7 Series

700R11

Indoor Split Geothermal Heat Pump

- R-410A Refrigerant
- 033, 042, 050 ton Variable Speed

7 Series 700R11 Installation Manual

Installation Information

Water Piping Connections

Hot Water Generator Connections

Electrical

Startup Procedures

Troubleshooting

Preventive Maintenance

PROUD MEMBER

Intertek

Water Source HP
ANSI/AHRI/ASHRAE/ISO13256-1

ENERGY STAR PARTNER

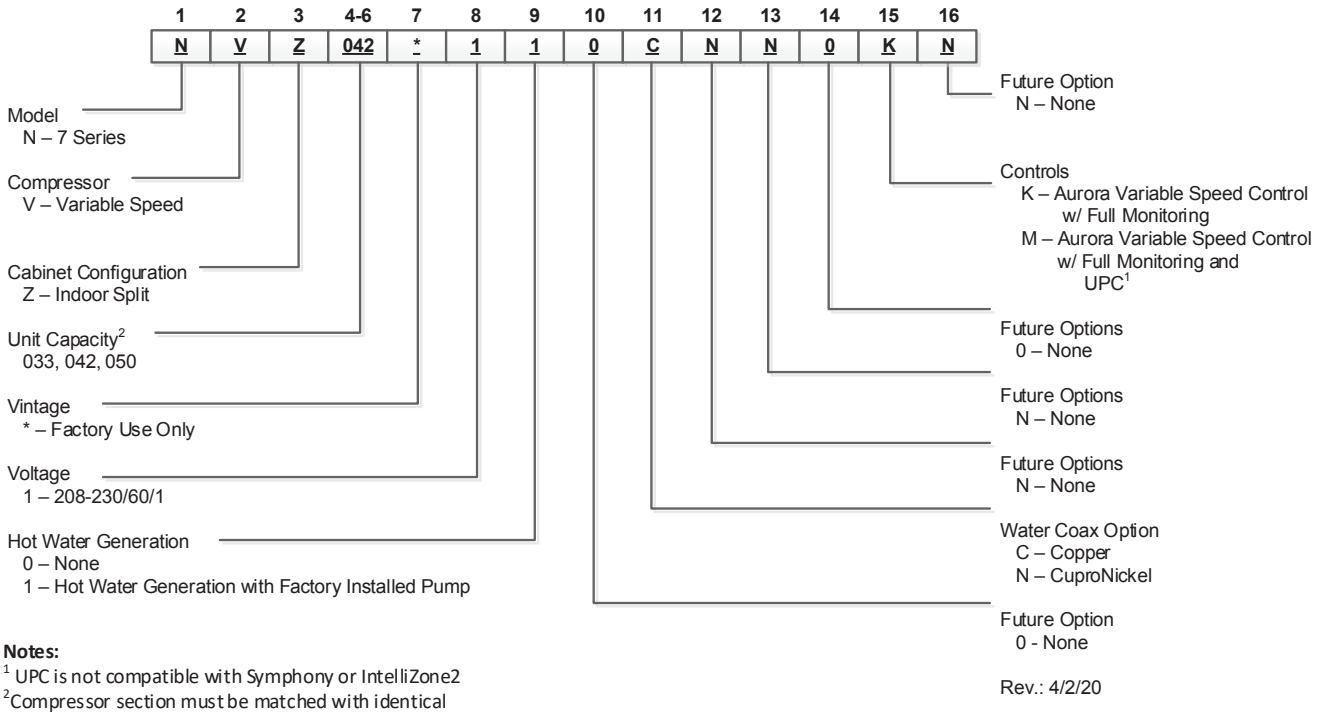
WaterFurnace
Smarter from the Ground Up™

IM2703SN 01/21

Table of Contents

Model Nomenclature 4
General Installation Information 5
Water Quality Guidelines 8
Flow Centers 10
Closed Loop Ground Water Systems 11
Open Loop- Well Water Systems 13
Hot Water Generator Connections 14
Electrical Information 16
Air Handler General Installation Information 21
Refrigeration 26
Line Set Sizes 28
Electrical Data 28
Electronic Thermostat Installation 28
Air Handler Electrical Data 29
Dimensional Data 31
Physical Data 34
The Aurora™ Advanced VS Control System 35
Operation Logic 47
Wiring Schematics 48
Pressure/Temperature Conversion Chart 65
Pressure Drop/Thermistor Resistance 66
Antifreeze Corrections 66
Correction Factor Tables 67
Compressor Resistance 68
Refrigerant Circuit Guideline 68
Heat of Extraction/Rejection 68
Operating Parameters 69
Air Handler EA Corrections 70
SVH Blower Performance Data 70
Unit Start Up (NVZ Compressor Section) 72
Unit Start Up (SVH Air Handler Section) 74
Reference Calculations and Legend 76
Troubleshooting 76
Preventive Maintenance and Replacement Procedures 80
Service Parts List 81

Unit Nomenclature (Compressor Section)



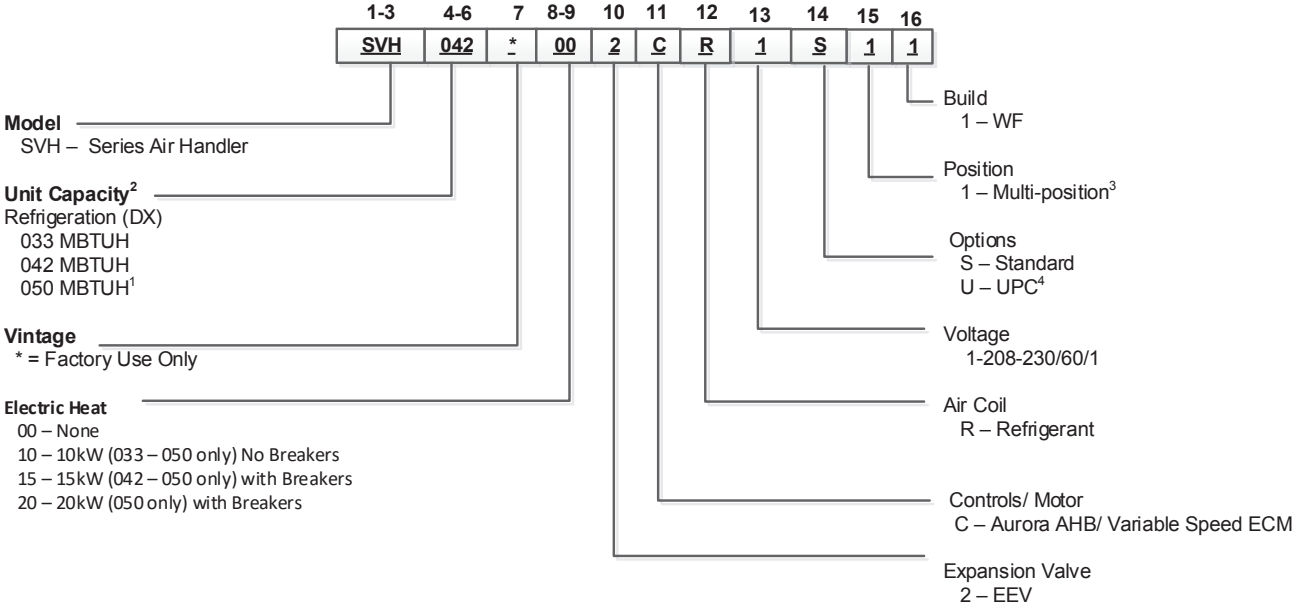
Rev.: 4/2/20

Notes:

[1] UPC is not compatible with Symphony or IntelliZone2

[2] Compressor section must be matched with identical model SVH air handler section. See Compatibility Table.

Unit Nomenclature (Air Handler)



Notes:

[1]- Air flow on the 050 unit in the horizontal configurations should be limited to 1900 cfm in cooling mode, or condensate blow off may occur.

[2] - Compressor section must be matched with identical model SVH air handler section. See Compatibility Table

[3]- To field convert the SVH to bottomflow air discharge. The SAHBCK kit must be ordered separately.

[4]- UPC is not compatible with Symphony or IntelliZone2.

Rev.: 4/2/20

General Installation Information

WARNING: This appliance is not intended for use by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience or knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety. CHILDREN SHOULD BE SUPERVISED TO ENSURE THAT THEY DO NOT PLAY WITH THE APPLIANCE.

Compatibility

The 7 Series Split uses a communicating control and the system has been designed as a matched set, compressor section to air handler section (see table). The 7 Series NVZ compressor section is not compatible with the SAH air handler or any other air handler except for the SVH. The SVH is not compatible with any other compressor section other than the mated NVZ.

Air Handler	7 Series Indoor Split Model	Rated Airflow (CFM)	Electric Heat (kW)
SVH033**2CR1S11	NVZ033	1200	10
SVH042**2CR1S11	NVZ042	1500	10, 15
SVH050**2CR1S11	NVZ050	1800	10, 15, 20

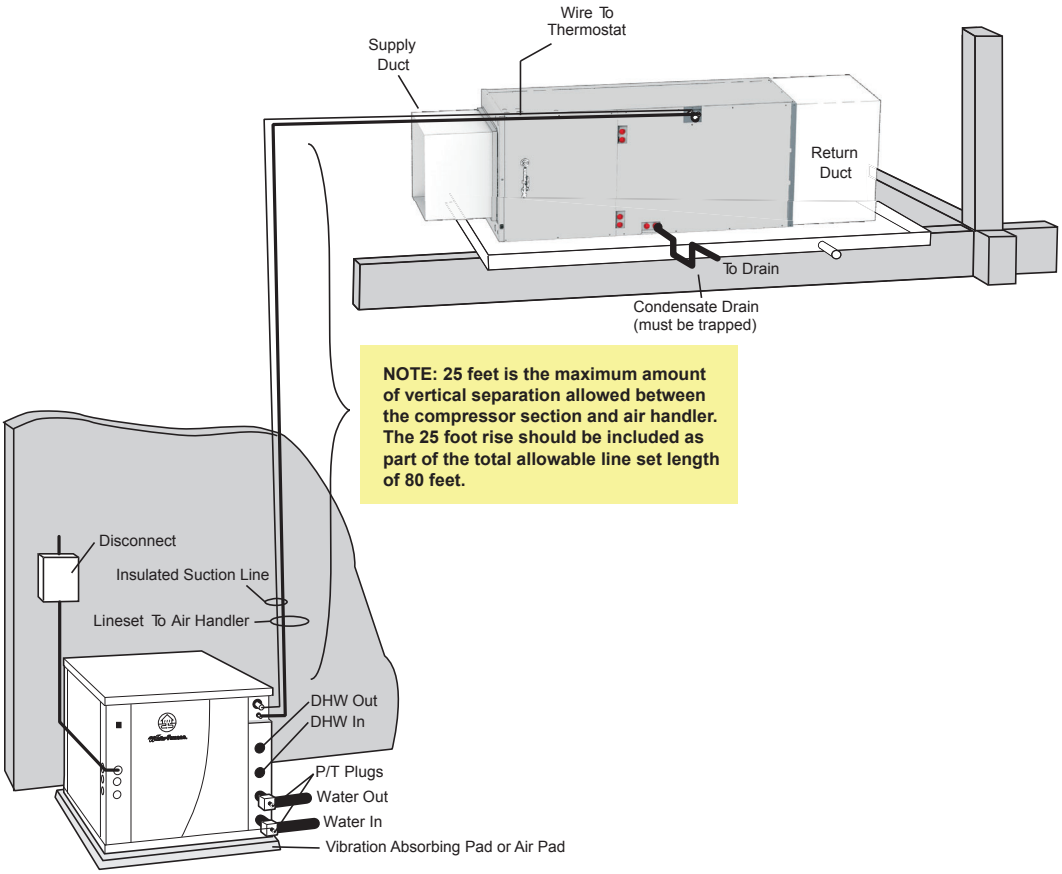
1/29/2020

Initial Inspection

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.

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.

Figure 1: Typical Split System Application with Remote Blower Coil



General Installation Information cont.

Safety Instructions

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, such as the following safety measures:

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

Moving and Storage

Move units in the normal “up” orientation. Units may be moved and stored per the information on the packaging. Do not stack more than three units in total height. 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.

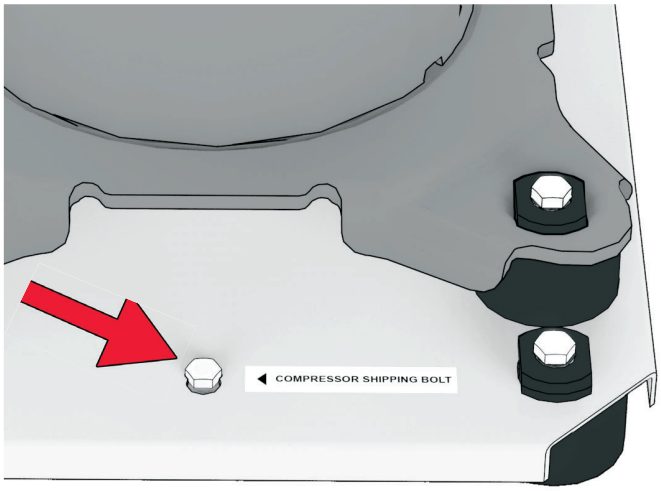
Clearances

Clearances must be taken into consideration, and provided for as follows:

- Refrigerant piping and connections - minimum 12” recommended.
- Maintenance and servicing access - minimum 24” from front of unit recommended for blower motor/coil replacement.
- Condensate drain lines routed to clear filter and panel access.
- Filter removal - minimum 24” recommended.

Compressor Section Location

NOTE: Prior to setting the unit in place, remove and discard the compressor shipping bolt located at the front of the compressor mounting bracket.



Locate the compressor section in an indoor area, minimum ambient of 45°F and maximum ambient of 100°F. Installing the compressor section in an attic is not approved and could result in loss of warranty. Installation is not recommended in areas with excessive dirt and debris as this may be drawn into the VS drive causing overheating of the VS drive. 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.

When utilizing an existing line set, only flushing compounds that vaporize should be used; which means they are packaged in a pressurized disposable cylinder. It is preferable to use a flushing agent that removes oil, water, and acid, plus, is biodegradeable and non-toxic. The flushing agent should be safe to use with both HCFC and HFC refrigerants. Once a flushing agent has been selected, follow the instructions provided with the product.

The first step should be purging the lines with nitrogen. Purging with nitrogen first will remove some of the particulate and residual oil which will allow the flushing agent to work better. Never blow the flushing agent through a compressor, filter drier, or EEV as it will cause the components to fail.

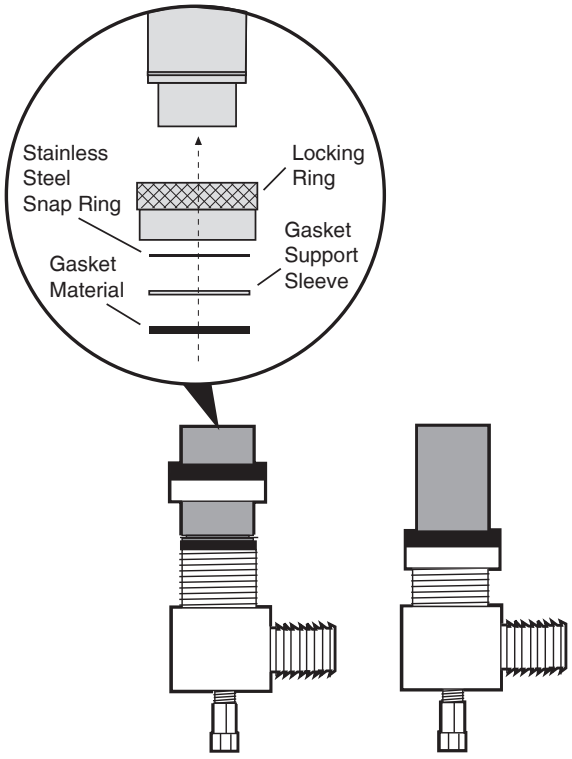
When flushing is complete and the final system is assembled, an acid check should be preformed on the system. Acid test kits are available from most HVACR distributors.

General Installation Information cont.

Connection to Air Coil

Figure 1 illustrates a typical 7 Series Split installation. Reference the Line Set Sizes table for typical line set diameters and maximum length. Line sets over 80 feet are not recommended. Longer line sets will significantly reduce capacity and efficiency of the system. If the line set is kinked or deformed and cannot be reformed, the bad section of pipe should be replaced. A restricted line set will affect unit performance. As in all R-410A equipment, a reversible liquid line filter drier is required to ensure all moisture is removed from the system. This drier should be replaced whenever "breaking into" the system for service. All line sets should be insulated with a minimum of 1/2 in. closed cell insulation. All exterior insulation should be painted with UV resistant paint or covering to ensure long insulation life.

Figure 2: Swivel Connections



Water Piping

The proper water flow must be provided to each unit whenever the unit operates. To assure proper flow, read the flow from the on-board water flow meter or 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 reading the flow from the on-board flow meter or measuring the water pressure drop through the refrigerant-to-water heat exchanger.

All source water connections are swivel piping fittings (see Figure 2) that accept 1 in. male pipe threads (MPT).

The swivel connector has a rubber gasket seal similar to a rubber hose gasket, which when mated to the flush end of any 1 in. threaded pipe provides a leak-free seal without the need for thread sealing tape or compound. Check to ensure that the rubber seal is in the swivel connector prior to attempting any connection. The rubber seals are shipped attached to the waterline. To make the connection to a ground loop system, mate the brass connector (supplied in CK4LI connector kit) against the rubber gasket in the swivel connector and thread the female locking ring onto the pipe threads, while maintaining the brass connector in the desired direction. Tighten the connectors by hand, then gently snug the fitting with pliers to provide a leak-proof joint. When connecting to an open loop (ground water) system, thread the 1 in. MPT fitting (SCH80 PVC or copper) into the swivel connector and tighten in the same manner as noted above. The open and closed loop piping system should include pressure/temperature taps for serviceability.

Never use flexible hoses smaller than 1 in. inside diameter on the unit. Limit hose length to 10 ft. per connection. Check carefully for water leaks.

Water Quality Guidelines

It is the responsibility of the system designer and installing contractor to ensure that acceptable water quality is present and that all applicable codes have been met in these installations. Failure to adhere to the guidelines in the water quality table could result in loss of warranty. 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.

Heat pumps 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.

Water Treatment

Do not use untreated or improperly treated water. Equipment damage may occur. The use of improperly treated or untreated water in this equipment may result in scaling, erosion, corrosion, algae or slime. Purchase of a pre-mix antifreeze could significantly improve system reliability if the water quality is controlled and there are additives in the mixture to inhibit corrosion. There are many examples of such fluids on the market today such as Environol™ 1000 (pre-mix ethanol), and others. The services of a qualified water treatment specialist should be engaged to determine what treatment, if any, is required. The product warranty specifically excludes liability for corrosion, erosion or deterioration of equipment.

The heat exchangers and water lines in the units are copper or cupronickel tube. There may be other materials in the buildings piping system that the designer may need to take into consideration when deciding the parameters of the water quality. If antifreeze or water treatment solution is to be used, the designer should confirm it does not have a detrimental effect on the materials in the system.

Contaminated Water

In applications where the water quality cannot be held to prescribed limits, the use of a secondary heat exchanger is recommended to separate the unit from the contaminated water. The table outlines the water quality guidelines for unit heat exchangers. If these conditions are exceeded, a secondary heat exchanger is required. Failure to supply a secondary heat exchanger where needed will result in a warranty exclusion for primary heat exchanger corrosion or failure.

Low Water Coil Limit

Set the freeze sensing switch SW2-1 on the Aurora Base Control (ABC) printed circuit board for applications using a closed loop antifreeze solution to “LOOP” (15°F). On applications using an open loop/ground water system (or closed loop no antifreeze), set this dip switch to “WELL” (30°F), the factory default setting. (Refer to the DIP Switch Settings table in the Aurora Control section.)

Water Quality Guidelines cont.

Material		Copper	90/10 Cupronickel	316 Stainless Steel
pH	**Acidity/Alkalinity**	7 - 9	7 - 9	7 - 9
Scaling	Calcium and Magnesium Carbonate	(Total Hardness) less than 350 ppm	(Total Hardness) less than 350 ppm	(Total Hardness) less than 350 ppm
Corrosion	Hydrogen Sulfide	Less than 0.5 ppm (rotten egg smell appears at 0.5 ppm)	10 - 50 ppm	Less than 1 ppm
	Sulfates	Less than 125 ppm	Less than 125 ppm	Less than 200 ppm
	Chlorine	Less than 0.5 ppm	Less than 0.5 ppm	Less than 0.5 ppm
	Chlorides	Less than 20 ppm	Less than 125 ppm	Less than 300 ppm
	Carbon Dioxide	Less than 50 ppm	10 - 50 ppm	10 - 50 ppm
	Ammonia	Less than 2 ppm	Less than 2 ppm	Less than 20 ppm
	Ammonia Chloride	Less than 0.5 ppm	Less than 0.5 ppm	Less than 0.5 ppm
	Ammonia Nitrate	Less than 0.5 ppm	Less than 0.5 ppm	Less than 0.5 ppm
	Ammonia Hydroxide	Less than 0.5 ppm	Less than 0.5 ppm	Less than 0.5 ppm
	Ammonia Sulfate	Less than 0.5 ppm	Less than 0.5 ppm	Less than 0.5 ppm
	Total Dissolved Solids (TDS)	Less than 1000 ppm	1000 - 1500 ppm	1000 - 1500 ppm
	LSI Index	+0.5 to -0.5	+0.5 to -0.5	+0.5 to -0.5
Iron Fouling (Biological Growth)	Iron, FE^{2}+ (Ferrous) Bacterial Iron Potential	< 0.2 ppm	< 0.2 ppm	< 0.2 ppm
	Iron Oxide	Less than 1 ppm, above this level deposition will occur	Less than 1 ppm, above this level deposition will occur	Less than 1 ppm, above this level deposition will occur
Erosion	Suspended Solids	Less than 10 ppm and filtered for max. of 600 micron size	Less than 10 ppm and filtered for max. of 600 micron size	Less than 10 ppm and filtered for max. of 600 micron size
	Threshold Velocity (Fresh Water)	< 6 ft/sec	< 6 ft/sec	< 6 ft/sec

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

2/22/12

Flow Centers

Pressurized Flow Centers:

- Part numbers: FC1-GL, FC2-GL, FC1-FPT, FC2-FPT,FCV1B-GL, FCV2B-GL
- Used with one or multiple heat pumps on a single loop (need to follow installation manual and install check valves)
- Fixed speed and variable speed pumping available, although variable speed pumping is recommended with the 7 Series
- Small footprint for mounting location flexibility.
- Can be mounted in several orientations (see flow center manual for acceptable orientations)
- Injection molded and insulated cabinet
- Brass 3-way valves
- Standard hose kits available

Non-Pressurized Flow Center:

- Part numbers: FC1-GLNP, FC2-GLNP, FCV1B-GLNPP, FCV2B-GLNPP
- Used with a single heat pump on a single loop (or two units if using pump sharing feature). Multiple units cannot be installed in parallel with multiple heat pumps on the same loop.
- Fixed speed and variable speed pumping available, although variable speed pumping is recommended with the 7 Series
- Floor mounted (larger footprint than pressurized flow centers)
- Design allows for air and debris separation, and easy fluid checking or addition
- Insulated plastic cabinet
- Composite 3-way valves
- GLNPP flow centers use standard hose kit

Non-Pressurized Dual Circuit Flow Centers:

- Part numbers: FC3-GLNPD, FC4-GLNPD, FCV2AB-GLNPD, FCV2BB-GLNPD, FCV3CB-GLNPD, FCV4AB-GLNPD
- Designed for applications with two geothermal heat pumps by eliminating the need for T's, additional piping, check valves, and pump sharing wiring.
- Multiple pump configurations (fixed and variable speed) to match your flow requirements.
- Multiple pump configurations (fixed speed and variable speed pumping available) although variable speed pumping is recommended with the 7 Series
- Insulated sheet metal cabinet
- Brass and composite 3-way valves
- Design allows for air and debris separation, and easy fluid checking or addition
- Floor mounted (larger footprint than pressurized flow centers)
- Standard hose kits available

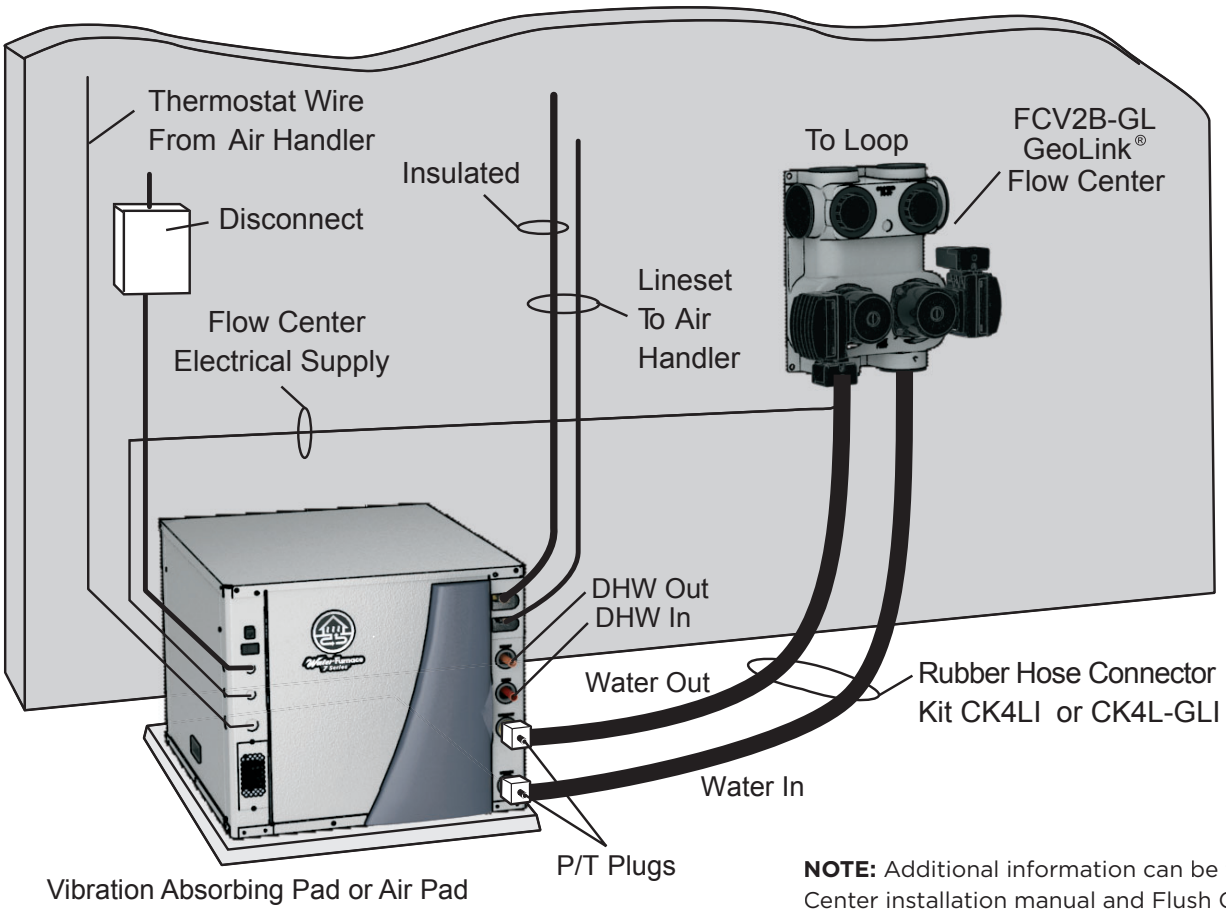
Closed Loop - Ground Source Systems

NOTE: For closed loop systems with antifreeze protection, set SW2-1 to the 15˚F (LOOP) position. (Refer to the DIP Switch Settings table in the Aurora Control section.)

Once piping is completed between the unit, pumps and the ground loop (see figure below), final purging and charging of the loop is required. A flush cart (or a 1.5 HP pump minimum) 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 40-50 psi (summer) or 50-75 psi (winter). This is normally adequate for good system operation. Loop static pressure will 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 initially charging the system.

After pressurization, be sure to turn the venting (burping) screw in the center of the pump two (2) turns open (water will drip out), wait until all air is purged from the pump, then tighten the plug. Ensure that the loop pumps provide adequate flow through the unit(s) by checking the pressure drop across the heat exchanger and comparing it to the unit capacity data in this catalog. 2.5 to 3 gpm of flow per ton of cooling capacity is recommended in earth loop applications.

Figure 4: Typical Split System Application Closed Loop - Earth Coupled



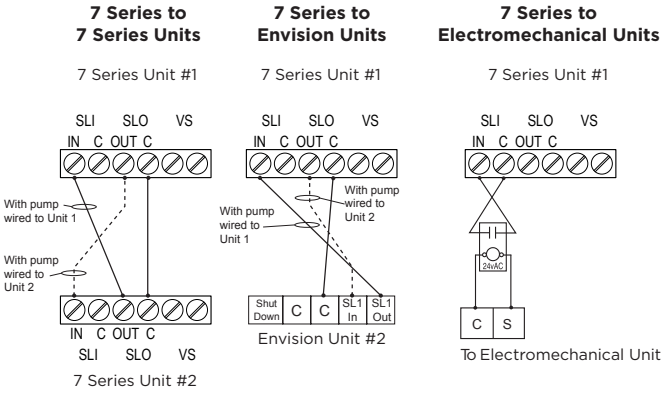
NOTE: Additional information can be found in Flow Center installation manual and Flush Cart manual.

Closed Loop - Ground Source Systems cont.

Multiple Units on One Flow Center

When two units are connected to one loop pumping system, pump control is automatically achieved by connecting the SL terminals on connector P2 in both units with 2-wire thermostat wire. These terminals are polarity dependant (see Figure 5a). The loop pump(s) may be powered from either unit, whichever is more convenient. If either unit calls, the loop pump(s) will automatically start. The use of two units on one flow center is generally limited to a total of 20 gpm capacity. It is recommended that water solenoid valves be installed on heat pumps that share a flow center. This is to allow water flow through only the heat pump that has a demand. Circulating fluid through a heat exchanger of a system that is not operating could be detrimental to the long term reliability of the compressor.

Figure 5a: Primary/Secondary Hook-up



Variable Speed Pump Setup

When using a variable speed pump flow center (FCV type) the use of an AID Tool will be necessary to adjust minimum and maximum flow rates. The factory default is: minimum=50% and maximum=100% speed levels. See the 7 Series Variable Speed Pump Setup and Modulating Water Valve Setup instructions within the Unit Startup section which is located in the back of this manual. Always ensure that there is adequate flow for the heat pump. See Recommended Minimum/Maximum Flow Rates table.

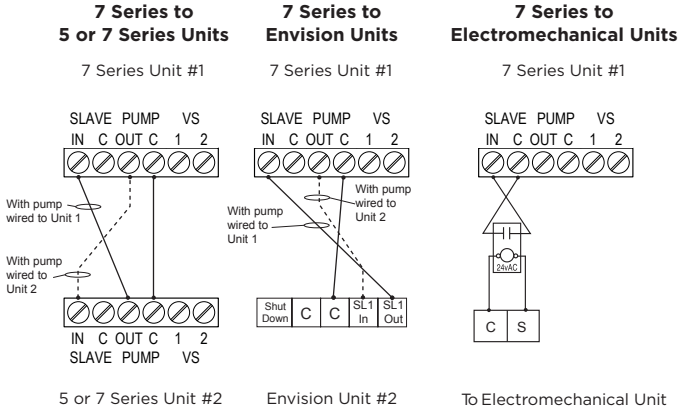
NOTE: When sharing a flow center, the variable speed heat pump should be the primary unit. When two variable speed heat pumps share a flow center, the larger capacity heat pump should be the primary unit.

Recommended Minimum/Maximum Flow Rates

Model and Size	Closed Loop		Open Loop	
	Min. Flow Rate	Max. Flow Rate	Min. Flow Rate	Max. Flow Rate
	GPM	GPM	GPM	GPM
033	5.0	12.0	5.0	8.0
042	5.0	15.0	5.0	10.0
050	5.0	18.0	5.0	12.0

3/18/2020

Figure 6: Primary/Secondary Hook-up



Open Loop - Well 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. Ensure 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. 1.5-2 gpm of flow per ton of cooling capacity is recommended in open loop applications.

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.

NOTE: For open loop/groundwater systems or systems that do not contain an antifreeze solution, set SW2-Switch #1 to the 30°F (WELL) position. (Refer to the DIP Switch Settings table in the Aurora Control section.) Slow opening/closing solenoid valves (type V or VM) are recommended to eliminate water hammer.

Figure 6: Typical Split System Application Open Loop - Well Water

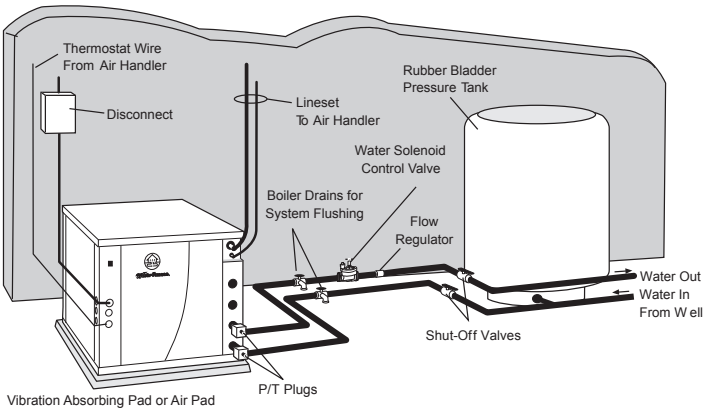


Figure 9a: Modulating Water Valve Connection Option
Typical 0-10VDC modulating water valve.

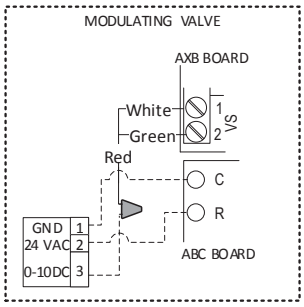


Figure 9b: Open Loop Solenoid Valve Connection Option
Typical slow operating external 24V water solenoid valve (type V) wiring.

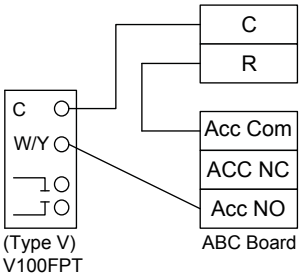
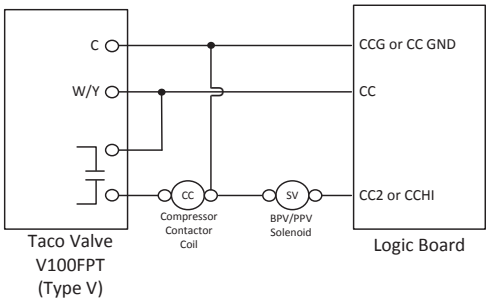
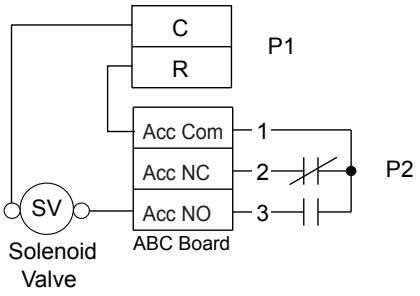


Figure 9c: *Wiring diagram for dual water valve installations, one type V slow operating solenoid and one BPV100/PPV100 quick operating solenoid.*



Note: SW2-4 should be 'ON' and SW2-5 should be 'OFF'.

Figure 9d: Open Loop Solenoid Valve Connection Option
Typical quick operating external 24V water solenoid valve (type PPV100 or BPV100) wiring.



NOTE: SW2-4 and SW2-5 should be "OFF" to cycle with the compressor.

Hot Water Generator Connections

The heat reclaiming hot water generator coil is vented double-wall copper construction and is suitable for potable water. To maximize the benefits of the hot water generator a minimum 50-gallon water heater is recommended. For higher demand applications, use an 80-gallon water heater or two 50-gallon water heaters connected in a series as shown below. Two tanks plumbed in series is recommended to maximize the hot water generator capability. A geo storage tank should not be used in this application unless it is plumbed in a series with an electric water heater. The geo storage tank is equipped with a single 4500 Watt element and will not be able to provide adequate water heating if used as a standalone water heater. Electric water heaters are recommended. Make sure all local electrical and plumbing codes are followed when installing a hot water generator. Residential units with hot water generators contain an internal circulator and fittings. A water softener is recommended for hard water applications (greater than 10 grains or 170 ppm total hardness).

NOTE: Using a preheat tank, as shown in Figure 9, will maximize hot water generator capabilities.

Figure 8: Typical Hot Water Generator Installation

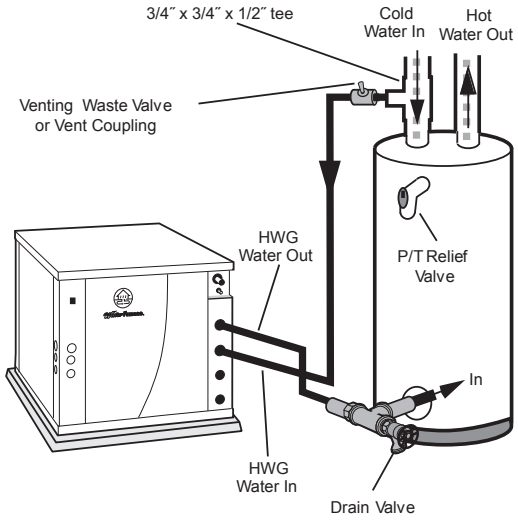
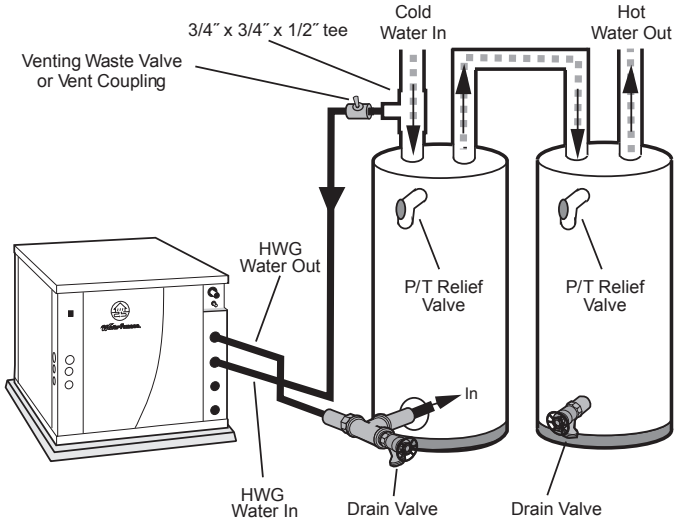


Figure 9: Hot Water Generator Installation in Preheat Tank



Note: This is the preferred configuration as it maximizes hot water generator capability.

Water Tank Preparation

To install a unit with hot water generator, follow these installation guidelines.

1. Turn off the power to the water heater.
2. Attach a water hose to the water tank drain connection and run the other end of the hose to an open drain or outdoors.
3. Close the cold water inlet valve to the water heater tank.
4. Drain the tank by opening the valve on the bottom of the tank, then open the pressure relief valve or hot water faucet.
5. Flush the tank by opening the cold water inlet valve to the water heater to free the tank of sediments. Close when draining water is clear.
6. Disconnect the garden hose and remove the drain valve from the water heater.
7. Refer to Plumbing Installation and Hot Water Generator Startup.

CAUTION: Elements will burn out if energized dry.

Hot Water Generator Connections cont.

Plumbing Installation

1. Inspect the dip tube in the water heater cold inlet for a check valve. If a check valve is present it must be removed or damage to the hot water generator circulator will occur.
2. Remove drain valve and fitting.
3. Thread the 3/4-inch NPT x 3-1/2-inch brass nipple into the water heater drain port.
4. Attach the center port of the 3/4-inch FPT tee to the opposite end of the brass nipple.
5. Attach the 1/2-inch copper to 3/4-inch NPT adaptor to the side of the tee closest to the unit.
6. Install the drain valve on the tee opposite the adaptor.
7. Run interconnecting tubing from the tee to hot water generator water out.
8. Cut the cold water “IN” line going to the water heater.
9. Insert the reducing solder tee in line with cold water “IN” line as shown.
10. Run interconnecting copper tubing between the unit hot water generator water “IN” and the tee (1/2-inch nominal). The recommended maximum distance is 50 feet.
11. To prevent air entrapment in the system, install a vent coupling at the highest point of the interconnecting lines.
12. Insulate all exposed surfaces of both connecting water lines with 3/8-inch wall closed cell insulation.

NOTE: All plumbing and piping connections must comply with local plumbing codes.

Hot Water Generator Switch

The hot water generator switch is taped in the disabled position at the factory.

Hot Water Generator Startup

1. Turn the hot water generator switch to the “ON” position. The hot water generator switch will allow the hot water generator pump to be enabled or disabled by the service technician or homeowner.
2. Close the drain valve to the water heater.
3. Open the cold water supply to the tank.
4. Open a hot water faucet in the building to bleed air from the system. Close when full.
5. Open the pressure relief valve to bleed any remaining air from the tank, then close.
6. If so equipped, turn the venting (burping) screw in the center of the pump two (2) turns open (water will drip out), wait until all air is purged from the pump, then tighten the plug. Use vent couplings to bleed air from the lines.
7. Carefully inspect all plumbing for water leaks and correct as required.
8. Before restoring electrical supply to the water heater, adjust the temperature setting on the tank.
    - On tanks with both upper and lower elements, the lower element should be turned down to the lowest setting, approximately 100°F. The upper element should be adjusted to 120°F to 130°F. Depending upon the specific needs of the customer, you may want to adjust the upper element differently.
    - On tanks with a single element, lower the thermostat setting to 120°F.
9. After the thermostat(s) is adjusted, replace the access cover and restore electrical supply to the water heater.
10. Make sure that any valves in the hot water generator water circulating circuit are open.
11. Turn on the unit to first stage heating.
12. Use an AID Tool to enable HWG and select the desired water heating set point. Selectable set points are 100°F – 140°F in 5°F increments (default 130°F). From the Main Menu of the AID Tool select Setup, then AXB Setup.
13. The hot water generator pump should be running. When the pump is first started, turn the venting (burping) screw (if equipped) in the center of the pump two (2) turns open until water dribbles out, then replace. Allow the pump to run for at least five minutes to ensure that water has filled the circulator properly. Be sure the switch for the hot water generator pump switch is “ON”.
14. The temperature difference between the water entering and leaving the hot water generator should be 5°F to 15°F. The water flow should be approximately 0.4 gpm per ton of nominal cooling.
15. Allow the unit to heat water for 15 to 20 minutes to be sure operation is normal.

CAUTION: Never operate the HWG circulating pump while dry. If the unit is placed in operation before the hot water generator piping is connected, be sure that the pump switch is set to the OFF position.

Electrical Information

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. The compressor has no internal overload. The circuit breaker in the control box is the overload protection for the drive and the compressor. Bypassing the circuit breaker could result in damage to the compressor and voiding the warranty.

Unit Power Connection

Connect the incoming line voltage wires to L1 and L2 of the contactor as shown in Figure 13c for single-phase unit. Consult the Unit Electrical Data in this manual for correct fuse sizes.

Open lower front access panel. Remove ground fastener from bottom of control box (Figure 13b). Swing open control box (Figure 13a). Insert power wires through knockouts on lower left side of cabinet. Route wires through left side of control box and connect to contactor and ground (Figure 13c). Close control box and replace grounding fastener before unit startup.

CAUTION: Frequent cycling of power to the drive can damage the drive! Wait at least 5 minutes between cycles (connecting and disconnecting power to the drive).

Accessory Relay

A set of “dry” contacts has been provided to control accessory devices, such as water solenoid valves on open loop installations, electronic air cleaners, humidifiers, etc. This relay contact should be used only with 24 volt signals and not line voltage power. The relay has both normally open and normally closed contacts and can operate with either the blower or the compressor. Use DIP switch SW2-4 and 5 to cycle the relay with blower, compressor, or control a slow opening water valve. The relay contacts are available on terminals #1 and #3 for normally closed, and on terminals #2 and #3 for normally open on P2.

A second configurable accessory relay is provided on the AXB board. When powering high VA draw components such as electronic air cleaners or VM type open loop water valves, R should be taken ‘pre-fuse’ from the ‘R’ quick connect on the ABC board and not the ‘post-fuse’ ‘R’ terminal on the thermostat connection. If not, blown ABC fuses might result.

208 Volt Operation

All 208/230 units are factory wired for 230 volt operation. For 208 volt operation, the red and blue transformer wires must be switched on terminal strip PS.

Figure 13a:
Wire access (control box open)

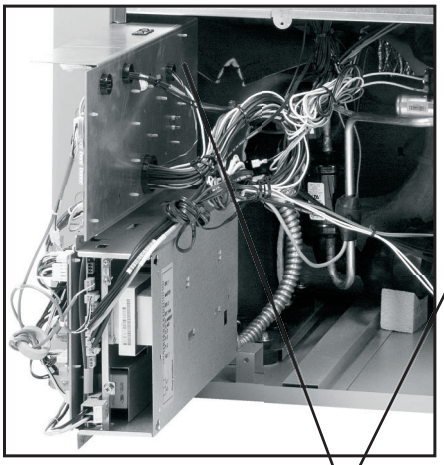


Figure 13b:
Wire access (control box closed)

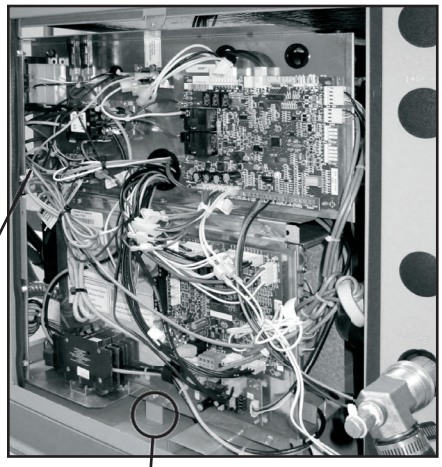
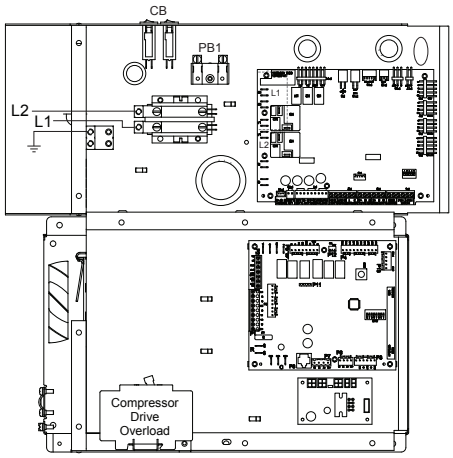


Figure 13c:
Line Voltage 208-230/60/1 control box



Electrical Information cont.

Variable Speed Flow Center

Single Pump Variable Speed Flow Center

If a variable speed single pump flow center is used, the flow center will come with two red and one green wires for the high voltage wiring. The variable speed pump MUST be powered at all times and therefore **MUST** be wired to the "L" side of electrical system or damage to the pump will occur (pump cannot be powered from "T" side of compressor contactor). Connect the red HIGH VOLTAGE wires to L1 and L2 on the AXB, connect the green GROUND wire to the ground lug, as shown in figure 4a. Follow all electrical and local codes for wiring.

The variable speed UPMXL 25-124 pump also requires a low voltage signal to operate properly, if the low voltage signal isn't present the pump will run at 100%. Route the low voltage harness connected to the pump to the AXB screw terminals on P2 and P3 connectors per diagram 4b.

Both the low and high voltage harnesses are labeled. The pump will be automatically cycled as required either by the unit or by a signal from another unit sharing the same flow center. Pumps are protected by circuit breakers as shown on the unit schematic.

Figure 4a: Single VS Pump High Voltage Wiring

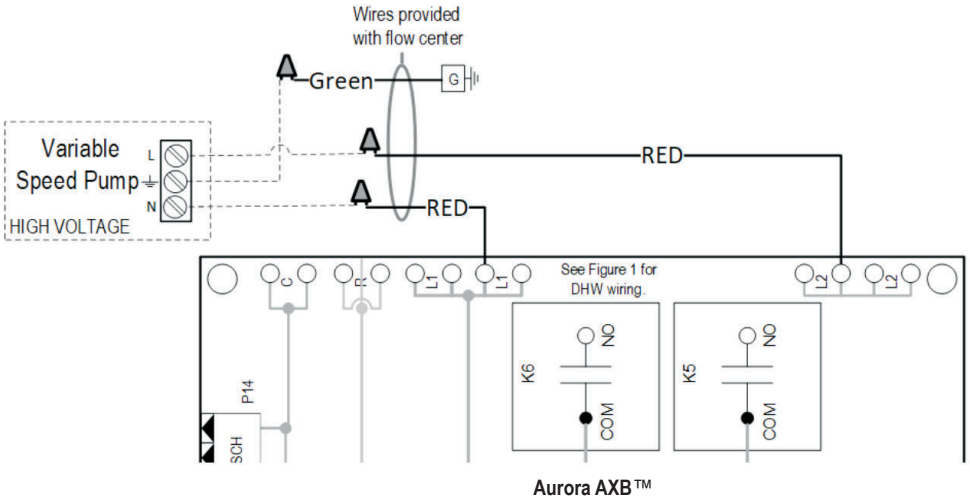
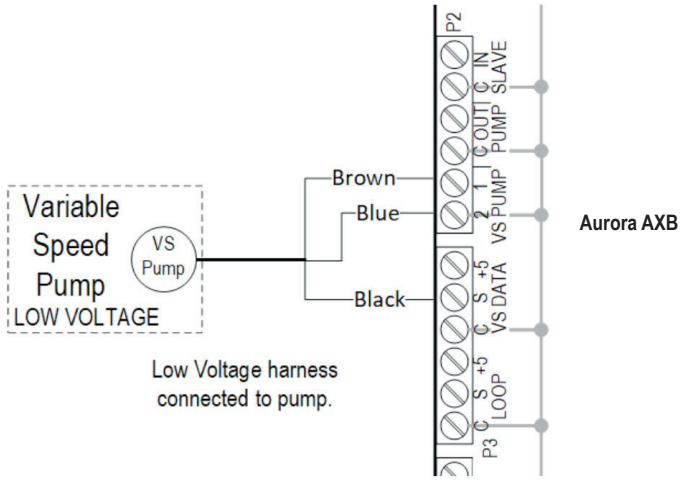


Figure 4b: Single VS Pump Low Voltage Wiring



Note: Aurora AXB must be used to control the UPMXL 25-124 pump.

Electrical Information cont.

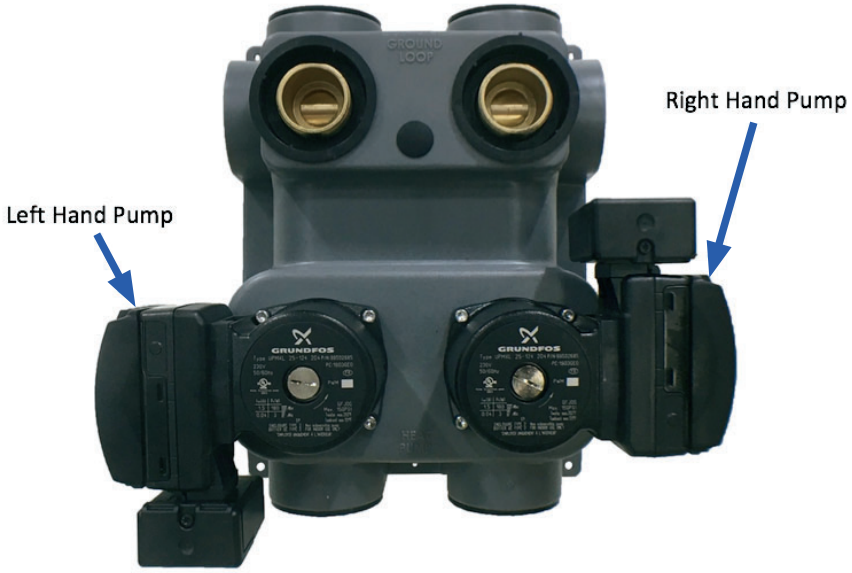
Variable Speed Flow Center cont.

Two Pump Variable Speed Flow Center

If a variable speed two pump flow center is used, the flow center will come with four red and two green wires for the high voltage wiring. The second set of (2) red and (1) green wires is provided for installation flexibility. The variable speed pump MUST be powered at all times and therefore **MUST** be wired to the "L" side of electrical system or damage to the pump will occur (pump cannot be powered from "T" side of compressor contactor). The UPMXL 25-124 pump has screw terminals for the high voltage connection. Connect the red HIGH VOLTAGE wires to L1 and L2 on the AXB, connect the green GROUND wire to the ground lug, as shown in figure 4d. Follow all electrical and local codes for wiring.

The variable speed UPMXL 25-124 pump also requires a low voltage signal to operate properly, if the low voltage signal isn't present the pump will run at 100%. Route the low voltage harness connected to the right hand pump to the AXB screw terminals on P2 and P3 connectors. Route the low voltage harness connected to the left hand pump to the AXB screw terminals on P2 and P3 connector per figure 4c. The black wire on the left hand pump will have a label on it that reads **"DO NO CONNECT THIS WIRE. ONLY ONE VS PUMP FEEDBACK SIGNAL CAN BE CONNECTED TO AXB BOARD".**

Both the low and high voltage harnesses are labeled. The pump will be automatically cycled as required either by the unit or by a signal from another unit sharing the same flow center. Pumps are protected by circuit breakers as shown on the unit schematic.



NOTE: Both pumps will speed up and slow down together.

Electrical Information cont.

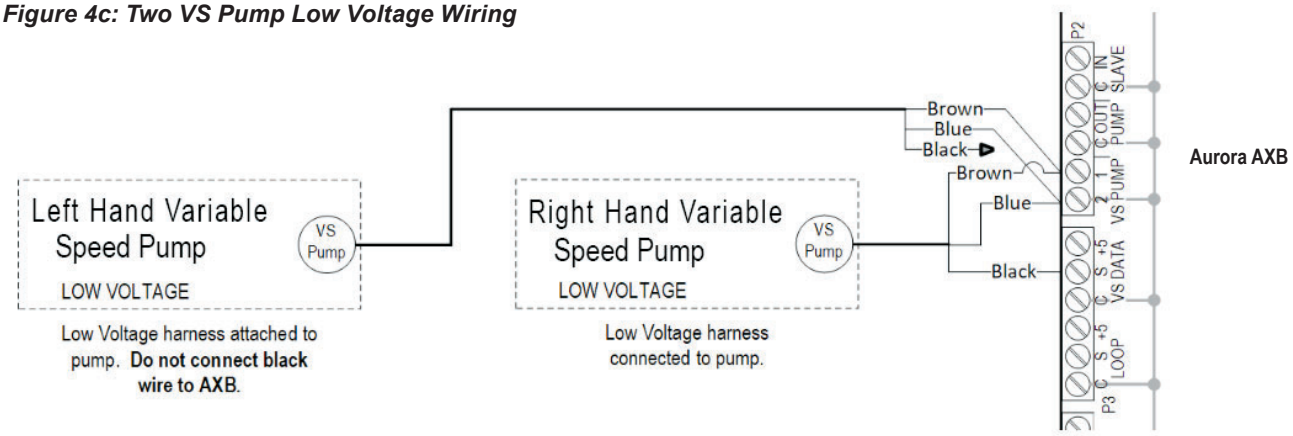
Variable Speed Units cont.

Two Pump Variable Speed Flow Center cont.

The use of the black wire on the left hand pump is ONLY to be connected for troubleshooting of the pumps. The left hand pump will have a closed end splice connector crimped to the black wire. Cut the closed end splice connector off and strip the wire. During troubleshooting remove the black wire from the right hand pump from the AXB P3 VS DATA S screw terminal and connect the black wire from the left hand pump to the same location. After the troubleshooting is complete remove the black wire from the left hand pump and connect the black wire from the right hand pump.

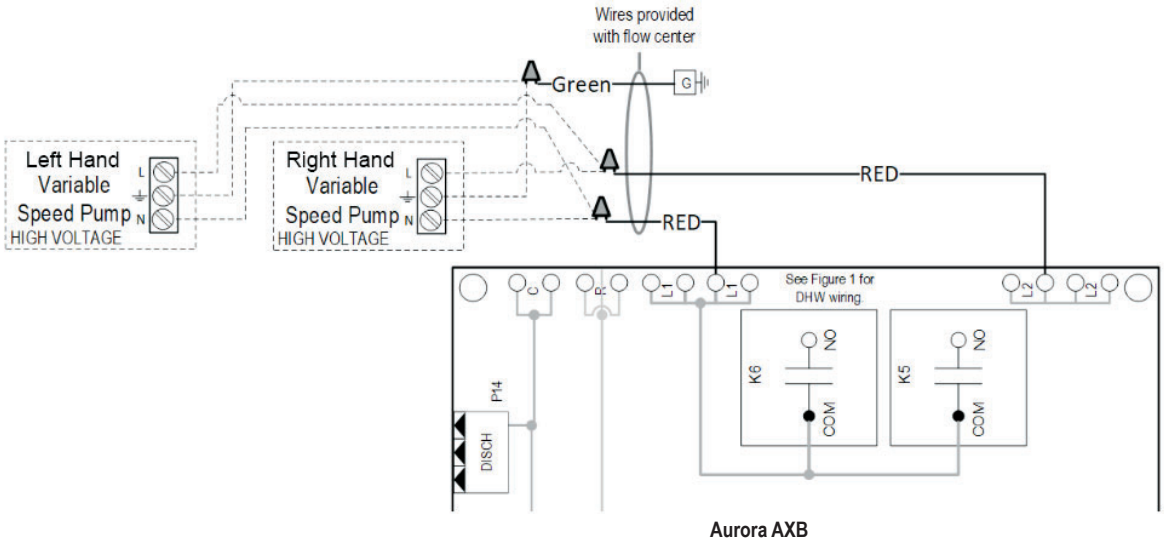
Place electrical tape or wire nut on the left hand pump black wire. The two pump variable speed flow center cannot have each UPMXL 25-124 pump wired to two separate heat pumps otherwise damage to the pumps will occur (unless it's an NPD Series flow center).

Figure 4c: Two VS Pump Low Voltage Wiring



Note: Aurora AXB must be used to control the UPMXL 25-124 pump.

Figure 4d: Two VS Pump High Voltage Wiring



Electrical Information cont.

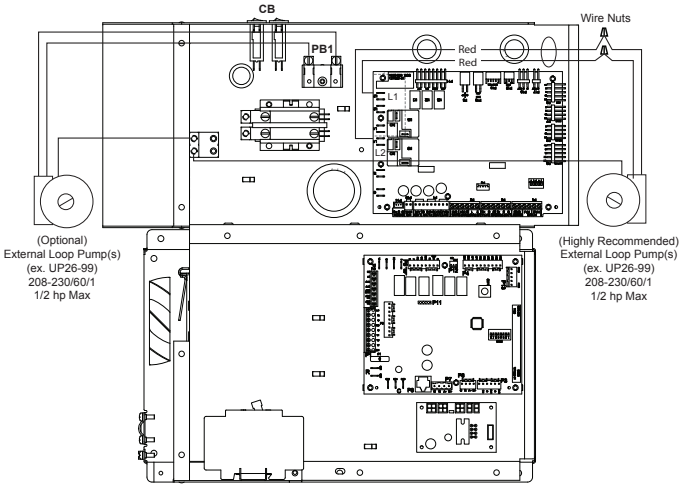
Pump Power Wiring

See Figure 14 for electrical connections from control box to pumps.

FC1/FC2 style flow centers with fixed speed pumps connect to PB1 in the control box. If using a variable speed pump it should be connected to L1 and L2 on the AXB.

Variable speed pump flow centers are recommended for use with the 7 Series so the water flow is adjusted along with the compressor speed. Using fixed speed pumps with the 7 Series will cost considerably more to operate than variable speed pumps and may cause system faults because the flow isn't being adjusted as it needs in certain operating conditions.

Figure 14: Pump Wiring 208-230/60/1



Air Handler General Installation Information

Safety Considerations

Warning: Before performing service or maintenance operations on a system, turn off main power switches to the equipment. 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.

Note: Local codes and regulations take precedent over any recommendations by the manufacturer. In addition to conforming to manufacturer's and local municipal building codes, the equipment should also be installed in accordance with the National Electric Code and National Fire Protection Agency recommendations.

Moving and Storage

If the equipment is not needed for immediate installation it should be left in its shipping carton and stored in a clean, dry area. Units must only be stored or moved in the normal "up" orientation.

Unit Location

Locate the unit in an indoor area that allows for easy removal of the filter and access panels (the air handler units are not approved for outdoor installation). Location should have enough space for service personnel to perform maintenance or repair. Provide sufficient room to make refrigerant, electrical and duct connections. 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. The air handler section may be installed on any level surface strong enough to support its weight. When installed in a closet or on a stand, it should be mounted on vibration absorbing material slightly larger than the base to minimize vibration transmission to the building structure.

When installed in an attic or above a drop ceiling, the installation must conform to all local codes. If the unit is suspended and installed in the horizontal position, the entire length of the unit should be supported. If the application requires the air handler to be installed above a finished space then the unit should be set in a full size secondary drain pan. In this case the secondary drain pan should be set on top of a vibration absorbing mesh. The secondary drain pan is usually placed on a plywood base.
A secondary drain pan should be used when equipment is installed over a finished living area to provide protection from water damage in case of plugging of the air handler primary drain line. The secondary drain line should terminate somewhere that is easily visible by the homeowner. Be certain to show the homeowner the termination location of the secondary drain line and to explain its purpose.

Duct System

Many of the problems encountered with heating and cooling systems can be linked to improperly designed or installed duct systems. It is therefore highly important for a successfully operating system that the duct system be designed and installed properly.

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 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. When installing a central air return grille in or near the living space, it is recommended to design the ductwork so that the grille is not in direct line with the return opening in the air handler. One or two elbows will also assure a quieter installation and system. Application of the unit to un-insulated metal ductwork in an unconditioned space will cause poor unit performance and allow condensation to form on the duct and possibly cause damage to the structure.

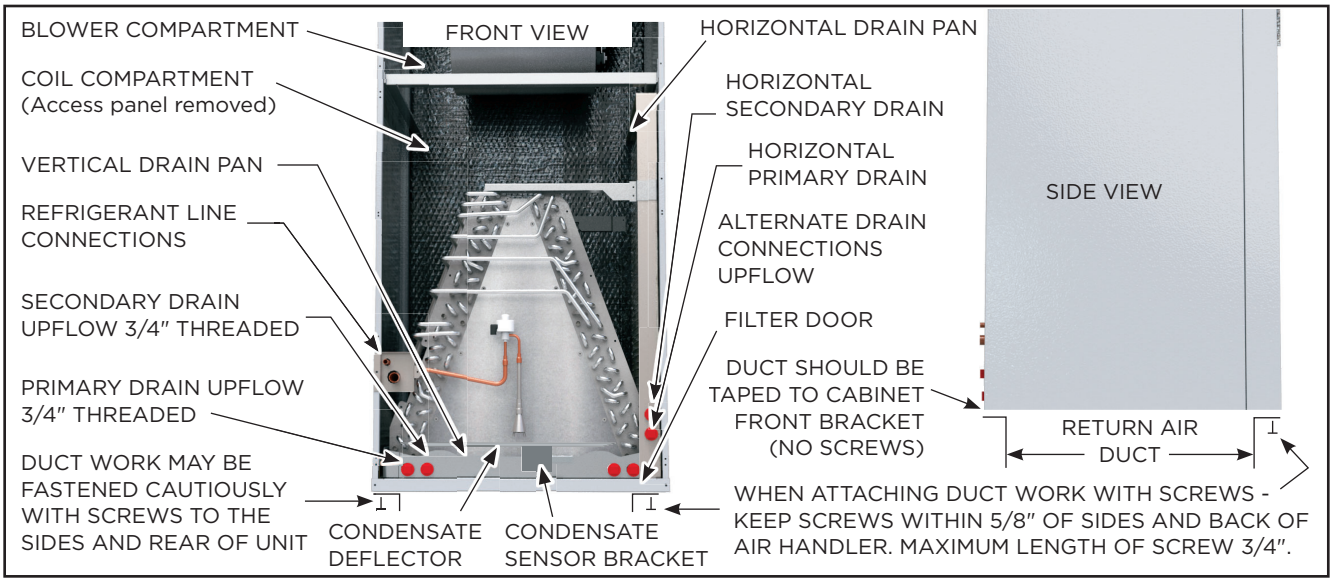
If the unit is connected to existing ductwork, check the duct system to ensure that it has the capacity to accommodate the air required for the unit application. If the duct is too small, as in the replacement of heating only systems, larger ductwork should be installed. All existing ductwork should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

Air Handler Sizing Selection

Air Handler	7 Series Indoor Split Model	Rated Airflow (CFM)	Electric Heat (kW)
SVH033**2CR1S11	NVZ033	1200	10
SVH042**2CR1S11	NVZ042	1500	10, 15
SVH050**2CR1S11	NVZ050	1800	10, 15, 20

1/29/2020

Air Handler General Installation Information cont.



Return Duct Attachment & Component Location

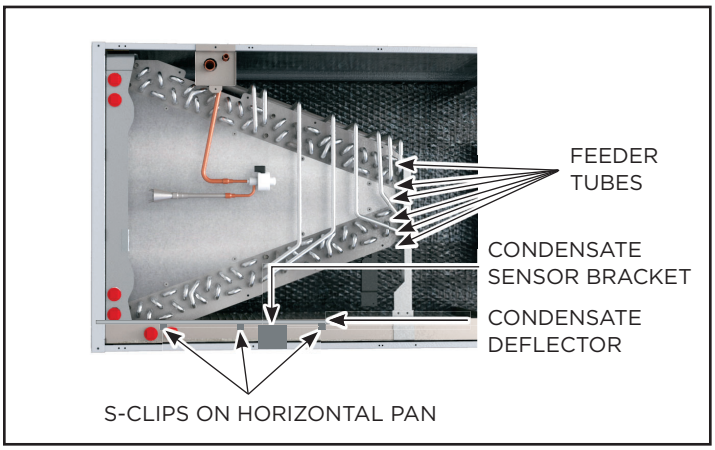
Condensate Deflector Shield

A condensate deflector shield comes attached to the vertical A-coil drain pan. If the unit is being installed in either the top flow or bottom flow configuration, no change is necessary.

If the air handler is being installed in either horizontal position, the condensate deflector shield will need to be removed from the vertical pan and placed on the horizontal pan. Remove the condensate deflector shield and the S-clips that attach it to the vertical pan. Reposition the condensate deflector shield and S-clips on the horizontal drain pan.

The condensate sensor bracket will also need to be moved and attached to the horizontal pan.

Note: Condensate deflector shield should be installed in the S-clip section which is inside the drain pan edge.



Condensate Deflector on Horizontal Drain Pan Edge

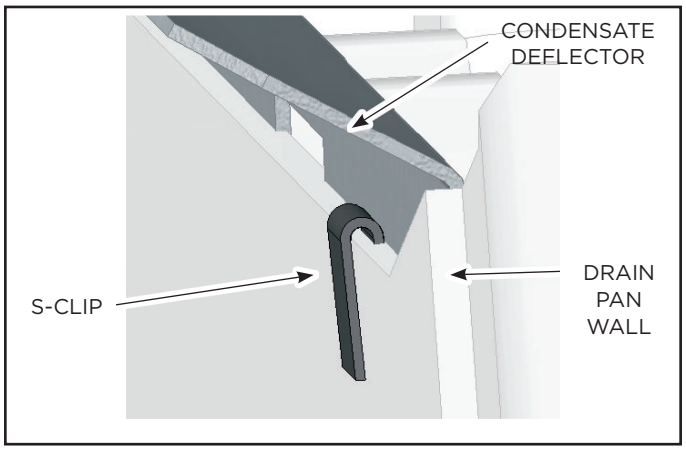


FIGURE 6: S-Clip Installation

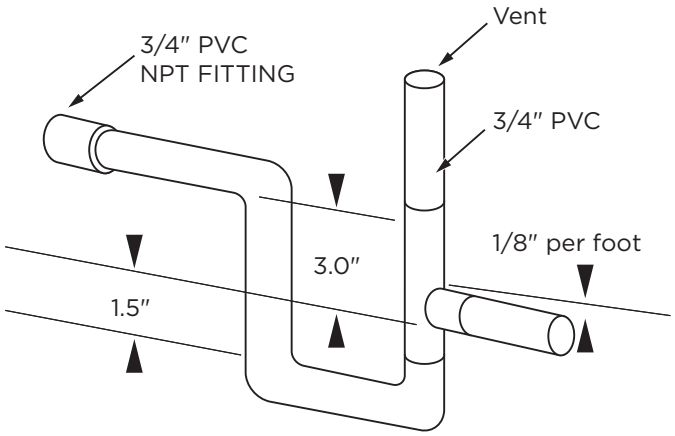
Air Handler General Installation Information cont.

Condensate Drain

To facilitate complete condensate removal, the air handler should be mounted level or slightly pitched toward the drain. The drain line contains cold water and should be insulated in unconditioned spaces to avoid drain line condensation from dripping on ceiling, etc. The drain pan has a primary and secondary drain connection. The air handler drain connections must be connected to a drain line and pitched away from the unit a minimum of 1/8" per foot to allow the condensate to flow away from the air handler. **A trap must be installed in the drain line** below the bottom of the drain pan to ensure free condensate flow (units are not internally trapped). The primary condensate drain must be terminated to an open drain or sump. Do not connect the condensate drain to a closed waste system. An open vertical air vent should be installed to overcome line length, friction and static pressure. It is recommended that the secondary drain be connected to a drain line for all units. The secondary drain should be run to an area where the homeowner will notice it draining which means that the primary drain is blocked. The drain line should not be smaller than the drain connection at the condensate pan. If the air handler is located in an unconditioned space, water in the trap may freeze. Since the air handler is under negative pressure it is recommended to prime the traps so air is not drawn through the condensate drain. It is recommended that the trap material be of a type that will allow for expansion of water when it freezes. All unused drain ports should be capped. Drain lines must be in conformance with local codes.

CAUTION: Threaded drain connection should be hand-tightened, plus no more than 1/16 turn.

The drain pan connections are designed to ASTM Standard D 2466 Schedule 40. Use 3/4" PVC or non-corrosive metal threaded pipe. Since the drains are not subject to any pressure it is not necessary to use Schedule 40 pipe for drain lines.



Air Handler Configuration

The Air Handler is factory configured for upflow and horizontal right hand air discharge installation. For bottomflow or horizontal left hand discharge, certain field modifications are required.

Warning: Do not lift or reposition the 'A' coil by grasping the almuminum tube header or distributor. This could cause a tubing fracture resulting in a refrigerant leak.

Air Handler General Installation Information cont.

Bottomflow Application

To convert the SVH Series air handler for bottomflow applications follow the steps below:

1. With the air handler in the verticle top flow position remove all access panels and the refrigerant line panel.
2. Carefully slide the air coil assembly out of the cabinet.
3. Rotate the cabinet 180˚ so the blower outlet is facing down.
4. **Install the SAHBCK bottom flow conversaion kit per instructions in the kit. Failure to install this kit will result in condensate blow-off from the 'A' coil into the cabinet and ductwork.**
5. Place the air coil assembly back on the air coil support brackets.
6. Reattach the refrigerant line panel and the other access panels.
7. Bottom air discharge units should be sealed well to the floor to prevent air leakage.

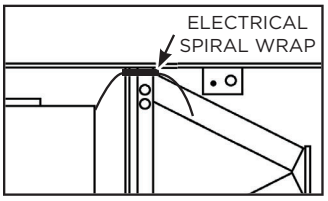
NOTE: Air Handlers installed in the bottomflow or horizontal left position will have to re-route the EEV suction line thermistor, condensate sensor and FP2 sensor wires. The wires can be routed as shown below. A section of electrical spiral wrap is included in the Installers Kit. Wrap the section of wire that is placed in the corner with the wrap to protect the wires. The wires can be placed between the air coil support bracket and insulation.

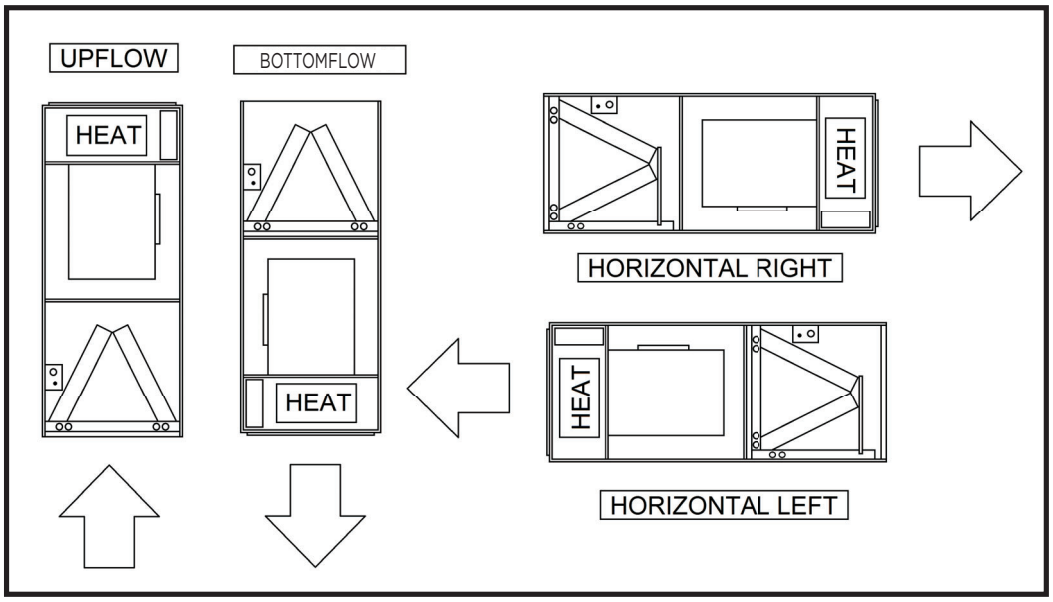
Horizontal Left Air Discharge Application

To convert the SVH Series air handler for horizontal left air discharge applications follow the steps below:

1. With the air handler in the vertical top flow position remove all access panels and the refrigerant line panel
2. Carefully slide the air coil assembly out of the cabinet.
3. Remove and reposition the condensate deflector from the vertical pan to the horizontal pan.
4. Rotate the cabinet 180˚ so the blower outlet is facing down.
5. Place the air coil assembly back on the air coil support brackets.
6. Reattach the refrigerant line panel and the other access panels.
7. Position the air handler in the left hand horizontal application.
8. Remove the drain pan plugs from the horizontal pan and screw them in the vertical drain pan.
9. Reattach the refrigerant line panel and the other access panels.
10. If the unit is suspended, the entire length of the cabinet should be supported.

Important: When removing the coil, there is possible danger of equipment damage and personal injury. Be careful when removing the coil assembly from the unit.





TYPICAL INSTALLATION

Note: Air flow on the 050 units in the horizontal configuration should be limited to 1900 CFM in cooling mode, or condensate blow off may occur.

Air Handler General Installation Information cont.

Air Handler Installation

The air handler is attached to the shipping pallet with four external shipping brackets.

An air filter must always be installed upstream of the air coil on the return air side of the air handler and must be field supplied. Filtration can be added external to the unit or the integral filter rack may be used. A 1" filter access rack has been built into the cabinet. Remove the filter access cover and install the proper sized filter. Standard 1" size permanent or throw away filter may be used. If there is limited access to the filter rack for normal maintenance, it is suggested that a return air filter grille be installed. Be sure that the return duct is properly installed and free of leaks to prevent dirt and debris from bypassing the filter and plugging the air coil.

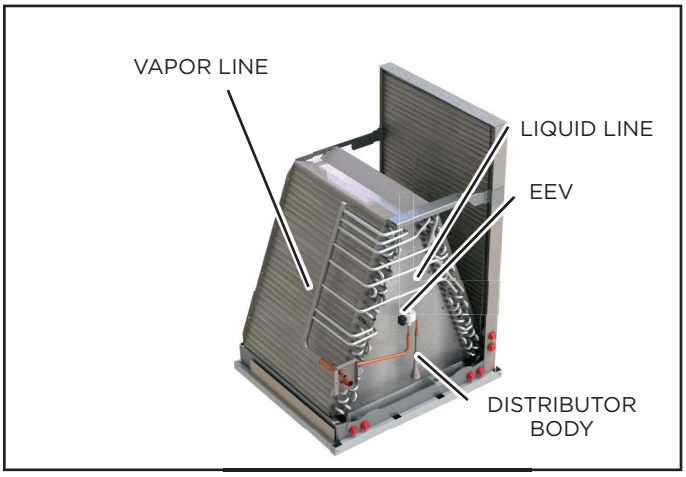
The cabinet should be sealed so that unconditioned warm air can not enter the cabinet. Warm air will introduce moisture into the cabinet which could result in water blow-off problems, especially when installed in an unconditioned space. Make sure that the liquid line, suction line and drain line entry points into the cabinet are well sealed. Use the butyl tape supplied with the air handler to seal around the copper lines entering the cabinet.

All wall penetrations should be sealed properly. The line set should not come into direct contact with water pipes, floor joists, wall studs, duct work, floors, walls and brick. The line set should not be suspended from joists or studs with a rigid wire or strap which comes into direct contact with the tubing. Wide hanger straps which conform to the shape of the tubing are recommended. All line sets should be insulated with a minimum of 1/2" closed cell insulation. The line set insulation should be pliable, and should completely surround the refrigerant line. As in all R-410a equipment, a reversible liquid line filter drier is required to ensure all moisture is removed from the system. This drier is factory installed in the Manufacturers Split compressor section. This drier should be replaced whenever "breaking into" the system for service. All exterior insulation should be painted with UV resistant paint or covering to insure long insulation life.

Connection to the Coil

Connect the refrigerant line set to the 'A' coil tubes. Nitrogen should be bled through the system at 2 to 3 PSI to prevent oxidation inside the refrigerant tubing. Use a low silver phos-copper braze alloy on all brazed connections. The Split compressor section is shipped with a factory charge and the service valves are not to be opened until the line set and air handler have been leak tested, purged and evacuated. A damp towel or heat sink should be used on the service valves to prevent damage caused by excessive heat.

Refer to the Refrigerant Line Sizing table to determine the proper line set configuration for the system being installed. Line sets over 80 feet in length are not recommended. If the line set is kinked or deformed and cannot be reformed, the bad section of pipe should be replaced. A restricted line set will affect unit performance. Line sets should be routed as directly as possible, avoiding any unnecessary bends and turns.



Leak Testing

The refrigeration line set must be pressurized and checked for leaks before purging and charging the unit. To pressurize the line set, attach refrigerant gauges to the service ports and add an inert gas (nitrogen or dry carbon dioxide) until pressure reaches 60 to 90 PSIG. Never use oxygen or acetylene to pressure test the system. Use an electronic leak detector or a good quality bubble solution to detect leaks on all connections made in the field. Be sure to check the service valve ports and stems for leaks. If a leak is found, repair it and repeat the above steps. For safety reasons do not pressurize the system above 150 PSIG. Purge pressure from the line set slowly when the pressure test is complete. The system is now ready for evacuation.

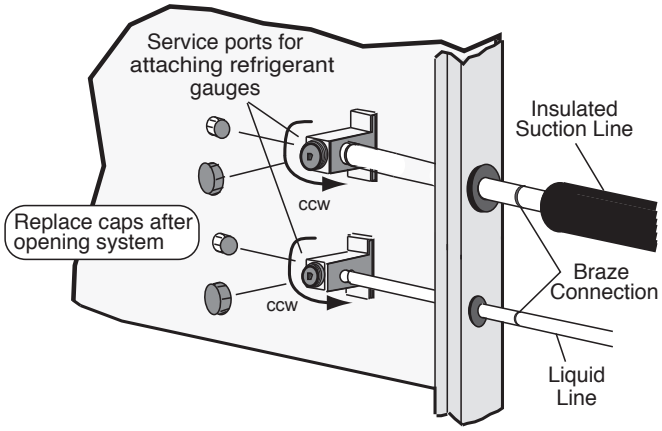
System Evacuation

Ensure that the line set and air coil are evacuated before opening service valves. The line set and air coil must be evacuated to 250 microns with a good quality vacuum pump and use a vacuum gauge to ensure that air and moisture are removed. With the system shut off from the vacuum pump a sufficient system vacuum is achieved when a 500 micron vacuum can be held for 30 minutes. A fast rise to atmospheric pressure indicates a leak, while a slower rise to around 1500 microns indicates moisture is still present in the system and further evacuation is required.

Refrigeration

The Variable Speed Split Series comes with a holding charge. The charge must be adjusted in the field based on performance. Refrigeration piping on the split consists of installing a brazed copper line set between the blower coil unit and the unit's split compressor section. To select the proper tube diameters for the installation, refer to the Line Set Sizes table. Line sets over 80 feet long are not recommended due to excessive pressure drop and perfomance degradation. The suction line must always be insulated. Handle and route the line sets carefully to avoid kinking or bending the tubes. If the line set is kinked or distorted and it cannot be formed back into its original shape, the bad portion of the pipe should be replaced. A restricted line set will affect the performance of the system.

Figure 13: Typical Split System Refrigerant Line Connections



Position	Description	System	Service Port
CW - Full In	Shipping Position	Closed	Open
CCW - Full Out 1/2 turn CW	Service Position	Open	Open
CCW - Full Out	Operation Position	Open	Closed

Nitrogen should be bled through the system at 2 to 3 PSI to prevent oxidation inside the refrigerant tubing. Use a low silver phos-copper braze alloy on all brazed connections.

The Variable Speed indoor split service valves are recessed in the unit's corner post and protected by a cover. Remove the protective cover and braze the line set to the service valve stubs as shown in Figure 13. Care should be used when brazing the service valves as to not scorch the paint. Nitrogen should be bled through the system at 2 to 3 psi to prevent oxidation contamination. Use a low silver phos-copper braze alloy on all brazed connections. 7 Series split units are shipped with a factory charge and service valves are not to be opened until the line set has been leak tested, purged, and evacuated. Schrader cores should be removed before brazing, and replaced after the valves have cooled. A heat sink should be used on the service valve to prevent damage caused by excessive heat. When brazing is completed, reinstall the protective cover.

Refrigerant Piping Limits

The maximum refrigerant total line set length should not exceed 80 feet. The maximum vertical separation between the compressor section and air handler should not exceed 25 feet. As an example; if vertical separation is 25 feet then the rest of the line set can't exceed 55 feet in length, 25' + 55' = 80'. Friction loss of copper elbows or bends should be included in the calculation of the total line set length.

Longer line sets require more refrigerant that must be managed throughout the entire operating range of the application. Excess refrigerant in the compressor at start up, or condensed liquid refrigerant in the suction line at start up must be avoided for compressor reliability. Proper line set sizing is crucial for controlling oil return to the compressor and minimizing capacity losses. See Line Set Size table in this manual or Symphony Contractor Connect phone app for proper sizing. The liquid line should be no larger than 3/8" in diameter. Pressure drop in the suction line will increase power consumption and reduce system capacity. A commonly accepted value for the suction line in R-410A systems is 5PSI pressure drop.

The use of long radius elbows can reduce the equivalent length of a line and thus reduce the friction loss.
A factory installed filter drier is in the compressor section, do not add a drier or filter in series with the factory installed drier as the added pressure drop may cause "flashing" of liquid refrigerant.

Tube Bend/Fitting Losses in Equivalent Feet

Tube Size O.D. (in)	90° Standard Radius	90° Long Radius	45° Standard Radius
3/8	1.3	0.8	0.3
1/2	1.4	0.9	0.4
5/8	1.5	1.0	0.5
3/4	1.9	1.3	0.6
7/8	2.3	1.5	0.7
1-1/8	2.7	1.8	0.9

Refrigeration cont.

Charge Amount When Using SVH Air Handler

The Variable Speed Split is shipped with a factory pre-charge. This volume of refrigerant is not sufficient to run the system and additional refrigerant must be added. If using an SVH Air Handler please refer to the Line Set Sizes table for charge amounts to be added. The "Factory Charge" column is the charge amount the compressor section/split is shipped with from the factory. The "Charge Amount with SVH Air Handler" column is the total amount of charge for the SVH Air Handler + Compressor section/split. This column does not factor in additional refrigerant needed for the line set. The installer of the system must add charge appropriately for the specific length of the line set. A 3/8 in. liquid line is calculated at 0.50 oz. of charge per linear foot using R-410A refrigerant. The suction line will not hold "liquid" and should be ignored for the charge calculation.

Example: NVZ/SVH with 20 ft. of 3/8 in. liquid line Remember that when using the SVH Air Handler, the column "Charge Amount with SVH Air Handler" will be used. Now calculate for the additional 20 ft. line set.
Additional refrigerant to be added = (20 ft. x 0.5 oz/ft)
= 10 oz.

Solution: 10 oz. should be added to the recommended charge of 118 oz. found in the "Charge Amount with SVH Air Handler" column for a total charge of 128 oz. The NVZ has a factory charge of 68 oz, so 60 oz of R410A refrigerant will need to be added to the system.

After initial charge, the system should be operated and the system subcooling and superheat verified to the Unit Operating Parameters table.

Charging the System

Charge Method – After purging and evacuating the line set, fully open the service valves counterclockwise. Add R-410A (liquid) into the liquid line service port until the pressure in the system reaches approximately 200 PSIG. Never add liquid refrigerant into the suction side of a compressor. Start the unit and measure superheat and subcooling. Keep adding refrigerant until the unit meets the superheat and subcooling values on the Operating Parameters tables.

Checking Superheat and Subcooling (Without an AID Tool)

NOTE: Subcooling and Superheat can be checked using the on-board sensors and the AID Tool.

Determining Superheat

1. Measure the temperature of the suction line. See troubleshooting section, 7 Series Sensor Locations for correct measurement points.
2. Determine the suction pressure in the suction line by attaching refrigeration gauges to the Schrader connection on the suction side of the compressor.
3. Convert the pressure obtained in Step 2 to the saturation temperature by using the R-410A Pressure/Temperature Conversion Chart.
4. Subtract the temperature obtained in Step 3 from Step 1. The difference is the amount of superheat for the unit. Refer to the Operating Parameters tables for superheat ranges at specific entering water conditions.

Determining Subcooling

1. Measure the temperature of the liquid line on the small refrigerant line (liquid line) just outside the split cabinet. This location will be adequate for measurement in both modes unless a significant temperature drop in the liquid line is anticipated.
2. Measure the liquid line pressure by attaching refrigerant gauges to the Schrader connection on the liquid line service valve.
3. Convert the pressure obtained in Step 2 to the saturation temperature by using the R-410A Pressure/Temperature Conversion Chart.
4. Subtract the temperature in Step 1 from the temperature in Step 3. The difference will be the subcooling value for that unit. Refer to the Operating Parameters tables for subcooling ranges at specific enter water conditions.

Line Set Sizes

Unit	Air	20 feet		40 feet		60 feet		80 feet		NZ Factory Charge (oz.)	*Charge Amount with SVH Air Handler (oz.)
Size	Handler	Suction	Liquid	Suction	Liquid	Suction	Liquid	Suction	Liquid		
NVZ033	SVH033	3/4" OD	3/8" OD	3/4" OD	3/8" OD	3/4" OD	3/8" OD	3/4" OD	3/8" OD	68	118
NVZ042	SVH042	3/4" OD	3/8" OD	3/4" OD	3/8" OD	3/4" OD	3/8" OD	3/4" OD	3/8" OD	90	142
NVZ050	SVH050	3/4" OD	3/8" OD	3/4" OD	3/8" OD	3/4" OD	3/8" OD	7/8" OD	3/8" OD	92	152
CAPACITY MULTIPLIER		1.00		0.985		0.97		0.955			

12/7/20

Notes: * The "Charge Amount with SVH Air Handler" column is based on the charge amount for a SVH Air Handler + Compressor Section/Split.
Additional charge will need to be added accordingly for line set length.
After charge is added, additional adjustments can be made to get appropriate subcooling and superheat measurements.
Additional charge for R410A is 0.50 oz. per ft. for 3/8" and 1.0 oz. per ft. for 1/2" tube.

NOTE: Manufacturer recommends the total line set length not to exceed 80 ft with no more than 25 ft of vertical separation between the compressor section and air handler.

Electrical Data

Variable speed with external loop pump

Model	Rated Voltage	Voltage Min/Max	COMP LRA	COMP MCC	Drive RLA	Drive Internal Fuse	HWG Pump FLA	Ext Loop FLA	Total Unit FLA	Minimum Circuit Amp	Max Fuse HACR Breaker
033	208-230/60/1	187/253	10.2	18.0	22.0	30.0	0.4	5.4	27.8	33.3	35
042	208-230/60/1	187/253	12.0	23.5	28.0	35.0	0.4	5.4	33.8	40.8	45
050	208-230/60/1	187/253	12.0	30.0	33.0	40.0	0.4	5.4	38.8	47.1	50

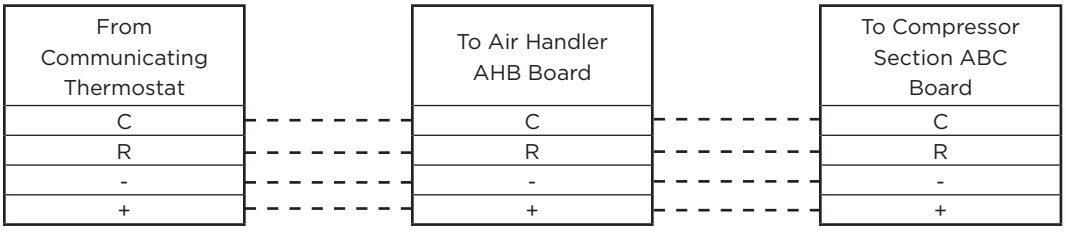
Rated Voltage of 208/230/60/1
HACR circuit breaker in USA only
All fuses Class RK-5

8/21/19

Electronic Thermostat Installation

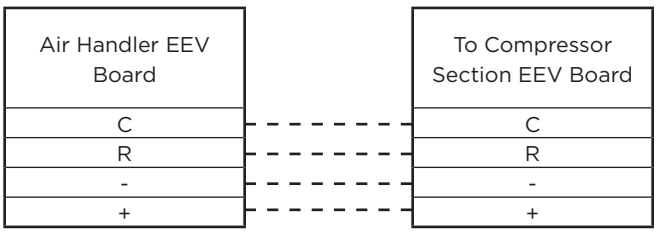
Communicating Thermostat with SVH Air Handler (AHB in Air Handler)

Field low voltage point to point wiring:



Air Handler transformer must be 100VA.

03/25/20



Air Handler Electrical Data

Model	Electric Heat Capacity		Supply Circuit	Aux. Heat Minimum CFM	Rated Voltage	Voltage Min/Max	Fan Motor FLA	Heater Ampacity		Total Unit FLA		Minimum Circuit Ampacity		Maximum Fuse/HACR	
	KW	BTUH													
	240v	240v						208v	240v	208v	240v	208v	240v	208v	240v
033	0	0	-		208-230/60/1	197/253	7.0	-	-	7.0	7.0	8.8	8.8	15	15
	9.6	32,765	single	1,300			7.0	34.7	40.0	41.7	47.0	52.1	58.8	60	60
042	0	0	-				7.0	-	-	7.0	7.0	8.8	8.8	15	15
	9.6	32,765	single	1,300			7.0	34.7	40.0	41.7	47.0	52.1	58.8	60	60
	14.4	49,147	single	1,700			7.0	52.0	60.0	59.0	67.0	73.8	83.8	80	90
	14.4	49,147	L1/L2				7.0	34.7	40.0	41.7	47.0	52.1	58.8	60	60
			L3/L4				-	17.3	20.0	17.3	20.0	21.6	25.0	25	25
050	0	0	-				7.0	-	-	7.0	7.0	8.8	8.8	15	15
	9.6	32,765	single	1,300			7.0	34.7	40.0	41.7	47.0	52.1	58.8	60	60
	14.4	49,147	single	1,700			7.0	52.0	60.0	59.0	67.0	73.8	83.8	80	90
	14.4	49,147	L1/L2				7.0	34.7	40.0	41.7	47.0	52.1	58.8	60	60
			L3/L4				-	17.3	20.0	17.3	20.0	21.6	25.0	25	25
	19.2	65,530	single	2,000			7.0	69.3	80.0	76.3	87.0	95.4	108.8	100	110
	19.2	65,530	L1/L2				7.0	34.7	40.0	41.7	47.0	52.1	58.8	60	60
			L3/L4				-	34.7	40.0	34.7	40.0	43.4	50.0	50	50

1/29/20

Rated Voltage of 208/230/60/1
HACR circuit breaker in USA only

Air Handler Electrical Data cont.

All field wiring must comply with local and national fire, safety and electrical codes. Be sure the available power is the same voltage and phase as that shown on the unit serial plate. Refer to the unit Electrical Data table for fuse and circuit breaker sizing. Line voltage power should be supplied to the breakers on air handlers with 15kW and 20kW heater kits (see the electric heat control section picture).

15kW and 20kW Wiring Instructions

If two separate circuits are used to supply power to the auxiliary heat kit, the installer will need to verify that each leg of the auxiliary circuit breakers are wired from the power supply correctly in order for the electric heat kit to operate properly. This can be done by measuring the supply side voltage of the auxiliary heat circuit breakers. Put a voltmeter lead on the L2 side of Circuit Breaker One and on the L2 side of Circuit Breaker Two. The voltmeter should read approximately 0 volts. If the meter reads high voltage, the auxiliary heat breakers need to be rewired so that breakers in the auxiliary heat kit match the wiring of the Disconnect Panel breakers. Meaning, L1 and L2 from one breaker in the disconnect panel must connect to L1 and L2 at one of the auxiliary heat circuit breakers and L1 and L2 from the other breaker in the disconnect panel must connect to L1 and L2 of the other auxiliary heat circuit breaker, making sure that the L1 and L2 from each disconnect breaker matches the L1 and L2 at each of the auxiliary heat breakers.

On air handlers with 15 and 20kW heater kits, a circuit breaker cover is provided. The installer can place the cover on the outside of the cabinet to seal the breaker opening. The cover will still allow operation of the breaker switches.

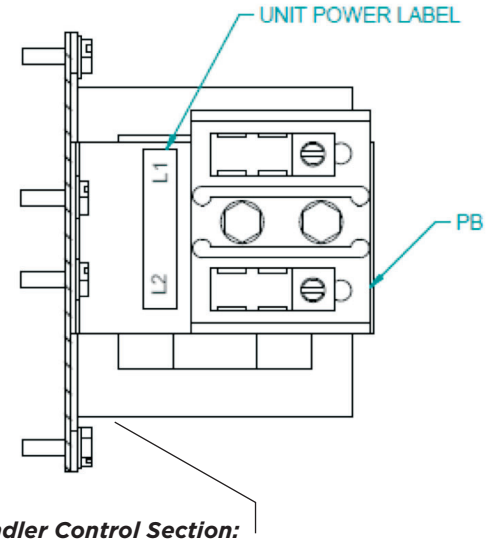
On air handlers with no electric heat installed, or with 10kW heater kits the power should be supplied to L1 and L2 lugs on PB (see air handler control section picture).

15kW and 20kW Heater Kits

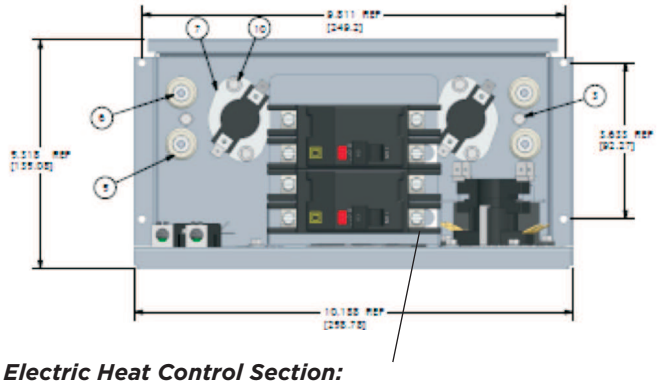
On units that are equipped with factory installed 15 or 20kW heater kits, the installer will need to route the wires through the electric heat current transducer that is connected to the BLACK wires. The wires that are identified with a label will need to pass through the center of the transducer, and will need to be disconnected from the breakers screw lugs. Once the wires are passed through the transducer, reconnect to the breakers and secure tightly in the screw lugs. On 10kW heater kits, the electric heat current transducer is factory installed.

SVH Auxiliary Heat Minimum Blower Settings

Model	Variable Speed ECM DIP Setting
SVH033	10
SVH042	11
SVH050	11

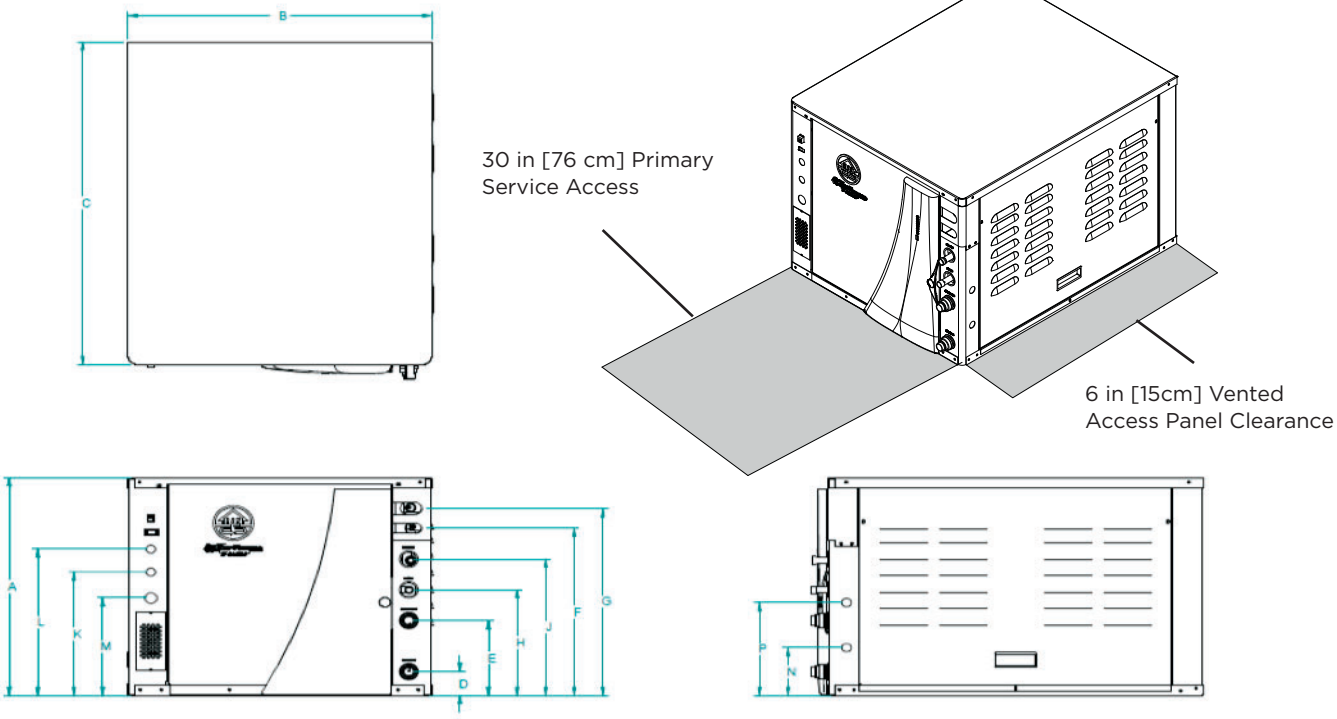


Air Handler Control Section:
Power should be supplied to PB on air handlers with no electric heat or 10kW heaters.



Electric Heat Control Section:
Power should be supplied to the breakers on air handlers with 15kW and 20kW heaters.

Compressor Section Dimensional Data

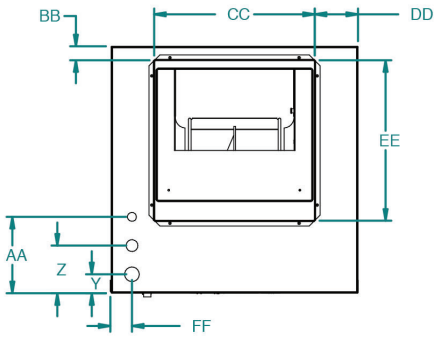


Models		Height	Width	Depth	Water In	Water Out	Service Valve		HWG In	HWG Out	Low Voltage	External Pump	Line Voltage	KNOCK OUT	KNOCK OUT
							Liquid	Gas							
		A	B	C	D	E	F	G	H	J	K	L	M	N	P
033-050	in.	21.25	25.62	31.60	2.30	7.21	16.40	18.30	10.30	13.30	12.10	14.30	9.50	4.70	9.10
	cm.	54.00	65.10	80.30	5.80	18.50	41.70	46.50	26.20	33.80	30.70	36.30	24.10	11.90	23.10

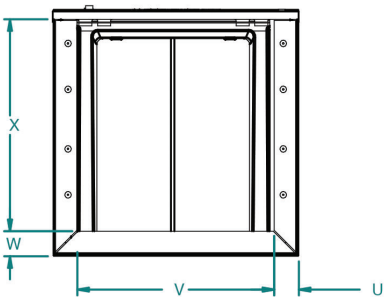
Air Handler Dimensional Data - SVH Air Handler

Top Flow/Horizontal Unit Configuration

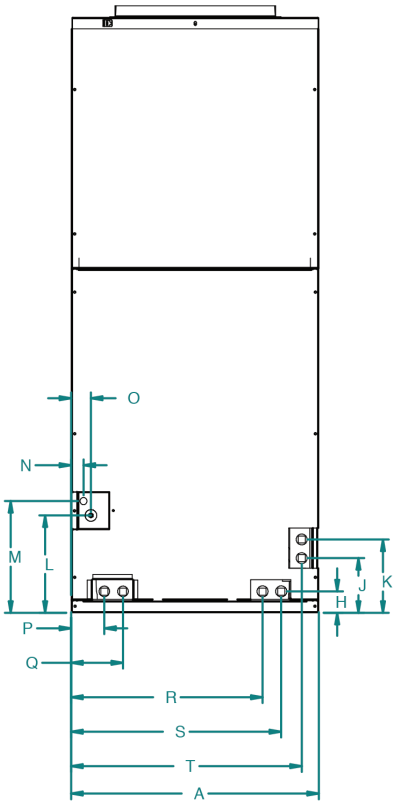
Top View



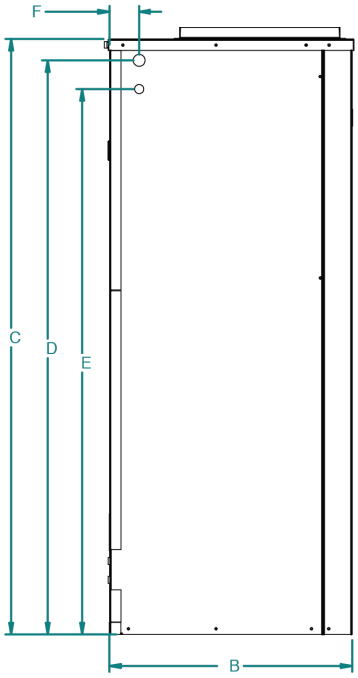
Bottom View



Front View



Right Side View



SVH Air Handler - Topflow/Horizontal

Topflow/ Horizontal Configuration		Overall Cabinet			D	E					Refrigerant Connections																					
		A	B	C	3/4" cond	1/2" cond	F	H	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	BB	CC	DD	EE	FF
		Width	Depth	Height	Power Supply	Low Voltage					Suction	Liquid												Power Supply		Low Voltage						
033-050	in.	24.9	21.2	58.0	56.1	53.2	2.6	1.9	4.8	6.4	9.6	10.8	1.1	1.7	2.9	4.5	20.3	21.9	23.5	2.2	20.6	2.2	18.4	1.7	4.2	6.7	1.5	18.0	3.4	18.0	1.8
	cm.	63.2	53.8	147.3	142.5	135.1	6.6	4.8	12.2	16.3	24.4	27.4	2.8	4.3	7.4	11.4	51.6	55.6	59.7	5.6	52.3	5.6	46.7	4.3	10.7	17.0	3.8	45.7	8.6	45.7	4.6

Condensate is plastic 3/4" FPT

Discharge flange is field installed and extends 1" (25.4 mm) from cabinet

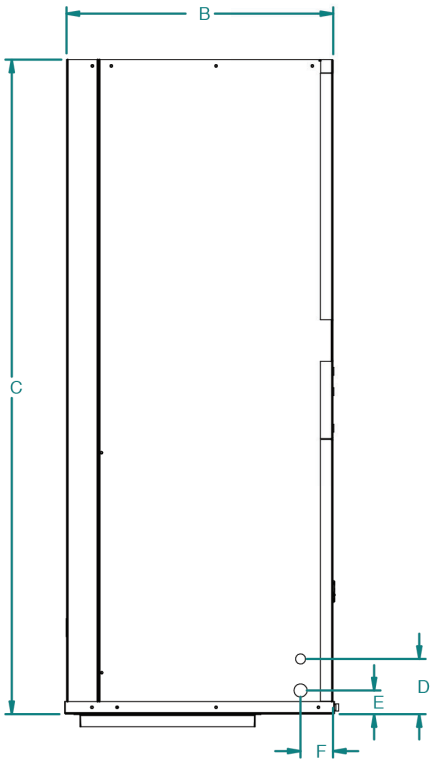
NOTE: Clearance for maintenance and servicing access - minimum 30" from front of unit recommended for blower motor/coil replacement. Condensate drain lines routed to clear filter and panel access. Filter removal - minimum 30" recommended.

" Y" IS 1 3/8 KNOCKOUT HIGH VOLTAGE
"Z" IS 1 1/8 KNOCKOUT HIGH VOLTAGE
"AA" IS 7/8 KNOCKOUT LOW VOLTAGE

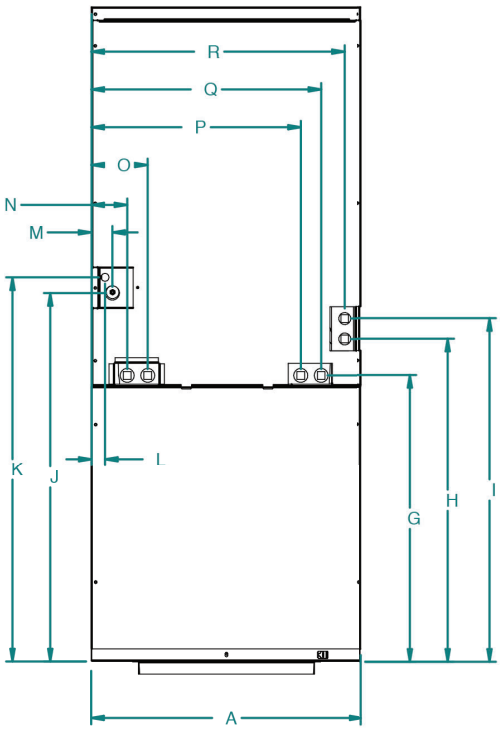
Air Handler Dimensional Data - SVH Air Handler

Bottom Flow Unit Configuration

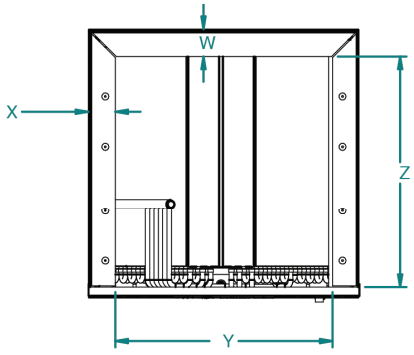
Left Side View



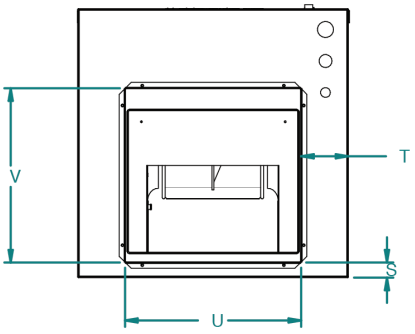
Front View



Top View



Bottom View



SVH Air Handler - Bottom flow

Bottomflow Configuration		Overall Cabinet			D	E	F				Refrigerant Connections																	
		A	B	C	1/2" cond	3/4" cond		G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
		Width	Depth	Height	Low Voltage	Power Supply	Power Supply				Suction	Liquid																
033-050	in.	24.9	21.2	58.0	4.4	1.9	2.6	24.0	27.0	28.5	31.3	32.8	1.1	1.7	2.8	4.5	20.2	21.9	23.5	1.2	3.4	18.0	18.0	2.1	2.2	20.5	18.5
	cm.	63.2	53.8	147.3	11.2	4.8	6.6	61.0	68.6	72.4	79.5	83.3	2.8	4.3	7.1	11.4	51.3	55.6	59.7	3.0	8.6	45.7	45.7	5.3	5.6	52.1	47.0

Condensate is plastic 3/4" FPT

Discharge flange is field installed and extends 1" (25.4 mm) from cabinet

NOTE: Clearance for maintenance and servicing access - minimum 30" from front of unit recommended for blower motor/coil replacement. Condensate drain lines routed to clear filter and panel access. Filter removal - minimum 30" recommended.

Compressor Section Physical Data

Model		NVZ033	NVZ042	NVZ050
Compressor (1 each)		Variable Speed Scroll		
Factory Charge R410a, oz [kg]		68 [1.93]	90 [2.55]	92 [2.61]
Coax and Water Piping				
Water Connections Size - Swivel - in [mm]		1" [25.4]	1" [25.4]	1" [25.4]
HWG Connection Size - Female Sweat I.D. - in [mm]		1/2" [12.7]	1/2" [12.7]	1/2" [12.7]
	Brass Service Valve - Liquid Line - in [mm]	3/8" [9.45]		
	Brass Service Valve - Suction Line - in [mm]	3/4" [19.1]		7/8" [22.23]
Coax & Piping Water Volume - gal [l]		1.3 [4.9]	2.3 [8.7]	2.3 [8.7]
	Weight - Operating, lb [kg]	241 [109]	302 [137]	302 [137]
	Weight - Packaged, lb [kg]	261 [118]	322 [146]	322 [146]

Notes: All units have an EEV and 1/2 in. [12.7mm], and 3/4 in. [19.1] electrical knockouts 03/18/20
Brass services valves are sweat type valves

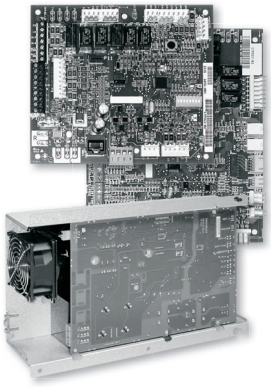
Air Handler Physical Data

Air Handler Model Number (Refrigerant)		033	042	050
Evaporator Coil	Air Coil Total Face Area, ft2 [m2]	6.81 [0.63]		
	Tube outside diameter - in. [mm]	3/8 [9.52]		
	Number of rows	3		
	Fins per inch	12		
	Suction line connection - in. [mm] sweat	7/8 [22.23]		
	Liquid line connection - in. [mm] sweat	3/8 [9.45]		
Refrigerant		R-410a		
Condensate drain connection - (FPT) in. [mm]		3/4 [19.05]		
Blower Wheel Size (Dia x W), in. [mm]		11 x 10 [279 x 254]		
Blower motor type/speeds		Variable Speed ECM		
Blower motor output - hp [W]		1 [746]		
Filter Standard - 1" [51mm] Field Supplied.		22 X 20 [559 x 508]		
Electrical characteristics (60hz)		208/230 - 1ph		
Shipping weight - lbs. [kg]		206 [93.4]	206 [93.4]	
Operating weight - lbs. [kg]		188 [85.3]	188 [85.3]	

04/07/2020

The Aurora™ Advanced VS Control System

Aurora Advanced VS Control



Aurora Advanced VS Control System is a complete residential and commercial comfort system that brings all aspects of the HVAC system into one cohesive module network. The Aurora Advanced VS Control features the Aurora Base Control (ABC), the Aurora Expansion Board (AXB), the Aurora Air Handler Board (AHB) and optional Unitary Protocol Converter (UPC). The variable speed drive communicates to the Aurora Control and provides variable capacity and envelope control. The ABC features microprocessor control and HP, LP, loss of charge, condensate and freeze detection, over/under voltage faults, along with communicating thermostat capability for complete fault detection text at the thermostat. Aurora uses the Modbus communication protocol to communicate between modules. Each module contains the logic to control all features that are connected to the module. The ABC has two Modbus channels. The first channel is configured for connecting to devices such as a communicating thermostat, expansion board, or other devices. The second channel is configured for connecting the Aurora Interface Diagnostics Tool (AID Tool).

The Aurora AXB expands on the capability of the ABC control board. The additional features include active dehumidification, SuperBoost cooling mode, loop pump linking, intelligent hot water generator control, variable speed pump capability, and also allows for optional energy, refrigeration, and performance monitoring add-on sensor kits. The AXB also features a second field configurable accessory relay, and two home automation inputs that are AID configurable for different types of alarms from sump pumps to home security. The Smart Grid input is AID configurable with many options to react to Utility controlled relay operation for On Peak optimization. The AXB also expands the communication capability for IntelliZone2 ready operation as well as other expansion with the ClimateTalk protocol.

The SVH Air Handler with the 'Advanced' control option expands on the capability of the Aurora 'Advanced' Control (ABC and AXB) in the compressor section, by adding the AHB board in the air handler. The AHB features electric heat staging, energy monitoring, temperature and pressure inputs, ECM control, condensate overflow and freeze detection. The AHB also features, an AID Tool port, field configurable accessory relay, and two home automation inputs that are AID configurable for different types of alarms from sump pumps to home security. The AHB also offers another communication connection point for IntelliZone2.

Aurora Control Features	Description	Aurora Advanced VS
Advanced Microprocessor Features	Smart Grid, Home Automation Alarm Inputs, and Accessory2 Relay (HRV/ERV)	•
Advanced Hot Water Generator Control	Microprocessor and separate power relay for Hot Water Generator Pump with digital temperature monitoring and multiple HWG setpoint selection.	•
Advanced Speed Pump Control	Microprocessor and separate power relay for loop pump and inline circuit breakers and loop pump slaving.	•
Variable Speed Pump	Capable of setup, monitoring and controlling a variable speed flow center.	•
Active Dehumidification	Coil temperature is monitored and air flow is reduced for maximum latent moisture removal.	7 Series Variable Speed Only
SuperBoost	Allow the variable speed compressor to ramp up extra cooling capacity if needed. This extra 'SuperBoost' will only be available for a 24 hr period and then the unit will revert to normal operation.	•
Smart Grid/Utility Input	Allows simple input to externally enable of occupied/unoccupied mode for basic utility time of use programs.	Dry Contact x1
Home Automation Alarm Input	Allows simple input to signal sump, security, or smoke/CO sensor alarms from other home automation or security systems. The two inputs can be field configured to a number of options and logic.	Dry Contact x2
HAN/Smart Grid Com (AWL and Portal) Kit	Allows direct communication of the Aurora to Smart Meters, Home Automation Network and Internet.	Optional AWL
IntelliZone2® Compatibility	IntelliZone2 communicates to the heat pump via the AXB board. IntelliZone requires traditional thermostat inputs and is not compatible with the 7 Series.	Optional IntelliZone2

Service Device	Description	Aurora Advanced VS
 **Aurora Interface and Diagnostics (AID) Tool**	Allows setup, monitoring and troubleshooting of any Aurora Control. **NOTE:** Although the ABC has basic compatibility with all Aurora, new product features may not be available on older AID Tools. To simplify the basic compatibility ensure the version of AID is at least the same or greater than the ABC software version.	For Service (Ver. 2.10 or greater)

The Aurora Advanced VS Control System cont.

Add On Control Feature Kits (field or factory Installed)	Description	Aurora Advanced VS
Geo Energy Monitoring Kit	Monitors real time power consumption of compressor, blower, aux heat and pump. Requires thermostat TPCM32U04A or TPCC32U01.	Standard
Refrigeration Monitoring Kit	Monitors real time pressures, temperatures, superheat, and subcooling.	Standard
Performance Monitoring Kit	Monitors air and water temperatures, and water flow rate and calculates heat of extraction/rejection.	Standard
Data Logging (AWL) Kit	Allows data logging of up to 12 months. Can also be temporarily installed.	Optional
HAN/Smart Grid Com (AWL and Portal) Kit	Allows direct communication of the Aurora to Smart Meters, HAN, and internet.	Optional

Add On Thermostats and Zoning	Description	Aurora Advanced VS
 **TPCM32U04A - MonoChrome Communicating Thermostat**	Elite Stat with full English fault codes and alerts, communicating thermostat; Required for viewing Energy Monitoring. Monochrome thermostat allows instantaneous energy measurement only. Compatible with AWL, not compatible with IntelliZone2.	Optional
 **TPCC32U01 - Color Touchscreen Communicating Thermostat**	4.3 in. color touchscreen communicating thermostat with full English fault codes and alerts; Required for viewing Energy Monitoring. Color thermostat allows instantaneous and 13 month history. Compatible with AWL.	Optional
 **IntelliZone2® Zoning**	Includes color main thermostat and up to 6 zones (with variable speed), 4 zones (with dual capacity), and 2 zones (with single speed). There are 4 thermostat options (MasterStat, SensorStat, ZoneStat and SensorStat-Remote). Compatible with AWL. IntelliZone2 is not compatible with UPC controls.	Optional

NOTES: The IntelliZone2 or one of the communicating thermostats shown above must be used to control the variable speed heat pump.

Aurora Advanced VS Control Features

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

Control Features

Software ABC VS SPL

- 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
- Diagnostic LED
- Test mode push button switch
- Two auxiliary electric heat outputs
- Alarm output
- AWL compatible
- Accessory output with N.O. and N.C.
- Modbus communication

Advanced Hot Water Generator Control (Domestic Hot Water Option)

An AID Tool selectable temperature limit and microprocessor control of the process is featured. This will maximize hot water generation and prevent undesirable energy use. An alert will occur when the hot water input temperature is at or above the set point (130°F default) for 30 continuous seconds. This alert will appear as an E15 on the AID Tool and the hot water pump de-energizes. Hot water pump operations resume on the next compressor cycle or after 15 minutes of continuous compressor operation during the current thermostat demand cycle. Since compressor hot gas temperature is dependent on loop temperature in cooling mode, loop temperatures may be too low to allow proper heating of water. The control will monitor water and refrigerant temperatures to determine if conditions are satisfactory for heating water.

VS Drive and Envelope Control

The VS drive operates the compressor between 20 and 100% capacity. The VS drive communicates any out of refrigerant envelope conditions to the Aurora and will attempt to adjust the compressor speed to keep within the envelope. These conditions are measured using the discharge and suction pressure transducers, discharge temperature, and current sensors of the drive.

The Aurora Advanced VS Control System cont.

IntelliZone2 Zoning Compatibility (Optional IntelliZone2 Communicating Zoning)

A dedicated input to connect and communicate with the IntelliZone2 (IZ2) zoning system is provided on P7 on the AXB control board. There is a dedicated communication port using a proprietary ModBus protocol. The AXB is standard on variable speed systems. Consult the IntelliZone2 literature for more information. Not compatible with UPC control option.

Electronic Expansion Valve (EEV)

The electronic expansion valve is operated by the EEV board and is set to maintain optimal superheat setting for maximum efficiency. All operation parameters are communicated to the VS drive and the Aurora system.

AWL - Aurora WebLink (Optional Accessory)

AWL is an add-on WiFi router that connects to the ABC and offers many features:

- Remote access to thermostat settings, schedules, etc. with your smartphone, tablet or laptop.
- Receive Lockout/Fault info via text or email.
- View heat pump energy usage from the internet for the day, week, month, year or real-time.
- Internet AID Tool capability allows remote troubleshooting for the technician.
- Remote AID Tool capability at the heat pump with smartphone, tablet or laptop for the technician.
- Allows data acquisition of the heat pump through the internet, see graphs of performance and chart historical data for the technician.
- Stores historical data on SD card.
- Not compatible with UPC control option

Variable Speed Pump

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. 50% 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. Variable speed pump flow centers are recommended for use over fixed speed pumps with the 7 Series so the water flow is adjusted along with the compressor speed. Using fixed speed pumps with the 7 Series will cost considerably more to operate than variable speed pumps and may cause system faults because the flow isn't being adjusted as it needs in certain operating conditions.

Modulating Water Valve

This output is provided to drive a modulating water valve. Through advanced design the 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. 50% and 100% are the default settings respectively. It is recommended to set the minimum no lower than 65% when using the modulating water valve.

Loop Pump Linking

This input and output are provided so that two units can be linked together with a common flow center. When either unit has a call for loop outputs, 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 linked together in this fashion.

Advanced Communication Ports

AXB Communication ports P6 and P8 will provide future expansion via dedicated protocols. These are for future use.

Smart Grid/On Peak (SG) Input

The 'Smart Grid/On Peak' input was designed to allow utilities to utilize simple radio controlled switches to control the On Electric Peak behavior of the 5 and 7 Series Geothermal Heat Pumps and provide demand reduction. With a closed contact signal, this input will limit the operation and thus the power consumption of the unit by disabling the compressor and electric heat as long as the signal is present. Code 7 will flash on the Green LED signifying the 'On Peak' mode. On Peak will also display on communicating thermostats.

Home Automation 1 and 2 Inputs

The Home Automation inputs are simple closed contact inputs that will trigger an AID Tool and thermostat alert for the homeowner. These would require optional sensors and or equipment for connection to the AXB board. With two inputs, two different sensors can be selected. The selected text will then be displayed on the AID Tool and communicating thermostats. These events will NOT alter functionality or operation of the heat pump/accessories and is for homeowner/service notification only.

Home Automation 1 - E23 HA1

With a closed dry contact signal, this input will cause an alarm and Alert Code 23 to indicate on the stat or flash on ABC. The AID Tool will allow configuration of this input between the following selections:

- *No Action*
- *Home Automation Fault* [no lockout info only] - Output from home automation system
- *Security Alarm* [no lockout info only] - Output from home security
- *Sump Alarm Fault* [no lockout info only] - Switch output from sump sensor
- *Smoke/CO Alarm Fault* [no lockout info only] - Switch output from Smoke/CO sensor
- *Dirty Filter Alarm* [no lockout info only] - Output from dirty filter sensor

The Aurora Advanced VS Control System cont.

Home Automation 2 – E24 HA2

With a closed dry contact signal, this input will cause an alarm and Alert Code 24 to indicate on the stat or flash on ABC. The AID Tool will allow configuration of this input between the following selections:

- *No Action*
- *Home Automation Fault* [no lockout info only] - Output from home automation system
- *Security Alarm* [no lockout info only] - Output from home security
- *Sump Alarm Fault* [no lockout info only] - Switch output from sump sensor
- *Smoke/CO Alarm Fault* [no lockout info only] - Switch output from Smoke/CO sensor
- *Dirty Filter Alarm* [no lockout info only] - Output from dirty filter sensor

Monitoring Sensor Kits

Energy Monitoring

(Standard on all 7 Series units)

The Energy Monitoring Kit includes two current transducers (blower and electric heat on AHB board). The variable speed drive measures compressor drive power so that the complete power usage of the heat pump can be measured. The AID Tool provides configuration detail for the type of blower motor and a line voltage calibration procedure to improve the accuracy. This information can be displayed on the AID Tool or selected communicating thermostats. The TPCM32U04A will display instantaneous energy use while the color touchscreen TPCC32U01 will, in addition, display a 13 month history in graph form.

Refrigerant Monitoring

(Standard on all 7 Series units)

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 will only be displayed on the AID Tool.

Performance Monitoring

(Standard on all 7 Series units)

The 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 AID Tool for selection of water or antifreeze.

Special Modes and Applications

Communicating Digital Thermostats

The Aurora VS controls system also requires either the monochromatic or color touch screen graphic display thermostats for user interface. These displays not only feature easy to use graphical interface but display alerts and faults in plain English.

'SuperBoost' Cooling Mode

Occasionally there can be a requirement for a short term 'boost' of cooling capacity during a large party etc. The 7 Series allows the user to select 'SuperBoost' mode on the thermostat which will allow the 7 Series VS to ramp up extra cooling capacity if needed. This extra 'SuperBoost' will only be available for a 24 hr period and then the unit will revert to normal operation. The short term boost does not affect ground loop sizing since it is limited in operation. Continuous use of SuperBoost will result in overheating of the ground loop.

Dehumidification – Active

Active dehumidification will only activate during cooling operation and is based upon the humidity setpoint of the thermostat being at least 5% below the actual relative humidity and being within the temperature parameters described here. The green status LED will flash code 2 when active. The unit can operate a maximum of 1.5°F below the cooling setpoint. The compressor will ramp up and airflow will begin at a low level. Airflow is then reduced periodically until air coil temperature setpoint is reached. If coil temperature continues to drop, the airflow is increased until air coil setpoint is maintained. After 20 minutes of operation in the Active Dehumidification mode, normal cooling operation will resume for 5 minutes. This cycle continues until the dehumidification setpoint is reached, room temperature is more than 1.5°F below cooling setpoint, or more than 1°F above cooling setpoint (normal cooling takes over). In IntelliZone2 systems, active dehumidification is only enabled when system is operating on compressor speeds 4 or lower. Once active dehumidification is activated the main zone and any other active cooling zone will remain open.

Field Hardware Selectable Options

ABC Field Selectable Options via Button (SW1)

Test/Configuration Button (See SW1 Operation Table)

Test Mode

The control is placed in the test mode by holding the push button switch on the ABC 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.

The Aurora Advanced VS Control System cont.

Reset Configuration Mode

The control is placed in reset configuration mode by holding the push button switch SW1 on the ABC 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.

ABC DIP Switch (SW2)

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

SW2-2 FP2 Selection – Low air coil temperature limit setting for freeze detection. On = 30°F; Off = Not Used

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

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

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

SW2-6 CC Operation – selection of single or dual capacity compressor. On = Single Stage; Off = Dual Capacity
NOTE: SW2-6 is not applicable to the 7 Series

SW2-7 Lockout and Alarm Outputs (P2) – selection of a continuous or pulsed output for both the LO and ALM Outputs. On = Continuous; Off = Pulsed
NOTE: SW2-7 is not applicable to the 7 Series

SW2-8 *Future Use*

Alarm Jumper Clip Selection

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

Variable Speed ECM Blower Speeds

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

AXB DIP Switch (SW1)

DIP 1 - ID: This is the AXB ModBus ID and should always read On.

DIP 2 & 3 - Future Use

DIP 4 & 5 - Accessory Relay2: A second, DIP configurable, accessory relay is provided that can be cycled with the compressor 1 or 2 , blower, or the Dehumidifier (DH) input. This is to complement the Accessory 1 Relay on the ABC board.

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

Field Selectable Options via Software

(Selectable via the Aurora AID Tool)

Many options are field selectable and configurable in Aurora software via the AID Tool. Consult the installation manual or Aurora documentation for further details.

Basic Aurora 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 VS 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 VS call, then the control will go to Lockout mode.

Lockout – when locked out, the blower will operate continuously in "G" blower speed setting. 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, the demand call must be removed for at least 30 seconds. To reset lockout conditions with SW2-8 Off, the demand call must be removed for at least 30 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 30 seconds.

CAUTION: Frequent cycling of power to the drive can damage the drive! Wait at least 5 minutes between cycles (connecting and disconnecting power to the drive).

The Aurora Advanced VS Control System cont.

Lockout With Emergency Heat - if the control is locked out in the heating mode, and a call for emergency heat 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 variable speed ECM blower will shift to low speed.

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 hardwired 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 - Air Coil Freeze Detection will use 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.

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.

Other Lockouts and Alarms

Several other lockouts and alarms are shown in the Status LED1 (LED1, Red) table with the associated codes visible on the thermostat, ABC Fault LED, and in text in the AID Tool.

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 the compressor, pump, and blower motor are not active. The RV may be active. The blower and compressor will be off.

Heating Operation - The unit will operate based upon demand as calculated by the room setpoint algorithm. The resulting compressor speed (1-12) will also select an appropriate blower speed for the selected compressor speed. Aux Heat will not be available (on IntelliZone2 Aux Heat is available on compressor speeds 10-12) until after the 12th compressor speed has been operational and still is not satisfying the thermostat, then auxiliary electric heat will be activated.

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.

Cooling Operation - The unit will operate based upon demand as calculated by the room setpoint algorithm. The resulting compressor speed, speeds 1-9, (speeds 10-12 are reserved for SuperBoost mode only) will also select an appropriate blower speed. The blower mode will also have the cooling airflow adjustment applied. 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.

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

SVH Controls

SVH AHB Board

The SVH Air Handler with the 'Advanced' control option expands on the capability of the Aurora 'Advanced' Control (ABC and AXB) in the compressor section, by adding the AHB board in the air handler.

The AHB board includes the following features:

AHB DIP Switch

DIP 1 - ID: This is the AHB ModBus ID and should always read Off.

DIP 2 & 3 - Future Use

DIP 4 & 5 - Accessory Relay2: A second, DIP configurable, accessory relay is provided that can be cycled with the compressor 1 or 2 , blower, or the Dehumidifier (DH) input. This is to complement the Accessory 1 Relay on the ABC board.

Position	DIP 4	DIP 5	Description
1	ON	ON	Cycles with Fan or ECM (or G)
2	OFF	ON	Cycles with CC1 first stage of compressor or compressor spd 1-6
3	ON	OFF	Cycles with CC2 second stage of compressor or compressor spd 7-12
4	OFF	OFF	Cycles with DH input from ABC board

IntelliZone2 Zoning Compatibility (Optional IntelliZone2 Communicating Zoning)

A dedicated input to connect and communicate with the IntelliZone2 (IZ2) zoning system is provided on P7 on the AHB and AXB. This is a dedicated communication port using a proprietary ModBus protocol. An AXB in the compressor section or an AHB in the air handler is required. Consult the Intellizone2 literature for more information.

Communicating Digital Thermostats

The Aurora controls system also features either mono-chromatic or color touch screen graphic display thermostats for user interface. These displays not only feature easy to use graphical interface but display alerts and faults in plain English. Many of the features discussed here may not be applicable without these thermostats.

Energy Monitoring (AXB Board Required in Compressor Section) (Standard Sensor Kit on 'Advanced' models)

The Energy Monitoring Kit includes two current transducers (blower and electric heat) so that the complete power usage of the air handler can be measured. The AID Tool provides configuration detail for the type of blower motor, power adjustment and a line voltage calibration procedure to improve the accuracy. The information can be displayed on the AID Tool or selected communicating thermostats. The TPCM32U04A(*) will display instantaneous energy use while the color touchscreen TPCC32U01(*) will in addition display a 13 month history in graph form. Refer to Compressor Section Start Up Energy Monitoring for configuration details.

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.

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.

Leaving Air Temperature (AXB Board Required in Compressor Section)

A leaving air temperature (LAT) thermistor is located near the blower inlet and can be read via the AID tool.

Electric Heat Staging

The AHB board provides two stages of auxiliary heat operation. During normal operation, the first stage of electric heat is energized 10 seconds after the W command is received. If the demand continues the second stage is of electric heat will be energized after 5 minutes. In an Emergency heat operation the time delay between stage one and stage two will be 2 minutes.

The Aurora Advanced VS Control System cont.

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.

Aurora Advanced VS 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. See the LED tables for further explanation.

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, variable speed ECM setup, and system configuration capabilities to the Aurora family of controls. An AID Tool is recommended, although not required, for variable speed ECM airflow settings. The AID Tool simply plugs into the exterior of the cabinet in the AID Tool port.

NOTE: The AID Tool is required when installing and servicing the 7 Series Indoor Split and Air Handler.

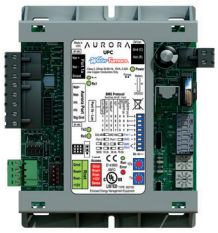
Status LED (LED3, Green)

Description of Operation	Fault LED, Green
Normal Mode	ON
Control is Non-functional	OFF
Test Mode	Slow Flash
Lockout Active	Fast Flash
Dehumidification Mode	Flash Code 2
Load Shed	Flash Code 5
Emergency Shutdown	Flash Code 6
On Peak Mode	Flash Code 7
Warning! VS Derated	Flash Code 8
Warning! VS SafeMode	Flash Code 9

Configuration LED (LED2, Yellow)

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

The Aurora Advanced VS Control System cont.

Aurora Control w/UPC BACnet 	The Aurora Unitary Protocol Converter (UPC) is an integrated solution and communicates directly with the Aurora Heat Pump Controls and allows access/control of a variety of internal Aurora Heat pump operations such as sensors, relay operation, faults and other information. In turn, the UPC then converts internal Aurora Modbus protocol to BACnet MS/TP protocol and communicates to the HAS system. This provides the great benefit of complete control integration and a myriad of information available to the HAS from the heat pump control. Plus it also allows individual unit configuration such as ECM fan speeds or freeze protection setting directly over the HAS without the need for access to the actual heat pump.	The Aurora UPC is implemented with the Aurora Base Controller (ABC) heat pump control into our latest water source heat pumps. All internal Aurora points are accessible to the UPC via firmware providing an integrated solution. All zone temperatures and zone sensors are connected to the UPC on an RNet bus, simplifying hook up at the unit. RNet sensors can include a combination of zone temperature and humidity, CO2, and VOC sensors. The UPC includes built-in support for a custom configurable keypad/display unit.	Optional Equipment Touch Cable kit	BACnet MS/ TP

UPC Sensors & Thermostats	Description	Aurora 'Base'	Aurora 'Base'	Aurora 'Advanced'
ZS Standard 	Local access port /No user control	Optional	Optional	Optional
ZS Plus 	Local access port/Slide potentiometer to make the zone warmer or cooler /Control button to override the schedule and put the zone in an occupied state, or force the zone to an unoccupied state/Green LED to Indicate occupied state.	Optional	Optional	Optional
ZS Pro 	Local access port/LED display/Control button to override the schedule and put the zone in an occupied state, or force the zone to an unoccupied state/Arrow UP and DOWN buttons to change any editable property, such as the setpoint temperature/ibutton to cycle through information defined in the control program/Green LED to Indicate occupied state.	Optional	Optional	Optional
ZS Pro-F 	Local access port/LED display/Control button to override the schedule and put the zone in an occupied state, or force the zone to an unoccupied state/Arrow UP and DOWN buttons to change any editable property, such as the setpoint temperature/ibutton to cycle through information defined in the control program/Green LED to Indicate occupied state/Mode button to turn on heating, cooling, or fan only, or to set auto control/ Fan button to adjust fan speed/ F/C button to set temperature to Fahrenheit of Celsius	Optional	Optional	Optional

NOTE: A ZS type sensor/thermostat is necessary for compatibility with UPC.

Aurora UPC

An optional Aurora UPC for DDC applications communicates directly with the entire Aurora system and provides DDC protocol of BACnet MS/TP for connection to the HAS providing a wide variety of points covering configurations, sensors, airflow and freeze protection. For more information on the Aurora UPC, please consult the Aurora UPC Application Guide for Variable Speed Applications.

NOTE: The UPC is not compatible with IntelliZone2 or Symphony.

Aurora Touch Interface

Utilizing the service technicians personal Android tablet (Android 4.0 or higher) along with Equipment Touch App (purchased from the Play Store) and our Aurora Touch Cable (part number ATCK01), a technician will have the ability to access the UPC to configure and diagnose equipment at the unit or from any room sensor. The technician will have full access to equipment status, parameter values, temperature, and humidity sensing as well as access to alarm history. The Equipment Touch App is easy to use and provides important insight into the system so it can operate as efficiently as possible.

The Aurora Advanced VS Control System cont.

	Red Fault LED	LED Flash Code *	Lock-out	Reset/ Remove	Fault Condition Summary	ABC Action: ABC Green Status LED	ABC Action: ABC Red Fault LED	AID Tool: Display and History	IZ2 and Stat Display: IZ2 & Thermostat Display
ABC & AXB Basic Faults	Normal - No Faults	Off							
	Fault-Input	1	No	Auto	Tstat input error. Autoreset upon condition removal.	Normal	Code 1		
	Fault-High Pressure	2	Yes	Hard or Soft	HP switch has tripped (>600 psi)	Lockout	Code 2	Lockout - E2 High Press	Lockout - E2 High Press
	Fault-Low Pressure	3	Yes	Hard or Soft	Low Pressure Switch has tripped (<40 psi for 30 continous sec.)	Lockout	Code 3	Lockout - E3 Low Press	Lockout - E3 Low Press
	Fault-Freeze Detection FP2	4	Yes	Hard or Soft	Freeze protection sensor has tripped (<15 or 30 degF for 30 continuous sec.)	Lockout	Code 4	Lockout - E4 Freeze Detection FP2	Lockout - E4 Freeze Detection FP2
	Fault-Freeze Detection FP1	5	Yes	Hard or Soft	Freeze protection sensor has tripped (<15 or 30 degF for 30 continuous sec.)	Lockout	Code 5	Lockout - E5 Freeze Detection FP1	Lockout - E5 Freeze Detection FP1
	Fault-Reserved	6	Yes	Hard or Soft	Not used	Lockout	Code 6	Lockout - E6	Lockout - E6
	Fault-Condensate Overflow	7	Yes	Hard or Soft	Condensate switch has shown continuity for 30 continuous sec.	Lockout	Code 7	Lockout - E7 Condensate	Lockout - E7 Condensate
	Fault-Over/Under Voltage	8	No**	Auto	Instantaneous Voltage is out of range. **Controls shut down until resolved.	Lockout	Code 8	Lockout - E8 Over/Under voltage	Lockout - E8 Over/Under voltage
	Fault-FP1 & 2 Snsr Error	11	Yes	Hard or Soft	If FP1 or 2 Sensor Err	Lockout	Code 11	Lockout - E11 FP1/FP2 Sensor Error	Lockout - E11 FP1/FP2 Sensor Error
	Non-CriticAXBSnsrErr	13	No	Auto	Any Other Sensor Err	Normal	Code 13	Alert - E13 Non-Critical AXB Sensor Error	Alert - E13 Non-Critical AXB Sensor Error
	CriticAXBSnsrErr	14	Yes	Hard or Soft	Sensor Err for EEV or HW	Lockout	Code 14	Lockout - E14 Critical AXB Sensor Error	Lockout - E14 Critical AXB Sensor Error
	Alarm-HotWtr	15	No	Auto	HW over limit or logic lockout. HW pump deactivated.	Normal	Code 15	Alert - E15 Hot Water Temp Limit	No Display
	Fault-VarSpdPump	16	No	Auto	Alert is read from PWM feedback.	Normal	Code 16	Alert - E16 Var Spd Pump Err	Alert - E16 Var Spd Pump Err
	Fault-ComTStat	17	No	Auto	Fault with any com Tstat. Autoreset upon condition removal.	Normal	Code 17	Alert - E17 Stat Communication Error	Alert - E17 Stat Communication Error
	Non-CritComErr	18	No	Auto	Any non-critical com error	Normal	Code 18	Alert - E18 Non-Critical Communication Error	Alert - E18 Non-Critical Communica-tion Error
	Fault-CritComErr	19	No	Auto	Any critical com error. Auto reset upon condition removal	Normal	Code 19	Alert - E19 Critical Communication Error	Alert - E19 Critical Communication Error
	Alarm - Low Loop Pressure	21	No	Auto	Loop pressure is below 3 psi for more than 3 minutes	Normal	Code 21	Alert - E51 Low Loop Pressure	No Display
	Alarm - Home Automation 1	23	No	Auto	Closed contact input is present on Dig 2 input - Text is configurable	Normal	Code 23	Alert - E23 Selected choice	Alert - E23 Selected choice
	Alarm - Home Automation 2	24	No	Auto	Closed contact input is present on Dig 3 input - Text is configurable	Normal	Code 24	Alert - E24 Selected Choice	Alert - E24 Selected Choice
Danfoss VS Drive	Derate-DriveTemp	41	No	Auto	Drive Temp has reached critical High Temp	Derated	Code 41	Warning! Derated - E41 DriveTemp	Warning! Derated - E41 DriveTemp
	Derate-HiDisTemp	42	No	Auto	Compressor Discharge isexceeded limit for 90 continuous sec..	Derated	Code 42	Warning! Derated - E42 HiDisTemp	Warning! Derated - E42 HiDisTemp
	Derate-LoSucPres	43	No	Auto	Suction Pressure is critically low	Derated	Code 43	Warning! Derated - E43 LoSucPres	Warning! Derated - E43 LoSucPres
	Derate-LoConPres	44	No	Auto	Condensing pressure is critically low	Derated	Code 44	Warning! Derated - E44 LoConPress	Warning! Derated - E44 LoConPress
	Derate-HiConPres	45	No	Auto	Condensing pressure is critically high	Derated	Code 45	Warning! Derated - E45 HiConPress	Warning! Derated - E45 HiConPress
	Derate-OutPwrLmt	46	No	Auto	Supply Voltage is <208V or Max Pwr is reached due to high pressure	Derated	Code 46	Warning! Derated - E46 OutPwrLmt	Warning! Derated - E46 OutPwrLmt
	SafeMd-EEVIndCom	47	No	Auto	Com with EEV is interupted EEV has gone independent mode	SafeMode	Code 47	Warning! SafeMode - E47 EEVIndCom	Warning! SafeMode - E47 EEVIndCom
	SafeMd-EEVOutCom	48	No	Auto	Com with EEV is interupted EEV has gone independent mode	SafeMode	Code 48	Warning! SafeMode - E48EEVOutCom	Warning! SafeMode - E48EEVOutCom
	SafeMd-AmbTmpSnr	49	No	Auto	Ambient Temperature (Tamb) is <-76 or > 212 F and out of range or invalid	SafeMode	Code 49	Warning! SafeMode - E49	Warning! SafeMode - E49
	Fault-DisTmpSnr	51	Yes	Hard or Soft	Discharge Sensor (Sd) is > 280 F or invalid (-76 to 392 F)	Lockout	Code 51	Lockout! - E51 DisTmpSnr	Lockout! - E51 DisTmpSnr
	Fault-SucPrsSnr	52	Yes	Hard or Soft	Suction Pressure (P0) is invalid (0 to 232 psi)	Lockout	Code 52	Lockout! - E52 SucPrsSnr	Lockout! - E52 SucPrsSnr
	Fault-ConPrsSnr	53	10x then Yes	Hard or Soft	Low condensing pressure (PD) or invalid (0 to 870 psi) Retry 10x.	Norm then Lockout	Code 53	Lockout! - E53 ConPrsSnr	Lockout! - E53 ConPrsSnr
	Fault-LowSupVolt	54	Yes	Hard or Soft	Supply Voltage is <175 V (190V to reset) or powered off/on too quickly (<30 sec.).	Lockout	Code 54	Lockout! - E54 LowSupVolt	Lockout! - E54 LowSupVolt
	Fault-OutEnvelop	55	10x then Yes	Hard or Soft	Comp Operating out of envelope (P0) more than 90 sec. Retry 10x.	Norm then Lockout	Code 55	Lockout! - E55 OutEnvelop	No Display
	Fault-OverCurrnt	56	Yes	Hard or Soft	Over current tripped by phase loss, earth fault, short circuit or major drive fault.	Lockout	Code 56	Lockout! - E56 OverCurrnt	Lockout! - E56 OverCurrnt
	Fault-Over/UnderVolt	57	Yes	Hard or Soft	DC Link Voltage to compressor is >253V or at minimum Volt.	Lockout	Code 57	Lockout! - E57 Over/Under Volt	Lockout! - E57 Over/Under Volt
	Fault-HiDrivTemp	58	Yes	Hard or Soft	Drive Temp has reached critical High Temp >239 F	Lockout	Code 58	Lockout! - E58HiDrivTemp	Lockout! - E58HiDrivTemp
	Fault-DrvIntErr MOC/AOC	59	Yes	Hard or Soft	The MOC has encountered an internal fault or an internal error. Probably fatal.	Lockout	Code 59	Lockout! - E59 DrvIntErr	Lockout! - E59 DrvIntErr
	Fault-MultSafeMd	61	Yes	Hard or Soft	More than one SafeMode condition is present requiring lockout.	Lockout	Code 61	Lockout! - E61 MultSafeMd	Lockout! - E61 MultSafeMd
Danfoss EEV1 & EEV2	EEV2 Fault-LossofCharge	71	Yes	Hard or Soft	High superheat and high EEV opening % for a long time will trigger a loss of charge fault	Lockout	Code 71	Lockout! - E71 LossCharge	Lockout! - E71 LossCharge
	EEV2 SafeMd-SucTmpSnr	72	No	Auto	Suction Temperature Sensor is invalid (-76 to 392 F)	SafeMode	Code 72	Warning! SafeMode - E72 SucTmpSnr	Warning! SafeMode - E72 SucTmpSnr
	EEV2 SafeMd-LATSensor	73	No	Auto	Leaving Air Temperature Sensor is invalid (-76 to 392 F)	Normal	Code 73	Alert - E73 LAT Sensor	No Display
	EEV2 SafeMd-MaxOpPres	74	No	Auto	Suction pressure has exceeded that maximum operating level for 90 sec.	SafeMode	Code 74	Warning! SafeMode - E74 MaxOpPress	Warning! SafeMode - E74 MaxOpPress
	EEV1 Fault-LossofCharge	75	Yes	Hard or Soft	High superheat and high EEV opening % for a long time will trigger a loss of charge fault	Lockout	Code 75	Lockout! - E75 Loss Charge	Lockout! - E75 Loss Charge
	EEV1 SafeMd-SucTmpSnr	76	No	Auto	Suction Temperature Sensor is invalid (-76 to 392 F)	SafeMode	Code 76	Warning! SafeMode - E76 SucTmpSnr	Warning! SafeMode - E76 SucTmpSnr
	EEV1 SafeMd-LATSensor	77	No	Auto	Leaving Air Temperature Sensor is invalid (-76 to 392 F)	Normal	Code 77	Alert - E77 LATSensor	No Display
	EEV1 SafeMd-MaxOpPres	78	No	Auto	Suction pressure has exceeded that maximum operating level for 90 sec.	SafeMode	Code 78	Warning! SafeMode - E78 MaxOpPress	Warning! SafeMode - E78 MaxOpPress

8/6/2020

Note:
*All codes >11 use long flash for tens digit and short flash for the ones digit. 20, 30, 40, 50 etc. will be 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.

The Aurora Advanced VS Control System cont.

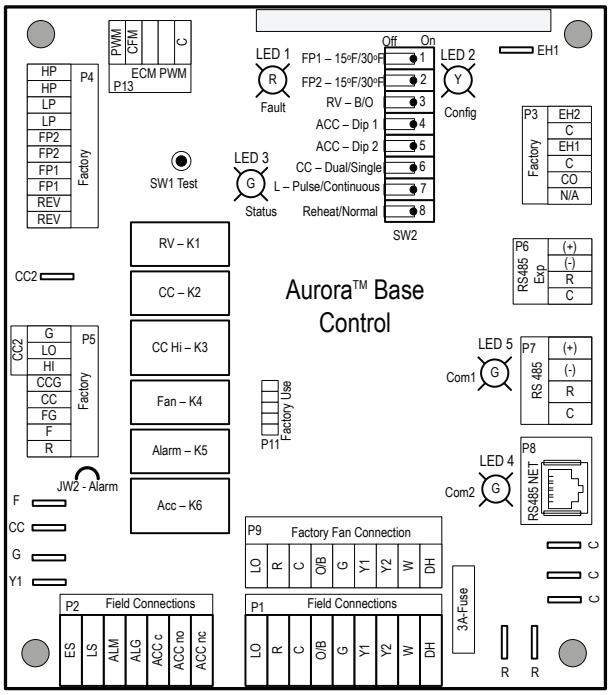
ABC Green Status LED	LED Code	Full Description	Removal
Normal Mode	ON	Normal operation of the heat pump	-
Control non-functional	OFF	Microprocessor is not operational	Board replacement
Test Mode	Slow Flash	Speeds some timings for faster troubleshooting. Entered from pushed button on ABC	Auto after 20 min
LOCKOUT Active	Fast Flash	Lockout is active. Can be removed by hard or soft reset.	Hard or Soft Reset
Dehumidification Mode	Code 2	Unit has either Dehumidification Mode Call from dehumidistat (Active or Passive).	Remove Dehumid Call from Stat
Load Shed	Code 5	Active Load Shed (LS) input on ABC	Remove LS input
Emergency Shutdown	Code 6	Active Emergency Shutdown (ES) input on ABC	Remove ES input
On Peak Mode	Code 7	On Peak Mode is signalled from external source through Smart Grid Input (dig1) or through ext communication.	Remove Smart Grid Input or com
Warning! VS Derated	Code 8	Unit has encountered unacceptable condition and has moderated compressor speed to compensate.	Only automatic removal
Warning! VS SafeMode	Code 9	Unit has encountered unacceptable condition or lost EEV com and has adjusted operation to 2400 rpm and safe EEV %.	Only automatic removal

ABC Yellow Config LED	LED
No Override	ECM Setting
DIP Switch Overridden	Slow Flash
ECM Config Mode	Fast Flash
Reset Config Mode	OFF

The Aurora Advanced VS Control System cont.

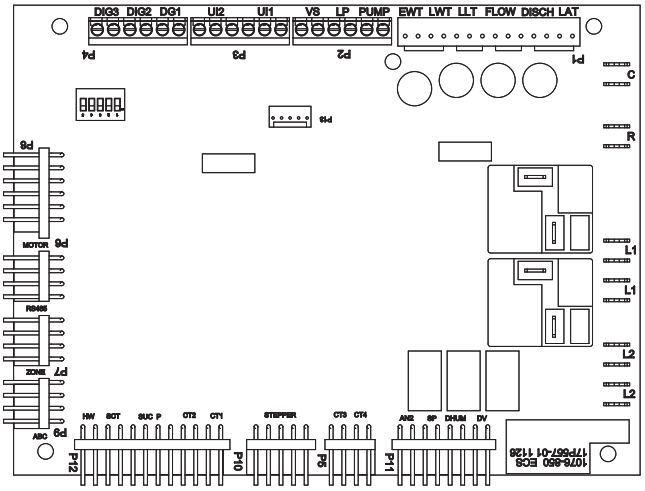
ABC Control Board Layout

(Located in the NVZ compressor section)



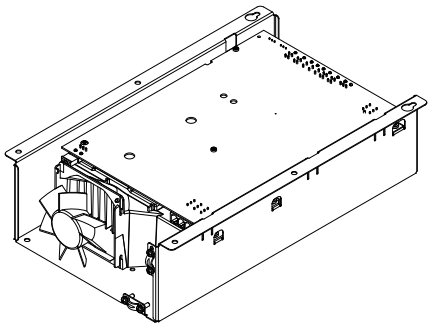
AXB Control Board Layout

(Located in the NVZ compressor section)



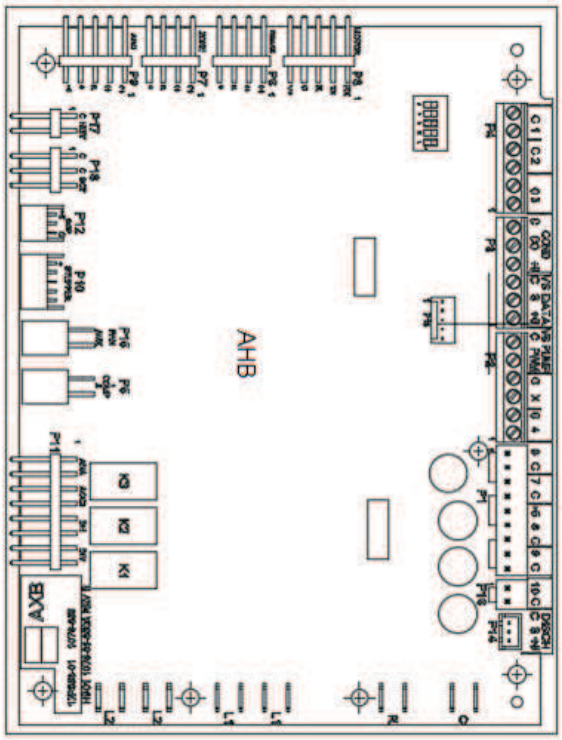
Variable Speed Drive

(Located in the NVZ compressor section)



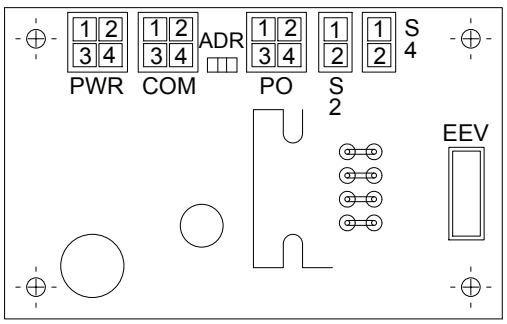
AHB

(Located in the SVH air handler)



EEV Board Layout

(EEV1 Located in NVZ compressor section)
(EEV2 located in SVH air handler)



Operation Logic

Heating Mode

When the variable speed controls determine that heating is needed in the space the blower will be turned on, the compressor will be ramped to speed 6 and the loop pump will be started. The compressor will continue to run at speed 6 for 60 seconds for oil circulation. During the 60 second oil circulation the controls will calculate what speed the compressor will need to operate at to maintain the set point in the space. If the compressor is operating at speed 12 and the unit is unable to maintain set point the controls will stage on the electric heat. Electric heat will not operate unless the compressor is already running at speed 12. Every 30 minutes if the compressor has been operating lower than speed 6, the controls will increase the compressor to speed 6 for one minute for oil circulation.

Cooling Mode

When the variable speed controls determine that cooling is needed in the space the blower will be turned on, the reversing valve will be enabled, the compressor will be ramped to speed 6, and the loop pump will be started. The compressor will continue to run at speed 6 for 60 seconds for oil circulation. During the 60 second oil circulation the controls will calculate what speed the compressor will need to operate at to maintain the set point in the space. The compressor will be limited to a maximum of speed 9 for cooling. If additional capacity is needed SuperBoost mode can be enabled from the thermostat allowing the compressor to run at speeds higher than 9 for a period of 24 hours. Every 30 minutes if the compressor has been operating lower than speed 6, the controls will increase the compressor to speed 6 for one minute for oil circulation.

ECM Blower Motor

The variable speed controls will vary the ECM blower output to maintain optimum air flow at each of the 12 compressor speeds. If dehumidification mode is selected during the cooling operation the airflow will be varied to allow for maximum moisture removal.

Variable Speed Loop Pump

The variable speed controls will operate the variable speed loop pump similar to the way the ECM blower motor operates. The speed of the pump will be increased as the compressor speed is increased to maintain adequate water flow.

Safe Mode

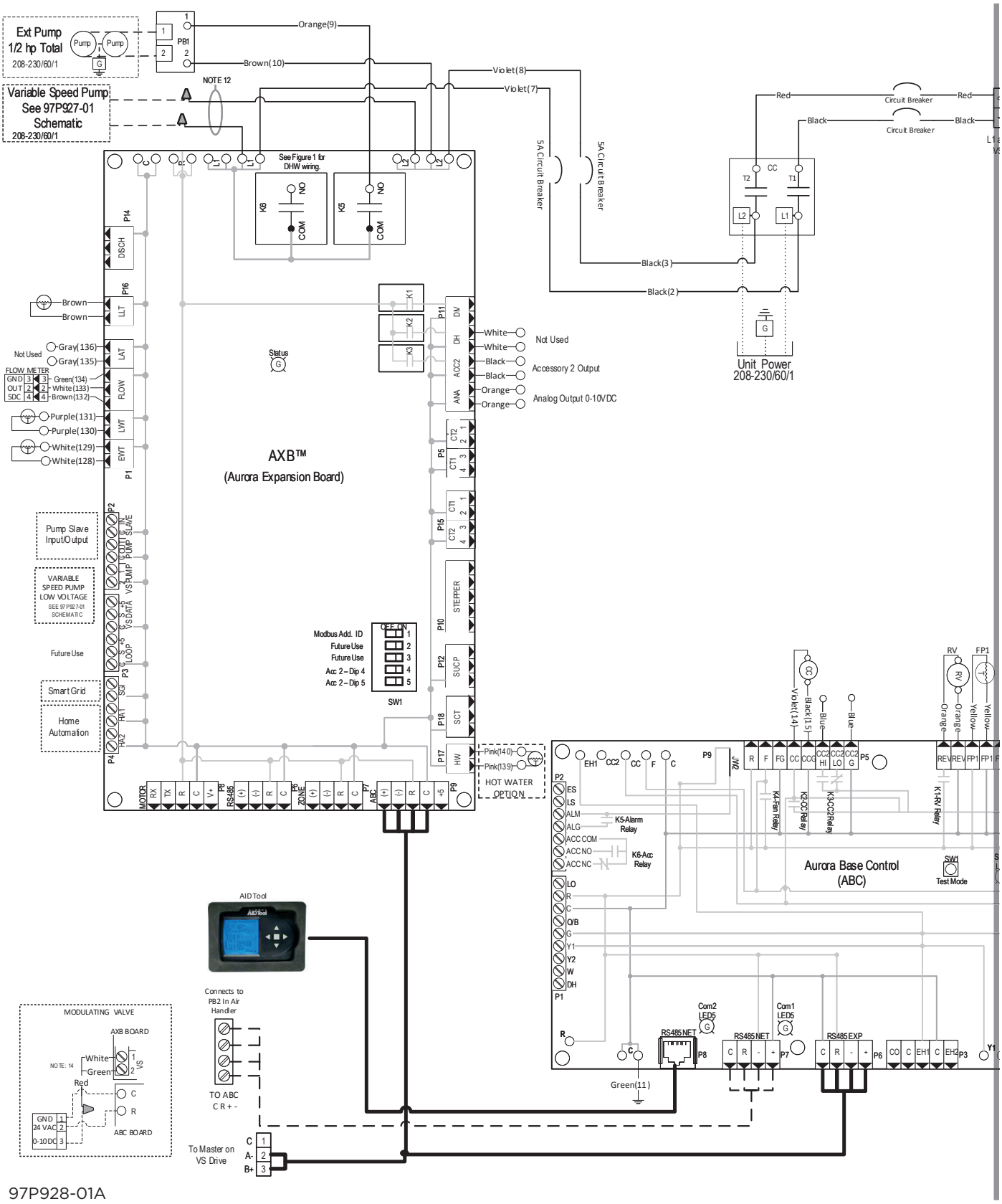
The system has encountered an unsafe operating condition that prevents automatic speed control, e.g. lost a sensor signal. To avoid damage to the system, the drive is running the compressor at a fixed speed of 2400 rpm awaiting the problem to be solved and eventually returning to normal operation. If the problem cannot be solved the drive stops and issues an alarm. (See fault/alarm table.)

Derating

The VS compressor utilizes ‘envelope control’ to maintain performance within operational limits and improve reliability. To accomplish this, pressure sensors for discharge and suction pressure as well as hot gas temperature sensing are used to monitor the conditions in which the compressor operates. The envelope does vary based upon operating speed (rpm). When operating out of these limits the control will attempt to improve the situation by moderating the compressor speed for a larger envelope. When this occurs it can be observed on the Aurora control as an ‘E’ code. The control will automatically try to resolve the situation. If the situation progresses, a fault and lockout will be generated by the control.

Compressor Section Wiring Schematics

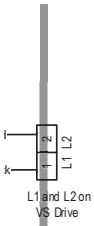
Aurora Variable Speed Indoor Split

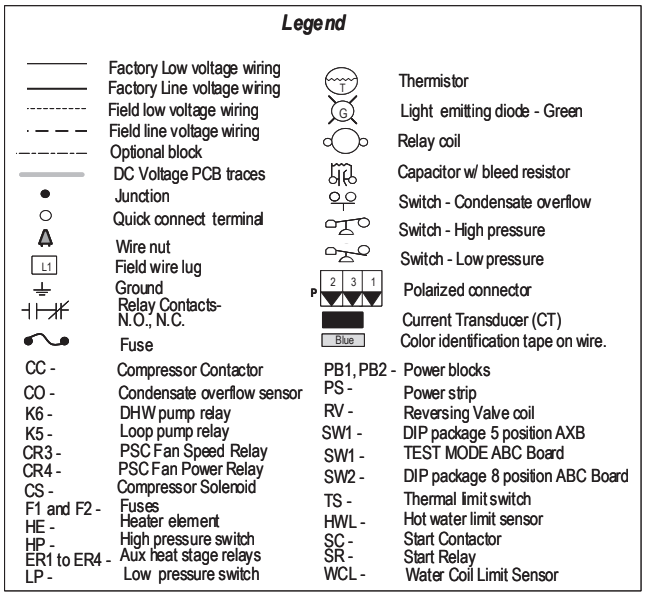


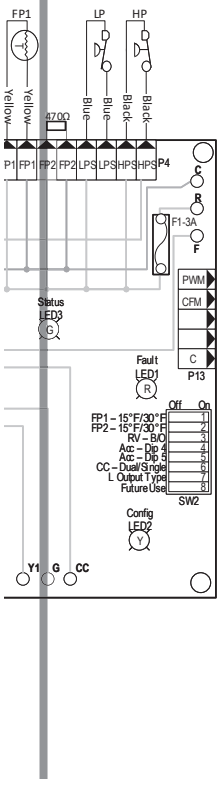
97P928-01A

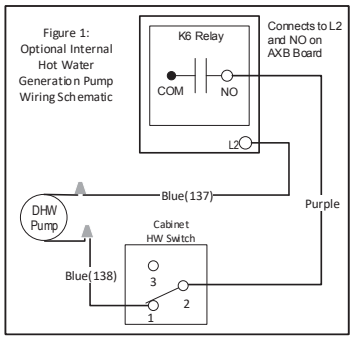
Compressor Section Wiring Schematics cont.

Aurora Variable Speed Indoor Split







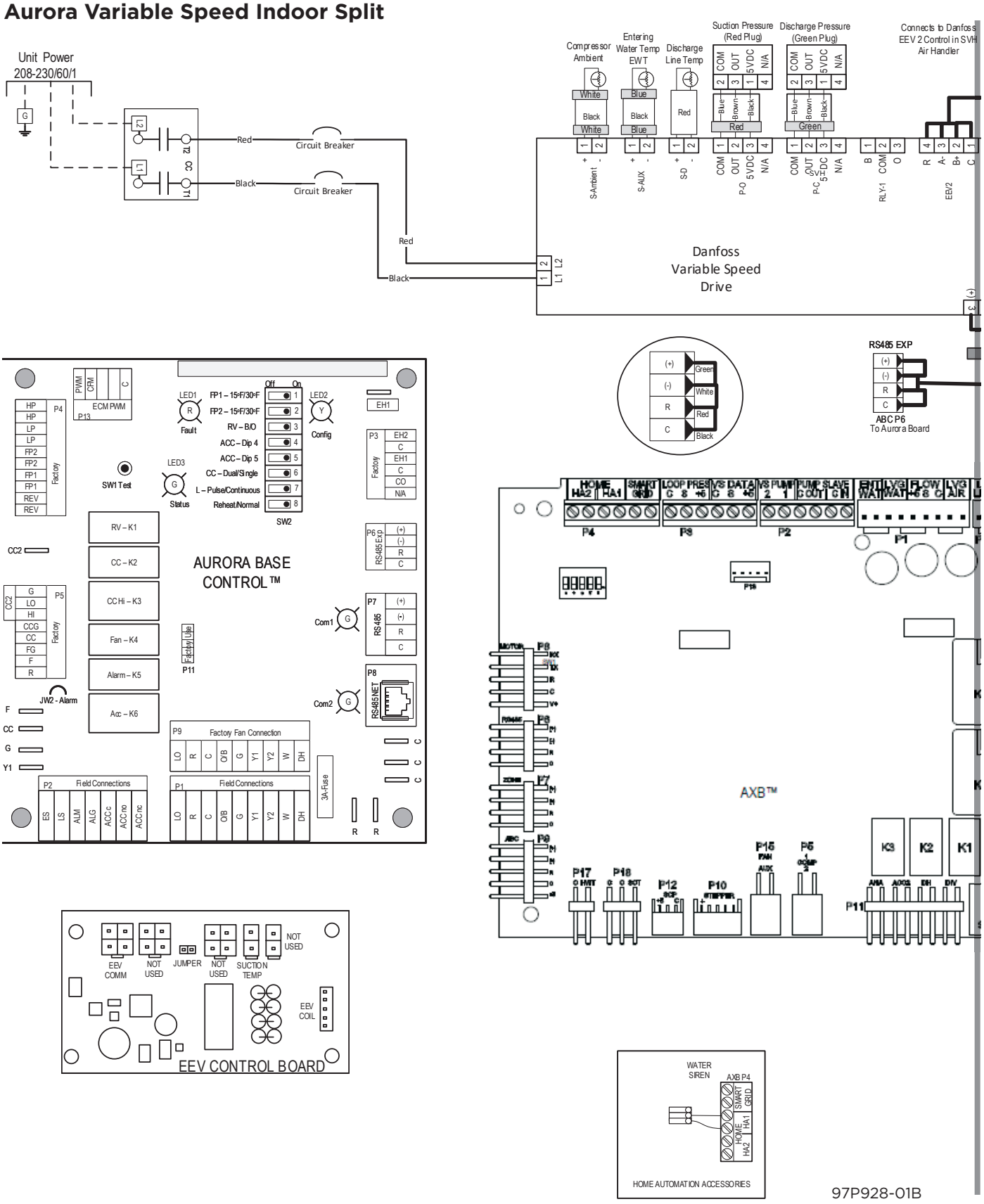


Notes

4 – Variable speed pump low voltage harness provided with Variable Speed Flow Center.
5 – Low voltage wiring CLASS 2.
7 - EEV board JUMPER must be removed.
10 – Communication cable routed through Ferrite Toroid four times.
11 – Compressor power cable routed through Ferrite Toroid three times.
12 – Variable speed pump power wires to connect the pump to L1 and L2 on the AXB board are provided with Variable Speed Flow Center.
14 - Wiring harness supplied with valve.

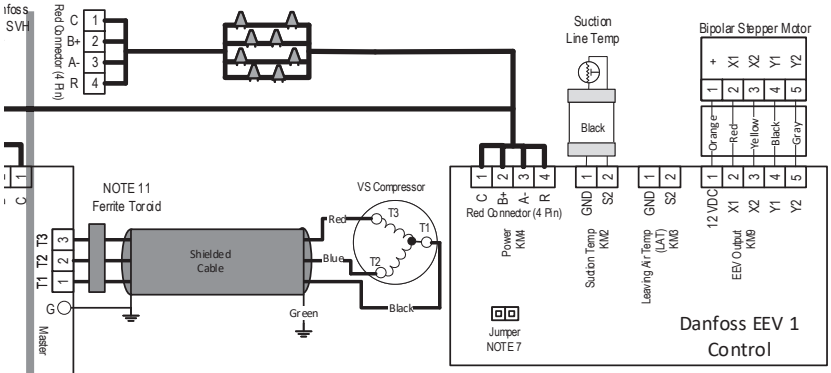
Compressor Section Wiring Schematics cont.

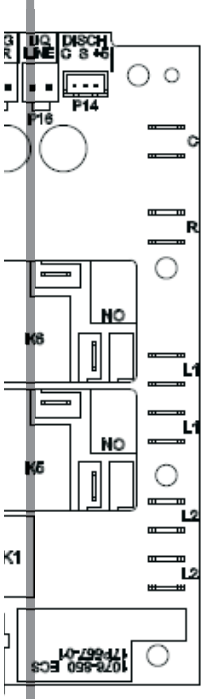
Aurora Variable Speed Indoor Split

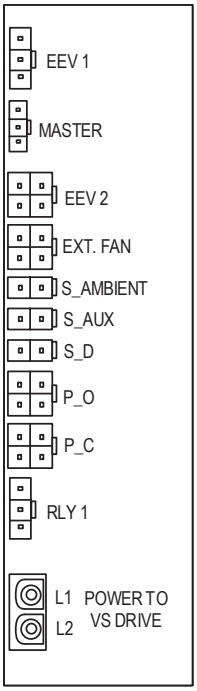


Compressor Section Wiring Schematics cont.

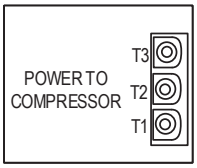
Aurora Variable Speed Indoor Split







VARIABLE SPEED DRIVE END VIEWS



Aurora LED Flash Codes			
Slow Flash	1 second on and 1 second off		
Fast Flash	100 milliseconds on and 100 milliseconds off		
Flash Code	100 milliseconds on and 400 milliseconds off with a 2 second pause before repeating		
Fault LED (LED 1, Red)		**Random Start Delay (Alternating Colors)**	
Normal Mode	OFF	Status LED (LED1, Green)	Fast Flash
Input Fault Lockout	Flash Code 1	Configuration LED (LED 2, Yellow)	Fast Flash
High Pressure Lockout	Flash Code 2	Fault LED (LED 3, Red)	Fast Flash
Low Pressure Lockout	Flash Code 3	**Configuration LED (LED 2, Yellow)**	
Freeze Detection- FP2	Flash Code 4	No Software Overide	OFF
Freeze Detection - FP1	Flash Code 5	DIP Switch Overide	Slow Flash
Reserved	Flash Code 6	**Status LED (LED 3, Green)**	
Condensate Overflow Lockout	Flash Code 7	Normal Mode	ON
Over/Under Voltage Shutdown	Flash Code 8	Control is Non - Functional	OFF
Future Use	Flash Code 9	Test Mode	Slow Flash
		Lockout Active	Fast Flash
Fault- FP1 and FP2 Sensor Error	Flash Code 11	Dehumidification Mode	Flash Code 2
Future Use	Flash Code 12	Future Use	Flash Code 3
Non-Critical AXB Sensor Error	Flash Code 13	Future Use	Flash Code 4
Critical AXB Sensor Error	Flash Code 14	Load Shed	Flash Code 5
Alarm - Hot Water	Flash Code 15	ESD	Flash Code 6
Fault Variable Speed Pump	Flash Code 16	Future Use	Flash Code 7
Future Use	Flash Code 17	**Fault LED (LED 1, Red) Cont.**	
Non-Critical Communication Error	Flash Code 18	Safe Mode - Ambient Temp Sensor	Flash Code 49
Fault - Critical Communication Error	Flash Code 19	Fault - Discharge Temperature Sensor	Flash Code 51
Alarm - Low Loop Pressure	Flash Code 21	Fault - Suction Pressure Sensor	Flash Code 52
Fault - Communication ECM Fan Motor Erro	Flash Code 22	Fault - Condensing Pressure Sensor	Flash Code 53
Alarm - Home Automation 1	Flash Code 23	Fault - Low Supply Voltage	Flash Code 54
Alarm - Home Automation 2	Flash Code 24	Fault - Compressor Out of Envelope	Flash Code 55
Fault - EEV Error	Flash Code 25	Fault - Over Current	Flash Code 56
Derate - Drive Temperature	Flash Code 41	Fault - Over/Under Voltage	Flash Code 57
Derate - High Discharge Temperature	Flash Code 42	Fault - High Drive Temperature	Flash Code 58
Derate - Low Suction Temperature	Flash Code 43	Fault - Drive Internal Error MOC/AOC	Flash Code 59
Derate - Low Condensing Pressure	Flash Code 44	Fault - Multiple Safe Modes	Flash Code 61
Derate - High Condensing Pressure	Flash Code 45	EEV2 Fault - Loss of Charge	Flash Code 71
Derate - Outer Power Limit	Flash Code 46	EEV2 Safe Mode - Suc Temp Sensor	Flash Code 72
Safe Mode - EEV (Indoor) Communication	Flash Code 47	EEV2 Safe Mode - LAT Temp Sensor	Flash Code 73
Safe Mode - EEV (Outdoor) Communication	Flash Code 48	EEV2 Safe Mode - Max Op Pressure	Flash Code 74
		EEV1 Fault - Loss of Charge	Flash Code 75
		EEV1Safe Mode - Suction Temp Sensor	Flash Code 76
		EEV1Safe Mode - LAT Temp Sensor	Flash Code 77
		EEV1 Safe Mode - Max Op Pressure	Flash Code 78

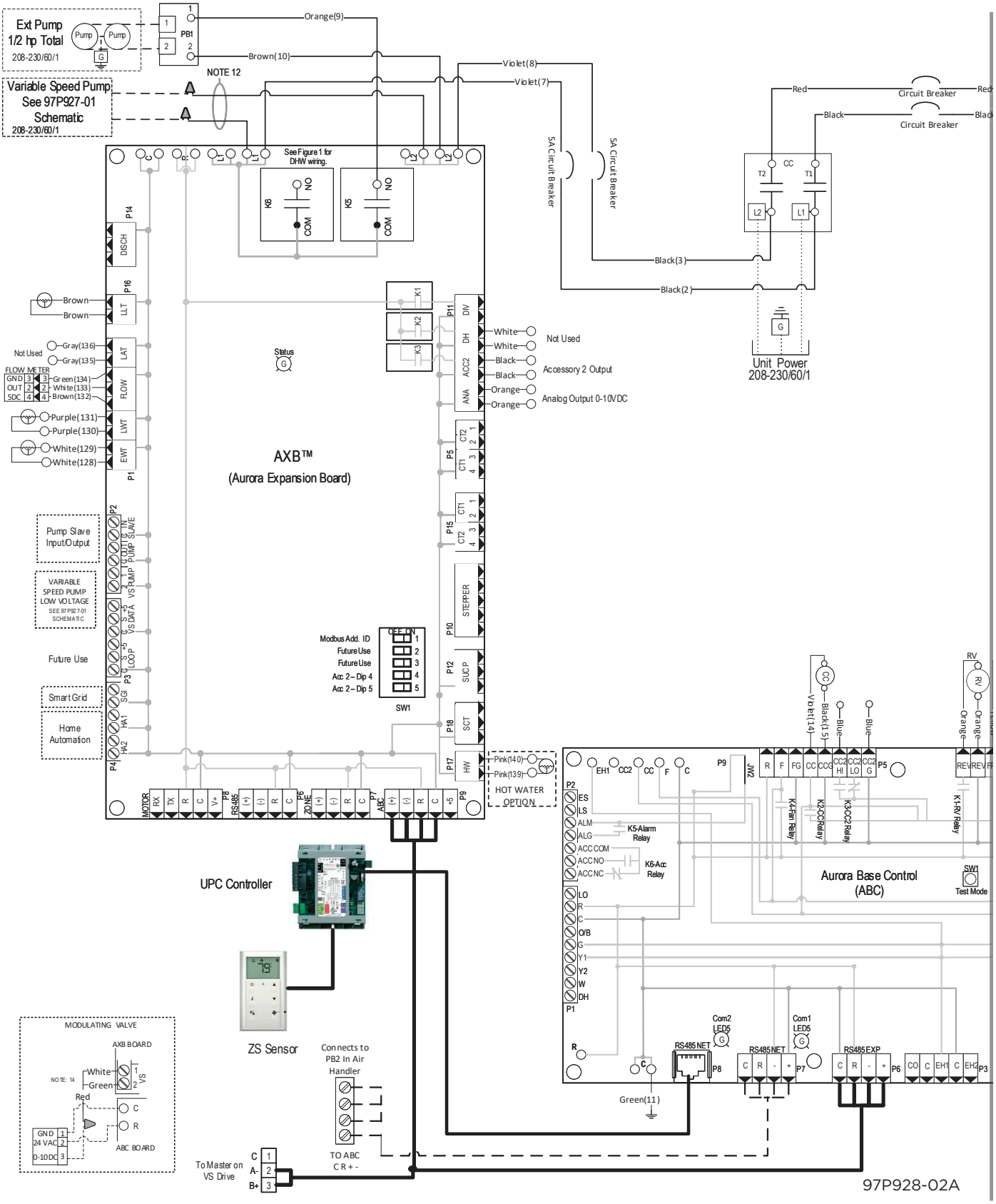
AXB Accessory 2 DIP Settings		
SW1-4	**SW1-5**	**DESCRIPTION**
ON	ON	Cycles with Blower
OFF	ON	Cycles with CC first stage compressor or compressor spd 1-12
ON	OFF	Cycles with CC2 second stage of compressor or comp spd 7-12
OFF	OFF	Cycles with DH from ABC board

ABC SW2 Accessory Relay		
DESCRIPTION	**SW2-4**	**SW2-5**
Cycle with Blower	ON	ON
Cycle with Compressor	OFF	OFF
Water Valve Slow Opening	ON	OFF
Cycle with Comm. T-stat Hum Cmd	OFF	ON

97P928-01B

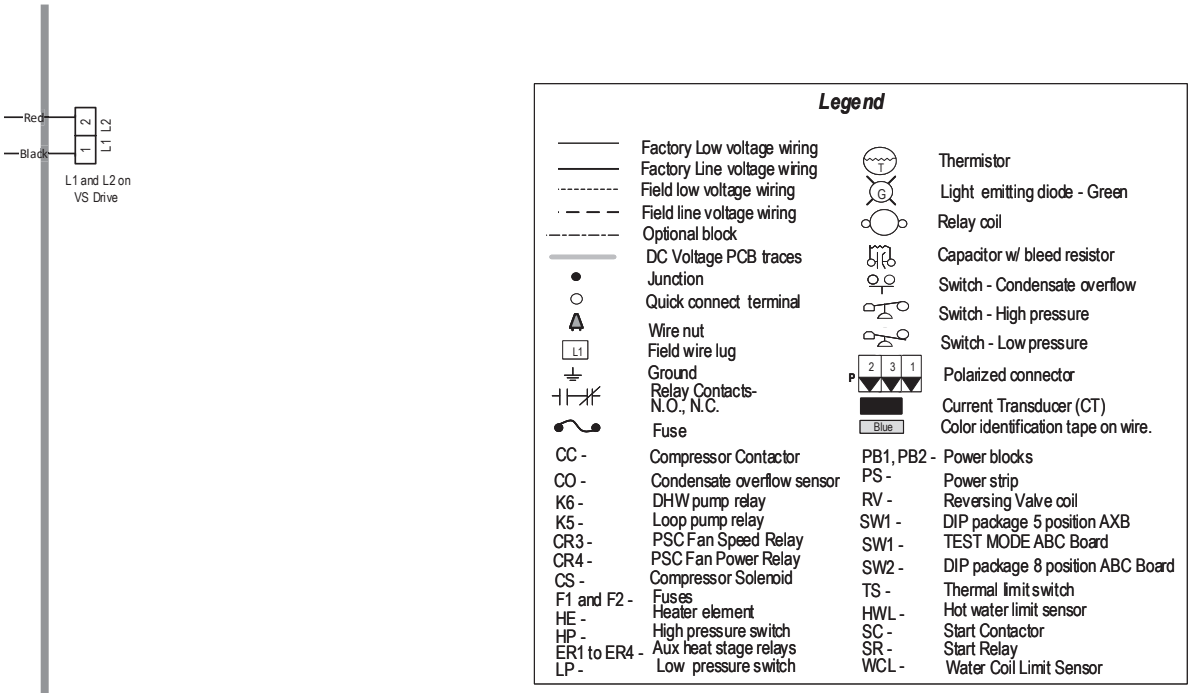
Compressor Section Wiring Schematics cont.

Aurora Variable Speed Indoor Split with UPC



Compressor Section Wiring Schematics cont.

Aurora Variable Speed Indoor Split with UPC



Legend

	Factory Low voltage wiring		Thermistor
	Factory Line voltage wiring	G	Light emitting diode - Green
	Field low voltage wiring		Relay coil
	Field line voltage wiring		Capacitor w/ bleed resistor
	Optional block		Switch - Condensate overflow
	DC Voltage PCB traces		Switch - High pressure
	Junction		Switch - Low pressure
	Quick connect terminal	P 2 3 1	Polarized connector
	Wire nut		Current Transducer (CT)
L1	Field wire lug	Blue	Color identification tape on wire.
	Ground		
	Relay Contacts- N.O., N.C.		
	Fuse		

CC -	Compressor Contactor	PB1, PB2 -	Power blocks
CO -	Condensate overflow sensor	PS -	Power strip
K6 -	DHW pump relay	RV -	Reversing Valve coil
K5 -	Loop pump relay	SW1 -	DIP package 5 position AXB
CR3 -	PSC Fan Speed Relay	SW1 -	TEST MODE ABC Board
CR4 -	PSC Fan Power Relay	SW2 -	DIP package 8 position ABC Board
CS -	Compressor Solenoid	TS -	Thermal limit switch
F1 and F2 -	Fuses	HWL -	Hot water limit sensor
HE -	Heater element	SC -	Start Contactor
HP -	High pressure switch	SR -	Start Relay
ER1 to ER4 -	Aux heat stage relays	WCL -	Water Coil Limit Sensor
LP -	Low pressure switch		

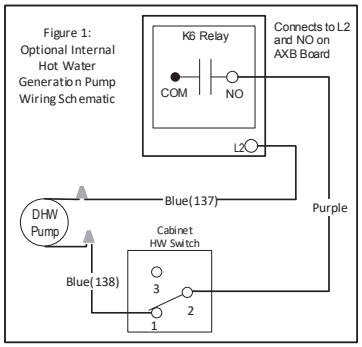


Figure 1: Optional Internal Hot Water Generation Pump Wiring Schematic

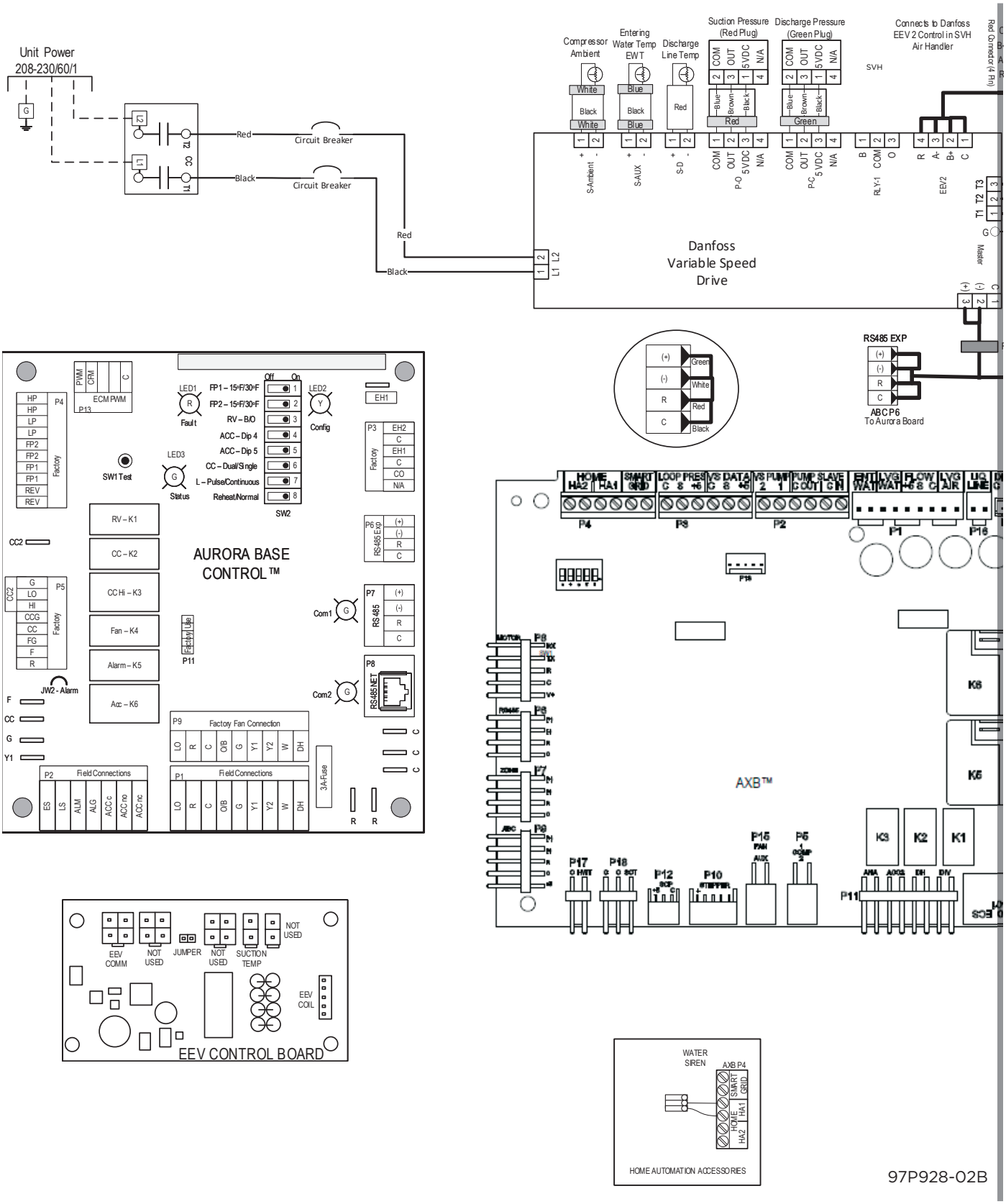
Notes

4 – Variable speed pump low voltage harness provided with Variable Speed Flow Center.
5 – Low voltage wiring CLASS 2.
7 - EEV board JUMPER must be removed.
10 – Communication cable routed through Ferrite Toroid four times.
11 – Compressor power cable routed through Ferrite Toroid three times.
12 – Variable speed pump power wires to connect the pump to L1 and L2 on the AXB board are provided with Variable Speed Flow Center.
14 - Wiring harness supplied with valve.

97P928-02A

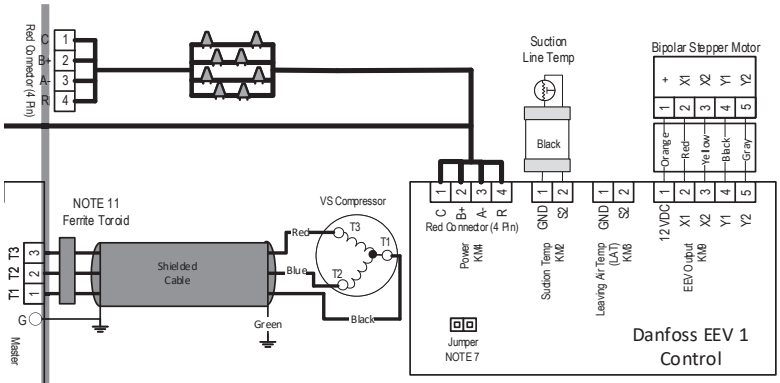
Compressor Section Wiring Schematics cont.

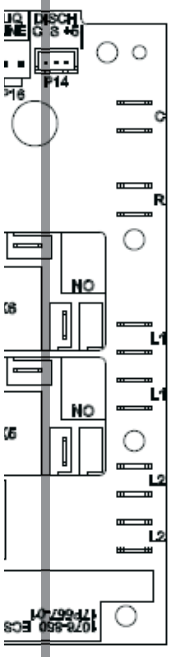
Aurora Variable Speed Indoor Split

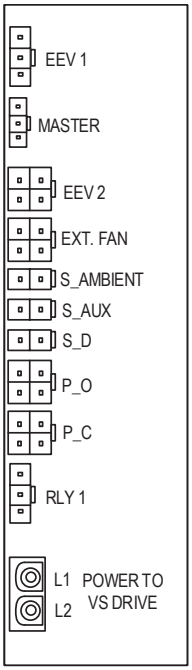


Compressor Section Wiring Schematics cont.

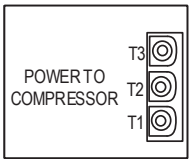
Aurora Variable Speed Indoor Split







VARIABLE SPEED DRIVE END VIEWS



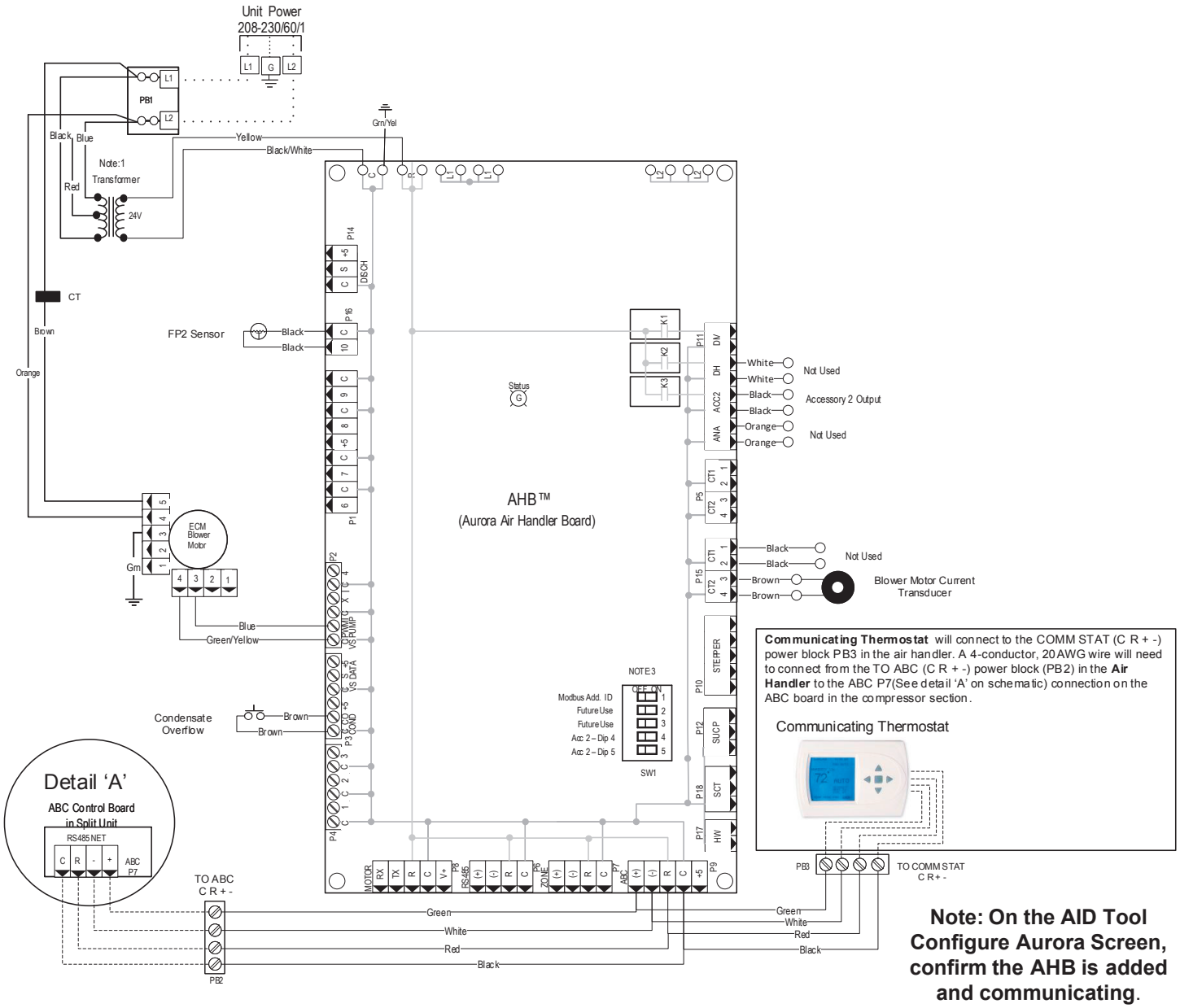
Aurora LED Flash Codes			
Slow Flash	1 second on and 1 second off		
Fast Flash	100 milliseconds on and 100 milliseconds off		
Flash Code	100 milliseconds on and 400 milliseconds off with a 2 second pause before repeating		
Fault LED (LED 1, Red)		**Random Start Delay (Alternating Colors)**	
Normal Mode	OFF	Status LED (LED1, Green)	Fast Flash
Input Fault Lockout	Flash Code 1	Configuration LED (LED 2, Yellow)	Fast Flash
High Pressure Lockout	Flash Code 2	Fault LED (LED 3, Red)	Fast Flash
Low Pressure Lockout	Flash Code 3	**Configuration LED (LED 2, Yellow)**	
Freeze Detection- FP2	Flash Code 4	No Software Overide	OFF
Freeze Detection - FP1	Flash Code 5	DIP Switch Overide	Slow Flash
Reserved	Flash Code 6	**Status LED (LED 3, Green)**	
Condensate Overflow Lockout	Flash Code 7	Normal Mode	ON
Over/Under Voltage Shutdown	Flash Code 8	Control is Non - Functional	OFF
Future Use	Flash Code 9	Test Mode	Slow Flash
		Lockout Active	Fast Flash
Fault- FP1 and FP2 Sensor Error	Flash Code 11	Dehumidification Mode	Flash Code 2
Future Use	Flash Code 12	Future Use	Flash Code 3
Non-Critical AXB Sensor Error	Flash Code 13	Future Use	Flash Code 4
Critical AXB Sensor Error	Flash Code 14	Load Shed	Flash Code 5
Alarm - Hot Water	Flash Code 15	ESD	Flash Code 6
Fault Variable Speed Pump	Flash Code 16	Future Use	Flash Code 7
Future Use	Flash Code 17	**Fault LED (LED 1, Red) Cont.**	
Non-Critical Communication Error	Flash Code 18	Safe Mode - Ambient Temp Sensor	Flash Code 49
Fault - Critical Communication Error	Flash Code 19	Fault - Discharge Temperature Sensor	Flash Code 51
Alarm - Low Loop Pressure	Flash Code 21	Fault - Suction Pressure Sensor	Flash Code 52
Fault - Communication ECM Fan Motor Erro	Flash Code 22	Fault - Condensing Pressure Sensor	Flash Code 53
Alarm - Home Automation 1	Flash Code 23	Fault - Low Supply Voltage	Flash Code 54
Alarm - Home Automation 2	Flash Code 24	Fault - Compressor Out of Envelope	Flash Code 55
Fault - EEV Error	Flash Code 25	Fault - Over Current	Flash Code 56
Derate - Drive Temperature	Flash Code 41	Fault - Over/Under Voltage	Flash Code 57
Derate - High Discharge Temperature	Flash Code 42	Fault - High Drive Temperature	Flash Code 58
Derate - Low Suction Temperature	Flash Code 43	Fault - Drive Internal Error MOC/AOC	Flash Code 59
Derate - Low Condensing Pressure	Flash Code 44	Fault - Multiple Safe Modes	Flash Code 61
Derate - High Condensing Pressure	Flash Code 45	EEV2 Fault - Loss of Charge	Flash Code 71
Derate - Outer Power Limit	Flash Code 46	EEV2 Safe Mode - Suc Temp Sensor	Flash Code 72
Safe Mode - EEV (Indoor) Communication	Flash Code 47	EEV2 Safe Mode - LAT Temp Sensor	Flash Code 73
Safe Mode - EEV (Outdoor) Communication	Flash Code 48	EEV2 Safe Mode - Max Op Pressure	Flash Code 74
		EEV1 Fault - Loss of Charge	Flash Code 75
		EEV1Safe Mode - Suction Temp Sensor	Flash Code 76
		EEV1Safe Mode - LAT Temp Sensor	Flash Code 77
		EEV1 Safe Mode - Max Op Pressure	Flash Code 78

AXB Accessory 2 DIP Settings		
SW1-4	**SW1-5**	**DESCRIPTION**
ON	ON	Cycles with Blower
OFF	ON	Cycles with CC first stage compressor or compressor spd 1-12
ON	OFF	Cycles with CC2 second stage of compressor or comp spd 7-12
OFF	OFF	Cycles with DH from ABC board

ABC SW2 Accessory Relay		
DESCRIPTION	**SW2-4**	**SW2-5**
Cycle with Blower	ON	ON
Cycle with Compressor	OFF	OFF
Water Valve Slow Opening	ON	OFF
Cycle with Comm. T-stat Hum Cmd	OFF	ON

Air Handler Wiring Schematics

SVH Air Handler: No Electric Heat



Note: On the AID Tool Configure Aurora Screen, confirm the AHB is added and communicating.

Air Handler Wiring Schematics cont.

97P929-01 1/28/2020

7 SeriesAir Handler Air Flow													
Model	**Max ESP**	**Speed 1**	**Speed 2**	**Speed 3**	**Speed 4**	**Speed 5**	**Speed 6**	**Speed 7**	**Speed 8**	**Speed 9**	**Speed 10**	**Speed 11**	**Speed 12**
033	0.75	**250**	**400 G**	**550 L**	**650**	**750**	**850**	1000	1150	1250 H	1350 Aux	1450	1600
042	0.75	**250**	**450 G**	**650 L**	**800**	**950**	**1050**	1200	1350	1450	1600 H	1750 Aux	1850
050	0.75	**300**	**550 G**	**800 L**	**1000**	**1150**	**1300**	1450	1600	1750	1900 H	2050 Aux	2200
**VS Compressor Speed				1-2	3-4		5-6	7-8		9-10	11-12		

11/29/2018

** VS Compressor speed is given for the factory default cfm settings. When the cfm default settings are changed it will change the relationship to the compressor speed that is shown in the table. In cooling mode compressor speeds 10-12 are only available when SuperBoost mode is selected at the thermostat.

Factory settings are at recommended G, L , H and Aux positions

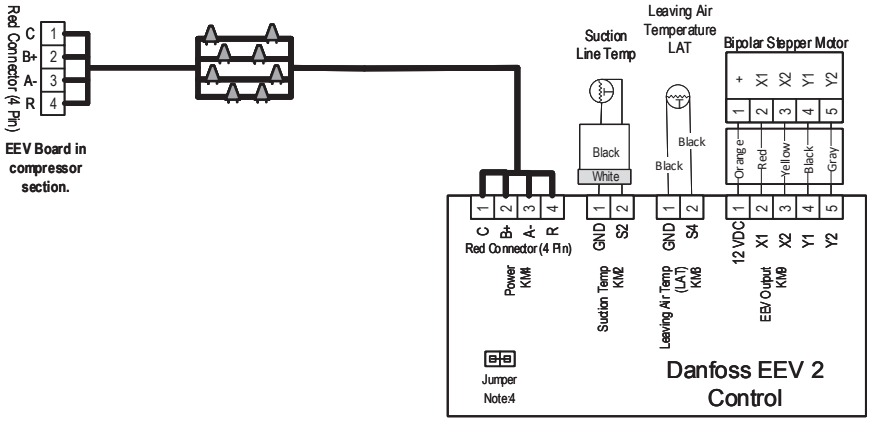
"G" may be located anywhere within the airflow table.

"L" setting should be located within the boldface CFM range

"H" setting MUST be located within the shaded CFM range

"Aux" setting MUST be equal to or greater than "H" setting

CFM is controlled within 5% up to the maximum ESP



Notes:

1 – To operate in 208V mode replace the blue transformer wire connected to PB1-L2 with red transformer wire.

2 – Low voltage wiring CLASS 2.

3 – DIP switch 1 on SW1 must be set in the OFF position.

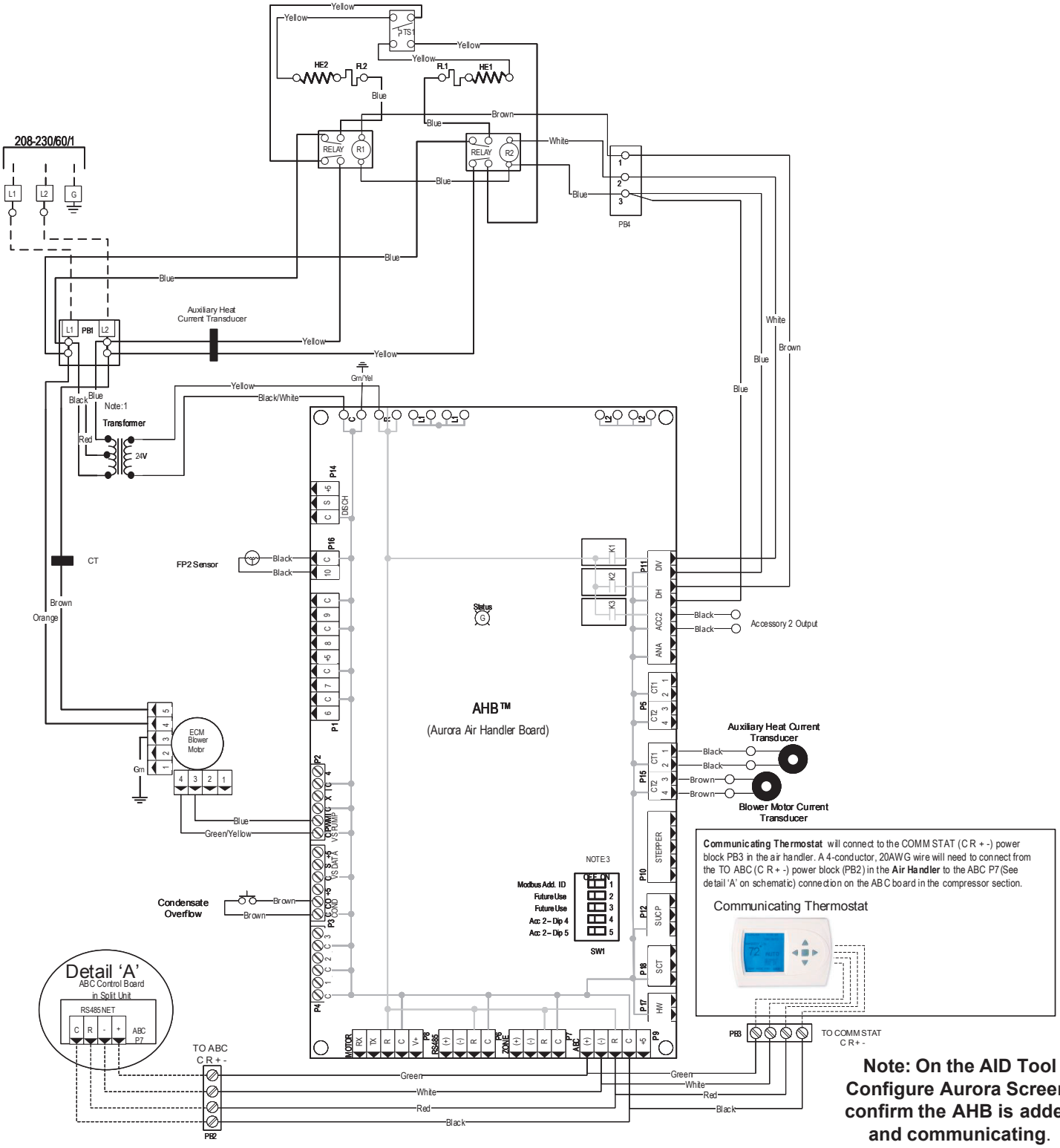
4 – Jumper must be in place on Air Handler EEV. DO NOT REMOVE.

Legend

- Factory Low voltage wiring
- Factory Line voltage wiring
- Field low voltage wiring
- Field line voltage wiring
- Optional block
- DC Voltage PCB traces
- Internal junction
- Quick connect terminal
- TS Thermal Limit Switch
- L1 Field wire lug
- Ground
- N.O., N.C.
- G Light emitting diode - Gr
- FL Fused Limit
- Breaker
- P 1 2 3 Polarized connector
- PB - Power block
- SW1 - DIP package 4 position
- HE - Heater element
- Current Transducer

Air Handler Wiring Schematics cont.

SVH Air Handler: 10kW Electric Heat



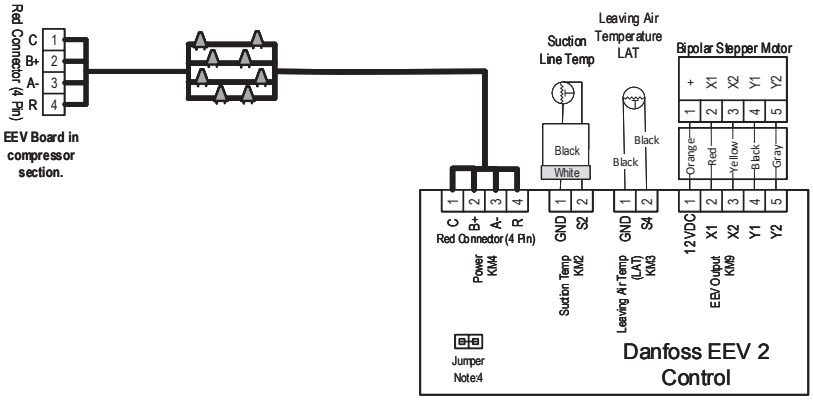
Air Handler Wiring Schematics cont.

97P929-02 1/28/2020

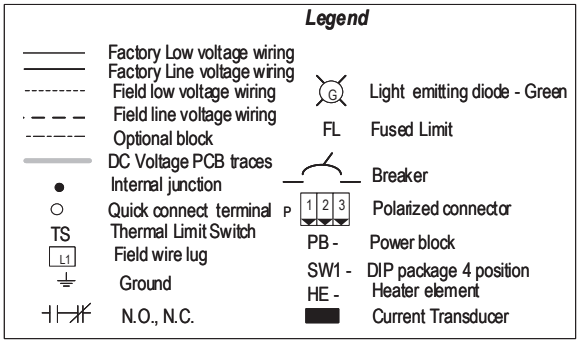
7 SeriesAir Handler Air Flow													
Model	**Max ESP**	**Speed 1**	**Speed 2**	**Speed 3**	**Speed 4**	**Speed 5**	**Speed 6**	**Speed 7**	**Speed 8**	**Speed 9**	**Speed 10**	**Speed 11**	**Speed 12**
033	0.75	**250**	**400 G**	**550 L**	**650**	**750**	**850**	1000	1150	1250 H	1350 Aux	1450	1600
042	0.75	**250**	**450 G**	**650 L**	**800**	**950**	**1050**	1200	1350	1450	1600 H	1750 Aux	1850
050	0.75	**300**	**550 G**	**800 L**	**1000**	**1150**	**1300**	1450	1600	1750	1900 H	2050 Aux	2200
**VS Compressor Speed				1-2	3-4		5-6	7-8		9-10	11-12		

11/29/2018

** VS Compressor speed is given for the factory default cfm settings. When the cfm default settings are changed it will change the relationship to the compressor speed that is shown in the table. In cooling mode compressor speeds 10-12 are only available when SuperBoost mode is selected at the thermostat.
Factory settings are at recommended G, L , H and Aux positions
"G" may be located anywhere within the airflow table.
"L" setting should be located within the boldface CFM range
"H" setting MUST be located within the shaded CFM range
"Aux" setting MUST be equal to or greater than "H" setting
CFM is controlled within 5% up to the maximum ESP

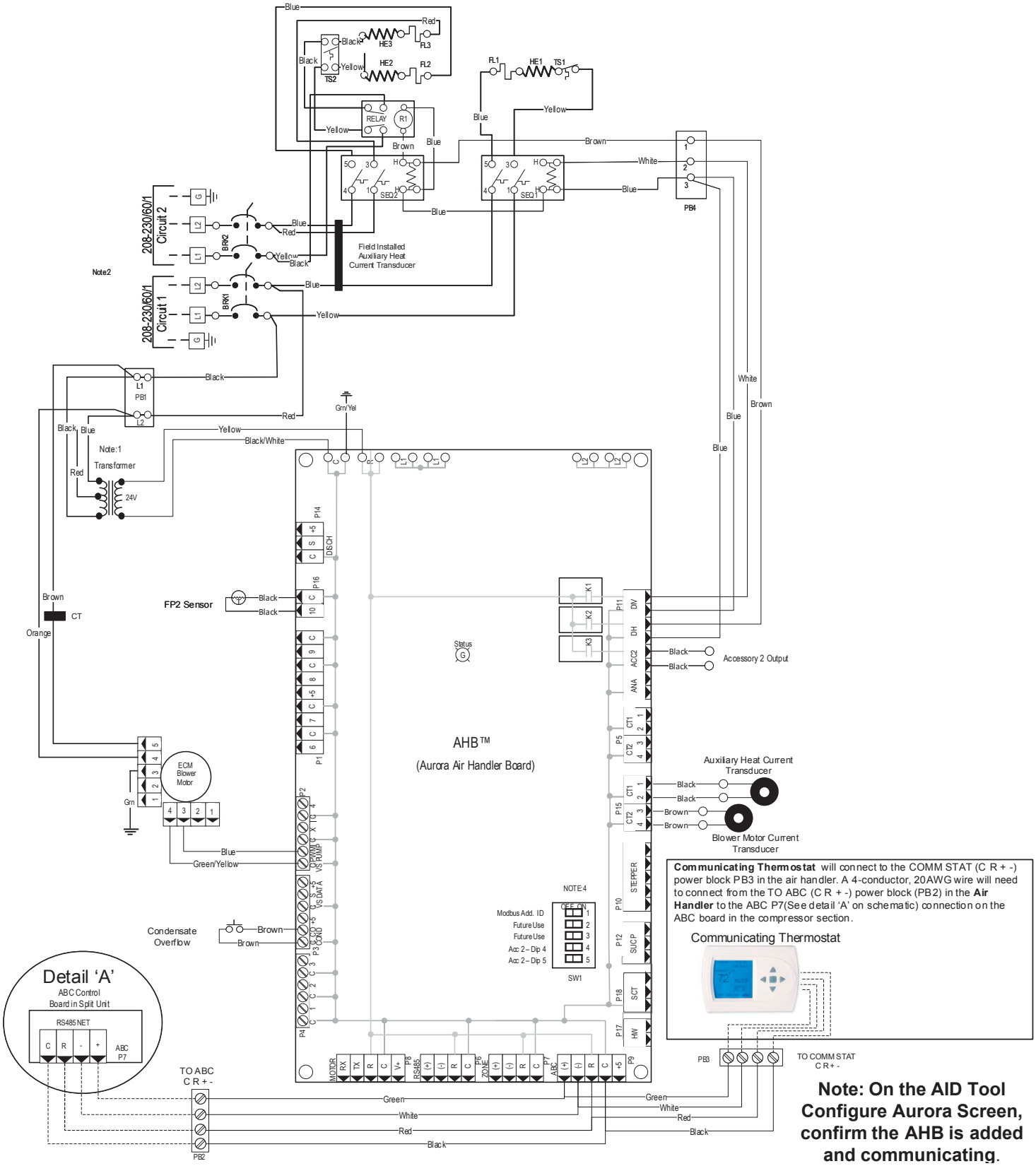


Notes:
1 – To operate in 208V mode replace the blue transformer wire connected to PB1-L2 with red transformer wire.
2 – Low voltage wiring CLASS 2.
3 – DIP switch 1 on SW1 must be set in the OFF position.
4 – Jumper must be in place on Air Handler EEV. DO NOT REMOVE.



Air Handler Wiring Schematics cont.

SVH Air Handler: 15kW Electric Heat



Communicating Thermostat will connect to the COMM STAT (C R + -) power block PB3 in the air handler. A 4-conductor, 20AWG wire will need to connect from the TO ABC (C R + -) power block (PB2) in the **Air Handler** to the ABC P7(See detail 'A' on schematic) connection on the ABC board in the compressor section.

Note: On the AID Tool Configure Aurora Screen, confirm the AHB is added and communicating.

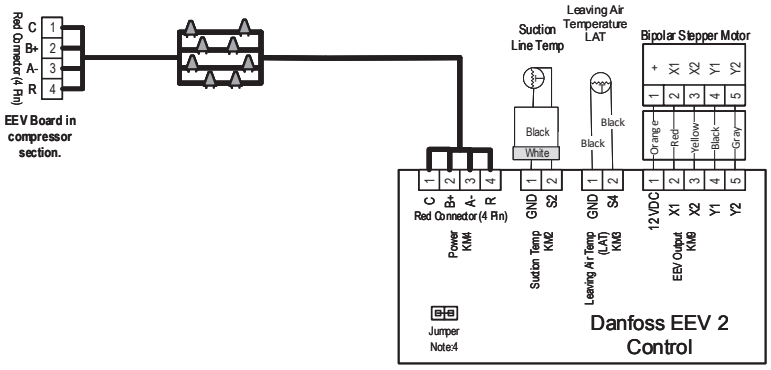
Air Handler Wiring Schematics cont.

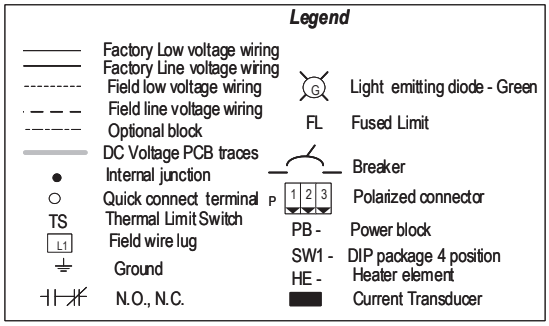
97P929-03 1/28/2020

7 SeriesAir Handler Air Flow													
Model	Max ESP	Speed 1	Speed 2	Speed 3	Speed 4	Speed 5	Speed 6	Speed 7	Speed 8	Speed 9	Speed 10	Speed 11	Speed 12
033	0.75	**250**	**400 G**	**550 L**	**650**	**750**	**850**	1000	1150	1250 H	1350 Aux	1450	1600
042	0.75	**250**	**450 G**	**650 L**	**800**	**950**	**1050**	1200	1350	1450	1600 H	1750 Aux	1850
050	0.75	**300**	**550 G**	**800 L**	**1000**	**1150**	**1300**	1450	1600	1750	1900 H	2050 Aux	2200
**VS Compressor Speed				1-2	3-4		5-6	7-8		9-10	11-12		

11/29/2018

** VS Compressor speed is given for the factory default cfm settings. When the cfm default settings are changed it will change the relationship to the compressor speed that is shown in the table. In cooling mode compressor speeds 10-12 are only available when SuperBoost mode is selected at the thermostat.
Factory settings are at recommended G, L , H and Aux positions
"G" may be located anywhere within the airflow table.
"L" setting should be located within the boldface CFM range
"H" setting MUST be located within the shaded CFM range
"Aux" setting MUST be equal to or greater than "H" setting
CFM is controlled within 5% up to the maximum ESP





Notes:

1 – To operate in 208V mode replace the blue transformer wire connected to PB1-L2 with red transformer wire.

2 – Use manufacturer's part number 19P592-01 (jumper bar assembly) when single source power is required.

3 – DIP switch 1 on SW1 must be set in the OFF position.

4 – Jumper must be in place on Air Handler EEV. DO NOT REMOVE.

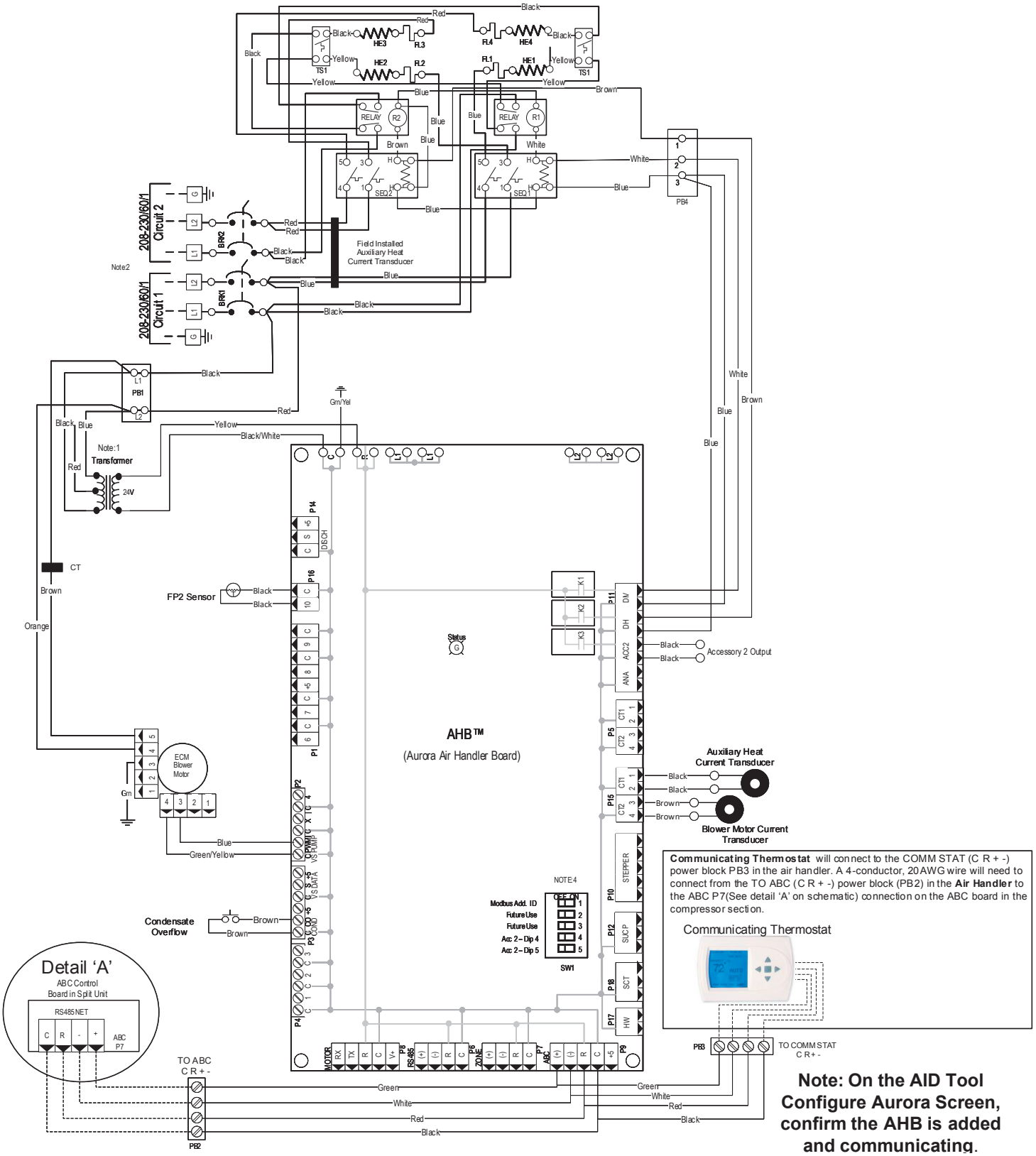
5 – Low voltage wiring CLASS 2.

Dual Power Supply Connections

If two separate circuits are used to supply power to the auxiliary heat kit, the Installer will need to verify that each leg of the auxiliary heat circuit breakers are wired from the power supply correctly in order for the electric heat kit to operate properly. This can be done by measuring the supply side voltage of the auxiliary heat circuit breakers. Put a voltmeter on the L2 side of Circuit Breaker One and on the L2 side of Circuit Breaker Two. The voltmeter should read approximately 0 volts. If the meter reads high voltage, the auxiliary heat breakers need to be rewired so that breakers in the auxiliary heat kit match the wiring of the Disconnect Panel breakers. Meaning, L1 and L2 from one breaker in the disconnect panel must connect to L1 and L2 at one of the auxiliary heat circuit breakers and L1 and L2 from the other breaker in the disconnect panel must connect to L1 and L2 of the other auxiliary heat circuit breaker, making sure that the L1 and L2 from each disconnect breaker matches the L1 and L2 at each of the auxiliary heat breakers.

Air Handler Wiring Schematics cont.

SVH Air Handler: 20kW Electric Heat



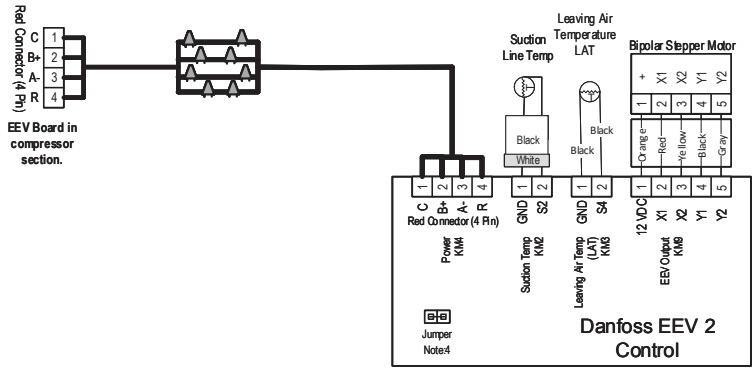
Air Handler Wiring Schematics cont.

97P929-04 1/28/2020

7 SeriesAir Handler Air Flow													
Model	**Max ESP**	**Speed 1**	**Speed 2**	**Speed 3**	**Speed 4**	**Speed 5**	**Speed 6**	**Speed 7**	**Speed 8**	**Speed 9**	**Speed 10**	**Speed 11**	**Speed 12**
033	0.75	**250**	**400 G**	**550 L**	**650**	**750**	**850**	1000	1150	1250 H	1350 Aux	1450	1600
042	0.75	**250**	**450 G**	**650 L**	**800**	**950**	**1050**	1200	1350	1450	1600 H	1750 Aux	1850
050	0.75	**300**	**550 G**	**800 L**	**1000**	**1150**	**1300**	1450	1600	1750	1900 H	2050 Aux	2200
**VS Compressor Speed				1-2	3-4		5-6	7-8		9-10	11-12		

11/29/2018

** VS Compressor speed is given for the factory default cfm settings. When the cfm default settings are changed it will change the relationship to the compressor speed that is shown in the table. In cooling mode compressor speeds 10-12 are only available when SuperBoost mode is selected at the thermostat.
Factory settings are at recommended G, L , H and Aux positions
"G" may be located anywhere within the airflow table.
"L" setting should be located within the boldface CFM range
"H" setting MUST be located within the shaded CFM range
"Aux" setting MUST be equal to or greater than "H" setting
CFM is controlled within 5% up to the maximum ESP



Notes:
1 – To operate in 208V mode replace the blue transformer wire connected to PB1-L2 with red transformer wire.
2 – Use manufacturer's part number 19P592-01 (jumper bar assembly) when single source power is required.
3 – DIP switch 1 on SW1 must be set in the OFF position.
4 – Jumper must be in place on Air Handler EEV. DO NOT REMOVE.
5 – Low voltage wiring CLASS 2.

Dual Power Supply Connections

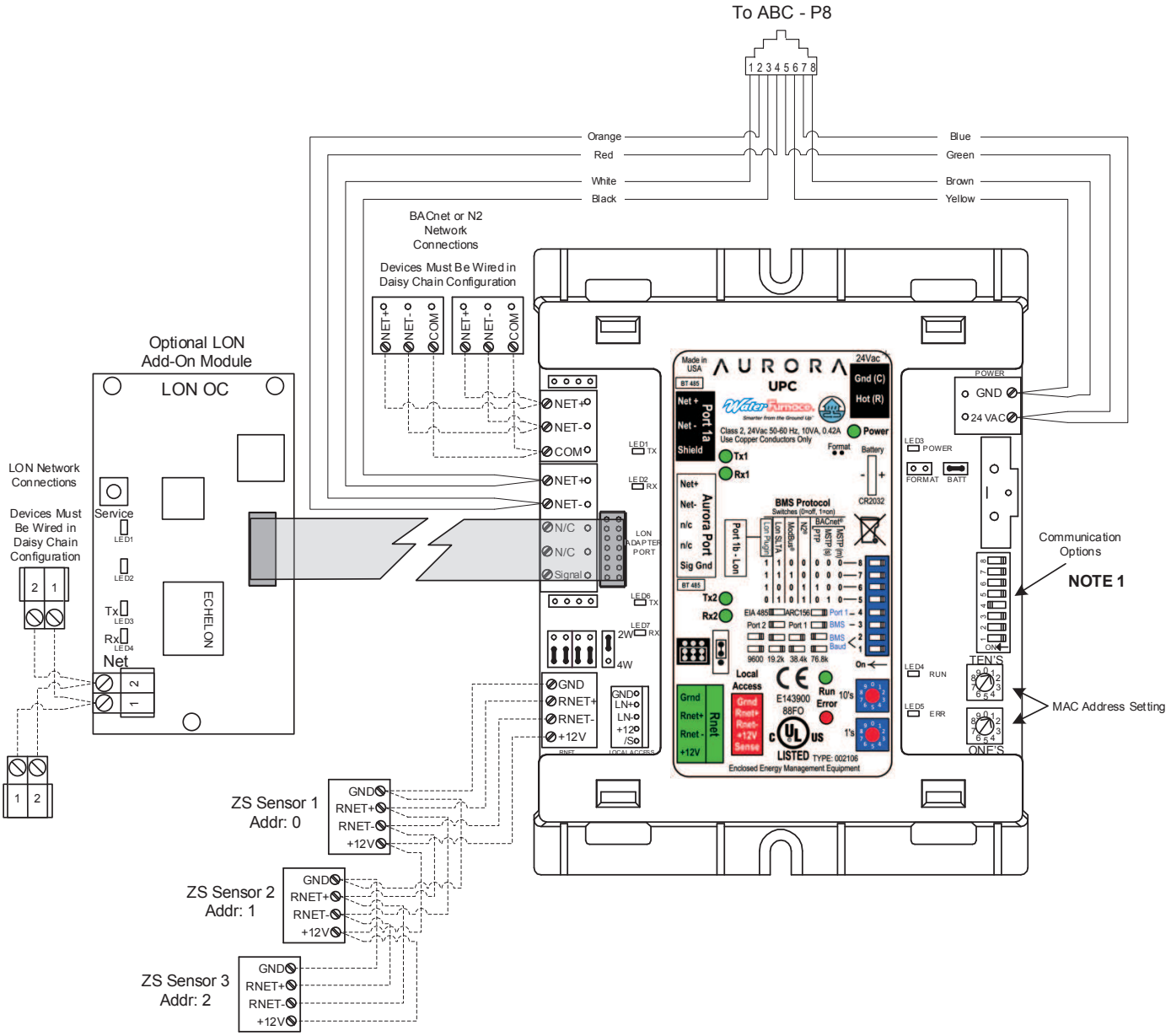
If two separate circuits are used to supply power to the auxiliary heat kit, the Installer will need to verify that each leg of the auxiliary heat circuit breakers are wired from the power supply correctly in order for the electric heat kit to operate properly. This can be done by measuring the supply side voltage of the auxiliary heat circuit breakers. Put a voltmeter on the L2 side of Circuit Breaker One and on the L2 side of Circuit Breaker Two. The voltmeter should read approximately 0 volts. If the meter reads high voltage, the auxiliary heat breakers need to be rewired so that breakers in the auxiliary heat kit match the wiring of the Disconnect Panel breakers. Meaning, L1 and L2 from one breaker in the disconnect panel must connect to L1 and L2 at one of the auxiliary heat circuit breakers and L1 and L2 from the other breaker in the disconnect panel must connect to L1 and L2 of the other auxiliary heat circuit breaker, making sure that the L1 and L2 from each disconnect breaker matches the L1 and L2 at each of the auxiliary heat breakers.

Legend

- Factory Low voltage wiring
- Factory Line voltage wiring
- Field low voltage wiring
- Field line voltage wiring
- Optional block
- DC Voltage PCB traces
- Internal junction
- Quick connect terminal
- TS Thermal Limit Switch
- L1 Field wire lug
- Ground
- N.O., N.C.
- G Light emitting diode - Green
- FL Fused Limit
- Breaker
- P 1 2 3 Polarized connector
- PB - Power block
- SW1 - DIP package 4 position
- HE - Heater element
- Current Transducer

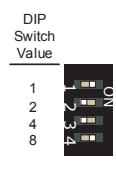
Wiring Schematics Cont.

Aurora 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
12345678 RJ45 Connector

Pressure/Temperature Conversion Chart for R-410A

PRESSURE (PSIG)	TEMP °F
60	8.5
62	9.9
64	11.2
66	12.5
68	13.8
70	15.1
72	16.3
74	17.5
76	18.7
78	19.8
80	21.0
82	22.1
84	23.2
86	24.3
88	25.4
90	26.5
92	27.5
94	28.6
96	29.6
98	30.6
100	31.6
102	32.6
104	33.5
106	34.5
108	35.4
110	36.4
112	37.3
114	38.2
116	39.1
118	40.0
120	40.9
122	41.7
124	42.6
126	43.4
128	44.3
130	45.1
132	45.9
134	46.7
136	47.5
138	48.3
140	49.1
142	49.9
144	50.7
146	51.5
148	52.2
150	53.0
152	53.7
154	54.5
156	55.2
158	55.9
160	56.6
162	57.4
164	58.1
166	58.8
168	59.5
170	60.2
172	60.8
174	61.5
176	62.2
178	62.9

PRESSURE (PSIG)	TEMP °F
180	63.5
182	64.2
184	64.8
186	65.5
188	66.1
190	66.8
192	67.4
194	68.0
196	68.7
198	69.3
200	69.9
202	70.5
204	71.1
206	71.7
208	72.3
210	72.9
212	73.5
214	74.1
216	74.7
218	75.3
220	75.8
222	76.4
224	77.0
226	77.5
228	78.1
230	78.7
232	79.2
234	79.8
236	80.3
238	80.9
240	81.4
242	81.9
244	82.5
246	83.0
248	83.5
250	84.1
252	84.6
254	85.1
256	85.6
258	86.1
260	86.6
262	87.1
264	87.7
266	88.2
268	88.7
270	89.2
272	89.6
274	90.1
276	90.6
278	91.1
280	91.6
282	92.1
284	92.6
286	93.0
288	93.5
290	94.0
292	94.5
294	94.9
296	95.4
298	95.8

PRESSURE (PSIG)	TEMP °F
300	96.3
302	96.8
304	97.2
306	97.7
308	98.1
310	98.6
312	99.0
314	99.5
316	99.9
318	100.4
320	100.8
322	101.2
324	101.7
326	102.1
328	102.5
330	103.0
332	103.4
334	103.8
336	104.2
338	104.7
340	105.1
342	105.5
344	105.9
346	106.3
348	106.7
350	107.2
352	107.6
354	108.0
356	108.4
358	108.8
360	109.2
362	109.6
364	110.0
366	110.4
368	110.8
370	111.2
372	111.6
374	112.0
376	112.3
378	112.7
380	113.1
382	113.5
384	113.9
386	114.3
388	114.7
390	115.0
392	115.4
394	115.8
396	116.2
398	116.5
400	116.9
402	117.3
404	117.6
406	118.0
408	118.4
410	118.7
412	119.1
414	119.5
416	119.8
418	120.2

PRESSURE (PSIG)	TEMP °F
420	120.6
422	120.9
424	121.3
426	121.6
428	122.0
430	122.3
432	122.7
434	123.0
436	123.4
438	123.7
440	124.1
442	124.4
444	124.8
446	125.1
448	125.4
450	125.8
452	126.1
454	126.5
456	126.8
458	127.1
460	127.5
462	127.8
464	128.1
466	128.5
468	128.8
470	129.1
472	129.4
474	129.8
476	130.1
478	130.4
480	130.7
482	131.1
484	131.4
486	131.7
488	132.0
490	132.3
492	132.7
494	133.0
496	133.3
498	133.6
500	133.9
502	134.2
504	134.5
506	134.9
508	135.2
510	135.5
512	135.8
514	136.1
516	136.4
518	136.7
520	137.0
522	137.3
524	137.6
526	137.9
528	138.2
530	138.5
532	138.8
534	139.1
536	139.4
538	139.7

PRESSURE (PSIG)	TEMP °F
540	140.0
542	140.3
544	140.6
546	140.9
548	141.2
550	141.4
552	141.7
554	142.0
556	142.3
558	142.6
560	142.9
562	143.2
564	143.5
566	143.7
568	144.0
570	144.3
572	144.6
574	144.9
576	145.1
578	145.4
580	145.7
582	146.0
584	146.2
586	146.5
588	146.8
590	147.1
592	147.3
594	147.6
596	147.9
598	148.2
600	148.4
602	148.7
604	149.0
606	149.2
608	149.5

Compressor Section Pressure Drop

Model	GPM	Pressure Drop (psi)				
		30° F	50° F	70°	90° F	110° F
033	11.5	3.60	3.30	3.10	2.90	2.70
	9.0	2.30	2.10	2.00	1.90	1.70
	7.0	2.10	2.00	1.80	1.80	1.60
	6.0	1.10	1.05	1.00	0.90	0.85
	4.5	0.70	0.66	0.64	0.60	0.55
042	13.5	4.10	3.80	3.60	3.40	3.10
	10.5	1.90	1.80	1.70	1.60	1.50
	7.5	1.70	1.50	1.40	1.30	1.20
	6.0	1.00	0.90	0.80	0..7	0.60
	4.0	0.40	0.38	0.36	0.34	0.30
050	17.0	6.20	5.80	5.40	5.00	4.60
	13.5	3.90	3.70	3.50	3.10	2.90
	9.5	1.90	1.80	1.70	1.60	1.50
	7.5	1.40	1.30	1.20	1.10	0.90
	5.0	0.60	0.55	0.50	0.45	0.40

8/21/2019

Compressor Section Thermistor Resistance

Thermistor Resistance (10k Ohm) for FP1, FP2, HWL, LWT and LLT (EWT with Performance Option)		Thermistor Resistance (1k Ohm) for compressor discharge line, suction line, LAT, compressor ambient and EWT	
Thermistor Temperature (°F)	Thermistor Resistance (Ohms)	Thermistor Temperature (°F)	Thermistor Resistance (Ohms)
5	75757-70117	20	974.4-973.4
14	57392-53234	25	985.4-984.4
23	43865-40771	30	996.1-995.1
32	33809-31487	35	1007.0-1006.0
41	26269-24513	40	1017.8-1016.8
50	20570-19230	45	1028.6-1027.6
59	16226-15196	50	1039.5-1038.5
68	12889-12093	55	1050.2-1049.2
77	10310-9688	60	1061.2-1060.2
86	8300-7812	65	1072.9-1071.9
95	6723-6337	70	1082.7-1081.7
104	5480-5172	75	1093.4-1092.4
113	4490-4246	80	1103.0-1102.0
122	3700-3504	85	1115.5-1114.5
131	3067-2907	90	1126.2-1125.2
140	2554-2424	95	1136.6-1135.6
149	2149-2019	100	1147.2-1146.2
		105	1158.1-1157.1
		110	1168.8-1167.8
		115	1179.4-1178.4
		120	1190.1-1189.1
		125	1200.3-1199.3
		130	1212.2-1211.2

4/24/12

4/24/12

Antifreeze Corrections

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

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

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

Antifreeze Correction Example

Antifreeze solution is Propylene Glycol 20% by weight. Determine the corrected heating and cooling performance at 30°F and 90°F respectively as well as pressure drop at 30°F for a 033 operating at 100% capacity.
The corrected cooling capacity at 90°F would be: 30,500 Btu/h x 0.969 = 29,554 Btu/h
The corrected heating capacity at 30°F would be: 34,100 Btu/h x 0.913 = 31,133 Btu/h
The corrected pressure drop at 30°F and 11.5 gpm would be: 7.9 feet of head x 1.270 = 10.03 feet of head

Correction Factor Tables

Air Flow Corrections (Compressor Speeds 1-3)

Airflow		Cooling				Heating		
CFM Per Ton of Clg	% of Nominal	Total Cap	Sens Cap	Power	Heat of Rej	Htg Cap	Power	Heat of Ext
240	60	0.940	0.740	0.967	0.951	0.943	1.106	0.902
275	69	0.950	0.783	0.973	0.959	0.953	1.088	0.918
300	75	0.960	0.827	0.978	0.967	0.962	1.070	0.935
325	81	0.970	0.870	0.984	0.975	0.972	1.053	0.951
350	88	0.980	0.913	0.989	0.984	0.981	1.035	0.967
375	94	0.990	0.957	0.995	0.992	0.991	1.018	0.984
400	**100**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**
425	106	1.030	1.022	1.024	1.026	1.009	0.982	1.016
450	113	1.060	1.045	1.048	1.051	1.019	0.965	1.033
475	119	1.091	1.067	1.071	1.077	1.028	0.947	1.049
500	125	1.121	1.089	1.095	1.103	1.038	0.930	1.065
520	130	1.151	1.111	1.110	1.129	1.047	0.912	1.082

6/29/12

Air Flow Corrections (Compressor Speeds 4-12)

Airflow		Cooling				Heating		
CFM Per Ton of Clg	% of Nominal	Total Cap	Sens Cap	Power	Heat of Rej	Htg Cap	Power	Heat of Ext
240	60	0.928	0.747	0.936	0.929	0.961	1.097	0.938
275	69	0.940	0.789	0.946	0.941	0.967	1.081	0.948
300	75	0.952	0.831	0.957	0.953	0.974	1.064	0.959
325	81	0.964	0.873	0.968	0.965	0.980	1.048	0.969
350	88	0.976	0.916	0.979	0.976	0.987	1.032	0.979
375	94	0.988	0.958	0.989	0.988	0.993	1.016	0.990
400	**100**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**
425	106	1.020	1.023	1.004	1.018	1.010	0.966	1.018
450	113	1.056	1.042	1.008	1.035	1.020	0.932	1.036
475	119	1.072	1.079	1.011	1.053	1.029	0.898	1.054
500	125	1.087	1.095	1.015	1.070	1.039	0.865	1.071
520	130	1.099	1.113	1.019	1.088	1.049	0.831	1.089

6/14/12

Cooling Capacity Corrections

Entering Air	Total Clg	Sensible Cooling Capacity Multipliers - Entering DB ° F										Power	Heat of
WB ° F	Cap	60	65	70	75	80	80.6	85	90	95	100	Input	Rejection
55	0.898	0.723	0.866	1.048	1.185	*	*	*	*	*	*	0.985	0.913
60	0.912		0.632	0.880	1.078	1.244	1.260	*	*	*	*	0.994	0.927
63	0.945			0.768	0.960	1.150	1.175	*	*	*	*	0.996	0.954
65	0.976			0.694	0.881	1.079	1.085	1.270	*	*	*	0.997	0.972
66.2	0.983			0.655	0.842	1.040	1.060	1.232	*	*	*	0.999	0.986
67	**1.000**			0.616	0.806	1.000	1.023	1.193	1.330	1.480	*	**1.000**	**1.000**
70	1.053				0.693	0.879	0.900	1.075	1.205	1.404	*	1.003	1.044
75	1.168					0.687	0.715	0.875	1.040	1.261	1.476	1.007	1.141

NOTE: *Sensible capacity equals total capacity at conditions shown. 1/5/2017

Heating Capacity Corrections

Ent Air DB °F	Heating Corrections		
	Htg Cap	Power	Heat of Ext
45	1.062	0.739	1.158
50	1.050	0.790	1.130
55	1.037	0.842	1.096
60	1.025	0.893	1.064
65	1.012	0.945	1.030
68	1.005	0.976	1.012
70	**1.000**	**1.000**	**1.000**
75	0.987	1.048	0.970
80	0.975	1.099	0.930

1/5/17

Compressor Resistance

Model	Compressor Model No.	Winding Resistance 208-230/60/1
033	VRJ028UKNP6	0.255
042	VRJ035UKNP6	0.210
050	VRJ044UKNP6	0.210

03/26/20

VRJ scroll compressors are equipped with an IPM (permanent magnet motor). Winding resistance is the resistance between indicated terminal pins at 77˚F (Resistance value ± 7%). Winding resistance is generally low and it requires adapted tools for precise measurement. Use a digital ohm-meter capable of connecting a 4 wire probe. Use the 4 Wire Kelvin method and measure resistances under stabilized ambient temperature. Winding resistance varies strongly with winding temperature; If the compressor is stabilized at a different value than 77˚F, the measured resistance must be corrected with the following formula:

$$R_{tamb} = R_{77^\circ F} \frac{a + t_{amb}}{a + t_{77^\circ F}}$$

$t_{77^\circ F}$: reference temperature = 77˚F
t_{amb} : temperature during measurement (˚F)
$R_{77^\circ F}$: winding resistance at 77˚F
R_{tamb} : winding resistance at t_{amb}
a : Coefficient a = 390

Refrigerant Circuit Guideline

Symptom	Head Pressure	Suction Pressure	Compressor Amp Draw	Superheat	Subcooling	Air Temp. Differential	Water Temp. Differential
Under Charged System (Possible Leak)	Low	Low	Low	High	Low	Low	Low
Over Charged System	High	High	High	Normal	High	Normal/Low	Normal
Low Air Flow Heating	High	High	High	High/Normal	Low	High	Low
Low Air Flow Cooling	Low	Low	Low	Low/Normal	High	High	Low
Low Water Flow Heating	Low/Normal	Low/Normal	Low	Low	High	Low	High
Low Water Flow Cooling	High	High	High	High	Low	Low	High
High Air Flow Heating	Low	Low	Low	Low	High	Low	Low
High Air Flow Cooling	Low	High	Normal	High	Low	Low	Normal
High Water Flow Heating	Normal	Low	Normal	High	Normal	Normal	Low
High Water Flow Cooling	Low	Low	Low	Low	High	Normal	Low
Low Indoor Air Temperature Heating	Low	Low	Low	Normal	High	Normal	Normal/High
Low Indoor Air Temperature Cooling	Low	Low	Low	Normal/Low	High	Low	Low
High Indoor Air Temperature Heating	High	High	High	Normal/High	Normal/Low	Low	Normal
High Indoor Air Temperature Cooling	High	High	High	High	Low	Low	High
Restricted EEV (Check Service Advisory)	High	Low	Normal/Low	High	High	Low	Low
Insufficient Compressor (Possible Bad Valves)	Low	High	Low	High	Normal/High	Low	Low
Scaled Coaxial Heat Exchanger Heating	Low	Low	Low	Normal/Low	High	Low	Low
Scaled Coaxial Heat Exchanger Cooling	High	High	High	Normal/Low	Low	Low	Low
Restricted Filter Drier	Check temperature difference (delta T) across filter drier.						

6/1/12

Heat of Extraction/Rejection

Full Load Performance

Model		GPM	Heat of Extraction (MBtuh)				GPM	Heat of Rejection (MBtuh)				
			30°F	50°F	70°F	90°F		30°F	50°F	70°F	90°F	110°F
033	Full Load	6.0	22.4	29.9	38.3	45.1	4.5	39.4	41.9	38.9	37.7	36.7
		9.0	23.1	31.3	40.9	48.2	6.5	39.6	42.3	39.7	38.4	37.5
		12.0	23.7	32.1	42.2	49.9	9.0	39.9	42.6	39.9	38.6	37.6
042	Full Load	9.0	26.3	36.2	51.0	52.5	6.0	44.5	53.9	52.3	47.0	43.8
		12.0	28.8	40.1	51.4	58.7	8.5	44.7	53.9	51.4	46.3	43.5
		15.0	29.9	41.7	54.2	62.6	11.0	45.1	53.8	51.7	47.1	44.4
050	Full Load	9.0	34.8	47.9	62.5	74.4	9.0	54.6	64.6	62.8	59.5	57.3
		13.5	38.3	51.4	66.4	57.7	11.5	54.9	65.0	62.4	59.6	57.4
		18.0	38.7	52.5	68.5	78.9	14.0	55.3	65.4	62.7	59.9	57.5

Note: operation not recommended in shaded areas. 12/26/2019

Operating Parameters

Unit Operating Parameters

NVZ050 - Comp Speed 9 - 1600 CFM

Entering Water Temp °F	Water Flow	Cooling -- No Hot Water Generation					
		Suction Pressure psig	Discharge Pressure psig	Superheat	Subcooling	Water Temp Rise °F	Air Temp Drop °F DB
30	14.0	95-105	147-157	35-45	7-12	8-12	17-25
50	14.0	120-130	205-215	8-14	6-12	8-12	19-25
70	14.0	128-138	272-282	8-14	6-12	8-12	19-25
90	14.0	135-145	350-360	8-13	9-14	8-12	17-22
110	14.0	138-148	450-460	7-12	10-18	8-12	17-22

NVZ050 - Comp Speed 12 - 2200 CFM

Entering Water Temp °F	Water Flow	Heating - No Hot Water Generation					
		Suction Pressure psig	Discharge Pressure psig	Superheat	Subcooling	Water Temp Drop °F	Air Temp Rise °F DB
30	18.0	72-80	336-346	7-12	15-25	4-8	20-26
50	18.0	105-115	390-400	8-13	15-25	4-8	24-30
70	18.0	145-155	442-452	8-13	8-15	6-10	35-40
90	18.0	170-180	460-470	15-22	8-15	8-12	39-45

Unit Operating Parameters

NVZ042 - Comp Speed 9 - 1400 CFM

Entering Water Temp °F	Water Flow	Cooling -- No Hot Water Generation					
		Suction Pressure psig	Discharge Pressure psig	Superheat	Subcooling	Water Temp Rise °F	Air Temp Drop °F DB
30	11.0	105-115	140-150	5-45	4-10	8-13	19-25
50	11.0	132-139	198-208	10-14	2-8	8-13	19-25
70	11.0	138-148	260-270	10-14	4-10	8-13	18-24
90	11.0	142-152	343-348	10-14	4-10	7-12	17-23
110	11.0	140-147	340-350	10-14	7-14	7-12	17-23

NVZ042 - Comp Speed 12 - 1800 CFM

Entering Water Temp °F	Water Flow	Heating - No Hot Water Generation					
		Suction Pressure psig	Discharge Pressure psig	Superheat	Subcooling	Water Temp Drop °F	Air Temp Rise °F DB
30	15.0	77-85	305-315	6-12	8-12	3-8	15-25
50	15.0	110-117	345-355	7-12	6-11	5-9	26-32
70	15.0	150-158	383-393	7-12	2-7	8-12	32-37
90	15.0	174-180	415-425	11-19	2-7	8-12	32-38

Unit Operating Parameters

NVZ033 - Comp Speed 9 - 1200 CFM

Entering Water Temp °F	Water Flow	Cooling -- No Hot Water Generation					
		Suction Pressure psig	Discharge Pressure psig	Superheat	Subcooling	Water Temp Rise °F	Air Temp Drop °F DB
30	9.0	118-126	150-156	14-22	8-16	7-12	17-25
50	9.0	130-138	200-207	10-17	8-16	7-12	17-25
70	9.0	135-142	264-272	8-14	8-16	6-10	17-25
90	9.0	141-148	348-356	8-14	9-18	6-10	16-21
110	9.0	145-152	452-462	8-14	9-18	6-10	16-21

NVZ033 - Comp Speed 12 - 1500 CFM

Entering Water Temp °F	Water Flow	Heating - No Hot Water Generation					
		Suction Pressure psig	Discharge Pressure psig	Superheat	Subcooling	Water Temp Drop °F	Air Temp Rise °F DB
30	12.0	80-86	298-306	8-14	5-10	3-7	17-22
50	12.0	112-118	330-336	8-14	5-10	4-9	23-28
70	12.0	149-156	365-374	8-14	2-7	4-9	30-35
90	12.0	180-186	402-409	15-22	2-7	7-11	35-40

12/27/2019

Air Handler EA Corrections

EA Corrections
Cooling Capacity Corrections

Entering Air WB ºF	Total Clg Cap	Sensible Cooling Capacity Multipliers - Entering DB ºF										Power Input	Heat of Rejection
		60	65	70	75	80	80.6	85	90	95	100		
55	0.898	0.723	0.866	1.048	1.185	*	*	*	*	*	*	0.985	0.913
60	0.912		0.632	0.880	1.078	1.244	1.260	*	*	*	*	0.994	0.927
65	0.967			0.694	0.881	1.079	1.085	1.270	*	*	*	0.997	0.972
66.2	0.983			0.655	0.842	1.040	1.060	1.232	*	*	*	0.999	0.986
67	**1.000**			0.616	0.806	**1.000**	1.023	1.193	1.330	*	*	**1.000**	**1.000**
70	1.053				0.693	0.879	0.900	1.075	1.250	1.404	*	1.003	1.044
75	1.168					0.687	0.715	0.875	1.040	1.261	1.476	1.007	1.141

Note: * Sensible capacity equals total capacity at conditions shown. 03/25/20

Heating Corrections

Ent Air DB °F	Htg Cap	Power	Heat of Ext
45	1.062	0.739	1.158
50	1.050	0.790	1.130
55	1.037	0.842	1.096
60	1.025	0.893	1.064
65	1.012	0.945	1.030
68	1.005	0.976	1.012
70	**1.000**	**1.000**	**1.000**
75	0.987	1.048	0.970
80	0.975	1.099	0.930

03/25/20

SVH Blower Performance Data

Variable Speed ECM

Model	Max ESP	Speed 1	Speed 2	Speed 3	Speed 4	Speed 5	Speed 6	Speed 7	Speed 8	Speed 9	Speed 10	Speed 11	Speed 12
033	0.75	**250**	**400 G**	**550 L**	**650**	**750**	**850**	1000	1150	1250 H	1350 Aux	1450	1600
042	0.75	**250**	**450 G**	**650 L**	**800**	**950**	**1050**	1200	1350	1450	1600 H	1750 Aux	1850
050	0.75	**300**	**550 G**	**800 L**	**1000**	**1150**	**1300**	1450	1600	1750	1900 H	2050 Aux	2200
**VS Compressor Speed				1-2	3-4		5-6	7-8		9-10	11-12		

4/15/2020

** VS Compressor speed is given for the factory default cfm settings. When the cfm default settings are changed it will change the relationship to the compressor speed that is shown in the table. In cooling mode compressor speeds 10-12 are only available when SuperBoost mode is selected at the thermostat.

Factory settings are at recommended G, L , H and Aux positions

“G” may be located anywhere within the airflow table.

“L” setting should be located within the boldface CFM range

“H” setting MUST be located within the shaded CFM range

“Aux” setting MUST be equal to or higher than factory setting shown in the table above

CFM is controlled within 5% up to the maximum ESP

SVH Blower Performance Data cont.

Setting Blower Speed - Variable Speed ECM

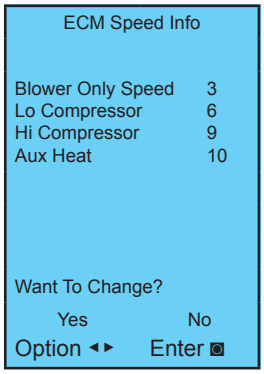
The ABC board's Yellow Config LED will flash the current ECM blower speed selections for "G", low, and high continuously with a short pause in between. The speeds can also be confirmed with the AID Tool under the Setup/ ECM Setup screen. The Aux will not be flashed but can be viewed in the AID Tool. The ECM blower motor speeds can be field adjusted with or without using an AID Tool.

ECM Setup without an AID Tool

The blower speeds for "G", Low (Y1) and High (Y2) 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 ECM Configuration Mode portion of the Aurora 'Base' Control System section. The Aux blower speed will remain at default or current settings, and requires the AID tool for adjustments.

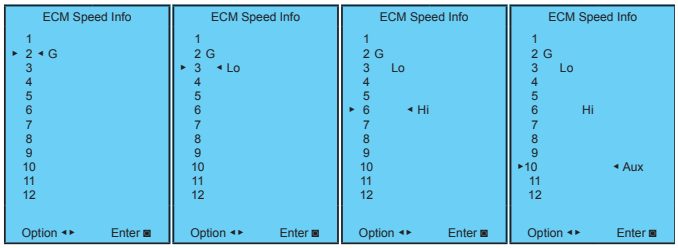
ECM Setup with an AID Tool

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 ECM settings. It allows the technician to enter the setup screens to change the ECM settings. Change the highlighted item using the ◂ and ▸ buttons and then press the ◙ button to select the item.



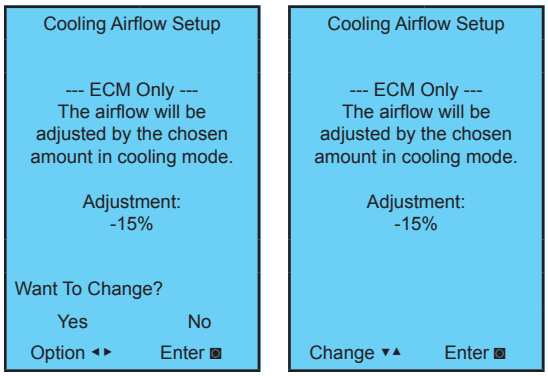
Selecting YES will enter ECM speed setup, while selecting NO will return to the previous screen.

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



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

Cooling Airflow Setup - These screens allow the technician to select -15%, -10%, -5%, None or +5%. Change the adjustment percentage using the ▲ and ▼ buttons. Press the ◙ button to save the change.



Unit Startup (NVZ Compressor Section)

Before Powering Unit, Check the Following:

NOTE: Remove and discard the compressor hold down shipping bolt located at the front of the compressor mounting bracket.

- **Dip switches are set correctly.**
- **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.
- Hot water generator pump switch is "OFF" unless piping is completed and air has been purged.
- Variable speed drive filter is clean and in place.
- Service/access panels are in place.

Powering The Controls

Initial Configuration of the Unit

Before operating the unit, apply power and complete the following Aurora Startup procedure for the controls configuration. An AID Tool is required for setup, configuration, and troubleshooting on the 7 Series Variable Speed system. AID Tool version 2.10 or greater is necessary for AHB and EEV1 set up.

1. Configure Aurora Screen

a. Confirm AXB is added and communicating.
b. Confirm AHB is added and communicating.
c. Confirm AOC is added and communicating.
d. Confirm MOC is added and communicating.
e. Confirm EEV1 is added and communicating.
f. Confirm EEV2 is added and communicating.
g. Confirm IntelliZone2 is added and communicating if installed. Set zoning system to OFF.
h. Confirm communicating thermostat is added and communicating if IntelliZone2 is not installed. Set thermostat mode to OFF.

NOTE: The AOC and MOC are the two boards that comprise the VS drive.

2. Aurora Setup Screen

a. ECM Setup for Heating Airflow – select G, low, high and aux blower speeds as appropriate for the unit and electric heat.
b. Cooling Airflow % – sets the cooling airflow % from heating airflow. Factory setting is -15%
c. AXB Setup
    i. DHW Enable – Ensure air is purged from HW system before enabling (remember the HW switch on the front cabinet)
    ii. DHW Setpoint – 130 °F is the default but can be changed from 100 to 140 °F
    iii. 7 Series Variable Speed Pump Setup and Modulating Water Valve Setup – Can be setup to a range between 5% and 100%. Defaults are 50% and 100%. A minimum of 65% is recommended for modulating water valve Minimum setting.
        - From the Main Menu of the AID Tool go to AXB Setup and select "Yes" at the bottom of the screen to Make Changes
        - Set VS Pump Control to MIN
        - The pump(s) or water valve should begin to operate and flow rate is visible on this screen, it may take several seconds for flow to stabilize. Adjust the minimum % until the minimum flow rate is achieved.
        - Go back to Set VS Pump Control and select MAX.
        - The pump(s) or water valve should begin to operate and flow rate is visible on this screen, it may take several seconds for flow to stabilize. Adjust the maximum % until the maximum flow rate is achieved.
        - Press Enter.
d. Sensor Kit Setup
    i. Brine Selection – for HE/HR capacity calculation
    ii. Flow Meter – activates the flow meter
    iii. Pump - Select the correct flow center option using table 1. If using an open system select "Open Loop." This selection is used to calculate the system pumping watts.
    iii. Activate energy option
    iv. Select blower energy – ECM 208-230
    v. Line Voltage calibration – Voltmeter required to calibrate line voltage during heating or cooling. Refer to Line Voltage Calibration in this manual for more details.
e. Smart Grid Setup – Select action option for utility received On Peak signal
f. Home Automation 1 and 2 Setup – Select type of sensor for two home automation inputs.

Unit Startup (NVZ Compressor Section) cont.

Configuring the Sensor Kits

Configuring the Sensor kits

The Aurora Advanced Control allows Refrigeration, Energy, and Performance Monitoring sensor kits. These kits are factory installed. The following description is for field activation of a factory installation of the sensor kits.

Table 1

Sensor Kit Setup Screen in AID TOOL for Flow Center			
FC1	**FC2**	**VS Pump**	**VS X2 Pump**
FC1-GL	FC2-GL	FCV1B-GL	FCV2B-GL
FC1-FPT	FC2-FPT		
FC1-GLNP	FC2-GLNP	FCV1B-GLNPP	FCV2B-GLNPP
FC2-GLNPD	FC4-GLNPD		
FC3-GLNPD (right side)	FC3-GLNPD (left side)		
FCV2AB-GLNPD (right side)		FCV2AB-GLNPD (left side)	
		FCV2BB-GLNPD (right & left side)	
		FCV3CB-GLNPD (right side)	FCV3CB-GLNPD (left side)
			FCV4AB-GLNPD (right & left side)

Energy Monitoring

(Standard Sensor Kit Variable Speed Models)

The Energy Monitoring Kit includes two current transducers (fan and electric heat on the AHB board) added to the existing compressor drive sensor so that the complete power usage of the heat pump can be measured. The AID Tool provides configuration detail for the type of blower motor and a line voltage calibration procedure to improve the accuracy. This information can be displayed on the AID Tool or selected communicating thermostats. The TPCM32U04A will display instantaneous energy use while the color touchscreen TPCC32U01 will in addition display a 13 month history in graph form. Ensure the Energy Kit has been enabled by accessing the 'Sensor Kit Setup' in the AID Tool and complete the following:

a. Select 'Blower Energy' – PSC or ECM/5-Speed ECM
b. Activate 'Energy Option' to activate the sensors on for compressor (2), blower and aux heat current sensor.
c. Select 'Pump' option of FC1, FC2, VS Pump, VS +26-99, or open loop (see Table 1)
d. Line Voltage Calibration – Voltmeter required to calibrate line voltage during heating or cooling.
    i. Turn on Unit in Heating or Cooling .
    ii. Use multimeter at L1 and L2 to measure line voltage
    iii. In the Sensor Kit Setup screen adjust the 'Base Voltage' to the nearest value to that is measured
    iv. Then use the 'Fine Adjust' to select the exact voltage being measured at L1 and L2.
    v. Exit 'Sensor Setup' Screen
e. Energy monitoring can be read on any of the following components:
    i. AID Tool – instantaneous information only
    ii. TPCM32U04A Communicating Thermostat (B/W) - instantaneous information only
    iii. TPCC32U01 Color Touchscreen Thermostat – Both Instantaneously and historical (13 months)
    iv. WaterFurnace Web Portal via AWL device connected to Aurora

Refrigerant Monitoring

(Standard on Variable Speed Models)

The 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 will only be displayed on the AID Tool. Ensure the Refrigerant Monitoring has been setup by accessing the 'Sensor Kit Setup' in the AID Tool and complete the following:

Once sensors are installed for discharge pressure, suction pressure, suction line, liquid line cooling, liquid line heating, and leaving air temperature no further setup is required.

a. Turn on unit in Heating or Cooling.
b. Use the AID Tool to view the refrigerant performance in the 'Refrigerant Monitor' screen.
c. Refrigerant monitoring can be read on any of the following components:
    i. AID Tool – instantaneous information only
    ii. WF Web Portal via AWL device connected to Aurora

Performance Monitoring

(Standard Sensor Kit)

The 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 AID Tool for selection of water or antifreeze. Ensure the Performance Kit has been enabled by accessing the 'Sensor Kit Setup' in the AID Tool and complete the following:

a. Select 'Brine' – and then choose Water or Antifreeze for the proper factor
b. Activate 'Flowmeter' to activate the flow sensor select the appropriate 3/4 in., 1 in., or none (1 in. is standard on variable speed units).
c. Exit 'Sensor Kit Setup' screen.
    i. Enter the AXB Setup Screen and turn the VS Pump Control ON
    ii. Then set the VS Pump Min % to achieve at least 2.5 gpm per ton for part load operation.

Unit Startup (NVZ Compressor Section) cont.

iii. Then set the VS Pump Max % to achieve at least 3.0 gpm per ton for full load operation.

d. Turn on unit in Heating or Cooling.
e. Use the AID Tool to view the performance in the 'Performance Monitor' screen.
f. Performance monitoring can be read on any of the following components:
   i. AID Tool – instantaneous information only
   ii. WaterFurnace Web Portal via AWL device connected to Aurora

Recommended Minimum/Maximum Flow Rates

Model and Size	Closed Loop		Open Loop	
	Min. Flow Rate	Max. Flow Rate	Min. Flow Rate	Max. Flow Rate
	GPM	GPM	GPM	GPM
033	5.0	12.0	5.0	8.0
042	5.0	15.0	5.0	10.0
050	5.0	18.0	5.0	12.0

3/18/2020

SVH Air Handler Start Up

- **Check that supply voltage matches nameplate data.**
- **Fuses, breakers and wire size are correct.**
- **Confirm that the 15kW or 20kW auxiliary heat kit is wired correctly (see "Electrical Data" section if applicable).**
- **Low voltage wiring is complete.**
- Condensate line is open and correctly pitched.
- Transformer switched to 208v if applicable.
- DIP switches are set correctly.
- Blower rotates freely.
- Blower speed is 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° cooling.
- Check air coil cleanliness to ensure 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.

Powering The SVH Controls

Confirm that

1. **Dipswitch 1 on SW1 on the AHB board is set in the OFF position.**
2. **Aurora Setup Screen**
   a. ECM Setup for Heating Airflow - select "G", low, high and aux blower speeds as appropriate for the unit and electric heat.
   b. Cooling Airflow % - sets the cooling airflow % from heating airflow. Factory setting is -15%.

See Compressor Section for more control instructions.

Ethernet Cable

A 100 foot Cat6 Ethernet cable is shipped with the air handler in the 985506-01 SVH Installation Kit. This cable can be plugged into the backside of the Ethernet port located on the top panel of the air handler. The cable then can be routed and connected into the AID Tool port on the compressor section. The installer will then be able to plug the AID Tool into the Ethernet port on the air handler giving him control of the compressor section. If the compressor section is connected to Symphony, the Ethernet cable would connect to the AID Tool port on the back of the Symphony router. If the installer was using the AID Tool and the compressor section equipped with Symphony, the Ethernet cable from the air handler would need to be unplugged, and replaced with the AID Tool cable. The maximum Cat6 cable length should be kept to 150ft or less.

SVH Air Handler Unit Startup cont.

Startup Steps

NOTE: Complete the Equipment Startup/Commissioning Check Sheet during this procedure. Refer to thermostat operating instructions and complete the startup procedure. Verify that the compressor shipping bolt has been removed.

1. Initiate a control signal to energize the blower motor. Check blower operation through the AID Tool.
2. Initiate a control signal to place the unit in the cooling mode. Cooling setpoint must be set below room temperature.
3. First stage cooling will energize after a time delay.
4. Be sure that the compressor and water control valve or loop pump(s) are activated.
5. 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 unit performance data in catalog or view on the AID Tool if Performance Kit is installed.
6. Check the temperature of both the supply and discharge water (see the Unit Operating Parameters tables).
7. Check for an air temperature drop of 15°F to 25°F across the air coil (cooling compressor speed 9), depending on the blower speed and entering water temperature.
8. Decrease the cooling set point several degrees and verify high-speed blower operation.
9. Adjust the cooling setpoint above the room temperature and verify that the compressor and water valve or loop pumps deactivate.
10. Initiate a control signal to place the unit in the heating mode. Heating set point must be set above room temperature.
11. First stage heating will energize after a time delay.
12. Check the temperature of both the supply and discharge water (see the Unit Operating Parameters tables).
13. Check for an air temperature rise of 12°F to 35°F across the air coil (heating compressor speed 12), depending on the fan speed and entering water temperature.
14. If auxiliary electric heaters are installed, increase the heating setpoint until the electric heat banks are sequenced on (must get to compressor speed 12 before auxiliary heat enables). All stages of the auxiliary heater should be sequenced on when the thermostat is in the Emergency Heat mode. Check amperage of each element.
15. Adjust the heating setpoint below room temperature and verify that the compressor and water valve or loop pumps deactivate.
16. During all testing, check for excessive vibration, noise or water leaks. Correct or repair as required.
17. Set system to desired normal operating mode and set temperature to maintain desired comfort level.
18. 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.

Reference Calculations

Heating Calculations:	Cooling Calculations:
$LWT = EWT - \frac{HE}{gpm \times 500}$	$LWT = EWT + \frac{HR}{gpm \times 500}$
$LAT = EAT + \frac{HC}{cfm \times 1.08}$	$LAT\ (DB) = EAT\ (DB) - \frac{SC}{cfm \times 1.08}$
	$LC = TC - SC$
$TH = HC + HW$	$S/T = \frac{SC}{TC}$

Legend

Abbreviations and Definitions

cfm = airflow, cubic feet/minute
EWT = entering water temperature, Fahrenheit
gpm = water flow in gallons/minute
WPD = water pressure drop, psi and feet of water
EAT = entering air temperature, Fahrenheit (dry bulb/wet bulb)
HC = air heating capacity, MBtu/h
TC = total cooling capacity, MBtu/h
SC = sensible cooling capacity, MBtu/h
kW = total power unit input, kilowatts
HR = total heat of rejection, MBtu/h
HE = total heat of extraction, MBtu/h
HWC = hot water generator capacity, MBtu/h
EER = Energy Efficient Ratio
= Btu output/Watt input
COP = Coefficient of Performance
= Btu output/Btu input
LWT = leaving water temperature, °F
LAT = leaving air temperature, °F
TH = total heating capacity, MBtu/h
LC = latent cooling capacity, MBtu/h
S/T = sensible to total cooling ratio

Troubleshooting

Aurora Control System

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

To check the unit control board for proper operation:

1. General Check
   - If any new device was installed, or any wiring was changed, check the connections to ensure the wiring is correct, and all the wires are in good condition.
   - Verify all the plugs are securely connected and in good condition.
   - Check the DIP switch (SW2) positions are correct.
   - Measure 24 VAC between R and C. (The actual reading may be from 18 to 30 VAC). Check the incoming power and the power transformer if the R and C voltage reading is not correct.
2. No LEDs are On
   - Check 24 VAC on board.
   - Check the 3 amp fuse. Replace the fuse if needed.
   - Verify transformer circuit breaker has not tripped if no low voltage is present.
   - Disconnect the thermostat connection P1.
   - Replace the Aurora base control board.

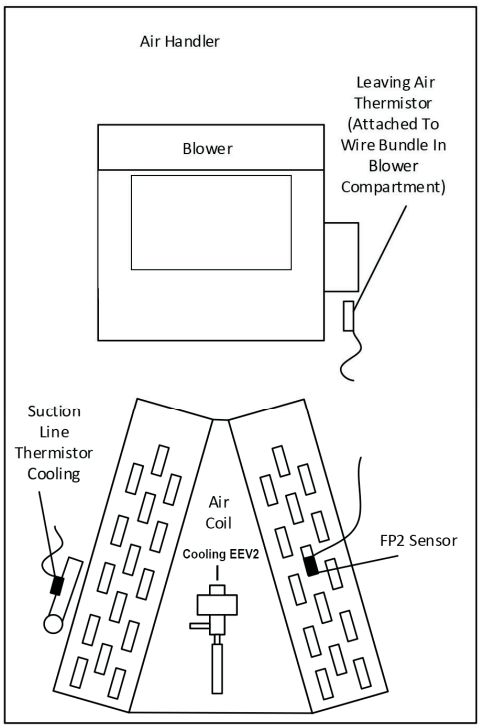
Refrigerant Systems

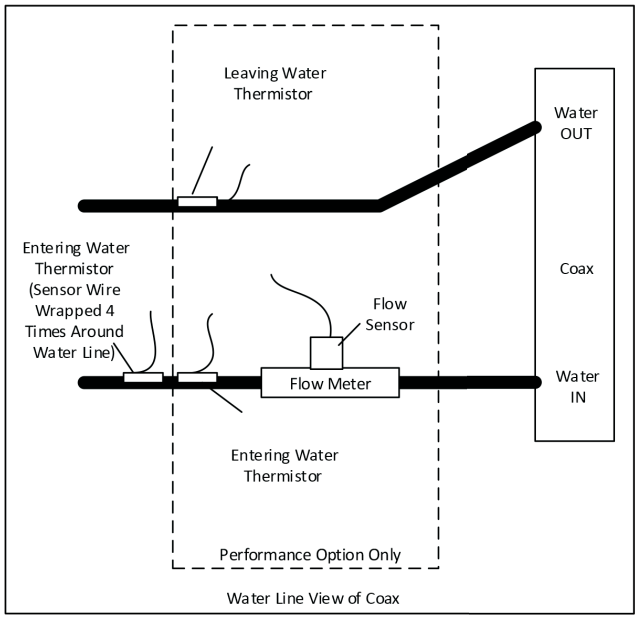
Refrigerant pressures are monitored by the control system; to maintain sealed circuit integrity, do not install service gauges unless pressure sensor is suspected to be inoperative. Compare the change in temperature on the air side as well as the water side to the Unit Operating Parameters tables. If the unit's performance is not within the ranges listed, make sure the airflow and water flow are correct. Check superheat and subcooling with an AID Tool. If superheat and subcooling are outside recommended ranges, an adjustment to the refrigerant charge may be necessary.

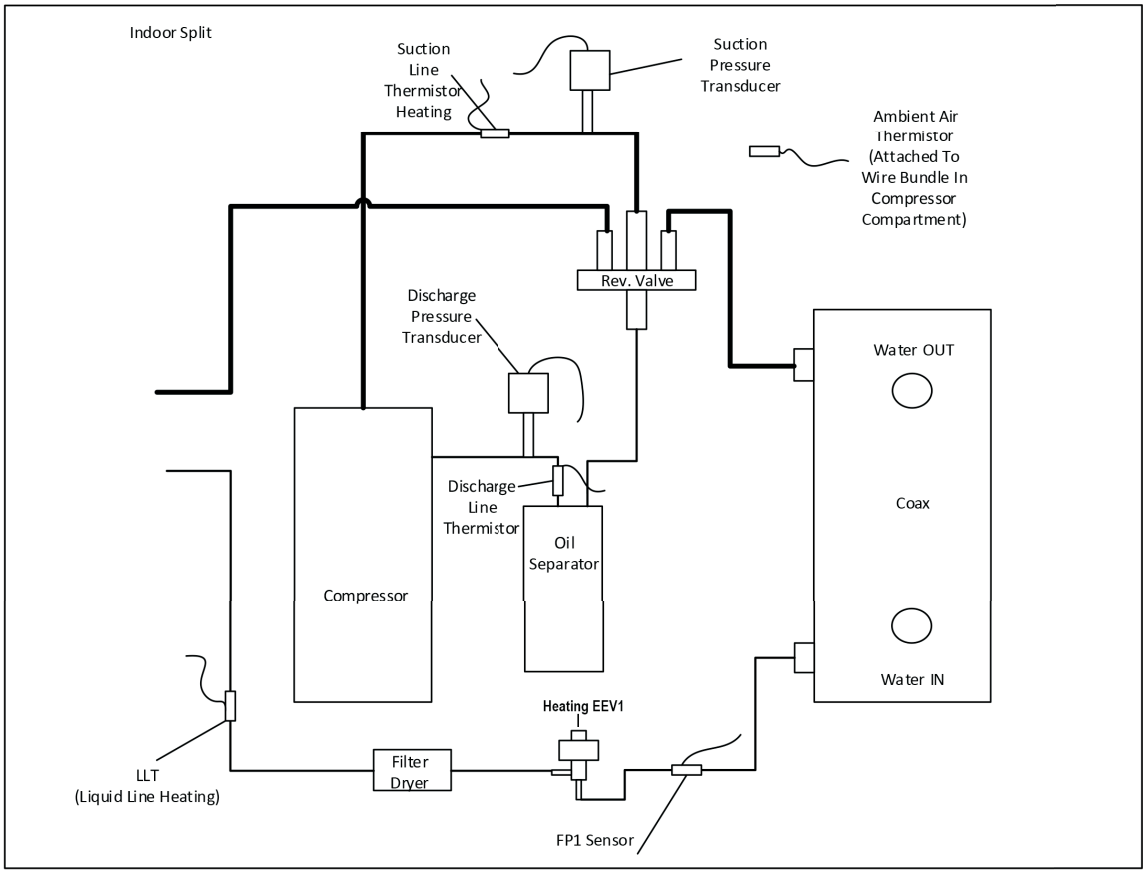
NOTE: Refrigerant tests must be made with hot water generator turned "OFF". Verify that air and water flow rates are at proper levels before servicing the refrigerant circuit.

Troubleshooting cont.

7 Series Sensor Locations

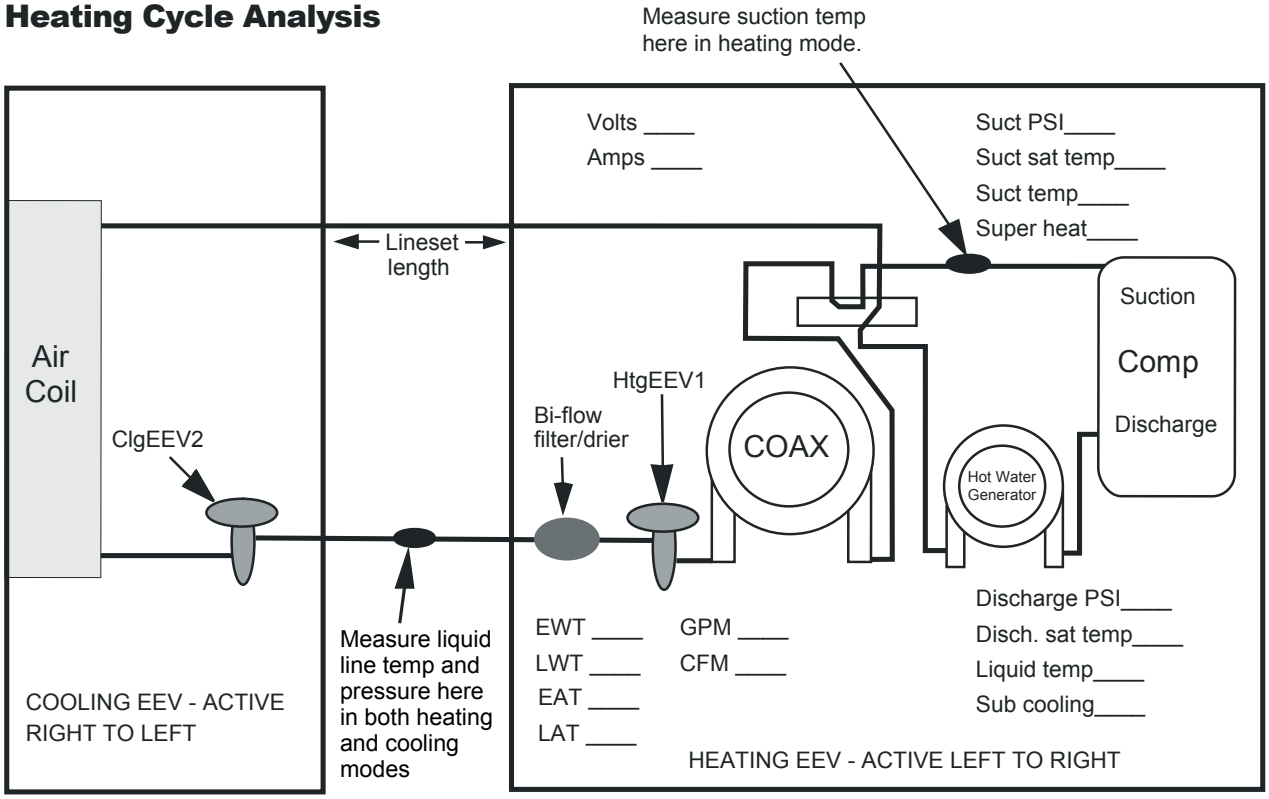






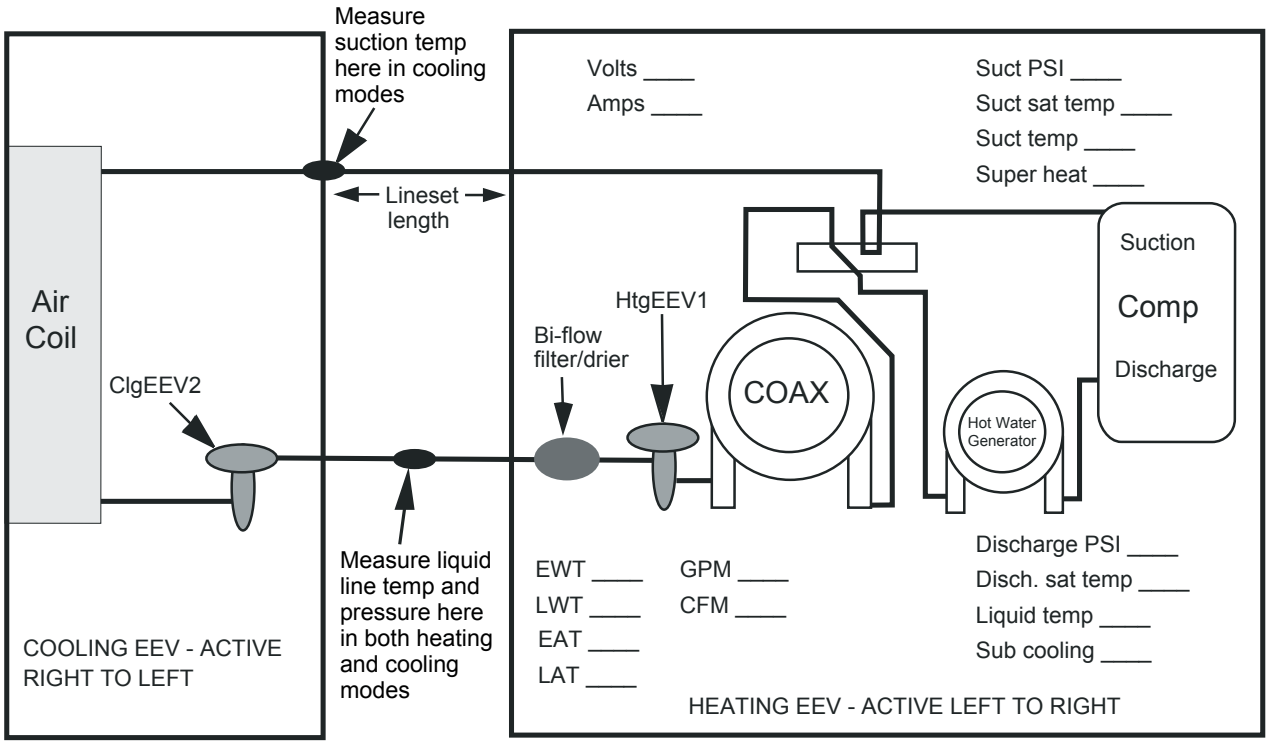
Unit Startup/Troubleshooting

Heating Cycle Analysis



Heat of Extraction/Rejection = GPM x 500 (485 for water/antifreeze) x ∆T
Note: DO NOT hook up pressure gauges unless there appears to be a performance problem.

Cooling Cycle Analysis



Troubleshooting cont.

Variable Speed Startup/Troubleshooting Form

1. Job Information

Model # _____ Job Name: _____ Loop: Open / Closed

Serial # _____ Install Date: _____ Hot Water Generator: Y / N

2. Flow Rate in gpm — **SOURCE COAX**

	HEATING SPEED 12	HEATING SPEED 4	COOLING SPEED 9	COOLING SPEED 3
WATER IN Pressure:	a. _____ psi	a. _____ psi	a. _____ psi	a. _____ psi
WATER OUT Pressure:	b. _____ psi	b. _____ psi	b. _____ psi	b. _____ psi
Pressure Drop: a - b	c. _____ psi	c. _____ psi	c. _____ psi	c. _____ psi
Look up flow rate in table:	d. _____ gpm	d. _____ gpm	d. _____ gpm	d. _____ gpm

3. Temperature Rise/Drop Across Coaxial Heat Exchanger[1]

	HEATING SPEED 12	HEATING SPEED 4	COOLING SPEED 9	COOLING SPEED 3
WATER IN Temperature:	e. _____ °F	e. _____ °F	e. _____ °F	e. _____ °F
WATER OUT Temperature:	f. _____ °F	f. _____ °F	f. _____ °F	f. _____ °F
Temperature Difference:	g. _____ °F	g. _____ °F	g. _____ °F	g. _____ °F

4. Temperature Rise/Drop Across Air Coil

	HEATING SPEED 12	HEATING SPEED 4	COOLING SPEED 9	COOLING SPEED 3
SUPPLY AIR Temperature:	h. _____ °F	h. _____ °F	h. _____ °F	h. _____ °F
RETURN AIR Temperature:	i. _____ °F	i. _____ °F	i. _____ °F	i. _____ °F
Temperature Difference:	j. _____ °F	j. _____ °F	j. _____ °F	j. _____ °F

5. Heat of Rejection (HR)/Heat of Extraction (HE)

Brine Factor[2]: k. _____

	HEATING SPEED 12	HEATING SPEED 4	COOLING SPEED 9	COOLING SPEED 3
HR/HE = d x g x k	l. _____ Btu/h	l. _____ Btu/h	l. _____ Btu/h	l. _____ Btu/h

STEPS 6-9 NEED ONLY BE COMPLETED IF A PROBLEM IS SUSPECTED. USE HEATING SPEED 12 AND COOLING SPEED 9 FOR STEPS 6-9.

6. Watts — ENERGY MONITOR

	HEATING SPEED 12	COOLING SPEED 9
Volts:	m. _____ Volts	m. _____ Volts
Total Amps (Comp. + Blower)[3]:	n. _____ Amps	n. _____ Amps
Watts = m x n x 0.85:	o. _____ Watts	o. _____ Watts

7. Capacity

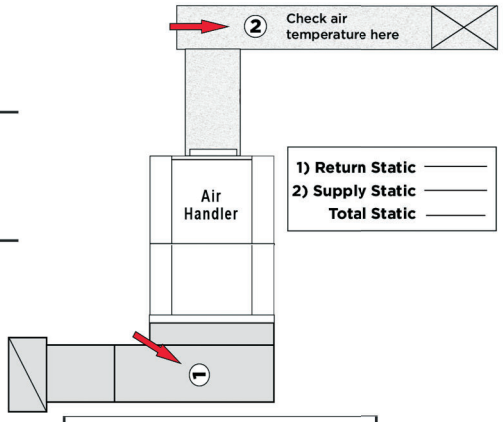
	HEATING SPEED 12	COOLING SPEED 9
Cooling Capacity = l - (o x 3.413): Heating Capacity = l + (o x 3.413):	p. _____ Btu/h	p. _____ Btu/h

8. Efficiency

	HEATING SPEED 12	COOLING SPEED 9
Cooling EER = p / o: Heating COP = p / (o x 3.413):	q. _____ Btu/h	q. _____ Btu/h

9. Superheat (S.H.)/Subcooling (S.C.)

	HEATING SPEED 12	COOLING SPEED 9
Suction Pressure:	r. _____ psi	r. _____ psi
Suction Saturation Temperature:	s. _____ °F	s. _____ °F
Suction Line Temperature:	t. _____ °F	t. _____ °F
S.H. = t - s	u. _____ °F	u. _____ °F
Head Pressure:	v. _____ psi	v. _____ psi
High Pressure Saturation Temp:	w. _____ °F	w. _____ °F
Liquid Line Temperature[4]:	x. _____ °F	x. _____ °F
S.C. = w - x	y. _____ °F	y. _____ °F



Software Version

ABC: _____
AXB: _____
IZ2: _____
TSTAT: _____
AOC: _____
MOC: _____
EEV1 _____
EEV2: _____
AHB: _____

NOTES: [1] Steps 3-9 should be conducted with the hot water generator disconnected.

[2] Use 500 for pure water, 485 for methanol or Environol™. (This constant is derived by multiplying the weight of one gallon of water (8.34) times the minutes in one hour (60) times the specific heat of the fluid. Water has a specific heat of 1.0.

[3] If there is only one source of power for the compressor and blower, amp draw can be measured at the source wiring connection.

[4] Liquid line is between the coax and the expansion device in the cooling mode; between the air coil and the expansion device in the heating mode.

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

A SVH air filter and variable speed drive filter 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. The VS drive filter is located on the lower left corner of the cabinet. Removing the two screws in the honey comb grill allows access to the filter. Run the filter under warm water and gently rub. Let the filter dry. Then re-install the filter and cover.

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

ECM blower motors are equipped with sealed ball bearings and require no periodic oiling.

Hot Water Generator Coil

See Water Coil Maintenance section above.

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.

Compressor Section Service Parts List

	Part Description	036	048	060
Compressor	Compressor 208-230/60/1	34P647-01	34P648-01	34P649-01
	Sound Jacket	92P504A05		
	Power Harness	11P853-01		
Refrigeration Components	Coax	62I628-01	62I555-01	
	EEV	75SEVA		
	Reversing Valve	33P526-05		
	Oil Separator	36P517-01		
	Filter Dryer	36P500B01	36P500B02	
Hot Water Generator	Hot Water Generator	62P516-03		
	Hot Water Generator Pump	24P501A01		
Electrical	Contactor	13P004A03		
	2 Pole Screw Term. Block	12P500A01		
	EEV Solenoid Coil	33P617-04		
	EEV/VS Drive Communication Cable	11P965-01		
	ABC/AXB/VS Drive Communication Cable	11P836-01		
	Keystone Category 5 Coupler (AID Port)	12P553-01		
	Category 5 cable (AID Port to ABC)	11P846-01		
	Current Transformer	12P557-01		
	Rocker Switch - HWG ON/OFF	13P607A01		
	Pump Circuit Breaker - 5 amp, 250v	19P583-01		
	VS Drive Control	17P560-04	17P560-05	17P560-06
	Drive Circuit Breaker	19P595-01	19P595-02	19P595-03
	EEV Board	EEV1BRK		
	ABC Board	17X553-25		
	AXB Board	17X557-24		
Sensors & Safeties	Freeze Detection Thermistor-FP1-Yellow	12P505-09		
	HWL Thermistor-Pink (AXB P17)	12P555-04		
	Thermistor - /EWT/Suct Line/Comp Ambient (VS Drive)	12P556-12		
	Thermistor - Compressor Discharge Line	12P556-02		
	Thermistor - Heating Liquid Line	12P555-03		
	Thermistor - Leaving Water Temperature (AXB)	12P560-02		
	Thermistor - Entering Water Temperature (AXB)	12P560-01		
	Transmitter, Flow Meter (sensor, clip, harness)	29P535-01		
	Pressure Transmitter Replacement, High Pressure	SK7SHPT		
	Pressure Transmitter Replacement, Low Pressure	SK7SLPT		
	Switch, High Pressure	SKHPE600		
	Switch, Low Pressure	SKLPE40		
Miscellaneous	VS Drive Fan Filter	59P512-01		

Part numbers subject to change 5/06/2020

Air Handler Service Parts

	Part Description	033	042	020
Refrigeration	Air Coil	61P769-41		
	EEV	33P617-01		
ECM Motor & Blower	Blower Assembly	54S568-01N	54S568-02N	54S568-02N
	ECM Blower Housing	53P526-01		
	ECM Motor 208-230/60/1	14S567-01	14S567-02	14S567-02
	ECM Power Harness	11P922-01		
	ECM Control Harness	11P940-01		
Electrical	AHB Board	17X558-02		
	EEV Board	17P561-01		
	EEV Stepper Motor	33P617-04		
	Transformer 100VAC	15P519-01		
	Power Block 70 Amp 2 Pole	12P501A02		
	Ground Lug	12P004A		
	Condensate Sensor	12P504A01		
	FP2 Sensor	12P550-01		
	Leaving Air Thermistor	12P556-12		
	Suction Line Thermistor	12P556-12		
	Current Transducer(s)	12P557-01		
	4 Pole Low Voltage Block	12P570-01		
10 kW Auxiliary Heat	Limit	13P725-05		
	Fused Back Up	13P735-01		
15 kW Auxiliary Heat	Limit	13P725-05		
	Limit DPST	13P734-01		
	Fused Back Up	13P735-02		
20kW Auxiliary Heat	Limit DPST	13P734-01		
	Fused Back Up	13P735-02		
	Breaker 60 Amp	19P593-02		

4/01/2020

Revision Guide

Pages:	Description:	Date:	By:
26	Updated line set length	07 Dec 2020	MA
ALL	Document Created	23 Oct 2019	MA

Smarter from the Ground Up™

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

Product: **7 Series 700R11**
Type: Indoor Split Geothermal Heat Pump
Size: 033, 042, 050 ton Variable Speed Split
Document: Installation Manual

PROUD MEMBER

Water Source HP
ANSI/AHRI/ASHRAE/ISO13256-1

ENERGY STAR PARTNER

TESTING
ISO 17025 Accredited

IM2703SN 01/21