THE SMART SOLUTION FOR ENERGY EFFICIENCY

ENGINEERING DESIGN GUIDE: CONSOLE (CCE) SERIES 0.5 TO 1.5 TON CONSOLE UNITS

CLIMATEMASTER®

WATER-SOURCE HEAT PUMP SYSTEMS

The Smart Choice for Energy Efficiency

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Revised: 07/26/06D

ClimateMaster Water-Source Heat Pumps
Console (CCE) Series
0.5 to 1.5 Ton Console 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.

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 reenforcement 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

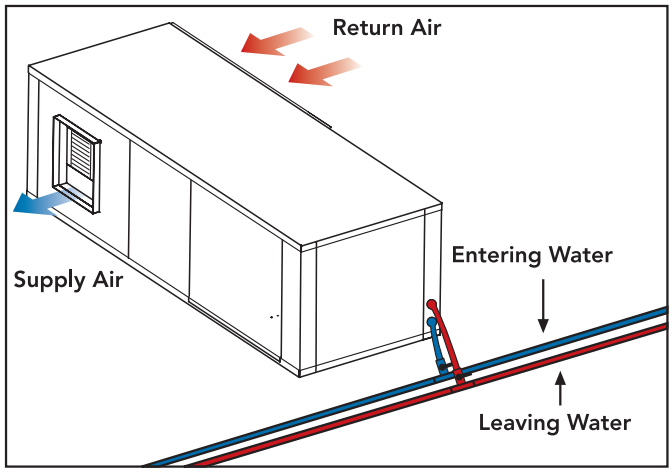
WATER-SOURCE HEAT PUMPS

As the most energy efficient HVAC systems on the market, Water-Source Heat Pumps are uniquely simple in design. Heat is moved through an interconnected water loop and either rejected through a cooling tower, or put to work in other areas. Each unit is an independent, packaged system, eliminating the chance of a total system failure. If one unit goes down, the other units are not affected. Conveniently located above the ceiling or in a closet, units can be easily accessed.

SYSTEM MODES

Water-Source Heat Pump systems can operate in one of four modes depending on the space conditioning requirements. The versatility of operation allows Water-Source Heat Pumps to show their full potential as a solution for customized comfort and flexibility.

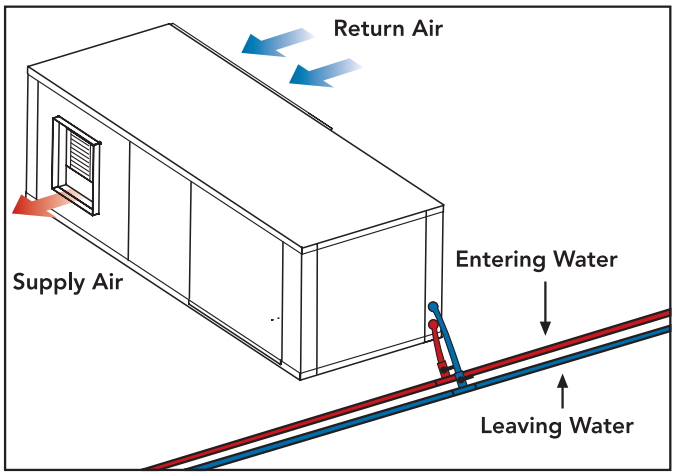
COOLING MODE



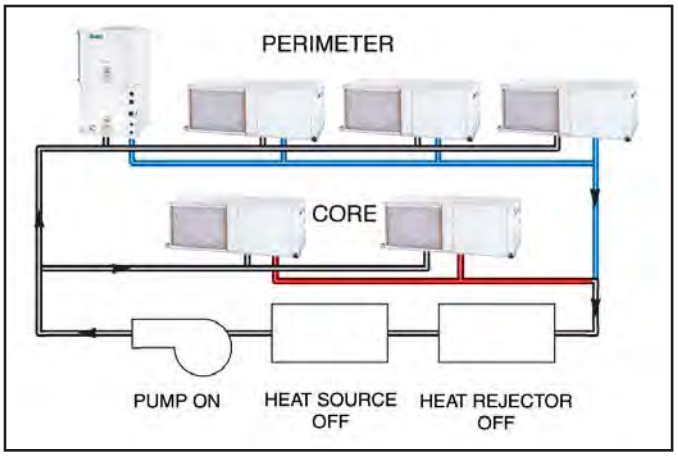
The system extracts heat from the air and rejects it into the water loop through the coaxial refrigerant-to-water heat exchanger. This heat can either be moved to a different part of the building to satisfy a heating mode requirement, or be rejected out of the building via a cooling tower.

HEATING MODE

The system extracts heat from the water loop through the coaxial heat exchanger and compresses it to a higher temperature. This heat is then transferred into the air through the air coil and used to condition the building space. A nominally sized boiler is often used to maintain a constant temperature of 60 to 70°F in the water loop during high heating demand months. Within this temperature range, the units can operate in either heating or cooling mode.



BALANCED MODE



A mixture of units in heating mode and units in cooling mode create a constant temperature in the water loop. In Balanced Mode, there is no need for heat injection or rejection via the boiler or cooling tower. The heat is simply moved from one zone to another.

DEHUMIDIFICATION MODE

The system, using a multi-speed blower and separate humidistat, slows the air movement across the air-coil to extract moisture and provide a more comfortable space. An additional reheat coil is available on select products for those climates where high humidity is a problem.

GEOTHERMAL SYSTEMS

These "Boilerless/Towerless" Heat Pump systems use the natural thermal properties of the Earth to dissipate or capture heat for the water loop. Geothermal Heat Pumps operate in an identical fashion to Water-Source Heat Pump units. However, without the need for a boiler or cooling tower, they save substantial energy costs and space. The water loop system is underground and the units are inside the building. Thus, the environmentally friendly geothermal system preserves the architectural design of a building naturally.

GEOTHERMAL EARTH LOOPS

Geothermal Earth Loops come in several different configurations depending on space availability and soil properties. Chances are at some point you have either stood over, or walked across a geothermal loop field. Loop fields can be located under parking lots, landscaped areas, or any number of other locations. All earth loops use high-density polyethylene pipe to circulate either water or an antifreeze mixture. All joints and connection fittings are thermally fused to prevent leaks and most piping comes with a 25-year or longer warranty.

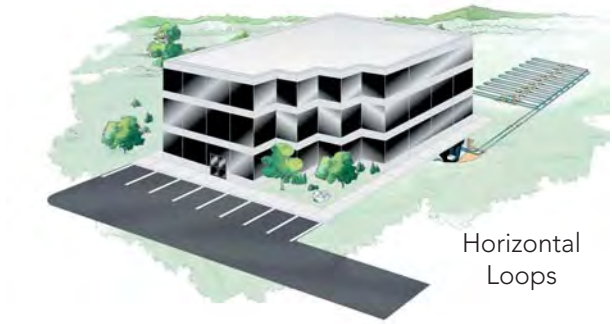
VERTICAL LOOPS

Vertical loops utilize bore holes drilled to an average depth of 250 feet. Once the loop pipe is inserted into the bore, it is grouted using a Bentonite mixture for maximum thermal conductivity. When space is a limited, vertical loops are the most common type of geothermal loop installed.

Vertical Loops

HORIZONTAL LOOPS

Horizontal loops utilize trenches dug to an average depth of four to six feet. As one of the more cost effective loops to install, horizontal loops are commonly found in open fields, parks or under parking lots.



Horizontal Loops

LAKE LOOPS

Lake loops utilize a "slinky" assembly of geothermal loop piping placed at the bottom of a pond, lake, or other large body of water. An extremely cost effective loop system, lake loops are an easy alternative if the option is available.

Lake Loops

WELL SYSTEMS

Most commonly known as "Open Loop", well systems pump water out of a nearby body of water or water well, and then discharge the water into another body of water or water well. Well systems usually employ a plate heat exchanger inside the building to keep the building water loop separated from the well water. This prevents any contaminates from affecting unit performance and extends system life. Well systems are often the most efficient as the well water is always at the same temperature year-round.

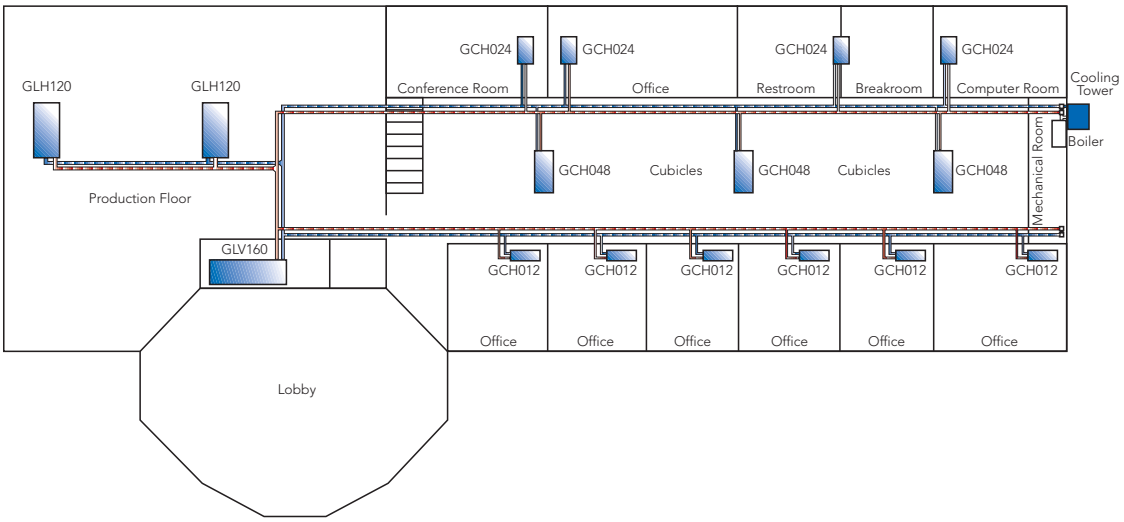
Well Systems

A WATER-SOURCE EXAMPLE

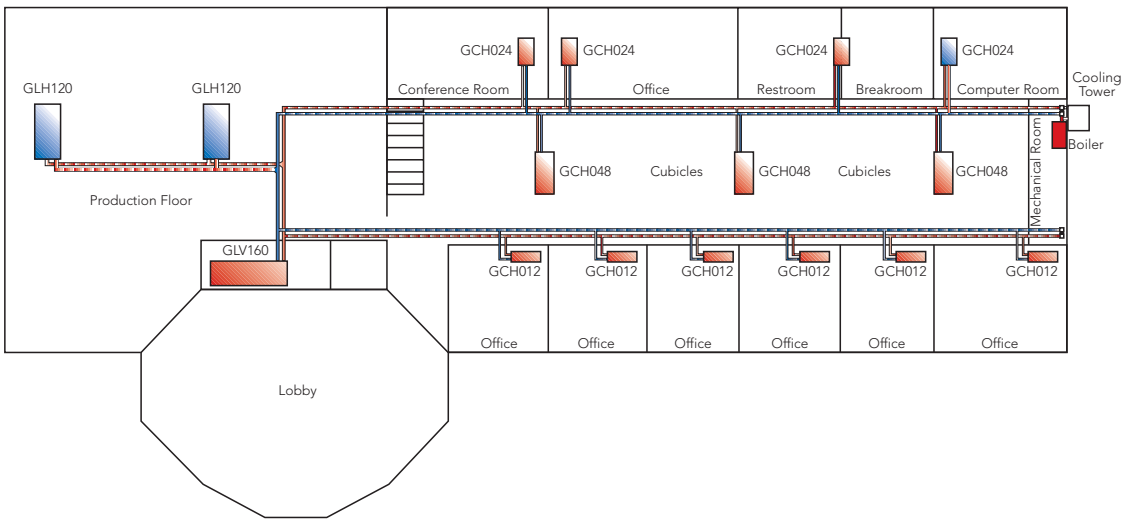
As an example of how Water-source Heat Pumps can handle a variety of different applications, the building shown to the right is a fictional bronze statue foundry company in the midwest portion of the United States. The first floor comprises their production floor and office space. The second floor of the building is reserved for future use. The cooling tower and boiler work as needed to maintain an average loop temperature between 60 to 95°F. Water-source Heat Pumps can efficiently operate in either heating, or cooling mode under these conditions. This gives individual and specialized zone control for maximum comfort and the ability to change operation modes as needed.

A mixture of units in heating mode and units in cooling mode create a constant temperature in the water loop. In Balanced Mode, there is no need for heat injection or rejection via the boiler or cooling tower. The heat is simply moved from one zone to another.

WARM WEATHER (HIGH COOLING DEMAND)



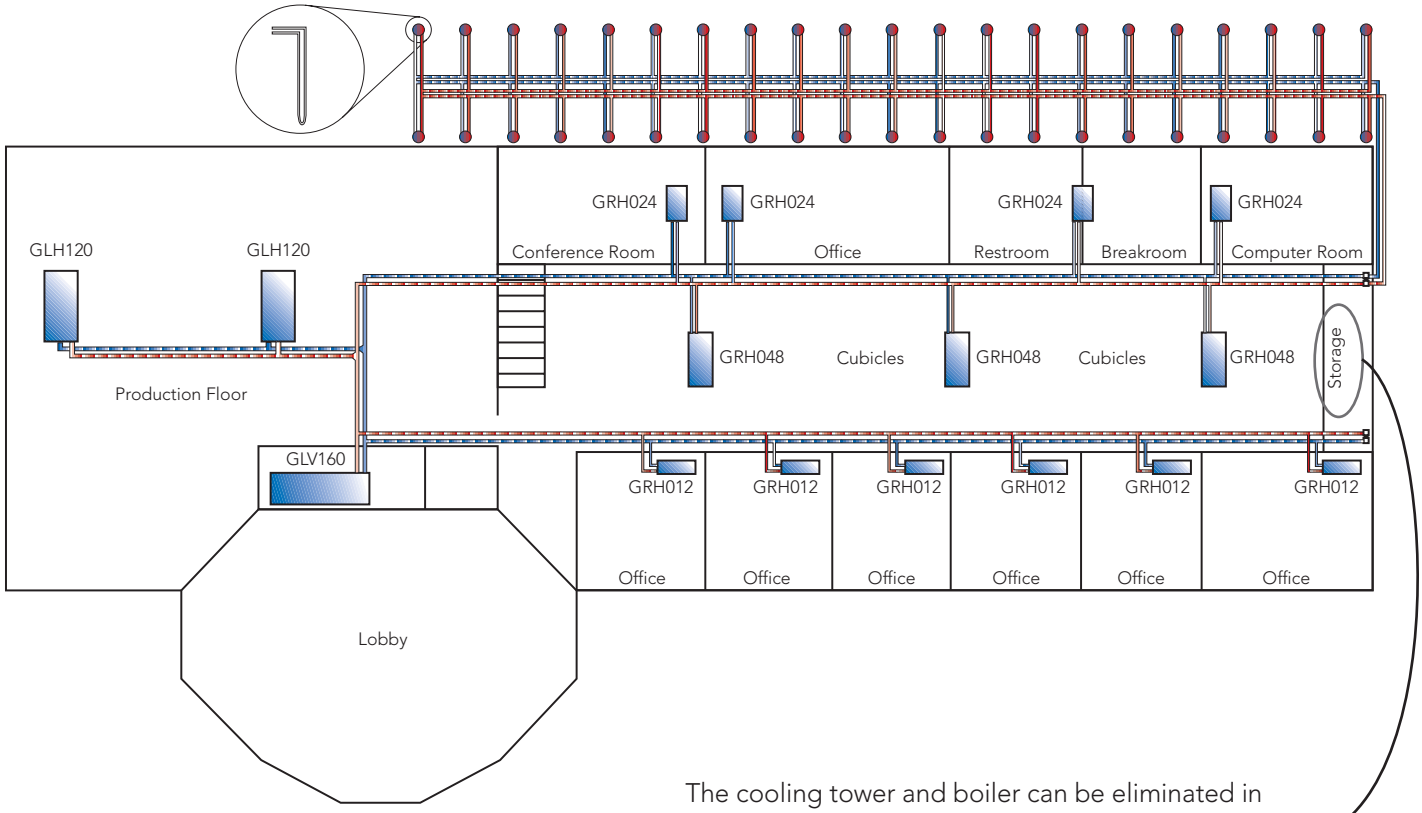
COOL WEATHER (HIGH HEATING DEMAND)



A GEOTHERMAL EXAMPLE

Using the same building model, the cooling tower and boiler are replaced with a geothermal vertical loop field. Identical in overall zone operation, the building benefits by having less overall equipment and reduced operation costs. Building aesthetics are also improved by eliminating outdoor equipment and additional space is gained by eliminating the boiler and additional support equipment.

WARM WEATHER (HIGH COOLING DEMAND)



The cooling tower and boiler can be eliminated in the geothermal application freeing up space used for equipment for other use. Only a small amount of room is needed for loop circulation equipment.

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 IPCS. This multi-million dollar computer system watches each unit as it comes down the assembly line. To back up the IPCS 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.

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.

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.

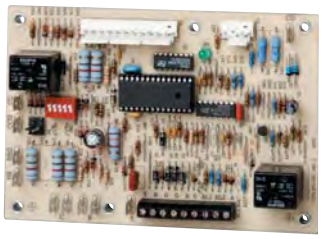
ADVANTAGE EXCLUSIVES

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,

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
Console (CCE) Series
0.5 to 1.5 Ton Console Units

THE CONSOLE (CCE) SERIES

The CCE series console unit provides a high efficiency WSHP "ductless" solution for spaces where individual, quiet control of the heating and cooling system is important. CCE units are especially ideal where ceiling height and space are limited, or when preserving the integrity of an existing structure. The CCE series meets ASHRAE 90.1 efficiencies, yet maintains small cabinet dimensions.

Available in sizes 1/2 ton (1.76 kW) through 1-1/2 tons (5.3 kW) with numerous cabinet, water piping and control choices, the CCE series offers a wide range of units for most any installation. The CCE has an extended range refrigerant circuit, capable of ground loop (geothermal) applications as well as water loop (boiler-tower) applications. Standard features are many. Microprocessor controls, galvanized steel cabinet, epoxy powder coat paint and TXV refrigerant metering device are just some of the features of the flexible CCE series.

ClimateMaster's exclusive double isolation compressor mounting system makes the CCE series one of the quietest console units on the market. Compressors are mounted on vibration isolation rubber grommets to a heavy gauge mounting plate, which is then isolated from the cabinet base with rubber grommets for maximized vibration/sound attenuation. Options such as e-coated air coil, DDC controls, internal pump and factory-installed water solenoid valves allow customized design solutions.

The CCE Series console water-source heat pumps are designed to meet the challenges of today's HVAC demands with a low cost/high value "ductless" solution.

UNIT FEATURES

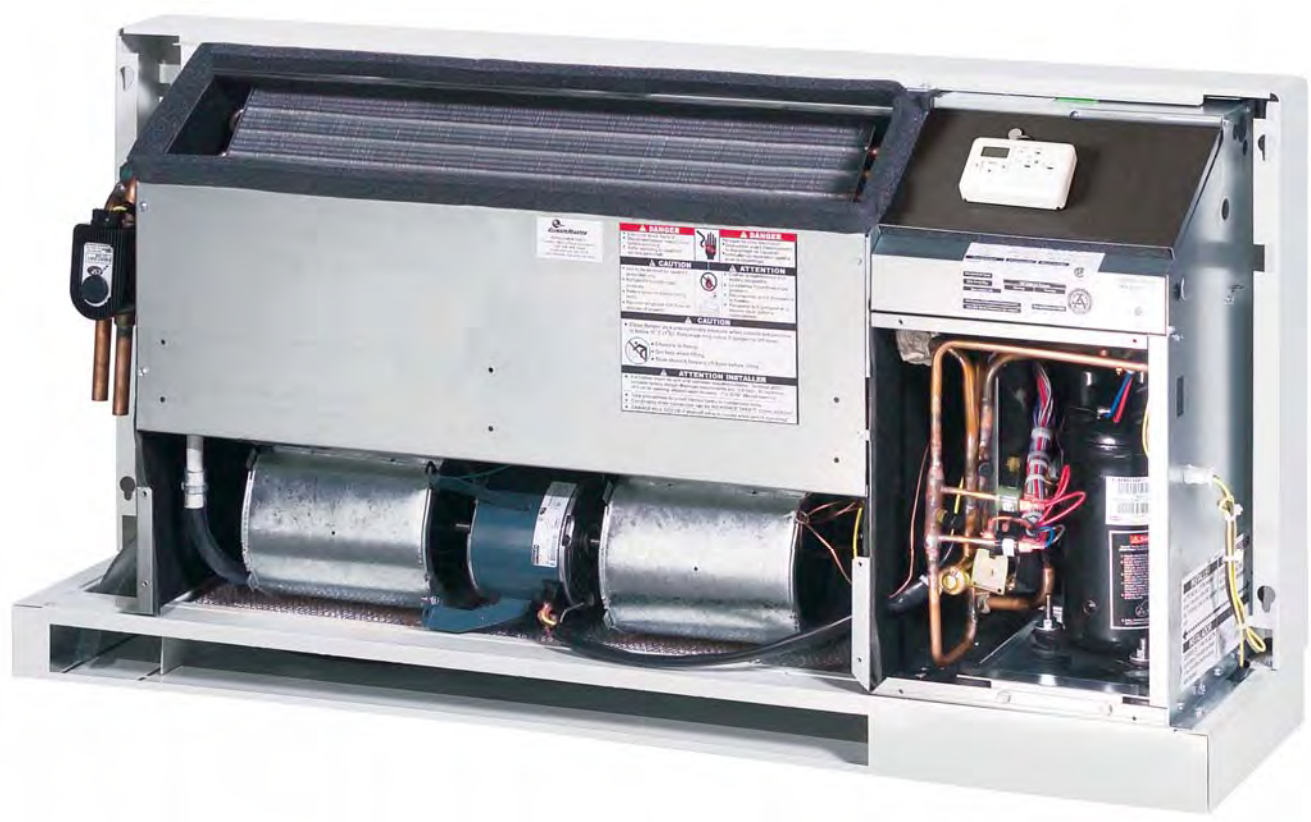
- Sizes 007 (1/2 ton, 1.76 kW) through 019 (1-1/2 ton, 5.3 kW)
- Efficient Rotary compressors
- Meets ASHRAE 90.1 efficiencies
- Two-piece chassis/cabinet design
- Galvanized steel cabinet with durable Polar Ice powder coat finish
- Slope top/aluminum rigid bar supply air grille
- Unique double isolation compressor mounting for quiet operation
- TXV metering device
- Extended range (20 to 120°F, -6.7 to 48.9°C) operation
- ADA approved unit mounted controls, auto or manual-change-over
- Remote-mounted controls available
- Microprocessor controls standard (optional DXM and/or DDC controls)
- LonWorks, BACnet, Modbus and Johnson N2 compatibility options for DDC controls
- Right or left-hand piping arrangement
- Front or bottom return
- Unit Performance Sentinel performance monitoring system (remote controls)
- Eight Safeties Standard

New digital controls available in manual and auto changeover

The Smart Choice for Energy Efficiency

Optional motorized damper for outside air intake for improved air quality

Advanced digital controls with Remote Service Sentinel. Optional Enhanced controls (DXM) & DDC Controllers



Optional insulated water circuit for extended range applications

Exclusive double compressor isolation reduces compressor vibration and improves overall sound performance

New EarthPure® HFC-410A console chassis currently under development

About ARI/ISO/ASHRAE 13256-1

The performance standard ARI/ASHRAE/ISO 13256-1 became effective January 1, 2000 and replaces ARI Standards 320, 325, and 330. This new standard has three major categories: Water Loop (comparable to ARI 320), Ground Water (ARI 325), and Ground Loop (ARI 330). Although these standards are similar there are some differences:

Entering Water Conditions Changes
Entering water temperatures have changed to reflect the centigrade temperature scale. For instance the water loop heating test is performed with 68°F (20°C) water instead of 70°F.

Entering Air Condition Changes
Entering air temperatures have changed to reflect the centigrade temperature scale. For instance the cooling tests are performed with 80.6°F (27°C) dry bulb and 66.2°F (19°C) wet bulb entering air instead of the traditional 80°F DB and 67°F WB entering air temperatures. 80/67 and 70 data (as presented in performance data on pages 16-26) may be converted to the new ISO conditions of 80.6/66.2 and 68 using the entering air correction table on page 14.

Pump Power Correction
Within each model, only one water flow rate is specified for all three groups and pumping watts are calculated using the following formula. This additional power is added onto the existing power consumption.

Pump power correction = (gpm x 0.0631) x (Press Drop x 2990) / 300
Where 'gpm' is waterflow in gpm and 'Press Drop' is the pressure drop through the unit heat exchanger at rated water flow in feet of head.

Fan Power Correction
Fan power is corrected to zero external static pressure using the following equation. The nominal airflow is rated at a specific external static pressure. This effectively reduces the power consumption of the unit and increases cooling capacity but decreases heating capacity. These watts are significant enough in most cases to increase EER and COP's fairly dramatically over ARI 320, 325, and 330 ratings.

Fan Power Correction = (cfm x 0.472) x (esp x 249) / 300
Where 'cfm' is airflow in cfm and esp is the external static pressure at rated airflow in inches of water gauge.

ISO Capacity and Efficiency Equations
The following equations illustrate cooling calculations:

ISO Cooling Capacity = Cooling Capacity (Btuh) + (Fan Power Correction (Watts) x 3.412)
ISO EER Efficiency (W/W) = [ISO Cooling Capacity (Btuh) ÷ 3.412] / [Power Input (watts) – Fan Power Correction (watts) + Pump Power Correction (watt)]

The following equations illustrate heating calculations:

ISO Heating Capacity = Heating Capacity (Btuh) - (Fan Power Correction (Watts) x 3.412)
ISO COP Efficiency (W/W) = [ISO Heating Capacity (Btuh) ÷ 3.412] / [Power Input (watts) - Fan Power Correction (watts) + Pump Power Correction (watt)]

	ARI 320	ISO WLHP	ARI 325	ISO GWHP	ARI 330	ISO GLHP
Cooling						
Entering Air -DB/WB °F	80/67	80.6/66.2	80/67	80.6/66.2	80/67	80.6/66.2
Entering Water -°F	85	86	50/70	59	77	77
Fluid Flow Rate	Note 1	Note 2	Note 2	Note 2	Note 2	Note 2
Heating						
Entering Air -°F	70	68	70	68	70	68
Entering Water -°F	70	68	50/70	50	32	32
Fluid Flow Rate	Note 1	Note 2	Note 2	Note 2	Note 2	Note 2

Note 1: Flow rate is set by 10°F rise in standard cooling test.
Note 2: Flow rate is specified by manufacturer.

Rev.: 3/09/01

ARI/ISO/ASHRAE 13256-1 Data

ASHRAE/ARI/ISO 13256-1. English (IP) Units

Model	Water Loop Heat Pump				Ground Water Heat Pump				Ground Loop Heat Pump			
	Cooling 86°F		Heating 68°F		Cooling 59°F		Heating 50°F		Cooling 77°F		Heating 32°F	
	Capacity Btuh	EER Btuh/W	Capacity Btuh	COP	Capacity Btuh	EER Btuh/W	Capacity Btuh	COP	Capacity Btuh	EER Btuh/W	Capacity Btuh	COP
CCE07	7,800	12.1	10,400	4.9	8,900	19.5	8,400	4.3	8,000	14.0	6,500	3.6
CCE09	9,300	12.0	12,000	4.4	10,300	18.1	9,700	3.8	10,000	14.0	7,800	3.4
CCE12	12,300	11.6	15,000	4.4	13,700	17.8	12,400	3.8	12,800	13.4	9,800	3.3
CCE15	13,800	11.8	17,300	4.4	15,200	17.3	14,000	3.8	14,100	13.5	11,000	3.3
CCE19	16,000	12.0	19,300	4.2	17,800	17.3	16,000	3.7	16,400	13.4	12,500	3.1

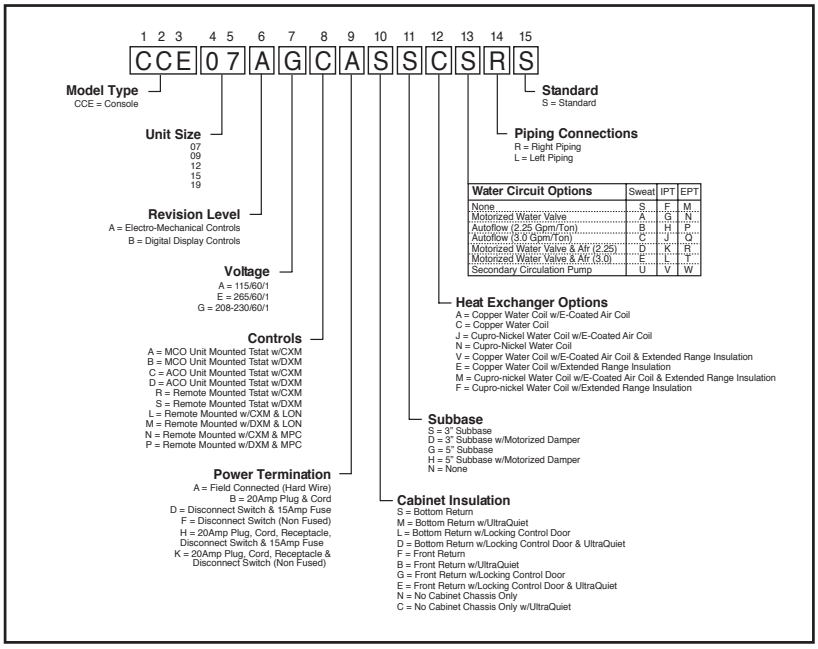
Cooling capacities based upon 80.6°F DB, 66.2°F WB entering air temperature
Heating capacities based upon 68°F DB, 59°F WB entering air temperature
All air flow is rated on high speed
All ratings based upon operation at lower voltage of dual voltage rated models

ASHRAE/ARI/ISO 13256-1. Metric (SI) Units

Model	Water Loop Heat Pump				Ground Water Heat Pump				Ground Loop Heat Pump			
	Cooling 30°C		Heating 20°C		Cooling 15°C		Heating 10°C		Cooling 25°C		Heating 0°C	
	Capacity Watts	EER W/W	Capacity Watts	COP	Capacity Watts	EER W/W	Capacity Watts	COP	Capacity Watts	EER W/W	Capacity Watts	COP
CCE07	2,286	3.5	3,048	4.9	2,608	5.7	2,462	4.3	2,345	4.1	1,905	3.6
CCE09	2,726	3.5	3,517	4.4	3,019	5.3	2,843	3.8	2,931	4.1	2,286	3.4
CCE12	3,605	3.4	4,396	4.4	4,015	5.2	3,634	3.8	3,751	3.9	2,872	3.3
CCE15	4,045	3.5	5,070	4.4	4,455	5.1	4,103	3.8	4,132	4.0	3,224	3.3
CCE19	4,689	3.5	5,657	4.2	5,217	5.1	4,689	3.7	4,807	3.9	3,664	3.1

Cooling capacities based upon 27°C DB, 19°C WB entering air temperature
Heating capacities based upon 20°C DB, 15°C WB entering air temperature
All air flow is rated on high speed
All ratings based upon operation at lower voltage of dual voltage rated models

Model Nomenclature



Rev.: 06/01/06D

Reference Calculations

Heating

$$LWT = EWT - \frac{HE}{GPM \times 500}$$

$$LAT = EAT + \frac{HC}{CFM \times 1.08}$$

Cooling

$$LWT = EWT + \frac{HR}{GPM \times 500}$$

$$LAT\ (DB) = EAT\ (DB) - \frac{SC}{CFM \times 1.08}$$

$$LC = TC - SC$$

$$S/T = \frac{SC}{TC}$$

Legend and Glossary of Abbreviations

BTUH = BTU(British Thermal Unit) per hour
CFM = airflow, cubic feet/minute
COP = coefficient of performance = BTUH output/BTUH input
DB = dry bulb temperature (°F)
EAT = entering air temperature, Fahrenheit (dry bulb/wet bulb)
EER = energy efficiency ratio = BTUH output/Watt input
ESP = external static pressure (inches w.g.)
EWT = entering water temperature
GPM = water flow in U.S. gallons/minute
HE = total heat of extraction, BTUH
HC = air heating capacity, BTUH
HR = total heat of rejection, BTUH
HWC = hot water generator (desuperheater) capacity, Mbtuh
KW = total power unit input, kilowatts
LAT = leaving air temperature, °F
LC = latent cooling capacity, BTUH
LWT = leaving water temperature, °F
MBTUH = 1000 BTU per hour
S/T = sensible to total cooling ratio
SC = sensible cooling capacity, BTUH
TC = total cooling capacity, BTUH
WB = wet bulb temperature (°F)
WPD = waterside pressure drop (psi & ft. of hd.)

Conversion Table - to convert inch-pound (English) to SI (Metric)

Air Flow	Water Flow	Ext Static Pressure	Water Pressure Drop
Airflow (L/s) = CFM x 0.472	Water Flow (L/s) = gpm x 0.0631	ESP (Pa) = ESP (in of wg) x 249	PD (kPa) = PD (ft of hd) x 2.99

Correction Tables

Air Flow Correction Table

Airflow	Cooling				Heating		
% of Rated	Total Capacity	Sensible Capacity	Power	Heat of Rejection	Heating Capacity	Power	Heat of Extraction
75%	0.951	0.860	0.963	0.952	0.990	1.054	0.966
81%	0.964	0.894	0.973	0.965	0.993	1.035	0.977
88%	0.979	0.936	0.984	0.979	0.996	1.019	0.987
94%	0.990	0.969	0.992	0.990	0.998	1.008	0.994
100%	1.000	1.000	1.000	1.000	1.000	1.000	1.000
106%	1.010	1.033	1.008	1.010	1.002	0.994	1.005
113%	1.019	1.069	1.016	1.019	1.003	0.988	1.011

Entering Air Correction Table

Heating			
Entering Air DB°F	Heating Capacity	Power	Heat of Extraction
60	1.011	0.989	1.007
65	1.004	0.994	1.004
68	1.002	0.997	1.002
70	1.000	1.000	1.000
75	0.996	1.007	0.995
80	0.991	1.018	0.990

Cooling										
Entering Air WB°F	Total Capacity	Sensible Cooling Capacity Multiplier - Entering DB °F							Power	Heat of Rejection
		70	75	80	80.6	85	90	95		
60	0.893	0.889	1.087	*	*	*	*	*	0.964	0.902
65	0.964	0.692	0.884	1.085	1.108	*	*	*	0.988	0.967
66.2	0.983	0.645	0.838	1.036	1.059	1.231	*	*	0.995	0.985
67	1.000	0.613	0.806	1.000	1.027	1.199	*	*	1.000	1.000
70	1.049		0.683	0.879	0.902	1.077	1.274	1.415	1.016	1.046
75	1.118			0.676	0.698	0.866	1.068	1.266	1.037	1.106

* = Sensible capacity equals total capacity
ARI/ISO/ASHRAE 13256-1 uses entering air conditions of Cooling - 80.6°F DB/66.2°F WB, 1 and Heating - 68°F DB/59°F WB entering air temperature

Antifreeze Correction Table

Antifreeze Type	Anitfreeze %	Cooling EWT 90°F			Heating EWT 30°F		WPD Corr. Fct. EWT 30°F
		Total Cap	Sens Cap	Power	Htg Cap	Power	
Water	0	1.000	1.000	1.000	1.000	1.000	1.000
Propylene Glycol	5	0.995	0.995	1.003	0.989	0.997	1.070
	15	0.986	0.986	1.009	0.968	0.990	1.210
	25	0.978	0.978	1.014	0.947	0.983	1.360
Methanol	5	0.997	0.997	1.002	0.989	0.997	1.070
	15	0.990	0.990	1.007	0.968	0.990	1.160
	25	0.982	0.982	1.012	0.949	0.984	1.220
Ethanol	5	0.998	0.998	1.002	0.981	0.994	1.140
	15	0.994	0.994	1.005	0.944	0.983	1.300
	25	0.986	0.986	1.009	0.917	0.974	1.360
Ethylene Glycol	5	0.998	0.998	1.002	0.993	0.998	1.040
	15	0.994	0.994	1.004	0.980	0.994	1.120
	25	0.988	0.988	1.008	0.966	0.990	1.200

Unit Model Number Designation
CCE = Console Heat Pump (Rev. B)

Capacity Table Index
CCE-07B - CCE-19B - See Page 20-24.

Glossary of Terms
See Page 16.

Selection Procedure

Step 1 Determine the actual heating and cooling loads at the desired dry bulb and wet bulb conditions.

Step 2 Obtain the following design parameters: Entering water temperature, water flow rate in GPM, air flow in CFM, water flow pressure drop and design wet and dry bulb temperatures. Air flow CFM should be between 300 and 450 CFM per ton. Unit water pressure drop should be kept as close as possible to each other to make water balancing easier. Go to the appropriate tables and find the proper indicated water flow and water temperature.

Step 3 Select a unit based on total and sensible cooling conditions. Select a unit which is closest to, but no larger than, the actual cooling load.

Step 4 Enter tables at the design water flow and water temperature. Read the total and sensible cooling capacities (Note: interpolation is permissible, extrapolation is not).

Step 5 Read the heating capacity. If it exceeds the design criteria it is acceptable. It is quite normal for Water-Source Heat Pumps to be selected on cooling capacity only since the heating output is usually greater than the cooling capacity.

Step 6 Determine the correction factors associated with the variable factors of dry bulb and wet bulb (page 14).

Corrected Total Cooling = tabulated total cooling x wet bulb correction.
Corrected Sensible Cooling = tabulated sensible cooling x wet/dry bulb correction.

Step 7 Compare the corrected capacities to the load requirements. Normally if the capacities are within 10% of the loads, the equipment is acceptable. It is better to undersize than oversize, as undersizing improves humidity control, reduces sound levels and extends the life of the equipment.

Step 8 When completed, calculate water temperature rise and assess the selection. If the units selected are not within 10% of the load calculations, then review what effect changing the GPM, water temperature and/or air flow and air temperature would have on the corrected capacities. If the desired capacity cannot be achieved, select the next larger or smaller unit and repeat the procedure. Remember, when in doubt, undersize slightly for best performance.

Example Equipment Selection For Cooling

Step 1 Load Determination:
Assume we have determined that the appropriate cooling load at the desired dry bulb 80°F and wet bulb 65°F conditions is as follows:

Total Cooling .....11,500 BTUH
Sensible Cooling.....9,000 BTUH
Entering Air Temp ..... 80°F Dry Bulb / 65°F Wet Bulb

Step 2 Design Conditions:
Similarly, we have also obtained the following design parameters:

Entering Water Temp .....90°F
Water Flow (Based upon 12°F rise in temp.) 2.3 GPM
Air Flow .....350 CFM

Step 3, 4 & 5 HP Selection:
After making our preliminary selection (CCE12), we enter the tables at design water flow and water temperature and read Total Cooling, Sens. Cooling and Heat of Rej. capacities:

Total Cooling .....12,000 BTUH
Sensible Cooling.....8,800 BTUH
Heat of Rejection.....15,000 BTUH

Step 6 & 7 Entering Air and Airflow Corrections:
Next, we determine our correction factors.

	Table		Ent Air		Air Flow		Corrected
Corrected Total Cooling =	12,000	x	0.964	x	1.000	=	11,568
Corrected Sens Cooling =	8,800	x	1.085	x	1.000	=	9,548
Corrected Heat of Reject =	15,800	x	0.967	x	1.000	=	15,279

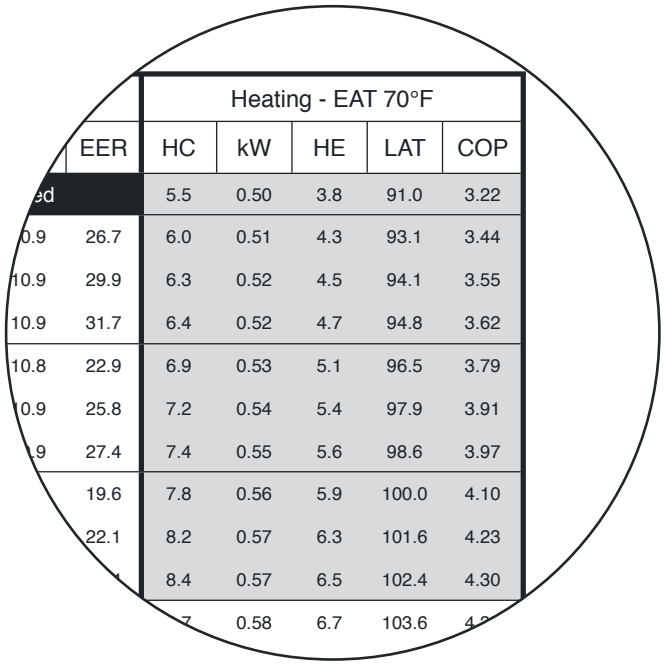
Step 8 Water Temperature Rise Calculation & Assessment:

Actual
Temperature Rise 13.2°F

When we compare the Corrected Total Cooling and Corrected Sensible Cooling figures with our load requirements stated in Step 1, we discover that our selection is within +/- 10% of our sensible load requirement. Furthermore, we see that our Corrected Total Cooling figure is slightly undersized as recommended, when compared to the actual indicated load.

Performance Data
Selection Notes

For operation in the shaded area when water is used in lieu of an anti-freeze solution, the LWT (Leaving Water Temperature) must be calculated. Flow must be maintained to a level such that the LWT is maintained above 42°F [5.6°C] when the JW3 jumper is not clipped (see example below). This is due to the potential of the refrigerant temperature being as low as 32°F [0°C] with 40°F [4.4°C] LWT, which may lead to a nuisance cutout due to the activation of the Low Temperature Protection. JW3 should never be clipped for standard range equipment or systems without antifreeze.



		Heating - EAT 70°F				
	EER	HC	kW	HE	LAT	COP
ed		5.5	0.50	3.8	91.0	3.22
0.9	26.7	6.0	0.51	4.3	93.1	3.44
10.9	29.9	6.3	0.52	4.5	94.1	3.55
10.9	31.7	6.4	0.52	4.7	94.8	3.62
10.8	22.9	6.9	0.53	5.1	96.5	3.79
0.9	25.8	7.2	0.54	5.4	97.9	3.91
.9	27.4	7.4	0.55	5.6	98.6	3.97
	19.6	7.8	0.56	5.9	100.0	4.10
	22.1	8.2	0.57	6.3	101.6	4.23
		8.4	0.57	6.5	102.4	4.30
		7	0.58	6.7	103.6	4.3

Example:

At 50°F EWT (Entering Water Temperature) and 1.5 gpm/ton, a 3 ton unit has a HE of 22,500 Btuh. To calculate LWT, rearrange the formula for HE as follows:

HE = TD x GPM x 500, where HE = Heat of Extraction (Btuh); TD = temperature difference (EWT - LWT) and GPM = U.S. Gallons per Minute.

TD = HE / (GPM x 500)

TD = 22,500 / (4.5 x 500)

TD = 10°F

LWT = EWT - TD

LWT = 50 - 10 = 40°F

In this example, a higher flow rate will be required for EWTs at or below 50°F without antifreeze. At 2 gpm/ton, the calculation above results in a TD of 7.5. LWT = 50 - 7.5 = 42.5°F, which is above 42°F EWT, and is acceptable for this application.

Performance Data CCE-07B

240 CFM Nominal (Rated) Airflow

Performance capacities shown in thousands of Btuh

*WPD Adder for Motorized Valve, CCE07 (Cv = 4.9, MOPD = 125 psi)		
GPM	WPD Adder	
	PSI	FT
1.0	0.20	0.47
1.4	0.44	1.00
1.9	0.87	2.00

EWT °F	GPM	WPD*		Cooling - EAT 80/67°F						Heating - EAT 70°F				
		PSI	FT	TC	SC	Sens/Tot Ratio	kW	HR	EER	HC	kW	HE	LAT	COP
20	1.9	3.7	8.5	Operation Not Recommended						5.5	0.50	3.8	91.0	3.22
30	1.0	1.4	3.2	9.7	6.9	0.71	0.36	10.9	26.7	6.0	0.51	4.3	93.1	3.44
	1.4	2.2	5.1	9.8	6.9	0.70	0.33	10.9	29.9	6.3	0.52	4.5	94.1	3.55
	1.9	3.3	7.6	9.9	6.9	0.70	0.31	10.9	31.7	6.4	0.52	4.7	94.8	3.62
40	1.0	1.0	2.3	9.4	6.8	0.72	0.41	10.8	22.9	6.9	0.53	5.1	96.5	3.79
	1.4	1.5	3.5	9.6	6.9	0.71	0.37	10.9	25.8	7.2	0.54	5.4	97.9	3.91
	1.9	2.1	4.9	9.7	6.9	0.71	0.36	10.9	27.4	7.4	0.55	5.6	98.6	3.97
50	1.0	0.9	2.1	9.0	6.7	0.74	0.46	10.6	19.6	7.8	0.56	5.9	100.0	4.10
	1.4	1.4	3.2	9.3	6.8	0.73	0.42	10.8	22.1	8.2	0.57	6.3	101.6	4.23
	1.9	2.0	4.6	9.5	6.8	0.72	0.40	10.8	23.4	8.4	0.57	6.5	102.4	4.30
60	1.0	0.8	1.8	8.6	6.5	0.76	0.52	10.4	16.6	8.7	0.58	6.7	103.6	4.39
	1.4	1.3	3.0	8.9	6.6	0.74	0.48	10.5	18.8	9.2	0.59	7.2	105.4	4.53
	1.9	1.9	4.4	9.1	6.7	0.74	0.46	10.6	20.0	9.4	0.60	7.4	106.3	4.61
70	1.0	0.7	1.6	8.1	6.3	0.78	0.58	10.1	14.0	9.6	0.61	7.6	107.1	4.67
	1.4	1.2	2.8	8.5	6.5	0.76	0.53	10.3	15.9	10.2	0.62	8.1	109.1	4.82
	1.9	1.8	4.2	8.6	6.5	0.76	0.51	10.4	16.9	10.5	0.63	8.3	110.2	4.90
80	1.0	0.7	1.6	7.6	6.1	0.79	0.65	9.8	11.8	10.6	0.63	8.4	110.7	4.93
	1.4	1.1	2.5	8.0	6.2	0.78	0.60	10.0	13.3	11.1	0.64	9.0	112.9	5.10
	1.9	1.6	3.7	8.1	6.3	0.78	0.57	10.1	14.2	11.5	0.65	9.3	114.1	5.19
85	1.0	0.6	1.4	7.4	5.9	0.80	0.68	9.7	10.8	11.0	0.64	8.9	112.5	5.06
	1.4	1.0	2.3	7.7	6.1	0.79	0.63	9.9	12.2	11.6	0.65	9.4	114.8	5.24
	1.9	1.5	3.5	7.9	6.2	0.78	0.61	10.0	13.0	12.0	0.66	9.7	116.1	5.33
90	1.0	0.6	1.4	7.2	5.8	0.81	0.72	9.6	9.9	11.5	0.65	9.3	114.2	5.19
	1.4	1.0	2.3	7.5	6.0	0.80	0.67	9.8	11.1	12.1	0.66	9.9	116.7	5.38
	1.9	1.4	3.2	7.6	6.1	0.79	0.64	9.8	11.9	12.5	0.67	10.2	118.0	5.48
100	1.0	0.5	1.2	6.7	5.5	0.81	0.81	9.5	8.3	Operation Not Recommended				
	1.4	0.9	2.1	7.0	5.7	0.81	0.75	9.6	9.3					
	1.9	1.3	3.0	7.2	5.8	0.81	0.72	9.6	9.9					
110	1.0	0.5	1.2	6.4	5.2	0.81	0.91	9.5	7.0					
	1.4	0.9	2.1	6.6	5.4	0.81	0.84	9.5	7.8					
	1.9	1.3	3.0	6.7	5.5	0.81	0.81	9.5	8.3					

Interpolation is permissible; extrapolation is not.
All entering air conditions are 80°F DB and 67°F WB in cooling, and 70°F DB in heating. ARI/ISO certified conditions are 80.6°F DB and 66.2°F WB in cooling and 68°F DB in heating.
Table does not reflect fan or pump power corrections for ARI/ISO conditions.
All performance is based upon the lower voltage of dual voltage rated units.
Operation below 40°F EWT is based upon a 15% antifreeze solution.
Operation below 60°F EWT requires optional insulated water/refrigerant circuit (standard on residential models).
See performance correction tables for operating conditions other than those listed above.
See Performance Data Selection Notes for operation in shaded areas.

Performance Data CCE-09B

300 CFM Nominal (Rated) Airflow

Performance capacities shown in thousands of Btuh

*WPD Adder for Motorized Valve, CCE09 (Cv = 4.9, MOPD = 125 psi)		
GPM	WPD Adder	
	PSI	FT
1.3	0.34	0.80
1.9	0.80	1.85
2.5	1.50	3.46

EWT °F	GPM	WPD*		Cooling - EAT 80/67°F						Heating - EAT 70°F				
		PSI	FT	TC	SC	Sens/Tot Ratio	kW	HR	EER	HC	kW	HE	LAT	COP
20	2.5	6.2	14.3	Operation Not Recommended						7.2	0.63	5.1	92.3	3.35
30	1.3	1.8	4.2	11.3	7.6	0.67	0.48	13.0	23.8	7.5	0.66	5.2	93.0	3.34
	1.9	3.2	7.4	11.7	7.7	0.66	0.44	13.2	26.5	7.6	0.67	5.4	93.5	3.36
	2.5	5.0	11.6	11.9	7.8	0.66	0.42	13.3	28.1	7.7	0.67	5.4	93.8	3.38
40	1.3	1.5	3.5	10.9	7.4	0.68	0.54	12.8	20.4	8.1	0.69	5.8	95.1	3.46
	1.9	2.6	6.0	11.2	7.5	0.67	0.49	12.9	22.6	8.4	0.70	6.0	95.9	3.52
	2.5	4.0	9.2	11.3	7.6	0.67	0.47	13.0	23.9	8.6	0.71	6.2	96.4	3.56
50	1.3	1.3	3.0	10.6	7.2	0.68	0.60	12.6	17.6	9.1	0.72	6.6	97.9	3.67
	1.9	2.5	5.8	10.8	7.3	0.68	0.56	12.7	19.4	9.4	0.73	6.9	99.1	3.77
	2.5	3.9	9.0	10.9	7.4	0.67	0.53	12.8	20.5	9.7	0.74	7.1	99.7	3.82
60	1.3	1.2	2.8	10.2	7.1	0.69	0.67	12.5	15.2	10.1	0.75	7.6	101.2	3.94
	1.9	2.4	5.5	10.4	7.2	0.69	0.62	12.6	16.8	10.6	0.77	8.0	102.7	4.05
	2.5	3.7	8.5	10.6	7.2	0.68	0.60	12.6	17.6	10.9	0.77	8.2	103.5	4.12
70	1.3	1.2	2.8	9.8	6.9	0.71	0.75	12.4	13.1	11.3	0.79	8.6	104.8	4.21
	1.9	2.2	5.1	10.1	7.0	0.70	0.70	12.5	14.4	11.9	0.80	9.1	106.6	4.34
	2.5	3.5	8.1	10.2	7.1	0.69	0.67	12.5	15.2	12.2	0.81	9.4	107.5	4.42
80	1.3	1.1	2.5	9.3	6.8	0.73	0.83	12.1	11.2	12.5	0.82	9.7	108.4	4.48
	1.9	2.1	4.9	9.6	6.9	0.71	0.78	12.3	12.4	13.1	0.83	10.3	110.4	4.61
	2.5	3.2	7.5	9.8	6.9	0.71	0.75	12.4	13.1	13.5	0.84	10.6	111.5	4.68
85	1.3	1.1	2.5	9.0	6.7	0.74	0.87	12.0	10.3	13.1	0.83	10.2	110.3	4.60
	1.9	2.0	4.6	9.4	6.8	0.72	0.82	12.2	11.5	13.7	0.85	10.8	112.3	4.73
	2.5	3.1	7.2	9.6	6.9	0.72	0.79	12.3	12.1	14.1	0.86	11.2	113.4	4.79
90	1.3	1.0	2.3	8.7	6.5	0.75	0.92	11.8	9.4	13.7	0.85	10.8	112.1	4.71
	1.9	2.0	4.6	9.1	6.7	0.74	0.86	12.0	10.5	14.3	0.87	11.4	114.1	4.83
	2.5	3.0	6.9	9.3	6.8	0.73	0.83	12.1	11.1	14.7	0.88	11.7	115.2	4.89
100	1.3	1.0	2.3	7.9	6.2	0.79	1.01	11.3	7.8	Operation Not Recommended				
	1.9	1.9	4.4	8.4	6.4	0.77	0.95	11.6	8.8					
	2.5	3.0	6.9	8.6	6.5	0.76	0.92	11.8	9.4					
110	1.3	1.0	2.3	6.9	5.7	0.83	1.10	10.7	6.3					
	1.9	1.9	4.4	7.5	6.0	0.80	1.04	11.1	7.2					
	2.5	3.0	6.9	7.8	6.2	0.79	1.02	11.3	7.7					

Interpolation is permissible; extrapolation is not.
All entering air conditions are 80°F DB and 67°F WB in cooling, and 70°F DB in heating. ARI/ISO certified conditions are 80.6°F DB and 66.2°F WB in cooling and 68°F DB in heating.
Table does not reflect fan or pump power corrections for ARI/ISO conditions.
All performance is based upon the lower voltage of dual voltage rated units.
Operation below 40°F EWT is based upon a 15% antifreeze solution.
Operation below 60°F EWT requires optional insulated water/refrigerant circuit (standard on residential models).
See performance correction tables for operating conditions other than those listed above.
See Performance Data Selection Notes for operation in shaded areas.

Performance Data CCE-12B

350 CFM Nominal (Rated) Airflow

Performance capacities shown in thousands of Btuh

*WPD Adder for Motorized Valve, CCE12 (Cv = 4.9, MOPD = 125 psi)		
GPM	WPD Adder	
	PSI	FT
1.6	0.52	1.21
2.3	1.17	2.71
3.1	2.31	5.33

EWT °F	GPM	WPD*		Cooling - EAT 80/67°F						Heating - EAT 70°F				
		PSI	FT	TC	SC	Sens/Tot Ratio	kW	HR	EER	HC	kW	HE	LAT	COP
20	3.1	9.1	21.0	Operation Not Recommended						8.7	0.78	6.0	93.0	3.26
30	1.6	2.5	5.8	14.8	9.8	0.66	0.60	16.8	24.6	9.4	0.81	6.6	94.8	3.39
	2.3	4.4	10.2	14.9	9.9	0.66	0.55	16.8	27.1	9.7	0.83	6.9	95.7	3.46
	3.1	7.2	16.6	15.0	9.9	0.66	0.53	16.8	28.4	9.9	0.83	7.1	96.2	3.49
40	1.6	2.0	4.6	14.4	9.6	0.67	0.68	16.7	21.3	10.6	0.86	7.7	97.9	3.63
	2.3	3.5	8.1	14.7	9.7	0.66	0.62	16.8	23.7	11.0	0.87	8.0	99.1	3.71
	3.1	5.7	13.2	14.8	9.8	0.66	0.59	16.8	24.9	11.2	0.88	8.3	99.7	3.76
50	1.6	1.9	4.4	14.0	9.5	0.68	0.76	16.6	18.3	11.8	0.89	8.8	101.2	3.88
	2.3	3.4	7.9	14.3	9.6	0.67	0.70	16.7	20.4	12.3	0.91	9.2	102.5	3.98
	3.1	5.5	12.7	14.5	9.6	0.67	0.67	16.7	21.6	12.6	0.92	9.5	103.2	4.03
60	1.6	1.8	4.2	13.5	9.3	0.69	0.86	16.4	15.6	13.1	0.93	9.9	104.5	4.13
	2.3	3.4	7.9	13.8	9.4	0.68	0.79	16.5	17.5	13.6	0.94	10.4	106.0	4.24
	3.1	5.3	12.2	14.0	9.5	0.68	0.76	16.6	18.5	13.9	0.95	10.7	106.8	4.30
70	1.6	1.7	3.9	12.9	9.1	0.71	0.97	16.2	13.2	14.3	0.96	11.0	107.8	4.38
	2.3	3.0	6.9	13.3	9.2	0.69	0.90	16.3	14.8	14.9	0.97	11.6	109.3	4.50
	3.1	4.6	10.6	13.5	9.3	0.69	0.86	16.4	15.7	15.2	0.98	11.9	110.1	4.56
80	1.6	1.6	3.7	12.2	8.9	0.73	1.10	15.9	11.1	15.5	0.98	12.1	110.8	4.62
	2.3	2.8	6.5	12.7	9.0	0.71	1.01	16.1	12.5	16.0	0.99	12.7	112.4	4.74
	3.1	4.4	10.2	12.9	9.1	0.71	0.97	16.2	13.3	16.3	1.00	12.9	113.1	4.80
85	1.6	1.5	3.5	11.8	8.8	0.74	1.16	15.8	10.2	16.0	0.99	12.6	112.2	4.73
	2.3	2.7	6.2	12.3	8.9	0.72	1.07	16.0	11.5	16.6	1.00	13.2	113.7	4.85
	3.1	4.4	10.2	12.6	9.0	0.72	1.03	16.1	12.2	16.9	1.01	13.4	114.5	4.91
90	1.6	1.4	3.2	11.5	8.6	0.75	1.23	15.7	9.3	16.5	1.00	13.1	113.6	4.83
	2.3	2.6	6.0	12.0	8.8	0.73	1.14	15.8	10.5	17.1	1.01	13.6	115.0	4.95
	3.1	4.3	9.9	12.2	8.9	0.73	1.09	15.9	11.2	17.3	1.01	13.9	115.7	5.01
100	1.6	1.4	3.2	10.7	8.4	0.78	1.37	15.4	7.8	Operation Not Recommended				
	2.3	2.6	6.0	11.2	8.6	0.76	1.27	15.6	8.8					
	3.1	4.3	9.9	11.5	8.6	0.75	1.23	15.7	9.4					
110	1.6	1.4	3.2	9.9	8.1	0.82	1.52	15.1	6.5					
	2.3	2.6	6.0	10.4	8.3	0.79	1.42	15.3	7.3					
	3.1	4.3	9.9	10.7	8.4	0.78	1.37	15.4	7.8					

Interpolation is permissible; extrapolation is not.
All entering air conditions are 80°F DB and 67°F WB in cooling, and 70°F DB in heating. ARI/ISO certified conditions are 80.6°F DB and 66.2°F WB in cooling and 68°F DB in heating.
Table does not reflect fan or pump power corrections for ARI/ISO conditions.
All performance is based upon the lower voltage of dual voltage rated units.
Operation below 40°F EWT is based upon a 15% antifreeze solution.
Operation below 60°F EWT requires optional insulated water/refrigerant circuit (standard on residential models).
See performance correction tables for operating conditions other than those listed above.
See Performance Data Selection Notes for operation in shaded areas.

Performance Data CCE-15B

400 CFM Nominal (Rated) Airflow

Performance capacities shown in thousands of Btuh

*WPD Adder for Motorized Valve, CCE15 (Cv = 4.9, MOPD = 125 psi)		
GPM	WPD Adder	
	PSI	FT
1.8	0.66	1.53
2.7	1.62	3.74
3.6	3.11	7.18

EWT °F	GPM	WPD*		Cooling - EAT 80/67°F						Heating - EAT 70°F				
		PSI	FT	TC	SC	Sens/Tot Ratio	kW	HR	EER	HC	kW	HE	LAT	COP
20	3.6	4.9	11.3	Operation Not Recommended						9.9	0.93	6.7	92.8	3.10
30	1.8	1.2	2.8	16.5	11.2	0.67	0.68	18.8	24.5	10.4	0.95	7.2	94.1	3.20
	2.7	2.6	6.0	16.6	11.1	0.67	0.62	18.7	26.6	10.7	0.96	7.4	94.8	3.26
	3.6	4.2	9.7	16.6	11.0	0.67	0.60	18.6	27.6	10.9	0.97	7.6	95.2	3.29
40	1.8	1.3	3.0	16.3	11.1	0.68	0.76	18.9	21.5	11.6	0.99	8.2	96.9	3.44
	2.7	2.3	5.3	16.5	11.2	0.68	0.70	18.9	23.6	12.1	1.00	8.7	97.9	3.53
	3.6	3.6	8.3	16.5	11.2	0.67	0.67	18.8	24.6	12.3	1.01	8.9	98.5	3.57
50	1.8	1.2	2.8	15.8	11.0	0.70	0.85	18.7	18.7	13.1	1.03	9.6	100.2	3.72
	2.7	2.2	5.1	16.2	11.1	0.69	0.78	18.8	20.6	13.7	1.05	10.1	101.6	3.84
	3.6	3.5	8.1	16.3	11.1	0.68	0.75	18.9	21.6	14.0	1.05	10.4	102.4	3.90
60	1.8	1.2	2.8	15.2	10.8	0.71	0.94	18.4	16.1	14.7	1.07	11.1	104.0	4.03
	2.7	2.1	4.9	15.6	10.9	0.70	0.87	18.6	17.9	15.4	1.09	11.7	105.7	4.17
	3.6	3.4	7.9	15.8	11.0	0.69	0.84	18.7	18.8	15.8	1.09	12.1	106.6	4.24
70	1.8	1.1	2.5	14.3	10.5	0.73	1.04	17.9	13.7	16.4	1.10	12.6	107.8	4.34
	2.7	2.0	4.6	14.9	10.7	0.72	0.97	18.2	15.3	17.2	1.12	13.4	109.7	4.50
	3.6	3.2	7.4	15.2	10.8	0.71	0.94	18.4	16.1	17.6	1.13	13.8	110.7	4.58
80	1.8	1.1	2.5	13.4	10.2	0.76	1.16	17.3	11.6	18.0	1.13	14.1	111.6	4.65
	2.7	2.0	4.6	14.0	10.4	0.74	1.08	17.7	13.0	18.8	1.15	14.9	113.5	4.82
	3.6	3.1	7.2	14.3	10.5	0.73	1.05	17.9	13.7	19.3	1.15	15.3	114.5	4.91
85	1.8	1.1	2.5	12.9	10.0	0.78	1.21	17.0	10.6	18.8	1.14	14.8	113.3	4.80
	2.7	1.9	4.4	13.5	10.3	0.76	1.14	17.4	11.9	19.6	1.15	15.6	115.2	4.98
	3.6	3.0	6.9	13.9	10.4	0.75	1.10	17.6	12.6	20.0	1.16	16.0	116.1	5.07
90	1.8	1.0	2.3	12.3	9.9	0.80	1.27	16.7	9.7	19.5	1.15	15.5	115.0	4.95
	2.7	1.9	4.4	13.0	10.1	0.78	1.20	17.1	10.9	20.2	1.16	16.3	116.7	5.13
	3.6	3.0	6.9	13.4	10.2	0.76	1.16	17.3	11.5	20.6	1.16	16.6	117.6	5.22
100	1.8	1.0	2.3	11.1	9.4	0.85	1.40	15.9	8.0	Operation Not Recommended				
	2.7	1.8	4.2	11.9	9.7	0.82	1.32	16.4	9.0					
	3.6	2.9	6.7	12.2	9.8	0.80	1.28	16.6	9.5					
110	1.8	1.0	2.3	9.8	8.9	0.91	1.53	15.0	6.4					
	2.7	1.8	4.2	10.6	9.2	0.87	1.45	15.5	7.3					
	3.6	2.9	6.7	11.0	9.4	0.85	1.41	15.8	7.8					

Interpolation is permissible; extrapolation is not.
All entering air conditions are 80°F DB and 67°F WB in cooling, and 70°F DB in heating. ARI/ISO certified conditions are 80.6°F DB and 66.2°F WB in cooling and 68°F DB in heating.
Table does not reflect fan or pump power corrections for ARI/ISO conditions.
All performance is based upon the lower voltage of dual voltage rated units.
Operation below 40°F EWT is based upon a 15% antifreeze solution.
Operation below 60°F EWT requires optional insulated water/refrigerant circuit (standard on residential models).
See performance correction tables for operating conditions other than those listed above.
See Performance Data Selection Notes for operation in shaded areas.

Performance Data CCE-19B

460 CFM Nominal (Rated) Airflow

Performance capacities shown in thousands of Btuh

*WPD Adder for Motorized Valve, CCE19 (Cv = 4.9, MOPD = 125 psi)		
GPM	WPD Adder	
	PSI	FT
2.4	1.17	2.71
3.6	2.88	6.64
4.8	5.53	12.77

EWT °F	GPM	WPD*		Cooling - EAT 80/67°F						Heating - EAT 70°F				
		PSI	FT	TC	SC	Sens/Tot Ratio	kW	HR	EER	HC	kW	HE	LAT	COP
20	4.8	7.9	18.2	Operation Not Recommended						11.2	1.05	7.6	92.5	3.13
30	2.4	2.1	4.9	20.1	13.2	0.66	0.81	22.8	24.7	12.2	1.09	8.5	94.6	3.30
	3.6	4.2	9.7	20.5	13.4	0.66	0.76	23.1	26.9	12.6	1.10	8.9	95.3	3.36
	4.8	6.8	15.7	20.7	13.5	0.65	0.74	23.2	28.1	12.8	1.11	9.0	95.7	3.40
40	2.4	2.0	4.6	19.4	12.9	0.66	0.90	22.5	21.6	13.8	1.14	9.9	97.8	3.54
	3.6	3.8	8.8	19.8	13.1	0.66	0.84	22.7	23.5	14.3	1.16	10.3	98.7	3.61
	4.8	6.2	14.3	20.0	13.2	0.66	0.82	22.8	24.6	14.5	1.17	10.6	99.2	3.64
50	2.4	2.0	4.6	18.7	12.5	0.67	1.00	22.1	18.8	15.5	1.21	11.4	101.1	3.76
	3.6	3.7	8.5	19.2	12.7	0.66	0.94	22.4	20.5	16.0	1.23	11.9	102.2	3.83
	4.8	6.0	13.9	19.4	12.8	0.66	0.91	22.5	21.4	16.3	1.24	12.1	102.8	3.86
60	2.4	1.9	4.4	18.0	12.1	0.67	1.11	21.8	16.2	17.2	1.27	12.8	104.5	3.96
	3.6	3.5	8.1	18.5	12.4	0.67	1.04	22.0	17.8	17.8	1.30	13.4	105.7	4.02
	4.8	5.8	13.4	18.7	12.5	0.67	1.01	22.1	18.6	18.1	1.31	13.6	106.4	4.06
70	2.4	1.8	4.2	17.2	11.8	0.68	1.23	21.4	14.0	18.8	1.34	14.2	107.8	4.13
	3.6	3.3	7.6	17.7	12.0	0.68	1.16	21.6	15.3	19.4	1.36	14.8	109.0	4.19
	4.8	5.5	12.7	17.9	12.1	0.67	1.12	21.8	16.0	19.8	1.37	15.1	109.7	4.22
80	2.4	1.7	3.9	16.3	11.4	0.70	1.36	20.9	12.0	20.3	1.40	15.6	110.8	4.27
	3.6	3.2	7.4	16.8	11.6	0.69	1.28	21.2	13.1	20.9	1.42	16.1	112.1	4.33
	4.8	5.2	12.0	17.1	11.7	0.69	1.24	21.3	13.8	21.3	1.43	16.4	112.7	4.35
85	2.4	1.6	3.7	15.8	11.2	0.71	1.43	20.7	11.1	21.0	1.42	16.2	112.2	4.33
	3.6	3.1	7.2	16.4	11.4	0.70	1.35	21.0	12.2	21.6	1.44	16.7	113.4	4.39
	4.8	5.0	11.6	16.7	11.5	0.69	1.31	21.1	12.7	21.9	1.46	16.9	114.0	4.41
90	2.4	1.6	3.7	15.3	11.0	0.72	1.50	20.4	10.2	21.7	1.45	16.7	113.5	4.39
	3.6	3.0	6.9	15.9	11.2	0.71	1.42	20.7	11.2	22.2	1.47	17.2	114.6	4.44
	4.8	4.9	11.3	16.2	11.3	0.70	1.38	20.9	11.7	22.5	1.48	17.4	115.2	4.46
100	2.4	1.6	3.7	14.1	10.5	0.75	1.65	19.8	8.6	Operation Not Recommended				
	3.6	2.9	6.7	14.8	10.8	0.73	1.56	20.1	9.5					
	4.8	4.8	11.1	15.1	10.9	0.72	1.52	20.3	9.9					
110	2.4	1.6	3.7	12.8	10.0	0.78	1.81	19.0	7.1					
	3.6	2.9	6.7	13.6	10.3	0.76	1.72	19.4	7.9					
	4.8	4.8	11.1	13.9	10.5	0.75	1.68	19.6	8.3					

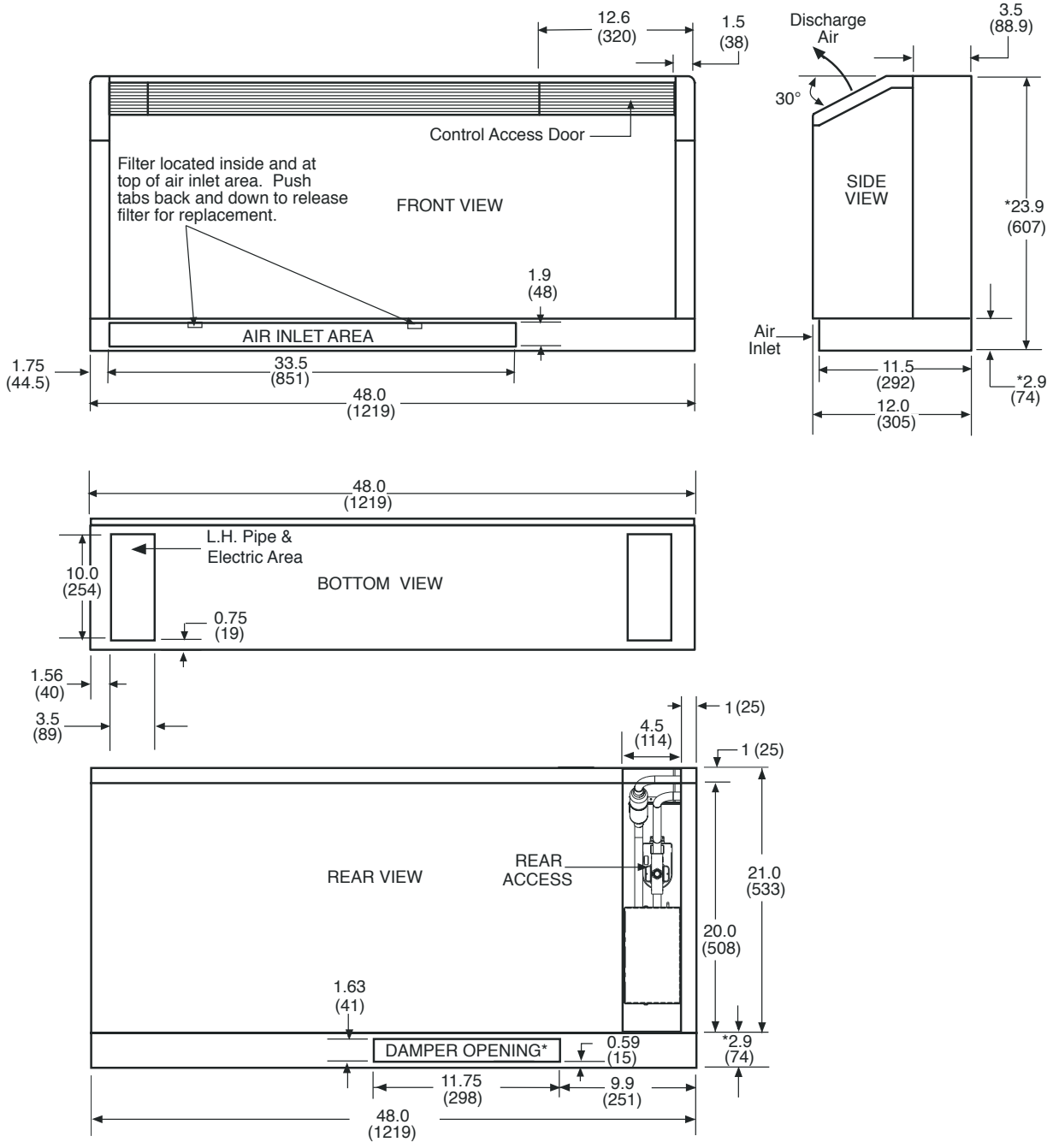
Interpolation is permissible; extrapolation is not.
All entering air conditions are 80°F DB and 67°F WB in cooling, and 70°F DB in heating. ARI/ISO certified conditions are 80.6°F DB and 66.2°F WB in cooling and 68°F DB in heating.
Table does not reflect fan or pump power corrections for ARI/ISO conditions.
All performance is based upon the lower voltage of dual voltage rated units.
Operation below 40°F EWT is based upon a 15% antifreeze solution.
Operation below 60°F EWT requires optional insulated water/refrigerant circuit (standard on residential models).
See performance correction tables for operating conditions other than those listed above.
See Performance Data Selection Notes for operation in shaded areas.

Physical Data

Model	07	09	12	15	19
Compressor (1 Each)	Rotary				
Factory Charge R22 (oz) [kg]	16 [0.454]	16 [0.454]	21 [0.595]	27 [0.765]	24 [0.680]
PSC Fan Motor & Blower (3 Speeds)					
Fan Motor (hp) [W]	1/20 [27]	1/15 [50]	1/15 [50]	1/6 [124]	1/6 [124]
Blower Wheel Size (dia x w) - (in) [mm]	5-1/4 x 6-1/4 [133 x 159]	5-1/4 x 6-1/4 [133 x 159]	5-1/4 x 6-1/4 [133 x 159]	5-1/4 x 6-1/4 [133 x 159]	5-1/4 x 6-1/4 [133 x 159]
Water Connection Size					
O.D. Sweat (in) [mm]	5/8 [15.9]	5/8 [15.9]	5/8 [15.9]	5/8 [15.9]	5/8 [15.9]
Optional IPT Fittings (in)	1/2	1/2	1/2	1/2	1/2
Optional EPT Fittings (in)	1/2	1/2	1/2	1/2	1/2
Condensate Connection Size					
I.D. Vinyl Hose (In) [mm]	5/8 [15.9]	5/8 [15.9]	5/8 [15.9]	5/8 [15.9]	5/8 [15.9]
Air Coil Size					
Dimensions (h x w) - (in) [mm]	8 x 26 [20.3 x 66.0]			10 x 26 [25.4 x 66.0]	
Filter Size					
Bottom Return (in) [cm]	1 - 8 x 29-1/2 x 3/8 [20.3 x 74.9 x 0.95]				
Front Return (In) [cm]	1 - 7 x 29-1/2 x 1/8 [17.8 x 74.9 x 0.32]				
Cabinet Size					
Bottom Return (Std. 3" Base) (W x H x D) - (In) [cm]	48 x 24 x 12 [121.9 x 61.0 x 30.5]				
Bottom Return (Std. 5" Base) (W x H x D) - (In) [cm]	48 x 26 x 12 [121.9 x 66.0 x 30.5]				
Bottom Return (No Subbase) (W x H x D) - (In) [cm]	48 x 21 x 12 [121.9 x 53.3 x 30.5]				
Unit Weight					
Weight - Operating, (lbs) [kg]	173 [78.5]	177 [80.3]	187 [84.5]	193 [87.5]	198 [89.8]
Weight - Packaged, (lbs) [kg]	181 [82.1]	185 [83.9]	195 [88.5]	201 [91.2]	206 [93.4]

Cabinet Dimensions - Bottom Return - Left Hand Piping

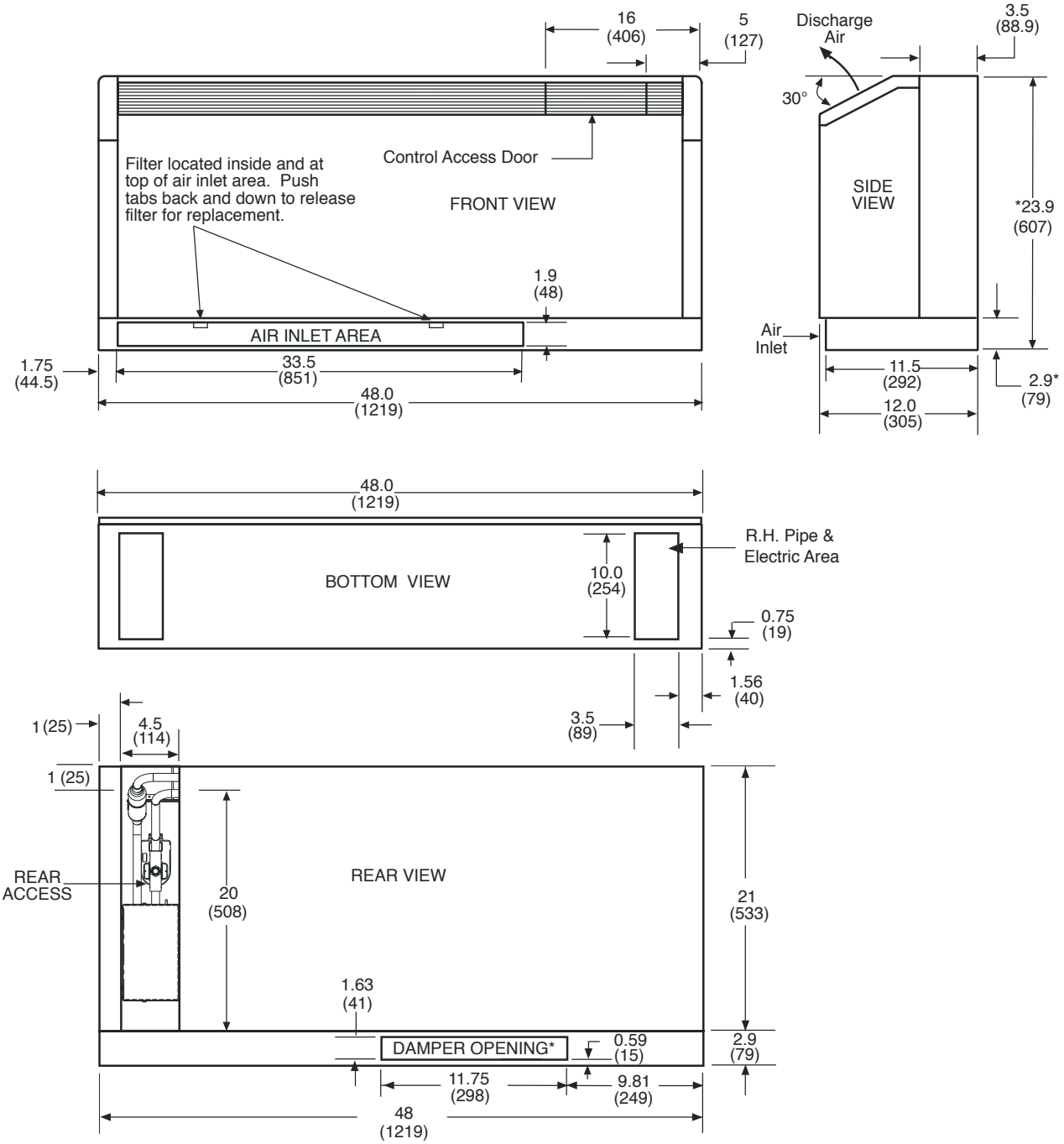
Left Hand Bottom Return



Notes:
All Dimensions are in inches (mm)
* Dimension with 3" (76.2 mm) subbase. Add 2" (50.8 mm) to dimension shown for 5"(127 mm) subbase.
Optional autoflow valve, motorized water valve and disconnect box are shown.

Cabinet Dimensions - Bottom Return - Right Hand Piping

Right Hand Bottom Return

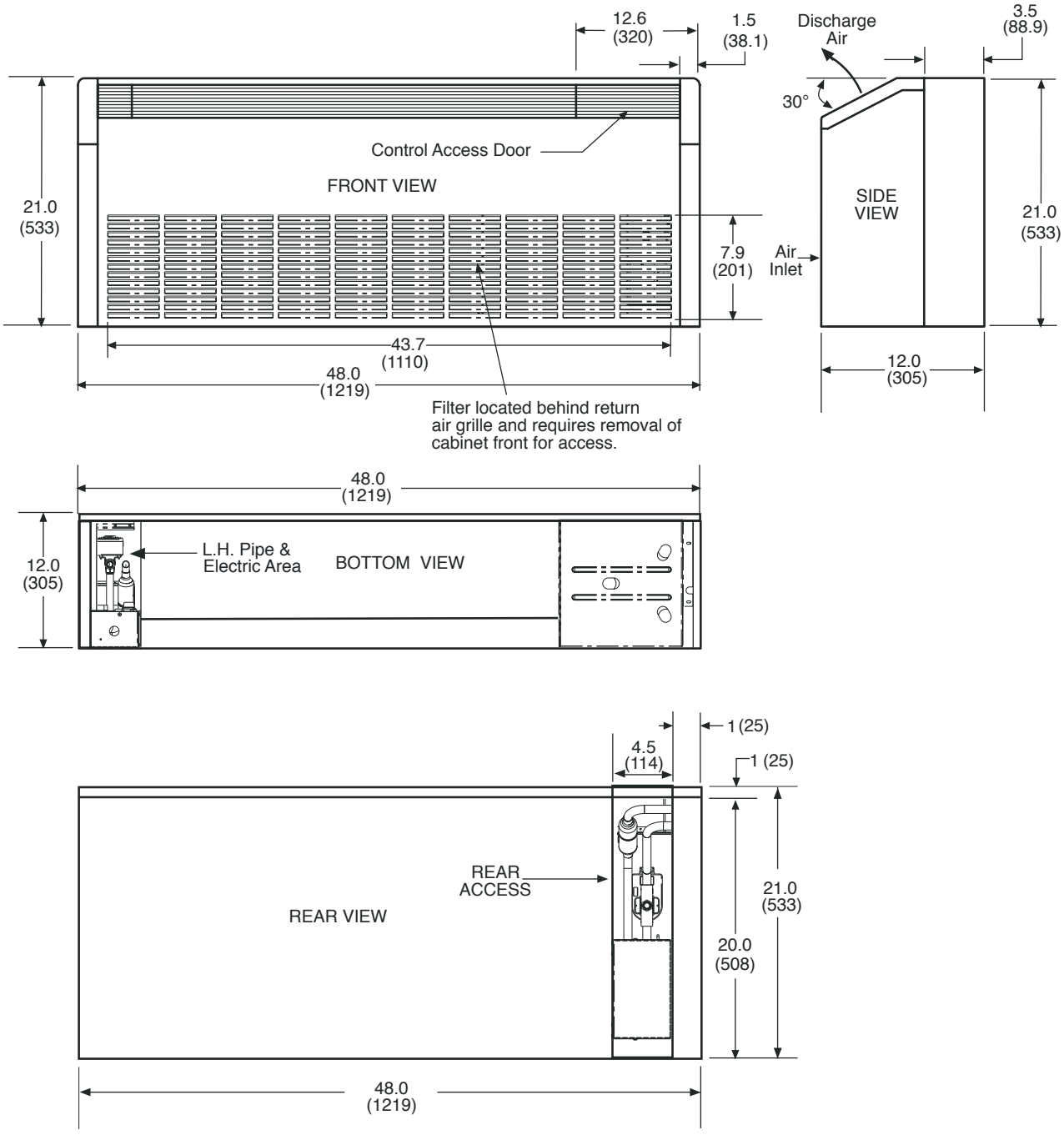


Notes:
All Dimensions are in inches (mm)
* Dimension with 3" (76.2mm) subbase. Add 2" (50.8mm) to dimensions shown for 5" (127mm) subbase.
Optional autoflow valve, motorized water valve and disconnect box are shown.

Rev.: 08/06/05D

Cabinet Dimensions - Front Return - Left Hand Piping

Left Hand Front Return

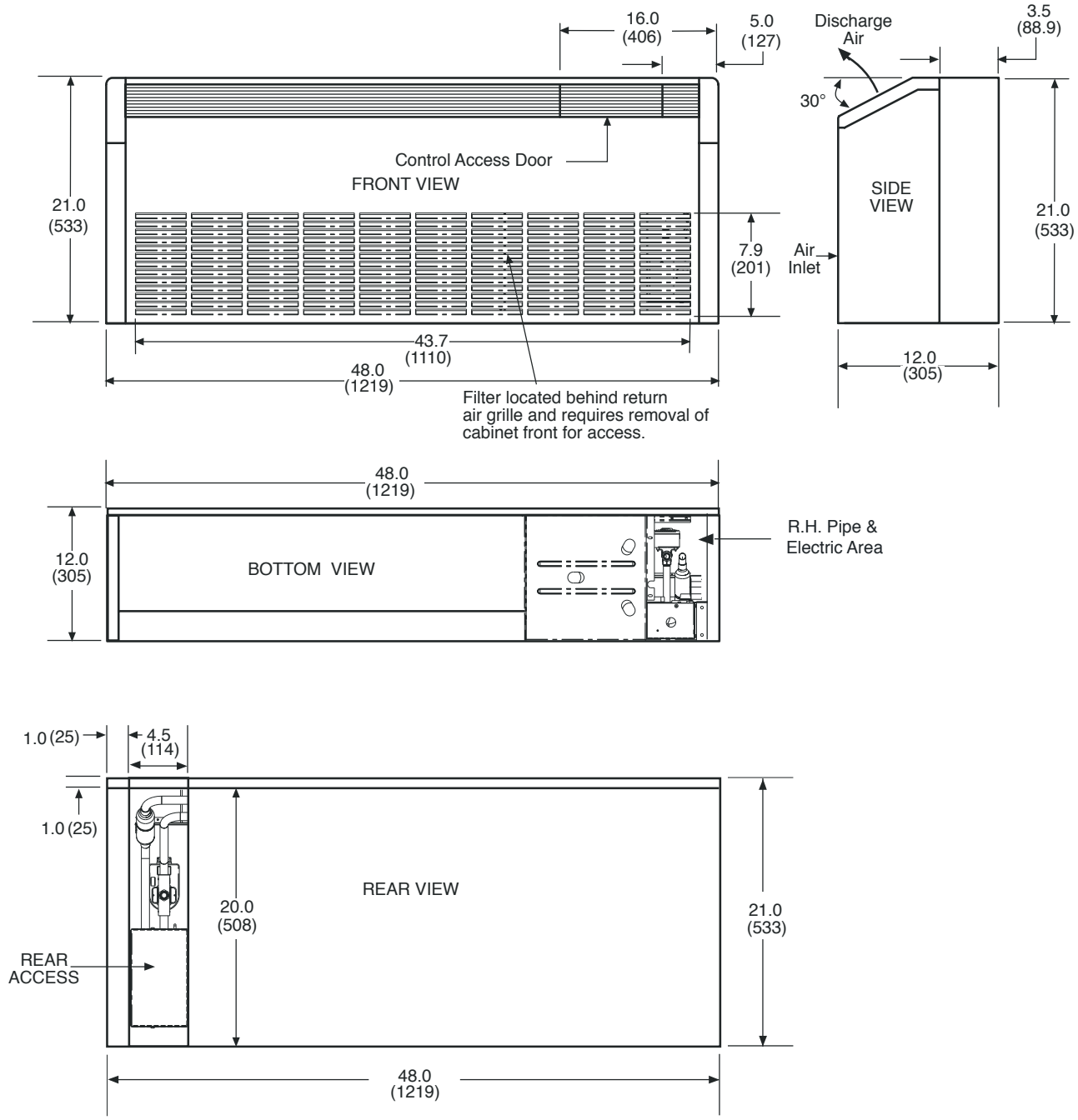


Notes:
All Dimensions are in inches (mm)
Optional autoflow valve, motorized water valve and disconnect box are shown.

Rev.: 07/14/06D

Cabinet Dimensions - Front Return - Right Hand Piping

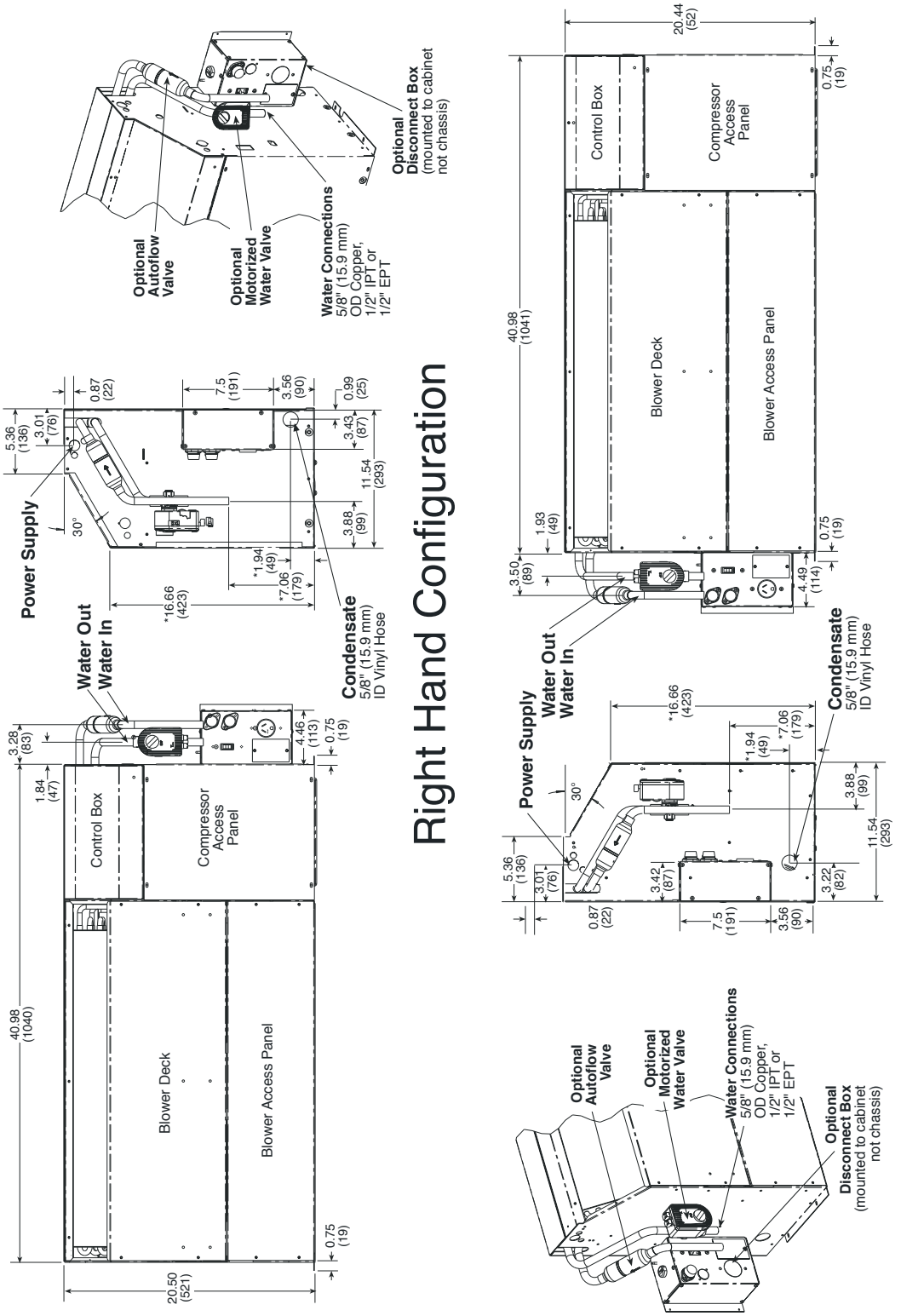
Right Hand Front Return



Notes:
All Dimensions are in inches (mm).
Optional autoflow valve, motorized water valve and disconnect box are shown.

Rev.: 07/14/06D

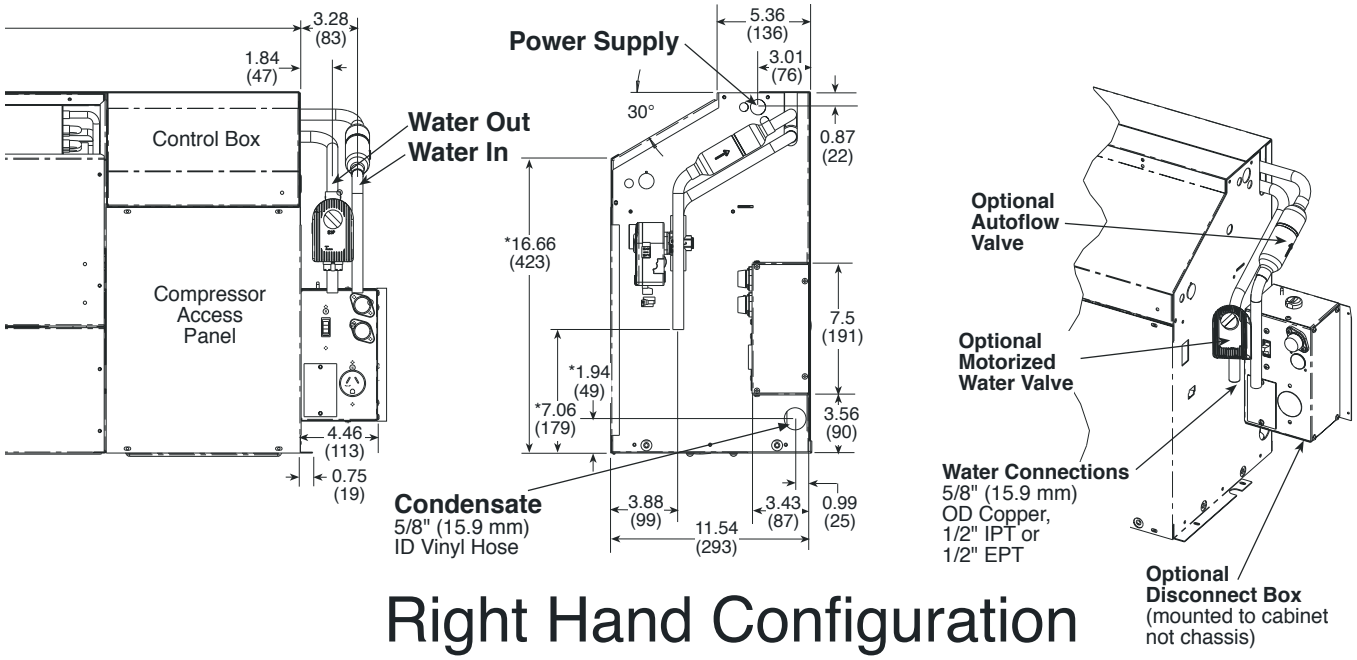
Chassis Dimensions



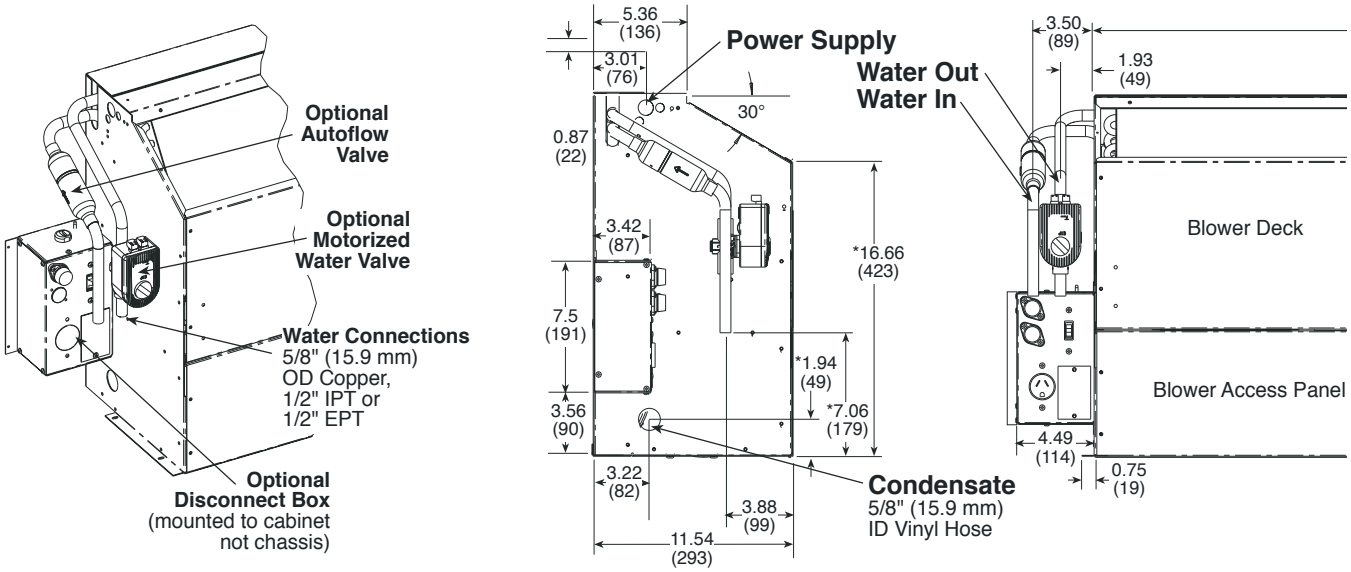
Rev.: 08/12/03 B

Notes:
All Dimensions are in inches (mm)
* For installed dimension, add to dimension shown 2.9" [74mm] with 3" subbase and 4.9" [124mm] for 5" subbase.
Optional autoflow valve, motorized water valve and disconnect box are shown.
Water connection in same location regardless of connection type.

Piping Detail



Right Hand Configuration



Left Hand Configuration

Notes:
All Dimensions are in inches (mm)
* For installed dimension, add to dimension shown 2.9" [74mm] with 3" subbase and 4.9" [124mm] for 5" subbase.
Optional autoflow valve, motorized water valve and disconnect box are shown.
Water connection in same location regardless of connection type.

Blower Performance Data

Model	Rated CFM	SCFM	
		Low Speed	High Speed
CCE07	240	190	240
CCE09	300	240	300
CCE12	350	300	350
CCE15	400	340	400
CCE19	460	400	460

Fan speed is user selectable
All airflow is rated at lowest Voltage if unit is dual Voltage rated, i.e. 208V for 208-230V units
All units ARI/ISO/ASHRAE 13256-1 rated on high fan speed
All units are designed and rated for zero external static pressure (non-ducted) application

Unit Electrical Data

Model	Voltage Code	Voltage	Min/Max Voltage	Compressor			Fan Motor FLA	Total Unit FLA	Min Circuit Amps	Max Fuse/ HACR
				QTY	RLA	LRA				
CCE07	A	115/60/1	104-126	1	7.1	46.5	0.50	7.6	9.3	15
CCE07	G	208-230/60/1	197-254	1	3.7	19.0	0.33	4.0	5.0	15
CCE07	E	265/60/1	239-292	1	2.8	16.0	0.35	3.1	3.8	15
CCE09	A	115/60/1	104-126	1	9.0	46.5	1.30	10.3	12.5	20
CCE09	G	208-230/60/1	197-254	1	4.7	23.0	0.50	5.2	6.3	15
CCE09	E	265/60/1	239-292	1	3.8	16.0	0.50	4.3	5.3	15
CCE12	A	115/60/1	104-126	1	10.6	63.0	1.30	11.9	14.6	25
CCE12	G	208-230/60/1	197-254	1	6.1	29.0	0.50	6.6	8.1	15
CCE12	E	265/60/1	239-292	1	4.8	21.6	0.50	5.3	6.5	15
CCE15	G	208-230/60/1	197-254	1	7.0	33.2	1.10	8.1	9.8	15
CCE15	E	265/60/1	239-292	1	5.4	29.0	1.00	6.4	7.8	15
CCE19	G	208-230/60/1	197-254	1	7.7	38.0	1.10	8.8	10.7	15
CCE19	E	265/60/1	239-292	1	5.8	29.0	1.00	6.8	8.2	15

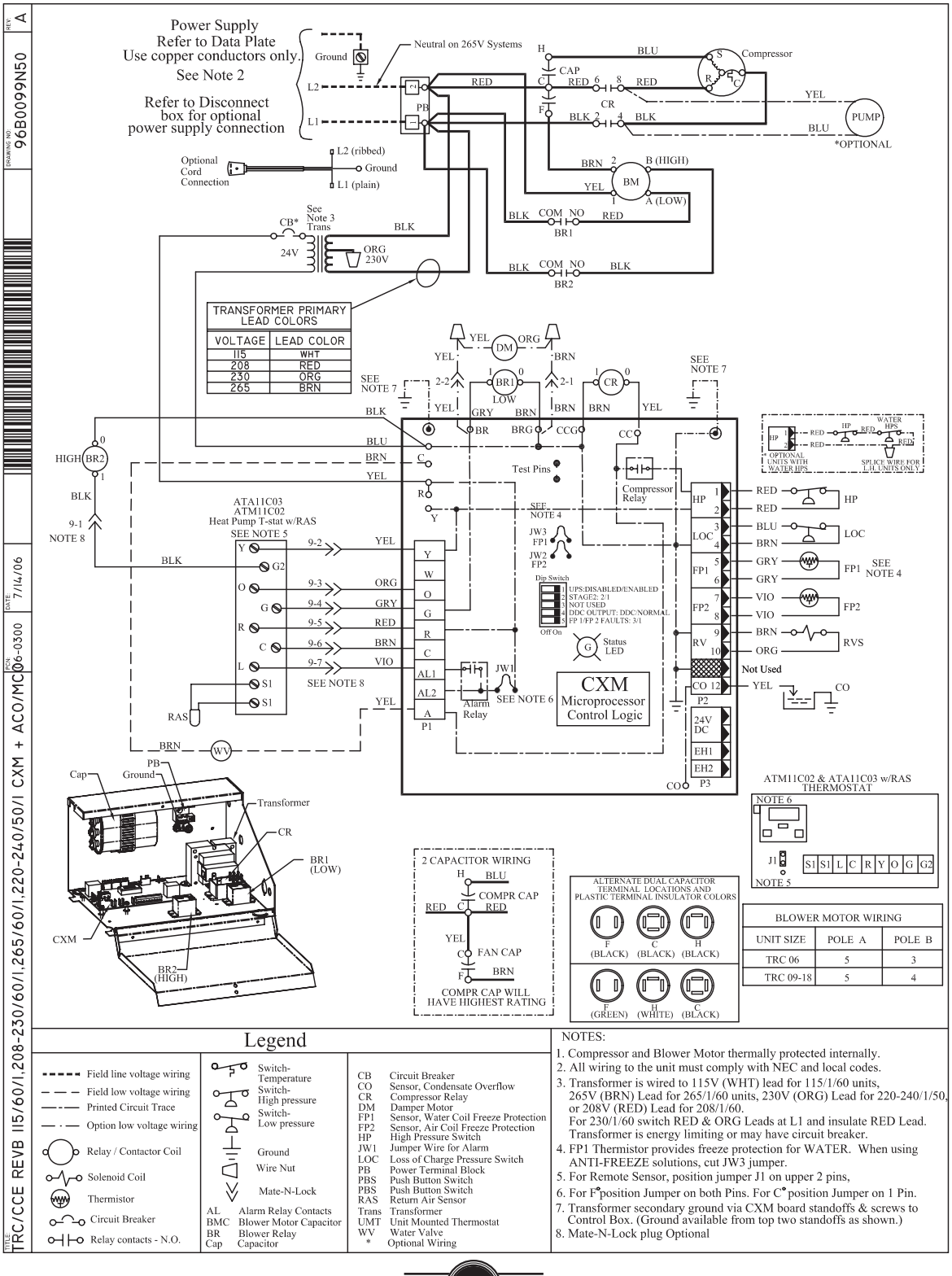
Wiring Diagram Matrix

Only CXM and DXM diagrams, with a representative diagram of LON and MPC Options are presented in this submittal. Other diagrams can be located online at www.climatemaster.com using the part numbers presented below.

Model	Refrigerant	Wiring Diagram Part Number	Electrical	Control		Agency
CCE07 - CCE19	R22	96B0099N50	115/60/1, 208-230/60/1, 265/60/1	CXM	MCO/ACO	-
	R22	96B0099N03			REM	-
	R22	96B0099N04			LON	-
	R22	96B0099N05			MPC	-
	R407C	96B0099N07	220-240/50/1		MCO	CE
	R407C	96B0099N08			ACO	CE
	R407C	96B0099N09			REM	CE
	R407C	96B0099N10			LON	CE
	R407C	96B0099N11			MPC	CE
	R22	96B0100N50	115/60/1, 208-230/60/1, 265/60/1	DXM	MCO/ACO	-
	R22	96B0100N03			REM	-
	R22	96B0100N04			LON	-
	R22	96B0100N05			MPC	-
	R407C	96B0100N07	220-240/50/1		MCO	CE
	R407C	96B0100N08			ACO	CE
	R407C	96B0100N09			REM	CE
	R407C	96B0100N10			LON	CE
	R407C	96B0100N11			MPC	CE

All wiring diagrams available at www.climatemaster.com. R407C submittals will only contain CE Mark wiring diagrams

Typical Wiring Diagram - CXM Controls - Auto/Manual Changeover



BLOWER MOTOR WIRING

UNIT SIZE	POLE A	POLE B
TRC 06	5	3
TRC 09-18	5	4

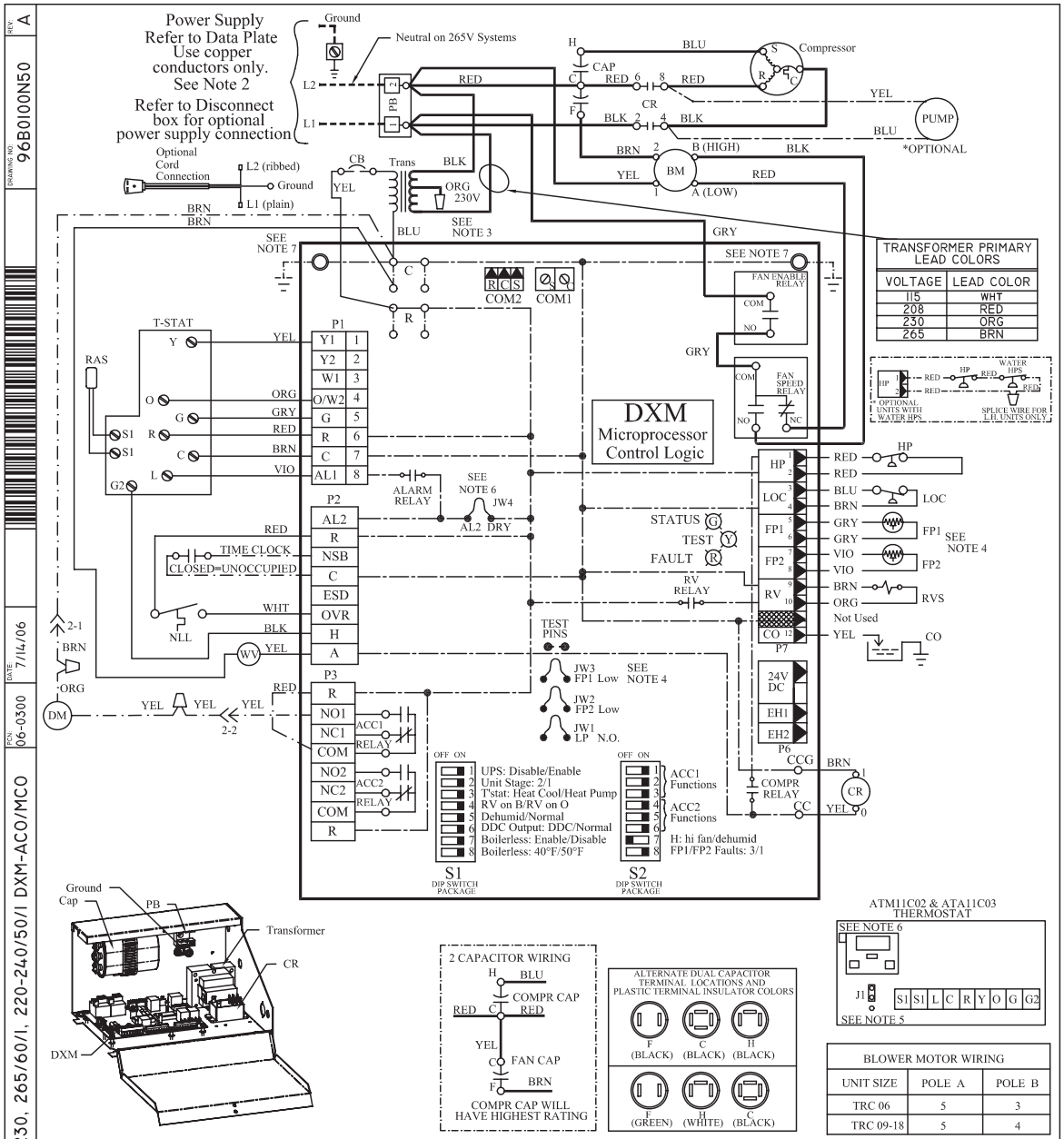
Legend

- Field line voltage wiring
- Field low voltage wiring
- Printed Circuit Trace
- Option low voltage wiring
- Relay / Contactor Coil
- Solenoid Coil
- Thermistor
- Circuit Breaker
- Relay contacts - N.O.
- Switch-Temperature
- Switch-High pressure
- Switch-Low pressure
- Ground
- Wire Nut
- Mate-N-Lock

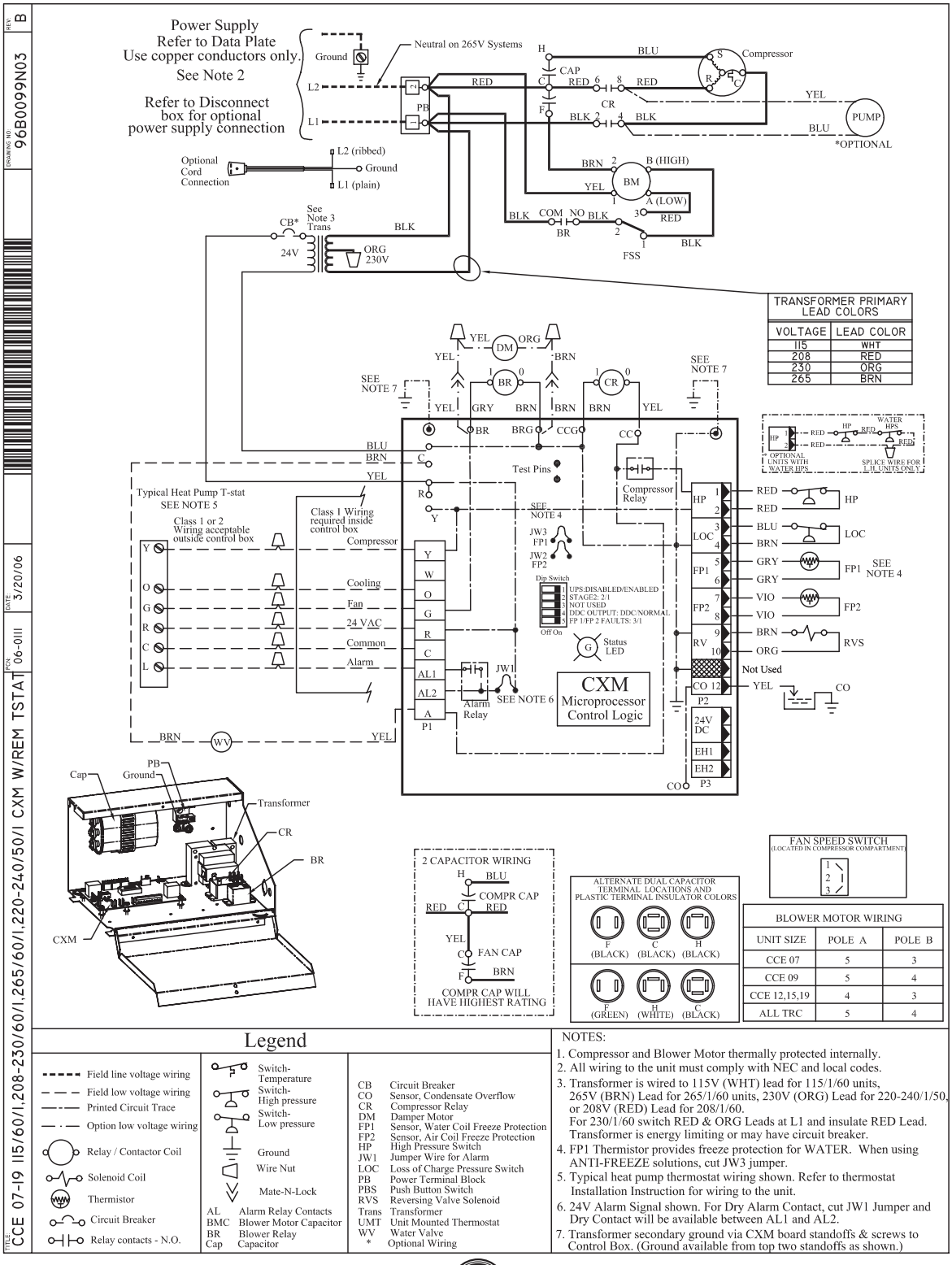
AL Alarm Relay Contacts
BMC Blower Motor Capacitor
BR Blower Relay
Cap Capacitor
CB Circuit Breaker
CO Sensor, Condensate Overflow
CR Compressor Relay
DM Damper Motor
FP1 Sensor, Water Coil Freeze Protection
FP2 Sensor, Air Coil Freeze Protection
HP High Pressure Switch
JW1 Jumper Wire for Alarm
LOC Loss of Charge Pressure Switch
PB Power Terminal Block
PBS Push Button Switch
PBS Push Button Switch
RAS Return Air Sensor
Trans Transformer
UMT Unit Mounted Thermostat
WV Water Valve
* Optional Wiring

NOTES:
1. Compressor and Blower Motor thermally protected internally.
2. All wiring to the unit must comply with NEC and local codes.
3. Transformer is wired to 115V (WHT) lead for 115/1/60 units, 265V (BRN) Lead for 265/1/60 units, 230V (ORG) Lead for 220-240/1/50, or 208V (RED) Lead for 208/1/60. For 230/1/60 switch RED & ORG Leads at L1 and insulate RED Lead. Transformer is energy limiting or may have circuit breaker.
4. FP1 Thermistor provides freeze protection for WATER. When using ANTI-FREEZE solutions, cut JW3 jumper.
5. For Remote Sensor, position jumper J1 on upper 2 pins,
6. For F°position Jumper on both Pins. For C° position Jumper on 1 Pin.
7. Transformer secondary ground via CXM board standoffs & screws to Control Box. (Ground available from top two standoffs as shown.)
8. Mate-N-Lock plug Optional

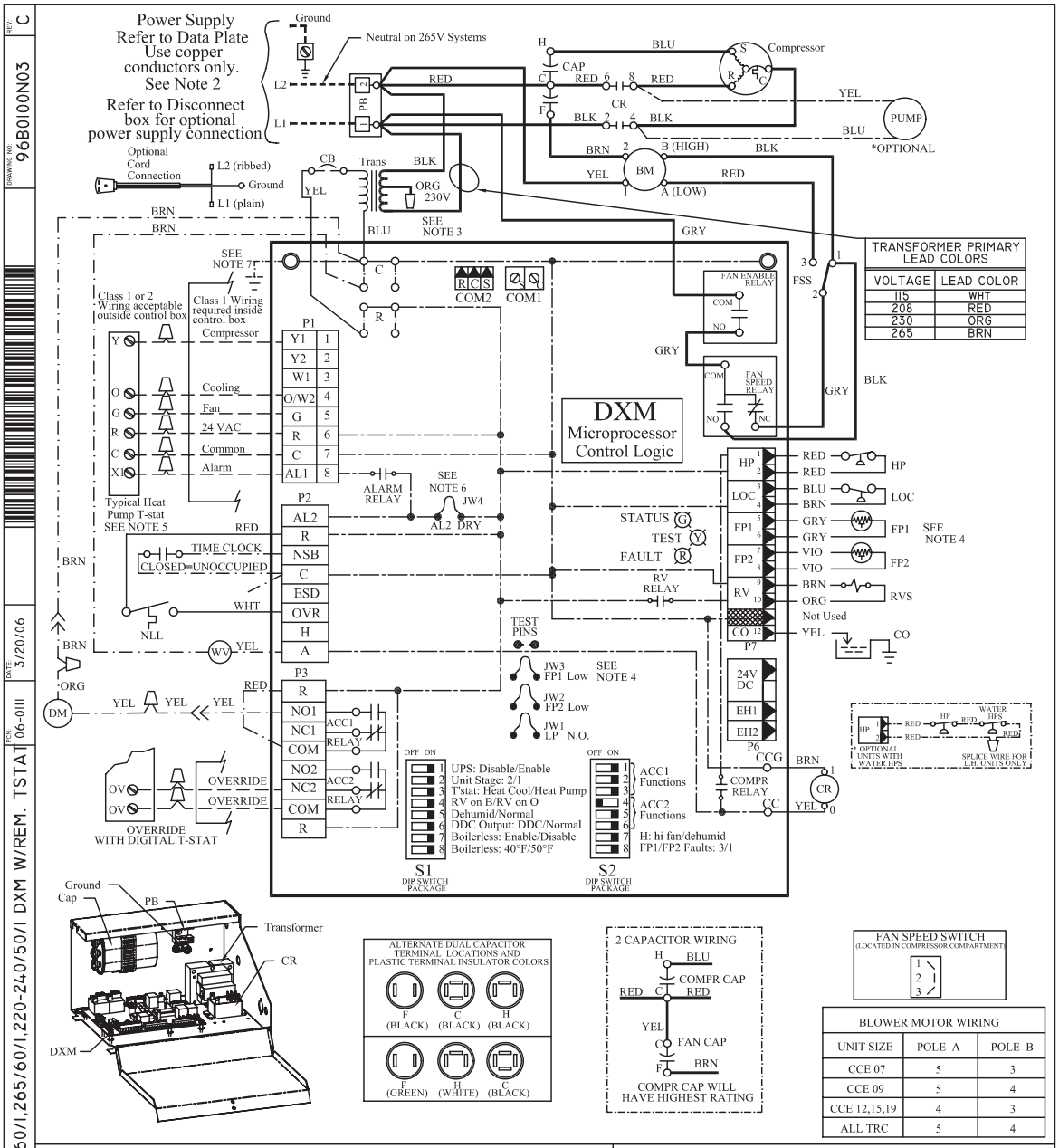
Typical Wiring Diagram - DXM Controls - Auto/Manual Changeover



Typical Wiring Diagram - CXM Controls - Remote Mount Thermostat



Typical Wiring Diagram - DXM Controls - Remote Mount Thermostat



Legend

- Field line voltage wiring
- Field low voltage wiring
- Printed Circuit Trace
- Option low voltage wiring
- Relay / Contactor Coil
- Solenoid Coil
- Thermistor
- Circuit Breaker
- Relay contacts - N.O.
- Switch-Temperature
- Switch-High pressure
- Switch-Low pressure
- Ground
- Wire Nut
- Mate-N-Lock

AL	Alarm Relay Contacts
BMC	Blower Motor Capacitor
BR	Blower Relay
Cap	Capacitor
CB	Circuit Breaker
CO	Sensor, Condensate Overflow
CR	Compressor Relay
DM	Damper Motor
FP1	Sensor, Water Coil Freeze Protection
FP2	Sensor, Air Coil Freeze Protection
HP	High Pressure Switch
JW1	Jumper Wire for Alarm
LOC	Loss of Charge Pressure Switch
PB	Power Terminal Block
PBS	Push Button Switch
RVS	Reversing Valve Solenoid
Trans	Transformer
UMT	Unit Mounted Thermostat
WV	Water Valve
*	Optional Wiring

NOTES:
1. Compressor and Blower Motor thermally protected internally.
2. All wiring to the unit must comply with NEC and local codes.
3. Transformer is wired to 115V (WHT) lead for 115/1/60 units, 265V (BRN) Lead for 265/1/60 units, 230V (ORG) Lead for 220-240/1/50, or 208V (RED) Lead for 208/1/60. For 230/1/60 switch RED & ORG Leads at L1 and insulate RED Lead. Transformer is energy limiting or may have circuit breaker.
4. FP1 Thermistor provides freeze protection for WATER. When using ANTI-FREEZE solutions, cut JW3 jumper.
5. Typical unit mounted thermostat wiring shown.
6. 24V Alarm Signal shown. For Dry Alarm Contact, cut AL2DRY (JW4) jumper and Dry Contact will be available between AL1 and AL2.
7. Transformer secondary ground via DXM board standoffs & screws to Control Box. (Ground available from top two standoffs as shown.)

TITLE: CCE 07-19 115/60/1,208-230/60/1,265/60/1,220-240/50/1 DXM W/REM. TSTAT
FCN: 06-0111
DATE: 3/20/06
DRAWING NO: 96B0100N03
REV: C

CXM AND DXM SERIES CONTROLLERS

The CXM and DXM Series Controllers are designed to enhance Water-Source Heat Pump unit performance with the ability to coordinate complete systems. CXM Series controllers offer complete stand-alone unit control. DXM Series controls add advanced unit operation and system control features. Either control can allow you to connect your heat pump system to a LonWorks or MPC (Multiple ProtoCol -- BACNET, N2, Modbus) DDC control system which includes lighting and other energy saving controls. The CXM and DXM Series are the most advanced controllers made by any heat pump manufacturer today.

STANDARD CXM CONTROL FUNCTIONS

The CXM controller package offers all of the basic features available with electromechanical systems, plus 15 additional standard functions. This group of added features includes condensate overflow, anti-short cycle, random start, aircoil low temperature limit (except GC Series and water-to-water units), under/over voltage protection, and intelligent reset, designed to automatically restart a unit within a specific period of time following a fault, given the fault has been adequately corrected. Also included are LED fault and status indication to aid in diagnostics and troubleshooting. These added features, and the many others provided, are specifically designed to improve the life expectancy, reliability, and serviceability of Water-Source Heat Pumps. The CXM is compatible with most heat pump thermostats.

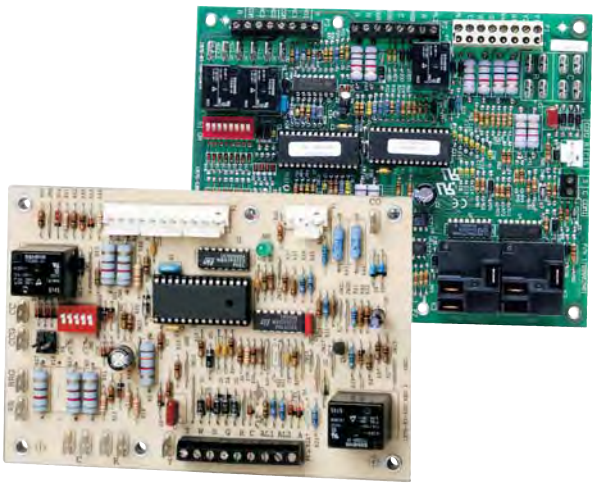
ADDITIONAL DXM CONTROL FUNCTIONS

The DXM controller adds system functions such as emergency shutdown and night setback with override to the stand-alone capability provided by the CXM. Fully configured, the DXM offers 17 additional features over the CXM, including advanced system control capabilities such as intelligent fan speed, reheat control, two-stage compressor, and boilerless electronic heat. The DXM is compatible with almost any type of thermostat, whether heat pump or heat/cool.

UNIT/SYSTEM OPERATING EFFICIENCY

Emergency shutdown, night setback, pump restart and advanced unit functional control all work to enhance the performance of your system. These features are standard on DXM Series Electronic Controllers.

DXM Control Board



CXM Control Board

COMFORT CONTROL

User selectable or intelligent control of fan speed, dehumidification modes, outdoor air damper control, and a complete offering of accurate electronic thermostats add up to increased comfort through superior unit control.

DIAGNOSTICS

ClimateMaster controls provide on-board diagnostics which highlight eight (seven for GC Series) different reasons for unit malfunction, speeding up service time, eliminating unnecessary service charges, and minimizing down time. The exclusive UPS (Unit Performance Sentinel) provides an early warning of inefficient operating conditions before unit shutdown actually occurs. Fault types are not only indicated at the control, but are kept in memory after a user reset for future service use. And another ClimateMaster exclusive, fault types can be displayed on a conventional thermostat if equipped with a fault LED, or can be remotely communicated with the DDC option.

OPEN-PROTOCOL DDC CAPABILITY

The CXM and DXM Series can be upgraded with the addition of a separate LonMark or MPC (Multiple ProtoCol -- BACNET, N2, Modbus) DDC module, either as a factory option, or field installed at a later date.

LonWorks is an open protocol DDC network, which can be integrated with most third-party building automation systems. In addition, the MPC controller offers the other popular building management system protocols (BACNET, N2, Modbus). ClimateMaster's DDC options provide the flexibility to upgrade your control system as your demands require, and gives you the freedom to interface with most any DDC system vendor. Leaving air and water temperature sensors are factory mounted, for remote monitoring, and a wide range of wall sensors are available. The wall sensors utilize a simple interface and can provide digital display and the unit control capability found in conventional thermostats.

ASW Wall Sensors for Lon or MPC DDC Systems

Basic Features	CXM	CXM-Lon	CXM-MPC	DXM	DXM-Lon	DXM-MPC
High and Low Refrigerant Pressure Protection	S	S	S	S	S	S
Water Coil Low Temperature Limit	S	S	S	S	S	S
True 24VA Thermostat Signals	S	S	S	S	S	S
Thermostat Inputs Compatible with Triacs	S	S	S	S	S	S
Condensate Overflow Sensor	S	S	S	S	S	S
Anti-Short-Cyle Time Delay	S	S	S	S	S	S
Random Start	S	S	S	S	S	S
Alarm (selectable dry contact or 24VA)	S	S	S	S	S	S
Water Valve Relay	S	S	S	S	S	S
Water Valve Relay with Compressor Delay	N/A	N/A	N/A	S	S	S
Emergency Shutdown	N/A	DDC	DDC	S	DDC	DDC
Night Setback with Override	N/A	DDC	DDC	S	DDC	DDC
Outdoor Air Damper Control	N/A	N/A	N/A	S	S	S
Advanced Features						
Intelligent Reset	S	S	S	S	S	S
High and Low Voltage Protection	S	S	S	S	S	S
Air Coil Low Temperature Limit	S	S	S	S	S	S
Freeze Setpoint Field Select (water, antifreeze)	S	S	S	S	S	S
Electric Heat Control Outputs	S	S	S	S	S	S
Boilerless Electric Heat Control	N/A	N/A	N/A	S	S	S
Intelligent Reversing Valve Operation	N/A	DDC	DDC	S	S	S
High/Low Fan Speed Outputs	N/A	N/A	N/A	S	S	S
Intelligent Fan Speed Control	N/A	N/A	N/A	S	S	S
Thermostat Type Select (Y,O or Y,W)	N/A	N/A	N/A	S	N/A	N/A
Reversing Valve Signal Select (O or B)	N/A	N/A	N/A	S	N/A	N/A
Dehumidistat Input	N/A	N/A	N/A	S	S	S
Reheat Dehumidification Control*	N/A	N/A	N/A	O	O	O
Multiple Units on One Thermostat/Wall Sensor	N/A	DDC	DDC	S	DDC	DDC
Service and Reliability Features						
Service Test Mode	S	S	S	S	S	S
LED Fault and Status Lights	S	S	S	S	S	S
Fault Memory after Reset	S	S	S	S	S	S
Unit Performance Sentinel	S	S	S	S	S	S
Harness-Type Factory Wiring Connections	S	S	S	S	S	S
Fully Noise-Tested Design	S	S	S	S	S	S
CE Approval	S	S	S	S	S	S
Removable Low Voltage Connector	N/A	N/A	N/A	S	S	S
DDC / Energy Management Features						
Echelon LonMark Compliant	N/A	S	N/A	N/A	S	N/A
BACNET Compliant	N/A	N/A	S	N/A	N/A	S
Johnson N2 Compliant	N/A	N/A	S	N/A	N/A	S
Modbus Compliant	N/A	N/A	S	N/A	N/A	S
Leaving Air and Water Temperature Sensor	N/A	S	S	N/A	S	S
Digital Wall Sensor	N/A	O	O	N/A	O	O

S = Standard O = Optional DDC = Feature can be provided by DDC System CXM-Lon = CXM with LonMark Module
DXM-Lon = DXM with LonMark Module CXM-MPC = CXM with MPC Module DXM-MPC = DXM with MPC Module
* = Check with your Factory Representative for model availability MPC = Multiple ProtoCol (BACNET, N2, Modbus)

CCE Console Series 60Hz
Engineering Guide Specs. Rev.: 07/07/06

General:
Furnish and install ClimateMaster "Console" Water Source Heat Pumps, as indicated on the plans. Equipment shall be completely assembled, piped and internally wired. Capacities and characteristics as listed in the schedule and the specifications that follow.

Console Water Source Heat Pumps:
Units shall be supplied completely factory built for an entering water temperature range from 20° to 110°F (-6.7° to 43.3°C) as standard. Equivalent units from other manufacturers can be proposed provided approval to bid is given 10 days prior to bid closing. All equipment listed in this section must be rated and certified in accordance with American Refrigeration Institute / International Standards Organization (ARI / ISO) and Canadian Standards Association (CSA-US). The units shall have ARI / ISO 13256-1 and CSA-US labels.

Basic Construction:
Console Units shall have one of the following air flow and piping arrangements: Front Inlet/Right-hand Piping; Front Inlet/ Left-hand piping; Bottom Inlet/Right-hand piping; or Bottom Inlet/Left-hand piping as shown on the plans. ***If units with these arrangements are NOT used, the contractor is responsible for any extra costs incurred by other trades.*** If other arrangements make servicing difficult, the contractor must provide access panels and clear routes to ease service. Architect/ Engineer must approve any changes in layout.

The cabinet, wall mounting hardware and subbase shall be constructed of heavy gauge galvanized steel with a baked polyester powder coat paint finish. Corrosion protection system shall meet the stringent 1000 hour salt spray test per ASTM B117. ***Unit corrosion protection must meet these stringent requirements or unit(s) will not be accepted.*** Color will be Polar Ice. Both sides of the steel shall be painted for added protection. Additionally, the wall mounting hardware shall have welded corner bracing. The easily removable cabinet enclosure allows for easy service to the chassis, piping compartment and control compartment.

All interior surfaces shall be lined with 1/4 inch (6.4mm) thick, dual density, 2 lb/ft3 (32 kg/m3) acoustic flexible blanket type glass fiber insulation with a non-woven, anti-microbial treated mat face. Insulation placement shall be designed in a manner that will eliminate any exposed edges to prevent the introduction of glass fibers into the air stream.

Standard insulation must meet NFPA Fire Hazard Classification requirements 25/50 per ASTM E84, UL 723, CAN/ULC S102-M88 and NFPA 90A requirements; air erosion and mold growth limits of UL-181; stringent fungal resistance test per ASTM-C1071 and ASTM G21; and shall meet zero level bacteria growth per ASTM G22. ***Unit insulation must meet these stringent requirements or unit(s) will not be accepted.***

The cabinet shall have a 30° sloped top with aluminum rigid bar type discharge grille. Aluminum discharge grille shall be anodized charcoal grey in color including hinged control door. Cabinet shall have rounded edges (0.325 inch / 8.255 mm minimum radius) on all exposed corners for safety and esthetic purposes. Units not having sloped top and rounded corners (0.325 inch / 8.255 mm minimum) on front, side, top slope, and top corners shall not be accepted.

Return Air Filter shall be 3/8" (9.5mm) permanent cleanable media type or 1/8" (3.2mm) for front return type units.

Option: The unit shall be provided with a keyed lock on the control access door.

Option: The unit shall be provided with a motorized outside air damper and damper assembly, factory mounted and wired.

Option: The unit shall be provided with a 5 inch (127mm) high subbase (3 inch / 76.2mm subbase is standard).

Option: The unit shall be provided without a subbase (3 inch / 76.2mm high subbase is standard).

Option: The unit shall include a front return air grille integrally stamped into Cabinet (no subbase allowed).

Option: The unit shall be supplied with extended range Insulation option, which adds closed cell insulation to internal water lines, and provides insulation on suction side refrigeration tubing including refrigerant to water heat exchanger.

Fan and Motor Assembly:
Fan and motor assembly shall be assembled on a slide out fan deck with quick electrical disconnecting means to provide and facilitate easy field servicing. The fan motor shall be multi-speed, permanently lubricated, PSC type, with internal thermal overload protection. Units supplied without permanently lubricated motors must provide external oilers for easy service. The fan motor shall include a torsionally flexible motor mounting system or saddle mount system with resilient rings to inhibit vibration induced high noise levels associated with "hard wire belly band" motor mounting. The airflow rating of the unit shall be based on a wet coil and a clean filter in place. ***Ratings based on a dry coil and / or no filter shall NOT be acceptable.***

Refrigerant Circuit:
Units shall have a sealed refrigerant circuit including a high efficiency rotary compressor designed for heat pump operation, a thermostatic expansion valve for refrigerant metering, an enhanced corrugated aluminum lanced fin and rifled copper tube refrigerant to air heat exchanger, reversing valve, coaxial (tube in tube) refrigerant to water heat exchanger, and safety controls including a high pressure switch, low pressure switch (loss of charge), water coil low temperature sensor, and air coil low temperature sensor. Access fittings shall be factory installed on high and low pressure refrigerant lines to facilitate field service. Activation of any safety device shall prevent compressor operation via a microprocessor lockout circuit. The lockout circuit shall be reset at the thermostat or at the contractor supplied disconnect switch. ***Units that cannot be reset at the thermostat shall not be acceptable.***

Hermetic compressors shall be internally sprung. The compressor shall have a dual level vibration isolation system. The compressor will be mounted on computer selected vibration isolation grommets to a large heavy gauge compressor mounting tray plate, which is then isolated from the cabinet base with rubber grommets for maximized vibration attenuation. Compressor shall have thermal overload protection. Compressor shall be located in an insulated compartment away from air stream to minimize sound transmission. Refrigerant to air heat exchangers shall utilize enhanced corrugated lanced aluminum fins and rifled copper tube construction rated to withstand 450 PSIG (3101 kPa) refrigerant working pressure. Refrigerant to water heat exchangers shall be of copper inner water tube and steel refrigerant outer tube design, rated to withstand 450 PSIG (3101 kPa) working refrigerant pressure and 450 PSIG (3101 kPa) working water pressure.

Refrigerant metering shall be accomplished by thermostatic expansion valve only. Expansion valves shall be dual port balanced types with external equalizer for optimum refrigerant metering. Units shall be designed and tested for operating ranges of entering water temperatures from 20° to 110°F (-6.7° to 43.3°C). Reversing valve shall be four-way solenoid activated refrigerant valve, which shall default to heating mode should the solenoid fail to function. If the reversing valve solenoid defaults to cooling mode, an additional low temperature thermostat must be provided to prevent over-cooling an already cold room.

Option: The unit will be supplied with cupro nickel coaxial water to refrigerant heat exchanger.

Option: The unit will be supplied with internally factory mounted two-way water valve for variable speed pumping requirements. A factory-mounted or field-installed high pressure switch shall be installed in the water piping to disable compressor operation in the event water pressures build due to water freezing in the piping system.

Option: The unit will be supplied with internally factory mounted automatic water flow regulators.

Option: The unit will be supplied with internally mounted secondary pump for primary/secondary applications, specifically one-pipe systems.

Option: The unit shall be supplied with extended range Insulation option, which adds closed cell insulation to internal water lines, and provides insulation on suction side refrigeration tubing including refrigerant to water heat exchanger.

Option: The refrigerant to air heat exchanger shall be "electro-coated" with a low cure cathodic epoxy material a minimum of 0.4 mils thick (0.4 – 1.5 mils range) on all surfaces. The black colored coating shall provide a minimum of 1,000 hours salt spray protection per ASTM B117-97 on all galvanized end plates and copper tubing, and a minimum of 2,000 hours of salt spray on all aluminum fins. The material shall be formulated without the inclusion of any heavy metals and shall exhibit a pencil hardness of 2H (ASTM D3363-92A), crosshatch adhesion of 4B-5B (ASTM D3359-95), and impact resistance of 160 in/lbs direct (ASTM D2794-93).

Piping:
Water piping shall terminate in the same location regardless of the connection and valve options.

Option: Threaded EPT copper fittings (sweat connections are standard).

Option: Threaded IPT copper fittings (sweat connections are standard).

Drain Pan:
The drain pan shall be constructed of galvanized steel and have a powder coat paint application to further inhibit corrosion. This corrosion protection system shall meet the stringent 1000 hour salt spray test per ASTM B117. If plastic type material is used, it must be HDPE (High Density Polyethylene) to avoid thermal cycling shock stress failure over the lifetime of the unit. Stainless Steel materials are also acceptable. Drain pan shall be fully insulated. Drain outlet shall be located at pan as to allow complete and unobstructed drainage of condensate. The unit as standard will be supplied with solid-state electronic condensate overflow protection. ***Mechanical float switches will NOT be accepted.***

Electrical:
Unit controls shall be located under the hinged control door in the sloped top grille. Operating controls shall consist of slide switches to select "OFF", "HEAT," "COOL," "AUTO" (when equipped with auto change-over option – "AUTO" is not available for standard manual change-over controls), Fan "AUTO" (fan cycles with compressor), Fan "ON" (continuous fan), Fan "LO" (low speed fan), and Fan "HI" (high speed fan). Temperature adjustment shall be accomplished via two push buttons, one labeled with an arrow up, and the other labeled with an arrow down. Controls shall include an LCD display for display of temperature and set point. ***Units without an LCD display shall not be accepted.***

A control box shall be located above the unit compressor compartment and shall contain operating controls as outlined in the paragraph above, 24VAC transformer, double-pole compressor relay, and solid-state controller for complete unit operation. Reversing valve and fan motor wiring shall be routed through this electronic controller. Units shall be name-plated for use with time delay fuses or HACR circuit breakers. A unit-mounted digital thermostat with a remote bulb measuring return air temperature shall control the compressor operation for heating and cooling. Control shall be equipped with a fan switch (provides options to cycle fan with compressor or provide continuous fan) and a fault indicator light. ***Units without a fault indicator light shall not be accepted.***

Option: Digital ACO unit mounted thermostat (MCO is standard).

Option: Provisions for remote thermostat (unit mounted is standard).

Option: Disconnect Switch, Non-Fused.

Option: Disconnect Switch, Fused with 15A fuse.

Option: 20A power plug/cord.

Option: 20A plug, cord, receptacle, disconnect switch, fused with 15A fuse.

Option: 20A plug, cord, receptacle, disconnect switch, non fused.

Solid State Control System (CXM):
Units shall have a solid-state control system. ***Units utilizing electro-mechanical control shall not be acceptable.*** The control system microprocessor board shall be specifically designed to protect against building electrical system noise contamination, EMI, and RFI interference. The control system shall interface with a heat pump type thermostat. The control system shall have the following features:

a. Anti-short cycle time delay on compressor operation.
b. Random start on power up mode.
c. Low voltage protection.
d. High voltage protection.
e. Unit shutdown on high or low refrigerant pressures.
f. Unit shutdown on low water temperature.
g. Condensate overflow electronic protection.

h. Option to reset unit at thermostat or disconnect.
i. Automatic intelligent reset. Unit shall automatically reset the unit 5 minutes after trip if the fault has cleared. If a fault occurs 3 times sequentially without thermostat meeting temperature, then lockout requiring manual reset will occur.
j. Ability to defeat time delays for servicing.
k. Light emitting diode (LED) on circuit board to indicate high pressure, low pressure, low voltage, high voltage, low water/air temperature cut-out, condensate overflow, and control voltage status.
l. The low-pressure switch shall not be monitored for the first 120 seconds after a compressor start command to prevent nuisance safety trips.
m. 24V output to cycle a motorized water valve or other device with compressor contactor.
n. Unit Performance Sentinel (UPS). The UPS warns when the heat pump is running inefficiently.
o. Water coil low temperature sensing (selectable for water or anti-freeze).
p. Air coil low temperature sensing.

NOTE: Units not providing the 8 safety protections of anti-short cycle, low voltage, high voltage, high refrigerant pressure, low pressure (loss of charge), air coil low temperature cut-out, water coil low temperature cut-out, and condensate overflow protections will not be accepted.

Option: Enhanced solid state control system (DXM)
This control system features two stage control of cooling and two stage control of heating modes for exacting temperature and dehumidification purposes.

This control system coupled with a multi-stage thermostat will better dehumidify room air by automatically running the heat pump's fan at lower speed on the first stage of cooling thereby implementing low sensible heat ratio cooling. On the need for higher cooling performance the system will activate the second stage of cooling and automatically switch the fan to the higher fan speed setting. This system may be further enhanced with a humidistat. ***Units not having automatic low sensible heat ratio cooling will not be accepted;*** as an alternate a hot gas reheat coil may be provided with control system for automatic activation.

Control shall have all of the above mentioned features of the CXM control system along with the following expanded features:

a. Removable thermostat connector.
b. Night setback control.
c. Random start on return from night setback.
d. Minimized reversing valve operation (Unit control logic shall only switch the reversing valve when cooling is demanded for the first time. The reversing valve shall be held in this position until the first call for heating, ensuring quiet operation and increased valve life.).
e. Override temperature control with 2-hour (adjustable) timer for room occupant to override setback temperature at the thermostat.
f. Dry contact night setback output for digital night setback thermostats.
g. Ability to work with heat pump or heat/cool (Y, W) type thermostats.
h. Ability to work with heat pump thermostats using O or B reversing valve control.
i. Emergency shutdown contacts.
j. Boilerless system heat control at low loop water temperature.
k. Ability to allow up to 3 units to be controlled by one thermostat.
l. Relay to operate an external damper.
m. Ability to automatically change fan speed from multistage thermostat.
n. Relay to start system pump.
o. 75 VA control transformer. Control transformer shall have load side short circuit and overload protection via a built in circuit breaker.

Remote Service Sentinel (CXM/DXM):
Solid state control system shall communicate with thermostat to display (at the thermostat) the unit status, fault status, and specific fault condition, as well as retrieve previously stored fault that caused unit shutdown. The Remote Service Sentinel allows building maintenance personnel or service personnel to diagnose unit from the wall thermostat. The control board shall provide a signal to the thermostat fault light, indicating a lockout. Upon cycling the G (fan) input 3 times within a 60 second time period, the fault light shall display the specific code as indicated by a sequence of flashes. A detailed flashing code shall be provided

at the thermostat LED to display unit status and specific fault status such as over/under voltage fault, high pressure fault, low pressure fault, low water temperature fault, condensate overflow fault, etc. ***Units that do not provide this remote service sentinel shall not be acceptable.***

Option: Lonworks interface system
Units shall have all the features listed above (either CXM or DXM) and the control board will be supplied with a LONWORKS interface board, which is LONMark certified. This will permit all units to be daisy chained via a 2-wire twisted pair shielded cable. The following points must be available at a central or remote computer location:

a. Space temperature
b. Leaving water temperature
c. Discharge air temperature
d. Command of space temperature setpoint
e. Cooling status
f. Heating status
g. Low temperature sensor alarm
h. Low pressure sensor alarm
i. High pressure switch alarm
j. Condensate sensor alarm
k. Hi/low voltage alarm
l. Fan "ON/AUTO" position of space thermostat as specified above
m. Unoccupied / occupied command
n. Cooling command
o. Heating command
p. Fan "ON / AUTO" command
q. Fault reset command
r. Itemized fault code revealing reason for specific shutdown fault (any one of 7)

This option also provides the upgraded 75VA control transformer with load side short circuit and overload protection via a built in circuit breaker.

Option: MPC (Multiple Protocol Control) interface system
Units shall have all the features listed above (either CXM or DXM) and the control board will be supplied with a Multiple Protocol interface board. Available protocols are BACnet MS/TP, Modbus, or Johnson Controls N2. The choice of protocol shall be field selectable/changeable via the use of a simple selector switch. Protocol selection shall not require any additional programming or special external hardware or software tools. This will permit all units to be daisy chain connected by a 2-wire twisted pair shielded cable. The following points must be available at a central or remote computer location:

a. Space temperature
b. Leaving water temperature
c. Discharge air temperature
d. Command of space temperature setpoint
e. Cooling status
f. Heating status
g. Low temperature sensor alarm
h. Low pressure sensor alarm
i. High pressure switch alarm
j. Condensate overflow alarm
k. Hi/low voltage alarm
l. Fan "ON/AUTO" position of space thermostat as specified above
m. Unoccupied / occupied command
n. Cooling command
o. Heating command
p. Fan "ON / AUTO" command
q. Fault reset command
r. Itemized fault code revealing reason for specific shutdown fault (any one of 7)

This option also provides the upgraded 75VA control transformer with load side short circuit and overload protection via a built in circuit breaker.

Warranty:
ClimateMaster shall warranty equipment for a period of 12 months from start up or 18 months from shipping (which ever occurs first).

Option: Extended 4-year compressor warranty covers compressor for a total of 5 years.

Option: Extended 4-year refrigeration circuit warranty covers coils, reversing valve, expansion valve and compressor for a total of 5 years.

Option: Extended 4-year control board warranty covers the CXM/DXM control board for a total of 5 years.

FIELD INSTALLED OPTIONS

Hose Kits:
Hoses shall be 1 foot (31cm) long, braided stainless steel; fire rated hoses complete with adapters. Only fire rated hoses will be accepted. Note: Threaded connection piping option must be ordered for hose kit connections.

Option: 2 foot (61cm) hose lengths instead of standard 1 foot (31cm) length.

Valves:
The following valves are available and will be shipped loose:
a. Ball valve; bronze material, standard port full flow design, IPT connections.
b. Ball valve with memory stop and PT Port; standard port full flow design, IPT connections.
c. "Y" strainer with cap; bronze material, IPT connections.
d. "Y" strainer with blowdown valve; bronze material, IPT connections.
e. Motorized water valve; slow acting, 24v, IPT connections.

Hose Kit Assemblies:
The following assemblies ship with the valves already assembled to the hose described:
a. Supply and return hoses having ball valve with PT port.
b. Supply hose having ball valve with PT port; return hose having automatic flow regulator valve (Measureflo) with PT ports, and ball valve.
c. Supply hose having "Y" strainer with blowdown valve, and ball valve with PT port; return hose having automatic flow regulator (Measureflo) with PT ports, and ball valve.

Thermostats:
The thermostat shall be a ClimateMaster mechanical or electronic type thermostat as selected below with the described features (Note: "Remote mounted thermostat" control option must be selected for the console unit):

a. Single Stage Standard Manual Changeover (ATM11C01)
   Thermostat shall be a single-stage, vertical mount, manual changeover with HEAT-OFF-COOL system switch and fan ON-AUTO switch. Thermostat shall have a mechanical temperature indicator and set point indication. Thermostat shall only require 4 wires for connection. Mercury bulb thermostats are not acceptable.
b. Single Stage Digital Manual Changeover with Two-Speed Fan Control (ATM11C03) – Recommended for Console Remote-Mount Thermostat (DXM required)
   Thermostat shall be a single-stage, digital, manual changeover with HEAT-OFF-COOL system switch, fan ON-AUTO switch, and fan LO-HI switch. Thermostat shall have an LCD display with temperature and set-point(s) in °F or °C. The Thermostat shall provide permanent memory of set-point(s) without batteries. A fault LED shall be provided to display specific fault condition. Thermostat shall come standard with remote temperature sensor, but may be operated with internal sensor if desired via installation of a jumper.
c. Single Stage Digital Auto or Manual Changeover (ATA11U01)
   Thermostat shall be a single-stage, digital, auto or manual changeover with HEAT-OFF-COOL-AUTO system switch and fan ON-AUTO switch. Thermostat shall have an LCD display with temperature and set-point(s) in °F or °C. The Thermostat shall provide permanent memory of set-point(s) without batteries. A fault LED shall be provided to display specific fault condition. Thermostat shall provide temperature display offset for custom applications.
d. Single Stage Digital Automatic Changeover with Two-Speed Fan Control (ATA11C04) – Recommended for Console Remote-Mount Thermostat (DXM required)

Thermostat shall be a single-stage, digital, auto or manual changeover with HEAT-OFF-COOL-AUTO system switch, fan ON-AUTO switch, and fan LO-HI switch. Thermostat shall have an LCD display with temperature and set-point(s) in °F or °C. The Thermostat shall provide permanent memory of set-point(s) without batteries. A fault LED shall be provided to display specific fault condition. Thermostat shall come standard with remote temperature sensor, but may be operated with internal sensor if desired via installation of a jumper.

e. Multistage Digital Automatic Changeover (ATA22U01)
Thermostat shall be multi-stage (2H/2C), manual or automatic changeover with HEAT-OFF-COOL-AUTO system settings and fan ON-AUTO settings. Thermostat shall have an LCD display with temperature, set-point(s), mode, and status indication. The temperature indication shall be selectable for °F or °C. The thermostat shall provide permanent memory of set-point(s) without batteries. A fault LED shall be provided to indicate specific fault condition(s). Thermostat shall provide temperature display offset for custom applications. Thermostat shall allow unit to provide better dehumidification with optional DXM controller by automatically using lower fan speed on stage 1 cooling (higher latent cooling) as main cooling mode, and automatically shifting to high speed fan on stage 2 cooling.

f. Single Stage Manual Changeover Programmable 5/2 Day (ATP11N01)
Thermostat shall be 5 day/2 day programmable (with up to 4 set points per day), single stage (1H/1C), manual changeover with HEAT-OFF-COOL system settings and fan ON-AUTO settings. Thermostat shall have an LCD display with temperature, set-point(s), mode, and status indication. The temperature indication shall be selectable for °F or °C. The thermostat shall provide permanent memory of set-point(s) without batteries. Thermostat shall provide convenient override feature to temporarily change set point.

g. Multistage Automatic or Manual Changeover Programmable 5/2 Day (ATP21U01)
Thermostat shall be 5 day/2 day programmable (with up to 4 set points per day), multi-stage (2H/1C), automatic or manual changeover with HEAT-OFF-COOL-AUTO system settings and fan ON-AUTO settings. Thermostat shall have an LCD display with temperature, set-point(s), mode, and status indication. The temperature indication shall be selectable for °F or °C. The thermostat shall provide permanent memory of set-point(s) without batteries. Thermostat shall provide convenient override feature to temporarily change set point.

h. Multistage Automatic or Manual Changeover Programmable 7 Day (ATP32U01)
Thermostat shall be 7 day programmable (with up to 4 set points per day), multi-stage (3H/2C), automatic or manual changeover with HEAT-OFF-COOL-AUTO system settings and fan ON-AUTO settings. Thermostat shall have a blue backlit dot matrix LCD display with temperature, set-points, mode, and status indication. The temperature indication shall be selectable for °F or °C. Time display shall be selectable for 12 or 24 hour clock. Fault identification shall be provided (when used with ClimateMaster CXM or DXM controls) to simplify troubleshooting by providing specific unit fault at the thermostat with red backlit LCD during unit lockout. The thermostat shall provide permanent memory of set-points without batteries. Thermostat shall provide heating set-point range limit, cooling set-point range limit, temperature display offset, keypad lockout, dead-band range setting, and inter-stage differential settings. Thermostat shall provide progressive recovery to anticipate time required to bring space temperature to the next programmed event. Thermostat shall provide an installer setup for configuring options and for setup of servicing contractor name and contact information. Thermostat shall allow the use of an accessory remote and/or outdoor temperature sensor (AST008). Thermostat navigation shall be accomplished via five buttons (up/down/right/left/select) with menu-driven selections for ease of use and programming.

i. Multistage Automatic or Manual Changeover Programmable 7 Day with Humidity Control (ATP32U02)
Thermostat shall be 7 day programmable (with up to 4 set points per day), multi-stage (3H/2C), automatic or manual changeover with HEAT-OFF-COOL-AUTO system settings and fan ON-AUTO settings. Separate dehumidification and humidification set points shall be configurable for discreet outputs to a dehumidification option and/or an external humidifier. Installer configuration mode shall allow thermostat dehumidification mode to operate with ClimaDry reheat or with ECM fan dehumidification mode via settings changes. Thermostat shall have a blue backlit dot matrix LCD display with temperature, relative humidity, set-points, mode, and status indication. The temperature indication shall be selectable for °F or °C. Time display shall be selectable for 12 or 24 hour clock. Fault identification shall be provided (when used with ClimateMaster CXM or DXM controls) to simplify troubleshooting by providing specific unit fault at the thermostat with red backlit LCD during unit lockout. The thermostat shall provide permanent memory of set-points without batteries. Thermostat shall provide heating set-point range limit, cooling set-point range limit, temperature display offset, keypad lockout, dead-band range setting, and inter-stage differential settings. Thermostat shall provide progressive recovery to anticipate time required to bring space temperature to the next programmed event. Thermostat shall provide an installer setup for configuring options and for setup of servicing contractor name and contact information. Thermostat shall allow the use of an accessory remote and/or outdoor temperature sensor (AST008). Thermostat navigation shall be accomplished via five buttons (up/down/right/left/select) with menu-driven selections for ease of use and programming.

DDC Sensors:
ClimateMaster wall mounted DDC sensor to monitor room temperature and interfaces with optional interface system described above. Several types as described below:

a. Sensor only with no display (LON and MPC).
b. Sensor with override (LON only).
c. Sensor with setpoint and adjustment override (MPC only).
d. Sensor with setpoint and adjustment override, LCD display, status/fault indication (LON and MPC).

Guide Revision History:

Date:	Page:	Description:
07/26/06	42	Updated specs for Rev. B and new thermostat offering
07/26/06	19	Updated motorized valve data for all sizes
07/26/06	18	Added Performance data selection notes
07/26/06	All	Added Rev. B digital controls
12/23/05	19-23	Updated Water Valve Data
12/13/05	All	Formatting Changes
08/22/05	43	Specifications: Updated CXM verbiage
08/22/05	17	Correction Factors: Changed "Nominal" to "Rated"
12/30/04	All	New Layout

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