5 Series

Geo-Ready® Split

Geothermal Heat Pump

- R-410A Refrigerant
- 3, 4, 5 Ton Dual Capacity

5 Series Geo-Ready® Split Installation Manual

PROUD MEMBER

Intertek

ENERGY STAR PARTNER

WaterFurnace® Smarter from the Ground Up™

IM2510EW 07/24

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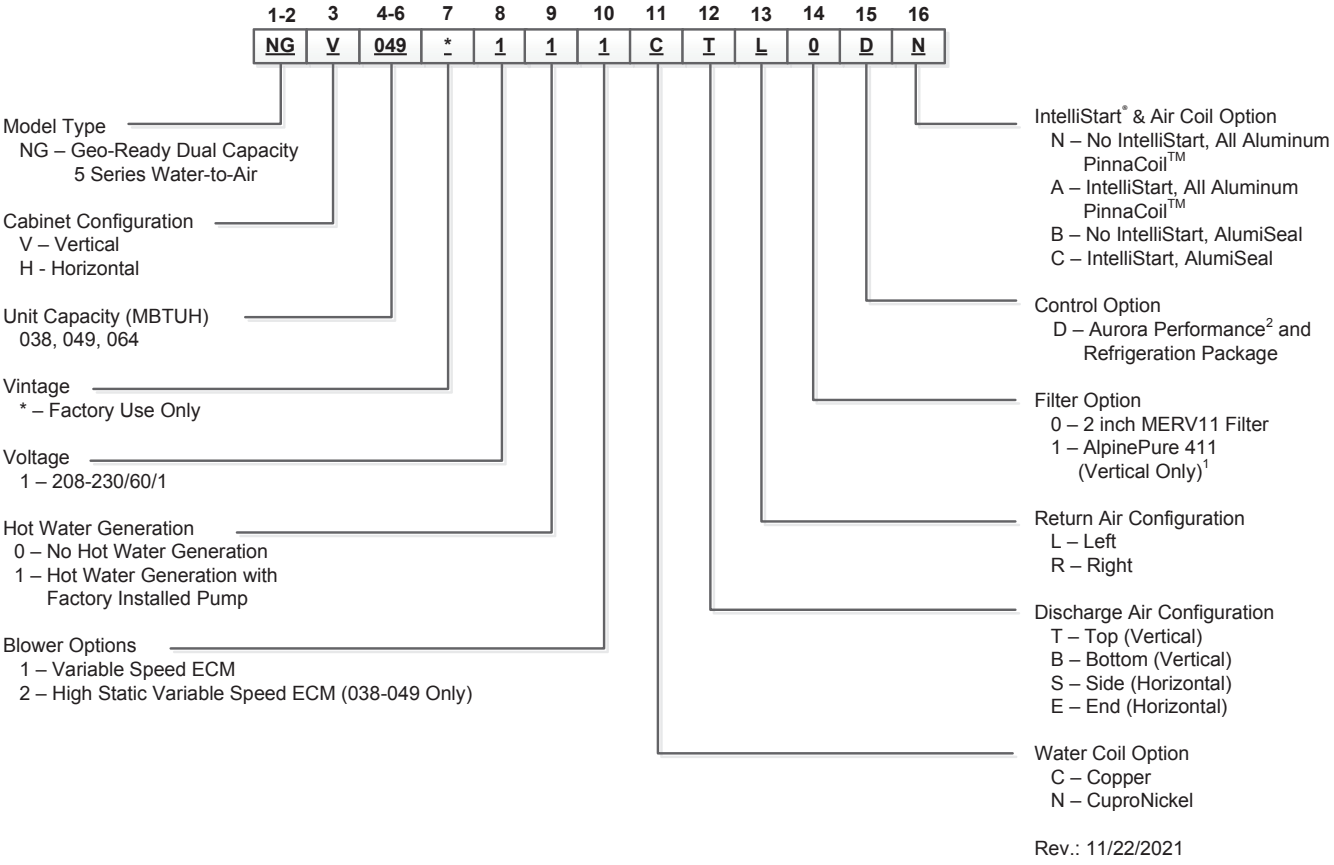
Model Nomenclature

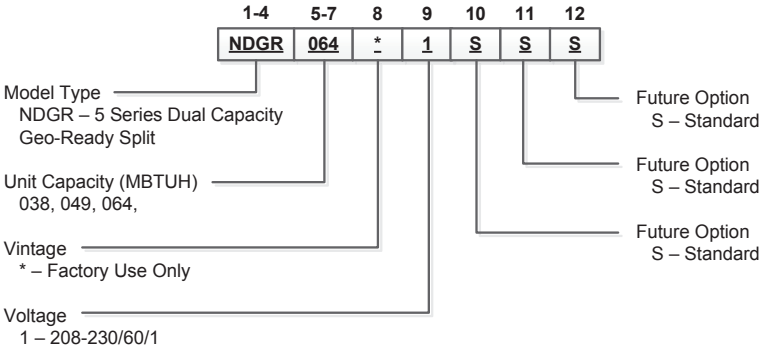
Indoor



Notes:
All Models include sound kits as std. equipment
[1] Available on vertical configurations only
[2] Performance demonstrated only when connected to ground source

Model Nomenclature Cont.

Outdoor



Rev.: 3/28/22

General Installation Information

NOTE: The Geo-Ready shall be shipped as an Air Source Heat Pump for installation. If it is intended to be installed as a Geothermal Heat Pump, please proceed to the "Air Source vs Geo Mode" Section for Conversion Steps.

Safety Considerations

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

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

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

R410A Requirements and Safety Considerations

Toxicity: R410A is low toxicity

Flammability: DOT considers R410A non-flammable

Combustibility: At pressures above one atmosphere, mixtures of air and R410A can become combustible.

Ingestion: If ingestion does occur, induce vomiting and seek medical attention.

Skin and eye contact: Avoid contact with skin and promptly flush eyes and skin with clean lukewarm water if contact is made. POE oils can cause skin irritation. Therefore gloves should be worn when handling POE lubricants. Promptly flush eyes and skin with clean lukewarm water if contact is made)

Inhalation – Inhaling high concentrations of refrigerant vapors can have a narcotic effect. A feeling of intoxication, dizziness loss of coordination and slurred speech are symptoms. Cardiac irregularities, unconsciousness, and ultimate death can result from breathing this concentration. If any of these symptoms become evident, move to fresh air and seek medical help immediately.

Refrigerant Decomposition

When refrigerants are exposed to high temperatures from open flames or heater elements, decomposition occurs. Decomposition produces toxic and irritating compounds, such as hydrogen fluoride with HFC's. The acidic vapors produced are dangerous and the area should be evacuated and ventilated.

Safety Overview

ASHRAE Standard 15 details safety precautions when handling refrigerants in commercial systems and should be read and understood. Refrigerants are especially dangerous in confined spaces.

- R410A has a much higher pressure (60%) associated with its operation and therefore has the potential for serious accidents.
- Use an R410A approved recovery device. Recovery cylinders must have a service pressure rating of 400 psig (DOT 4BA 400 and DOT 4BW 400 are acceptable).

DO NOT USE STANDARD DOT RECOVERY OR STORAGE CYLINDERS WITH A 300 PSIG RATING WITH R410A. NEVER LET A CYLINDER GET ABOVE 125°F.

- The color code for R410A cylinders is "Rose".
- A 410a specific gauge set is required. These will allow pressure measurements to 800 psig on the high side and 250 psig on the low side. Hoses will have a service rating 800 psig.
- Do not mix air and R410A. The resulting mixture can be flammable above atmospheric pressure.
- Do not mix R410A and other refrigerants. Gauges, manifold, and hoses should be evacuated after each use.
- Dedicated equipment for R410A will go a long way toward eliminating this concern.
- Consult the MSDS sheet for details on toxicity, flammability, ingestion limits etc.
- Exposure is the same as R22 – 40 hour work week.

General Installation Information

Moving and Storage

Move the indoor units in the normal “up” orientation. Horizontal units may be moved and stored per the information on the packaging. Do not stack more than three units in total height. Vertical units may be stored one upon another to a maximum height of two units. Do not attempt to move units while stacked. Outdoor units must not be 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.

Limitations

- All National, State and Local Safety Codes must be observed during unit installation.
- Maximum allowable Lineset length limitations: 60ft (NOTE: If longer than 80ft then follow instructions on the Long Line Set section.)
- Vertical Rise limitations: Max 20ft (NOTE: If more than 20ft then follow instructions on the Long Line Set section.)
- Due to the outdoor fan being a propeller type, any sort of duct work must not be installed with the outdoor unit. The outdoor fan will not operate effectively against additional external static pressure.
- Max/Min OD/ID Heating/Cooling DB operating conditions for maximum performance

Outdoor Ambient Temperature Limits		
Cooling Operation	Max DB	125˚F
	Min DB	55˚F
Heating Operation	Max DB	75˚F
	Min DB	-5˚F

Indoor Unit Location

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

Filter Rack Conversion

A 2 in. MERV 11 filter is shipped with the heat pump. To field convert the filter rack to use 1 in. filters, simply insert the provided plastic push pins into the holes located in the filter rack. There are holes on the top and bottom of the rack, underneath the instruction labels, for field conversion to 1 in. filters.

Installing Vertical Units

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

Vertical units are available in left or right air return configurations. Top and rear air discharge vertical units should be mounted level on a vibration absorbing pad slightly larger than the base to provide isolation between the unit and the floor. It is not necessary to anchor the unit to the floor (see below).

Bottomflow units should be mounted level and sealed well to floor to prevent air leakage. Bottomflow units require the supply air opening to be cut at least 1/2 in. larger than the unit’s air outlet. Protect the edges of combustible flooring with sheet metal over-wrap or other non-combustible material.

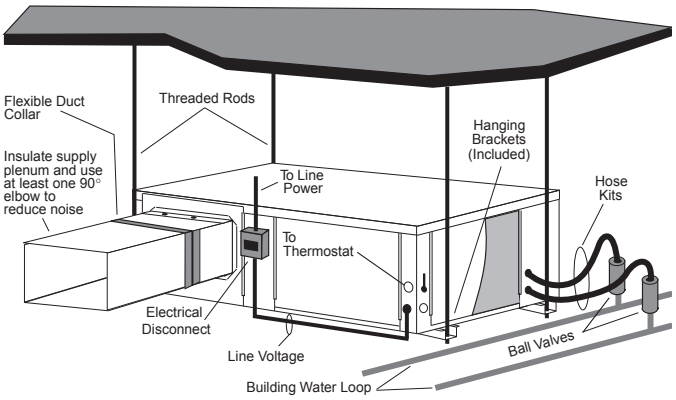
Figure 1: Vertical Unit Mounting

General Installation Information cont.

Installing Horizontal Units

Remove and discard the compressor hold down shipping bolt located at the front of the compressor mounting bracket prior to setting the unit in place. Horizontal units are available with side or end discharge. Horizontal units are normally suspended from a ceiling by four or six 3/8 in. diameter threaded rods. The rods are usually attached to the unit by hanger bracket kits furnished with each unit.

Figure 2: Horizontal Unit Mounting

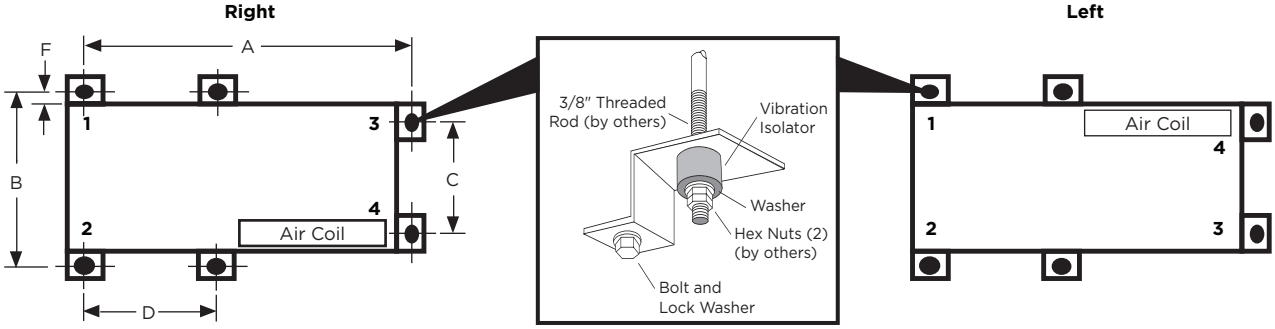


Lay out the threaded rods per the dimensions in Figure 3. Assemble the hangers to the unit as shown. Securely tighten the brackets to the unit using the weld nuts located on the underside of the bottom panel. When attaching the hanger rods to the bracket, a double nut is required since vibration could loosen a single nut. To allow filter access, one bracket on the filter side should be installed 180° from the position shown in Figure 3. The unit should be pitched approximately 1/4-inch towards the drain in both directions to facilitate the removal of condensate. Use only the bolts provided in the kit to attach hanger brackets. The use of longer bolts could damage internal parts.

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

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

Figure 3: Hanger Location and Assembly



Hanger Dimensions

Model			Hanger Kit Part Number	Unit Hanger Dimensions			
				A	B	C	D
Dual Capacity	038	in.	99S500A03	72.4	27.8	24.1	29.3
		cm.		183.9	70.6	61.2	74.4
	049	in.	99S500A03	77.4	27.8	24.1	29.3
		cm.		196.6	70.6	61.2	74.4
	064	in.	99S500A03	82.4	27.8	24.1	29.3
		cm.		209.3	70.6	61.2	74.4

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Weight Distribution

Model		Vertical Weight	Horizontal Weight	Horizontal Weight Distribution			
				Front		Back	
				1	2	3	4
Dual Capacity	038	378	388	147	94	94	52
		[171]	[176]	[67]	[43]	[43]	[24]
	049	428	438	136	114	123	66
		[194]	[199]	[62]	[52]	[56]	[30]
	064	473	483	150	126	135	72
		[214]	[219]	[68]	[57]	[61]	[33]

Weights are listed in lbs. [kg]

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General Installation Information cont.

Outdoor Unit Location

Allow sufficient space for airflow clearance, wiring, refrigerant piping, and servicing unit. Locate unit so that condenser airflow is unrestricted on both sides.

Clearance Requirements

With coil facing wall: Allow 12" (304.8 mm) minimum clearance on coil side and coil end and 24" (609.6 mm) minimum clearance on control box end (for service) and fan side to prevent air recirculation. When installing single or multiple units in an alcove, roof well or partially enclosed area, ensure there is adequate ventilation to prevent recirculation of discharge air.

Mounting on Ground

Mount unit on a solid, level pad that is at least 2" above grade (Follow local codes for mounting height requirements). Ensure that the pad is stable and will not shift. An unstable base may cause strain on the refrigerant lines and possible leaks due to shifting. Maintain sufficient clearance between the base pad and the residence foundation to prevent sound transmission. Position unit so water or ice from roof does not fall directly onto unit. Use field provided snow stand or ice rack where prolonged subfreezing temperatures or heavy snow occurs. Maintain sufficient clearance from trees, shrubs, building corners, fences or any other structures that may inhibit sufficient airflow to the air coil resulting in capacity loss. If conditions or local codes require unit be fastened to a pad, tie down bolts should be used and fastened through holes provided in unit mounting feet.

Roof Mounting

Mount unit on a level platform or frame at least 6 inches (152.4 mm) above roof surface. Isolate unit and tubing from structure. It is recommended to install the unit so that the coil does not face into prevailing winds.

Wall Mounting

Care must be taken to mount the outdoor unit on a solid base that is level, secure from settlement, and is isolated from the structural foundation or walls to prevent sound and vibration transmission into the living space. In addition heat pump units must be elevated above anticipated snow accumulation levels to allow for proper defrost drainage and airflow. On occasion, site conditions may require direct wall mounted brackets to be used to locate and support the outdoor unit. In these applications, care must be taken to address unit base pan support, structural integrity, safe access and serviceability, as well as the possible sound and vibration transmission into the structure. These applications are best served by a properly engineered solution.

Use ACB-36 Mounting Brackets (DiversiTech) or any other Equivalent Mounting Brackets for wall mounting.

Multi unit application

When installing multiple units, ensure the discharge air from one unit is not drawn into another unit.

Piping Connections

Use field supplied refrigerant grade copper tubing to connect the outdoor unit to the indoor unit. Appropriate tubing sizes must be used for each unit size as specified on Table 1.

General Installation Information cont.

Duct System

An air outlet collar is provided on vertical top and rear air discharge units and all horizontal units to facilitate a duct connection (vertical bottomflow units have no collar). A flexible connector is recommended for discharge and return air duct connections on metal duct systems. Uninsulated duct should be insulated with a minimum of 1-inch duct insulation. Application of the unit to uninsulated ductwork in an unconditioned space is not recommended as the unit's performance will be adversely affected.

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

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

CAUTION: When attaching ductwork or accessories to the cabinet, make sure the fasteners do not come into contact with the air coil.

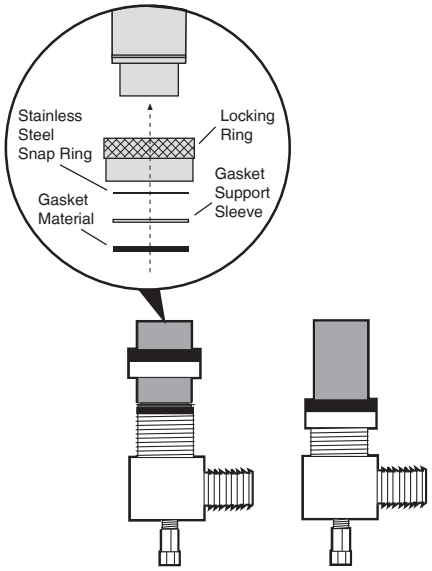
Water Piping

The proper water flow must be provided to each unit whenever the unit operates. To assure proper flow, use pressure/temperature ports to determine the flow rate. These ports should be located at the supply and return water connections on the unit. The proper flow rate cannot be accurately set without measuring the water pressure drop through the refrigerant-to-water heat exchanger.

All source water connections on residential units are swivel piping fittings (see Figure 4) that accept a 1-inch male pipe thread (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-inch 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 any 1-inch 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-inch inside diameter on the unit. Limit hose length to 10 feet per connection. Check carefully for water leaks.

Figure 4: Swivel Connections



Water Quality

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.

General Installation Information 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

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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 or intermediate heat exchanger is recommended to separate the unit fro the contaminated water. The table above 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

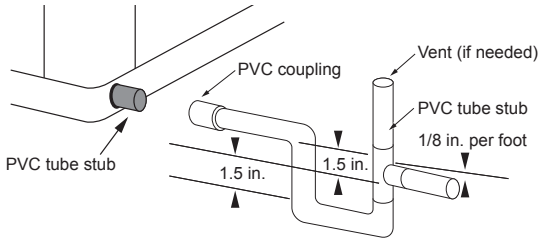
Set the freeze sensing switch SW2-1 on the Aurora Base Control (ABC) printed circuit board for applications using a closed loop antifreeze solution to “LOOP” (15°F). On applications using an open loop/ground water system (or closed loop no antifreeze), set this dip switch to “WELL” (30°F), the factory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

Condensate Drain

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

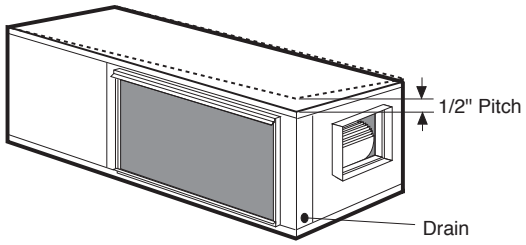
On horizontal units, a PVC stub is provided for condensate drain piping connection. An external trap is required (see below). If a vent is necessary, an open stand pipe may be applied to a tee in the field-installed condensate piping.

Figure 5: Horizontal Drain Connection



NOTE: Check dimensional data for actual PVC sizes.

Figure 6: Unit Pitch for Drain



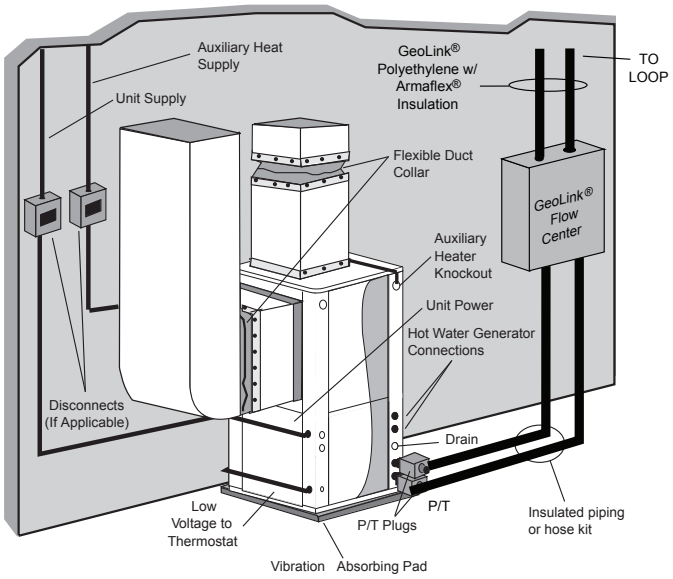
Closed Loop Ground Source Systems

NOTE: For closed loop systems with antifreeze protection, set SW2-1 to the "LOOP" (15°F) 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 7: Closed Loop Ground Source Application



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

Multiple Units on One Flow Center

NOTE: This feature is only available in the Aurora Advanced Control package (AXB board), NOT the Aurora Base Control (ABC).

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 8b). 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.

NOTE: To achieve this same feature when heat pumps have only the Aurora Base Control, follow Figure 8a. Installer will be required to supply fuses, two relays, and wiring.

Figure 8a: Primary/Secondary Wiring with Aurora Base Control (no AXB Board)

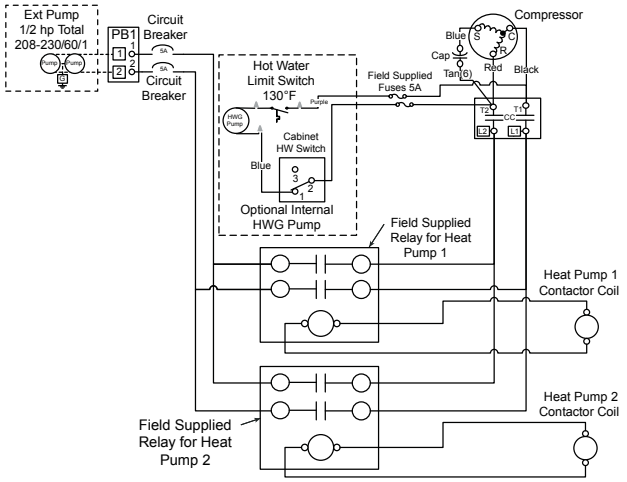
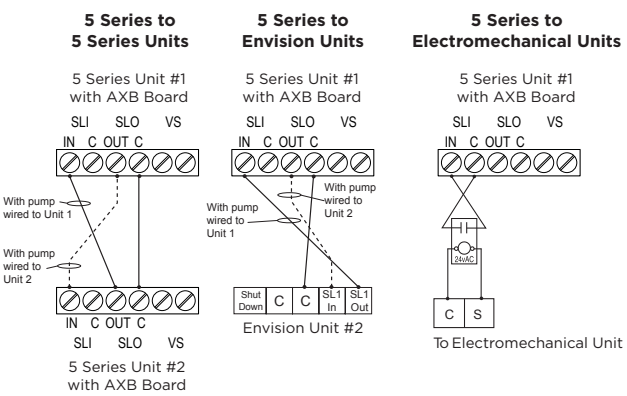


Figure 8b: Primary/Secondary Hook-up



Open Loop Ground Water Systems

Variable Speed Pump Setup

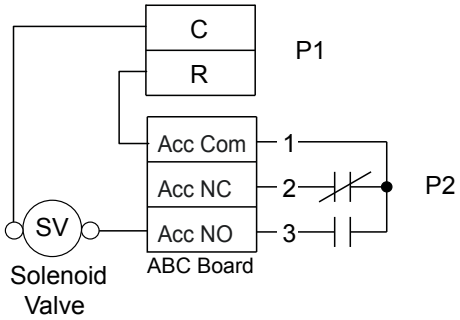
When using a variable speed pump flow center (FCV1B-GL or FCV2B-GL) the use of an AID Tool will be necessary to adjust minimum and maximum flow rates. The factory default is: minimum=75% and maximum=100% speed levels.

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.

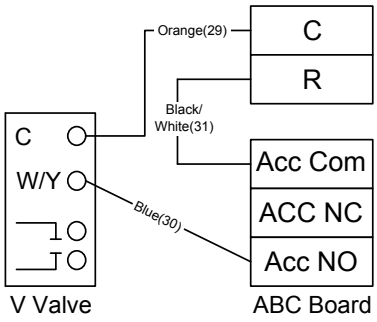
NOTE: For open loop/groundwater systems or systems that do not contain an antifreeze solution, set SW2-Switch #1 to the "WELL" (30°F) position. (Refer to the DIP Switch Settings table in the Aurora Control section.) Slow opening/closing solenoid valves (type V100FPT) are recommended to eliminate water hammer.

Figure 9a: 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.

Figure 9b: Open Loop Solenoid Valve Connection Option
Typical slow operating external 24V water solenoid valve (type V100FPT) wiring.



NOTE: SW2-4 should be "ON" and SW2-5 should be "OFF" when using a slow opening (V100FPT) water valve.

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

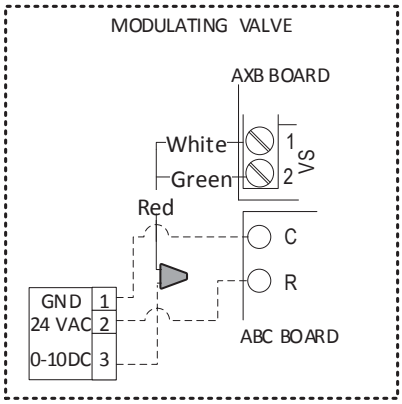
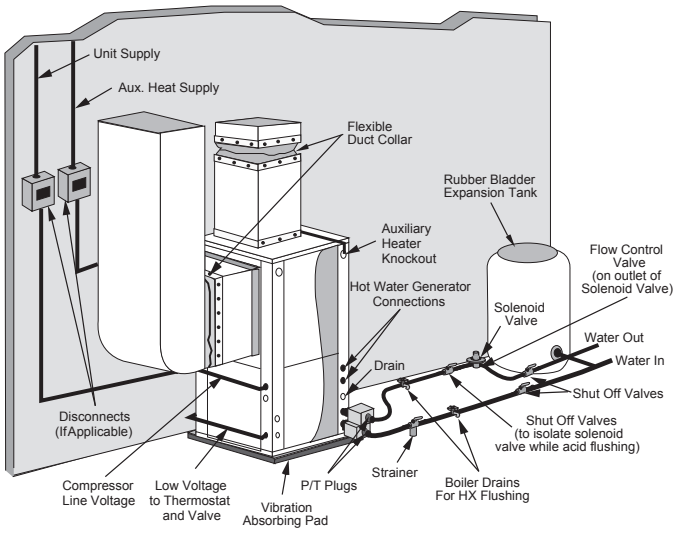


Figure 10: Open System - Groundwater Application



Hot Water Generator Connections

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 a series is recommended to maximize the hot water generator capability. Electric water heaters are recommended. Make sure all local electrical and plumbing codes are met for installing a hot water generator. Residential units with hot water generators contain an internal circulator and fittings. A water softener is recommended with hard water (greater than 10 grains or 170 total hardness).

NOTES: 1) Using a preheat tank, as shown in Figure 12, will maximize hot water generator capabilities. 2) The hot water generator coil is constructed of vented double wall copper suitable for potable water.

Water Tank Preparation

To install a unit with a 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.

Figure 11: Typical Hot Water Generator Installation

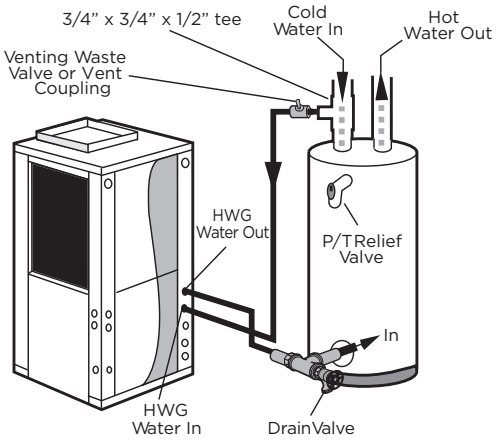
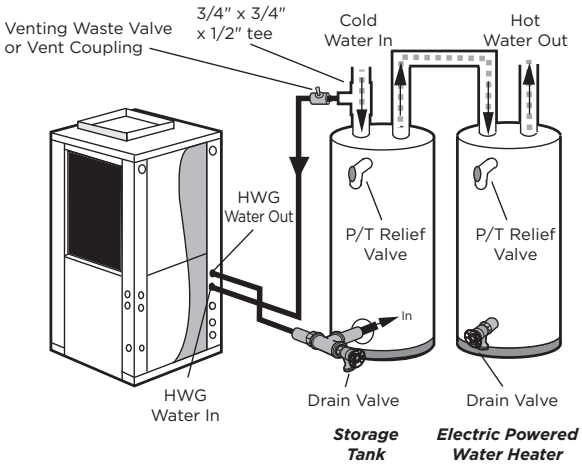


Figure 12: Hot Water Generator Installation In Preheat Tank



NOTE: This configuration maximizes hot water generator capability.

Hot Water Generator Connections cont.

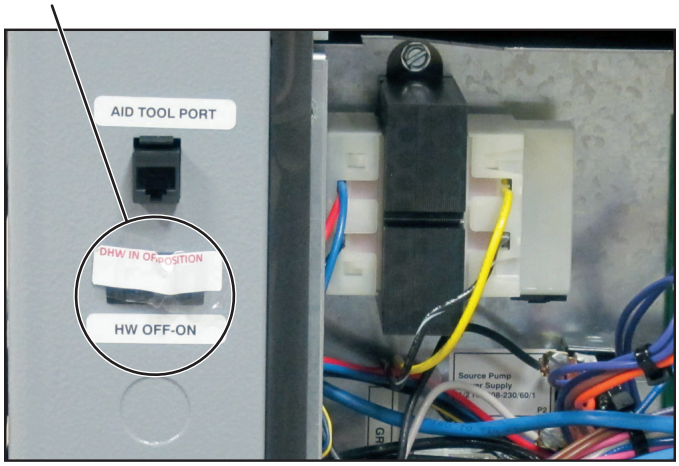
Plumbing Installation

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.

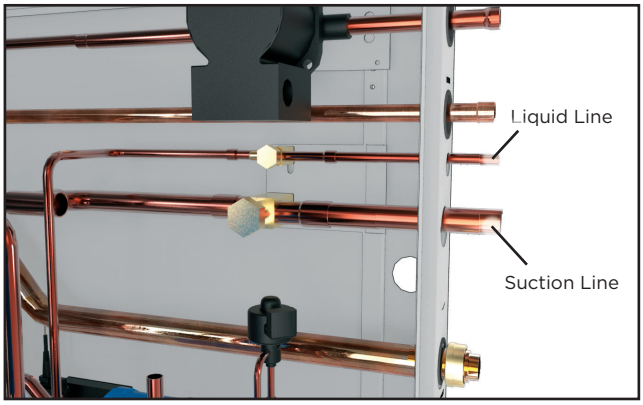
Refrigeration

The indoor unit comes with a holding Geo charge. When installed as an air source heat pump 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 indoor unit and the outdoor unit. To select the proper tube diameters for the installation, refer to the Line Set Sizes table. 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. Fasten the copper line set to the outdoor unit as instructed by the coil installation instructions shown in Figure 14. 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 5 Series Geo-Ready indoor service valves are recessed inside the cabinet for protection. Remove the front access panel to gain access to the service valves. 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 phoscopper braze alloy on all brazed connections. 5 Series Geo-Ready indoor 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 wet rag should be used on the service valve to prevent damage caused by excessive heat.

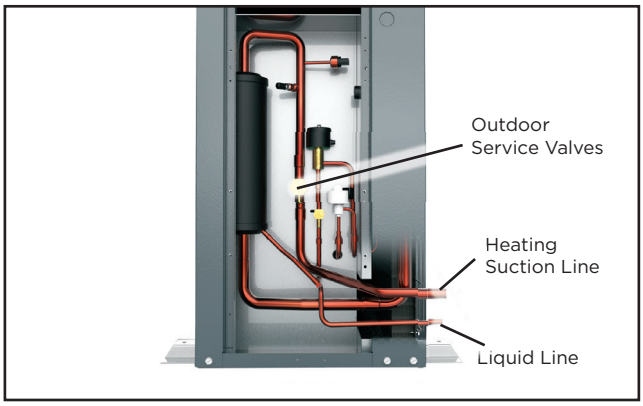
NOTE: Location of Service Valves on the Outdoor Unit for Air Source application.

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

Figure 14: Attaching the Air Coil



Evacuation and Charging using AID Tool

Precaution

Ensure that the Solenoid Valves on both the Indoor and Outdoor units are open before Evacuating or Charging the system. Refer to the instructions on the next page for methods to open up the solenoid valves with the unit powered and not powered. Failure to do this will result in inaccurate refrigerant charge and improper system evacuation.

Precautions During Line Installation

- Minimize bends on refrigerant lines during installation to prevent restrictions. Ensure proper installation without any damage or kinks to the tubing.
- Isolate the refrigerant line-sets to minimize noise transmission from the equipment. Insulate the vapor line with a minimum of ½" foam rubber insulation. It is recommended to insulate liquid lines that may be exposed to direct sunlight, high temperatures or excessive humidity.
- Prevent tube metal-to-metal contact between vapor and liquid lines.
- General piping recommendations for vapor/liquid line sizing, elevation limits, system charging or traps etc.

Precautions During Brazing of Lines

All refrigerant line-set connections are copper-to-copper and should be brazed using phosphorus-copper alloy material. DO NOT use soft solder. Service valves are provided on both the liquid and vapor lines on the outdoor and indoor units for proper evacuation and charging.

Always use dry nitrogen when brazing and wrap all components with damp rags to reduce heat damage. Never unbraze a liquid line filter drier. Unbrazing a liquid line filter drier can release acids and contaminants back into the system. Since R410a can fractionate, it should always be charged using liquid into the suction line at low enough rates to allow vaporization before it enters the compressor. Take necessary steps and precautions to ensure a clean and dry system.

Precautions During Brazing Service Valve

Use extra precaution to prevent heat damage to the service valves during brazing. Use a wet rag to wrap around the valves during and during and after brazing is complete to cool down joints.

- The service access port has a valve core. Remove the cap and Schrader core from both the liquid and vapor service valves at the outdoor unit. Connect low pressure nitrogen to the liquid line service port. Open the service valves at the outdoor unit to allow nitrogen to flow.
- Braze the liquid line to the liquid valve on the outdoor unit while supplying nitrogen.
- Remove the cap and Schrader core from both the liquid and vapor service valves at the indoor unit.
- Braze the liquid line to the liquid valve on the indoor unit while supplying nitrogen.
- Braze vapor line to the vapor service valve on the indoor unit. Make sure to use a wet rag to cool down joints before and after brazing.
- Braze vapor line to the vapor service valve on the outdoor unit. Make sure to use a wet rag to cool down joints before and after brazing.
- Remove nitrogen source from the liquid line service port on the outdoor.
- Replace the Schrader cores in the liquid and vapor valves. Then conduct a leak check on the system.

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. Use an electronic leak detector or a good quality bubble solution to detect leaks on all connections made in the field. Check the service valve ports and stem for leaks and all connections made in the field. If a leak is found, repair it and repeat the above steps. For safety reasons do not pressurize the system above 150 psi. Purge pressure from line set. The system is now ready for evacuating and charging.

System Evacuation

Ensure that the line set and outdoor unit are evacuated before opening service valves. The line set and outdoor unit 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. For the most accurate results, the vacuum gauge should always be located at the unit service port, not at the vacuum pump outlet. 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.

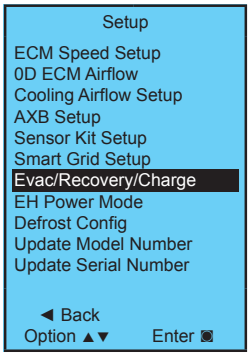
The vacuum pump must be maintained per the vacuum pumps published care and maintenance schedule. This includes the oil and cleaning the inlet debris screen if equipped.

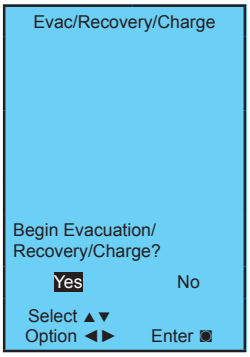
Evacuation and Charging using AID Tool cont.

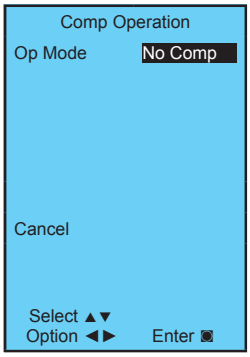
Unit Powered

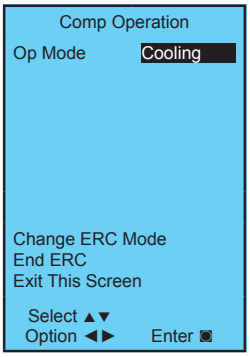
Ensure that the system power is ON and the AID Tool is connected to the ABC control board on the Indoor before system is evacuated and charged. Use the AID Tool to navigate to the "Evacuation/Recovery/Charging" screen under "Setup" on the Main Menu. Then select the following option: "Begin Evacuation/Recovery/Charging". Upon selecting this option, the system controls shall fully open both Solenoid Valves without turning ON the compressor. If the compressor is required to be turned ON to assist with Charging the system, then proceed to the "Compressor Operation" option on the same screen in order to operate the compressor in Heat/Cool mode.

NOTE: Same steps shall be carried out using the AID Tool for Refrigerant Recovery during field servicing.

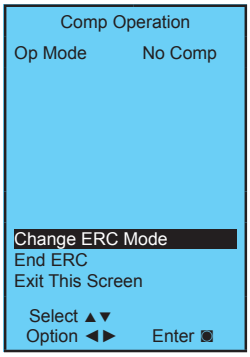


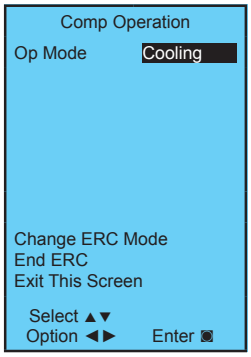




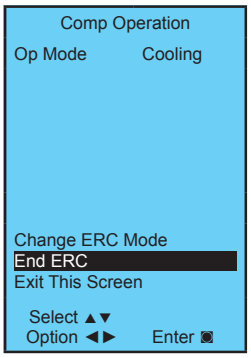


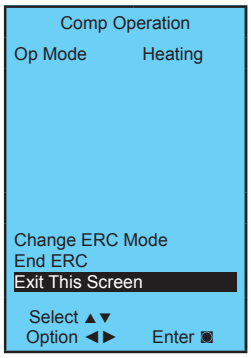
When the compressor is ON, select “Change ERC Mode” to modify compressor Operation Mode.





Selecting “End ERC” will remove 24VAC from the DIV terminal and the solenoid valves shall close.
Selecting “Exit This Screen” shall take the user back to the “Setup” screen.





Unit Not Powered

Part number RSVT (solenoid valve magnet), quantity of two, can be ordered to open the refrigerant solenoid vales if power in not yet applied to the unit. To use the RSVT remove the screw that holds the green coil on the refrigerant solenoid valve. The coil can now be lifted off. The RSVT will be placed over the refrigerant solenoid valve. You will hear a clicking sound that will indicate that the valve is open. When you finish the evacuation and charge process reinstall the coils on the refrigerant solenoid valves.

NOTE: In Geo Mode, the Indoor Solenoid Valve shall remain open at all times (when power is applied), regardless of whether the compressor is running or not.

Charge Amount When Using Geo-Ready

The Geo-Ready indoor unit is shipped with a factory charge to operate in Geo Mode. This volume of refrigerant is not sufficient to run the system and additional refrigerant must be added to operate in Air Source Mode. As an air source heat pump the “Factory Charge” column is the charge amount the compressor section/split is shipped with from the factory. The “Charge Amount for Outdoor Unit” is the total amount of charge required for the outdoor condensing unit. 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, and a ½ in. liquid line is calculated at 1.0 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.

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

Evacuation and Charging using AID Tool cont.

Charge Amount in Air Source Mode

The system factory charge in the indoor unit includes enough refrigerant to operate in Geo Mode, but not enough for air source mode.. Refer to Table-5 Line Set Sizes, to determine the Total System Charge for Air Source Mode.

Use the Equations below to calculate the Total System

There is a label that is located on the lower front access panel. Record the date and total system refrigeration charge.

Total Charge (Air Source Mode) = Factory Charge + Outdoor Charge Adder + Lineset Charge

Charging the System using Active Charge Assist

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 utilize the SCC Virtual AID Tool for Active Charge Assist on your phone to validate charge. Please download the SCC App on your phone to gain access to the Active Charge Assist Instructional Video.

Charging using Superheat and Subcooling

Another method of verifying system charge is through superheat and subcool measurement. Keep adjusting refrigerant until the unit meets the superheat and subcooling values on the Operating Parameters tables.

Determining Superheat

1. Measure the temperature of the suction line at the point where the suction line thermistor is located.
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 Outdoor Dry Bulb temperature.

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 Outdoor Dry Bulb temperature.

Evacuation for unit conversion

There are two methods recommended for removing the charge from the unit when converting from air source heat pump to geothermal.

1) Remove the entire refrigerant charge from the entire system. This includes the indoor unit, outdoor unit and lineset. Once the refrigerant is removed, pull a vacuum per System Evacuation section. The charge can be removed from any of the service valves.

2) Close the refrigerant service valves in the outdoor unit. Weigh out the refrigerant charge that is located in the indoor unit and lineset. This can be done at the indoor service valves or service ports. Once completed subtract the total system charge that was on the label located inside the lower access panel from the refrigerant that was removed. This will be the amount of refrigerant left in the outdoor unit. Record this amount on the label located on the inside of the upper access panel.

Evacuation and Charging using AID Tool cont.

Long Lineset

The piping design of the heat pump system will impact the performance, reliability, and operational cost of the system the homeowner will experience. The refrigerant piping system design affects the capacity, efficiency, oil management, reliability, refrigerant charge quantity, liquid refrigerant control, and effectiveness of the heat pump system to provide comfort to the space. It is important that the installing contractor understands the effect of the piping design and location of the heat pump equipment to provide reliable operation and ensure long life.

Long line applications must be treated differently from standard systems. Standard split systems of ≤20 foot vertical rise and < 60 feet, dual capacity compressors of total length can be applied using the equipment installation guide instructions. A longer line set or higher vertical rise system requires special consideration for the following reasons:

Line Set Sizing and Oil Return Concerns

In residential applications, proper suction line sizing is critical to achieve adequate oil return and maintain expected system performance. Oil return in heating mode is different from cooling mode thus, in some cases, heat pumps have additional line set limitations from air conditioning units. Follow all suction and liquid line sizing recommendations in Table 2 or 3 to ensure system performance and adequate oil return for compressor lubrication. Due to the additional refrigerant required to fill the line set, the likelihood of slugging is greatly increased with lines over 50 feet in length. The liquid line temperature is normally above that of the surrounding ambient so there is no “flashing” as a result of temperature rise. In special cases where the liquid line is run through hot attics or other heat sources the liquid line should be insulated.

A crankcase heater should be installed on the compressor if in an unconditioned space.

Table 1 - Line Set Sizes for NGV/NDGR

Unit Size	Matched Oudoor	20 feet		40 feet		60 feet		Factory Charge Vertical (oz)	Factory Charge Horizontal (oz)	*Charge Adder for Outdoor Unit (oz.)
		Suction	Liquid	Suction	Liquid	Suction	Liquid			
038	NDGR038	3/4” OD	3/8” OD	3/4” OD	3/8” OD	3/4” OD	3/8” OD	76	70	123
049	NDGR049	7/8” OD	3/8” OD	7/8” OD	3/8” OD	7/8” OD	3/8” OD	93	91	117.5
064	NDGR064	7/8” OD	3/8” OD	7/8” OD	3/8” OD	7/8” OD	3/8” OD	86	100	165.5

Notes: *The “Charge Adder for Outdoor Unit” column provides the additional charge that needs to be added to the system in Air Source Mode. 11/17/2022
Additional charge will have to be added accordingly for lineset length.
After Charge is added adjustments can be made to get appropiate subcooling and superheat.
Additional charge for R410A is 0.50 oz. per ft. for 3/8” and 1.0 oz. per ft. for 1/2” tube.

Table 2. Crankcase Heater

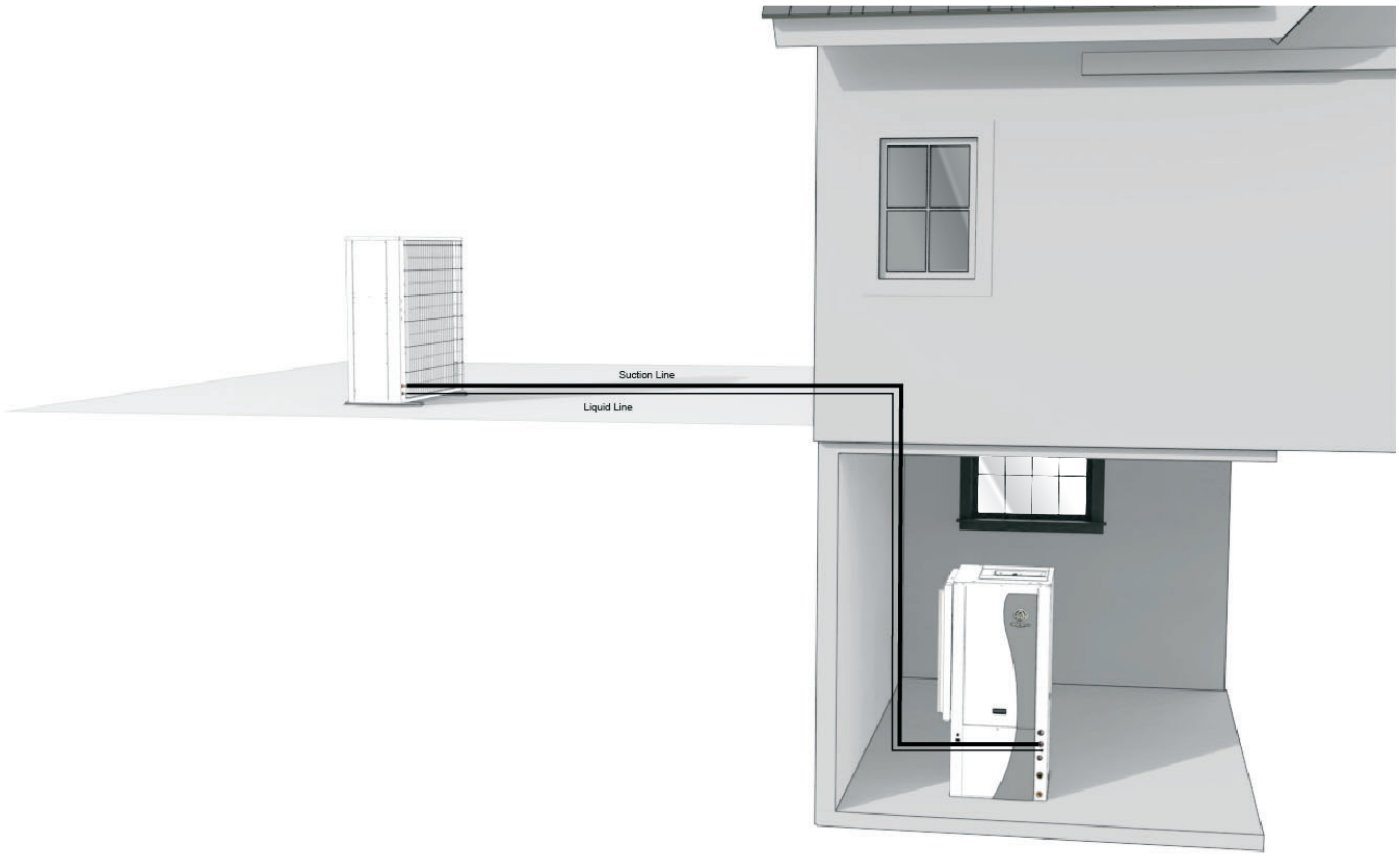
Model	Part Number
038	19P535-09
049	19P535-07
064	19P535-08

Table 3. Dual Capacity Compressor Equipment Maximum Line Set Length

Size [Btuh]	Liquid Line Dia [in]	Suction Line Dia [in]	Maximum Line Set Length** [ft]: Condensing Unit Below Air Handler Vertical Separation [ft]		
			0-10	11-20	21-50
38000	3/8	3/4	120*	120*	120*
49000	3/8	7/8	120*	120*	120*
64000	3/8	1-1/8	120*	120*	120*

* Maximum actual length not to exceed 120 ft (36.5 m)
** 150 ft (45.7 m) total equivalent length accounts for losses due to elbows or fittings.
Standard Applications of <20ft vertical rise OR <60ft total length can be applied per equipment installation manual.

Evacuation and Charging using AID Tool cont.



Long Line Sets will require the following:

- Maximum actual length and lift per Table 4 or 5
- A crankcase heater should be installed on the compressor if in an unconditioned space. See Table 4.

Evacuation and Charging using AID Tool cont.

Table 4. Crankcase Heater

Model	Part Number
038	19P535-09
049	19P535-07
060	19P535-08

*Single and Dual Capacity Units Only

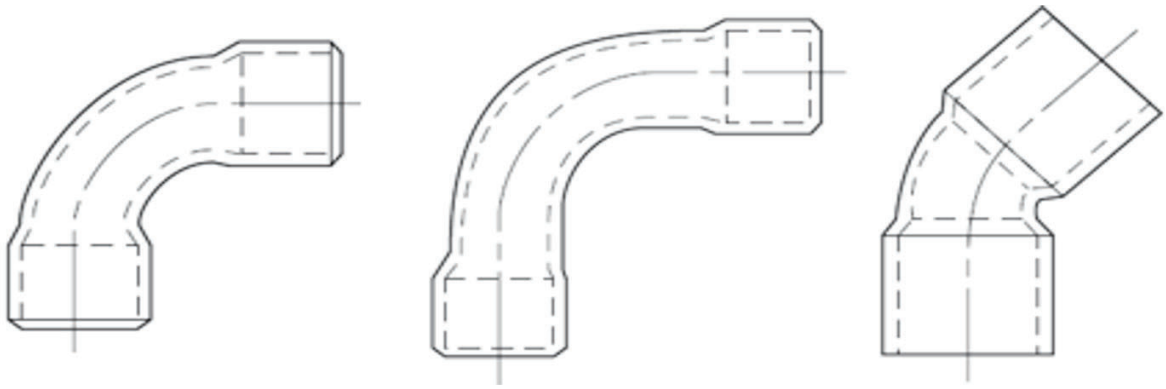
Table 5. Dual Capacity Compressor Equipment Maximum Line Set Length
Feet of Long Lineset: Compressor Section Below Air Handler

Size [Btuh]	Liquid Line Dia [in]	Suction Line Dia [in]	Maximum Line Set Length** [ft]: Condensing Unit Below Air Handler Vertical Separation [ft]		
			0-10	11-20	21-50
38000	3/8	3/4	120*	120*	120*
49000	3/8	7/8	120*	120*	120*
64000	3/8	1-1/8	120*	120*	120*

* Maximum actual length not to exceed 120 ft (36.5 m)
** 150 ft (45.7 m) total equivalent length accounts for losses due to elbows or fittings.
Standard Applications of <20ft vertical rise OR <60ft total length can be applied per equipment installation manual.

Fitting Losses in Equivalent Feet:

When calculating long line set lengths, the equivalent length of the fittings used in the line set must be taken into consideration.



90˚ STD **90˚ LONG RAD** **45˚ STD**

Evacuation and Charging using AID Tool cont.

Table 6: Fitting Losses in Equivalent Feet

Tube Size O.D. (in.)	90° Std	90° Long- Rad	45° Std
1/2	1.2	0.8	0.6
5/8	1.6	1.0	0.8
3/4	1.8	1.2	0.9
7/8	2.0	1.4	1.0
1-1/8	2.6	1.7	1.3

Example: 3/4” 105’ line set with four 90° long radius elbows.
Total line set = 105’ (tubing length) + (four elbows X 1.2)= 105’+ 4.8’ = 109.8’ total equivalent length

Table 7: Allowable Vapor and Liquid Line Diameters for Split Systems

Unit nominal capacity	Rated Vapor Line OD	Vapor Service Valve	Minimum Vapor Line OD	Maximum Vapor Line OD	Rated Liquid Line OD	Liquid Service Valve OD	Minimum Liquid Line OD	Maximum Liquid Line OD
Dual Capacity Compressor Systems								
38000	3/4	3/4	3/4	3/4	3/8	3/8	3/8	1/2
49000	3/4	3/4	3/4	7/8	3/8	3/8	3/8	1/2
64000	7/8	7/8	7/8	1-1/8	1/2	1/2	3/8	1/2

Table 8. Capacity Multipliers

Model	Compressor	Capacity Multiplier by Line Set Length						
		20’	40’	60’	80’	100’	120’	150’
38000	Dual Capacity	1.00	0.985	0.97	0.955	0.94	0.925	NA
49000	Dual Capacity	1.00	0.985	0.97	0.955	0.94	0.925	NA
64000	Dual Capacity	1.00	0.985	0.97	0.955	0.94	0.925	NA

Electrical Connections

General

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

Unit Power Connection

Connect the incoming line voltage wires to L1 and L2 of the contactor as shown in Figure 15C 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 15B). Swing open control box (Figure 15A). 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 15C). Close control box and replace grounding fastener before unit start-up.

Accessory Relay

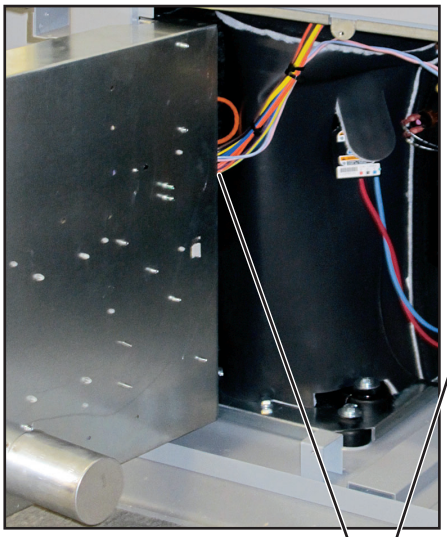
A set of “dry” contacts has been provided to control accessory devices, such as water solenoid valves on open loop installations, electronic air cleaners, humidifiers, etc. This relay contact should be used only with 24 volt signals and not line voltage power. The relay has both normally open and normally closed contacts and can operate with either the fan 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 #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 V 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

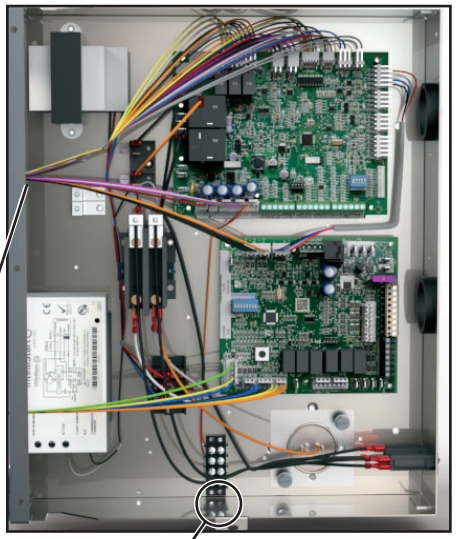
All 208/230 units are factory wired for 230 volt operation. For 208 volt operation, the red and blue transformer wires must be switched on terminal strip PB2.

Figure 15A:
Wire access (control box open)



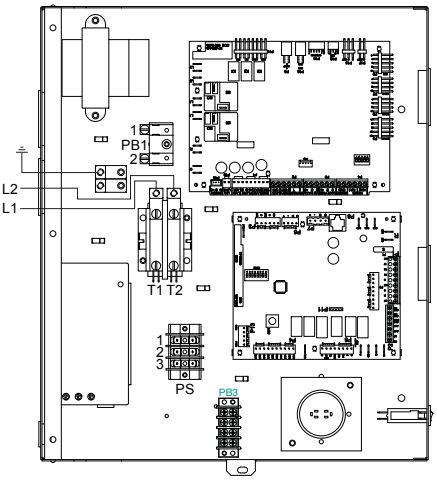
Wire Insert Location

Figure 15B:
Wire access (control box closed)



Ground Fastener must be installed for proper unit ground

Figure 15C:
Line Voltage 208-230/60/1 control box



Electrical Connections cont.

Pump Power Wiring

See Figure 16 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.

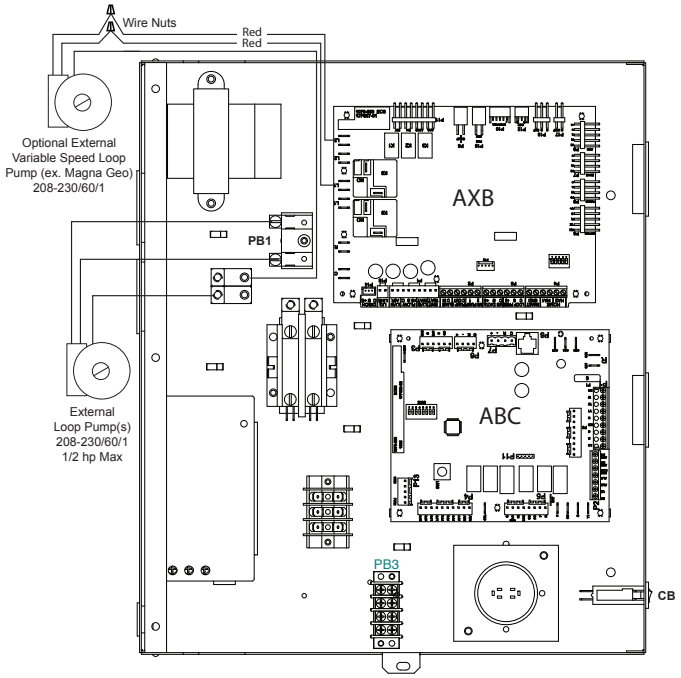
Solenoid Valve

The Geo-Ready system uses two Normally Closed Refrigerant Solenoid Valves in order to hold refrigerant pressure within the system during compressor off-cycles. This will reduce the amount of work done by the compressor during instances where the system might short-cycle in the field and enable the system to reach steady-state capacity sooner during compressor ON cycles. They are also needed to meet the unit performance ratings. The Outdoor Solenoid Valve shall be wired to the DIV terminal on the AOB. Therefore, the DIV output shall turn ON with any compressor call (Part Load or Full Load).

The Indoor Solenoid Valve shall be wired to the DIV terminal on the AXB. Therefore, the DIV output shall turn ON with any compressor call (Part Load or Full Load).

Once 24VAC is applied through the DIV output the valves will open. The valves must be open to complete the evacuation and charging process.

Figure 16: Pump Wiring 208-230/60/1



Electronic Thermostat Installation

Position the thermostat subbase against the wall so that it is level and the thermostat wires protrude through the middle of the subbase. Mark the position of the subbase mounting holes and drill holes with a 3/16-inch bit. Install supplied anchors and secure base to the wall. Thermostat wire must be 8-conductor (4 or 5 conductor for communicating thermostats), 20-AWG (minimum) wire. Strip the wires back 1/4-inch (longer strip lengths may cause shorts) and insert the thermostat wires into the connector as shown. Tighten the screws to ensure secure connections. The thermostat has the same type connectors, requiring the same wiring. See instructions enclosed in the thermostat for detailed installation and operation information. The W1 terminal on TPCM32U03A and TPCM32U04A communicating thermostats may be hard wired to provide aux/emergency heat in the event communication is lost between the thermostat and the ABC microprocessor.

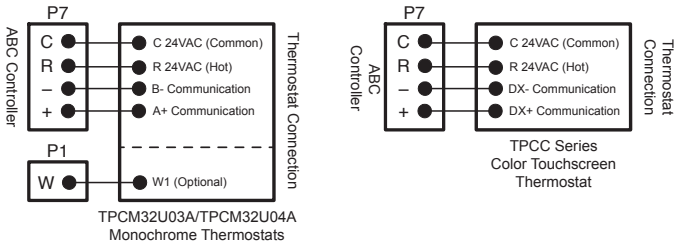
NOTE: Aurora Base Control (ABC) DIP switch SW2-7 is required to be in the "OFF" position for the control to operate with FaultFlash or ComforTalk thermostats. SW2-7 in the "ON" position configures the control to operate with typical thermostats (continuous lockout signal). There must be a wire connecting Y2 on the Aurora controller to 2nd stage compressor on the thermostat for proper operation. SW2-7 DIP switch position is not relevant with communicating thermostats.

Wiring between indoor and outdoor section

Shielded communication wiring is recommended to be ran between the indoor and outdoor units. 20-AWG (minimum 4 - conductor thermostat wire can be ran to connect the indoor and outdoor units. If thermostat wire is ran care must be taken in the routing to make sure there is no interference picked up by the wire.

The indoor unit will have a shielded communication harness with a sticker on it. Crimp wire nut the wire going to the outdoor unit to this wire. Follow C-C, R-R, +-+, and - - -. Located in the outdoor unit there will be a screw terminal strip. Cut the field supplied wire, strip the wire leads and place them under the correct screws. If you have small fork terminals they can be used.

Figure 17: Thermostat Wiring (Communicating Style Signals)



Auxiliary Heat Ratings

Model	KW		Stages	BTU/HR		Min CFM	5 Series Compatibility		Minimum Unit Size
	208V	230V		208V	230V		038	049 - 064	
EAL(H)10	7.2	9.6	2	24,600	32,700	1100	•	•	038
EAL(H)15	10.8	14.4	2	36,900	49,100	1250	•	•	049
EAL(H)20	14.4	19.2	2	49,200	65,500	1500		•	064

Order the “H” part number when installed on horizontal and vertical rear discharge units 5/16/2022

Air flow level for auxiliary heat (Aux) must be equal to or above the minimum CFM in this table

NOTE: Compressor is disabled below -5F to conserve compressor health as temperatures below -5F are beyond the compressor's operating envelope. The system shall run on Emergency Heat below -5F if demand for heating exists.

Auxiliary Heat Electrical Data

Model	Supply Circuit	Heater Amps		Min Circuit Amp		Fuse (USA)		Fuse (CAN)		CKT BRK	
		208 V	240 V	208 V	240 V	208 V	240 V	208 V	240 V	208 V	240 V
EAL(H)10	Single	34.7	40.0	53.3	60.0	60	60	60	60	60	60
EAL(H)15	Single	52.0	60.0	75.0	85.0	80	90	80	90	70	100
	L1/L2	34.7	40.0	53.3	60.0	60	60	60	60	60	60
	L3/L4	17.3	20.0	21.7	25.0	25	25	25	25	20	30
EAL(H)20	Single	69.3	80.0	96.7	110.0	100	110	100	110	100	100
	L1/L2	34.7	40.0	53.3	60.0	60	60	60	60	60	60
	L3/L4	34.7	40.0	43.3	50.0	45	50	45	50	40	50

All heaters rated single phase 60 cycle and include unit fan load 3/9/22

All fuses type “D” time delay (or HACR circuit breaker in USA)

Supply wire size to be determined by local codes

Electrical Data

Dual Capacity with ECM2.3 motor

Rated		Voltage Min/Max	Compressor				HWG Pump FLA	Ext Loop FLA	Blower Motor FLA	Total Unit FLA	Min Circ Amp	Max Fuse/ HACR
Model	Voltage		MCC	RLA	LRA	LRA**						
038	208-230/60/1	187/253	24.1	15.4	92.0	33.0	0.4	5.4	4.0	25.2	29.1	50
049	208-230/60/1	187/253	31.1	19.9	126.5	45.0	0.4	5.4	4.0	29.7	34.7	60
064	208-230/60/1	187/253	37.0	23.7	151.0	54.0	0.4	5.4	7.0	36.5	42.4	70

Rated Voltage of 208/230/60/1 11/17/2022
HACR circuit breaker in USA only
All fuses Class RK-5

Geo-Ready Split Outdoor Unit Electrical Table

Rated		Voltage Min/Max	Outdoor Motor FLA	Max Fuse/ HACR
Model	Voltage			
038	208-230	187/253	2.8	10
049	208-230	187/253	2.8	10
064	208-230	187/253	2.8	10

Rated Voltage of 208/230/60/1 5/16/2022
HACR circuit breaker in USA only
All fuses Class RK-5

Blower Performance Data

5 Series Dual Capacity ECM Blower Table

MODEL	MAX ESP	INDOOR AIR FLOW SPEED SETTINGS											
		1	2	3	4	5	6	7	8	9	10	11	12
038	0.50	650	750 G	850	1000	**1100 L**	**1200**	**1300 H**	**1400**	**1500**	1550 Aux		
049	0.50	650	800 G	900	1050	1150	**1250**	**1350 L**	**1450**	**1550 H**	1575 Aux		
064	0.75	800	950 G	1100	1300	**1500 L**	**1750**	**1950 H**	**2100**	**2300**	2325 Aux		

Factory settings are at recommended G-L-H-Aux speed settings 3/9/22
L-H settings MUST be located within boldface CFM range
“Aux” is factory setting for auxiliary heat and must be equal to or above the “H” setting as well as at least the minimum required for the auxiliary heat package
“G” may be located anywhere within the airflow table
CFM is controlled within ±5% up to the maximum ESP
Max ESP includes allowance for wet coil and standard filter

Blower Performance Data cont.

Setting Blower Speed - Variable Speed ECM

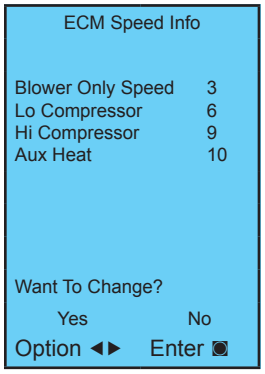
The ABC board's Yellow Config LED will flash the current ECM blower speed selections for "G", low, and high continuously with a short pause in between. The speeds can also be confirmed with the AID Tool under the Setup/ ECM Setup screen. The Aux will not be flashed but can be viewed in the AID Tool. 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), High (Y2), and Aux can be adjusted directly at the Aurora ABC board which utilizes the push button (SW1) on the ABC board. This procedure is outlined in the ECM Configuration Mode portion of the Aurora 'Base' Control System section. The Aux cannot be set manually without an AID Tool.

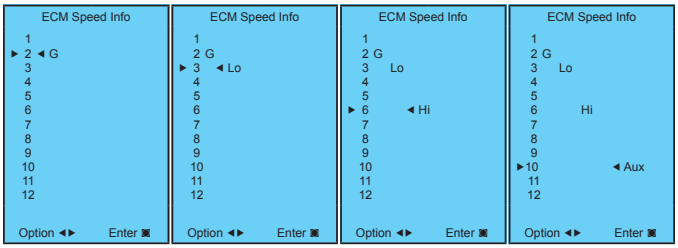
Outdoor and Indoor ECM Setup with an AID Tool

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.



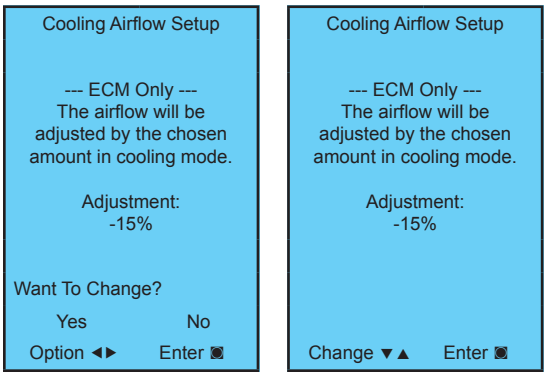
Selecting YES will enter ECM speed setup, while selecting NO will return to the previous screen.

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.

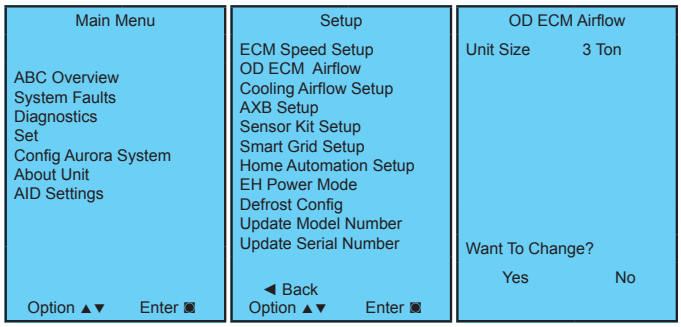


After the auxiliary heat speed setting is selected the AID Tool will automatically transfer back to the ECM Setup screen.

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.

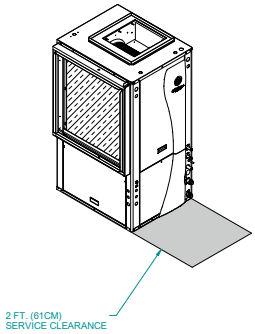


Unit Size Setup - The following AID Tool screen allows the technician to select the correct Unit Size for the Geo-Ready System in Air Source Mode, so that the system delivers the correct amount of outdoor airflow. In order to access this screen, simply navigate to the "Setup" screen and select the "OD ECM Airflow" option. Then select the correct "Unit Size" for the system.

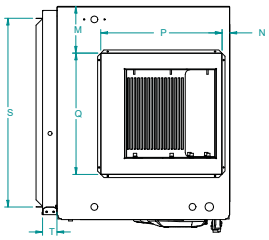


Vertical Dimensional Data

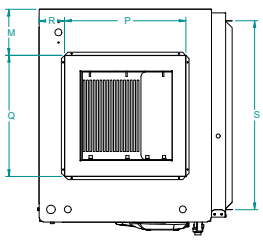
Top Air Discharge



TOP

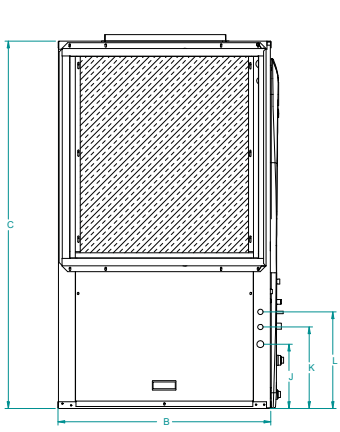


TOP

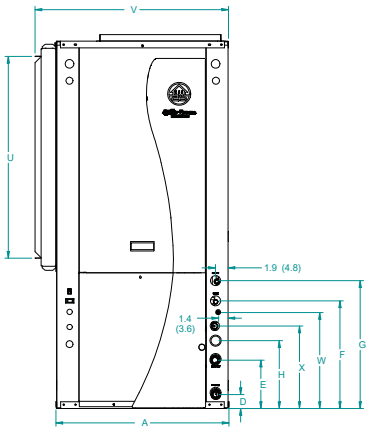


LEFT RETURN

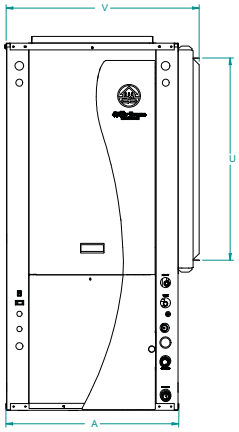
RIGHT RETURN



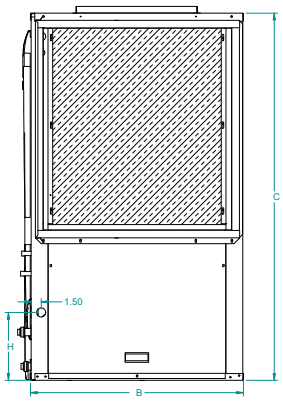
LEFT



FRONT



FRONT



RIGHT

Vertical Top Flow		Overal Cabinet			Water Connections							Electrical Connections			Discharge Connection					Return Connection				Refrigerant Connections (O.d.)		
												J	K	L	duct flanges installed ± .01"					using std deluxe filter rack (± 0.10 IN)						
		A	B	C	D	E	F	G	H	LOOP WATER FPT	HWG SWEAT (I.D.)	3/4" K.O.	1/2" K.O.	1/2" K.O.	M	N	P	Q	R	S	T	U	V	W	X	
		Width	Depth	Height	Loop In	Loop Out	HWG In	HWG Out	Conden-sate			Power Supply	Ext. Pump	Low Voltage			Supply Width	Supply Depth		Return Width	Return Depth	Return Height		3/8"	3/4"	7/8"
038	in.	25.7	31.6	50.4	2.3	7.2	16.0	19.0	9.8	1" Swivel	1/2" Female	9.5	12.1	14.3	6.9	1.1	18.0	18.0	3.8	28.0	2.2	30.0	28.6	14.2	12.2	N/A
	cm.	65.3	80.3	128.0	5.8	18.3	40.6	48.3	24.9			24.1	30.7	36.3	17.5	2.8	45.7	45.7	9.7	71.1	5.6	76.2	72.6	36.1	31.0	N/A
049	in.	25.7	31.6	54.5	2.3	7.2	16.0	19.0	10.6	1" Swivel	1/2" Female	9.5	12.1	14.3	6.9	1.1	18.0	18.0	3.8	28.0	2.2	30.0	28.6	14.2	N/A	12.2
	cm.	65.3	80.3	138.4	5.8	18.3	40.6	48.3	26.9			24.1	30.7	36.3	17.5	2.8	45.7	45.7	9.7	71.1	5.6	76.2	72.6	36.1	N/A	31.0
064	in.	25.7	31.6	58.4	2.3	7.2	16.0	19.0	10.6	1" Swivel	1/2" Female	9.5	12.1	14.3	6.9	1.1	18.0	18.0	3.8	28.0	2.2	34.0	28.6	14.2	N/A	12.2
	cm.	65.3	80.3	148.3	5.8	18.3	40.6	48.3	26.9			24.1	30.7	36.3	17.5	2.8	45.7	45.7	9.7	71.1	5.6	86.4	72.6	36.1	N/A	31.0

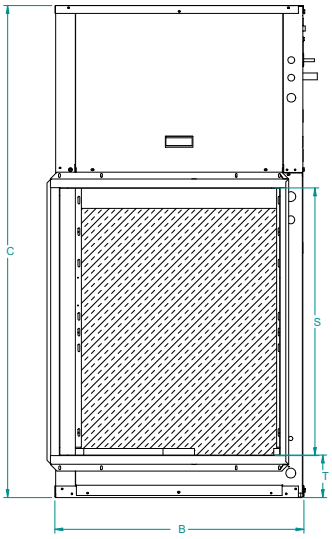
Condensate is 3/4" PVC female glue socket and is switchable from side to front
Unit shipped with deluxe 2" (field adjustable to 1") duct collar/filter rack extending from unit 3.25" and is suitable for duct connection.
Discharge flange is field installed and extends 1" [25.4mm] from cabinet
Decorative molding and/or water connections extend 1.2" [30.5mm] beyond front of cabinet.
Top panel has 1.375 and 1.125 knockouts for electrical connections

10/24/22

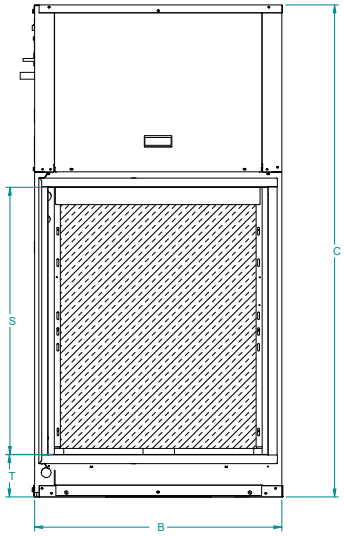
Vertical Dimensional Data cont.

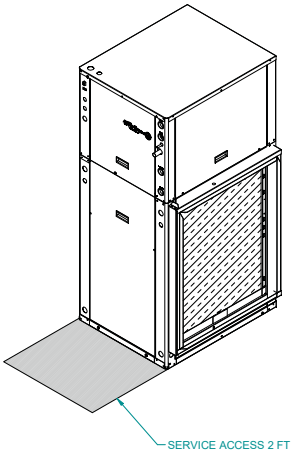
Bottom Air Discharge

LEFT RETURN

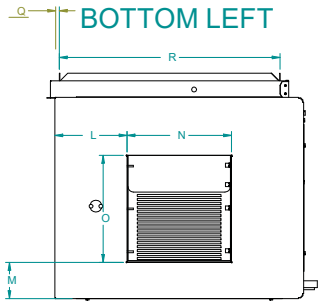


RIGHT RETURN



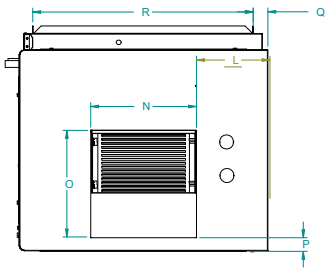


BOTTOM LEFT

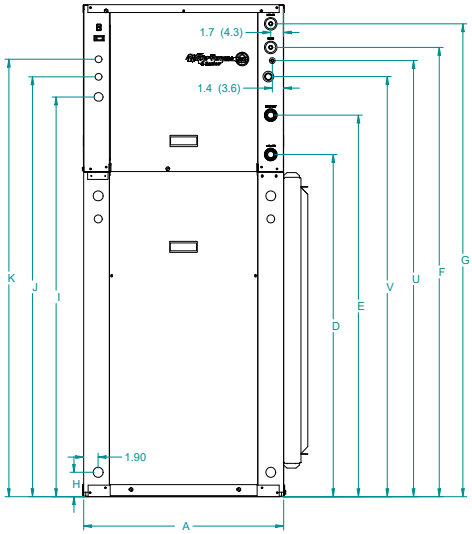


LEFT BOTTOM DISCHARGE
FLOOR FOOT PRINT

BOTTOM RIGHT



RIGHT BOTTOM DISCHARGE
FLOOR FOOT PRINT



FRONT

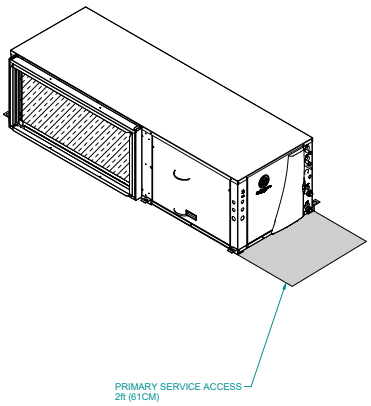
Bottomflow Models		Overall Cabinet			Water Connections							Electrical Knockouts			Discharge Connection					Return Connection					REFRIGERANT CONNECTIONS (O.D.)		
					1	2	3	4	5			I 3/4" cond	J 1/2" cond	K 1/2" cond	duct flange installed (±0.10 in)					using std deluxe filter rack (±0.10 in)							
		A	B	C	D	E	F	G	H						L	M	N	O	P	Q	R	S	T	U	V	W
		Width	Depth	Height	In	Out	HWG In	HWG Out	Conden-sate	Loop Water FPT	HWG Sweat (I.D.)	Power Supply	Ext Pump	Low Votage			Supply Width	Supply Depth			Return Depth	Return Height		3/8"	3/4"	7/8"
038	in.	25.5	31.5	62.5	43.4	48.4	57.0	60.0	3.1	1" Swivel	1/2" female	50.8	53.3	55.6	9.1	4.8	13.4	13.6	1.5	1.9	28.1	34.0	5.6	55.4	53.4	N/A
	cm.	64.8	80.0	158.8	110.2	122.9	144.8	152.4	7.9			129.0	135.4	141.2	23.1	12.2	34.0	34.5	3.8	4.8	71.4	86.4	14.2	140.7	135.6	N/A
049-064	in.	25.5	31.5	62.5	43.4	48.4	57.0	60.0	3.1	1" Swivel	1/2" female	50.8	53.3	55.6	9.1	4.8	13.4	13.6	1.5	1.9	28.1	34.0	5.6	55.4	N/A	53.4
	cm.	64.8	80.0	158.8	110.2	122.9	144.8	152.4	7.9			129.0	135.4	141.2	23.1	12.2	34.0	34.5	3.8	4.8	71.4	86.4	14.2	140.7	N/A	135.6

Condensate is 3/4" PVC female glue socket and is switchable from side to front
Vertical bottomflow unit shipped with deluxe 2" (field adjustable to 1") duct collar/filter rack extending from unit 3.25" and is suitable for duct connection.
Decorative molding and water connections extend 1.2" (30.5mm) beyond front of cabinet.

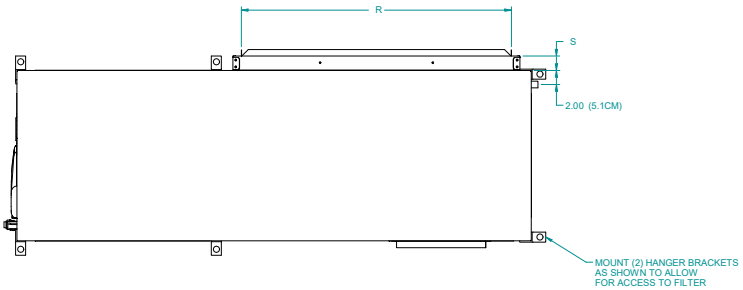
10/24/2022

Horizontal Dimensional Data

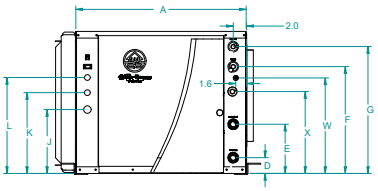
GEO-READY HORIZONTAL SUBMITTAL



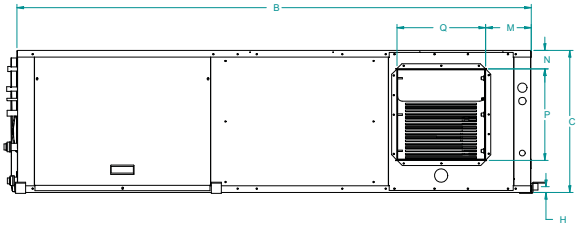
TOP VIEW



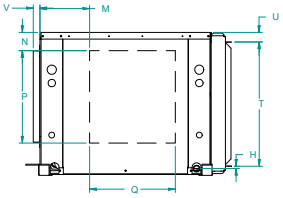
FRONT VIEW



SIDE DISCHARGE VIEW



END VIEW



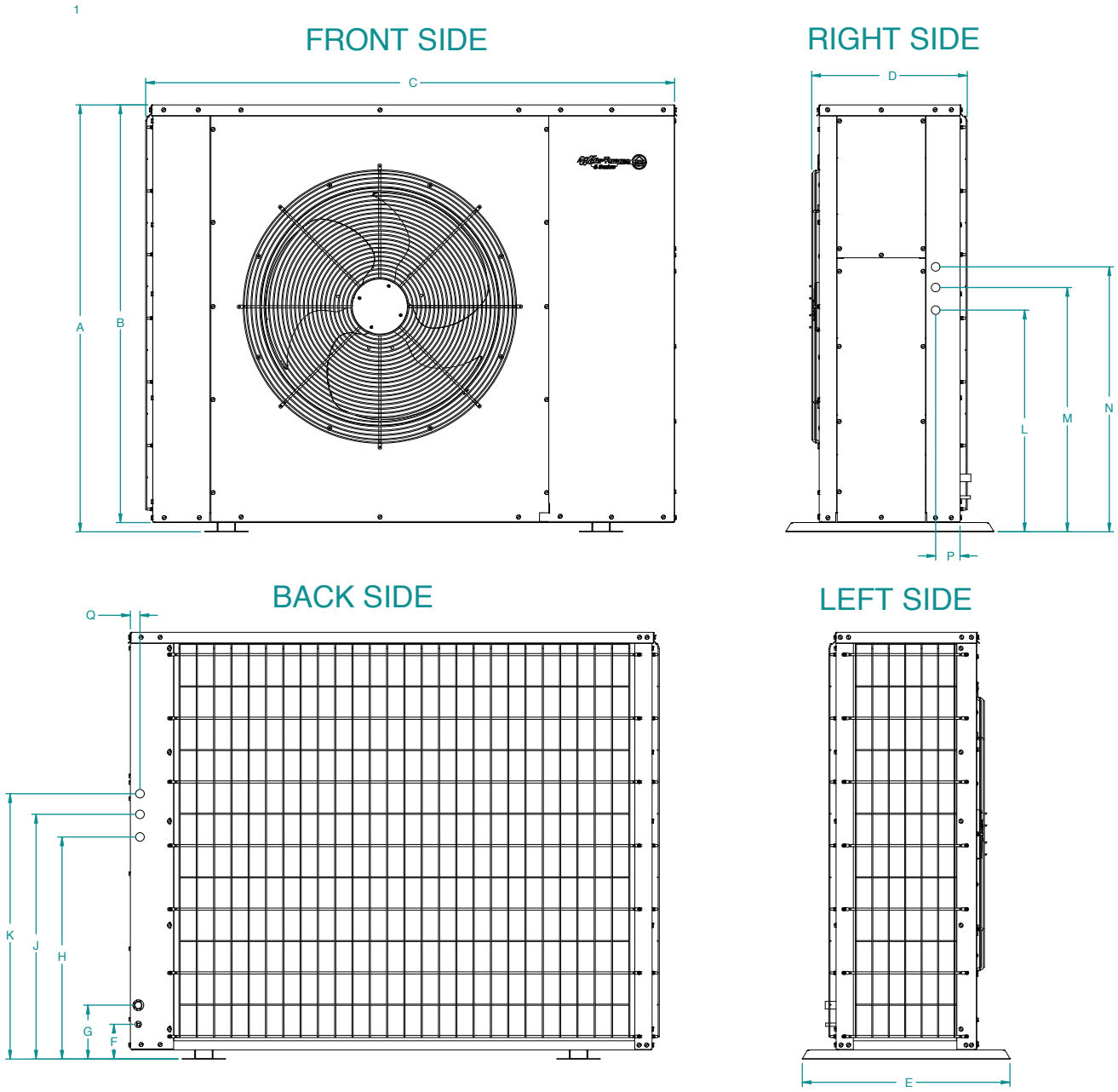
Horizontal Models		Overall Cabinet			Water Connections							Electrical Connections			Discharge Connection					Return Connection				Refrigerant Connections (O.d.)		
												J	K	L	duct flanges installed ± .01"					using std deluxe filter rack ± .01"						
		A	B	C	D	E	F	G	H	LOOP WATER FPT	HWG SWEAT (I.D.)	3/4" K.O.	1/2" K.O.	1/2" K.O.	M	N	P	Q	R	S	T	U	V	W	X	Y
		Width	Depth	Height	Loop In	Loop Out	HWG In	HWG Out	Conden-sate			Power Sup-ply	Ext. Pump	Low Voltage			Supply Width	Supply Depth		Return Width	Return Depth	Return Height		3/8"	3/4"	7/8"
038	in.	25.6	72.0	21.3	2.3	7.2	16.0	19.0	0.1	1" Swivel	1/2" Female	9.5	12.1	14.3	6.9	2.8	13.7	13.2	1.0	35.4	2.2	18.7	1.4	14.2	12.2	N/A
	cm.	65.0	182.9	54.1	5.8	18.3	40.6	48.3	0.2			24.1	30.7	36.3	17.5	7.1	34.8	33.5	2.5	89.9	5.6	47.5	3.6	36.1	31.0	N/A
049	in.	25.6	77.0	21.3	2.3	7.2	16.0	19.0	0.9	1" Swivel	1/2" Female	9.5	12.1	14.3	6.9	2.8	13.7	13.2	1.0	40.4	2.2	18.7	1.4	14.2	N/A	12.2
	cm.	65.0	195.6	54.1	5.8	18.3	40.6	48.3	2.3			24.1	30.7	36.3	17.5	7.1	34.8	33.5	2.5	102.6	5.6	47.5	3.6	36.1	N/A	31.0
064	in.	25.6	82.0	21.3	2.3	7.2	16.0	19.0	0.9	1" Swivel	1/2" Female	9.5	12.1	14.3	6.9	2.8	13.7	13.2	1.0	45.4	2.2	18.7	1.4	14.2	N/A	12.2
	cm.	65.0	208.3	54.1	5.8	18.3	40.6	48.3	2.3			24.1	30.7	36.3	17.5	7.1	34.8	33.5	2.5	115.3	5.6	47.5	3.6	36.1	N/A	31.0

Condensate is 3/4" PVC tube.
Unit shipped with deluxe 2" (field adjustable to 1") duct collar/filter rack extending from unit 3.25" and is suitable for duct connection.
Discharge flange is field installed and extends 1" [25.4mm] from cabinet
Decorative molding and/or water connections extend 1.2" [30.5mm] beyond front of cabinet.

10/24/22

038-064 MODEL		Q	P
Right Return End Discharge	in	2.8	4.6
	cm	7.1	11.8
Right Return Side Discharge	in	4.9	6.9
	cm	12.4	17.5
Left Return End Discharge	in	4.9	7.6
	cm	12.4	19.4
Left Return Side Discharge	in	2.8	6.9
	cm	7.1	17.5

Geo-Ready Dimensional Data

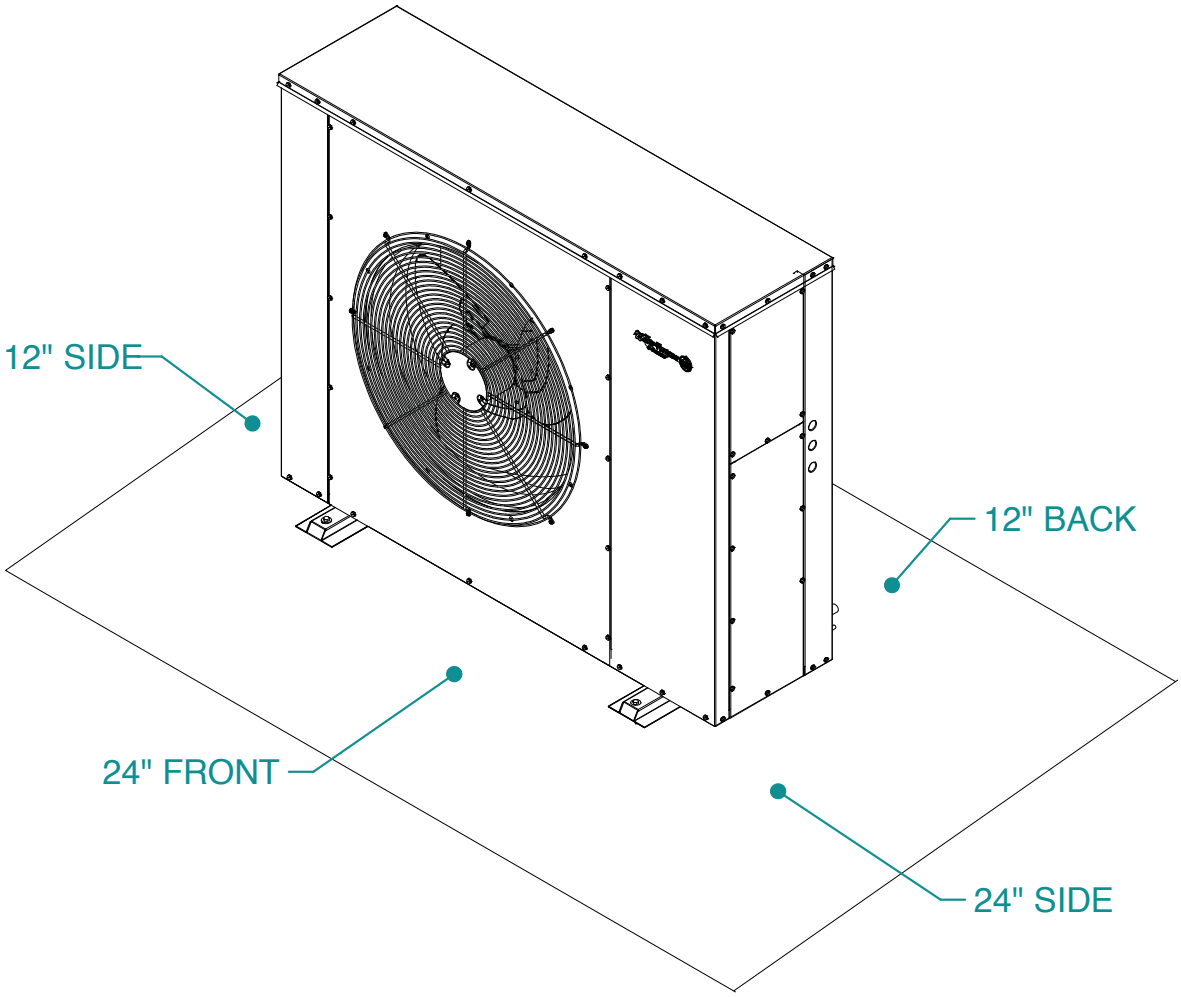


FLEX OUTDOOR UNIT

Models		Height	Height w/ Bracket	Width	Depth	Depth w/ Bracket	Service Valve Connections		KNOCK OUT	KNOCK OUT	KNOCK OUT	KNOCK OUT	KNOCK OUT	KNOCK OUT	KNOCK OUT SIDE	KNOCK OUT BACK
							Liquid	Gas								
		A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q
038-064	in.	48.3	49.3	61.1	18.0	24.0	4.0	6.2	25.7	28.3	30.7	25.7	28.3	30.7	2.8	1.1
	cm.	122.7	125.2	155.2	45.7	61.0	10.2	15.7	65.3	71.9	78.0	65.3	71.9	78.0	7.1	2.8

3/9/22

Geo-Ready Service Clearance



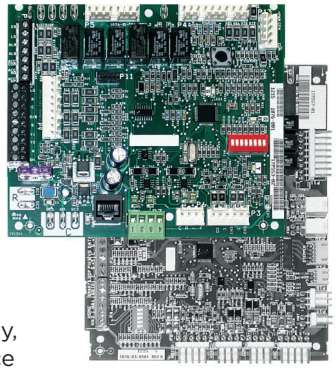
Physical Data

Model		038	049	064
Compressor (1 each)				
Indoor Factory Charge R410a, oz [kg] (Aluminum tube and fin air coil)	Vertical	76 [2.15]	93 [2.64]	86 [2.44]
Indoor Factory Charge R410a, oz [kg] (Aluminum tube and fin air coil)	Horizontal	70 [1.98]	91 [2.58]	100 [2.83]
ECM Blower Motor & Blower				
Blower Motor Type/Speeds	VS ECM			
Blower Motor- hp [W]	VS ECM	1/2 [373]	1/2 [373]	1 [746]
High Static Blower Motor - hp [W]	VS ECM	1 [746]	1 [746]	n/a
Blower Wheel Size (Dia x W), in. [mm]	VS ECM	11 x 10 [279 x 254]	11 x 10 [279 x 254]	11 x 10 [279 x 254]
High Static Blower Wheel Size - [Dia. x W], in. [mm]	VS ECM	11 x 10 [279 x 254]	11 x 10 [279 x 254]	n/a
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]
Coax & Piping Water Volume - gal [l]		1.3 [4.9]	1.6 [6.1]	1.6 [6.1]
Indoor Vertical				
Air Coil Dimensions (H x W), in. [mm]		28 x 25 [711 x 635]	32 x 25 [813 x 635]	36 x 25 [914 x 635]
Air Coil Total Face Area, ft2 [m2]		4.9 [0.451]	5.6 [0.570]	6.3 [0.641]
Air Coil Tube Size, in [mm]		3/8 [9.5]	3/8 [9.5]	3/8 [9.5]
Air Coil Number of rows		3	3	4
Filter Standard - 2" [51mm] Pleated MERV11 Throwaway, in [mm]		28 x 30 [712 x 762]	32 x 30 [813 x 762]	36 x 30 [914 x 762]
Weight - Operating, lb [kg]		358 [162]	408 [185]	453 [205]
Weight - Packaged, lb [kg]		378 [172]	428 [194]	473 [215]
Indoor Horizontal				
Air Coil Dimensions (H x W), in. [mm]		20 x 35 [508 x 889]	20 x 40 [508 x 1016]	20 x 45 [508 x 1143]
Air Coil Total Face Area, ft2 [m2]		4.9 [0.451]	5.6 [0.570]	6.3 [0.641]
Air Coil Tube Size, in [mm]		3/8 [9.5]	3/8 [9.5]	3/8 [9.5]
Air Coil Number of rows		3	3	4
Filter Standard - 2" [51mm] Pleated MERV11 Throwaway, in [mm]		1 - 20 x 37 [686 x 940]	1 - 20 x 20 [508 x 508] 1 - 20 x 22 [508 x 559]	1 - 20 x 25 [508 x 635] 1 - 20 x 22 [508 x 559]
Weight - Operating, lb [kg]		368 [167]	418 [190]	463 [210]
Weight - Packaged, lb [kg]		388 [176]	438 [199]	483 [219]
Outdoor				
Air Coil Dimensions (H x W), in. [mm]		48 x 64 [1219 x 1626]	48 x 64 [1219 x 1626]	48 x 64 [1219 x 1626]
Air Coil Total Face Area, ft2 [m2]		21 [1.951]	21 [1.951]	21 [1.951]
Air Coil Tube Size, in [mm]		5/16 [7.9]	5/16 [7.9]	5/16 [7.9]
Air Coil Number of rows		2	2	2
Weight - Operating, lb [kg]		215 [98]	215 [98]	215 [98]
Weight - Packaged, lb [kg]		235 [107]	235 [107]	235 [107]

11/17/2022

The Aurora™ Control System

Aurora 'Advanced' Control



The Aurora 'Advanced' Control expands on the capability of the Aurora 'Base' Control (ABC) System by adding the Aurora Expansion Board (AXB). The additional features include compressor current monitoring, loop pump linking, intelligent hot water generator control, variable speed pump capability, and also allows for optional energy, refrigeration, and performance monitoring factory installed 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.

In addition, the AXB monitors Suction Temperature and Pressure to support EEV Control in both Air Source and Geo Mode.

Aurora "Outdoor" Control (AOB)

This is an additional Control Board utilized in Air Source Mode. It is mounted inside the Control Box on the Outdoor Unit. In Air Source Mode, the AOB is connected to the ABC through a 4-wire Communication Cable. The AOB controls the Outdoor Fan Motor and also supports additional features including Outdoor Coil Temperature, Outdoor Ambient Temperature, Outdoor Discharge Air Temperature monitoring. It also monitors the Suction Temperature and Pressure on the Outdoor Unit for accurate EEV Control during Heating Operation. The DIV output on the AOB controls the outdoor Solenoid Valve, so that it opens and closes with the compressor ON and OFF cycle. Outdoor Fan Motor current is monitored by the AOB to provide information regarding the health of the OD Fan Motor or Current Transducer.

Aurora Control Features	Description	Aurora 'Advanced'
Microprocessor Compressor Control	Microprocessor control of compressor for timings with FP1, HP, LP, Condensate, assignable Acc relay	•
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.	•
Compressor Monitoring	Control monitors compressor starts for high current, missing leg etc.	•
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 Contactx2
HAN/Smart Grid Com (AWL and Portal) Kit	Allows direct communication of the Aurora to Smart Meters, Home Automation Network and Internet.	Standard
IntelliZone2® Compatibility	IntelliZone2 communicates Modbus to the heat pump via the AXB board.	Optional IntelliZone2

The Aurora Control System cont.

Service Device	Description	Aurora 'Advanced'
 **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.xx or greater)

Add On Control Feature Kits (field or factory installed)	Description	Aurora 'Advanced'
Energy Monitoring Kit	Monitors realtime power consumption of compressor, blower, aux heat and pump. Requires thermostat TPCM32UO3A, TPCM32UO4A, or TPCC32UO2. AXB required.	Standard
Refrigeration Monitoring Kit	Monitors realtime pressures, temperatures, superheat, and subcooling. AXB required.	Standard
Performance Monitoring Kit (N/A in ASHP mode)	Monitors air and water temperatures, and water flow rate and calculates heat of extraction/rejection. AXB required.	Standard
Data Logging (AWL) Kit	Allows data logging of up to 12 months. AXB required. Can also be temporarily installed.	Standard
HAN/Smart Grid Com (AWL and Portal) Kit	Allows direct communication of the Aurora to Smart Meters, HAN, and internet. AXB required.	Optional
AXB Kit for advanced hot water generator control, flow center linking, variable speed pump, IntelliZone2	Added to 5 Series for key features of advanced hot water generator control, advanced loop control/linking, IntelliZone2 communication, and variable speed pump control.	Standard

Add On Thermostats and Zoning	Description	Aurora Advanced
 **TPCM32U03A/04A - MonoChrome Communicating Thermostat**	Elite Stat with full English fault codes and alerts, communicating thermostat. Monochrome thermostat allows instantaneous energy measurement only. Compatible with AWL.	Optional
 **TPCC32U02 - Color Touchscreen Communicating Thermostat**	4.3 in. color touchscreen communicating thermostat with full English fault codes and alerts. Color thermostat allows instantaneous energy measurement and 13 month energy usage history. Compatible with AWL.	Optional
 **IntelliZone2® Zoning**	IntelliZone2® is a communicating zoning system that 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 3 thermostat options (MasterStat, SensorStat, ZoneStat). Compatible with AWL.	Optional (IntelliZone2 Preferred)

The Aurora Control System cont.

Control Features

Software ABC Geo-Ready (Air)

Variable Speed Indoor ECM Blower Motor Option

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

Other Control Features

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

Air Source Control Features:

- Demand Defrost
- Timed Defrost
- 6-Hour Defrost
- Air Source Mode
- Geo Mode
- Outdoor Coil Temperature Sensor
- Outdoor Ambient Temperature Sensor
- Discharge Line Temperature Sensor
- Discharge Air Temperature Sensor(for Charge Assist)
- Indoor/Outdoor EEV
- Indoor/Outdoor Solenoid Valve
- Charging/Recovery/Evacuation

Field Selectable Options via Hardware

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

Test Mode

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

Variable Speed Indoor ECM Configuration Mode

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

The Aurora Control System cont.

Reset Configuration Mode

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

DIP Switch (SW2)

SW2-1 FP1 Selection – Low water coil temperature limit setting for freeze detection. On = 30°F; Off = 15°F.
SW2-2 FP2 Selection – On = 30°F; Off = N/A
SW2-3 GEO/ASHP Mode - Used to switch between Air Source and Geo Mode depending on field application. On = ASHP (Air Source Mode); Off = GEO (Geo Mode).
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

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

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

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

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

Alarm Jumper Clip Selection

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

Variable Speed Indoor ECM Configuration Mode

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

Field Selectable Options via Software

(Selectable via the Aurora AID Tool)

Unit Size (Air Source Mode)

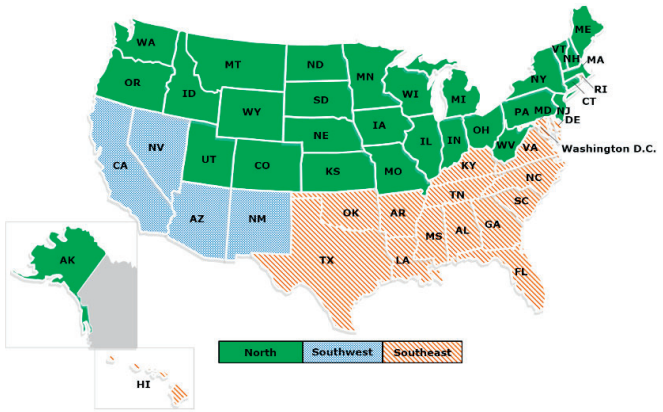
Full Load and Part Load Outdoor Fan speeds for each tonnage can be selected through the AID Tool. Correct Airflow for each system size will be set in the Factory before units are shipped.

Defrost Configuration

Mode - The AID Tool will have both **Timed and On-Demand Defrost options** available. By default, the system will be configured to run Demand Defrost (recommended). At any time, this can be changed to Timed Defrost by simply accessing the Defrost Configuration screen on the AID Tool. It is recommended to make any necessary changes to the Defrost Mode before Unit Startup.

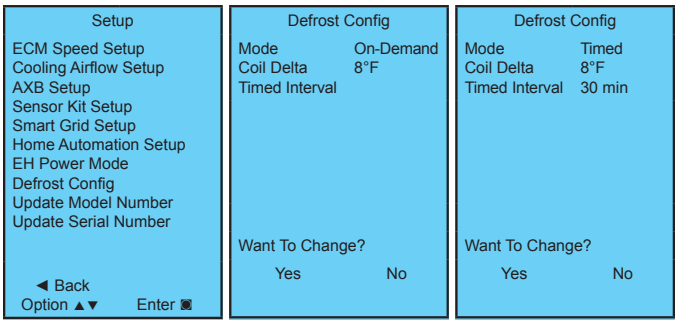
Coil Delta - The Coil Delta is a variable that is utilized to determine the amount of frost on the Outdoor Air Coil and enables accurate Defrost initiation. By default, this value is set to 4°F (recommended) . It can be configured between 4°F - 8°F (at 1°F increments) if needed.

USA Regions	Coil Delta Recommended Settings
Northern Region States	4˚F-7˚F
Southeastern Region States	6˚F-8˚F
Southwestern Region States	8˚F



Timed Interval - This is the interval at which Defrost is initiated in Timed Mode only. By default, this interval is set at 30 minutes, but can be configured to 60 and 90 minutes if needed. It is recommended to only configure this setting if the system requires to run Timed Defrost Mode.

For High Humidity Northern States such as Washington or Oregon, Timed Defrost Mode may be beneficial in keeping up with excessive frost build up on the outdoor coil and allowing efficient heating operation in cold weather.



The Aurora Control System cont.

Safety Features

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

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

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

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

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

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

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

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

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

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

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

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

Freeze Detection (Indoor 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.

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.

Air Source Safety Features

Low Pressure Switch Ignore - this is an Air Source Mode only Feature that is activated during low Ambient Heating Mode. The control shall ignore the LPS Input when the Outdoor Ambient Temperature is <= 17°F. The LPS Input is also ignored during Active Defrost and also 120 seconds following the termination of a Defrost Cycle. This feature ensures continued system operation at low ambient heating conditions.

Low Discharge Gas Temperature - this is an Air Source Mode only Fault Code. This fault code is only active in Heating Mode. This fault is recognized at Outdoor Ambient temperature <= 17°F in Heating Mode and after fifteen minutes of accumulated compressor run time following the exit of a defrost cycle. The low discharge temperature fault could indicate a failed outdoor fan or other things such as the outdoor coil turning too cold during heating operation. The lockout is intended to prevent refrigerant flooding back to the compressor. The discharge sensor must be well insulated and installed properly to prevent nuisance lockouts from occurring. This is a secondary safety feature at low ambient heating conditions to provide system protection when the LPS is ignored.

The Aurora Control System cont.

High Discharge Gas Temperature - this is an Air Source Mode only Fault Code. This fault code is active in both Heating and Cooling Mode. This fault is recognized at discharge gas temperatures of 250°F and above. The control shall lockout after the third occurrence of this fault. A soft reset will clear the fault code counter for High Discharge Gas Temperature.

Operation Description

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

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

Heating Operation

Heating, 1st Stage (Y1) - The blower is started on "G" speed immediately and the compressor is energized 10 seconds after the Y1 input is received. The ECM blower motor is switched to low speed 15 seconds after the Y1 input.

Heating, 2nd Stage (Y1, Y2) - The compressor will be staged to full capacity 20 seconds after Y2 input is received. The ECM blower will shift to high speed 15 seconds after the Y2 input is received.

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

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

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

Cooling Operation

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

Cooling, 1st Stage (Y1, O) - The blower is started on "G" speed immediately and the compressor is energized 10 seconds after the Y1 input is received. The ECM blower motor is switched to low speed 15 seconds after the Y1 input.

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

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

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

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

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

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

Defrost Operation (Air Source Mode)

The system utilizes an adaptive Defrost algorithm to sense frost accumulation on the Outdoor Air Coil and initiates defrost cycles accordingly to keep the coil frost free during the heating season. Defrost Operation is equivalent to cooling operation except that the outdoor fan motor is de-energized. Both Demand and Timed Defrost modes will be selectable through the AID Tool, whichever is applicable in the field. By Default, all units will be programmed to run Demand Defrost unless a need for switching to Timed Defrost arises.

Defrost Logic Basic Description

Defrost Monitoring - During normal Heating operation, the outdoor ambient and outdoor coil temperatures are measured for the Defrost Initiation trigger and stored.

Pre Defrost Rampdown (Stage-1) - Once Triggered, compressor is ramped down within 10s.

The Aurora Control System cont.

Pre Defrost Wait – System is shutdown for 10s to shift reversing valve prior to Defrost.

Defrost Cycle Time – Compressor started in cooling full capacity for a minimum of 3 minutes and a maximum of 12 minutes while monitoring outdoor coil temperature for termination logic.

Post Defrost Wait – System is shutdown for 10s to shift reversing valve prior to normal heating.

Clean Coil Calibration – After coil is cleaned, system operates in heating at Full Load for 1 minute to cool coil down and then coil temperature is measured four times 1 min apart to obtain an average clean coil temperature related to current ambient temperature for the next defrost cycle.

End of Cycle – Normal heating is resumed with little time delays. Correct compressor speed is communicated based on mode of operation prior to defrost initiation.

Demand Defrost Initiation

Sacrificial Defrost - In Heating Mode, the system will initiate a Sacrificial Defrost Cycle after the first 30 minutes of accumulated compressor run time if the measured Outdoor Coil Temperature remains at or below 35°F and the Outdoor Ambient Temperature remains at or below 50°F. This is because the system is considered un-calibrated for Defrost during every power cycle after the system starts up in Heating Mode.

Clean Coil Calibration - Once the Sacrificial Defrost has terminated, a clean coil temperature is established by averaging Outdoor Coil Temperature readings once a minute (for 4 minutes).

Defrost Trigger - The Defrost Trigger temperature is the temperature that is calculated right before the beginning of every Defrost Cycle in Demand Mode. For Sacrificial Defrost, the Defrost Trigger Temperature is assigned a default value of 35°F. The Defrost Trigger Temperature varies with changing Outdoor Ambient and Coil Temperature conditions and is also dependent upon stored Clean Coil Temperature readings and a specified Coil Delta Temperature (NOTE: The Coil Delta Temperature is configurable through the AID Tool Defrost Configuration Screen). Therefore, anytime after the compressor accumulated runtime reaches 30 minutes, if the Outdoor Coil Temperature is measured to be equal to or less than the Defrost Trigger Temperature, then a Defrost Cycle is initiated (provided the measured Outdoor Ambient Temperature is still less than or equal to 50°F).

NOTE: Look at Figure-xx Demand Defrost Example for how the cycle is initiated and terminated.

Timed Defrost Initiation

In Timed Defrost Mode, the system does not go through Clean Coil Calibration and is therefore unable to detect the amount of frost on the Outdoor Air Coil. It is only dependent upon a specified Outdoor Coil Temperature of 35°F and accumulated compressor run time of 30/60/90 minutes (NOTE: The timed intervals of 30/60/90 minutes are selectable through the AID Tool Defrost Configuration Screen). If the system is configured for 30 Minute Timed Defrost Mode, then during heating operation, if the accumulated compressor runtime reaches 30 minutes and the Outdoor Coil Temperature is measured to be less than or equal to 35°F, then a Defrost Cycle is initiated.

Defrost Initiation Sequence

Following is a step by step outline of the Defrost Initiation sequence:

Step-1 Begin ignoring Low Pressure Switch;
Ramp Compressor speed down to OFF (within 10s)

Step-2 Ramp the Outdoor Fan down to OFF (within 5s);
Ramp the Indoor Blower down to OFF (within 5s)

Step-3 Wait 5s

Step-4 Begin “Defrost Cycle Timer”; Ramp up Compressor to Full Speed; Energize Reversing Valve; Ramp Indoor Blower up to Full Speed; Turn ON Auxiliary Heat (EH-1)

Step-5 Wait 1 minute. Turn ON Auxiliary Heat (EH-2)

Step-6 Active Defrost Cycle

Defrost Termination Sequence

Defrost is terminated if any of the following conditions are satisfied:

1. If the Outdoor Coil Temperature is measured to be equal to or above the Defrost Terminate Coil Temperature (this has a maximum value of 50°F and a minimum value of 37°F).
2. After 12 minutes of operation in Defrost Mode.
3. If call for Heating is removed during an Active Defrost Cycle, defrost is terminated and the Defrost Cycle timer is paused. When the control receives another call for heating, the system shall continue the Defrost Cycle from the point where the Defrost Cycle timer was paused.

The control shall do the following to terminate a defrost cycle:

The Aurora Control System cont.

Step-7 Ramp down compressor to OFF; Wait 10s

Step-8 Turn OFF Auxiliary Heat (EH-1 & EH-2); Wait 5 seconds. De-energize Reversing Valve;

Step-9 Wait 5 seconds

Step-10 Ramp up compressor to Full Speed; Ramp up Outdoor Fan to Full Speed;

Step 11-14 Take 4 readings of the Coil Temp at one reading per minute (t1, t2, t3, t4)

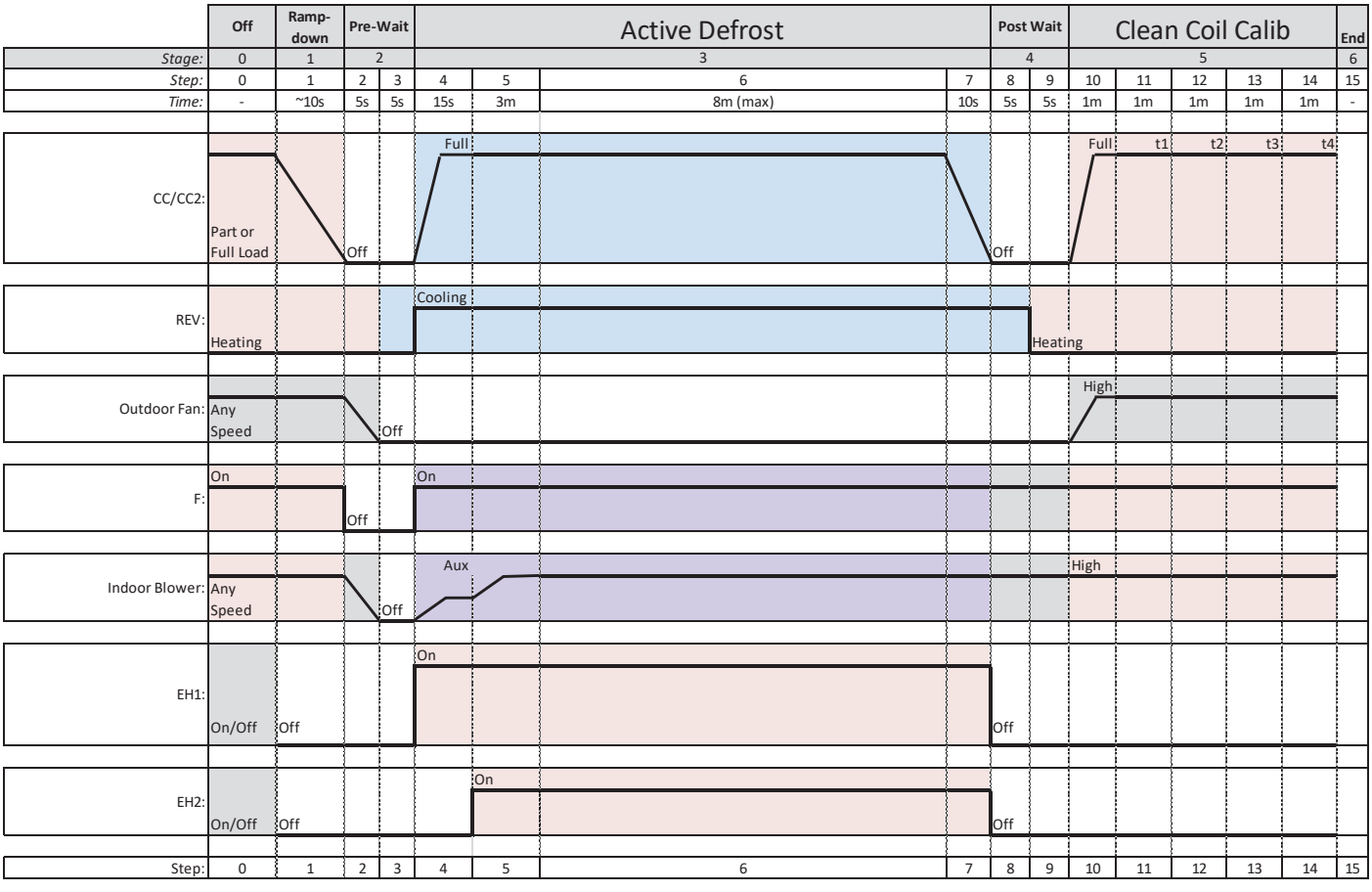
Step-15 Communicate proper speed of compressor after calibration is completed; Reset and restart accumulated compressor runtime. Ignore Low Pressure Switch (start 120s timer for LPS Ignore time)

6-Hour Defrost

Should 6 hours of "Accumulated Compressor Run Time" in Heating elapse without a Defrost Cycle AND the Outdoor Ambient Temperature is <= 50°F (for 1 continuous minute), a Defrost Cycle will be initiated immediately. This forced defrost shall be terminated after 6 minutes if the Outdoor Coil Temperature is greater than or equal to the Defrost Terminate Coil Temperature (NOTE: In Timed Mode, this value is specified at 50°F). The purpose of this 6-Hour Defrost is to allow oil return to the compressor at lower operating temperatures. The compressor shall run Full Stage during the Defrost Cycle. However, if the Outdoor Coil Temperature goes above the Defrost Terminate Coil Temperature, 3 minutes after the 6hr mark, then the system shall terminate Defrost normally per the Defrost Termination Logic. This event shall occur if the Outdoor Coil Temperature is greater than the Defrost Trigger Coil Temperature (NOTE: In Timed Mode, this value is specified at 35°F) for 6 hours of "Accumulated Compressor Run Time" in Heating.

NOTE: Look at Figure-18 Six Hour Defrost Example (Demand) and Figure-19 Six Hour Defrost Example (Timed) for how the cycle is initiated and terminated.

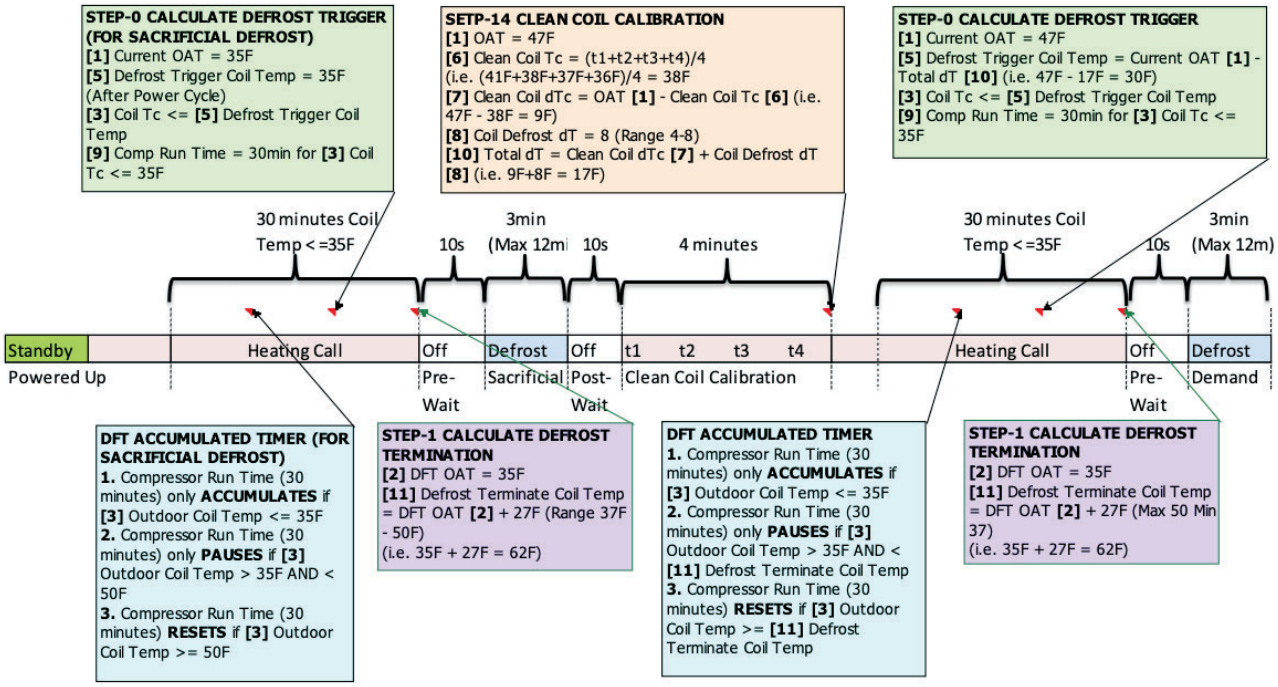
Dual Capacity Demand Defrost Logic



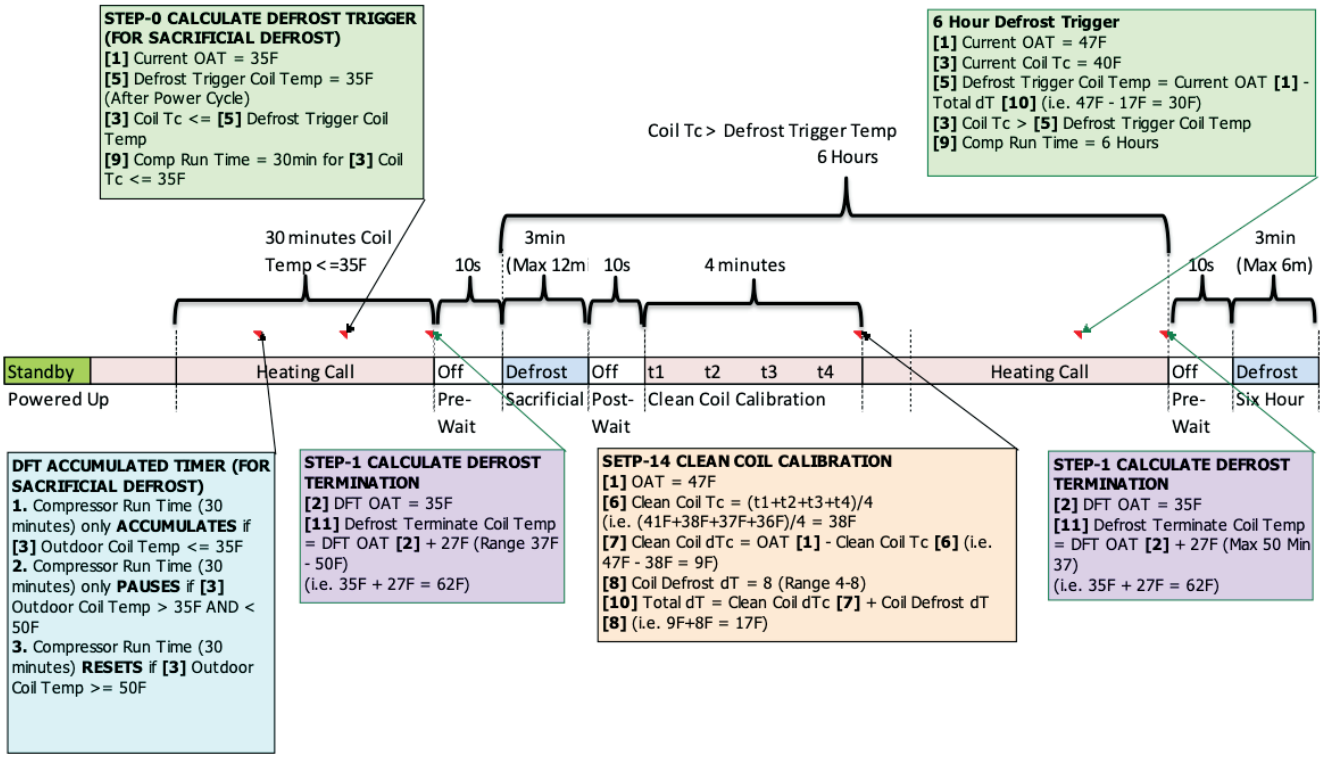
NOTE: For 6-Hr Defrost, Step-5 = 3 minutes and Step-6 = 3 minutes.

The Aurora Control System cont.

Demand Defrost Example (Figure 18)

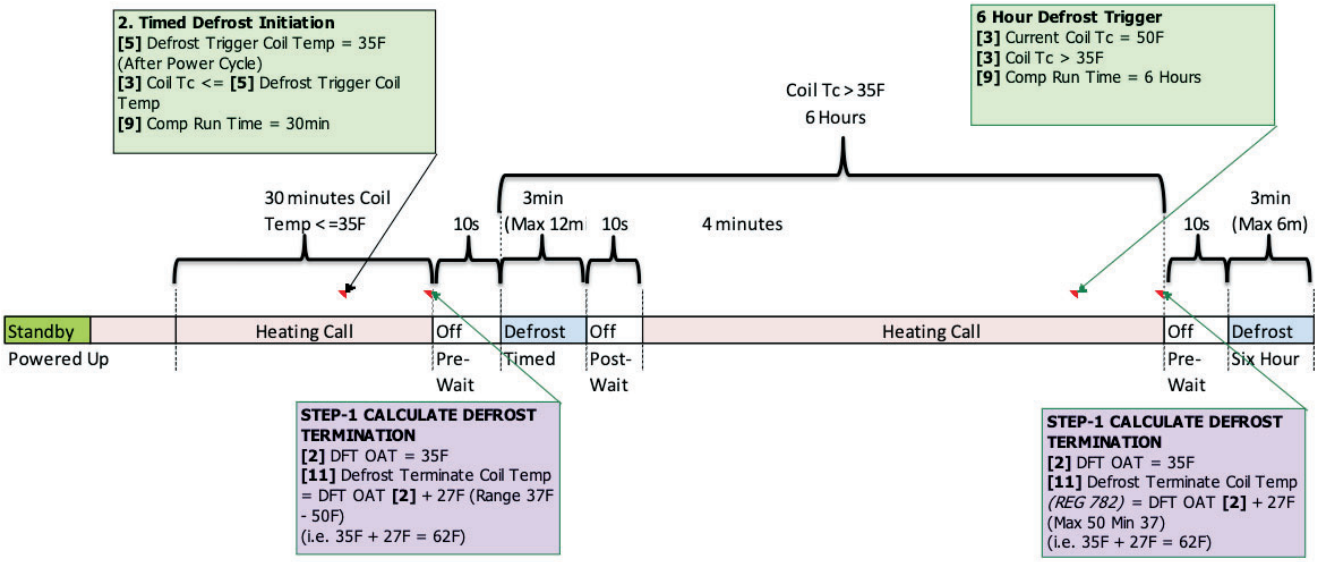


Six Hour Defrost Example (Demand) (Figure 19)



The Aurora Control System cont.

Six Hour Defrost Example (Timed)



The Aurora Control System cont.

Aurora 'Base' Control LED Displays

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

Status LED (LED3, Green)

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

Configuration LED (LED2, Yellow)

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

Fault LED (LED1, Red)

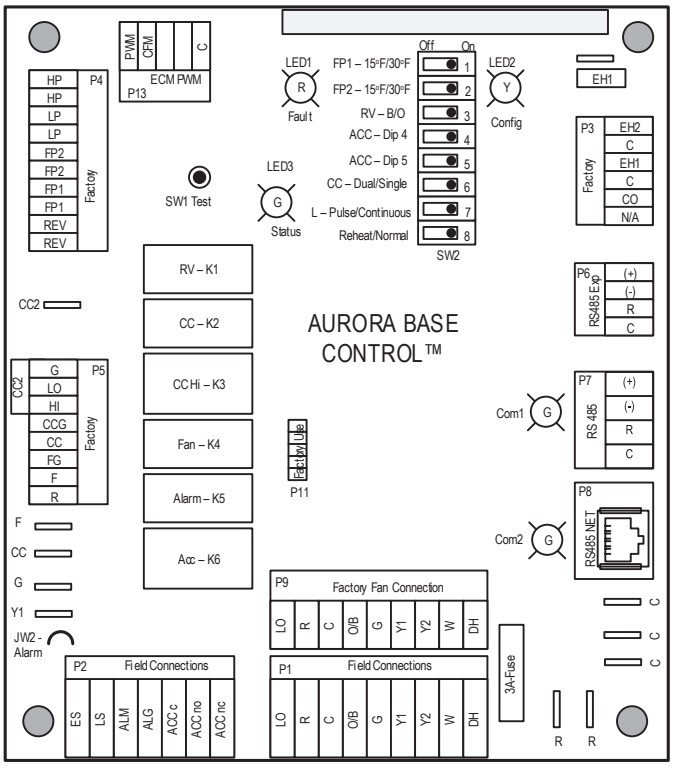
	Red Fault LED	LED Flash Code*	Lockout	Reset/ Remove
ABC Basic Faults	Normal - No Faults	OFF	–	
	Fault - Input	1	No	Auto
	Fault - High Pressure	2	Yes	Hard or Soft
	Fault - Low Pressure	3	Yes	Hard or Soft
	Fault - Freeze Detection FP2	4	Yes	Hard or Soft
	Fault - Freeze Detection FP1	5	Yes	Hard or Soft
	Fault - Condensate Overflow	7	Yes	Hard or Soft
	Fault - Over/Under Voltage	8	No	Auto
	Fault - FP1 Sensor Error	11	Yes	Hard or Soft
	Fault - CritComErr	19	NO	Auto

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

Aurora Interface and Diagnostics (AID) Tool

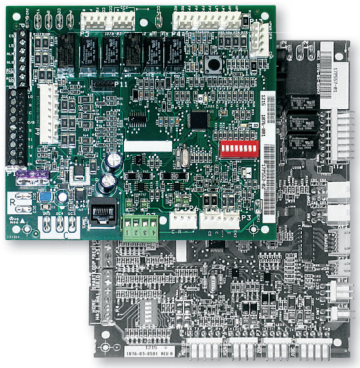
The Aurora Interface and Diagnostics (AID) Tool is a device that is a member of the Aurora network. The AID Tool is used to troubleshoot equipment which uses the Aurora control via Modbus RTU communication. The AID Tool provides diagnostics, fault management, variable speed ECM setup, and system configuration capabilities to the Aurora family of controls. An AID Tool is required, for ECM airflow settings and for setting the correct Unit Size in Air Source Mode. The AID Tool simply plugs into the exterior of the cabinet in the AID Tool port.

ABC Control Board Layout



The Aurora Control System cont.

Aurora 'Advanced' Control Features



The Aurora 'Advanced' Control system expands on the capability of the Aurora 'Base' Control (ABC) by adding the Aurora Expansion Board (AXB). All of the preceding features of the Aurora 'Base' Control are included. The following control description is of the additional features and capability of the Aurora advanced control.

It is highly recommended the installing/servicing contractor obtain an Aurora Interface and Diagnostic Tool (AID) and specialized training before attempting to install or service an Aurora 'Advanced' control system.

The additional AXB features include the following:

AXB DIP Switch

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 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

Advanced Hot Water Generator Control (Domestic Hot Water Option)

The Advanced features an AID Tool selectable temperature limit and microprocessor control of the process. 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 setpoint (100°F - 140°F) for 30 continuous seconds (130°F is the default setting). 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. LED1 (red LED) will flash code 15 when the DHW limit is reached and when conditions are not favorable for water heating. Error code 15 will also be displayed on the AID Tool in the fault screen. This flash code is a noncritical alert and does not necessarily indicate a problem.

Compressor Monitoring

The AXB includes two current transducers to monitor the compressor current and starting characteristics. Open circuits or welded contactor faults will be detected. A fault will produce an E10 code.

Indoor Solenoid Valve

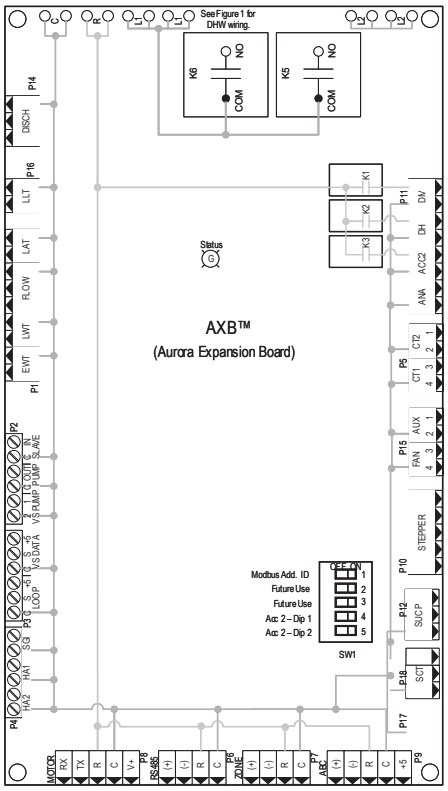
The DIV output on the AXB controls the indoor Solenoid Valve, so that it opens and closes with the compressor ON and OFF cycle. The solenoid valve holds refrigerant pressure within the system during compressor off-cycles. This reduces the amount of work done by the compressor during instances where the system might short-cycle in the field and enables the system to reach steady-state capacity sooner during compressor ON cycles.

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. The is a dedicated communication port using a proprietary ModBus protocol. An AXB is required. Consult the IntelliZone2 literature for more information.

The Aurora Control System cont.

AXB Control Board Layout



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. 75% and 100% are the default settings respectively. The VS data input allows a separate PWM signal to return from the pump giving fault and performance information. Fault received from the variable speed pump will be displayed as E16.

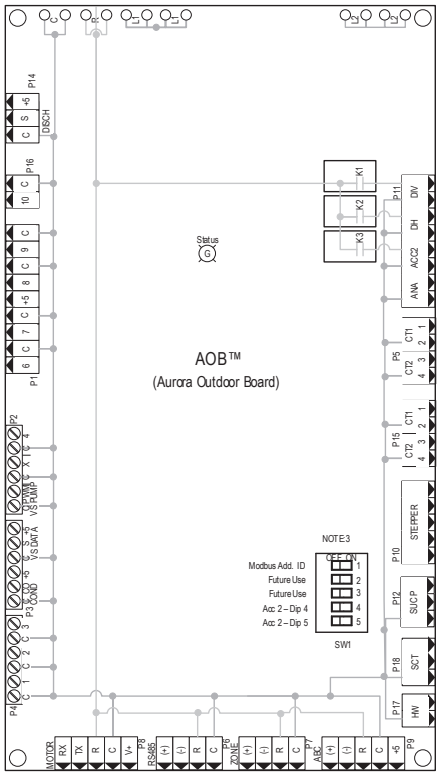
Modulating Water Valve

This 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. 75% and 100% are the default settings respectively.

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 pump, both unit's loop pump relays and variable speed pumps are energized. The flow center then can simply be wired to either unit. The output from one unit should be routed to the input of the other. If daisy chained up to 16 heat pumps can be wired and linked together in this fashion.

AOB Control Board Layout



Aurora "Outdoor" Control Features

This is an additional Control Board utilized in Air Source Mode. It is mounted inside the Control Box on the Outdoor Unit. In Air Source Mode, the AOB is connected to the ABC through a 4-wire Communication Cable. The AOB controls the Outdoor Fan Motor and also supports additional features including Outdoor Coil Temperature, Outdoor Ambient Temperature, Outdoor Discharge Air Temperature monitoring. It also monitors the Suction Temperature and Pressure on the Outdoor Unit for accurate EEV Control during Heating Operation.

Outdoor Solenoid Valve

The DIV output on the AOB controls the outdoor Solenoid Valve, so that it opens and closes with the compressor ON and OFF cycle. The solenoid valve holds refrigerant pressure within the system during compressor off-cycles. This reduces the amount of work done by the compressor during instances where the system might short-cycle in the field and enables the system to reach steady-state capacity sooner during compressor ON cycles.

The Aurora Control System cont.

AWL – Aurora Weblink

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 e-mail
- 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

Advanced Communication Ports

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

Smart Grid-On Peak (SG) Input

The '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. With a closed contact signal, this input will limit the operation and thus the power consumption of the unit by one of the below selections. The AID Tool will allow configuration of this input for the action of:

- No Action
- Disable compressor operation until removed
- Go to On Peak thermostat settings until removed [Requires Com T-Stat] (Future Release)
- Compressor limited to 50% or low cap until removed [dual capacity or variable speed only] (Future Release)
- Disable compressor operation for 1/2 hr (can be removed immediately) (Future Release)

Then Flash Code 7 on the Green LED for the 'On Peak' mode. And On Peak will 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

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 Packages

Energy Monitoring (Geo Mode)

The Energy Monitoring Package includes two current transducers (blower and electric heat) added to the existing two compressor sensors so that the complete power usage of the heat pump can be measured. The AID Tool provides configuration detail for the type of blower motor, power adjustment and a line voltage calibration procedure to improve the accuracy, and a power adjustment setting that allows the compressor power to be adjusted to match the unit's line voltage using the provided tables. This information can be displayed on the AID Tool or selected communicating thermostats. The TPCM32U03A/04A will display instantaneous energy use while the color touchscreen TPCC32U02 will in addition display a 13 month history in graph form. Refer to Unit Start Up Energy Monitoring for configuration details.

Dual Capacity Power Adjustment

Model	Unit Capacity	Voltage		
		208	230	250
038	Full Load	0.99	0.97	0.91
	Part Load	0.99	0.94	0.83
049	Full Load	0.94	0.91	0.85
	Part Load	0.91	0.84	0.75
064	Full Load	0.95	0.9	0.79
	Part Load	0.92	0.83	0.71

The Aurora Control System cont.

Energy Monitoring (Air Source Mode)

When the system is configured for Air Source Mode, an additional current transducer on the AOB monitors power consumption by the Outdoor Fan Motor.
The AID Tool provides configuration detail for power adjustment and a line voltage calibration procedure to improve the accuracy, and a power adjustment setting that allows the outdoor fan motor power to be adjusted to match the unit's line voltage.

Refrigerant Monitoring (Geo Mode)

The Refrigerant Monitoring Package 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, subcooling, and EEV%. This information will only be displayed on the AID Tool.

Refrigerant Monitoring (Air Source)

In Air Source Mode, the Refrigerant Monitoring Package includes three Pressure Transducers and four Temperature sensors, liquid line, compressor suction temperature, outdoor suction temperature and compressor discharge line temperature. The additional pressure transducer and temperature sensor compared to the Geo Configuration are due to the addition of the Outdoor Unit which includes Suction Pressure and Temperature monitoring during Heating Operation. Other than that, the AID Tool will display similar Superheat, Subcooling and EEV% information as Geo Mode.

Performance Monitoring (Geo Mode Only)

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 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.

Dehumidification – Passive

In passive dehumidification mode, the airflow is reduced by 15% from the heating airflow setting. If cooling airflow is set to +5, -5 or -10% of heating airflow it will automatically be set to -15% of heating airflow whenever the dehumidification call is present in the communicating stat or from the thermostat input DH. If the airflow for cooling is already set to -15% no airflow change will be noticed from normal cooling. Dehumidification mode will be shown on the ABC and the communicating thermostats.

Aurora 'Advanced' Control LED Displays

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

Status LED (LED3, Green)

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

Configuration LED (LED2, Yellow)

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

Air Source Mode Fault Codes

Red Fault LED	LED Flash Code	Lockout	Reset/Remove	Air Source/ Geo Mode	Mode of Operation	Fault Condition Summary
Loss of Charge	6	Yes	Hard or Soft	TBD	Heating and Cooling	Low Pressure Switch is sensed open before compressor startup.
Outdoor Coil Temperature Sensor Failure	35	No	Auto	Air Source Only	Heating and Cooling	Outdoor Coil Temperature is > 350°F OR <-80°F for 30 seconds continually.
Low Discharge Line Temperature	36	Yes	Hard or Soft	Air Source Only	Heating Only	Discharge Line Temperature has not reached 70°F.
High Discharge Line Temperature	42	Yes	Soft	Air Source Only	Heating and Cooling	Discharge Line Temperature > 250°F for more than 30 seconds.
Outdoor Ambient Temperature Sensor Failure	49	No	Auto	Air Source Only	Heating and Cooling	Outdoor Ambient Temperature is > 350°F OR <-80°F for 30 seconds continually.
Discharge Temperature Sensor Failure	51	Yes	Soft Reset needed below 17°F OD Ambient	Air Source Only	Heating and Cooling	Discharge Line Temperature is > 350°F OR <-80°F for 30 seconds continually.
Suction Pressure (EEV-1/EEV-2)	52	No	Soft	Air Source/ Geo Mode	Heating and Cooling	Suction Pressure is > 285PSI OR <0.5PSI for 30 seconds continually.
Suction Temperature Sensor Failure (EEV-1/EEV-2)	72	Yes	Hard or Soft	Air Source/ Geo Mode	Heating and Cooling	Suction Temperature is > 350°F OR <-80°F for 30 seconds continually.

Reference Calculations

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

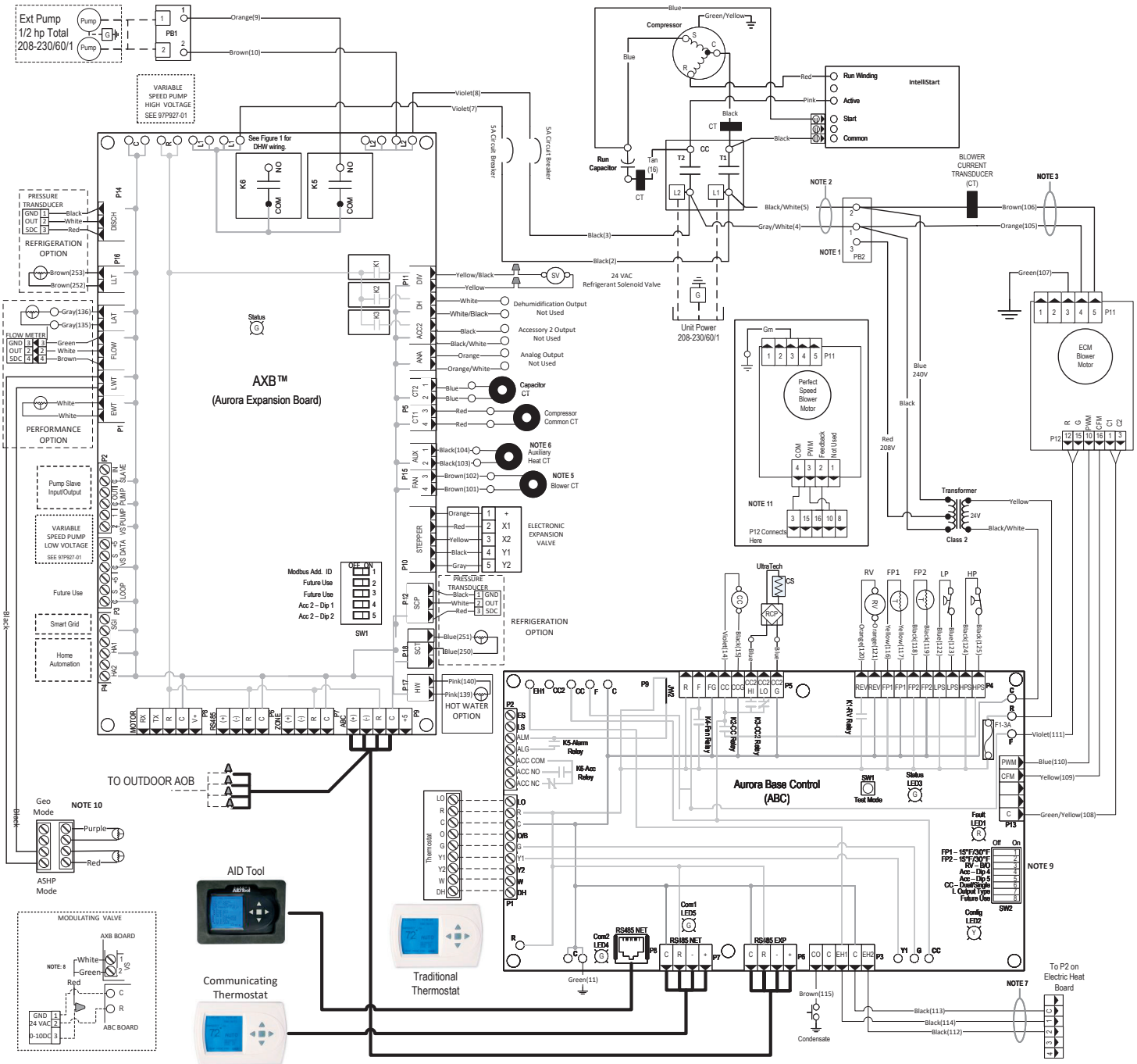
Legend

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
LPS = low pressure switch

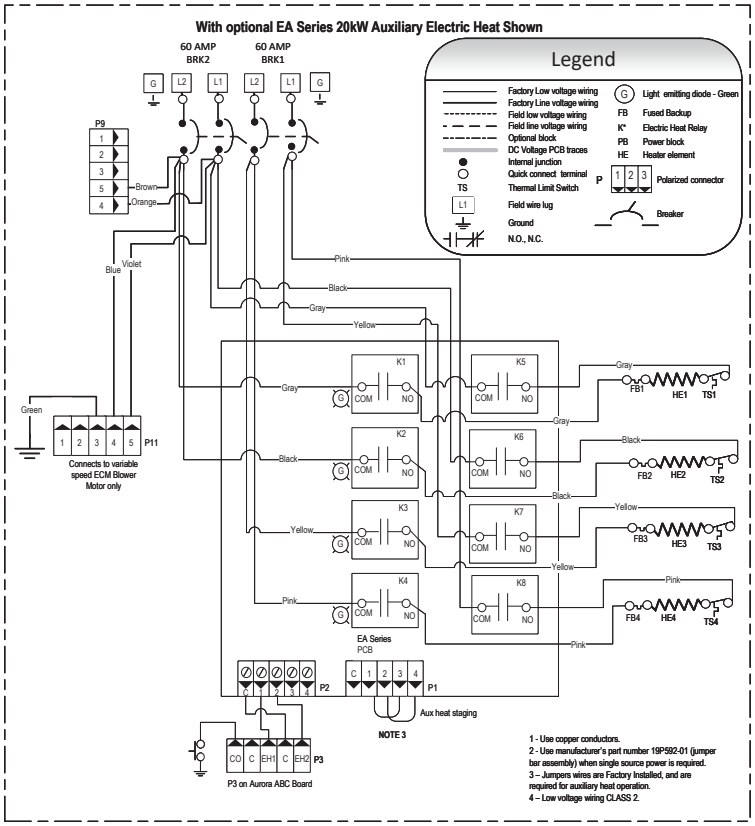
Wiring Schematics

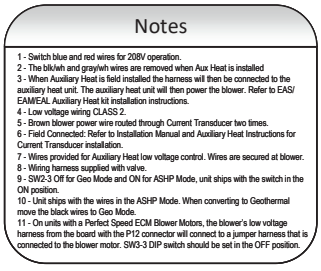
Aurora Advanced with ECM and IntelliStart

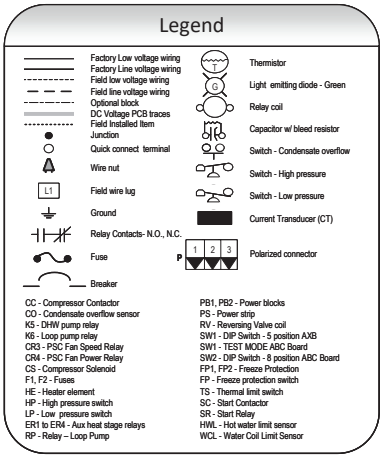


Wiring Schematics cont.

Aurora Advanced with ECM and IntelliStart cont.

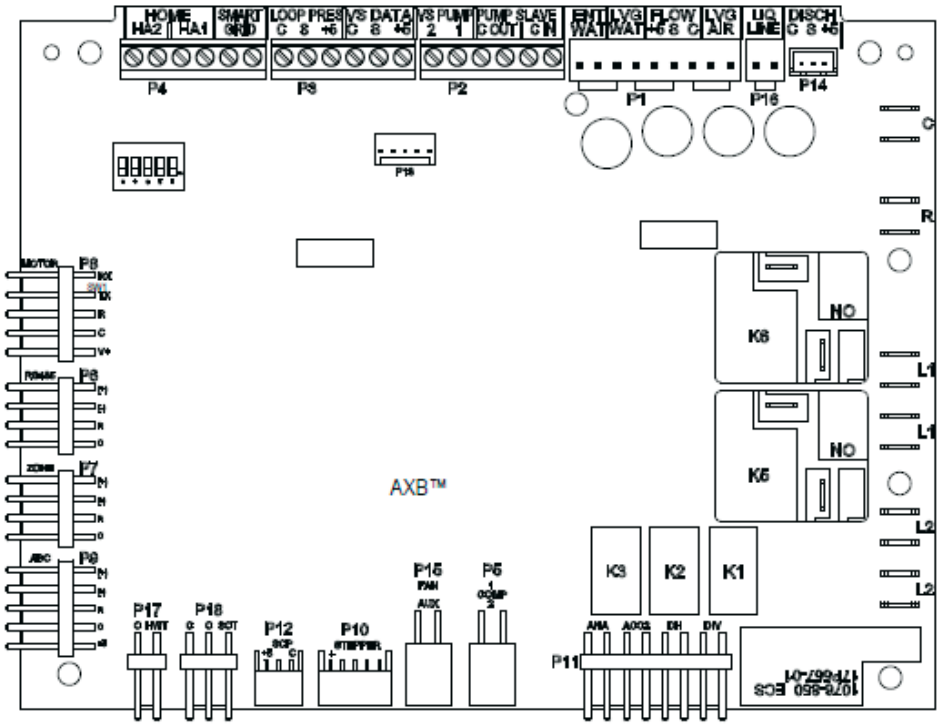






Wiring Schematics cont.

Aurora Advanced with ECM and IntelliStart cont.

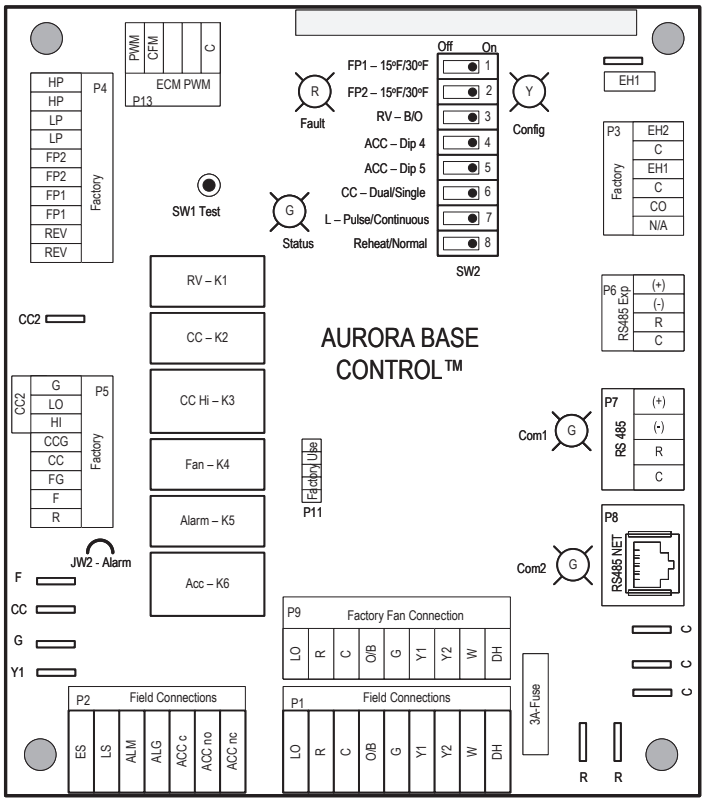


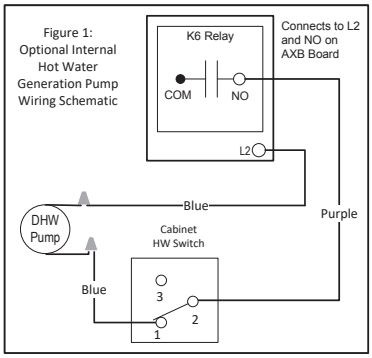
Aurora LED Flash Codes	
Slow Flash	1 second on and 1 second off
Fast Flash	100 milliseconds on and 100 milliseconds off
Flash Code	100 milliseconds on and 400 milliseconds off with a 2 second pause before repeating

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
Loss of Charge	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
Compressor Monitoring	Flash Code 10	Lockout Active	Fast Flash
Fault- FP1 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	Alarm - Home Automation 1	Flash Code 23
Fault - Critical Communication Error	Flash Code 19	Alarm - Home Automation 2	Flash Code 24
Alarm - Low Loop Pressure	Flash Code 21	Fault - EEV Error	Flash Code 25
Fault - Communication ECM Fan Motor Error	Flash Code 22	Outdoor Coil Temperature Sensor Failure	Flash Code 35
		Low Discharge Line Temperature	Flash Code 36
		High Discharge Line Temperature	Flash Code 42
		Outdoor Ambient Temperature Sensor Failure	Flash Code 49
		Discharge Temperature Sensor Failure	Flash Code 51
		Suction Pressure (EEV-1/EEV-2)	Flash Code 52
		Suction Temperature Sensor Failure (EEV-1/EEV-2)	Flash Code 72

Wiring Schematics cont.

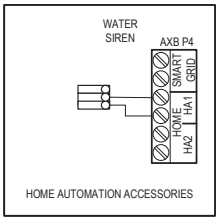
Aurora Advanced with ECM and IntelliStart cont.

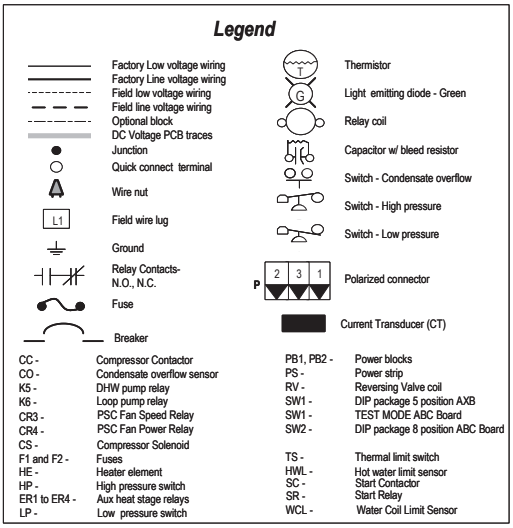




AXB Accessory 2 DIP Settings		
SW1-4	**SW1-5**	**DESCRIPTION**
ON	ON	Cycles with Blower
OFF	ON	Cycles with CC first stage compressor or compressor spd 1-12
ON	OFF	Cycles with CC2 second stage of compressor or comp spd 7-12
OFF	OFF	Cycles with DH from ABC board

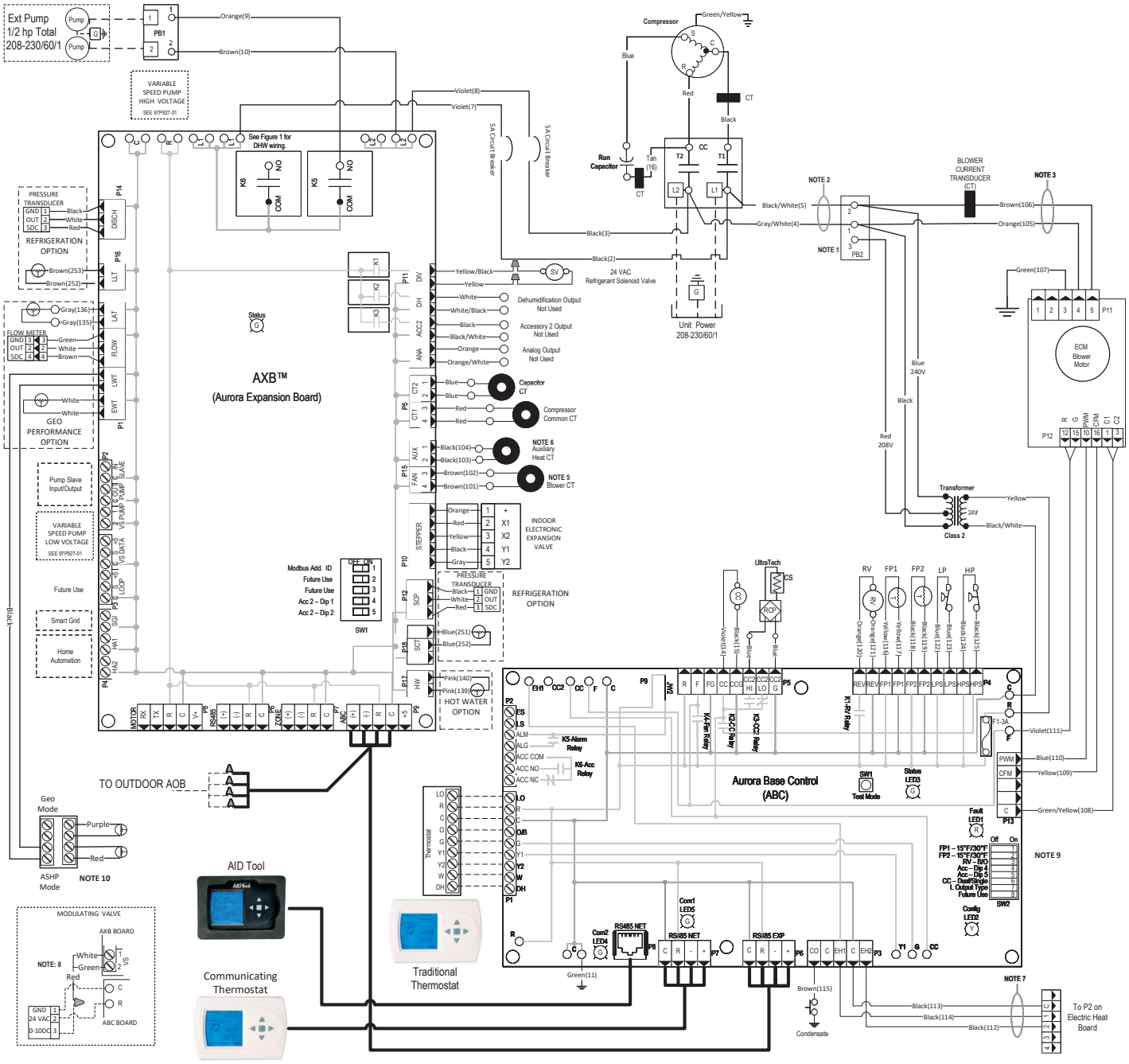
ABC SW2 Accessory Relay		
DESCRIPTION	**SW2-4**	**SW2-5**
Cycle with Blower	ON	ON
Cycle with Compressor	OFF	OFF
Water Valve Slow Opening	ON	OFF
Cycle with Comm. T-stat Hum Cmd	OFF	ON





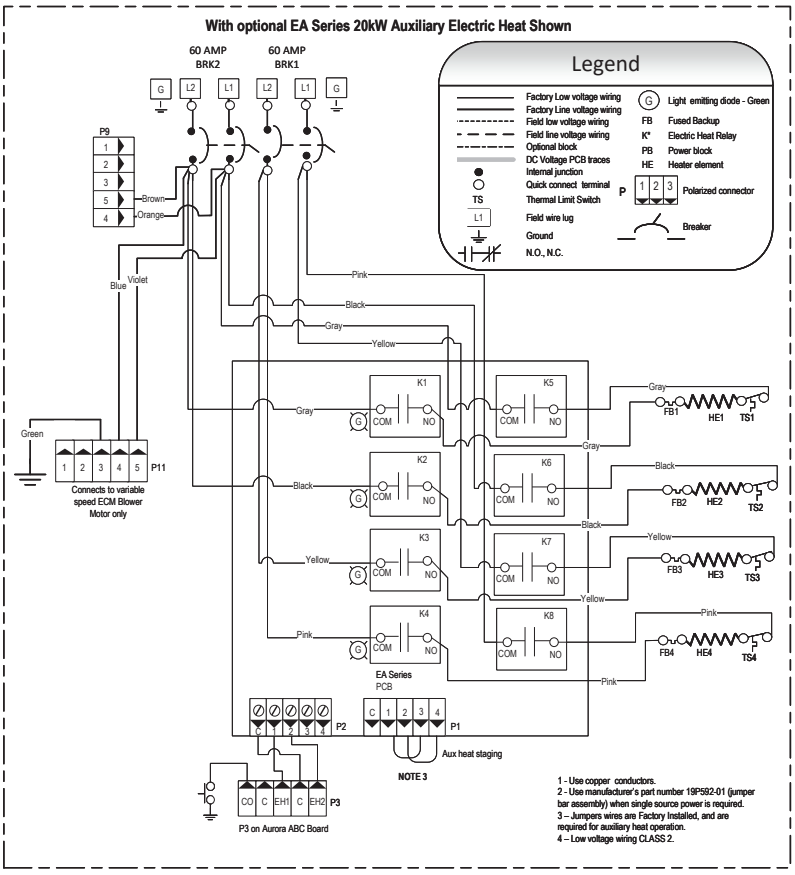
Wiring Schematics cont.

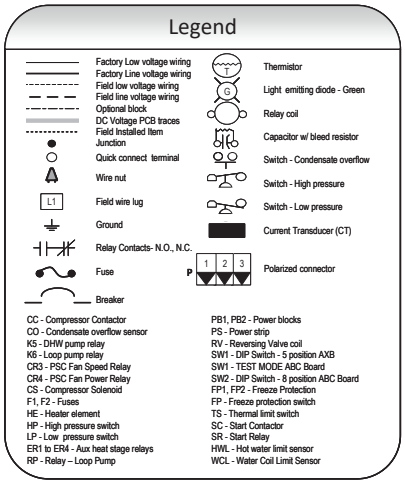
Aurora Advanced with ECM

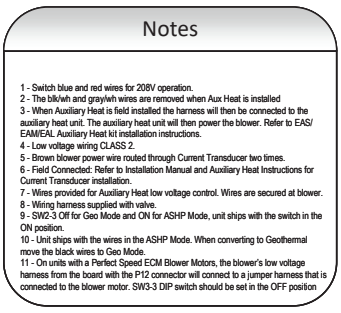


Wiring Schematics cont.

Aurora Advanced with ECM cont.

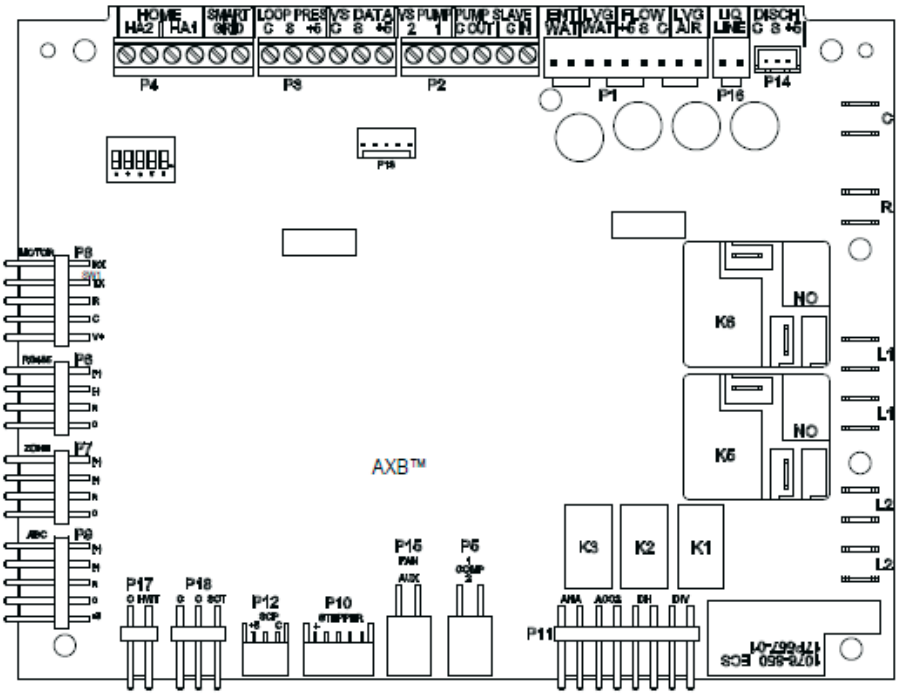






Wiring Schematics cont.

Aurora Advanced with ECM cont.



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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
Compressor Monitoring	Flash Code 10	Lockout Active	Fast Flash
Fault- FP1 Sensor Error	Flash Code 11	Dehumidification Mode	Flash Code 2
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Fault Variable Speed Pump	Flash Code 16	Future Use	Flash Code 7
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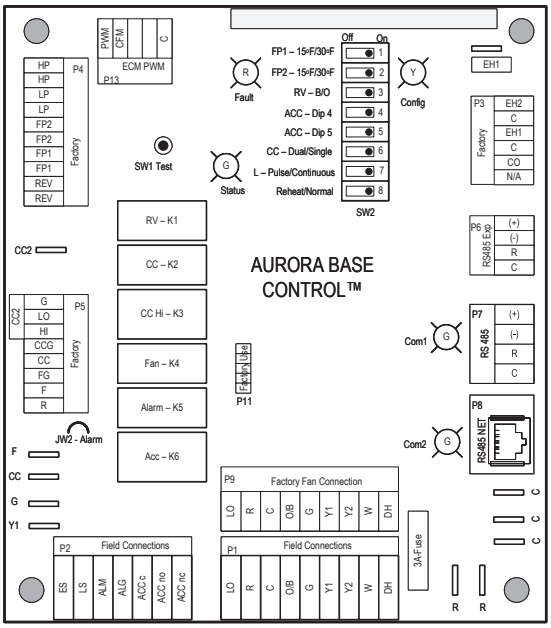
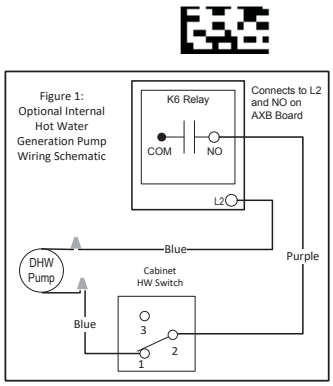
Fault - Critical Communication Error	Flash Code 19	Alarm - Home Automation 2	Flash Code 24
Alarm - Low Loop Pressure	Flash Code 21	Fault - EEV Error	Flash Code 25
Fault - Communication ECM Fan Motor Error	Flash Code 22		

Wiring Schematics cont.

Aurora Advanced with ECM cont.





AXB Accessory 2 DIP Settings		
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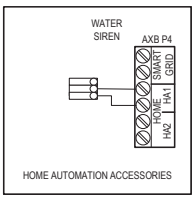
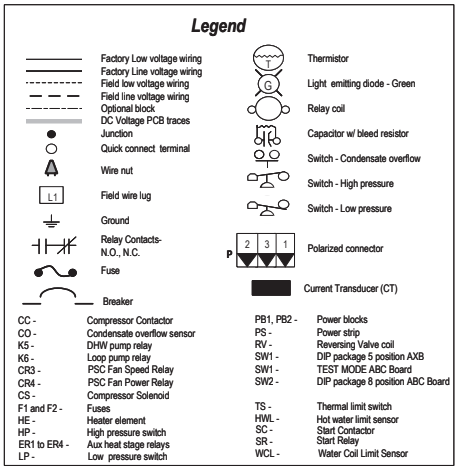
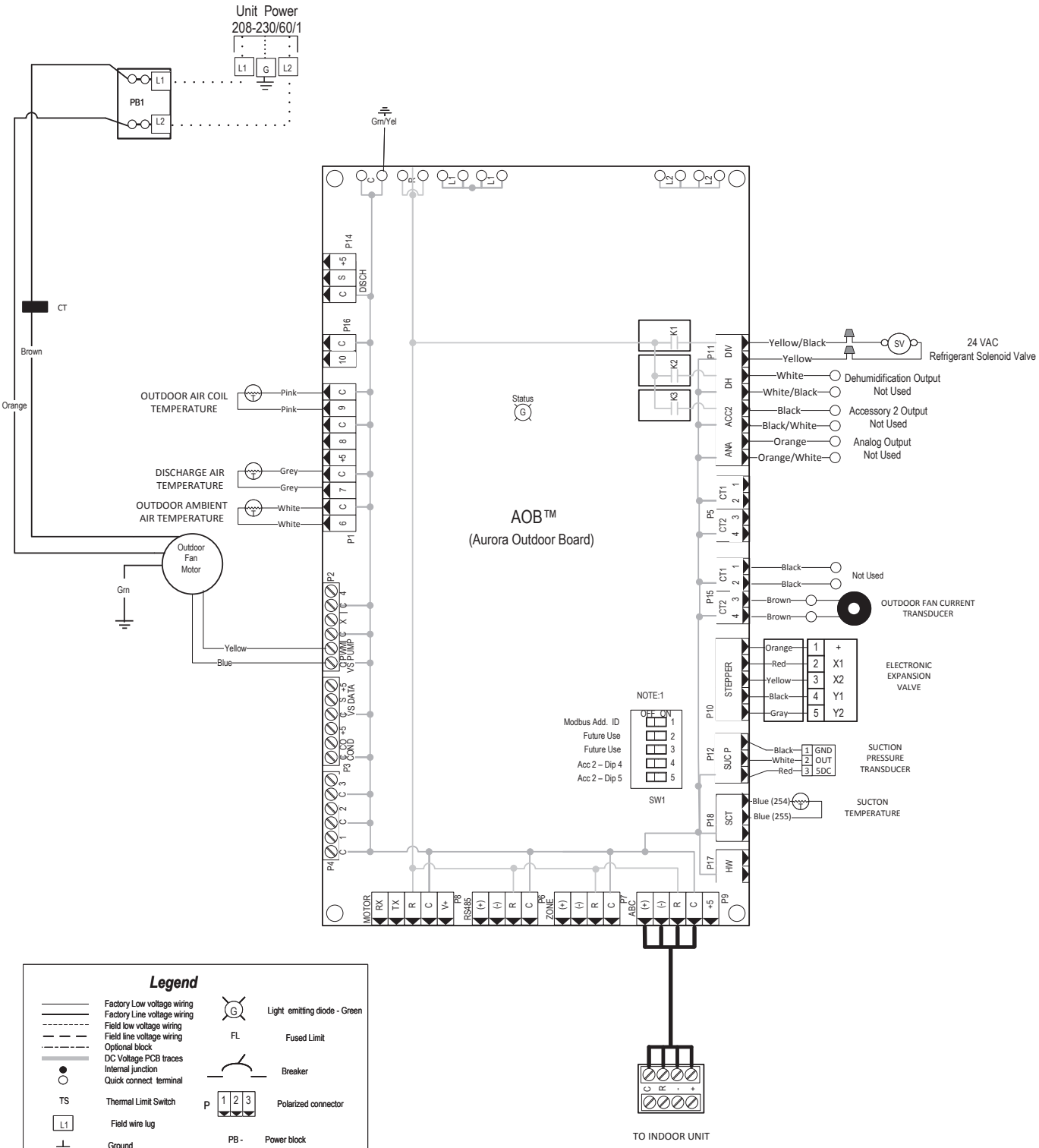
Cycle with Compressor	OFF	OFF
Water Valve Slow Opening	ON	OFF
Cycle with Comm. T-stat Hum Cmd	OFF	ON





Wiring Schematics



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.
- Crimp Wire Nut
- 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

Notes:

1) SW1-5 must be in the off position

Air Source vs Geo Mode

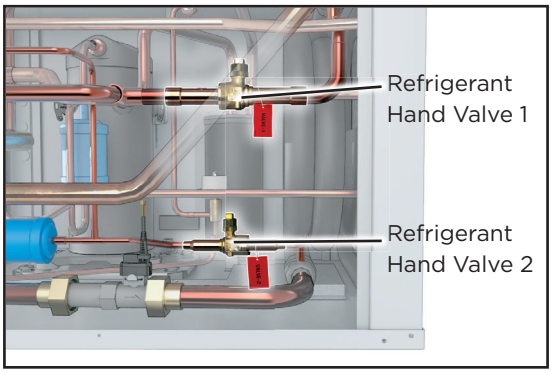
The Geo-Ready Heat Pump ships from the factory in Air Source Mode. Ready to be connected to the Outdoor Unit.

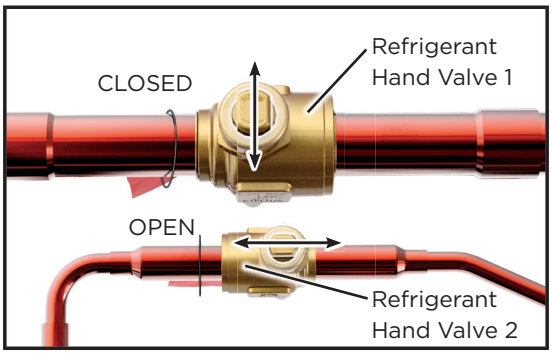
The Geo-Ready Split system has the capability to switch between Air Source and Geo Mode depending on field application.

NOTE: Ensure the refrigerant hand valves in the Indoor Unit are "Closed" for Air Source Mode and "Open" for Geo Mode.

Air Source Mode: In Air Source Mode, the system will operate as a traditional Air Source Heat Pump with the refrigeration being circulated between the Indoor Unit and the Outdoor Condensing Unit. The Air Source Mode will be enabled by Default on the ABC. In this case, the SW 2-3 dipswitch on the ABC will remain in the "ON" position.

Geo Mode: In Geo Mode, the system will operate as a Geothermal Heat Pump with the refrigeration being circulated between the Indoor Unit and a Coaxial Heat Exchanger. In order to enable Geo Mode, the SW 2-3 dipswitch on the ABC will need to be switched to the "OFF" position.



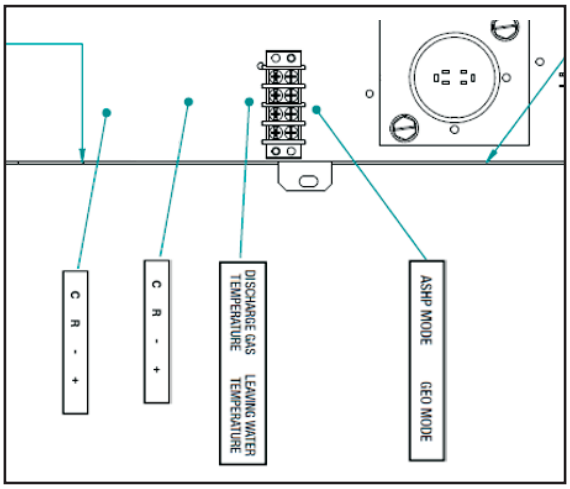


Since the indoor system leaves the factory as an Air Source Heat Pump, only add charge in the field for OD Condenser and Lineset. No need to evacuate the "indoor" system in this case but the line set and outdoor section will need evacuation.

Air Source to Geo Conversion

Follow the procedures below to convert the system from an Air Source to a Geothermal Heat Pump:

- Ensure that the system is de-energized and all high voltage power to the system is removed before beginning the conversion process.
- Refer to "Evacuation and Charging using AID Tool" section to evacuate charge before beginning the Conversion process
- Remove the Lower Right Side Access Panel on the Indoor Unit.
- Rotate Refrigerant Hand Valve-1 to Open Position (refer to Schematics) to allow refrigerant flow to the Coaxial Heat Exchanger.
- Rotate Refrigerant Hand Valve-2 to Open Position (refer to Schematics) to allow refrigerant flow to the Coaxial Heat Exchanger.
- Change the Dipswitch Setting (SW2-3 to OFF) on the ABC Board from Air Source to Geo Mode (as shown in schematics)
- Remove the two fork terminals from PB3 labeled ASHP MODE
- Move the two fork terminals removed in the previous step to PB3 labeled GEO MODE
- Once the conversion is complete, refer to "Evacuation and Charging using AID Tool" section on Page-17, 18 & 19 to utilize the appropriate method to add the correct amount of Refrigerant R410A to the system based on system size and refrigerant line-set length.
- Refer to Loop Installation Manual
- Refer to the Unit Startup Section once the conversion process is complete



Air Source vs Geo Mode cont.

Outdoor Unit Storage

The outdoor unit MUST be capped once the outdoor unit is removed. This will keep debris out of the outdoor unit that could contaminate the next unit's refrigeration circuit. The outdoor unit should be stored in a building to prevent damage and debris from collecting in the outdoor unit. If that is not possible it should be covered with a tarp and secured.

Geo to Air Source Conversion

Follow the procedures below to convert the system from a Geothermal to an Air Source Heat Pump:

- Ensure that the system is de-energized and all high voltage power to the system is removed before beginning the conversion process.
- Remove the Lower Right Side Access Panel on the Indoor Unit.
- Rotate Refrigerant Hand Valve-1 to Close Position (refer to Schematics) to isolate the Coaxial Heat Exchanger from the refrigeration circuit and allow refrigerant flow to the Outdoor Condensing Unit.
- Rotate Refrigerant Hand Valve-2 to Close Position (refer to refrigeration diagrams in the Troubleshooting section) to isolate the Coaxial Heat Exchanger from the refrigeration circuit and allow refrigerant flow to the Outdoor Condensing Unit.
- Change the Dipswitch Setting (SW2-3 to ON) on the ABC Board from Geo to Air Source Mode (as shown in schematics)
- Remove the two fork terminals from PB3 labeled GEO MODE
- Move the two fork terminals removed in the previous step to PB3 labeled ASHP MODE
- Power Cycle after flipping dipswitch
- Once the conversion is complete, refer to "Evacuation and Charging using AID Tool" section on Page-17, 18 & 19 to utilize the appropriate method to add the correct amount of Refrigerant R410A to the system based on system size and refrigerant line-set length.
- Fully open the Service Valves counterclockwise, located on both Indoor and Outdoor units (see Figure- for Air Source Service Valve locations). Refer to Section-III Refrigeration
- Refer to the Unit Startup Section once the conversion process is complete
- Connect the AID Tool to the AID Tool port located in the front left corner post of the Indoor unit and go to the AURORA Config Screen and ADD Device “AOB”
- Configure the system to the correct tonnage.

Unit Startup

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.

- **Black/white and gray/white wires in unit control box have been removed if auxiliary heat has been installed.**
- **Dip switches are set correctly.**
- **Transformer switched to 208V if applicable.**
- **High voltage is correct and matches nameplate.**
- Fuses, breakers and wire size correct.
- Low voltage wiring complete.
- Piping completed and water system cleaned and flushed.
- Air is purged from closed loop system.
- Isolation valves are open, water control valves or loop pumps wired.
- Condensate line open and correctly pitched.
- Hot water generator pump switch is "OFF" unless piping is completed and air has been purged.
- 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°F 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% solution of dishwasher detergent and water is recommended for both sides of coil, a thorough water rinse should follow.

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 recommended for setup, configuration and troubleshooting, especially with an Aurora 'Advanced' Control. AID Tool version 2.18 or greater is preferred.

1. Configure Aurora Screen

a. In advanced controls - Confirm AXB is added and communicating.
b. In advanced controls - Confirm AOB is added and communicating. (only if the system is setup to run in Air Source Mode)
c. In advanced controls - Confirm communicating thermostats are added and communicating. Set thermostat mode to off.
d. In advanced controls - Confirm IntelliZone2, if installed, is added and communicating. Set Zoning system to off mode.

2. Aurora Setup Screen

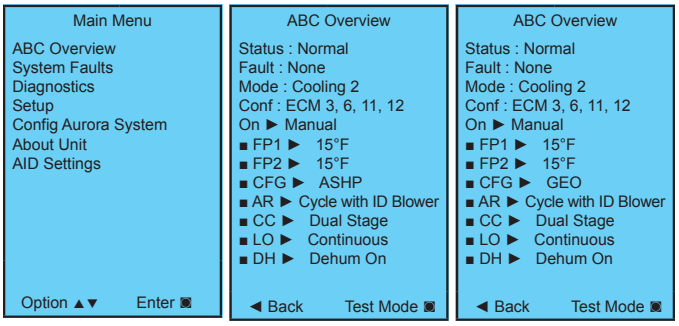
a. ECM Setup for Heating Airflow – select "G", low, high and aux blower speeds as appropriate for the unit and electric heat.
b. Cooling Airflow % - sets the cooling airflow % from heating airflow. Factory setting is -15%.
c. AXB Setup
    i. DHW Enable – Ensure air is purged from HW system before enabling (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. FCV1-GL, FCV2-GL Pump Setup and Modulating Water Valve Setup – Can be setup to a range between 5% and 100%. Defaults are 75% and 100%. (Geo Mode Only)
        - 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 (Geo Mode Only)
    ii. Flow Meter – activates the flow meter (Geo Ready Mode)
    iii. Select blower energy – PSC or ECM/5-Speed ECM (May be shown but not available)
    iv. Activate energy option
    v. Blower and Aux heat current sensor activation
    vi. Line Voltage calibration – Voltmeter required to calibrate line voltage during heat 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 & 2 Setup – Select type of sensor for two home automation inputs.
g. OD ECM Airflow - Select the correct "Unit Size" (2, 3, 4 or 5 Ton) based on the model that is installed (only if the system is setup to run in Air Source Mode).

Unit Startup cont.

3. ABC/AXB/AOB Overview (IMPORTANT)

a. If the ABC is configured to run in Air Source Mode (i.e. Dip Switch SW 2-3 is set to ON), then check and ensure that "CFG = ASHP". Ensure that SW-1 is set to ON for the AXB. Ensure that SW-1 is set to OFF for the AOB on the Outdoor Unit.

b. If the ABC is configured to run in Geo Mode (i.e. Dip Switch SW 2-3 is set to OFF), then check and ensure that "CFG = GEO".



Configuring the Sensor Kits

Configuring the Sensor kits

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

Energy Monitoring

The Energy Monitoring Kit includes two current transducers (blower and electric heat) added to the existing two compressor sensors so that the complete power usage of the heat pump can be measured. When the system is configured for Air Source Mode, an additional current transducer on the AOB monitors power consumption by the Outdoor Fan Motor. The AID Tool provides configuration detail for the type of blower motor, a line voltage calibration procedure to improve the accuracy, and a power adjustment setting that allows the compressor power to be adjusted to match the unit's line voltage using the provided tables. The energy use can be displayed on the AID Tool or selected communicating thermostats. The TPCM32U03A/04A will display instantaneous energy use while the color touchscreen TPCC32U02 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' – ECM

b. Activate 'Energy Option' to activate the sensors on for compressor (2), blower and aux heat current sensor. In Air Source Mode, this should also activate the Outdoor Fan Motor current sensor.

c. Select 'Pump' option of FC1, FC2, VS Pump, VS+26-99, or open loop. This selects the pump watts used in the calculation. Pump watts are not measured but estimated.

d. Line Voltage Calibration – Voltmeter required to calibrate line voltage during heating or cooling. Refer to Line Voltage Calibration in this manual for more details.

   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. Power Adjustment: Refer to the Single Speed and Dual Capacity Power Adjustment tables in the Aurora 'Advanced' Control section of the literature

   i. On the Main Menu screen select Setup
   ii. Once in the Setup menu select the Power Adjustment Factor
   iii. Power Adjustment - allows you to enter the unit's compressor power setting for high and low speed operation. Refer to the tables and use the voltage that is closest to the unit's line voltage and set the power adjustment accordingly.

f. Energy monitoring can be read on any of the following components:

   i. AID Tool – instantaneous information only
   ii. TPCM32U03A/04A Communicating Thermostat (B/W) - instantaneous information only
   iii. TPCC32U02 Color Touchscreen Thermostat – Both Instantaneously and historical (13 months)
   iv. WaterFurnace® Web Portal via AWL device connected to Aurora

Refrigerant Monitoring (Geo Mode)

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, subcooling, and EEV%. 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:

Unit Startup cont.

Once sensors are installed for discharge pressure, suction pressure, suction, 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

Refrigerant Monitoring (Air Source)

In Air Source Mode, the Refrigerant Monitoring Package includes three Pressure Transducers and four Temperature sensors, liquid line, compressor suction temperature, outdoor suction temperature and compressor discharge line temperature. The additional pressure transducer and temperature sensor compared to the Geo Configuration are due to the addition of the Outdoor Unit which includes Suction Pressure and Temperature monitoring during Heating Operation. Other than that, the AID Tool will display similar Superheat, Subcooling and EEV% information as Geo Mode.

Performance Monitoring (Geo Mode Only)

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 Energy 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 1 in. (038-064 models), or none.
c. Exit Sensor Kit Setup Screen; if the unit is connected to a Variable Speed Flow Center the min/max flow rate must be set.
    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.
    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.

Startup Steps

NOTE: Complete the Equipment Start-Up/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. Ensure the OD Fan turns ON (if in Air Source Mode)
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.
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, depending on the fan 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, 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. 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.

Correction Factor Tables

Air Flow Corrections (Dual Capacity Part Load)

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	0.922	0.778	0.956	0.924	0.943	1.239	0.879
275	69	0.944	0.830	0.962	0.944	0.958	1.161	0.914
300	75	0.957	0.866	0.968	0.958	0.968	1.115	0.937
325	81	0.970	0.900	0.974	0.970	0.977	1.075	0.956
350	88	0.982	0.933	0.981	0.980	0.985	1.042	0.972
375	94	0.991	0.968	0.991	0.991	0.993	1.018	0.988
400	**100**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**
425	106	1.007	1.033	1.011	1.008	1.007	0.990	1.010
450	113	1.013	1.065	1.023	1.015	1.012	0.987	1.018
475	119	1.017	1.099	1.037	1.022	1.018	0.984	1.025
500	125	1.020	1.132	1.052	1.027	1.022	0.982	1.031
520	130	1.022	1.159	1.064	1.030	1.025	0.979	1.034

5/30/06

Air Flow Corrections (Dual Capacity Full Load and Single Speed)

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	0.922	0.786	0.910	0.920	0.943	1.150	0.893
275	69	0.944	0.827	0.924	0.940	0.958	1.105	0.922
300	75	0.959	0.860	0.937	0.955	0.968	1.078	0.942
325	81	0.971	0.894	0.950	0.967	0.977	1.053	0.959
350	88	0.982	0.929	0.964	0.978	0.985	1.031	0.973
375	94	0.992	0.965	0.982	0.990	0.993	1.014	0.988
400	**100**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**	**1.000**
425	106	1.007	1.034	1.020	1.010	1.007	0.990	1.011
450	113	1.012	1.065	1.042	1.018	1.013	0.983	1.020
475	119	1.017	1.093	1.066	1.026	1.018	0.980	1.028
500	125	1.019	1.117	1.092	1.033	1.023	0.978	1.034
520	130	1.020	1.132	1.113	1.038	1.026	0.975	1.038

5/30/06

Cooling Capacity Corrections

Entering Air WB °F	Total Clg Cap	Sensible Cooling Capacity Multipliers - Entering DB °F										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
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.

3/28/12

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

11/10/09

Operating Parameters

Dual Capacity Models

First Stage Operation (Geo Mode)

Entering Water Temp °F	Water Flow gpm/ton	Cooling -- No Hot Water Generation					
		Suction Pressure psig	Discharge Pressure psig	Superheat	Subcooling	Water Temp Rise °F	Air Temp Drop °F DB
30	1.5	105 - 120	140 - 155	20 - 35	9 - 17	17 - 21	17 - 23
	3.0	100 - 115	115 - 130	20 - 35	9 - 17	8 - 12	17 - 23
50	1.5	125 - 140	205 - 225	12 - 20	8 - 14	17 - 21	17 - 23
	3.0	120 - 135	180 - 200	12 - 20	8 - 14	8 - 12	17 - 23
70	1.5	135 - 145	280 - 290	10 - 16	8 - 14	16 - 20	17 - 23
	3.0	133 - 143	250 - 260	10 - 16	8 - 14	9 - 13	17 - 23
90	1.5	142 - 152	345 - 355	8 - 12	8 - 14	14 - 20	17 - 23
	3.0	140 - 150	330 - 340	8 - 12	8 - 14	8 - 12	17 - 23
110	1.5	152 - 158	405 - 435	8 - 12	8 - 14	14 - 20	17 - 23
	3.0	148 - 153	390 - 420	8 - 12	8 - 14	8 - 12	17 - 23

Entering Water Temp °F	Water Flow gpm/ton	Heating -- No Hot Water Generation					
		Suction Pressure psig	Discharge Pressure psig	Superheat	Subcooling	Water Temp Drop °F	Air Temp Rise °F DB
30	1.5	76 - 84	270 - 285	8 - 12	3 - 10	5 - 9	12 - 16
	3.0	80 - 88	275 - 290	8 - 12	3 - 10	3 - 7	14 - 18
50	1.5	100 - 115	280 - 310	10 - 14	3 - 10	7 - 11	18 - 22
	3.0	105 - 120	290 - 315	10 - 14	3 - 10	5 - 9	20 - 24
70	1.5	135 - 150	310 - 325	12 - 16	3 - 10	8 - 12	24 - 28
	3.0	140 - 155	315 - 330	12 - 16	3 - 10	6 - 10	22 - 30
90	1.5	155 - 165	330 - 370	12 - 16	3 - 10	8 - 12	24 - 28
	3.0	160 - 170	340 - 380	12 - 16	3 - 10	6 - 10	22 - 30
110	1.5						
	3.0						

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

2/15/12

Second Stage Operation (Geo Mode)

Entering Water Temp °F	Water Flow gpm/ton	Cooling -- No Hot Water Generation					
		Suction Pressure psig	Discharge Pressure psig	Superheat	Subcooling	Water Temp Rise °F	Air Temp Drop °F DB
30	1.5	115 - 125	150 - 170	20 - 35	10 - 17	17 - 22	17 - 23
	3.0	105 - 120	130 - 145	20 - 35	10 - 17	8 - 10	17 - 23
50	1.5	130 - 140	215 - 235	12 - 20	8 - 14	16 - 22	17 - 23
	3.0	128 - 138	190 - 210	12 - 20	8 - 14	8 - 12	17 - 23
70	1.5	138 - 148	280 - 310	10 - 16	10 - 16	15 - 21	17 - 23
	3.0	136 - 146	250 - 280	10 - 16	8 - 14	7 - 13	17 - 23
90	1.5	145 - 155	350 - 380	9 - 14	10 - 16	14 - 20	17 - 23
	3.0	143 - 153	320 - 350	9 - 14	8 - 14	6 - 10	17 - 23
110	1.5	145 - 155	420 - 450	9 - 14	10 - 16	14 - 20	17 - 23
	3.0	143 - 153	405 - 435	9 - 14	8 - 14	6 - 10	17 - 23

Entering Water Temp °F	Water Flow gpm/ton	Heating -- No Hot Water Generation					
		Suction Pressure psig	Discharge Pressure psig	Superheat	Subcooling	Water Temp Drop °F	Air Temp Rise °F DB
30	1.5	73 - 85	270 - 305	8 - 14	3 - 10	6 - 10	15 - 21
	3.0	77 - 90	280 - 315	8 - 14	3 - 10	4 - 8	17 - 23
50	1.5	97 - 110	290 - 325	10 - 16	3 - 10	9 - 13	22 - 28
	3.0	102 - 115	300 - 335	10 - 16	3 - 10	7 - 11	24 - 30
70	1.5	130 - 145	320 - 355	13 - 19	3 - 10	10 - 14	30 - 36
	3.0	135 - 150	325 - 360	13 - 19	3 - 10	8 - 12	32 - 38
90	1.5	150 - 160	350 - 390	13 - 19	3 - 10	10 - 14	30 - 36
	3.0	155 - 165	365 - 405	13 - 19	3 - 10	8 - 12	32 - 38
110	1.5						
	3.0						

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

2/15/12

Operating Parameters cont.

Second Stage Operation (Air Source Mode)

NG*038

OD DB Temp °F	ID Air Flow CFM	Cooling -- No Hot Water Generation			
		Suction Pressure psig	Discharge Pressure psig	Superheat	Subcooling
55	1050	113 - 147	205 - 220	11 - 13	8 - 11
	1250	117 - 152	206 - 222	11 - 15	10 - 11
65	1050	114 - 150	242 - 257	11 - 13	9 - 11
	1250	119 - 154	243 - 259	11 - 14	10 - 11
75	1050	116 - 153	278 - 294	12 - 13	10 - 11
	1250	121 - 157	280 - 296	12 - 13	10 - 11
85	1050	118 - 155	314 - 331	12 - 13	10 - 11
	1250	123 - 160	317 - 332	12 - 13	10 - 11
95	1050	120 - 158	351 - 368	12 - 13	10 - 11
	1250	125 - 162	353 - 369	12 - 13	10 - 11
105	1050	126 - 162	404 - 413	11 - 12	10 - 13
	1250	133 - 166	407 - 415	11 - 12	10 - 13
115	1050	132 - 166	457 - 459	11 - 12	8 - 15
	1250	141 - 170	460 - 461	10 - 12	9 - 15
125	1050	138 - 170	510 - 505	11 - 12	10 - 16
	1250	149 - 174	514 - 507	10 - 12	10 - 16

NOTE: All data have been recorded between 75F - 80F ID DB Temp and 57F - 72F ID WB Temp. 7/20/2022
The Min and Max Ranges for Suction Pressure, Discharge Pressure, SH and SC are based on the Min and Max ID DB/WB Temps

NG*038

OD DB Temp °F	ID Air Flow CFM	Heating -- No Hot Water Generation			
		Suction Pressure psig	Discharge Pressure psig	Superheat	Subcooling
5	1050	52 - 53	235 - 311	5 - 8	2 - 4
	1250	48 - 53	229 - 303	5 - 10	6 - 11
15	1050	61 - 64	249 - 335	4 - 8	4 - 6
	1250	62 - 63	242 - 326	7 - 8	8 - 9
25	1050	70 - 76	264 - 359	3 - 4	4 - 14
	1250	73 - 75	255 - 349	4 - 8	5 - 11
35	1050	84 - 89	284 - 377	6 - 8	7 - 17
	1250	87 - 90	270 - 370	5 - 11	6 - 15
45	1050	104 - 108	308 - 411	11 - 14	13 - 20
	1250	106 - 107	286 - 389	10 - 15	11 - 19
55	1050	126 - 129	322 - 419	9 - 12	11 - 14
	1250	126 - 128	300 - 396	9 - 12	9 - 14
65	1050	147 - 150	336 - 428	8 - 10	8 - 9
	1250	145 - 150	314 - 403	8 - 10	8 - 9

NOTE: All data have been recorded between 60F - 80F ID DB Temp and 55F - 67F ID WB Temp. 7/13/2022
The Min and Max Ranges for Suction Pressure, Discharge Pressure, SH and SC are based on the Min and Max ID DB Temps

NG*049

OD DB Temp °F	ID Air Flow CFM	Cooling -- No Hot Water Generation			
		Suction Pressure psig	Discharge Pressure psig	Superheat	Subcooling
55	1350	107 - 139	224 - 243	7 - 19	13 - 17
	1550	113 - 140	228 - 242	5 - 22	14 - 17
65	1350	109 - 142	261 - 280	8 - 17	13 - 17
	1550	114 - 143	264 - 280	6 - 19	14 - 17
75	1350	112 - 144	298 - 318	8 - 15	13 - 16
	1550	116 - 146	301 - 319	8 - 16	14 - 16
85	1350	114 - 146	335 - 356	9 - 12	14 - 16
	1550	117 - 149	337 - 358	9 - 13	14 - 16
95	1350	116 - 148	372 - 394	10 - 11	14 - 15
	1550	118 - 152	373 - 396	10 - 11	14 - 15
105	1350	121 - 153	422 - 444	10 - 11	13 - 15
	1550	125 - 156	425 - 446	10 - 11	13 - 15
115	1350	126 - 157	473 - 494	10 - 11	11 - 15
	1550	131 - 160	477 - 497	10 - 11	12 - 15
125	1350	131 - 162	523 - 544	9 - 10	12 - 14
	1550	137 - 164	530 - 547	10 - 11	12 - 14

NOTE: All data have been recorded between 75F - 80F ID DB Temp and 57F - 72F ID WB Temp. 7/20/2022
The Min and Max Ranges for Suction Pressure, Discharge Pressure, SH and SC are based on the Min and Max ID DB/WB Temps

Operating Parameters cont.

NG*049

OD DB Temp °F	ID Air Flow CFM	Heating -- No Hot Water Generation			
		Suction Pressure psig	Discharge Pressure psig	Superheat	Subcooling
5	1350	47 - 51	276 - 336	3 - 26	12 - 26
	1550	41 - 46	262 - 355	13 - 14	22 - 23
15	1350	57 - 60	294 - 369	2 - 18	21 - 29
	1550	53 - 56	284 - 373	8 - 12	26 - 27
25	1350	67 - 69	313 - 403	7 - 9	29 - 32
	1550	65 - 66	306 - 392	3 - 11	30 - 32
35	1350	82 - 83	327 - 414	7 - 9	31 - 32
	1550	81 - 82	311 - 405	2 - 10	29 - 30
45	1350	100 - 104	335 - 430	6 - 10	27 - 28
	1550	101 - 102	301 - 413	5 - 11	18 - 28
55	1350	121 - 123	348 - 454	7 - 8	25 - 30
	1550	121 - 123	326 - 413	6 - 7	20 - 22
65	1350	142 - 143	361 - 479	5 - 10	22 - 32
	1550	140 - 143	351 - 414	3 - 8	12 - 26

NOTE: All data have been recorded between 60F - 80F ID DB Temp and 55F - 67F ID WB Temp. 8/16/2022
The Min and Max Ranges for Suction Pressure, Discharge Pressure, SH and SC are based on the Min and Max ID DB Temps

NG*064

OD DB Temp °F	ID Air Flow CFM	Cooling -- No Hot Water Generation			
		Suction Pressure psig	Discharge Pressure psig	Superheat	Subcooling
55	1500	119 - 130	248 - 256	5 - 27	22 - 23
	1800	124 - 131	250 - 256	17 - 28	22 - 23
65	1500	119 - 135	286 - 297	5 - 23	22 - 23
	1800	125 - 138	288 - 300	15 - 24	23 - 24
75	1500	119 - 140	324 - 339	6 - 19	21 - 23
	1800	125 - 146	327 - 343	13 - 19	22 - 24
85	1500	120 - 146	361 - 381	8 - 15	21 - 23
	1800	125 - 153	365 - 387	11 - 15	21 - 24
95	1500	120 - 151	399 - 423	9 - 11	20 - 23
	1800	125 - 161	404 - 431	10 - 11	20 - 24
105	1500	125 - 156	454 - 478	9 - 11	20 - 23
	1800	128 - 163	457 - 484	10 - 11	20 - 23
115	1500	130 - 161	509 - 532	9 - 11	20 - 22
	1800	132 - 166	510 - 538	10 - 11	20 - 22
125	1500	135 - 165	564 - 587	9 - 11	20 - 21
	1800	135 - 169	564 - 591	10 - 11	20 - 21

NOTE: All data have been recorded between 75F - 80F ID DB Temp and 57F - 72F ID WB Temp. 7/20/2022
The Min and Max Ranges for Suction Pressure, Discharge Pressure, SH and SC are based on the Min and Max ID DB/WB Temps

NG*064

OD DB Temp °F	ID Air Flow CFM	Heating -- No Hot Water Generation			
		Suction Pressure psig	Discharge Pressure psig	Superheat	Subcooling
5	1500	38 - 50	227 - 317	5 - 7	2 - 4
	1800	37 - 59	220 - 270	6 - 8	3 - 4
15	1500	51 - 59	260 - 330	5 - 6	5 - 10
	1800	49 - 62	247 - 313	5 - 7	9 - 10
25	1500	64 - 67	293 - 344	5 - 6	10 - 21
	1800	60 - 65	274 - 356	5 - 7	18 - 19
35	1500	79 - 80	313 - 381	5 - 6	19 - 24
	1800	77 - 78	292 - 385	4 - 7	22 - 26
45	1500	100 - 102	321 - 427	5 - 6	19 - 24
	1800	98 - 99	300 - 402	3 - 9	17 - 24
55	1500	117 - 120	354 - 463	5 - 4	19 - 32
	1800	117 - 119	324 - 425	5 - 8	17 - 31
65	1500	135 - 138	386 - 500	6 - 4	24 - 34
	1800	136 - 139	348 - 449	7 - 6	24 - 34

NOTE: All data have been recorded between 60F - 80F ID DB Temp and 55F - 67F ID WB Temp. 7/13/2022
The Min and Max Ranges for Suction Pressure, Discharge Pressure, SH and SC are based on the Min and Max ID DB Temps

Pressure Drop

Model	GPM	Pressure Drop (psi)				
		30°F	50°F	70°F	90°F	110°F
038 full load	5	1.3	1.2	1.1	0.8	0.7
	7	2.8	2.3	2.0	1.8	1.6
	9	4.6	3.7	3.3	3.0	2.6
	11	6.3	5.4	4.7	4.3	3.9
038 part load	4	0.9	0.8	0.6	0.5	0.4
	6	2.1	1.7	1.4	1.3	1.2
	8	3.6	3.1	2.5	2.3	1.8
	10	5.5	4.5	4.0	3.6	3.2
049 full load	6	1.5	1.4	1.2	1.1	1.0
	9	3.0	2.7	2.5	2.2	2.0
	12	4.9	4.3	3.9	3.7	3.6
	15	7.2	6.2	5.9	5.5	5.6
049 part load	5	1.1	1.1	1.0	0.9	0.7
	8	2.5	2.2	2.0	1.8	1.6
	11	4.2	3.7	3.4	3.1	3.0
	14	6.3	5.5	5.3	4.9	5.0
064 full load	8	2.5	2.2	2.0	1.8	1.6
	12	4.9	4.3	3.9	3.7	3.6
	16	7.9	7.0	6.7	6.3	6.5
	20	11.7	10.5	10.5	9.6	10.2
064 part load	6	1.5	1.4	1.2	1.1	1.0
	10	3.5	3.2	2.9	2.6	2.5
	14	6.3	5.5	5.3	4.9	5.0
	18	9.5	8.7	8.3	7.9	8.2

6/3/22

Compressor Resistance

Model	Compressor Model No.	208-230/60/1	
		Run	Start
038	ZPS30K7E-PFV	0.751	1.587
049	ZPS40K7E-PFV	0.477	1.299
064	ZPS51K7E-PFV	0.387	1.304

10/13/2021

Thermistor Resistance

Thermistor Temperature (°F)	Microprocessor Resistance (Ohms)
5	75757-70117
14	57392-53234
23	43865-40771
32	33809-31487
41	26269-24513
50	20570-19230
59	16226-15196
68	12889-12093
77	10310-9688
86	8300-7812
95	6723-6337
104	5480-5172
113	4490-4246
122	3700-3504
131	3067-2907
140	2554-2424
149	2149-2019

2/8/12

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 TXV (Check Service Advisory)	High	Low	Normal/Low	High	High	Low	Low
Insufficient Compressor (Possible Bad Valves)	Low	High	Low	High	Normal/High	Low	Low
TXV - Bulb Loss of Charge	Low	Low	Low	High	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.						

7/6/10

Heat of Extraction/Rejection (GEO MODE ONLY)

Dual Capacity

Model		GPM	Heat of Extraction (kBtuh)				Heat of Rejection (kBtuh)				
			30°F	50°F	70°F	90°F	30°F	50°F	70°F	90°F	110°F
038	Part Load	4.0		20.0	26.2	32.7		35.4	34.5	32.4	
		6.0	14.5	20.8	27.6	34.7	32.1	35.6	34.7	32.5	30.3
		8.0	15.6	21.9	28.3	34.7	33.0	36.1	35.2	32.9	30.7
	Full Load	5.0		28.2	34.8	40.8		48.4	48.5	45.9	
		7.0	21.7	29.4	36.7	43.6	45.1	48.8	49.2	46.8	43.5
		9.0	22.3	30.2	37.9	45.2	45.5	49.2	49.5	47.0	43.7
049	Part Load	5.0		24.5	30.2	35.9		47.2	46.3	45.3	
		8.0	19.7	27.0	33.4	39.9	42.0	47.4	46.1	44.8	42.2
		11.0	20.4	28.0	35.1	42.4	42.4	47.4	46.5	45.7	43.3
	Full Load	6.0		33.0	40.9	48.1		63.9	64.2	60.5	
		9.0	27.0	36.4	45.2	53.6	58.8	63.8	63.8	59.6	56.3
		12.0	28.0	37.8	47.6	57.1	59.2	63.7	64.2	60.8	57.7
064	Part Load	6.0		33.7	42.0	49.3		60.6	59.4	55.5	
		10.0	23.7	34.0	43.7	53.1	55.8	60.5	59.5	55.8	52.2
		14.0	24.9	35.3	44.6	53.2	56.3	60.5	59.6	56.1	52.5
	Full Load	8.0		44.0	56.4	69.1		81.0	82.9	76.5	
		12.0	34.5	47.0	58.9	70.2	73.5	81.5	83.4	76.7	71.4
		16.0	34.9	48.0	60.7	73.1	74.1	82.0	83.8	77.2	71.5

Note: operation not recommended in shaded areas.

3/9/2022

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. Disconnect thermostat wires at the control board.
2. Jumper the desired test input (Y1, Y2, W, O or G) to the R terminal to simulate a thermostat signal.
3. If control functions properly:
    - Check for thermostat and field control wiring (use the diagnostic inputs mode).
4. If control responds improperly:
    - Ensure that component being controlled is functioning (compressor, blower, reversing valve, etc.).
    - Ensure that wiring from control to the component is correct.
    - Refer to the Aurora Base Control Application and Troubleshooting Guide and the Instruction Guide: Aurora Interface and Diagnostics (AID) Tool for additional information.

Refrigerant Systems (Geo Mode)

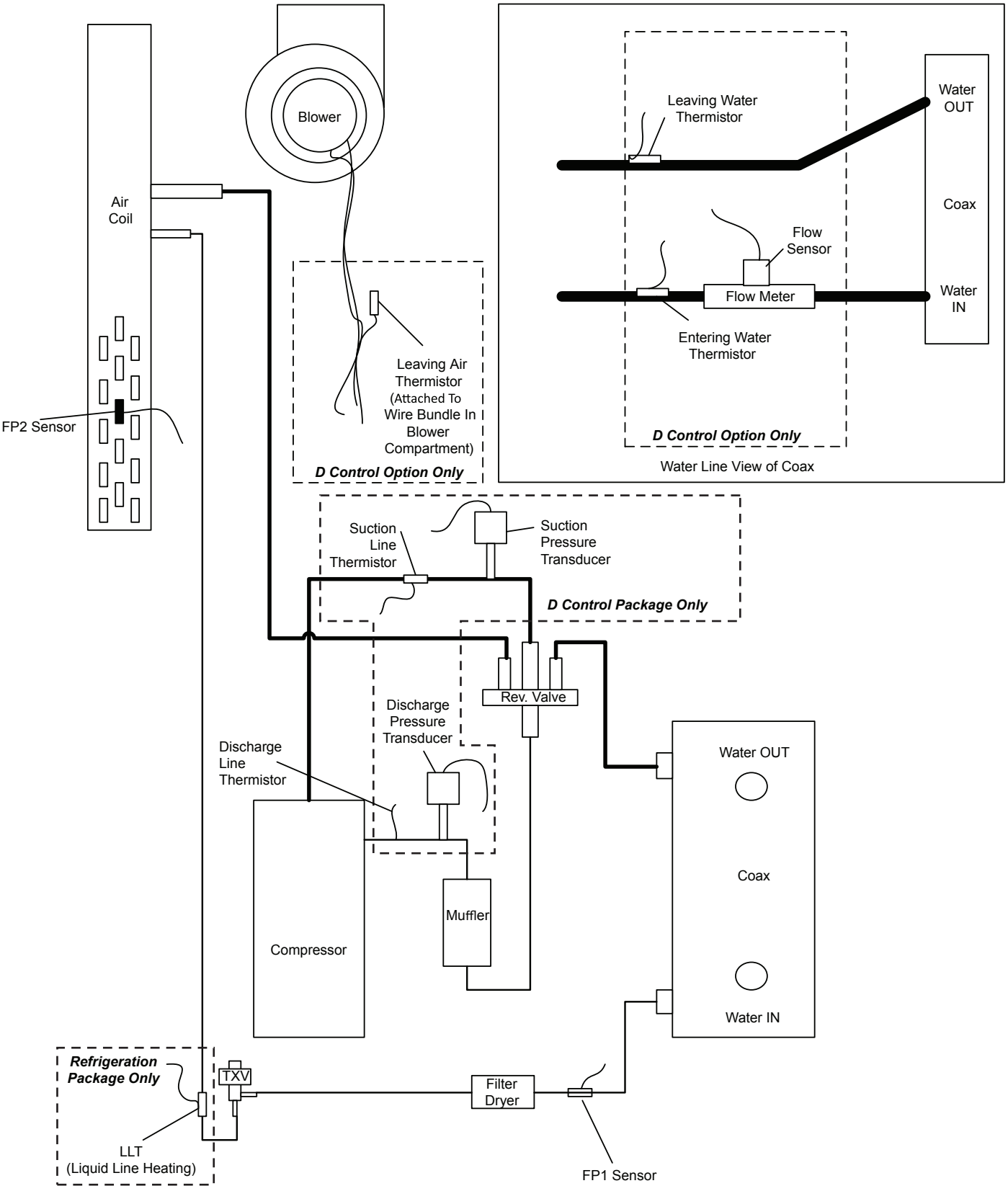
To maintain sealed circuit integrity, do not install service gauges unless unit operation appears abnormal. Compare the change in temperature on the air side as well as the water side to the Unit Operating Parameters tables. If the unit's performance is not within the ranges listed, and the airflow and water flow are known to be correct, access the Refrigeration screen to verify superheat and subcool. 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.

Refrigerant Systems (Air Source Mode)

In Air Source Mode, ensure that the Suction and Discharge Pressures are within the ranges listed under the Operating Parameters tables for each unit size. If the unit's performance is not within the ranges listed, and the airflow is known to be correct, access the Refrigeration screen to verify superheat and subcool. If superheat and subcooling are outside recommended ranges, an adjustment to the refrigerant charge may be necessary.

Troubleshooting cont.



Startup/Troubleshooting Form

Dealer: _____

Phone #: _____ Date: _____

Problem: _____

Model #: _____

Serial #: _____

Controls Info:

ABC Version: _____

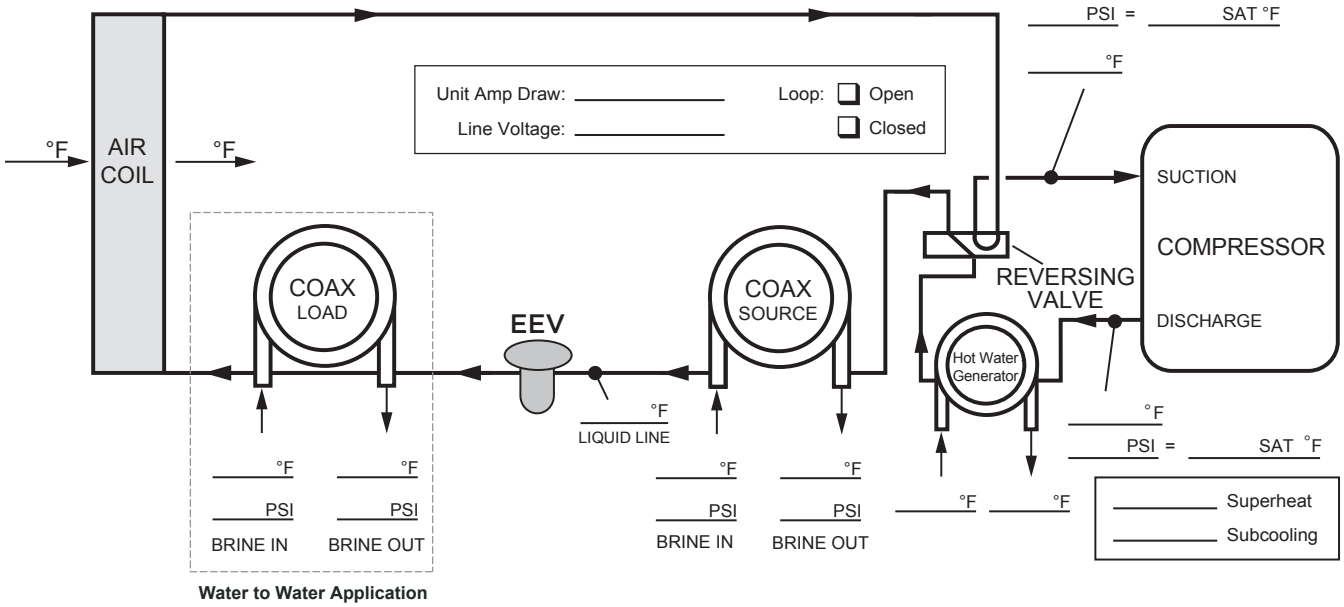
AXB Version: _____

IZ2 Version: _____

T-Stat Version: _____

Installed Sensors: _____

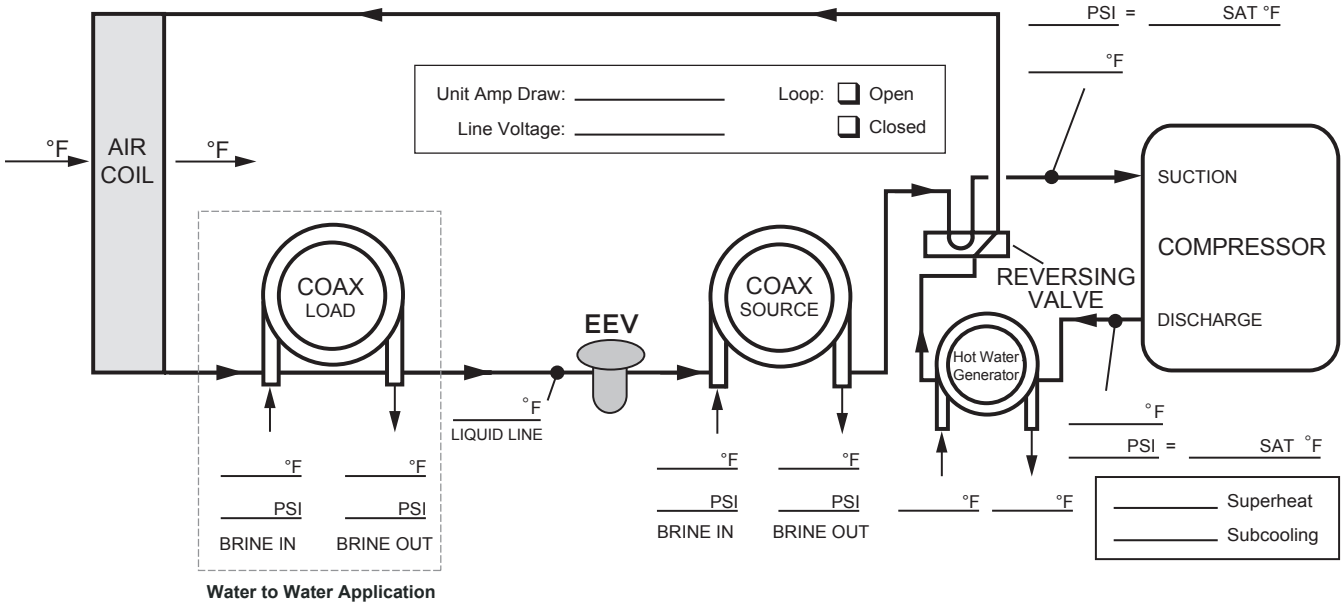
COOLING CYCLE ANALYSIS



Heat of Extraction/Rejection = gpm x 500 (485 for water/antifreeze) x ΔT

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

HEATING CYCLE ANALYSIS



Troubleshooting cont.

Single Speed/Dual Capacity 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**		**LOAD COAX (Water-to-Water)**	
	HEATING	COOLING	HEATING	COOLING
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. Temp. Rise/Drop Across Coaxial Heat Exchanger[1]			**3b. Temp. Rise/Drop Across Outdoor Air Cool (Air Source Mode)**		
	HEATING	COOLING		HEATING	COOLING
WATER IN Temperature:	e. _____ °F	e. _____ °F	ENTERING AIR Temp:	e. _____ °F	e. _____ °F
WATER OUT Temperature:	f. _____ °F	f. _____ °F	LEAVING AIR Temp:	f. _____ °F	f. _____ °F
Temperature Difference:	g. _____ °F	g. _____ °F	Temperature Difference:	g. _____ °F	g. _____ °F

4. Temp. Rise/Drop Across Air Coil			**LOAD COAX (Water-to-Water)**	
	HEATING	COOLING	HEATING	COOLING
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	COOLING
HR/HE = d x g x k	l. _____ Btu/h	l. _____ Btu/h

STEPS 6-9 NEED ONLY BE COMPLETED IF A PROBLEM IS SUSPECTED.

6. Watts	ENERGY MONITOR	
	HEATING	COOLING
Volts:	m. _____ Volts	m. _____ Volts
Amps (Comp. + Blower)[3]:	n. _____ Amps	n. _____ Amps
Outdoor Fan Motor Amps	o. _____ Amps	o. _____ Amps
Watts = m x (n+o) x 0.85:	p. _____ Watts	p. _____ Watts

7. Capacity

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

8. Efficiency

	HEATING	COOLING
Cooling EER = q / p: Heating COP = q / (p x 3.413):	r. _____ Btu/h	r. _____ Btu/h

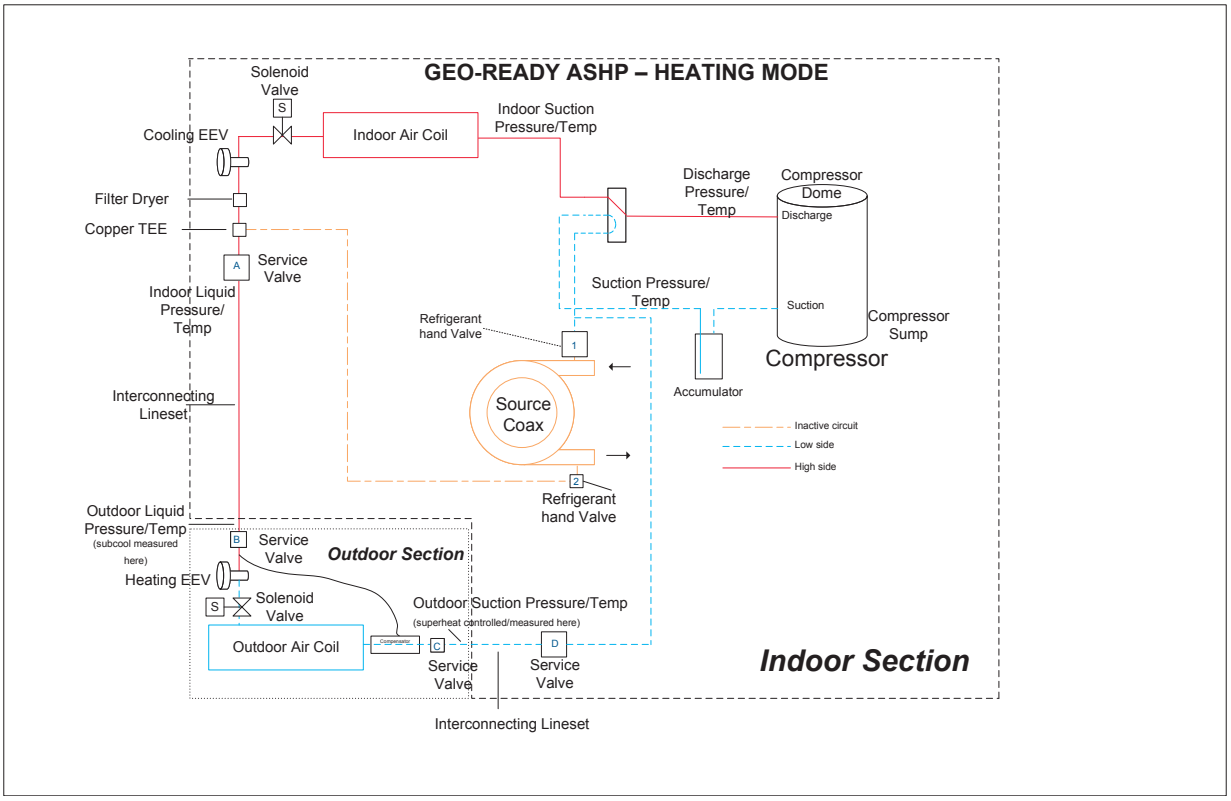
9. Superheat (S.H.)/Subcooling (S.C.)

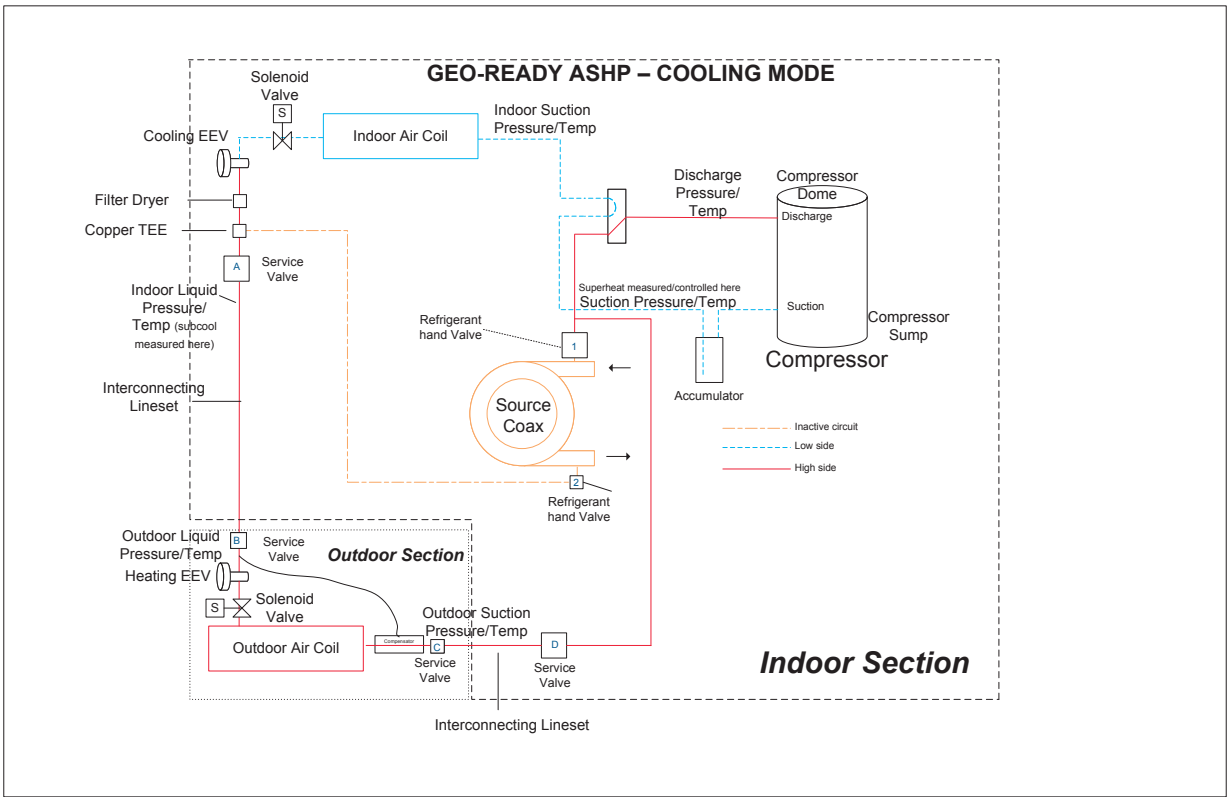
	HEATING	COOLING
Suction Pressure:	s. _____ psi	s. _____ psi
Suction Saturation Temperature:	t. _____ °F	t. _____ °F
Suction Line Temperature:	u. _____ °F	u. _____ °F
S.H. = u - t	v. _____ °F	v. _____ °F
Head Pressure:	w. _____ psi	w. _____ psi
High Pressure Saturation Temp:	x. _____ °F	x. _____ °F
Liquid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

Software Version
ABC: _____
AXB: _____
AOB: _____
IZ2: _____
T'STAT: _____

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.
[5] In Air Source Mode, use the OD Fan Motor Amp measured at the source wiring connection to calculate Total Watts for the system.

Troubleshooting cont.





Preventive Maintenance

Water Coil Maintenance

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

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

Other Maintenance

Filters

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

Condensate Drain

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

Blower Motors

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

PSC blower motors should only be lubricated if dry operation is suspected.

Hot Water Generator Coil

See Water Coil Maintenance section above.

Indoor 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.

Outdoor Air Coil Maintenance

Ensure that the outdoor air coil is free of dirt. Take necessary measures to keep the air coil clean. A brush, vacuum cleaner attachment, garden hose, etc. may be used for cleaning the coil. Use a PH neutral detergent for cleaning the air coil. Allow the solution to remain on the coil for several minutes before rinsing with clean water. Ensure that the solution does not come in contact with painted surfaces.

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.

Service Parts List

Parts List - Indoor Unit				
		038	049	064
Compressor	Compressor 208-230/60/1	34P743-01	34P744-01	34P746-01
	Run Capacitor 208-230/60/1	16P008D18CK	16P008D19CK	16P008D31CK
	Sound Jacket	92P504A16	92P504A16	92P504A16
	Power Harness	11P781-01	11P781-01	11P781-01
	Solenoid Harness	11P782-02	11P782-02	11P782-02
ECM Motor & Blower	ECM Motor 208-230/60/1	14S573-01	14S573-01	14S572-01
	ECM Blower Housing	53P501B01	53P501B01	53P501B01
	ECM Harness - horizontal	11P827-02	11P827-02	11P827-02
	ECM Harness - vertical	11P827-01	11P827-01	11P827-01
	ECM Power Harness - vertical	11P585B03	11P585B03	11P585B03
	ECM Power Harness - horizontal	11P585B04	11P585B04	11P585B04
Air Filters	2” Air Filters (Horizontal Model) and Second Filter If Needed	59P509-10	59P509-02	59P509-03
		n/a	59P509-11	59P509-11
	2” Air Filters (Vertical Model)	59P509-08	59P509-07	59P509-06
Refrigeration Components	Air Coil (Vertical Model)	61P706-41	61P715-41	61P725-41
	Air Coil (Horizontal Model)	61P709-41	61P710-41	61P717-41
	Coax	62I638-01	62I628-01	62I628-01
	EEV	33P617-01	33P617-01	33P617-01
	Reversing Valve	33P503-05	33P526-05	33P526-05
	Discharge Muffler	36P503B02	36P503B02	36P503B02
	Solenoid Valve	33P575-01	33P575-01	33P575-01
	Accumulator	36P509-02	36P509-01	36P509-01
	Filter Dryer	36P500B01	36P500B01	36P500B02
	Service Valve Suction	33P554-01	33P554-01	33P554-01
	Service Valve Liquid	33P554-03	33P554B04	33P554B04
	Regfigerant hand Valve Liquid	23P539-01	23P539-01	23P539-01
	Regfigerant hand Valve Suction	23P539-04	23P539-05	23P539-05
Desuperheater	Hot Water Generator	62P516-05	62P516-03	62P516-03
	Hot Water Generator Pump	24P501A01	24P501A01	24P501A01
Electrical	Contactor	13P004A03	13P004A03	13P004A03
	Transformer 208-230/60/1	15P531-01	15P531-01	15P531-01
	3 Pole Power Block	12P503-06	12P503-06	12P503-06
	2 Pole Screw Term. Block	12P500A01	12P500A01	12P500A01
	ABC Board	17X553-31	17X553-31	17X553-31
	AXB Board	17X597-25	17X597-25	17X597-25
	ABC/AXB Communication Cable	11P983-05	11P983-05	11P983-05
	EEV Stepper motor	33P617-04	33P617-04	33P617-04
	Keystone Category 5 Coupler (AID Port)	12P553-01	12P553-01	12P553-01
	Category 5 cable (AID Port to ABC)	11P846-01	11P846-01	11P846-01
	Rocker Switch - HWG ON/OFF	13P607A01	13P607A01	13P607A01
	Pump Circuit Breaker - 5 amp, 250v	19P583-01	19P583-01	19P583-01
Sensors & Safeties	Thermistor, Low Water Coil Limit (FP1)	12P560-07	12P560-07	12P560-07
	Thermistor, Hot Water Limit (HWG)	12P505B02	12P505B02	12P505B02
	HW Thermo-switch SPNC 130°F	13P073B05	13P073B05	13P073B05
	Current Sensors	12P557-01	12P557-01	12P557-01
	Flow Meter Sensor Kit (clip, sensor, harness)	29P534-01	29P534-01	29P534-01
	Thermistor Vertical, Air Coil Freeze Detection (FP2)	12P550-01	12P550-01	12P550-01
	Thermistor, Suction Line	12P555-05	12P555-05	12P555-05
	Thermistor, Liquid Line Heating	12P555-03	12P555-03	12P555-03
	Thermistor, Entering Water	12P560-01	12P560-01	12P560-01
	Thermistor, Leaving Water	12P560-09	12P560-09	12P560-09
	Thermistor, Leaving Air	12P555-06	12P555-06	12P555-06
	Thermistor, Discharge Gas Temperature	12P505-23	12P505-23	12P505-23
	High Pressure Transducer Kit	SK5SHPT	SK5SHPT	SK5SHPT
	Low Pressure Transducer Kit	SK5SLPT	SK5SLPT	SK5SLPT
	High Pressure Switch	SKHPE650	SKHPE650	SKHPE650
	Low Pressure Switch	SKLPE40	SKLPE40	SKLPE40

Part numbers subject to change

Service Parts List cont.

Parts List - Outdoor Unit				
		038	049	064
Refrigeration Components	Air Coil	61S778-02B	61S778-02B	61S778-02B
	Charge Compensator	36P512-05	36P512-03	36P512-03
	EEV	33P617-01	33P617-01	33P617-01
	Service Valve Suction	33P554-01	33P554-01	33P554-01
	Service Valve Liquid	33P554-03	33P554B04	33P554B04
	Solenoid Valve	33P575-01	33P575-01	33P575-01
Outdoor Motor and Prop Fan	1/3 HP motor	14P586-01	14P586-01	14P586-01
	Motor Module	14P592-01	14P592-01	14P592-01
	Prop Fan	53P537-01	53P537-01	53P537-01
	Motor and Prop Fan Assembly	54S579-01	54S579-01	54S579-01
Gaurds	Fan Guard	59P516-05	59P516-05	59P516-05
	Coil Guard Face	59P520-06	59P520-06	59P520-06
	Coil Guard Small Side	59P520-04	59P520-04	59P520-04
Sensors	OD Suction temp	12P555-05	12P555-05	12P555-05
	OD Ambient Temp	12P575-01	12P575-01	12P575-01
	OD Leaving Air	12P575-02	12P575-02	12P575-02
	OD coil temp	12P575-03	12P575-03	12P575-03
	Low pressure transducer	SK5SLPT	SK5SLPT	SK5SLPT
	Current Transducer	12P557-01	12P557-01	12P557-01
Electrical	Power Distribution Block 70A 2-Pole	12P501A02	12P501A02	12P501A02
	EEV Stepper motor	33P617-04	33P617-04	33P617-04
	AOB Board	17X55801-01	17X55801-01	17X55801-01
	Wire Harness-Flex Unit Comm Harness	11P983-01	11P983-01	11P983-01
	Terminal Strip 4 Pole Double Screw	12P570-01	12P570-01	12P570-01

Notes

Revision Guide

Pages:	Description:	Date:	By:
All	Document Creation	24 Feb 2023	JM
All	Geo-Ready™ updated to Geo-Ready®	18 July 2024	SW

Smarter from the Ground Up™

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

Product: **Geo-Ready Split**
Type: Geothermal Heat Pump
Size: 3-5 Ton Dual Capacity
Document: Installation Manual

PROUD MEMBER

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

ENERGY STAR PARTNER

TESTING
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Unitary Small HP
AHRI Standard 210/240

IM2510EW 07/24