EnergyX v2 – Factory Installed Energy Recovery
Centurion Commercial Rooftop Units 2 to 25 Nominal Tons
with PURON® (R-410A) Refrigerant and ComfortLINK™ Controls

Supplement Installation Instructions

This document is a supplemental installation instruction for the EnergyX factory installed Energy Recovery Ventilator. It is to be used in conjunction with the base rooftop unit Installation Instructions and Start-Up/Operation Instructions.

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SAFETY CONSIDERATIONS

Installation and servicing of air-conditioning equipment can be hazardous due to system pressure and electrical components.

Only trained and qualified service personnel should install, repair, or service air-conditioning equipment. Untrained personnel can perform the basic maintenance functions of replacing filters. Trained service personnel should perform all other operations.

When working on air-conditioning equipment, observe precautions in the literature, tags and labels attached to the unit, and other safety precautions that may apply. Follow all safety codes. Wear safety glasses and work gloves. Use quenching cloth for unbrazing operations. Have fire extinguishers available for all brazing operations.

Follow all safety codes. Wear safety glasses and work gloves. Use quenching cloth for brazing operations. Have a fire extinguisher available. Read these instructions thoroughly and follow all warnings or cautions attached to the unit. Consult local building codes and National Electrical Code (NEC) for special requirements.

Recognize safety information. This is the safety-alert symbol: △

When you see this symbol on the furnace and in instructions or manuals, be alert to the potential for personal injury.

Understand the signal words DANGER, WARNING, and CAUTION. These words are used with the safety-alert symbol.

DANGER identifies the most serious hazards which will result in severe personal injury or death.

WARNING signifies a hazard which could result in personal injury or death.

CAUTION is used to identify unsafe practices which may result in minor personal injury or product and property damage.

NOTE is used to highlight suggestions which will result in enhanced installation, reliability, or operation.

IMPORTANT: There are two different design revisions of EnergyX units. This manual covers EnergyX version-2 units, which can be identified by one of the following options in position #14 of the PG or PM model number: E, S, T, V, W, X, Y, Z or 1.

EnergyXv1 designs are identified by digit 14 options G, H, K, L, N, P and R. Refer to Installation Supplement EXCL-4si for EnergyXv1 models.
GENERAL

This publication contains Installation, Start-Up, Controls, Operation, Troubleshooting and Service information for the EnergyXv2 Energy Recovery system, factory installed on a 48/50PG or 48/50PM rooftop unit. This document is a supplemental installation instruction and is to be used in conjunction with the base rooftop unit Installation Instructions and Start-Up/Operation Instructions for ComfortLINK units only.

The EnergyXv2 Energy Recovery system is designed to precondition the outside air prior to it entering the rooftop unit evaporator using building exhaust air as a heat sink / source. The EnergyXv2 system provides latent and sensible energy exchange between the outside ventilation air and the building exhaust air. This preconditioning of air allows higher operating efficiencies, increased comfort control, potential downsizing of the base rooftop unit while still meeting the ASHRAE ventilation requirements. Operational cost savings are realized by the high efficiency Energy Recovery device meeting the cooling and heating call for a larger portion of the operating cycle than just a normal damper or economizer device. This is demonstrated by the EnergyXv2 AHRI Guideline-V Combined Efficiency Factor.

The EnergyXv2 is a factory integrated, single piece, fully tested and certified energy recovery system specifically designed for the Carrier Centurion rooftop units with ComfortLINK. It uses a single power supply and a single roofcurb.

The EnergyXv2 is shipped in the vertical supply and return duct configurations only. A horizontal adaptor curb can be purchased for horizontal return configuration. The unit supply configuration can be field converted from vertical to horizontal supply, however, the PM16-28 models require a separate horizontal supply-air conversion kit. See the base unit product data for indoor fan performance when unit is operating in the horizontal supply air configuration.

The EnergyXv2 Energy Recovery Wheel is rated in accordance with ARI 1060 and is ETL certified.

WARNING

ELECTRICAL SHOCK HAZARD
Failure to follow this warning could cause personal injury or death.
Before performing service or maintenance operations on unit, turn off main power switch to unit and install lockout tag. Ensure electrical service to rooftop unit agrees with voltage and amperage listed on the unit rating plate.

UNIT DAMAGE HAZARD
Failure to follow this caution may cause equipment damage.
This unit uses a microprocessor–based electronic control system. Do not use jumpers or other tools to short out components or to bypass or otherwise depart from recommended procedures. Any short-to-ground of the control board or accompanying wiring may destroy the electronic modules or electrical components.

FIRE, EXPLOSION HAZARD
Failure to follow this warning could result in personal injury, death and/or property damage.
Improper installation, adjustment, alteration, service, or maintenance can cause property damage, personal injury, or loss of life. Refer to the User’s Information Manual provided with this unit for more details. Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.

What to do if you smell gas:
1. DO NOT try to light any appliance.
2. DO NOT touch any electrical switch, or use any phone in your building.
3. IMMEDIATELY call your gas supplier from a neighbor’s phone. Follow the gas supplier’s instructions.
4. If you cannot reach your gas supplier, call the fire department.
INSTALLATION

An EnergyX unit is installed as a single piece unit. To install an EnergyX unit, follow the base unit installation instructions with the following exceptions and additions:

Install roof curb
Vertical Airflow Configurations
The EnergyXv2 unit uses the standard PG or PM base unit roof curb. No extra curb support rails or extensions are required. See the unit nameplate for model number designation. Refer to the base rooftop installation manual for roof curb instructions. Ductwork must be attached to the curb.

Horizontal Airflow Applications
EnergyXv2 units with a horizontal return air configuration require a horizontal adaptor curb. Refer to the base rooftop installation manual and the horizontal curb adaptor manual for roof curb instructions. EnergyXv2 units can be field converted for horizontal supply configurations. 48/50PM 16-28 units require an accessory horizontal conversion kit to convert the supply air to horizontal configuration.

Rig and place unit on curb
Inspect the EnergyX system for damage. File a claim with the shipping company if shipment is incomplete or damaged.

See Table 1 & 2 for physical data.

For PG03-14 base units, see the rigging label on the exterior of the base unit and Figure 1A. This label is provided for guidance purposes ONLY. The unit’s actual weight and center of gravity location will vary based on the specific combination of factory options included with the unit. Use prudent judgment when rigging and lifting the unit to account for weight variances and make adjustments for the actual center of gravity as necessary.

For PM16-28 base units, see the rigging label on exterior of base unit and Figure 1B. This label is provided for guidance purposes ONLY. The unit’s actual weight and center of gravity location will vary based on the specific combination of factory options included with the unit. Use prudent judgment when rigging and lifting the unit to account for weight variances and make adjustments for the actual center of gravity as necessary.

Positioning
Maintain unit clearances as listed on EnergyX dimensional drawings (Appendix A) for minimum distance from combustible materials, proper airflow, and service access. Follow all local codes for proper clearances—the local code requirements take precedence over any clearance listed in this document. Contact your local Carrier representative for clearance obstructions and any potential resulting affect on unit warranty.

Follow all other curb, rigging, and positioning installation guidance in base rooftop unit installation instructions.
CAUTION - NOTICE TO RIGGERS:
ALL PANELS MUST BE IN PLACE WHEN RIGGING.

NOTICE TO RIGGERS: Hook rigging shackles through holes in base rails, as shown in Detail A. Use wooden top skid where applicable, when rigging to prevent rigging straps from damaging unit. On units without wooden top skid use spreader bars. Leave coil cover attached to unit while rigging to protect coil from damage.

### EnergyX Rigging Details PM16-28 Units

**Carrier EnergyX Unit Weights**

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<th>Max. Wt.</th>
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<th>B</th>
<th>C</th>
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<td>25.2&quot;</td>
<td>9.7&quot;</td>
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<td>PM06</td>
<td>1221</td>
<td>27.7&quot;</td>
<td>9.4&quot;</td>
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<td>1241</td>
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<td>9.3&quot;</td>
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<td>28.9&quot;</td>
<td>10.1&quot;</td>
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<td>PM09</td>
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<td>29.1&quot;</td>
<td>15.0&quot;</td>
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<td>PM12</td>
<td>1986</td>
<td>26.2&quot;</td>
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*Dimensions and weights will vary depending on the specific EnergyX model number. Adjust lifting apparatus accordingly to maintain a level lift. Refer certified prints for specific weights and centers of gravity for each unit.*

See Figure 1A – EnergyX Rigging Details PG03-14 Units

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CAUTION - NOTICE TO RIGGERS:
ALL PANELS MUST BE IN PLACE WHEN RIGGING.

NOTICE TO RIGGERS: Hook rigging shackles through holes in base rails, as shown in Detail A. **Note a 6-point rigging lift is required for these units.** Use wooden top skid where applicable, when rigging to prevent rigging straps from damaging unit. On units without wooden top skid use spreader bars. Leave coil cover attached to unit while rigging to protect coil from damage.

### EnergyX Rigging Details PM16-28 Units

**Carrier EnergyX Unit Weights**

<table>
<thead>
<tr>
<th>Max. Wt.</th>
<th>A</th>
<th>B</th>
<th>C</th>
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<tr>
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<td>4699</td>
<td>40&quot;</td>
<td>68&quot;</td>
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*Dimensions and weights will vary depending on the specific EnergyX model number. Adjust lifting apparatus accordingly to maintain a level lift. Refer certified prints for specific weights and centers of gravity for each unit.*

Use spreader bar as required to eliminate unit damage.

See Figure 1B – EnergyX Rigging Details PM16-28 Units
Make electrical connections
See the base unit name plate for the ETL certified singlepoint electrical values and component electrical information. See the base unit and EnergyX access doors for electrical wiring diagrams specific to each unit.

Main power
Follow all base unit installation instructions, using electrical values shown on unit nameplate. The EnergyX module designation is contained in the RTU model number position 14, and only one main power supply is required. The EnergyXv2 base rooftop unit and energy recovery module is ETL listed as a single point power supply only.

All constant volume units are 208/240v, a transformer is used on the main power of the ERV to step down from 460v or 575v as needed. Modulation ERVs can be 208/230v or 460v. On 575v applications a transformer is used to step it down to 460v.

All 208/230-v ERVs are factory wired for 230-v power supply. If the 208/230-v unit is to be connected to a 208-v power supply, the ERV transformer must be rewired. To do this, move the wire connection from the 240-volt orange wire connection on the primary side of the transformer. Refer to unit label diagram for additional information.

CAUTION
Some electric heat modules require a dual-point electrical service connection independent from all other electrical circuits in the unit. Consult the unit installation instructions, unit wiring diagram and/or electric heater installation instructions for verification.

Control power
Follow all base unit installation instructions for low voltage wiring. The ERV control board is factory wired into the base unit communications via the protocol converter module. See Figure 3. All external control wires still connect to the RTU terminal strip as in the base unit installation instructions.

The EnergyXv2 modulating units can use an optional CO2 sensor for Demand Control Ventilation. If the optional CO2 sensor will be used, install and connect the sensor to the base unit ComfortLINK controller per CO2 sensor installation instructions. See the base unit ComfortLINK controls manual and the Configuration section of this manual for specific CO2 sensor configurations.

NOTE: CO2 operation is not supported on constant volume EnergyX models because typical CO2 economizer Demand Control Ventilation logic does not apply for this device.

Install Outdoor Air hoods
Install the EnergyXv2 supply and exhaust air hoods using supplied components. Hoods are shipped under the RTU condenser coil. NOTE: Outside Air hood may be factory installed on the ERV module.

1. Remove and discard the outside air opening covers on the end of the unit. See figure 1c.
2. Locate and remove the knocked down exhaust hood and the pre-assembled outside air hood from their shipping locations under the condenser coil. See figure 1c
3. Assemble the exhaust hood. See Figure 1d. Using screws provided in the hardware bag, screw the filter brackets to the side panels. Screw the side panels to the top panel. Screw the cross brace to the side panels. Screw the filter retaining clips to the top panel.
4. If 2-position motorized outdoor air damper kits were purchased, install the dampers per installation instructions in the accessory kit.
5. Apply the grey gasket from the hardware bag to the pre-assembled outside air hood and the assembled exhaust hood from step 3.
6. On 48/50PM 16-28 size units, connect the plastic airflow sensor tubing from the outside air opening to the corresponding labeled brass connection fittings on the hoods. The tubing should be coiled and tied inside the air opening of the unit and are marked for the high/low sensor port connections. See figures 1e and 1f. If a field installed 2-position damper is being used, the tubing must be routed thru the damper assembly and connected to the hood. See figure 1g.

IMPORTANT: The sensing tubes must be connected securely with air-tight connections to the fittings. The pressure sensing tubes provide data to the control module for CFM monitoring. Leaks in the tubing will result in inaccurate airflow readings.

IMPORTANT: The sensing tubes must be connected to the proper sensor high/low port for correct airflow measurement. If in doubt, follow the tubes back to the control box and determine which sensing module the tube is connected to. See Figure 3. When looking in the control box, the upper pressure sensor is for the supply air monitor and the lower is for the exhaust air monitor. On each hood sensor the fitting is labeled; the top barb is the high port and the bottom barb is the low port.

7. Using the seal tek screws provided, install the outside air hood to the ERV using pre-set holes. Install the aluminum water filter in the outside air hood held by the filter clips. See figure 1h.
8. Using seal tek screws provided, install the exhaust hood to the ERV using pre-set holes with the barometric damper completely within the hood. Remove shipping tape from damper blades. See figure 1h.

Base unit components
Follow the base unit installation instructions to install all other base unit components, including (but not limited to) flue hoods, condensate trap and other accessory devices.
Figure 1c – Panel and shipping location

- Left Side panel (1)
- Left Filter bracket (1)
- Aluminum Filter (1) (not shown)
- Retaining clips (2)
- Top panel (1)
- Right Side panel (1)
- Right Filter bracket (1)
- Cross brace (1)

Figure 1d – Exhaust Hood Assembly
(view shown is from back of hood as it attaches to cabinet)
Figure 1e – Outside Air Tube Connections

Figure 1f – Outside Air Hood
Figure 1g – 2 Position Damper Tube Connections

Figure 1h – Hood Installation
## TABLE 1 - PHYSICAL DATA MODULATING CAPABLE ENERGYX UNITS

<table>
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<tr>
<th>Model</th>
<th>PG 2 - 6 TON</th>
<th>PG 7.5 - 12.5 TON</th>
<th>PM 16-24 TON</th>
<th>PM 25 TON</th>
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**Notes**
1. Second supply fan is standard and only applicable on PM 15-25 ton units with High-CFM EnergyXv2.
2. Second exhaust fan is standard on all PM 15-25 ton High-CFM EnergyXv2 units and only PM 15-25 ton Low-CFM EnergyXv2 with optional Economizer units.

**LEGEND**
ERV – Energy Recovery Unit
OA – Outside Air
EA – Exhaust Air
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<td>Max Economizer EA (CFM)</td>
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<td></td>
</tr>
<tr>
<td>SIZE (L X W)(in.)</td>
<td>37 13/16 x 8 1/2</td>
</tr>
</tbody>
</table>

* Economizer exhaust fan only applicable on units with the optional economizer

**LEGEND**
ERV – Energy Recovery Unit
OA – Outside Air
EA – Exhaust Air
**START UP**

The EnergyX unit is operated in coordination with the base rooftop unit. Follow the base unit instructions for proper start-up with addition of the following:

**Start-Up Check List**

Use the EnergyX Start-Up checklist (on last page) in conjunction with the base unit Start-Up checklist from the base unit installation instructions. Fill in all blank data entries that are applicable to the exact unit being installed. Save the checklist for future service and maintenance use. It is recommended that a copy of the checklist be left with the unit in the literature slot on the base unit control box access door.

**Base unit Evaporator Fan**

Perform base unit instructions while balancing the RTU indoor fan. The ERV fans should be off during base unit fan set-up. To disable the ERV, disconnect the communication cable (RJ12 plug plugged in the LEN port). Before start-up and testing the ERV, verify that the ComfortLINK minimum damper positions are set to 0 and if not change them to 0. Configuration →AIR.Q →AQ.MN = 0, and Configuration →AIR.Q →EC.MN = 0.

**NOTE:** When plugging the communication cable back in there could be a 1 minute communication initialization process before the ERV will communicate with the base rooftop unit.

### 2-6 TON Constant volume ERV

The 2 to 6 ton low CFM constant volume ERVs are not equipped with an LCD screen, therefore there is not a test mode or configuration settings. ERV performance has to be adjusted mechanically. To adjust the ERV’s supply and exhaust airflows, adjust the supply and exhaust fan speeds by using the following procedures.

**Outside air and exhaust fans**

After the Base unit’s fan is balanced, the ERV fans can be set up. Plug the communication cable back in the rooftop’s LEN port. Make sure the ComfortLINK is Service test Mode. Except for PE.1 & PE.2 configurations. Default values for these points are 30% and 60%.

**NOTE:** If a value was recorded in step 8, change the Economizer damper positions can now be set in ComfortLINK for PE1 and PE2 configurations. (Configuration →ECON→PE.1 & PE.2 = recorded values). Default values for these points are 30% and 60%.

1. Turn on the power exhaust 1 relay (Service Test →INDP→PE.1 = On). Wait 45 seconds for the ERV exhaust fans 1 to come on.
2. Turn on the power exhaust 2 relay (service test - INDP - PE.2 = on) Wait 45 seconds for the ERV exhaust fans 2 and 3 to come on.
3. Continue to open the economizer damper to the 100% open position. If the building/exhaust design pressure is exceeded on the way to 100%, record that percent damper position.
4. The recorded economizer damper positions can now be set in ComfortLINK for PE1 and PE2 configurations. (Configuration →ECON→PE.1 & PE.2 = recorded values). Default values for these points are 30% and 60%.

### 2-25 TON Modulating ERV

The modulating ERVs are equipped with an LCD screen to utilize a test mode and configuration of the ERV. The following sections explain their functions. It is important that these configurations be set correctly in order for the ERV module to properly control the air performance.

**ERV Test Mode**

ERV Test Mode should be used when starting up an EnergyX unit to verify proper ERV component operation. It can also be used for troubleshooting. To enter test mode on the ERV, use the Scrolling Marquee to put the ComfortLINK RTU into test mode. Then go to the ERV LCD screen. It will display Test Mode Active and current CFM values. There are four tests which can be performed separately or together while in test mode. Press the

---

**Table 3A – Pressure Drop Across Wheel (inH2O)**

<table>
<thead>
<tr>
<th>CFM</th>
<th>Δ inH2O</th>
<th>CFM</th>
<th>Δ inH2O</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>0.18</td>
<td>550</td>
<td>0.66</td>
</tr>
<tr>
<td>200</td>
<td>0.24</td>
<td>600</td>
<td>0.72</td>
</tr>
<tr>
<td>250</td>
<td>0.30</td>
<td>650</td>
<td>0.78</td>
</tr>
<tr>
<td>300</td>
<td>0.36</td>
<td>700</td>
<td>0.84</td>
</tr>
<tr>
<td>350</td>
<td>0.42</td>
<td>750</td>
<td>0.90</td>
</tr>
<tr>
<td>400</td>
<td>0.48</td>
<td>800</td>
<td>0.96</td>
</tr>
<tr>
<td>450</td>
<td>0.54</td>
<td>850</td>
<td>1.02</td>
</tr>
<tr>
<td>500</td>
<td>0.60</td>
<td>900</td>
<td>1.08</td>
</tr>
</tbody>
</table>

**Table 3B – Direct Drive (ECM) Speed Wiring**

<table>
<thead>
<tr>
<th>PLUG PIN #</th>
<th>WIRE COLOR</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Blue</td>
<td>Speed 1 (min)</td>
</tr>
<tr>
<td>2</td>
<td>Gray</td>
<td>Speed 2</td>
</tr>
<tr>
<td>3</td>
<td>Red</td>
<td>Speed 3</td>
</tr>
<tr>
<td>4</td>
<td>Black</td>
<td>Speed 4 (max)*</td>
</tr>
<tr>
<td>5</td>
<td>White</td>
<td>Neutral</td>
</tr>
<tr>
<td>6</td>
<td>Green</td>
<td>Ground</td>
</tr>
</tbody>
</table>

*Default wiring from the factory

**Economizer free cooling power exhaust**

When an economizer is included with the ERV, the exhaust fan must also be set up to handle free cooling.

1. Make sure ComfortLINK is in Service Test Mode
2. Turn the rooftop fan on (Service Test →FANS→IDF = On). Wait 45 second and verify that the ERV wheel, supply air fan and exhaust fan are running.
3. Open the economizer damper to 10% (Service Test →INDP→ECON = 10). Wait 45 second for the ERV to shutdown.
4. While measuring the building/exhaust duct static pressure, adjust the economizer % open to allow outside air to come into the building/unit. When the building pressure reaches the design value, record the economizer damper open percentage.
5. Turn on the power exhaust 1 relay (Service Test →INDP→PE.1 = On). Wait 45 second for the ERV exhaust fan 1 to come on.
6. Continue to open the economizer damper until the building pressure again reaches the design pressure value, and record the economizer damper percentage.
7. Turn on the power exhaust 2 relay (service test - INDP - PE.2 = on) Wait 45 seconds for the ERV exhaust fans 2 and 3 to come on.
8. Continue to open the economizer damper to the 100% open position. If the building/exhaust design pressure is exceeded on the way to 100%, record that percent damper position.
9. The recorded economizer damper positions can now be set in ComfortLINK for PE1 and PE2 configurations. (Configuration →ECON→PE.1 & PE.2 = recorded values). Default values for these points are 30% and 60%.
10. If a value was recorded in step 8, change the Economizer Cool Max Position (Configuration - ECON - EC.MX) configuration must be changed from 100% to the recorded value.
push button to enter test points. Use the turn pot to change the value of the test point and press the pushbutton to lock in the change. Press the pushbutton again to move on to the next test point. See Table 3C. Test points are listed in the order that they appear in the menu.

NOTE: The RJ12 communication cable must be plugged into the base unit ComfortLINK LEN port for ERV test mode to work.

The 4 test mode points are 2POS Damper, Wheel, OA Fan Speed, and EX Fan Speed. The 2 position damper can be opened and closed with the 2POS Damper point; the 2-position damper accessory must be installed. The ERV wheel motor can be turned on and off with the Wheel test point. The ERV’s outside air (OA) and building exhaust air (EX) motors can be ramped up and down during test mode with their corresponding fan speed test points. Table 3C shows the test mode test points in the order they appear during test mode. Communication failures will cause test mode to end. The EXCB board LEDs will show active alarms during test mode.

NOTE: If 2 position dampers are installed, they must be opened in test mode while operating the other tests.

### Table 3C – ERV Test Mode Points

<table>
<thead>
<tr>
<th>TEST POINT</th>
<th>VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test 2POS Damper</td>
<td>ON/OFF</td>
</tr>
<tr>
<td>Test ERV Wheel</td>
<td>ON/OFF</td>
</tr>
<tr>
<td>Test OA Fan Speed</td>
<td>0-100 %</td>
</tr>
<tr>
<td>Test EX Fan Speed</td>
<td>0-100 %</td>
</tr>
</tbody>
</table>

### ERV Configuration

The ERV configuration menu can be accessed from the ERV LCD screen. The rooftop unit ComfortLINK cannot be in service test mode to access ERV configurations. While the LCD is cycling through status points, press and release the pushbutton. The screen will display “ERV Configurations”. Press the pushbutton again to access the configuration points.

There are five configurations which can be changed. Use the turn pot to change the value of the configuration and press the pushbutton to lock in the change. Press the pushbutton again to move on to the next configuration point. See Table 3D, the configuration points are listed in the order that they appear in the menu. See operation section for details on individual configurations, brief descriptions are listed below.

### Table 3D – ERV LCD Configuration points

<table>
<thead>
<tr>
<th>CONFIGURATION</th>
<th>DEFAULT</th>
<th>RANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>DCV OA SP CFM</td>
<td>1000</td>
<td>0 to 32000</td>
</tr>
<tr>
<td>Min Outside Air CFM</td>
<td>1000</td>
<td>0 to 32000</td>
</tr>
<tr>
<td>EX Air Offset CFM</td>
<td>-200</td>
<td>-17000 to 17000</td>
</tr>
<tr>
<td>ERV Control Config</td>
<td>1</td>
<td>0 to 2</td>
</tr>
<tr>
<td>ERV Unocc Run</td>
<td>YES</td>
<td>YES/NO</td>
</tr>
</tbody>
</table>

DCV OA SP CFM – This sets the lowest setting for ventilation using outside air. This is only accessible if CO2 sensors are installed and Comfortlink is configured properly. NOTE: ERV must be equipped with optional economizer to operate with CO2 sensors.

Min Outside Air CFM – This sets the outside air ventilation rate when not using a CO2 sensor. When using CO2 sensors this sets the max amount of outside air for ventilation.

EX Air Offset CFM – This sets the offset for exhausting building air based on outside air being brought in.

ERV Control Config – This sets the type of ERV operation required. Currently this is the only mode of operation available. Changing this setting is not recommended.

ERV Unocc Run – This allows the ERV to run during the unoccupied period when the rooftop fan is brought on.

### ERV with Economizer Additional Configurations

There are seven important ComfortLINK configurations that impact the ERV operation when equipped with optional economizer. To change these configuration use the ComfortLINK Scrolling Marquee, Navigator, or a CCN communication tool. Refer to the base unit Controls, Start-up, Operation, Service, and Troubleshooting manual for more information on using these tools. Table 3E shows these Comfortlink points that impact ERV operation. See operation section for details on individual configurations, brief descriptions are listed below.

### Table 3E – Comfortlink Configurations

<table>
<thead>
<tr>
<th>DISPLAY ITEM</th>
<th>EXPANDED TEXT</th>
<th>DEFAULT</th>
<th>RANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>EC.EN</td>
<td>Economizer Installed</td>
<td>No: no FIOP</td>
<td>Yes/No</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Yes: FIOP</td>
<td></td>
</tr>
<tr>
<td>EC.MN</td>
<td>Econo Minimum Position</td>
<td>0</td>
<td>0 to 100</td>
</tr>
<tr>
<td>AQ.MN</td>
<td>Econo Min IAQ Position</td>
<td>0</td>
<td>0 to 100</td>
</tr>
<tr>
<td>IA.CF</td>
<td>IAQ Analog Input Config</td>
<td>0</td>
<td>0=No IAQ</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1=FIOP</td>
<td>1=DCV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2=Override</td>
<td>3=Ctl Min</td>
</tr>
<tr>
<td>IA.FN</td>
<td>IAQ Analog Fan Config</td>
<td>0</td>
<td>0=Never</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1=Occupied</td>
<td>2=Always</td>
</tr>
<tr>
<td>AQD.L</td>
<td>AQ Differential Low</td>
<td>100</td>
<td>0 to 5000</td>
</tr>
<tr>
<td>AQD.H</td>
<td>AQ Differential High</td>
<td>700</td>
<td>0 to 5000</td>
</tr>
</tbody>
</table>

EC.EN – This tells the ERV that an optional economizer is installed

EC.MN and AQ.MN – Must be set to 0 so the base rooftop does not use the economizer for ventilation, only free cooling.

IA.CF – This tells the ERV that a CO2 sensor is installed. Only a value of 1 or 2 will allow the ERV to use the CO2 sensor value.

IA.FN – This tells the ERV if it can activate DCV during the unoccupied period.

AQD.L and AQD.H – These set the indoor air quality (IAQ) CO2 DCV operating range. Differential is based off a 400PPM outside CO2 value.

### Adjusting ERV Options

The ERV can come with factory installed filter status, fan status, and/or frost protection. These options are factory configured when installed, but can be adjusted if field required. Refer to the Major Component section of this manual for details on each.
OPERATING SEQUENCE

General
An EnergyXv2 unit is a Centurion rooftop unit an energy recovery ventilator (ERV). It operates the ERV module in an integrated manner with the base rooftop unit. The base rooftop unit functions per the base unit sequence of operation, for information regarding ComfortLINK controller operation see the base rooftop unit Controls, Start-Up, Operations, Service, and Troubleshooting manual. The ERV will operate based on communication from the ComfortLINK controller. The following section discusses the ERV operation in detail. In summary, the ERV operates to provide pre-conditioned outside air for ventilation requirements. If equipped with an optional economizer the ERV can provide free cooling when the outside air conditions are satisfactory.

In general the ERV monitors occupancy and indoor fan state of the base unit to determine when to activate. The outside air fan(s) bring in the outside air pass it through the enthalpy wheel and into the rooftop mixing box. The building return air is pulled through the enthalpy wheel by the exhaust fan(s) and released outside. During operation the enthalpy wheel is rotating to use the building air to pre-condition the outside air. When free cooling is required and allowed the wheel is not needed to pre-condition the air therefore a damper (wheel bypass) is used to bring in the outside air directly to the mixing box.

Communication
The ERV relies on communication with ComfortLINK to operate. The ERV monitors ComfortLINK points to determine operation. If communication is lost the ERV will shut down and remain in the Off mode until communication is established. Refer to the troubleshooting section for details on communication failures. Table 4a and 4b shows the ComfortLINK points that the ERV monitors for operation and a brief description of their functions.

2-6 ton Constant Volume ERV
The Constant volume ERV is a simple ERV, meaning that it is either on or off and there is not a user interface. The ERV is controlled through communication with the rooftop unit and will operate in one of three modes, Off, On, or Free Cooling. When the rooftop is occupied (Run Status → MODE → OCC) and it’s indoor fan is on (Outputs → FANS → IDF), the ERV will run in the On mode. If the rooftop is unoccupied or if its indoor fan shuts down, the ERV will shutdown. In the On mode, the ERV wheel will rotate, the outside air fan will be on, and the exhaust fan 1 will be on. Table 4a shows the ComfortLINK communication points.

Free Cooling Operation
Free Cooling is only available if an optional economizer (wheel bypass) is installed in the ERV. Free Cooling will be activated when the rooftop unit starts to use the economizer damper for cooling operation. The ERV will see this when the economizer damper position (Outputs → ECON → EC.AP) is greater than 5%. The outside air fan will shut down and the ERV wheel will utilize a “Stop/Jog” operation to periodically rotate the wheel and minimize potential dirt build-up and excess wear on one section of the wheel. Stop/Jog will rotate the wheel for 5 seconds then stop it for 5 minutes. The exhaust fans will turn on and off based on the rooftop’s power exhaust relays. When the damper position gets above the ComfortLINK configuration (Configuration → ECON → PE.1) the power exhaust 1 relay (Outputs → ECON → PE.1) will energize and the ERV will turn on its exhaust fan 1. When the damper position gets above the ComfortLINK configuration (Configuration → ECON → PE.2) the power exhaust 2 relay (Outputs → ECON → PE.2) will energize and the ERV will turn on its exhaust fans 2 and 3.

Defrost operation
Defrost is only available when the optional Frost Protection is installed. The ERV will be set to defrost any time the ERV wheel is running and frost is detected on the wheel. Defrost runs for at least 2 minutes but continues to run until the frost is removed. The frost protection device senses a pressure differential across the wheel and trips when that differential is greater than the setpoint (default 2.0 in wc). For information on the frost protection device, refer to the Major Component section. When in Defrost, the wheel will be rotating and the outside air fan will be off. The exhaust 1 fan will be on and if equipped the exhaust fans 2 and 3 will be off.

NOTE: CO2 Sensors
A CO2 sensor cannot be used with the 2-6 ton Constant Volume EnergyX unit because it serves no purpose for constant volume energy recovery. A typical CO2 system used for Demand Control Ventilation allows the rooftop unit economizer to close below the normal minimum ventilation position unless a high CO2 signal is received. This reduces operational cost by not allowing excess ventilation air unless required due to high occupancy load. The high CO2 signal indicates the presence of larger number of occupants and a need for higher volumes of ventilation air. In this situation, the economizer would then open to a position above the normal minimum ventilation position to bring in more outdoor air. However, in a constant volume EnergyX unit, the ERV constant volume outdoor air ventilation setting is already set at this higher volume of outdoor air. Use of a CO2 sensor would artificially reduce the ERV pre-conditioning effect and thus reduce the efficiency of the ERV operation.

2-25 ton Modulating ERV
The modulating ERV is an intelligent ERV. It has variable speed fan motors and a LCD screen user interface. The ERV can provide a variety of volumes of outside air and offset it with different exhaust speeds. CO2 sensors can also be tied into it for Demand control ventilation (DCV) operation. The modulating ERV will operate based on occupancy and the rooftop’s operating mode, the following sections explain operation in detail. Refer to Figure 2a for the overview flow diagram of a modulating ERV operation. Table 4b shows the ComfortLINK communication points. Table 4c shows the ERV’s LCD screen menus and points.

Occupancy
The ERV will not be allowed to run unless it is determined to be occupied. The ERV monitors the rooftop’s occupancy point (Run Status → MODE → OCC) to determine when it is occupied. The ERV watches the rooftop’s indoor fan point (Outputs → FANS → IDF) to know when its indoor fan has started. When the rooftop is occupied and its indoor fan is on, the ERV is considered to be occupied and allowed to run. The ERV can also operate during the rooftop’s unoccupied period. If the ERV is configured for unoccupied run (ERV Configurations → ERV Unocc Run = YES), then it will ignore the occupancy of ComfortLINK and allow occupancy any time the rooftop fan is on. If not configured for unoccupied run but there is a CO2 sensor installed and ComfortLINK is configured to turn on its indoor fan for demand control ventilation at any time (Configuration → AIR.Q → IA.FN = 2), the ERV will be occupied any time the rooftop indoor fan is on.
Modes of Operation
The ERV will always operate in one of six modes (OFF, ERV Mode, Free Cooling, DCV ERV, Defrost, or Test), depending upon the ComfortLINK mode and outside conditions. The ERV monitors the ComfortLINK CCN point NVO_MODE to determine the rooftops operating mode.

The NVO_MODE values tell the ERV what the rooftop mode is based on the following: 7 is Test, 3 and 10 are cooling, and the rest are just ventilation. The following sections describe each ERV mode and ERV operation during that mode.

Off Mode (ERV Operation Mode = 0)
The ERV will be set to the Off mode whenever the rooftop indoor fan is turned off, ERV is unoccupied, or if communication fails. During Off Mode, the ERV 2 position dampers will be closed and the wheel, outside air fan(s), and exhaust fan(s) will be off.

Test Mode (ERV Operation Mode = 5)
If at any time during operation, the rooftop is put in Service Test mode the ERV will be set to Test Mode. Refer to Start-Up section for Test mode operation. NVO_MODE will equal 7.

ERV Mode (ERV Operation Mode = 1)
ERV Mode is the basic operating mode of the ERV. With no options installed on the ERV this will be the only operating mode besides off and test. ERV Mode will be active when the rooftop ComfortLINK mode is Heating, Cooling, Fan Only, or Dehumidification (NVO_MODE = 1, 3, 9, or 14) and the ERV is occupied.

When in ERV mode, the ERV 2 position damper will be open and the wheel will be rotating. The outside air fan(s) will run at a speed that produces a CFM equal to the minimum outside air CFM setpoint (ERV Configurations →Min Outside Air CFM). The exhaust fan(s) will run at a speed equal to the required offset CFM. Refer to Exhaust Control for details on determining offset CFM.

Free Cooling Mode (ERV Operation Mode = 2)
Free Cooling Mode is only available if an optional economizer is installed in the ERV (Configuration →ECON →EC.EN = Yes). Free Cooling Mode will be active when the rooftop unit is in Free Cooling Mode or in Cooling Mode and the economizer damper position (Outputs →ECON →EC.CP) is greater than 5% (NVO_MODE = 10 or 3). ERV occupancy tells the control which speed to start the outside air fan(s) during free cooling, because the outside fan(s) are needed to assist the indoor fan in bringing in outside air.

When in Free Cooling Mode, the ERV 2 position damper will be open and the wheel will be set to stop/jog operation. The rooftop unit will modulate the economizer damper to provide free cooling as if an ERV was not installed. As the damper opens the ERV outside air fan(s) will maintain a speed that produces minimum outside air CFM. Once the damper position passes that percent fan speed of the outside air fan(s), the fan(s) speed will ramp up directly with the damper position, up to 100%. The exhaust fan(s) will run at a speed equal to the required offset CFM. Refer to Exhaust Control for details on determining offset CFM.

Defrost Mode (ERV Operation Mode = 4)
Defrost Mode is only available when the optional Frost Protection is installed. The ERV will be set to defrost mode any time the ERV wheel is running and frost is detected on the wheel. Defrost Mode runs for at least 2 minutes but continues to run until the frost is removed. The frost protection device senses a pressure differential across the wheel and trips when that differential is greater than the setpoint (default 2.0 in wc). For information on the frost protection device, refer to the Major Component section.

When in Defrost Mode, the ERV 2 position damper will be open and the wheel will be rotating. The outside air fan(s) will ramp down to 0% speed (shut-off). The exhaust fan(s) will run at a speed equal to the required offset CFM. Refer to Exhaust Control for details on determining offset CFM.

DCV ERV Mode (ERV Operation Mode = 3)
DCV ERV Mode takes the place of ERV mode if an optional economizer is installed in the ERV (Configuration →ECON →EC.EN = Yes) and when an optional CO2 sensor is installed on the rooftop unit (Configuration →AIR.Q →IA.CF = 1 or 2). DCV ERV Mode will be active when the rooftop ComfortLINK mode is Heating, Cooling, Fan Only, or Dehumidification (NVO_MODE = 1, 3, 9, or 14) and the ERV is occupied. When in DCV ERV mode, the ERV 2 position damper will be open and the wheel will be rotating. The outside air fan(s) will run at a speed that produces a CFM equal to the minimum outside air CFM determined by Demand Control Ventilation (DCV). The exhaust fan(s) will run at a speed equal to the required offset CFM. Refer to Exhaust Control for details on determining offset CFM.

Demand Control Ventilation (DCV) uses the indoor air quality levels (CO2 PPM) to determine how much outside air is required for ventilation. The ERV monitors the IAQ (Inputs →AIR.Q →IA.Q) reading from the rooftop’s installed CO2 sensor and compares it to a hard coded outside air value of 400PPM. The difference is then weighed on scale between AQ Differential Low (Configuration →AIR.Q →AQD.L) and AQ Differential High (Configuration →AIR.Q →AQD.H) to determine the minimum outside air CFM required for ventilation. The minimum outside air CFM can be equal to or between the DCV outside air CFM setpoint (DCV OA SP CFM) and the minimum outside air CFM setpoint (Min Outside Air CFM). As the CO2 differential rises from AQD.L to AQD.H, the ERV outside air CFM requirement will rise from DCV OA SP CFM to Min Outside Air CFM. The outside air fan(s) will ramp its speed % up or down to produce the required CFM. If at any time the CO2 sensor fails or IAQ reads 0ppm, the DCV minimum outside air requirement will be forced to the maximum value (MIN Outside Air CFM). Figure 2b shows the DCV minimum outside air CFM determination curve.
**Exhaust Control**
The ERV exhaust fan(s) operate to offset the outside air being introduced to the building. The required exhaust offset CFM is determined based on the exhaust offset setpoint (ERV Configurations → EX Air Offset CFM). The exhaust offset setpoint can be set as a negative or positive number to accommodate a requirement of positive or negative building pressure. The ERV will determine the required amount of outside air CFM based on setpoints and current mode of operation. The exhaust air CFM is then calculated by the sum of the current required outside air CFM and the exhaust air offset setpoint. During defrost mode the exhaust will run the same as if the outside air fan(s) were still running.

**Wheel Stop/Jog**
During free cooling the wheel utilizes a “stop-jog” operation to periodically rotate the wheel and minimize potential dirt build-up and excess wear on one section of the wheel. The wheel will rotate for 5 seconds then stop for 5 minutes.

**Status Points**
The ERV LCD screen will cycle through status points as the ERV is powered. These status points can be viewed at the ERV LCD screen and are explained below.

<table>
<thead>
<tr>
<th><strong>Status Point</strong></th>
<th><strong>Description</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>ERV Operation Mode</td>
<td>Displays the current operating mode of the ERV</td>
</tr>
<tr>
<td>C.OA CFM</td>
<td>Displays the commanded CFM for the outside air fan(s) to achieve.</td>
</tr>
<tr>
<td>A.OA CFM</td>
<td>Displays the actual CFM being achieved by the outside air fan(s).</td>
</tr>
<tr>
<td>C.EX CFM</td>
<td>Displays the commanded CFM for the exhaust air fan(s) to achieve.</td>
</tr>
<tr>
<td>A.EX CFM</td>
<td>Displays the actual CFM being achieved by the exhaust air fan(s).</td>
</tr>
<tr>
<td>OA Fan Speed</td>
<td>Displays the actual speed of the outside air fan(s).</td>
</tr>
<tr>
<td>EX Fan Speed</td>
<td>Displays the actual speed of the exhaust air fan(s).</td>
</tr>
<tr>
<td>Indoor Air CO2</td>
<td>Displays the communicated indoor air quality CO2 level.</td>
</tr>
<tr>
<td>UPC version</td>
<td>Displays the version of software installed on the UPC.</td>
</tr>
<tr>
<td>EXCB version</td>
<td>Displays the version of software installed on the EXCB.</td>
</tr>
</tbody>
</table>
Figure 2a – Modulating ERV Control & Operation Flow Chart

**Notes:**
* Min CFM represents the minimum outside air CFM requirement based on CO2 values and setpoints.
** Occupied also means being in the unoccupied period but configured to run.
## Table 4a – Constant Volume ERV Communication Points

<table>
<thead>
<tr>
<th>CCN Table</th>
<th>CCN Point</th>
<th>Marquee Point</th>
<th>Expanded Text</th>
<th>Range</th>
<th>Read / Write</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>MODEDISP</td>
<td>OCCUPIED</td>
<td>OCC</td>
<td>Currently Occupied</td>
<td>Yes/No</td>
<td>R</td>
<td>Determine if RTU occupied</td>
</tr>
<tr>
<td>UOUTPUT</td>
<td>IDF</td>
<td>IDF</td>
<td>Indoor Fan Relay</td>
<td>On/Off</td>
<td>R</td>
<td>Determine if RTU fan is on (ComfortLINK Version 3.x)</td>
</tr>
<tr>
<td>IDFSTATE</td>
<td>IDF</td>
<td>IDF</td>
<td>Indoor Fan State</td>
<td>On/Off</td>
<td>R</td>
<td>Determine if RTU fan is on (ComfortLINK Version 4.x and up)</td>
</tr>
<tr>
<td>ECONOPOS</td>
<td>EC.AP</td>
<td>Eco Actual Position</td>
<td>0 to 100 %</td>
<td>R</td>
<td></td>
<td>Monitor econ position</td>
</tr>
<tr>
<td>PE_1</td>
<td>PE.1</td>
<td>Power Exhaust 1 Relay</td>
<td>On/Off</td>
<td>R</td>
<td></td>
<td>Determine when to turn on PE1 during free cooling</td>
</tr>
<tr>
<td>PE_2</td>
<td>PE.2</td>
<td>Power Exhaust 2 Relay</td>
<td>On/Off</td>
<td>R</td>
<td></td>
<td>Determine when to turn on PE2 during free cooling</td>
</tr>
<tr>
<td>TESTFANS</td>
<td>S_IDF</td>
<td>IDF</td>
<td>Indoor Fan Power Test</td>
<td>On/Off</td>
<td>R</td>
<td>Determine if RTU fan is on in test mode</td>
</tr>
<tr>
<td>TESTINDP</td>
<td>S_PE_1</td>
<td>PE.1 Power Exhaust 1 Test</td>
<td>On/Off</td>
<td>R</td>
<td></td>
<td>Determine when to turn on PE1 during test mode</td>
</tr>
<tr>
<td></td>
<td>S_PE_2</td>
<td>PE.2 Power Exhaust 2 Test</td>
<td>On/Off</td>
<td>R</td>
<td></td>
<td>Determine when to turn on PE2 during test mode</td>
</tr>
<tr>
<td>UINPUT</td>
<td>FILTSTAT</td>
<td>FIL.S</td>
<td>Filter Status Switch</td>
<td>Dirty/Clean</td>
<td>RW</td>
<td>Monitor RTU, and set ERV filter alarm</td>
</tr>
<tr>
<td></td>
<td>FAN_STAT</td>
<td>FAN.S</td>
<td>Fan Status Switch</td>
<td>On/Off</td>
<td>RW</td>
<td>Monitor RTU, and set ERV motor alarm</td>
</tr>
</tbody>
</table>

## Table 4b – Modulating ERV Communication Points

<table>
<thead>
<tr>
<th>CCN Table</th>
<th>CCN Point</th>
<th>Marquee Point</th>
<th>Expanded Text</th>
<th>Range</th>
<th>Config Default</th>
<th>Read / Write</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>LON_DATA</td>
<td>NVO_MODE</td>
<td>nvoUnitStatus.mode</td>
<td>xxxx</td>
<td>R</td>
<td></td>
<td>Determine RTU HVAC mode</td>
<td></td>
</tr>
<tr>
<td>MODEDISP</td>
<td>OCCUPIED</td>
<td>OCC</td>
<td>Currently Occupied</td>
<td>Yes/No</td>
<td>R</td>
<td>Determine if occupied</td>
<td></td>
</tr>
<tr>
<td>UOUTPUT</td>
<td>IDFSTATE</td>
<td>IDF</td>
<td>Indoor Fan State</td>
<td>On/Off</td>
<td>R</td>
<td>Determine if fan is on</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ECONOCMD</td>
<td>EC.CP</td>
<td>Econo Commanded Position</td>
<td>0 to 100 %</td>
<td>R</td>
<td>Monitor econ position</td>
<td></td>
</tr>
<tr>
<td>UINPUT</td>
<td>FILTSTAT</td>
<td>FIL.S</td>
<td>Filter Status Switch</td>
<td>Dirty/Clean</td>
<td>RW</td>
<td>Set ERV filter alarm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>FAN_STAT</td>
<td>FAN.S</td>
<td>Fan Status Switch</td>
<td>On/Off</td>
<td>RW</td>
<td>Set ERV motor alarm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>IAQ</td>
<td>IAQ</td>
<td>IAQ Level (sensor)</td>
<td>xxxx</td>
<td>R</td>
<td>Monitor CO2</td>
<td></td>
</tr>
<tr>
<td>ECONO_CFG</td>
<td>ECONO</td>
<td>EC.EN</td>
<td>Economizer Installed</td>
<td>Yes/No</td>
<td>No: no FIOP</td>
<td>R</td>
<td>Determine if economizer is installed</td>
</tr>
<tr>
<td></td>
<td>ECONO</td>
<td>ECONO</td>
<td>Economizer Installed</td>
<td>Yes/No</td>
<td>Yes: FIOP</td>
<td>R</td>
<td>Determine if economizer is installed</td>
</tr>
<tr>
<td>IAQ_CFG</td>
<td>IAQNCFG</td>
<td>IA.CF</td>
<td>IAQ Analog Input Config</td>
<td>0=No IAQ 1=DCV 2=Override IAQ 3=Ctrl Min Pos</td>
<td>0: no FIOP 1: FIOP</td>
<td>R</td>
<td>Determine if CO2 sensor is installed</td>
</tr>
<tr>
<td>IAQANFAN</td>
<td>IA.FN</td>
<td>IAQ Analog Fan Config</td>
<td>0=Never 1=Occupied 2=Always</td>
<td>R</td>
<td></td>
<td>Determine when to run ventilation in unoccupied mode</td>
<td></td>
</tr>
<tr>
<td>DAQ_LOW</td>
<td>AQD.L</td>
<td>AQ Differential Low</td>
<td>0 to 5000</td>
<td>R</td>
<td></td>
<td>Determine CO2 Min</td>
<td></td>
</tr>
<tr>
<td>DAQ_HIGH</td>
<td>AQD.H</td>
<td>AQ Differential High</td>
<td>0 to 5000</td>
<td>R</td>
<td></td>
<td>Determine CO2 Max</td>
<td></td>
</tr>
</tbody>
</table>
Table 4c – Modulating ERV LCD Screen Menus and Points

<table>
<thead>
<tr>
<th>GENERAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Initialize LEN Communication – When first powered up</td>
</tr>
<tr>
<td>2. Communication Failure-1: UPC_to_LEN_Fail – Results if device cannot communicate on the LEN bus</td>
</tr>
<tr>
<td>3. Communication Failure-2: UPC_to_EXCB_Fail – Results if device cannot communicate</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MENU</th>
<th>POINT</th>
<th>RANGE</th>
<th>UNITS</th>
<th>DEFAULT</th>
</tr>
</thead>
<tbody>
<tr>
<td>STANDBY</td>
<td>After 15 minute time out or during normal operation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALARM - T418 ERV Wheel Status</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALARM - T418 ERV Fan Status</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ALARM - T418 ERV Filter Dirty</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ERV Operation Mode</td>
<td>0=Off 1=ERV Mode 2=Free Cooling 3=DCV ERV 4=Defrost 5=Test</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C.OA CFM</td>
<td>xxxxx</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A.OA CFM</td>
<td>xxxxx</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C.EX CFM</td>
<td>xxxxx</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A.EX CFM</td>
<td>xxxxx</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OA Fan Speed</td>
<td>xxx</td>
<td>%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EX Fan Speed</td>
<td>xxx</td>
<td>%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indoor Air CO2</td>
<td>xxxx</td>
<td>PPM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UPC ver</td>
<td>xxx</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EXCB ver</td>
<td>xxx</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ERV Configurations</td>
<td>Press Pushbutton during normal operation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>DCV OA SP CFM</td>
<td>0 to 32000</td>
<td>CFM</td>
<td>15000</td>
<td></td>
</tr>
<tr>
<td>Min Outside Air</td>
<td>0 to 32000</td>
<td>CFM</td>
<td>16000</td>
<td></td>
</tr>
<tr>
<td>EX Air Offset</td>
<td>-17000 to 17000</td>
<td>CFM</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>ERV Control Config</td>
<td>0=Constant Speed 1=Offset Exhaust 2=Building Pressure</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ERV Unocc Run</td>
<td>YES/NO</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Test Mode Active</td>
<td>When Rooftop is put in test mode</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OA CFM</td>
<td>xxxxx</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EX CFM</td>
<td>xxxxx</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Test 2POS Damper</td>
<td>On/Off</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Test ERV Wheel</td>
<td>On/Off</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Test OA Fan Speed</td>
<td>0 to 100</td>
<td>%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Test EX Fan Speed</td>
<td>0 to 100</td>
<td>%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
TROUBLESHOOTING

EnergyX units are a combination of the base rooftop unit and an integrated ERV. The ERV requires communication form the rooftop for operation. This section covers ERV troubleshooting only. For rooftop troubleshooting refer to the base unit's Controls, Start-up, Operation, Service, and Troubleshooting manual. Figure 3 shows a cross section of the modulating ERV for troubleshooting.

Complete ERV Stoppage

There are several conditions that can cause the ERV to shutdown or appear to be shutdown:

- General power failure.
- Transformer's circuit breaker tripped.
- ERV main power fuses blown.
- Communication failures.
- Active alarm on the base rooftop unit or the ERV preventing operation. Review alarms.
- Programmed occupancy schedule. Rooftop Unoccupied.
- Rooftop indoor fan is off.
- On modulating ERVs, the airflow sensor tubing connected to the incorrect high/low sensor ports in the outside air.
- On constant volume ERV, when economizer is open more than 5%.

Check Alarms

The ERV has 3 possible alarms based on options installed in the ERV. Modulating ERVs can display all 3 alarms on the LCD screen but will only force two alarms in ComfortLINK. Constant volume ERVs can only trip two of the alarms and force them in ComfortLINK. Table 5 is a quick reference alarm table.

NOTE: Constant volume ERVs cannot be ordered with factory installed motor status or filter status.

T408 Dirty Filter / T418 ERV Filter Dirty

The ERV's dirty filter alarm should only occur if the optional Filter Maintenance Switch is installed on the ERV. It is used in combination with the rooftop units filter alarm, and can be seen on the ComfortLINK system as a T408. This requires the ComfortLINK’s Status Switch configuration point to be set to normally open (FILTSCFG = 1), factory default if filter status is factory ordered. There can be filter status switches on both the base rooftop and the ERV module or only one and either one (or both) can cause the alarm. If both switches are being used when the alarm is tripped, inspect both sets of filters to determine which filter caused the alarm.

When the ERV's dirty filter alarm activates due to an increase in differential pressure across the filter, it will then force the ComfortLINK’s Dirty Filter alarm (T408) to become active. On modulating ERVs the T418 ERV Filter Dirty alarm will also be shown on the LCD screen. The alarm does not affect unit operation but serves as a warning to replace the filters. It will automatically reset when the pressure differential falls below setpoint. Verify proper operation by partially blocking airflow through the ERV filters and confirming that the alarm does trip.

T409 Fan Status / T418 ERV Fan Status or Wheel Status

The ERV’s fan and wheel status alarms should only occur if the motor status option is installed on the ERV. It is used in combination with the rooftop units fan status alarm, and can be seen on the ComfortLINK system as a T409. This requires the ComfortLINK’s Filter Status Switch configuration point to be set to normally open (FANSTCFG = 1), factory default if fan status is factory ordered. There can be fan status switches on both the base rooftop and the ERV module or only one, and either one (or both) can cause the alarm. If all switches are being used and the alarm is tripped, inspect all fans to determine which motor caused the alarm. If there is not a base unit fan status switch but there is EnergyX motor status, the ComfortLINK’s Shut Down on IDF Failure point will be set to No (FATALFAN = No). This setting means the rooftop and ERV will continue to run upon alarm. The ERV’s LCD screen will display which motor failure has occurred and are explained below. If the 409 alarm is active and the ERV is not in alarm then the rooftop fan should be inspected.

T418 ERV Fan Status

This alarm occurs if any one of the ERV's outside or exhaust motors detect a problem. It will close its built-in normally open alarm contact, which will be seen as 24vac at EXCB J8-3. The ERV LCD will display T418 ERV Fan Status, and the D18 LED will be on. The ERV will force the fan status point (INPUTS →GEN.I →FANS) to the opposite of what is current in ComfortLINK. The ERV will only shutdown if ComfortLINK is set to shutdown on fan failure (Configuration →UNIT →IDF.F = Yes). This alarm will automatically reset when the motor opens its alarm relay. This alarm is tripped by one of the following: phase loss, locked rotor, thermal overload, communication error, incorrect signal, or a fan failure.

T418 ERV Wheel Status

This alarm will occur when the ERV wheel is turned on and the wheel proxy sensor does not detect wheel motion within the set time. It will open its contact which energizes the normally closed rotation monitor relay (RMR). This is seen as 24vac at EXCB J5-3 and causes the alarm. The ERV LCD will display T418 ERV Wheel Status, and the D18 LED will be on. The ERV will force the fan status point (INPUTS →GEN.I →FANS) to the opposite of what is current in ComfortLINK. The ERV will only shutdown if ComfortLINK is set to shutdown on fan failure (Configuration →UNIT →IDF.F = Yes). This alarm will automatically reset when motion is detected. Possible causes of this alarm are: the wheel belt breaking or slipping, wheel motor failure, proxy sensor failure or incorrect setting, or wiring error.

Constant volume ERVs

Motor Status is not available on the constant volume ERVs. However, the alarm can occur if 24vac is seen at EXCB J7-2. The D18 LED will be on and the ERV will force the fan status point (INPUTS →GEN.I →FANS) to the opposite of what is current in ComfortLINK. The ERV will only shutdown if ComfortLINK is set to shutdown on fan failure (Configuration →UNIT →IDF.F = Yes). This alarm will automatically reset when 24vac is lost at EXCB J7-2. Remove any wires on EXCB J7 to prevent this alarm from occurring.

Check Diagnostic LEDs

Use the on board LEDs to assist in troubleshooting the EnergyX system. The EnergyX Control Board (EXCB) and the Universal Protocol Converter (UPC) each have LEDs that can help in the troubleshooting process. See Tables 6a to 6c. The EXCB has five green LEDs and one red LED. The red LED is for power indication and the green LEDs are status indicators. The UPC has seven LEDs. There are four communication LEDs and three status LEDs. The communication LEDs indicate if the translator is speaking to the devices on the network and should reflect communication traffic based on the baud rate set. The higher the baud rate, the LEDs would become more solid.
Communication Failures

Communication is critical for ERV operation. It can fail on two different paths; between the UPC and the rooftop (LEN), or between the UPC and the EXCB. This makes the UPC critical to ERV operation. Make sure the UPC DIP switches and rotary switches are set correctly. Make sure the board hardware jumpers are set on EIA 485 and 2W. During normal operation the 4 communication LEDs will flash interchangeably. If all 4 LEDs are not flashing then there is a communication problem. Check connections between Port 1a and rooftop LEN (plugged into the ECB or small connection board in its place), and Port 2 and the EXCB J23. On modulating ERVs, the LCD screen will show specific communication failure when they occur.

Comm Failure1 – UPC to LEN Fail
This will be displayed if the EXCB can communicate with the UPC but does not receive information from ComfortLINK. This will occur is the cable is connected to the CCN port instead of the LEN port, or if the cable is pinched or disconnected.

Comm Failure2 – UPC to EXCB Fail
This will be displayed if the EXCB cannot communicate with the UPC. This will occur is the connection between them is disconnected or pinched. This will also occur if the UPC does not have power or software, or if it has an error or configured wrong.

On-board Pressure Transducers
NOTE: Pressure Transducers are only used on modulating ERVs. The EXCB uses on-board pressure transducers to measure the air pressure of the incoming outside air and the building exhaust air. The CFM values are then calculated based on these readings and the fan speed. There is a pressure transducer for the outside air and one for the exhaust air. These are screwed into the EXCB board to J24 and J25 respectively. They have three pins: IN, GND, and OUT. The IN pin is 5vdc input power and GND is the common or ground pin. The OUT pin will be 0.26 to 4.5vdc based on the pressure reading. There are two different transducers used, one inch of water column (inWC) and 5 inWC. Table 7 shows the voltage/pressure characteristics of each.

Table 5 – Alarms

<table>
<thead>
<tr>
<th>ComfortLINK ALARM</th>
<th>LCD DISPLAY*</th>
<th>DESCRIPTION</th>
<th>ACTION TAKEN BY CONTROL</th>
<th>RESET METHOD</th>
<th>PROBABLE CAUSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>T408</td>
<td>ALARM - T418 ERV Filter Dirty</td>
<td>Dirty Filter</td>
<td>Generate Alarm</td>
<td>Automatic</td>
<td>Dirty Outside Air and/or Exhaust Filter</td>
</tr>
<tr>
<td>T409</td>
<td>ALARM - T418 ERV Fan Status</td>
<td>Motor Status</td>
<td>ERV shutdown (if comfortlink IDF.F = yes)</td>
<td>Automatic</td>
<td>Phase loss, motor failure, wrong wiring</td>
</tr>
<tr>
<td>T409</td>
<td>ALARM - T418 ERV Wheel Status</td>
<td>Wheel Rotation</td>
<td>ERV shutdown (if comfortlink IDF.F = yes)</td>
<td>Automatic</td>
<td>Wheel belt broken, wheel motor failed, wrong wiring</td>
</tr>
<tr>
<td>-</td>
<td>Comm Failure1 UPC_to_LEN_Fail</td>
<td>LEN Comm Failure*</td>
<td>ERV shutdown</td>
<td>Automatic</td>
<td>LEN communication cable pinched or disconnected, UPC failure</td>
</tr>
<tr>
<td>-</td>
<td>Comm Failure2 UPC_to_EXCB_Fail</td>
<td>UPC Comm Failure*</td>
<td>ERV shutdown</td>
<td>Automatic</td>
<td>No program in the UPC or DIP switches set wrong, UPC failure</td>
</tr>
</tbody>
</table>

*Only available on Modulating ERVs

Table 6a – EXCB LED Indicators

<table>
<thead>
<tr>
<th>LED</th>
<th>COLOR</th>
<th>DESCRIPTION</th>
<th>STATUS IF LIGHT IS LIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>D9</td>
<td>Red</td>
<td>24vAC board power</td>
<td>Board has power</td>
</tr>
<tr>
<td>D2</td>
<td>Green</td>
<td>Factory test/bootsloader</td>
<td>Unit in Factory test or Bootloader</td>
</tr>
<tr>
<td>D12</td>
<td>Green</td>
<td>ERV Wheel Frost Protection (2-6 ton constant volume ERVs) ERV Wheel Status Alarm (2-25 ton modulating ERVs)</td>
<td>ERV detects frost on the wheel and running in Frost Mode ERV Wheel not rotating when it should be.</td>
</tr>
<tr>
<td>D14</td>
<td>Green</td>
<td>ERV Wheel Frost Protection (2-25 ton modulating ERVs)</td>
<td>ERV detects frost on the wheel and running in Frost Mode</td>
</tr>
<tr>
<td>D16</td>
<td>Green</td>
<td>ERV Dirty Filter Alarm</td>
<td>Dirty Filter</td>
</tr>
<tr>
<td>D18</td>
<td>Green</td>
<td>ERV Blower Status Alarm</td>
<td>Fan Failure</td>
</tr>
</tbody>
</table>

Table 6b – EXUPC LED Indicators

<table>
<thead>
<tr>
<th>LED</th>
<th>COLOR</th>
<th>DESCRIPTION</th>
<th>STATUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power</td>
<td>Green</td>
<td>Power Indicator</td>
<td>Lights when power is being supplied to the translator.</td>
</tr>
<tr>
<td>Rx1</td>
<td>Green</td>
<td>Port 1 Receiving Data</td>
<td>Lights when the translator receives data from the ComfortLINK MBB via LEN</td>
</tr>
<tr>
<td>Rx2</td>
<td>Green</td>
<td>Port 2 Receiving Data</td>
<td>Lights when the translator receives data from the Modbus EXCB</td>
</tr>
<tr>
<td>Tx1</td>
<td>Green</td>
<td>Port 1 Transmitting Data</td>
<td>Lights when the translator transmits data to the ComfortLINK MBB via LEN</td>
</tr>
<tr>
<td>Tx2</td>
<td>Green</td>
<td>Port 2 Transmitting Data</td>
<td>Lights when the translator transmits data to the Modbus EXCB</td>
</tr>
<tr>
<td>Run</td>
<td>Green</td>
<td>Run indicator</td>
<td>Lights based on translator health. See table below.</td>
</tr>
<tr>
<td>Error</td>
<td>Red</td>
<td>Internal Error indicator</td>
<td>Lights based on translator health. See table below.</td>
</tr>
</tbody>
</table>
### Table 6c – EXUPC LED Flash Code Diagnostics

<table>
<thead>
<tr>
<th>Run LED Status</th>
<th>Error LED Status</th>
<th>ERV Module Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 flashes per second</td>
<td>Off</td>
<td>Normal</td>
</tr>
<tr>
<td>2 flashes per second</td>
<td>2 flashes, alternating with Run LED</td>
<td>5 minute auto-restart delay after system error</td>
</tr>
<tr>
<td>2 flashes per second</td>
<td>3 flashes then off</td>
<td>Module has just been formatted</td>
</tr>
<tr>
<td>2 flashes per second</td>
<td>4 flashes then pause</td>
<td>Two or more devices on this network have the same ARC156 network address</td>
</tr>
<tr>
<td>2 flashes per second</td>
<td>1 flash per second</td>
<td>Module is alone on the network</td>
</tr>
<tr>
<td>2 flashes per second</td>
<td>On</td>
<td>Operation halted after frequent system errors or control programs halted</td>
</tr>
<tr>
<td>5 flashes per second</td>
<td>On</td>
<td>Operation start-up aborted. Boot is running</td>
</tr>
<tr>
<td>5 flashes per second</td>
<td>Off</td>
<td>Firmware transfer in progress. Boot is running</td>
</tr>
<tr>
<td>7 flashes per second</td>
<td>7 flashes per second, alternating with Run LED</td>
<td>Ten second recovery period after brownout</td>
</tr>
<tr>
<td>14 flashes per second</td>
<td>14 flashes per second, alternating with Run LED</td>
<td>Brownout</td>
</tr>
</tbody>
</table>

### Table 7 – Pressure Transducer Voltage

<table>
<thead>
<tr>
<th>Voltage (vDC)</th>
<th>Pressure (inWC)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1” transducer</td>
</tr>
<tr>
<td>&lt;= 0.26</td>
<td>0</td>
</tr>
<tr>
<td>0.5</td>
<td>0.06</td>
</tr>
<tr>
<td>1</td>
<td>0.17</td>
</tr>
<tr>
<td>1.5</td>
<td>0.29</td>
</tr>
<tr>
<td>2</td>
<td>0.41</td>
</tr>
<tr>
<td>2.5</td>
<td>0.53</td>
</tr>
<tr>
<td>3</td>
<td>0.65</td>
</tr>
<tr>
<td>3.5</td>
<td>0.76</td>
</tr>
<tr>
<td>4</td>
<td>0.88</td>
</tr>
<tr>
<td>4.5</td>
<td>1.00</td>
</tr>
</tbody>
</table>
Figure 3 – EnergyXv2 Component Layout, Modulating Airflow Units
Drawings shown with panels removed for demonstration purposes only.
(7.5 – 12.5 ton unit shown)
MAJOR SYSTEM COMPONENTS

An EnergyXv2 unit has a factory installed energy recovery (ERV) device on a 48/50PG or 48/50PM rooftop unit. The EnergyXv2 energy recovery unit is integrated into the base rooftop unit construction and is factory wired. The energy recovery unit contains a control box, supply fan(s), exhaust fan(s) and an enthalpy wheel assembly. All control operations of the ERV are based on the rooftop units operation through communication with ComfortLINK. Some ERV models contain a user interface. See Figure 4a-4e for ERV wiring schematics and component arrangements.

EnergyX Control Board (EXCB)
See Figure 5 and Table 8.
The EXCB board is the center of the ERV control system. It contains the major portion of the operating software and controls the operation of the unit. The EXCB continuously monitors input/output channel information received from its inputs and from the Universal Protocol Converter (UPC). The EXCB receives inputs from transducers and discrete inputs. See Options and Accessories section. The EXCB has relay and analog outputs. Modulating ERVs are also equipped with a user interface. The EXCB communicates with a Modbus protocol and is not a CCN device. The EXCB is a reset button that is used to force all the outputs and reset communication.
NOTE: There are hardware jumpers set throughout the. Do not change these jumpers. There are 2 different software versions for the EXCB, one for the constant volume ERV and one for the modulating ERVs.

Universal Protocol Converter (UPC)
See Figure 6 and Table 9.
The UPC board is required to convert CCN into Modbus to allow the EXCB to monitor the rooftops operation. The UPC is connected to the ComfortLINK LEN bus on the rooftop unit (ECB or small connection board when not equipped with ECB).
NOTE: The DIP switches should be set as follows: 1=off, 2=off, 3=on, 4=on, 5=off, 6=off, 7=on, and 8=off. The address rotary switches should be set to 01 (10’s=0 and 1’s=1). Do not change these settings. There are 2 different software versions for the UPC, one for the constant volume ERV and one for the modulating ERVs.

User Interface
Modulating ERVs are equipped with a user interface. It can be used to monitor, test, and configure the ERV. The user interface consists of an LCD screen, an access door, a pushbutton, and a turn pot. The pushbutton and turn pot are behind the access door. See Figure 4e. The LCD will display test points during test mode, configuration points during configuration, and status points during standby. The pushbutton is used to lock in settings changed to points, and pressed again will advance the screen to the next point. The turn pot is used to change settings of the currently displayed point. Turn the pot to the right to advance the setting and turn the pot to the left to change back or decrease the setting. The status points are displayed during standby and provide insight to the ERV operation. The standby screens will cycle every three seconds. The configuration screens will timeout after 15 minutes of inactivity.

Enthalpy Wheel
The enthalpy wheel is the “heat exchangers” of the ERV. It consists of several wheel segments aligned in a cassette assembly. These are not “filters” but made of a desiccant material. The wheel is rotated by a motor and belt, no adjustments required. When the wheel rotates it uses the building exhaust air to pre-conditions the outside air as it passes through the wheel.

Modulating Fan
The modulating ERV is equipped with direct drive variable speed plenum fans for outside air intake and exhaust air. The motors have built in VFDs that accept a 2-10vdc signal from the EXCB. This 2-10vdc signal is used by the VFD to determine the speed to run the motor at (0-100%). Some ERV models are equipped with multiple outside air and/or exhaust air fans. The additional motor’s signal is parallel off the first motor through the coupling signal plug. Motor status switches are also paralleled for additional motors.

Economizer Damper
The economizer damper is a factory installed option that provides a wheel bypass damper. This damper is controlled by the base unit rooftop as an economizer for the purpose of free cooling. The damper is installed adjacent to the ERV wheel to allow outside air to flow through it when opened instead of the wheel.
**Options and Accessories**

The modulating ERV has three optional factory installed options and one field installed accessory: Frost Protection, Motor Status, Filter Maintenance, and 2-position damper (field installed). Refer to Table 8 for where these options wire into the EXCB. NOTE: Constant volume ERVs cannot be ordered with factory installed options.

**Frost Protection**

Frost protection is a factory installed pressure sensor device which senses a differential pressure across the wheel. This occurs if frost builds up on the wheel. The sensor closes its contact when the pressure differential is greater than the setpoint. When the EXCB reads the contact closer it will activate defrost mode. The setpoint is a dial on the sensor, is adjustable from 0.2 to 2.0 inwc, and is factory preset to 2.0 inwc. Changing this setting may cause false signal causing defrost mode when not needed. NOTE: Constant volume ERVs Frost Protection is only field supplied, not available from the factory.

**Motor Status**

The motor status option includes outside and exhaust air fan status switches, and a wheel motion proxy sensor. The fan status switches are built into each motor and provide a feedback to the EXCB if a problem is detected. The feedback signal is a discrete input that is normally open, when closed the EXCB will initiate the motor status alarm. The wheel motion sensor is aimed at the wheel to detect rotation. If the wheel does not rotate at the appropriate speed the sensor will open causing the rotation monitor relay to close a contact to initiate the wheel status alarm. The motion sensor is factory set at the highest speed (clockwise until stop) and should not be changed. Refer to the troubleshooting section for details on the alarms.

**Filter Maintenance**

Filter maintenance consists of two factory installed pressure sensor devices which sense differential pressure across the ERV filters. This occurs if dirt builds up on the filters. There is a separate pressure sensor for each filter (outside air and exhaust air). The sensor closes its contact when the pressure differential is greater than the setpoint. The sensors are wired in parallel, so when the EXCB reads a contact closer from either sensor it will activate the filter alarm. The setpoint is a dial on the sensor, is adjustable from 0.2 to 2.0 inwc, and is factory preset to 2.0 inwc. Changing this setting may cause false signal causing false dirty filter alarms.

**2-position Damper (field install only)**

The 2-position damper accessory is only available for field installation. It is 2 separate damper assemblies that mount behind the outside air and exhaust air hoods. When closed the dampers will seal off the ERV outside openings and prevent unwanted air from being introduced to the rooftop unit. Refer to the 2 position damper accessory installation instructions for more information.
Figure 4a - Constant Volume ERV Wiring Schematic (2-6 ton Unit ONLY)
Figure 4b – Modulating ERV Wiring Schematic
(Note: Three-phase unit configuration shown)
Figure 4c – Modulating ERV Control Box Component Arrangement

Figure 4d – Constant Volume ERV Control Box Component Arrangement
Figure 4e – Low Voltage Control Box Cover – User Interface

Fig. 5 – EnergyX Control Board (EXCB)
<table>
<thead>
<tr>
<th>DISPLAY NAME</th>
<th>POINT DESCRIPTION</th>
<th>SENSOR LOCATION</th>
<th>Input/Output</th>
<th>TYPE OF Input/Output</th>
<th>CONNECTION PIN NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>Download</td>
<td>N/A</td>
<td>Both</td>
<td>Communication</td>
<td>J1</td>
</tr>
<tr>
<td>-</td>
<td>LCD</td>
<td>Low voltage control box</td>
<td>Both</td>
<td>Communication</td>
<td>J2</td>
</tr>
<tr>
<td>-</td>
<td>Power from TRANS</td>
<td>Control box</td>
<td>Input</td>
<td>24VAC</td>
<td>J3, 1-2</td>
</tr>
<tr>
<td>-</td>
<td>Power to J19</td>
<td>Low voltage control box</td>
<td>Output</td>
<td>24VAC</td>
<td>J4, 1</td>
</tr>
<tr>
<td>-</td>
<td>Power to UPC</td>
<td>Low voltage control box</td>
<td>Output</td>
<td>33VDC</td>
<td>J4, 3-4</td>
</tr>
<tr>
<td>-</td>
<td>Frost switch**</td>
<td>Cabinet</td>
<td>Input</td>
<td>Switch</td>
<td>J5, 1-2</td>
</tr>
<tr>
<td>ERV Wheel Status</td>
<td>Wheel Rotation Relay</td>
<td>High voltage control box</td>
<td>Input</td>
<td>Switch</td>
<td>J5, 2-4</td>
</tr>
<tr>
<td>Defrost</td>
<td>Frost Switch</td>
<td>High voltage control box</td>
<td>Input</td>
<td>Switch</td>
<td>J6, 3-4</td>
</tr>
<tr>
<td>ERV Filter Dirty</td>
<td>Filter Status Switches</td>
<td>High voltage control box</td>
<td>Input</td>
<td>Switch</td>
<td>J7, 3-4</td>
</tr>
<tr>
<td>ERV Fan Status</td>
<td>Motor Status Switches</td>
<td>Low voltage control box</td>
<td>Input</td>
<td>Switch</td>
<td>J8, 3-4</td>
</tr>
<tr>
<td>-</td>
<td>Economizer logic enable switch**</td>
<td>N/A</td>
<td>Input</td>
<td>Switch</td>
<td>J10, 1-3</td>
</tr>
<tr>
<td>-</td>
<td>Turn Pot</td>
<td>Low voltage control box cover</td>
<td>Input</td>
<td>0-5v</td>
<td>J15, 1-4</td>
</tr>
<tr>
<td>-</td>
<td>Pushbutton</td>
<td>Low voltage control box cover</td>
<td>Input</td>
<td>Switch</td>
<td>J16, 1-2</td>
</tr>
<tr>
<td>-</td>
<td>Power to UPC**</td>
<td>Cabinet</td>
<td>Output</td>
<td>33VDC</td>
<td>J16, 5-6</td>
</tr>
<tr>
<td>ERV Wheel</td>
<td>Wheel Relay or Wheel Motor**</td>
<td>High voltage control box</td>
<td>Output</td>
<td>Relay</td>
<td>J17, 4</td>
</tr>
<tr>
<td>Outside Air Motor**</td>
<td>N/A</td>
<td>Output</td>
<td>Relay</td>
<td>J18, 4</td>
<td></td>
</tr>
<tr>
<td>2 Pos Damper</td>
<td>2-position damper relay or Power exhaust 2 Motors**</td>
<td>Damper assembly</td>
<td>Output</td>
<td>Relay</td>
<td>J19, 4</td>
</tr>
<tr>
<td>Outside Air Fan(s)</td>
<td>OA fan speed signal</td>
<td>N/A</td>
<td>Output</td>
<td>2-10vdc</td>
<td>J21, 1-3</td>
</tr>
<tr>
<td>Exhaust Air Fan(s)</td>
<td>EX fan speed signal</td>
<td>N/A</td>
<td>Output</td>
<td>2-10vdc</td>
<td>J22, 1-3</td>
</tr>
<tr>
<td>-</td>
<td>Modbus with UPC</td>
<td>Control box</td>
<td>both</td>
<td>Communication</td>
<td>J23, 1-3</td>
</tr>
<tr>
<td>-</td>
<td>Outside Air pressure Transducer</td>
<td>Low voltage control box</td>
<td>Input</td>
<td>Digital 0-5vdc</td>
<td>J24</td>
</tr>
<tr>
<td>-</td>
<td>Exhaust Air pressure Transducer</td>
<td>Low voltage control box</td>
<td>Input</td>
<td>Digital 0-5vdc</td>
<td>J25</td>
</tr>
</tbody>
</table>

* Display name only available with the LCD screen
**Only on Constant Volume ERV units
Fig. 6 – Universal Protocol Converter (UPC)

Table 9 – UPC Input / Output Connections

<table>
<thead>
<tr>
<th>TERMINAL NAME</th>
<th>DESCRIPTION</th>
<th>Input/Output</th>
<th>TYPE OF Input/Output</th>
<th>CONNECTION PIN NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>24V ac</td>
<td>Supply power to UPC</td>
<td>Input</td>
<td>33VDC</td>
<td>1-2</td>
</tr>
<tr>
<td>Port 2</td>
<td>UPC Modbus</td>
<td>both</td>
<td>Communication</td>
<td>1-2</td>
</tr>
<tr>
<td>Port 1a</td>
<td>UPC LEN</td>
<td>both</td>
<td>Communication</td>
<td>1-3</td>
</tr>
<tr>
<td>Port 1b</td>
<td>Not used</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Rnet</td>
<td>BACview User Interface or Download Connection</td>
<td>both</td>
<td>Communication</td>
<td>1-4</td>
</tr>
<tr>
<td>Local Access</td>
<td></td>
<td>both</td>
<td>Communication</td>
<td>1-5</td>
</tr>
</tbody>
</table>
SERVICE & MAINTENANCE

Refer to base unit Controls, Startup, Operation, Service, and Troubleshooting manual for base unit service and maintenance. This section contains service and maintenance for just the ERV unit.

Cleaning
Wheel and Segment Cleaning
Wheel cleaning periodicity is application dependent. Field experience shows that offices, schools and other ‘clean’ environments will often go 10 years before any build up of dust and dirt is noticed. Other applications such as restaurants, casinos and factory environments may experience fairly rapid build-up of contaminants and may require multiple cleanings per year to maintain airflow and recovery efficiencies.

All air-to-air energy recovery devices will become dirty over time, even with well-maintained filtration. Proper filtration usage and changes will improve the life of the wheel transfer segments. Once the wheel is exposed to oils, tars or greases in either the supply or exhaust air streams, these pollutants deposit on the rotary surface which they become ‘sticky’ and begin to attract and hold the dust particles that previously passed thru the wheel. Over time this particle build up can lead to blocked airflow passages, loss of recovery, excessive pressure drop through the wheel and loss of energy savings.

1. Follow steps for wheel and segment removal to remove the affected energy transfer matrix segments. (For one-piece wheels 25 inches in diameter and smaller, remove the entire wheel from the cassette.)
2. Gently brush the wheel face to remove loose accumulated dirt.
3. Wash the segments or small wheels with a non-acid based (evaporator) coil cleaner or alkaline detergent solution. Non-acid based coil cleaner such as KMP Acti-Clean AK-1 concentrate in a 5% solution has been demonstrated to provide excellent results. DO NOT use acid based cleaners, aromatic solvents, temperatures in excess of 170°F or steam! Damage to the wheel will result.
4. Soak the wheel and/or segments in the cleaning solution until all grease and tar deposits are loosened. An overnight soak may be required to adequately loosen heavy deposits of tar and oil based contaminants.
5. Internal heat exchange surfaces may be examined by separating the polymer strips by hand. (Note: some staining of the desiccant may remain and is not harmful to performance.)
6. After soaking, rinse the dirty solution from the wheel until the water runs clear.
7. Allow excess water to drain prior to replacing segments in the wheel or reinstalling the wheel in the cassette. A small amount of water remaining in the wheel will be dried out by the airflow.

Filters
Clean or replace at start of each heating and cooling seasons, or more often if operating conditions require (based on filter manufacture recommendation or filter status alarm indication). Refer to Tables 1 and 2 for type and size of filters.

Outdoor-Air Inlet Screens
Clean screens with steam or hot water and a mild detergent at the beginning of each heating and cooling season. Do not use throwaway filters in place of screens.

Wheel Drive Adjustment
The wheel motor and drives do not require adjustment. The wheel drive pulley is secured to the drive motor shaft by a set screw. The set screw is secured with removable locktite to prevent loosening. Annually confirm set screw is secure. The wheel drive belt is a urethane stretch belt designed to provide constant tension throughout the life of the belt. Inspect the drive belt annually for proper tracking and tension. A properly tensioned belt will turn the wheel immediately after power is applied with no visible slippage during start-up.

Wheel Air Seal Adjustment
Diameter seals are provided on each wheel cassette to minimize transfer of air between the counter flowing airstreams. Follow below instructions if adjustment is needed.
1. Loosen diameter seal adjusting screws and back seals away from the wheel surface. See figure 7.
2. Rotate the wheel clockwise until two opposing spokes are hidden behind the bearing support beam.
3. Using a folded piece of paper as a feeder gauge, position the paper between the seal and wheel surface.
4. Adjust the seal towards wheel surface until a slight friction on the feeder gauge (paper) is detected while moving the gauge along the length of the spoke.
5. Retighten adjustment screws and re-check clearance with the feeder gauge.

Figure 7 – Diameter Seal Adjustment

Wheel and Segment Removal / Installation
The wheel and segments represent a substantial portion of the value of the cassette therefore must be handled with care and never be dropped. Use a suitable crate or harness to lift wheel and segments to a roof surface, never use the shipping cartons for this purpose. Wheel and segments may require “slight” persuasion during installation and removal but never force or impacted with a hammer or similar tool. The wheel assembly can be removed and installed or the wheel or segments can be removed from the assembly.

<table>
<thead>
<tr>
<th>CAUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>The weight of the wheel assembly must be supported when assembly is extended from the unit chassis to avoid damage to wheel or unit.</td>
</tr>
</tbody>
</table>
ERV wheels can be a whole wheel assembly or a segmented wheel assembly. Constant volume ERVs and the 2 to 6 ton low CFM modulating ERV have a 19 inch whole wheel assembly. Modulating 2 to 6 ton High CFM and 7.5 to 12.5 ton Low CFM ERVs have a 25 inch whole wheel assembly. All other ERVs are segmented wheel assemblies. Follow the correct section below for removing and installing specific wheels from their assemblies. To remove or installed the whole assembly, simply side in or out the assembly noting the motor power plug.

**Wheel Segment Removal / Installation**
1. Turn off, lockout and tag-out electrical power to unit.
2. Open access door to the EnergyX module on back side of the unit.
3. Slide the entire wheel assembly out until the necessary segment(s) of the wheel can be accessed. Support the weight of the wheel assembly as necessary to avoid damage to wheel or unit.
4. Position one segment opening at the top of the cassette.
5. Unlock and open the segment retaining brackets on both sides of the selected segment opening. See Figure 9.
7. Close segment retaining latches and rotate wheel 180° to remove next segment. Follow this pattern to remove all segments and keep wheel balanced.
8. To install the wheel segments, hold the segment as vertically as possible and centered between spokes, insert nose of segment downward between the hub plates. See Figure 10. **NOTE:** The face of the segment, with the imbedded stiffener (vertical support between nose and rim end of segment) must face the motor side of the cassette. See Figure 11.
9. Ease the segment downward until its outer rim clears the inside of the wheel rim. Press the segment inward against the spoke flanges.
10. Close and latch segment retaining brackets to the position shown in Figure 9. Make certain the retaining bracket is fully engaged under the catch.
11. Slowly rotate, by hand, the first installed segment to the bottom of the cassette, and then install the second segment opposite the first. Repeat this sequence with the two installed segments rotated to the horizontal position to balance the weight of installed segments.
12. Continue this sequence with the remaining segments as necessary.
13. When complete, close access door and remove lockout and tagout to apply power to unit.

**CAUTION**
Weight of the installed segment will cause the wheel to accelerate in rotation as segments are removed. Failure to maintain control of the wheel rotation while installing all segments could cause severe injury to fingers or hand caught between revolving spokes and the bearing support beam. The handle of a tool such as a hammer, should be inserted through spokes and above or below bearing support beams to limit rotation of unbalanced wheel. See Figure 8.

---

**Figure 8 – Wheel Stop**

3. Slide the entire wheel assembly out until the necessary segment(s) of the wheel can be accessed. Support the weight of the wheel assembly as necessary to avoid damage to wheel or unit.
4. Position one segment opening at the top of the cassette.
5. Unlock and open the segment retaining brackets on both sides of the selected segment opening. See Figure 9.

**Figure 9 – Segment Retaining Brackets**

7. Close segment retaining latches and rotate wheel 180° to remove next segment. Follow this pattern to remove all segments and keep wheel balanced.
8. To install the wheel segments, hold the segment as vertically as possible and centered between spokes, insert nose of segment downward between the hub plates. See Figure 10. **NOTE:** The face of the segment, with the imbedded stiffener (vertical support between nose and rim end of segment) must face the motor side of the cassette. See Figure 11.
9. Ease the segment downward until its outer rim clears the inside of the wheel rim. Press the segment inward against the spoke flanges.
10. Close and latch segment retaining brackets to the position shown in Figure 9. Make certain the retaining bracket is fully engaged under the catch.
11. Slowly rotate, by hand, the first installed segment to the bottom of the cassette, and then install the second segment opposite the first. Repeat this sequence with the two installed segments rotated to the horizontal position to balance the weight of installed segments.
12. Continue this sequence with the remaining segments as necessary.
13. When complete, close access door and remove lockout and tagout to apply power to unit.

---

**Figure 10 – Segment Removal**

**Figure 11 – Imbedded Wheel Stiffeners**
(shown from motor side of wheel assembly)
Whole Wheel Removal / Installation
19” wheel
These wheels are secured to the shaft and bearing support beam by a Philips head screw and hub cover. Follow the steps below for removal and reverse for installation. See Figure 12.
1. Turn off, lockout and tag-out electrical power to unit.
2. Open access door to the EnergyX module on back side of the unit.
3. Remove front seal assembly (pulley side of the cassette) if present.
4. Remove belt from pulley and position temporarily around wheel rim
5. Remove the hub cover from the wheel NOTE: The wheel to shaft alignment pin under the hub cover. Insure this pin engages the notch at the end of the shaft when reinstalling the wheel.
6. Pull the wheel straight off the shaft. Handle with care.

Whole Wheel Removal / Installation
19” wheel
These wheels include the shaft and are secured to two wheel support beams by two flange bearings with locking collars. Follow the steps below for removal and reverse for installation. See Figure 13.
1. Loosen the two set screws on each of the two wheel bearings.
2. Remove belt from pulley and position temporarily around wheel rim
3. Remove pulley side wheel support beam with bearing, by removing four support beam screws.
4. Pull the wheel with shaft straight out of the motor side wheel support beam and bearing. Handle wheel with care.
5. When replacing wheel be certain to tighten four bearing set screws. Premature bearing failure can occur if not set tightly.

Figure 12 – 19” Wheel Mount

Outside Air and Exhaust Hood Removal
1. Turn off, lockout and tag-out electrical power to unit.
2. Remove the hood by removing the seal-tek screws along the perimeter of the hood. Note: even after all screws have been removed from entire perimeter of hood, it will still be difficult to remove due to the gasket applied from original installation. See Figure 1h and 14.
3. Do not damage plastic tubing running from high and low labeled grommets inside the EnergyX unit to high and low labeled brass connectors in the outside air hood. Cut the tubing directly at the end of the brass connector. See Figures 1e – 1g.

Motorized 2-Position Damper Removal
1. Turn off, lockout and tag-out electrical power to unit.
2. Remove the outdoor air and exhaust hoods per instructions above.
3. Remove the 2-position motorized dampers by removing seal-tek screws from the perimeter mating flange of the damper. Support the weight of the damper assembly while removing screws. Note: even after all screws have been removed from entire perimeter of hood, it will still be difficult to remove due to the gasket applied from original installation. See Figures 1h and 14.
4. Disconnect the two 4-pin electrical plugs for the damper actuator from the wiring harness inside the air chambers of the EnergyX unit. See figure 15.
5. Remove the plastic tubing from the grommets in the damper assembly. See figure 1g.
Figure 14 – Hoods and dampers

Figure 15 – Panel Removal and 2-Position Plug Connections
Outside Air and Exhaust Fans Replacement

1. Turn off, lockout and tag-out electrical power to unit.
2. Remove the exhaust and/or outside air hoods per instructions above.
3. Remove the damper assemblies as follows:
   - Units with Barometric Damper: Remove the barometric damper from the front of the EnergyX unit. The damper is attached by seal-tek screws. Note: even after all screws have been removed from the perimeter of hood, it will still be difficult to remove due to the gasket applied from original installation. See Figure 14.
   - Units with 2-Position Motorized Dampers - Remove the 2-position motorized dampers per applicable section in this manual. See Figure 14.
4. PG models 03-14 only: Remove the front rail from the front panel and side rails of the EnergyX unit. The front rail is attached by seal-tek screws to the front panel and four seal-tek screws to each side rail. See Figure 15.
5. Remove the screws along the front edge and sides edges of the EnergyX module top panel. Lift up the front section of the top panel away from the EnergyX unit and place a spacer between the top panel and EnergyX unit. This will allow access to the screws across the top of the front panel.
6. Remove EnergyX module front panel(s) by removing seal-tek screws in each panel. See Figure 15. On PG 03-14 the front panel is one piece, and on PM 16-25 the front panel is two pieces.
7. Remove the Accessory control box cover. See Figure 3. Remove the high voltage control box cover. Locate the power distribution terminal block. This terminal block routes electrical power to all fans in the EnergyX module.
8. Locate the fan needing to be replaced and trace the power wire cable back to the high voltage control box.
9. Disconnect the corresponding power wires from distribution block. See Figure 3. The power wire cable consists of four legs (red, black, white, and green) in black insulation. Pull the red, black, and white wires from the distribution block and cut the green wire from the grounding wire group.
   - NOTE: Leave room for splicing new green wire(s) to the ground lug.
10. Disconnect the blower’s control and maintenance plugs. The supply fan control wires are blue and black, and its maintenance wires are purple and yellow. The exhaust fan control wires are red and black, and its maintenance wires are pink and yellow.
   - NOTE: On multiple supply or exhaust fan systems the control and maintenance wires are daisy chained from the fan closest to the control box to the one furthest. The blower control wires will plug into the extra plug on the fan, and the blower maintenance wires will be spliced together via wire nuts.
11. Pull the power wires through the center divider and economizer panel (if applicable). Make sure all wires are free from the EnergyX unit and directly behind the fan being replaced. Relief panels are provided and can be removed to allow room for plugs to pass through center divider and economizer panel.
12. Remove the fan mounting bolts and discard. New bolts are provided with replacement fan. See Figure 16. Remove the fan assembly from EnergyX unit.

Figure 16 – Fan Mounting Bolts

15. Before installing the replacement fan(s), pre run as much of the power wire, blower control wires, and blower maintenance wires as possible. Be sure to run all three the exact same way that they were removed. The power wire will go to the distribution block. The control and maintenance wires will have plugs.
16. Attach the red, black, white power wires back into their corresponding lugs on the distribution block. Using a wire nut, splice the green wire back onto to wire that was cut during the fan removal process.
17. Connect the blower control and maintenance wire plugs to unit plug on single fan (closest to control box) or to the fan closest to the control box (on furthest fan replacement).
18. After all wiring is complete secure the replacement fan into the new fan mounting bolts provided with replacement fan. Installation of the new fan is complete.
19. Now all the chassis pieces that were removed must be attached back to the EnergyX chassis.
20. Reinstall the barometric relief dampers or 2-position dampers as applicable. Apply new gasket to all flanges and surfaces where gasketing was originally applied.
21. Reinstall the outside air and exhaust hood assemblies. Apply new gasket to all flanges and surfaces where gasketing was originally applied. Attach the plastic tubing to the correct brass connector inside the outside air hood.
22. Reinstall the aluminum water filter inside the outside air hood using the provided filter clips.
APPENDIX

APPENDIX – A: BASE UNIT DIMENSIONS
48PG 03-07 Low CFM – Constant Volume
48PG 03-07 Modulating
48PG 08-14 Modulating
48PM 16-24 Modulating
48PM 28 Modulating

50PG 03-07 Low CFM – Constant Volume
50PG 03-07 Modulating
50PG 08-14 Modulating
50PM 16-24 Modulating
50PM 28 Modulating

APPENDIX – B: EXHAUST FAN PERFORMANCE
PG 03-07 Low & High CFM Modulating Exhaust Fan Curves
PG 08-14 Low & High CFM Modulating Exhaust Fan Curves
PM 16-24 Low & High CFM Modulating Exhaust Fan Curves
PM 28 Low & High CFM Modulating Exhaust Fan Curves
1. For outdoor use only.
2. Weights shown are for 48PGD3-07 low heat unit with aluminum coils, and standard drive. For weights of optional equipment consult the product data manual.
3. Do not locate adjacent units with flue discharge facing energy recovery inlet.
4. Minimum clearances (local codes or jurisdictions may prevail):
   - Right side: 36" condenser airflow
   - Left side: 42" outdoor airflow & exhaust
   - Front side: 54" service (indoor fan sled removal, else 36")
   - 36" condenser airflow
   - 42" to another unit (per NEC)
   - 36" unit to ungrounded surface (per NEC)
   - 42" unit to grounded surface (per NEC)
   - Flue outlet: 48" to combustible surfaces, utility meters, regulators or relief (18" when using accessory flue discharge deflector)
   - Rear side: 72" condenser airflow
   - 54" condensate pan removal
   - 36" service access
   - 12" horizontal supply
   - Bottom: 1" bottom of base pan to combustible surface when not using roof curb
   - 0" bottom of base rail to combustible surfaces when not using roof curb
   - Top: 72" condenser exhaust
   - Fence walls: Louvered or chain link fences require no clearance for airflow. Clearance for combustible surfaces and NEC codes apply.
   - Removable fence/barricade requires no service clearance.
   - Clearance for combustible surfaces and NEC codes apply.
   - Dimensions are from outside of base rail.
   - For reduced service and operational clearances contact Carrier sales and application engineer.
5. Down shot ducts designed to be attached to accessory roof curb only. If unit is mounted side supply, ducts must be supported by cross braces as done on accessory roof curb.
6. Horizontal return requires accessory curb adaptor.
7. Dimensions in ( ) are in millimeters and weights in kilograms.
8. Units may be installed on combustible floors made from class A, B or C roof covering material if set on base rails.

**Center of Gravity**

**Direction of Airflow**

**Data Shown for Standard Unit with Low Heat, Standard Coils, Standard IFM Drive and No Factory Options**

---

**Table: Standard Unit Dimensions**

<table>
<thead>
<tr>
<th>RTU Type</th>
<th>BRU Type</th>
<th>Weight (lbs)</th>
<th>Center of Gravity (inches)</th>
<th>Center of Gravity (meters)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low 5M</td>
<td>1099</td>
<td>494</td>
<td>26.4 116.6 9.9</td>
<td>699 47.1 2.5</td>
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<tr>
<td>Medium 5M</td>
<td>1096</td>
<td>490</td>
<td>26.1 116.6 9.8</td>
<td>693 47.1 2.5</td>
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<tr>
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<td>1095</td>
<td>503</td>
<td>20.2 118.5 9.7</td>
<td>606 51.9 2.6</td>
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<tr>
<td>Low 7M</td>
<td>1216</td>
<td>552</td>
<td>28.0 118.5 9.5</td>
<td>711 47.0 2.4</td>
</tr>
<tr>
<td>Medium 7M</td>
<td>1214</td>
<td>561</td>
<td>28.2 118.5 9.4</td>
<td>711 47.0 2.4</td>
</tr>
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<td>1214</td>
<td>561</td>
<td>28.9 118.5 9.3</td>
<td>710 46.9 2.4</td>
</tr>
<tr>
<td>Low 8M</td>
<td>1270</td>
<td>579</td>
<td>28.0 118.5 9.3</td>
<td>725 46.0 2.4</td>
</tr>
<tr>
<td>Medium 8M</td>
<td>1270</td>
<td>579</td>
<td>28.0 118.5 9.3</td>
<td>725 46.0 2.4</td>
</tr>
<tr>
<td>High 8M</td>
<td>1270</td>
<td>579</td>
<td>28.0 118.5 9.3</td>
<td>725 46.0 2.4</td>
</tr>
</tbody>
</table>

---

**Notes:**

- Data shown for standard unit with low heat, standard coils, standard IFM drive and no factory options.
- Unit dimensions and weights are approximate and subject to change.
- Consult product data manual for detailed specifications.
- For installation and operation, refer to the installation manual provided with the unit.

---

**Footer:**

**United Technologies Corporation, Carrier**

**P.O. Box 4808, Syracuse, NY 13221**

**Drawing Control:**

- 48PG 03-07 with Modulating Energy X
- 48H504250

**Revision:**

- 08/04/09
- N/A
Data shown for standard unit with low heat, standard coils, standard IFM drive and no factory options.

1. FOR OUTDOOR USE ONLY.
2. WEIGHTS SHOWN ARE FOR 48PG05-14 LOW HEAT UNIT WITH ALUMINUM COILS, AND STANDARD DRIVE. FOR WEIGHTS OF OPTIONAL EQUIPMENT CONSULT THE PRODUCT DATA MANUAL.
3. DO NOT LOCATE ADJACENT UNITS WITH FLUE DISCHARGE FACING ENERGY RECOVERY UNIT.
4. MINIMUM CLEARANCES (LOCAL CODES OR JURISDICTIONS MAY PREVAIL): RIGHT SIDE: 36" CONDENSER AIRFLOW
   LEFT SIDE: 42" OUTDOOR AIRFLOW & EXHAUST
   FRONT SIDE: 54" SERVICE (INDOOR PAN SLED REMOVAL, ELSE 36")
   REAR SIDE: 54" CONDENSER AIRFLOW
   BOTTOM: 1" BOTTOM OF BASE PAN TO COMBUSTIBLE SURFACES WHEN NOT USING ROOF Curb
   TOP: 72" CONDENSER EXHAUST
   FENCE: LOUVERED OR CHAIN LINK FENCES REQUIRE NO CLEARANCE FOR AIRFLOW.
   CLEARANCE FOR COMBUSTIBLE SURFACES AND NEC CODES APPLY.
   REMOVABLE FENCE/BARRICADE REQUIRES NO SERVICE CLEARANCE.
   CLEARANCE FOR COMBUSTIBLE SURFACES AND NEC CODES APPLY.

DIMENSIONS ARE FROM OUTSIDE OF BASE RAIL.
FOR REDUCED SERVICE AND OPERATIONAL CLEARANCES CONTACT CARRIER SALES & APPLICATION ENGINEER.
5. DOWNSIDE DUCTS DESIGNED TO BE ATTACHED TO ACCESSORY ROOF CURB ONLY. IF UNIT IS MOUNTED SIDE SUPPLY, DUCTS MUST BE SUPPORTED BY CROSS BRACES AS DONE ON ACCESSORY ROOF CURB.
6. HORIZONTAL RETURN REQUIRES ACCESSORY CURB ADAPTOR.
7. DIMENSIONS IN [] ARE IN MILLIMETERS AND WEIGHTS IN KILOGRAMS.
8. UNITS MAY BE INSTALLED ON COMBUSTIBLE FLOORS MADE FROM CLASS A, B OR C ROOF COVERING MATERIAL IF SET ON BASE RAILS.

CENTER OF GRAVITY

DIRECTION OF AIRFLOW

OUTSIDE AIR
HOOD

EXHAUST
HOOD

CONDENSER
ACCESS COVER

3/4"-14 NPT CONDENSATE DRAIN

CONDENSATE ACCESS COVER

CENTER OF GRAVITY

CLEANOUT PANEL

CONDENSER COIL

OUTSIDE AIR
HOOD

EXHAUST
HOOD

DATA SHOWN FOR STANDARD UNIT WITH LOW HEAT, STANDARD COILS, STANDARD IFM DRIVE AND NO FACTORY OPTIONS
1. FOR OUTDOOR USE ONLY.
2. WEIGHTS SHOWN ARE FOR 48PM16-24 LOW HEAT UNIT WITH ALUMINUM COILS, AND STANDARD DRIVE. FOR WEIGHTS OF OPTIONAL EQUIPMENT CONSULT THE PRODUCT DATA MANUAL.
3. DO NOT LOCATE ADJACENT UNITS WITH FLUE DISCHARGE FACING ENERGY RECOVERY INLET.
4. MINIMUM CLEARANCES (LOCAL CODES OR JURISDICTIONS MAY PREVAIL):
   - RIGHT SIDE: 72" CONDENSER AIRFLOW
   - LEFT SIDE: 120" OUTDOOR AIRFLOW & EXHAUST
   - FRONT SIDE: 36" SERVICE
   - REAR SIDE: 72" CONDENSER EXHAUST
   - BOTTOM: 14" BOTTOM OF BASE PAN TO COMBUSTIBLE SURFACES WHEN NOT USING ROOF CURB
   - TOP: 72" CONDENSER EXHAUST

5. DOWN SHOT DUCTS DESIGNED TO BE ATTACHED TO ACCESSORY ROOF CURB ONLY. IF UNIT IS MOUNTED SIDE SUPPLY, DUCTS MUST BE SUPPORTED BY CROSS BRACES AS DONE ON ACCESSORY ROOF CURB.
6. HORIZONTAL RETURN REQUIRES ACCESSORY CURB ADAPTOR.
7. DIMENSIONS IN [ ] ARE IN MILLIMETERS AND WEIGHT IN KILOGRAMS.
8. UNITS MAY BE INSTALLED ON COMBUSTIBLE FLOORS MADE FROM CLASS A, B OR C ROOF COVERING MATERIAL IF SET ON BASE RAILS.

<table>
<thead>
<tr>
<th>RTU TYPE</th>
<th>ERV TYPE</th>
<th>Weight (lbs)</th>
<th>Center of Gravity (inches)</th>
<th>Center of Gravity (mm)</th>
<th>Weight (kg)</th>
<th>Center of Gravity (inches)</th>
<th>Center of Gravity (mm)</th>
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<td>Low CFM</td>
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<td>X = 28.7, Y = 66.6, Z = 1013</td>
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<td>48PM24</td>
<td>Low CFM</td>
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<td>X = 728, Y = 1750</td>
<td>Z = 1750</td>
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CENTER OF GRAVITY
DIRECTION OF AIRFLOW

UNITS MAY BE INSTALLED ON COMBUSTIBLE FLOORS MADE FROM CLASS A, B OR C ROOF COVERING MATERIAL IF SET ON BASE RAILS.
1. FOR OUTDOOR USE ONLY.
2. WEIGHTS SHOWN ARE FOR 48PM16-24 LOW HEAT UNIT WITH ALUMINUM COILS, AND STANDARD DRIVE. FOR WEIGHTS OF OPTIONAL EQUIPMENT CONSULT THE PRODUCT DATA MANUAL.
3. DO NOT LOCATE ADJACENT UNITS WITH FLUE DISCHARGE FACING ENERGY RECOVERY INLET.
4. MINIMUM CLEARANCES (LOCAL CODES OR JURISDICTIONS MAY PREVAIL):
   - RIGHT SIDE: 72" CONDENSER AIRFLOW
   - LEFT SIDE: 120" OUTDOOR AIRFLOW & EXHAUST
   - FRONT SIDE: 36" SERVICE
   - FLUE OUTLET: 48" TO COMBUSTIBLE SURFACES, UTILITY METERS, REGULATORS OR RELIEF
   - REAR SIDE: 72" CONDENSER AIRFLOW
   - BOTTOM: 14" BOTTOM OF BASE PAN TO COMBUSTIBLE SURFACES WHEN NOT USING ROOF CURB
   - TOP: 72" CONDENSER EXHAUST
   - FENCE: LOUVERED OR CHAIN LINK FENCES REQUIRE NO CLEARANCE FOR AIRFLOW. CLEARANCE FOR COMBUSTIBLE SURFACES AND NEC CODES APPLY.
   - REMOVABLE FENCE/BARRICADE REQUIRES NO SERVICE CLEARANCE. CLEARANCE FOR COMBUSTIBLE SURFACES AND NEC CODES APPLY.
5. DOWN SHOT DUCTS DESIGNED TO BE ATTACHED TO ACCESSORY ROOF CURB ONLY. IF UNIT IS MOUNTED SIDE SUPPLY, DUCTS MUST BE SUPPORTED BY CROSS BRACES AS DONE ON ACCESSORY ROOF CURB.
6. HORIZONTAL RETURN REQUIRES ACCESSORY CURB ADAPTOR.
7. DIMENSIONS IN [ ] ARE IN MILLIMETERS AND WEIGHT IN KILOGRAMS.
8. UNITS MAY BE INSTALLED ON COMBUSTIBLE FLOORS MADE FROM CLASS A, B OR C ROOF COVERING MATERIAL IF SET ON BASE RAILS.

CENTER OF GRAVITY
DIRECTION OF AIRFLOW
1. FOR OUTDOOR USE ONLY.
2. WEIGHTS SHOWN ARE FOR 48PM28 LOW HEAT UNIT WITH ALUMINUM COILS, AND STANDARD DRIVE. FOR WEIGHTS OF OPTIONAL EQUIPMENT CONSULT THE PRODUCT DATA MANUAL.
3. DO NOT LOCATE ADJACENT UNITS WITH FLUE DISCHARGE FACING ENERGY RECOVERY INLET.
4. MINIMUM CLEARANCES (LOCAL CODES OR JURISDICTIONS MAY PREVAIL):
   - RIGHT SIDE: 72" CONDENSER AIRFLOW
   - LEFT SIDE: 72" CONDENSER AIRFLOW & EXHAUST
   - FRONT SIDE: 36" SERVICE
   - 96" COIL REMOVAL
   - 42" TO ANOTHER UNIT (PER NEC)
   - 36" UNIT TO UNGROUND UNIT (PER NEC)
   - 42" UNIT TO GROUND UNIT (PER NEC)
   - FLUE OUTLET: 48" TO COMBUSTIBLE SURFACES, UTILITY METERS, REGULATORS OR RELIEF
   - REAR SIDE: 72" CONDENSER EXHAUST
   - 12" HORIZONTAL SUPPLY
   - BOTTOM: 14" BOTTOM OF BASE PAN TO COMBUSTIBLE SURFACES WHEN NOT USING ROOF CURB
   - 72" BOTTOM OF BASE RAIL TO COMBUSTIBLE SURFACES WHEN NOT USING ROOF CURB
   - TOP: 72" CONDENSER EXHAUST
   - FENCE: COVERED OR CHAIN LINK FENCES REQUIRE NO CLEARANCE FOR AIRFLOW. CLEARANCE FOR COMBUSTIBLE SURFACES AND NEC CODES APPLY.
   - CLEARANCE FOR COMBUSTIBLE SURFACES AND NEC CODES APPLY.
5. DOWN SHOT DUCTS DESIGNED TO BE ATTACHED TO ACCESSORY ROOF CURB ONLY. IF UNIT IS MOUNTED SIDE SUPPLY, DUCTS MUST BE SUPPORTED BY CROSS BRACES AS DONE ON ACCESSORY ROOF CURB.
6. HORIZONTAL RETURN REQUIRES ACCESSORY CURB ADAPTOR.
7. DIMENSIONS ARE FROM OUTSIDE OF BASE RAIL.
8. UNITS MAY BE INSTALLED ON COMBUSTIBLE FLOORS MADE FROM CLASS A, B OR C ROOF COVERING MATERIAL IF SET ON BASE RAILS.

CENTER OF GRAVITY

DIRECTION OF AIRFLOW

RTU TYPE | ERV TYPE | Weight (lbs) | Center of Gravity (inches) X Y Z | Center of Gravity (mm) X Y Z
--- | --- | --- | --- | ---
48PM28 | Low CFM | 3691 | 42.3 33.0 69.0 | 1075 839 1752
48PM28 | High CFM | 3823 | 40.7 33.3 68.3 | 1034 846 1735

UNITED TECHNOLOGIES CORPORATION
P.O. BOX 4808
SYRACUSE, NY 13221

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UNITED TECHNOLOGIES CARRIER
P.O. BOX 4808
SYRACUSE, NY 13221

N/A 08/04/09 48PM28 W/ MODULATING ENERGYX 50TG506987
1. FOR OUTDOOR USE ONLY.
2. WEIGHTS SHOWN ARE FOR 48PM28 LOW HEAT UNIT WITH ALUMINUM COILS, AND STANDARD DRIVE. FOR WEIGHTS OF OPTIONAL EQUIPMENT CONSULT THE PRODUCT DATA MANUAL.
3. DO NOT LOCATE ADJACENT UNITS WITH FLUE DISCHARGE FACING ENERGY RECOVERY INLET.
4. MINIMUM CLEARANCES (LOCAL CODES OR JURISDICTIONS MAY PREVAIL):
   - RIGHT SIDE: 72" CONDENSER AIRFLOW
   - LEFT SIDE: 120" OUTDOOR AIRFLOW & EXHAUST
   - FRONT SIDE: 36" SERVICE
   - 72" CONDENSER AIRFLOW
   - 96" COIL REMOVAL
   - 42" TO ANOTHER UNIT (PER NEC)
   - 36" UNIT TO UNGROUNDED SURFACE (PER NEC)
   - 42" UNIT TO GROUNDED SURFACE (PER NEC)
   - FLUE OUTLET: 48" TO COMBUSTIBLE SURFACES, UTILITY METERS, REGULATORS OR RELIEF
   - 72" CONDENSER AIRFLOW
   - 36" SERVICE ACCESS
   - 36" UNIT TO GROUNDED SURFACE (PER NEC)
   - BOTTOM: 14" BOTTOM OF BASE RAIL TO COMBUSTIBLE SURFACES WHEN NOT USING ROOF CURB
   - 10" BOTTOM OF BASE RAIL TO COMBUSTIBLE SURFACES WHEN USING ROOF CURB
   - TOP: 72" CONDENSER EXHAUST
   - CHAIN LINK FENCES REQUIRE NO CLEARANCE FOR AIRFLOW.
   - CLEARANCE FOR COMBUSTIBLE SURFACES AND NEC CODES APPLY.
   - REMOVAL BARRICADE REQUIRE NO SERVICE CLEARANCE. CLEARANCE FOR COMBUSTIBLE SURFACES AND NEC CODES APPLY.
   - DIAMETERS ARE FROM OUTSIDE OF BASE RAIL.
   - DIMENSIONS IN [ ] ARE IN MILLIMETERS AND WEIGHT IN KILOGRAMS.
   - UNITS MAY BE INSTALLED ON COMBUSTIBLE FLOORS MADE FROM CLASS A, B OR C ROOF COVERING MATERIAL IF SET ON BASE RAILS.

### RTU ERV Weight Center of Gravity (inches) Center of Gravity (mm)
<table>
<thead>
<tr>
<th>RTU TYPE</th>
<th>TYPE</th>
<th>Weight (lbs)</th>
<th>Weight (kg)</th>
<th>X</th>
<th>Y</th>
<th>Z</th>
<th>X</th>
<th>Y</th>
<th>Z</th>
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<tr>
<td>48PM28</td>
<td>Low CFM</td>
<td>3691</td>
<td>1674</td>
<td>42.3</td>
<td>33.0</td>
<td>69.0</td>
<td>1075</td>
<td>839</td>
<td>1752</td>
</tr>
<tr>
<td>48PM28</td>
<td>High CFM</td>
<td>3823</td>
<td>1734</td>
<td>40.7</td>
<td>33.3</td>
<td>68.3</td>
<td>1034</td>
<td>846</td>
<td>1735</td>
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</table>

CENTER OF GRAVITY

DIRECTION OF AIRFLOW

RIGHT SIDE

REAR

OUTSIDE AIR HOOD

EXHAUST AIR HOOD

CONDENSATE ACCESS COVER

ERV WHEEL AND FILTER ACCESS DOOR

CONDENSATE DRAIN 3/4" NPT

SUBMITTED IF THESE DRAWINGS OR DOCUMENTS DOES NOT CONSTITUTE PART PERFORMANCE OR ACCEPTANCE OF CONTRACT.

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Data shown for standard unit with no heat, standard coils, standard IFR drive and no factory options

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<tr>
<th>RF2 TYPE</th>
<th>AIR DOLLSY (lbs)</th>
<th>CENTER OF GRAVITY (inches)</th>
<th>CENTER OF GRAVITY (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>X</td>
<td>Y</td>
</tr>
<tr>
<td>DEP054</td>
<td>Low CFM, 1100 lbf</td>
<td>20.5</td>
<td>18.9</td>
</tr>
<tr>
<td>DEP054</td>
<td>High CFM, 1221 lbf</td>
<td>27.7</td>
<td>18.5</td>
</tr>
</tbody>
</table>

1. For outdoor use only.
2. Weights shown are for 50PG03-07 unit with no electric heat, aluminum coils, and standard drive. For weights of optional equipment consult the product data manual.
3. Minimum clearances (local codes or jurisdictions may prevail):
   - Right side: 36" condenser airflow
   - Left side: 42" outdoor airflow & exhaust
   - Front side: 54" service (indoor pan s/e removal, else 36"
   - Rear side: 72" condenser airflow
   - Bottom: 1" bottom of base pan to combustible surfaces when not using roof curb
   - Top: 72" condenser exhaust

Vertical discharge: 1" to combustible materials for first 12" of duct tube.

Fences/walls: Louvered or chain link fences require no clearance for airflow. Clearances for combustible surfaces and NEC codes apply. Removable fence/barricade requires no service clearance. Clearances for combustible surfaces and NEC codes apply.

Dimensions are from outside of base rail. For reduced service and operational clearances contact Carrier sales & application engineer.

4. Down shot ducts designed to be attached to accessory roof curb only. If unit is mounted side supply, ducts must be supported by cross braces as done on accessory roof curb.
5. Horizontal return requires accessory curb adaptor.
6. Dimensions in [ ] are in millimeters and weights in kilograms.
7. Units may be installed on combustible floors made from Class A, B or C roof covering material if set on base rails.

Data shown for standard unit with low heat, standard coils, standard IFR drive and no factory options.
Data shown for standard unit with no heat, standard coils, standard IFR drive and no factory options

1. FOR OUTDOOR USE ONLY.
2. WEIGHTS SHOWN ARE FOR 50PG03-07 UNIT WITH NO ELECT HEAT, ALUMINUM COILS, AND STANDARD DRIVE. FOR WEIGHTS OF OPTIONAL EQUIPMENT CONSULT PRODUCT DATA MANUAL.
3. MINIMUM CLEARANCES (LOCAL CODES OR JURISDICTIONS MAY PREVAIL):
   - **RIGHT SIDE:** 36” CONDENSER AIRFLOW
   - **LEFT SIDE:** 42” OUTDOOR AIRFLOW & EXHAUST
   - **FRONT SIDE:** 54” SERVICE (INDOOR PAN SLED REMOVAL, ELSE 36”)
   - **CONDENSER AIRFLOW**
   - **2’ TO ANOTHER UNIT (PER NEC)**
   - **36” UNIT TO UNGROUNDED SURFACE (PER NEC)**
   - **42” UNIT TO GROUNDED SURFACE (PER NEC)**
   - **REAR SIDE:** 72” CONDENSER AIRFLOW
   - **54” CONDENSATE PAN REMOVAL**
   - **36” SERVICE ACCESS**
   - **12” HORIZONTAL SUPPLY**
   - **BOTTOM:** 1” BOTTOM OF BASE PAN TO COMBUSTIBLE SURFACES WHEN NOT USING ROOF CURB
   - **0” BOTTOM OF BASE RAIL TO COMBUSTIBLE SURFACES WHEN NOT USING ROOF CURB**
   - **TOP:** 72” CONDENSER EXHAUST

   **VERTICAL DISCHARGE:** 1” TO COMBUSTIBLE MATERIALS FOR FIRST 12” OF DUCT TUBE

   **FENCE/WALLS:** LOUVERED OR CHAIN LINK FENCES REQUIRE NO CLEARANCE FOR AIRFLOW. CLEARANCE FOR COMBUSTIBLE SURFACES AND NEC CODES APPLY. REMOVABLE FENCE/BARRICADE REQUIRES NO SERVICE CLEARANCE. CLEARANCE FOR COMBUSTIBLE SURFACES AND NEC CODES APPLY.

   DIMENSIONS ARE FROM OUTSIDE OF BASE RAIL.

   FOR REDUCED SERVICE AND OPERATIONAL CLEARANCES CONTACT CARRIER SALES & APPLICATION ENGINEER.

4. DOWN SHOT DUCTS DESIGNED TO BE ATTACHED TO ACCESSORY ROOF CURB ONLY. IF UNIT IS MOUNTED SIDE SUPPLY, DUCTS MUST BE SUPPORTED BY CROSS BRACES AS DONE ON ACCESSORY ROOF CURB.
5. HORIZONTAL RETURN REQUIRES ACCESSORY CURB ADAPTOR.
6. DIMENSIONS IN [ ] ARE IN MILLIMETERS AND WEIGHTS IN KILOGRAMS.
7. UNITS MAY BE INSTALLED ON COMBUSTIBLE FLOORS MADE FROM CLASS A, B OR C ROOF COVERING MATERIAL IF SET ON BASE Rails.

**CENTER OF GRAVITY**

**DIRECTION OF AIRFLOW**

---

**OUTSIDE AIR HOOD**

**EXHAUST AIR HOOD**

---

**DATA SHOWN FOR STANDARD UNIT WITH LOW HEAT, STANDARD COILS, STANDARD IFR DRIVE AND NO FACTORY OPTIONS**

---

**UNITED TECHNOLOGIES CORPORATION**

**P.O. BOX 4808**

**SYRACUSE, NY 13221**

---

**484504252**

---

**DATE**

**SUPERVISOR**

**50PG 03-07 WITH MODULATING ENERGY X**

**REV**
1. FOR OUTDOOR USE ONLY.
2. WEIGHTS SHOWN ARE FOR 5PG06-14 UNIT WITH NO ELECT HEAT, ALUMINUM COILS, AND STANDARD DRIVE. FOR WEIGHTS OF OPTIONAL EQUIPMENT CONSULT THE PRODUCT DATA MANUAL.
3. MINIMUM CLEARANCES (LOCAL CODES OR JURISDICTIONS MAY PREVAIL):
   - RIGHT SIDE: 36" CONDENSER AIRFLOW
   - LEFT SIDE: 42" OUTDOOR AIRWAVES, EXHAUST
   - FRONT SIDE: 54" SERVICE (INDOOR PAN SLED REMOVAL, ELSE 36")
   - 36" CONDENSER AIRFLOW
   - 42" TO ANOTHER UNIT (PER NEC)
   - 36" UNIT TO UNGROUNDED SURFACE (PER NEC)
   - 42" UNIT TO GROUNDED SURFACE (PER NEC)
   - REAR SIDE: 72" CONDENSER AIRFLOW
   - 54" CONDENSATE PAN REMOVAL
   - 36" SERVICE ACCESS
   - 12" HORIZONTAL SUPPLY
   - BOTTOM: 1" BOTTOM OF BASE PAN TO COMBUSTIBLE SURFACES WHEN NOT USING ROOF CURB
   - 0" BOTTOM OF BASE RAIL TO COMBUSTIBLE SURFACES WHEN NOT USING ROOF CURB
   - TOP: 72" CONDENSER EXHAUST
   - VERTICAL DISCHARGE: 1" TO COMBUSTIBLE MATERIALS FOR FIRST 12" OF DUCT TUBE FENCET WALLS. LOUVERED OR CHAIN LINK FENCES REQUIRE NO CLEARANCE FOR AIRFLOW.
   - CLEARANCE FOR COMBUSTIBLE SURFACES AND NEC CODES APPLY.
   - CLEARANCE FOR COMBUSTIBLE SURFACES AND NEC CODES APPLY.
   - CLEARANCE FOR COMBUSTIBLE SURFACES AND NEC CODES APPLY.
   - DIMENSIONS ARE FROM OUTSIDE OF BASE RAIL.
   - FOR REDUCED SERVICE AND OPERATIONAL CLEARANCES CONTACT CARRIER SALES & APPLICATION ENGINEER.
4. DOWN SHOT DUCTS DESIGNED TO BE ATTACHED TO ACCESSORY ROOF CURB ONLY. IF UNIT IS MOUNTED SIDE UP, DUCTS MUST BE SUPPORTED BY CROSS BRACES AS DONE ON ACCESSORY ROOF CURB.
5. HORIZONTAL RETURN REQUIRES ACCESSORY CURB ADAPTOR
6. DIMENSIONS IN [ ] ARE IN MILLIMETERS AND WEIGHTS IN KILOGRAMS.
7. UNITS MAY BE INSTALLED ON COMBUSTIBLE FLOORS MADE FROM CLASSES A, B OR C ROOF COVERING MATERIAL IF SET ON BASE RAILS.

CENTER OF GRAVITY

DIRECTION OF AIRFLOW

DATA SHOWN FOR STANDARD UNIT WITH LOW HEAT, STANDARD COILS, STANDARD IFM DRIVE AND NO FACTORY OPTIONS.
Data shown for standard unit with low heat, standard coils, standard IFM drive and no factory options.

1. FOR OUTDOOR USE ONLY.
2. WEIGHTS SHOWN ARE FOR 50PG08-14 UNIT WITH NO ELECT HEAT, ALUMINUM COILS, AND STANDARD DRIVE. FOR WEIGHTS OF OPTIONAL EQUIPMENT CONSULT THE PRODUCT DATA MANUAL.
3. MINIMUM CLEARANCES (LOCAL CODES OR JURISDICTIONS MAY PREVAIL):
   RIGHT SIDE: 36" CONDENSER AIRFLOW
   LEFT SIDE: 42" OUTDOOR AIRFLOW & EXHAUST
   FRONT SIDE: 54" SERVICE (INDOOR PAN SLED REMOVAL, ELSE 36"
   36" CONDENSER AIRFLOW
   42" TO ANOTHER UNIT (PER NEC)
   36" UNIT TO UNGRONDED SURFACE (PER NEC)
   42" UNIT TO GROUNDED SURFACE (PER NEC)
   REAR SIDE: 72" CONDENSER AIRFLOW
   54" CONDENSATE PAN REMOVAL
   36" SERVICE ACCESS
   12" HORIZONTAL SUPPLY
   BOTTOM: 1" BOTTOM OF BASE PAN TO COMBUSTIBLE SURFACES WHEN NOT USING ROOF CURB
   0" BOTTOM OF BASE RAIL TO COMBUSTIBLE SURFACES WHEN NOT USING ROOF CURB
   TOP: 72" CONDENSER EXHAUST
   VERTICAL DISCHARGE: 1" TO COMBUSTIBLE MATERIALS FOR FIRST 12" OF DUCT TUBE FENC/ WALLS; LOUVERED OR CHAIN LINK FENCES REQUIRE NO CLEARANCE FOR AIRFLOW.
   CLEARANCE FOR COMBUSTIBLE SURFACES AND NEC CODES APPLY.
   REMOVABLE FENCE/BARRICADE REQUIRES NO SERVICE CLEARANCE.
   CLEARANCE FOR COMBUSTIBLE SURFACES AND NEC CODES APPLY.
   DIMENSIONS ARE FROM OUTSIDE OF BASE RAIL.
   FOR REDUCED SERVICE AND OPERATIONAL CLEARANCES CONTACT CARRIER SALES & APPLICATION ENGINEER.
4. DOWN SHOT DUCTS DESIGNED TO BE ATTACHED TO ACCESSORY ROOF CURB ONLY. IF UNIT IS MOUNTED SIDE SUPPLY, DUCTS MUST BE SUPPORTED BY CROSS BRACES AS DONE ON ACCESSORY ROOF CURB.
5. HORIZONTAL RETURN REQUIRES ACCESSORY CURB ADAPTOR.
6. DIMENSIONS IN MILLIMETERS AND WEIGHTS IN KILOGRAMS.
7. UNIT MAY BE INSTALLED ON COMBUSTIBLE FLOORS MADE FROM CLASS A, B OR C ROOF COVERING MATERIAL IF SET ON BASE RAILS.

CENTER OF GRAVITY

DIRECTION OF AIRFLOW

CONRAD ROY

CONTRIBUTED PANEL

CONDENSATE DRAIN

3/4"-14 NPT CONDENSATE DRAIN

CONDENSATE ACCESS COVER

5'-8"

3'-1"
1. FOR OUTDOOR USE ONLY.
2. WEIGHTS SHOWN ARE FOR 50PM16-24 UNIT WITHOUT ELECTRIC HEAT, ALUMINUM COILS, AND STANDARD DRIVE.
   FOR WEIGHTS OF OPTIONAL EQUIPMENT CONSULT THE PRODUCT DATA MANUAL.
3. DO NOT LOCATE ADJACENT UNITS WITH FLUE DISCHARGE FACING ENERGY RECOVERY INLET.
4. MINIMUM CLEARANCES (LOCAL CODES OR JURISDICTIONS MAY APPLY):
   RIGHT SIDE: 12" CONDENSER AIRFLOW
   LEFT SIDE: 120" OUTDOOR AIRFLOW & EXHAUST
   FRONT SIDE: 36" SERVICE
   72" CONDENSER AIRFLOW
   96" COIL REMOVAL
   42" TO ANOTHER UNIT (PER NEC)
   36" UNIT TO UNGROUNDED SURFACE (PER NEC)
   42" UNIT TO GROUNDED SURFACE (PER NEC)
   REAR SIDE: 72" CONDENSER AIRFLOW
   36" SERVICE ACCESS
   12" HORIZONTAL SUPPLY
   BOTTOM: 14" BOTTOM OF BASE PAN TO COMBUSTIBLE SURFACES WHEN NOT USING ROOF CURB
   10" BOTTOM OF BASE RAIL TO COMBUSTIBLE SURFACES WHEN NOT USING ROOF CURB
   TOP: 72" CONDENSER EXHAUST
   14" CHAIN LINK FENCES REQUIRE NO CLEARANCE FOR AIRFLOW.
   CLEARANCE FOR COMBUSTIBLE SURFACES AND NEC CODES APPLY.
   REMOVABLE FENCE/BARRICADE REQUIRE NO SERVICE CLEARANCE.
   CLEARANCE FOR COMBUSTIBLE SURFACES AND NEC CODES APPLY.
   DIMENSIONS ARE FROM OUTSIDE OF BASE RAIL.
   FOR REDUCED SERVICE AND OPERATIONAL CLEARANCES CONTACT CARRIER SALES & APPLICATION ENGINEER.
5. DOWN SHOT DUCTS DESIGNED TO BE ATTACHED TO ACCESSORY ROOF CURB ONLY.
   IF UNIT IS MOUNTED SIDE SUPPLY, DUCTS MUST BE SUPPORTED BY CROSS BRACES AS DONE ON ACCESSORY ROOF CURB.
6. HORIZONTAL RETURN REQUIRES ACCESSORY CURB ADAPTER.
7. DIMENSIONS IN [ ] ARE IN MILLIMETERS AND WEIGHT IN KILOGRAMS.
8. UNITS MAY BE INSTALLED ON COMBUSTIBLE FLOORS MADE FROM CLASS A, B OR C ROOF COVERING MATERIAL IF SET ON BASE RAILS.

UNIT ERV UNIT

<table>
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<tr>
<th>ITU TYPE</th>
<th>ITU TYPE</th>
<th>Weight (lbs)</th>
<th>Center of Gravity (inches)</th>
<th>Center of Gravity (mm)</th>
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<tr>
<td>50PM16</td>
<td>Low CFM</td>
<td>3296</td>
<td>1495 39.2 28.9 68.0 996 735 1727</td>
<td>996 735 1727</td>
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<tr>
<td>50PM16</td>
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<td>1552 37.9 29.2 67.2 956 742 1705</td>
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<td>1515 39.5 29.0 68.2 1004 736 1733</td>
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<td>50PM20</td>
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<td>1572 37.9 29.2 67.2 963 742 1706</td>
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<tr>
<td>50PM24</td>
<td>Low CFM</td>
<td>3394</td>
<td>1539 39.9 29.0 68.5 1013 736 1740</td>
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<tr>
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<td>3520</td>
<td>1597 38.3 29.2 67.4 972 743 1713</td>
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UNIT WEIGTH

<table>
<thead>
<tr>
<th>ITU TYPE</th>
<th>ITU TYPE</th>
<th>Weight (lbs)</th>
<th>Center of Gravity (inches)</th>
<th>Center of Gravity (mm)</th>
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<tr>
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<td>High CFM</td>
<td>3520</td>
<td>1597 38.3 29.2 67.4 972 743 1713</td>
<td></td>
</tr>
</tbody>
</table>
1. FOR OUTDOOR USE ONLY.
2. WEIGHTS SHOWN ARE FOR 50PM16-24 UNIT WITH NO ELECTRIC HEAT, ALUMINUM COILS, AND STANDARD DRIVE.
   FOR WEIGHTS OF OPTIONAL EQUIPMENT CONSULT THE PRODUCT DATA MANUAL.
3. DO NOT LOCATE ADJACENT UNITS WITH FLUE DISCHARGE FACING ENERGY RECOVERY INLET.
4. MINIMUM CLEARANCES (LOCAL CODES OR JURISDICTIONS MAY PREVAIL):
   RIGHT SIDE: 72" CONDENSER AIRFLOW
   LEFT SIDE: 120" OUTDOOR AIRFLOW & EXHAUST
   FRONT SIDE: 36" SERVICE
   72" CONDENSER AIRFLOW
   96" COIL REMOVAL
   42" TO ANOTHER UNIT (PER NEC)
   36" UNIT TO UNGROUNDED SURFACE (PER NEC)
   42" UNIT TO GROUNDED SURFACE (PER NEC)
   REAR SIDE: 72" CONDENSER AIRFLOW
   36" SERVICE ACCESS
   12" HORIZONTAL SUPPLY
   BOTTOM: 14" BOTTOM OF BASE PANT TO COMBUSTIBLE SURFACES WHEN NOT USING ROOF CURB
   10" BOTTOM OF BASE RAIL TO COMBUSTIBLE SURFACES WHEN NOT USING ROOF CURB
   TOP: 72" CONDENSER EXHAUST
   FENCE: LOUVERED OR CHAIN LINK FENCES REQUIRE NO CLEARANCE FOR AIRFLOW. CLEARANCE
   FOR COMBUSTIBLE SURFACES AND NEC CODES APPLY.
   REMOVABLE FENCE/BARRICADE REQUIRES NO SERVICE CLEARANCE. CLEARANCE FOR
   COMBUSTIBLE SURFACES AND NEC CODES APPLY.
   DIMENSIONS ARE FROM OUTSIDE OF BASE RAIL.
   FOR REDUCED SERVICE AND OPERATIONAL CLEARANCES CONTACT CARRIER SALES & APPLICATION ENGINEER.
5. DOWN SHOT DUCTS DESIGNED TO BE ATTACHED TO ACCESSORY ROOF CURB ONLY. IF UNIT IS MOUNTED SIDE
   SUPPLY, DUCTS MUST BE SUPPORTED BY CROSS BRACES AS DONE ON ACCESSORY ROOF CURB.
6. HORIZONTAL RETURN REQUIRES ACCESSORY CURB ADAPTOR.
7. DIMENSIONS IN [ ] ARE IN MILLIMETERS AND WEIGHT IN KILOGRAMS.
8. UNITS MAY BE INSTALLED ON COMBUSTIBLE FLOORS MADE FROM CLASS A, B OR C ROOF COVERING MATERIAL
   IF SET ON BASE RAILS.

---

<table>
<thead>
<tr>
<th>UNIT</th>
<th>ERV CENTER OF GRAVITY (inches)</th>
<th>CENTER OF GRAVITY (mm)</th>
<th>ERV CENTER OF GRAVITY (inches)</th>
<th>CENTER OF GRAVITY (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>50PM16 Low CFM</td>
<td>3296</td>
<td>1495</td>
<td>39.2</td>
<td>28.9</td>
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<tr>
<td>50PM16 High CFM</td>
<td>3422</td>
<td>1552</td>
<td>37.6</td>
<td>29.2</td>
</tr>
</tbody>
</table>

---

**RIGHT SIDE**

- CONDENSER COIL
- DIRECTION OF AIRFLOW

---

**REAR**

- OUTSIDE AIR HOOD
- EXHAUST AIR HOOD
- CONDENSATE ACCESS COVER
- ERV WHEEL ACCESS DOOR

---

**RTU**

- 50PM16 - 24 W/ MODULATING ENERGYX
- N/A

---

**SUPERVISOR**

- 08/04/09

---

**UNITED TECHNOLOGIES CORPORATION**

- CARRIER
- P.O. BOX 4808
- SYRACUSE, NY 13221

---

**THIS DOCUMENT IS THE PROPERTY OF CARRIER CORPORATION AND IT IS DELIVERED WITH THE LIMITING CONDITION THAT FOR
CONSENT WILL NOT BE DISCLOSED OR USED WITHOUT CARRIER CORPORATION'S WRITTEN CONSENT.**
1. For outdoor use only.
2. Weights shown are for 50PM28 unit with no electric heat, aluminum coils, and standard drive.
   For weights of optional equipment consult the product data manual.
3. Do not locate adjacent units with flue discharge facing energy recovery inlet.
4. Minimum clearances (local codes or jurisdictions may prevail):
   - Right side: 72" condenser airflow
   - Front side: 36" service
   - Rear side: 72" condenser airflow
   - 90° coil removal
   - 42" to another unit (per NEC)
   - 36" unit to ungrounded surface (per NEC)
   - 42" unit to grounded surface (per NEC)
   - Bottom: 14" horizontal supply
top: 10" bottom of base rail to combustible surfaces when not using roof curb
   - Top: 72" condenser exhaust
   - Fence: Louvered or chain link fences require no clearance for airflow. Clearance for combustible surfaces and NEC codes apply.
   - Removable fence/barricade requires no service clearance. Clearance for combustible surfaces and NEC codes apply.
5. Dimensions are from outside of base rail.
   - For reduced service and operational clearances contact Carrier sales & application engineer.
6. Down shot ducts designed to be attached to accessory roof curb. If unit is mounted side supply, ducts must be supported by cross braces as done on accessory roof curb.
7. Horizontal return requires accessory curb/adaptor.
8. Units may be installed on combustible floors made from Class A, B or C roof covering material if set on base rails.

- Center of gravity
- Direction of airflow

---

# Dimensions

<table>
<thead>
<tr>
<th>RTU Type</th>
<th>ERV Type</th>
<th>Weight (lbs)</th>
<th>Weight (kg)</th>
<th>Center of Gravity (inches) X</th>
<th>Center of Gravity (inches) Y</th>
<th>Center of Gravity (inches) Z</th>
<th>Center of Gravity (mm) X</th>
<th>Center of Gravity (mm) Y</th>
<th>Center of Gravity (mm) Z</th>
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</thead>
<tbody>
<tr>
<td>50PM28</td>
<td>Low CFM</td>
<td>3586</td>
<td>1627</td>
<td>41.6</td>
<td>33.3</td>
<td>68.5</td>
<td>1057</td>
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<td>50PM28</td>
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<td>3718</td>
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<td>33.6</td>
<td>67.8</td>
<td>1016</td>
<td>853</td>
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</table>

---

# Drawing Information

- Issue Date: 08/04/09
- Superintendent: N/A
- Unit: 50PM 28 W/ Modulating EnergyX
- 50TG06989

---

# Notice

This document is the property of Carrier Corporation and is delivered upon the express condition that the contents will not be disclosed or used without Carrier Corporation's written consent.
1. FOR OUTDOOR USE ONLY.
2. WEIGHTS SHOWN ARE FOR 50PM28 UNIT WITH NO ELECTRIC HEAT, ALUMINUM COILS, AND STANDARD DRIVE. FOR WEIGHTS OF OPTIONAL EQUIPMENT CONSULT THE PRODUCT DATA MANUAL.
3. DO NOT LOCATE ADJACENT UNITS WITH FLUE DISCHARGE FACING ENERGY RECOVERY INLET.
4. MINIMUM CLEARANCES (LOCAL CODES OR JURISDICTIONS MAY PREVAIL):
   RIGHT SIDE: 72" CONDENSER AIRFLOW
   LEFT SIDE: 120" OUTDOOR AIRFLOW & EXHAUST
   FRONT SIDE: 36" SERVICE
   REAR SIDE: 72" CONDENSER AIRFLOW
   36" SERVICE ACCESS
   12" HORIZONTAL SUPPLY
   BOTTOM: 14" BOTTOM OF BASE PAN TO COMBUSTIBLE SURFACES WHEN NOT USING ROOF CURB
   10" BOTTOM OF BASE RAIL TO COMBUSTIBLE SURFACES WHEN NOT USING ROOF CURB
   TOP: 72" CONDENSER EXHAUST
   FINISH: LOUVERED OR CHAIN LINK FENCES REQUIRE NO CLEARANCE FOR AIRFLOW. CLEARANCE FOR COMBUSTIBLE SURFACES AND NEC CODES APPLY. REMOVABLE FENCE/BARRICADE REQUIRES NO SERVICE CLEARANCE. CLEARANCE FOR COMBUSTIBLE SURFACES AND NEC CODES APPLY.
5. DIMENSIONS ARE FROM OUTSIDE OF BASE RAIL.
6. DOWN SHOT DUCTS DESIGNED TO BE ATTACHED TO ACCESSORY ROOF CURB ONLY. IF UNIT IS MOUNTED SIDE SUPPLY, DUCTS MUST BE SUPPORTED BY CROSS BRACES AS DONE ON ACCESSORY ROOF CURB.
7. DIMENSIONS IN [ ] ARE IN MILLIMETERS AND WEIGHT IN KILOGRAMS.
8. UNITS MAY BE INSTALLED ON COMBUSTIBLE FLOORS MADE FROM CLASS A, B OR C ROOF COVERING MATERIAL IF SET ON BASE RAILS.

CENTER OF GRAVITY

DIRECTION OF AIRFLOW

---

**RTU**

<table>
<thead>
<tr>
<th>TYPE</th>
<th>ERV TYPE</th>
<th>Weight (lbs)</th>
<th>Weight (kg)</th>
<th>Center of Gravity (inches)</th>
<th>Center of Gravity (mm)</th>
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</thead>
<tbody>
<tr>
<td>50FM28</td>
<td>Low CFM</td>
<td>3586</td>
<td>1627</td>
<td>X: 41.6</td>
<td>Y: 33.3</td>
</tr>
<tr>
<td>50FM28</td>
<td>High CFM</td>
<td>3718</td>
<td>1687</td>
<td>X: 40.0</td>
<td>Y: 33.6</td>
</tr>
</tbody>
</table>

---

**CONVENTIONAL COIL**

**ERV WHEEL AND FILTER ACCESS DOOR**

**CONDENSATE ACCESS COVER**

**OUTSIDE AIR HOOD**

**EXHAUST AIR HOOD**

---

**RTU CENTER**

**UPRIGHT ACCESS DOOR**

**CONDENSATE DRAIN**

**SUB LANDING CONDENSATE DRAIN**
APPENDIX B – EXHAUST FAN PERFORMANCE

Many applications that utilize energy recovery incorporate ducted return/exhaust air paths. In these applications, it is important to consider the duct pressure of the return/exhaust just as a designer would consider the effects of the supply duct static pressure on the airflow of the rooftop unit itself.

**EnergyXv2 Constant Volume 2-6 ton Units** – The 2-6 ton Constant Volume EnergyXv2 units use constant speed outdoor air and exhaust air fans for low return/exhaust static pressure applications. In this situation, the fans are designed to augment the base rooftop unit. Use the base rooftop unit fan curve(s) for these applications.

**EnergyXv2 Modulating Volume 2-25 ton Units** – The exhaust fan in the Modulating Volume EnergyXv2 unit will assist the rooftop unit fan in pulling air through the exhaust/return duct. These exhaust fans are backwards curved impeller designs which are capable of significant more static pressure operation than typical forward curved fan designs. The following exhaust fan performance curves are provided for additional guidance when considering return/exhaust duct design. Note: if application designs require two separate ducts (one for exhaust air, one for return air) contact your Carrier Sales Engineer for additional guidance prior to specification or ordering.
APPENDIX B – EXHAUST FAN PERFORMANCE

Energy Xv2  PG 08-14 Low CFM

Energy Xv2  PG 08-14 High CFM
**APPENDIX B – EXHAUST FAN PERFORMANCE**

**EnergyXv2 PM16-24 Low CFM**

- Dotted line: Exhaust - No Economizer
- Solid line: Exhaust - Economizer Closed
- Dashed line: Exhaust - Economizer Open

- CFM vs. External Static Pressure (in H2O)

**EnergyXv2 PM16-24 High CFM**

- Solid line: Exhaust - No Economizer or Economizer Closed
- Dashed line: Exhaust - Economizer Open

- CFM vs. External Static Pressure (in H2O)
ENERGYX UNIT START-UP CHECKLIST
(TO BE USED IN CONJUNCTION WITH BASE ROOFTOP UNIT START-UP CHECKLIST)

MODEL NO.: ___________________________  SERIAL NO.: ___________________________
DATE: ___________________________  TECHNICIAN: ___________________________

I. PRE-START-UP:
☐ VERIFY THAT ALL PACKAGING MATERIALS HAVE BEEN REMOVED FROM UNIT
☐ VERIFY INSTALLATION OF OUTDOOR AIR HOODS
☐ CHECK THAT AIR FILTERS ARE CLEAN AND IN PLACE ON SUPPLY AND EXHAUST OF ERV WHEEL
☐ CHECK THAT OUTDOOR AIR INLET SCREENS ARE IN PLACE
☐ VERIFY CONFIGURATION VALUES FOR ELECTRONIC CONTROLS

II. START-UP

ELECTRICAL

<table>
<thead>
<tr>
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<td>SUPPLY VOLTAGE</td>
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<td>EX SUPPLY FAN AMPS</td>
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<td>EX EXHAUST FAN-1 AMPS</td>
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<td>EX EXHAUST FAN-2 AMPS</td>
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<td>EX EXHAUST FAN-3 AMPS</td>
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(2-6 ton unit, Low CFM only)

TEMPERATURES

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<tr>
<th>TYPE</th>
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<tbody>
<tr>
<td>OUTDOOR-AIR TEMPERATURE</td>
<td>_______ F</td>
<td>dB (Dry Bulb)</td>
</tr>
<tr>
<td>RETURN-AIR TEMPERATURE</td>
<td>_______ F</td>
<td>dB / F wB (Dry Bulb / Wet Bulb)</td>
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<tr>
<td>ENERGYX COOLING DISCHARGE AIR</td>
<td>_______ F</td>
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</tr>
<tr>
<td>ENERGYX HEATING DISCHARGE AIR</td>
<td>_______ F</td>
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GENERAL

☐ COMFORTLINK MINIMUM DAMPER POSITIONS SET TO “0”
☐ ERV MINIMUM VENTILATION POSITION PER JOB REQUIREMENTS
☐ ERV AND COMFORTLINK POWER EXHAUST SETPOINTS PER JOB REQUIREMENTS
☐ VERIFY ENERGY RECOVERY WHEEL ROTATING IN PROPER DIRECTION
☐ VERIFY SUPPLY AND EXHAUST BLOWER FANS ROTATING IN PROPER DIRECTION
☐ VERIFY ALL EXTERNAL PANELS FULLY SHUT AND LATCHED

III. CONFIGURATION

<table>
<thead>
<tr>
<th>TYPE</th>
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<tbody>
<tr>
<td>DCV OA SP CFM</td>
<td>_______</td>
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<tr>
<td>Minimum Outside Air CFM</td>
<td>_______</td>
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<tr>
<td>Exhaust Air Offset CFM</td>
<td>_______</td>
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<tr>
<td>ERV Control Configuration</td>
<td>_______</td>
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<tr>
<td>ERV Unoccupied Run setpoint</td>
<td>_______</td>
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</tbody>
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