outlet screens.
- Inspect for insect nests.

TO CLEAN THE ENERGY EXCHANGE CORE

Clean the core annually.

- Remove the filters.
- Vacuum the exposed faces of the energy exchange core with a soft brush.
- Vacuum out dust from the rest of the unit case.
- Install new filters.

CAUTION

Use proper eye protection when servicing unit.

CAUTION

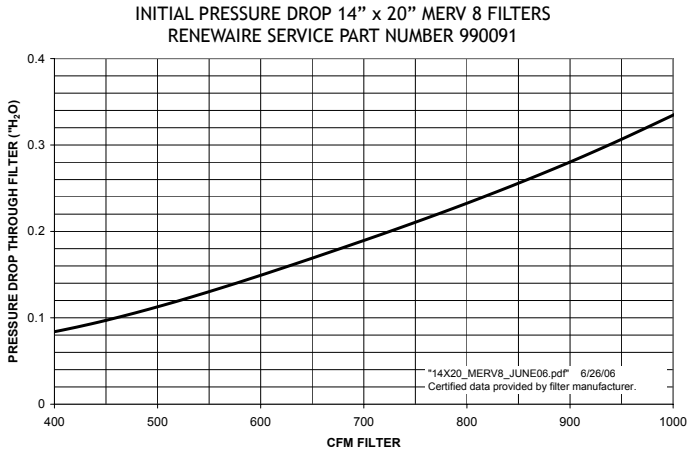
DO NOT WASH THE ENERGY EXCHANGE CORE. Keep it away from water or fire to avoid damaging it. Always handle the core carefully.

⚠WARNING

Danger of injury from un-guarded blowers 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.

Initial Resistance of Filters supplied with this unit:



Filter Specifications:
(2) 14" x 20" x 2"(nominal) pleated filters
Actual size: 13.5" x 19.5" x 1.75"
Unit shipped with MERV-8 Filters
Minimum recommended effectiveness: MERV-6

CAUTION

Filters must be used or the energy exchange core will become blocked by dust and the unit will not do its job. In extreme cases components may be damaged.

CAUTION

Do not allow the access door to drop when unlatched. Do not allow the access door to get caught by the wind. Injury to personnel or damage to unit may occur.

⚠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.