Installation Information

Water Piping Connections

Electrical

Startup Procedures

Troubleshooting

Preventive Maintenance
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## Model Nomenclature

<table>
<thead>
<tr>
<th>1-3</th>
<th>4</th>
<th>5-7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
<th>17</th>
<th>18</th>
<th>19</th>
<th>20</th>
<th>21</th>
<th>22-23</th>
<th>24</th>
</tr>
</thead>
<tbody>
<tr>
<td>UBK</td>
<td>V</td>
<td>010</td>
<td>T</td>
<td>L</td>
<td>Z</td>
<td>0</td>
<td>1</td>
<td>C</td>
<td>A</td>
<td>N</td>
<td>A</td>
<td>N</td>
<td>0</td>
<td>A</td>
<td>3</td>
<td>0</td>
<td>SS</td>
<td>*</td>
</tr>
</tbody>
</table>

### Model Type
- UBK – Versatec Compact

### Cabinet Configuration
- V – Vertical
- H – Horizontal

### Unit Capacity (kW)
- 002, 003, 005, 006, 007, 009, 010, 012, 015, 017

### Discharge Configuration
- T – Top (Vertical)
- E – End (Horizontal)
- S – Side (Horizontal)

### Return Air Configuration
- L – Left
- R – Right

### Voltage
- 6 – 220-240/50/1 (002-009, 012)
- 7 – 380-420/50/3 (006-017)

### Future Option
- 0 – None

### Blower Options
- 1 – Variable Speed ECM Blower
- 4 – 5-Speed ECM Blower (005-017)
- 6 – Variable Speed Constant Torque ECM Blower (002-003)

### Water Coil Option
- C – Copper
- D – Insulated Copper
- N – CuproNickel
- P – Insulated CuproNickel

### Sound Kit Option
- A – None
- B – Sound Kit

### Vintage
- * – Factory Use Only

### Non-Standard Options
- SS – Standard
- SA – Split Access Panel
- SB – Service Ports located to the front of the unit
- SD – Split Access Panel and Service Ports located to the front

### Drain Pan Option
- 0 – Composite, No Secondary Connection
- 1 – Composite, Secondary Connection
- 2 – Stainless Steel, No Secondary Connection
- 3 – Stainless Steel, Secondary Connection

### Air Coil Option
- 3 – All-Aluminum, Uncoted
- 4 – All-Aluminum, AlumiSeal™

### Filter Option
- A – MERV 4
- B – MERV 13

### Cabinet Option
- 0 – Unpainted Cabinet, Filter Rail
- 1 – Painted Cabinet, Filter Rail
- 2 – Unpainted Cabinet, 4-Sided Filter Rack
- 3 – Painted Cabinet, 4-Sided Filter Rack

### Electrical Options
- N – No Phase Guard, No Disconnect
- D – No Phase Guard, Disconnect
- P – Phase Guard, No Disconnect
- B – Phase Guard, Disconnect

### Control Option
- A – Aurora™ Base Control (ABC)
- E – Aurora™ UPC DDC Controller
- F – Aurora™ UPC DDC Controller with LON

### Water Control Option
- N – None
- R – Water Flow Regulator
- V – 2-Way Valve
- B – 2-Way Valve w/ Water Flow Regulator

---

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

Safety Considerations

**WARNING:** Before performing service or maintenance operations on a system, turn off main power switches to the indoor unit. If applicable, turn off the accessory heater power switch. Electrical shock could cause personal injury.

Installing and servicing heating and air conditioning equipment can be hazardous due to system pressure and electrical components. Only trained and qualified service personnel should install, repair or service heating and air conditioning equipment. Untrained personnel can perform the basic maintenance functions of cleaning coils and cleaning and replacing filters. All other operations should be performed by trained service personnel. When working on heating and air conditioning equipment, observe precautions in the literature, tags and labels attached to the unit and other safety precautions that may apply.

Follow all safety codes. Wear safety glasses and work gloves. Use a quenching cloth for brazing operations and have a fire extinguisher available.

Moving and Storage

Move units in the normal “up” orientation. Horizontal units may be moved and stored per the information on the packaging. Do not stack more than three units in total height. Vertical units may be stored one upon another to a maximum height of two units. Do not attempt to move units while stacked. When the equipment is received, all items should be carefully checked against the bill of lading to be sure all crates and cartons have been received. Examine units for shipping damage, removing the units from the packaging if necessary. Units in question should also be internally inspected. If any damage is noted, the carrier should make the proper notation on the delivery receipt, acknowledging the damage.

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.

Installing Vertical Units

Vertical units are available in left or right air return configurations. Top flow vertical units should be mounted level on a vibration absorbing pad slightly larger than the base to provide isolation between the unit and the floor.
NOTE: * Water connections protrude approximately 1.5 in. (3.81 cm) from cabinet.
### Vertical Dimensional Data cont.

<table>
<thead>
<tr>
<th>Vertical Models</th>
<th>Overall Cabinet</th>
<th>Water Connections</th>
<th>Electrical Knockouts</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Width</td>
<td>Depth</td>
<td>Height*</td>
</tr>
<tr>
<td>002-003</td>
<td>cm.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>005</td>
<td>cm.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>006-007</td>
<td>cm.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>009</td>
<td>cm.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>010-012</td>
<td>cm.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>015</td>
<td>cm.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>017</td>
<td>cm.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Dimensions in cm**

Vertical Models

<table>
<thead>
<tr>
<th>Vertical Models</th>
<th>LL</th>
</tr>
</thead>
<tbody>
<tr>
<td>002-003</td>
<td>16.5</td>
</tr>
<tr>
<td>005</td>
<td>40.1</td>
</tr>
<tr>
<td>006-007</td>
<td>47.8</td>
</tr>
<tr>
<td>009</td>
<td>38.9</td>
</tr>
<tr>
<td>010-012</td>
<td>35.1</td>
</tr>
<tr>
<td>015</td>
<td>36.3</td>
</tr>
<tr>
<td>017</td>
<td>36.3</td>
</tr>
</tbody>
</table>

Condensate is 3/4" PVC female glue socket and is switchable from side to front. **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.
Horizontal Dimensional Data

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

NOTE: * Water connections protrude approximately 3.8 cm from cabinet.
## Horizontal Dimensional Data cont.

<table>
<thead>
<tr>
<th>Horizontal Models</th>
<th>Overall Cabinet</th>
<th>Water Connections</th>
<th>Electrical Knockouts</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>B</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td>Width</td>
<td>Depth</td>
<td>Height*</td>
</tr>
<tr>
<td>002-003</td>
<td>cm.</td>
<td>48.8</td>
<td>88.9</td>
</tr>
<tr>
<td>005</td>
<td>cm.</td>
<td>57.2</td>
<td>88.9</td>
</tr>
<tr>
<td>006-007</td>
<td>cm.</td>
<td>57.2</td>
<td>106.7</td>
</tr>
<tr>
<td>009</td>
<td>cm.</td>
<td>57.2</td>
<td>106.7</td>
</tr>
<tr>
<td>010-012</td>
<td>cm.</td>
<td>57.2</td>
<td>114.3</td>
</tr>
<tr>
<td>015</td>
<td>cm.</td>
<td>64.8</td>
<td>121.9</td>
</tr>
<tr>
<td>017</td>
<td>cm.</td>
<td>64.8</td>
<td>134.6</td>
</tr>
</tbody>
</table>

### Horizontal Units

- **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.

<table>
<thead>
<tr>
<th>Horizontal Models</th>
<th>KK</th>
</tr>
</thead>
<tbody>
<tr>
<td>002-003</td>
<td>(20.32)</td>
</tr>
<tr>
<td>005</td>
<td>(20.8)</td>
</tr>
<tr>
<td>006-007</td>
<td>(20.8)</td>
</tr>
<tr>
<td>009</td>
<td>(23.4)</td>
</tr>
<tr>
<td>010-012</td>
<td>(23.4)</td>
</tr>
<tr>
<td>015</td>
<td>(28.4)</td>
</tr>
<tr>
<td>017</td>
<td>(25.9)</td>
</tr>
</tbody>
</table>

Dimensions in [cm]
Installing Horizontal Units

Installing Horizontal Units
Horizontal units are available with side or end discharge and may be easily field converted by flipping the blower discharge panel. Horizontal units are normally suspended from a ceiling by four 3/8 in. 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 dimensions below. 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.

NOTE: The unit should be pitched approximately 1/4 in. 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. Insulate supply plenum and use at least one 90° elbow and flexible duct collar to reduce noise.

CAUTION: Do not use rods smaller than 3/8 in. diameter since they may not be strong enough to support the unit. The rods must be securely anchored to the ceiling.
Hanger Bracket Locations

**Weight Distribution Table**

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

2/18/18
Duct System

An air outlet collar is provided on vertical top flow units and all horizontal units to facilitate a duct connection. A flexible connector is recommended for discharge and return air duct connections on metal duct systems. Uninsulated duct should be insulated with a minimum of 1-inch duct insulation. Application of the unit to uninsulated ductwork in an unconditioned space is not recommended as the unit’s performance will be adversely affected.

If the unit is connected to existing ductwork, check the duct system to ensure that it has the capacity to accommodate the air required for the unit application. If the duct is too small, as in the replacement of heating only systems, larger ductwork should be installed. All existing ductwork should be checked for leaks and repaired if necessary.

The duct system should be sized to handle the design airflow quietly and efficiently. To maximize sound attenuation of the unit blower, the supply and return plenums should include an internal duct liner of fiberglass or constructed of ductboard for the first few feet. On systems employing a sheet metal duct system, canvas connectors should be used between the unit and the ductwork. If air noise or excessive airflow is a problem, the blower speed can be changed.

Water Piping

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.

All source water connections on commercial units 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. When connecting to an open loop (groundwater) system, thread any copper MPT fitting into the connector and tighten in the same manner as described above.
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.

<table>
<thead>
<tr>
<th>Material</th>
<th>Copper</th>
<th>90/10 Cupronickel</th>
<th>316 Stainless Steel</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>7 - 9</td>
<td>7 - 9</td>
<td>7 - 9</td>
</tr>
<tr>
<td>Calcium and Magnesium Carbonate</td>
<td>Less than 350 ppm</td>
<td>Less than 350 ppm</td>
<td>Less than 350 ppm</td>
</tr>
<tr>
<td>Scaling</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hydrogen Sulfide</td>
<td>Less than 0.5 ppm</td>
<td>(rotten egg smell appears at 0.5 ppm)</td>
<td></td>
</tr>
<tr>
<td>Sulfates</td>
<td>Less than 125 ppm</td>
<td>Less than 125 ppm</td>
<td>Less than 200 ppm</td>
</tr>
<tr>
<td>Chlorine</td>
<td>Less than 0.5 ppm</td>
<td>Less than 0.5 ppm</td>
<td>Less than 0.5 ppm</td>
</tr>
<tr>
<td>Chlorides</td>
<td>Less than 20 ppm</td>
<td>Less than 125 ppm</td>
<td>Less than 500 ppm</td>
</tr>
<tr>
<td>Carbon Dioxide</td>
<td>Less than 50 ppm</td>
<td>10 - 50 ppm</td>
<td>Less than 1 ppm</td>
</tr>
<tr>
<td>Ammonia</td>
<td>Less than 2 ppm</td>
<td>Less than 2 ppm</td>
<td>Less than 20 ppm</td>
</tr>
<tr>
<td>Ammonia Chloride</td>
<td>Less than 0.5 ppm</td>
<td>Less than 0.5 ppm</td>
<td>Less than 0.5 ppm</td>
</tr>
<tr>
<td>Ammonia Nitrate</td>
<td>Less than 0.5 ppm</td>
<td>Less than 0.5 ppm</td>
<td>Less than 0.5 ppm</td>
</tr>
<tr>
<td>Ammonia Hydroxide</td>
<td>Less than 0.5 ppm</td>
<td>Less than 0.5 ppm</td>
<td>Less than 0.5 ppm</td>
</tr>
<tr>
<td>Ammonia Sulfate</td>
<td>Less than 0.5 ppm</td>
<td>Less than 0.5 ppm</td>
<td>Less than 0.5 ppm</td>
</tr>
<tr>
<td>Total Dissolved Solids (TDS)</td>
<td>Less than 1000 ppm</td>
<td>1000 - 1500 ppm</td>
<td>1000 - 1500 ppm</td>
</tr>
<tr>
<td>Iron Fouling (Biological Growth)</td>
<td>+0.5 to -0.5</td>
<td>+0.5 to -0.5</td>
<td>+0.5 to -0.5</td>
</tr>
<tr>
<td>Iron, FE⁺ (Ferrous)</td>
<td>&lt; 0.2 ppm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bacterial Iron Potential</td>
<td>&lt; 0.2 ppm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Iron Oxide</td>
<td>Less than 1 ppm, above this level deposition will occur</td>
<td>Less than 1 ppm, above this level deposition will occur</td>
<td>Less than 1 ppm, above this level deposition will occur</td>
</tr>
<tr>
<td>Erosion</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Suspended Solids</td>
<td>Less than 10 ppm and filtered for max. of 600 micron size</td>
<td>Less than 10 ppm and filtered for max. of 600 micron size</td>
<td>Less than 10 ppm and filtered for max. of 600 micron size</td>
</tr>
<tr>
<td>Threshold Velocity (Fresh Water)</td>
<td>&lt; 1.8 m/sec</td>
<td>&lt; 1.8 m/sec</td>
<td>&lt; 1.8 m/sec</td>
</tr>
</tbody>
</table>

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

Condensate Drain

On vertical units, the internal condensate drain assembly consists of a drain tube which is connected to the drain pan, a 3/4 in. PVC female adapter and a flexible connecting hose. The female adapter may exit either the front or the side of the cabinet. The adapter should be glued to the field-installed PVC condensate piping. On vertical units, a condensate hose is inside all cabinets as a trapping loop; therefore, an external trap is not necessary.

**Horizontal Drain Connection (Composite Drain Pan)**

![Diagram of Horizontal Drain Connection](image)

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

On horizontal units, a PVC stub or stainless steel tube is provided for condensate drain piping connection. An external trap is required (see below). If a vent is necessary, an open stand pipe may be applied to a tee in the field-installed condensate piping.

**Unit Pitch for Drain**

![Diagram of Unit Pitch for Drain](image)

1/2” (1.27 cm) Pitch

**NOTES:**

- On vertical units equipped with electronic condensate overflow protection.
**System Cleaning and Flushing**

**Cleaning and Flushing**

Prior to start up of any heat pump, the water circulating system must be cleaned and flushed of all dirt and debris.

If the system is equipped with water shutoff valves, the supply and return runouts must be connected together at each unit location (This will prevent the introduction of dirt into the unit, see Flushing with Water Shutoff Valve Equipped Systems illustration). The system should be filled at the water make-up connection with all air vents open. After filling, vents should be closed.

**Flush with Water Shutoff Valve Equipped Systems**

![Diagram](image)

The contractor should start the main circulator with the pressure reducing valve makeup open. Vents should be checked in sequence to bleed off any trapped air and to verify circulation through all components of the system.

As water circulates through the system, the contractor should check and repair any leaks found in the piping system. Drain(s) at the lowest point(s) in the system should be opened for initial flush and blowdown, making sure water fill valves are set at the same rate. Check the pressure gauge at the pump suction and manually adjust the make-up water valve to hold the same positive pressure both before and after opening the drain valves. Flushing should continue for at least two hours, or longer if required, until drain water is clean and clear.

The supplemental heater and/or circulator pump, if used, should be shut off. All drains and vents should be opened to completely drain the system. Short-circuited supply and return runouts should now be connected to the unit supply and return connections.

Refill the system with clean water. Test the system water for acidity and treat as required to leave the water slightly alkaline (pH 7.5 to 8.5). The specified percentage of antifreeze may also be added at this time. Use commercial grade antifreeze designed for HVAC systems only. Environol™ brand antifreeze is recommended.

Once the system has been filled with clean water and antifreeze (if used), precautions should be taken to protect the system from dirty water conditions. Dirty water will result in system-wide degradation of performance, and solids may clog valves, strainers, flow regulators, etc. Additionally, the heat exchanger may become clogged which reduces compressor service life and can cause premature unit failure.

In boiler/tower application, set the loop control panel set points to desired temperatures. Supply power to all motors and start the circulating pumps. After full flow has been established through all components including the heat rejector (regardless of season), air vented and loop temperatures stabilized, each of the units will be ready for check, test and start up and for air and water balancing.

**Ground Source Loop System Checkout**

Once piping is completed between the unit pumping system and ground loop, final purging and charging of the loop is needed. A high pressure pump is needed to achieve adequate flow velocity in the loop to purge air and dirt particles from the loop itself. Antifreeze solution is used in most areas to prevent freezing. Flush the system adequately to remove as much air as possible; then pressurize the loop to a static pressure of 276-345 kPa (summer) or 345-517 kPa (winter). This is normally adequate for good system operation. Loop static pressure may decrease soon after initial installation, due to pipe expansion and loop temperature change. Running the unit for at least 30 minutes after the system has been completely purged of air will allow for the “break-in” period. It may be necessary to adjust static loop pressure (by adding water) after the unit has run for the first time. Loop static pressure will also fluctuate with the seasons. Pressures will be higher in the winter months than during the cooling season. This fluctuation is normal and should be considered when charging the system initially.

Ensure the pump provides adequate flow through the unit by checking pressure drop across the heat exchanger. Usually 0.14-0.19 L/s of flow per ton of cooling capacity is recommended in earth loop applications.
Open Loop Ground Water Systems

Typical open loop piping is shown below. Always maintain water pressure in the heat exchanger by placing water control valves at the outlet of the unit to prevent mineral precipitation. Use a closed, bladder-type expansion tank to minimize mineral formation due to air exposure. Insure proper water flow through the unit by checking pressure drop across the heat exchanger and comparing it to the figures in unit capacity data tables in the specification catalog. 0.09-0.13 L/s of flow per ton of cooling capacity is recommended in open loop applications. Due to only minor differences in flow rate from low to high, only one solenoid valve should be used. The valve should be sized for full flow.

Discharge water from the unit is not contaminated in any manner and can be disposed of in various ways, depending on local codes, i.e. recharge well, storm sewer, drain field, adjacent stream or pond, etc. Most local codes forbid the use of sanitary sewer for disposal. Consult your local building and zoning departments to assure compliance in your area.

Open System - Groundwater Application
Freeze Detection

For Aurora Base Control, set SW2-1, FP1, on the printed circuit board for applications using a closed loop antifreeze solution to 15°F [-9.4°C]. On applications using an open loop/ground water system (or closed loop no antifreeze), set this dip switch to 30°F [-1.1°C], the factory default setting. (Refer to the Dip Switch Field Selection table).

Electrical Connections

General
Be sure the available power is the same voltage and phase as that shown on the unit serial plate. Line and low voltage wiring must be done in accordance with local codes or the National Electric Code, whichever is applicable.

Power Connection
Connect the incoming line voltage wires to L1 and L2 of the contactor for single-phase unit. Consult the Electrical Data tables for correct fuse sizes.

220 Volt Operation
All Versatec Compact Series 220-240 units are factory wired for 240 volt operation. For 220 volt operation, the red and blue transformer wires must be switched on terminal strip PS.

CAUTION: When installing a unit with a variable speed ECM blower motor in 420/50/3 voltage, a neutral wire is required to allow
## Electrical Data

### 5-Speed ECM Motor

<table>
<thead>
<tr>
<th>Model</th>
<th>Rated Voltage</th>
<th>Voltage Min/Max</th>
<th>Compressor FLA</th>
<th>Blower Motor FLA</th>
<th>Total Unit FLA</th>
<th>Min Circ Amp</th>
<th>Max Fuse/HACR Breaker</th>
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</thead>
<tbody>
<tr>
<td>005</td>
<td>220-240/50/1</td>
<td>198/264</td>
<td>13.1</td>
<td>5.5</td>
<td>24.0</td>
<td>4.1</td>
<td>9.6 11.0 15</td>
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<tr>
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<td>198/264</td>
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<td>9.0</td>
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<td>9.5</td>
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HACR circuit breaker in USA only
### Electrical Data cont.

#### Variable Speed ECM Motor

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<thead>
<tr>
<th>Model</th>
<th>Rated Voltage</th>
<th>Voltage Min/Max</th>
<th>Compressor</th>
<th>Blower Motor FLA</th>
<th>Total Unit FLA</th>
<th>Min Circ Amp</th>
<th>Max Fuse/HACR Breaker</th>
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</thead>
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<tr>
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<td>MCC 6.4</td>
<td>RLA 4.1</td>
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<td>342/462</td>
<td>MCC 13.3</td>
<td>RLA 8.5</td>
<td>LRA 67.1</td>
<td>6.9</td>
<td>15.4</td>
</tr>
</tbody>
</table>

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**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.
VERSATEC COMPACT SERIES 50Hz INSTALLATION MANUAL

Blower Performance Data cont.

5-Speed ECM Motor

<table>
<thead>
<tr>
<th>Model</th>
<th>Motor Spd</th>
<th>Motor Tap</th>
<th>Blower Size</th>
<th>Motor kW</th>
<th>Airflow (L/s) at External Static Pressure</th>
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</thead>
<tbody>
<tr>
<td>005</td>
<td>3/16 in.</td>
<td>0.37</td>
<td>380 570 361 354 349 342 333 323 314 309 300 286 252</td>
<td>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</td>
<td></td>
</tr>
<tr>
<td>006</td>
<td>3/16 in.</td>
<td>0.37</td>
<td>328 319 307 297 288 278 271 260 248 231 224 205 186 165</td>
<td>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</td>
<td></td>
</tr>
<tr>
<td>007</td>
<td>3/16 in.</td>
<td>0.37</td>
<td>427 419 411 406 401 392 385 380 375 366 354 345 328 302 - -</td>
<td>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</td>
<td></td>
</tr>
<tr>
<td>009</td>
<td>3/16 in.</td>
<td>0.37</td>
<td>540 533 526 522 517 510 503 497 491 485 478 465 454 432 - -</td>
<td>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</td>
<td></td>
</tr>
<tr>
<td>010</td>
<td>3/16 in.</td>
<td>0.37</td>
<td>621 610 599 586 573 558 543 529 514 498 481 469 450 432 - -</td>
<td>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</td>
<td></td>
</tr>
<tr>
<td>012</td>
<td>3/16 in.</td>
<td>0.37</td>
<td>738 729 711 700 689 676 663 651 639 629 618 602 585 570 555 538 520 505 498 481 466 449 432 - -</td>
<td>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</td>
<td></td>
</tr>
<tr>
<td>015</td>
<td>3/16 in.</td>
<td>0.37</td>
<td>852 846 840 835 831 821 812 807 802 796 791 781 772 750 732 715 698 689 679 669 658 648 632 616 - -</td>
<td>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</td>
<td></td>
</tr>
<tr>
<td>017</td>
<td>3/16 in.</td>
<td>0.37</td>
<td>944 939 934 929 923 916 908 906 904 901 899 896 893 889 885 881 877 874 871 867 863 859 853 849 843 - -</td>
<td>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</td>
<td></td>
</tr>
</tbody>
</table>

Factory settings are in Bold

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

5-Speed ECM Motor Connections

- G - Blue
- L - Orange
- G - Green
- C - Black
- N - Brown
- Y - Red
- AUX - Gray

9/21/15
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 ECM 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)

If more than one tap are energized at the same time, built in logic gives precedence to the highest tap number and allows air flow to change with G, Y1, Y2 and W signals. Each of those 5 speeds has a specific ‘Torque’ value programmed into the motor for each speed selection. As static pressure increases, airflow decreases resulting in less torque on the rotor. The motor responds only to changes in torque and adjusts its speed accordingly.

The 5-speed ECM motor is powered by line voltage but the motor speed is energized by 24VAC.

Signal Connection - 1/4 in. quick connects - Common to C, 24VAC to Taps #1-5.

Applying 24VAC power between any of the motor taps 1-5 (1/4 in. quick connects) and common will signal the motor to run and regulate torque at the programmed level. The tap input voltage must be in the range 12-33VAC. The 5-speed ECM will have less variation over the operating static pressure range versus a PSC motor as well as a significant watts reduction due to the high motor efficiency.

Thermal Protection - Motor is electronically protected.

Locked Rotor Amps - If motor speed decreases below a programmed stall speed, the motor will shut down and after a delay period, the control will attempt to restart the motor.

The 5-speed ECM speed tap selections are as follows:
The blue wire should be placed on the speed tap desired for the (G) continuous blower setting – factory wired to Tap 1.

The red wire should be placed on the speed tap desired during compressor operation (Y1 signal) – factory wired to Tap 3 or 4.

The gray wire is not factory wired to the motor and is tied to the wire harness. It is field connected and can be used with 3ht/2cl thermostats or IntelliZone to deliver the required air flow for the Y2 signal.

The tan wire should be placed on the speed tap desired for auxiliary heat (W signal) – factory wired to Tap 5.
Blower Performance Data cont.

Variable Speed ECM Motor

<table>
<thead>
<tr>
<th>Model</th>
<th>Max ESP (Pa)</th>
<th>Blower Size</th>
<th>Motor kW</th>
<th>Air Flow Dip Switch Settings</th>
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<td>229 x 178</td>
<td>0.37</td>
<td>189 L 236 M 330 H 425 472 519</td>
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<tr>
<td>007</td>
<td>124.50</td>
<td>229 x 178</td>
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<td>189 236 M 330 M 378 425 472 519</td>
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<tr>
<td>009</td>
<td>124.50</td>
<td>229 x 178</td>
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<td>010</td>
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<td>279 x 254</td>
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<td>236 283 330 L 413 496 543 M 590 625 649 H 696 732</td>
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<td>283 378 472 L 614 708 826 M 920 991 H 1038 1085</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Fan Speed</th>
<th>Fan RPM</th>
<th>Airflow [L/s] at External Static Pressure [Pa]</th>
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<td>1600</td>
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<tr>
<td>12</td>
<td></td>
<td>1700</td>
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</tbody>
</table>

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

Setting Blower Speed - Variable Speed ECM

Variable speed ECM blower motors have 12 selectable speeds and are factory set for optimum performance. When applicable, the speed settings may also be adjusted through the Building Automation System (BAS).

CAUTION: Disconnect all power before performing this operation.
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 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.
Wiring Schematics

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.

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
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.
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

**Legend**

- **Factory Low Voltage Wiring**
- **Field Low Voltage Wiring**
- **Optional Block**
- **Field Zone Sensor Wiring**
- **Internal Junction**
- **Quick Connect Terminal**
- **Field Wiring Lug**
- **Ground**
- **Relay Contacts - N.O., N.C.**
- **Capacitor**
- **Fuse**

- **CC** – Compressor Contactor
- **CD** – Condensate Overflow Sensor
- **DS** – Emergency Shutdown
- **HP** – High Pressure Switch
- **LP** – Low Pressure Switch
- **FD** – Freeze Detection Sensor
- **FL** – Flame

**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.

#### Aurora LED Flash Codes

<table>
<thead>
<tr>
<th>Normal Mode</th>
<th>OFF</th>
<th>ECM Config Mode</th>
<th>Field Flash</th>
<th>High Pressure Lockout</th>
<th>Flash Code 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal Mode</td>
<td>ON</td>
<td>ECM Config Mode</td>
<td>Field Flash</td>
<td>Low Pressure Lockout</td>
<td>Flash Code 2</td>
</tr>
</tbody>
</table>

#### Aurora Timing Events

<table>
<thead>
<tr>
<th>Event</th>
<th>Normal Mode</th>
<th>Test Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Random Start Delay</td>
<td>5 to 10 seconds</td>
<td>1 second</td>
</tr>
<tr>
<td>Compressor On Delay</td>
<td>5 seconds</td>
<td>1 second</td>
</tr>
<tr>
<td>Compressor On Time</td>
<td>2 minutes</td>
<td></td>
</tr>
<tr>
<td>Compressor Start Cycle Delay</td>
<td>4 minutes</td>
<td>15 seconds</td>
</tr>
<tr>
<td>Button Off Delay</td>
<td>30 seconds</td>
<td>1 second</td>
</tr>
<tr>
<td>Full Recognition Delay – High Pressure</td>
<td>Less than 1 second</td>
<td>Less than 1 second</td>
</tr>
<tr>
<td>Start-Up Bypass – Low Pressure</td>
<td>2 minutes</td>
<td>30 seconds</td>
</tr>
<tr>
<td>Full Recognition Delay – Low Water/Air Coil Limit</td>
<td>2 minutes</td>
<td>30 seconds</td>
</tr>
<tr>
<td>Full Recognition Delay – Low Water/Air Coil Limit</td>
<td>2 minutes</td>
<td>30 seconds</td>
</tr>
<tr>
<td>Start-Up Bypass – Low Water/Air Coil Limit</td>
<td>2 minutes</td>
<td>30 seconds</td>
</tr>
<tr>
<td>Full Recognition Delay – Condensate Overflow</td>
<td>30 seconds</td>
<td>30 seconds</td>
</tr>
<tr>
<td>Random Start Delay</td>
<td>5 minutes</td>
<td>2 seconds</td>
</tr>
<tr>
<td>Auxiliary Heat Staging Delay</td>
<td>5 minutes</td>
<td>20 seconds</td>
</tr>
<tr>
<td>Emergency Heat Staging Delay</td>
<td>2 minutes</td>
<td>7.5 seconds</td>
</tr>
<tr>
<td>Steam Valve Slow Open Delay</td>
<td>30 seconds</td>
<td>30 seconds</td>
</tr>
<tr>
<td>Restart Delay</td>
<td>30 seconds</td>
<td>30 seconds</td>
</tr>
</tbody>
</table>

#### Aurora Flash Events

<table>
<thead>
<tr>
<th>Flash Event</th>
<th>Normal Mode</th>
<th>Test Mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flash Code 1</td>
<td>OFF</td>
<td>ECM Config Mode</td>
</tr>
<tr>
<td>Flash Code 2</td>
<td>ECM Config Mode</td>
<td>Field Flash</td>
</tr>
<tr>
<td>Flash Code 3</td>
<td>ECM Config Mode</td>
<td>Field Flash</td>
</tr>
<tr>
<td>Flash Code 4</td>
<td>ECM Config Mode</td>
<td>Field Flash</td>
</tr>
<tr>
<td>Flash Code 5</td>
<td>ECM Config Mode</td>
<td>Field Flash</td>
</tr>
<tr>
<td>Flash Code 6</td>
<td>ECM Config Mode</td>
<td>Field Flash</td>
</tr>
<tr>
<td>Flash Code 7</td>
<td>ECM Config Mode</td>
<td>Field Flash</td>
</tr>
<tr>
<td>Flash Code 8</td>
<td>ECM Config Mode</td>
<td>Field Flash</td>
</tr>
<tr>
<td>Flash Code 9</td>
<td>ECM Config Mode</td>
<td>Field Flash</td>
</tr>
<tr>
<td>Flash Code 10</td>
<td>ECM Config Mode</td>
<td>Field Flash</td>
</tr>
</tbody>
</table>

#### Wiring Diagram

[Diagram showing various components and connections including F1, FD, LP, HP, ES, CO, CC, L1, 5, 4, 3, 2, 1, Capacitor, Fuse, Field Wiring Lug, Ground, Relay Contacts, Capacitor, and other connections such as RH, PGM, RV, SW2, etc.]

#### Flash Code Table

<table>
<thead>
<tr>
<th>Flash Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Normal Mode</td>
</tr>
<tr>
<td>1</td>
<td>ECM Config Mode</td>
</tr>
<tr>
<td>2</td>
<td>Field Flash</td>
</tr>
<tr>
<td>3</td>
<td>High Pressure Lockout</td>
</tr>
<tr>
<td>4</td>
<td>Low Pressure Lockout</td>
</tr>
<tr>
<td>5</td>
<td>Condensate Overflow Lockout</td>
</tr>
<tr>
<td>6</td>
<td>Factory Voltage Setting</td>
</tr>
<tr>
<td>7</td>
<td>Config Mode</td>
</tr>
<tr>
<td>8</td>
<td>Field Flash</td>
</tr>
<tr>
<td>9</td>
<td>Random Start Delay</td>
</tr>
<tr>
<td>10</td>
<td>Auxiliary Heat Staging Delay</td>
</tr>
<tr>
<td>11</td>
<td>Emergency Heat Staging Delay</td>
</tr>
<tr>
<td>12</td>
<td>Steam Valve Slow Open Delay</td>
</tr>
<tr>
<td>13</td>
<td>Restart Delay</td>
</tr>
</tbody>
</table>

#### Flash Code Symbols

- **LED1** (Green) – Status LED
- **LED2** (Yellow) – Configuration LED
- **LED3** (Red) – Fault LED

#### Flash Code Examples

- **LED3** (Red) – Flash Code 6 (Fast Flash), Flash Code 5 (Slow Flash)
- **LED1** (Green) – Flash Code 1 (Fast Flash), Flash Code 2 (Slow Flash)
- **LED2** (Yellow) – Flash Code 3 (Fast Flash), Flash Code 4 (Slow Flash)

---

**Note:**
The Aurora LED Flash Codes are used to indicate various conditions and configurations within the HVAC system, providing a visual means to diagnose issues and configure the equipment.

---

**Additional Information:**

- **Config**: Configuration LED (LED2, Yellow)
- **Fault**: Status LED (LED1, Green)
- **ECM PWM**: ECM Pulse Width Modulation
- **CFM**: Fan Control Mode
- **ALM**: Alarm LED
- **ALG**: Alarm LED Flash Code
- **PWM**: Pulse Width Modulation
- **ON**: On
- **OFF**: Off
- **ACC**: ACC – Dip 5
- **ACC no**: ACC – Dip 4
- **ACC c**: ACC – Dip 3
- **ACC nc**: ACC – Dip 2
- **RS485 NET**: RS 485 Network
- **RS485 Exp Factory**: RS 485 Expansion Factory
- **G**: Red LED Flash Code
- **Y**: Yellow LED Flash Code
- **R**: Green LED Flash Code

---

**Configuration Examples:**

- **LED3** (Red) – Flash Code 6 (Fast Flash), Flash Code 5 (Slow Flash)
- **LED1** (Green) – Flash Code 1 (Fast Flash), Flash Code 2 (Slow Flash)
- **LED2** (Yellow) – Flash Code 3 (Fast Flash), Flash Code 4 (Slow Flash)

---

**Notes for Installation:**

- Ensure all connections are secure and按照正确的电压和电流规格接线。
- Use appropriate cable connectors for all connections.
- Test the system before full installation to ensure proper operation.

---

**Technical Specifications:**

- **Model**: VERSATEC COMPACT SERIES 50Hz INSTALLATION MANUAL
- **Version**: 27
- **Pages**: 27

---

**Contact Information:**

For additional support or questions, contact your local HVAC supplier or manufacturer's customer support.

---

**Safety Precautions:**

- Wear appropriate personal protective equipment (PPE) when handling electrical components.
- Follow local electrical codes and regulations.
- Ensure the system is de-energized before making any connections.

---

**Legal Information:**

- The information provided is for reference purposes only.
- Consult the manufacturer's manual for the most accurate and up-to-date technical data.

---

**Disclaimer:**

- The content is intended for educational and informational purposes only.
- The author and publisher are not liable for any errors or omissions.
- Further consultation with a qualified professional is recommended for any concerns related to installation or operation.
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 isolation valve.
4. Optional, factory installed reheater.

Legend

Flash ECM Setting
Test Mode

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

Wireless Schematics cont.

Notes:

Aurora Timing Events

- Outdoor Air Damper
- Water Valve Slow Open
- Cycle with Compressor
- Cycle with Blower
- Operation

Less than 1 second
5 to 80 seconds
1 second
30 seconds
30 seconds
30 seconds
30 seconds
2 seconds
2 seconds
2 seconds
2 seconds
2 minutes
2 minutes
4 minutes
15 seconds
2 minutes
5 seconds
7.5 seconds
20 seconds
Less than 1 second
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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 | FPI 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 | Access Relay Operation (P2) and 2-5 |

<table>
<thead>
<tr>
<th>Access Relay Operation</th>
<th>SW2-4</th>
<th>SW2-5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cycle with Blower</td>
<td>ON</td>
<td>ON</td>
</tr>
<tr>
<td>Cycle with Compressor</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>Water Valve Slow Opening</td>
<td>ON</td>
<td>OFF</td>
</tr>
<tr>
<td>Cycle with Comm. T-stat Hum Cmd</td>
<td>OFF</td>
<td>ON</td>
</tr>
</tbody>
</table>
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.

**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**
*(Selective 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”, “W”, and “Y” must be removed for at least 3 seconds. To reset lockout conditions with SW2-8 Off, thermostat inputs “Y1”, “Y2”, “Y”, 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, O)
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)

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

### Configuration LED (LED2, Yellow)

<table>
<thead>
<tr>
<th>Description of Operation</th>
<th>Configuration LED, Yellow</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Software Overwritten</td>
<td>Flashing ECM Setting</td>
</tr>
<tr>
<td>DIP Switch was Overwritten</td>
<td>Slow Flash</td>
</tr>
<tr>
<td>ECM Configuration Mode</td>
<td>Fast Flash</td>
</tr>
</tbody>
</table>

### Fault LED (LED1, Red)

<table>
<thead>
<tr>
<th>Red Fault LED</th>
<th>LED Flash Code*</th>
<th>Lockout</th>
<th>Reset/Remove</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal - No Faults</td>
<td>OFF</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>Fault - Input</td>
<td>1</td>
<td>No</td>
<td>Auto</td>
</tr>
<tr>
<td>Fault - High Pressure</td>
<td>2</td>
<td>Yes</td>
<td>Hard or Soft</td>
</tr>
<tr>
<td>Fault - Low Pressure</td>
<td>3</td>
<td>Yes</td>
<td>Hard or Soft</td>
</tr>
<tr>
<td>Fault - Freeze Detection FP2</td>
<td>4</td>
<td>Yes</td>
<td>Hard or Soft</td>
</tr>
<tr>
<td>Fault - Condensate Overflow</td>
<td>7</td>
<td>Yes</td>
<td>Hard or Soft</td>
</tr>
<tr>
<td>Fault - Over/Under Voltage</td>
<td>8</td>
<td>No</td>
<td>Auto</td>
</tr>
<tr>
<td>Fault - FP1 &amp; FP2 Sensor Error</td>
<td>11</td>
<td>Yes</td>
<td>Hard or Soft</td>
</tr>
</tbody>
</table>

**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

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**ABC Basic Faults**

- Normal - No Faults
- Fault - Input
- Fault - High Pressure
- Fault - Low Pressure
- Fault - Freeze Detection FP2
- Fault - Condensate Overflow
- Fault - Over/Under Voltage
- Fault - FP1 & FP2 Sensor Error

---

**NOTE:** All codes >11 use long flash for tens digit and short flash for the ones digit. 20, 30, 40, 50, etc. are skipped.
The Aurora Unitary Protocol Converter (UPC) is designed to add-on to any Aurora based heat pump control. The Aurora Unitary Protocol Converter (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.

2. **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.

3. **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.

4. **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.

5. **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.

6. **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.

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

### Aurora Base Fault Codes (ABC Only)

<table>
<thead>
<tr>
<th>Fault LED (LED1, Red)</th>
<th>Red Fault LED</th>
<th>LED Flash Code</th>
<th>Lockout</th>
<th>Reset/ Remove</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABC Basic Faults</td>
<td>Normal - No Faults</td>
<td>OFF</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Fault - Input</td>
<td>1</td>
<td>No</td>
<td>Auto</td>
</tr>
<tr>
<td></td>
<td>Fault - High Pressure</td>
<td>2</td>
<td>Yes</td>
<td>Hard or Soft</td>
</tr>
<tr>
<td></td>
<td>Fault - Low Pressure</td>
<td>3</td>
<td>Yes</td>
<td>Hard or Soft</td>
</tr>
<tr>
<td></td>
<td>Fault - Freeze Detection FP2</td>
<td>4</td>
<td>Yes</td>
<td>Hard or Soft</td>
</tr>
<tr>
<td></td>
<td>Fault - Freeze Detection FP1</td>
<td>5</td>
<td>Yes</td>
<td>Hard or Soft</td>
</tr>
<tr>
<td></td>
<td>Fault - Condensate Overflow</td>
<td>7</td>
<td>Yes</td>
<td>Hard or Soft</td>
</tr>
<tr>
<td></td>
<td>Fault - Over/Under Voltage</td>
<td>8</td>
<td>No</td>
<td>Auto</td>
</tr>
<tr>
<td></td>
<td>Fault - FP1 &amp; FP2 Sensor Error</td>
<td>11</td>
<td>Yes</td>
<td>Hard or Soft</td>
</tr>
</tbody>
</table>

**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)

<table>
<thead>
<tr>
<th>Fault LED (LED1, Red)</th>
<th>Red Fault LED</th>
<th>LED Flash Code</th>
<th>Lockout</th>
<th>Reset/ Remove</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABC Basic Faults</td>
<td>Normal - No Faults</td>
<td>OFF</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Fault - Input</td>
<td>1</td>
<td>No</td>
<td>Auto</td>
</tr>
<tr>
<td></td>
<td>Fault - High Pressure</td>
<td>2</td>
<td>Yes</td>
<td>Hard or Soft</td>
</tr>
<tr>
<td></td>
<td>Fault - Low Pressure</td>
<td>3</td>
<td>Yes</td>
<td>Hard or Soft</td>
</tr>
<tr>
<td></td>
<td>Fault - Freeze Detection FP2</td>
<td>4</td>
<td>Yes</td>
<td>Hard or Soft</td>
</tr>
<tr>
<td></td>
<td>Fault - Freeze Detection FP1</td>
<td>5</td>
<td>Yes</td>
<td>Hard or Soft</td>
</tr>
<tr>
<td></td>
<td>Fault - Condensate Overflow</td>
<td>7</td>
<td>Yes</td>
<td>Hard or Soft</td>
</tr>
<tr>
<td></td>
<td>Fault - Over/Under Voltage</td>
<td>8</td>
<td>No</td>
<td>Auto</td>
</tr>
<tr>
<td></td>
<td>Fault - FP1 &amp; FP2 Sensor Error</td>
<td>11</td>
<td>Yes</td>
<td>Hard or Soft</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ABC &amp; AXB Advanced Faults</th>
<th>Normal - No Faults</th>
<th>OFF</th>
<th>-</th>
<th>-</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fault - Compressor Monitor</td>
<td>10</td>
<td>Yes</td>
<td>Hard or Soft</td>
</tr>
<tr>
<td></td>
<td>Non-CritcAXBSnrErr</td>
<td>13</td>
<td>No</td>
<td>Auto</td>
</tr>
<tr>
<td></td>
<td>CriticAXBSnrErr</td>
<td>14</td>
<td>Yes</td>
<td>Hard or Soft</td>
</tr>
<tr>
<td></td>
<td>Alert - HotWtr</td>
<td>15</td>
<td>No</td>
<td>Auto</td>
</tr>
<tr>
<td></td>
<td>Fault - VarSpdPump</td>
<td>16</td>
<td>No</td>
<td>Auto</td>
</tr>
<tr>
<td></td>
<td>Not Used</td>
<td>17</td>
<td>No</td>
<td>Auto</td>
</tr>
<tr>
<td></td>
<td>Non-CritComErr</td>
<td>18</td>
<td>No</td>
<td>Auto</td>
</tr>
<tr>
<td></td>
<td>Alarm - Low Loop Pressure</td>
<td>21</td>
<td>No</td>
<td>Auto</td>
</tr>
<tr>
<td></td>
<td>Alarm - Home Automation 1</td>
<td>23</td>
<td>No</td>
<td>Auto</td>
</tr>
<tr>
<td></td>
<td>Alarm - Home Automation 2</td>
<td>24</td>
<td>No</td>
<td>Auto</td>
</tr>
</tbody>
</table>

**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)

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

Configuration LED (LED2, Yellow)

<table>
<thead>
<tr>
<th>Description of Operation</th>
<th>Configuration LED, Yellow</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Software Overwritten</td>
<td>ECM Setting</td>
</tr>
<tr>
<td>DIP Switch Overwritten</td>
<td>Slow Flash</td>
</tr>
<tr>
<td>ECM Configuration Mode</td>
<td>Fast Flash</td>
</tr>
<tr>
<td>Reset Configuration Mode</td>
<td>OFF</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Access Relay Operation</th>
<th>SW2-4</th>
<th>SW2-5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cycle with Blower</td>
<td>ON</td>
<td>ON</td>
</tr>
<tr>
<td>Cycle with Compressor</td>
<td>OFF</td>
<td>OFF</td>
</tr>
<tr>
<td>Water Valve Slow Opening</td>
<td>ON</td>
<td>OFF</td>
</tr>
<tr>
<td>Cycle with Comm. T-stat Hum Cmd</td>
<td>OFF</td>
<td>ON</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Position</th>
<th>DIP 4</th>
<th>DIP 5</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ON</td>
<td>ON</td>
<td>Cycles with Fan or ECM (or G)</td>
</tr>
<tr>
<td>2</td>
<td>OFF</td>
<td>ON</td>
<td>Cycles with CC1 first stage of compressor or compressor spd 1-12</td>
</tr>
<tr>
<td>3</td>
<td>ON</td>
<td>OFF</td>
<td>Cycles with CC2 second stage of compressor or compressor spd 7-12</td>
</tr>
<tr>
<td>4</td>
<td>OFF</td>
<td>OFF</td>
<td>Cycles with DH input from ABC board</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Features</th>
<th>ZS Base</th>
<th>ZS Plus</th>
<th>ZS Pro</th>
<th>ZS Pro-F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temp, CO₂, Humidity, and VOC Options</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Neutral Color</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Addressable/supports daisy chaining</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Hidden communication port</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Mounts on a standard 2&quot; by 4&quot; electrical box</td>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Occupancy Status indicator LED</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>Push button occupancy override</td>
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<td>✓</td>
<td>✓</td>
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<tr>
<td>Setpoint adjust</td>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Large, easy to read LCD</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Alarm indicator</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>°F to °C conversion button</td>
<td>✓</td>
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<table>
<thead>
<tr>
<th>Options</th>
<th>Part Number</th>
<th>Part Number</th>
<th>Part Number</th>
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<td>ZSU</td>
<td>ZSUPL</td>
<td>ZSUP</td>
<td>ZSUPF</td>
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<td>Temp with CO₂</td>
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<td>ZSUPL-C</td>
<td>ZSUP-C</td>
<td>ZSUPF-C</td>
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<tr>
<td>Temp with Humidity</td>
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<td>ZSUPL-H</td>
<td>ZSUP-H</td>
<td>ZSUPF-H</td>
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<tr>
<td>Temp with Humidity, CO₂</td>
<td>ZSU-HC</td>
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<td>ZSUP-HC</td>
<td>ZSUPF-HC</td>
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<tr>
<td>Temp, Humidity, VOC</td>
<td>ZSU-HV</td>
<td>ZSUPL-HV</td>
<td>ZSUP-HV</td>
<td>ZSUPF-HV</td>
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<tr>
<td>Temp with VOC</td>
<td>ZSU-V</td>
<td>ZSUPL-V</td>
<td>ZSUP-V</td>
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### Controls - UPC DDC Control (optional) cont.

**RNet Sensor Physical and Electrical Data**

<table>
<thead>
<tr>
<th>Sensing Element</th>
<th>Range</th>
<th>Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature (on non-Humidity models)</td>
<td>(-20° C to 50° C)</td>
<td>(0.2° C)</td>
</tr>
<tr>
<td>Temperature (on Humidity models)</td>
<td>(10° C to 40° C)</td>
<td>(0.3° C)</td>
</tr>
<tr>
<td>Humidity</td>
<td>10% to 90%</td>
<td>31.8% typical</td>
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<tr>
<td>CO2</td>
<td>400 to 1250 PPM</td>
<td>330 PPM or +/-3% of reading (greater of two)</td>
</tr>
<tr>
<td></td>
<td>1250 to 2000 PPM</td>
<td>35% of reading plus 30 PPM</td>
</tr>
<tr>
<td>VOC</td>
<td>0 to 2,000 PPM</td>
<td>3100 PPM</td>
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</table>

**Power Requirements**

<table>
<thead>
<tr>
<th>Sensor Type</th>
<th>Power Required</th>
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<tr>
<td>Temperature Only</td>
<td>12 Vdc @ 8 mA</td>
</tr>
<tr>
<td>Temperature with Humidity</td>
<td>12 Vdc @ 15 mA (idle) to 190 mA (CO2 measurement cycle)</td>
</tr>
<tr>
<td>Temp with VOC, or Temp/VOC/Humidity</td>
<td>12 Vdc @ 60 mA</td>
</tr>
<tr>
<td>Temp with CO2 , or Temp/CO2/Humidity</td>
<td>12 Vdc @ 15 mA (idle) to 190 mA (CO2 measurement cycle)</td>
</tr>
</tbody>
</table>

**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

---

![All Segments](image1)

![Setpoint Adjust](image2)

![Home Screen](image3)

![Info Screen - CO2](image4)

![Mounting Dimensions Diagram](image5)
Unit Startup

Before Powering Unit, Check The Following:

NOTE: Remove and discard the compressor shipping bolts. The bolts can then be discarded.

- High voltage is correct and matches nameplate.
- Fuses, breakers and wire size correct.
- Low voltage wiring complete.
- Piping completed and water system cleaned and flushed.
- Air is purged from closed loop system.
- Isolation valves are open, water control valves or loop pumps wired.
- Condensate line open and correctly pitched.
- Transformer switched to 208V if applicable.
- Dip switches are set correctly.
- Blower rotates freely – foam shipping support has been removed.
- Blower speed correct.
- Air filter/cleaner is clean and in position.
- Service/access panels are in place.
- Return air temperature is between 50-80°F heating and 60-95°F cooling.
- Check air coil cleanliness to insure optimum performance. Clean as needed according to maintenance guidelines. To obtain maximum performance the air coil should be cleaned before startup. A 10-percent solution of dishwasher detergent and water is recommended for both sides of coil, a thorough water rinse should follow.

Startup Steps

NOTE: Complete the Equipment Start-Up/Commissioning Check Sheet during this procedure. Refer to thermostat operating instructions and complete the startup procedure.

1. Initiate a control signal to energize the blower motor. Check blower operation.
2. Initiate a control signal to place the unit in the cooling mode. Cooling setpoint must be set below room temperature. Incorrect rotation will cause low refrigerant pressures and possibly unusual noise. Switch any two power leads at the compressor or contactor to reverse rotation.
3. Be sure that the compressor and water control valve or loop pump(s) are activated.
4. Verify that the water flow rate is correct by measuring the pressure drop through the heat exchanger using the P/T plugs and comparing to the pressure drop table.
5. Check the temperature of both the supply and discharge water (Refer to Operating Parameters tables).
6. Check for an air temperature drop of 15°F to 25°F across the air coil, depending on the blower speed and entering water temperature.
7. Decrease the cooling set point several degrees and verify high-speed blower operation (variable speed ECM only).
8. Adjust the cooling setpoint above the room temperature and verify that the compressor and water valve or loop pumps deactivate.
9. Initiate a control signal to place the unit in the heating mode. Heating set point must be set above room temperature. Heating will energize after a time delay.
10. Check the temperature of both the supply and discharge water (Refer to Unit Operating Parameters tables).
11. Check for an air temperature rise of 20°F to 35°F across the air coil, depending on the blower speed and entering water temperature.
12. If auxiliary electric heaters are installed, increase the heating setpoint until the electric heat banks are sequenced on. All stages of the auxiliary heater should be sequenced on when the thermostat is in the Emergency Heat mode. Check amperage of each element.
13. Adjust the heating setpoint below room temperature and verify that the compressor and water valve or loop pumps deactivate.
14. During all testing, check for excessive vibration, noise or water leaks. Correct or repair as required.
15. Set system to desired normal operating mode and set temperature to maintain desired comfort level.
16. Instruct the owner/operator in the proper operation of the thermostat and system maintenance.

NOTE: Be certain to fill out and forward all warranty registration papers.
Operating Parameters

Single Speed Models

SI

<table>
<thead>
<tr>
<th>Entering Water Temp °C</th>
<th>Water Flow L/s/kW</th>
<th>Suction Pressure kPa</th>
<th>Discharge Pressure kPa</th>
<th>Superheat</th>
<th>Subcooling</th>
<th>Water Temp Rise °C</th>
<th>Air Temp Drop °C DB</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1.1</td>
<td>0.09</td>
<td>793 - 862</td>
<td>1034 - 1172</td>
<td>11 - 19</td>
<td>6 - 9</td>
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</tr>
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<td></td>
<td>0.19</td>
<td>724 - 827</td>
<td>896 - 1000</td>
<td>11 - 19</td>
<td>6 - 9</td>
<td>4 - 6</td>
<td>9 - 13</td>
</tr>
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<td>10</td>
<td>0.09</td>
<td>896 - 965</td>
<td>1482 - 1620</td>
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<td>4 - 8</td>
<td>9 - 12</td>
<td>9 - 13</td>
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<td>1310 - 1448</td>
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<td>4 - 8</td>
<td>4 - 7</td>
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<td>1931 - 2137</td>
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<td>6 - 9</td>
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<td>9 - 13</td>
</tr>
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<td></td>
<td>0.19</td>
<td>938 - 1007</td>
<td>1724 - 1931</td>
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<td>4 - 8</td>
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<td>6 - 9</td>
<td>8 - 11</td>
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</tr>
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<td>2206 - 2413</td>
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<tr>
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<td>1000 - 1063</td>
<td>2896 - 3102</td>
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<td>8 - 11</td>
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<td>2792 - 2999</td>
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<td>4 - 8</td>
<td>3 - 6</td>
<td>9 - 13</td>
</tr>
</tbody>
</table>

Note: Cooling performance based on entering air temperatures of 80º F DB, 67º F WB. Heating performance based on entering air temperature of 70º F DB.

Heating - No Hot Water Generation

<table>
<thead>
<tr>
<th>Suction Pressure kPa</th>
<th>Discharge Pressure kPa</th>
<th>Superheat</th>
<th>Subcooling</th>
<th>Water Temp Drop °C</th>
<th>Air Temp Rise °C DB</th>
</tr>
</thead>
<tbody>
<tr>
<td>503-586</td>
<td>1862 - 2103</td>
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<td>2 - 6</td>
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<td>1931 - 2172</td>
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<td>1999 - 2241</td>
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<td>2 - 6</td>
<td>5 - 7</td>
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</table>

12/5/14

Operating Limits

<table>
<thead>
<tr>
<th>Operating Limits</th>
<th>Cooling (°C)</th>
<th>Heating (°C)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Limits</td>
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</tr>
<tr>
<td>Min. Ambient Air</td>
<td>7.2</td>
<td>7.2</td>
</tr>
<tr>
<td>Rated Ambient Air</td>
<td>26.7</td>
<td>21.1</td>
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<tr>
<td>Max. Ambient Air</td>
<td>37.8</td>
<td>29.4</td>
</tr>
<tr>
<td>Min. Entering Air</td>
<td>10.0</td>
<td>4.4</td>
</tr>
<tr>
<td>Rated Entering Air db/wb</td>
<td>27/19</td>
<td>20.0</td>
</tr>
<tr>
<td>Max. Entering Air db/wb</td>
<td>43/28.3</td>
<td>26.7</td>
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<tr>
<td>Water Limits</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Min. Entering Water</td>
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<tr>
<td>Normal Entering Water</td>
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<td>-11</td>
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<tr>
<td>Max. Entering Water</td>
<td>48.9</td>
<td>32.2</td>
</tr>
</tbody>
</table>

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.
# Pressure Drop

<table>
<thead>
<tr>
<th>Model</th>
<th>L/s</th>
<th>Pressure Drop (kPa)</th>
<th>-1.11°C</th>
<th>10°C</th>
<th>21.1°C</th>
<th>32.2°C</th>
<th>43.3°C</th>
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<td>002</td>
<td>0.09</td>
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<td>1.9</td>
<td>1.7</td>
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<tr>
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<td>0.25</td>
<td>32.4</td>
<td>29.0</td>
<td>26.9</td>
<td>24.8</td>
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<tr>
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<td>0.38</td>
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<td>33.8</td>
<td>32.4</td>
<td>31.0</td>
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<td>0.50</td>
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<td>51.7</td>
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## Compressor Resistance

### Compressor Resistance Chart

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<td>Run</td>
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<td>3.65 - 4.19</td>
<td>3.75 - 4.31</td>
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<td>3.35 - 3.85</td>
<td>2.80 - 3.22</td>
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**VERSTATEC COMPACT SERIES 50Hz INSTALLATION MANUAL**

2/18/18
Compressor and Thermistor Resistance

### Compressor Resistance Chart

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<thead>
<tr>
<th>Model</th>
<th>Run</th>
<th>Start</th>
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<tr>
<td>002</td>
<td>3.65 - 4.19</td>
<td>3.75 - 4.31</td>
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<tr>
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<td>3.35 - 3.85</td>
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8/18/18

### Thermistor Resistance

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12/5/14

### Refrigerant Circuit Guideline

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<th>Suction Pressure</th>
<th>Compressor Amp Draw</th>
<th>Superheat</th>
<th>Subcooling</th>
<th>Air Temp. Differential</th>
<th>Water Temp. Differential</th>
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<td>Low</td>
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Restricted Filter Drier | Check temperature difference (delta T) across filter drier.

7/6/10
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2/18/18
Reference Calculations

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<thead>
<tr>
<th>Heating Calculations:</th>
<th>Cooling Calculations:</th>
</tr>
</thead>
<tbody>
<tr>
<td>LWT = EWT - ( \frac{HE}{WF \times 4.2} )</td>
<td>LWT = EWT + ( \frac{HR}{WF \times 4.2} )</td>
</tr>
<tr>
<td>LAT = EAT + ( \frac{HC}{AF \times 1.08} )</td>
<td>LAT(DB) = EAT(DB) - ( \frac{SC}{AF \times 1.08} )</td>
</tr>
<tr>
<td>TH = HC + HWC</td>
<td>LC = TC - SC</td>
</tr>
<tr>
<td>S/T = ( \frac{SC}{TC} )</td>
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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.
**Troubleshooting**

Should a major problem develop, refer to the following information for possible causes and corrective steps.

**If compressor won't run:**

1. The fuse may be open or the circuit breaker is tripped. Check electrical circuits and motor windings for shorts or grounds. Investigate for possible overloading. Replace fuse or reset circuit breakers after fault is corrected.
2. Supply voltage may be too low. Check it with a volt meter.
3. Control system may be faulty. Check control for correct wiring of thermostat or aquastat and check the 24 volt transformer for proper voltage.
4. Wires may be loose or broken. Replace or tighten.
5. The low pressure switch may have tripped due to one or more of the following:
   a) Heating
      1) Plugged heat exchanger on source side
      2) Water flow source side - (Low)
      3) Water too cold source side
      4) Low refrigerant
   b) Cooling
      1) Plugged heat exchanger on load side
      2) Water flow load side - (Low)
      3) Water too cold load side
      4) Low refrigerant
6. The high pressure switch may have tripped due to one or more of the following:
   a) Heating
      1) Plugged heat exchanger on load side
      2) Low water flow load side
      3) Water too warm load side
   b) Cooling
      1) Plugged heat exchanger on source side
      2) Low water flow on source side
      3) Water too warm source side
7. The compressor overload protection may be open.
8. The internal winding of the compressor motor may be grounded to the compressor shell. If so, replace the compressor.
9. The compressor winding may be open or shorted. Disconnect power. Check continuity with ohm meter. If the winding is open, replace the compressor.

**If sufficient cooling or heating is not obtained:**

1. Check control for improper location or setting.
2. Check for restriction in water flow.
3. Check refrigerant subcooling and superheat for proper refrigerant charge and expansion valve operation.
4. The reversing valve may be defective and creating a bypass of refrigerant. If the unit will not heat, check the reversing valve coil.

**If the unit operation is noisy:**

1. Check compressor for loosened mounting bolts. Make sure compressor is floating free on its isolator mounts. Check for tubing contact with the compressor or other surfaces. Readjust it by bending slightly.
2. Check screws on all panels.
3. Check for chattering or humming in the contactor or relays due to low voltage or a defective holding coil. Replace the component.
4. Check for proper installation of vibration absorbing material under the unit.
5. Check for abnormally high discharge pressures.
6. Compressor rotation incorrect

**Refrigerant Systems**

To maintain sealed circuit integrity, do not install service gauges unless unit operation appears abnormal. Compare the change in temperature on the air side as well as the water side to the Operating Parameters tables. If the unit's performance is not within the ranges listed, and the airflow and water flow are known to be correct, gauges should then be installed and superheat and subcooling numbers calculated. If superheat and subcooling are outside recommended ranges, an adjustment to the refrigerant charge may be necessary.

**NOTE:** Verify that air and water flow rates are at proper levels before servicing the refrigerant circuit.
# Startup and Troubleshooting Form

Company Name: _______________________________  Company Phone No: _______________________________
Technician Name: _____________________________  Date: _______________________________
Model No: _____________________________  Serial No: _______________________________
Owner’s Name: _____________________________  Open or Closed Loop: _____________________________
Installation Address: _____________________________  Installation Date: _______________________________

Check One
☐ Start up/Check-out for new installation  ☐ Troubleshooting  Problem: ____________________________________

## 1. FLOW RATE IN GPM (COAXIAL HEAT EXCHANGER)

- **Water In Pressure:** a.______ kPa
- **Water Out Pressure:** b.______ kPa
- **Pressure Drop:** c.______ kPa
- **Convert Pressure Drop to Flow Rate** (refer to Pressure Drop table) d.______ L/s

## 2. TEMPERATURE RISE OR DROP ACROSS COAXIAL HEAT EXCHANGER

<table>
<thead>
<tr>
<th>COOLING</th>
<th>HEATING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water In Temperature: e.______ °C</td>
<td>e.______ °C</td>
</tr>
<tr>
<td>Water Out Temperature: f.______ °C</td>
<td>f.______ °C</td>
</tr>
<tr>
<td>Temperature Difference: g.______ °C</td>
<td>g.______ °C</td>
</tr>
</tbody>
</table>

## 3. TEMPERATURE RISE OR DROP ACROSS AIR COIL

<table>
<thead>
<tr>
<th>COOLING</th>
<th>HEATING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air In Temperature: h.______ °C</td>
<td>h.______ °C</td>
</tr>
<tr>
<td>Air Out Temperature: i.______ °C</td>
<td>i.______ °C</td>
</tr>
<tr>
<td>Temperature Difference: j.______ °C</td>
<td>j.______ °C</td>
</tr>
</tbody>
</table>

## 4. HEAT OF REJECTION (HR) / HEAT OF EXTRACTION (HE) CALCULATION

HR or HE = Flow Rate x Temperature Difference x Brine Factor*
\[ d. \text{(above)} \times g. \text{(above)} \times 485 \text{ for Methanol or Environol, 500 for water} \]

- **Heat of Extraction (Heating Mode):** = kW/hr
- **Heat of Rejection (Cooling Mode):** = kW/hr

Compare results to Capacity Data Tables

Note: Steps 5 through 8 need only be completed if a problem is suspected

## 5. WATTS

<table>
<thead>
<tr>
<th>COOLING</th>
<th>HEATING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volts: m._____ VOLTS</td>
<td>m._____ VOLTS</td>
</tr>
<tr>
<td>Total Amps (Comp. + Fan): n._____ AMPS</td>
<td>n._____ AMPS</td>
</tr>
<tr>
<td>Watts = m. x n. x 0.85: o._____ WATTS</td>
<td>o._____ WATTS</td>
</tr>
</tbody>
</table>

## 6. CAPACITY

<table>
<thead>
<tr>
<th>COOLING</th>
<th>HEATING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooling Capacity = HR. - (o. x 3.413): p._____ kW/hr</td>
<td></td>
</tr>
<tr>
<td>Heating Capacity= HE. + (o. x 3.413): p._____ kW/hr</td>
<td></td>
</tr>
</tbody>
</table>

## 7. EFFICIENCY

<table>
<thead>
<tr>
<th>COOLING</th>
<th>HEATING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooling EER = p. / o.: q._____ COP</td>
<td></td>
</tr>
<tr>
<td>Heating COP = p. / o.: q._____ COP</td>
<td></td>
</tr>
</tbody>
</table>

## 8. SUPERHEAT (S.H.) / SUBCOOLING (S.C.)

<table>
<thead>
<tr>
<th>COOLING</th>
<th>HEATING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suction Pressure: r.______ kPa</td>
<td>r.______ kPa</td>
</tr>
<tr>
<td>Suction Saturation Temperature: s.______ °C</td>
<td>s.______ °C</td>
</tr>
<tr>
<td>Suction Line Temperature: t.______ °C</td>
<td>t.______ °C</td>
</tr>
<tr>
<td>Superheat = t. - s.: u.______ °C</td>
<td>u.______ °C</td>
</tr>
<tr>
<td>Head Pressure: v.______ kPa</td>
<td>v.______ kPa</td>
</tr>
<tr>
<td>High Pressure Saturation Temp.: w.______ °C</td>
<td>w.______ °C</td>
</tr>
<tr>
<td>Liquid Line Temperature*: x.______ °C</td>
<td>x.______ °C</td>
</tr>
<tr>
<td>Subcooling = w. - x.: y.______ °C</td>
<td>y.______ °C</td>
</tr>
</tbody>
</table>

* Note: Liquid line is between the coaxial heat exchanger and the expansion valve in the cooling mode; between the air coil and the expansion valve in the heating mode.
COOLING CYCLE ANALYSIS

Heat of Extraction/Rejection = GPM x 500 (485 for water/antifreeze) x \( \Delta T \)

Note: DO NOT hook up pressure gauges unless there appears to be a performance problem.

HEATING CYCLE ANALYSIS
Preventive Maintenance

Water Coil Maintenance
1. Keep all air out of the water. An open loop system should be checked to ensure that the well head is not allowing air to infiltrate the water line. Lines should always be airtight.
2. Keep the system under pressure at all times. It is recommended in open loop systems that the water control valve be placed in the discharge line to prevent loss of pressure during off cycles. Closed loop systems must have positive static pressure.

NOTE: On open loop systems, if the installation is in an area with a known high mineral content (125 PPM or greater) in the water, it is best to establish with the owner a periodic maintenance schedule so the coil can be checked regularly. Should periodic coil cleaning be necessary, use standard coil cleaning procedures which are compatible with either the cupronickel or copper water lines. Generally, the more water flowing through the unit the less chance for scaling.

Other Maintenance

Filters
Filters must be clean to obtain maximum performance. They should be inspected monthly under normal operating conditions and be replaced when necessary. Units should never be operated without a filter.

Condensate Drain
In areas where airborne bacteria produce a slime in the drain pan, it may be necessary to treat chemically to minimize the problem. The condensate drain can pick up lint and dirt, especially with dirty filters. Inspect twice a year to avoid the possibility of overflow.

Blower Motors
Blower motors are equipped with sealed ball bearings and require no periodic oiling.

Air Coil
The air coil must be cleaned to obtain maximum performance. Check once a year under normal operating conditions and, if dirty, brush or vacuum (with a brush attachment) clean. Care must be taken not to damage the aluminum fins while cleaning.

CAUTION: Fin edges are sharp.

Replacement Procedures

Obtaining Parts
When ordering service or replacement parts, refer to the model number and serial number of the unit as stamped on the serial plate attached to the unit. If replacement parts are required, mention the date of installation of the unit and the date of failure, along with an explanation of the malfunctions and a description of the replacement parts required.

In-Warranty Material Return
Material may not be returned except by permission of authorized warranty personnel. Contact your local distributor for warranty return authorization and assistance.
## Revision Guide

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<td>20 Sept 2018</td>
<td>JM</td>
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All Versatec Compact 50Hz product is safety tested to CE standards and performance tested in accordance with standard EN 14511-2.