

THE SMART SOLUTION FOR ENERGY EFFICIENCY
ENGINEERING DESIGN GUIDE:
R_x (ERV) MODULE
ROOFTOP ENERGY RECOVERY UNITS

The Smart Choice for Energy Efficiency

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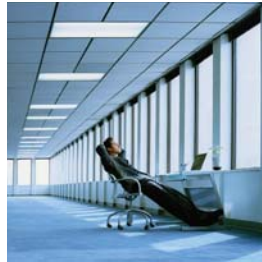
ClimateMaster Water-Source Heat Pumps Rx (ERV) Module Rooftop Energy Recovery Units

COMMERCIAL HVAC

The ever-changing environment of commercial construction offers exciting breakthroughs in technology and materials, but it is not without some heartburn. Today, owners, architects, and contractors face many challenges in the design and construction of their projects. Challenges such as usable space, indoor air quality, energy efficiency, maintenance costs, building longevity, and the LEED® program all come to the forefront of the design process. When considering the solutions to these challenges, the type of HVAC system chosen directly affects each one.

USABLE SPACE

It has been said that the reason real estate grows in value is because no one is making any more. As cities continue to grow and spread out, the value of maximizing usable space becomes increasingly important. When selecting an HVAC system, you positively or negatively impact the usable space on a project. As an example, VAV (Variable Air Volume) systems utilize complicated ductwork systems along with extensive equipment rooms to deliver conditioned air into the building space. Additionally, VAV duct systems many times require more ceiling height which increases floor-to-floor space thus increasing building costs. By comparison, ClimateMaster Water-Source and Geothermal Heat Pump systems require little to no equipment room space and use a very simple, compact, and independent ductwork system.



INDOOR AIR QUALITY

As important as the actual temperature of a building space is, the quality of air within that space is equally important. The American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE) has implemented Standard 62, which requires significantly higher amounts of fresh outdoor air for buildings. The challenge now becomes how to properly introduce, condition, and deliver this fresh air into the building space. Traditional options like two- and four-pipe Fan Coil systems must be up-sized significantly to handle the additional conditioning load. This means larger, more expensive units, larger, more expensive piping, and larger more expensive boilers and chillers. In comparison, ClimateMaster systems offer a variety of options that can actually lower the overall system size, introduce 100% outdoor air, and lower system usage cost.

ENERGY EFFICIENCY

Today's offices equipped with computers, copiers and other office tools can dramatically affect the heating and cooling load of a given space. When considering heating and cooling loads, rising energy costs demand an HVAC system that is efficient while building designs require a system that is also flexible. ClimateMaster has a solution for practically any application, and does so with some of most energy efficient HVAC systems available on the market today. In fact, all of ClimateMaster's products either meet or exceed the new federal mandated efficiency minimums.

MAINTENANCE COSTS

Complex systems such as two- and four-pipe fan coils and VAV systems require advanced maintenance and the trained personnel to perform it. Large equipment rooms filled with chillers, air handlers, or large-scale boilers require personnel for monitoring and maintenance, which consume building space and leasing profits. The effect to the bottom line becomes significant when considering the potential of a complete system failure along with costly parts and equipment replacement. However, Water-Source and Geothermal Heat Pumps require very little monitoring and maintenance - aside from routine filter changes. With factory installed DDC controls, the entire building can be accessed via any web-enabled computer for monitoring and set point control. No muss, no fuss, no worries.

BUILDING LONGEVITY

New innovations offer longer life expectancies for today's buildings. You should expect the same from the HVAC systems being placed inside these buildings. However, when it comes to longevity, not all systems are created equal. Complex chillers and air handling systems often have a large number of moving parts that will wear out over time. Water-Source and Geothermal Heat Pumps offer the advantage of very few moving parts. Fewer moving parts lower the occurrence of parts replacement and extend equipment life. This simplicity of design allows ClimateMaster systems to provide average life spans of 20 years or more. In fact, there are a number of ClimateMaster units that are still performing after 50 years - providing the continual comfort our customers have come to expect.



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MANY CHOICES, ONE SOLUTION

When choosing a HVAC system for a project, there are four basic types from which to choose.

FAN COILS

Fan coil systems are comprised of water-to-air coil air handlers connected via a two- or four-pipe insulated water loop. Fan coils require complex chillers and boilers to provide water loop fluid in a particular temperature range (i.e. chilled water for cooling and hot water for heating). Two-pipe fan coils have a major disadvantage as control is substantially limited to whatever mode the system is currently set at (i.e. cooling or heating). A four-pipe version can be installed that requires both chilled and heated water to be available at the same time. Four-pipe systems also require twice the piping and twice the circulation equipment of a two-pipe system, which makes a four-pipe system one of the most expensive systems to install.

VARIABLE AIR VOLUME (VAV)

Variable Air Volume, or VAV, is one of the most common types of HVAC systems used in large commercial buildings today. A typical system is usually comprised of a large air handler, central ductwork system, and a relatively large equipment room. Conditioned air is distributed throughout the building via a central ductwork system and is regulated via dampers in each space. VAV systems typically have a higher first cost than Water-Source Heat Pumps, and may have similar operating costs, resulting in overall increased life cycle costs.

ROOFTOP

Rooftop systems are similar to VAV systems in that they use a central ductwork system to distribute conditioned air into the building space. However, instead of one central unit, the system is comprised of multiple units which can be tasked for different conditioning requirements. Rooftop systems usually require additional structural reinforcement as well as cranes or other lifting equipment to place the units. Control in a particular zone is limited to what the system is currently set to (i.e. cooling or heating). Rooftop installation costs are low to moderate, but operating costs are typically 50% higher than Water-Source Heat Pumps. Additionally, the systems are exposed to the elements and are subject to damage and vandalism.

WATER-SOURCE AND GEOTHERMAL HEAT PUMPS

Water-Source and Geothermal Heat Pump systems are comprised of individual packaged units that transfer heat via a single- or two-pipe water loop. Each unit can be used in either heating or cooling mode year-round and loop temperature is maintained via a boiler/tower combination or earth-coupled loop. Each zone has complete control of its heating/cooling mode and each unit is independent from the others. This means if one unit goes down, the whole system is not affected. Controls can be as simple as one unit, one thermostat. Water-Source and Geothermal Heat Pump systems are the most energy, cost, and space efficient of any system in the industry.

SYSTEM COMPARISON

System	Ease of Design	Ease of Installation	Installation Space	Installation Cost	Maintenance Requirements	Maintenance Costs	Future System Expansion	Sound Levels	Operating Costs	Total Zone Failure Chance	Individual Tenant Control	Options	Additional Auxiliary Equipment Needed	Structure Modification Needs	System Longevity
Two-Pipe Fan Coils	Low	Low	High	Med	High	High	Low	Low	Med	High	Low	Low	High	High	Med
Four-Pipe Fan Coils	Low	Low	High	High	High	High	Low	Low	High	High	Low	Low	High	High	Med
PTAC / PTHP	Low	Low	Low	Low	High	High	Med	High	High	Low	Med	Low	Med	High	Low
VAV	Low	Low	High	Med	High	High	Low	Med	Med	High	Low	Low	High	High	Med
Rooftop	Low	Low	High	Low	Med	High	Low	Med	Med	High	Low	Low	Med	High	Med
Water-source Heat Pumps	High	High	Low	Low	Low	Low	High	Low	Low	Low	High	High	Low	Low	High
Geothermal Heat Pumps	High	High	Low	Low	Low	Low	High	Low	Low	Low	High	High	Low	Low	High

ClimateMaster Water-Source Heat Pumps Rx (ERV) Module Rooftop Energy Recovery Units

THE CLIMATEMASTER ADVANTAGE

WHO IS CLIMATEMASTER?

Who is ClimateMaster? ClimateMaster emerged from the marriage of several Water-Source heat pump companies in a blending of strengths to form a focused organization. For over 50 years, we have been focused on enhancing business and home environments around the world. Our mission as the world's largest and most progressive leader in the Water-Source and geothermal heat pump industry reveals our commitment to excellence - not only in the design and manufacture of our products, but in our people and services.

CLIMATEMASTER DESIGN

From concept to product, ClimateMaster's Integrated Product Development Team brings a fusion of knowledge and creativity that is unmatched in the industry today. Drawing from every aspect of our business: Engineering, Sales, Marketing, and Manufacturing, our Development Team has created some of the most advanced, efficient, and versatile products available.



INNOVATION, CONCEPT, NEEDS

Great products are born from necessity. Whether it is a need to reduce sound, fit in a smaller space, make easier to service, achieve better efficiencies, or due to changing technologies, or new government regulations, ClimateMaster leads the industry in advancing the form, fit and function of Water-Source and geothermal heat pumps. Our Design Team continually strives for even the slightest improvement to our products. It is this continual drive for excellence that sets ClimateMaster apart from all other manufacturers.

START TO FINISH

At ClimateMaster, every product development project begins with a comprehensive set of specifications. These specifications are a culmination of input from the market, a specific need, or a number of other factors. From these detailed specifications, prototypes are constructed and testing begins. After a rigorous testing period in ClimateMaster's own state-of-the-art lab facility, the data is compared to the project specifications. Once the Design Team is satisfied that all of the specs are met, the unit is sent to the production department for pilot runs. After the

pilot runs are completed, unit literature is finalized and the product is released to the marketplace. Every unit we produce follows this strict and sequenced path insuring no stone is left unturned, and no detail is missed.

CLIMATEMASTER PRODUCTION

Innovative products demand innovative manufacturing processes. ClimateMaster's integrated production process combines every aspect of the manufacturing of our equipment into an organized, balanced, and controlled whole.

FABRICATION

Every sheet-metal component of a ClimateMaster unit is produced in our fabrication department. Panels are precisely constructed of galvanized or stainless steel using computerized cutting, punching, and forming equipment. This precise fabrication means a tighter fit that makes for a more solid unit and reduced vibration, which equals reduced noise. On certain series, an optional epoxy powder coating is then applied to increase corrosion resistance and enhance the look of the unit. The final step is the addition of fiberglass insulation to the inside as an additional layer of sound deadening. This insulation meets stringent NFPA regulations, and includes antibacterial material.



ASSEMBLY

ClimateMaster's 250,000 square foot production facility produces over 50,000 units per year using the most stringent quality control standards in the industry. Each unit is assembled under the close supervision of our Integrated Process Control System or ECI. This multi-million dollar computer system watches each unit as it comes down the assembly line. To back up the ECI system, our Quality department is stationed on each line and performs random audits not only on the units, but also on component parts. All component parts must pass each and every quality checkpoint before a unit is packaged and shipped. These systems and processes are maximized due to the comprehensive and ongoing training every employee receives from the date they are hired.



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COMPONENT PARTS

To produce a quality unit, you have to start with quality components. ClimateMaster's purchasing department is relentless in its search for the best components for our products - while securing these components at prices that keep costs low. Any new component must go through a grueling testing phase before it ever sees the production line. Working closely with vendors and their engineers, we continually find new ways to not only improve our units, but to ensure component quality as well. Sister companies like KOAX, who produce our coaxial heat exchangers, allow ClimateMaster to provide components specifically designed for our applications



CLIMATEMASTER CERTIFICATION

ClimateMaster leads the industry in product awards and certifications. From 100% Air-Conditioning and Refrigeration Institute (ARI) performance ratings to industry awards for innovation, ClimateMaster applies cutting-edge technology to every product we design and manufacture.



ClimateMaster's new Tranquility 27™ series has won multiple awards and is taking the industry by storm. Hot off the heels of winning The News Bronze Dealer Design Award, the Tranquility 27™ won Best of Show at ComforTech in September 2004. You know you are doing great things when a lot of people tell you so.

ENGINEERING LAB FACILITIES

ClimateMaster has one of the largest testing facilities of any Water-Source heat pump manufacturer. Innovation and product improvements are a mainstay of the ClimateMaster Engineering Lab. Our people are what make the difference in the development of superior products in a timely manner. Our certified facility has six automated test cells capable of testing a wide variety of unit types under varying conditions. These cells are capable of producing data twenty-four hours a day, seven days a week. The development time of equipment is significantly reduced allowing ClimateMaster Engineers and Lab Technicians to spend more time on the actual development process. This team effort has

allowed us to maintain a high degree of competence in our industry. Our test cells and test equipment are calibrated and certified periodically, per recognized industry standards, to insure the data is accurate and repeatable. In addition to testing new concept units, the lab continually audits production units throughout the year to insure quality performance and reliability.

INDUSTRY AFFILIATIONS AND ASSOCIATIONS

ClimateMaster works closely with the International Standards Organization (ISO), the American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE), the Canadian Standards Association (CSA-US), the Electrical Testing Laboratories (ETL), and Conformité Européene (CE) to insure that our equipment not only meets the highest performance standards, but meets the highest industry standards as well. In a recent milestone, **ClimateMaster celebrated three consecutive years of 100% success rate in ARI's performance certification program.** An uncommon feat in the industry, this award is a testament to the craftsmanship, design, and construction of every ClimateMaster unit.



CUSTOMER SERVICE

ClimateMaster has gone to great lengths to meet our customers' business-to-business needs. ClimateMaster provides great products and our customer support is second to none. Our highly trained and experienced Customer Service department is available to assist you. Visit our on-line Business Center or contact Tech Services for any information you may need.

WWW.CLIMATEMASTER.COM

Our web site has become the central hub for all of our customers' information needs. Current literature, specifications, presentations, and other resources are readily available in an intuitive, easy-to-navigate format. At the click of a mouse, our new on-line Business Center allows you to check the status of your orders, lookup sales history, manage contact information, and even order literature, accessories, and units. Combined with our unique EZ-ORDER and EZ-SEND software, we take all the effort and guesswork out of unit orders.

ClimateMaster Water-Source Heat Pumps Rx (ERV) Module Rooftop Energy Recovery Units

ENGINEERING DESIGN SPECIFICATIONS

Advanced units need advanced specifications. ClimateMaster's new Engineering Design specifications provide the most detailed information for your next project.

LITERATURE

At ClimateMaster, Innovation never sleeps. As new advances are made, and new products are released, the need for accurate literature becomes critical. Every piece of technical literature that ClimateMaster produces is printed in our state-of-the-art on-demand printing facility. What this means is that we print only the literature we need at the time we need it. This insures that only the most current and accurate data is in the field.

SHIPPING

When you need that critical service part or piece of literature for your next presentation, you may rest assured that ClimateMaster has a shipping option for you. Networked with a variety of carriers such as FedEx, Watkins, Estes, Central Freight, Dugan, and many others, we provide fast and reliable shipping to anywhere in the world.

THE FUTURE OF CLIMATEMASTER

Our long history of innovation has paved the way for future endeavors with a solid platform of success. Growing markets in Europe and Asia demand a different way of not only manufacturing our products, but also successfully marketing them. New government regulations will phase out R-22 refrigerant at the beginning of 2010 paving the way for new R-410a, a much more environmentally friendly refrigerant. Additionally, new federally mandated efficiency increases of 30% becomes effective in January of 2006. In looking ahead, we continually strive for better processes, better designs, and better innovations that will keep ClimateMaster as the Global Leader in Water-Source and Geothermal Heat Pumps.

ADVANTAGE EXCLUSIVES

Being a leader in innovation, ClimateMaster brings industry firsts, as well as industry exclusives, to our family of products.

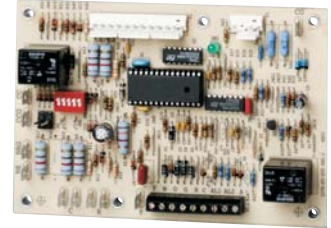
CONTROLS

ClimateMaster offers two levels of solid-state digital controls; the CXM and DXM control board.

CXM

Our standard CXM control board comes programmed with ClimateMaster's Unit Performance Sentinel (UPS) which monitors unit performance and notifies the owner of potential unit problems before a lockout occurs. Additionally, the CXM's eight standard safeties protect the unit from damage.

- Anti-Short Cycle
- Low Voltage
- High Voltage
- High Refrigerant Pressure
- Low Refrigerant Pressure (Loss of Charge)
- Air Coil Freeze (Excluding GC Series)
- Water Coil Freeze
- Condensate Overflow



DXM

Our enhanced controls option, the DXM control board offers all of the advantages of the CXM board but adds the following additional features:

- Multi-Stage Operation
- Night Setback
- Emergency Override
- Reheat Control
- Boilerless Electric Heat



DDC CONTROLS

Factory mounted LONWorks or Multi-ProtoCol (MPC) DDC controllers are an available option on all ClimateMaster products. These controllers give owners the ability to implement a variety of building automation systems such as BACnet, ModBus, and Johnson N2. Through a web enabled PC, individual units, unit zones, and entire building systems can be monitored and controlled with the click of a mouse. The systems provide unit status, set-point control, performance curves, and fault indications.



CONFIGURATIONS

No other manufacturer provides as many size,

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performance, configuration, and cost options as the ClimateMaster family of products offers. From our smallest horizontal unit in the GCH006, to our largest vertical in the GLV300, to our Rooftop series with available 100% make-up air (when mated with the Rx ERV), to the console, water-to-water, and two-stage Tranquility 27™, we have a unit to fit your application.

SOUND

Prior to the recently adopted sound standard ARI 260-2000 there had been no standard for the evaluation of Water-Source heat pump sound performance. Also, those manufacturers who did generate and publish their own sound data, did so in their own labs making it difficult to have the data independently certified and accurate comparisons were therefore, impossible. Now that a standard has been established, it is critical to compare the data correctly. If data from two manufacturers is compared using different test procedures, results are not comparable. ClimateMaster has tested its product line for both ducted discharge and free inlet air combined with case radiated tests. Comfort has never been so quiet with our intelligent sound design. Our products use a variety of technologies to maintain our lead as the quietest units in the industry.

DUAL LEVEL VIBRATION ISOLATION

ClimateMaster units use an exclusive double isolation compressor mounting system. This dual level isolation deadens vibration and provides quiet operation.



TORSION-FLEX BLOWERS

Blower motors, on select models, are mounted with a unique torsion-flex mounting system which not only allows for easy service, but also reduces vibration from the blower motor during operation.



ULTRAQUIET

ClimateMaster's optional additional sound suppression package enhances our already excellent sound performance through the use of dual density acoustical insulation and other strategically placed sound attenuating materials. No other manufacturer's mute package comes close to matching the performance of the UltraQuiet package.

E-COATED AIR COILS

All ClimateMaster Water-Source heating and cooling systems (excluding the RE series rooftop) are available with an E-Coated air-coil option. This process provides years of protection against coil corrosion from airborne chemicals resulting from modern building material outgassing and most airborne environmental chemicals. In fact, ClimateMaster's exclusive E-Coated air-coils enhance corrosion protection to nearly 20 times that of a traditional uncoated coil.*



* Test based upon ASTM B117 Salt Spray test hours.

CLIMADRY REHEAT

Continuing to lead the industry in IAQ (Indoor Air Quality) solutions, select ClimateMaster units are available with an innovative method (patent pending) of reheating the air. The ClimaDry microprocessor-controlled option will automatically provide 100% reheat by adjusting the amount of reheat capacity based upon supply air temperature. This new approach to reheat provides dehumidified, neutral temperature supply air, while eliminating the problem of overcooling the space when loop temperatures drop. All components are internal to the unit, saving space and keeping installation costs low. A simple humidistat or DDC controls activates the option.

VOLTAGES

ClimateMaster units are available in a wide variety of commercial voltages, providing maximum flexibility in building design. Available voltages are as follows:

- 208-230/60/1
- 208-230/60/3
- 265/60/1
- 460/60/3
- 575/60/3
- 220-240/50/1
- 380-420/50/3

* Not all units are available with every voltage combination shown above.

ACCESSORIES

ClimateMaster offers a complete line of accessories to complete any project, including hoses, thermostats, valves, pumps, fittings, controllers, sensors, filters and more.

ClimateMaster Water-Source Heat Pumps Rx (ERV) Module Rooftop Energy Recovery Units

THE Rx (ERV) MODULE

ASHRAE (American Society of Heating, Refrigerating and Air Conditioning Engineers) standard 62 requires significantly higher amounts of outside air for building HVAC systems. In extremely warm, cold or humid conditions these requirements create a substantial load management problem. The size of the HVAC unit can be increased to handle the additional outside air load, but this significantly increases the initial project costs and wastes energy. The Rx 100% outside air Water-source Heat Pump (WSHP) uses ClimateMaster's RE series rooftop units mated with the latest Energy Recovery Ventilator (ERV) technology to provide the most energy efficient Make Up Air (MUA) system on the market today.

The energy recovery wheel inside the ERV unit transfers energy from the warmer to the cooler air stream through counter-flowing supply and exhaust air streams through a slowly rotating wheel (less than 60 revolutions per minute). The large energy-transfer surface is arranged to provide laminar air flow through the wheel causing the constant flow of recovered energy to represent up to 70% of the difference in total energy contained within the two air streams. ClimateMaster uses Airxchange ARI 1060 certified energy recovery wheels, which come with a 5 year limited warranty.

During both summer and winter, the energy recovery wheel transfers moisture entirely in the vapor state. This process eliminates wet surfaces that retain dust and promote fungal growth. The need for a condensate pan and drain is also eliminated. Because it is constantly rotating, the energy recovery wheel is always being cleaned by counter-flowing air streams, first in one direction, and then the other. Because it is always dry, dust or other particles impinging on the surface during one half cycle, are automatically removed during the next half cycle.

When ventilation air is introduced into a building, the cooling and heating equipment must be sized to handle both the building envelope load and the outdoor air ventilation load at the extremes of summer and winter design conditions. The use of an ERV can significantly reduce the outdoor air ventilation load applied to the heating and cooling equipment, effectively decreasing the heating and cooling requirements. Savings of capital equipment cost for ventilation is significant. The Rx system is unique for many reasons. ERV

technology produces impressive results on its own, but when mated to a WSHP, the system is unlike anything else on the market. Whether a water-loop (boiler/tower) or geothermal application, the RE series rooftop has many features and benefits that are not found on traditional gas/electric rooftop units.

- 3 to 20 tons (1,200 to 8,000 cfm – 566 to 3776 l/s)
 - 100% OA capability (when ordered as a Rx system)
 - Very high efficiencies (EER of 20+ Btuh/Watt, 5.86+ Watts/Watt) with Rx system
 - Copeland scroll compressors
 - Balanced port TXV
 - Extended range operation (20 to 110°F, -6.7 to 43.3°C)
 - Microprocessor controls standard
 - DDC control options (LON/BacNet/Modbus/Johnson N2)
 - Belt-drive high efficiency motors
 - Economizer option with enthalpy controls ("wheel bypass" with enthalpy controls when ordered as a Rx system)
 - Double-walled access doors
 - Slide out blower assembly (RE unit)
 - Single 14" (356mm) curb for both rooftop and mated ERV application (Rx system)
 - Optional horizontal discharge curb for ground mounted applications
 - Several filter options
 - Easy to clean removable ERV wheel segments
- Additional options for ERV units include . . .
- Energy recovery wheel frost protection
 - Electric preheaters
 - Wheel bypass operation (economizer mode) with stop jog
 - Filter maintenance alarm
 - Blower/wheel monitor
 - Airflow monitor

When selecting a make-up air unit, it is important to consider not only the features/benefits listed above, but also the operation of the ERV unit. Many MUA units with integrated energy recovery wheels are limited by the amount of outside air that can be introduced due to cabinet or wheel size restraints. The Rx system allows 100% outside air to be introduced through the ERV before entering the heat pump, taking full advantage of the Rx's 70% energy recovery capability. Other manufacturer's integrated models bypass as much as 40% of the outside air, resulting in decreased ERV performance and much higher operating costs. Count on ClimateMaster to deliver a make up air system that combines both high efficiency and cost effectiveness into one package.

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ERV – KEY POINTS

- An HVAC system using an Energy Recovery Ventilator (ERV) is the most cost effective way of resolving the inherent conflict between ventilation for indoor air quality and energy conservation.
- The ERV/RE series rooftop unit combination (Rx series) provides a water source heat pump that can handle 100% outside air.
- The ClimateMaster ERV is designed to mate directly to the RE series rooftop unit without a separate roof penetration. ClimateMaster offers ERV units for each rooftop size, 1200 through 8000 cfm (566 to 3766 l/s).
- The ERV does not eliminate the outside air load, but reduces it by 70-80%. This allows the HVAC equipment in the building to be downsized, since it is no longer required to handle 100% of the outside air load.
- The Airchange desiccant wheel utilizes a silica gel that is permanently bonded in the wheel polymer. Silica Gel is the best desiccant for space conditioning applications; it has superior moisture transfer capabilities when compared to molecular sieve desiccants.
- The ClimateMaster ERV uses an ARI certified Airchange desiccant wheel to reduce the cooling load by 3 tons per 1000 cfm (2.31 Watts per 100 l/s) of ventilation for savings on initial equipment costs and related building operating costs.
- The ClimateMaster/Airchange selection software utilizes local design conditions to help select the proper ERV match for the ventilation load AND calculates ERV effectiveness along with total system EER. Submittal data is generated from reports created in the software package.

AIRXCHANGE WHEEL



Rx ERV OPTIONS

ROOFCURBS

The ERV roofcurbs are constructed of heavy gage galvanized steel and include wood nailer and gasket package for a tight unit-to-curb seal. Standard curbs are 14" tall and are manufactured to NRCA specifications. For mated applications the full (RE & ERV) curb should be ordered. Locator pieces are included to seal the area between the HVAC curb and the ERV curb - as well as to ensure that the ERV curb is set in the proper location. Vibration isolation curbs, pitched curbs, and curbs of varying heights are also available as engineering specials.

ERV-TO-HVAC TRANSITIONS

For applications where the ERV unit is to be mated to the HVAC unit, transitions are available. Each transition is custom designed to connect to the specific HVAC unit. Transitions are insulated, shipped fully assembled and are constructed of pre-paint steel to match the finish of the HVAC unit and ERV unit.

ELECTRICAL DISCONNECTS

Factory installed electrical disconnects are available for all ERV units. Disconnects are sized to handle the ERV unit and pre-heater (when ordered together). Both switched and fused disconnects are available.

FILTER MAINTENANCE INDICATOR SWITCH

Senses static pressure across outside air intake filters. Rising static pressure indicates filters need service. Connect to field supplied 24 volt indicator light. Note: by request, the indicator can be set up for the return air filters (contact factory).

ERV WHEEL MAINTENANCE INDICATOR SWITCH

This option monitors the amp draw for the ERV wheel and if there is an electrical spike (e.g. the ERV belt breaks), a signal is sent to a field supplied 24 volt light to indicate maintenance is required.

OUTSIDE AIR AND EXHAUST AIR BLOWER MAINTENANCE INDICATOR SWITCH

This option monitors the amp draw for both the outside air and the exhaust air blowers/motors. If there is an electrical spike (e.g. the belt breaks), a signal is sent to a

ClimateMaster Water-Source Heat Pumps Rx (ERV) Module Rooftop Energy Recovery Units

field supplied 24 volt light to indicate that maintenance is required.

AIRFLOW MONITORING

Airflow monitoring gauges measure the outside air intake and exhaust air velocity/CFM across the ERV wheel. This allows for easier setup, balancing and monitoring.

CO₂ SENSOR

CO₂ sensors measure the CO₂ level in the space and activate the ERV unit at setpoint.

PRE-HEATERS

Some climates may dictate the use of an electric pre-heater to warm the outside air before it enters the ERV unit. Refer to the ClimateMaster ERV selection software for details. Pre-heaters are factory installed and wired and includes a thermostat to set the pre-heater activation point. Pre-heater sizes are available from 5 to 20kW, depending on cabinet size.

FROST PROTECTION

Applications in extremely cold climates may use the frost protection option as a means of eliminating frost build up on the ERV wheel. Refer to the MicroMetl ERV selection software for details. When frost builds up on the ERV wheel, the outside air blower is temporarily shut off and the warmer exhaust air “defrosts” the wheel. Once the frost build up is eliminated, the outside air blower is reactivated.

LOW TEMPERATURE LOCKOUT

For applications where the ERV unit is to be locked out in extremely cold temperatures, the low temperature lockout option should be used. When the outside air temperature is below setpoint the ERV unit is completely shut down. The thermostat can be set as low as 30°F.

ERV CONTROL TIMERS

If the ERV unit is to be activated at only certain times of the day or week, the ERV control timer option should be ordered. Set the timer to planned occupancy periods. The 24 volt timer is factory installed in the ERV unit and wired.

MOTORIZED DAMPERS

Two-position motorized outside air and exhaust air dampers are available to eliminate the migration of unwanted outside air into the building space when the ERV unit is off. Motors are 24 volt and are factory installed and wired. Outside air and exhaust air dampers are ordered separately.

WHEEL BY-PASS (ECONOMIZER OPERATION)

This option checks the temperature/humidity of the outside air and if it is acceptable for “free-cooling” the ERV wheel is shutdown to allow the outside air to enter the space “as is”. The level of outside air intake is limited to the capacity of the ERV unit. Enthalpy controls are included with this option.

STOP/JOG CONTROL

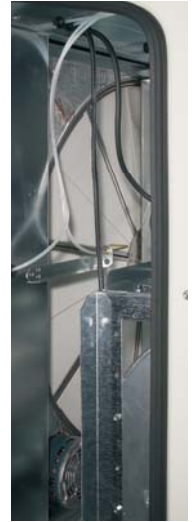
Use this option in conjunction with the wheel bypass option to energize the ERV wheel periodically during the “free-cooling” (wheel bypass) operation of the ERV. This prevents contamination build up on the ERV wheel.

The Smart Choice for Energy Efficiency



Centrifugal belt-driven forward-curved blowers with adjustable pulleys and isolation pads. High efficiency motors are thermally protected

The Airxchange energy recovery wheel transfers energy from the warmer to cooler air streams at a nominal 70% efficiency and is ARI 1060 certified



Segmented wheel makes cleaning and maintenance easy

Polar Ice finish matches RE series rooftop



Exhaust and supply air streams have back-draft dampers to prevent air penetration during off cycles.

Transitions for RE series rooftop allow "mated" ERV-rooftop application

Optional factory-installed pre-heater available

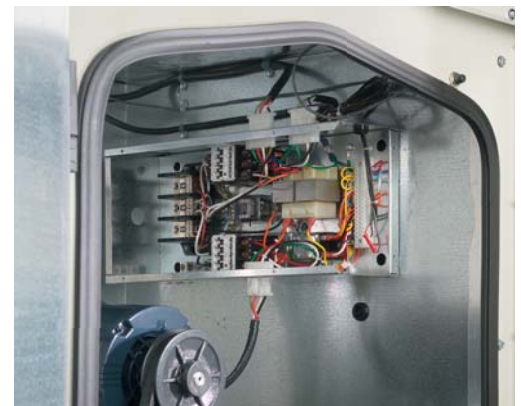
Hinged access doors with 1/4 turn spring-loaded latches

Heavy duty base rails for easy lifting and rigging



Cleanable aluminium filters and 2" pleated pre-filters for outside air with 2" pleated filters on exhaust air help keep the wheel clean

Easy access controls with optional ERV fault indicators
Six-pin Molex connector ties ERV controls to RE series rooftop unit controls



ClimateMaster Water-Source Heat Pumps Rx (ERV) Module Rooftop Energy Recovery Units

ERV SELECTION AND PERFORMANCE SOFTWARE

SCREEN 1: PROJECT INFORMATION

SCREEN 3: DESIGN CONDITIONS

SCREEN 5: SCHEDULES

ClimateMaster's ERV Selection and Performance Analysis Software details the energy savings and return on investment provided by the ClimateMaster Stmmetry Series. Specific criteria is entered for your job and location (city). The software is available through the ClimateMaster Business Center or on the Rx ERV Software CD.

SCREEN 2: UNIT SELECTION

No.	Tag	Model	Sup cfm	Exh cfm	FanMot Eff.	Supply dP	Return dP	EATR
1		ERVB-2532-CM	3300	3300	40	1.09	1.09	4.5

SCREEN 4: UTILITY INFORMATION

The Smart Choice for Energy Efficiency

SCREEN 6: DESIGN POINT PERFORMANCE

DESIGN CONDITIONS

	SUMMER		WINTER	
	outdoor	indoor	outdoor	indoor
Dry Bulb Temperature, F	98.00	75.00	9.00	72.00
Wet Bulb Temperature, F	74.00	63.00	8.00	54.00
Enthalpy, Btu/lb	38.32	28.09	3.25	22.96
	Meas.	Net	Meas.	Net
Total Effectiveness, %	62.4	60.6	63.2	61.2

DESIGN LOADS

	DA Sensible Btu/h	DA Latent Btu/h	DA Total Btu/h	Total Recovered Btu/h	Net DA Load Btu/h
Summer	83.28	67.42	32.96	44.9	78,878
Winter	48.31	39.27	15.13	43.8	223,038

SYSTEM CAPACITY SAVED: COOLING, TONS 6.39 **HEATING, Btu/h** 170,113

SCREEN 7: SUMMARY REPORT

Project Name: _____ **Date:** 11/1/2004

ClimateMaster, Inc. AIRX ERC SUMMARY DESIGN POINT DATA

DESIGN CONDITIONS	Dry Bulb, F	Wet Bulb, F	Enthalpy, Btu/lb
SUMMER, Outdoor	99.00	74.00	38.32
SUMMER, Indoor	75.00	63.00	29.09
WINTER, Outdoor	9.00	8.00	3.25
WINTER, Indoor	72.00	54.00	22.96

Model Unit (Effectiveness)	Supply cfm	Exhaust cfm	CR	Supply DB F	Supply WB F	OA Load Btu/h	Recovered Load Btu/h	Net Load Btu/h	A/C Rad. Tons	HTG Rad. Btu/h
ERV-2532-CM	3300	3300	Clg	83.28	67.42	126,323	76,695	49,628	6.39	
(62.42%)			Htg	48.31	39.27	290,723	170,113	120,610		170,113
SUMMARY										
All Units	3,300	3,300	Clg			126,323	76,695	49,628	6.39	
			Htg			290,723	170,113	120,610		170,113

SCREEN 8: ENERGY ANALYSIS

SELECT A UNIT FOR ANNUAL ANALYSIS OR SELECT "ALL UNITS" FOR ENTIRE PROJECT

Unit No. 1 Model ERVB-2532-CM No Units in Project 1 Weather Conditions Oklahoma City, Oklahoma

Dry Bulb F	MChW F	Annual Hours	Enthalpy Btu/lb	Ventilation Load, MBtu	Recovered Load, MBtu	Net Vent. Load, MBtu
102.50	75.74	23	40.02	3,440	2,093	1,357
97.50	73.86	103	38.22	12,879	7,780	5,099
92.50	73.26	217	37.72	25,649	15,246	10,403
87.50	72.04	424	36.61	43,662	25,593	18,069
82.50	69.97	635	34.69	44,935	25,351	18,984
77.50	67.49	682	32.70	34,249	19,298	14,951
72.50	64.44	764	30.32			
67.50	60.56	971	27.45	-697	-460	-228
62.50	55.78	796	24.21	-3,637	-2,617	-1,081
57.50	50.94	712	21.23	-17,844	-12,401	-5,443
52.50	46.43	645	18.70	-37,596	-24,381	-13,165

Print This Table

SCREEN 9: ECONOMIC SUMMARY

Weather Conditions Oklahoma City, Oklahoma

Calculate Economics

Unit No.	Model	Supply cfm	Exhaust cfm	Cooling \$ Saved	Heating \$ Saved	Heat Load
1	ERV-2532-C	3300	3300	95,951	448	291,598
SUMMARY						
All Units		3300	3300	95,951	448	291,598

Print This Table **Print Entire Report**

Note: Summer utility rates are assumed to apply from May through October

SCREEN 10: EER ANALYSIS

Airchange Component

This analysis calculates the recovery efficiency ratio (RER) for the ERV component at the selected design conditions and combines it with a user defined EER for the unitary air conditioner to provide a calculated efficiency for the combination (SystemEER).

Unitary Equipment

* Confirm that unitary equipment size is based on the reduced load with the addition of the ERV component (see Help for details)

Select a Unit: 1 Name or Model Number: RE08 EER: 14.7 Unitary Capacity: 91900 Btu/h

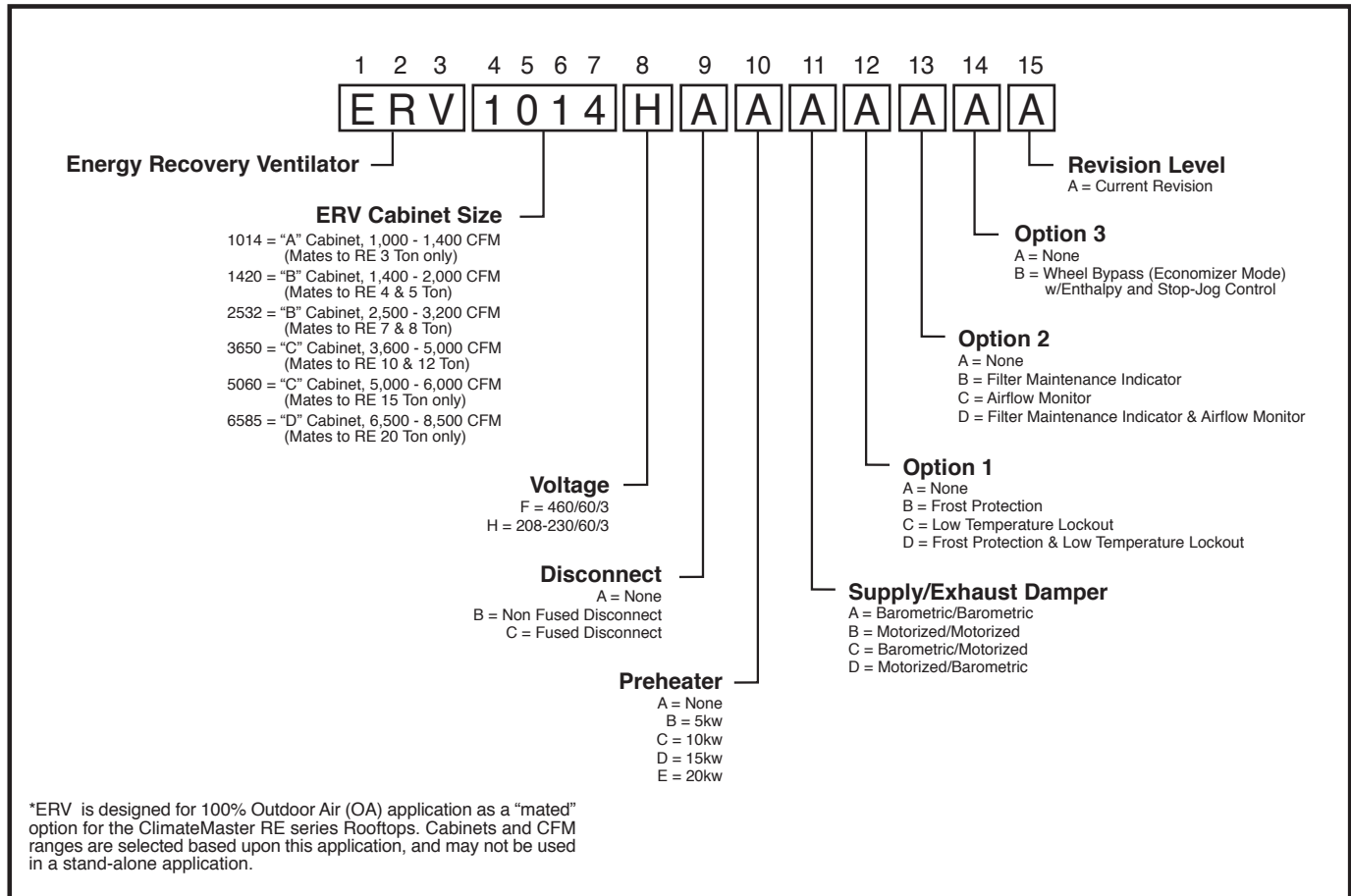
Calculate

Unit	ERV RER	Unitary Model	Unitary Cap.	Unitary EER	ERV Cap. (%)	SysEER
1	33.47	RE08	91900.0	14.70	45	19.74

Print Selection **Print All**

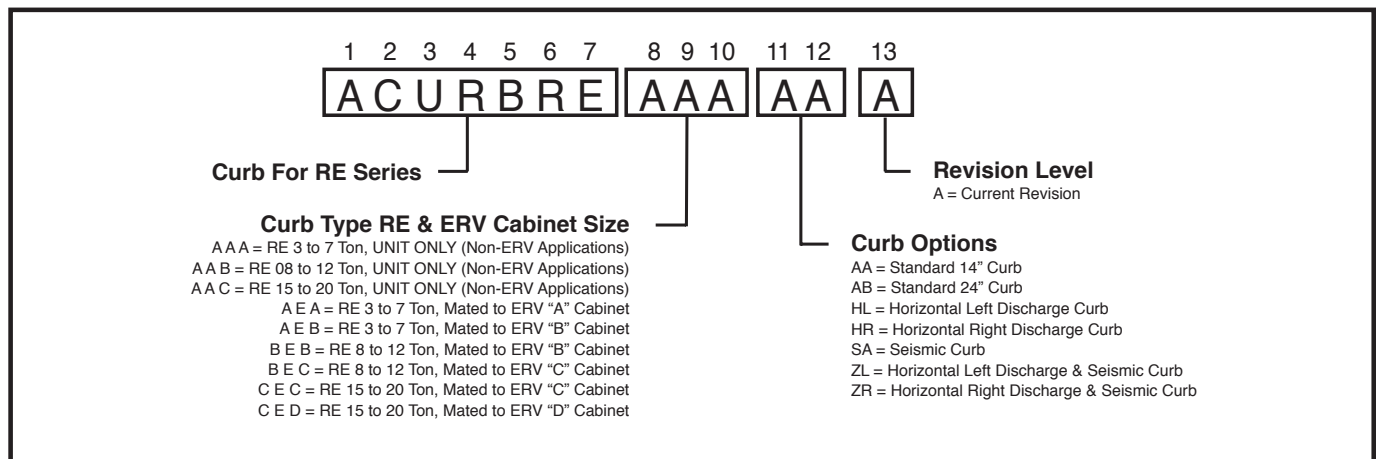
ClimateMaster Water-Source Heat Pumps Rx (ERV) Module Rooftop Energy Recovery Units

ERV Unit Nomenclature



Rev.: 10/04/05D

ERV Full Curb (RE and ERV Unit) Nomenclature



Rev.: 10/04/05D

ERV Unit Effectiveness and ARI 1060-2001

ARI certified energy recovery wheels insure that published effectiveness (%) has been verified by third party testing. The following certification program ratings are included in the ARI standard:

1. Airflow, scfm
2. Pressure drop, inches H₂O
3. Sensible and net sensible effectiveness (at 100% and 75% rated airflow for heating and cooling conditions)
4. Latent and net latent effectiveness (at 100% and 75% rated airflow for heating and cooling conditions)
5. Total and net total effectiveness (at 100% and 75% rated airflow for heating and cooling conditions)
6. Exhaust air transfer ratio, outdoor air correction factor, and purge angle or setting (if applicable) at 0.00 inches H₂O and two or more pressure differentials.

Test conditions are 95°F DB / 78°F WB outside air in cooling and 35°F DB outside air in heating with return air temperatures of 75°F DB / 63°F WB in cooling and 70°F DB in heating.

**ClimateMaster Water-Source Heat Pumps
Rx (ERV) Module
Rooftop Energy Recovery Units**

ERV Unit Effectiveness - "A" and "B" Cabinets

ERV Unit	ERV Wheel	CFM	Effectiveness (%)			
			Sensible	Latent	T Cooling	T Heating
ERV1014	ERC-2514 or ERC-2513	900	71.1	65.1	67.9	68.9
		1,000	69.4	62.8	65.8	67.0
		1,100	67.7	60.4	63.8	65.1
		1,200	66.1	58.0	61.7	63.2
		1,300	64.4	55.7	59.6	61.3
		1,400	62.7	53.3	57.5	59.3
ERV1420	ERC-3623	1,400	76.9	68.9	72.5	74.1
		1,500	75.8	67.8	71.4	73.0
		1,600	74.7	66.7	70.3	71.9
		1,700	73.7	65.7	69.2	70.8
		1,800	72.6	64.6	68.1	69.7
		1,900	71.5	63.5	67.1	68.6
ERV2532	ERC-3628	2,000	70.4	62.4	66.0	67.5
		2,200	71.3	64.3	67.1	68.8
		2,300	70.4	63.2	66.0	67.8
		2,400	69.5	62.0	65.0	66.8
		2,500	68.6	60.9	63.9	65.8
		2,600	67.6	59.7	62.9	64.8
		2,700	66.7	58.6	61.8	63.8
		2,800	65.8	57.4	60.7	62.8
		2,900	64.9	56.2	59.7	61.8
		3,000	64.0	55.1	58.6	60.8
		3,100	63.1	53.9	57.5	59.8
		3,200	62.2	52.7	56.5	58.8
3,300	61.3	51.6	55.4	57.8		

Notes:

1. Effectiveness shown are based on equal supply and exhaust cfm
 2. Energy Recovery component is certified in accordance with ARI 1060-2001.
- Actual performance in packaged equipment may vary.

ERV Unit Effectiveness - "C" and "D" Cabinets

ERV Unit	ERV Wheel	CFM	Effectiveness (%)			
			Sensible	Latent	T Cooling	T Heating
ERV3650	ERC-5245	3,600	73.6	65.6	69.1	70.7
		3,800	72.5	64.5	68.1	69.7
		4,000	71.5	63.5	67.1	68.6
		4,200	70.5	62.4	66.0	67.6
		4,400	69.4	61.4	65.0	66.5
		4,600	68.4	60.3	64.0	65.5
		4,800	67.3	59.3	62.9	64.4
		5,000	66.3	58.2	61.9	63.4
ERV5060	ERC-5262	4,600	71.5	64.7	67.4	69.0
		4,800	70.7	63.6	66.4	68.1
		5,000	69.8	62.5	65.4	67.2
		5,200	68.9	61.4	64.4	66.2
		5,400	68.1	60.3	63.4	65.3
		5,600	67.2	59.2	62.4	64.4
		5,800	66.4	58.1	61.4	63.4
		6,000	65.5	57.0	60.4	62.5
ERV6585	ERC-6488	6,500	71.8	65.0	67.7	69.4
		7,000	70.3	63.1	66.0	67.7
		7,500	68.8	61.2	64.2	66.1
		8,000	67.3	59.3	62.5	64.4
		8,500	65.8	57.4	60.7	62.8

Notes:

1. Effectiveness shown are based on equal supply and exhaust cfm
2. Energy Recovery component is certified in accordance with ARI 1060-2001. Actual performance in packaged equipment may vary.

ClimateMaster Water-Source Heat Pumps Rx (ERV) Module Rooftop Energy Recovery Units

ERV Unit Effectiveness - "A" Cabinet

Certified Directory of the Air-to-Air Energy Recovery Ventilation Program

Unit Manufacturer: ClimateMaster - 2514 or 2513

Type: WHEEL **Nominal Airflow:** 1100 scfm

Tilt Angle (Heating/Cooling): N / A Deg

Pressure Drop: 0.95 inches

Leakage Ratings

	Pressure Differential	EATR	OACF	Purge Angle or Setting
Test 1:	-1.00 inches	8.8%	0.96	N/A
Test 2:	0.00 inches	0.5%	1.18	N/A
Test 3:	1.00 inches	0.0%	1.33	N/A
Optional Add'l Test(s):	inches			

Thermal Effectiveness Ratings at 0" Pressure Differential

	Sensible	Latent	Total
100% Airflow Heating Condition:	68%	60%	65%
75% Airflow Heating Condition:	71%	67%	70%
100% Airflow Cooling Condition:	68%	60%	64%
75% Airflow Cooling Condition:	71%	67%	69%
	Net Sensible	Net Latent	Net Total
100% Airflow Heating Condition:	68%	60%	65%
75% Airflow Heating Condition:	71%	67%	70%
100% Airflow Cooling Condition:	68%	60%	64%
75% Airflow Cooling Condition:	71%	67%	69%

Notes:

scfm = Standard Cubic Feet per Minute

EATR = Exhaust Air Transfer Rate

OACF = Outdoor Air Correction Factor

N/A = Not Applicable



Energy recovery component certified to the ARI Air-to-Air Energy Recovery Ventilation Equipment Certification Program in accordance with ARI standard 1060-2001. Actual performance in packaged equipment may vary.

The Smart Choice for Energy Efficiency

ERV Unit Effectiveness - "B" Cabinets

Certified Directory of the Air-to-Air Energy Recovery Ventilation Program

Unit Manufacturer: ClimateMaster - 3623
Type: WHEEL **Nominal Airflow:** 2200 scfm
Tilt Angle (Heating/Cooling) N / A Deg
Pressure Drop: 1.00 inches

Leakage Ratings

	Pressure Differential	EATR	OACF	Purge Angle or Setting
Test 1:	-0.50 inches	2.0%	1.03	N/A
Test 2:	0.00 inches	0.4%	1.06	N/A
Test 3	0.50 inches	0.1%	1.09	N/A
Optional Add'l Test(s):	inches			

Thermal Effectiveness Ratings at 0" Pressure Differential

	Sensible	Latent	Total
100% Airflow Heating Condition:	68%	60%	65%
75% Airflow Heating Condition:	74%	66%	71%
100% Airflow Cooling Condition:	68%	60%	64%
75% Airflow Cooling Condition:	74%	66%	70%
	Net Sensible	Net Latent	Net Total
100% Airflow Heating Condition:	68%	60%	65%
75% Airflow Heating Condition:	74%	66%	71%
100% Airflow Cooling Condition:	68%	60%	64%
75% Airflow Cooling Condition:	74%	66%	70%

Certified Directory of the Air-to-Air Energy Recovery Ventilation Program

Unit Manufacturer: ClimateMaster - 3628
Type: WHEEL **Nominal Airflow:** 2600 scfm
Tilt Angle (Heating/Cooling) N / A Deg
Pressure Drop: 0.95 inches

Leakage Ratings

	Pressure Differential	EATR	OACF	Purge Angle or Setting
Test 1:	-1.00 inches	6.1%	0.99	N/A
Test 2:	0.00 inches	0.4%	1.13	N/A
Test 3	1.00 inches	0.0%	1.23	N/A
Optional Add'l Test(s):	inches			

Thermal Effectiveness Ratings at 0" Pressure Differential

	Sensible	Latent	Total
100% Airflow Heating Condition:	68%	60%	65%
75% Airflow Heating Condition:	74%	67%	71%
100% Airflow Cooling Condition:	68%	60%	63%
75% Airflow Cooling Condition:	74%	67%	70%
	Net Sensible	Net Latent	Net Total
100% Airflow Heating Condition:	68%	60%	65%
75% Airflow Heating Condition:	74%	67%	71%
100% Airflow Cooling Condition:	68%	60%	63%
75% Airflow Cooling Condition:	74%	67%	70%

Notes:

scfm = Standard Cubic Feet per Minute
 EATR = Exhaust Air Transfer Rate
 OACF = Outdoor Air Correction Factor
 N/A = Not Applicable



Energy recovery component certified to the ARI Air-to-Air Energy Recovery Ventilation Equipment Certification Program in accordance with ARI standard 1060-2001. Actual performance in packaged equipment may vary.

ClimateMaster Water-Source Heat Pumps Rx (ERV) Module Rooftop Energy Recovery Units

ERV Unit Effectiveness - "C" Cabinet

Unit Manufacturer: ClimateMaster - 5245
Type: WHEEL **Nominal Airflow:** 4600 scfm
Tilt Angle (Heating/Cooling) N / A Deg
Pressure Drop: 1.00 inches

Leakage Ratings

	Pressure Differential	EATR	OACF	Purge Angle or Setting
Test 1:	-0.50 inches	1.8%	1.01	N/A
Test 2:	0.00 inches	0.9%	1.03	N/A
Test 3	0.50 inches	0.6%	1.04	N/A
Optional Add'l Test(s):	inches			

Thermal Effectiveness Ratings at 0" Pressure Differential

	Sensible	Latent	Total
100% Airflow Heating Condition:	68%	60%	66%
75% Airflow Heating Condition:	74%	66%	72%
100% Airflow Cooling Condition:	68%	60%	64%
75% Airflow Cooling Condition:	74%	66%	70%
	Net Sensible	Net Latent	Net Total
100% Airflow Heating Condition:	68%	60%	66%
75% Airflow Heating Condition:	74%	66%	72%
100% Airflow Cooling Condition:	68%	60%	64%
75% Airflow Cooling Condition:	74%	66%	70%

Unit Manufacturer: ClimateMaster - 5262
Type: WHEEL **Nominal Airflow:** 5500 scfm
Tilt Angle (Heating/Cooling) N / A Deg
Pressure Drop: 0.95 inches

Leakage Ratings

	Pressure Differential	EATR	OACF	Purge Angle or Setting
Test 1:	-1.00 inches	4.0%	0.99	N/A
Test 2:	0.00 inches	1.0%	1.06	N/A
Test 3	1.00 inches	0.2%	1.10	N/A
Optional Add'l Test(s):	inches			

Thermal Effectiveness Ratings at 0" Pressure Differential

	Sensible	Latent	Total
100% Airflow Heating Condition:	68%	60%	65%
75% Airflow Heating Condition:	73%	67%	71%
100% Airflow Cooling Condition:	68%	60%	63%
75% Airflow Cooling Condition:	73%	67%	70%
	Net Sensible	Net Latent	Net Total
100% Airflow Heating Condition:	68%	60%	65%
75% Airflow Heating Condition:	73%	67%	71%
100% Airflow Cooling Condition:	68%	60%	63%
75% Airflow Cooling Condition:	73%	67%	70%

Notes:

scfm = Standard Cubic Feet per Minute
 EATR = Exhaust Air Transfer Rate
 OACF = Outdoor Air Correction Factor
 N/A = Not Applicable



Energy recovery component certified to the ARI Air-to-Air Energy Recovery Ventilation Equipment Certification Program in accordance with ARI standard 1060-2001. Actual performance in packaged equipment may vary.

The Smart Choice for Energy Efficiency

ERV Unit Effectiveness - "D" Cabinet

Unit Manufacturer: ClimateMaster - 6488
 Type: WHEEL Nominal Airflow: 7900 scfm
 Tilt Angle (Heating/Cooling) N / A Deg
 Pressure Drop: 0.85 inches

Leakage Ratings

	Pressure Differential	EATR	OACF	Purge Angle or Setting
Test 1:	0.00 inches	2.2%	1.02	0.0 d
Test 2:	0.50 inches	1.0%	1.04	1.0 d
Test 3	1.00 inches	0.6%	1.05	1.0 d

Optional Add'l inches
 Test(s):

Thermal Effectiveness Ratings at 0" Pressure Differential

	Sensible	Latent	Total
100% Airflow Heating Condition:	65%	61%	64%
75% Airflow Heating Condition:	72%	66%	70%
100% Airflow Cooling Condition:	65%	61%	63%
75% Airflow Cooling Condition:	72%	66%	69%

	Net Sensible	Net Latent	Net Total
100% Airflow Heating Condition:	65%	61%	64%
75% Airflow Heating Condition:	72%	66%	70%
100% Airflow Cooling Condition:	65%	61%	63%
75% Airflow Cooling Condition:	72%	66%	69%

Notes:

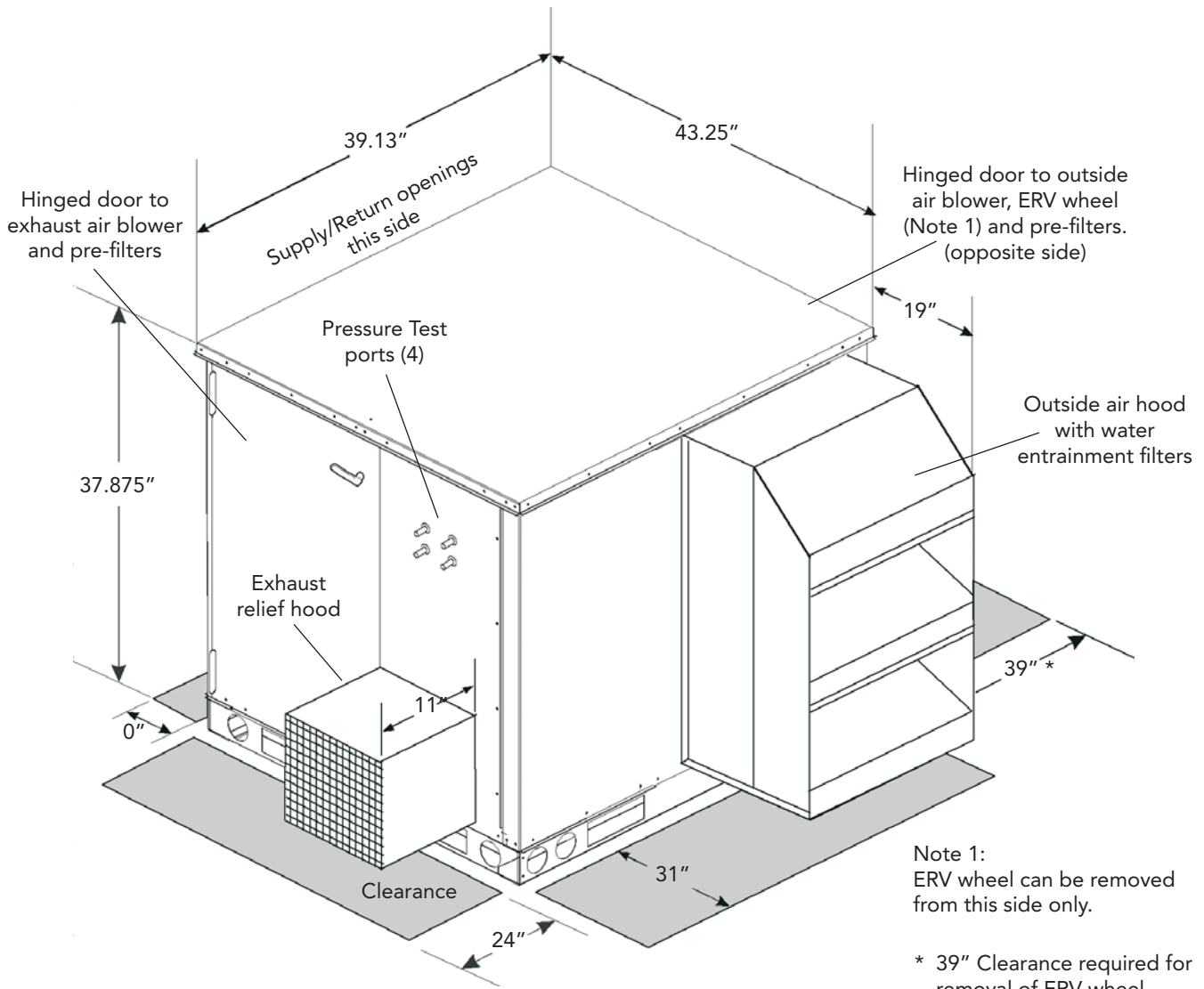
scfm = Standard Cubic Feet per Minute
 EATR = Exhaust Air Transfer Rate
 OACF = Outdoor Air Correction Factor
 N/A = Not Applicable



Energy recovery component certified to the ARI Air-to-Air Energy Recovery Ventilation Equipment Certification Program in accordance with ARI standard 1060-2001. Actual performance in packaged equipment may vary.

**ClimateMaster Water-Source Heat Pumps
Rx (ERV) Module
Rooftop Energy Recovery Units**

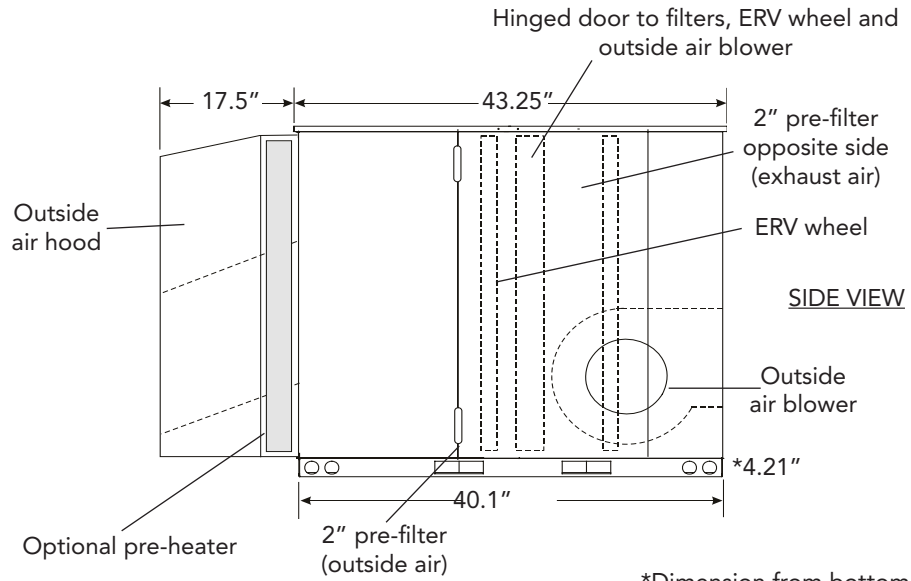
**ERV "A" Cabinet Physical Data
(900 - 1,400 CFM)**



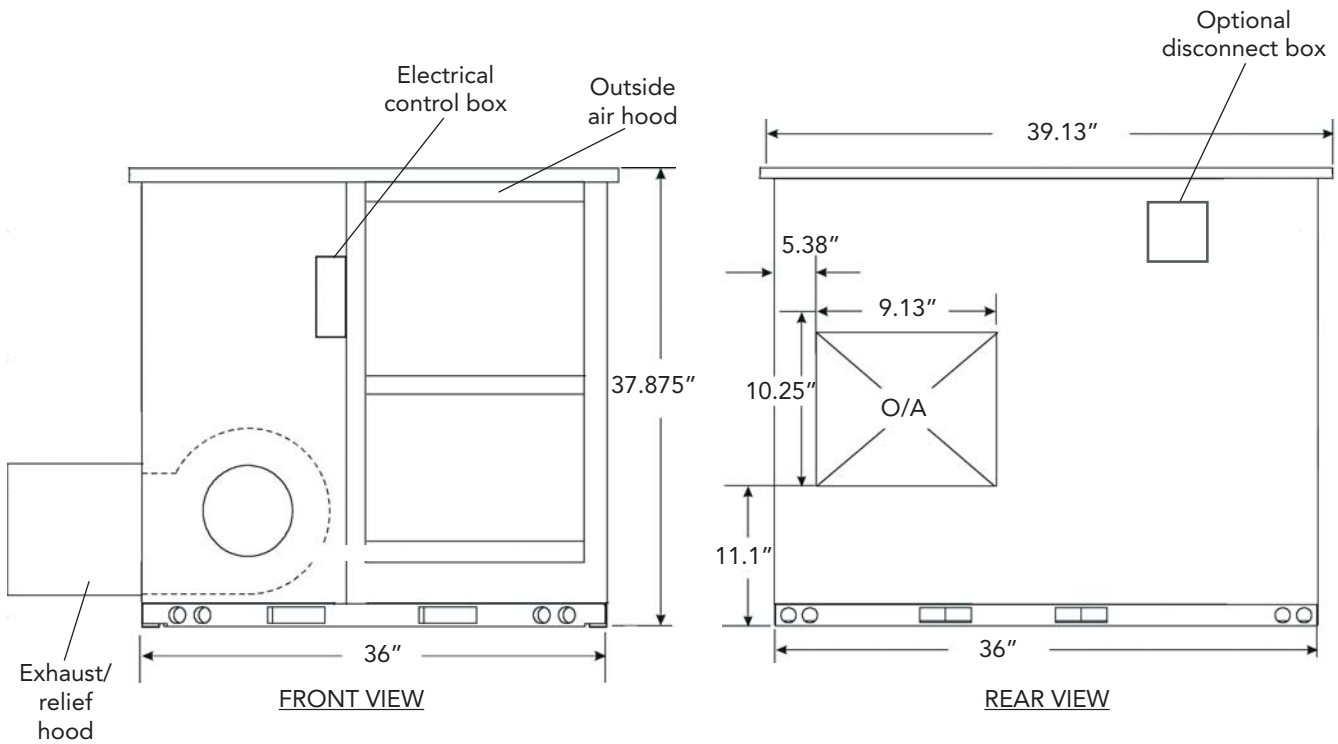
Maximum shipping wt. 470 lbs.



The Smart Choice for Energy Efficiency

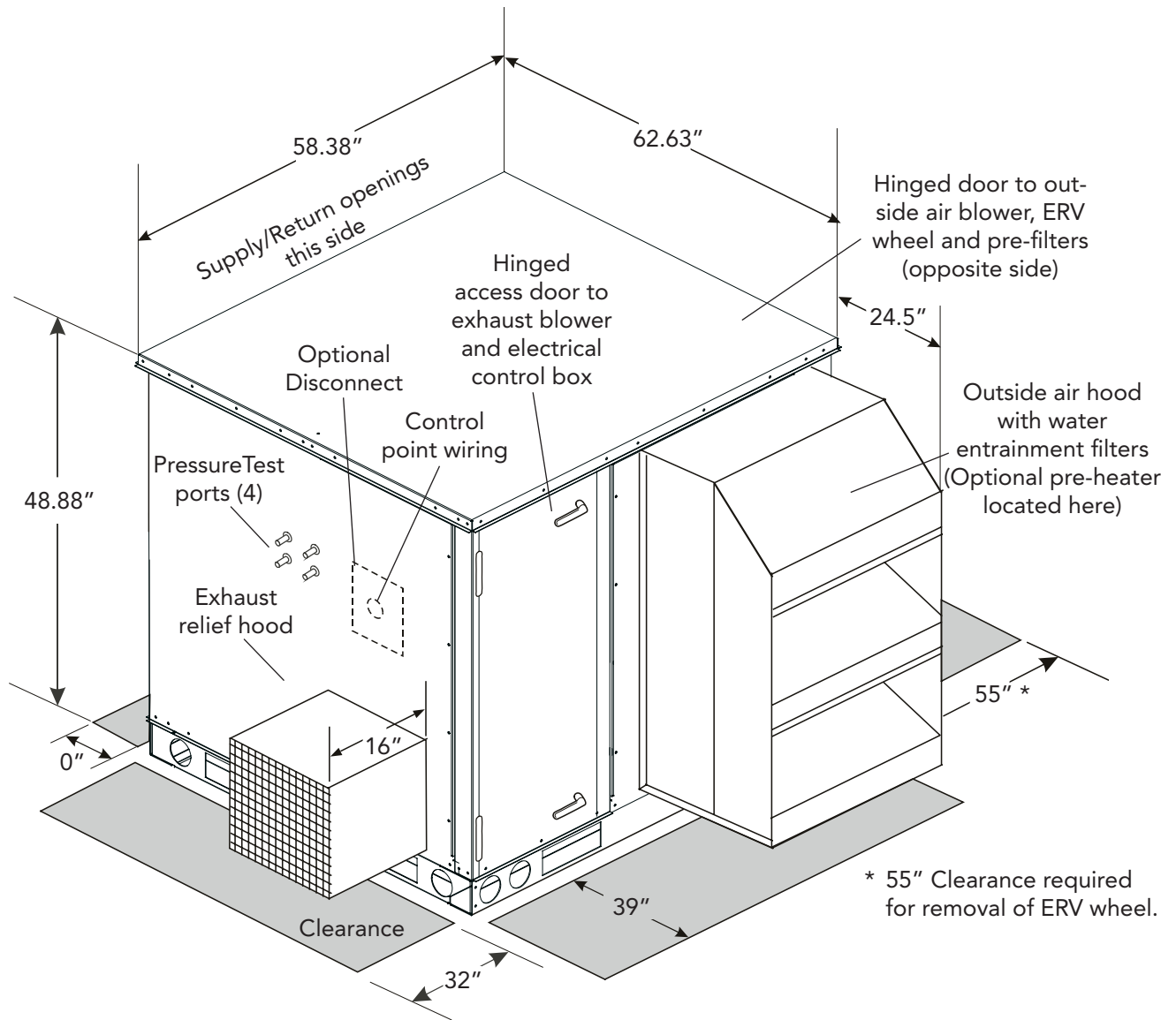


*Dimension from bottom of rail to unit base.



**ClimateMaster Water-Source Heat Pumps
Rx (ERV) Module
Rooftop Energy Recovery Units**

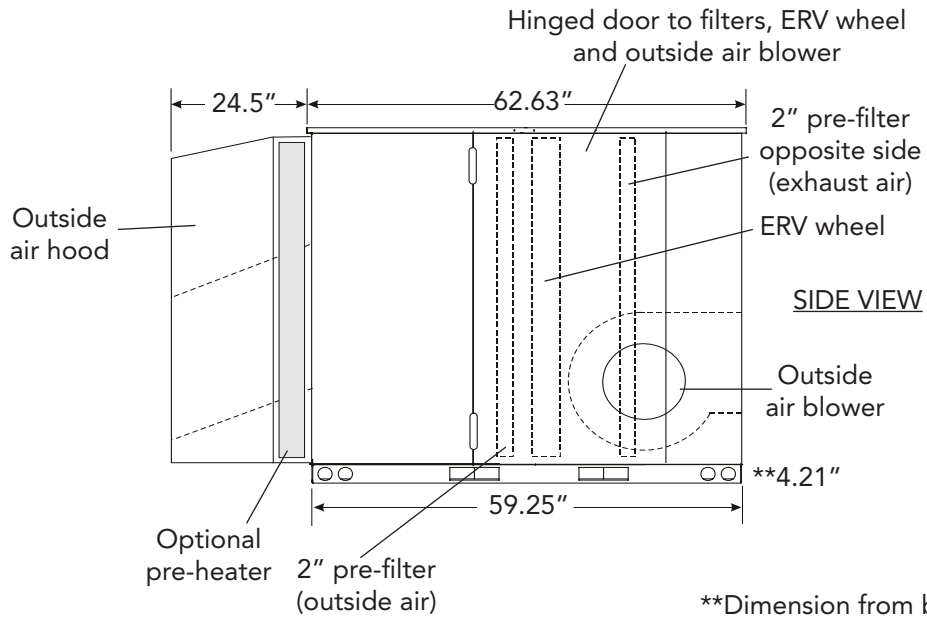
**ERV "B" Cabinet Physical Data
(1,400 - 3,200 CFM)**



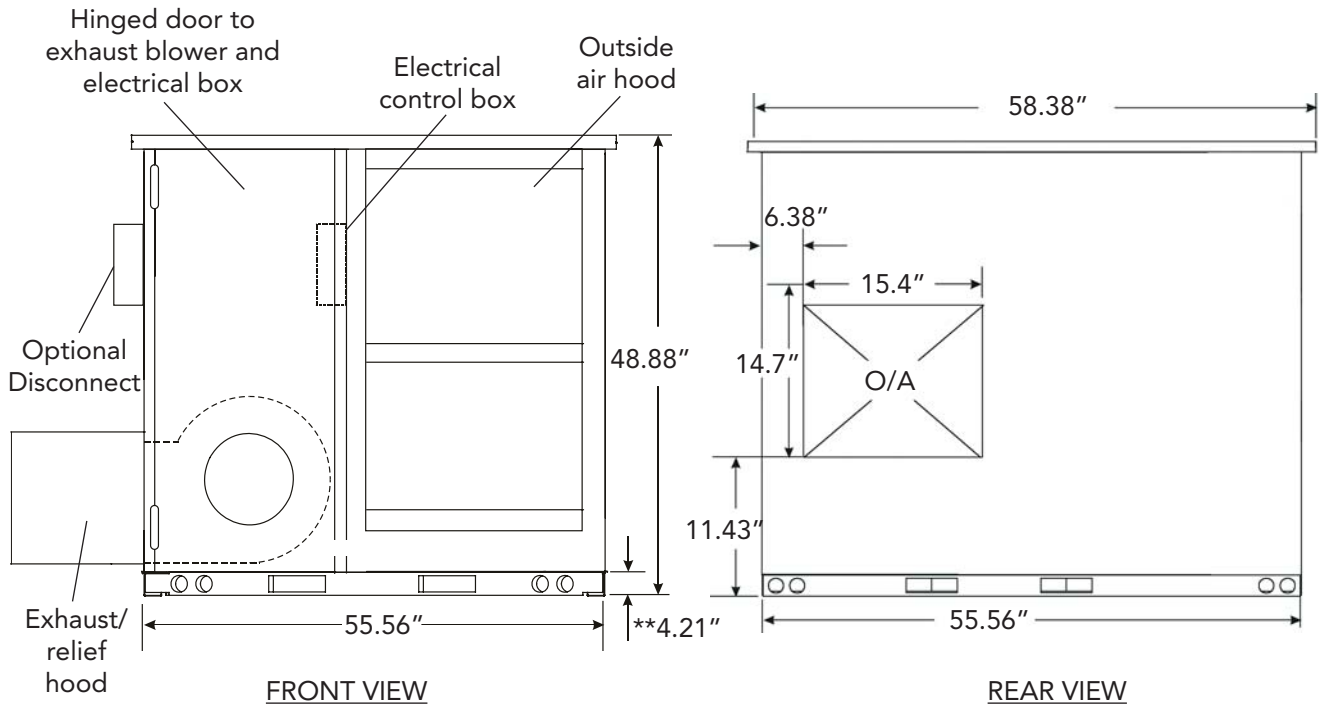
Maximum shipping wt. 730 lbs.



The Smart Choice for Energy Efficiency

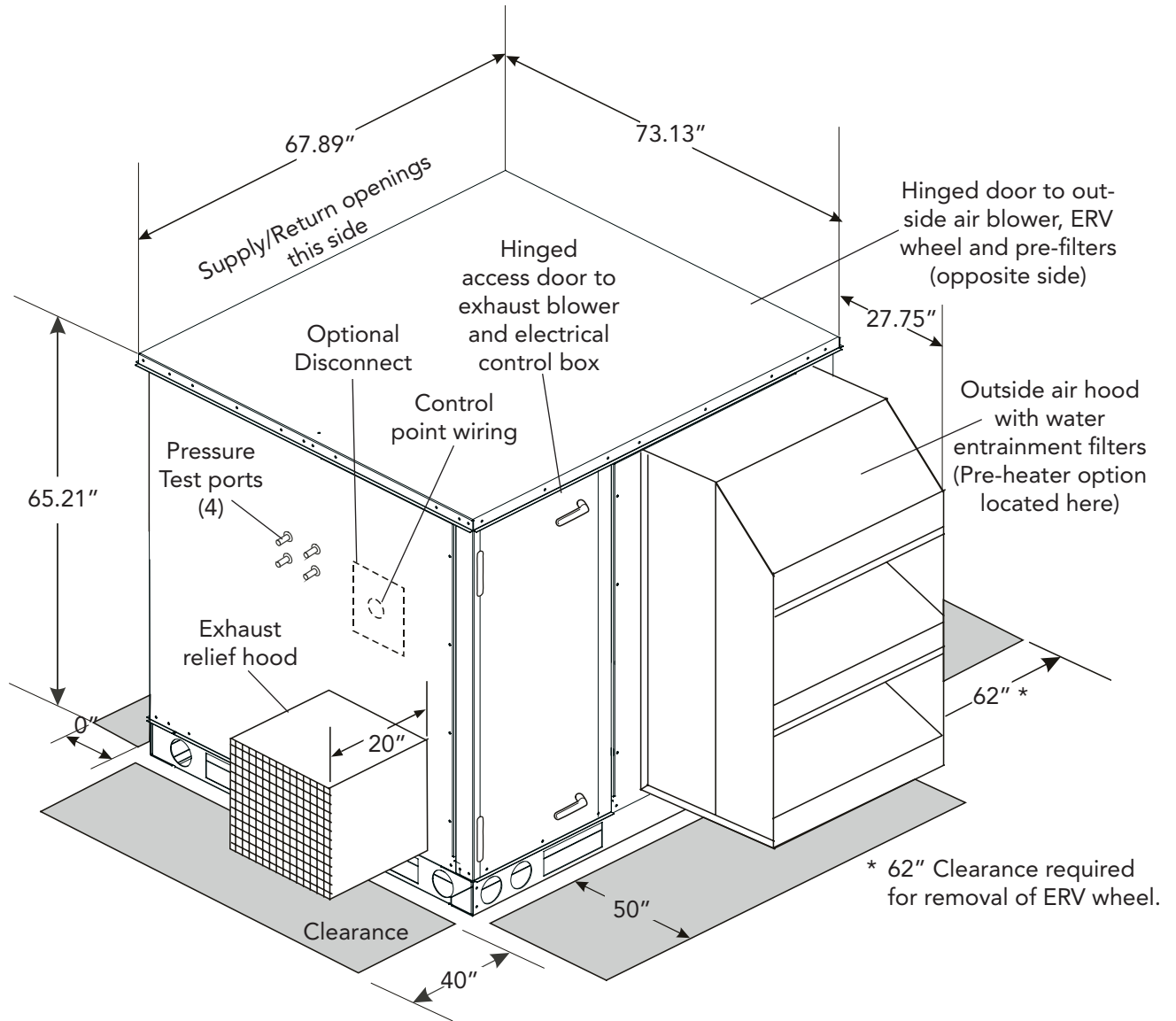


**Dimension from bottom of rail to unit base.



**ClimateMaster Water-Source Heat Pumps
Rx (ERV) Module
Rooftop Energy Recovery Units**

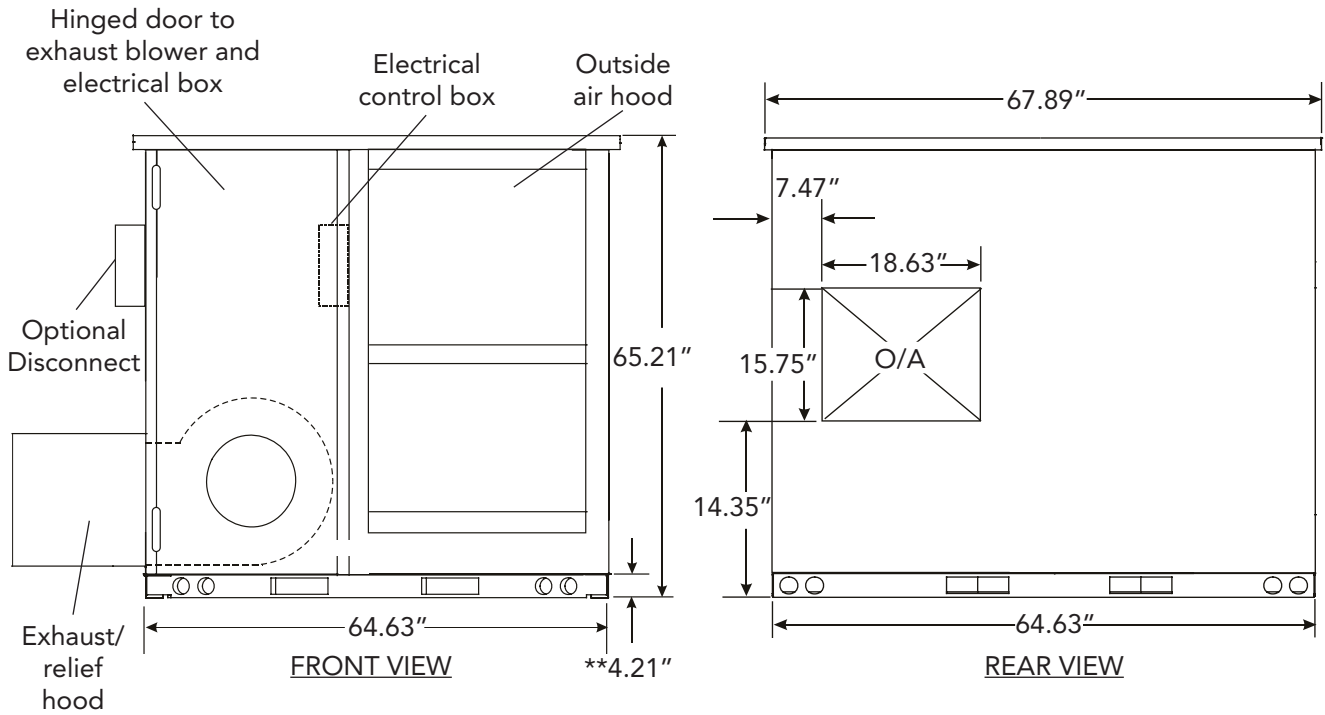
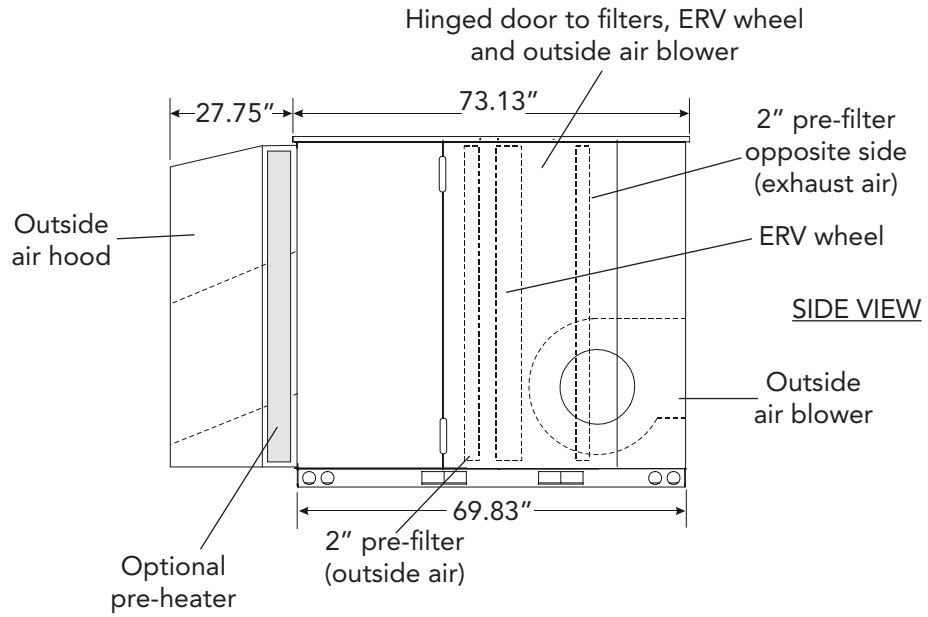
**ERV "C" Cabinet Physical Data
(3,000 - 6,800 CFM)**



Maximum shipping wt. 1,600 lbs.



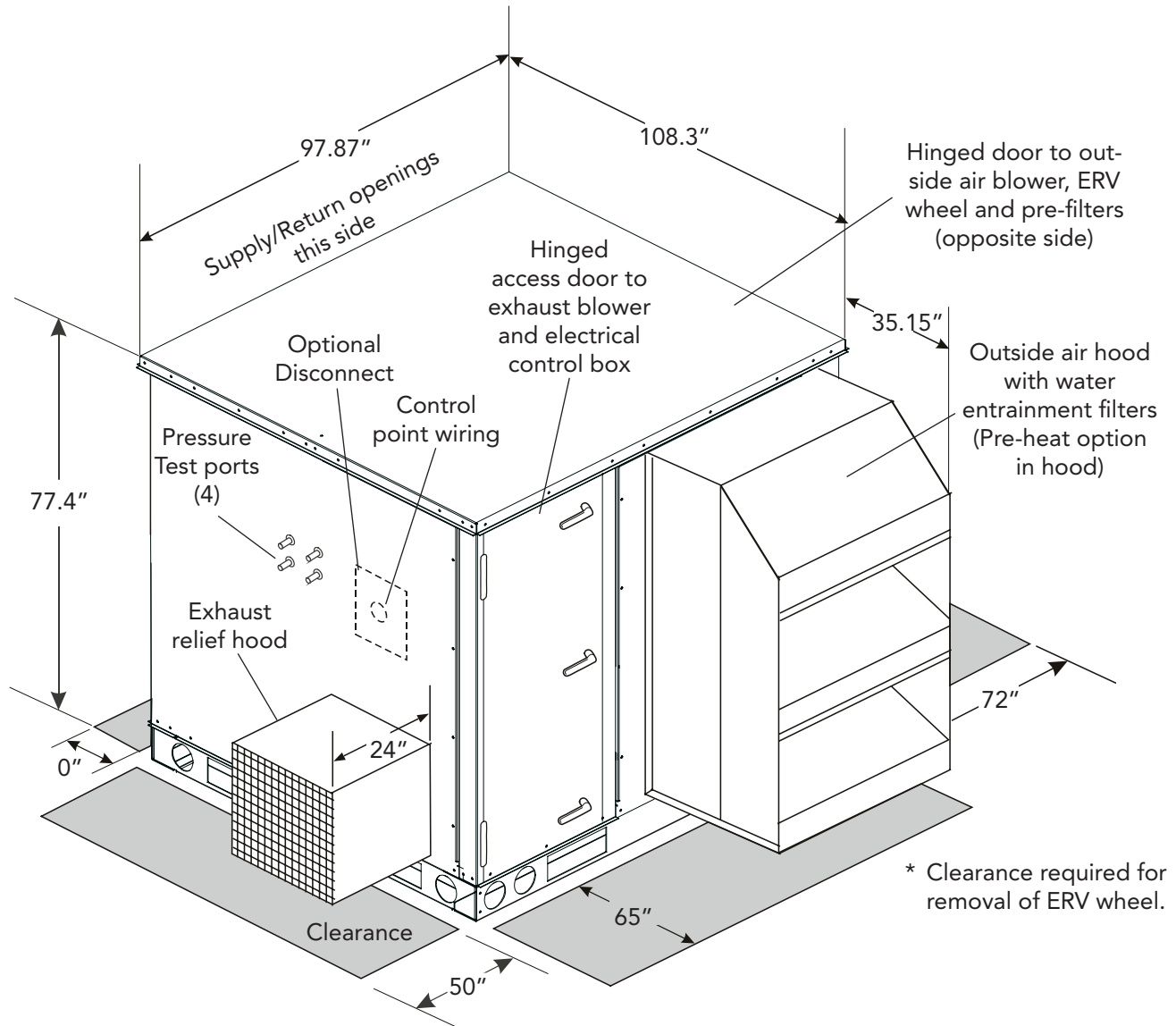
The Smart Choice for Energy Efficiency



**From bottom of rail to unit base.

**ClimateMaster Water-Source Heat Pumps
Rx (ERV) Module
Rooftop Energy Recovery Units**

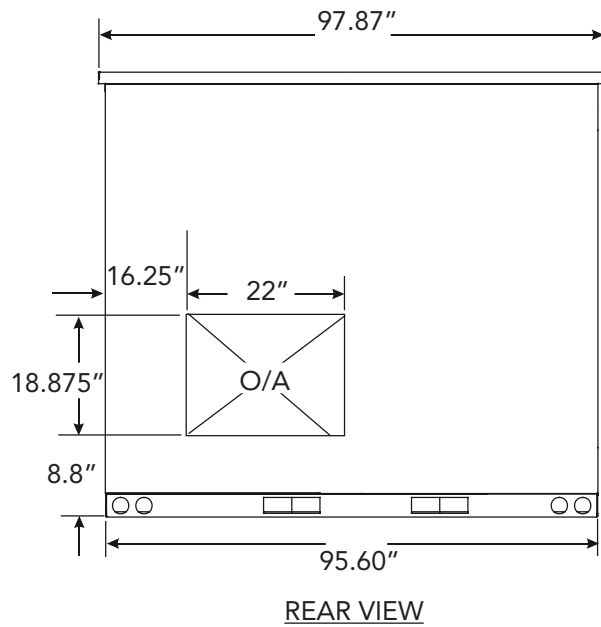
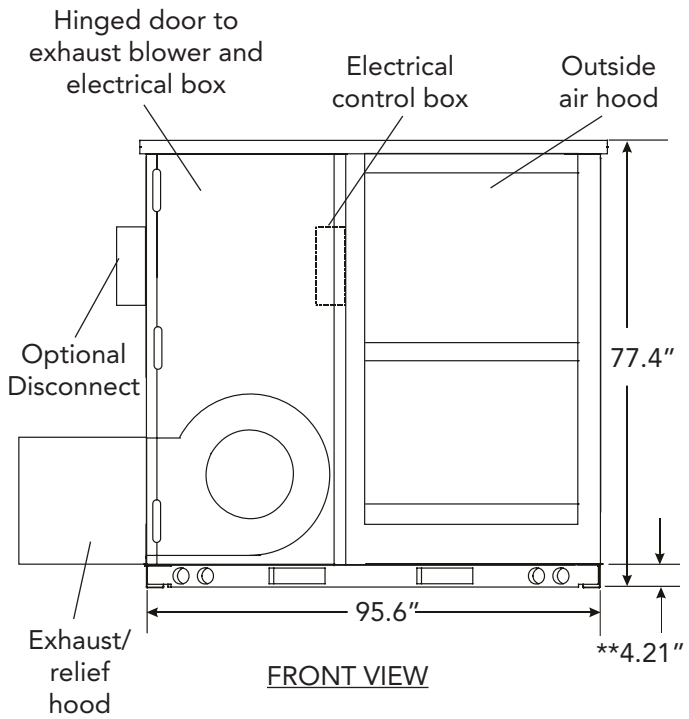
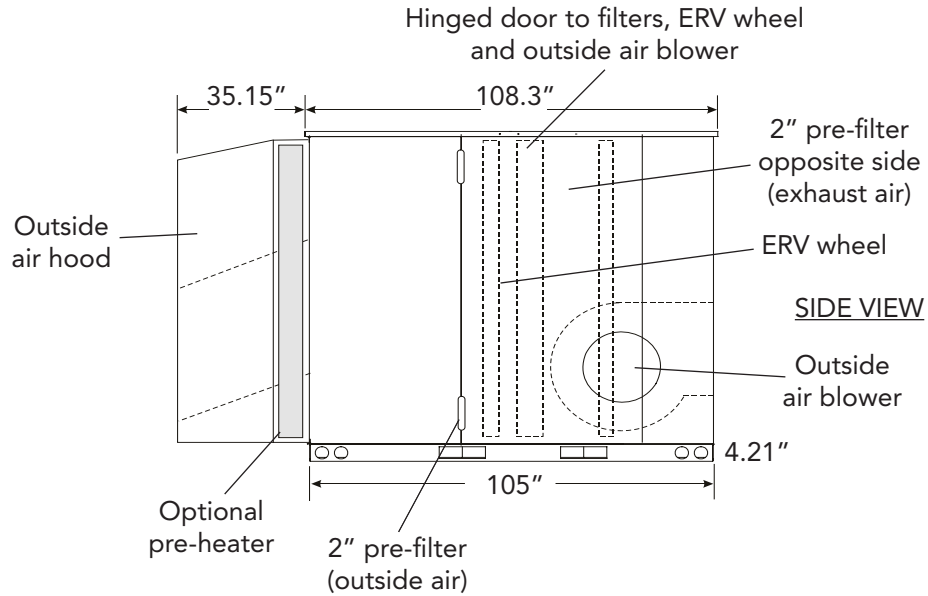
**ERV "D" Cabinet Physical Data
(6,500 - 8,500 CFM)**



Maximum shipping wt. 2,200 lbs.



The Smart Choice for Energy Efficiency

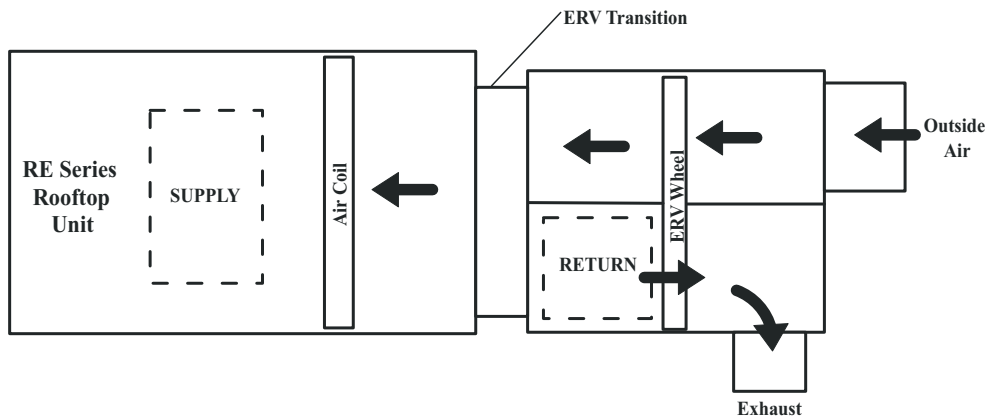
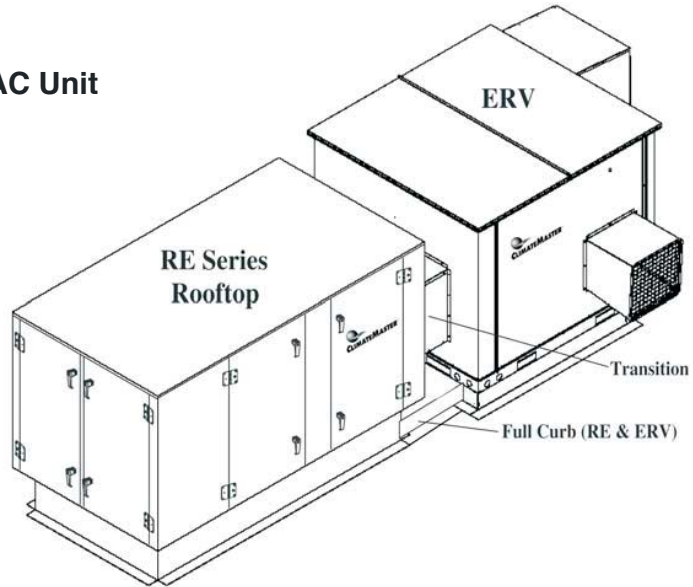


**From bottom of rail to unit base.

ClimateMaster Water-Source Heat Pumps Rx (ERV) Module Rooftop Energy Recovery Units

ERV Mated To RE Series Rooftop WSHP - Cabinet Layout

Mated To Down Discharge 3 - 20 Ton HVAC Unit



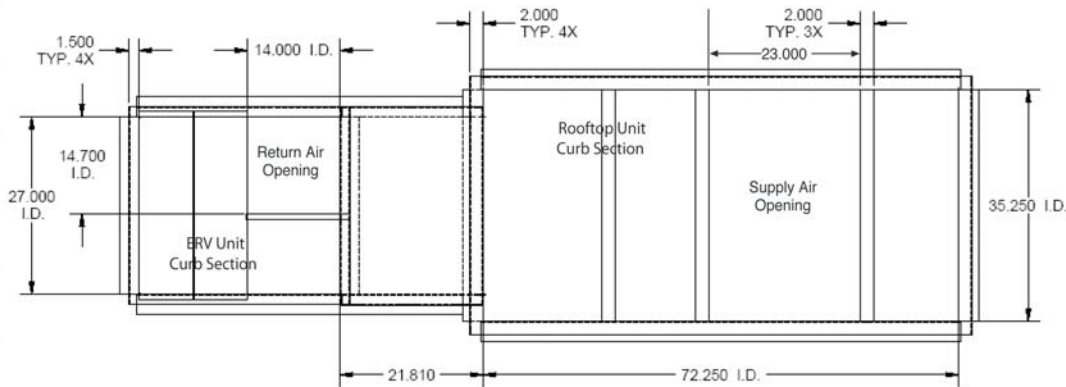
ERV Match Up Guide

Rooftop Unit*	ERV	Full Curb (ERV & RE)
RE03	ERV1014	ACURBREAEAA
RE04	ERV1420	ACURBREAEBA
RE05	ERV1420	ACURBREAEBA
RE07	ERV2532	ACURBREAEBA
RE08	ERV2532	ACURBREBEBA
RE10	ERV3650	ACURBREBECA
RE12	ERV3650	ACURBREBECA
RE15	ERV5060	ACURBRECECA
RE20	ERV6585	ACURBRECEDA

*Must be configured for 100% OA

Roofcurb For Mated Applications

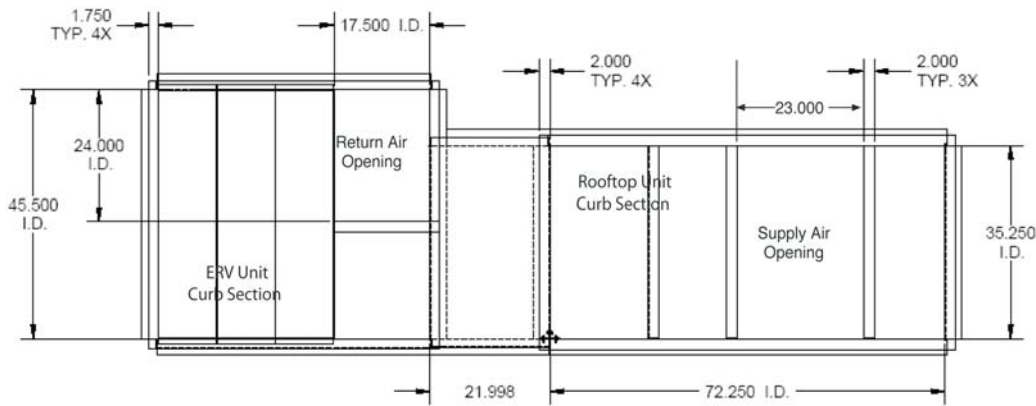
Full Curb for RE03 Mated to ERV "A" Cabinet (Part # ACURBREAEAA)



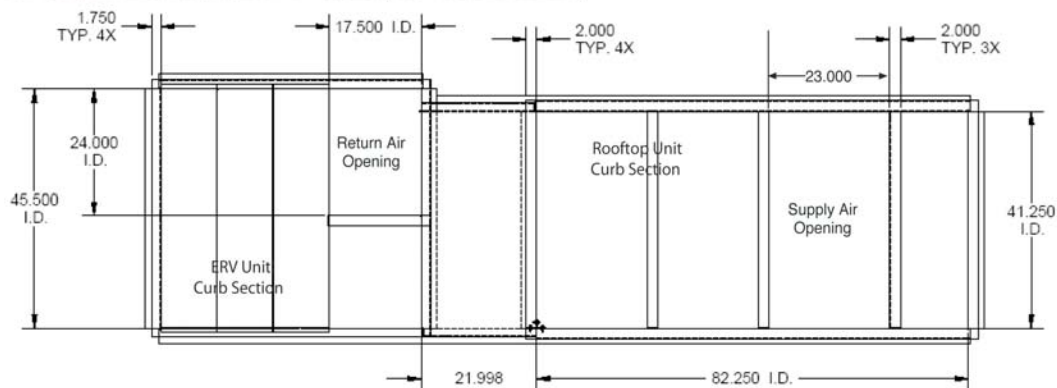
14" Curb Features

- Curbs ship knocked down and are designed for easy assembly
- Wood nailer included
- Constructed of heavy gage galvanized
- Gasket package included
- Vibration isolation curbs are available

Full Curb for RE04 to RE07 Mated to ERV "B" Cabinet (Part # ACURBREAEBA)

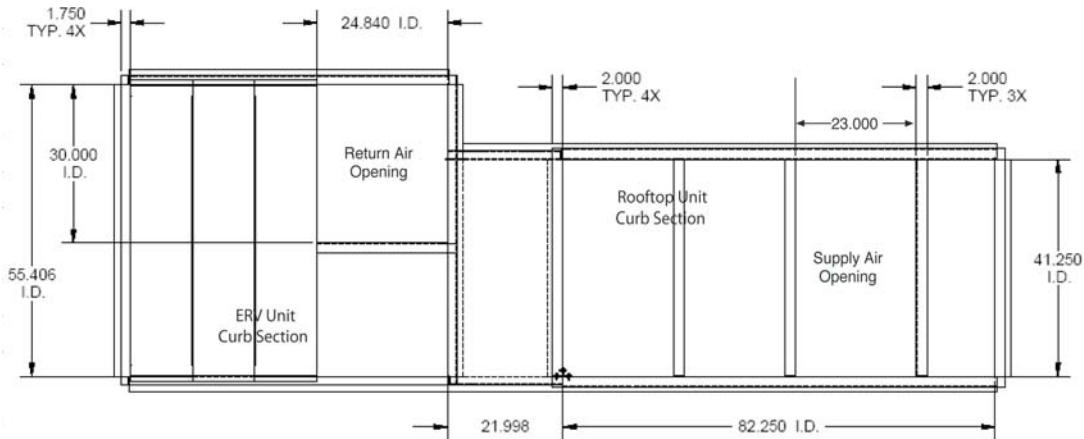


Full Curb for RE08 Mated to ERV "B" Cabinet (Part # ACURBREBEBA)

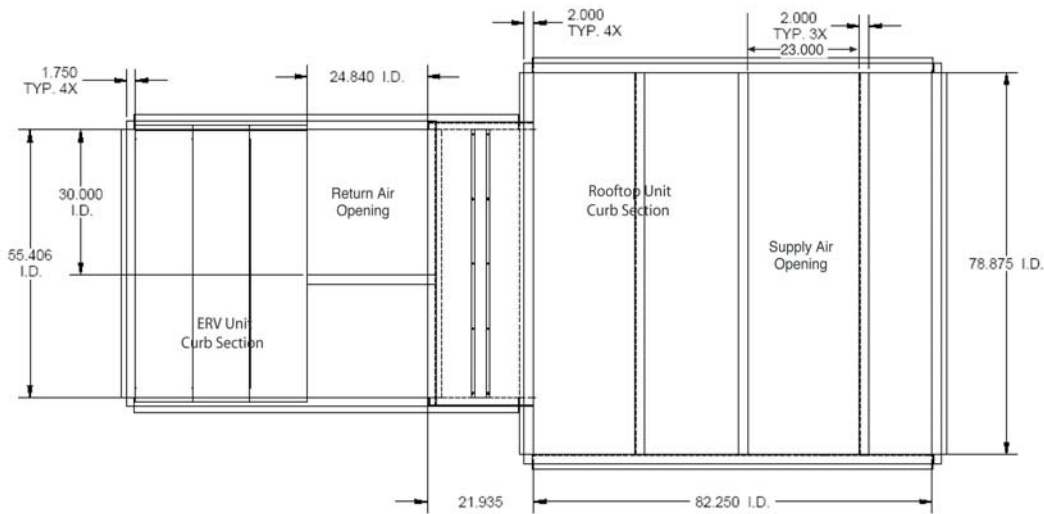


ClimateMaster Water-Source Heat Pumps Rx (ERV) Module Rooftop Energy Recovery Units

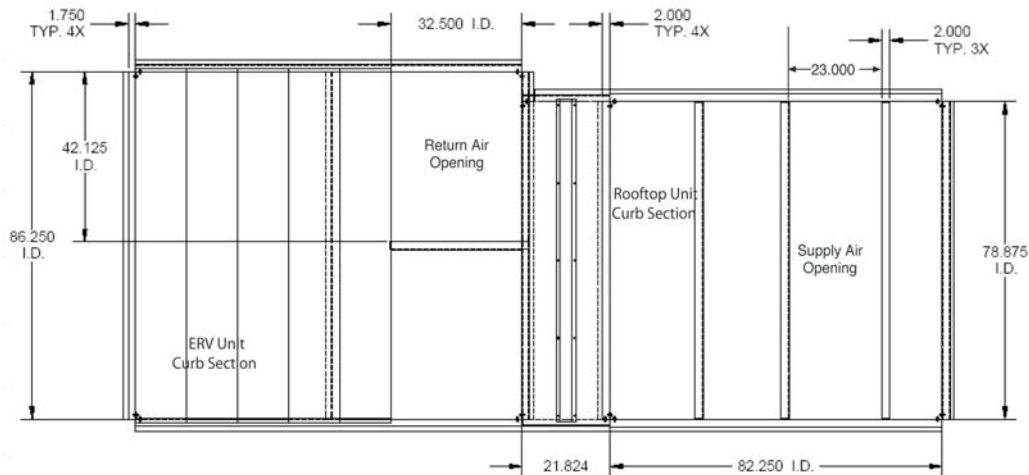
Full Curb for RE10 to RE12 Mated to ERV "C" Cabinet (Part # ACURBREBECA)



Full Curb for RE15 Mated to ERV "C" Cabinet (Part # ACURBRECECA)



Full Curb for RE20 Mated to ERV "D" Cabinet (Part # ACURBRECEDA)



The Smart Choice for Energy Efficiency

ERV Electrical Data

Model Number	ERV Wheel Data*			Optional Preheater	Exhaust and Supply Motor Data			Complete ERV Unit Data			Optional Disconnect	Internal Fusing RK5
	Part No.	FLA	HP Wheel	FLA	NEC - FLA (ea.)	HP	Voltage	FLA	MCA	MOP		
ERV1014H	ERC-2513 or ERC-2514	0.3	N/A	-	4.2	1	230/60/3	9.03	10.50	13.65	30 Amp	12 Amp
5KW Preheater	ERC-2513 or ERC-2514	0.3	N/A	12.57	4.2	1	230/60/3	21.59	26.21	26.22	40 Amp	25 Amp
ERV1014F	ERC-2513 or ERC-2514	0.3	N/A	-	2.1	1	460/60/3	4.53	5.25	6.83	30 Amp	6 Amp
5KW Preheater	ERC-2513 or ERC-2514	0.3	N/A	6.28	2.1	1	460/60/3	10.81	13.10	13.11	30 Amp	12 Amp
ERV1420H	ERC-3623	0.6	N/A	-	4.2	1	230/60/3	9.33	10.50	13.65	30 Amp	12 Amp
5KW Preheater	ERC-3623	0.6	N/A	12.57	4.2	1	230/60/3	21.90	26.21	26.22	40 Amp	25 Amp
10KW Preheater	ERC-3623	0.6	N/A	25.13	4.2	1	230/60/3	34.46	41.92	41.92	60 Amp	40 Amp
ERV1420F	ERC-3623	0.6	N/A	-	2.1	1	460/60/3	4.69	5.25	6.83	30 Amp	6 Amp
5KW Preheater	ERC-3623	0.6	N/A	6.28	2.1	1	460/60/3	10.97	13.10	13.11	30 Amp	12 Amp
10KW Preheater	ERC-3623	0.6	N/A	12.57	2.1	1	460/60/3	17.26	20.96	20.96	30 Amp	20 Amp
ERV2532H	ERC-3628	0.6	N/A	-	6.8	2	230/60/3	14.53	17.00	22.10	30 Amp	20 Amp
5KW Preheater	ERC-3628	0.6	N/A	12.57	6.8	2	230/60/3	27.01	32.71	34.67	40 Amp	30 Amp
10KW Preheater	ERC-3628	0.6	N/A	25.13	6.8	2	230/60/3	39.66	48.42	48.42	60 Amp	45 Amp
ERV2532F	ERC-3628	0.6	N/A	-	3.4	2	460/60/3	7.29	8.50	11.05	30 Amp	10 Amp
5KW Preheater	ERC-3628	0.6	N/A	6.28	3.4	2	460/60/3	13.57	16.35	17.33	30 Amp	15 Amp
10KW Preheater	ERC-3628	0.6	N/A	12.57	3.4	2	460/60/3	19.86	24.21	24.21	30 Amp	20 Amp
ERV3650H	ERC-5245	1.2	0.17	-	9.6	3	230/60/3	20.73	25.50	32.40	40 Amp	30 Amp
10KW Preheater	ERC-5245	1.2	0.17	25.13	9.6	3	230/60/3	45.86	56.92	57.53	80 Amp	50 Amp
15KW Preheater	ERC-5245	1.2	0.17	37.70	9.6	3	230/60/3	58.43	72.62	72.62	100 Amp	70 Amp
ERV3650F	ERC-5245	1.2	0.17	-	4.8	3	460/60/3	10.42	13.50	16.80	30 Amp	15 Amp
10KW Preheater	ERC-5245	1.2	0.17	12.57	4.8	3	460/60/3	22.98	29.21	29.37	40 Amp	25 Amp
15KW Preheater	ERC-5245	1.2	0.17	18.85	4.8	3	460/60/3	29.26	37.06	37.06	60 Amp	35 Amp
ERV5060H	ERC-5262	1.2	0.17	-	15.2	5	230/60/3	31.93	39.50	50.60	60 Amp	50 Amp
10KW Preheater	ERC-5262	1.2	0.17	25.13	15.2	5	230/60/3	57.06	70.92	75.73	100 Amp	70 Amp
15KW Preheater	ERC-5262	1.2	0.17	37.70	15.2	5	230/60/3	69.63	86.62	88.30	200 Amp	80 Amp
ERV5060F	ERC-5262	1.2	0.17	-	7.6	5	460/60/3	16.02	20.50	25.90	30 Amp	25 Amp
10KW Preheater	ERC-5262	1.2	0.17	12.57	7.6	5	460/60/3	28.58	36.21	38.47	60 Amp	35 Amp
15KW Preheater	ERC-5262	1.2	0.17	18.85	7.6	5	460/60/3	34.86	44.06	44.75	60 Amp	40 Amp
ERV6585H	ERC-6488	2.5	1/4	-	22	7.5	230/60/3	46.83	58.13	74.00	100 Amp	70 Amp
10KW Preheater	ERC-6488	2.5	1/4	25.13	22	7.5	230/60/3	71.96	89.54	99.13	200 Amp	90 Amp
15KW Preheater	ERC-6488	2.5	1/4	37.70	22	7.5	230/60/3	84.53	105.25	111.70	200 Amp	110 Amp
20KW Preheater	ERC-6488	2.5	1/4	50.26	22	7.5	230/60/3	97.09	120.95	124.26	200 Amp	110 Amp
ERV6585F	ERC-6488	1.2	1/4	-	11	7.5	460/60/3	23.36	29.00	36.95	60 Amp	35 Amp
10KW Preheater	ERC-6488	1.2	1/4	12.57	11	7.5	460/60/3	35.93	44.71	49.52	60 Amp	45 Amp
15KW Preheater	ERC-6488	1.2	1/4	18.85	11	7.5	460/60/3	42.21	52.56	55.80	80 Amp	50 Amp
20KW Preheater	ERC-6488	1.2	1/4	25.13	11	7.5	460/60/3	48.50	60.42	62.08	80 Amp	60 Amp

*Note: The ERC 2514 non-segmented wheel is being replaced by the ERC 2513 segmented wheel

ClimateMaster Water-Source Heat Pumps Rx (ERV) Module Rooftop Energy Recovery Units

Airflow vs. Pressure Drop Across Wheel - "A" Cabinet

MMC ERV Part #	ERV Wheel	CFM	900	1,000	1,100	1,200	1,300	1,400
ERV1014	ERC-2514 or ERC-2513	▲Ps	0.40	0.45	0.50	0.57	0.63	0.68

Airflow vs. Pressure Drop Across Wheel - "B" Cabinet

MMC ERV Part #	ERV Wheel	CFM	1,400	1,600	1,800	2,000	2,200	
ERV1420	ERC-3623	▲Ps	0.52	0.58	0.65	0.72	0.78	
		CFM	2,300	2,500	2,700	2,900	3,100	3,300
ERV2532	ERC-3628	▲Ps	0.63	0.70	0.75	0.80	0.88	0.93

Airflow vs. Pressure Drop Across Wheel - "C" Cabinet

MMC ERV Part #	ERV Wheel	CFM	3,000	3,400	3,800	4,200	4,600	4,800	5,000
ERV3650	ERC-5245	▲Ps	0.59	0.67	0.81	0.88	0.99	1.04	1.09
		CFM	5,000	5,400	5,800	6,200	6,600	7,000	
ERV5060	ERC-5262	▲Ps	0.86	0.93	1.00	1.04	1.13	1.18	

Airflow vs. Pressure Drop Across Wheel - "D" Cabinet

MMC ERV Part #	ERV Wheel	CFM	7,000	7,500	8,000	8,500
ERV6585	ERC-6488	▲Ps	0.74	0.83	0.90	0.94

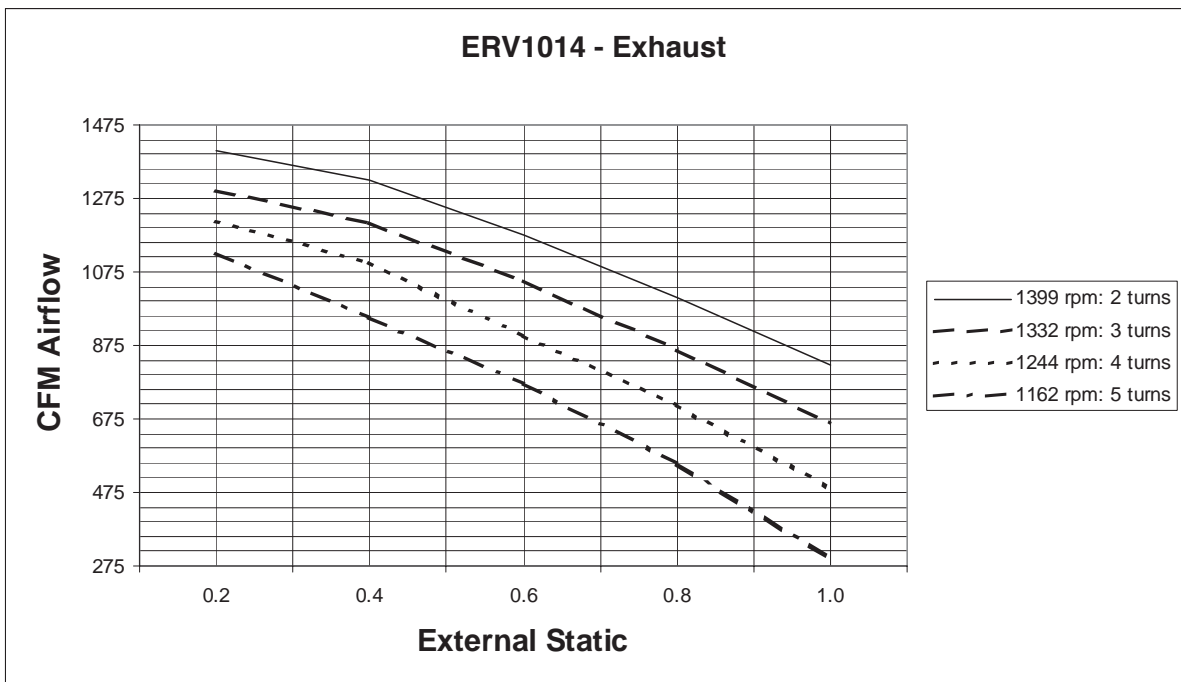
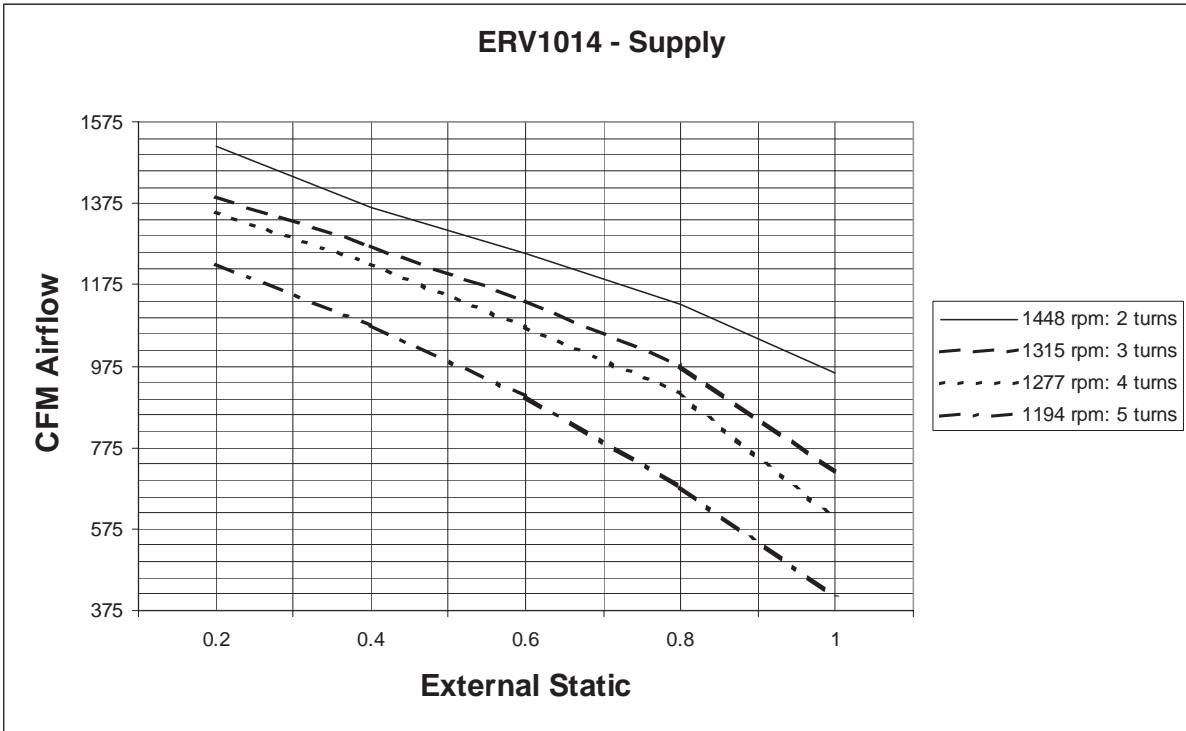
Note: Pressure ports are provided on both sides of the ERV wheel for testing and balancing purposes.

Formulas:

$$\text{BTU} = 1.08 \times \text{CFM} \times \text{DELTA T}$$

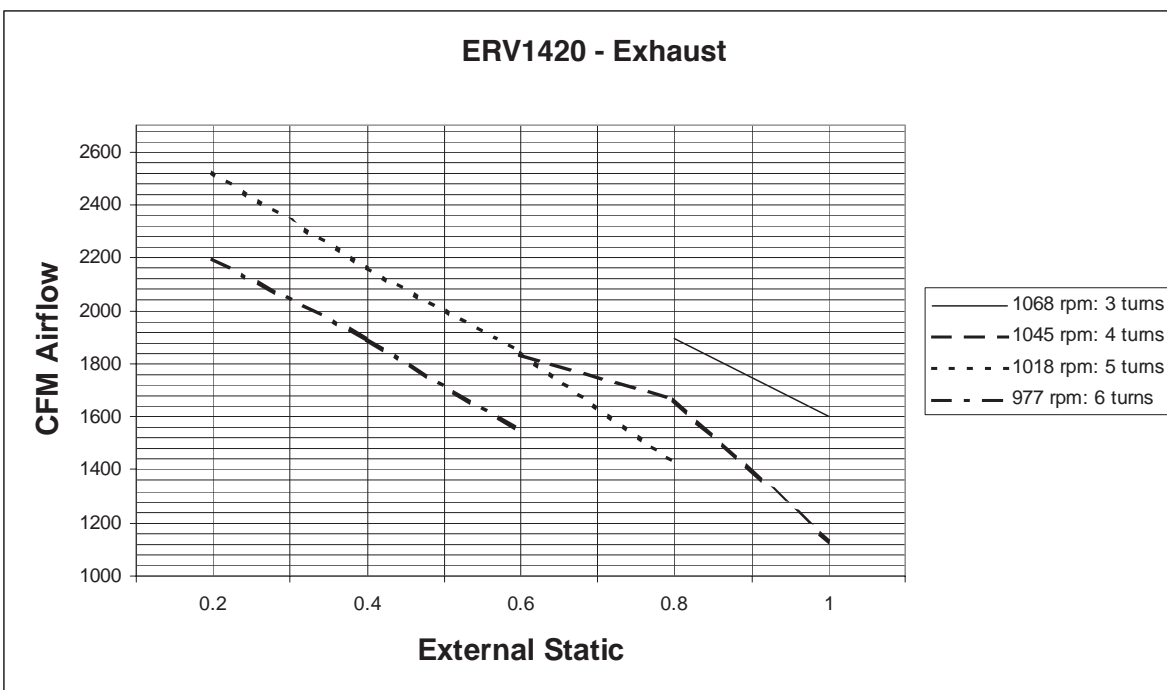
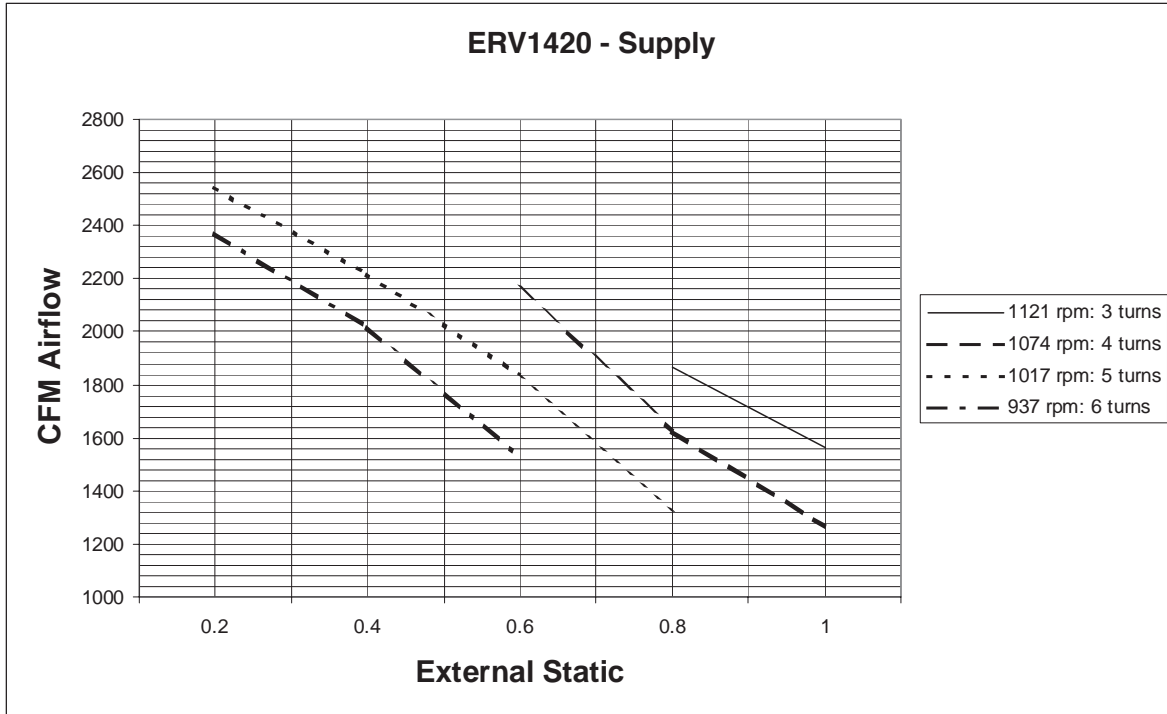
$$\text{KW} = \text{BTU} / 3415$$

Fan Curves - ERV1014

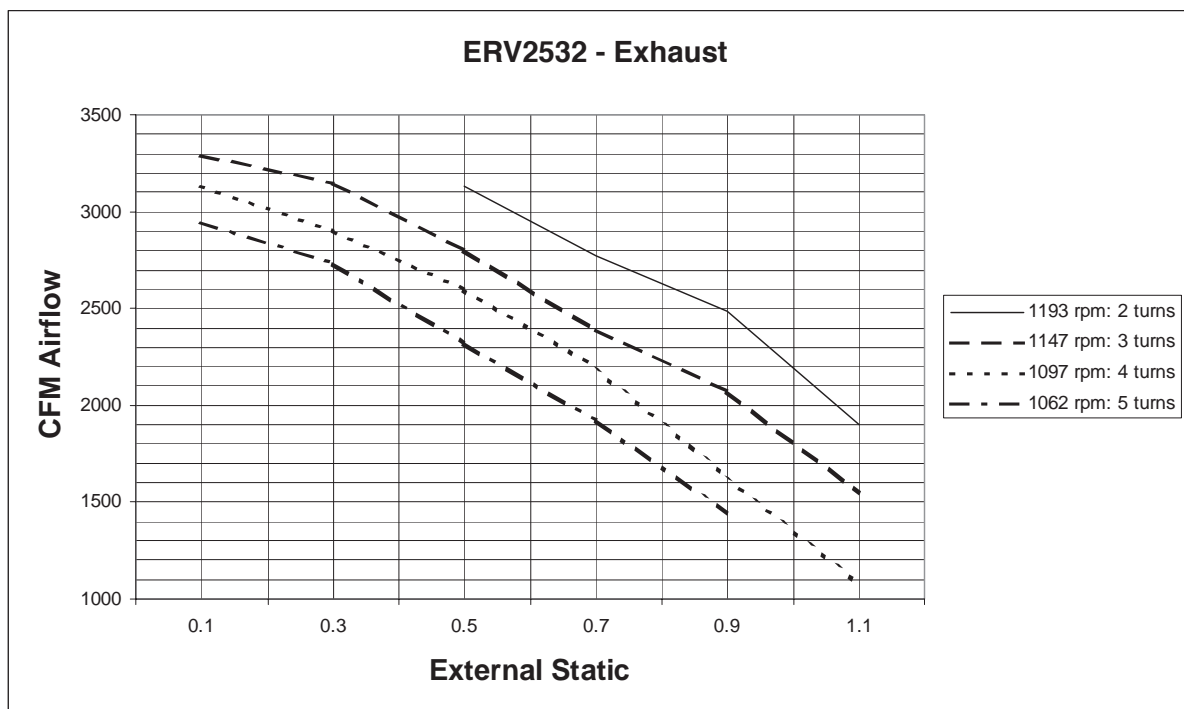
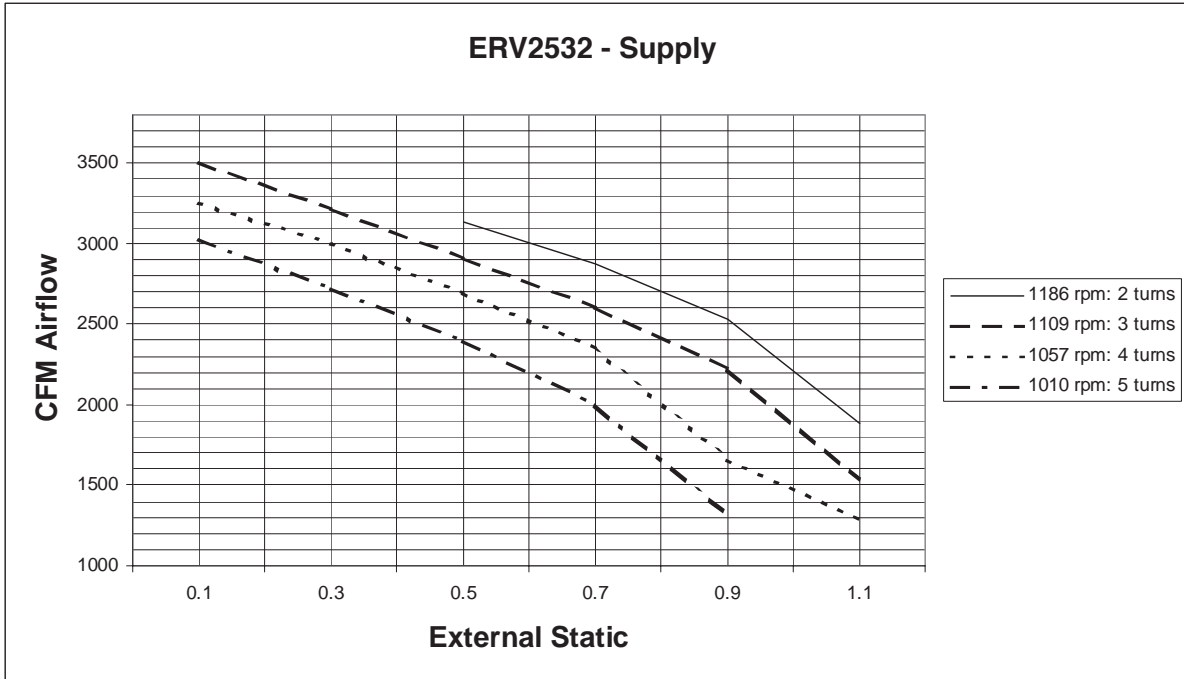


ClimateMaster Water-Source Heat Pumps
Rx (ERV) Module
Rooftop Energy Recovery Units

Fan Curves - ERV1420

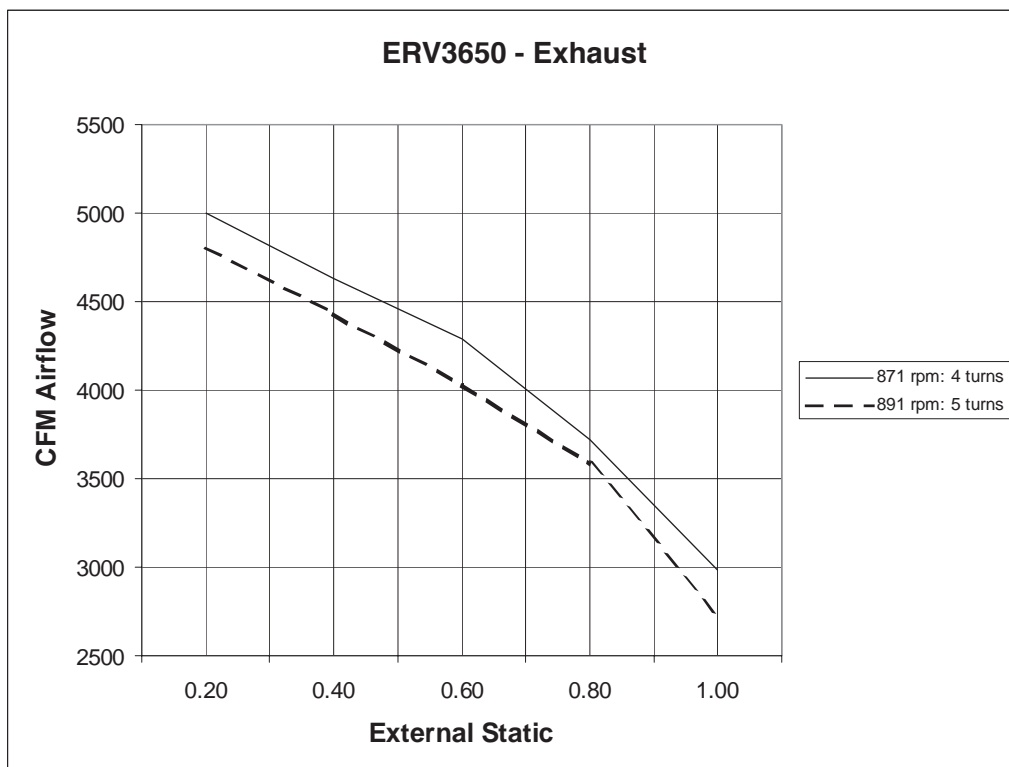
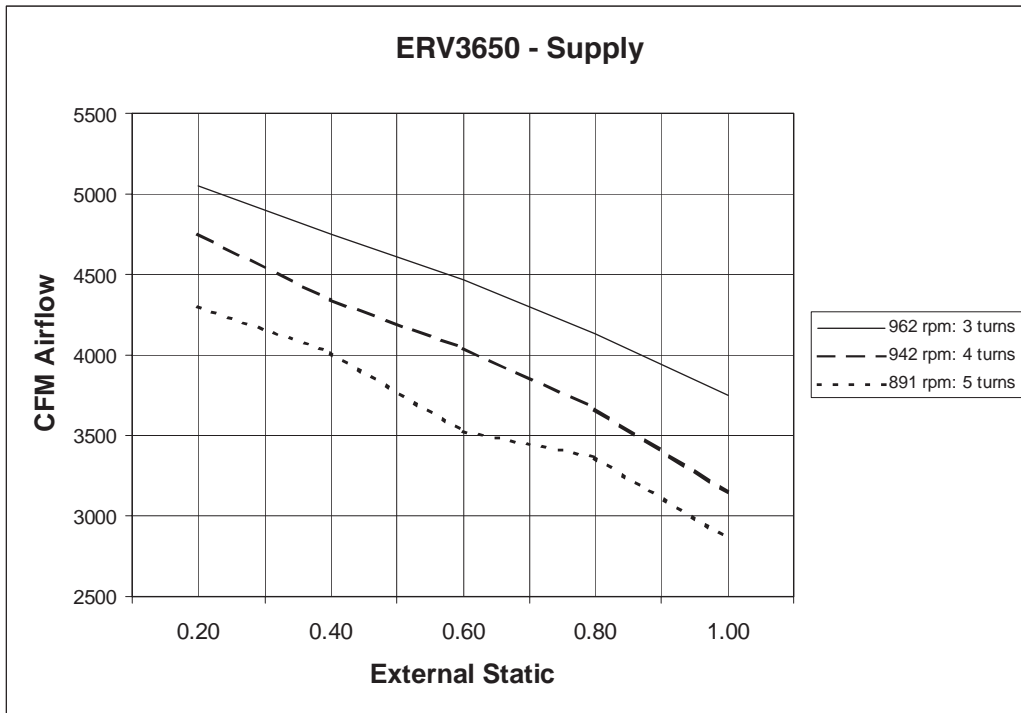


Fan Curves - ERV2532

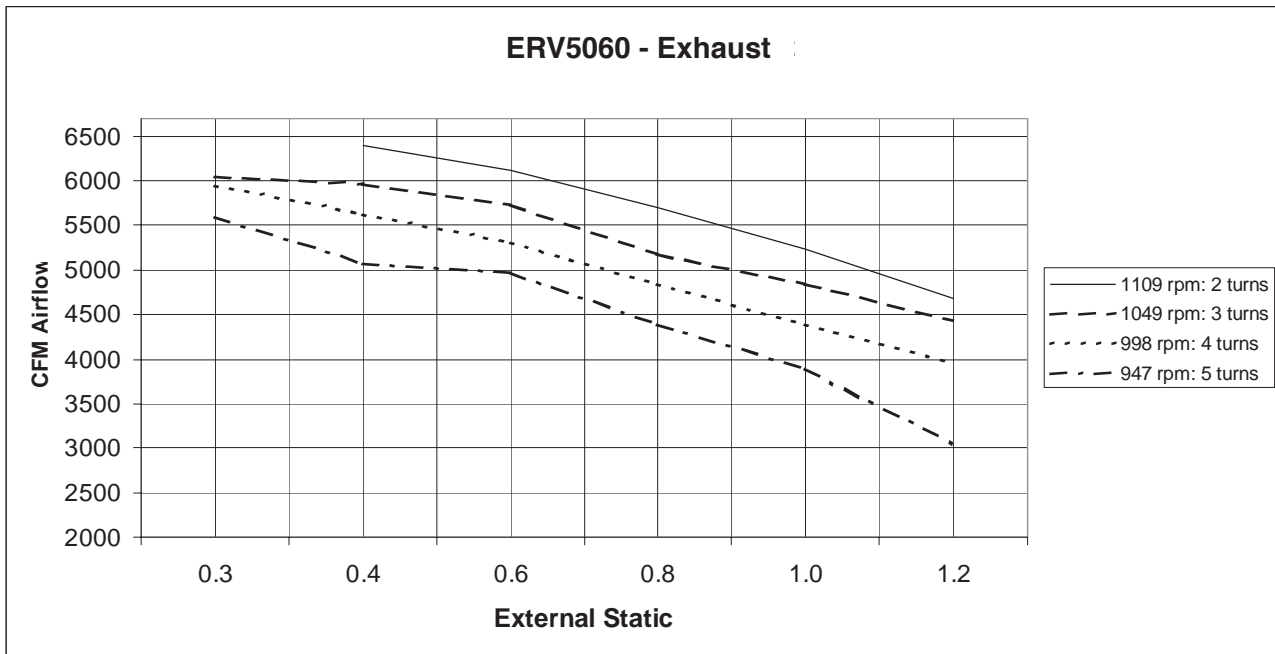
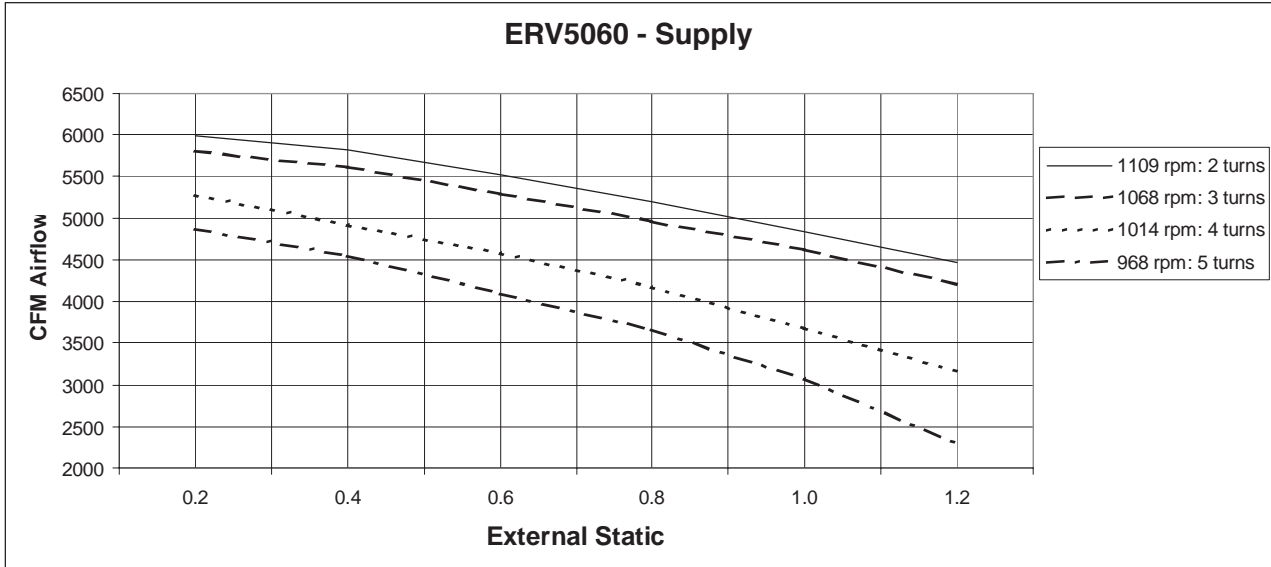


ClimateMaster Water-Source Heat Pumps
Rx (ERV) Module
Rooftop Energy Recovery Units

Fan Curves - ERV3650

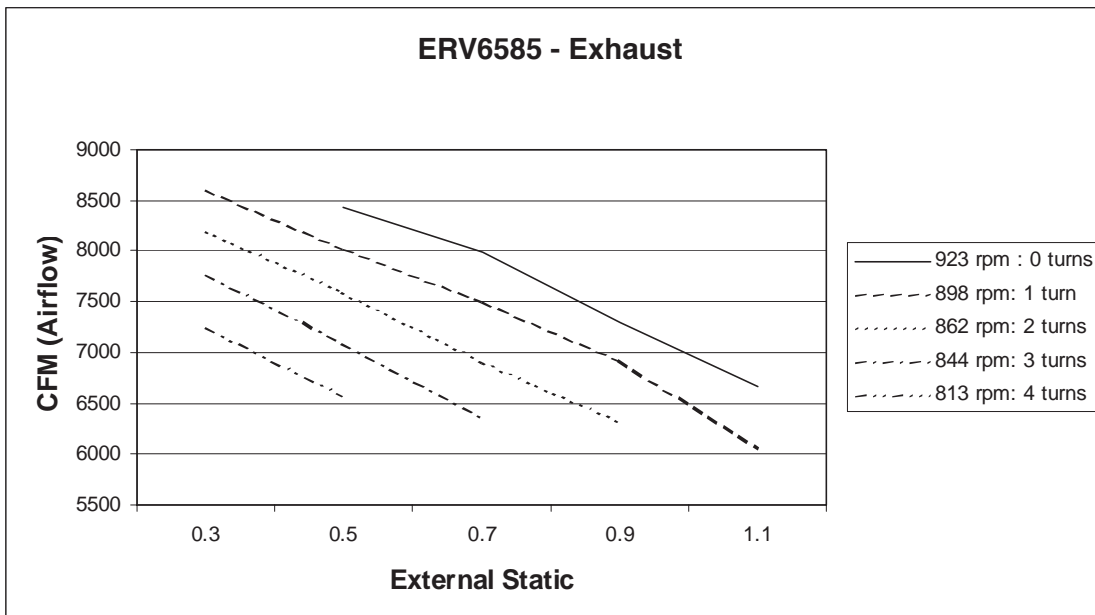
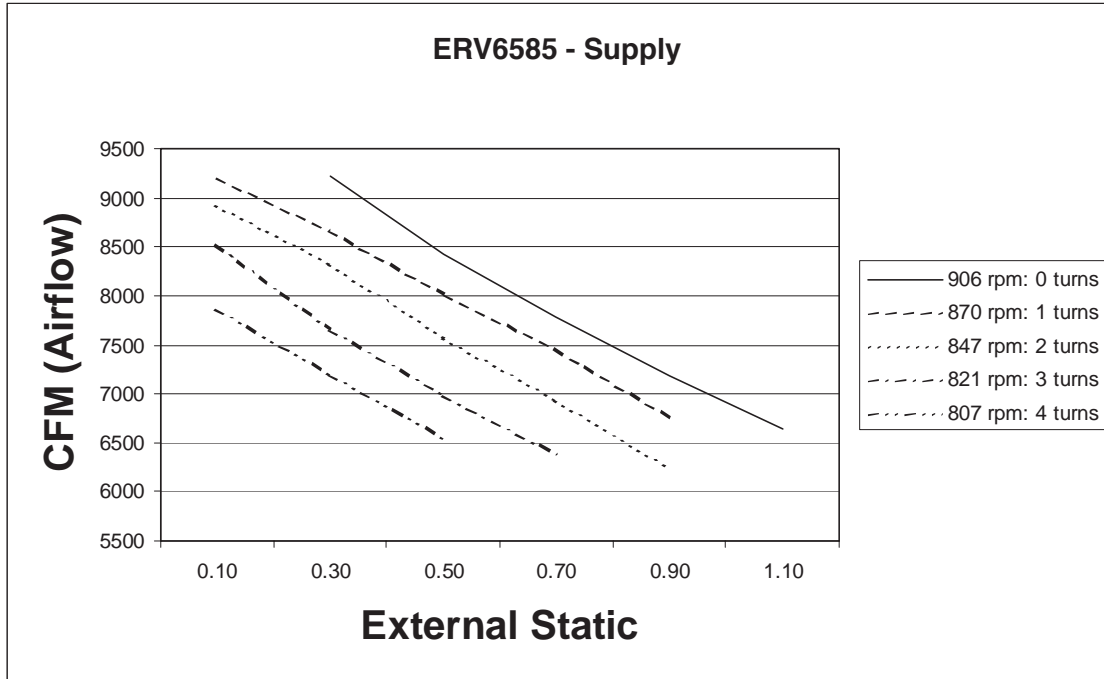


Fan Curves - ERV5060



ClimateMaster Water-Source Heat Pumps
 Rx (ERV) Module
 Rooftop Energy Recovery Units

Fan Curves - ERV6585



APPLICATION DATA

All ventilated spaces are good candidates for energy recovery systems. The best applications are when a large amount of outside air is required for a space that has a low internal load. This is true because most outside air loads are latent - which requires the upsizing of the unit to meet both internal and ventilation loads. The advantages of the ERV unit are the ability to reduce the size of the HVAC unit, to provide better humidity levels and to provide a stable, tempered space.

Examples of ERV applications are classrooms, churches, conference rooms, casinos, auditoriums, movie theaters, day care centers, nursing homes, funeral homes, dormitories, and clinics. Retrofits of existing systems to handle outside air represent excellent ERV applications.

Other examples are bars, restaurants, casino, barber-beauty shops, bingo halls, locker rooms, recreational facilities and health clubs. Animal shelters such as veterinary clinics, kennels, retail spaces and manufacturing facilities are also good candidates for ERV systems.

If the outside air requirement is greater than 10% of the HVAC unit's supply air rating an ERV unit should be considered to enhance the comfort of the occupants and reduce the tonnage of the HVAC unit. The ClimateMaster/Airxchange selection program offers a quick, simple look at the advantages and payback of an ERV system. The following pages contain a sample application and examples of the ClimateMaster/Airxchange selection program. The weather data is for Oklahoma City, Oklahoma at 1% ASHRAE weather conditions.

Choosing the proper airflow is essential. The ClimateMaster part numbers include the airflow range that the cabinet blowers are manufactured to operate within. This airflow range can be determined from digits 4 through 7 of the part number: digits 1 and 2 (multiplied by 100) indicate the minimum airflow while digits 3 and 4 indicate the maximum airflow. For example, an ERV1014 unit has an airflow range of 1000 cfm to 1400 cfm.

Although performance is optimized at equal exhaust and supply airflow rates, the ClimateMaster/Airxchange selection program and the ERV unit can be used with unequal airflow amounts. The ClimateMaster ERV system is specifically designed for 100% OA application with ClimateMaster RE Series rooftop units. See the ERV match-up guide (page 30) for details.

SAMPLE APPLICATION

The following is a typical application for an ERV unit.

A consulting engineering firm has specified a make-up air unit requiring 4,000 cfm of outside air for a building in Oklahoma City (99°F summer design and 9°F winter design). This system as specified would require 13 tons of equipment for cooling (plus hot gas reheat, hot gas bypass and the controls associated with handling outside air) and 348,000 Btu/hr of heating. In order to reduce outside air load, lower operating costs and avoid complicated controls, an ERV will be considered.

1. Obtain the design conditions from the consulting engineer.
2. Enter design conditions into the ClimateMaster/Airxchange selection program.
3. Select model ERV3650 ERV unit at 4,000 cfm.
4. The ClimateMaster/Airxchange selection specifies that the cooling outside air load is 153,784 Btu/hr without the ERV unit. The ERV unit recovers 108,336 Btu/hr, resulting in an outside air load of only 45,448 Btu/hr.
5. The heating outside air load is 347,948 Btu/hr without the ERV unit. The ERV unit recovers 239,476 Btu/hr, resulting in an outside air load of only 108,471 Btu/hr.
6. The RE10 (4,000 cfm) unit can easily handle the remaining 45,448 Btu/hr of cooling required with only one refrigeration circuit operating (full load cooling capacity is 119,100 Btu/hr at WLHP conditions). Both refrigeration circuits will be required to handle the heating load of 108,471 (full load heating capacity is 129,900 Btu/hr at WLHP conditions).
7. The combination RE10/ERV system now handles 100% of the outside air, while downsizing the cooling equipment needed by three tons and significantly reducing the heating makeup air requirements.
8. Air leaving the ERV at design conditions is 81/66°F (DB/WB) in the summer and 54°F in the winter. Therefore, the system will be able to provide neutral air to the space even at design conditions with control from a simple leaving air temperature thermostat (ERV leaving air).
9. If required, the selection software contains an hourly bin analysis option that will provide operational data.
10. It is recommended that the wheel bypass option be used as well to provide "free cooling" when conditions will allow.

ClimateMaster Water-Source Heat Pumps Rx (ERV) Module Rooftop Energy Recovery Units

GUIDE SPECIFICATIONS -

SERIES ENERGY RECOVERY VENTILATOR

ERV Guide Specifications
Size Range: 1,200 to 8,000 CFM
70 % Nominal Effectiveness (Variable)

PART 1 - GENERAL

1.1 SYSTEM DESCRIPTION

ERV unit is an outdoor rooftop mounted, electrically controlled outdoor air pre-conditioner utilizing an Airchange Energy Recovery Cassette to reduce the heating and cooling load placed on the HVAC unit by untreated outdoor air. Exhaust air shall be introduced to the ERV unit through a transition connected to the HVAC unit, which utilizes either a horizontal or vertical return. Supply air will be introduced to the HVAC unit through the HVAC economizer opening.

1.2 QUALITY ASSURANCE

- a. Unit shall be designed in accordance with UL Standard 1995.
- b. Unit shall be ETL tested and certified.
- c. Roof curb shall be designed to conform to NRCA Standards.
- d. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.
- e. Unit casing shall be capable of withstanding Federal Test Method Standard No. 141 (Method 6061) 500-hour salt spray test.

PART 2 - PRODUCTS

2.1 EQUIPMENT (STANDARD)

A. General

The ERV unit shall be a factory assembled, single piece unit. Contained within the unit enclosure shall be all factory wiring with a single, pre-determined point of power input and a single point of 24 volt control wiring.

B. Unit Cabinet

1. Unit cabinet shall be constructed of galvanized steel coated with a prepainted baked enamel finish.
2. The pre-conditioned area of the exhaust air stream and post-conditioned area of the supply air stream

shall be insulated with a 1 inch, 2 pound density foiled faced insulation. Insulation contained within a double walled panel, with equivalent R values may be substituted.

3. Cabinet panels shall be hinged.
4. Exhaust and supply air streams shall have back-draft dampers to prevent air penetration during off cycles.
5. Holes shall be provided in the base rails for rigging shackles to facilitate overhead rigging.

C. Blowers

1. Blower shall be belt driven. Belt shall include an adjustable pulley.
2. Blower wheel shall be made from steel with a corrosion resistant finish. It shall be a dynamically balanced, double-inlet type with forward-curved blades.

D. Filter Section

1. Standard filter section shall consist of commercially available, 2 inch pleated filter(s).

E. Controls and Safeties

1. Control box power out must be interrupted when the access panel is opened.
2. ERV unit shall operate in conjunction with HVAC unit fan. Factory wired plug will be provided.
3. Frost protection to prevent supply motor overload (optional).
4. Motorized Dampers - supply and/or return (optional).
5. Wheel by-pass (Economizer Mode) switch based upon outside air temperature or enthalpy (optional).
6. Stop-jog timer for wheel by-pass option (optional).

F. Electrical Requirements

1. All unit power wiring shall enter unit cabinet at a single location.

G. Energy Recovery Cassette

1. The energy recovery media (lightweight polymer) shall be a nominal 70% effective. Efficiency ratings shall be ARI 1060 certified.
2. The wheel must have desiccant permanently integrated into the media of the wheel.
3. The energy recovery cassette shall be an UL Recognized component for electrical and fire safety.

Note:

One spare wheel segment should be provided for maintenance purposes. The spare segment will allow one segment of the wheel to be cleaned at a time without shutting down the ventilation system.

H. SPECIAL FEATURES

1. Roofcurb Option

- a. Formed of heavy gage galvanized steel with wood nailer strip and shall be capable of supporting entire unit weight.

2. Transition Option

- a. ERV unit has a specially designed transition to mate the ERV unit with the HVAC unit. Transition must be ordered with the ERV unit.

3. Fused Disconnect Switch Option

- a. For 460 volt power, a 30 amp, 600 volt, 3 pole, NEMA3R fused disconnect switch shall be factory installed.
- b. For 208/230 volt power, a 30 amp, 250 volt, 3 pole, NEMA3R fused disconnect switch shall be factory installed.

4. Switch Disconnect Option

- a. For 460 volt power, a 30 amp, 600 volt, 3 pole, NEMA3R disconnect switch shall be factory installed.
- b. For 208/230 volt power, a 30 amp, 250 volt, 3 pole, NEMA3R disconnect switch shall be factory installed.

5. Frost Protection Option

- a. Frost protection module shall sense pressure differential across the energy recovery cassette
- b. Supply blower must be shut-off if the pressure differential across the energy recovery cassette exceeds a factory set point. Blower will remain off for an adjustable period of time.
- c. Exhaust blower and wheel shall remain in operation in order to remove any frost build-up on the wheel.

6. Remote Control Option

- a. Remote control option shall provide a 24 volt output signal to the ERV unit (wiring from control panel to ERV plug field supplied).

- b. Remote control panel shall provide a 24 hour timer to only operate ERV unit during occupied times.
- c. Remote control panel shall have a switch to override the 24 hour timer.

7. Filter Maintenance Indicator – A pressure switch is provided to indicate that the pressure across the outside air filter has increased and the filter should be serviced.

8. Low Temperature Lockout – A lockout thermostat used in extreme conditions to de-energize the ERV preventing outside air from entering the space if the air is too cold.

9. Wheel By-pass Option – Air sensor used to prevent the wheel from rotating if the outside air conditions are acceptable for free cooling. Both exhaust and supply blowers will remain on.

10. Motorized Supply Damper – The supply dampers are motorized with 24 volt motors.

11. Motorized Exhaust Damper – The exhaust dampers are motorized with 24 volt motors.

12. Stop-Jog-Control – Used in conjunction with the wheel by-pass option to energize the wheel periodically during the free cooling operation of the ERV. This option is used to prevent dirt build-up on the wheel.

13. Pre-heater Option (ERVPH) - Preheaters are factory installed in outside air hood. Refer to ERV software for pre heat requirements.

14. Airflow monitor - Flush mount gages measure airflow across wheel.

ClimateMaster Water-Source Heat Pumps Rx (ERV) Module Rooftop Energy Recovery Units



ERV Selection Criteria

1 Unit Selection

Exhaust Air (cfm): _____ Static press: _____
 Supply Air (cfm): _____ Static press: _____
 Unit Voltage & phase: _____

2 Design Conditions

	Outdoor	Indoor
Summer DB Temp, °F:	_____	_____
Summer WB Temp, °F:	_____	_____
Winter DB Temp, °F:	_____	_____
Winter WB Temp, °F:	_____	_____

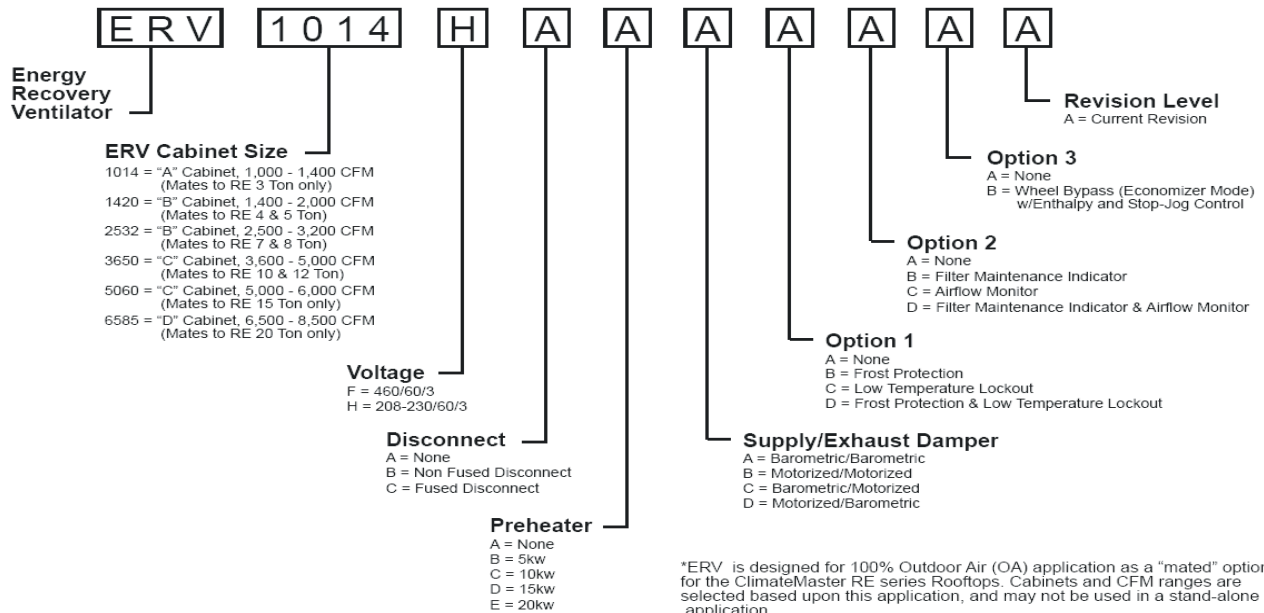
3 Rooftop Unit

RE unit model #: _____ based upon 400 cfm/ton from step #1
 (RE03, RE04, RE05, RE07, RE08, RE10, RE12, RE15 or RE20 - MODEL # MUST BE CONFIGURED FOR ERV OPTION)

4 Curb

Curb Type / Model #: _____
 Note: Curb adapters, seismic curbs, vibration isolation curbs and horizontal discharge curbs are available as engineering specials.

5 ERV Options / Model #:



*ERV is designed for 100% Outdoor Air (OA) application as a "mated" option for the ClimateMaster RE series Rooftops. Cabinets and CFM ranges are selected based upon this application, and may not be used in a stand-alone application.

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The Smart Choice for Energy Efficiency

NOTES:

ClimateMaster Water-Source Heat Pumps
Rx (ERV) Module
Rooftop Energy Recovery Units

Guide Revision History:

Date:	Page:	Description:
12/13/05	All	Various Formatting Changes
08/22/05	16,17	Changed "Efficiencies" to "Effectiveness"
08/23/05	18	Added 2513 Wheel
08/23/05	22-28	Dimensions: Removed "Horizontal Units"
08/23/05	46	Added Revision Log
12/06/04	All	Guide first published

The Smart Choice for Energy Efficiency

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