Premium Forced Air
Geothermal Comfort System

Geothermal Heat Pumps
R-410A Refrigerant
2-6 Ton Dual Capacity

INSTALLATION, OPERATION & MAINTENANCE MANUAL

- Installation Information
- Water Piping Connections
- Hot Water Generator Connections
- Electrical
- Startup Procedures
- Troubleshooting
- Preventive Maintenance

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GEOSMART ENERGY

TEC-ECO-Y-0914v1

Table of Contents

Model Nomenclature

1-2	3-5	6	7	8	9	10	11	12	13	14	15	16	17-18	19
YT	048	T	L	1	1	4	C	S	0	2	N	B	SS	*

Model Type
YT – ECO-Y Dual Capacity

Unit Capacity (MBTUH)
024, 036, 048, 060, 072

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

Return Air Configuration
L – Left
R – Right

Voltage
1 – 208-230/60/1

Hot Water Generation
0 – No Hot Water Generation
1 – Hot Water Generation with Factory Installed Pump

Blower Options
4 – 5 Speed ECM

Water Coil Option
C – Copper
N – CuproNickel

Control Option
S – Microprocessor

IntelliStart® Option
0 – None
1 - IntelliStart

Filter Option
2 – Duct Flanges, No Filter
0 – 1" Filter Rack with 1" MERV 8 Filter

Future Option
N – None

Cabinet Option
B – Beige Cabinet

Non-Standard Option
SS – Standard

Vintage
* - Factory Use Only

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

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

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

If access to the left side of the unit will be limited after installation, remove the two mounting screws on the left side of the control box before setting the unit (leave the two front mounting screws intact). This will allow the control box to be removed with only the two front mounting screws for future service.

Figure 1: Vertical Unit Mounting

General Installation Information cont.

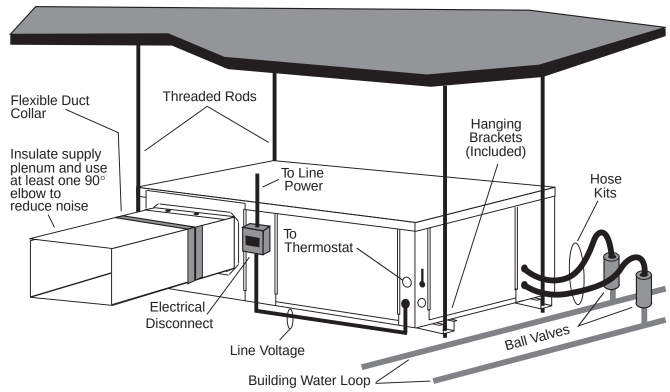
Installing Horizontal Units

Remove and discard the compressor hold down shipping bolt located at the front of the compressor mounting bracket prior to setting the unit in place. Horizontal units are available with side or end discharge and may be easily field converted by flipping the blower discharge panel (The 024 model requires an additional discharge panel). Horizontal units are normally suspended from a ceiling by four or six 3/8 in. diameter threaded rods. The rods are usually attached to the unit by hanger bracket kits furnished with each unit.

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

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

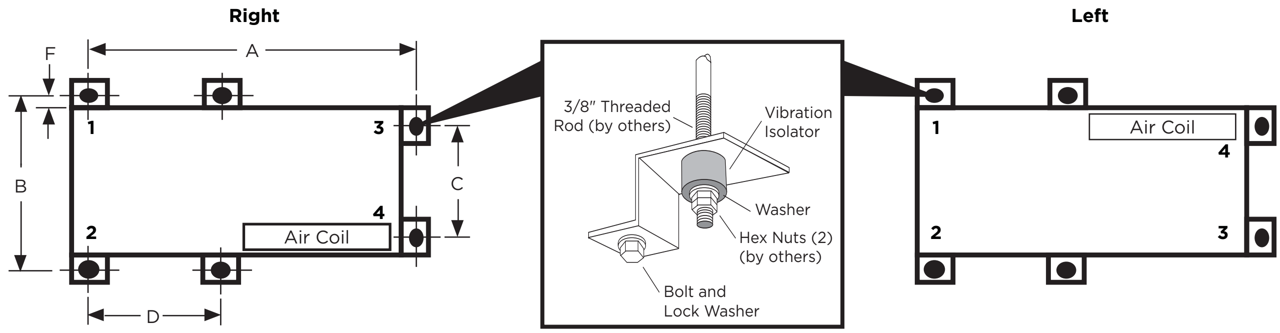
Figure 2: Horizontal Unit Mounting



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

General Installation Information cont.

Figure 3: Hanger Location and Assembly



Weight Distribution

Model		Vertical Weight	Horizontal Weight	Horizontal Weight Distribution			
				Front		Back	
				1	2	3	4
024	lb	198	228	69	63	73	23
	kg	90	103	31	29	33	10
036	lb	221	250	80	65	70	35
	kg	100	113	36	29	32	16
048	lb	303	325	93	97	101	34
	kg	137	147	42	44	46	15
060	lb	329	358	110	100	103	45
	kg	149	162	50	45	47	20
072	lb	350	369	141	78	71	79
	kg	159	167	64	35	32	36

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Hanger Bracket Locations (See Figure 3)

Model		Hanger Kit Part Number	Unit Hanger Dimensions			
			A	B	C	D
024	in.	99S500A04	53.7	25.1	21.4	n/a
	cm.		136.4	63.8	54.4	n/a
036	in.	99S500A04	63.7	25.1	21.4	n/a
	cm.		161.8	63.8	54.4	n/a
048-060	in.	99S500A03	72.7	28.1	24.4	29.3
	cm.		184.7	71.4	62.0	74.4
072	in.	99S500A03	77.7	28.1	24.4	29.3
	cm.		197.4	71.4	62.0	74.4

General Installation Information cont.

Duct System

An air outlet collar is provided on vertical top air discharge 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.

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

Water Piping

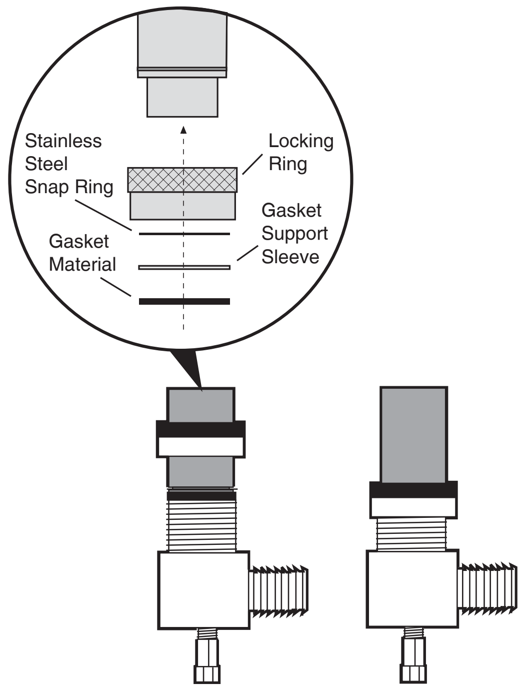
The proper water flow must be provided to each unit whenever the unit operates. To assure proper flow, use pressure/temperature ports to determine the flow rate. These ports should be located at the supply and return water connections on the unit. The proper flow rate cannot be accurately set without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

All source water connections on residential units are swivel piping fittings (see Figure 4) that accept a 1-inch male pipe thread (MPT). The swivel connector has a rubber gasket seal similar to a rubber hose gasket, which when mated to the flush end of any 1-inch threaded pipe provides a leak-free seal without the need for thread sealing tape or compound. Check to ensure that the rubber seal is in the swivel connector prior to attempting any connection. The rubber seals are shipped attached to the waterline. To make the connection to a ground loop system, mate the brass connector (supplied in CK4LI connector kit) against the rubber gasket in the swivel connector and thread the female locking ring onto the pipe threads, while maintaining the brass connector in the desired direction. Tighten the connectors by hand, then gently snug the fitting with pliers to provide a leak-proof joint.

When connecting to an open loop (ground water) system, thread any 1-inch MPT fitting (SCH80 PVC or copper) into the swivel connector and tighten in the same manner as noted above. The open and closed loop piping system should include pressure/temperature taps for serviceability.

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

Figure 4: Swivel Connections



Water Quality

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.

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. Failure to adhere to the guidelines in the water quality table could result in the loss of warranty.

General Installation Information cont.

Water Quality Guidelines

Material		Copper	90/10 Cupro-Nickel	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 .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 .5 ppm	Less than .5 ppm	Less than .5 ppm
	Chlorides	Less than 20 ppm	Less than125 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 .5 ppm	Less than .5 ppm	Less than .5 ppm
	Ammonia Nitrate	Less than .5 ppm	Less than .5 ppm	Less than .5 ppm
	Ammonia Hydroxide	Less than .5 ppm	Less than .5 ppm	Less than .5 ppm
	Ammonia Sulfate	Less than .5 ppm	Less than .5 ppm	Less than .5 ppm
	Total Dissolved Solids (TDS)	Less than 1000 ppm	1000-1500 ppm	1000-1500 ppm
	LSI Index	$^{+}$0.5 to $^{-}$.05	$^{+}$0.5 to $^{-}$.05	$^{+}$0.5 to $^{-}$.05
Iron Fouling (Biological Growth)	Iron, Fe^{2+} (Ferrous) Bacterial Iron Potential	< .2ppm	< .2 ppm	< .2 ppm
	Iron Oxide	Less than 1 ppm. Above this level deposition will occur.	Less than 1 ppm. Above this level deposition will occur.	Less than 1 ppm. Above this level deposition will occur.
Erosion	Suspended Solids	Less than 10 ppm and filtered for max of 600 micron size	Less than 10 ppm and filtered for max of 600 micron size	Less than 10 ppm and filtered for max of 600 micron size
	Threshold Velocity (Fresh Water)	< 6 ft/sec	< 6 ft/sec	<6 ft/sec

NOTE: Grains = PPM divided by 17 • mg/l is equivalent to PPM 7/17/14

Low Water Coil Limit

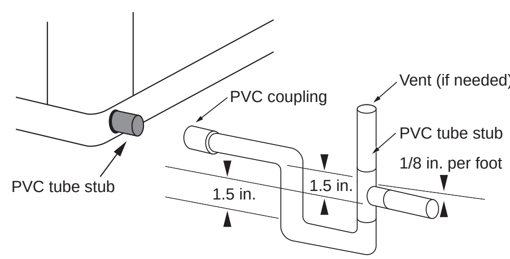
Set the freeze sensing switch SW2-2 on the printed circuit board for applications using a closed loop antifreeze solution to "LOOP." On applications using an open loop/ground water system (or closed loop no antifreeze), set this dip switch to "WELL", the factory default setting. (See DIP Switch Settings table in the Microprocessor Control section.)

Condensate Drain

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

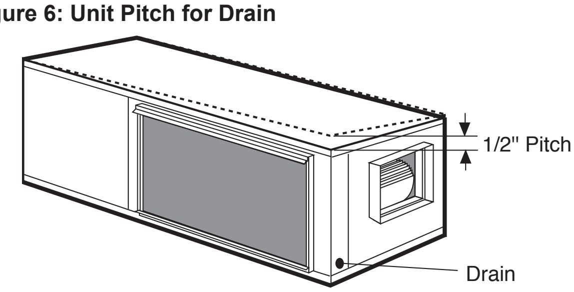
On horizontal units, a PVC stub is provided for condensate drain piping connection. An external trap is required (see below). If a vent is necessary, an open stand pipe may be applied to a tee in the field-installed condensate piping.

Figure 5: Horizontal Drain Connection



NOTE: Check dimensional data for actual PVC sizes.

Figure 6: Unit Pitch for Drain



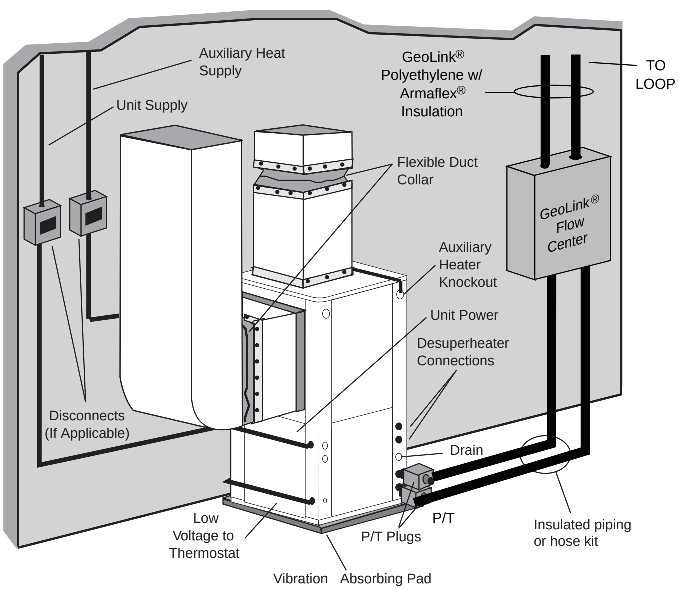
Closed Loop Ground Source Systems

NOTE: For closed loop systems with antifreeze protection, set SW2-2 to the “loop” position (see DIP Switch Settings table in the Microprocessor Control section).

Once piping is completed between the unit, pumps and the ground loop (see figure below), final purging and charging of the loop is required. A flush cart (or a 1.5 HP pump minimum) is needed to achieve adequate flow velocity in the loop to purge air and dirt particles from the loop itself. Antifreeze solution is used in most areas to prevent freezing. Flush the system adequately to remove as much air as possible then pressurize the loop to a static pressure of 40-50 psi (summer) or 50-75 psi (winter). This is normally adequate for good system operation. Loop static pressure will fluctuate with the seasons. Pressures will be higher in the winter months than during the cooling season. This fluctuation is normal and should be considered when initially charging the system.

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

Figure 7: Closed Loop Ground Source Application



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

Multiple Units on One Flow Center

When two units are connected to one loop pumping system, pump control is automatically achieved by connecting the SL terminals on connector P2 in both units with 2-wire thermostat wire. These terminals are polarity dependant (see Figure 8a and 8b). The loop pump(s) may be powered from either unit, whichever is more convenient. If either unit calls, the loop pump(s) will automatically start. The use of two units on one flow center is generally limited to a total of 20 GPM capacity.

Figure 8a: Primary/Secondary Hook-up

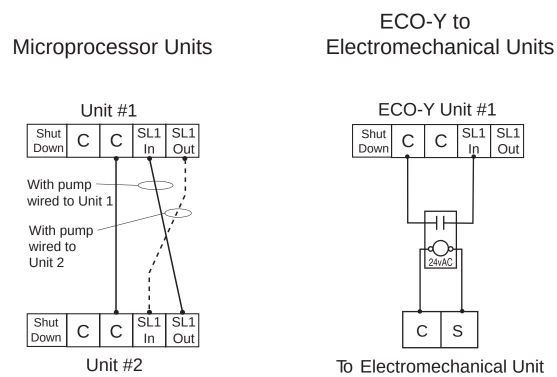
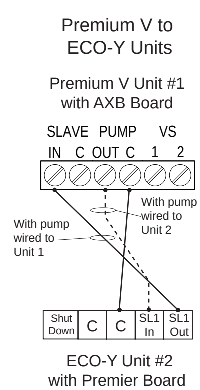


Figure 8b: Primary/Secondary Hook-up (Premium V to ECO-Y Units)



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. 1.5-2 GPM 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.

NOTE: For open loop/groundwater systems or systems that do not contain an antifreeze solution, set SW2-Switch #2 to the "WELL" position (see DIP Switch Settings table in the Microprocessor Control section). Slow opening/closing solenoid valves (type V or VM) are recommended to eliminate water hammer.

Figure 10: Open System - Groundwater Application

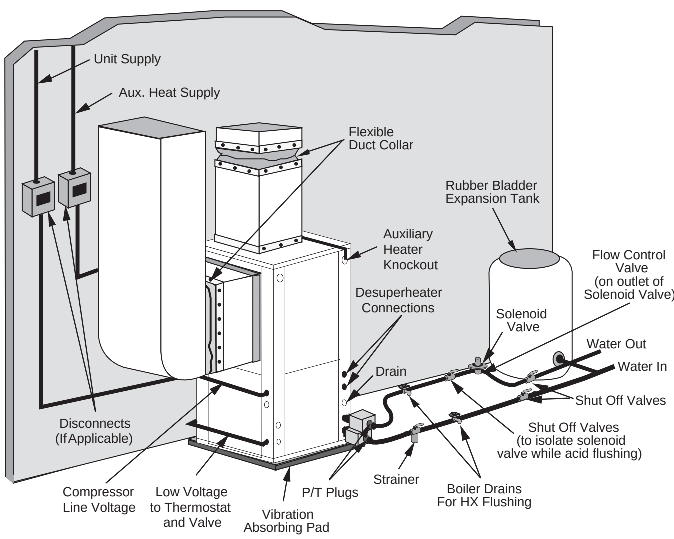


Figure 9a: Open Loop Solenoid Valve Connection Option
Typical slow operating external 24V water solenoid valve (type V) wiring.

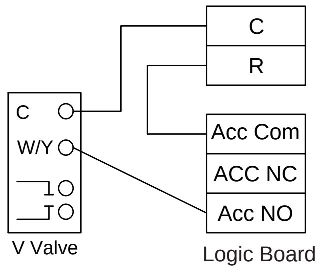
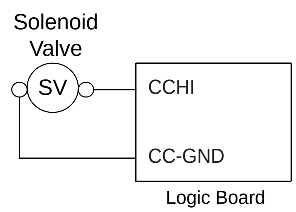
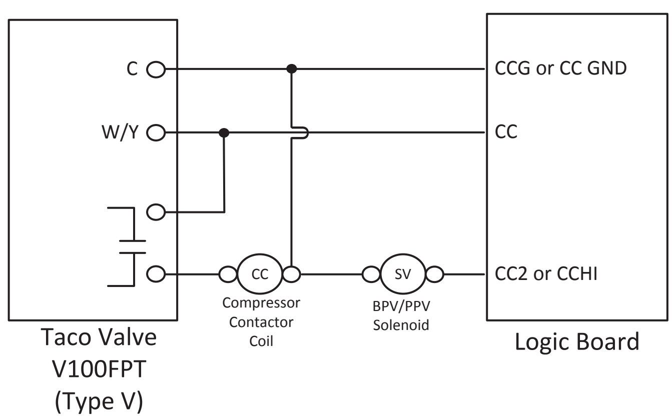


Figure 9b: Open Loop Solenoid Valve Connection Option
Typical quick operating external 24V water solenoid valve (type PPV100 or BPV100) wiring.



NOTE: SW2-3 should be in the Comp "ON" position.

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



Hot Water Generator Connections

To maximize the benefits of the hot water generator a minimum 50-gallon water heater is recommended For higher demand applications, use an 80-gallon water heater or two 50-gallon water heaters connected in a series as shown below. Two tanks plumbed in a series is recommended to maximize the hot water generator capability. Electric water heaters are recommended. Make sure all local electrical and plumbing codes are met for installing a hot water generator. Residential units with hot water generators contain an internal circulator and fittings. A water softener is recommended with hard water (greater than 10 grains or 170 total hardness).

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

Figure 11: Typical Hot Water Generator Installation

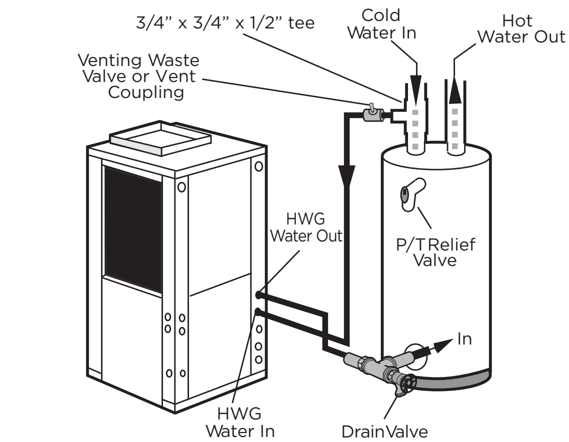
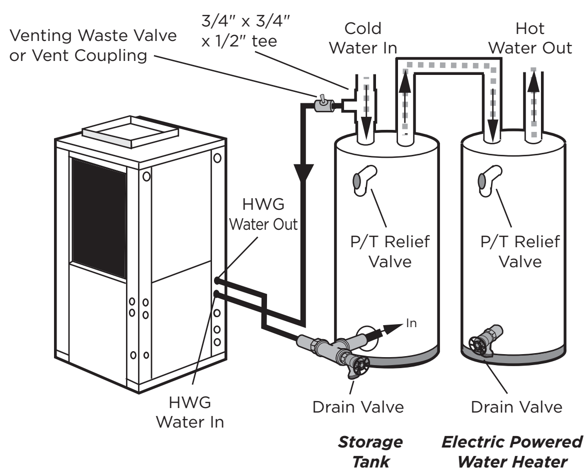


Figure 12: Hot Water Generator Installation In Preheat Tank



NOTE: This configuration maximizes hot water generator capability.

Water Tank Preparation

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

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

CAUTION: Elements will burn out if energized dry.

Hot Water Generator Connections cont.

Plumbing Installation

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

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

Hot Water Generator Startup

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

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

Electrical Connections

General

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

Unit Power Connection

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

Open lower front access panel. Insert power wires through knockouts on lower left side of cabinet. Route wires through left side of control box and connect to contactor and ground (Figure 13B).

Accessory Relay

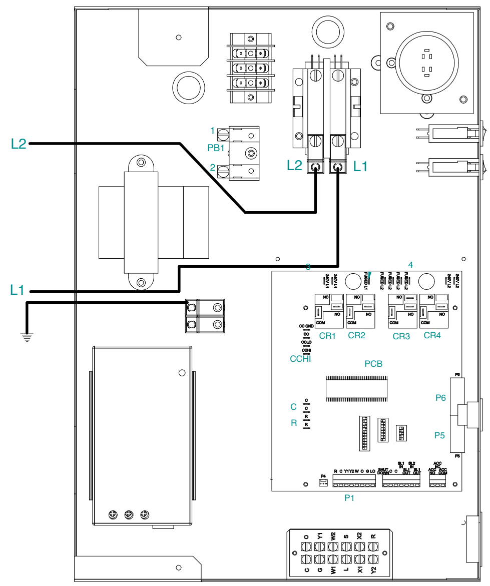
A set of “dry” contacts has been provided to control accessory devices, such as water solenoid valves on open loop installations, electronic air cleaners, humidifiers, etc. This relay contact should be used only with 24 volt signals and not line voltage power.
The relay has both normally open and normally closed contacts and can operate with either the fan or the compressor. Use DIP switch SW2-3 to cycle the relay with fan or compressor. The relay contacts are available on terminals #2 and #3 of P3.

208 Volt Operation

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

Figure 13A:
Wire access

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

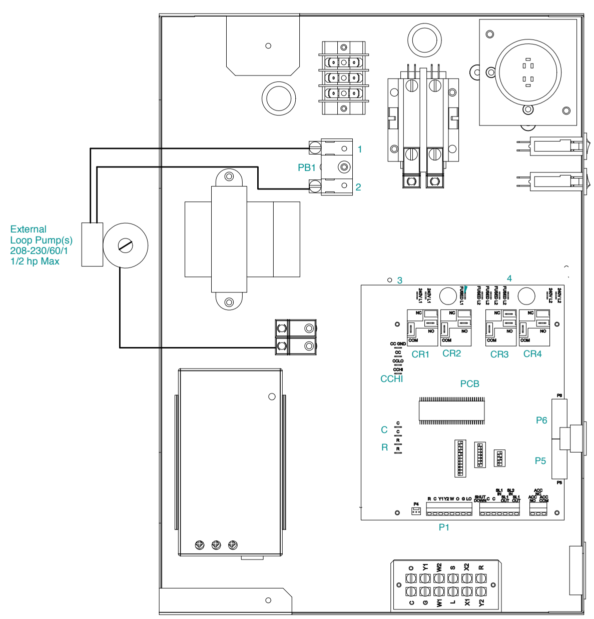


Pump Power Wiring

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

FC1/FC2 style flow centers with fixed speed pumps connect to PB1 in the control box.

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

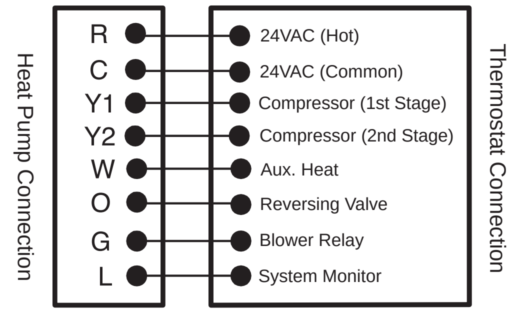


Electronic Thermostat Installation

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

NOTE: The DIP switch SW2-8 is required to be in the "OFF" position for the control to operate with FaultFlash thermostats. SW2-8 in the "ON" position configures the control to operate with typical thermostats (continuous lockout signal). There must be a wire connecting Y2 to the microprocessor controller to 2nd stage compressor on the thermostat for proper operation.

Figure 15a: Thermostat Wiring (Y1 Style Signals)



Auxiliary Heat Ratings

Model	KW		Stages	BTU/HR		Min CFM			
	208V	230V		208V	230V		024	036	048 - 072
EAM(H)5A	3.6	4.8	1	12,300	16,300	450	●	●	
EAM(H)8A	5.7	7.6	2	19,400	25,900	550	●	●	
EAM(H)10A	7.2	9.6	2	24,600	32,700	650	●	●	
EAL(H)10A	7.2	9.6	2	24,600	32,700	1100			●
EAL(H)15A	10.8	14.4	2	36,900	49,100	1250			●
EAL(H)20A	14.4	19.2	2	49,200	65,500	1500			●

Order the "H" part number when installed on horizontal units 6/9/2014
Air flow level for auxiliary heat (Aux) must be equal to or above the minimum CFM in this table

Auxiliary Heat Electrical Data

Model	Supply Circuit	Heater Amps		Min Circuit Amp		Fuse (USA)		Fuse (CAN)		CKT BRK	
		208 V	240 V	208 V	240 V	208 V	240 V	208 V	240 V	208 V	240 V
EAM(H)5A	Single	17.3	20.0	26.7	30.0	30	30	30	30	30	30
EAM(H)8A	Single	27.5	31.7	39.3	44.6	40	45	40	45	40	45
EAM(H)10A	Single	34.7	40.0	48.3	55.0	50	60	50	60	50	60
EAL(H)10A	Single	34.7	40.0	53.3	60.0	60	60	60	60	60	60
EAL(H)15A	Single	52.0	60.0	75.0	85.0	80	90	80	90	70	100
	L1/L2	34.7	40.0	53.3	60.0	60	60	60	60	60	60
	L3/L4	17.3	20.0	21.7	25.0	25	25	25	25	20	30
EAL(H)20A	Single	69.3	80.0	96.7	110.0	100	110	100	110	100	100
	L1/L2	34.7	40.0	53.3	60.0	60	60	60	60	60	60
	L3/L4	34.7	40.0	43.3	50.0	45	50	45	50	40	50

All heaters rated single phase 60 cycle and include unit fan load 3/10/14
All fuses type "D" time delay (or HACR circuit breaker in USA)
Supply wire size to be determined by local codes

Electrical Data

Dual Capacity Unit with 5 Speed ECM Motor

Model	Rated Voltage	Voltage Min/Max	Compressor				HWG Pump FLA	Ext Loop FLA	Blower Motor FLA	Total Unit FLA	Min Circ Amp	Max Fuse/ HACR
			MCC	RLA	LRA	LRA**						
024	208-230/60/1	187/253	18.2	11.6	58.3	21.0	0.4	5.4	4.1	21.5	24.5	35
036	208-230/60/1	187/253	23.8	15.2	83.0	30.0	0.4	5.4	4.1	25.1	28.9	40
048	208-230/60/1	187/253	33.0	21.1	104.0	37.0	0.4	5.4	7.6	34.5	39.8	60
060	208-230/60/1	187/253	42.3	27.1	152.9	54.0	0.4	5.4	7.6	40.5	47.2	70
072	208-230/60/1	187/253	46.3	29.6	179.2	63.0	0.4	5.4	7.6	43.0	50.4	80

**With optional IntelliStart 6/9/14
Rated Voltage of 208/230/60/1
HACR circuit breaker in USA only
All fuses Class RK-5

Blower Performance Data

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 ECM Motor. Because it's an ECM Motor, the 5-Speed ECM can ramp slowly up or down like the 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.

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 or with Fan, CC, CC2, and E1 output 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 24 VAC.

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)

Dual Capacity with 5-Speed ECM

Model	Motor Speed	Motor Tap	T'stat Cnct.	Blower Size	Motor HP	Airflow (cfm) at External Static Pressure (in. wg)															
						0	0.05	0.1	0.15	0.2	0.25	0.3	0.35	0.4	0.45	0.5	0.6	0.7	0.8	0.9	1.00
024	**High**	**5**	W	9 x 7	1/2	1024	1013	1002	988	974	963	951	940	929	901	872	785	691	-	-	-
	Med High	**4**	Y2			932	917	902	892	882	867	851	842	832	817	802	756	661	-	-	-
	Med	3				835	826	816	801	785	772	759	749	738	719	700	677	636	-	-	-
	Med Low	**2**	Y1			765	747	729	720	710	696	681	662	643	627	611	581	515	-	-	-
	Low	**1**	G			665	656	647	626	605	593	580	561	541	519	496	443	392	-	-	-
036	**High**	**5**	W	9 x 7	1/2	1325	1319	1313	1293	1272	1242	1212	1158	1103	1058	1013	930	839	-	-	-
	Med High	**4**	Y2			1279	1267	1254	1238	1222	1203	1184	1137	1089	1049	1008	926	836	-	-	-
	Med	3				1229	1218	1206	1187	1167	1154	1140	1110	1079	1044	1008	929	829	-	-	-
	Med Low	**2**	Y1			1201	1184	1167	1156	1145	1129	1113	1086	1058	1028	997	914	808	-	-	-
	Low	**1**	G			1007	989	971	958	945	925	904	889	873	862	850	818	778	-	-	-
048	**High**	**5**	W	11 x 10	1	1890	1874	1857	1845	1833	1809	1784	1769	1754	1736	1718	1672	1629	1601	1562	1522
	Med High	**4**	Y2			1769	1754	1739	1721	1703	1685	1666	1645	1623	1604	1585	1539	1499	1463	1432	1376
	Med	3				1671	1652	1632	1614	1595	1576	1557	1536	1514	1494	1474	1430	1387	1351	1313	1173
	Med Low	**2**	Y1			1574	1555	1535	1514	1492	1472	1452	1431	1410	1387	1363	1330	1284	1236	1108	1014
	Low	**1**	G			1388	1370	1352	1322	1292	1264	1236	1216	1195	1178	1161	1095	984	916	842	787
060	**High**	**5**	W	11 x 10	1	2077	2066	2055	2044	2033	2017	2000	1966	1931	1904	1877	1841	1810	1791	1740	1653
	Med High	**4**	Y2			1948	1937	1925	1910	1895	1880	1865	1831	1797	1778	1759	1720	1707	1680	1660	1612
	Med	3				1810	1794	1778	1739	1700	1684	1667	1657	1646	1629	1612	1576	1583	1547	1510	1480
	Med Low	**2**	Y1			1680	1667	1653	1618	1583	1562	1540	1522	1503	1488	1473	1465	1449	1410	1369	1319
	Low	**1**	G			1594	1572	1550	1512	1474	1450	1426	1410	1393	1385	1376	1351	1325	1290	1168	1085
072	**High**	**5**	W	11 x 10	1	2402	2388	2373	2358	2343	2334	2325	2307	2289	2274	2258	2215	2177	2125	2052	1933
	Med High	**4**	Y2			2209	2193	2177	2164	2151	2135	2118	2105	2092	2072	2052	2017	1982	1954	1925	1844
	Med	3				2085	2072	2058	2045	2031	2010	1989	1972	1954	1936	1918	1881	1852	1821	1790	1751
	Med Low	**2**	Y1			1961	1951	1940	1926	1911	1885	1859	1844	1829	1814	1798	1759	1727	1703	1670	1636
	Low	**1**	G			1767	1751	1735	1715	1694	1678	1661	1640	1619	1602	1584	1548	1512	1475	1426	1397

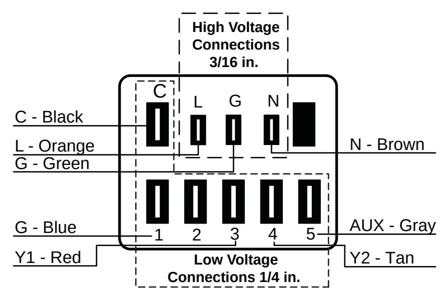
Factory speed settings are in Bold 7/30/14
Air flow values are with dry coil and standard filter
For wet coil performance first calculate the face velocity of the air coil (Face Velocity [fpm] = Airflow [cfm] / Face Area [sq ft]).
Then for velocities of 200 fpm reduce the static capability by 0.03 in. wg, 300 fpm by 0.08 in. wg, 400 fpm by 0.12in. wg., and 500 fpm by 0.16 in. wg.
Highest setting is for auxiliary heat (W) and lowest setting is for constant blower (G). The "Y1" and "Y2" settings must be between the "G" and "W" settings.

Setting Blower Speed - 5-Speed ECM

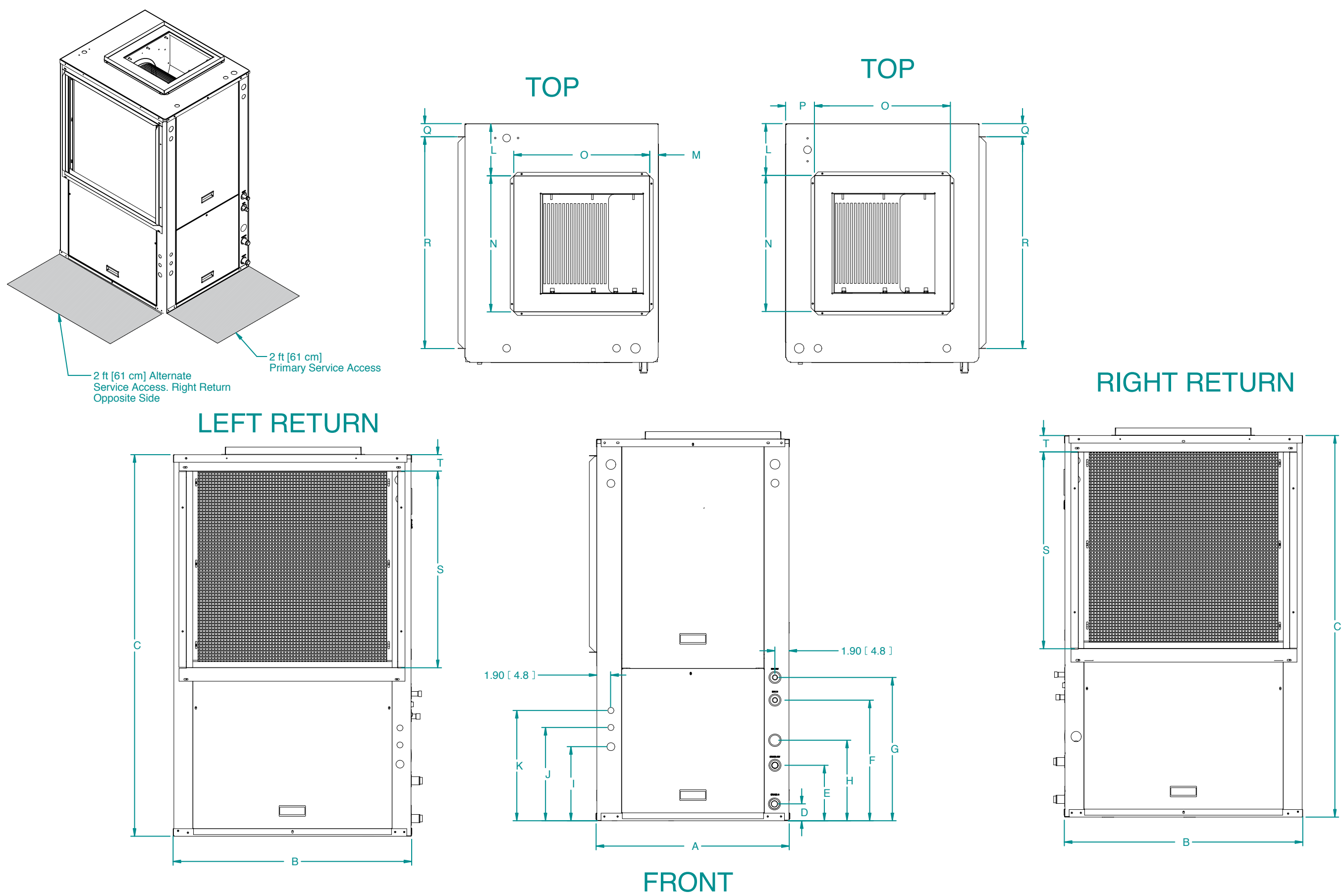
5-Speed ECM blower motors have five (5) speeds of which four (4 are selectable on dual capacity.

CAUTION: Disconnect all power before performing this operation.

5-Speed ECM Motor Connections - Dual Capacity



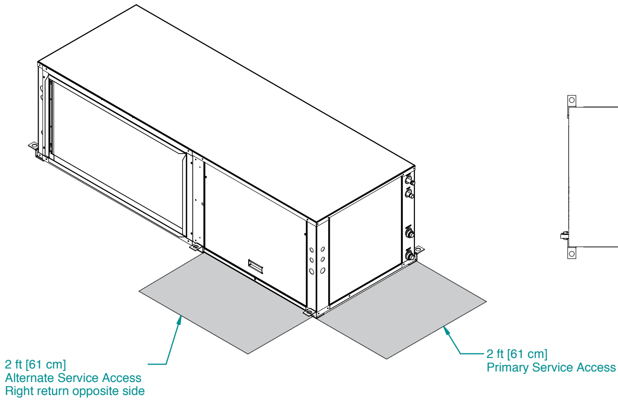
Vertical Dimensional Data

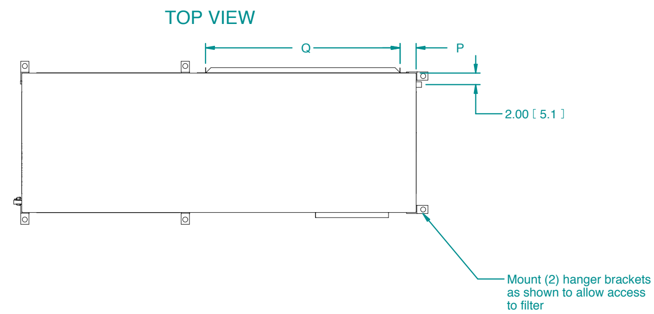


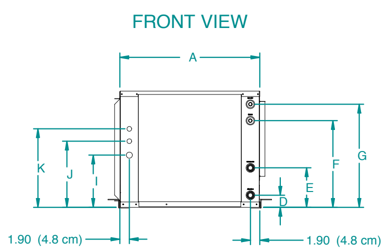
Vertical Top Flow Model		Overall Cabinet			Water Connections							Electrical Connections			Discharge Connection						Return Connection		
												I 3/4" cond	J 1/2" cond	K 1/2" cond	Duct Flange Installed						Return Duct Flanges		
		A	B	C	D	E	F	G	H	Loop Water FPT	HWG Sweat (I.D.)				L	M	N	O	P	Q	R	S	T
		Width	Depth	Height	Loop In	Loop Out	HWG In	HWG Out	Cond-ensate			Power Supply	Ext Pump	Low Votage			Supply Width	Supply Depth			Return Depth	Return Height	
024	in.	22.5	26.5	39.4	2.3	5.3	13.4	16.4	9.6	1" Swivel	1/2" female	8.9	11.4	13.7	6.3	0.7	14.0	14.0	2.7	2.3	22.0	18.0	1.8
	cm.	57.2	67.3	100.1	5.8	13.5	34.0	41.7	24.4			22.6	29.0	34.8	16.0	1.8	35.6	35.6	6.9	5.8	55.9	45.7	4.6
036	in.	22.5	26.5	44.5	2.0	7.0	13.5	16.5	10.2	1" Swivel	1/2" female	9.5	12.1	14.3	6.1	0.8	14.0	14.0	4.4	2.4	22.0	22.0	2.0
	cm.	57.2	67.3	113.0	5.1	17.8	34.3	41.9	25.9			24.1	30.7	36.3	15.5	2.0	35.6	35.6	11.2	6.1	55.9	55.9	5.1
048-060	in.	25.6	31.6	50.4	2.3	7.3	15.9	18.9	10.6	1" Swivel	1/2" female	9.8	12.3	14.6	6.9	1.1	18.0	18.0	3.8	1.7	28.0	26.0	1.7
	cm.	65.0	80.3	128.0	5.8	18.5	40.4	48.0	26.9			24.9	31.2	37.1	17.5	2.8	45.7	45.7	9.7	4.3	71.1	66.0	4.3
072	in.	25.6	31.6	54.4	2.3	7.3	15.9	18.9	10.6	1" Swivel	1/2" female	9.8	12.3	14.6	6.9	1.1	18.0	18.0	3.8	1.7	28.1	30.0	2.2
	cm.	65.0	80.3	138.2	5.8	18.5	40.4	48.0	26.9			24.9	31.2	37.1	17.5	2.8	45.7	45.7	9.7	4.3	71.4	76.2	5.6

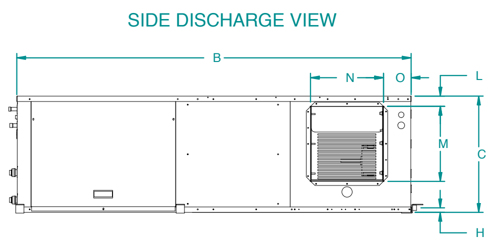
Condensate is 3/4" PVC female glue socket and is switchable from side to front 7/17/14
Unit shipped with 1" [25.4mm] return duct flanges and are suitable for duct connection.
Discharge flange is field installed and extends 1" [25.4mm] from cabinet
Water connections extend 1.2" [30.5mm] beyond front of cabinet.
The optional 1" filter rack (not shown) has the same return opening connection size as the duct flanges shown in the drawing. The filter rack extends 2.25"(57.1 mm) from the unit.
The optional 1" filter rack is suitable for duct connection.

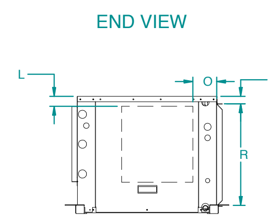
Horizontal Dimensional Data











Horizontal Model		Overall Cabinet			Water Connections							Electrical Connections			Discharge Connection Duct Flange Installed				Return Connection Return Duct Flanges			
		A	B	C	D	E	F	G	H	Loop Water FPT	HWG Sweat (I.D.)	I 3/4" cond	J 1/2" cond	K 1/2" cond	L*	M	N	O*	P	Q	R	S
		Width	Depth	Height	In	Out	HWG In	HWG Out	Cond-ensate			Power Supply	Ext Pump	Low Votage		Supply Height	Supply Depth			Return Depth	Return Height	
024	in.	22.5	53.0	19.3	2.3	5.3	13.8	16.8	0.8	1"	1/2"	8.9	11.5	13.7	1.7	10.5	9.5	8.2	2.2	21.8	16.5	1.5
	cm.	57.2	134.6	49.0	5.8	13.5	35.1	42.7	2.0	Swivel	female	22.6	29.2	34.8	4.3	26.7	24.1	20.8	5.6	55.4	41.9	3.8
036	in.	22.5	63.0	19.3	2.3	7.3	13.5	16.5	0.8	1"	1/2"	9.5	12.1	14.3	2.3	10.5	9.5	5.7	2.8	30.5	16.7	1.3
	cm.	57.2	160.0	49.0	5.8	18.5	34.3	41.9	2.0	Swivel	female	24.1	30.7	36.3	5.8	26.7	24.1	14.5	7.1	77.5	42.4	3.3
048-060	in.	25.6	72.0	21.3	2.3	7.3	15.9	18.9	0.8	1"	1/2"	9.5	12.1	14.3	1.9	13.6	13.2	5.0	2.9	35.5	18.6	1.3
	cm.	65.0	182.9	54.1	5.8	18.5	40.4	48.0	2.0	Swivel	female	24.1	30.7	36.3	4.8	34.5	33.5	12.7	7.4	90.2	47.2	3.3
072	in.	25.6	77.0	21.3	2.3	7.3	15.9	18.9	0.8	1"	1/2"	9.5	12.1	14.3	1.9	13.6	13.2	5.0	2.8	40.4	18.7	1.5
	cm.	65.0	195.6	54.1	5.8	18.5	40.4	48.0	2.0	Swivel	female	24.1	30.7	36.3	4.8	34.5	33.5	12.7	7.1	102.6	47.5	3.8

* Dimensions shown are for left return side discharge other configurations shown in tables below
Condensate is 3/4" PVC female glue socket and is switchable from side to front
Unit shipped with 1" [25.4mm] return duct flanges suitable for duct connection.
Discharge flange is field installed and extends 1" [25.4mm] from cabinet
Water connections extend 1.2" [30.5mm] beyond front of cabinet.
The optional 1" filter rack (not shown) has the same return opening connection size as the duct flanges shown in the drawing. The filter rack extends 2.25"(57.1 mm) from the unit.
The optional 1" filter rack is suitable for duct connection.
The 024 model is not field convertible changing from end to side discharge. It requires an additional discharge panel (not supplied).

7/17/14

024 model		L	O
Right Return End Discharge	in	2.2	5.7
	cm	5.6	14.5
Right Return Side Discharge	in	6.9	8.3
	cm	17.5	21.1
Left Return End Discharge	in	6.5	7.3
	cm	16.5	18.5

036 model		L	O
Right Return End Discharge	in	6.5	6.6
	cm	16.5	16.8
Right Return Side Discharge	in	2.3	5.7
	cm	5.8	14.5
Left Return End Discharge	in	6.5	6.6
	cm	16.5	16.8

048-060 model		L	O
Right Return End Discharge	in	1.9	5.0
	cm	4.8	12.7
Right Return Side Discharge	in	5.7	5.0
	cm	14.5	12.7
Left Return End Discharge	in	5.7	4.9
	cm	14.5	12.4

072 model		L	O
Right Return End Discharge	in	1.9	5.0
	cm	4.8	12.7
Right Return Side Discharge	in	5.7	5.0
	cm	14.5	12.7
Left Return End Discharge	in	5.7	5.0
	cm	14.5	12.7

Physical Data

Model		Dual Capacity				
		024	036	048	060	072
Compressor (1 each)		Copeland Ultra Tech, Dual Capacity Scroll				
Factory Charge R410a, oz [kg]	Vertical	39 [1.05]	52 [1.47]	68 [1.93]	76 [2.15]	88 [2.49]
Factory Charge R410a, oz [kg]	Horizontal	38 [1.08]	52 [1.47]	68 [1.93]	72 [2.04]	85 [2.41]
ECM Blower Motor & Blower						
Blower Motor Type/Speeds	ECM	5 Speed ECM				
Blower Motor- hp [W]	ECM	1/2 [373]	1/2 [373]	1 [746]	1 [746]	1 [746]
Blower Wheel Size (Dia x W), in. [mm]	ECM	9 x 7 [229 x 178]	9 x 7 [229 x 178]	11 x 10 [279 x 254]	11 x 10 [279 x 254]	11 x 10 [279 x 254]
Coax and Water Piping						
Water Connections Size - Swivel - in [mm]		1” [25.4]	1” [25.4]	1” [25.4]	1” [25.4]	1” [25.4]
HWG Connection Size - Female Sweat I.D. - in [mm]		1/2” [12.7]	1/2” [12.7]	1/2” [12.7]	1/2” [12.7]	1/2” [12.7]
Coax & Piping Water Volume - gal [l]		.35 [1.3]	.7 [2.6]	.7 [2.6]	1.3 [4.9]	1.6 [6.1]
Vertical						
Air Coil Dimensions (H x W), in. [mm]		19 x 20 [483 x 508]	24 x 20 [610 x 508]	28 x 25 [711 x 635]	28 x 25 [711 x 635]	32 x 25 [813 x 635]
Air Coil Total Face Area, ft2 [m2]		2.6 [0.245]	3.3 [0.310]	4.9 [0.452]	4.9 [0.452]	5.6 [0.516]
Air Coil Tube Size, in [mm]		3/8 [9.5]	3/8 [9.5]	3/8 [9.5]	3/8 [9.5]	3/8 [9.5]
Air Coil Number of rows		3	3	3	3	3
Optional Filter - 1” [25mm] Pleated MERV8 Throwaway, in [mm]		20 x 24 [508 x 610]	20 x 24 [508 x 610]	28 x 30 [711 x 762]	28 x 30 [711 x 762]	30 x 32 [762 x 813]
Weight - Operating, lb [kg]		198 [90]	221 [100]	303 [137]	329 [149]	350 [159]
Weight - Packaged, lb [kg]		218 [99]	241 [109]	323 [147]	349 [158]	370 [168]
Horizontal						
Air Coil Dimensions (H x W), in. [mm]		18 x 21 [457 x 533]	18 x 27 [457 x 686]	20 x 35 [508 x 889]	20 x 35 [508 x 889]	20 x 40 [508 x 1016]
Air Coil Total Face Area, ft2 [m2]		2.6 [.244]	3.4 [0.314]	4.9 [0.452]	4.9 [0.452]	5.6 [0.516]
Air Coil Tube Size, in [mm]		3/8 [9.5]	3/8 [9.5]	3/8 [9.5]	3/8 [9.5]	3/8 [9.5]
Air Coil Number of rows		3	3	3	3	3
Optional Filter - 1” [25mm] Pleated MERV8 Throwaway, in [mm]		1 - 18 x 24 [457 x 610]	1 - 20 x 32 [508 x 813]	1 - 20 x 37 [508 x 940]	1 - 20 x 37 [508 x 940]	1 - 20 x 20 [508 x 508] 1 - 20 x 22 [508 x 559]
Weight - Operating, lb [kg]		228 [103]	250 [113]	325 [147]	358 [162]	369 [167]
Weight - Packaged, lb [kg]		248 [112]	270 [122]	345 [156]	378 [171]	389 [176]

9/11/2014

Microprocessor Control System

Startup

The unit will not operate until all the inputs and safety controls are checked for normal conditions. At first power-up, a four minute delay is employed before the compressor is energized.

Component Sequencing Delays

Components are sequenced and delayed for optimum space conditioning performance.

Accessory Relay

An accessory relay on the control board allows for field connection of solenoid valves, electronic air cleaners, etc. The accessory relay has a normally open output and a normally closed output.

Short Cycle Protection

The control employs a minimum "off" time of four minutes to provide for short cycle protection of the compressor.

Condensate Overflow Protection

The microprocessor control board incorporates an impedance sensing liquid sensor at the top of the drain pan. Upon a continuous 30-second sensing of the condensate, compressor operation is suspended (see Fault Retry), and the condensate overflow lockout LED begins flashing.

Shutdown Mode

A 24VAC common signal to the “shutdown” input on the control board puts the unit into shutdown mode. Compressor, hot water pump and fan operation are suspended.

Safety Controls

The microprocessor control receives separate signals for a high pressure switch for safety, a low pressure switch to prevent loss of charge damage, and a low suction temperature thermistor for freeze sensing. Upon a continuous 30-second measurement of the fault (immediate for high pressure), compressor operation is suspended, the appropriate lockout LED begins flashing. (Refer to the "Fault Retry" section below.)

Testing

The microprocessor control allows service personnel to shorten most timing delays for faster diagnostics. (Refer to the Field Selection DIP switch SW2-1 in the Microprocessor Control section.)

Fault Retry

All faults are retried twice before finally locking the unit out. An output signal is made available for a fault LED at the thermostat. The “fault retry” feature is designed to prevent nuisance service calls.

Diagnostics

The microprocessor control board allows all inputs and outputs to be displayed on the LEDs for fast and simple control board diagnosis. (Refer to the Field Selection DIP Switch SW2-1 in the Microprocessor Control section.)

Resistance Heat Control (208-230 Units)

The electric heat control module contains the appropriate high-voltage control relays. Control signals energize the relays in the proper sequence, and the LED display board indicates which stages are energized.

Hot Water High Limit (Domestic Hot Water Option)

This mode occurs when the hot water input temperature is at or above 130°F for 30 continuous seconds. The HWG limit status LED on the unit illuminates and the hot water pump de-energizes. Hot water pump operations resume on the next compressor cycle or after 15 minutes of continuous compressor operation during the current thermostat demand cycle.

Hot Water Justification

Since compressor hot gas temperature is dependant on loop temperature in cooling mode, loop temperatures may be too low to allow proper heating of water. The control will monitor water and refrigerant temperatures to determine if conditions are satisfactory for heating water. The HWG limit status LED on the unit illuminates when conditions are not favorable for heating water.

Heating Operation
Heat, 1st Stage (Y1)

The fan motor is started on tap speed G immediately, the loop pump is energized 5 seconds after the “Y1” input is received, and the compressor is energized on low capacity 10 seconds after the “Y1” input. The fan is switched to Y1 tap speed 15 seconds after “Y1” input. The hot water pump is cycled 30 seconds after the "Y1" input.

Heat, 2nd Stage (Y1,Y2)

The second stage compressor will be activated 5 seconds after receiving a “Y2” input as long as the minimum first stage compressor run time of 1 minute has expired. The blower changes from Y1 tap speed to Y2 tap speed 15 seconds after the “Y2” input.

Microprocessor Control System cont.

Heat, 3rd Stage (Y1,Y2,W)

The hot water pump is de-energized which directs all heat to satisfy the thermostat. The 1st stage of resistance heat is energized 10 seconds after “W” input, and with continuous 3rd stage demand, the second stage of resistance heat will be energized after 5 minutes.

Emergency Heat (W only)

The fan is started on W tap speed, and the first stage of resistance heat is energized 10 seconds after the "W" input. Continuing demand will engage the second stage of resistance heat after 2 minutes.

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.

Cool, 1st Stage (Y1,O)

The blower motor and hot water pump are started immediately, the loop pump(s) is energized 5 seconds after the “Y1” input is received. The compressor will be energized (on low capacity for Dual Capacity units) 10 seconds after the “Y1” input. The ECM blower will shift from tap speed G to Y1 tap speed 15 seconds after the “Y1” input.

Cool, 2nd Stage (Y1, Y2, O)

The second stage compressor will be activated 5 seconds after receiving a “Y2” input as long as the minimum first stage compressor run time of 1 minute has expired. The blower changes to Y2 tap speed 15 seconds after the “Y2” input.

Fan (G only)

The fan starts on low speed. Regardless of fan input “G” from thermostat, the fan will remain on low speed for 30 seconds at the end of each heating, cooling or emergency heat cycle.

Lockout Conditions

During lockout mode, the appropriate unit and thermostat lockout LEDs will illuminate. The compressor, loop pump, hot water pump, and accessory outputs are de-energized. The fan will continue to run on low speed. If the thermostat calls for heating, emergency heat operation will occur.

All lockout modes can be reset at the thermostat after turning the unit off, then on, which restores normal operation but keeps the unit lockout LED illuminated. Interruption of power to the unit will reset a lockout without a waiting period and clear all lockout LEDs.

High Pressure

This lockout mode occurs when the normally closed safety switch is opened momentarily (set at 600 PSI).

Low Pressure

This lockout mode occurs when the normally closed low pressure switch is opened for 30 continuous seconds (set at 40 PSI).

Microprocessor Control System cont.

Freeze Sensing (Water Flow)

This lockout mode occurs when the freeze thermistor temperature is at or below the selected freeze sensing point (well 30°F or loop 15°F) for 30 continuous seconds.

Condensate Overflow

This lockout mode occurs when the condensate overflow level has been reached for 30 continuous seconds.

Fan RPM

The control board monitors fan RPM to sense operation. This lockout mode occurs if the fan RPM falls below the low RPM limit (100 RPM) for 30 continuous seconds.

Thermostat Displays

Fault Flash

When using a TA32W02 or TP32W03 thermostat and SW2-8 is in the pulsing "L" position, FaultFlash will enable a user to view the thermostat and count the fault indicator flashes to determine the lockout condition the unit is experiencing.

FaultFlash Thermostats

TA32W02 and TP32W03 Thermostats	
Thermostat Display Lockout Code	Lockout Description
2 Flashes	High Pressure Fault
3 Flashes	Low Pressure Fault
4 Flashes	Not Applicable
5 Flashes	Water Flow Fault
6 Flashes	Not Applicable
7 Flashes	Condensate Fault
8 Flashes	Voltage out of Range
9 Flashes	RPM Fault

Microprocessor Control System cont.

DIP Switch Settings

Prior to powering unit, ensure that all DIP switches on SW2 & SW3 are set properly according to the tables below.

FACTORY SETUP DIP SWITCHES (SW3)				
DIP SWITCH NUMBER		DESCRIPTION	OFF POSITION	ON POSITION
SW 3-	1	**Dual Capacity/Single-Speed** Configures the control for single-speed compressor operation or dual capacity operation.	Dual Capacity Operation	Single-Speed Operation
SW 3-	2	**Zoned/Finish on Second Stage** This switch allows the unit to down stage with the thermostat when off and finish with second stage when on. Finish on second stage reduces stage changing in reciprocating dual capacity compressors.	Normal - All Other Systems	Finish on 2nd - Unzoned Dual Capacity
SW 3-	3	**No RPM/RPM** Configures the control to monitor the RPM output of an Variable Speed ECM blower motor. When using IntelliZone, 5-Speed ECM or a PSC fan motor, the control should be configured for “NO RPM” sensing.	PSC or 5-Speed ECM Fan/RPM Monitoring Disabled	Variable Speed ECM Fan/ RPM Monitoring Enabled
SW 3-	4	**Electric heat and ECM** Allows backward compatibility with older models. In the Off position this switch allows older electric heat board (17P501A01) and older ECM (square end) compatibility. On is for all newer EH board (17P514A01) and ECM (round end).	Old EH & Old ECM	Normal
SW 3-	5	On dual capacity units this switch allows stage change: on the fly when off, and 1 minute delay when on. A delay is required on all reciprocating dual capacity units.	Dual-Capacity Models	N/A

FIELD SELECTION DIP SWITCHES (SW2)				
DIP SWITCH NUMBER		DESCRIPTION	OFF POSITION	ON POSITION
SW 2-	1	**Service Test Mode** On the control, allows field selection of “NORMAL” or “TEST” operational modes. Test mode accelerates most timing functions 16 times to allow faster troubleshooting. Test mode also allows viewing the “CURRENT” status of the fault inputs on the LED display.	Test Mode	Normal Speed Operation
SW 2-	2	**Low Water Coil Limit** Allows field selection of freeze thermistor fault sensing temperatures for well water (30°F) or antifreeze-protected (15°F) earth loops.	Loop Water Freeze Detection 15° F	Well Water Freeze Detection 30° F
SW 2-	3	**Accessory Relay** Allows field selection of the accessory relay to operate with the compressor or fan.	Acc Relay Tracks Fan	Acc Relay Tracks Compressor
SW 2-	4	**Fan Speed Control** Not Applicable	N/A	N/A
SW 2-	5	**Auxiliary Off** Disables 3rd-stage Heating. Full emergency heat would still be available if needed.	Disable Heating Stage 3	Enable Heating Stage 3
SW 2-	6	**Diagnostics Inputs** Allows viewing the inputs from the thermostat to the control board such as Y1, Y2, O, G, W, SL1-In on the LED display.	Diagnostic Inputs Viewed at LEDs	Normal Display Viewed at LEDs
SW 2-	7	**Diagnostics Outputs** Allows viewing the outputs from the control board such as compressor, reversing valve, blower, hot water pump, and loop pump on the LED display.	Diagnostic Outputs Viewed at LEDs	Normal Display Viewed at LEDs
SW 2-	8	**Thermostat Selection** Configures the control for a pulsed lockout signal (FaultFlash thermostats) or continuous lockout signal.	Pulsed “L” signal	Continuous “L” signal

Reference Calculations

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

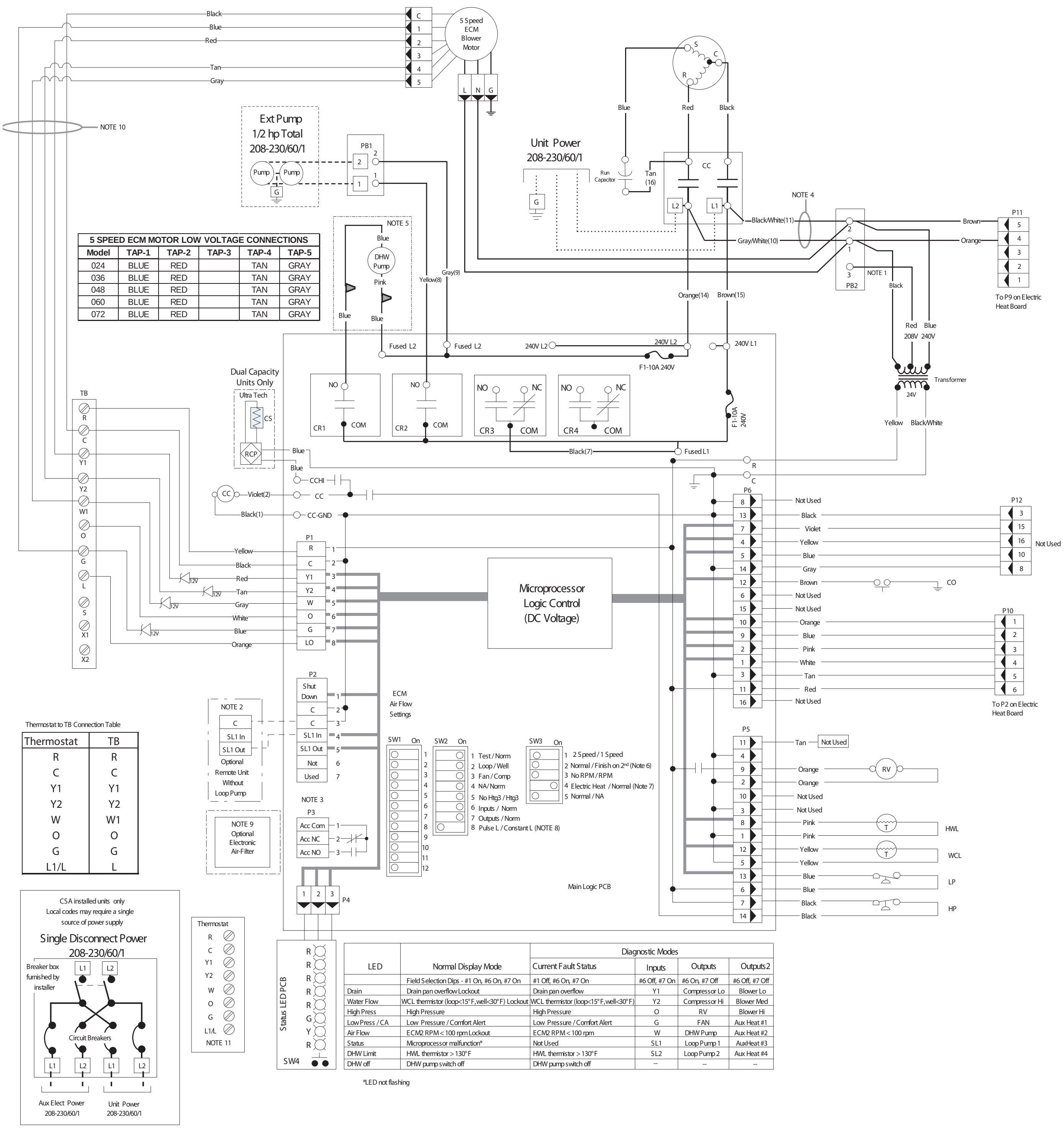
Legend

Abbreviations and Definitions

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

Wiring Schematics

Premier with 5-Speed ECM



5 SPEED ECM MOTOR LOW VOLTAGE CONNECTIONS					
Model	TAP-1	TAP-2	TAP-3	TAP-4	TAP-5
024	BLUE	RED		TAN	GRAY
036	BLUE	RED		TAN	GRAY
048	BLUE	RED		TAN	GRAY
060	BLUE	RED		TAN	GRAY
072	BLUE	RED		TAN	GRAY

Thermostat to TB Connection Table

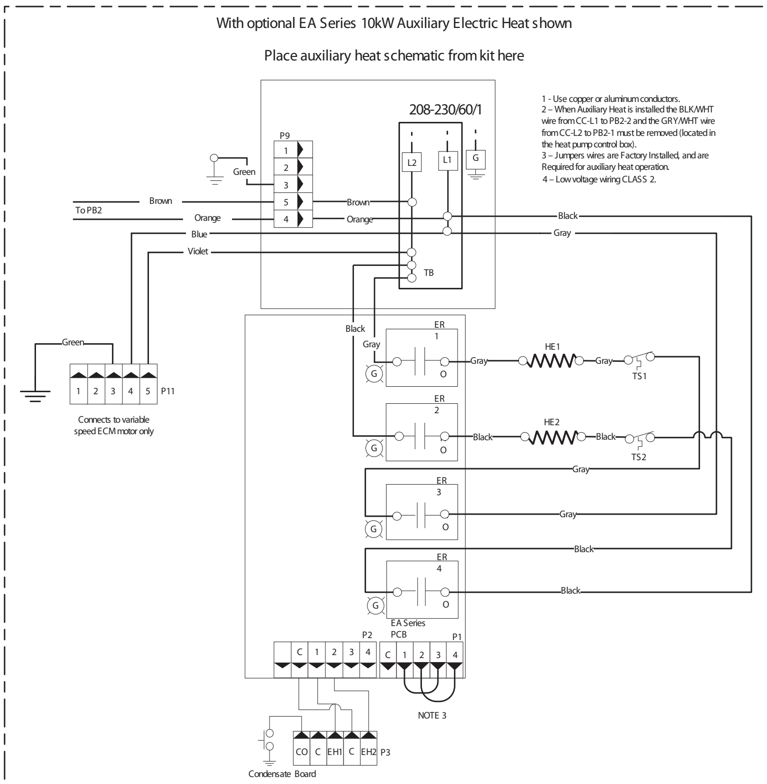
Thermostat	TB
R	R
C	C
Y1	Y1
Y2	Y2
W	W1
O	O
G	G
L1/L	L

LED	Normal Display Mode	Diagnostic Modes			
		Current Fault Status	Inputs	Outputs	Outputs2
	Field Selection Dips - #1 On, #6 On, #7 On	#1 Off, #6 On, #7 On	#6 Off, #7 On	#6 On, #7 Off	#6 Off, #7 Off
Drain	Drain pan overflow Lockout	Drain pan overflow	Y1	Compressor Lo	Blower Lo
Water Flow	WCL thermistor (loop<15°F,well<30°F) Lockout	WCL thermistor (loop<15°F,well<30°F)	Y2	Compressor Hi	Blower Med
High Press	High Pressure	High Pressure	O	RV	Blower Hi
Low Press / CA	Low Pressure / Comfort Alert	Low Pressure / Comfort Alert	G	FAN	Aux Heat #1
Air Flow	ECM2 RPM < 100 rpm Lockout	ECM2 RPM < 100 rpm	W	DHW Pump	Aux Heat #2
Status	Microprocessor malfunction*	Not Used	SL1	Loop Pump 1	AuxHeat #3
DHW Limit	HWL thermistor > 130°F	HWL thermistor > 130°F	SL2	Loop Pump 2	Aux Heat #4
DHW off	DHW pump switch off	DHW pump switch off	--	--	--

*LED not flashing

Wiring Schematics cont.

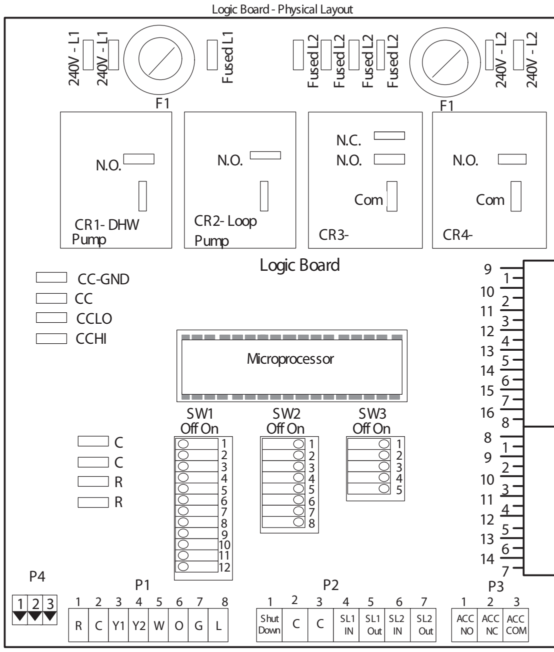
Premier with 5-Speed ECM cont.

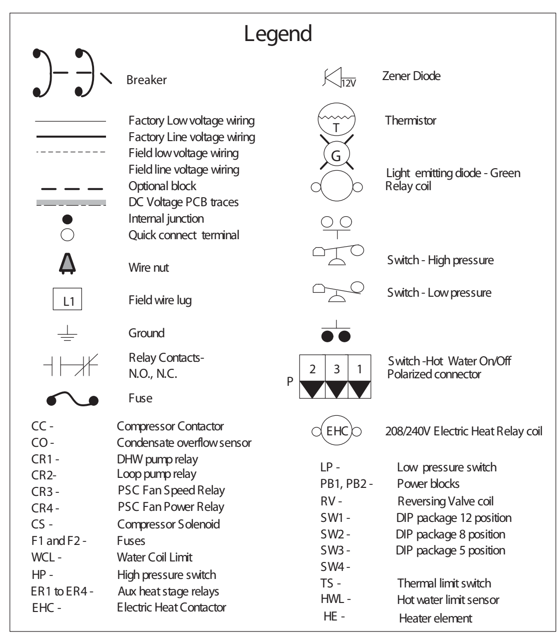


Notes:

1 – Switch Blue and Red wires for 208V operation.
2 - Connection of remote unit that does not have a loop pump for slave operation.
3 - 24V Accessory relay (see SW2 - 3 for description of operation)
4 - The blk/wh and gray/wh wires are removed when Aux Heat is installed.
5 - DHW pump only in models with hot water generation option.
6 – This Switch allows the unit to down stage with the t-stat when OFF and finish on second stage when ON.
7 – SW3-4 should be in the OFF position when using the 17P501A01 electric heat board and should be ON when using the 17P514A01 electric heat board .
8 – SW2-8 must be in the OFF position for pulsed “L” lockout signal and in the ON position for constant “L” lockout signal.
9 - When optional electronic air-filter is installed, power for the electronic air-filter is provided by P2-2 and 24 VAC.
10- Refer to 5 Speed ECM Motor Low Voltage Connection Table for factory settings.
11 - Refer to Thermostat/TB Connection table for thermostat connections to unit.
12 - All low voltage wiring CLASS 2
13 - Use copper or aluminum conductors

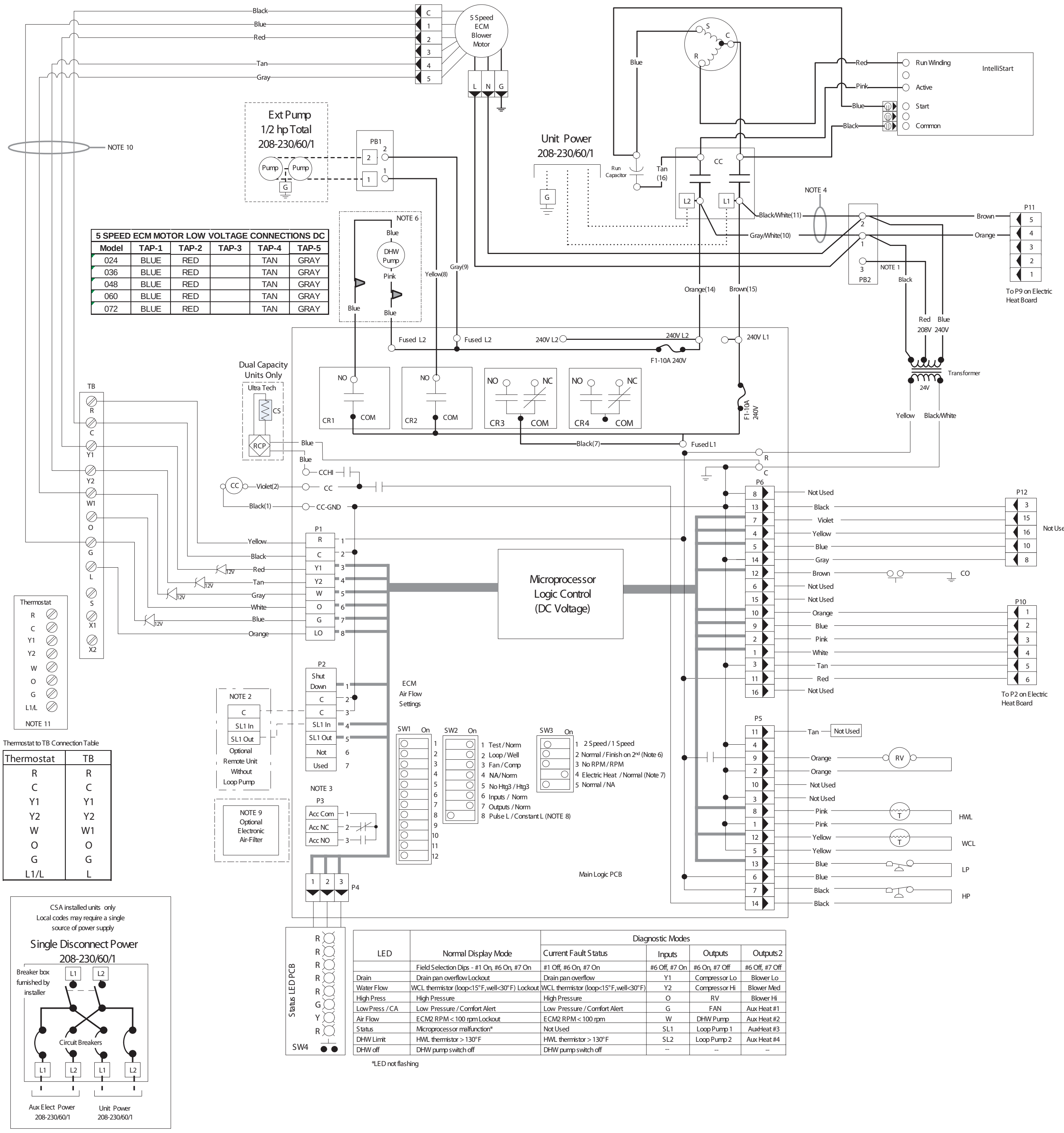
Logic Board - Physical Layout





Wiring Schematics cont.

Premier with 5 Speed ECM and IntelliStart



5 SPEED ECM MOTOR LOW VOLTAGE CONNECTIONS DC					
Model	TAP-1	TAP-2	TAP-3	TAP-4	TAP-5
024	BLUE	RED		TAN	GRAY
036	BLUE	RED		TAN	GRAY
048	BLUE	RED		TAN	GRAY
060	BLUE	RED		TAN	GRAY
072	BLUE	RED		TAN	GRAY

Thermostat to TB Connection Table

Thermostat	TB
R	R
C	C
Y1	Y1
Y2	Y2
W	W1
O	O
G	G
L1/L	L

CSA installed units only
Local codes may require a single source of power supply

Single Disconnect Power
208-230/60/1

Breaker box furnished by installer

Circuit Breakers

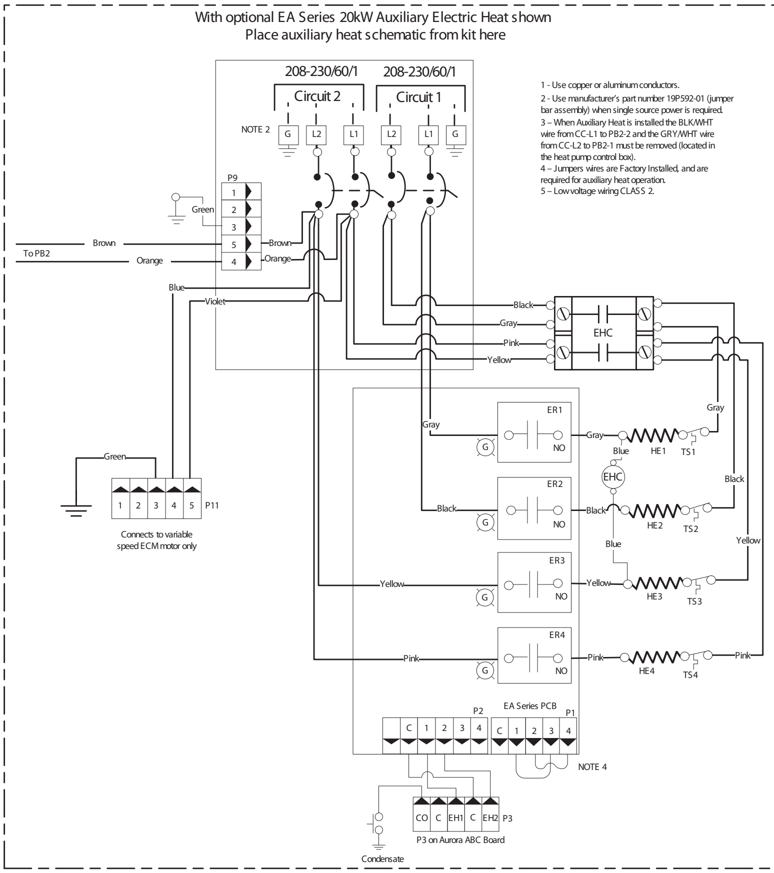
Aux Elect Power 208-230/60/1
Unit Power 208-230/60/1

LED	Normal Display Mode	Diagnostic Modes			
		Current Fault Status	Inputs	Outputs	Outputs 2
	Field Selection Dips - #1 On, #6 On, #7 On	#1 Off, #6 On, #7 On	#6 Off, #7 On	#6 On, #7 Off	#6 Off, #7 Off
Drain	Drain pan overflow Lockout	Drain pan overflow	Y1	Compressor Lo	Blower Lo
Water Flow	WCL thermistor (loop<15°F,well<30°F) Lockout	WCL thermistor (loop<15°F,well<30°F)	Y2	Compressor Hi	Blower Med
High Press	High Pressure	High Pressure	O	RV	Blower Hi
Low Press / CA	Low Pressure / Comfort Alert	Low Pressure / Comfort Alert	G	FAN	Aux Heat #1
Air Flow	ECM2 RPM < 100 rpm Lockout	ECM2 RPM < 100 rpm	W	DHW Pump	Aux Heat #2
Status	Microprocessor malfunction*	Not Used	SL1	Loop Pump 1	AuxHeat #3
DHW Limit	HWL thermistor > 130°F	HWL thermistor > 130°F	SL2	Loop Pump 2	Aux Heat #4
DHW off	DHW pump switch off	DHW pump switch off	--	--	--

*LED not flashing

Wiring Schematics cont.

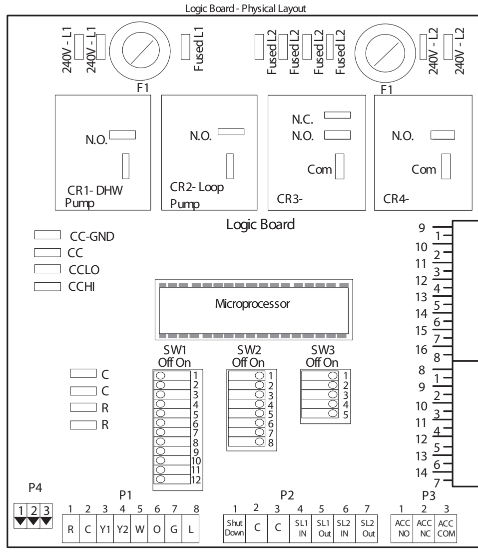
Premier with 5 Speed ECM and IntelliStart

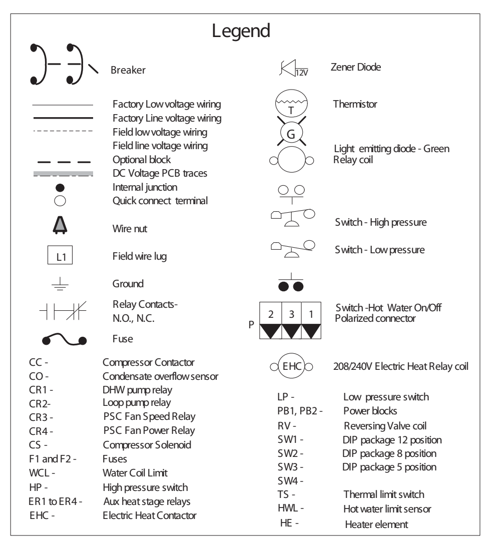


Notes:

1 – Switch Blue and Red wires for 208V operation.
2 - Connection of remote unit that does not have a loop pump for slave operation.
3 - 24V Accessory relay (see SW2 - 3 for description of operation)
4 - The blk/wh and gray/wh wires are removed when Aux Heat is installed.
5 - DHW pump only in models with hot water generation option.
6 – This Switch allows the unit to down stage with the t-stat when OFF and finish on second stage when ON.
7 – SW3-4 should be in the OFF position when using the 17P501A01 electric heat board and should be ON when using the 7P514A01 electric heat board.
8 – SW2-8 must be in the OFF position for pulsed "L" lockout signal and in the ON position for constant "L" lockout signal.
9 - When optional electronic air-filter is installed, power for the electronic air-filter is provided by P2-2 and 24 VAC.
10- Refer to 5 Speed ECM Motor Low Voltage Connection Table for factory settings.
11 - Refer to Thermostat/TB Connection table for thermostat connections to unit.
12 - All low voltage wiring CLASS 2
13 - Use copper or aluminum conductors

Logic Board - Physical Layout





Unit Startup

Before Powering Unit, Check the Following:

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

- 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.
- Black/white and gray/white wires in unit control box have been removed if auxiliary heat has been installed.
- Dip switches are set correctly.
- Hot water generator pump switch is “OFF” unless piping is completed and air has been purged.
- Blower rotates freely.
- Blower speed is correct.
- Air filter/cleaner is clean and in position.
- Service/access panels are in place.
- Return air temperature is between 50-80°F heating and 60-95°F cooling.
- Check air coil cleanliness to ensure optimum performance. Clean as needed according to maintenance guidelines. To obtain maximum performance the air coil should be cleaned before startup. A 10% solution of dishwasher detergent and water is recommended for both sides of coil, a thorough water rinse should follow.

Startup Steps

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

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

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

024 Operating Parameters

Dual Capacity Models

First Stage Operation

Entering Water Temp °F	Water Flow gpm/ton	Cooling -- No Hot Water Generation					
		Suction Pressure psig	Discharge Pressure psig	Superheat	Subcooling	Water Temp Rise °F	Air Temp Drop °F DB
30	1.5	108 - 123	135 - 145	10 - 15	5 - 12	14 - 19	17 - 25
	3.0	105 - 120	130 - 145	10 - 15	5 - 12	5 - 10	17 - 25
50	1.5	123 - 138	205 - 225	8 - 15	5 - 12	14 - 19	17 - 25
	3.0	120 - 135	180 - 200	8 - 15	5 - 12	5 - 10	17 - 25
70	1.5	135 - 145	275 - 290	6 - 12	5 - 12	14 - 19	17 - 25
	3.0	133 - 143	245 - 260	6 - 12	5 - 12	5 - 10	17 - 25
90	1.5	142 - 152	335 - 360	6 - 12	5 - 12	13 - 19	17 - 25
	3.0	140 - 150	320 - 345	6 - 12	5 - 12	5 - 10	17 - 25
110	1.5	152 - 164	425 - 455	6 - 12	5 - 12	13 - 19	17 - 25
	3.0	148 - 160	410 - 440	6 - 12	5 - 12	5 - 10	17 - 25

Entering Water Temp °F	Water Flow gpm/ton	Heating -- No Hot Water Generation					
		Suction Pressure psig	Discharge Pressure psig	Superheat	Subcooling	Water Temp Drop °F	Air Temp Rise °F DB
30	1.5	80 - 90	275 - 305	6 - 12	8 - 15	5 - 9	16 - 26
	3.0	84 - 94	280 - 310	6 - 12	8 - 15	2.5 - 6	18 - 28
50	1.5	100 - 115	290 - 320	7 - 13	8 - 15	5 - 9	20 - 30
	3.0	115 - 130	300 - 330	7 - 13	8 - 15	3 - 7	22 - 32
70	1.5	145 - 160	325 - 355	8 - 14	6 - 13	6 - 10	26 - 38
	3.0	150 - 165	330 - 360	8 - 14	6 - 13	4 - 8	28 - 40
90	1.5	185 - 200	340 - 380	12 - 18	6 - 13	7 - 11	28- 40
	3.0	190 - 205	350 - 390	12 - 18	6 - 13	5 - 9	30 - 42
110	1.5						
	3.0						

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.

Second Stage Operation

Entering Water Temp °F	Water Flow gpm/ton	Cooling -- No Hot Water Generation					
		Suction Pressure psig	Discharge Pressure psig	Superheat	Subcooling	Water Temp Rise °F	Air Temp Drop °F DB
30	1.5	108 - 125	155 - 180	18 - 30	5 - 12	15 - 21	17 - 25
	3.0	105 - 120	135 - 155	18 - 30	5 - 12	6 - 9	17 - 25
50	1.5	122 - 132	215 - 235	7 - 17	5 - 14	15 - 21	17 - 25
	3.0	120 - 130	190 - 210	7 - 17	5 - 14	6 - 9	17 - 25
70	1.5	133 - 143	280 - 310	6 - 15	5 - 12	14 - 20	17 - 25
	3.0	129 - 141	250 - 280	6 - 15	5 - 12	6 - 9	17 - 25
90	1.5	137 - 148	355 - 385	6 - 15	5 - 12	13 - 20	17 - 25
	3.0	135 - 146	325 - 355	6 - 15	5 - 12	6 - 9	17 - 25
110	1.5	145 - 155	435 - 465	6 - 15	5 - 12	13 - 20	17 - 25
	3.0	143 - 153	420 - 450	6 - 15	5 - 12	6 - 9	17 - 25

Entering Water Temp °F	Water Flow gpm/ton	Heating -- No Hot Water Generation					
		Suction Pressure psig	Discharge Pressure psig	Superheat	Subcooling	Water Temp Drop °F	Air Temp Rise °F DB
30	1.5	73 - 85	275 - 305	8 - 14	8 - 15	5 - 10	15 - 28
	3.0	77 - 90	285 - 315	8 - 14	8 - 15	3 - 7	17 - 30
50	1.5	100 - 115	295 - 335	9 - 15	9 - 17	7 - 11	20 - 32
	3.0	105 - 120	305 - 345	9 - 15	9 - 17	4 - 8	22 - 35
70	1.5	140 - 155	330 - 370	10 - 16	8 - 15	8 - 12	28 - 42
	3.0	145 - 160	335 - 375	10 - 16	8 - 15	5 - 9	30 - 45
90	1.5	175 - 195	350 - 390	10 - 16	8 - 15	8 - 13	30 - 46
	3.0	180 - 200	365 - 405	10 - 16	8 - 15	6 - 10	32 - 48
110	1.5						
	3.0						

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.

7/24/2014

036 Operating Parameters

Dual Capacity Models

First Stage Operation

Entering Water Temp °F	Water Flow gpm/ton	Cooling -- No Hot Water Generation					
		Suction Pressure psig	Discharge Pressure psig	Superheat	Subcooling	Water Temp Rise °F	Air Temp Drop °F DB
30	1.5	111 - 125	140 - 155	32 - 43	5 - 13	14 - 19	17 - 25
	3.0	108 - 122	135 - 148			5 - 10	17 - 25
50	1.5	138 - 153	210 - 240	12 - 18	5 - 12	15 - 20	17 - 25
	3.0	135 - 150	185 - 215			6 - 11	17 - 25
70	1.5	142 - 157	270 - 300	7 - 13	5 - 12	15 - 20	17 - 25
	3.0	140 - 155	250 - 280			6 - 11	17 - 25
90	1.5	142 - 163	350 - 380	6 - 12	5 - 12	13 - 19	17 - 25
	3.0	144 - 158	330 - 360			5 - 10	17 - 25
110	1.5	154 - 169	435 - 465	6 - 12	5 - 12	13 - 19	17 - 25
	3.0	153 - 167	420 - 450			5 - 10	17 - 25

Entering Water Temp °F	Water Flow gpm/ton	Heating -- No Hot Water Generation					
		Suction Pressure psig	Discharge Pressure psig	Superheat	Subcooling	Water Temp Drop °F	Air Temp Rise °F DB
30	1.5	77 - 87	275 - 305	6 - 12	8 - 15	5 - 9	15 - 25
	3.0	81 - 91	280 - 310			2.5 - 6	16 - 26
50	1.5	105 - 120	295 - 325	7 - 13	8 - 15	5 - 9	18 - 28
	3.0	110 - 125	305 - 335			3 - 7	20 - 30
70	1.5	140 - 155	330 - 360	8 - 14	8 - 15	6 - 10	24 - 36
	3.0	145 - 160	335 - 365			5 - 9	26 - 38
90	1.5	180 - 195	345 - 385	12 - 18	6 - 13	9 - 14	28 - 40
	3.0	185 - 200	355 - 395			7 - 11	30 - 42
110	1.5						
	3.0						

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.

Second Stage Operation

Entering Water Temp °F	Water Flow gpm/ton	Cooling -- No Hot Water Generation					
		Suction Pressure psig	Discharge Pressure psig	Superheat	Subcooling	Water Temp Rise °F	Air Temp Drop °F DB
30	1.5	103 - 118	162 - 182	35 - 45	8 - 15	17 - 23	17 - 25
	3.0	100 - 115	142 - 162			8 - 11	17 - 25
50	1.5	124 - 138	220 - 250	20 - 26	8 - 15	18 - 24	17 - 25
	3.0	122 - 136	195 - 225			9 - 12	17 - 25
70	1.5	133 - 147	290 - 320	9 - 15	8 - 15	18 - 24	17 - 25
	3.0	130 - 145	260 - 290			9 - 12	17 - 25
90	1.5	137 - 148	370 - 400	6 - 12	8 - 15	18 - 24	17 - 25
	3.0	135 - 146	340 - 375			9 - 12	17 - 25
110	1.5	145 - 158	445 - 485	6 - 12	8 - 15	17 - 23	17 - 25
	3.0	143 - 156	430 - 470			8 - 11	17 - 25

Entering Water Temp °F	Water Flow gpm/ton	Heating -- No Hot Water Generation					
		Suction Pressure psig	Discharge Pressure psig	Superheat	Subcooling	Water Temp Drop °F	Air Temp Rise °F DB
30	1.5	68 - 82	290 - 320	6 - 12	13 - 19	5 - 10	15 - 28
	3.0	72- 87	300 - 330			3 - 7	17 - 30
50	1.5	100 - 115	315 - 355	7 - 13	13 - 19	7 - 11	20 - 32
	3.0	105 - 120	325 - 365			4 - 8	22 - 35
70	1.5	131 - 146	340 - 380	8 - 14	12 - 18	9 - 14	25 - 37
	3.0	136 - 151	350 - 390			6 - 10	27 - 40
90	1.5	165 - 185	385 - 425	13 - 20	9 - 16	10 - 16	30 - 46
	3.0	170 - 190	395 - 435			8 - 13	32 - 48
110	1.5						
	3.0						

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.

7/24/2014

048 Operating Parameters

Dual Capacity Models

First Stage Operation

Entering Water Temp °F	Water Flow gpm/ton	Cooling -- No Hot Water Generation					
		Suction Pressure psig	Discharge Pressure psig	Superheat	Subcooling	Water Temp Rise °F	Air Temp Drop °F DB
30	1.5	111 - 125	143 - 157	32 - 43	8 - 15	14 - 19	17 - 25
	3.0	108 - 122	138 - 150			5 - 10	17 - 25
50	1.5	138 - 153	210 - 240	15 - 21	5 - 12	15 - 20	17 - 25
	3.0	135 - 150	185 - 215			6 - 11	17 - 25
70	1.5	142 - 157	270 - 300	10 - 16	5 - 12	15 - 20	17 - 25
	3.0	140 - 155	250 - 280			6 - 11	17 - 25
90	1.5	143 - 165	350 - 380	6 - 12	5 - 12	13 - 19	17 - 25
	3.0	145 - 160	330 - 360			5 - 10	17 - 25
110	1.5	154 - 169	435 - 465	8 - 13	5 - 12	13 - 19	17 - 25
	3.0	153 - 167	420 - 450			5 - 10	17 - 25

Entering Water Temp °F	Water Flow gpm/ton	Heating -- No Hot Water Generation					
		Suction Pressure psig	Discharge Pressure psig	Superheat	Subcooling	Water Temp Drop °F	Air Temp Rise °F DB
30	1.5	77 - 87	275 - 305	6 - 12	3 - 8	5 - 9	15 - 25
	3.0	81 - 91	280 - 310			2.5 - 6	16 - 26
50	1.5	105 - 120	295 - 325	7 - 13	3 - 8	5 - 9	18 - 28
	3.0	110 - 125	305 - 335			3 - 7	20 - 30
70	1.5	140 - 155	330 - 360	8 - 14	3 - 8	6 - 10	24 - 36
	3.0	145 - 160	335 - 365			5 - 9	26 - 38
90	1.5	173 - 188	340 - 380	14 - 20	3 - 8	9 - 14	28 - 40
	3.0	178 - 193	350 - 390			6 - 10	30 - 42
110	1.5						
	3.0						

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.

Second Stage Operation

Entering Water Temp °F	Water Flow gpm/ton	Cooling -- No Hot Water Generation					
		Suction Pressure psig	Discharge Pressure psig	Superheat	Subcooling	Water Temp Rise °F	Air Temp Drop °F DB
30	1.5	107 - 121	168 - 188	35 - 45	12 - 18	17 - 23	17 - 25
	3.0	104 - 118	148 - 168			8 - 11	17 - 25
50	1.5	127 - 141	225 - 255	20 - 26	8 - 15	18 - 24	17 - 25
	3.0	125 - 139	200 - 230			9 - 12	17 - 25
70	1.5	137 - 150	297 - 327	12 - 19	8 - 15	18 - 24	17 - 25
	3.0	134 - 148	267 - 297			9 - 12	17 - 25
90	1.5	142 - 156	370 - 400	10 - 16	8 - 15	18 - 24	17 - 25
	3.0	140 - 154	340 - 375			9 - 12	17 - 25
110	1.5	148 - 162	445 - 485	6 - 12	8 - 15	17 - 23	17 - 25
	3.0	146 - 160	430 - 470			8 - 11	17 - 25

Entering Water Temp °F	Water Flow gpm/ton	Heating -- No Hot Water Generation					
		Suction Pressure psig	Discharge Pressure psig	Superheat	Subcooling	Water Temp Drop °F	Air Temp Rise °F DB
30	1.5	68 - 82	280 - 310	6 - 12	6 - 12	5 - 10	15 - 25
	3.0	72 - 87	290 - 320			3 - 7	16 - 26
50	1.5	95 - 110	295 - 335	7 - 13	7 - 13	7 - 11	18 - 28
	3.0	100 - 115	305 - 345			4 - 8	20 - 30
70	1.5	127 - 141	325 - 365	10 - 16	3 - 8	12 - 16	24 - 36
	3.0	132 - 146	335 - 375			6 - 10	26 - 38
90	1.5	159 - 179	355 - 395	15 - 22	3 - 8	12 - 18	28 - 40
	3.0	164- 184	365 - 405			7 - 11	30 - 42
110	1.5						
	3.0						

Note: Cooling performance based on entering air temperatures of 80º F DB, 67º F WB. 7/24/2014
Heating performance based on entering air temperature of 70º F DB.

060 Unit Operating Parameters

Dual Capacity Models

First Stage Operation

Entering Water Temp °F	Water Flow gpm/ton	Cooling -- No Hot Water Generation					
		Suction Pressure psig	Discharge Pressure psig	Superheat	Subcooling	Water Temp Rise °F	Air Temp Drop °F DB
30	1.5	99 - 113	141 - 155	40 - 50	8 - 15	14 - 19	13 - 21
	3.0	96 - 110	136 - 148			5 - 10	13 - 21
50	1.5	131 - 146	210 - 240	13 - 19	5 - 12	15 - 20	17 - 25
	3.0	128 - 143	185 - 215			6 - 11	17 - 25
70	1.5	136 - 150	265 - 295	8 - 14	5 - 12	15 - 20	17 - 25
	3.0	134 - 148	245 - 275			6 - 11	17 - 25
90	1.5	143 - 165	345 - 375	6 - 12	5 - 12	13 - 19	17 - 25
	3.0	140 - 155	325 - 355			5 - 10	17 - 25
110	1.5	147 - 162	435 - 465	6 - 12	5 - 12	13 - 19	17 - 25
	3.0	145 - 160	420 - 450			5 - 10	17 - 25

Entering Water Temp °F	Water Flow gpm/ton	Heating -- No Hot Water Generation					
		Suction Pressure psig	Discharge Pressure psig	Superheat	Subcooling	Water Temp Drop °F	Air Temp Rise °F DB
30	1.5	71 - 81	295 - 325	6 - 12	9 - 15	5 - 9	15 - 25
	3.0	75 - 85	300 - 330			2.5 - 6	16 - 26
50	1.5	100 - 115	315 - 345	7 - 13	9 - 15	5 - 9	18 - 28
	3.0	105 - 120	325 - 355			3 - 7	20 - 30
70	1.5	123 - 147	350 - 380	10 - 16	9 - 15	8 - 14	24 - 36
	3.0	128 - 142	355 - 385			5 - 9	26 - 38
90	1.5	165 - 185	370 - 410	14 - 20	7 - 13	9 - 14	28 - 40
	3.0	175 - 190	380 - 420			6 - 10	30 - 42
110	1.5						
	3.0						

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.

Second Stage Operation

Entering Water Temp °F	Water Flow gpm/ton	Cooling -- No Hot Water Generation					
		Suction Pressure psig	Discharge Pressure psig	Superheat	Subcooling	Water Temp Rise °F	Air Temp Drop °F DB
30	1.5	88 - 103	144 - 164	45 - 55	8 - 15	17 - 23	15 - 23
	3.0	85 - 100	141 - 161			7 - 11	15 - 23
50	1.5	115 - 130	220 - 250	24 - 30	8 - 15	18 - 24	17 - 25
	3.0	113 - 128	195 - 225			8 - 12	17 - 25
70	1.5	126 - 141	295 - 325	10 - 16	8 - 15	18 - 24	17 - 25
	3.0	123 - 138	265 - 295			8 - 12	17 - 25
90	1.5	130 - 145	365 - 395	6 - 12	8 - 15	18 - 24	17 - 25
	3.0	128 - 143	335 - 370			8 - 12	17 - 25
110	1.5	137 - 152	445 - 485	6 - 12	8 - 15	17 - 23	17 - 25
	3.0	135 - 150	430 - 470			8 - 11	17 - 25

Entering Water Temp °F	Water Flow gpm/ton	Heating -- No Hot Water Generation					
		Suction Pressure psig	Discharge Pressure psig	Superheat	Subcooling	Water Temp Drop °F	Air Temp Rise °F DB
30	1.5	59 - 74	305 - 340	6 - 12	14 - 19	5 - 10	17 - 26
	3.0	63 - 78	315 - 350			3 - 7	18 - 28
50	1.5	90 - 105	335 - 375	7 - 13	11 - 16	7 - 11	23 - 33
	3.0	95 - 110	340 - 380			4 - 8	25 - 35
70	1.5	112 - 127	370 - 410	10 - 16	8 - 15	12 - 16	29 - 41
	3.0	117 - 132	380 - 420			5 - 9	31 - 43
90	1.5	160 - 180	410 - 450	15 - 22	7 - 13	12 - 18	36 - 48
	3.0	165- 185	420 - 460			7 - 11	38 - 50
110	1.5						
	3.0						

Note: Cooling performance based on entering air temperatures of 80º F DB, 67º F WB. 7/24/2014
Heating performance based on entering air temperature of 70º F DB.

072 Unit Operating Parameters

Dual Capacity Models

First Stage Operation

Entering Water Temp °F	Water Flow gpm/ton	Cooling -- No Hot Water Generation					
		Suction Pressure psig	Discharge Pressure psig	Superheat	Subcooling	Water Temp Rise °F	Air Temp Drop °F DB
30	1.5	103 - 118	141 - 155	40 - 50	8 - 15	14 - 19	13 - 21
	3.0	100 - 115	136 - 148			5 - 10	13 - 21
50	1.5	131 - 146	210 - 240	20 - 26	7 - 13	15 - 20	17 - 25
	3.0	128 - 143	185 - 215			6 - 11	17 - 25
70	1.5	142 - 157	270 - 300	8 - 14	5 - 12	15 - 20	17 - 25
	3.0	140 - 155	250 - 280			6 - 11	17 - 25
90	1.5	146 - 168	345 - 375	6 - 12	5 - 12	13 - 19	17 - 25
	3.0	143 - 158	325 - 355			5 - 10	17 - 25
110	1.5	151 - 165	435 - 465	6 - 12	5 - 12	13 - 19	17 - 25
	3.0	149 - 163	420 - 450			5 - 10	17 - 25

Entering Water Temp °F	Water Flow gpm/ton	Heating -- No Hot Water Generation					
		Suction Pressure psig	Discharge Pressure psig	Superheat	Subcooling	Water Temp Drop °F	Air Temp Rise °F DB
30	1.5	76 - 86	295 - 325	6 - 12	13 - 20	5 - 9	15 - 25
	3.0	80 - 90	300 - 330			2.5 - 6	16 - 26
50	1.5	105 - 120	315 - 345	7 - 13	13 - 20	5 - 9	18 - 28
	3.0	110 - 125	325 - 355			3 - 7	23 - 33
70	1.5	143 - 167	360 - 390	7 - 13	13 - 20	8 - 14	27 - 39
	3.0	148 - 162	365 - 395			5 - 9	29 - 41
90	1.5	180 - 200	380 - 420	8 - 14	10 - 16	9 - 14	33 - 45
	3.0	190 - 205	390 - 430			7 - 11	35 - 47
110	1.5						
	3.0						

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.

Second Stage Operation

Entering Water Temp °F	Water Flow gpm/ton	Cooling -- No Hot Water Generation					
		Suction Pressure psig	Discharge Pressure psig	Superheat	Subcooling	Water Temp Rise °F	Air Temp Drop °F DB
30	1.5	91 - 106	144 - 164	45 - 55	12 - 18	16 - 22	13 - 21
	3.0	88 - 103	141 - 161			6 - 10	13 - 21
50	1.5	115 - 130	220 - 250	30 - 40	12 - 18	18 - 24	15 - 23
	3.0	113 - 128	195 - 225			8 - 12	15 - 23
70	1.5	130 - 145	290 - 320	14 - 20	8 - 15	18 - 24	17 - 25
	3.0	127 - 142	260 - 290			8 - 12	17 - 25
90	1.5	135 - 150	365 - 395	11 - 17	8 - 15	18 - 24	17 - 25
	3.0	133 - 148	335 - 370			8 - 12	17 - 25
110	1.5	142 - 157	445 - 485	11 - 17	8 - 15	17 - 23	15 - 23
	3.0	140 - 155	430 - 470			8 - 11	15 - 23

Entering Water Temp °F	Water Flow gpm/ton	Heating -- No Hot Water Generation					
		Suction Pressure psig	Discharge Pressure psig	Superheat	Subcooling	Water Temp Drop °F	Air Temp Rise °F DB
30	1.5	68 - 83	305 - 340	6 - 12	18 - 24	5 - 10	17 - 26
	3.0	72 - 87	315 - 350			3 - 7	18 - 28
50	1.5	98 - 113	335 - 375	8 - 14	17 - 23	7 - 11	23 - 33
	3.0	103- 118	340 - 380			4 - 8	25 - 35
70	1.5	135 - 150	365 - 405	10 - 16	14 - 20	10 - 14	29 - 41
	3.0	140 - 155	375 - 415			6 - 10	31 - 43
90	1.5	165 - 185	405 - 445	15 - 22	14 - 20	12 - 18	36 - 48
	3.0	170- 190	415 - 455			7 - 11	38 - 50
110	1.5						
	3.0						

Note: Cooling performance based on entering air temperatures of 80º F DB, 67º F WB. 7/24/2014
Heating performance based on entering air temperature of 70º F DB.

Pressure Drop

Model	GPM	Pressure Drop (psi)				
		30°F	50°F	70°F	90°F	110°F
024 Full Load	4	2.3	2.1	2.0	1.9	1.7
	6	4.5	4.3	4.0	3.7	3.5
	8	7.5	7.0	6.6	6.1	5.7
	10	10.5	9.7	9.9	8.5	7.9
024 Part Load	3	1.5	1.4	1.3	1.2	1.1
	5	3.3	3.1	2.9	2.7	2.5
	7	5.9	5.6	5.2	4.8	4.5
	9	8.5	8.1	8.2	6.9	6.5
036 Full Load	5	1.9	1.8	1.7	1.6	1.5
	7	3.6	3.4	3.2	3.0	2.9
	9	5.8	5.4	5.1	4.8	4.6
	11	8.0	7.4	7.4	6.6	6.3
036 Part Load	4	1.4	1.3	1.2	1.2	1.0
	6	2.7	2.6	2.4	2.3	2.1
	8	4.7	4.4	4.1	4.0	3.5
	10	6.7	6.2	6.2	5.7	4.9
048 Full Load	6	1.7	1.6	1.5	1.4	1.3
	9	3.9	3.6	3.4	3.2	3.1
	12	7.0	6.6	6.2	5.8	5.6
	15	10.1	9.6	9.8	8.4	8.1
048 Part Load	5	1.1	1.1	1.0	0.9	0.9
	8	3.1	2.9	2.7	2.5	2.3
	11	5.9	5.6	5.2	4.8	4.5
	14	8.7	8.3	8.5	7.1	6.7
060 Full Load	8	2.8	2.7	2.5	2.3	2.2
	12	5.8	5.4	5.1	4.8	4.4
	16	9.8	9.2	8.6	8.0	7.4
	20	13.8	13.0	13.0	11.2	10.4
060 Part Load	6	1.7	1.6	1.5	1.4	1.3
	10	4.2	4.0	3.7	3.4	3.2
	14	7.6	7.2	6.7	6.2	5.8
	18	11.0	10.4	10.7	9.0	8.4
072 Full Load	12	3.8	3.6	3.4	3.1	2.9
	15	5.7	5.3	5.0	4.7	4.3
	18	7.8	7.4	6.9	6.4	6.0
	21	9.9	9.5	9.1	8.1	7.7
072 Part Load	10	2.8	2.7	2.5	2.3	2.2
	13	4.4	4.2	3.9	3.6	3.4
	16	6.4	6.0	5.6	5.2	4.8
	19	8.4	7.8	7.6	6.8	6.2

7/18/14

Thermistor Resistance

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

7/21/14

Compressor Resistance

Model	Compressor Model No.	208-230/60/1	
		Run	Start
024	ZPS20K5E-PFV	1.21 - 1.39	1.52 - 1.75
036	ZPS30K5E-PFV	0.81 - 0.94	1.41 - 1.63
048	ZPS40K5E-PFV	0.48 - 0.55	1.72 - 1.99
060	ZPS51K5E-PFV	0.36 - 0.42	1.51 - 1.74
072	ZPS60K5E-PFV	0.31 - 0.36	1.72 - 1.98

Note: Resistance at 77˚F 7/21/2014

Refrigerant Circuit Guideline

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

7/21/14

Heat of Extraction/Rejection

Model		GPM	Heat of Extraction (kBtuh)				Heat of Rejection (kBtuh)				
			30°F	50°F	70°F	90°F	30°F	50°F	70°F	90°F	110°F
024	Part Load	3.0		12.6	16.1	20.1		21.1	20.8	20.1	
		5.0	9.2	13.2	17.4	21.4	20.3	21.2	20.9	20.1	19.4
		7.0	10.0	13.9	17.8	21.4	20.5	21.5	21.1	20.3	19.5
	Full Load	4.0		17.7	21.9	25.8		29.8	29.2	27.9	
		6.0	13.5	18.4	23.1	27.5	28.7	30.0	29.5	28.4	27.0
		8.0	13.9	18.9	23.8	28.5	28.9	30.2	29.7	28.5	27.1
036	Part Load	4.0		18.7	24.7	31.1		34.0	32.9	31.7	
		6.0	13.4	19.5	26.1	33.1	29.7	34.2	33.0	31.8	30.1
		8.0	14.5	20.6	26.8	33.1	29.9	34.6	33.4	32.1	30.4
	Full Load	5.0		26.6	33.1	39.2		45.3	45.0	42.9	
		7.0	20.5	27.7	34.9	41.8	40.3	45.7	45.5	43.7	41.3
		9.0	21.0	28.4	36.0	43.3	40.6	46.0	45.8	43.9	41.5
048	Part Load	5.0		23.5	29.1	34.6		45.0	44.9	43.1	
		8.0	18.9	25.9	32.1	38.5	39.3	45.1	44.7	42.5	40.7
		11.0	19.5	26.9	33.8	41.0	39.6	45.1	45.0	43.2	41.7
	Full Load	6.0		31.6	39.2	46.3		63.2	63.2	60.6	
		9.0	25.7	34.9	43.4	51.7	55.8	62.9	62.6	59.7	56.4
		12.0	26.6	36.2	45.8	55.1	56.1	62.7	62.9	60.7	57.7
060	Part Load	6.0		31.3	39.5	47.1		56.3	54.8	52.5	
		10.0	21.5	31.6	41.2	50.8	46.2	56.1	54.8	52.8	49.0
		14.0	22.6	32.8	42.1	50.9	46.5	56.1	55.0	53.1	49.3
	Full Load	8.0		39.7	51.8	63.6		73.1	74.3	72.9	
		12.0	30.7	42.6	54.2	64.7	63.4	73.5	74.7	73.1	69.4
		16.0	31.0	43.5	55.9	67.4	63.8	73.9	75.0	73.5	69.5
072	Part Load	10.0		40.7	52.2	63.1		67.9	68.0	63.3	
		13.0	28.5	41.0	54.5	68.1	55.8	67.7	67.9	63.5	60.6
		16.0	30.2	42.7	55.5	68.1	56.2	67.6	68.2	63.8	61.0
	Full Load	12.0		51.0	66.0	80.7		83.1	87.8	84.5	
		15.0	40.2	54.5	68.8	81.9	69.5	83.4	88.1	84.8	82.1
		18.0	40.7	55.6	71.0	85.3	69.9	83.9	88.7	85.2	82.3

Note: operation not recommended in shaded areas. HWG turned OFF. 7/21/14

Antifreeze Corrections

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

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

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

Antifreeze Correction Example

Antifreeze solution is Propylene Glycol 20% by weight. Determine the corrected heating and cooling performance at 30°F and 90°F respectively as well as pressure drop at 30°F for a 036.

The corrected cooling capacity at 90°F would be: 34,800 MBtu/h x 0.969 = 33,721 MBtu/h

The corrected heating capacity at 30°F would be: 29,300 MBtu/h x 0.913 = 26,750 MBtu/h

The corrected pressure drop at 30°F and 9 gpm would be: 13.4 feet of head x 1.270 = 17.02 feet of head

Troubleshooting

Standard Microprocessor Controls

To check the unit control board for proper operation:

1. Disconnect thermostat wires at the control board.
2. Jumper the desired test input (Y1, Y2, W, O or G) to the R terminal to simulate a thermostat signal.
3. If control functions properly:
   - Check for thermostat and field control wiring (use the diagnostic inputs mode).
4. If control responds improperly:
   - Ensure that component being controlled is functioning (compressor, blower, reversing valve, etc.).
   - Ensure that wiring from control to the component is functioning (refer to the LED Definition table below and use the diagnostic outputs mode).
   - If steps above check properly, replace unit control.

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 Unit Operating Parameters tables. If the unit's performance is not within the ranges listed, and the airflow and water flow are known to be correct, 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: Refrigerant tests must be made with hot water generator turned "OFF". Verify that air and water flow rates are at proper levels before servicing the refrigerant circuit.

LED Definitions and Diagnostics Standard Microprocessor

LED	NORMAL DISPLAY MODE		DIAGNOSTIC MODES							
			CURRENT FAULT STATUS		INPUTS		OUTPUTS 1		OUTPUTS 2	
	Field Selection DIPS									
	SW2-	1 On	SW2-	1 Off	SW2-	1 NA	SW2-	1 NA	SW2-	1 NA
	SW2-	6 On	SW2-	6 On	SW2-	6 Off	SW2-	6 On	SW2-	6 Off
	SW2-	7 On	SW2-	7 On	SW2-	7 On	SW2-	7 Off	SW2-	7 Off
Drain	Drain Pan Overflow Lockout		Drain Pan Overflow		Y1		Compressor (On or Low)		Blower Low	
Water Flow	FP Thermistor (Loop <15º F, Well <30ºF) Lockout		FP Thermistor (Loop <15º F, Well <30ºF)		Y2		Compressor (On or High)		Blower Medium	
High Pressure	High Pressure >600 PSI Lockout		High Pressure >600		O		Reversing Valve		Blower High	
Low Pressure	Low Pressure <40 PSI Lockout		Low Pressure <40		G		Fan		Aux Heat 1	
Airflow	ECM RPM <100 RPM		ECM RPM <100 RPM		W		HWG Pump		Aux Heat 2	
Status	Microprocessor Malfunction		Not Used		SL1		Loop Pump(s)		Aux Heat 3*	
HWG Limit	HWL Thermistor >130º		HWL Thermistor >130°F		Not Used		–		Aux Heat 4*	
HWG Off	HWG Pump Switch Off		HWG Pump Switch Off		–		–		–	

*Auxiliary heat board only allows for two stages

Troubleshooting cont.

Startup/Troubleshooting Form

Dealer: ______________________________

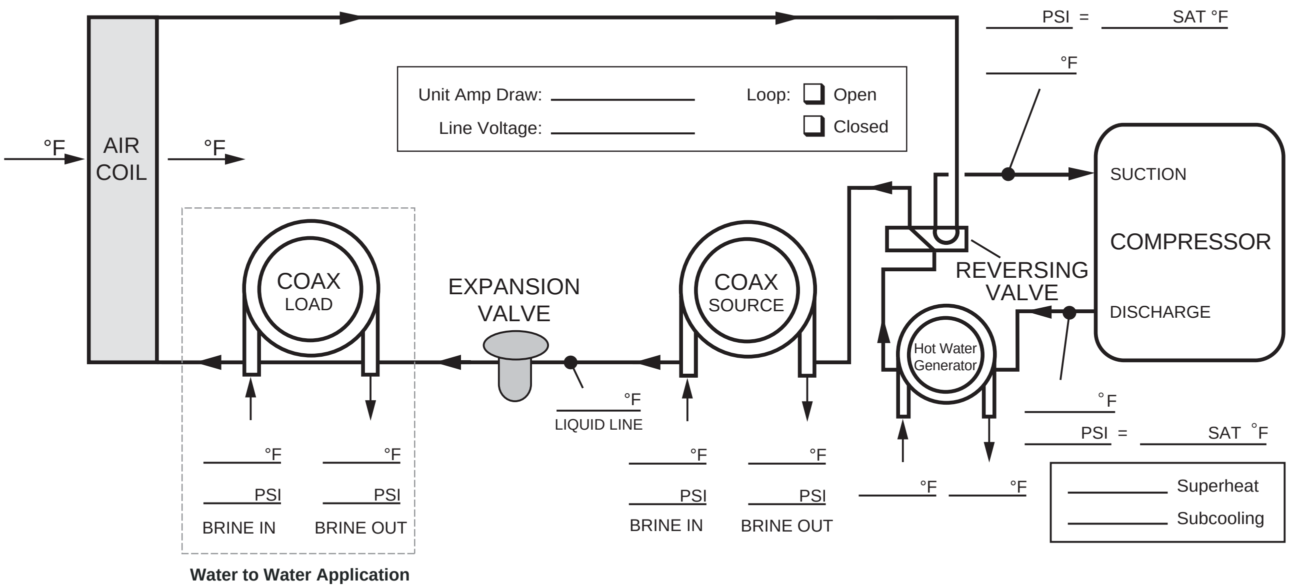
Phone #: ______________ Date: ______________

Problem: ______________________________

Model #: ______________________________

Serial #: ______________________________

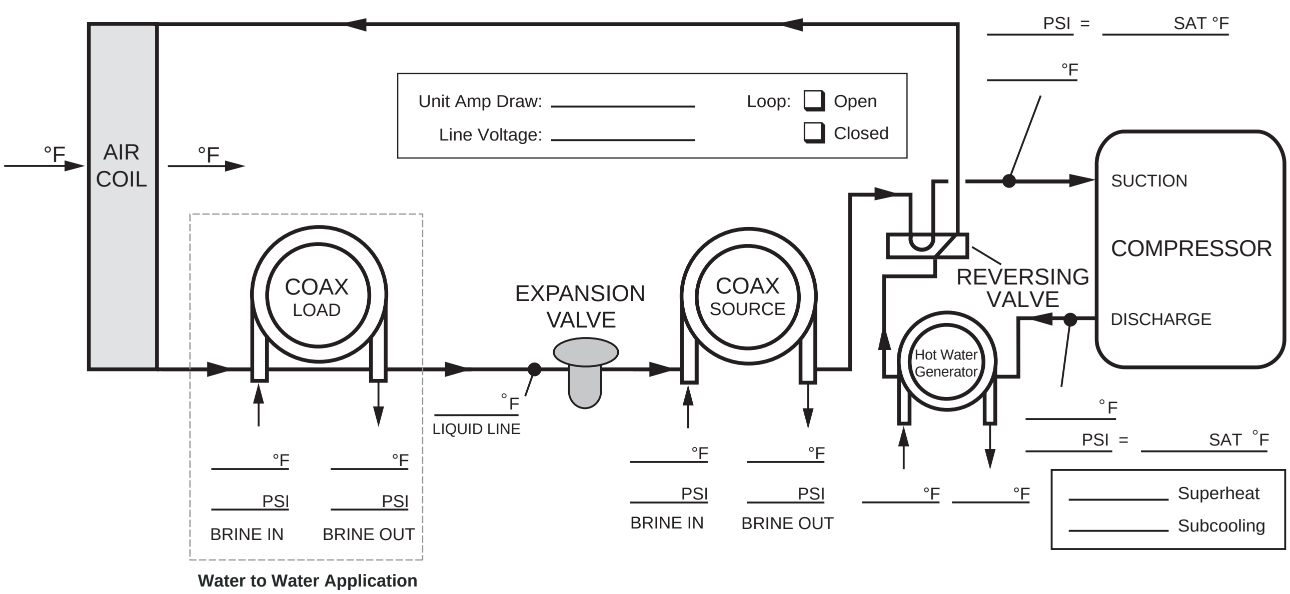
COOLING CYCLE ANALYSIS



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

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

HEATING CYCLE ANALYSIS



Troubleshooting cont.

Single Speed/Dual Capacity Startup/Troubleshooting Form

1. Job Information

Model # ____________________	Job Name: ____________________	Loop: Open / Closed
Serial # ____________________	Install Date: ____________________	Hot Water Generator: Y / N

2. Flow Rate in gpm	**SOURCE COAX**		**LOAD COAX (Water-to-Water)**	
	HEATING	COOLING	HEATING	COOLING
WATER IN Pressure:	a. __________ psi	a. __________ psi	a. __________ psi	a. __________ psi
WATER OUT Pressure:	b. __________ psi	b. __________ psi	b. __________ psi	b. __________ psi
Pressure Drop: a - b	c. __________ psi	c. __________ psi	c. __________ psi	c. __________ psi
Look up flow rate in table:	d. __________ gpm	d. __________ gpm	d. __________ gpm	d. __________ gpm

3. Temp. Rise/Drop Across Coaxial Heat Exchanger[1]		
	HEATING	COOLING
WATER IN Pressure:	e. __________ °F	e. __________ °F
WATER OUT Pressure:	f. __________ °F	f. __________ °F
Temperature Difference:	g. __________ °F	g. __________ °F

4. Temp. Rise/Drop Across Air Coil	**SOURCE COAX**		**LOAD COAX (Water-to-Water)**	
	HEATING	COOLING	HEATING	COOLING
SUPPLY AIR Temperature:	h. __________ °F	h. __________ °F	h. __________ °F	h. __________ °F
RETURN AIR Temperature:	i. __________ °F	i. __________ °F	i. __________ °F	i. __________ °F
Temperature Difference:	j. __________ °F	j. __________ °F	j. __________ °F	j. __________ °F

5. Heat of Rejection (HR)/Heat of Extraction (HE)		
Brine Factor[2]:	k. __________	
	HEATING	COOLING
HR/HE = d x g x k	l. __________ Btu/h	l. __________ Btu/h

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

6. Watts	ENERGY MONITOR	
	HEATING	COOLING
Volts:	m. __________ Volts	m. __________ Volts
Total Amps (Comp. + Blower)[3]:	n. __________ Amps	n. __________ Amps
Watts = m x n x 0.85:	o. __________ Watts	o. __________ Watts

7. Capacity		
	HEATING	COOLING
Cooling Capacity = l - (o x 3.413): Heating Capacity = l + (o x 3.413):	p. __________ Btu/h	p. __________ Btu/h

8. Efficiency		
	HEATING	COOLING
Cooling EER = p / o: Heating COP = p / (o x 3.413):	q. __________ Btu/h	q. __________ Btu/h

9. Superheat (S.H.)/Subcooling (S.C.)		
	HEATING	COOLING
Suction Pressure:	r. __________ psi	r. __________ psi
Suction Saturation Temperature:	s. __________ °F	s. __________ °F
Suction Line Temperature:	t. __________ °F	t. __________ °F
S.H. = t - s	u. __________ °F	u. __________ °F
Head Pressure:	v. __________ psi	v. __________ psi
High Pressure Saturation Temp:	w. __________ °F	w. __________ °F
Liquid Line Temperature[4]:	x. __________ °F	x. __________ °F
S.C. = w - x	y. __________ °F	y. __________ °F

NOTES:
[1] Steps 3-9 should be conducted with the hot water generator disconnected.
[2] Use 500 for pure water, 485 for methanol or Environol™. (This constant is derived by multiplying the weight of one gallon of water (8.34) times the minutes in one hour (60) times the specific heat of the fluid. Water has a specific heat of 1.0.
[3] If there is only one source of power for the compressor and blower, amp draw can be measured at the source wiring connection.
[4] Liquid line is between the coax and the expansion device in the cooling mode; between the air coil and the expansion device in the heating mode.

Preventive Maintenance

Proper maintenance is very important to obtain optimum performance and longevity for the heat pump system. It is best to establish a periodic maintenance schedule with the installer so the heat pump system can be checked regularly.

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 the heat exchanger and copper water lines. Generally, the more water flowing through the unit the less chance for scaling. However, flow rates above 3gpm/ton may erode the heat exchanger or water lines, due to high water velocity or system debris.

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. Operating the system without a filter or with a dirty filter could affect the longevity of the heat pump.

Condensate Drain

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

Blower Motors

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

Hot Water Generator Coil

See Water Coil Maintenance section above.

Air Coil

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

CAUTION: Fin edges are sharp.

Replacement Procedures

Obtaining Parts

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

In-Warranty Material Return

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

Service Parts List

Premier (uncoated coil)

Parts List		024	036	048	060	072
		Dual Capacity Units				
Compressor	Compressor 208-230/60/1	34P640-01	34P641-01	34P642-01	34P643-01	34P644-01
	Run Capacitor 208-230/60/1	16P002D19	16P002D20	16P002D18	16P002D31	16P002D31
	Power Harness	11P781-01	11P781-01	11P781-01	11P781-01	11P781-01
	Solenoid Harness	11P782-02	11P782-02	11P782-02	11P782-02	11P782-02
5 Speed ECM Motor & Blower	5 Speed ECM Motor 208-230/60/1	14S536-12	14S536-03	14S537-01	14S537-07	14S537-03
	5 Speed ECM Blower Housing	53P500B01	53P500B01	53P501B01	53P501B01	53P501B01
Air Filters	1" Air Filters (Horizontal Model) and Second Filter If Needed	59B503B07	59B503B23	59B503B08	59B503B08	59B503B02
		n/a	n/a	n/a	n/a	59B503B24
	1" Air Filters (Vertical Model)	59P503B12	59P509B27	59P503B28	59P503B28	59P503B21
Refrigeration Components	Air Coil (Vertical Model)	61P721-41	61P705-41	61P706-41	61P706-41	61P715-41
	Air Coil (Horizontal Model)	61P720-41	61P707-41	61P709-41	61P709-41	61P710-41
	Coax	62I592-01	62I594-01	62I568-01	62I542A01	62I543A01
	TXV	33P619-10	33P619-11	33P619-12	33P619-13	33P619-14
	Reversing Valve	33P506-04	33P506-04	33P526-05	33P526-05	33P526-05
	Discharge Muffler	36P503B02	36P503B02	36P503B02	36P503B02	36P503B02
	Filter Dryer	36P500B01	36P500B01	36P500B01	36P500B02	36P500B02
Hot Water Generator	Hot Water Generator	62P516-05	62P516-05	62P516-03	62P516-03	62P516-03
	Hot Water Generator Pump	24P501A01	24P501A01	24P501A01	24P501A01	24P501A01
Electrical	Contactor	13P004A03	13P004A03	13P004A03	13P004A03	13P004A03
	Transformer 208-230/60/1	15P501B01	15P501B01	15P501B01	15P501B01	15P501B01
	3 Pole Power Block	12P503-06	12P503-06	12P503-06	12P503-06	12P503-06
	2 Pole Screw Term. Block	12P500A01	12P500A01	12P500A01	12P500A01	12P500A01
	Status Light Board	17P503A03	17P503A03	17P503A03	17P503A03	17P503A03
	Premier Board	17P513-07	17P513-07	17P513-07	17P513-07	17P513-07
Sensors & Safeties	Freeze Protection Thermistor	12P505B03	12P505B03	12P505B03	12P505B03	12P505B03
	HWL Thermistor	12P505B02	12P505B02	12P505B02	12P505B02	12P505B02
	High Pressure Switch	SKHPE600	SKHPE600	SKHPE600	SKHPE600	SKHPE600
	Low Pressure Switch	SKLPE40	SKLPE40	SKLPE40	SKLPE40	SKLPE40

Part numbers subject to change 9/3/14

Notes

Revision Guide

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All	Document Creation	18 Sept 2014	MA

650 Jamieson Parkway, Unit #1, Cambridge, Ontario N3C 0A5 | o: 1.866.310.6690 | f: 1.866.533.3889
GEOSMARTENERGY.COM

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Size: 2 - 6 Ton Dual Capacity

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