Versatec® Compact

Commercial 002-017kW
Geothermal/Water Source Heat Pump 50Hz

Versatec Compact 50 Hz Series Installation Manual

Installation Information

Water Piping Connections

Electrical

Startup Procedures

Troubleshooting

Preventive Maintenance



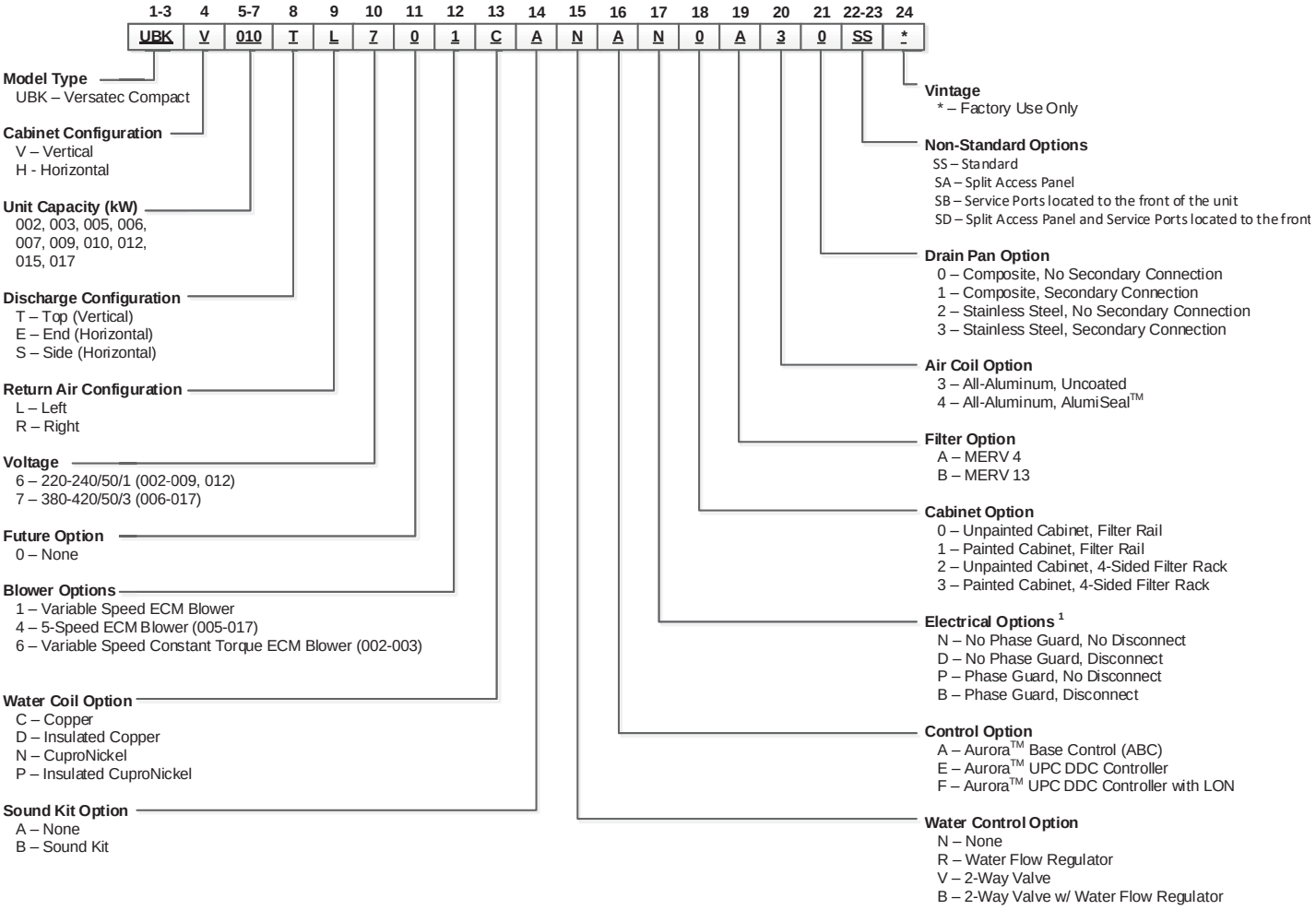
WaterFurnace®
Commercial Solutions

IM1252AU 12/18

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Model Nomenclature



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

CE

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

General Installation Information

Safety Considerations

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

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

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

Moving and Storage

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

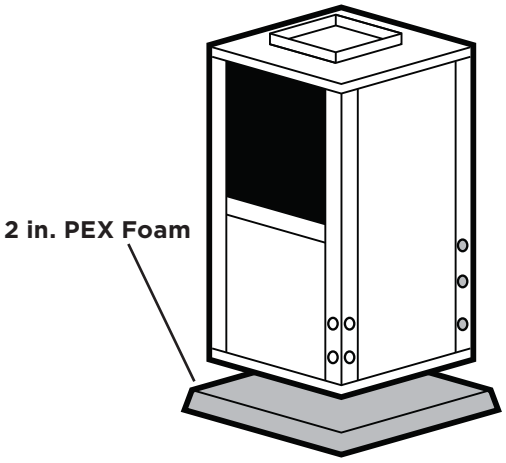
Unit Location

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

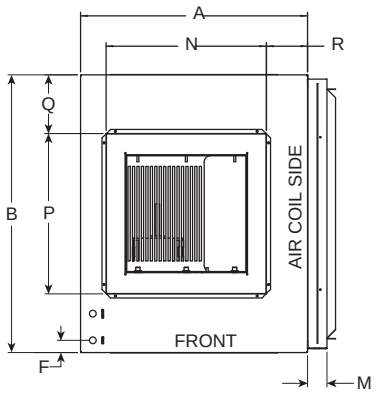
Installing Vertical Units

Vertical units are available in left or right air return configurations. Top flow vertical units should be mounted level on a vibration absorbing pad slightly larger than the base to provide isolation between the unit and the floor.

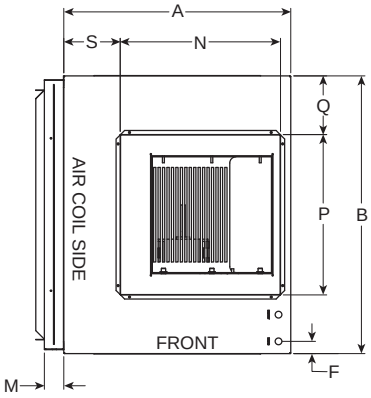
Vertical Unit Mounting



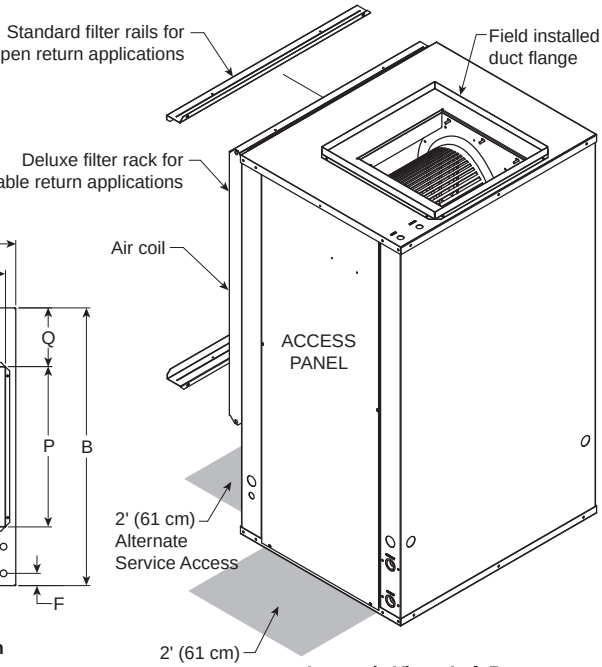
Vertical Dimensional Data



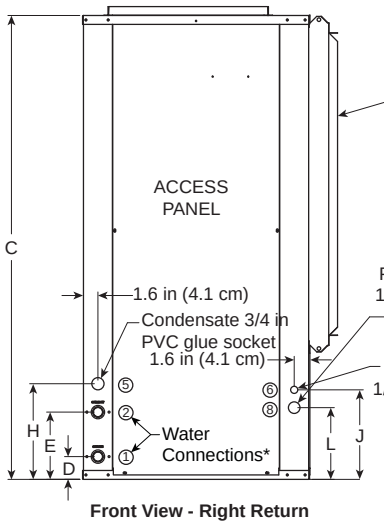
Top View - Right Return



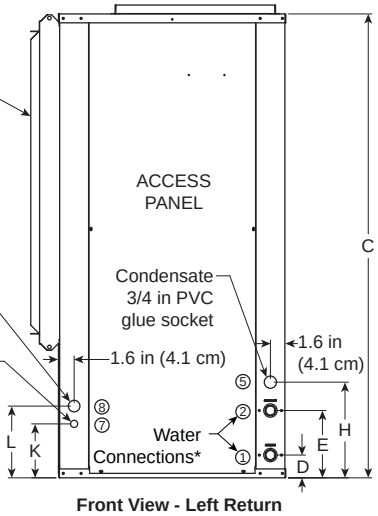
Top View - Left Return



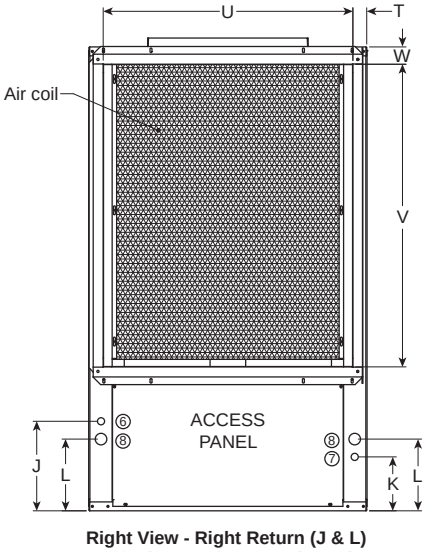
Isometric View - Left Return



Front View - Right Return



Front View - Left Return



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

NOTE: * Water connections protrude approximately 1.5 in. (3.81cm) from cabinet.

Vertical Dimensional Data cont.

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

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

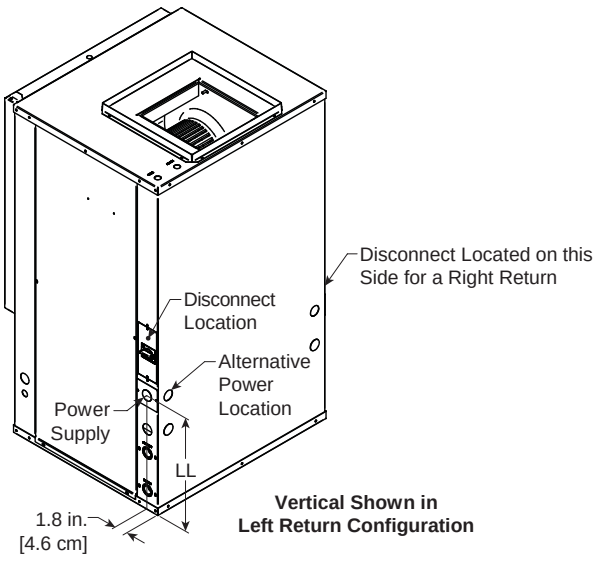
Condensate is 3/4" PVC female glue socket and is switchable from side to front. 2/18/18
*Discharge flange is field installed and extends 1" (25.4 mm) from top of cabinet.
**Vertical units shipped with standard 2" (field adjustable to 1") open application filter rack extending 2.2" from unit and is not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

Vertical Disconnect

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

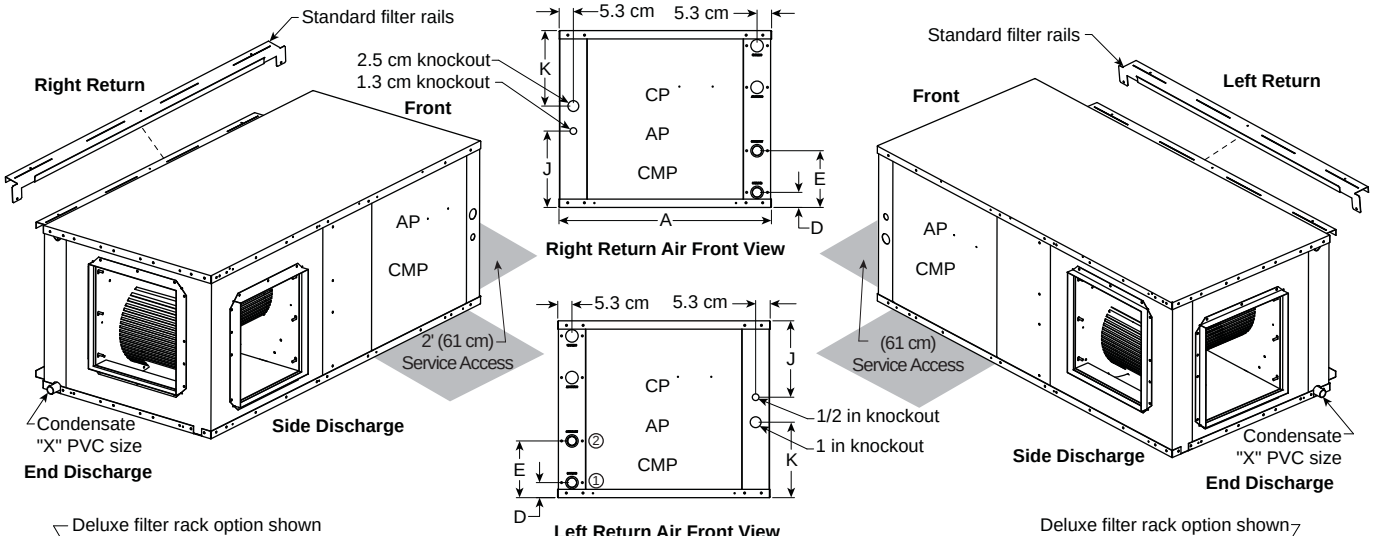
Vertical Models	LL
002-003	[16.5]
005	[40.1]
006-007	[47.8]
009	[38.9]
010-012	[35.1]
015	[36.3]
017	[36.3]

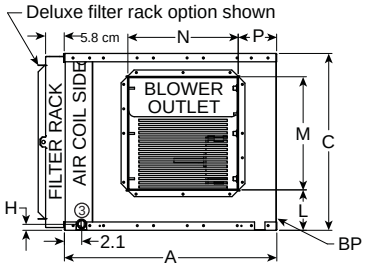
Dimensions in cm



Vertical Shown in Left Return Configuration

Horizontal Dimensional Data

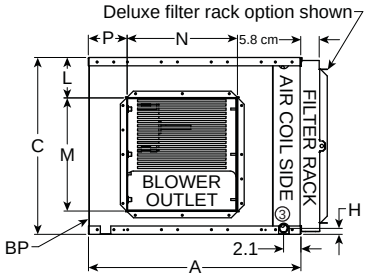




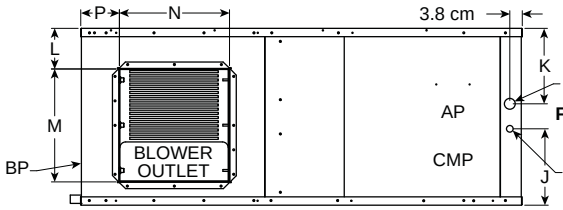
Right Return
End Discharge

Legend

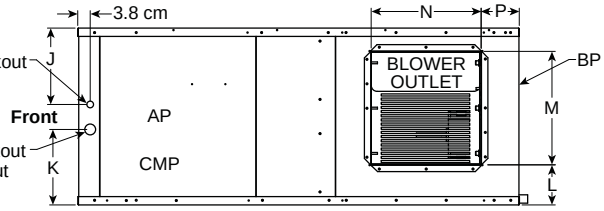
AP = Alternate Service Panel
BP = Blower Service Panel
CP = Control Access Panel
CMP = Compressor Service Panel



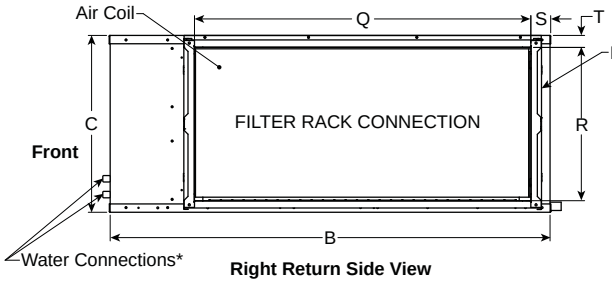
Left Return
End Discharge



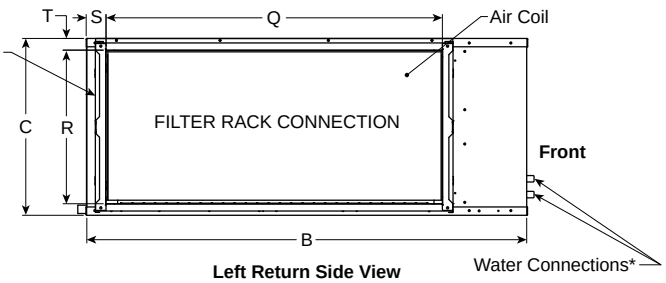
Right Return Side Discharge



Left Return Side Discharge



Right Return Side View



Left Return Side View

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

Horizontal Dimensional Data cont.

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

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

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

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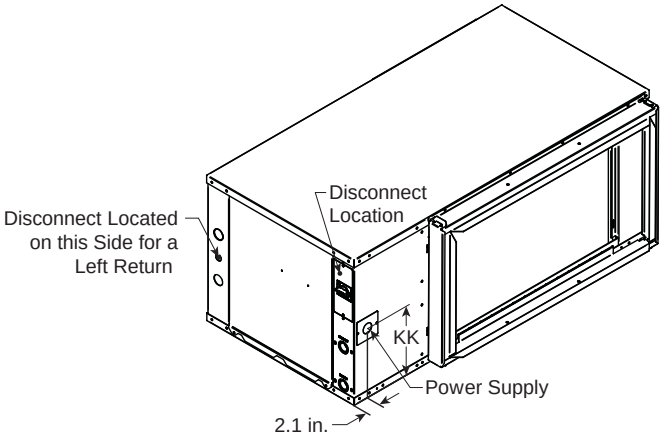
**** UBH006-012 offers a lifted drain pan that allows the trap to be installed without additional ceiling height required.**

Horizontal Disconnect

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

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

Dimensions in [cm]



Horizontal Shown in Right Return Configuration

Installing Horizontal Units

Installing Horizontal Units

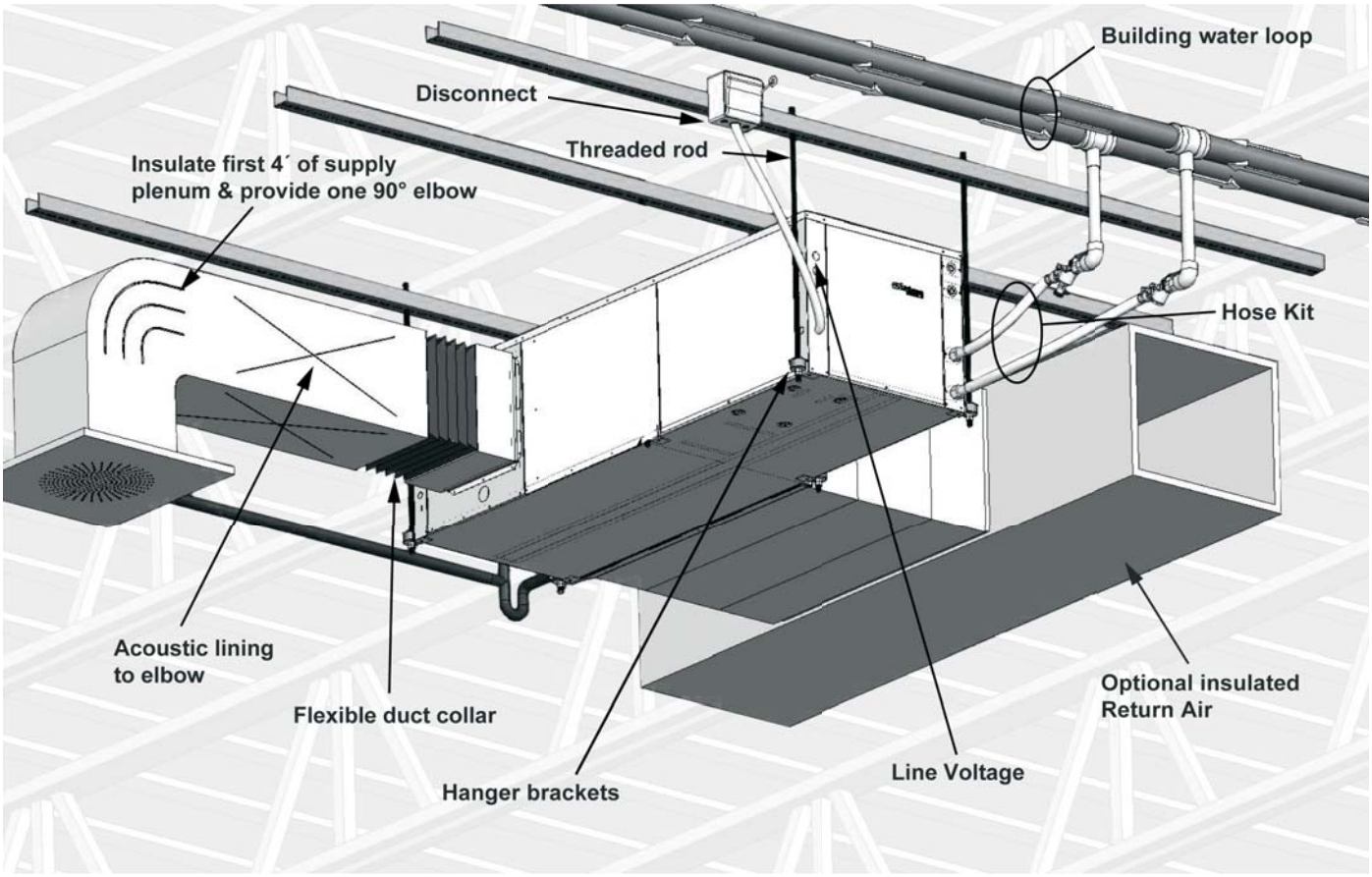
Horizontal units are available with side or end discharge and may be easily field converted by flipping the blower discharge panel. Horizontal units are normally suspended from a ceiling by four 3/8 in. diameter threaded rods. The rods are usually attached to the unit by hanger bracket kits furnished with each unit. Lay out the threaded rods per the dimensions below. Assemble the hangers to the unit as shown. Securely tighten the brackets to the unit using the weld nuts located on the underside of the bottom panel. When attaching the hanger rods to the bracket, a double nut is required since vibration could loosen a single nut.

NOTE: The unit should be pitched approximately 1/4 in. towards the drain in both directions to facilitate the removal of condensate.

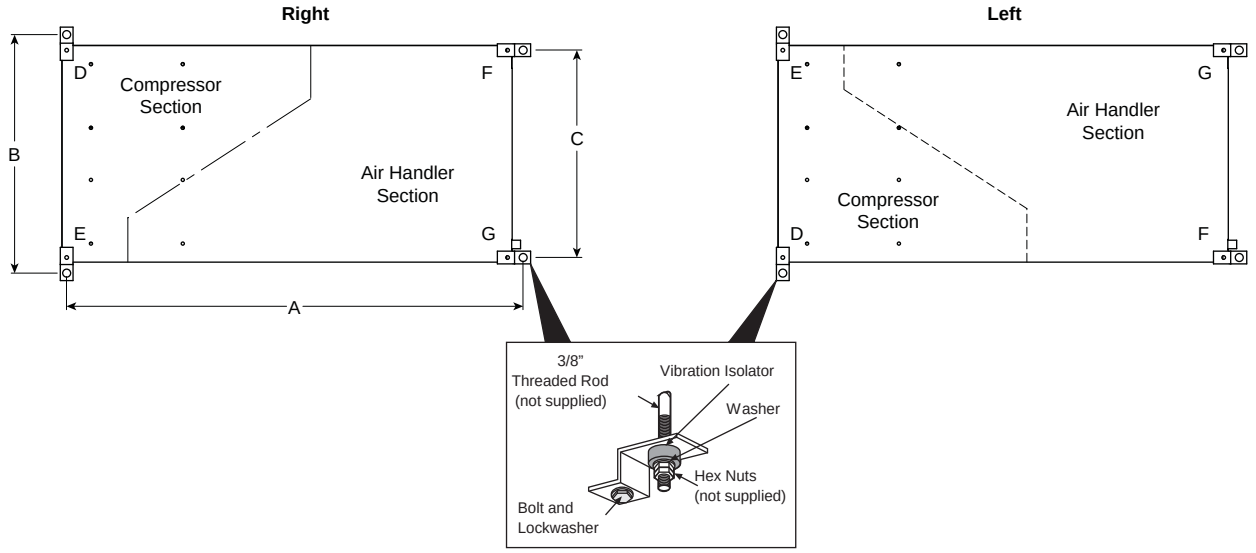
Use only the bolts provided in the kit to attach hanger brackets. The use of longer bolts could damage internal parts. Some applications require the installation of horizontal units on an attic floor. In this case, the unit should be set in a full size secondary drain pan on top of a vibration absorbing pad. The secondary drain pan prevents possible condensate overflow or water leakage damage to the ceiling. The secondary drain pan is usually placed on a plywood base isolated from the ceiling joists by additional layers of vibration absorbing material. Insulate supply plenum and use at least one 90° elbow and flexible duct collar to reduce noise.

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

Horizontal Unit Mounting



Hanger Bracket Locations



Hanger Bracket Locations

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

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Weight Distribution Table

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

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Duct System

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

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

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

Water Piping

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

All source water connections on commercial units are fittings that accept a male pipe thread (MPT). Insert the connectors by hand, then tighten the fitting with a wrench to provide a leakproof joint. When connecting to an open loop (groundwater) system, thread any copper MPT fitting into the connector and tighten in the same manner as described above.

Water Quality

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

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

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

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

2/22/12

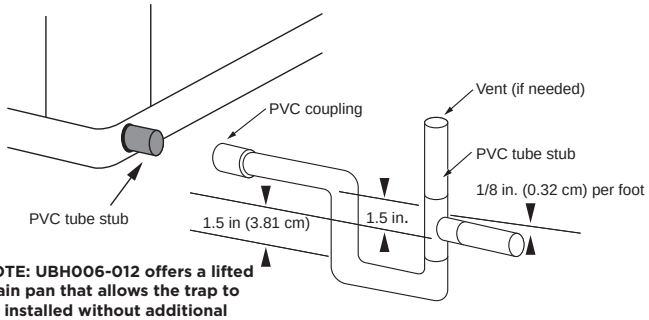
Condensate Drain

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

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

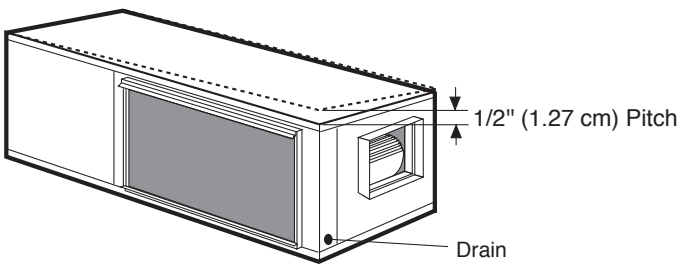
NOTE: All units equipped with electronic condensate overflow protection.

Horizontal Drain Connection (Composite Drain Pan)



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

Unit Pitch for Drain



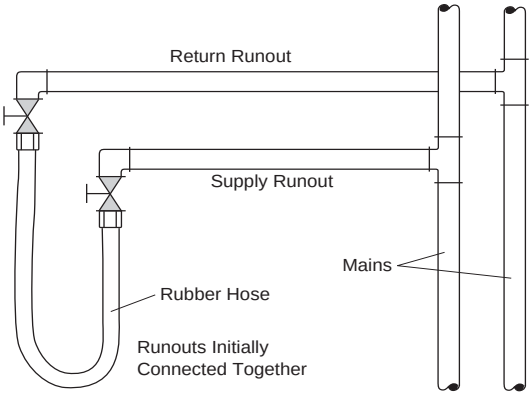
System Cleaning and Flushing

Cleaning and Flushing

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

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

Flushing with Water Shutoff Valve Equipped Systems



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

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

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

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

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

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

Ground Source Loop System Checkout

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

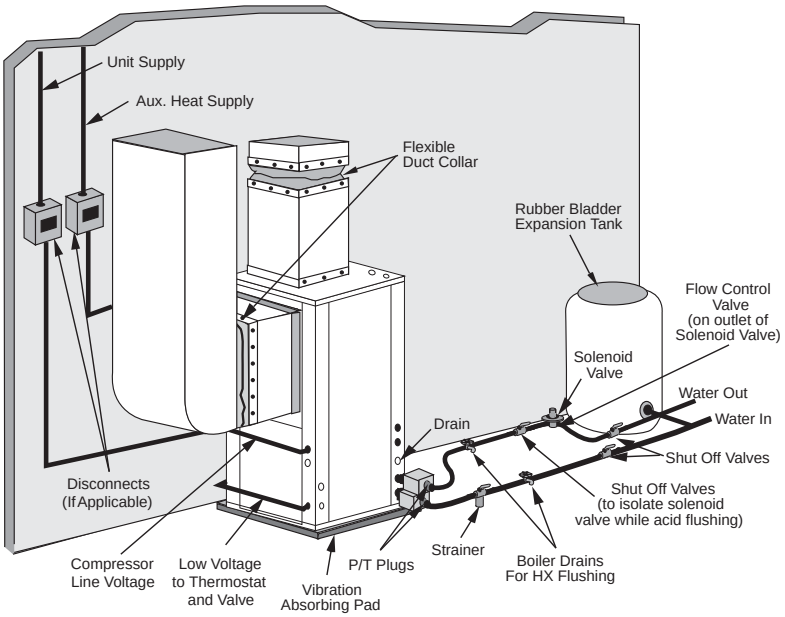
Ensure the pump provides adequate flow through the unit by checking pressure drop across the heat exchanger. Usually 0.14-0.19 L/s of flow per ton of cooling capacity is recommended in earth loop applications.

Open Loop Ground Water Systems

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

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

Open System - Groundwater Application



Freeze Detection

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

Electrical Connections

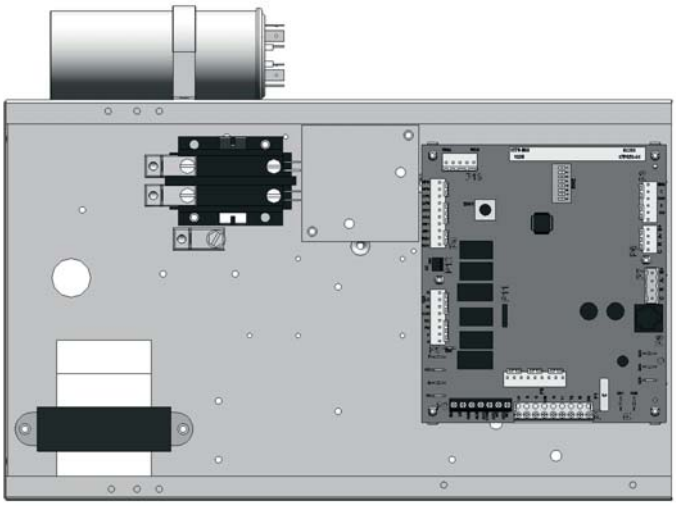
General

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

Power Connection

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

Aurora Base Control Box



220 Volt Operation

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

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

Electrical Data

5-Speed ECM Motor

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

HACR circuit breaker in USA only

8/18/18

Electrical Data cont.

Variable Speed ECM Motor

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

HACR circuit breaker in USA only 8/18/18

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

Blower Performance Data cont.

5-Speed ECM Motor

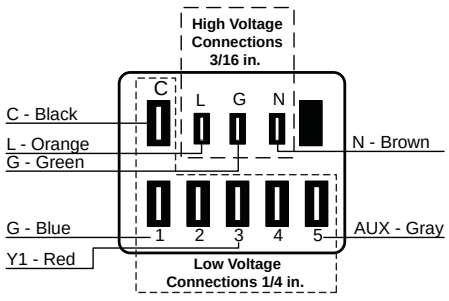
Model	Motor Spd	Motor Tap	Blower Size	Motor kW	Airflow (L/s) at External Static Pressure														
					0	12.45	24.90	37.35	49.80	62.25	74.70	87.15	99.60	112.05	124.50	149.40	174.30	199.20	224.20	249.00
	High	5			432	422	415	408	401	392	385	380	375	366	354	345	328	302	-	-
	Med High	**4**			380	370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

Factory settings are in Bold

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

9/21/15

5-Speed ECM Motor Connections



5-Speed ECM Constant Torque Motors

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

5-Speed ECM Benefits:

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

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

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

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

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

Thermal Protection - Motor is electronically protected.

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

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

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

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

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

Blower Performance Data cont.

Variable Speed ECM Motor

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

12/5/14

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

Variable Speed Constant Torque ECM

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

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

2/18/2018

Setting Blower Speed - Variable Speed ECM

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

CAUTION: Disconnect all power before performing this operation.

Blower Performance Data cont.

Setting Blower Speed - Variable Speed ECM

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

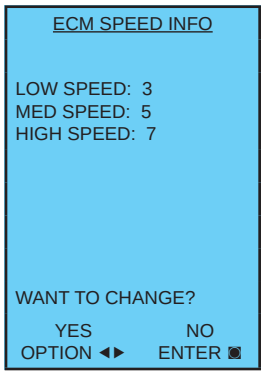
Variable Speed ECM Setup without an AID Tool

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

Variable Speed ECM Setup with an AID Tool

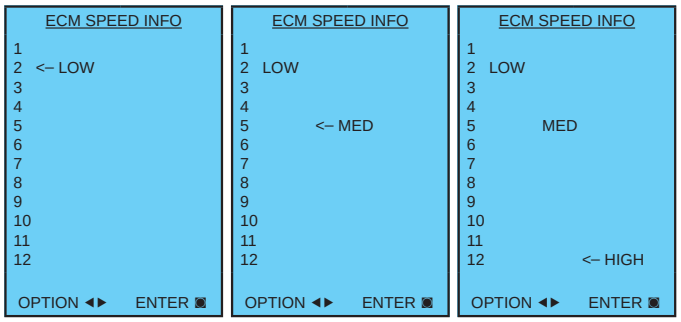
A much easier method utilizes the AID Tool to change the airflow using the procedure below. First navigate to the Setup screen and then select ECM Setup. This screen displays the current variable speed ECM settings. It allows the technician to enter the setup screens to change the variable speed ECM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

Variable Speed ECM Setup with an AID Tool cont.



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

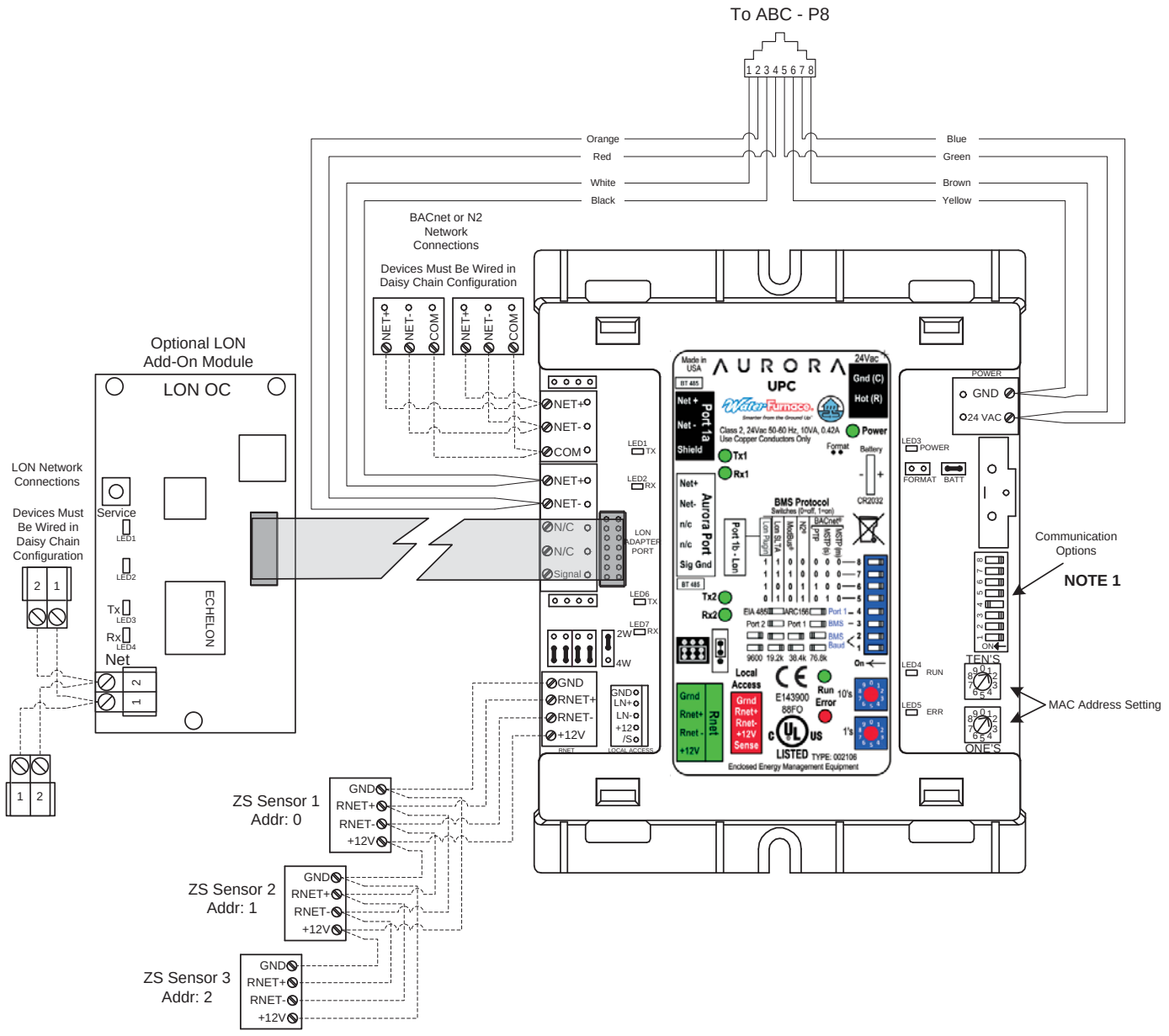
Variable Speed ECM Speed Setup - These screens allow the technician to select the low, medium, and high blower speed for the variable speed ECM blower motor. Change the highlighted item using the ▲ and ▼ buttons. Press the ◙ button to select the speed.



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

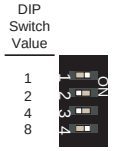
Wiring Schematics

Aurora Control with UPC



ZS Sensor Information

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



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

Notes

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

Legend

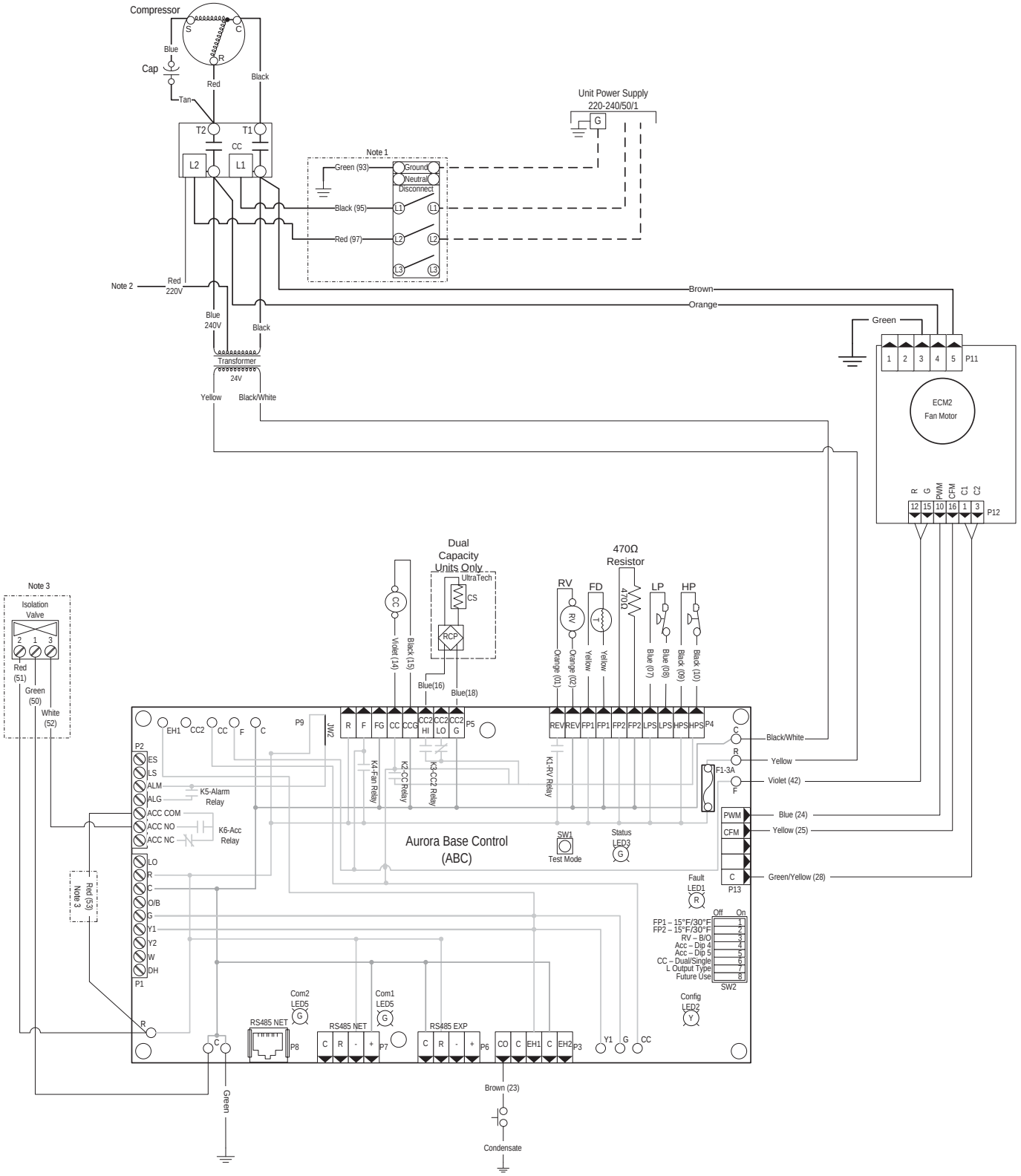
Factory Low Voltage Wiring

Field Low Voltage Wiring

12345678 RJ45 Connector

Wiring Schematics cont.

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



Wiring Schematics cont.

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

Legend

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

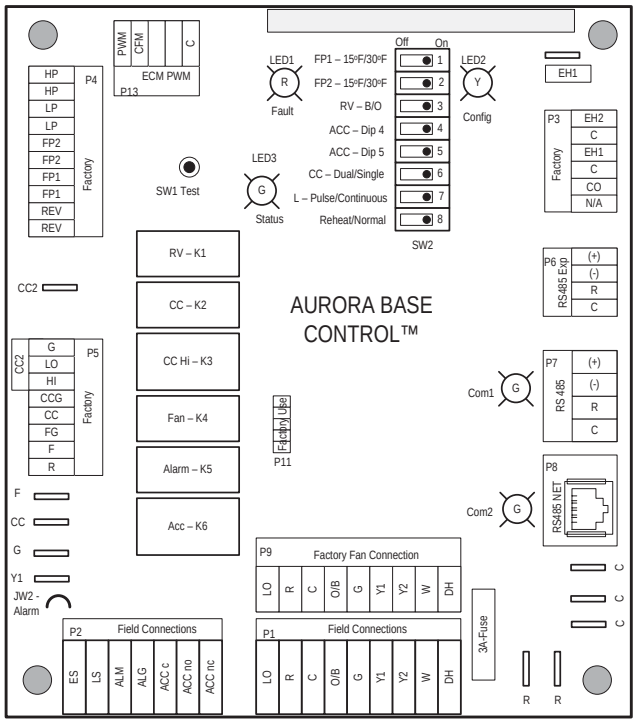
CC – Compressor Contactor
CO – Condensate Overflow Sensor
ES – Emergency Shutdown
HP – High Pressure Switch
LP – Low Pressure Switch
FD – Freeze Detection Sensor
F1 – Fuse

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

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

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

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



Notes:

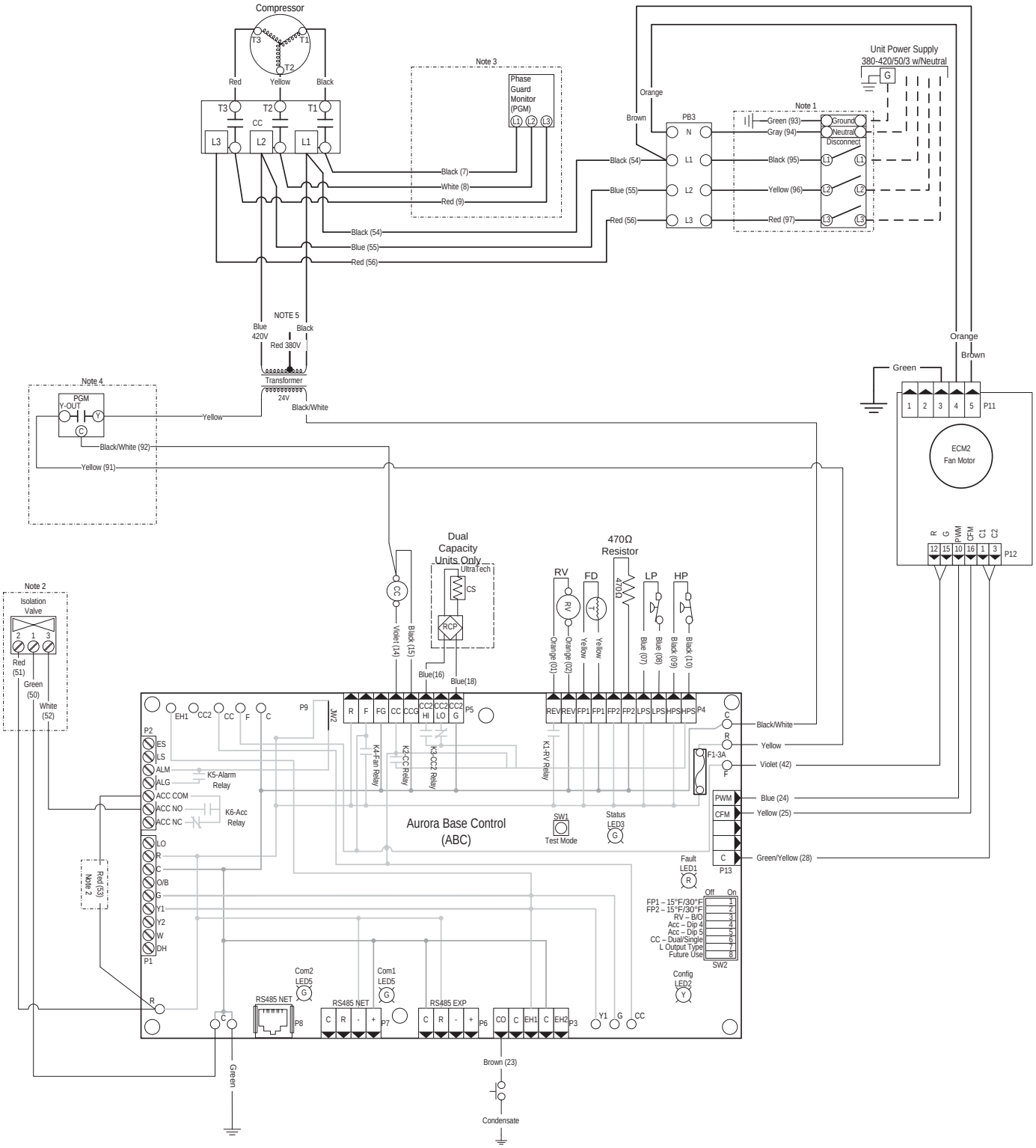
1 – Optional, factory installed unit mounted disconnect.
2 – Swap blue and red leads for 220V operation.
3 – Optional, factory installed internal isolation valve.

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

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

Wiring Schematics cont.

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



Wiring Schematics cont.

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

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

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

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

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

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

Notes:

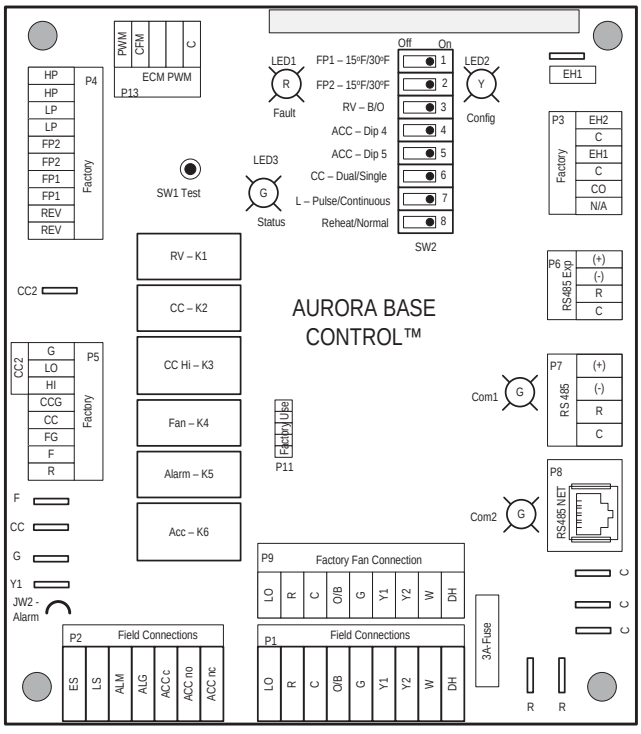
1 – Optional, factory installed unit mounted disconnect.
2 – Optional, factory installed internal isolation valve.
3 – Optional, factory installed phase guard
4 – Optional, factory installed phase guard. The yellow transformer wire shall be connected directly to the CPU board, if this option is not installed.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

Legend

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

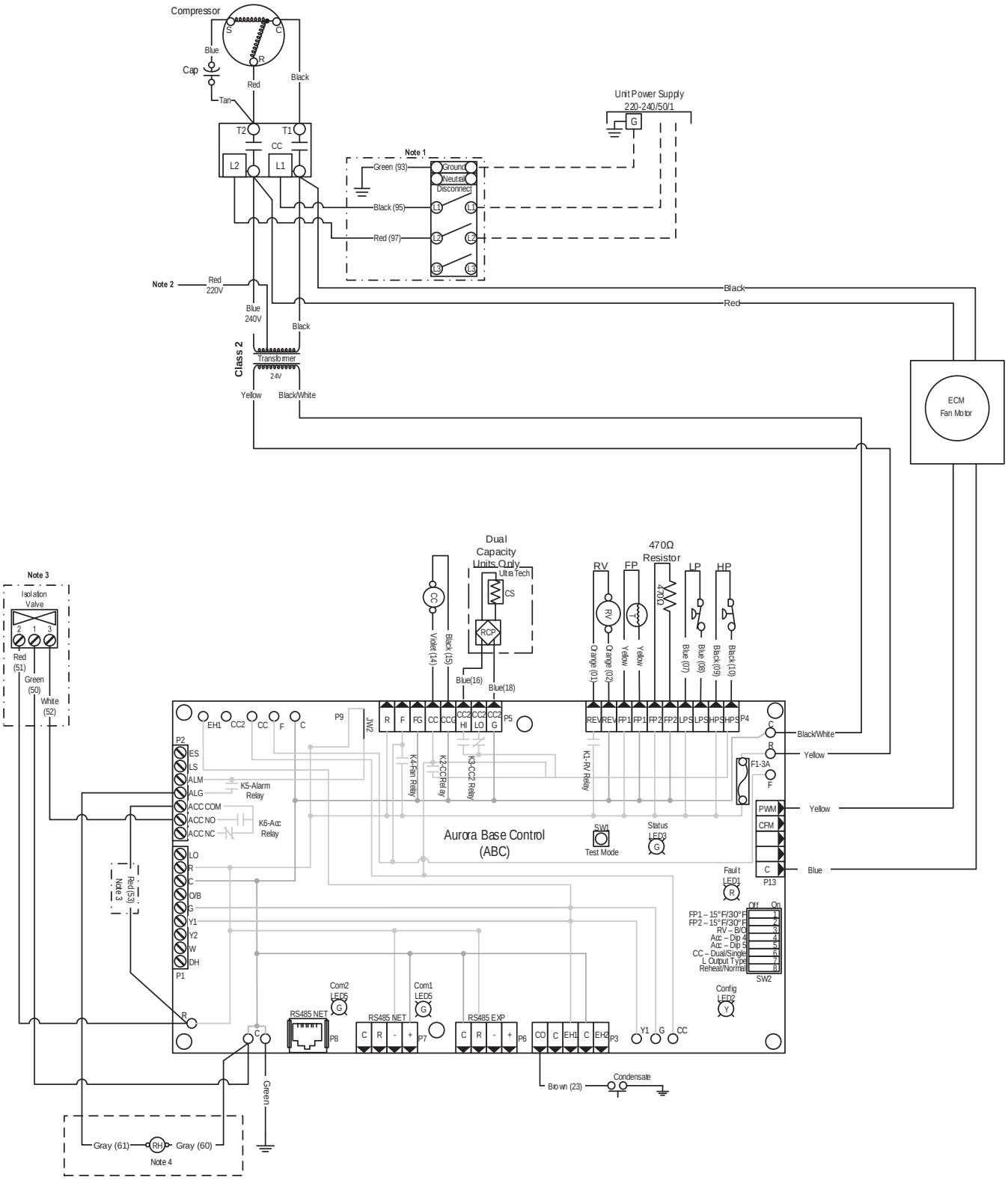
CC – Compressor Contactor
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HP – High Pressure Switch
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F1 – Fuse

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



Wiring Schematics cont.

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



Wiring Schematics cont.

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

Notes:

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

Legend

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

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

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

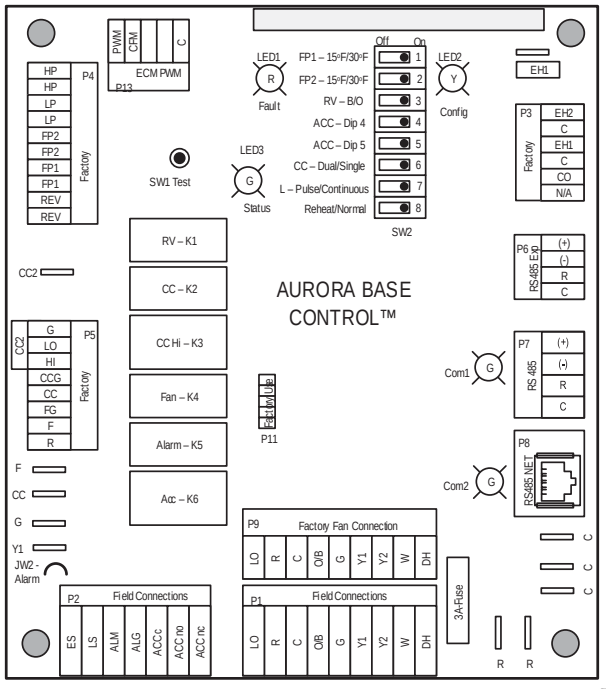
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Status LED (LED1, Green)		Configuration LED (LED2, Yellow)		Fault LED (LED3, Red)	
Normal Mode	ON	No Software Override	Flash ECM Setting	Normal Mode	OFF
Control is Non-Functional	OFF	DIP Switch Override	Slow Flash	Input Fault Lockout	Flash Code 1
Test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

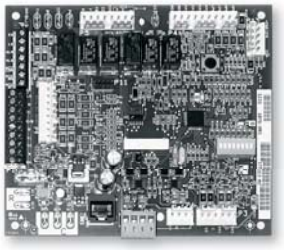
Accessory Relay		
Operation	SW2-4	SW2-5
Cycle with Blower	On	On
Cycle with Compressor	Off	Off
Water Valve Slow Open	On	Off
Outdoor Air Damper	Off	On

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



Controls - Aurora Base Control

Aurora 'Base' Control



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

Control Features

Software ABC Standard Version 3.0

Single or Dual Capacity Compressors

Either single or dual capacity compressors can be operated.

Variable Speed ECM

Blower Motor Option (If Applicable)

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

5-Speed ECM Blower Motor Option (If Applicable)

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

Other Control Features

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

Field Selectable Options via Hardware

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

Test Mode

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

Variable Speed ECM Configuration Mode (If Applicable)

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

Reset Configuration Mode

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

DIP Switch (SW2)

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

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

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

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

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

Controls - Aurora Base Control cont.

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

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

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

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

Alarm Jumper Clip Selection

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

Variable Speed ECM Blower Speeds

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

Field Selectable Options via Software

(Selectable via the Aurora AID Tool)

ECM Blower Speeds

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

Safety Features

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

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

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

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

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

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

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

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

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

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

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

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

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

Controls - Aurora Base Control cont.

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

Operation Description

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

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

Heating Operation

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

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

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

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

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

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

Cooling Operation

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

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

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

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

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

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

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

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

Controls - Aurora Base Control cont.

Aurora 'Base' Control LED Displays

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

Status LED (LED3, Green)

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

Configuration LED (LED2, Yellow)

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

Fault LED (LED1, Red)

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

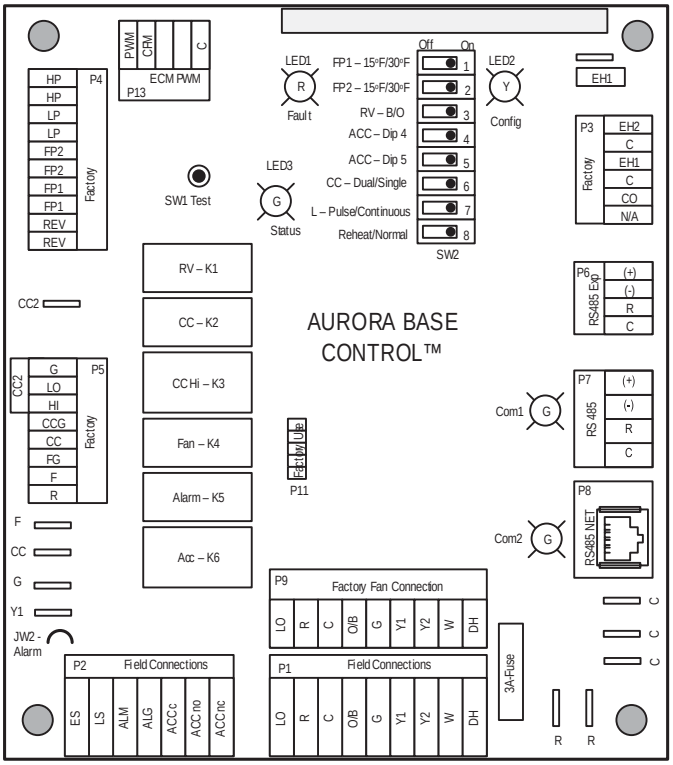
NOTE: All codes >11 use long flash for tens digit and short flash for the ones digit. 20, 30, 40, 50, etc. are skipped.

Aurora Interface and Diagnostics (AID) Tool

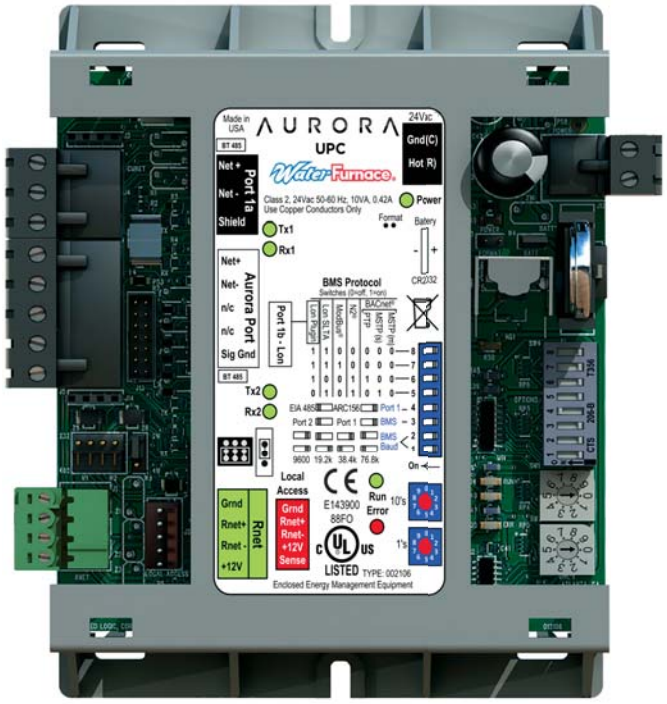


The Aurora Interface and Diagnostics (AID) Tool is a device that is a member of the Aurora network. The AID Tool is used to troubleshoot equipment which uses the Aurora control via Modbus RTU communication. The AID Tool provides diagnostics, fault management, ECM setup, and system configuration capabilities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

ABC Control Board Layout



Controls - UPC DDC Control (optional)



Aurora UPC Controller



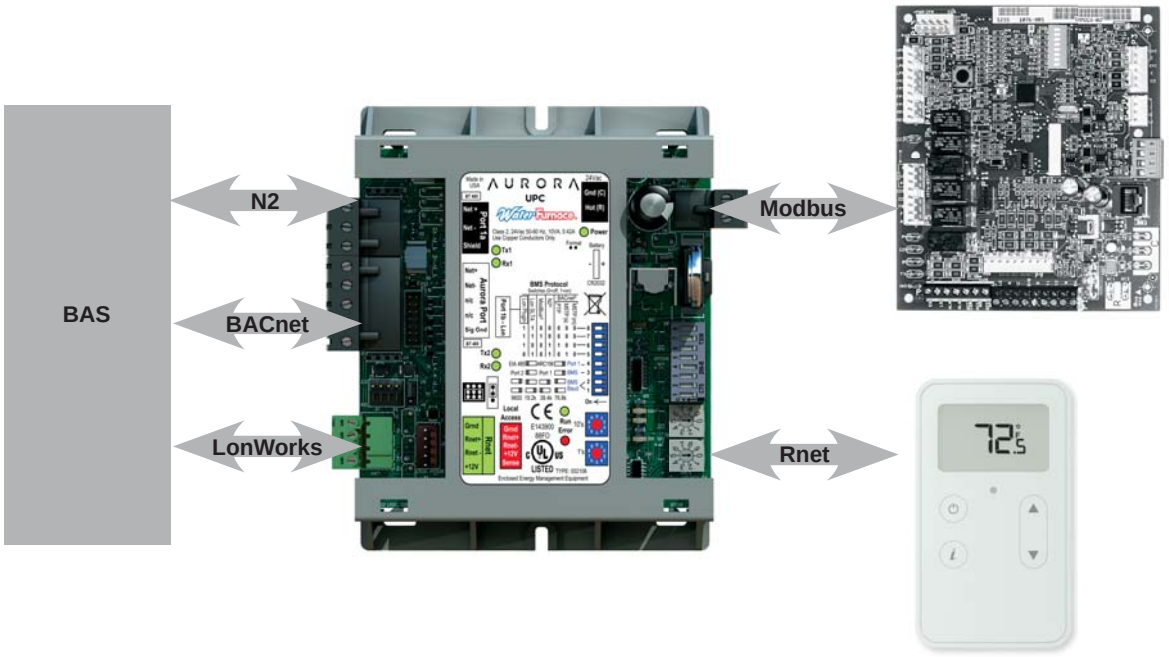
ZS Series Sensors

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

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

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

Controls - UPC DDC Control (optional) cont.



Aurora UPC Features

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

Aurora UPC Optional Features

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

Controls - UPC DDC Control (optional) cont.

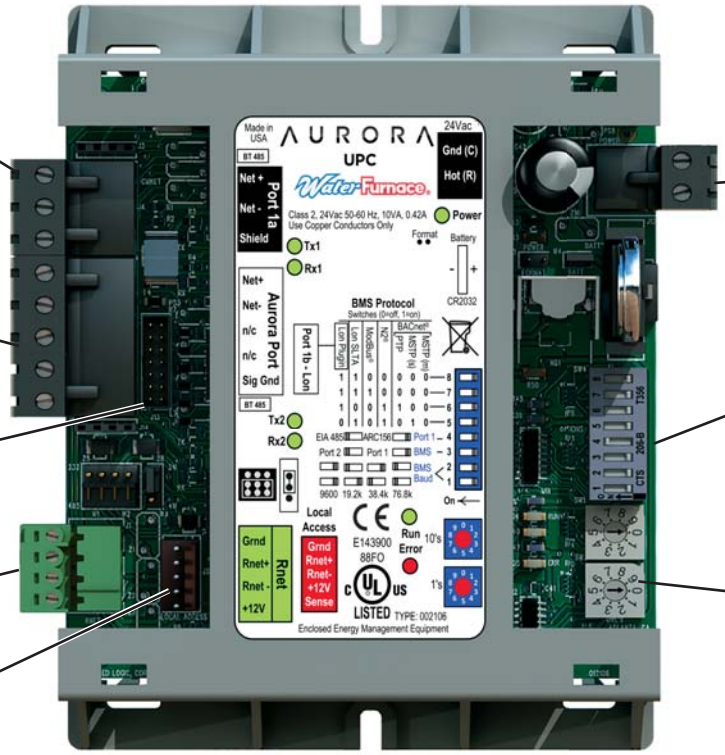
Port 1a is used to communicate to the Building Automation System (BAS). This port's settings are configured through the onboard dip switches.

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

Port 1b is used for the LonWorks plugin.

Rnet port is used for communicating zone sensors.

BACview or local laptop connection.



24Vac

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

Mac address is set by 2 rotary dials.

Aurora Touch Interface

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



Aurora UPC Smart Tablet Option

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



Controls - UPC DDC Control (optional) cont.

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

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

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

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

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

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

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

Aurora Base Fault Codes (ABC Only)

Fault LED (LED1, Red)

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

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

Aurora Advanced Fault Codes (ABC + AXB Expansion Board)

Fault LED (LED1, Red)

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

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

Controls - UPC DDC Control (optional) cont.

Aurora Base or Advanced Control Configuration and Status Codes

Status LED (LED3, Green)

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

Configuration LED (LED2, Yellow)

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

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

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

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

Controls - UPC DDC Control (optional) cont.

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

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

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

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

Controls - UPC DDC Control (optional) cont.

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

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

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

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

Controls - UPC DDC Control (optional) cont.

ZS Series RNet Sensor Overview

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

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



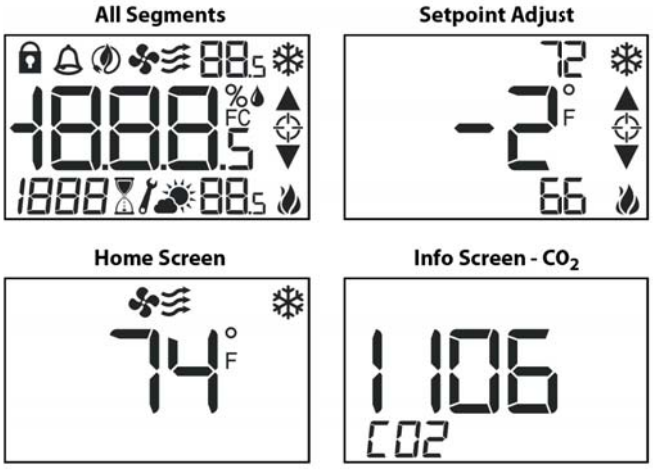
Features	ZS Base	ZS Plus	ZS Pro	ZS Pro-F
Temp, CO^2, Humidity, and VOC Options	√	√	√	√
Neutral Color	√	√	√	√
Addressable/supports daisy chaining	√	√	√	√
Hidden communication port	√	√	√	√
Mounts on a standard 2” by 4” electrical box	√	√	√	√
Occupancy Status indicator LED		√	√	√
Push button occupancy override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

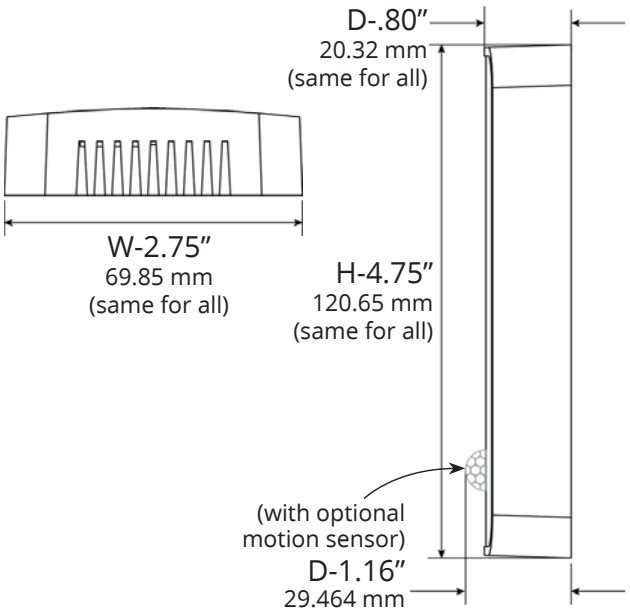
Options	Part Number	Part Number	Part Number	Part Number
Temperature Only	ZSU	ZSUPL	ZSUP	ZSUPF
Temp with CO^2	ZSU-C	ZSUPL-C	ZSUP-C	ZSUPF-C
Temp with Humidity	ZSU-H	ZSUPL-H	ZSUP-H	ZSUPF-H
Temp with Humidity, CO^2	ZSU-HC	ZSUPL-HC	ZSUP-HC	ZSUPF-HC
Temp, Humidity, VOC	ZSU-HV	ZSUPL-HV	ZSUP-HV	ZSUPF-HV
Temp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

Controls - UPC DDC Control (optional) cont.

RNet Sensor Physical and Electrical Data

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





Unit Startup

Before Powering Unit, Check The Following:

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

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

Startup Steps

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

1. Initiate a control signal to energize the blower motor. Check blower operation.
2. Initiate a control signal to place the unit in the cooling mode. Cooling setpoint must be set below room temperature.
3. Cooling will energize after a time delay. Check for correct rotation of scroll compressors in 3 phase applications. Incorrect rotation will cause low refrigerant pressures and possibly unusual noise. Switch any two power leads at the compressor or contactor to reverse rotation.
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 the pressure drop table.
6. Check the temperature of both the supply and discharge water (Refer to Operating Parameters tables).
7. Check for an air temperature drop of 15°F to 25°F across the air coil, depending on the blower speed and entering water temperature.
8. Decrease the cooling set point several degrees and verify high-speed blower operation (variable speed ECM only).
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. Heating will energize after a time delay.
12. Check the temperature of both the supply and discharge water (Refer to Unit Operating Parameters tables).
13. Check for an air temperature rise of 20°F to 35°F across the air coil, depending on the blower speed and entering water temperature.
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.

Operating Parameters

Single Speed Models

SI

Entering Water Temp °C	Water Flow L/s/kW	Cooling -- No Hot Water Generation					
		Suction Pressure kPa	Discharge Pressure kPa	Superheat	Subcooling	Water Temp Rise °C	Air Temp Drop °C DB
-1.1	0.09	793 - 862	1034 - 1172	11 - 19	6 - 9	9 - 12	9 - 13
	0.19	724 - 827	896 - 1000	11 - 19	6 - 9	4 - 6	9 - 13
10	0.09	896 - 965	1482 - 1620	7 - 11	4 - 8	9 - 12	9 - 13
	0.19	883 - 951	1310 - 1448	7 - 11	4 - 8	4 - 7	9 - 13
21.1	0.09	951 - 1020	1931 - 2137	6 - 9	6 - 9	8 - 12	9 - 13
	0.19	938 - 1007	1724- 1931	6 - 9	4 - 8	4 - 7	9 - 13
32.2	0.09	1000 - 1069	2413 - 2620	5- 8	6 - 9	8 - 11	9 - 13
	0.19	986 - 1055	2206 - 2413	5- 8	4 - 8	3 - 6	9 - 13
43.3	0.09	1000 - 1063	2896 - 3102	5- 8	6 - 9	8 - 11	9 - 13
	0.19	986 - 1055	2792 - 2999	5- 8	4 - 8	3 - 6	9 - 13

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

Heating - No Hot Water Generation					
Suction Pressure kPa	Discharge Pressure kPa	Superheat	Subcooling	Water Temp Drop °C	Air Temp Rise °C DB
503-586	1862- 2103	4 - 8	2 - 6	3 - 6	8 - 12
531 - 621	1931 - 2172	4 - 8	2 - 6	2 - 4	9 - 13
669 - 758	1999 - 2241	6 - 9	2 - 6	5 - 7	12 - 16
703 - 793	2068- 2310	6 - 9	2 - 6	4 - 6	13 - 17
896- 1000	2206 - 2448	7 - 11	2 - 6	6 - 8	17 - 20
931 - 1034	2241 - 2482	7 - 11	2 - 6	4 - 7	18 - 21
1034 - 1103	2413 - 2689	7 - 11	2 - 6	6 - 8	17 - 20
1069- 1038	2517 - 2792	7 - 11	2 - 6	4 - 7	18-21

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Operating Limits

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

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

Pressure Drop

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

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

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Compressor Resistance

Compressor Resistance Chart

Model	220-240/50/1		420/50/3
	Run	Start	
002	3.65 - 4.19	3.75 - 4.31	
003	3.35 - 3.85	2.80 - 3.22	
005	3.03 - 3.49	2.39 - 2.75	
006	1.33-1.47	2.34-2.58	5.06-5.6
007	1.33-1.47	2.34-2.58	5.06-5.6
009	0.76-0.84	1.67-1.85	4.38-4.84
010			4.38-4.84
012	0.64-0.71	1.58-1.75	3.41-3.77
015			2.78-3.07
017			2.72-3.13

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Compressor and Thermistor Resistance

Compressor Resistance Chart

Model	220-240/50/1		420/50/3
	Run	Start	
002	3.65 - 4.19	3.75 - 4.31	
003	3.35 - 3.85	2.80 - 3.22	
005	3.03 - 3.49	2.39 - 2.75	
006	1.38 - 1.58	2.02 - 2.32	8.00 - 9.20
007	1.24 - 1.42	2.42 - 2.78	7.57 - 8.71
009	1.13 - 1.31	1.07 - 1.23	4.71 - 7.20
010			3.75 - 4.31
012	0.48 - 0.56	0.76 - 0.88	3.44 - 3.96
015			2.98 - 3.42
017			2.34 - 2.70

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Thermistor Resistance

Thermistor Temperature (°C)	Microprocessor Resistance (Ohms)
-15	72,950
-10	55,330
-5	42,330
0	32,650
5	25,390
10	19,900
15	15,710
20	12,490
25	10,000
30	8,057
35	6,530
40	5,327
45	4,370
50	3,603
55	2,986
60	2,488
65	2,083

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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.						

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Heat of Extraction/Rejection Data

Heat of Extraction/Rejection

Model	L/s	Heat Of Extraction (HE)				Heat of Rejection (HR)				
		-1.11°C	10°C	21.1°C	32.2°C	-1.11°C	10°C	21.1°C	32.2°C	43.3°C
002	0.09		1.6	2.0	2.5		3.2	3.0	2.7	
	0.13	1.3	1.7	2.0	2.6	3.2	3.3	3.1	2.7	2.5
	0.19	1.3	1.7	2.1	2.6	3.3	3.3	3.1	2.7	2.5
003	0.09		2.2	2.8	3.6		4.0	3.7	3.4	
	0.16	1.8	2.3	2.9	3.7	4.1	4.1	3.7	3.4	3.1
	0.22	1.7	2.4	3.0	3.7	4.1	4.1	3.7	3.5	3.2
005	0.2		3.3	4.4	5.6		6.3	5.7	5.4	
	0.3	2.5	3.4	4.6	5.7	6.5	6.3	5.7	5.4	5.0
	0.3	2.5	3.5	4.7	5.7	6.5	6.4	5.7	5.5	5.1
006	0.2		4.5	5.8	6.8		8.7	8.0	7.5	
	0.3	3.6	4.7	6.0	7.0	8.7	8.8	8.1	7.5	6.5
	0.4	3.3	4.9	6.2	7.1	8.8	8.8	8.2	7.5	6.5
007	0.3		5.4	7.2	9.1		9.9	9.3	8.5	
	0.4	4.2	5.6	7.4	9.2	10.0	10.2	9.3	8.5	8.1
	0.5	3.9	5.8	7.7	9.3	10.0	10.5	9.3	8.6	8.1
009	0.3		6.3	8.3	10.7		12.1	11.4	10.7	
	0.4	5.0	6.5	8.5	10.9	11.4	12.2	11.5	10.7	9.8
	0.6	4.7	6.8	8.8	11.1	11.4	12.3	11.6	10.8	9.9
010	0.3		7.5	10.0	13.2		14.4	13.6	12.7	
	0.5	5.8	7.9	10.6	13.4	13.7	14.6	13.7	12.7	11.6
	0.7	5.8	8.3	11.2	13.6	13.8	14.7	13.8	12.8	11.7
012	0.4		8.9	12.0	15.6		17.3	16.3	15.3	
	0.6	6.9	9.3	12.5	15.9	15.5	17.3	16.4	15.3	14.0
	0.8	6.9	9.7	13.1	16.1	15.6	17.3	16.5	15.5	14.1
015	0.6		10.5	14.1	18.0		21.1	19.8	18.4	
	0.8	8.1	11.0	14.8	18.3	20.0	21.3	20.1	18.4	17.1
	0.9	8.0	11.5	15.4	18.6	20.1	21.5	20.3	18.6	17.2
017	0.8		12.1	15.8	20.1		21.2	20.1	19.4	
	0.9	9.6	12.7	16.7	20.5	19.1	21.6	20.7	19.4	18.0
	1.1	9.5	13.3	17.6	20.8	19.2	22.0	21.2	19.6	18.2

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Reference Calculations

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

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

Notes (Refer to Performance Data tables)

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

Troubleshooting

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

If compressor won't run:

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

If sufficient cooling or heating is not obtained:

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

If the unit operation is noisy:

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

Refrigerant Systems

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

NOTE: Verify that air and water flow rates are at proper levels before servicing the refrigerant circuit.

Startup and Troubleshooting Form

Company Name: _____ Company Phone No: _____
Technician Name: _____ Date: _____
Model No: _____ Serial No: _____
Owner's Name: _____ Open or Closed Loop: _____
Installation Address: _____ Installation Date: _____

Check One
❑ Start up/Check-out for new installation ❑ Troubleshooting Problem: _____

1. FLOW RATE IN GPM (COAXIAL HEAT EXCHANGER)

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

2. TEMPERATURE RISE OR DROP ACROSS COAXIAL HEAT EXCHANGER

	COOLING		HEATING	
Water In Temperature:	e._____	°C	e._____	°C
Water Out Temperature:	f. _____	°C	f. _____	°C
Temperature Difference:	g._____	°C	g._____	°C

3. TEMPERATURE RISE OR DROP ACROSS AIR COIL

	COOLING		HEATING	
Air In Temperature:	h._____	°C	h._____	°C
Air Out Temperature:	i. _____	°C	i. _____	°C
Temperature Difference:	j. _____	°C	j. _____	°C

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

HR or HE = Flow Rate x Temperature Difference x Brine Factor*
d. (above) x g. (above) x 485 for Methanol or Environol, 500 for water*
Heat of Extraction (Heating Mode) = _____ kW/hr
Heat of Rejection (Cooling Mode) = _____ kW/hr
Compare results to Capacity Data Tables

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

5. WATTS

	COOLING		HEATING	
Volts:	m._____	VOLTS	m._____	VOLTS
Total Amps (Comp. + Fan):	n. _____	AMPS	n. _____	AMPS
Watts = m. x n. x 0.85	o. _____	WATTS	o. _____	WATTS

6. CAPACITY

Cooling Capacity = HR. - (o. x 3.413)	p. _____	kW/hr
Heating Capacity= HE. + (o. x 3.413)	p. _____	kW/hr

7. EFFICIENCY

Cooling EER = p. / o.	q. _____	COP
Heating COP = p. / o.	q. _____	COP

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

	COOLING		HEATING	
Suction Pressure:	r. _____	kPa	r. _____	kPa
Suction Saturation Temperature:	s. _____	°C	s. _____	°C
Suction Line Temperature:	t. _____	°C	t. _____	°C
Superheat = t. - s.	u. _____	°C	u. _____	°C
Head Pressure:	v. _____	kPa	v. _____	kPa
High Pressure Saturation Temp.:	w. _____	°C	w. _____	°C
Liquid Line Temperature*:	x. _____	°C	x. _____	°C
Subcooling = w. - x.	y. _____	°C	y. _____	°C

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

DEALER: _____

PHONE #: _____ DATE: _____

PROBLEM: _____

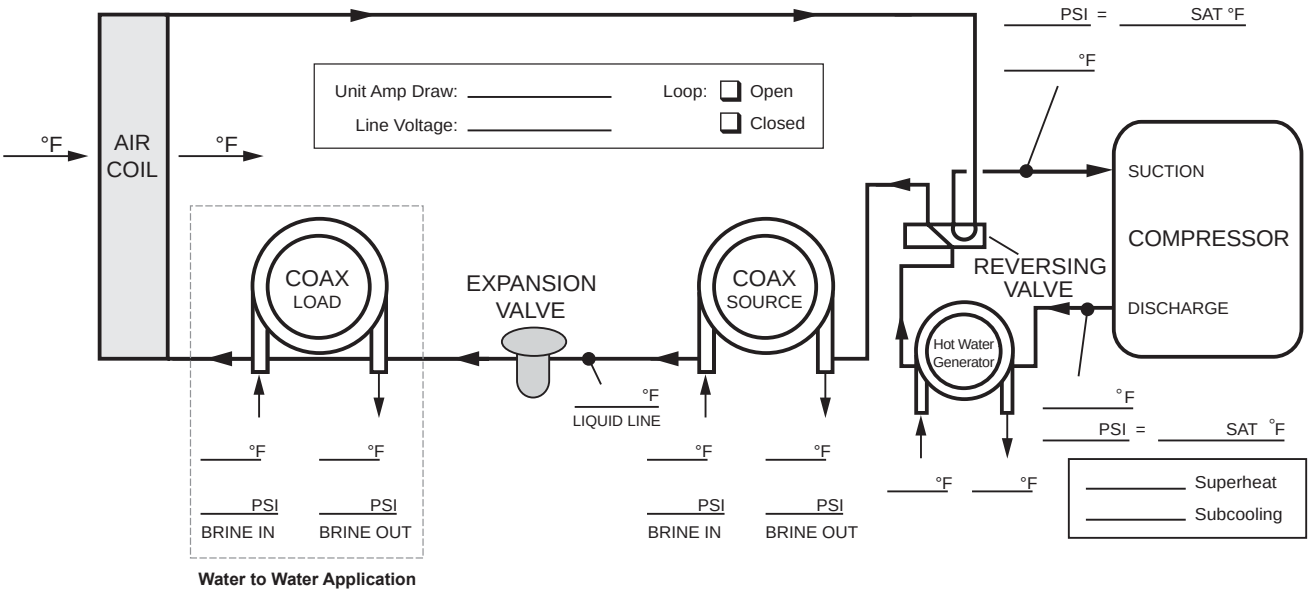
MODEL #: _____

SERIAL #: _____

WaterFurnace® Smarter from the Ground Up™

Startup/Troubleshooting Form

COOLING CYCLE ANALYSIS

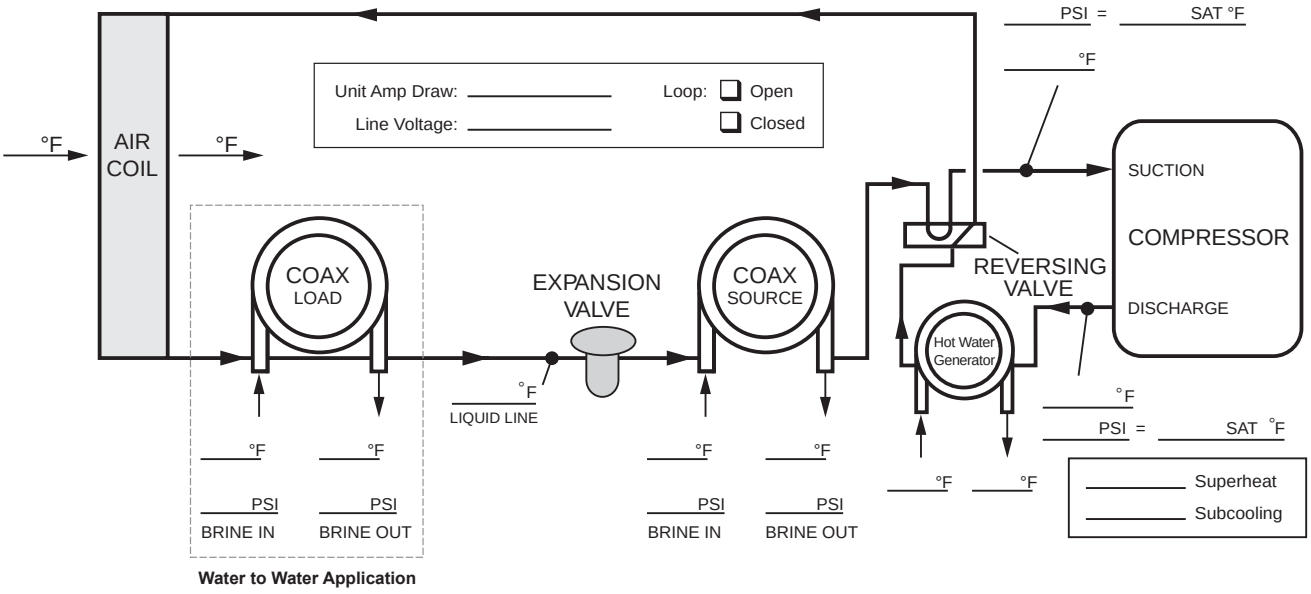


Water to Water Application

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



Water to Water Application

Preventive Maintenance

Water Coil Maintenance

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

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

Other Maintenance

Filters

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

Condensate Drain

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

Blower Motors

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

Air Coil

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



CAUTION: Fin edges are sharp.

Replacement Procedures

Obtaining Parts

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

In-Warranty Material Return

Material may not be returned except by permission of authorized warranty personnel. Contact your local distributor for warranty return authorization and assistance.

Notes

Revision Guide

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

WaterFurnace®
Commercial Solutions

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

Product:	**Versatec Compact Series**
Type:	Geothermal/Water Source Heat Pump
Size:	Commercial 0.5-6 Ton
Document:	Installation Manual

IM252AU 12/18

CE

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

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