SPECIFICATION CATALOG

Versatec® Compact

Commercial 002-017kW

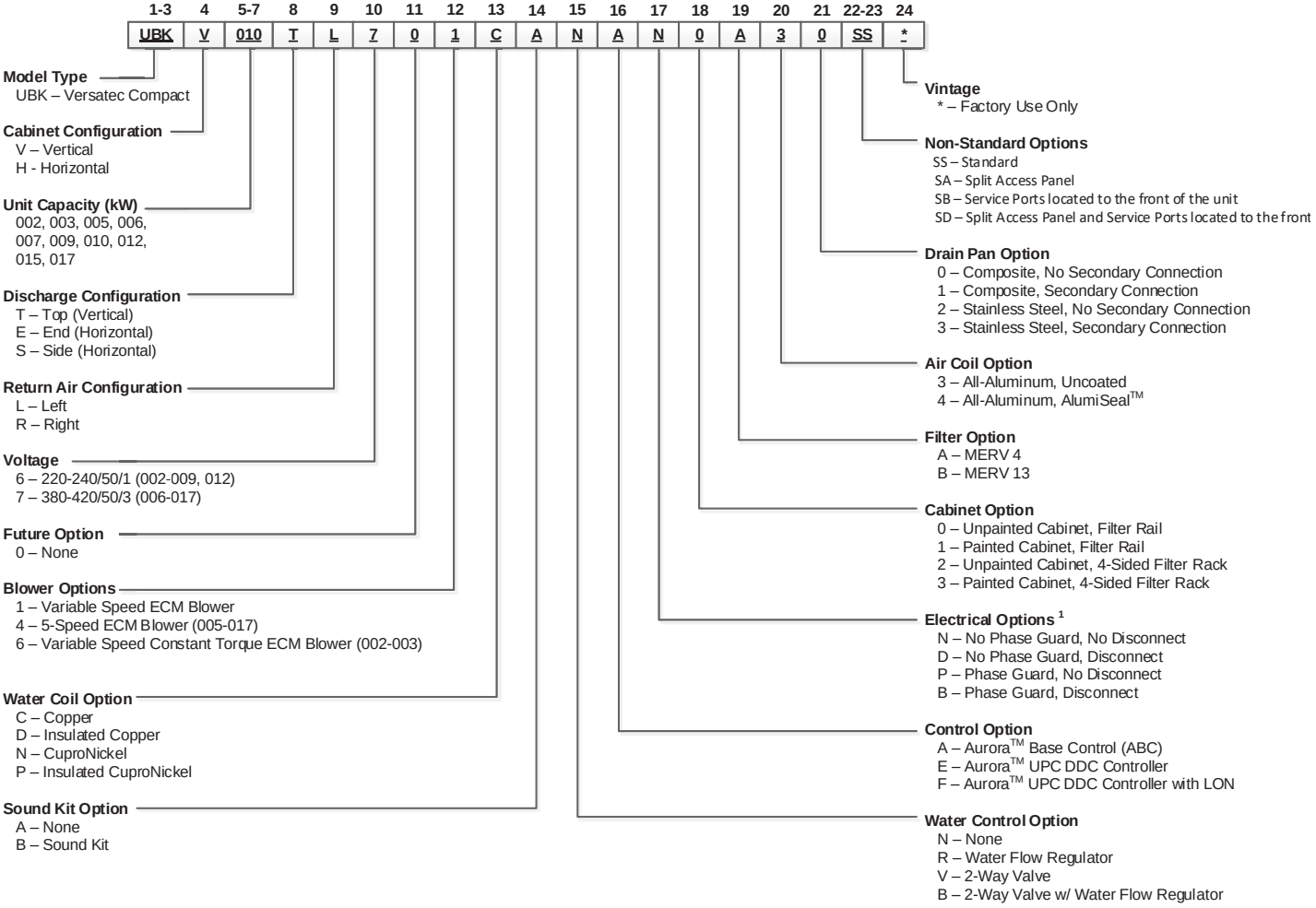
Geothermal/Water Source Heat Pump 50Hz

Water Furnace

Commercial Solutions

Table of Contents

Model Nomenclature



Note:
1 - Phase Guard Only Available on 380-420/50/3

EN 14511

Versatec Compact Series (50Hz) EN14511 Data
Variable Speed ECM, 5 Speed ECM motor
Metric (SI) Units

Model	Flow Rate		Cooling Tower		Water-to Brine		Control Cabinet		Close Control		Water		Brine		Water Loop	
			Cooling EWT 30°C		Cooling EWT 10°C		Cooling EWT 15°C		Cooling EWT 30°C		Heating EWT 10°C		Heating EWT 0°C		Heating EWT 20°C	
	Water, l/s	Air, l/s	Capacity Output, Watts	EER (W/W)	Capacity Output, Watts	EER (W/W)	Capacity Output, Watts	EER (W/W)	Capacity Output, Watts	EER (W/W)	Capacity Output, Watts	COP	Capacity Output, Watts	COP	Capacity Output, Watts	COP
002	0.20	165	2,000	3.7	2,900	7.0	3,200	7.6	1,700	3.2	2,500	3.9	1,900	3.2	2,600	4.6
003	0.20	189	2,600	3.7	3,500	7.0	3,800	7.6	2,300	3.2	3,000	3.9	2,300	3.3	3,700	4.5
005	0.32	283	4,200	4.1	5,500	8.5	6,050	8.8	3,800	3.8	4,300	4.5	3,300	3.7	5,400	5.4
006	0.38	378	5,800	4.0	7,600	7.4	8,100	7.2	5,300	3.7	5,900	4.5	4,400	3.7	7,200	5.1
007	0.50	425	7,000	4.3	8,900	8.3	9,750	8.4	6,300	4.0	7,200	4.5	5,300	3.8	9,100	5.2
009	0.57	543	8,700	4.5	10,850	8.3	11,500	8.5	7,900	4.1	8,900	4.8	6,700	3.9	11,300	5.6
010	0.69	661	10,500	4.7	13,500	9.2	14,500	9.6	9,600	4.4	10,100	4.8	7,600	4.0	12,600	5.5
012	0.76	755	12,600	4.2	15,200	7.5	16,900	7.6	11,400	3.9	12,400	4.3	9,700	3.6	15,700	4.9
015	0.95	897	15,600	4.6	18,900	8.6	21,200	8.8	14,100	4.2	14,300	4.4	11,100	3.7	18,400	5.1
017	1.14	991	16,500	4.4	19,900	7.9	22,400	8.1	15,300	4.2	16,200	4.3	12,500	3.6	20,200	5.0

Cooling capacities based upon 27°C DB, 19°C WB entering air temperature for cooling tower and water to brine, 35°C DB and 24°C WB for control cabinet, and 24°C DB and 17°C WB for close control.
Heating capacities based upon 20°C DB, 15°C WB entering air temperature

2/18/2018

CE

All Versatec Compact 50Hz product is safety tested to CE standards and performance tested in accordance with standard EN 14511-2.

The Versatec Compact Series

WaterFurnace has been a leader in geothermal closed loop applications for years by designing and manufacturing the most efficient and reliable equipment on the market. This is accomplished through superior engineering, manufacturing, and quality efforts. The Versatec Compact is the latest in WaterFurnace's efforts to be the best in the water source heat pump industry. The Versatec Compact raises the bar for boiler/tower applications by providing flexibility and efficiency into a compact cabinet at a competitive price. This full range product offers all the standard commercial voltages using high efficiency reciprocating compressors along with 5-speed ECM or variable speed ECM blower motors.

Versatec Compact Highlights

- High efficiency performance
- Unrivaled cabinet footprint that can fit most application requirements
    - 30.48cm high 002-003
    - 43.12cm high 005-007
    - 48.26cm high 009-012
    - 53.34cm high 015-017
    - Smallest horizontal cabinets in the industry!
- All-Aluminum rifled tube-and-fin air coils are not susceptible to formicary corrosion.
- Dedicated 420 V 5-Speed ECM does not require use of a neutral!
- 114.30cm long 12kW model
- Base microprocessor control capable of running 5-speed ECM or variable speed ECM with internally mounted 2-way valve
- Flexible factory installed options
    - Corrosion-proof composite or stainless steel drain pan; including internally mounted secondary drain connection option
    - Copper or cupronickel heat exchanger and optional low temperature insulation
    - Filter options: standard 25.4mm MERV 4 or option 50.8mm MERV 13 with either filter rails or option deluxe four sided filter rack that is field switchable between 25.4mm and 50.8mm.
    - Aurora Base Control or with Aurora UPC with N2, BACnet, or optional LonWorks card
    - Factory mounted internal water valve and/or flow regulator for variable speed pumping systems saves on installation costs
    - Other options: Sound Kit, Coated Air Coil, Phase Guard, Internally Mounted Non-fused Power Disconnect

Vertical Versatec Compact Series
Models UBKV 002-017 kW Single Speed

Horizontal Versatec Compact Series
Models UBKH 002-017 Single Speed

The Versatec Compact Series cont.

Product Features: Vertical Cabinet

Versatec Compact vertical units are designed for high efficiency, maximum flexibility, and primary servicing from the front.

Standard filter rail, field switchable for 25.4 mm or 50.8 mm filters
Optional factory mounted deluxe filter rack (shown), field switchable for 25.4 mm or 50.8 mm filters

Oversized rifled tube/ lanced fin *all-aluminum* air coil (optional AlumiSeal™ coil coating).

Corrosion-resistant, composite drain pan with overflow protection, optional secondary drain connection
Optional stainless steel drain pan with overflow protection, optional secondary drain connection

Microprocessor control
Aurora - Standard

Fault and status LEDs
(Aurora Base Control only)

AID Tool for diagnosing and controlling the Aurora control

Removable inlet rings for easy blower removal

Insulated divider panel

Optional ThermaShield coated coaxial heat exchanger

High efficiency rotary or scroll compressor

Internally trapped condensate line

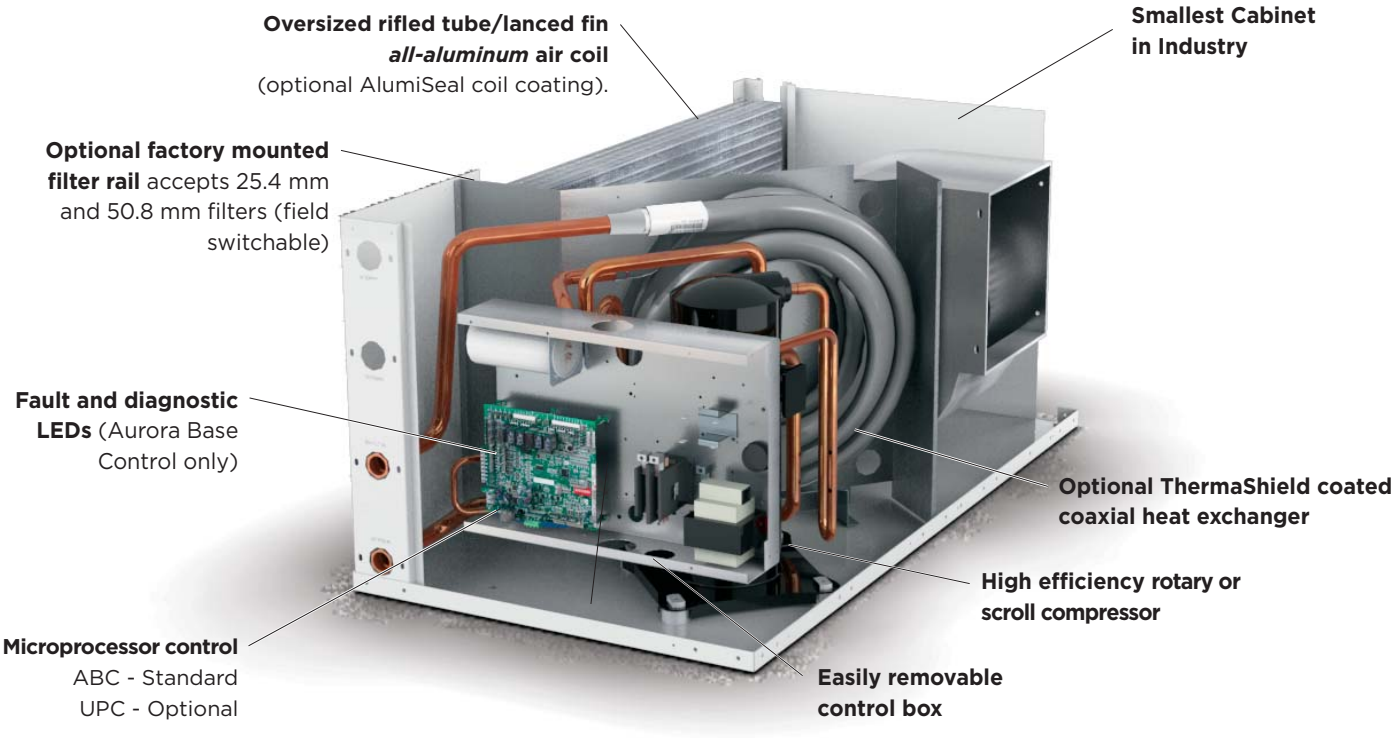
Fault and status LEDs
(Aurora Base Control only)

A true left and right return option is available.

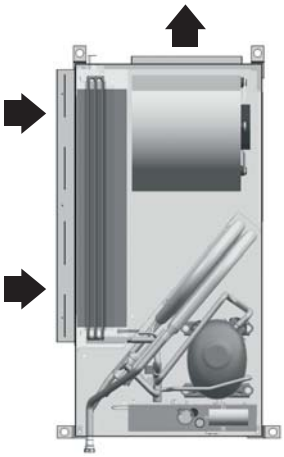
The Versatec Compact Series cont.

Product Features: Horizontal Cabinet

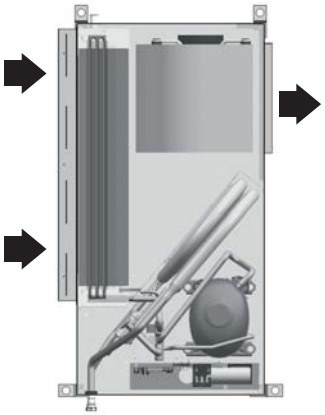
Horizontal units are designed for high efficiency, maximum flexibility, and primary servicing from the front.



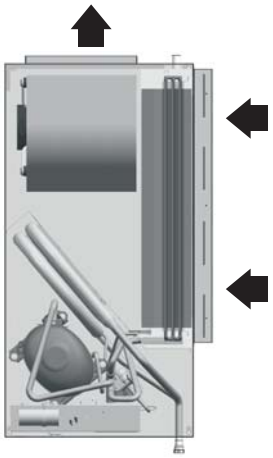
Four blower deck options are available. Factory or field conversion option of end or side discharge using switchable access panels and a factory only option of true left or right return air coil.



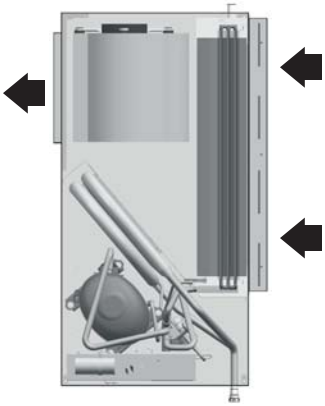
Left hand return with end discharge



Left hand return with side discharge



Right hand return with end discharge



Right hand return with side discharge

The Versatec Compact Series cont.

Flexible Product with Several Standard Options

- Compact cabinet design, vertical and horizontal with true left and right return configurations
- Horizontal end and side discharge with vertical top discharge air configurations
- Capacities 2 through 17kW
- All commercial voltages including 220-240/50/1 and 380-420/50/3
- 5 speed ECM, or optional variable speed ECM blower motors (005-17) and variable speed constant torque ECM (002-003)
- All-Aluminum rifled tube-and-fin air coil are not susceptible to formicary corrosion
- Optional AlumiSeal air coil e-coating for improved condensate runoff
- Extended range insulation option
- Super Quiet Sound Package, including multi-density compressor blanket
- Quiet rotary/scroll compressors
- 2-dimension refrigerant piping vibration loops to isolate the compressor
- Heavy gauge cabinet and 4 vibration isolating hanger brackets
- Internally mounted water flow regulator and/or water solenoid valve for variable speed pumping systems
- Standard Aurora Base Control or UPC DCC Control with standard N2, , BACnet, or optional LonWorks card
- Phase guard with optional 'dial' disconnect
- Polymer composite drain pan or stainless steel drain pan with optional secondary drain connection
- 25.4 mm MERV 4 or 50.8 mm MERV 13 filters

Other options are available by special request through WaterFurnace Commercial Sales.

High Efficiency

The Versatec Compact Series is a high efficiency water source heat pump in a compact vertical and horizontal cabinet. The product features highly efficient and reliable single capacity rotary/scroll compressors mated with large blowers. These blowers are driven by efficient 5-speed ECM blower motors, or highly efficient variable speed ECM blower motors.

Super Quiet Option

An optional Super Quiet Sound Package is also available for a modest cost and features multi-density laminate lined compressor blanket designed to completely surround the compressor and suppress low frequency noise.

Indoor Air Quality (IAQ)

All Versatec Compact Series features several IAQ benefits:

- Corrosion-free composite double-sloped drain pan to eliminate standing water and prevent bacterial growth
- A washable surface on insulation in all air handler compartments to allow cleanability and inhibit bacteria growth. Optional non-fibrous closed cell insulation is also available for more sensitive applications by special request through commercial sales..
- Open filter rail comes standard for non-ducted return applications. Filter rail is field switchable from 25.4 mm to 50.8 mm for more filter options.
- Optional factory mounted, four sided, deluxe filter rack that is field switchable from 25.4 mm to 50.8 mm is available for ducted return applications.
- Standard supplied filter is a pleated MERV 4, 25.4 mm. An optional low static high efficiency 50.8 mm MERV 13, for LEED certification points, is also available.

Internally Mounted Solenoid Valve Option

When variable speed circulating pump systems are designed, low pressure drop (high Cv) solenoid valves are specified at each unit to vary the pump according to flow required. It is important that these valves be low pressure drop to avoid unwanted pump watts. This option factory installs this valve inside the unit.

Secondary Drain Connection Option

Some local building authority's interpretation of codes require more condensate overflow protection than standard microprocessor based condensate sensors offer. In these areas a full secondary drain pan might be required causing both increased cost and unit service access issues. In many of these cases a secondary drain connection option can be added to the unit to pass this local interpretation of condensate drain redundancy. This option adds a second PVC drain connection to the drain pan at a higher level.

Phase Guard Monitor

Factory mounted phase guard device is available to protect the compressor against loss of phase.

The Versatec Compact Series cont.

Aurora Base Control

The Aurora Base Control (ABC) System is a complete residential and commercial comfort system that brings all aspects of the HVAC system into one cohesive module network. Aurora uses the Modbus communication protocol to communicate between modules. Each module contains the logic to control all features that are connected to the module. The Aurora Base Control (ABC) has two Modbus channels. The first channel is configured as a master for connecting to devices such as a communicating thermostat, expansion board, or other slave devices. The second channel is configured as a slave for connecting the Aurora Interface Diagnostic (AID) Tool.

Aurora Unitary Protocol Converter (UPC)

The optional Aurora UPC control provides unparalleled capability in several areas including energy, refrigerant, and performance monitoring, humidity, energy management, and service diagnostics, and then communicates it all thru standard DDC protocols like N2, Lon and BACnet MS/TP. The most unique feature is integration of the Aurora Base Control and UPC into the Versatec Compact as an integrated heat Pump and DDC controller providing both a cost advantage and providing features not typically found on WSHP controls. This integration allows heat pump monitoring sensors, status and service diagnosis faults to be communicated thru the DDC direct to the building automation system (BAS), giving building supervisors detailed and accurate information on every piece of equipment without removing an access panel!

Control	General Description	Application	Display/Interface	Protocol
Aurora Base Control 	The ABC microprocessor provides all the features necessary to operate today's standard WSHPs that utilize dual capacity compressors and variable speed ECM/5 speed ECM blower motors with hot gas reheat. This control can communicate to a handheld diagnostic tool to help the installing contractor or service technician with equipment setup and service. By utilizing Modbus RTU communication protocol, the ABC board can communicate with additional devices on the Aurora network	Used for residential and commercial applications that use single or dual capacity compressors with 5-speed ECM, or variable speed ECM blower motors. This base control can also communicate to the AID Tool to display faults, inputs/outputs, and software revision. Commercial features such as hot gas reheat, slow opening water valve, and random start are also capable with the ABC board.	Optional AID toll can be used for field service.	Standalone
Aurora Base Control w/UPC BACnet or N2 	The Aurora Unitary Protocol Converter (UPC) is an integrated solution and communicates directly with the Aurora Heat Pump Controls and allows access/control of a variety of internal Aurora heat pump operations such as sensors, relay operation, faults and other information. In turn, the UPC then converts internal Aurora Modbus protocol to BACnet MS/TP, or N2 protocols and communicates to the BAS system. This provides the great benefit of complete control integration and a myriad of information available to the BAS from the heat pump control. Plus it also allows individual unit configuration such as ECM fan speeds or freeze protection setting directly over the BAS without the need for access to the actual heat pump.	The Aurora UPC is implemented with the Aurora Base Controller (ABC) heat pump control into our latest water source heat pumps. All Internal Aurora points are accessible to the UPC via firmware providing an integrated solution. All zone temperatures and zone sensors are connected to the UPC on an RNet bus, simplifying hook up at the unit. RNet sensors can include a combination of zone temperature and humidity, CO2, and VOC sensors. The UPC includes built-in support for a custom configurable keypad/display unit.	Optional Equipment Touch display	BACnet MS/TP or N2 Open (DIP selectable)
Aurora Base Control w/UPC LonWorks 	The Aurora Unitary Protocol Converter (UPC) is an integrated solution and communicates directly with the Aurora Heat Pump Controls and allows access/control of a variety of internal Aurora heat pump operations such as sensors, relay operation, faults and other information. In turn, the UPC then converts internal Aurora Modbus protocol to LONWorks protocol and communicates to the BAS system.	The Aurora UPC is implemented with the Aurora Base Controller (ABC) heat pump control into our latest water source heat pumps. All Internal Aurora points are accessible to the UPC via firmware providing an integrated solution. All zone temperatures and zone sensors are connected to the UPC on an RNet bus, simplifying hook up at the unit. RNet sensors can include a combination of zone temperature and humidity, CO2, and VOC sensors. The UPC includes built-in support for a custom configurable keypad/display unit.	Optional Equipment Touch display	LonWorks
AXB Expansion Board **(Future Availability)**	Aurora Advanced Control adds the Aurora AXB expansion board and provides added I/O and standard features. AXB can be added to any of the above packages to enhance the I/O of the controls.	• ***Refrigeration Monitoring*** **–** provides Suction and discharge pressure, Suction, liquid line temps and superheat and subcooling. • ***Performance Monitoring*** **–** provides entering and leaving loop water temperatures, loop flow rate as well as heat of extraction or rejection rate into the loop. • ***Energy Monitoring*** **–** provides real-time power measurement (Watt) of compressor, fan, auxiliary heat and zone pump. • Plus many more I/O options		

The Versatec Compact Series cont.

Electrical Disconnect

An optional factory mounted, internally wired disconnect is available to avoid scheduling problems with the electrical contractor. Other features include:

- Non-fused, 'dial' type switch with "on/off" position
- Compact design
- "Lockout/Tagout" feature to keep the unit "off" during service

Factory Quality

- All refrigerant brazing is performed in a nitrogen environment.
- Computer controlled deep vacuum and refrigerant charging system.
- All joints are leak detected for maximum leak rate of less than 7.1g per year.
- Computer bar code equipped assembly line ensures all components are correct.
- All units are computer run-tested with water to verify both function and performance.

Inside the Versatec Compact Series

Refrigerant

Versatec Compact products all feature zero ozone depletion and low global warming potential refrigerant R-410A.

Cabinet

All units are constructed of corrosion resistant galvanized sheet metal. One large lift-out access panel provides access to the compressor and air handler section to allow servicing of blower motor, blower, and drain pan. Refrigerant circuit is designed to allow primary serviceability from the front. Six (6) horizontal and six (6) vertical cabinets are provided for application flexibility. The blower motor and blower can be completely serviced or replaced without removal of the unit. Service of the blower and blower motor is made easier via the removable orifice ring on the housing.

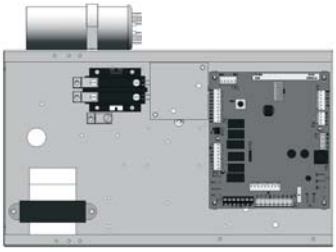
Flexible configurations include four (4) blower deck options for horizontals and a true left and right return on both horizontal and vertical.

Filter Rack

All units come standard with an open filter rail, for use in open return applications, or an optional deluxe filter rack/ duct collar for use with ducted returns. Both filter options are field switchable between 25.4 mm and 50.8 mm thick filters for filter flexibility. A MERV 4, 25.4 mm is standard with an optional 50.8 mm MERV 13 for LEED certification points and high efficiency filtration.

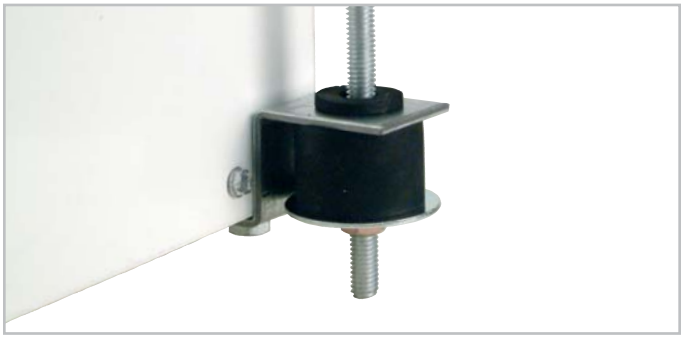
Electrical Box

Unit controls feature quick connect wiring harnesses for easy servicing. Separate knockouts for low voltage and two sides of the electrical corner post for easy access to the control box. 50VA or large 75VA transformer assures adequate controls power for accessories.



Horizontal Hanger Kits

Each horizontal unit includes a hanger kit to meet seismic specification requirements while still allowing filter access.



Drain Pan

All condensate connections are PVC glue for economical corrosion free connections. Bacteria resistant composite drain pan is sloped to promote complete drainage and will never rust or corrode. Complete drainage helps to inhibit bacterial or microbial growth. Vertical units feature an internally trapped condensate line using clear PVC hose for easy inspection and reduced installation cost. Optional factory installed stainless steel drain pans are also available.

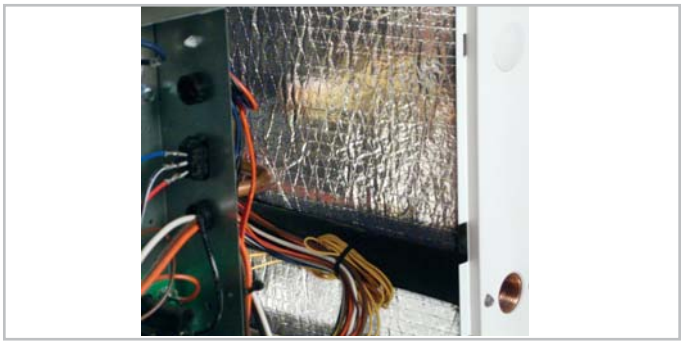
Compressors

The Versatec Compact features high efficiency R-410A rotary (002-005) and scroll (006-017) compressors. These types of compressors provide both high efficiency and great reliability.

Inside the Versatec Compact Series cont.

Air Handler Insulation

Washable air handler insulation surface provides cleanability to further enhance IAQ.



Thermostatic Expansion Valve

All Versatec Compact models utilize a balanced port bidirectional thermostatic expansion valve (TXV) for refrigerant metering. This allows precise refrigerant flow in a wide range of entering water variation (20 to 120°F [-7 to 49°C]) found in geothermal systems. The TXV is located in the compressor compartment for easy access.

Water-to-Refrigerant Coaxial Heat Exchanger Coil

Coaxial refrigerant to water heat exchangers provide unparalleled efficiency. The coaxes are designed for low pressure drop and low flow rates. All coaxes are pressure rated to 3103 kPa water side and 4137 kPa on the refrigerant side. Optional ThermaShield coating is available on the water-to-refrigerant heat exchanger to prevent condensation in low temperature loop operation.

Service Connections and Serviceability

Two Schrader service ports are provided in every unit. The suction side and discharge side ports are for field charging and servicing access. All valves are 7/16 in. SAE connections. All water and electrical connections are made from the front of the unit. Unit is designed for front access serviceability.

4-Way Reversing Valve

Versatec Compact units feature a reliable all-brass pilot operated refrigerant reversing valve. The reversing valve operation is limited to change of mode by the control to enhance reliability.

All-Aluminum Air Coil

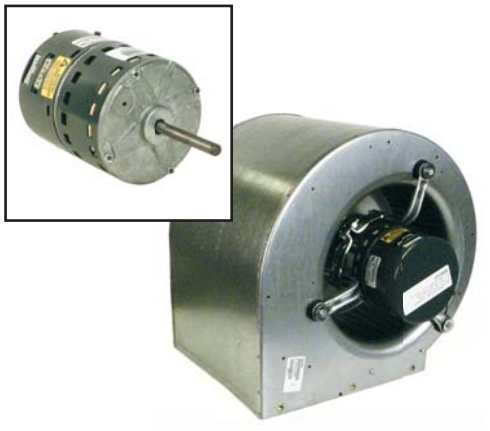
All models in the Versatec Compact line are shipped with all-aluminum air coils. WaterFurnace is the first manufacturer to offer an all-aluminum round-tube-and-fin air coil in a packaged water source heat pump. These air coils are constructed of lanced fin and rifled tube aluminum that is not susceptible to formicary corrosion. For additional condensate runoff and meeting project specifications, an optional AlumiSeal e-coating is available.

Inside the Versatec Compact Series cont.

Blower Motor and Housing

High efficiency low rpm galvanized direct drive blower featuring 5-speed ECM motor, and optional variable speed ECM blower motor. The variable speed ECM motor is controlled directly through the unit's microprocessor control. The lower rpm blower also reduces air noise. All 5-speed ECM motors have speed selection terminal strip on the motor for easy speed change. All motors are vibration isolated to reduce noise. Horizontal units can be field converted from end to side discharge as well.

NOTE: 420V 5-speed ECM blower motor does not require a neutral wire.



5-Speed ECM Constant Torque Motors

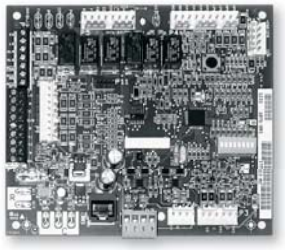
The 5-speed ECM is a 'Constant Torque' ECM motor and delivers air flow similar to a PSC but operates as efficiently as an variable speed ECM Motor. Because it's an ECM Motor, the 5-speed ECM can ramp slowly up or down like the variable speed ECM Motor. There are 5 possible speed taps available on the 5-speed motor with #1 being the lowest airflow and #5 being the highest airflow. These speed selections are preset at the time of manufacture and are easily changed in the field if necessary.

5-Speed ECM Benefits:

- High efficiency
- Soft start
- 5 speeds with up to 4 speeds on-line
- Built in logic allows air flow to change with G, Y1, Y2 and W signals
- Super efficient low airflow continuous blower setting (G)

Controls - Aurora Base Control

Aurora 'Base' Control



NOTE: Refer to the Aurora Base Control Application and Troubleshooting Guide and the Instruction Guide: Aurora Interface and Diagnostics (AID) Tool for additional information.

Control Features

Software ABC Standard Version 3.0

Single or Dual Capacity Compressors

Either single or dual capacity compressors can be operated.

Variable Speed ECM

Blower Motor Option (If Applicable)

A Variable Speed ECM blower motor can be driven directly using the onboard PWM output. Four blower speeds are available based upon the G, Y1, Y2, and W input signals to the board. The blower speeds can be changed either by the ECM manual configurations mode method or by using the Aurora AID Tool directly. All four blower speeds can be set to the same speed if desired.

5-Speed ECM Blower Motor Option (If Applicable)

A 5-Speed ECM blower motor will be driven directly using the thermostat connections. Any of the G, Y1, or Y2/W signals can drive any of the 5 available pre-programmed blower speeds on the motor. All 5 Series "G" vintage units will be wired this way at the factory.

Other Control Features

- Random start at power up
- Anti-short cycle protection
- High and low pressure cutouts
- Loss of charge
- Water coil freeze detection
- Air coil freeze detection
- Over/under voltage protection
- Condensate overflow sensor
- Load shed
- Dehumidification (where applicable)
- Emergency shutdown
- Hot gas reheat operation (where applicable)
- Diagnostic LED
- Test mode push button switch
- Two auxiliary electric heat outputs
- Alarm output
- Accessory output with N.O. and N.C.
- Two Modbus communication Ports

Field Selectable Options via Hardware

DIP Switch (SW1) – Test/Configuration Button (See SW1 Operation Table)

Test Mode

The control is placed in the test mode by holding the push button switch SW1 for 2 - 5 seconds. In test mode most of the control timings will be shortened by a factor of sixteen (16). LED3 (green) will flash at 1 second on and 1 second off. Additionally, when entering test mode LED1 (red) will flash the last lockout one time. Test mode will automatically time out after 30 minutes. Test mode can be exited by pressing and holding the SW1 button for 2 to 5 seconds or by cycling the power. **NOTE:** Test mode will automatically be exited after 30 minutes.

Variable Speed ECM Configuration Mode (If Applicable)

The control is placed in the ECM configuration mode by holding the pushbutton switch SW1 for 5 to 10 seconds, the high, low, and "G" ECM speeds can be selected by following the LED display lights. LED2 (yellow) will fast flash when entering the ECM configuration. When setting "G" speed LED3 (green) will be continuously lit, for low speed LED1 (red) will be continuously lit, and for high speed both LED3 (green) and LED1 (red) will be continuously lit. During the ECM configuration mode LED2 (yellow) will flash each of the 12 possible blower speeds 3 times. When the desired speed is flashed press SW1, LED2 will fast flash until SW1 is released. "G" speed has now been selected. Next select low speed, and high speed blower selections following the same process above. After third selection has been made, the control will exit the ECM configuration mode. Aux fan speed will remain at default or current setting and requires the AID Tool for adjustment.

Reset Configuration Mode

The control is placed in reset configuration mode by holding the push button switch SW1 for 50 to 60 seconds. This will reset all configuration settings and the EEPROM back to the factory default settings. LED3 (green) will turn off when entering reset configuration mode. Once LED3 (green) turns off, release SW1 and the control will reset.

DIP Switch (SW2)

SW2-1 FP1 Selection – Low water coil temperature limit setting for freeze detection. On = 30°F; Off = 15°F.

SW2-2 FP2 Selection – On = 30°F; Off = N/A

SW2-3 RV – O/B - thermostat type. Heat pump thermostats with "O" output in cooling or "B" output in Heating can be selected. On = O; Off = B.

SW2-4 and 2-5 Access Relay Operation (P2)

Access Relay Operation	SW2-4	SW2-5
Cycle with Blower	ON	ON
Cycle with Compressor	OFF	OFF
Water Valve Slow Opening	ON	OFF
Cycle with Comm. T-stat Hum Cmd	OFF	ON

Controls - Aurora Base Control cont.

Cycle with Blower - The accessory relay will cycle with the blower output.

Cycle with Compressor - The accessory relay will cycle with the compressor output.

Water Valve Slow Opening - The accessory relay will cycle and delay both the blower and compressor output for 90 seconds.

SW2-6 CC Operation – selection of single or dual capacity compressor. On = Single Stage; Off = Dual Capacity
SW2-7 Lockout and Alarm Outputs (P2) – selection of a continuous or pulsed output for both the LO and ALM Outputs. On = Continuous; Off = Pulsed
SW2-8 *Future Use*

Alarm Jumper Clip Selection

From the factory, ALM is connected to 24 VAC via JW2. By cutting JW2, ALM becomes a dry contact connected to ALG.

Variable Speed ECM Blower Speeds

The blower speeds can be changed either by using the ECM manual configurations mode method or by using the Aurora AID Tool directly (see Instruction Guide: Aurora Interface and Diagnostics (AID) Tool topic).

Field Selectable Options via Software

(Selectable via the Aurora AID Tool)

ECM Blower Speeds

An ECM blower motor can be driven directly using the onboard PWM output. Four blower speeds are available, based upon the "G", Y1 (low), Y2 (high), and Aux input signals to the board. The blower speeds can be changed either by the ECM manual configurations mode method (see ECM Configuration Mode topic) or by using the Aurora AID Tool directly. All four blower speeds can be set to the same speed if desired. Aux blower speed will remain at default or current setting and requires the AID Tool for adjustment.

Safety Features

The following safety features are provided to protect the compressor, heat exchangers, wiring and other components from damage caused by operation outside of design conditions.

Fuse – a 3 amp automotive type plug-in fuse provides protection against short circuit or overload conditions.

Anti-Short Cycle Protection – 4 minute anti-short cycle protection for the compressor.

Random Start – 5 to 80 second random start upon power up.

Fault Retry – in the fault condition, the control will stage off the outputs and then "try again" to satisfy the thermostat Y input call. Once the thermostat input calls are satisfied, the control will continue on as if no fault occurred. If 3 consecutive faults occur without satisfying the thermostat Y input call, then the control will go to Lockout mode.

Lockout – when locked out, the blower will operate continuously in "G" speed, and PSC blower motor output will remain on. The Alarm output (ALM) and Lockout output (L) will be turned on. The fault type identification display LED1 (Red) shall flash the fault code. To reset lockout conditions with SW2-8 On, thermostat inputs "Y1", "Y2", and "W" must be removed for at least 3 seconds. To reset lockout conditions with SW2-8 Off, thermostat inputs "Y1", "Y2", "W", and "DH" must be removed for at least 3 seconds. Lockout may also be reset by turning power off for at least 30 seconds or by enabling the emergency shutdown input for at least 3 seconds.

Lockout With Emergency Heat - if the control is locked out in the heating mode, and a Y2 or W input is received, the control will operate in the emergency heat mode while the compressor is locked out. The first emergency heat output will be energized 10 seconds after the W input is received, and the blower will shift to high speed. If the control remains locked out, and the W input is present, additional stage of emergency heat will stage on after 2 minutes. When the W input is removed, all of the emergency heat outputs will turn off, and the ECM blower will shift to "G" speed and PSC blower motor output will remain on.

High Pressure – fault is recognized when the Normally Closed High Pressure Switch, P4-9/10 opens, no matter how momentarily. The High Pressure Switch is electrically in series with the Compressor Contactor and serves as a hard-wired limit switch if an overpressure condition should occur.

Low Pressure - fault is recognized when the Normally Closed Low Pressure Switch, P4-7/8 is continuously open for 30 seconds. Closure of the LPS any time during the 30 second recognition time restarts the 30 second continuous open requirement. A continuously open LPS shall not be recognized during the 2 minute startup bypass time.

Loss of Charge – fault is recognized when the Normally Closed Low Pressure Switch, P4-7/8 is open prior to the compressor starting.

Condensate Overflow - fault is recognized when the impedance between this line and 24 VAC common or chassis ground drops below 100K ohms for 30 seconds continuously.

Freeze Detection (Coax) - set points shall be either 30°F or 15°F. When the thermistor temperature drops below the selected set point, the control shall begin counting down the 30 seconds delay. If the thermistor value rises above the selected set point, then the count should reset. The resistance value must remain below the selected set point for the entire length of the appropriate delay to be recognized as a fault. This fault will be ignored for the initial 2 minutes of the compressor run time.

Freeze Detection (Air Coil) - uses the FP2 input to protect against ice formation on the air coil. The FP2 input will operate exactly like FP1 except that the set point is 30 degrees and is not field adjustable.

Controls - Aurora Base Control cont.

Over/Under Voltage Shutdown - An over/under voltage condition exists when the control voltage is outside the range of 18 VAC to 30 VAC. If the over/under voltage shutdown lasts for 15 minutes, the lockout and alarm relay will be energized. Over/under voltage shutdown is self-resetting in that if the voltage comes back within range of 18 VAC to 30 VAC for at least 0.5 seconds, then normal operation is restored.

Operation Description

Power Up - The unit will not operate until all the inputs and safety controls are checked for normal conditions. The unit has a 5 to 80 second random start delay at power up. Then the compressor has a 4 minute anti-short cycle delay after the random start delay.

Standby In standby mode, Y1, Y2, W, DH, and G are not active. Input O may be active. The blower and compressor will be off.

Heating Operation

Single Compressor Heating, 2nd Stage (Y1, Y2)
The compressor will be staged to full capacity 20 seconds after Y2 input is received. The ECM blower will shift to high speed seconds after the Y2 input is received.

Dual Compressor Heating, 2nd Stage (Y1, Y2)
In dual compressor operation, two ABC boards used in 24 VAC operation, there will be a Y2 call to the Y1 input on the second ABC. The compressor will stage to full capacity 30 seconds after Y1 input is received to the second board.

Single Compressor Heating, 3rd Stage (Y1, Y2, W)
The hot water pump is de-energized and the first stage of electric heat is energized 10 seconds after the W command is received. If the demand continues the second stage of electric heat will be energized after 5 minutes.

Dual Compressor Heating, 3rd Stage (Y1, Y2, W) -
The first stage of electric heat is energized 10 seconds after the W command is received. If the demand continues the second stage of electric heat will be energized after 5 minutes

Emergency Heat (W) - The blower will be started on “G” speed, 10 seconds later the first stage of electric heat will be turned on. 5 seconds after the first stage of electric heat is energized the blower will shift to Aux speed. If the emergency heat demand is not satisfied after 2 minutes the second electric heat stage will be energized.

Blower (G) - The blower will start immediately upon receiving a thermostat G command. If there are no other commands from the thermostat the ECM will run on “G” speed until the G command is removed. Regardless of blower input (G) from the thermostat, the blower will remain on for 30 seconds at the end of each heating cycle.

Cooling Operation

In all cooling operations, the reversing valve directly tracks the O input. Thus, anytime the O input is present, the reversing valve will be energized.

Single Compressor Cooling, 2nd Stage (Y1, Y2, 0)
The compressor will be staged to full capacity 20 seconds after Y2 input was received. The ECM blower will shift to high speed 15 seconds after the Y2 input was received.

Dual Compressor Cooling, 2nd Stage (Y1, Y2, O)
In dual compressor operation, two ABC boards used in 24 VAC operation, there will be a Y2 call to the Y1 input on the second ABC. The compressor will stage to full capacity 30 seconds after Y1 input is received to the second board.

Blower (G) - The blower will start immediately upon receiving a thermostat G command. If there are no other commands from the thermostat the ECM will run on “G” speed until the G command is removed. Regardless of blower input (G) from the thermostat, the blower will remain on for 30 seconds at the end of each heating, cooling, and emergency heat cycle.

Dehumidification (Y1, O, DH or Y1, Y2, O, DH) - When a DH command is received from the thermostat during a compressor call for cooling the ECM blower speed will be reduced by 15% to increase dehumidification.

Emergency Shutdown - Four (4) seconds after a valid ES input, P2-7 is present, all control outputs will be turned off and remain off until the emergency shutdown input is no longer present. The first time that the compressor is started after the control exits the emergency shutdown mode, there will be an anti-short cycle delay followed by a random start delay. Input must be tied to common to activate.

Continuous Blower Operation - The blower output will be energized any time the control has a G input present, unless the control has an emergency shutdown input present. The blower output will be turned off when G input is removed.

Load Shed - The LS input disables all outputs with the exception of the blower output. When the LS input has been cleared, the anti-short cycle timer and random start timer will be initiated. Input must be tied to common to activate.

Controls - Aurora Base Control cont.

Aurora 'Base' Control LED Displays

These three LEDs display the status, configuration, and fault codes for the control. These can also be read in plain English via the Aurora AID Tool.

Status LED (LED3, Green)

Description of Operation	Fault LED, Green
Normal Mode	ON
Control is Non-functional	OFF
Test Mode	Slow Flash
Lockout Active	Fast Flash
Dehumidification Mode	Flash Code 2
(Future Use)	Flash Code 3
(Future Use)	Flash Code 4
Load Shed	Flash Code 5
ESD	Flash Code 6
(Future Use)	Flash Code 7

Configuration LED (LED2, Yellow)

Description of Operation	Configuration LED, Yellow
No Software Overwritten	Flashing ECM Setting
DIP Switch was Overwritten	Slow Flash
ECM Configuration Mode	Fast Flash

Fault LED (LED1, Red)

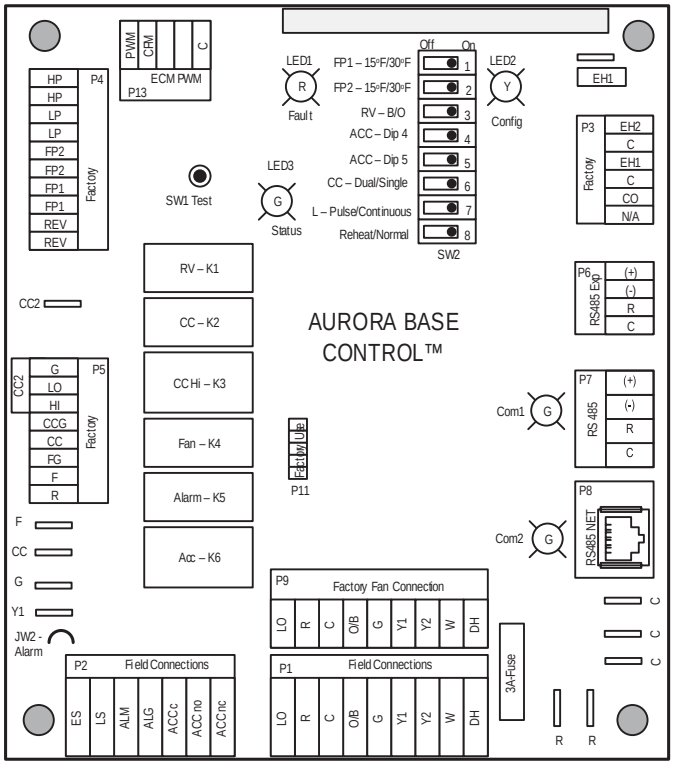
	Red Fault LED	LED Flash Code*	Lockout	Reset/ Remove
ABC Basic Faults	Normal - No Faults	OFF	–	
	Fault - Input	1	No	Auto
	Fault - High Pressure	2	Yes	Hard or Soft
	Fault - Low Pressure	3	Yes	Hard or Soft
	Fault - Freeze Detection FP2	4	Yes	Hard or Soft
	Fault - Freeze Detection FP1	5	Yes	Hard or Soft
	Fault - Condensate Overflow	7	Yes	Hard or Soft
	Fault - Over/Under Voltage	8	No	Auto
	Fault - FP1 & FP2 Sensor Error	11	Yes	Hard or Soft

NOTE: All codes >11 use long flash for tens digit and short flash for the ones digit. 20, 30, 40, 50, etc. are skipped.

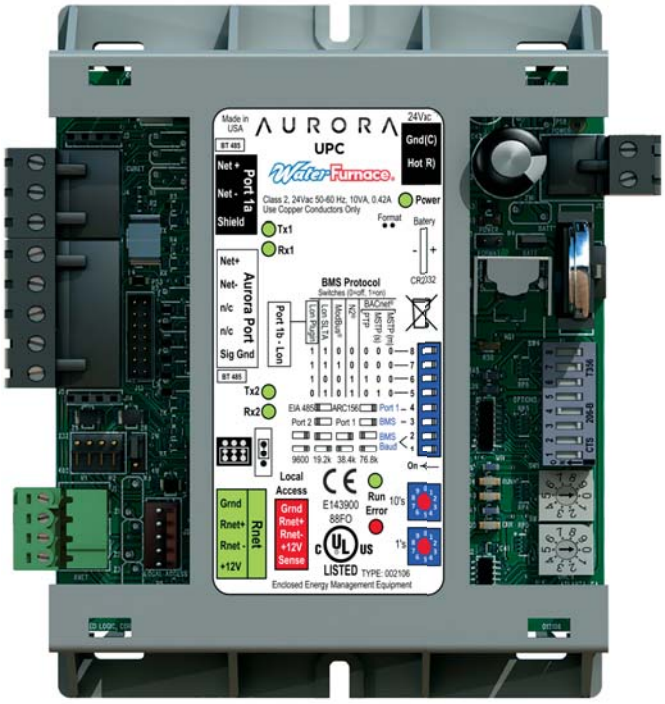
Aurora Interface and Diagnostics (AID) Tool

The Aurora Interface and Diagnostics (AID) Tool is a device that is a member of the Aurora network. The AID Tool is used to troubleshoot equipment which uses the Aurora control via Modbus RTU communication. The AID Tool provides diagnostics, fault management, ECM setup, and system configuration capabilities to the Aurora family of controls. An AID Tool is recommended, although not required, for ECM airflow settings. The AID Tool simply plugs into the exterior of the cabinet in the AID Tool port.

ABC Control Board Layout



Controls - UPC DDC Control (optional)



Aurora UPC Controller

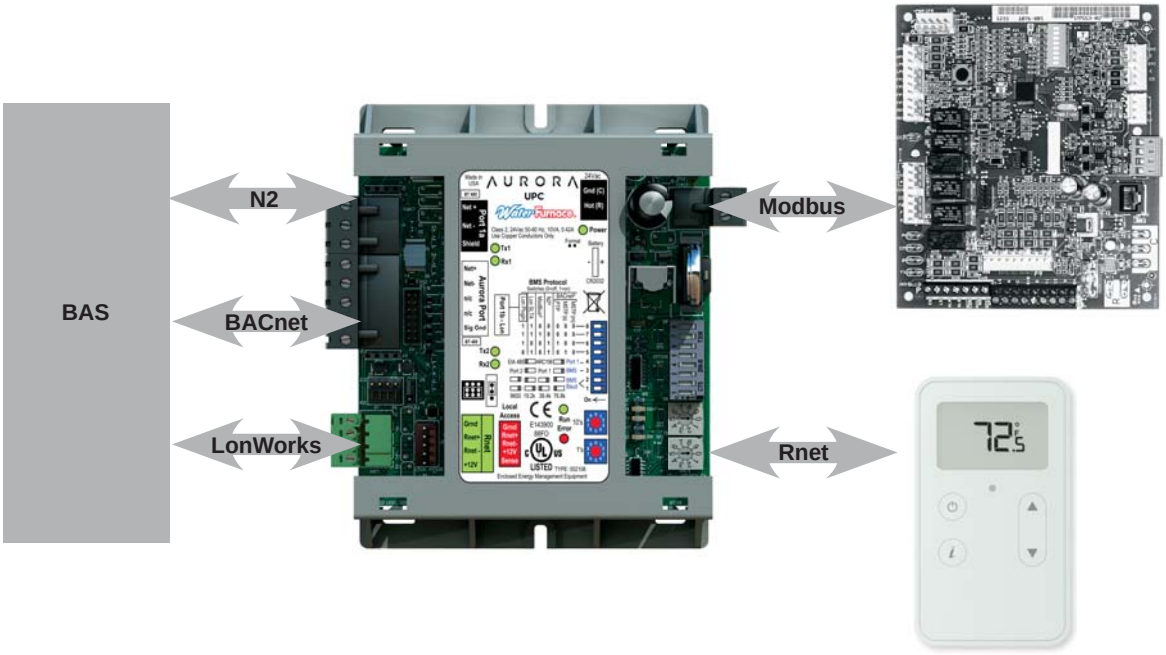
ZS Series Sensors

The Aurora Unitary Protocol Converter (UPC) is designed to add-on to any Aurora based heat pump control. The Aurora Unitary Protocol Convertor (UPC) is designed to allow water source heat pumps to be integrated into Building Automation Systems (BAS) with ease. The Aurora UPC is an integrated solution and communicates directly with the Aurora Heat Pump Controls and allows access/control of a variety of internal Aurora heat pump operations such as sensors, relay operation, faults and other information. In turn, the UPC then converts internal Aurora Modbus protocol to BACnet MS/TP, LON, or N2 protocols and communicates to the BAS system. This provides the great benefit of complete control integration and a myriad of information available to the BAS from the heat pump control. Plus it also allows individual unit configuration such as ECM fan speeds or freeze protection setting directly over the BAS without the need for access to the actual heat pump. The Aurora UPC is programmed using the powerful Eikon object oriented.

The Aurora UPC is implemented with the Aurora Base Controller (ABC) heat pump control into our latest water source heat pumps. This will allow for a BAS to integrate and communicate to the heat pump thru a choice of 3 different communication protocols. The Aurora UPC has the ability to communicate BACnet MS/TP, N2 open, or LonWorks (requires LON Plugin card). This flexibility is possible due to the onboard dipswitches which allow for the desired protocol and baud rate to be selected in the field. All zone temperatures and zone sensors are connected to the UPC on an RNet bus, simplifying hook up at the unit. RNet sensors can include a combination of zone temperature and humidity, CO2, and VOC sensors. The UPC includes built-in support for a custom configurable keypad/display unit - BACview6 (4-line by 40 character per line display) or BACview5 (2-line by 16 character per line display). Up to 2 Keypad/display units can be mounted remotely for configuration and troubleshooting.

There are an extensive number of points that the UPC has available over the network for integration into the BAS. Control programmers need to carefully determine which points they want to add into the BAS database. A list of the BACnet points, N2 points, and LON SNVTs are available along with their individual point descriptions by contacting the Commercial Solutions Group at 1-877-677-4420.

Controls - UPC DDC Control (optional) cont.



Aurora UPC Features

- Rugged enclosure made of GE C2950 Cycoloy plastic
- Built-in surge transient protection circuitry
- Operating range of -29°C to 60°C; 10 to 95% relative humidity, non-condensing
- Onboard CR123A battery has a life of 10 years with 720 hours of cumulative power outage
- Multi-Protocol field selectable communication port that supports:
  - EIA-485 BACnet MS/TP @ 9600, 19.2k, 38.4k, 76.8k baud
  - Metasys N2 Open
  - LonWorks TP/FT-10 (Requires optional LON plug-in communication card)
- Status of all unit operating conditions and fault lockouts
- Visual LED's for status of power, network communication, processor operation, and errors
- Provides gateway into Aurora heat pump controls for unsurpassed control flexibility
  - Network point for commanding unit into load shed
  - Network point for commanding unit into emergency shutdown
  - Network points to assist in fan speed selection
  - Network points for freeze protection settings
- Heating and cooling control from a remotely located zone sensor
- Rnet communication port which allows for multiple Rnet zone sensors (5) to be connected for space temperature averaging if desired.
- Local laptop or BACview connection for field service
- FCC, UL and CE listed. BTL Certification is pending

Aurora UPC Optional Features

- BACview handheld display, needed for field configuration of fan speeds, set points, etc.
- AID Tool for Aurora ABC configuration and troubleshooting.
- Aurora Advanced Control adds the Aurora AXB expansion board and provides added I/O and standard features
- Optional Sensor Kits (requires Aurora Advanced Control with AXB - Future Availability on Select Models/Configurations)
  - **Refrigeration Monitoring –** provides Suction and discharge pressure, Suction, liquid line temps and superheat and subcooling.
  - **Performance Monitoring –** provides entering and leaving loop water temperatures, loop flow rate as well as heat of extraction or rejection rate into the loop.
  - **Energy Monitoring –** provides real-time power measurement (Watt) of compressor, fan, auxiliary heat and zone pump.
- Graphics packages available in the future

Controls - UPC DDC Control (optional) cont.

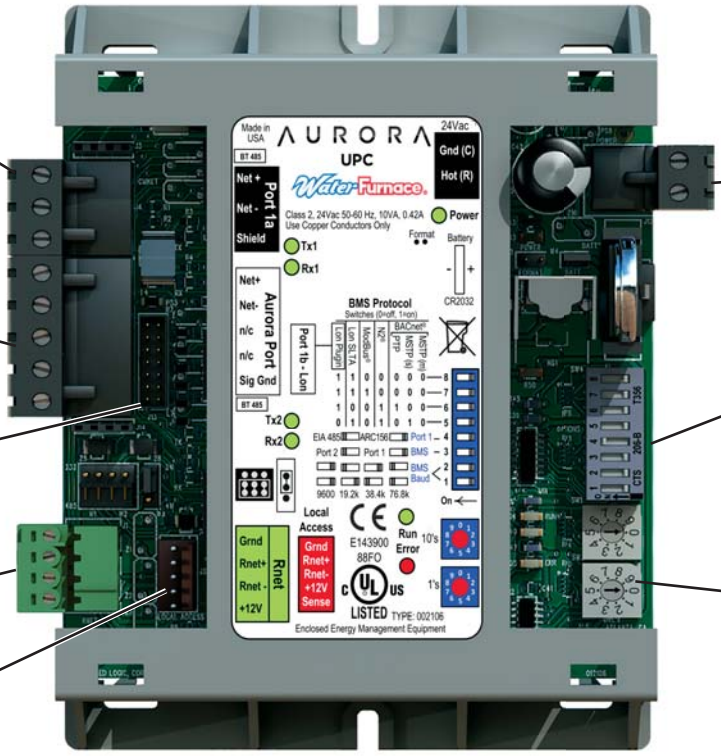
Port 1a is used to communicate to the Building Automation System (BAS). This port's settings are configured through the onboard dip switches.

Port 2 is used to communicate to the Aurora Base Controller (ABC).

Port 1b is used for the LonWorks plugin.

Rnet port is used for communicating zone sensors.

BACview or local laptop connection.



24Vac

Dip switches for configuring the communication port protocol and baud rate for the BAS port.

Mac address is set by 2 rotary dials.

Aurora Touch Interface

Utilizing a touch-screen interface, the UPC provides a technician the ability to configure and diagnose equipment at the unit or from any room sensor for added accessibility and simpler troubleshooting. The technician will have full access to equipment status, parameter values, temperature, and humidity sensing as well as access to alarm and trend history. With website-like navigation, the Aurora Touch Interface is easy to use and provides important insight into the system so your building can operate as efficiently as possible.

Aurora UPC Smart Tablet Option

A smart tablet option is also available. Purchase a smart tablet accessory cable from WaterFurnace and download the OEMCtrl App and connect to the unit either at the unit itself or via the zone sensor. This means connecting to the unit to adjust fan speeds, check on fault etc. as easily as walking up to the zone sensor without the need for accessing ceiling tiles or a stepladder.

Controls - UPC DDC Control (optional) cont.

1. ***Leaving Air Temperature (LAT) Sensor –*** This 10 kOhm NTC sensor is factory installed on all UPC equipped heat pumps. It typically is attached to wiring inside the blower cabinet on the suction side of the blower. This sensor is attached on ABC FP2 pins available as LAT AU-30.

1. ***Compressor Proving Sensors –*** This optional factory installed current sensor is connected to confirm compressor operation via the power wires. The sensor is attached at ABC Y1 and available at point BV-65.

1. ***Valve End Switch –*** This optional input is setup for a field installed flow valve end switch. This end switch input is attached at ABC Y2 and available at point BV-67.

1. ***Fan Proving Sensors –*** This optional factory installed current sensor is connected to confirm fan operation via the power wires. The sensor is attached at ABC G and available at point BV-33.

1. ***Occupancy Sensor -*** This standard feature includes a field installed and wired room sensor with occupancy sensor typically found in DDC systems. The RNet room sensors can be found thru your commercial representative. The occupancy Sensors are attached at ABC 0 and can be found at point BV-49.

1. ***Dirty Filter Switch –*** This optional field installed switch is connected to confirm dirty filter operation. The dirty filter switch can be found thru your commercial representative. The sensor is attached at ABC W and available at point BV-63.

2. ***Fault, Configuration, and Status Codes –*** The codes can be visible to the BAS if desired

Aurora Base Fault Codes (ABC Only)

Fault LED (LED1, Red)

	Red Fault LED	LED Flash Code*	Lockout	Reset/ Remove
ABC Basic Faults	Normal - No Faults	OFF	–	
	Fault - Input	1	No	Auto
	Fault - High Pressure	2	Yes	Hard or Soft
	Fault - Low Pressure	3	Yes	Hard or Soft
	Fault - Freeze Detection FP2	4	Yes	Hard or Soft
	Fault - Freeze Detection FP1	5	Yes	Hard or Soft
	Fault - Condensate Overflow	7	Yes	Hard or Soft
	Fault - Over/Under Voltage	8	No	Auto
	Fault - FP1 & FP2 Sensor Error	11	Yes	Hard or Soft

NOTE: All codes >11 use long flash for tens digit and short flash for the ones digit. 20, 30, 40, 50, etc. are skipped.

Aurora Advanced Fault Codes (ABC + AXB Expansion Board)

Fault LED (LED1, Red)

	Red Fault LED	LED Flash Code *	Lockout	Reset/ Remove	Fault Condition Summary
ABC Basic Faults	Normal - No Faults	Off	-		
	Fault-Input	1	No	Auto	Tstat input error. Autoreset upon condition removal.
	Fault-High Pressure	2	Yes	Hard or Soft	HP switch has tripped (>600 psi)
	Fault-Low Pressure	3	Yes	Hard or Soft	Low Pressure Switch has tripped (<40 psi for 30 continuous sec.)
	Fault-Freeze Detection FP2	4	Yes	Hard or Soft	Freeze protection sensor has tripped (<15 or 30 degF for 30 continuous sec.)
	Fault-Freeze Detection FP1	5	Yes	Hard or Soft	Freeze protection sensor has tripped (<15 or 30 degF for 30 continuous sec.)
	Fault-Condensate Overflow	7	Yes	Hard or Soft	Condensate switch has shown continuity for 30 continuous sec.
	Fault-Over/Under Voltage	8	No	Auto	Instantaneous voltage is out of range. **Controls shut down until resolved.
	Fault-FP1 & 2 Snsr Error	11	Yes	Hard or Soft	If FP1 or 2 Sensor Error
ABC & AXB Advanced Faults	Fault-Compressor Monitor	10	Yes	Hard or Soft	Open Crkt, Run, Start or welded cont
	Non-CriticAXBSnsrErr	13	No	Auto	Any Other Sensor Error
	CriticAXBSnsrErr	14	Yes	Hard or Soft	Sensor Error for EEV or HW
	Alert-HotWtr	15	No	Auto	HW over limit or logic lockout. HW pump deactivated.
	Fault-VarSpdPump	16	No	Auto	Alert is read from PWM feedback.
	Not Used	17	No	Auto	IZ2 Com Fault. Autoreset upon condition removal.
	Non-CritComErr	18	No	Auto	Any non-critical com error
	Fault-CritComErr	19	No	Auto	Any critical com error. Auto reset upon condition removal
	Alarm - Low Loop Pressure	21	No	Auto	Loop pressure is below 3 psi for more than 3 minutes
	Alarm - Home Automation 1	23	No	Auto	Closed contact input is present on Dig 2 input - Text is configurable
	Alarm - Home Automation 2	24	No	Auto	Closed contact input is present on Dig 3 input - Text is configurable

NOTES:
*All codes >11 use long flash for tens digit and short flash for the ones digit. 20, 30, 40, 50 etc. are skipped!
Alert' is a noncritical sensor or function that has failed. Normal operation of the heat pump is maintained but service is desired at some point.

Controls - UPC DDC Control (optional) cont.

Aurora Base or Advanced Control Configuration and Status Codes

Status LED (LED3, Green)

Description of Operation	Fault LED, Green
Normal Mode	ON
Control is Non-functional	OFF
Test Mode	Slow Flash
Lockout Active	Fast Flash
Dehumidification Mode	Flash Code 2
Load Shed	Flash Code 5
Emergency Shutdown	Flash Code 6
On Peak Mode	Flash Code 7
(Future Use)	Flash Code 8
(Future Use)	Flach Code 9

Configuration LED (LED2, Yellow)

Description of Operation	Configuration LED, Yellow
No Software Overwritten	ECM Setting
DIP Switch Overwritten	Slow Flash
ECM Configuration Mode	Fast Flash
Reset Configuration Mode	OFF

9. ***Alarm Relay –*** The Alarm relay (ALM) is factory connected to 24 VAC via jumper JW2. By cutting JW2, ABC ALM becomes a dry contact connected to ABC ALG. The Relay is field switchable between Factory setting as an Alarm output or available for other uses.
10. ***Accessory Relay1 –*** A configurable, accessory relay on the ABC is provided that can be cycled with the compressor, blower, or the Dehumidifier (DH) input. A third (factory) setting cycles the relay with the compressor but delays the compressor and blower output for 90 sec. Source pump or slow opening solenoid valves in well systems or variable speed primary pumping systems would be a prime use of this feature.

Access Relay Operation	SW2-4	SW2-5
Cycle with Blower	ON	ON
Cycle with Compressor	OFF	OFF
Water Valve Slow Opening	ON	OFF
Cycle with Comm. T-stat Hum Cmd	OFF	ON

11. ***Electric Heat EH1 –*** A digital 24VDC output is provided for electric heat powering. UPC's Default programming has EH1 set for AUX/ELEC Heat operation and will be controlled using the UPC's internal P.I.D. logic. However it can be changed by the BAS to be network controlled.
12. ***Electric Heat EH2 –*** A digital VDC output is provided for field options converted from the original EH2 output. Default UPC program has the EH2 output set for Network Control but can be changed by the BAS to be controlled by the UPC's internal P.I.D. logic.

Controls - UPC DDC Control (optional) cont.

Aurora Advanced Control Configuration and Options (Future Availability on Select Models/Configurations)

1. ***Accessory Relay2 –*** A second, configurable, accessory relay on the AXB is provided that can be cycled with the compressor 1 or 2 , blower, or the Dehumidifier (DH) input. This is to complement the Accessory 1 Relay on the ABC board.

Position	DIP 4	DIP 5	Description
1	ON	ON	Cycles with Fan or ECM (or G)
2	OFF	ON	Cycles with CC1 first stage of compressor or compressor spd 1-12
3	ON	OFF	Cycles with CC2 second stage of compressor or compressor spd 7-12
4	OFF	OFF	Cycles with DH input from ABC board

2. ***Analog Out –*** A standard 0-10VDC analog output is provided. This output can be used to drive modulating dampers etc.
3. ***Variable Speed Pump or Modulating Water Valve -*** This input and output are provided to drive and monitor a variable speed pump. The VS pump output is a PWM signal to drive the variable speed pump. The minimum and maximum level are set using the AID Tool. 75% and 100% are the default settings respectively. The VS data input allows a separate PWM signal to return from the pump giving fault and performance information. Fault received from the variable speed pump will be displayed as E16. ***Modulating Water Valve -*** This Variable speed PWM output is provided to optionally drive a modulating water valve. Through advanced design a 0-10VDC valve can be driven directly from the VS pump output. The minimum and maximum level are set in the same way as the VS pump using the AID Tool. 75% and 100% are the default settings respectively.
4. ***Loop Pump Slaving -*** This input and output are provided so that two units can be slaved together with a common flow center. When either unit has a call for loop pump, both unit's loop pump relays and variable speed pumps are energized. The flow center then can simply be wired to either unit. The output from one unit should be routed to the input of the other. If daisy chained up to 16 heat pumps can be wired and slaved together in this fashion.

Controls - UPC DDC Control (optional) cont.

Aurora Advanced Control Optional Sensor Kits (Future Availability on Select Models/Configurations)

1. ***Energy Monitoring (Standard Sensor Kit on 'Advanced' models) -*** The Energy Monitoring Kit includes two current transducers (blower and electric heat) added to the existing two compressor sensors so that the complete power usage of the heat pump can be measured. The BACview Tool provides configuration detail for the type of blower motor and a line voltage calibration procedure to improve the accuracy. This real time power usage information can be displayed on the AID Tool and is available thru network points when using BACnet or N2 Open.
   - Compressor Current 1
   - Compressor Current 2
   - Fan Current
   - Aux Heat Current
   - Pump Selection
   - Voltage
   - Compressor Watts
   - Fan Watts
   - Aux Heat Watts
   - Pump Watts (VS Only)

2. ***Refrigerant Monitoring (optional sensor kit) -*** The optional Refrigerant Monitoring Kit includes two pressure transducers, and three temperature sensors, heating liquid line, suction temperature and existing cooling liquid line (FP1). These sensors allow the measurement of discharge and suction pressures, suction and liquid line temperatures as well as superheat and subcooling. This information can be displayed on the BACview Tool, or the network when using BACnet and N2.
   - Htg Liquid Line
   - Clg Liquid Line
   - Discharge pressure
   - Suction Pressure
   - Discharge Saturated Temp
   - Suction Saturated Temperature
   - Superheat
   - SubCooling

3. ***Performance Monitoring (optional sensor kit) -*** The optional Performance Monitoring Kit includes: three temperature sensors, entering and leaving water, leaving air temperature and a water flow rate sensor. With this kit, heat of extraction and rejection will be calculated. This requires configuration using the BACview Tool for selection of water or antifreeze.
   - Leaving Air Temperature (supply)
   - Alt Leaving Air Temperature (Supply)
   - Entering Water Temperature
   - Leaving Water Temperature
   - Water Flow Meter
   - Entering Air Temperature (from zone sensor)
   - Brine Selection (water/antifreeze)
   - Heat of Extraction/Rejection

Controls - UPC DDC Control (optional) cont.

ZS Series RNet Sensor Overview

The ZS Series line of intelligent zone sensors provides the function and flexibility you need to manage the conditions important to the comfort and productivity of the zone occupants. The ZS sensors are available in a variety of zone sensing combinations to address your application needs. These combinations include temperature, relative humidity, and indoor air quality (carbon dioxide or VOCs (Volatile Organic Compounds)). They are built to be flexible allowing for easy customization of what the user/technician sees. Designed to work with the Aurora UPC controllers the ZS sensor line includes the ZS Base, ZS Plus, ZS Pro and ZS Pro-F.

The UPC uses a proprietary communication called Rnet to receive the space temperature from the zone sensor. This is done using (2) 18 AWG twisted pair unshielded cables for a total of 4 wires connected to the Rnet port. The sensor gets its power from the UPC controller and connecting multiple sensors to one UPC will allow for space temperature averaging. The UPC can support one ZS Pro or ZS Pro F with up to four ZS standard sensors wired to the Rnet port on the UPC for a total of 5 zone sensors. The sensors use a precise 10k ohm thermistor with less than 0.18°F drift over a ten year span, this allows for less maintenance or re-calibration after installation. The sensors also have a hidden communication port for connecting a BACview or local laptop that provides access to the equipment for commissioning and maintenance. The table below shows the features of each of the four sensors that are currently available.

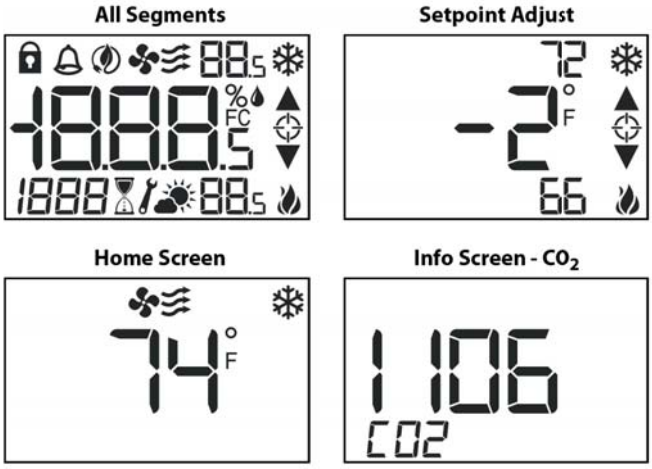
Features	ZS Base	ZS Plus	ZS Pro	ZS Pro-F
Temp, CO^2, Humidity, and VOC Options	√	√	√	√
Neutral Color	√	√	√	√
Addressable/supports daisy chaining	√	√	√	√
Hidden communication port	√	√	√	√
Mounts on a standard 2” by 4” electrical box	√	√	√	√
Occupancy Status indicator LED		√	√	√
Push button occupancy override		√	√	√
Setpoint adjust		√	√	√
Large, easy to read LCD			√	√
Alarm indicator			√	√
°F to °C conversion button				√

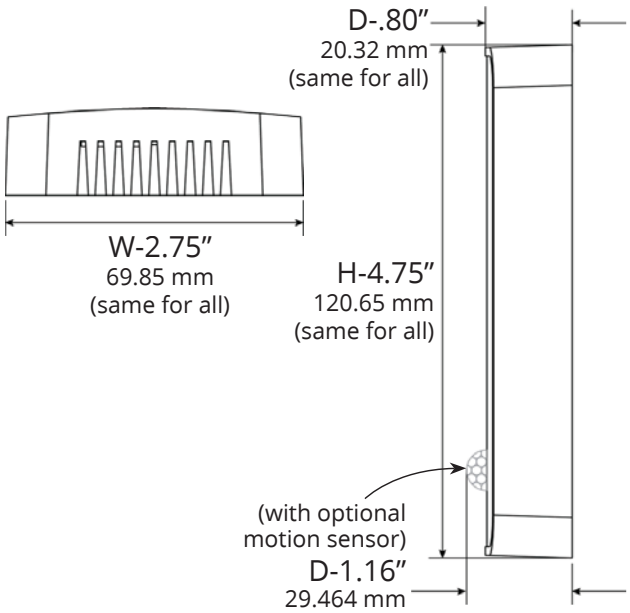
Options	Part Number	Part Number	Part Number	Part Number
Temperature Only	ZSU	ZSUPL	ZSUP	ZSUPF
Temp with CO^2	ZSU-C	ZSUPL-C	ZSUP-C	ZSUPF-C
Temp with Humidity	ZSU-H	ZSUPL-H	ZSUP-H	ZSUPF-H
Temp with Humidity, CO^2	ZSU-HC	ZSUPL-HC	ZSUP-HC	ZSUPF-HC
Temp, Humidity, VOC	ZSU-HV	ZSUPL-HV	ZSUP-HV	ZSUPF-HV
Temp with VOC	ZSU-V	ZSUPL-V	ZSUP-V	ZSUPF-V

Controls - UPC DDC Control (optional) cont.

RNet Sensor Physical and Electrical Data

Sensing Element	**Range**	**Accuracy**
Temperature (on non-Humidity models)	(-20° C to 50° C)	(0.2° C)
Temperature (on Humidity models)	(10° C to 40° C)	(0.3° C)
Humidity	10% to 90%	31.8% typical
CO2	400 to 1250 PPM 1250 to 2000 PPM	330PPM or +/-3% of reading (greater of two) 35% of reading plus 30 PPM
VOC	0 to 2,000 PPM	3100 PPM
Power Requirements	**Sensor Type**	**Power Required**
Temperature Only	All Models	12 Vdc @ 8 mA
Temperature with Humidity	All Models	12 Vdc @ 15 mA (idle) to 190 mA (CO2 measurement cycle)
Temp with VOC, or Temp/VOC/Humidity	All Models	12 Vdc @ 60 mA
Temp with CO2 , or Temp/ CO2/Humidity	All Models	12 Vdc @ 15 mA (idle) to 190 mA (CO2 measurement cycle)
Power Supply	A controller supplies the Rnet sensor network with 12 Vdc @ 210 mA. Additional power may be required for your application. See sensor ZS Installation Guide	
Communication	115 kbps Rnet connection between sensor(s) and controller 15 sensors max per Rnet network; 5 sensors max per control program	
Local Access Port	For connecting a laptop computer to the local equipment for maintenance and commissioning	
Environmental Operating Range	(0° - 50° C), 10% to 90% relative humidity, non-condensing	
Mounting Dimensions	Standard 4"x 2" electrical box using provided 6/32" x 1/2" mounting screws	



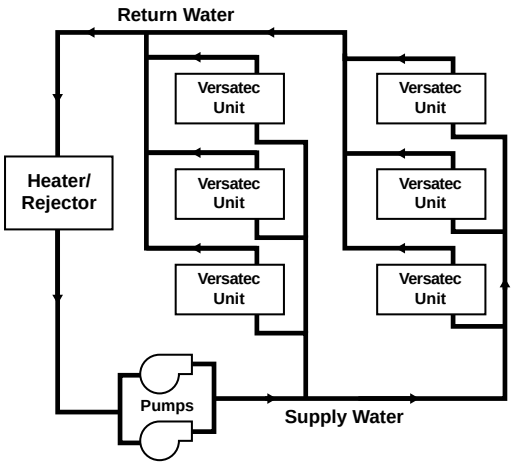


Application Notes

The Closed Loop Heat Pump Concept

The basic principle of a water source heat pump is the transfer of heat into water from the space during cooling, or the transfer of heat from water into the space during heating. Extremely high levels of energy efficiency are achieved as electricity is used only to move heat, not to produce it. Using a typical WaterFurnace Versatec Compact Series, one unit of electricity will move four to five units of heat.

When multiple water source heat pumps are combined on a common circulating loop, the ultimate in energy efficiency is created: The WaterFurnace units on cooling mode are adding heat to the loop which the units in heating mode can absorb, thus removing heat from the area where cooling is needed, recovering and redistributing that heat for possible utilization elsewhere in the system. In modern commercial structures, this characteristic of heat recovery from core area heat generated by lighting, office equipment, computers, solar radiation, people or other sources, is an important factor in the high efficiency and low operating costs of WaterFurnace closed source heat pump systems.



In the event that a building's net heating and cooling requirements create loop temperature extremes, Versatec Compact Series units have the extended range capacity and versatility to maintain a comfortable environment for all building areas. Excess heat can be stored for later utilization or be added or removed in one of three ways; by ground-source heat exchanger loops: plate heat exchangers connected to other water sources, or conventional cooler/ boiler configurations. Your WaterFurnace representative has the expertise and computer software to assist in determining optimum system type for specific applications.

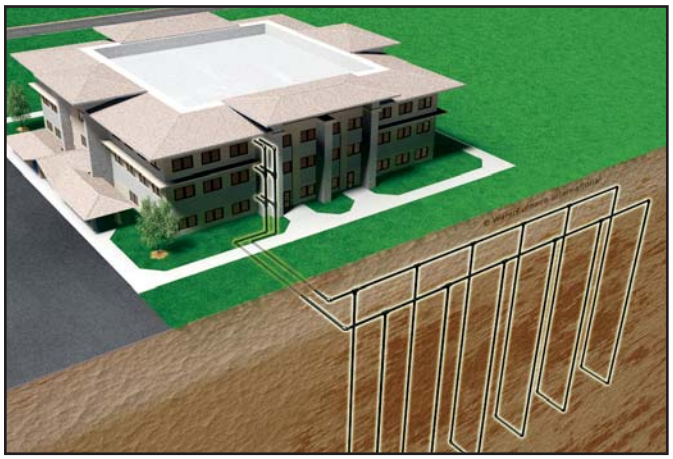
The Closed Loop Advantage

A properly applied water source heat pump system offers many advantages over other systems. First costs are low because units can be added to the loop on an "as needed basis"- perfect for speculative buildings. Installed costs are low since units are self-contained and can be located adjacent to the occupied space, requiring minimal ductwork. Maintenance can be done on individual units without system shut-down. Conditions remain comfortable since each unit operates separately, allowing cooling in one area and heating in another. Tenant spaces can be finished and added as needed. Power billing to tenants is also convenient since each unit can be individually metered: each pays for what each uses. Nighttime and/or weekend uses of certain areas are possible without heating or cooling the entire facility. A decentralized system also means if one unit should fault, the rest of the system will continue to operate normally, as well as eliminating air cross-contamination problems and expensive high pressure duct systems requiring an inefficient electric resistance reheat mode.

The Versatec Compact Approach

There are a number of proven choices in the type of Versatec Compact Series system which would be best for any given application. Most often considered are:

Vertical - Closed Loop/Ground Source



• ***Closed Loop/Ground-Source Systems*** utilize the stable temperatures of the earth to maintain proper water source temperatures (via vertical or horizontal closed loop heat exchangers) for Versatec Compact Series extended range heat pump system. Sizes range from a single unit through many hundreds of units. When net cooling requirements cause closed loop water temperatures to rise, heat is dissipated into the cooler earth through buried high strength plastic pipe "heat exchangers." Conversely if net space heating demands cause loop heat absorption beyond that heat recovered from building core areas, the loop temperature will fall causing heat to be extracted from the earth. Due to the extended loop temperatures, BS EN14511-2 Ground Loop Heat Pumps are required for this application. Because auxiliary equipment such as a fossil fuel boiler

Application Notes cont.

and cooling tower are not required to maintain the loop temperature, operating and maintenance costs are very low.

Ground-source systems are most applicable in residential and light commercial buildings where both heating and cooling are desired, and on larger envelope dominated structures where core heat recovery will not meet overall heating loads. Both vertical and horizontally installed closed-loops can be used. The land space required for the "heat exchangers" is 2.7-6.8 m^2/kW on vertical (drilled) installations and 20.4-40.8 m^2/kW for horizontal (trenched) installations. Closed loop heat exchangers can be located under parking areas or even under the building itself.

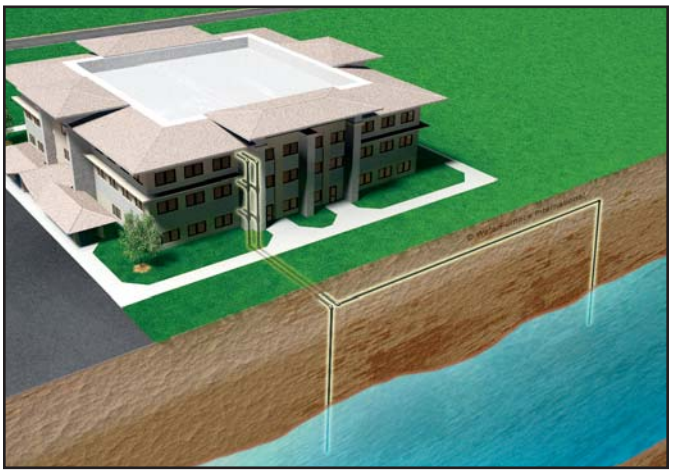
On large multi-unit systems, sizing the closed loop heat exchanger to meet only the net heating loads and assisting cooling loads with a closed circuit cooling tower may be the most cost effective choice.

Surface Water - Closed Loop/Ground Source

• ***Closed Loop/Ground-Source Surface Water Systems*** also utilize the stable temperatures of Surface Water to maintain proper water source temperatures for Versatec Compact Series extended range heat pump systems. These systems have all of the advantages of horizontal and vertical closed loop systems. Due to the extended loop temperatures, BS EN 14511-2 Ground Water or Ground Loop Heat Pumps are required for this application.

In cooling dominated structures, the ground-source surface water systems can be very cost effective especially where local building codes require water retention ponds for short term storage of surface run-off. Sizing requirements for the surface water is a minimum of 13.6 m^2/kW of surface area at a minimum depth of 2.4 meters. WaterFurnace should be contacted when designs for heating dominated structures are required.

Plate Heat Exchanger - Closed Loop/Ground Water



• ***Closed Loop/Ground Water Plate Heat Exchanger Systems*** utilize lake, ocean, well water or other water sources to maintain closed loop water temperatures in multi-unit Versatec Compact systems. A plate frame heal exchanger isolates the units from any contaminating effects of the water source, and allows periodic cleaning of the heat exchanger during off peak hours.

Operation and benefits are similar to those for ground-source systems. Due to the extended loop temperatures, BS EN 14511-2 Ground Loop Heat Pumps are required for this application. Closed loop plate heat exchanger systems are applicable in commercial, marine, or industrial structures where the many benefits of a water source heat pump system are desired, regardless of whether the load is heating or cooling dominated.

Application Notes cont.

Cooler/Boiler - Closed Loop

• ***Closed Loop /Cooler-Boiler Systems*** utilize a closed heat recovering loop with multiple water source heat pumps in the more conventional manner. Typically a boiler is employed to maintain closed loop temperatures above 16°C and a cooling tower to maintain loop temperatures below 32°C. These systems are applicable in medium to large buildings regardless of whether the load is heating or cooling dominated. Due to the moderate loop temperatures, BS EN 14511-2 Water Loop Heat Pumps are required for this application.

Water Quality

In ground water situations where scaling could be heavy or where biological growth such as iron bacteria will be present, a closed loop system is recommended. The heat exchanger coils in ground water systems may, over a period of time, lose heat exchange capabilities due to a buildup of mineral deposits inside. These can be cleaned, but only by a qualified service mechanic, as special solutions and pumping equipment are required. Hot water generator coils can likewise become scaled and possibly plugged. In areas with extremely hard water, the owner should be informed that the heat exchanger may require occasional flushing. Failure to adhere to the guidelines in the water quality table could result in loss of warranty.

Units with cupronickel heat exchangers are recommended for open loop applications due to the increased resistance to build-up and corrosion, along with reduced wear caused by acid cleaning.

Material		Copper	90/10 Cupronickel	316 Stainless Steel
pH	**Acidity/Alkalinity**	7 - 9	7 - 9	7 - 9
Scaling	Calcium and Magnesium Carbonate	(Total Hardness) less than 350 ppm	(Total Hardness) less than 350 ppm	(Total Hardness) less than 350 ppm
Corrosion	Hydrogen Sulfide	Less than 0.5 ppm (rotten egg smell appears at 0.5 ppm)	10 - 50 ppm	Less than 1 ppm
	Sulfates	Less than 125 ppm	Less than 125 ppm	Less than 200 ppm
	Chlorine	Less than 0.5 ppm	Less than 0.5 ppm	Less than 0.5 ppm
	Chlorides	Less than 20 ppm	Less than 125 ppm	Less than 300 ppm
	Carbon Dioxide	Less than 50 ppm	10 - 50 ppm	10 - 50 ppm
	Ammonia	Less than 2 ppm	Less than 2 ppm	Less than 20 ppm
	Ammonia Chloride	Less than 0.5 ppm	Less than 0.5 ppm	Less than 0.5 ppm
	Ammonia Nitrate	Less than 0.5 ppm	Less than 0.5 ppm	Less than 0.5 ppm
	Ammonia Hydroxide	Less than 0.5 ppm	Less than 0.5 ppm	Less than 0.5 ppm
	Ammonia Sulfate	Less than 0.5 ppm	Less than 0.5 ppm	Less than 0.5 ppm
	Total Dissolved Solids (TDS)	Less than 1000 ppm	1000 - 1500 ppm	1000 - 1500 ppm
	LSI Index	+0.5 to -0.5	+0.5 to -0.5	+0.5 to -0.5
Iron Fouling (Biological Growth)	Iron, FE^{2}+ (Ferrous) Bacterial Iron Potential	< 0.2 ppm	< 0.2 ppm	< 0.2 ppm
	Iron Oxide	Less than 1 ppm, above this level deposition will occur	Less than 1 ppm, above this level deposition will occur	Less than 1 ppm, above this level deposition will occur
Erosion	Suspended Solids	Less than 10 ppm and filtered for max. of 600 micron size	Less than 10 ppm and filtered for max. of 600 micron size	Less than 10 ppm and filtered for max. of 600 micron size
	Threshold Velocity (Fresh Water)	< 1.8 m/sec	< 1.8 m/sec	< 1.8 m/sec

NOTES: Grains = ppm divided by 17
mg/L is equivalent to ppm

2/22/12

Installation Notes

Typical Unit Installation

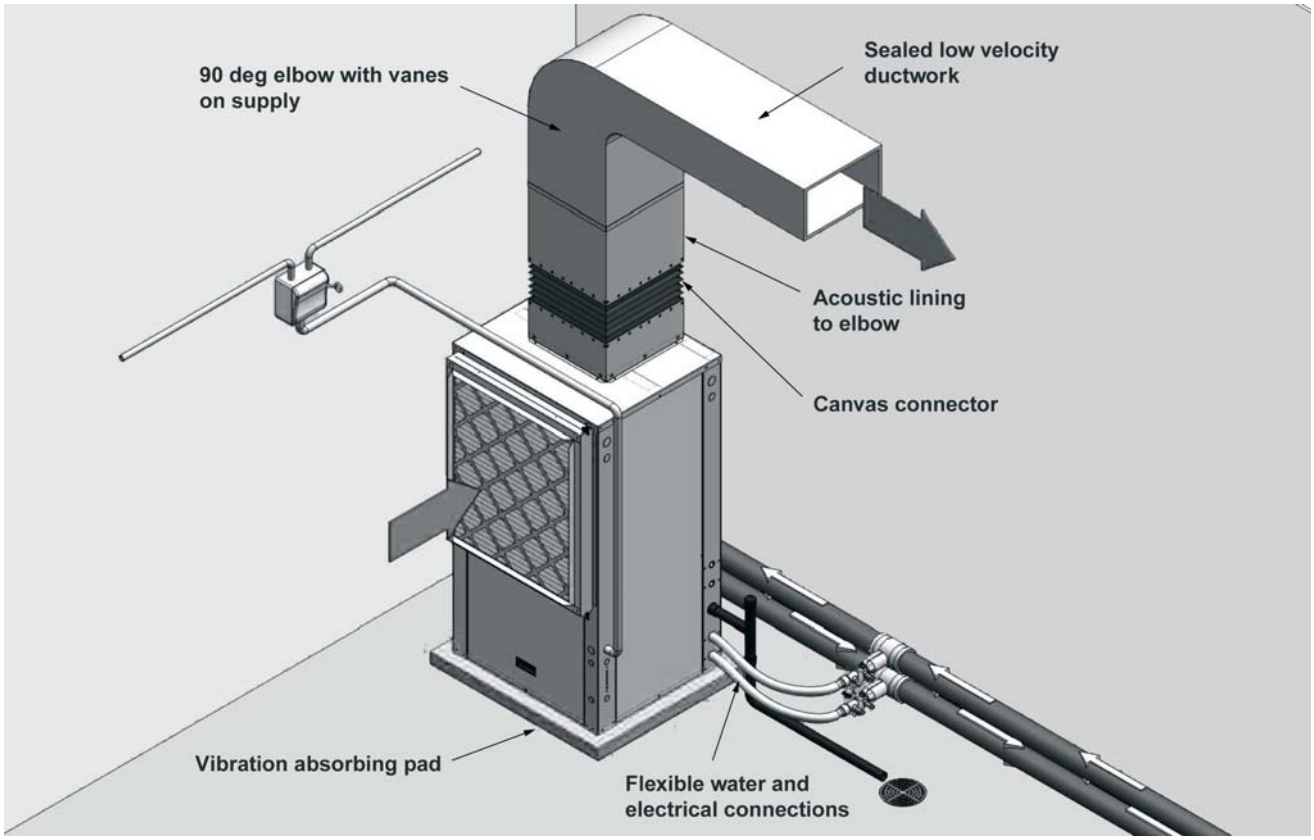
Unit Location

Locate the unit in an indoor area that allows for easy removal of the filter and access panels. Location should have enough space for service personnel to perform maintenance or repair. Provide sufficient room to make water, electrical and duct connection(s). If the unit is located in a confined space, such as a closet, provisions must be made for return air to freely enter the space by means of a louvered door, etc. Any access panel screws that would be difficult to remove after the unit is installed should be removed prior to setting the unit. On horizontal units, allow adequate room below the unit for a condensate drain trap and do not locate the unit above supply piping. Care should be taken when units are located in unconditioned spaces to prevent damage from frozen water lines and excessive heat that could damage electrical components.

Water Piping

Piping is usually design as 'reverse return' to equalize flow paths through each unit. A short flexible pressure rated hose is used to make connection to the fixed building piping system. This hose is typically stainless steel braid and includes a swivel fitting on one end for easy removal and is flexible to help isolate the unit for quieter operation. Isolation valves for servicing, y-strainers for filtering and memory-stop flow valve or a balancing valve can be provided for consistent water flow through the unit.

All unit source water connections are fittings that accept a male pipe thread (MPT). Insert the connectors by hand, then tighten the fitting with a wrench to provide a leakproof joint. The open and closed loop piping system should include pressure/temperature ports for serviceability. The proper water flow must be provided to each unit whenever the unit operates. To assure proper flow, use pressure/temperature ports to determine the flow rate. These ports should be located at the supply and return water connections on the unit. The proper flow rate cannot be accurately set without measuring the water pressure drop through the refrigerant-to-water heat exchanger. Never use flexible hoses smaller than the inside diameter of the water connection at the unit. Limit hose length to 3 meters per connection. Check carefully for water leaks.



Installation Notes cont.

Installing Horizontal Units

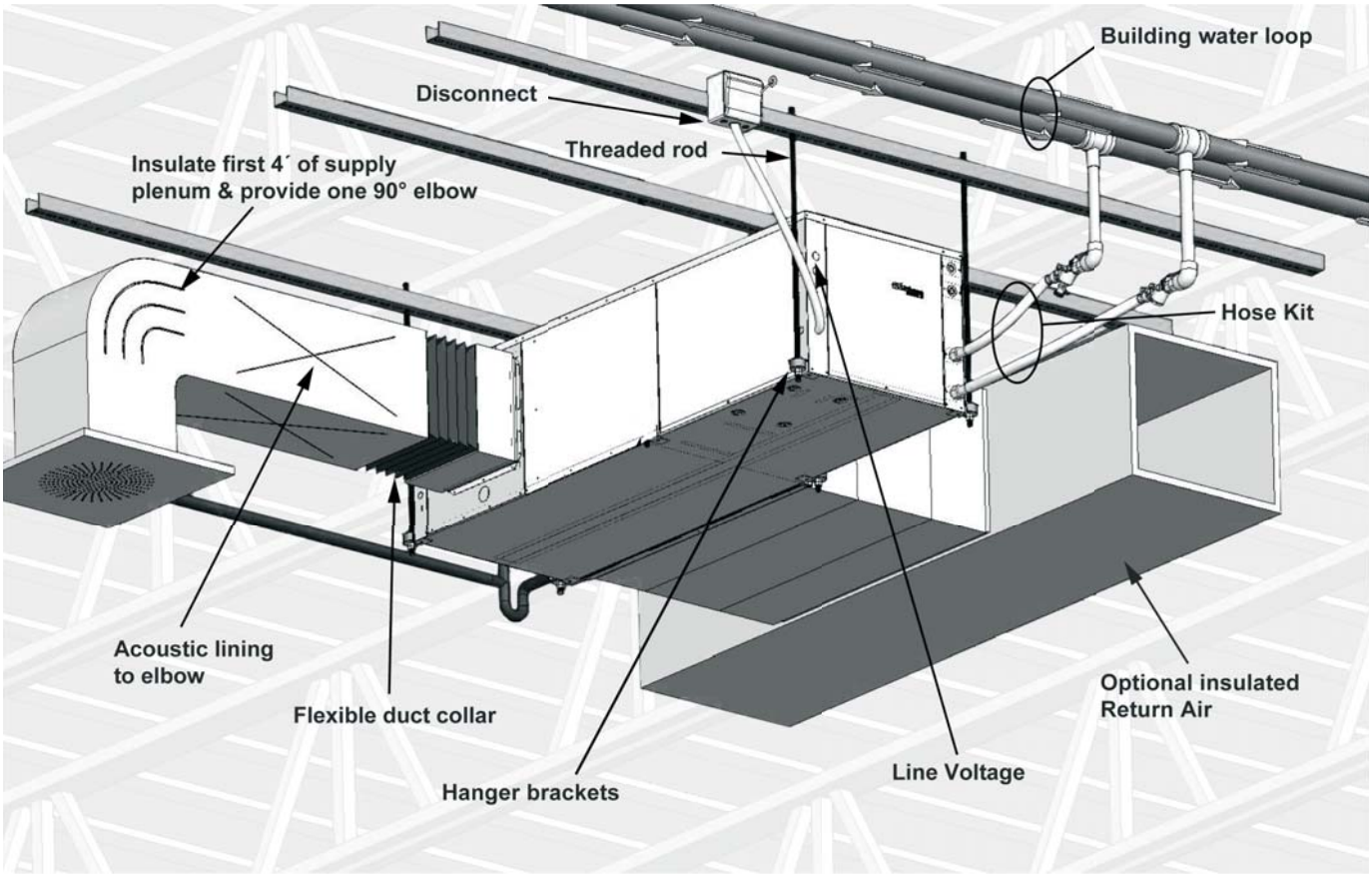
Remove and discard the compressor hold down shipping bolt or screw located at the front or side (side, horizontal only) of the compressor mounting bracket prior to setting the unit in place. Horizontal units are available with side or end discharge.

NOTE: Left (Right) Return Side Discharge cannot be converted to Left (Right) Return End Discharge or vice versa, without additional custom sheet metal parts. Horizontal units are normally suspended from a ceiling by four 9.5 mm diameter threaded rods. The rods are usually attached to the unit by hanger bracket kits furnished with each unit.

Lay out the threaded rods per the Hanger Bracket Dimensions table. Assemble the hangers to the unit as shown. Securely tighten the brackets to the unit using the weld nuts located on the underside of the bottom panel. When attaching the hanger rods to the bracket, a double nut is required since vibration could loosen a single nut. To allow filter access, install hanger brackets as illustrated in the Hanger Bracket Locations section. The unit should be pitched approximately 6.35 mm towards the drain in both directions to facilitate the removal of condensate. Use only the bolts provided in the kit to attach hanger brackets. The use of longer bolts could damage internal parts.

Some applications require the installation of horizontal units on an attic floor. In this case, the unit should be set in a full size secondary drain pan on top of a vibration absorbing pad. The secondary drain pan prevents possible condensate overflow or water leakage damage to the ceiling. The secondary drain pan is usually placed on a plywood base isolated from the ceiling joists by additional layers of vibration absorbing material.

CAUTION: Do not use rods smaller than 9.5 mm diameter since they may not be strong enough to support the unit. The rods must be securely anchored to the ceiling.



Installation Notes cont.

Acoustical Considerations and Equipment Sound Performance

Sound Performance

The Versatec Compact Series is third party sound rated in accordance with ARI 260. Please consult WaterFurnace Sound Performance Data Catalog for details on the AHRI standard and sound performance data.

Recommendations for Noise Reduction

Horizontal Unit Location

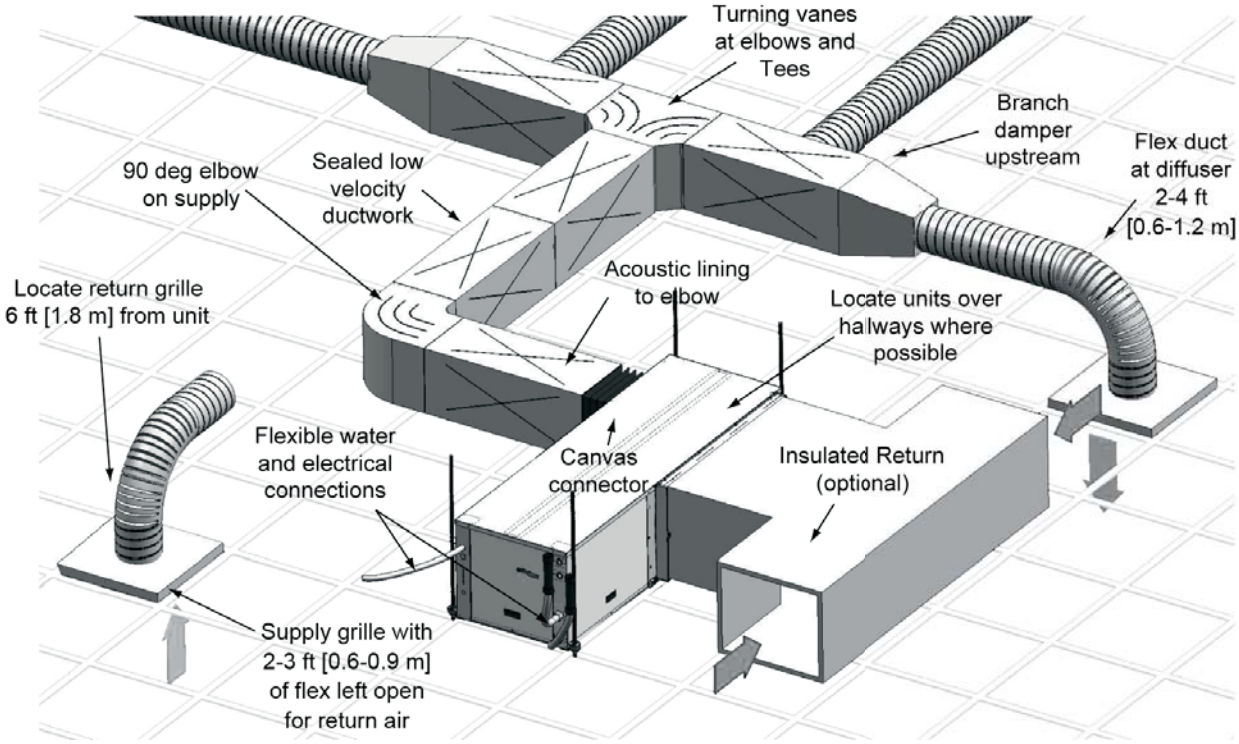
- Specify equipment with quietest sound power ratings
- Do not locate units above areas with a required NC 40 or less
- Space WSHP at least 3m apart to avoid noise summing of multiple units in a space.
- Maximize the height of the unit above the ceiling (horizontal).
- Suspend unit with isolation grommets that are appropriately rated to reduce vibrations (horizontal).

Vertical Unit Location

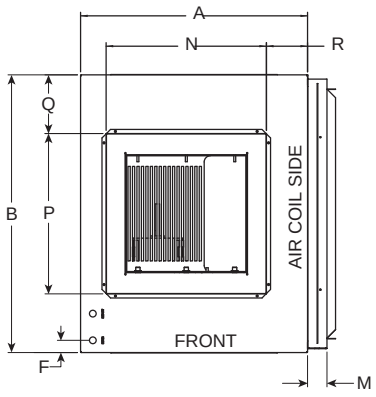
- Specify equipment with quietest sound power ratings
- Space WSHP at least 3m apart to avoid noise summing of multiple units in a space.
- Acoustic ceiling coatings can greatly reduce noise levels in mechanical rooms.
- Mount unit on a sound absorbing pad, extruded polystyrene, rubber or cork pad.

Ductwork

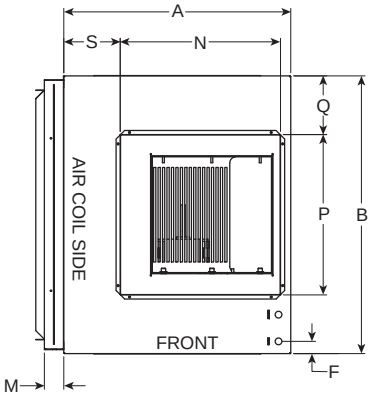
- Ensure return air grilles will not allow line of site noise to transfer to adjacent space. Use a sound barrier or some other material to isolate the grille from the unit. A supply grille, boot and short piece of flex duct pointed away from the unit can greatly attenuate equipment noise.
- Use a canvas isolation duct connector at the supply and return duct connection of the unit.
- Internally line the discharge and return duct within the first 1.2-2.4 m of unit with acoustic insulation. Install an internally lined 'L' shaped return duct elbow at return grille. Face the elbow away from adjacent units.
- Always install at least one 90° elbow in the discharge duct to eliminate line of sight noise transmission of the blower.
- Use turning vanes at all elbows and tees to reduce turbulence.
- Limit supply duct velocities to less than 1,000 fpm
- Design and install ductwork as stiff as possible
- Allow 3 duct diameters both up and down stream of the unit before any fittings or transitions are installed.
- Use duct sealant on all duct joints.
- Install a short 0.6-1.2 m of flex duct on all branch ducts just prior to discharge boot or diffuser to reduce vibration and duct sound prior to delivery in the room.
- Locate the branch duct balancing damper as far away from the diffuser as possible.
- In ceiling plenum systems, install an internally lined 'L' shaped return duct elbow at unit. Face the elbow away from adjacent units (horizontal).



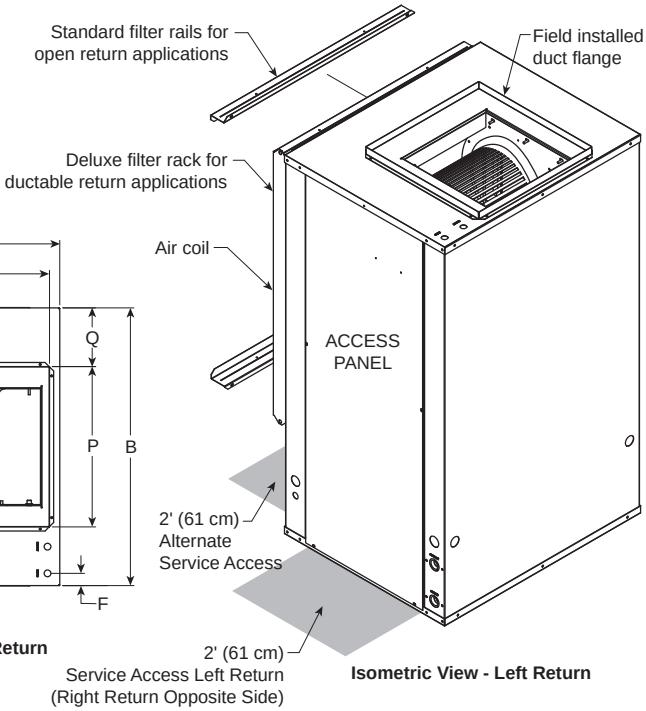
Vertical Dimensional Data



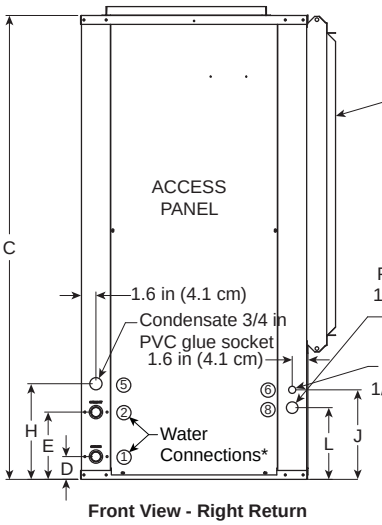
Top View - Right Return



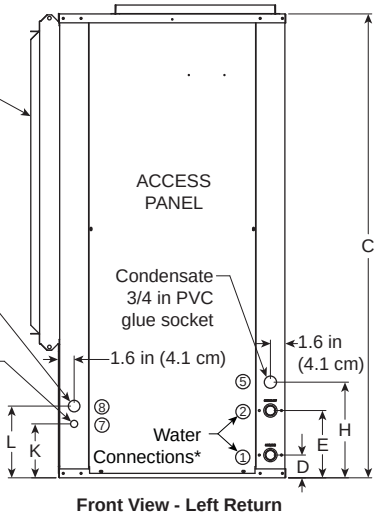
Top View - Left Return



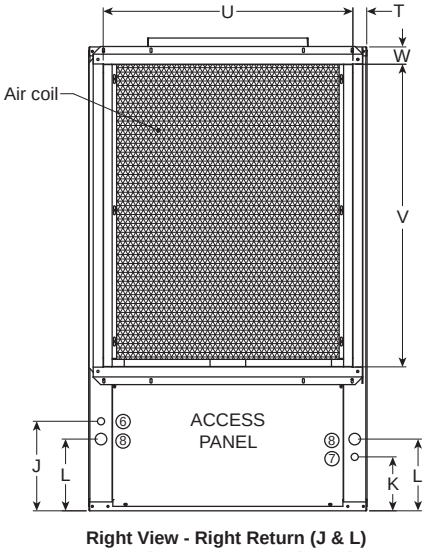
Isometric View - Left Return



Front View - Right Return



Front View - Left Return



Right View - Right Return (J & L)
Left View - Left Return (K & L)

NOTE: * Water connections protrude approximately 3.81 cm from cabinet et.

Vertical Dimensional Data cont.

Vertical Models		Overall Cabinet			Water Connections				Electrical Knockouts			
					1	2	5	Loop	6	7	8	
									J	K	L	
		A	B	C	D	E	H		1/2" (1.27cm) cond	1" (2.54cm) cond	1" (2.54cm) cond	M
		Width	Depth	Height*	In	Out	Condensate	Water FPT	Low Voltage	Low Voltage	Power Supply	Filter Rack Width
002-003	cm.	48.8	48.8	61.5	6.6	14.2	22.4	12.7 mm	18.8	8.6	13.7	5.6
005	cm.	57.2	56.4	76.7	6.6	19.3	27.4	19.1 mm	23.9	13.7	18.8	5.6
006-007	cm.	57.2	56.4	91.9	6.6	19.3	27.4	19.1 mm	23.9	13.7	18.8	5.6
009	cm.	57.2	66.5	102.1	6.6	19.3	27.4	19.1 mm	25.7	15.5	20.6	5.6
010-012	cm.	57.2	66.5	112.3	6.6	19.3	27.4	19.1 mm	25.7	15.5	20.6	5.6
015	cm.	64.8	79.2	112.3	6.6	19.3	27.4	25.4 mm	25.7	15.5	20.6	5.6
017	cm.	64.8	79.2	122.4	6.6	19.3	27.4	25.4 mm	25.7	15.5	20.6	5.6

Vertical Models		Discharge Connection duct flange installed (30.25 cm)					**Return Connection using deluxe filter rack (30.25 cm)			
		N	P	Q	R	S	T	U	V	W
		Supply Width	Supply Depth					Return Depth	Return Height	
002-003	cm.	25.4	25.4	11.7	11.2	19.8	6.1	36.3	25.7	5.1
005	cm.	35.6	35.6	10.4	10.9	19.6	5.3	46.0	35.6	5.1
006-007	cm.	35.6	35.6	10.4	10.9	19.6	5.3	46.0	50.8	5.1
009	cm.	35.6	35.6	15.5	11.4	19.6	5.3	56.1	56.1	5.1
010-012	cm.	45.7	45.7	10.4	5.3	9.9	5.3	56.1	66.3	5.1
015	cm.	45.7	45.7	16.8	11.7	16.0	4.1	71.4	66.0	5.1
017	cm.	45.7	45.7	16.8	11.7	16.0	4.1	71.4	76.2	5.1

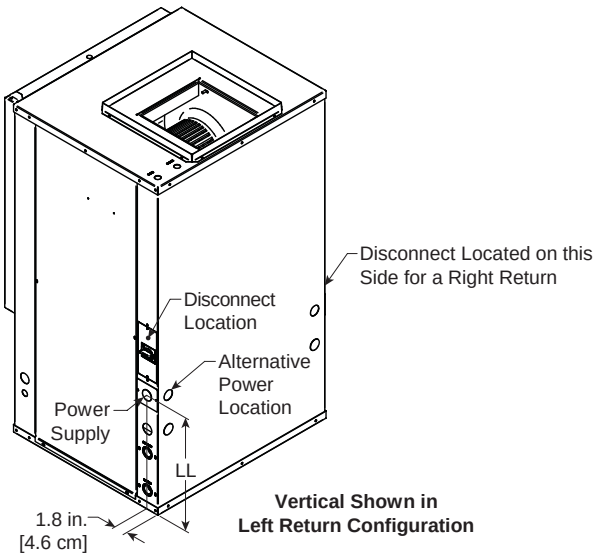
Condensate is 3/4" PVC female glue socket and is switchable from side to front. 2/18/18
*Discharge flange is field installed and extends 1" (25.4 mm) from top of cabinet.
**Vertical units shipped with standard 2" (field adjustable to 1") open application filter rack extending 2.2" from unit and is not suitable for duct connection,
For ductable return connection applications, order the deluxe 2" (field adjustable to 1") duct collar/filter rack which extends 3.25" from the unit and is suitable for duct connections.

Vertical Disconnect

When using disconnect, do not use dimension L from the standard vertical dimensional data. Use dimension LL from the vertical disconnect dimensional data.

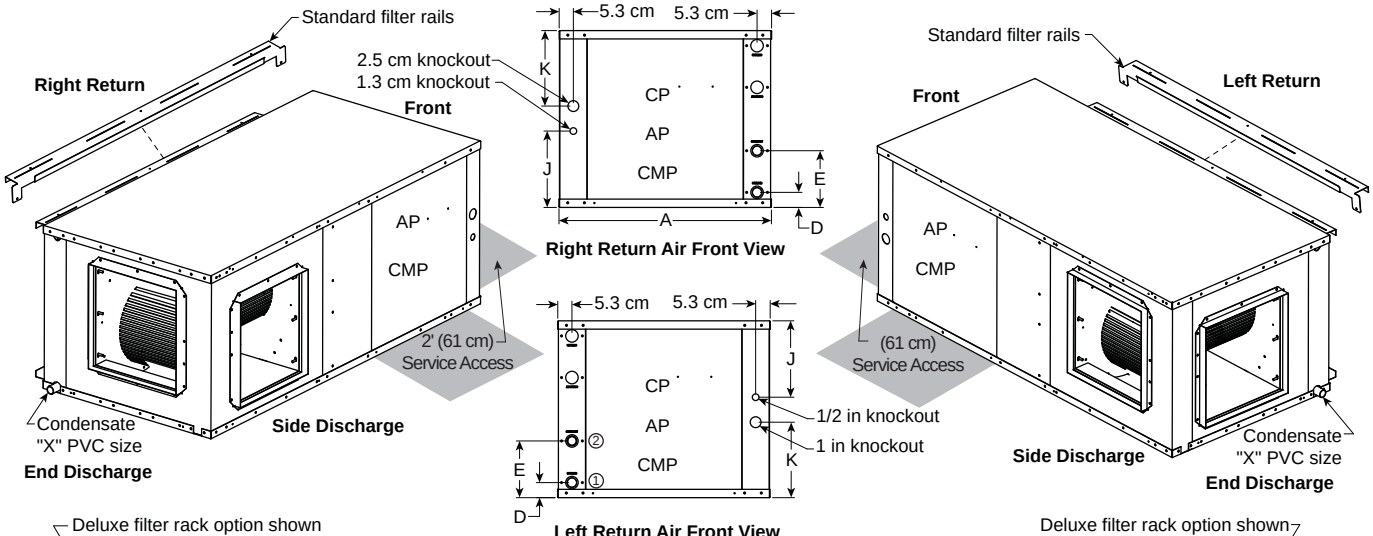
Vertical Models	LL
002-003	[16.5]
005	[40.1]
006-007	[47.8]
009	[38.9]
010-012	[35.1]
015	[36.3]
017	[36.3]

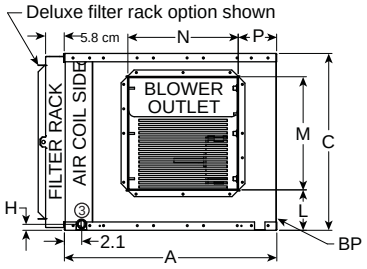
Dimensions in cm



Vertical Shown in Left Return Configuration

Horizontal Dimensional Data

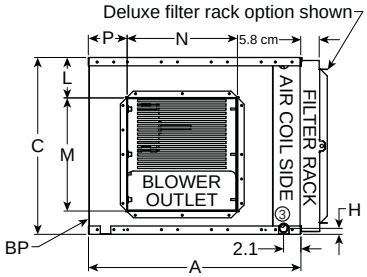




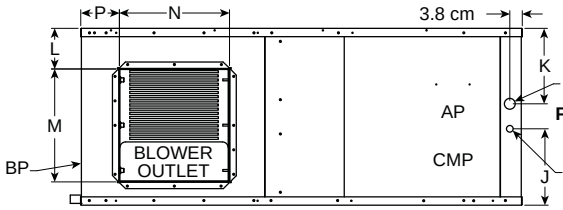
Right Return
End Discharge

Legend

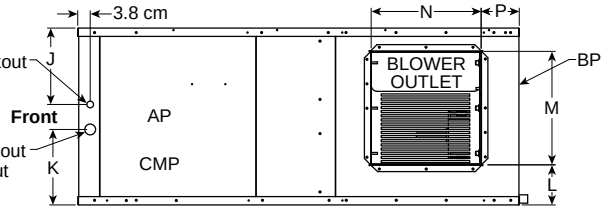
AP = Alternate Service Panel
BP = Blower Service Panel
CP = Control Access Panel
CMP = Compressor Service Panel



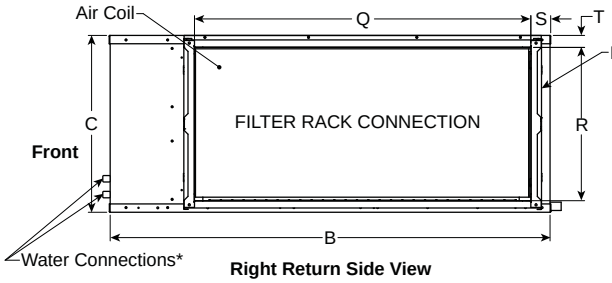
Left Return
End Discharge



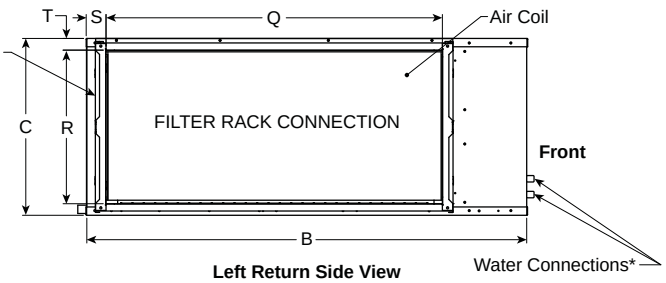
Right Return Side Discharge



Left Return Side Discharge



Right Return Side View



Left Return Side View

NOTE: * Water connections protrude approximately 3.8 cm from cabinet.

Horizontal Dimensional Data cont.

Horizontal Models		Overall Cabinet			Water Connections				Electrical Knockouts	
					1	2	3	Loop	J	K
		A	B	C	D	E	H		1/2" (1.27cm) cond	1" (2.54cm) cond
		Width	Depth	Height*	In	Out	Condensate	Water FPT	Low Voltage	Power Supply
002-003	cm.	48.8	88.9	30.7	4.6	12.2	9.1	12.70 mm	18.8	19.1
005	cm.	57.2	88.9	43.7	4.6	17.3	2.0	19.05 mm	18.0	18.0
006-007	cm.	57.2	106.7	43.7	4.6	17.3	2.0	19.05 mm	18.0	18.0
009	cm.	57.2	106.7	48.8	4.6	17.3	2.0	19.05 mm	23.4	18.0
010-012	cm.	57.2	114.3	48.8	4.6	17.3	2.0	19.05 mm	23.4	18.0
015	cm.	64.8	121.9	53.8	4.6	17.3	2.0	25.4 mm	23.4	23.1
017	cm.	64.8	134.6	53.8	4.6	17.3	2.0	25.4 mm	23.4	23.1

Horizontal Models		Discharge Connection duct flange installed (30.25 cm)				Return Connection using deluxe filter rack option (30.25 cm)				Unit Hanger Dimensions			PVC Size
		L	M	N	P	Q	R	S	T	U (A)	V (B)	W (C)	X
			Supply Width	Supply Depth		Return Depth	Return Height						
002-003	cm.	5.8	20.3	25.4	6.9	57.2	23.9	6.1	3.6	90.9	55.4	46.0	1.3
005	cm.	14.5	26.7	23.9	12.4	41.7	36.8	5.1	3.6	90.9	63.8	54.4	1.9
006-007	cm.	14.5	26.7	23.9	12.4	59.4	36.8	5.1	3.6	108.6	63.8	54.4	1.9
009	cm.	17.0	26.7	23.9	12.4	69.6	41.9	5.1	3.6	108.7	63.8	54.4	1.9
010-012	cm.	10.7	34.5	33.5	6.1	77.2	41.9	5.1	3.8	116.3	63.8	54.4	1.9
015	cm.	12.2	34.5	33.5	11.7	89.9	47.5	5.8	3.3	124.0	71.4	62.0	1.9
017	cm.	12.2	34.5	33.5	11.7	102.6	47.0	5.8	3.6	136.7	71.4	62.0	1.9

Horizontal units shipped with standard 2" (5.1 cm) (field adjustable to 1" (2.55 cm)) open application filter rack extending 2.2" (5.6 cm) from unit and is not suitable for duct connection,
For ductable return connection applications, order the deluxe 2" (field adjustable to 1") duct collar/filter rack which extends 3.25" from the unit and is suitable for duct connections. 2/18/18

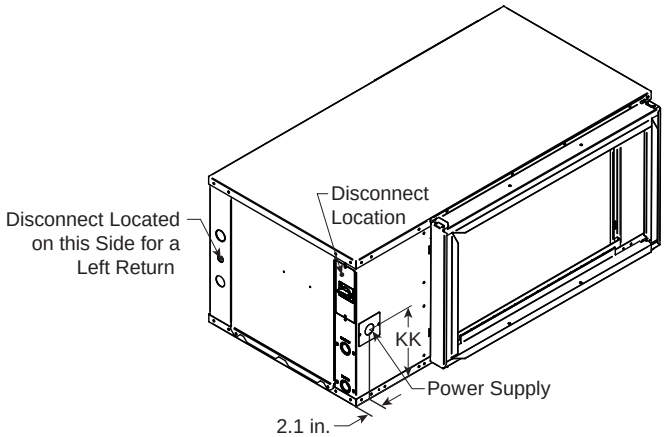
**** UBH006-012 offers a lifted drain pan that allows the trap to be installed without additional ceiling height required.**

Horizontal Disconnect

When using disconnect, do not use dimension K from the standard horizontal dimensional data. Use dimension KK from the horizontal disconnect dimensional data.

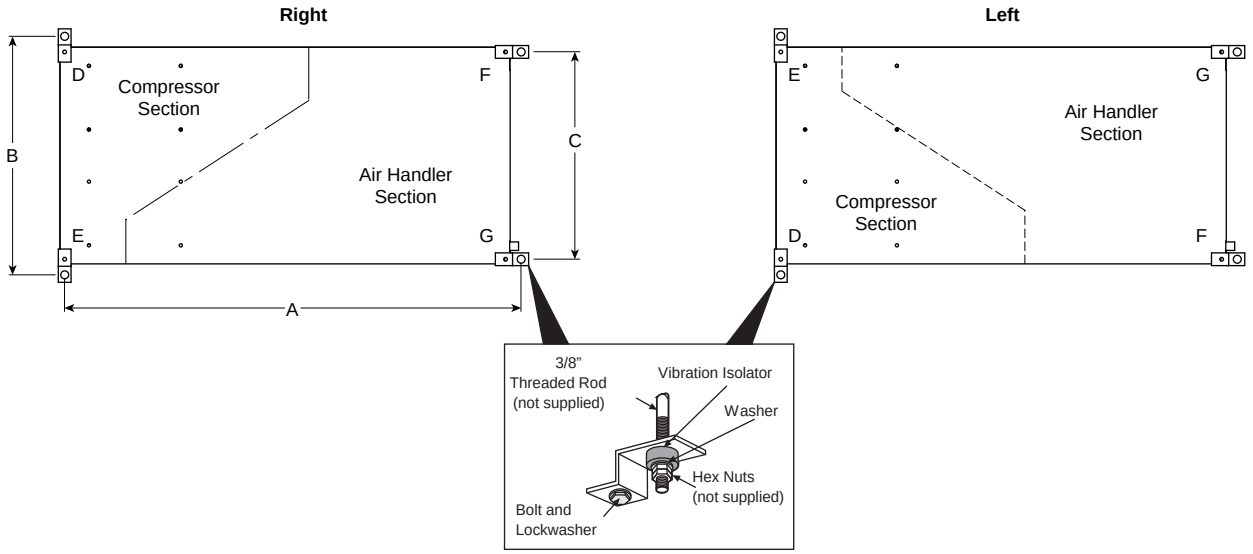
Horizontal Models	KK
002-003	[20.32]
005	[20.8]
006-007	[20.8]
009	[23.4]
010-012	[23.4]
015	[28.4]
017	[25.9]

Dimensions in [cm]



Horizontal Shown in Right Return Configuration

Hanger Bracket Locations



Hanger Bracket Locations

Model		Hanger Kit Part Number	A	B	C
002-003	in.	99S500A04	35.8	21.8	18.1
	cm.		90.9	55.4	46.0
005	in.	99S500A04	35.8	25.1	21.4
	cm.		90.9	63.8	54.4
006-007	in.	99S500A04	42.8	25.1	21.4
	cm.		108.6	63.8	54.4
009	in.	99S500A04	42.8	25.1	21.4
	cm.		108.7	63.8	54.4
010-012	in.	99S500A04	45.8	25.1	21.4
	cm.		116.3	63.8	54.4
015	in.	99S500A04	48.8	28.1	24.4
	cm.		124.0	71.4	62.0
017	in.	99S500A04	53.8	28.1	24.4
	cm.		136.7	71.4	62.0

2/18/18

Weight Distribution Table

Model		Vertical Shipping Weight	Horizontal Shipping Weight	Horizontal Weight Distribution			
				Front		Back	
				D	E	F	G
002-003	lbs	111	112	44	21	19	28
	kg	50	51	20	10	9	12
005	lbs	171	176	32	67	32	45
	kg	78	80	15	30	15	20
006	lbs	245	242	47	85	45	65
	kg	111	110	21	39	20	29
007	lbs	245	242	47	85	45	65
	kg	111	110	21	39	20	29
009	lbs	267	265	60	95	50	60
	kg	121	120	27	43	23	27
010	lbs	305	310	68	105	60	77
	kg	138	141	31	48	27	35
012	lbs	305	310	68	105	60	77
	kg	138	141	31	48	27	35
015	lbs	344	350	77	115	68	90
	kg	156	159	35	52	31	41
017	lbs	357	378	80	130	73	95
	kg	162	171	36	59	33	43

2/18/2018

Physical Data

		002	003	005	006	007	009	010	012	015	017
Compressor (1 each)		Rotary			Scroll						
Factory Charge R410A, oz [kg] Vertical		26 [0.74]	26 [0.74]	34 [0.96]	*	*	*	*	*	*	*
Factory Charge R410A, oz [kg] Horizontal		24 [0.68]	26 [0.74]	34 [0.96]	*	*	*	*	*	*	*
Blower Motor & Blower											
Blower Motor Type/Speeds	VS ECM	Variable Speed (Constant Torque)		Variable Speed (Constant CFM)							
	5 Speed ECM	Not Available		5 Speed ECM							
Blower Motor- hp [W]	VS ECM	1/10 [75]	1/10 [75]	1/2 [373]	1/2 [373]	1/2 [373]	1/2 [373]	1/2 [373]	1/2 [373]	1 [746]	1 [746]
	5 Speed ECM	Not Available		1/2 [373]	1/2 [373]	1/2 [373]	1/2 [373]	1 [746]	1 [746]	1 [746]	1 [746]
Blower Wheel Size (Dia x W), in. [mm]	VS ECM	6 x 8 [152 x 203]	6 x 8 [152 x 203]	9 x 7 [229 x 178]	9 x 7 [229 x 178]	9 x 7 [229 x 178]	9 x 7 [229 x 178]	11 x 10 [279 x 254]	11 x 10 [279 x 254]	11 x 10 [279 x 254]	11 x 10 [279 x 254]
	5 Speed ECM	Not Available		9 x 7 [229 x 178]	9 x 7 [229 x 178]	9 x 7 [229 x 178]	9 x 7 [229 x 178]	11 x 10 [279 x 254]	11 x 10 [279 x 254]	11 x 10 [279 x 254]	11 x 10 [279 x 254]
Coax and Water Piping											
Water Connection Size - FPT - in [mm]		1/2" [12.7]	1/2" [12.7]	3/4" [19.1]	3/4" [19.1]	3/4" [19.1]	3/4" [19.1]	3/4" [19.1]	3/4" [19.1]	1" [25.4]	1" [25.4]
Coax & Piping Water Volume - gal [l]		0.4 [1.49]	0.4 [1.49]	0.4 [1.49]	0.4 [1.49]	0.75 [2.83]	0.9 [3.41]	0.9 [3.41]	1.25 [4.72]	1.5 [5.68]	1.5 [5.68]
Vertical											
Air Coil Dimensions (H x W), in. [mm]		12 x 14 [305 x 356]	12 x 14 [305 x 356]	16 x 16 [406 x 406]	22 x 16 [559 x 406]	22 x 16 [559 x 406]	24 x 20 [610 x 508]	28 x 20 [711 x 508]	28 x 20 [711 x 508]	28 x 25 [711 x 635]	32 x 25 [813 x 635]
Air Coil Total Face Area, ft2 [m2]		1.17 [0.11]	1.17 [0.11]	1.8 [0.17]	2.4 [0.2]	2.4 [0.2]	3.3 [0.307]	3.9 [0.362]	3.9 [0.362]	4.9 [0.455]	5.6 [0.520]
Air Coil Tube Size, in [mm]		3/8 [9.5]	3/8 [9.5]	3/8 [9.5]	3/8 [9.5]	3/8 [9.5]	3/8 [9.5]	3/8 [9.5]	3/8 [9.5]	3/8 [9.5]	3/8 [9.5]
Air Coil Number of rows		3	3	3	3	3	3	3	3	3	3
Filter Standard - 1" [25mm] MERV4 Throwaway, in [mm]		12 x 16 [305 x 406]	12 x 16 [305 x 406]	16 x 20 [406 x 508]	22 x 20 [559 x 508]	22 x 20 [559 x 508]	24 x 24 [610 x 610]	28 x 24 [711 x 610]	28 x 24 [711 x 610]	28 x 30 [711 x 762]	32x 30 [813 x 762]
Filter Standard - 2" [51mm] Pleated MERV13 Throwaway, in [mm]		12 x 16 [305 x 406]	12 x 16 [305 x 406]	16 x 20 [406 x 508]	22 x 20 [559 x 508]	22 x 20 [559 x 508]	24 x 24 [610 x 610]	28 x 24 [711 x 610]	28 x 24 [711 x 610]	28 x 30 [711 x 762]	32x 30 [813 x 762]
Horizontal											
Air Coil Dimensions (H x W), in. [mm]		8 x 22 [203 x 559]	8 x 22 [203 x 559]	16 x 16 [406 x 406]	16 x 23 [406 x 584]	16 x 23 [406 x 584]	18 x 27 [457 x 686]	18 x 30 [457 x 762]	18 x 30 [457 x 762]	20 x 35 [508 x 889]	20 x 40 [508 x 1016]
Air Coil Total Face Area, ft2 [m2]		1.22 [0.11]	1.22 [0.11]	1.8 [0.17]	2.6 [0.238]	2.6 [0.238]	2.9 [0.269]	3.8 [0.353]	3.8 [0.353]	4.9 [0.455]	5.6 [0.52]
Air Coil Tube Size, in [mm]		3/8 [9.5]	3/8 [9.5]	3/8 [9.5]	3/8 [9.5]	3/8 [9.5]	3/8 [9.5]	3/8 [9.5]	3/8 [9.5]	3/8 [9.5]	3/8 [9.5]
Air Coil Number of rows		3	3	3	3	3	3	3	3	3	3
Filter Standard - 1" [25mm] MERV 4 Throwaway, in [mm]		11 x 25 [279 x 635]	11 x 25 [279 x 635]	16 x 20 [406 x 508]	16 x 25 [406 x 635]	16 x 25 [406 x 635]	2 -18 x 14 [457 x 356]	1 -18 x 18 [457 x 457] 1 - 18 x 14 [457 x 356]	1 -18 x 18 [457 x 457] 1 - 18 x 14 [457 x 356]	2 - 18 x 20 [457 x 508]	1 - 20 x 22 [508 x 559] 1 - 20 x 20 [508 x 508]
Filter Standard - 2" [51mm] Pleated MERV 13 Throwaway, in [mm]		11 x 25 [279 x 635]	11 x 25 [279 x 635]	16 x 20 [406 x 508]	16 x 25 [406 x 635]	16 x 25 [406 x 635]	18 x 29 [457 x 737]	18 x 32 [457 x 813]	18 x 32 [457 x 813]	20 x 37 [508 x 940]	1 - 20 x 22 [508 x 559] 1 - 20 x 20 [508 x 508]

* Not available at the time of publishing release

8/18/18

Electrical Availability

Variable Speed ECM

Voltage	Single Speed Models									
	002	003	005	006	007	009	010	012	015	017
220-240/50/1	•	•	•	•	•	•		•		
380-420/50/3				•	•	•	•	•	•	•

2/18/18

5 Speed ECM

Voltage	Single Speed Models									
	002	003	005	006	007	009	010	012	015	017
220-240/50/1			•	•	•	•		•		
380-420/50/3				•	•	•	•	•	•	•

4/20/17

Electrical Data

5-Speed ECM Motor

Model	Rated Voltage	Voltage Min/Max	Compressor			Blower Motor FLA	Total Unit FLA	Min Circ Amp	Max Fuse/HACR Breaker
			MCC	RLA	LRA				
005	220-240/50/1	198/264	13.1	5.5	24.0	4.1	9.6	11.0	15
006	220-240/50/1	198/264	14.0	9.0	52.0	4.1	13.1	15.4	20
	380-420/50/3	342/462	5.4	3.5	27.0	2.1	5.6	6.5	10/15
007	220-240/50/1	198/264	17.5	11.2	60.0	4.1	15.3	18.1	25
	380-420/50/3	342/462	6.1	3.9	28.0	2.1	6.0	7.0	10/15
009	220-240/50/1	198/264	19.0	12.2	67.0	4.1	16.3	19.4	30
	380-420/50/3	342/462	8.3	5.3	38.0	2.1	7.4	8.7	10/15
010	380-420/50/3	342/462	9.3	6.0	46.0	4.0	10.0	11.5	15
012	220-240/50/1	198/264	24.8	15.9	98.0	7.6	23.5	27.5	40
	380-420/50/3	342/462	9.5	6.1	43.0	4.0	10.1	11.6	15
015	380-420/50/3	342/462	12.1	7.8	51.5	4.0	11.8	13.8	20
017	380-420/50/3	342/462	13.3	8.5	67.1	4.0	12.5	14.6	20

HACR circuit breaker in USA only

8/18/18

Electrical Data cont.

Variable Speed ECM Motor

Model	Rated Voltage	Voltage Min/Max	Compressor			Blower Motor FLA	Total Unit FLA	Min Circ Amp	Max Fuse/HACR Breaker
			MCC	RLA	LRA				
002	220-240/50/1	198/264	6.4	4.1	17	0.94	5.04	6.1	10/15
003	220-240/50/1	198/264	5.8	3.7	18.7	0.94	4.64	5.6	15
005	220-240/50/1	198/264	13.1	5.5	24.0	4.0	9.5	10.9	15
006	220-240/50/1	198/264	14.0	9.0	52.0	4.0	13.0	15.3	20
	380-420/50/3	342/462	5.4	3.5	27.0	4.1	7.6	8.5	10/15
007	220-240/50/1	198/264	17.5	11.2	60.0	4.0	15.2	18.0	25
	380-420/50/3	342/462	6.1	3.9	28.0	4.1	8.0	9.0	10/15
009	220-240/50/1	198/264	19.0	12.2	67.0	4.0	16.2	19.3	30
	380-420/50/3	342/462	8.3	5.3	38.0	4.1	9.4	10.7	15
010	380-420/50/3	342/462	9.3	6.0	46.0	4.1	10.1	11.6	15
012	220-240/50/1	198/264	24.8	15.9	98.0	4.0	19.9	23.9	35
	380-420/50/3	342/462	9.5	6.1	43.0	4.1	10.2	11.7	15
015	380-420/50/3	342/462	12.1	7.8	51.5	6.9	14.7	16.7	20
017	380-420/50/3	342/462	13.3	8.5	67.1	6.9	15.4	17.5	25

HACR circuit breaker in USA only 8/18/18

Caution: When installing a unit with a Variable Speed ECM blower motor in 380-420/50/3 voltage, a neutral wire is required to allow proper unit operation.

Blower Performance Data

5-Speed ECM Motor

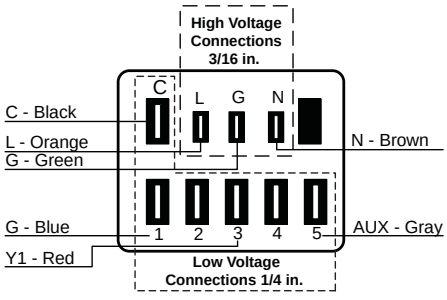
Model	Motor Spd	Motor Tap	Blower Size	Motor kW	Airflow (L/s) at External Static Pressure														
					0	12.45	24.90	37.35	49.80	62.25	74.70	87.15	99.60	112.05	124.50	149.40	174.30	199.20	224.20	249.00
	High	5			432	422	415	408	401	392	385	380	375	366	354	345	328	302	-	-
	Med High	**4**			380	370	361	354	349	342	333	323	314	309	300	286	252	-	-	-
005	Med	3	229 x 178	0.37	342	337	330	321	311	300	290	283	276	264	252	229	-	-	-	-
	Med Low	2			328	319	307	297	288	278	271	260	248	231	215	-	-	-	-	-
	Low	1			309	283	260	250	240	231	224	205	186	165	-	-	-	-	-	-
	High	5			472	464	455	448	441	435	429	425	420	412	404	378	342	-	-	-
	Med High	**4**			427	419	411	406	401	393	385	380	375	366	356	349	333		-	-
006	Med	3	229 x 178	0.37	404	395	387	378	368	365	361	352	342	337	333	316	274		-	-
	Med Low	2			373	365	356	350	345	335	326	319	311	303	295	269	-		-	-
	Low	1			290	283	276	267	257	247	236	221	205	192	179	-	-		-	-
	High	5			621	610	599	586	573	558	543	529	514	498	481	439	399	-	-	-
	Med High	**4**			540	533	526	522	517	510	503	497	491	478	465	427	387	-	-	-
007	Med	3	229 x 178	0.37	481	475	470	461	453	448	444	435	427	422	418	401	375	347	-	-
	Med Low	2			463	454	446	441	437	428	420	414	408	400	392	380	368	340	-	-
	Low	1			375	367	359	348	337	333	328	320	311	307	302	271	250	-	-	-
	High	5			663	651	639	629	618	602	585	570	555	536	517	479	422	366	-	-
	Med High	**4**			602	597	592	588	583	573	564	551	538	522	505	465	413	363	-	-
009	Med	3	229 x 178	0.37	557	549	540	536	531	524	517	512	507	500	493	460	408	354	-	-
	Med Low	2			531	526	522	514	507	503	498	491	484	475	467	448	404	345	-	-
	Low	1			394	388	382	374	366	357	349	341	333	326	319	302	269	-	-	-
	High	5			852	846	840	835	831	821	812	807	802	796	791	781	772	750	732	696
	Med High	4			800	796	793	783	774	766	757	752	746	742	739	724	710	689	658	614
010	**Med**	**3**	279 x 254	0.75	757	752	746	736	727	719	710	704	698	694	689	670	651	616	569	536
	Med Low	2			713	706	698	691	684	677	670	662	654	648	642	618	590	536	498	477
	Low	1			632	624	616	605	595	588	580	572	564	555	545	491	432	413	-	-
	High	5			944	939	934	929	923	916	908	906	904	901	899	887	871	845	781	710
	Med High	4			868	865	861	854	847	842	838	835	833	828	824	809	788	765	727	642
012	**Med**	**3**	279 x 254	0.75	828	822	816	811	805	801	798	794	791	781	772	755	734	706	677	614
	Med Low	2			776	769	762	757	753	747	741	736	732	722	713	696	670	637	597	557
	Low	1			675	667	658	654	649	641	632	623	614	602	590	552	500	470	439	413
	High	5			1159	1152	1144	1139	1133	1128	1123	1116	1109	1102	1095	1083	1060	1026	984	951
	Med High	4			1067	1062	1057	1049	1041	1036	1031	1023	1015	1006	998	984	965	946	932	911
015	**Med**	**3**	279 x 254	0.75	1010	1002	993	989	984	975	965	959	953	946	939	925	904	883	866	845
	Med Low	2			949	942	934	926	918	913	908	900	892	884	875	861	840	824	798	776
	Low	1			857	851	845	838	831	822	814	805	795	786	776	755	739	715	694	665
	High	5			1180	1178	1175	1167	1159	1150	1142	1135	1128	1115	1102	1097	1076	1045	1001	942
	Med High	4			1085	1083	1081	1071	1062	1054	1045	1038	1031	1023	1015	998	982	963	939	904
017	**Med**	**3**	279 x 254	0.75	1026	1021	1015	1009	1003	991	979	972	965	958	951	934	918	899	878	859
	Med Low	2			963	957	951	944	937	927	918	911	904	896	887	873	852	831	814	795
	Low	1			873	865	857	850	842	833	824	815	807	794	781	762	746	722	696	614

Factory settings are in Bold

9/21/15

Air flow values are with dry coil and standard 2.5 cm filter

5-Speed ECM Motor Connections



Blower Performance Data cont.

Variable Speed ECM Motor

Model	Max ESP (Pa)	Blower Size	Motor kW	Air Flow Dip Switch Settings											
				1	2	3	4	5	6	7	8	9	10	11	12
005	124.50	229 x 178	0.37	142	189 L	**236**	**283 M**	**330 H**	**378**						
006	124.50	229 x 178	0.37		189 L	236	283 M	**330**	**378 H**	**425**	**472**	**519**			
007	124.50	229 x 178	0.37		189	236 L	283	**330 M**	**378**	**425**	**472 H**	**519**			
009	124.50	229 x 178	0.37		189	236	283 L	330	**378**	**425 M**	**472**	**519 H**	**566**		
010	124.50	279 x 254	0.37	236	283	330 L	413	**496**	**543 M**	**590**	**625**	**649 H**	**696**	**732**	
012	124.50	279 x 254	0.37	236	283	330	413 L	496	543	**590**	**625 M**	**649**	**696**	**732 H**	**755**
015	186.75	279 x 254	0.75	283	378	472 L	614	**708 M**	**826**	**920 H**	**991**	**1038**	**1085**		
017	186.75	279 x 254	0.75	283	378	472 L	614	**708**	**826 M**	**920**	**991 H**	**1038**	**1085**		

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Factory settings are at recommended L-M-H DIP switch locations
L/s is controlled within 5% up to the maximum ESP
M-H settings MUST be located within boldface L/s range
Max ESP includes allowance for wet coil and standard filter
Lowest and Highest DIP switch settings are assumed to be L and H respectively

Variable Speed Constant Torque ECM

Fan Speed	Fan RPM	Airflow [L/s] at External Static Pressure [Pa]						
		0.0	24.9	49.8	74.7	99.6	124.5	149.4
1	0							
2	514							
3	630							
4	800							
5	950							
6	1100	165	144	118	76			
7	1200	186	165	142	109	73		
8	1300	205	189	168	144	111		
9	1400	229	212	196	177	156	123	
10	1500	231	227	219	212	193	175	142
11	1600							
12	1700							

Air flow values are with dry coil and standard 2.5 cm filter

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Blower Performance Data cont.

Setting Blower Speed - Variable Speed ECM

The ABC board's Yellow Config LED will flash the current variable speed ECM blower speed selections for low, med, and high continuously with a short pause in between. The speeds can also be confirmed with the AID Tool under the Setup/ECM Setup screen. The variable speed ECM blower motor speeds can be field adjusted with or without using an AID Tool.

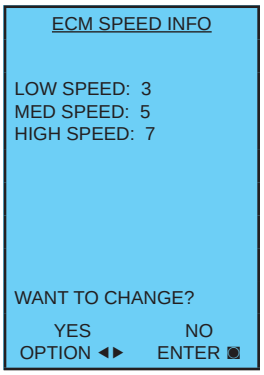
Variable Speed ECM Setup without an AID Tool

The blower speeds for Low (G only), Med (Y1), and High (Y2/Aux) can be adjusted directly at the Aurora ABC board which utilizes the push button (SW1) on the ABC board. This procedure is outlined in the Variable Speed ECM Configuration Mode portion of the Aurora 'Base' Control System section.

Variable Speed ECM Setup with an AID Tool

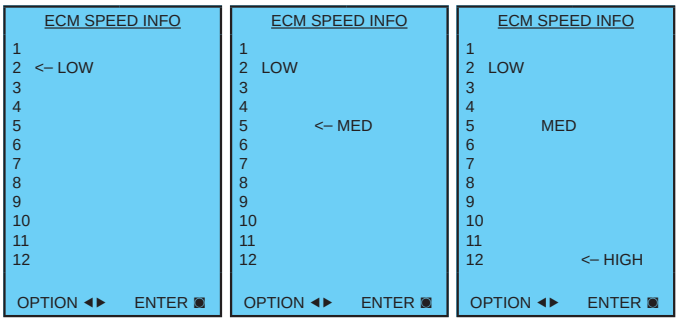
A much easier method utilizes the AID Tool to change the airflow using the procedure below. First navigate to the Setup screen and then select ECM Setup. This screen displays the current variable speed ECM settings. It allows the technician to enter the setup screens to change the variable speed ECM settings. Change the highlighted item using the ◄ and ► buttons and then press the ◙ button to select the item.

Variable Speed ECM Setup with an AID Tool cont.



Selecting YES will enter variable speed ECM speed setup, while selecting NO will return to the previous screen.

Variable Speed ECM Speed Setup - These screens allow the technician to select the low, medium, and high blower speed for the variable speed ECM blower motor. Change the highlighted item using the ▲ and ▼ buttons. Press the ◙ button to select the speed.



After the high speed setting is selected the AID Tool will automatically transfer back to the ECM Setup screen.

Selection Example

To achieve optimal performance, proper selection of each heat pump is essential. A building load program should be used to determine the heating and cooling load of each zone. A computer software selection program can then be used to develop an accurate and complete heat pump schedule. Software can be obtained from your local WaterFurnace representative.

While a computer software program is the easiest and most accurate method to size and select equipment, however, selection can still be accomplished manually using this manual and the following selection procedure. Sizing so that the actual sensible capacity of the equipment will satisfy the sensible capacity of the zone is the recommended method for best results.

Boiler/Tower Application

Typical boiler/tower application will result in entering water temperatures of 15.6-32.2°C with 21°C for heating and 32.2°C for cooling. Water to refrigerant insulation option would not be required. Flow rates are 0..45 to 0.06 L/s with 0.06 L/s per kW often representing an economical design point.

Geothermal Application

Typical geothermal application can result in a wide entering water temperature range of -1.1 to 37.8°C. Typically minimum heating entering water temperatures can range from -1.1 to 10°C depending upon loop type and geographical location. Cooling performance should be calculated using a maximum loop temperature of 37.8°C in most loop applications. Water flow is typically 0.045 to 0.06 L/s per kW with 0.06 L/s per kW recommended with the more extreme loop temperatures. **PLEASE NOTE THAT WATER COIL INSULATION OPTION SHOULD BE SELECTED WHEN ENTERING WATER TEMPERATURES ARE EXPECTED TO BE BELOW -7.7-10°C.**

Geothermal Selection Example

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 L/s, airflow in L/s, water flow pressure drop and design wet and dry bulb temperatures. Airflow, L/s, should be between 142 and 212 L/s per kW. 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.
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 complete, 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 airflow 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 - Cooling

1. Load Determination:
Assume we have determined that the appropriate cooling load at the desired dry bulb 26.7°C and wet bulb 18.3°C conditions is as follows:

Total Cooling.....14.4 kW
Sensible Cooling..... 10.4 kW
Entering Air Temp..... 24°C Dry Bulb / 18°C Wet Bulb

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

Entering Water Temp.....32°C
Water Flow (Based upon 5.6°C rise in temp.) 0.9 L/s
Airflow Required ..... 825 L/s @ 50 Pa.

Selection Example cont.

3, 4 & 5. HP Selection:
After making our preliminary selection (UBK*15 variable speed ECM), we enter the tables at design water flow and water temperature and read
Total Cooling, Sens. Cooling and Heat of Rej. capacities:
Total Cooling.....14.7 kW
Sensible Cooling.....11.8 kW
Heat of Rejection .....18.6 kW

6 & 7. Entering Air and Airflow Corrections:
Next, we determine our correction factors. (Refer to Correction Factor Tables - Airflow and Entering Air correction tables — using 825 cfm. or 825÷897 nom. = 92%).
Corrected Total Cooling = 14.7 kW x 0.992 x 0.967 = 14.1 kW
Corrected Sens Cooling = 11.8 x 0.965 x 0.881 = 10 kW
Corrected Heat of Reject = 18.6 x 0.990 x 0.972 = 17.9 kW

$$HR = 4.2 \times waterflow(L/s) \times (T_{in} - T_{out})$$

$$\frac{HR}{4.2 \times L/s} = (T_{in} - T_{out}) \text{ or } \Delta T \text{ Rise}$$

$$\frac{17.9}{4.2 \times 0.9} = 4.74\ ^\circ C \text{ Rise}$$

8. Water Temperature Rise Calculation & Assessment:
NOTE: 4.2 = parameters for water & 4.1 = parameters for antifreeze solutions to 30% weight.

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. Further more, we see that our Corrected Total Cooling figure is within 0.3 kW of the actual indicated load.

Antifreeze Corrections

Catalog performance can be corrected for antifreeze use. Please use the following table and note the example given.

Antifreeze Type	Antifreeze % by wt	Cooling Capacity	Heating Capacity	Pressure Drop
EWT - degF [DegC]		**90 [32.2]**	**30 [-1.1]**	**30 [-1.1]**
Water	0	1.000	1.000	1.000
Ethylene Glycol	10	0.991	0.973	1.075
	20	0.979	0.943	1.163
	30	0.965	0.917	1.225
	40	0.955	0.890	1.324
	50	0.943	0.865	1.419
Propylene Glycol	10	0.981	0.958	1.130
	20	0.969	0.913	1.270
	30	0.950	0.854	1.433
	40	0.937	0.813	1.614
	50	0.922	0.770	1.816
Ethanol	10	0.991	0.927	1.242
	20	0.972	0.887	1.343
	30	0.947	0.856	1.383
	40	0.930	0.815	1.523
	50	0.911	0.779	1.639
Methanol	10	0.986	0.957	1.127
	20	0.970	0.924	1.197
	30	0.951	0.895	1.235
	40	0.936	0.863	1.323
	50	0.920	0.833	1.399

***Warning**: Gray area represents antifreeze concentrations greater than 35% by weight and should be avoided due to the extreme performance penalty they represent.*

Antifreeze Correction Example

Antifreeze solution is Propylene Glycol 20% by weight. Determine the corrected heating and cooling performance at 30˚F(-1.1˚C) and 90˚F(32.2˚C) respectively as well as pressure drop at 30˚F(-1.1˚C) for a Versatec Base Series UBK006-ECM.

The corrected cooling capacity at 90˚F(32.2˚C) would be: 5.9 kW x 0.969 = 5.76 kW
The corrected heating capacity at 30˚F(-1.1˚C) would be: 4.6 kW x 0.913 = 4.17 kW
The corrected pressure drop at 30˚F(-1.1˚C) and 0.4 L/s would be: 62.1 kPa x 1.270 = 78.81 kPa

Reference Calculations

Heating Calculations:	Cooling Calculations:
$LWT = EWT - \frac{HE}{WF \times 4.2}$	$LWT = EWT + \frac{HR}{WF \times 4.2}$
$LAT = EAT + \frac{HC}{AF \times 1.08}$	$LAT(DB) = EAT(DB) - \frac{SC}{AF \times 1.08}$
$TH = HC + HWC$	$LC = TC - SC$
	$S/T = \frac{SC}{TC}$

Note: Use 4.1 for 15% Methanol/water or Environol solution.

Notes (Refer to Performance Data tables)

- Performance ratings are based on 27°C DB / 19°C WB EAT for cooling and 20°C DB EAT for heating.
- Three flow rates are shown for each unit. The lowest flow rate shown is used for geothermal open loop/well water systems with a minimum of 10°C EWT. The middle flow rate shown is the minimum geothermal closed loop flow rate. The highest flow rate shown is optimum for geothermal closed loop systems and the suggested flow rate for boiler/ tower applications.
- The hot water generator numbers are based on a flow rate of 7.16 ml/s per kW of rated capacity with an EWT of 32°C.
- Entering water temperatures below 4.5°C assumes 15% antifreeze solution.
- For non-standard EAT conditions, apply the appropriate correction factors on (Refer to Correction Factor Tables).
- Interpolation between EWT, WF and AF data is permissible.

Operating Limits

Operating Limits	Cooling (°C)	Heating (°C)
Air Limits		
Min. Ambient Air	7.2	7.2
Rated Ambient Air	26.7	21.1
Max. Ambient Air	37.8	29.4
Min. Entering Air	10.0	4.4
Rated Entering Air db/wb	27/19	20.0
Max. Entering Air db/wb	43/28.3	26.7
Water Limits		
Min. Entering Water	-1.1	-6.7
Normal Entering Water	10-43.3	-1.1
Max. Entering Water	48.9	32.2

NOTE: Minimum/maximum limits are only for start-up conditions, and are meant for bringing the space up to occupancy temperature. Units are not designed to operate at the minimum/maximum conditions on a regular basis. The operating limits are dependent upon three primary factors: 1) water temperature, 2) return air temperature, and 3) ambient temperature. When any of the factors are at the minimum or maximum levels, the other two factors must be at the normal level for proper and reliable unit operation.

Cooling Capacity Corrections

Entering Air WB ºC	Total Clg Cap	Sensible Cooling Capacity Multipliers - Entering DB ºC										Power Input	Heat of Rejection
		15.6	18.3	21.1	23.9	26.7	27	29.4	32.2	35	37.8		
12.8	0.898	0.723	0.866	1.048	1.185	*	*	*	*	*	*	0.985	0.913
15.6	0.912		0.632	0.880	1.078	1.244	1.260	*	*	*	*	0.994	0.927
18.3	0.967			0.694	0.881	1.079	1.085	1.270	*	*	*	0.997	0.972
19.0	0.983			0.655	0.842	1.040	1.060	1.232	*	*	*	0.999	0.986
19.4	**1.000**			0.616	0.806	**1.000**	1.023	1.193	1.330	*	*	**1.000**	**1.000**
21.1	1.053				0.693	0.879	0.900	1.075	1.250	1.404	*	1.003	1.044
23.9	1.168					0.687	0.715	0.875	1.040	1.261	1.476	1.007	1.141

Note: * Sensible capacity equals total capacity at conditions shown. 12/5/14

Heating Capacity Corrections

Ent Air DB °C	Htg Cap	Power	Heat of Ext
7.2	1.062	0.739	1.158
10.0	1.050	0.790	1.130
12.8	1.037	0.842	1.096
15.6	1.025	0.893	1.064
18.3	1.012	0.945	1.030
20.0	1.005	0.976	1.012
21.1	**1.000**	**1.000**	**1.000**
23.9	0.987	1.048	0.970
26.7	0.975	1.099	0.930

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Air Flow Corrections

Airflow		Cooling				Heating		
L/s Per kW of Clg	% of Nominal	Total Cap	Sens Cap	Power	Heat of Rej	Htg Cap	Power	Heat of Ext
32	60	0.922	0.786	0.910	0.920	0.943	1.150	0.893
37	69	0.944	0.827	0.924	0.940	0.958	1.105	0.922
40	75	0.959	0.860	0.937	0.955	0.968	1.078	0.942
44	81	0.971	0.894	0.950	0.967	0.977	1.053	0.959
47	88	0.982	0.929	0.964	0.978	0.985	1.031	0.973
50	94	0.992	0.965	0.982	0.990	0.993	1.014	0.988
54	**100**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**
57	106	1.007	1.034	1.020	1.010	1.007	0.990	1.011
61	113	1.012	1.065	1.042	1.018	1.013	0.983	1.020
64	119	1.017	1.093	1.066	1.026	1.018	0.980	1.028
67	125	1.019	1.117	1.092	1.033	1.023	0.978	1.034
70	130	1.020	1.132	1.113	1.038	1.026	0.975	1.038

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Pressure Drop

Model	L/s	Pressure Drop (kPa)				
		-1.11°C	10°C	21.1°C	32.2°C	43.3°C
002	0.09	13.1	11.7	10.3	9.0	7.6
	0.13	20.7	19.3	17.9	16.5	15.2
	0.19	43.4	43.4	42.1	40.7	39.3
	0.25	55.8	54.5	51.0	46.9	42.1
003	0.09	7.6	7.6	6.9	6.2	6.2
	0.16	16.5	15.9	15.2	13.8	13.1
	0.22	29.0	27.6	25.5	23.4	22.1
	0.28	42.1	40.7	35.9	32.4	28.3
005	0.19	22.8	22.1	20.7	19.3	17.9
	0.25	32.4	29.0	26.9	24.8	21.4
	0.32	42.7	35.9	32.4	28.3	24.1
	0.38	53.1	42.7	37.2	31.7	26.2
006	0.19	22.1	21.4	20.0	18.6	17.2
	0.28	42.1	37.9	33.8	31.0	29.0
	0.38	62.1	54.5	47.6	43.4	40.0
	0.50	88.9	75.2	65.5	60.7	54.5
007	0.25	16.5	15.9	15.2	13.8	12.4
	0.38	35.2	33.8	32.4	31.0	29.6
	0.50	53.8	51.7	49.0	47.6	46.2
	0.63	72.4	69.6	66.2	64.1	61.4
009	0.32	13.8	13.1	11.7	10.3	9.7
	0.44	24.8	24.1	22.8	21.4	20.0
	0.57	35.9	35.2	33.1	31.7	30.3
	0.76	51.7	51.0	49.0	47.6	46.2
010	0.32	14.5	13.8	12.4	11.0	9.7
	0.50	33.1	32.4	31.0	30.3	29.0
	0.69	51.7	51.0	48.3	45.5	42.1
	0.88	69.6	68.3	66.2	60.7	55.8
012	0.38	18.6	17.9	16.5	15.2	13.8
	0.57	41.4	40.7	37.2	35.9	35.2
	0.76	65.5	64.1	58.6	57.2	55.8
	1.01	97.9	95.8	87.6	84.8	83.4
015	0.57	31.0	30.3	29.0	27.6	26.2
	0.76	44.8	43.4	42.1	40.7	39.3
	0.95	59.3	55.8	54.5	53.1	51.7
	1.26	83.4	77.2	74.5	73.1	71.7
017	0.76	39.3	38.6	37.2	35.9	34.5
	0.95	61.4	59.3	56.5	53.1	46.2
	1.14	82.7	79.3	75.8	69.6	57.9
	1.51	120.0	116.5	113.8	104.1	81.4

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Valve	L/s	Cv	Pressure Drop (kPa)
Not Available			
Not Available			
1/2”	0.2	9.9	0.63
	0.3	10.1	1.07
	0.3	10.4	1.61
	0.4	10.6	2.22
3/4”	0.2	9.9	0.63
	0.3	10.2	1.33
	0.4	10.6	2.22
	0.5	11.0	3.64
3/4”	0.3	10.1	1.07
	0.4	10.6	2.22
	0.5	11.0	3.64
	0.6	11.5	5.26
3/4”	0.3	10.4	1.61
	0.4	10.8	2.90
	0.6	11.2	4.43
	0.8	11.9	7.03
3/4”	0.3	10.4	1.61
	0.5	11.0	3.64
	0.7	11.7	6.13
	0.9	12.3	8.89
3/4”	0.4	10.6	2.22
	0.6	11.2	4.43
	0.8	11.9	7.03
	1.0	12.8	10.83
1”	0.6	16.8	1.99
	0.8	17.4	3.27
	0.9	18.1	4.74
	1.3	19.2	7.50
1”	0.8	17.4	3.27
	0.9	18.1	4.74
	1.1	18.7	6.36
	1.5	20.1	9.87

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UBK002 - Performance Data

002 - Single Speed - Variable Speed ECM
Capacity Data (165 L/s)

SI Units

EWT °C	WATER FLOW L/s	WPD	HEATING - EAT 21.1 °C					COOLING - EAT 26.7/19.4 °C					
		kPa	HC kW	Power kW	HE kW	LAT °C	COP	TC kW	SC kW	S/T Ratio	Power kW	HR kW	EER
-6.7	0.09	13.8	Operation not recommended					Operation not recommended					
	0.13	21.4											
	0.19	44.1	1.55	0.54	1.01	27.8	2.88						
-1.1	0.09	13.1	Operation not recommended					Operation not recommended					
	0.13	20.7	1.88	0.55	1.33	29.4	3.42	2.83	2.01	0.71	0.40	3.24	7.0
	0.19	43.4	1.82	0.56	1.26	29.1	3.24	2.87	2.05	0.71	0.38	3.25	7.6
4.4	0.09	12.4	Operation not recommended					Operation not recommended					
	0.13	20.0	2.05	0.56	1.48	30.3	3.64	2.82	2.06	0.73	0.43	3.25	6.6
	0.19	42.7	2.05	0.58	1.48	30.3	3.57	2.87	2.10	0.73	0.41	3.28	7.1
10	0.09	11.7	2.20	0.57	1.63	31.0	3.86	2.78	2.08	0.75	0.46	3.24	6.1
	0.13	19.3	2.23	0.58	1.65	31.2	3.86	2.81	2.10	0.75	0.45	3.26	6.3
	0.19	43.4	2.29	0.59	1.70	31.5	3.87	2.87	2.14	0.74	0.43	3.30	6.7
15.6	0.09	11.0	2.40	0.59	1.82	32.1	4.11	2.62	1.96	0.75	0.51	3.13	5.2
	0.13	18.6	2.44	0.59	1.85	32.2	4.12	2.66	1.98	0.74	0.50	3.16	5.4
	0.19	42.7	2.51	0.61	1.90	32.6	4.14	2.74	2.02	0.74	0.48	3.22	5.8
21.1	0.09	10.3	2.61	0.60	2.01	33.1	4.35	2.46	1.85	0.75	0.55	3.01	4.5
	0.13	17.9	2.65	0.61	2.04	33.3	4.36	2.51	1.87	0.74	0.54	3.05	4.6
	0.19	41.7	2.73	0.62	2.11	33.7	4.40	2.61	1.90	0.73	0.52	3.13	5.0
26.7	0.09	9.7	2.91	0.65	2.26	34.6	4.50	2.25	1.86	0.83	0.62	2.87	3.6
	0.13	17.2	2.95	0.65	2.30	34.8	4.52	2.29	1.84	0.80	0.59	2.88	3.9
	0.19	41.4	3.02	0.67	2.35	35.1	4.54	2.36	1.82	0.77	0.58	2.93	4.1
32.2	0.09	9.0	3.21	0.69	2.52	36.1	4.64	2.04	1.88	0.92	0.68	2.72	3.0
	0.13	16.5	3.26	0.70	2.56	36.4	4.65	2.07	1.82	0.88	0.65	2.72	3.2
	0.19	40.5	3.31	0.71	2.60	36.6	4.66	2.11	1.73	0.82	0.63	2.74	3.3
37.8	0.09	8.3	Operation not recommended					Operation not recommended					
	0.13	15.9						1.92	1.64	0.86	0.71	2.63	2.7
	0.19	40.0						1.95	1.66	0.85	0.69	2.63	2.8
43.3	0.09	7.6						Operation not recommended					
	0.13	15.2						1.75	1.56	0.89	0.76	2.51	2.3
	0.19	39.3						1.79	1.58	0.89	0.74	2.53	2.4
48.9	0.09	6.9						Operation not recommended					
	0.13	14.5						1.49	1.33	0.89	1.07	2.56	1.4
	0.19	38.6						1.52	1.35	0.88	1.04	2.56	1.5

2/18/2018

UBK003 - Performance Data

003 - Single Speed - Variable Speed ECM
Capacity Data (189 L/s)

SI Units

EWT °C	WATER FLOW L/s	WPD	HEATING - EAT 21.1 °C					COOLING - EAT 26.7/19.4 °C					
		kPa	HC kW	Power kW	HE kW	LAT °C	COP	TC kW	SC kW	S/T Ratio	Power kW	HR kW	EER
-6.7	0.09	8.3	Operation not recommended					Operation not recommended					
	0.16	17.2											
	0.22	29.6	2.09	0.73	1.36	29.2	2.86						
-1.1	0.09	7.9	Operation not recommended					Operation not recommended					
	0.16	16.3	2.55	0.75	1.80	31.2	3.41	3.61	2.54	0.70	0.47	4.08	7.7
	0.22	29.0	2.43	0.76	1.67	30.6	3.21	3.66	2.58	0.71	0.44	4.10	8.3
4.4	0.09	7.4	Operation not recommended					Operation not recommended					
	0.16	16.5	2.80	0.76	2.04	32.3	3.67	3.56	2.53	0.71	0.51	4.06	7.0
	0.22	28.3	2.79	0.77	2.02	32.2	3.61	3.60	2.57	0.72	0.49	4.08	7.4
10	0.09	7.6	3.00	0.77	2.23	33.1	3.89	3.47	2.49	0.72	0.56	4.03	6.2
	0.16	15.9	3.08	0.78	2.30	33.5	3.94	3.50	2.53	0.72	0.55	4.05	6.4
	0.22	27.6	3.16	0.79	2.36	33.9	3.98	3.53	2.56	0.73	0.53	4.06	6.6
15.6	0.09	6.9	3.31	0.79	2.52	34.5	4.18	3.24	2.36	0.73	0.63	3.87	5.2
	0.16	15.0	3.40	0.80	2.60	34.9	4.25	3.28	2.40	0.73	0.61	3.89	5.4
	0.22	26.2	3.49	0.81	2.68	35.3	4.31	3.31	2.44	0.74	0.60	3.91	5.5
21.1	0.09	7.1	3.62	0.81	2.81	35.9	4.46	3.02	2.23	0.74	0.69	3.71	4.4
	0.16	15.2	3.72	0.82	2.90	36.3	4.55	3.05	2.28	0.75	0.68	3.73	4.5
	0.22	25.6	3.82	0.82	3.00	36.8	4.64	3.09	2.33	0.75	0.66	3.75	4.7
26.7	0.09	6.9	4.04	0.82	3.22	37.7	4.94	2.80	2.14	0.76	0.79	3.59	3.5
	0.16	14.5	4.12	0.83	3.29	38.1	4.99	2.83	2.18	0.77	0.76	3.59	3.8
	0.22	24.8	4.20	0.83	3.37	38.4	5.04	2.88	2.22	0.77	0.73	3.61	3.9
32.2	0.09	6.2	4.45	0.82	3.63	39.5	5.41	2.58	2.05	0.80	0.87	3.44	3.0
	0.16	13.8	4.52	0.83	3.68	39.8	5.42	2.62	2.08	0.80	0.83	3.44	3.2
	0.22	23.4	4.59	0.84	3.74	40.1	5.44	2.67	2.11	0.79	0.80	3.47	3.3
37.8	0.09	6.2	Operation not recommended					Operation not recommended					
	0.16	13.1						2.40	1.99	0.83	0.91	3.31	2.6
	0.22	22.8						2.44	2.01	0.82	0.88	3.31	2.8
43.3	0.09	6.2						Operation not recommended					
	0.16	13.1						2.16	1.88	0.87	0.98	3.14	2.2
	0.22	22.1						2.20	1.91	0.87	0.95	3.16	2.3
48.9	0.09	5.5						Operation not recommended					
	0.16	12.4						1.87	1.77	0.95	1.07	2.94	1.7
	0.22	21.4						1.91	1.79	0.94	1.04	2.95	1.8

2/18/2018

UBK005 - Performance Data

005 - Single Speed - Variable Speed ECM and 5 Speed ECM
Capacity Data (283 L/s)

SI Units

EWT °C	WATER FLOW L/s	WPD	HEATING - EAT 21.1 °C					COOLING - EAT 26.7/19.4 °C					
		kPa	HC kW	Power kW	HE kW	LAT °C	COP	TC kW	SC kW	S/T Ratio	Power kW	HR kW	EER
-6.7	0.19	24.8	Operation not recommended					Operation not recommended					
	0.25	37.2											
	0.32	50.7	3.04	0.96	2.08	28.9	3.17						
-1.1	0.19	24.1	Operation not recommended					Operation not recommended					
	0.25	33.8	3.56	0.97	2.59	30.4	3.65	5.84	3.94	0.67	0.59	6.43	9.9
	0.32	49.4	3.53	0.99	2.54	30.3	3.55	5.92	4.02	0.68	0.55	6.47	10.7
4.4	0.19	22.8	Operation not recommended					Operation not recommended					
	0.25	32.4	4.00	1.01	2.99	31.7	3.94	5.74	3.95	0.69	0.65	6.40	8.8
	0.32	42.7	4.05	1.03	3.03	31.9	3.95	5.80	4.00	0.69	0.62	6.43	9.3
10	0.19	22.1	4.40	1.05	3.34	32.9	4.17	5.60	3.94	0.70	0.75	6.35	7.5
	0.25	29.0	4.49	1.06	3.43	33.1	4.25	5.64	3.96	0.70	0.72	6.36	7.8
	0.32	47.6	4.58	1.06	3.52	33.4	4.32	5.69	3.99	0.70	0.69	6.38	8.2
15.6	0.19	21.4	4.98	1.07	3.90	34.6	4.64	5.18	3.74	0.72	0.86	6.04	6.0
	0.25	27.9	5.08	1.10	3.98	34.9	4.61	5.22	3.77	0.72	0.83	6.05	6.3
	0.32	34.5	5.18	1.13	4.05	35.2	4.59	5.26	3.80	0.72	0.80	6.06	6.6
21.1	0.19	20.6	5.55	1.09	4.46	36.2	5.09	4.76	3.55	0.75	0.97	5.73	4.9
	0.25	26.5	5.67	1.15	4.52	36.6	4.95	4.80	3.58	0.75	0.94	5.74	5.1
	0.32	32.4	5.79	1.20	4.59	36.9	4.82	4.83	3.62	0.75	0.91	5.75	5.3
26.7	0.19	20.0	6.12	1.10	5.02	37.9	5.57	4.47	3.43	0.77	1.11	5.58	4.0
	0.25	25.2	6.23	1.13	5.10	38.2	5.49	4.52	3.46	0.77	1.06	5.58	4.3
	0.32	30.3	6.34	1.17	5.17	38.6	5.43	4.58	3.50	0.76	1.03	5.61	4.5
32.2	0.19	19.3	6.69	1.11	5.58	39.6	6.04	4.17	3.31	0.79	1.23	5.41	3.4
	0.25	24.8	6.79	1.12	5.67	39.9	6.05	4.24	3.34	0.79	1.18	5.42	3.6
	0.32	28.3	6.90	1.14	5.76	40.2	6.07	4.33	3.37	0.78	1.14	5.46	3.8
37.8	0.19	18.6	Operation not recommended					Operation not recommended					
	0.25	24.1						3.94	3.21	0.81	1.30	5.25	3.0
	0.32	26.9						4.00	3.24	0.81	1.26	5.26	3.2
43.3	0.19	17.9						Operation not recommended					
	0.25	21.0						3.61	3.06	0.85	1.42	5.03	2.5
	0.32	24.2						3.68	3.10	0.84	1.38	5.06	2.7
48.9	0.19	17.2						Operation not recommended					
	0.25	20.7						3.34	2.88	0.86	1.56	4.90	2.1
	0.32	23.4						3.41	2.93	0.86	1.51	4.92	2.3

2/18/2018

UBK006 - Performance Data

006 - Single Speed - Variable Speed ECM and 5 Speed ECM
Capacity Data (378 L/s)

SI Units

EWT °C	WATER FLOW L/s	WPD	HEATING - EAT 21.1 °C					COOLING - EAT 26.7/19.4 °C					
		kPa	HC kW	Power kW	HE kW	LAT °C	COP	TC kW	SC kW	S/T Ratio	Power kW	HR kW	EER
-6.7	0.2	22.8	Operation not recommended					Operation not recommended					
	0.3	47.9											
	0.4	72.7	3.75	1.20	2.55	28.2	3.13						
-1.1	0.2	22.1	Operation not recommended					Operation not recommended					
	0.3	42.1	4.93	1.32	3.61	30.8	3.73	7.84	5.35	0.68	0.91	8.74	8.7
	0.4	62.1	4.57	1.29	3.28	30.0	3.54	7.94	5.45	0.69	0.85	8.79	9.3
4.4	0.2	22.1	Operation not recommended					Operation not recommended					
	0.3	42.1	5.49	1.37	4.12	32.0	4.01	7.73	5.36	0.69	1.02	8.75	7.6
	0.4	62.1	5.45	1.37	4.09	32.0	3.99	7.85	5.44	0.69	0.96	8.81	8.2
10	0.2	21.1	5.86	1.40	4.46	32.9	4.19	7.50	5.30	0.71	1.19	8.69	6.3
	0.3	37.9	6.10	1.42	4.68	33.4	4.29	7.63	5.36	0.70	1.13	8.76	6.8
	0.4	54.2	6.33	1.44	4.89	33.9	4.40	7.77	5.42	0.70	1.07	8.84	7.3
15.6	0.2	20.7	6.59	1.46	5.14	34.5	4.53	7.05	5.10	0.72	1.31	8.36	5.4
	0.3	36.2	6.82	1.47	5.35	35.0	4.63	7.19	5.16	0.72	1.25	8.44	5.7
	0.4	51.7	7.05	1.49	5.56	35.5	4.73	7.33	5.22	0.71	1.20	8.52	6.1
21.1	0.2	20.0	7.33	1.51	5.82	36.1	4.85	6.59	4.89	0.74	1.43	8.02	4.6
	0.3	33.8	7.55	1.53	6.02	36.6	4.95	6.74	4.95	0.73	1.38	8.12	4.9
	0.4	47.6	7.77	1.54	6.23	37.0	5.04	6.89	5.01	0.73	1.32	8.21	5.2
26.7	0.2	19.3	7.86	1.53	6.33	37.2	5.15	6.17	4.72	0.77	1.58	7.75	3.9
	0.3	32.1	8.03	1.54	6.49	37.6	5.21	6.29	4.76	0.76	1.51	7.79	4.2
	0.4	44.8	8.21	1.56	6.65	38.0	5.26	6.42	4.81	0.75	1.46	7.88	4.4
32.2	0.2	18.6	8.39	1.54	6.85	38.4	5.44	5.74	4.54	0.79	1.73	7.47	3.3
	0.3	31.0	8.52	1.56	6.96	38.7	5.46	5.83	4.57	0.78	1.65	7.48	3.5
	0.4	43.2	8.65	1.58	7.07	39.0	5.47	5.95	4.60	0.77	1.60	7.55	3.7
37.8	0.2	17.9	Operation not recommended					Operation not recommended					
	0.3	29.6						5.25	4.33	0.82	1.76	7.02	3.0
	0.4	41.4						5.33	4.37	0.82	1.71	7.04	3.1
43.3	0.2	17.2						Operation not recommended					
	0.3	28.6						4.62	4.07	0.88	1.86	6.48	2.5
	0.4	40.0						4.72	4.13	0.88	1.81	6.53	2.6
48.9	0.2	16.5						Operation not recommended					
	0.3	27.6						4.19	3.75	0.89	1.98	6.17	2.1
	0.4	38.7						4.28	3.80	0.89	1.92	6.20	2.2

2/18/2018

UBK007 - Performance Data

007 - Single Speed - Variable Speed ECM and 5 Speed ECM
Capacity Data (425 L/s)

EWT °C	WATER FLOW L/s	WPD	HEATING - EAT 21.1 °C					COOLING - EAT 26.7/19.4 °C					
		kPa	HC kW	Power kW	HE kW	LAT °C	COP	TC kW	SC kW	S/T Ratio	Power kW	HR kW	EER
-6.7	0.3	17.2	Operation not recommended					Operation not recommended					
	0.4	35.9											
	0.5	54.7	4.41	1.43	2.98	28.6	3.09						
-1.1	0.3	16.5	Operation not recommended					Operation not recommended					
	0.4	35.2	5.75	1.57	4.18	31.2	3.66	8.95	6.11	0.68	1.02	9.97	8.8
	0.5	53.7	5.44	1.54	3.90	30.6	3.53	9.08	6.23	0.69	0.96	10.03	9.5
4.4	0.3	15.9	Operation not recommended					Operation not recommended					
	0.4	33.8	6.49	1.65	4.85	32.7	3.95	8.96	6.24	0.70	1.14	10.09	7.9
	0.5	51.7	6.51	1.65	4.87	32.7	3.96	9.22	6.35	0.69	1.07	10.28	8.6
10	0.3	15.9	7.05	1.70	5.35	33.7	4.15	8.56	6.27	0.73	1.32	9.88	6.5
	0.4	33.8	7.31	1.73	5.59	34.3	4.25	8.96	6.37	0.71	1.25	10.21	7.2
	0.5	51.4	7.57	1.75	5.83	34.8	4.34	9.36	6.47	0.69	1.18	10.54	7.9
15.6	0.3	15.2	8.05	1.79	6.26	35.7	4.52	8.11	6.05	0.75	1.47	9.57	5.5
	0.4	32.4	8.32	1.81	6.51	36.2	4.61	8.35	6.12	0.73	1.40	9.75	6.0
	0.5	49.0	8.59	1.83	6.76	36.8	4.70	8.59	6.19	0.72	1.34	9.93	6.4
21.1	0.3	15.0	9.04	1.87	7.18	37.6	4.85	7.65	5.83	0.76	1.61	9.26	4.7
	0.4	32.4	9.32	1.89	7.44	38.2	4.94	7.74	5.87	0.76	1.55	9.29	5.0
	0.5	48.8	9.60	1.91	7.70	38.7	5.04	7.83	5.92	0.76	1.49	9.32	5.2
26.7	0.3	14.5	10.02	1.91	8.11	39.5	5.25	7.08	5.61	0.79	1.79	8.87	4.0
	0.4	31.7	10.24	1.93	8.31	40.0	5.30	7.17	5.66	0.79	1.70	8.88	4.2
	0.5	48.3	10.47	1.96	8.51	40.4	5.35	7.28	5.71	0.78	1.65	8.93	4.4
32.2	0.3	13.8	10.99	1.95	9.04	41.4	5.63	6.50	5.39	0.83	1.96	8.47	3.3
	0.4	31.0	11.16	1.98	9.18	41.8	5.64	6.61	5.45	0.83	1.87	8.48	3.5
	0.5	47.8	11.33	2.00	9.33	42.1	5.66	6.74	5.49	0.82	1.81	8.55	3.7
37.8	0.3	13.1	Operation not recommended					Operation not recommended					
	0.4	30.3						6.09	5.19	0.85	2.02	8.11	3.0
	0.5	46.9						6.18	5.23	0.85	1.96	8.14	3.2
43.3	0.3	12.4						Operation not recommended					
	0.4	29.6						5.51	4.90	0.89	2.16	7.67	2.5
	0.5	46.4						5.62	4.98	0.89	2.10	7.72	2.7
48.9	0.3	11.7						Operation not recommended					
	0.4	29.0						4.86	4.66	0.96	2.31	7.17	2.1
	0.5	45.4						4.96	4.73	0.95	2.24	7.21	2.2

2/18/2018

UBK009 - Performance Data

009 - Single Speed - Variable Speed ECM and 5 Speed ECM
Capacity Data (543 L/s)

SI Units

EWT °C	WATER FLOW L/s	WPD	HEATING - EAT 21.1 °C					COOLING - EAT 26.7/19.4 °C					
		kPa	HC kW	Power kW	HE kW	LAT °C	COP	TC kW	SC kW	S/T Ratio	Power kW	HR kW	EER
-6.7	0.3	14.5	Operation not recommended					Operation not recommended					
	0.4	25.5											
	0.6	36.5	5.4	1.73	3.7	28.2	3.12						
-1.1	0.3	13.8	Operation not recommended					Operation not recommended					
	0.4	24.8	6.9	1.92	5.0	30.5	3.59	10.1	6.6	0.65	1.24	11.4	8.2
	0.6	35.9	6.6	1.85	4.7	30.1	3.56	10.3	6.7	0.65	1.16	11.4	8.8
4.4	0.3	13.8	Operation not recommended					Operation not recommended					
	0.4	24.8	7.7	1.99	5.7	31.8	3.87	10.4	7.0	0.67	1.39	11.8	7.5
	0.6	35.9	7.7	1.98	5.7	31.8	3.91	10.5	7.0	0.67	1.32	11.8	8.0
10	0.3	13.1	8.4	2.02	6.3	32.8	4.14	10.5	7.3	0.70	1.61	12.1	6.5
	0.4	24.1	8.6	2.06	6.5	33.1	4.18	10.7	7.4	0.69	1.54	12.2	6.9
	0.6	35.0	8.9	2.10	6.8	33.5	4.21	10.8	7.4	0.69	1.47	12.3	7.3
15.6	0.3	12.4	9.4	2.11	7.3	34.4	4.48	10.0	7.2	0.72	1.77	11.8	5.6
	0.4	23.4	9.7	2.13	7.5	34.8	4.54	10.1	7.2	0.71	1.71	11.8	5.9
	0.6	34.5	9.9	2.16	7.8	35.1	4.59	10.3	7.2	0.70	1.64	11.9	6.3
21.1	0.3	11.7	10.5	2.19	8.3	36.0	4.79	9.5	7.0	0.74	1.93	11.4	4.9
	0.4	22.8	10.7	2.21	8.5	36.4	4.87	9.6	7.0	0.73	1.87	11.5	5.1
	0.6	33.2	11.0	2.22	8.8	36.8	4.95	9.8	7.0	0.72	1.81	11.6	5.4
26.7	0.3	11.0	11.8	2.24	9.5	38.0	5.26	8.9	6.8	0.77	2.16	11.1	4.1
	0.4	21.7	12.0	2.26	9.7	38.3	5.31	9.1	6.9	0.76	2.06	11.1	4.4
	0.6	32.4	12.2	2.28	9.9	38.6	5.35	9.2	6.9	0.75	1.99	11.2	4.6
32.2	0.3	10.3	13.0	2.28	10.7	39.9	5.71	8.3	6.7	0.80	2.35	10.7	3.5
	0.4	21.4	13.2	2.31	10.9	40.2	5.72	8.5	6.7	0.80	2.24	10.7	3.8
	0.6	31.6	13.4	2.34	11.1	40.5	5.74	8.6	6.8	0.78	2.17	10.8	4.0
37.8	0.3	10.3	Operation not recommended					Operation not recommended					
	0.4	21.4						7.9	6.5	0.82	2.42	10.3	3.3
	0.6	31.7						8.0	6.5	0.82	2.35	10.3	3.4
43.3	0.3	9.7						Operation not recommended					
	0.4	20.0						7.2	6.2	0.86	2.59	9.8	2.8
	0.6	30.0						7.4	6.3	0.85	2.52	9.9	2.9
48.9	0.3	9.0						Operation not recommended					
	0.4	19.3						6.5	6.0	0.92	2.78	9.3	2.3
	0.6	29.4						6.7	6.1	0.91	2.70	9.4	2.5

2/18/2018

UBK010 - Performance Data

010 - Single Speed - Variable Speed ECM and 5 Speed ECM
Capacity Data (661 L/s)

SI Units

EWT °C	WATER FLOW L/s	WPD	HEATING - EAT 21.1 °C					COOLING - EAT 26.7/19.4 °C					
		kPa	HC kW	Power kW	HE kW	LAT °C	COP	TC kW	SC kW	S/T Ratio	Power kW	HR kW	EER
-6.7	0.3	15.2	Operation not recommended					Operation not recommended					
	0.5	33.8											
	0.7	52.5	6.54	1.93	4.61	28.2	3.39						
-1.1	0.3	14.5	Operation not recommended					Operation not recommended					
	0.5	33.1	7.94	2.11	5.83	29.9	3.76	12.37	9.06	0.73	1.30	13.67	9.5
	0.7	51.4	7.85	2.07	5.78	29.8	3.79	12.54	9.23	0.74	1.22	13.76	10.3
4.4	0.3	14.5	Operation not recommended					Operation not recommended					
	0.5	33.1	9.01	2.21	6.81	31.3	4.08	12.62	9.28	0.74	1.49	14.11	8.4
	0.7	51.7	9.25	2.21	7.04	31.6	4.19	12.85	9.42	0.73	1.39	14.24	9.2
10	0.3	13.7	9.76	2.27	7.49	32.2	4.30	12.57	9.38	0.75	1.82	14.39	6.9
	0.5	32.4	10.20	2.31	7.89	32.8	4.42	12.87	9.50	0.74	1.69	14.56	7.6
	0.7	50.7	10.64	2.34	8.30	33.3	4.55	13.16	9.61	0.73	1.56	14.72	8.4
15.6	0.3	13.1	11.12	2.37	8.75	33.9	4.69	11.97	9.13	0.76	2.04	14.01	5.9
	0.5	31.4	11.66	2.41	9.25	34.6	4.84	12.23	9.22	0.75	1.92	14.14	6.4
	0.7	49.6	12.21	2.45	9.76	35.3	4.98	12.48	9.31	0.75	1.80	14.28	7.0
21.1	0.3	12.4	12.48	2.47	10.01	35.7	5.05	11.37	8.88	0.78	2.25	13.62	5.1
	0.5	31.0	13.13	2.52	10.61	36.5	5.22	11.59	8.94	0.77	2.14	13.73	5.4
	0.7	48.3	13.77	2.56	11.21	37.3	5.38	11.81	9.00	0.76	2.03	13.84	5.8
26.7	0.3	11.7	14.15	2.54	11.60	37.7	5.57	10.68	8.63	0.81	2.44	13.11	4.4
	0.5	31.0	14.59	2.58	12.01	38.3	5.65	10.86	8.67	0.80	2.32	13.19	4.7
	0.7	46.9	15.03	2.62	12.41	38.9	5.74	11.08	8.72	0.79	2.25	13.33	4.9
32.2	0.3	11.0	15.81	2.61	13.19	39.8	6.05	9.98	8.38	0.84	2.68	12.66	3.7
	0.5	30.3	16.05	2.65	13.40	40.1	6.06	10.14	8.41	0.83	2.55	12.69	4.0
	0.7	45.8	16.29	2.68	13.61	40.4	6.08	10.35	8.44	0.82	2.47	12.82	4.2
37.8	0.3	10.3	Operation not recommended					Operation not recommended					
	0.5	29.6						9.43	8.08	0.86	2.76	12.19	3.4
	0.7	42.7						9.57	8.15	0.85	2.68	12.24	3.6
43.3	0.3	9.7						Operation not recommended					
	0.5	29.0						8.62	7.74	0.90	2.96	11.58	2.9
	0.7	42.3						8.79	7.85	0.89	2.88	11.67	3.1
48.9	0.3	9.7						Operation not recommended					
	0.5	29.0						7.86	7.45	0.95	3.17	11.03	2.5
	0.7	42.0						8.03	7.56	0.94	3.08	11.11	2.6

2/18/2018

UBK012 - Performance Data

012 - Single Speed - Variable Speed ECM and 5 Speed ECM
Capacity Data (755 L/s)

SI Units

EWT °C	WATER FLOW L/s	WPD kPa	HEATING - EAT 21.1 °C					COOLING - EAT 26.7/19.4 °C					
			HC kW	Power kW	HE kW	LAT °C	COP	TC kW	SC kW	S/T Ratio	Power kW	HR kW	EER
-6.7	0.4	19.3	Operation not recommended					Operation not recommended					
	0.6	42.1											
	0.8	71.8	7.94	2.47	5.47	28.7	3.22						
-1.1	0.4	18.6	Operation not recommended					Operation not recommended					
	0.6	41.4	9.56	2.66	6.89	30.5	3.59	13.76	10.24	0.74	1.75	15.51	7.9
	0.8	65.8	9.85	2.67	6.90	30.5	3.61	13.95	10.43	0.75	1.64	15.59	8.5
4.4	0.4	18.6	Operation not recommended					Operation not recommended					
	0.6	41.4	10.84	2.80	8.04	31.9	3.87	14.45	10.66	0.74	1.96	16.41	7.4
	0.8	64.8	11.14	2.82	8.32	32.2	3.96	14.61	10.76	0.74	1.84	16.45	7.9
10	0.4	17.9	11.81	2.90	8.91	33.0	4.07	15.01	11.11	0.74	2.30	17.31	6.5
	0.6	40.7	12.27	2.94	9.33	33.5	4.17	15.14	11.09	0.73	2.17	17.31	7.0
	0.8	63.8	12.72	2.98	9.74	34.0	4.27	15.27	11.08	0.73	2.04	17.31	7.5
15.6	0.4	17.2	13.51	3.05	10.47	34.8	4.44	14.27	10.76	0.75	2.56	16.83	5.6
	0.6	40.0	14.02	3.09	10.93	35.4	4.53	14.43	10.76	0.75	2.43	16.86	5.9
	0.8	63.4	14.54	3.14	11.40	35.9	4.63	14.58	10.77	0.74	2.31	16.89	6.3
21.1	0.4	16.5	15.21	3.19	12.02	36.7	4.77	13.54	10.40	0.77	2.81	16.35	4.8
	0.6	37.2	15.78	3.25	12.54	37.3	4.86	13.72	10.43	0.76	2.70	16.41	5.1
	0.8	58.6	16.35	3.30	13.05	37.9	4.96	13.89	10.46	0.75	2.58	16.47	5.4
26.7	0.4	15.9	17.14	3.33	13.81	38.8	5.15	12.72	10.14	0.80	3.09	15.81	4.1
	0.6	36.5	17.58	3.38	14.20	39.3	5.20	12.90	10.17	0.79	2.94	15.85	4.4
	0.8	57.9	18.01	3.43	14.58	39.8	5.25	13.11	10.20	0.78	2.85	15.96	4.6
32.2	0.4	15.2	19.08	3.47	15.60	40.9	5.50	11.91	9.88	0.83	3.38	15.29	3.5
	0.6	35.9	19.37	3.52	15.85	41.2	5.51	12.09	9.91	0.82	3.22	15.32	3.7
	0.8	57.2	19.67	3.56	16.11	41.6	5.52	12.34	9.94	0.81	3.12	15.46	4.0
37.8	0.4	14.5	Operation not recommended					Operation not recommended					
	0.6	35.9						11.24	9.52	0.85	3.49	14.73	3.2
	0.8	56.5						11.42	9.60	0.84	3.38	14.79	3.4
43.3	0.4	13.8						Operation not recommended					
	0.6	35.2						10.28	9.12	0.89	3.73	14.01	2.8
	0.8	56.1						10.49	9.26	0.88	3.63	14.12	2.9
48.9	0.4	13.1						Operation not recommended					
	0.6	34.5						9.32	8.66	0.93	4.01	13.33	2.3
	0.8	55.2						9.52	8.79	0.92	3.89	13.41	2.4

2/18/2018

UBK015 - Performance Data

015 - Single Speed - Variable Speed ECM and 5 Speed ECM
Capacity Data (897 L/s)
SI Units

EWT °C	WATER FLOW L/s	WPD	HEATING - EAT 21.1 °C					COOLING - EAT 26.7/19.4 °C					
		kPa	HC kW	Power kW	HE kW	LAT °C	COP	TC kW	SC kW	S/T Ratio	Power kW	HR kW	EER
-6.7	0.6	31.7	Operation not recommended					Operation not recommended					
	0.8	50.3											
	0.9	68.9	9.91	3.18	6.73	29.2	3.12						
-1.1	0.6	31.0	Operation not recommended					Operation not recommended					
	0.8	44.8	11.45	3.37	8.07	30.6	3.39	17.78	11.21	0.63	2.17	19.95	8.2
	0.9	59.0	11.40	3.36	8.04	30.5	3.39	18.02	11.43	0.63	2.04	20.06	8.8
4.4	0.6	31.0	Operation not recommended					Operation not recommended					
	0.8	44.8	12.96	3.52	9.44	32.0	3.68	18.27	12.12	0.66	2.36	20.63	7.7
	0.9	59.3	13.31	3.56	9.75	32.3	3.74	18.51	12.35	0.67	2.29	20.80	8.1
10	0.6	30.0	14.07	3.59	10.48	33.0	3.92	18.52	12.78	0.69	2.57	21.09	7.2
	0.8	43.1	14.64	3.68	10.96	33.5	3.98	18.76	13.03	0.69	2.56	21.31	7.3
	0.9	56.0	15.21	3.76	11.45	34.1	4.05	18.99	13.28	0.70	2.54	21.53	7.5
15.6	0.6	29.6	16.05	3.76	12.29	34.8	4.27	17.55	12.31	0.70	2.91	20.46	6.0
	0.8	42.7	16.71	3.84	12.87	35.4	4.35	17.81	12.62	0.71	2.89	20.70	6.2
	0.9	55.2	17.36	3.92	13.44	36.0	4.43	18.07	12.94	0.72	2.87	20.94	6.3
21.1	0.6	28.8	18.02	3.93	14.09	36.7	4.59	16.59	11.84	0.71	3.24	19.83	5.1
	0.8	42.1	18.77	4.01	14.77	37.3	4.69	16.87	12.22	0.72	3.22	20.09	5.2
	0.9	54.5	19.52	4.08	15.44	38.0	4.78	17.14	12.60	0.74	3.20	20.34	5.4
26.7	0.6	28.3	20.16	4.09	16.07	38.6	4.93	15.41	11.80	0.77	3.83	19.24	4.0
	0.8	41.4	20.70	4.15	16.55	39.1	4.99	15.66	12.00	0.77	3.65	19.31	4.3
	0.9	53.8	21.25	4.22	17.03	39.6	5.04	15.94	12.21	0.77	3.54	19.48	4.5
32.2	0.6	27.6	22.29	4.24	18.05	40.6	5.26	14.23	11.75	0.83	4.19	18.42	3.4
	0.8	40.7	22.63	4.30	18.33	40.9	5.27	14.45	11.78	0.82	4.00	18.45	3.6
	0.9	53.1	22.98	4.35	18.63	41.2	5.28	14.74	11.81	0.80	3.87	18.61	3.8
37.8	0.6	26.9	Operation not recommended					Operation not recommended					
	0.8	40.0						13.52	11.35	0.84	4.33	17.86	3.1
	0.9	52.4						13.73	11.44	0.83	4.20	17.93	3.3
43.3	0.6	26.2						Operation not recommended					
	0.8	39.3						12.46	10.92	0.88	4.65	17.11	2.7
	0.9	51.7						12.72	11.08	0.87	4.52	17.24	2.8
48.9	0.6	25.5						Operation not recommended					
	0.8	38.6						11.33	10.37	0.91	4.97	16.31	2.3
	0.9	51.0						11.58	10.52	0.91	4.83	16.41	2.4

2/18/2018

UBK017 - Performance Data

017 - Single Speed - Variable Speed ECM and 5 Speed ECM
Capacity Data (991 L/s)

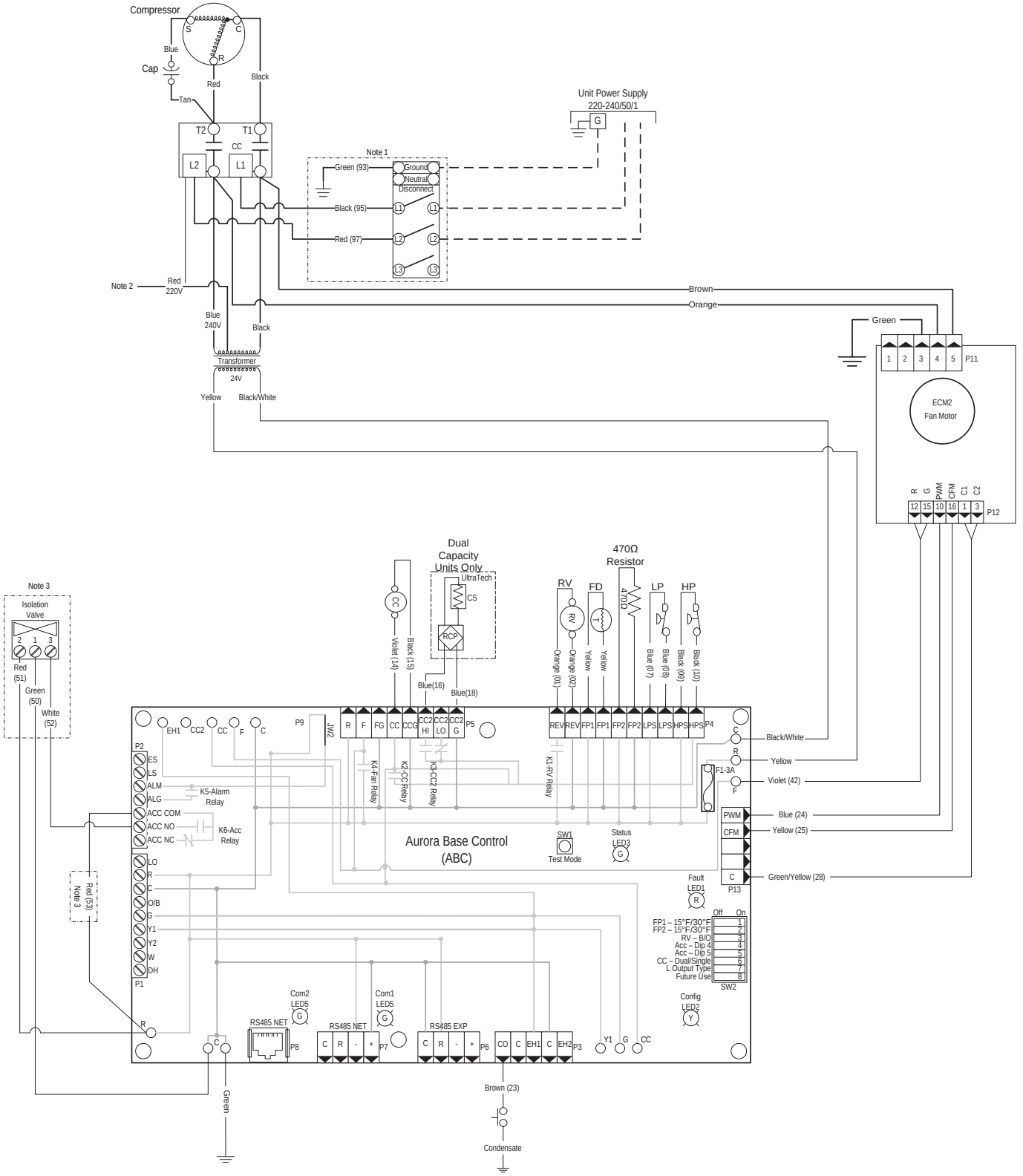
SI Units

EWT °C	WATER FLOW L/s	WPD kPa	HEATING - EAT 21.1 °C					COOLING - EAT 26.7/19.4 °C					
			HC kW	Power kW	HE kW	LAT °C	COP	TC kW	SC kW	S/T Ratio	Power kW	HR kW	EER
-6.7	0.8	40.0	Operation not recommended					Operation not recommended					
	0.9	62.4											
	1.1	84.7	11.2	3.35	7.8	29.4	3.34						
-1.1	0.8	39.3	Operation not recommended					Operation not recommended					
	0.9	61.0	13.0	3.49	9.6	30.9	3.74	16.9	10.9	0.65	2.23	19.1	7.6
	1.1	82.8	13.0	3.55	9.5	30.9	3.67	17.1	11.1	0.65	2.09	19.2	8.2
4.4	0.8	39.3	Operation not recommended					Operation not recommended					
	0.9	61.0	14.7	3.65	11.0	32.3	4.02	18.0	12.3	0.68	2.36	20.4	7.6
	1.1	82.7	15.1	3.75	11.4	32.6	4.03	18.3	12.8	0.70	2.34	20.6	7.8
10	0.8	38.8	15.8	3.70	12.1	33.2	4.27	18.8	12.8	0.68	2.41	21.2	7.8
	0.9	59.0	16.5	3.82	12.7	33.8	4.32	19.1	13.7	0.71	2.50	21.6	7.7
	1.1	79.5	17.2	3.94	13.3	34.4	4.37	19.5	14.5	0.75	2.59	22.0	7.5
15.6	0.8	37.9	17.9	3.90	14.0	34.9	4.59	17.9	12.4	0.69	2.75	20.7	6.5
	0.9	57.6	18.7	4.00	14.7	35.6	4.68	18.3	13.3	0.73	2.84	21.1	6.4
	1.1	77.2	19.5	4.11	15.4	36.3	4.76	18.7	14.2	0.76	2.94	21.6	6.4
21.1	0.8	37.4	19.9	4.09	15.8	36.7	4.87	17.0	12.0	0.70	3.09	20.1	5.5
	0.9	56.5	20.9	4.18	16.7	37.5	5.00	17.5	12.9	0.74	3.19	20.7	5.5
	1.1	76.1	21.9	4.27	17.6	38.3	5.13	17.9	13.8	0.77	3.28	21.2	5.5
26.7	0.8	36.5	22.2	4.22	18.0	38.6	5.26	16.0	12.3	0.77	3.95	20.0	4.1
	0.9	54.5	22.9	4.30	18.6	39.1	5.33	16.4	12.8	0.78	3.77	20.1	4.3
	1.1	72.4	23.6	4.37	19.2	39.7	5.40	16.7	13.3	0.79	3.65	20.4	4.6
32.2	0.8	35.9	24.5	4.36	20.1	40.5	5.62	15.0	12.7	0.85	4.35	19.4	3.4
	0.9	52.7	24.9	4.42	20.5	40.8	5.64	15.3	12.7	0.83	4.15	19.4	3.7
	1.1	69.8	25.3	4.47	20.8	41.1	5.65	15.6	12.7	0.82	4.02	19.6	3.9
37.8	0.8	35.2	Operation not recommended					Operation not recommended					
	0.9	50.0						14.3	12.2	0.85	4.52	18.8	3.2
	1.1	64.8						14.5	12.3	0.85	4.38	18.9	3.3
43.3	0.8	34.5						Operation not recommended					
	0.9	46.2						13.2	11.7	0.89	4.86	18.0	2.7
	1.1	58.1						13.5	11.9	0.88	4.73	18.2	2.8
48.9	0.8	33.8						Operation not recommended					
	0.9	45.5						11.8	11.1	0.94	5.24	17.1	2.3
	1.1	57.0						12.1	11.3	0.93	5.09	17.2	2.4

2/18/2018

Wiring Schematics

Commercial Aurora with Variable Speed ECM Motor 220-240/50/1



Wiring Schematics cont.

Commercial Aurora with Variable Speed ECM Motor 220-240/50/1

Legend

- Factory Low Voltage Wiring
- Factory Line Voltage Wiring
- Field Low Voltage Wiring
- Field Line Voltage Wiring
- Optional Block
- DC Voltage PCB Traces
- Field Zone Sensor Wiring
- Internal Junction
- Quick Connect Terminal
- L1 – Field Wiring Lug
- Ground
- Relay Contacts – N.O., N.C.
- Capacitor
- Fuse
- Thermistor
- Relay Coil
- Switch - Condensate Overflow
- Switch - High pressure
- Switch - Low pressure
- 3 2 1 – Polarized connector
- G – Light Emitting Diode - Green
- Y – Light Emitting Diode - Yellow
- R – Light Emitting Diode - Red

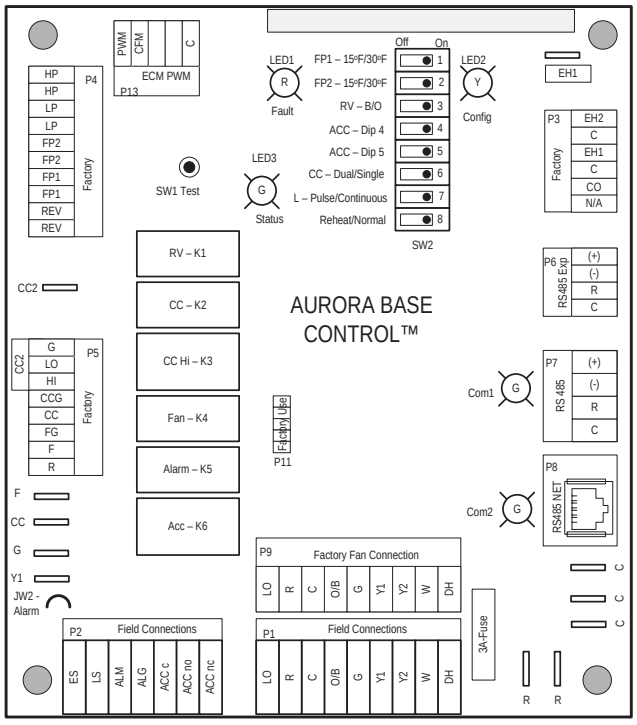
CC – Compressor Contactor
CO – Condensate Overflow Sensor
ES – Emergency Shutdown
HP – High Pressure Switch
LP – Low Pressure Switch
FD – Freeze Detection Sensor
F1 – Fuse

SW1 – Push button
SW2 – DIP package 8 position
RB – Blower Relay
RV – Reversing Valve Coil
PGM – Phase Guard Monitor
RH – Reheat Valve Coil

Aurora LED Flash Codes	
Slow Flash	1 second on and 1 second off
Fast Flash	100 milliseconds on and 100 milliseconds off
Flash Code	100 milliseconds on and 400 milliseconds off with a 2 second pause before repeating

Random Start Delay	
Status LED (LED1, Green)	Fast Flash
Configuration LED (LED2, Yellow)	Fast Flash
Fault LED (LED3, Red)	Fast Flash

Status LED (LED1, Green)		Configuration LED (LED2, Yellow)		Fault LED (LED3, Red)	
Normal Mode	ON	No Software Overide	Flash ECM Setting	Normal Mode	OFF
Control is Non-Functional	OFF	DIP Switch Overide	Slow Flash	Input Fault Lockout	Flash Code 1
Test Mode	Slow Flash	ECM Configure Mode	Fast Flash	High Pressure Lockout	Flash Code 2
Lockout Active	Fast Flash	Reset Configure Mode	Off	Low Pressure Lockout	Flash Code 3
Dehumidification Mode	Flash Code 2			Low Air Coil Limit Lockout - FP2	Flash Code 4
Reserved	Flash Code 3			Low Water Coil Limit Lockout - FP1	Flash Code 5
Reserved	Flash Code 4			Reserved	Flash Code 6
Load Shed	Flash Code 5			Condensate Overflow Lockout	Flash Code 7
ESD	Flash Code 6			Over/Under Voltage Shutdown	Flash Code 8
Reserved	Flash Code 7			Reserved	Flash Code 9
				Reserved	Flash Code 10
				Air/Water Coil Limit Sensor Error	Flash Code 11



Notes:

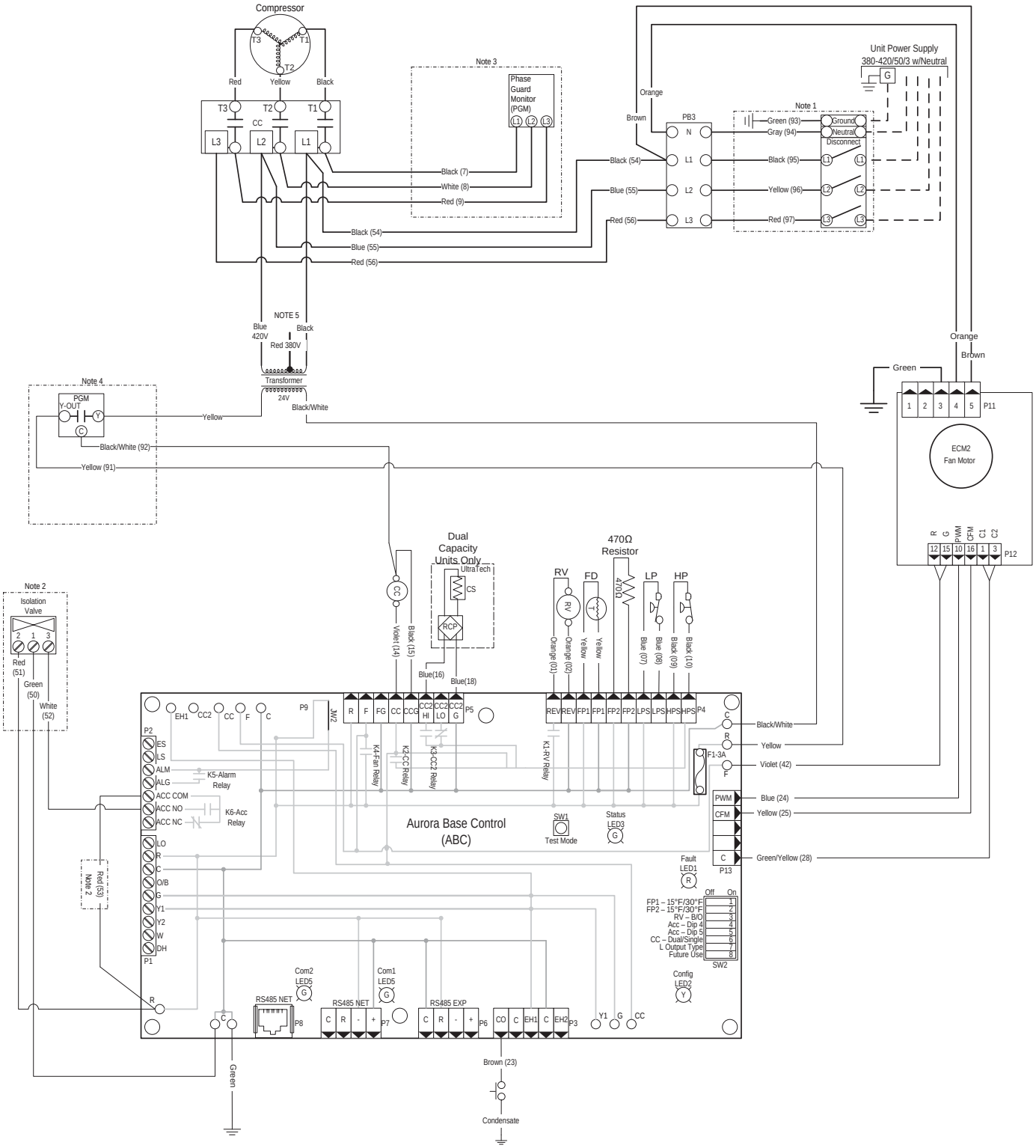
1 – Optional, factory installed unit mounted disconnect.
2 – Swap blue and red leads for 220V operation.
3 – Optional, factory installed internal isolation valve.

Accessory Relay		
Operation	SW2-4	SW2-5
Cycle with Blower	On	On
Cycle with Compressor	Off	Off
Water Valve Slow Open	On	Off
Outdoor Air Damper	Off	On

Aurora Timing Events		
Event	Normal Mode	Test Mode
Random Start Delay	5 to 80 seconds	1 second
Compressor On Delay	5 seconds	< 1 second
Compressor Minimum On Time	2 minutes	5 seconds
Compressor Short Cycle Delay	4 minutes	15 seconds
Blower Off Delay	30 seconds	2 seconds
Fault Recognition Delay – High Pressure	Less than 1 second	Less than 1 second
Start-Up Bypass – Low Pressure	2 minutes	30 seconds
Fault Recognition Delay – Low Pressure	30 seconds	30 seconds
Start-Up Bypass – Low Water/Air Coil Limit	2 minutes	30 seconds
Fault Recognition Delay – Low Water/Air Coil Limit	30 seconds	30 seconds
Fault Recognition Delay – Condensate Overflow	30 seconds	30 seconds
Thermostat Call Recognition Time	2 seconds	2 seconds
Auxiliary Heat Staging Delay	5 minutes	20 seconds
Emergency Heat Staging Delay	2 minutes	7.5 seconds
Water Valve Slow Open Delay	90 seconds	90 seconds
Reheat Delay	30 seconds	30 seconds

Wiring Schematics cont.

Commercial Aurora with Variable Speed ECM Motor 380-420/50/3



Wiring Schematics cont.

Commercial Aurora with Variable Speed ECM Motor 380-420/50/3

Accessory Relay		
Operation	SW2-4	SW2-5
Cycle with Blower	On	On
Cycle with Compressor	Off	Off
Water Valve Slow Open	On	Off
Outdoor Air Damper	Off	On

Aurora Timing Events		
Event	Normal Mode	Test Mode
Random Start Delay	5 to 80 seconds	1 second
Compressor On Delay	5 seconds	< 1 second
Compressor Minimum On Time	2 minutes	5 seconds
Compressor Short Cycle Delay	4 minutes	15 seconds
Blower Off Delay	30 seconds	2 seconds
Fault Recognition Delay – High Pressure	Less than 1 second	Less than 1 second
Start-Up Bypass – Low Pressure	2 minutes	30 seconds
Fault Recognition Delay – Low Pressure	30 seconds	30 seconds
Start-Up Bypass – Low Water/Air Coil Limit	2 minutes	30 seconds
Fault Recognition Delay – Low Water/Air Coil Limit	30 seconds	30 seconds
Fault Recognition Delay – Condensate Overflow	30 seconds	30 seconds
Thermostat Call Recognition Time	2 seconds	2 seconds
Auxiliary Heat Staging Delay	5 minutes	20 seconds
Emergency Heat Staging Delay	2 minutes	7.5 seconds
Water Valve Slow Open Delay	90 seconds	90 seconds
Reheat Delay	30 seconds	30 seconds

Aurora LED Flash Codes	
Slow Flash	1 second on and 1 second off
Fast Flash	100 milliseconds on and 100 milliseconds off
Flash Code	100 milliseconds on and 400 milliseconds off with a 2 second pause before repeating

Random Start Delay	
Status LED (LED1, Green)	Fast Flash
Configuration LED (LED2, Yellow)	Fast Flash
Fault LED (LED3, Red)	Fast Flash

Status LED (LED1, Green)		Configuration LED (LED2, Yellow)		Fault LED (LED3, Red)	
Normal Mode	ON	No Software Overide	Flash ECM Setting	Normal Mode	OFF
Control is Non-Functional	OFF	DIP Switch Overide	Slow Flash	Input Fault Lockout	Flash Code 1
Test Mode	Slow Flash	ECM Configure Mode	Fast Flash	High Pressure Lockout	Flash Code 2
Lockout Active	Fast Flash	Reset Configure Mode	Off	Low Pressure Lockout	Flash Code 3
Dehumidification Mode	Flash Code 2			Low Air Coil Limit Lockout - FP2	Flash Code 4
Reserved	Flash Code 3			Low Water Coil Limit Lockout - FP1	Flash Code 5
Reserved	Flash Code 4			Reserved	Flash Code 6
Load Shed	Flash Code 5			Condensate Overflow Lockout	Flash Code 7
ESD	Flash Code 6			Over/Under Voltage Shutdown	Flash Code 8
Reserved	Flash Code 7			Reserved	Flash Code 9
				Reserved	Flash Code 10
				Air/Water Coil Limit Sensor Error	Flash Code 11

Notes:

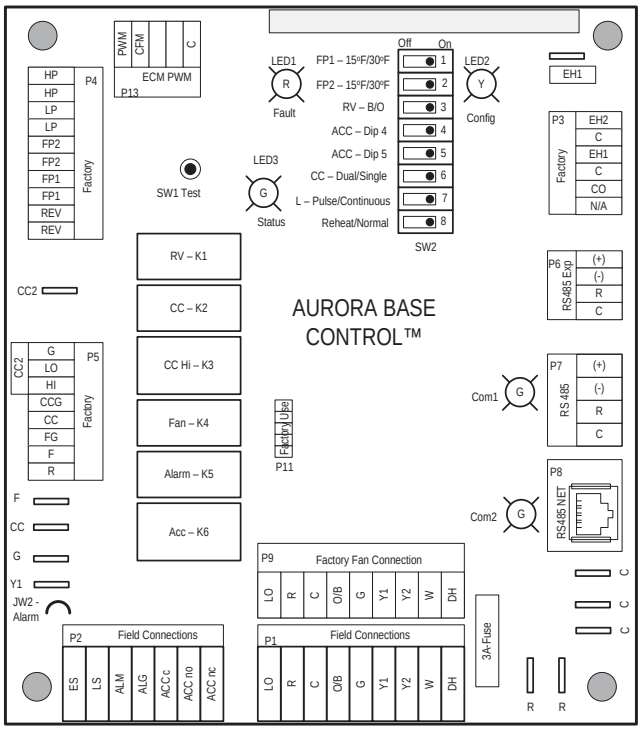
1 – Optional, factory installed unit mounted disconnect.
2 – Optional, factory installed internal isolation valve.
3 – Optional, factory installed phase guard
4 – Optional, factory installed phase guard. The yellow transformer wire shall be connected directly to the CPU board, if this option is not installed.
5 – Switch Blue and Red transformer wires for 380V Operation

Legend

- Factory Low Voltage Wiring
- Factory Line Voltage Wiring
- Field Low Voltage Wiring
- Field Line Voltage Wiring
- Optional Block
- DC Voltage PCB Traces
- Field Zone Sensor Wiring
- Internal Junction
- Quick Connect Terminal
- L1 – Field Wiring Lug
- Ground
- Relay Contacts – N.O., N.C.
- Capacitor
- Fuse
- Thermistor
- Relay Coil
- Switch - Condensate Overflow
- Switch - High pressure
- Switch - Low pressure
- 3 2 1 – Polarized connector
- G – Light Emitting Diode - Green
- Y – Light Emitting Diode - Yellow
- R – Light Emitting Diode - Red

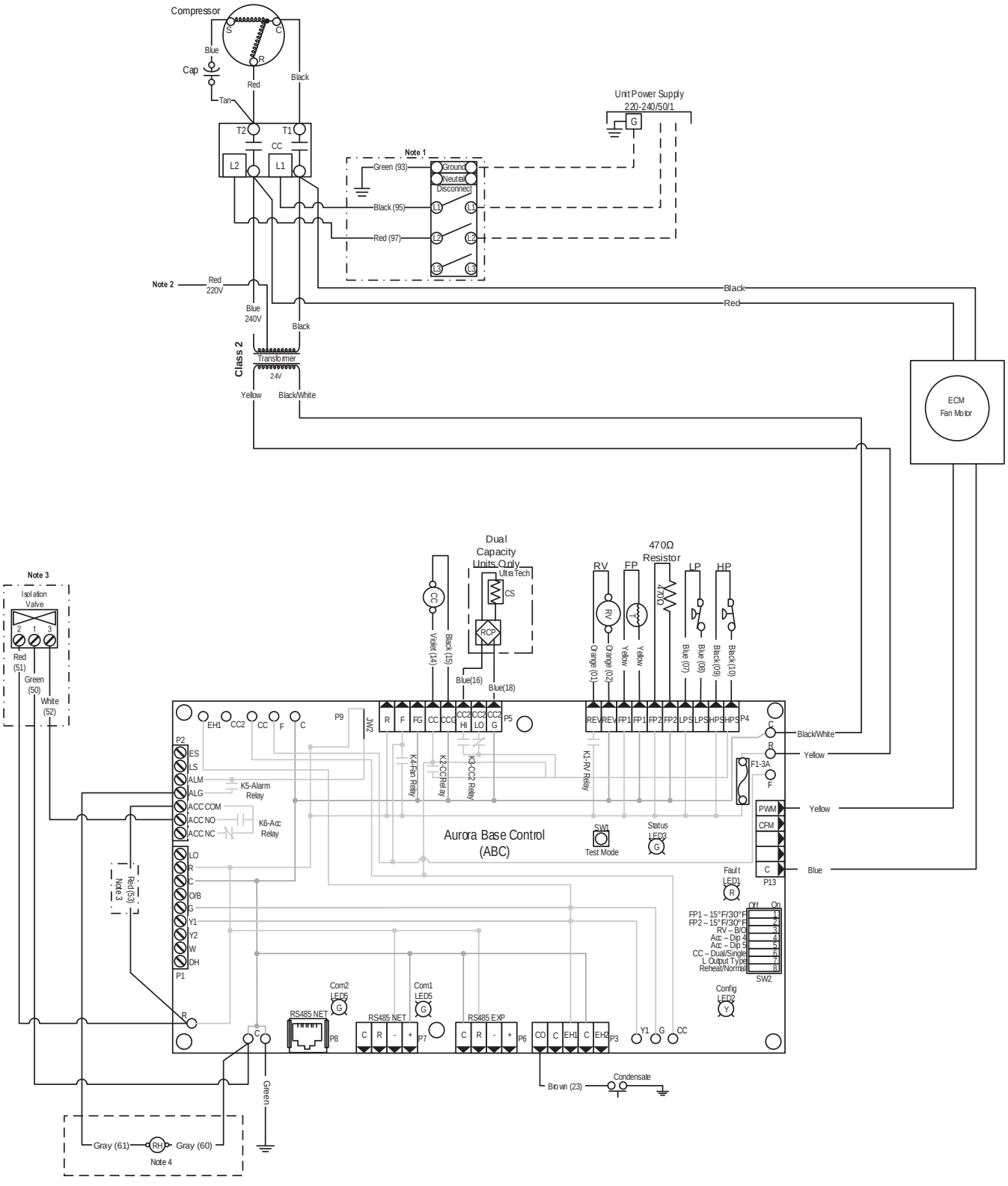
CC – Compressor Contactor
CO – Condensate Overflow Sensor
ES – Emergency Shutdown
HP – High Pressure Switch
LP – Low Pressure Switch
FD – Freeze Detection Sensor
F1 – Fuse

SW1 – Push button
SW2 – DIP package 8 position
RB – Blower Relay
RV – Reversing Valve Coil
PGM – Phase Guard Monitor
RH – Reheat Valve Coil



Wiring Schematics cont.

Commercial Aurora with Variable Speed ECM Motor 220-240/50/1



Wiring Schematics cont.

Commercial Aurora with Variable Speed ECM Motor 220-240/50/1

Notes:

1 – Optional, factory installed unit mounted disconnect.
2 – Swap blue and red leads for 220V operation.
3 – Optional, factory installed internal isolation valve.
4 – Optional, factory installed reheat.

Legend

Factory Low Voltage Wiring
Factory Line Voltage Wiring
Field Low Voltage Wiring
Field Line Voltage Wiring
Optional Block
DC Voltage PCB Traces
Field Zone Sensor Wiring
Internal Junction
Quick Connect Terminal
Field Wiring Lug
Ground
Relay Contacts – N.O., N.C.
Capacitor
Fuse

Thermistor
Relay Coil
Switch - Condensate Overflow
Switch - High pressure
Switch - Low pressure
Polarized connector
Light Emitting Diode - Green
Light Emitting Diode - Yellow
Light Emitting Diode - Red

CC – Compressor Contactor
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HP – High Pressure Switch
LP – Low Pressure Switch
FP – Freeze Protection
F1 – Fuse

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Status LED (LED1, Green)		Configuration LED (LED2, Yellow)		Fault LED (LED3, Red)	
Normal Mode	ON	No Software Override	Flash ECM Setting	Normal Mode	OFF
Control is Non-Functional	OFF	DIP Switch Override	Slow Flash	Input Fault Lockout	Flash Code 1
Test Mode	Slow Flash	ECM Configure Mode	Fast Flash	High Pressure Lockout	Flash Code 2
Lockout Active	Fast Flash	Reset Configure Mode	Off	Low Pressure Lockout	Flash Code 3
Dehumidification Mode	Flash Code 2			Low Air Coil Limit Lockout - FP2	Flash Code 4
Reserved	Flash Code 3			Low Water Coil Limit Lockout - FP1	Flash Code 5
Reserved	Flash Code 4			Reserved	Flash Code 6
Load Shed	Flash Code 5			Condensate Overflow Lockout	Flash Code 7
ESD	Flash Code 6			Over/Under Voltage Shutdown	Flash Code 8
Reserved	Flash Code 7			Reserved	Flash Code 9
				Reserved	Flash Code 10
				Air/Water Coil Limit Sensor Error	Flash Code 11

Accessory Relay		
Operation	SW2-4	SW2-5
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Fault Recognition Delay – Low Pressure	30 seconds	30 seconds
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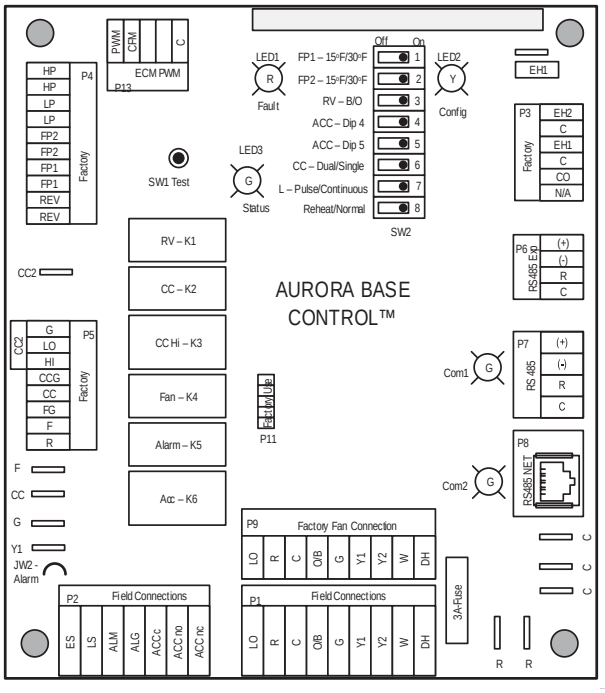
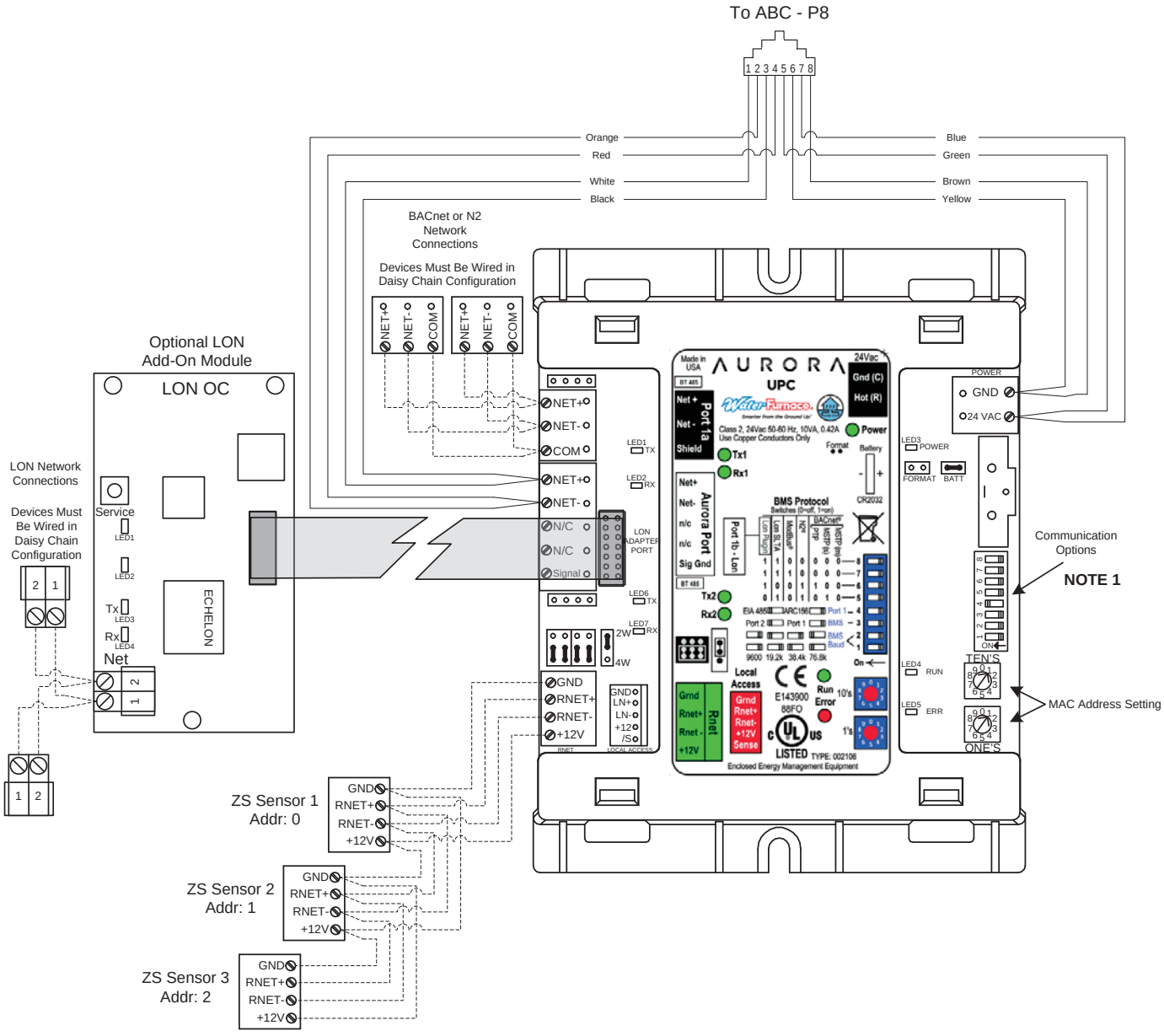
Fault Recognition Delay – Low Water/Air Coil Limit	30 seconds	30 seconds
Fault Recognition Delay – Condensate Overflow	30 seconds	30 seconds
Thermostat Call Recognition Time	2 seconds	2 seconds
Auxiliary Heat Staging Delay	5 minutes	20 seconds
Emergency Heat Staging Delay	2 minutes	7.5 seconds
Water Valve Slow Open Delay	90 seconds	90 seconds
Reheat Delay	30 seconds	30 seconds



Wiring Schematics cont.

Aurora Control with UPC



ZS Sensor Information

Zone Sensors can be wired in daisy chain as show or in a star or hybrid configuration. Maximum of 5 sensors per UPC. Maximum allowable load 210mA. See the UPC install manual for possible sensor combinations.

DIP Switch Value

1
2
4
8

Each ZS sensor must have a unique address, but the addresses do not need to be sequential. Use the DIP switches on the back of the ZS sensor to set an address from 0 to 4. (0 is the factory default.) Each DIP switch has the value shown in the figure to the left. Turn on as many DIP switches as you need so that their total value equals the address.

Notes

1. Use DIP Switches 5 – 8 to change communication protocol and DIP switches 1 – 2 to change BACnet baud rate

Legend

Factory Low Voltage Wiring

Field Low Voltage Wiring

RJ45 Connector

Engineering Guide Specifications

General

Furnish and install 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. The reverse cycle heating/cooling units shall be either suspended type with horizontal air inlet and discharge or floor mounted type with horizontal air inlet and vertical upflow air discharge. Units shall be AHRI/ISO 13256-1 certified and listed by a nationally recognized safety-testing laboratory or agency, such as ETL Testing Laboratory. Each unit shall be computer run-tested at the factory with conditioned water and operation verified to catalog data. Each unit shall be mounted on a pallet and shipped in a corrugated box or stretch-wrapped. The units shall be designed to operate with entering liquid temperature between 20°F and 120°F [-6.7°C and 48.9°C].

Casing and Cabinet

The cabinet shall be fabricated from heavy-gauge galvanized steel. The interior shall be insulated with 1/2 in. thick, multi-density, cleanable aluminum foil coated glass fiber with edges sealed or tucked under flanges to prevent the introduction of glass fibers into the discharge air. Standard cabinet panel insulation must meet 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.

One (horizontal) to two (vertical) blower and two compressor compartment access panels shall be 'lift-out' removable with supply and return ductwork in place.

A duct collar shall be provided on the supply air opening. Standard size 1 in. [2.54 cm] MERV 4 filters shall be provided with each unit. Units shall have a return air filter rack that is field convertible from 1 in. [2.54 cm] to 2 in. [5.1 cm]. The upflow vertical units shall have a removable insulated divider panel between the air handling section and the compressor section to minimize the transmission of compressor noise and to permit operational service testing without air bypass. Vertical units shall be supplied with left or right horizontal air inlet and top vertical air discharge. Horizontal units shall be supplied with left or right air inlet and side or end air discharge.

Option: AlpinePure MERV 13 Filter - A 2 in. thick [51 mm] MERV 13 filter can help fulfill a credit under the LEED Rating System. Its low initial resistance promotes low energy consumption (0.21 in. w.g. @ 300 fpm) and provides nearly twice the life of a standard filter (300 fpm vs. standard 500 fpm application).

Option: A Super Quiet Sound package shall include multi-density full coverage compressor blanket.

Option: An internally mounted low pressure drop (high Cv) water solenoid valve shall be factory installed for use in variable speed pumping applications.

Option: An internally mounted automatic flow regulator shall be set to 3 gpm/ton to deliver optimal flow to the unit.

Refrigerant Circuit

All units shall utilize the non-ozone depleting and low global warming potential refrigerant R-410A. All units shall contain a sealed refrigerant circuit including a hermetic motor-compressor, bidirectional thermostatic expansion valve, finned tube air-to-refrigerant heat exchanger, reversing valve, coaxial tube water-to-refrigerant heat exchanger, and service ports.

Compressors shall be high-efficiency single speed rotary or reciprocating type designed for heat pump duty and mounted on vibration isolators. Compressor motors shall be single-phase PSC with overload protection.

The air coil shall be sized for low-face velocity and constructed of lanced aluminum fins bonded to rifled aluminum tubes in a staggered pattern not less than three rows deep for enhanced performance. The all-aluminum air coil is not susceptible to formicary corrosion.

Option: AlumiSeal electro-coated air coil.

The coaxial water-to-refrigerant heat exchanger shall be designed for low water pressure drop and constructed of a convoluted copper inner tube and a steel outer tube. Refrigerant to air heat exchangers shall utilize enhanced corrugated lanced aluminum fins and rifled aluminum tube construction rated to withstand 600 psig (4135 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 600 psig (4135 kPa) working refrigerant pressure and 450 psig (3101 kPa) working water pressure. The thermostatic expansion valve shall provide proper superheat over the entire liquid temperature range with minimal "hunting." The valve shall operate bidirectionally without the use of check valves.

Option: Cupronickel refrigerant to water heat exchanger shall be of copper-nickel inner water tube and steel refrigerant outer tube design, rated to withstand 600 psig (4135 kPa) working refrigerant pressure and 450 psig (3101 kPa) working water pressure. Water lines shall also be of cupronickel construction.

Engineering Guide Specifications cont.

Blower Motor and Assembly

The blower shall be a direct drive centrifugal type with a dynamically balanced wheel. The housing and wheel shall be designed for quiet low outlet velocity operation. The blower housing shall be removable from the unit without disconnecting the supply air ductwork for servicing of the blower motor. The blower motor shall be isolated from the housing by rubber grommets. The motor shall be permanently lubricated and have thermostatic overload protection.

Option: PSC blower motor shall be a three-speed PSC type.

Option: 5-Speed ECM blower motor shall be a 5-speed ECM ECM type. The 5-speed ECM blower motor shall be soft starting, shall maintain constant torque over its operating static range, and shall provide 5 speed settings. The blower motor shall be isolated from the housing by rubber grommets. The motor shall be permanently lubricated and have thermostatic overload protection. 5-speed ECM motors shall be long-life ball bearing type.

Option: Variable Speed ECM blower motor shall be a variable-speed ECM type. The variable speed ECM blower motor shall be soft starting, shall maintain constant cfm over its operating static range, and shall provide 12 cfm settings. Variable speed ECM motors shall be long-life ball bearing type.

Electrical

A control box shall be located within the unit compressor compartment and shall contain a 50VA or 75VA transformer, 24 volt activated, 2 pole compressor contactor, terminal block for thermostat wiring and solid-state controller for complete unit operation. Electromechanical operation WILL NOT be accepted. Units shall be name-plated for use with time delay fuses or HACR circuit breakers. Unit controls shall be 24 volt and provide heating or cooling as required by the remote thermostat/sensor.

An Aurora microprocessor-based controller that interfaces with a multi-stage electronic thermostat to monitor and control unit operation shall be provided. The control shall provide operational sequencing, blower speed control, high and low pressure switch monitoring, freeze detection, condensate overflow sensing, lockout mode control, LED status and fault indicators, fault memory, field selectable options and accessory output. The control shall provide fault retry three times before locking out to limit nuisance trips.

A detachable terminal block with screw terminals will be provided for field control wiring. All units shall have knockouts for entrance of low and line voltage wiring. The blower motor and control box shall be harness plug wired for easy removal.

Option: ***An Aurora Unitary Protocol Converter (UPC) shall be included*** that communicates directly with the Aurora Heat Pump Controls and allows access/control of a variety of internal Aurora heat pump operations such as sensors, relay operation, faults and other information. In turn, the UPC shall convert the internal Aurora Modbus protocol to BACnet MS/TP, or N2 protocols for communication over a BAS system. Additional individual unit configuration items such as ECM fan speeds or freeze protection settings shall be directly available over the BAS without the need for access to the actual heat pump.

Option: Aurora UPC DDC communication protocols: LonWorks

Piping

Supply and return water connections shall be FPT copper fittings.

With vertical units, the condensate connection shall be a 3/4 in. [19.1 mm] PVC socket with internally-trapped hose that can be routed to front or side corner post locations.

Hanger Kit

(included with horizontal units only - field installed)
The hanger kit shall consist of galvanized steel brackets, bolts, lock washers, and isolators and shall be designed to fasten to the unit bottom panel for suspension from 3/8 in. threaded rods. Brackets shall not inhibit filter removal in any way.

Accessories

Thermostat (field-installed)

A multi-stage auto-changeover electronic digital thermostat shall be provided. The thermostat shall offer two heating stages and one cooling stage with precise temperature control. An OFF-HEAT-AUTO-COOL-EMERG system switch, OFF-AUTO blower switch, and indicating LEDs shall be provided. The thermostat shall display in °F or °C.

Engineering Guide Specifications cont.

Hose Kits – Ball Valves (field-installed)

A flexible steel braid hose featuring Kevlar® reinforced EPDM core with ANSI 302/304 stainless steel outer braid and fire rated materials per ASTM E 84-00 (NFPA 255, ANSI/UL 723 & UBC 8-1). Ball valve at one end; swivel connector with adapter at the other end (swivel to adapter connection via fiber or EPDM gasket). Swivel connection provides union between heat pump and piping system. The hoses feature brass fittings, stainless steel ferrules. A full port ball valve shall be provided with integral P/T (pressure/temperature) port on supply hose.

Specifications:
- Temperature range of 35°F [2°C] to 180°F [82°C].
- Max. working pressure of 400 psi [2757 kPa] for 1/2 in. and 3/4 in. hose kits; max. working pressure of 350 psi [kPa] for 1 in. and 1-1/4 in. hose kits.

Hose Kits – Automatic Balancing and Ball Valves (field-installed)

A flexible steel braid hose featuring Kevlar® reinforced EPDM core with ANSI 302/304 stainless steel outer braid and fire rated materials per ASTM E 84-00 (NFPA 255, ANSI/UL 723 & UBC 8-1). Ball valve at one end; swivel connector with adapter at the other end (swivel to adapter connection via fiber or EPDM gasket). Swivel connection provides union between heat pump and piping system. The hoses feature brass fittings, stainless steel ferrules. A full port ball valve shall be provided with integral P/T (pressure/temperature) port on supply hose and automatic balancing valve with integral P/T ports and full port ball valve on return hose.

Specifications:
- Temperature range of 35°F [2°C] to 180°F [82°C]
- Max. working pressure of 400 psi [2757 kPa] for 1/2 in. and 3/4 in. hose kits; max. working pressure of 350 psi [2413 kPa] for 1 in. and 1-1/4 in. hose kits
- Minimum burst pressure of four times working pressure

Hose Kits – Automatic Balancing and Ball Valves with 'Y' strainer (field-installed)

A flexible steel braid hose featuring Kevlar® reinforced EPDM core with ANSI 302/304 stainless steel outer braid and fire rated materials per ASTM E 84-00 (NFPA 255, ANSI/UL 723 & UBC 8-1). Ball valve at one end; swivel connector with adapter at the other end (swivel to adapter connection via fiber or EPDM gasket). Swivel connection provides union between heat pump and piping system. The hoses feature brass fittings, stainless steel ferrules. A "y" strainer is provided on one end for fluid straining and integral "blowdown" valve. A full port ball valve shall be provided with integral P/T (pressure/temperature) port on supply hose and automatic balancing valve with integral P/T ports and full port ball valve on return hose.

Specifications:
- Temperature range of 35°F [2°C] to 180°F [82°C]
- Max. working pressure of 400 psi [2756 kPa] for 1/2 in. and 3/4 in. hose kits; max. working pressure of 350 psi [2413 kPa] for 1 in. and 1-1/4 in. hose kits
- Minimum burst pressure of four times working pressure

Revision Guide

Pages:	Description:	Date:	By:
All	Document Creation	20 Sept 2018	JM

Commercial Solutions

Manufactured by
WaterFurnace International, Inc.
9000 Conservation Way
Fort Wayne, IN 46809
www.waterfurnace.com

Product:	**Versatec Compact Series 50 Hz**
Type:	Geothermal/Water Source Heat Pump
Size:	Commercial 0.5-6 Tons
Document:	Specification Catalog

CE

All Versatec Compact 50Hz product is safety tested to CE standards and performance tested in accordance with standard EN 14511-2.

SC1252AU 12/18