



# Installation, Start-Up, and Service Instructions

## CONTENTS

	Page		Page
<b>SAFETY CONSIDERATIONS</b> .....	1,2	<b>Antifreeze</b> .....	24
<b>GENERAL</b> .....	2	<b>Cooling Tower/Boiler Systems</b> .....	24
<b>INSTALLATION</b> .....	2-15	<b>Ground Coupled, Closed Loop and Plateframe Heat Exchanger Well Systems</b> .....	24
<b>Step 1 — Check Jobsite</b> .....	2	<b>OPERATION</b> .....	24,25
<b>Step 2 — Check Unit</b> .....	2	<b>Power Up Mode</b> .....	24
• STORAGE		<b>Units with Aquazone Complete C Control</b> .....	24
• PROTECTION		<b>Units with Aquazone Deluxe D Control</b> .....	24
• INSPECT UNIT		<b>SYSTEM TEST</b> .....	25,26
<b>Step 3 — Locate Unit</b> .....	5	<b>Test Mode</b> .....	25
<b>Step 4 — Mount Unit</b> .....	5	<b>Retry Mode</b> .....	25
<b>Step 5 — Install Duct System</b> .....	5	<b>Aquazone Deluxe D Control LED Indicators</b> .....	25
• SOUND ATTENUATION		<b>SERVICE</b> .....	26-29
• EXISTING DUCT SYSTEM		<b>Filters</b> .....	27
<b>Step 6 — Install Condensate Piping Drain</b> .....	6	<b>Water Coil</b> .....	27
• INSTALLATION		<b>Condensate Drain Pans</b> .....	27
• VENTING		<b>Refrigerant System</b> .....	27
<b>Step 7 — Field Convert Air Discharge</b> .....	6	<b>Condensate Drain Cleaning</b> .....	27
<b>Step 8 — Install Piping Connections</b> .....	7	<b>Air Coil Cleaning</b> .....	27
• WATER LOOP APPLICATIONS		<b>Condenser Cleaning</b> .....	27
• GROUND-LOOP APPLICATIONS		<b>Compressor</b> .....	28
• GROUND-WATER APPLICATIONS		<b>Fan Motors</b> .....	28
<b>Step 9 — Install Field Power Supply Wiring</b> .....	8	<b>Belt</b> .....	28
• POWER CONNECTION		<b>Air Coil</b> .....	28
• SUPPLY VOLTAGE		<b>Checking System Charge</b> .....	28
• EXTERNAL LOOP POWER CONNECTION		<b>Refrigerant Charging</b> .....	28
• 420-VOLT OPERATION		<b>Air Coil Fan Motor Removal</b> .....	28
<b>Step 10 — Install Field Control Wiring</b> .....	15	<b>Blower Fan Sheaves</b> .....	28
• THERMOSTAT CONNECTIONS		<b>Blower Fan Performance Adjustment</b> .....	29
• WATER FREEZE PROTECTION		<b>TROUBLESHOOTING</b> .....	30-32
• AIR COIL FREEZE PROTECTION		<b>Thermistor</b> .....	30
• ACCESSORY CONNECTIONS		<b>Control Sensors</b> .....	30
• WATER SOLENOID VALVES		<b>START-UP CHECKLIST</b> .....	CL-1,CL-2
<b>PRE-START-UP</b> .....	16-20		
<b>System Checkout</b> .....	16		
<b>Airflow and External Static Pressure</b> .....	16		
<b>FIELD SELECTABLE INPUTS</b> .....	20-22		
<b>Complete C Control Jumper Settings</b> .....	20		
<b>Complete C Control DIP Switches</b> .....	20		
<b>Deluxe D Control Jumper Settings</b> .....	20		
<b>Deluxe D Control DIP Switches</b> .....	21		
<b>Deluxe D Control Accessory Relay Configurations</b> .....	21		
<b>START-UP</b> .....	22-24		
<b>Operating Limits</b> .....	22		
<b>Air Coil Cleaning</b> .....	22		
<b>Start Up System</b> .....	22		
<b>Scroll Compressor Rotation</b> .....	22		
<b>Unit Start-Up in Cooling Mode</b> .....	22		
<b>Unit Start-Up in Heating Mode</b> .....	23		
<b>Flow Regulation</b> .....	23		
<b>Flushing</b> .....	23		

**IMPORTANT:** Read the entire instruction manual before starting installation.

### SAFETY CONSIDERATIONS

Installation and servicing of air-conditioning equipment can be hazardous due to system pressure and electrical components. Only trained and qualified service personnel should install, repair, or service air-conditioning equipment.

Untrained personnel can perform basic maintenance functions of cleaning coils and filters and replacing filters. All other operations should be performed by trained service personnel. When working on air-conditioning equipment, observe precautions in the literature, tags and labels attached to the unit, and other safety precautions that may apply.

Improper installation, adjustment, alteration, service, maintenance, or use can cause explosion, fire, electrical shock or other conditions which may cause personal injury or property damage. Consult a qualified installer, service agency, or your distributor or branch for information or assistance. The qualified installer or agency must use factory-authorized kits or

accessories when modifying this product. Refer to the individual instructions packaged with the kits or accessories when installing.

Follow all safety codes. Wear safety glasses and work gloves. Use quenching cloth for brazing operations. Have fire extinguisher available. Read these instructions thoroughly and follow all warnings or cautions attached to the unit. Consult local building codes and the National Electrical Code (NEC) for special installation requirements.

Understand the signal words — DANGER, WARNING, and CAUTION. DANGER identifies the most serious hazards which will result in severe personal injury or death. WARNING signifies hazards that could result in personal injury or death. CAUTION is used to identify unsafe practices, which would result in minor personal injury or product and property damage.

Recognize safety information. This is the safety-alert symbol ( $\triangle$ ). When you see this symbol on the unit and in instructions or manuals, be alert to the potential for personal injury.

### $\triangle$ WARNING

Electrical shock can cause personal injury and death. Shut off all power to this equipment during installation. There may be more than one disconnect switch. Tag all disconnect locations to alert others not to restore power until work is completed.

### $\triangle$ CAUTION

This system uses R-410A, which has higher pressures than R-22 and other refrigerants. No other refrigerant may be used in this system. Suction tubing design pressure is 3068 kPa and liquid tubing design pressure is 4522 kPa. Failure to use gage set, hoses, and recovery systems designed to handle R-410A refrigerant may result in personal injury and equipment damage. If unsure about equipment, consult the equipment manufacturer.

## GENERAL

This Installation and Start-Up Instructions literature is for Aquazone™ water source heat pump systems with Puron refrigerant.

Water source heat pumps (WSHPs) are single-package horizontally and vertically mounted units with electronic controls designed for year-round cooling and heating.

**IMPORTANT:** The installation of water source heat pump units and all associated components, parts, and accessories which make up the installation shall be in accordance with the regulations of ALL authorities having jurisdiction and MUST conform to all applicable codes. It is the responsibility of the installing contractor to determine and comply with ALL applicable codes and regulations.

## INSTALLATION

**Step 1 — Check Jobsite** — Installation, operation and maintenance instructions are provided with each unit. Before unit start-up, read all manuals and become familiar with the unit and its operation. Thoroughly check out the system before operation. Complete the inspections and instructions listed below to prepare a unit for installation. See Table 1 for unit physical data.

Horizontal units are designed for indoor installation only. Be sure to allow adequate space around the unit for servicing.

See Fig. 1 for overall unit dimensions. Refer to Fig. 2 for an example of a typical horizontal installation.

### $\triangle$ CAUTION

To avoid equipment damage, do not use these units as a source of heating or cooling during the construction process. The mechanical components and filters used in these units quickly becomes clogged with construction dirt and debris which may cause system damage.

**Step 2 — Check Unit** — Upon receipt of shipment at the jobsite, carefully check the shipment against the bill of lading. Make sure all units have been received. Inspect the carton or crating of each unit, and inspect each unit for damage. Ensure the shipping company makes proper notation of any shortages or damage on all copies of the freight bill. Concealed damage not discovered during unloading must be reported to the shipping company within 15 days of receipt of shipment.

**NOTE: It is the responsibility of the purchaser to file all necessary claims with the shipping company.**

1. Verify unit is correct model for entering water temperature of job.
2. Be sure that the location chosen for unit installation provides ambient temperatures maintained above freezing. Well water applications are especially susceptible to freezing.
3. Be sure the installation location is isolated from sleeping areas, private offices and other acoustically sensitive spaces.  
NOTE: A sound control accessory package may be used to help eliminate sound in sensitive spaces.
4. Check local codes to be sure a secondary drain pan is not required under the unit.
5. Be sure unit is mounted at a height sufficient to provide an adequate slope of the condensate lines. If an appropriate slope cannot be achieved, a field-supplied condensate pump may be required.
6. Provide sufficient space for duct connection.
7. Provide adequate clearance for filter replacement and drain pan cleaning. Do not allow piping, conduit, etc. to block filter access.
8. Provide sufficient access to allow maintenance and servicing of the fan and fan motor, compressor and coils. Removal of the entire unit from the closet should not be necessary.
9. Provide an unobstructed path to the unit within the closet or mechanical room. Space should be sufficient to allow removal of unit if necessary.
10. Provide ready access to water valves and fittings, and screwdriver access to unit side panels, discharge collar, and all electrical connections.
11. Where access to side panels is limited, pre-removal of the control box side mounting screws may be necessary for future servicing.

**STORAGE** — If the equipment is not needed for immediate installation upon its arrival at the jobsite, it should be left in its shipping carton and stored in a clean, dry area of the building or in a warehouse. Units must be stored in an upright position at all times. If carton stacking is necessary, stack units a maximum of 3 high. Do not remove any equipment from its shipping package until it is needed for installation.

**PROTECTION** — Once the units are properly positioned on the jobsite, they must be covered with either a shipping carton, vinyl film, or an equivalent protective covering. Open ends of pipes stored on the jobsite must be capped. This precaution is

especially important in areas where painting, plastering, or spraying of fireproof material, etc. is not yet complete. Foreign material that is allowed to accumulate within the units can prevent proper start-up and necessitate costly clean-up operations.

Before installing any of the system components, be sure to examine each pipe, fitting, and valve, and remove any dirt or foreign material found in or on these components.

**⚠ CAUTION**

DO NOT store or install units in corrosive environments or in locations subject to temperature or humidity extremes (e.g., attics, garages, rooftops, etc.). Corrosive conditions and high temperature or humidity can significantly reduce performance, reliability, and service life. Always move units in an upright position. Tilting units on their sides may cause equipment damage.

**INSPECT UNIT** — To prepare the unit for installation, complete the procedures listed below:

1. Compare the electrical data on the unit nameplate with ordering and shipping information to verify that the correct unit has been shipped.
2. Do not remove the packaging until the unit is ready for installation.

3. Verify that the unit's refrigerant tubing is free of kinks or dents, and that it does not touch other unit components.
4. Inspect all electrical connections. Be sure connections are clean and tight at their terminations.
5. Loosen compressor bolts until the compressor rides freely on springs. Remove shipping restraints.
6. Remove the four 6 mm (1/4 in.) shipping bolts from compressor support plate (two bolts on each side) to maximize vibration and sound alternation.

**⚠ CAUTION**

Failure to remove shipping brackets from spring-mounted compressors will cause excessive noise and could cause component failure due to added vibration.

7. Remove any blower support cardboard from inlet of the blower.
8. Locate and verify any accessory kit located in compressor and/or blower section.
9. Remove any access panel screws that may be difficult to remove once unit is installed.

**Table 1 — Physical Data — 50HQP072-120 Units**

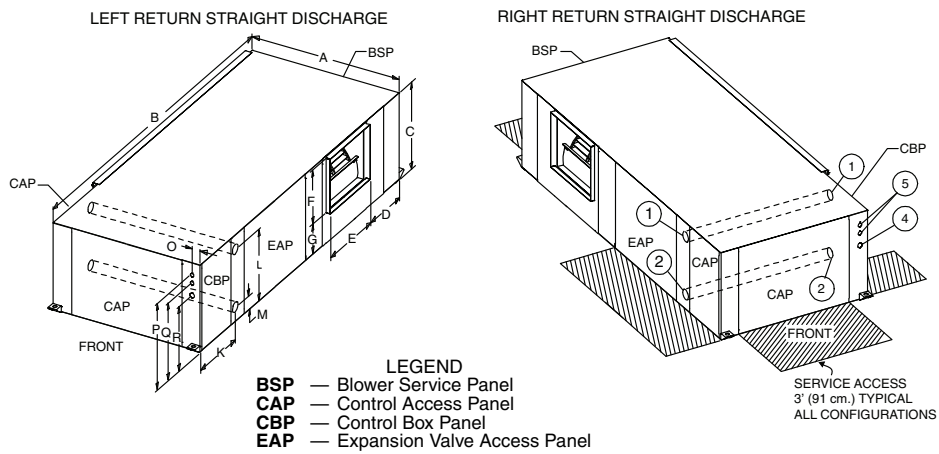
UNIT 50HQP	072	096	120
<b>COMPRESSOR QUANTITY*</b>		Scroll	
Number of Circuits (Compressors)		2	
Factory Charge HFC-410A (kg) per circuit	1.70	2.15	2.27
<b>BLOWER MOTOR</b>			
Blower Motor Quantity		1	
Standard Motor (kW)	0.75	1.49	2.24
<b>BLOWER</b>			
No. of Blowers		1	
Blower Wheel Size D x W (cm)		30.48 x 30.48	
<b>WATER CONNECTION SIZE</b>			
FPT (in.) [mm]		1 1/4 [31.8]	1 1/2 [38.1]
<b>COAX VOLUME</b>			
Volume (liters)	6.13	6.85	9.08
<b>CONDENSATE CONNECTION SIZE</b>			
FPT (in.) [mm]		3/4 [19.1]	
<b>AIR COIL DATA</b>			
Air Coil Dimensions H x W (cm)	50.8 x 137.16	50.8 x 162.56	
Air Coil Total Face Area (sq m)	0.70	0.83	
Air Coil Tube Size (cm)		0.953	
Air Coil Fin Spacing (fins per cm)		5.5	
Air Coil Number of Rows		3	
<b>MISCELLANEOUS DATA</b>			
Filter Standard - Throwaway (qty) (cm)†		40.64 x 50.80 x 2.54	
Weight - Operating (kg)	265.8	292.1	316.6
Weight - Packaged (kg)	283.9	310.3	334.8

\*All units have grommet and spring compressor mountings, and 2.2 mm and 3.5 mm electrical knockouts.

†51 mm filters are available as field-installed accessory.

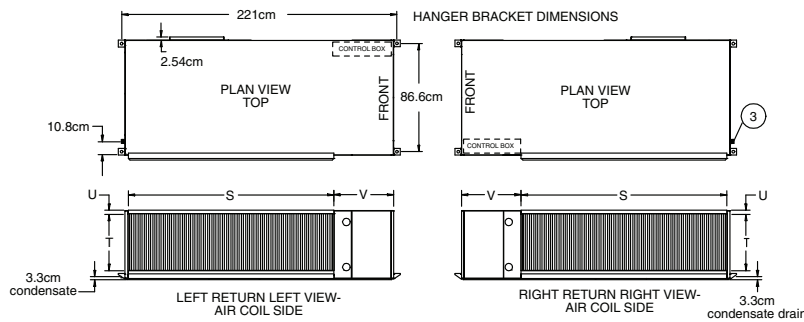
NOTE: Use the lowest maximum pressure rating when multiple options are combined:

OPTION	MAXIMUM PRESSURE (kPa)
Base Unit	3100



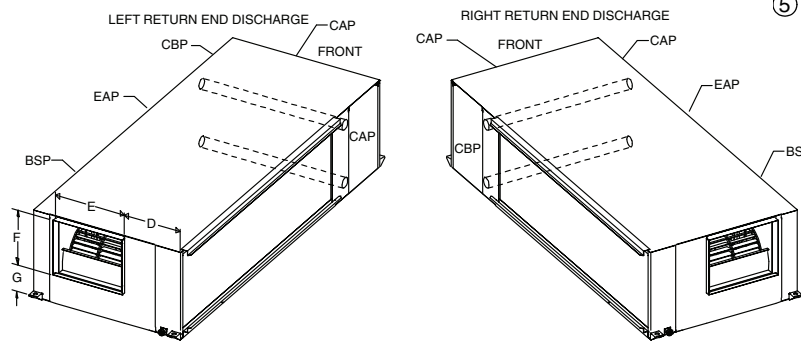
**LEGEND**  
**BSP** — Blower Service Panel  
**CAP** — Control Access Panel  
**CBP** — Control Box Panel  
**EAP** — Expansion Valve Access Panel

- NOTES:**
1. All dimensions in centimeters, unless indicated.
  2. Access is required for all removable panels and installer should take care to comply with all building codes and allow adequate clearance.
  3. Water inlet and outlet connections are available on either side of the unit. Plugs are shipped loose in a plastic bag tied to the water leg in front of the unit. Installer must plug unused connection.
  4. Condensate drain connection is on end opposite of compressor.
  5. Electrical access is available on either side of the front of the unit.
  6. Electrical box is on right side but can be field-converted to left.



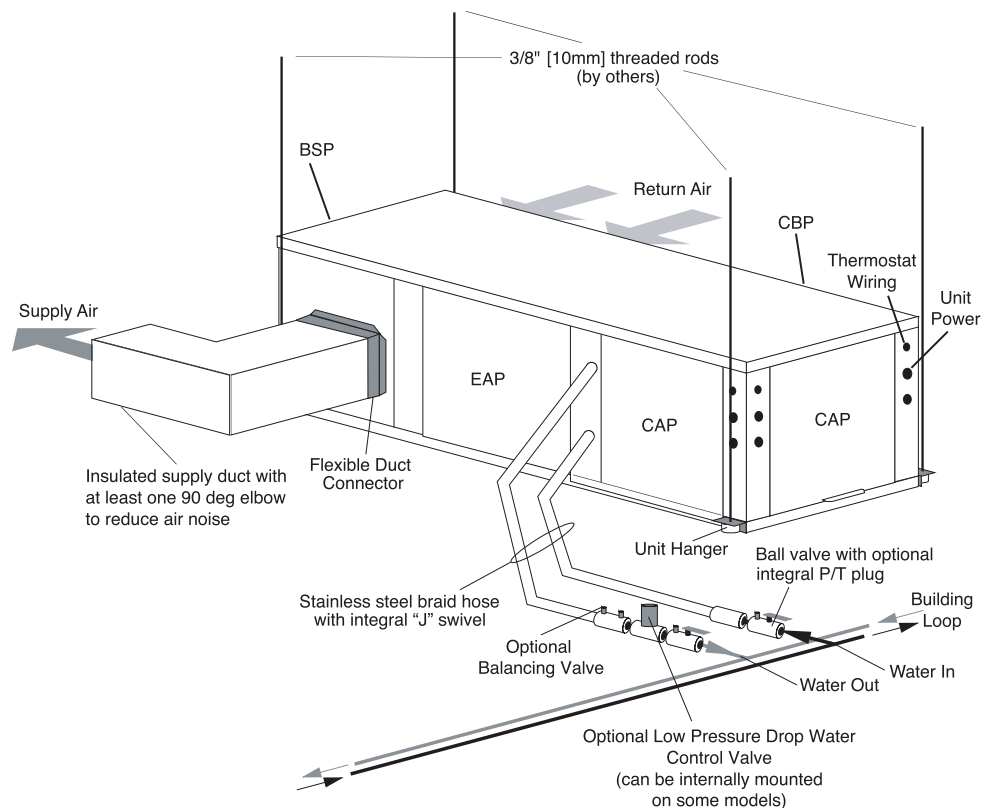
**CONNECTIONS**

- ① Water Outlet 1<sup>1</sup>/<sub>4</sub>" FPT (072.096)  
1<sup>1</sup>/<sub>2</sub>" FPT (120)
- ② Water Inlet 1<sup>1</sup>/<sub>4</sub>" FPT (072.096)  
1<sup>1</sup>/<sub>2</sub>" FPT (120)
- ③ Condensate Drain 3/4" FPT
- ④ High Voltage Access 1<sup>1</sup>/<sub>8</sub>" K.O.
- ⑤ Low Voltage Access 7/8" K.O.



UNIT 50HQP	OVERALL CABINET (cm)			DISCHARGE CONNECTIONS (cm) (Duct Flange [± 0.1 cm])					WATER CONNECTIONS (cm)				ELECTRICAL KNOCKOUTS (cm)				RETURN AIR CONNECTIONS (cm) (Using Return Air Opening)			
	A Depth	B Width	C Height	D	E Supply Depth	F Supply Height	G	K	L	M	O	P	Q	R	S Return Depth	T Return Height	U	V		
072-120	92.2	215.6	54.9	35.6	43.2	34.3	19.8	38.1	21.1	10.2	5.1	47.8	42.7	35.1	165.1	45.7	2.5	48.0		

**Fig. 1 — Unit Dimensions**



- LEGEND**
- BSP** — Blower Service Panel
  - CAP** — Control Access Panel
  - CBP** — Control Box Panel
  - EAP** — Expansion Valve Access Panel

- NOTES:**
1. Access is required for all removable panels and installer should take care to comply with all building codes and allow adequate clearance.
  2. Water inlet and outlet connections are available on either side of the unit. Plugs are shipped loose in a plastic bag tied to the water leg in front of the unit. Installer must plug unused connection.
  3. Condensate drain connection is on end opposite of compressor.
  4. Electrical access is available on either side of the front of the unit.
  5. Electrical box is on right side but can be field-converted to left.

**Fig. 2 — Typical Horizontal Installation**

**Step 3 — Locate Unit** — The following guidelines should be considered when choosing a location for a WSHP:

- Units are for indoor use only.
- Locate in areas where ambient temperatures are between 4.4 C and 37.8 C and relative humidity is no greater than 75%.
- Provide sufficient space for water, electrical and duct connections.
- Locate unit in an area that allows for easy access and removal of filter and access panels.
- Allow enough space for service personnel to perform maintenance.
- Provisions must be made for return air to freely enter the space if unit needs to be installed in a confined area such as a closet.

**NOTE:** Correct placement of the horizontal unit can play an important part in minimizing sound problems. Since ductwork is normally applied to these units, the unit can be placed so that the principal sound emission is outside the occupied space in sound-critical applications. A fire damper may be required by the local code if a fire wall is penetrated.

**Step 4 — Mount Unit** — Units should be mounted using the factory-installed hangers. See Fig. 3. Proper attachment

of hanging rods to building structure is critical for safety. See Fig. 2. Rod attachments must be able to support the weight of the unit. See Table 1 for unit operating weights.

**Step 5 — Install Duct System** — The duct system should be sized to handle the design airflow quietly.

**NOTE:** Depending on the unit, the fan wheel may have a shipping support installed at the factory. This must be removed before operating unit.

**SOUND ATTENUATION** — To eliminate the transfer of vibration to the duct system, a flexible connector is recommended for both discharge and return air duct connections on metal duct systems. The supply and return plenums should include internal duct liner of fiberglass or be made of duct board construction to maximize sound attenuation of the blower. Installing the WSHP unit to uninsulated ductwork in an unconditioned space is not recommended since it will sweat and adversely affect the unit's performance.

To reduce air noise, at least one 90-degree elbow could be included in the supply and return air ducts, provided system performance is not adversely impacted. The blower speed can be also changed in the field to reduce air noise or excessive airflow, provided system performance is not adversely impacted.

**EXISTING DUCT SYSTEM** — If the unit is connected to existing ductwork, consider the following:

- Verify that the existing ducts have the proper capacity to handle the unit airflow. If the ductwork is too small, larger ductwork should be installed.
- Check existing ductwork for leaks and repair as necessary.

**NOTE:** Local codes may require ventilation air to enter the space for proper indoor air quality. Hard-duct ventilation may be required for the ventilating air supply. If hard ducted ventilation is not required, be sure that a proper air path is provided for ventilation air to unit to meet ventilation requirement of the space.

### Step 6 — Install Condensate Piping Drain

**INSTALLATION** — Slope the unit toward the drain at a 1 cm per 50 cm pitch. See Fig. 4. If it is not possible to meet the required pitch, a condensate pump should be installed at the unit to pump condensate to building drain.

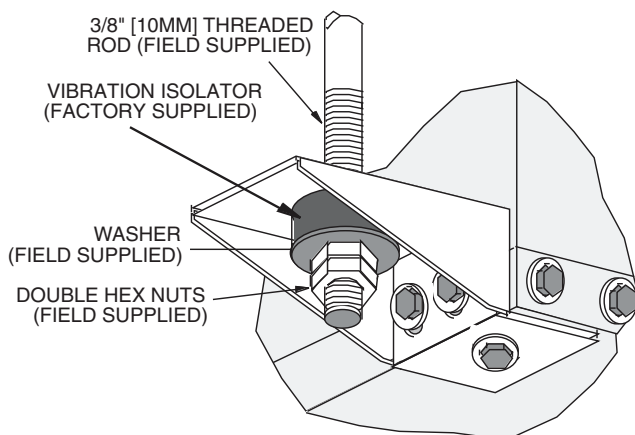
Install condensate trap at each unit with the top of the trap positioned below the unit condensate drain connection as shown in Fig. 5. Design the depth of the trap (water-seal) based upon the amount of ESP (external static pressure) capability of the blower (where 2 in. wg of ESP capability requires 2 in. of trap depth). As a general rule, 38 mm trap depth is the minimum. Each unit must be installed with its own individual trap and connection to the condensate line (main) or riser.

Units are not internally trapped, therefore an external trap is necessary. Each unit must be installed with its own individual trap and means to flush or blowout the condensate drain line. Do not install units with a common trap or vent. For typical condensate connections see Fig. 5.

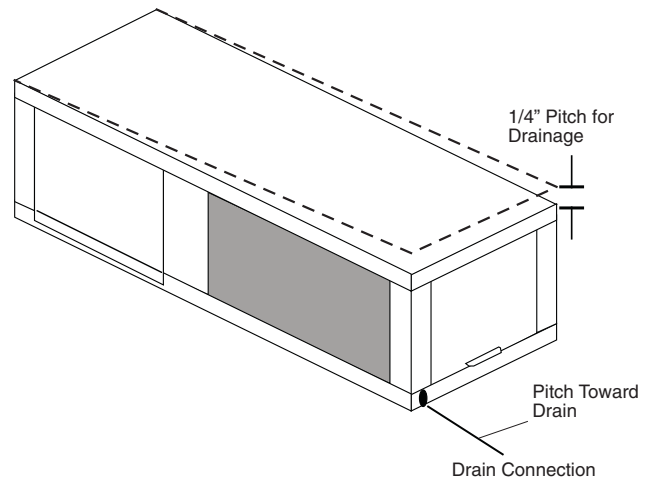
**NOTE:** Never use a pipe size smaller than the connection.

**VENTING** — A vent should be installed in the condensate line of any application which may allow dirt or air to collect in the line. Consider the following:

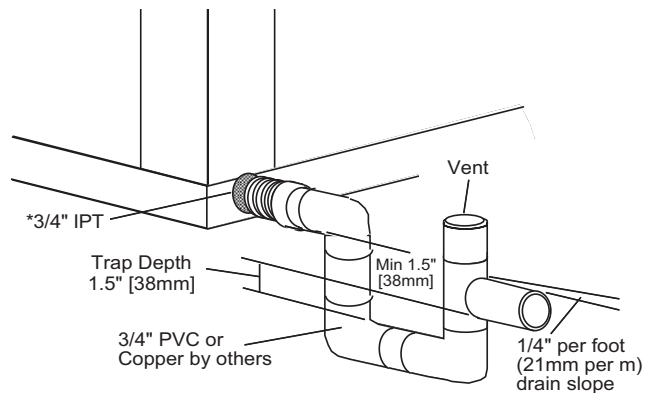
- Always install a vent where an application requires a long horizontal run.
- Always install a vent where large units are working against higher external static pressure and to allow proper drainage for multiple units connected to the same condensate main.
- Be sure to support the line where anticipated sagging from the condensate or when “double trapping” may occur.
- If condensate pump is present on unit, be sure drain connections have a check valve to prevent back flow of condensate into other units.



**Fig. 3 — Hanger Brackets**



**Fig. 4 — Horizontal Unit Pitch**



**Fig. 5 — Trap Condensate Drain**

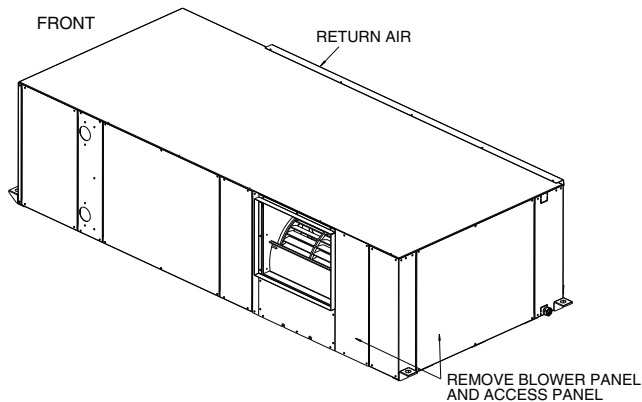
**Step 7 — Field Convert Air Discharge** — Horizontal units can be field converted between straight (side) and back (end) discharge.

**NOTE:** It is not possible to field convert return air between left or right return models due to the necessity of refrigeration copper piping changes.

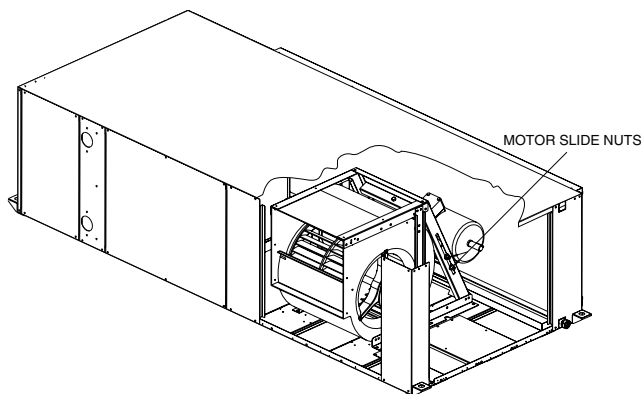
Field conversion must be completed on the ground. If the unit is already hung it should be taken down for the field conversion. Place in a well-lighted area. Conversion should only be attempted by a qualified service technician.

#### SIDE TO BACK DISCHARGE CONVERSION

1. Remove back panel and side access panel. See Fig. 6.
2. Loosen 2 motor slide nuts, raise motor slide assembly and remove belt and motor sheave. See Fig. 7.
3. Remove blower sheave. Remove motor bolts and carefully remove motor. See Fig. 8.
4. Remove 2 motor clips and reattach to opposite side. See Fig. 9.
5. Unbolt (3 per side) complete housing assembly. See Fig. 9.
6. Rotate complete assembly into new position. Locate over mounting holes in base, reattach using 3 bolts per side.



**Fig. 6 — Removing Panels**



**Fig. 7 — Removing Belt**

7. Mount motor, motor sheave, blower sheave and belt. Make sure wires are not pinched and not over sharp edges. Adjust motor downward to tighten belt. Raise or lower motor slide assembly with adjusting bolt and retighten the 2 slide nuts. Check for correct tension. Rewire motor (at contactor) for correct rotation. Spin blower wheel to ensure wheel is not obstructed.

8. Replace panels from Step 1.

**BACK TO SIDE DISCHARGE CONVERSION** — If the discharge is changed from back to side, use the above instructions. Note that figures will be reversed.

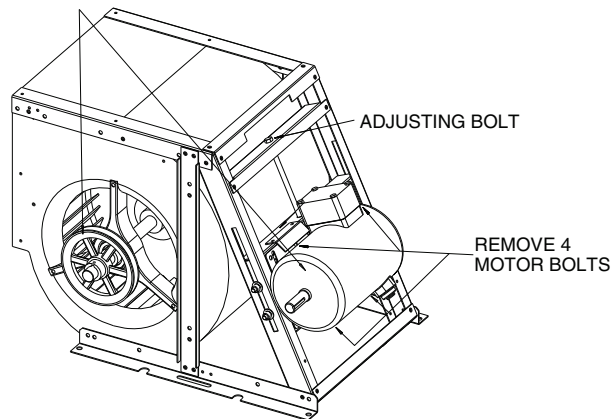
**LEFT OR RIGHT RETURN UNITS** — It is not possible to field convert return air between left or right return units due to the necessity of refrigeration copper piping changes. However, the conversion process of side to back or back to side discharge for either right or left return configuration is the same. In some cases, it may be possible to rotate the entire unit 180 degrees if the return air connection needs to be on the opposite side. Note that rotating the unit will move the piping to the other end of the unit.

**Step 8 — Install Piping Connections** — Depending on the application, there are 3 types of WSHP piping systems to choose from: water loop, ground-water and ground loop. Refer to the Carrier System Design Manual for additional information.

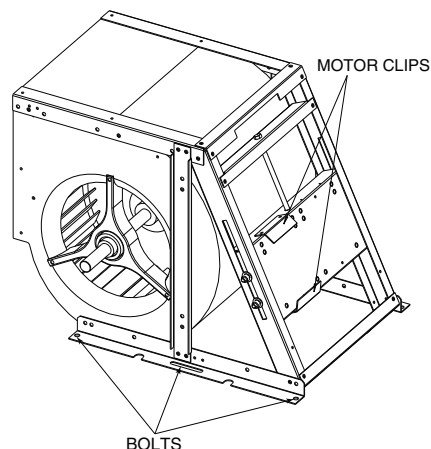
All WSHP units utilize low temperature soldered female pipe thread fittings for water connections to prevent annealing and out-of-round leak problems which are typically associated with high temperature brazed connections. Refer to Table 1 for connection sizes. When making piping connections, consider the following:

- A backup wrench must be used when making screw connections to unit to prevent internal damage to piping.

REMOVE MOTOR AND BLOWER SHEAVE



**Fig. 8 — Removing Motor**



**Fig. 9 — Removing Blower Assembly**

- Insulation may be required on piping to avoid condensation in the case where fluid in loop piping operates at temperatures below dew point of adjacent air.
- Piping systems that contain steel pipes or fittings may be subject to galvanic corrosion. Dielectric fittings may be used to isolate the steel parts of the system to avoid galvanic corrosion.
- Do not allow hoses to rest against structural building components. Compressor vibration may be transmitted through the hoses to the structure, causing unnecessary noise complaints.

Figure 10 shows a typical supply/return hose kit assembly.

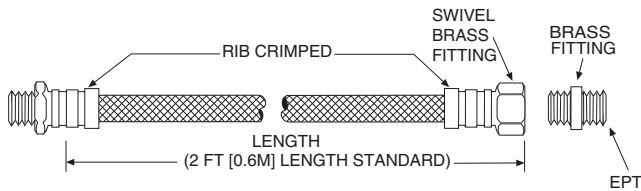
**WATER LOOP APPLICATIONS** — Water loop applications usually include a number of units plumbed to a common piping system. Maintenance to any of these units can introduce air into the piping system. Therefore, air elimination equipment comprises a major portion of the mechanical room plumbing.

The flow rate is usually set between 2.41 and 3.23 L/m per kW of cooling capacity. For proper maintenance and servicing, pressure-temperature (P/T) ports are necessary for temperature and flow verification.

In addition to complying with any applicable codes, consider the following for system piping:

- Piping systems utilizing water temperatures below 10 C require 13 mm closed cell insulation on all piping surfaces to eliminate condensation.

## Step 9 — Install Field Power Supply Wiring



**Fig. 10 — Supply/Return Hose Kit**

- All plastic to metal threaded fittings should be avoided due to the potential to leak. Use a flange fitted substitute.
- Teflon tape thread sealant is recommended to minimize internal fouling of the heat exchanger.
- Use backup wrench. Do not overtighten connections.
- Route piping to avoid service access areas to unit.
- The piping system should be flushed prior to operation to remove dirt and foreign materials from the system.

**GROUND-LOOP APPLICATIONS** — Temperatures between  $-3.9$  and  $43.3$  C and a cooling capacity of 2.41 to 3.23 L/s per kW of flow per ton are recommended. In addition to complying with any applicable codes, consider the following for system piping:

- Piping materials should be limited to only polyethylene fusion in the buried sections of the loop.
- Galvanized or steel fittings should not be used at any time due to corrosion.
- All plastic to metal threaded fittings should be avoided due to the potential to leak. Use a flange fitted substitute.
- Do not overtighten connections.
- Route piping to avoid service access areas to unit.
- Pressure-temperature (P/T) plugs should be used to measure flow of pressure drop.

**GROUND-WATER APPLICATIONS** — Typical ground-water piping is shown in Fig. 11. In addition to complying with any applicable codes, consider the following for system piping:

- Install shut-off valves for servicing.
- Install pressure-temperature plugs to measure flow and temperature.
- Boiler drains and other valves should be connected using a “T” connector to allow acid flushing for the heat exchanger.
- Do not overtighten connections.
- Route piping to avoid service access areas to unit.
- Use PVC SCH80 or copper piping material.

**NOTE:** PVC SCH40 should *not* be used due to system high pressure and temperature extremes.

**Water Supply and Quantity** — Check water supply. Water supply should be plentiful and of good quality. See Table 2 for water quality guidelines.

**IMPORTANT:** Failure to comply with the above required water quality and quantity limitations and the closed-system application design requirements may cause damage to the tube-in-tube heat exchanger that is not the responsibility of the manufacturer.

In all applications, the quality of the water circulated through the heat exchanger must fall within the ranges listed in the Water Quality Guidelines table. Consult a local water treatment firm, independent testing facility, or local water authority for specific recommendations to maintain water quality within the published limits.

### ⚠ WARNING

Electrical shock can cause personal injury and death. Shut off all power to this equipment during installation. There may be more than one disconnect switch. Tag all disconnect locations to alert others not to restore power until work is completed.

### ⚠ CAUTION

Use only copper conductors for field-installed electrical wiring. Unit terminals are not designed to accept other types of conductors.

All field-installed wiring, including the electrical ground, MUST comply with the National Electrical Code (NEC, U.S.A.) as well as applicable local codes. In addition, all field wiring must conform to the Class II temperature limitations described in the NEC.

Refer to unit wiring diagrams Fig. 12-16 for fuse sizes and a schematic of the field connections which must be made by the installing (or electrical) contractor.

Consult the unit wiring diagram located on the inside of the compressor access panel to ensure proper electrical hookup. The installing (or electrical) contractor must make the field connections when using field-supplied disconnect.

Operating voltage must be the same voltage and phase as shown in electrical data shown in Tables 3A and 3B.

Make all final electrical connections with a length of flexible conduit to minimize vibration and sound transmission to the building.

**POWER CONNECTION** — Line voltage connection is made by connecting the incoming line voltage wires to the L side of the power block terminal. See Fig. 17. See Tables 3A and 3B for correct wire and maximum overcurrent protection sizing. See Table 4 for low voltage VA ratings.

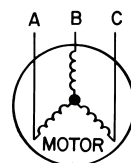
**SUPPLY VOLTAGE** — Operating voltage to unit must be within voltage range indicated on unit nameplate.

On 3-phase units, voltages under load between phases must be balanced within 2%. Use the following formula to determine the percentage voltage imbalance:

$$\% \text{ Voltage Imbalance} = 100 \times \frac{\text{max voltage deviation from average voltage}}{\text{average voltage}}$$

Example: Supply voltage is 420-3-50.

AB = 425 volts  
BC = 422 volts  
AC = 417 volts



$$\begin{aligned} \text{Average Voltage} &= \frac{425 + 422 + 417}{3} \\ &= \frac{1264}{3} \\ &= 421 \end{aligned}$$

Determine maximum deviation from average voltage:

(AB)  $425 - 421 = 4$  v  
(BC)  $422 - 421 = 1$  v  
(AC)  $421 - 418 = 3$  v

Maximum deviation is 4 v.



Determine percent voltage imbalance.

$$\begin{aligned} \% \text{ Voltage Imbalance} &= 100 \times \frac{4}{421} \\ &= 0.95\% \end{aligned}$$

This amount of phase imbalance is satisfactory as it is below the maximum allowable 2%.

Operation on improper line voltage or excessive phase imbalance constitutes abuse and may cause damage to electrical components.

NOTE: If more than 2% voltage imbalance is present, contact local electric utility.

EXTERNAL LOOP POWER CONNECTION — If the unit is to be connected to an external loop pump or flow controller, connect the pump to the loop pump terminal block PB1. The maximum power handling is 4 amps at 240 volts. The pumps will automatically cycle as required by the unit.

420-VOLT OPERATION — All 380/420 volt units are factory wired for 380 volts. The transformers may be switched to 420-volt operation (as illustrated on the wiring diagram) by disconnecting the VIO lead at L1 and attaching the BRN lead to L1. Close open end of VIO lead.

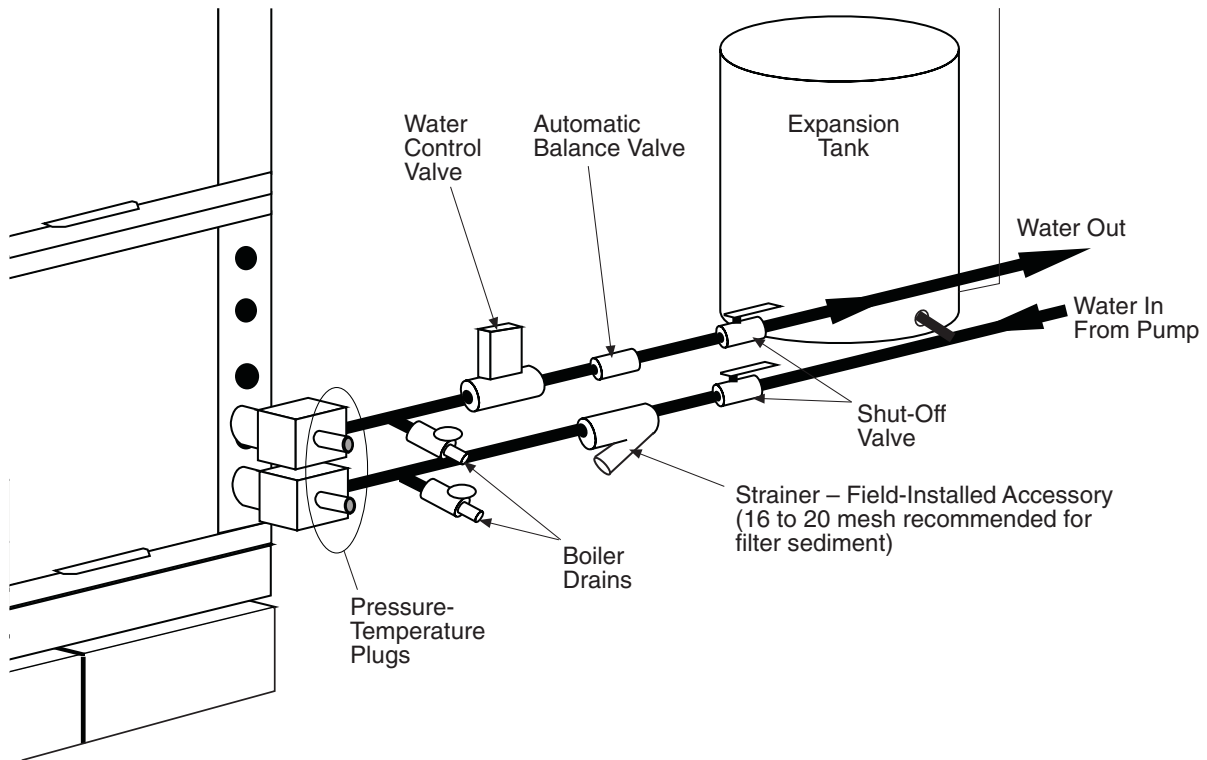


Fig. 11 — Typical Ground-Water Piping Installation

**Table 2 — Water Quality Guidelines**

CONDITION	HX MATERIAL*	CLOSED RECIRCULATING†	OPEN LOOP AND RECIRCULATING WELL**
<b>Scaling Potential — Primary Measurement</b>			
Above the given limits, scaling is likely to occur. Scaling indexes should be calculated using the limits below.			
pH/Calcium Hardness Method	All	N/A	pH < 7.5 and Ca Hardness, <100 ppm
<b>Index Limits for Probable Scaling Situations (Operation outside these limits is not recommended.)</b>			
Scaling indexes should be calculated at 150 F for direct use and HWG applications, and at 90 F for indirect HX use. A monitoring plan should be implemented.			
Ryznar Stability Index	All	N/A	6.0 - 7.5 If >7.5 minimize steel pipe use.
Langelier Saturation Index	All	N/A	-0.5 to +0.5 If <-0.5 minimize steel pipe use. Based upon 150 F HWG and direct well, 85 F indirect well HX.
<b>Iron Fouling</b>			
Iron Fe <sup>2+</sup> (Ferrous) (Bacterial Iron Potential)	All	N/A	<0.2 ppm (Ferrous) If Fe <sup>2+</sup> (ferrous) >0.2 ppm with pH 6 - 8, O <sub>2</sub> <5 ppm check for iron bacteria.
Iron Fouling	All	N/A	<0.5 ppm of Oxygen Above this level deposition will occur.
<b>Corrosion Prevention††</b>			
pH	All	6 - 8.5 Monitor/treat as needed.	6 - 8.5 Minimize steel pipe below 7 and no open tanks with pH <8.
Hydrogen Sulfide (H <sub>2</sub> S)	All	N/A	<0.5 ppm At H <sub>2</sub> S>0.2 ppm, avoid use of copper and cupronickel piping or HXs. Rotten egg smell appears at 0.5 ppm level. Copper alloy (bronze or brass) cast components are okay to <0.5 ppm.
Ammonia Ion as Hydroxide, Chloride, Nitrate and Sulfate Compounds	All	N/A	<0.5 ppm
Maximum Chloride Levels			Maximum allowable at maximum water temperature.
			50 F (10 C)      75 F (24 C)      100 F (38 C)
	Copper	N/A	<20 ppm
	CuproNickel	N/A	NR
	304 SS	N/A	NR
	316 SS	N/A	<250 ppm
	Titanium	N/A	<550 ppm
			>1000 ppm      >550 ppm      >375 ppm
<b>Erosion and Clogging</b>			
Particulate Size and Erosion	All	<10 ppm of particles and a maximum velocity of 6 fps. Filtered for maximum 800 micron size.	<10 ppm (<1 ppm "sand free" for reinjection) of particles and a maximum velocity of 6 fps. Filtered for maximum 800 micron size. Any particulate that is not removed can potentially clog components.
Brackish	All	N/A	Use cupronickel heat exchanger when concentrations of calcium or sodium chloride are greater than 125 ppm are present. (Seawater is approximately 25,000 ppm.)

**LEGEND**

- HWG** — Hot Water Generator
- HX** — Heat Exchanger
- N/A** — Design Limits Not Applicable Considering Recirculating Potable Water
- NR** — Application Not Recommended
- SS** — Stainless Steel

\*Heat exchanger materials considered are copper, cupronickel, 304 SS (stainless steel), 316 SS, titanium.

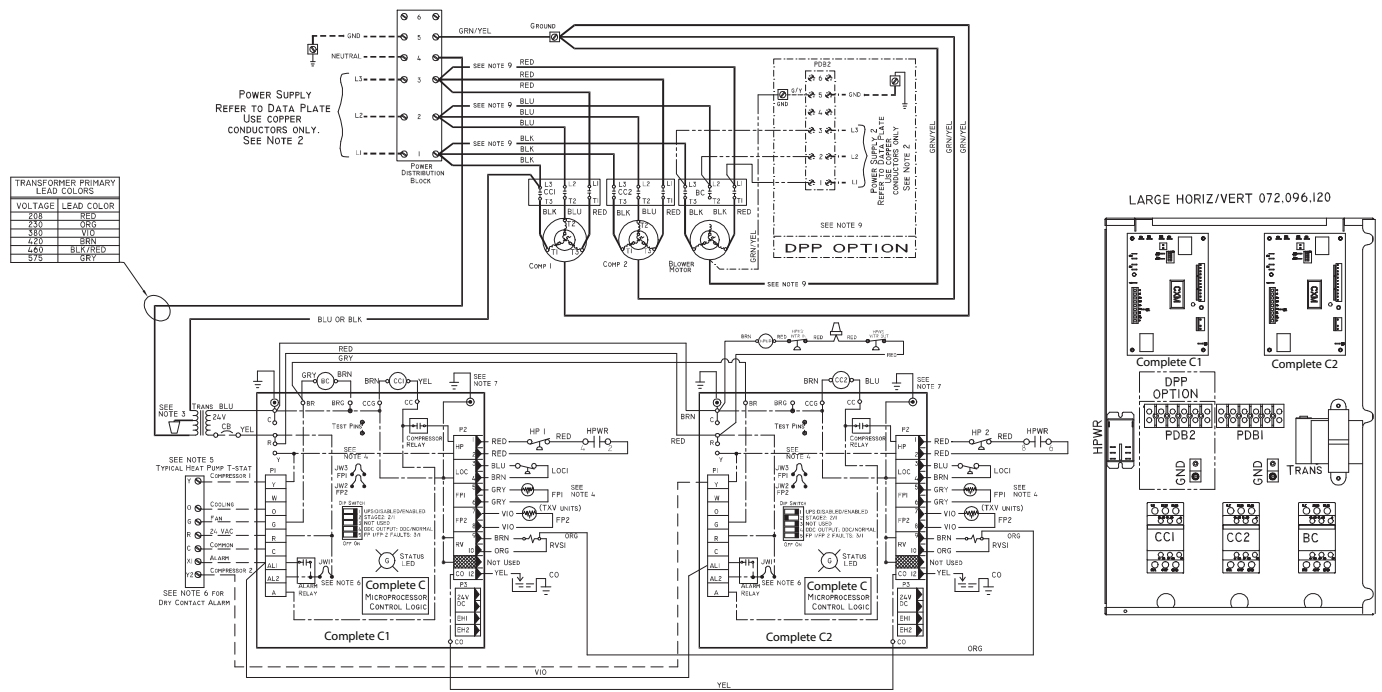
†Closed recirculating system is identified by a closed pressurized piping system.

\*\*Recirculating open wells should observe the open recirculating design considerations.

††If the concentration of these corrosives exceeds the maximum allowable level, then the potential for serious corrosion problems exists.

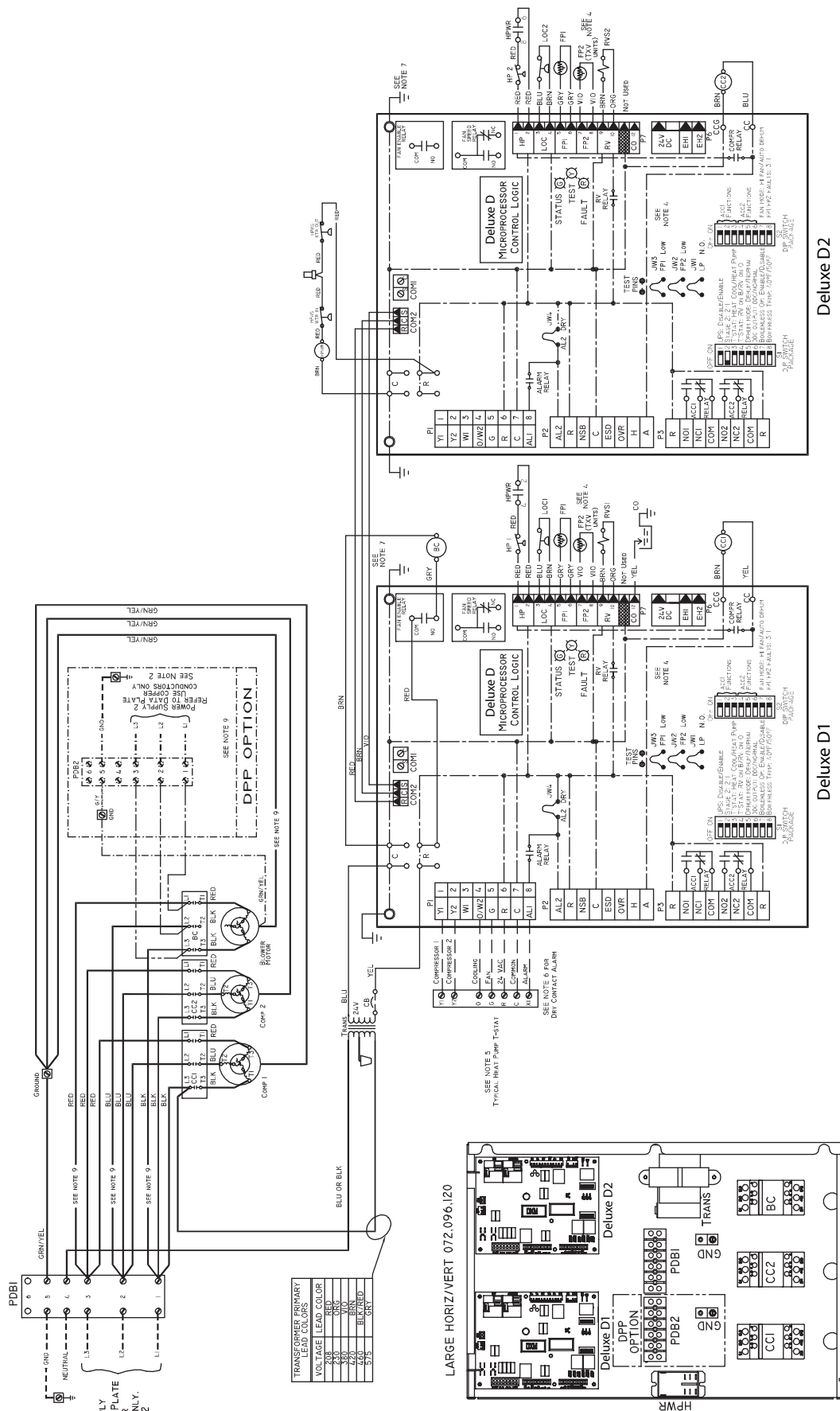
Sulfides in the water quickly oxidize when exposed to air, requiring that no agitation occur as the sample is taken. Unless tested immediately at the site, the sample will require stabilization with a few drops of one Molar zinc acetate solution, allowing accurate sulfide determination up to 24 hours after sampling. A low pH and high alkalinity cause system problems, even when both values are within ranges shown. The term pH refers to the acidity, basicity, or neutrality of the water supply. Below 7.0, the water is considered to be acidic. Above 7.0, water is considered to be basic. Neutral water contains a pH of 7.0.

NOTE: To convert ppm to grains per gallon, divide by 17. Hardness in mg/l is equivalent to ppm.



- NOTES:**
- Compressor and blower motor thermally protected internally.
  - All wiring to the unit must comply with NEC (National Electrical Code, U.S.A.) and local codes.
  - 380/420-v transformers will be connected for 380-v operation. For 420-v operation, disconnect VIO lead at L1, and attach BRN lead to L1. Close open end of VIO lead.
  - FPI thermistor provides freeze protection for WATER. When using ANTIFREEZE solutions, cut JW3 jumper.
  - Typical heat pump thermostat wiring shown. Refer to thermostat installation instructions for wiring to the unit. Thermostat wiring must be "Class 1" and voltage rating equal to or greater than unit supply voltage.
  - 24-v alarm signal shown. For dry alarm contact, cut JW1 jumper and dry contact will be available between AL1 and AL2.
  - Transformer secondary ground via Complete C board standoffs and screws to control box. (Ground available from top two stand-offs as shown.)
  - Suffix 1 designates association with lead compressor. Suffix 2 with lag compressor.
  - For dual point power (DPP) option, blower wire will connect to other PDB.

**Fig. 12 — 50HQP072-120 Units — Typical Control Wiring with Complete C Control**

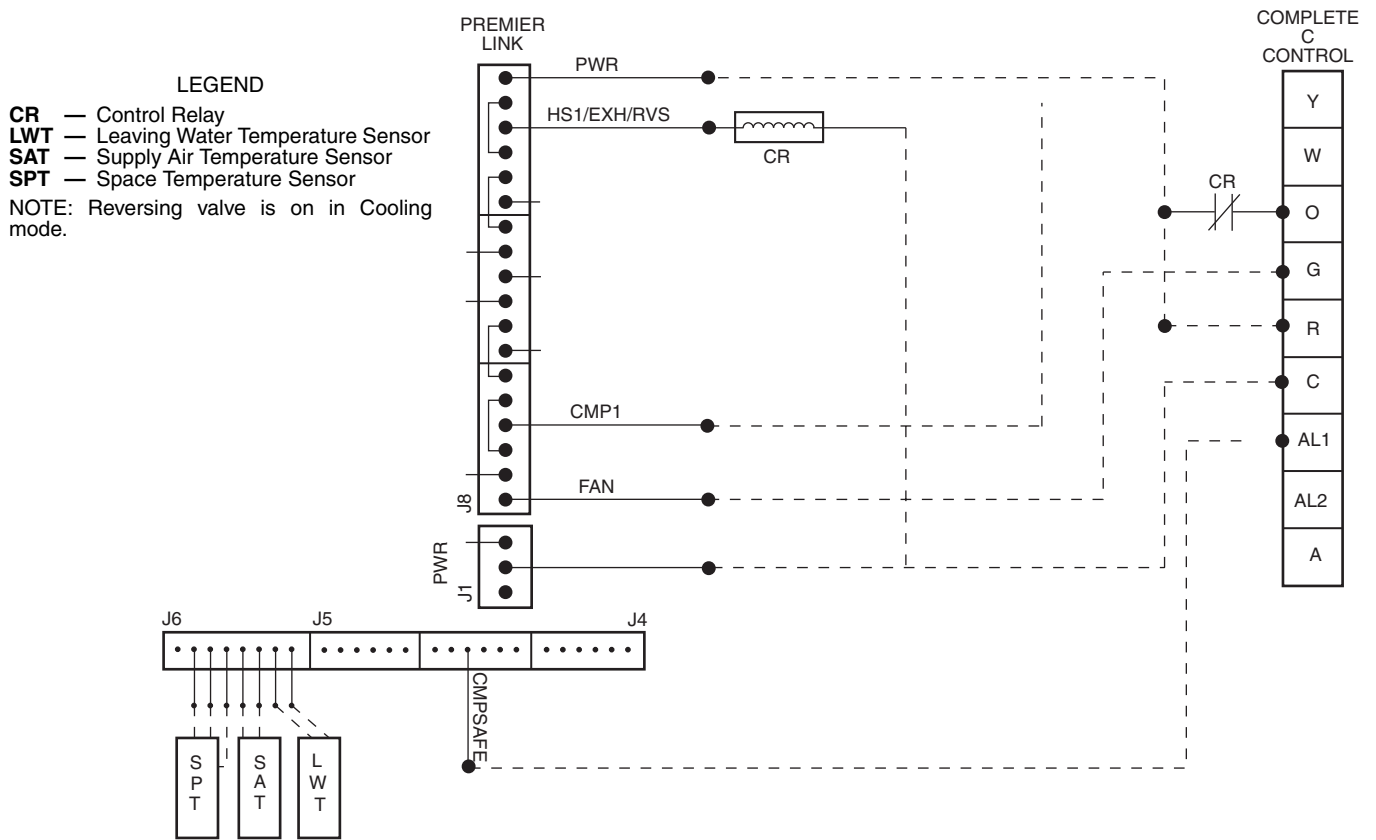


Deluxe D2

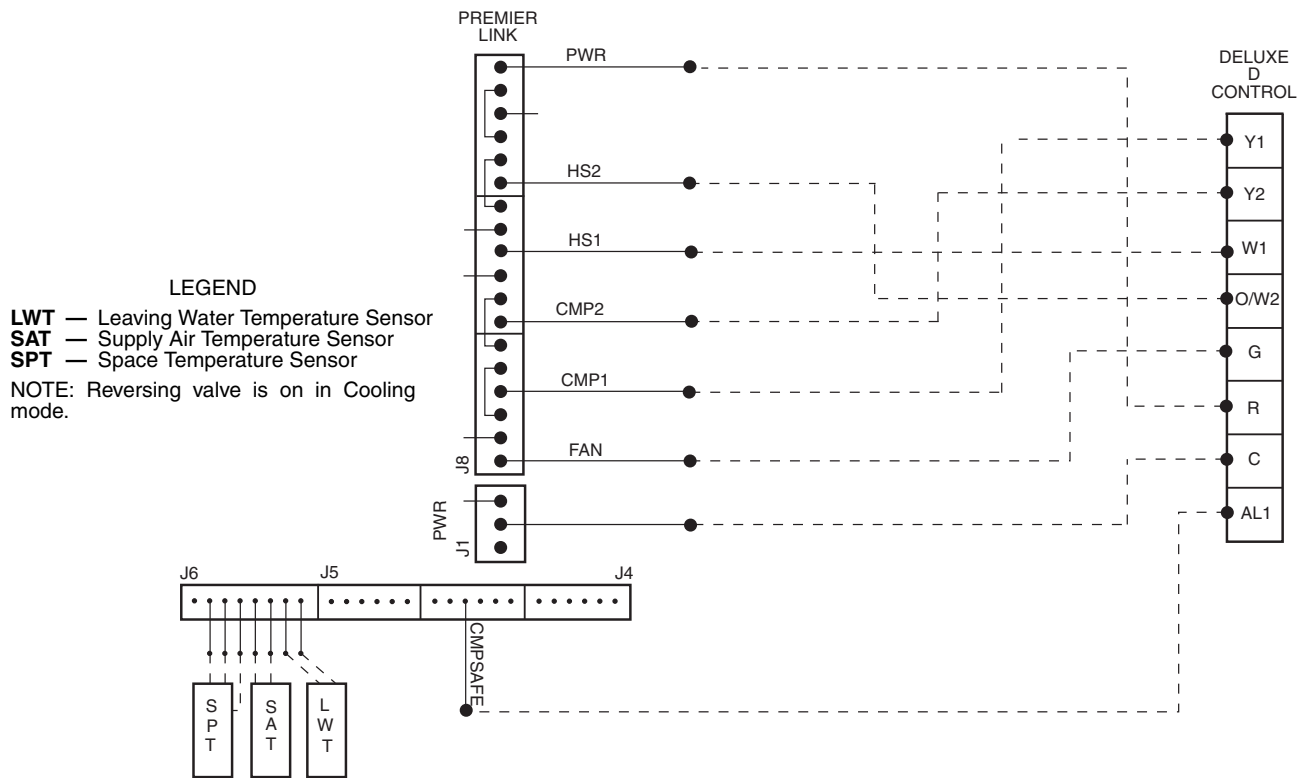
Deluxe D1

Fig. 13 — 50HQ072-120 Units — Typical Control Wiring with Deluxe D Control

See legend and notes on page 11.



**Fig. 14 — Premierlink™ Controller Applications Wiring with Complete C Control**



**Fig. 15 — Premierlink™ Controller Applications Wiring with Deluxe D Control**

**Table 3A — Electrical Data — 50HQP072-120 Standard Units**

UNIT 50HQP	VOLTAGE CODE	VOLTAGE	MIN/MAX VOLTAGE	BLOWER OPTION	COMPRESSOR			FAN MOTOR FLA	TOTAL UNIT FLA	MIN CIRCUIT AMP	MAX FUSE
					QTY	RLA	LRA				
072	9	380/420-3-50	360/440	A,B,C	2	5.4	38.0	1.8	12.6	13.9	15
096	9	380/420-3-50	360/440	A,B,C	2	6.1	43.0	3.4	15.6	17.1	20
120	9	380/420-3-50	360/440	A,B,C	2	7.8	51.5	4.9	20.5	22.5	30

**Table 3B — Electrical Data — 50HQP072-120 Dual Point Power Units**

UNIT 50HQP	VOLTAGE CODE	VOLTAGE	MIN/MAX VOLTAGE	BLOWER OPTION	COMPRESSOR						EMERGENCY POWER SUPPLY		
					QTY	RLA	LRA	Total Comp FLA	Comp MCA	Comp Max Fuse	Fan Motor FLA	Fan MCA	FAN MAX FUSE
072	9	380/420-3-50	360/440	A,B,C	2	5.4	38.0	10.8	12.2	15	1.8	2.3	15
096	9	380/420-3-50	360/440	A,B,C	2	6.1	43.0	12.2	13.7	15	3.4	4.3	15
120	9	380/420-3-50	360/440	A,B,C	2	7.8	51.5	15.6	17.6	25	4.9	6.1	15

**LEGEND**

- FLA — Full Load Amps
- HACR — Heating, Air Conditioning, and Refrigeration
- LRA — Locked Rotor Amps
- MCA — Minimum Circuit Amps
- RLA — Rated Load Amps

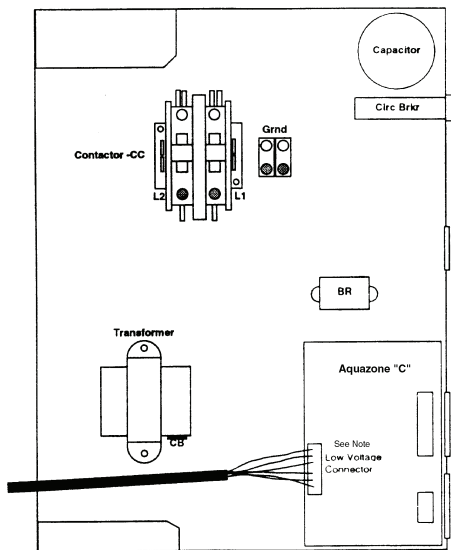
\*Time-delay fuse or HACR circuit breaker.



**Table 4 — Low Voltage VA Ratings**

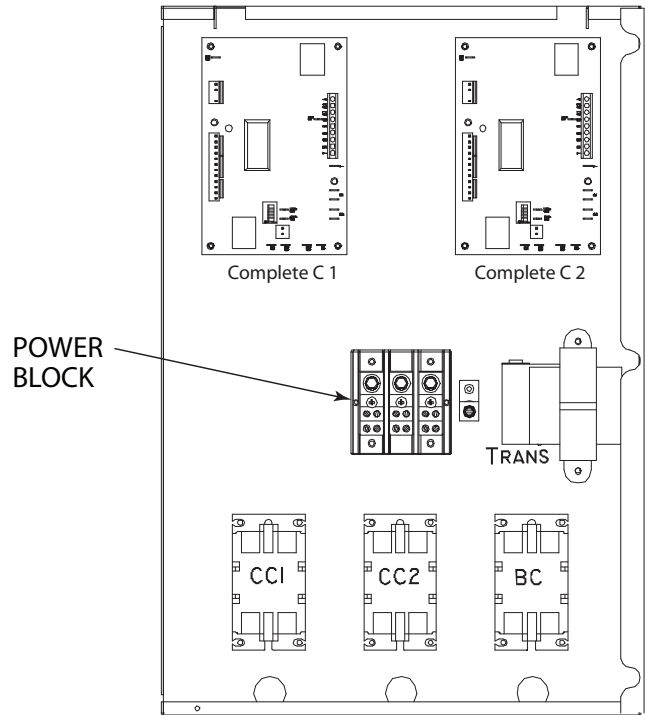
COMPONENTS IN UNIT	VA
Typical Blower Contactor	6 - 9
Typical Reversing Valve Solenoid (2)	8 - 12
30A Compressor Contactor (2)	12 - 18
Complete C Board (2)	10 - 18
Deluxe D Board (2)	16 - 24
<b>Remaining VA for Accessories*</b>	
Units with Complete C	18 - 39
Units with Deluxe D	12 - 33

\* Standard transformer is 75 VA.



NOTE: Low voltage connector may be removed for easy installation.

**Fig. 16 — Low Voltage Field Wiring**



**Fig. 17 — Line Voltage Wiring**

## Step 10 — Install Field Control Wiring

**THERMOSTAT CONNECTIONS** — The thermostat should be wired directly to the Aquazone™ control board. See Fig. 18 and 19.

The thermostat should be located on an interior wall in a larger room, away from supply duct drafts. **DO NOT** locate the thermostat in areas subject to sunlight, drafts or on external walls. The wire access hole behind the thermostat may in certain cases need to be sealed to prevent erroneous temperature measurement.

Position the thermostat back plate against the wall so that it appears level and so the thermostat wires protrude through the middle of the back plate. Mark the position of the back plate mounting holes and drill holes with a 3/16-in. bit. Install supplied anchors and secure plate to the wall. Thermostat wire must be 18 AWG (American Wire Gage) wire. Wire the appropriate thermostat as shown in Fig. 20 and 21 to the low voltage terminal strip on the Complete C or Deluxe D control board.

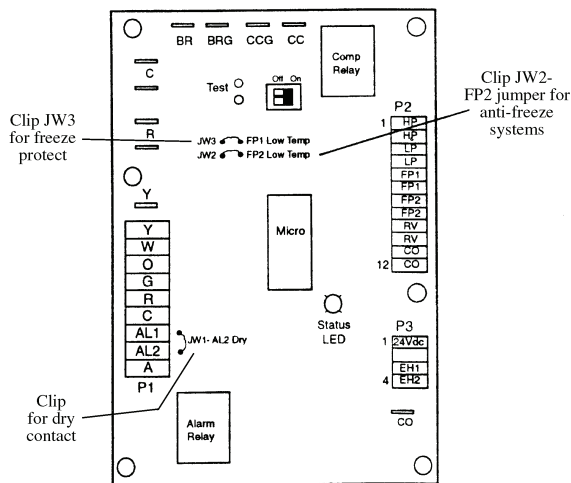
Most heat pump thermostats will work with a Carrier unit, provided the thermostat has the correct number of heating and cooling stages.

**WATER FREEZE PROTECTION** — The Aquazone control allows the field selection of source fluid freeze protection points through jumpers. The factory setting of jumper JW3 (FP1) is set for water at -1.1 C. In earth loop applications, jumper JW3 should be clipped to change the setting to -12.2 C when using antifreeze in colder earth loop applications. See Fig. 18.

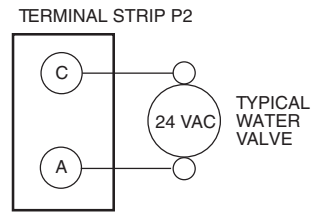
**AIR COIL FREEZE PROTECTION** — The air coil freeze protection jumper JW2 (FP2) is factory set for -1.1 C and should not need adjusting.

**ACCESSORY CONNECTIONS** — Terminal labeled A on the control is provided to control accessory devices such as water valves, electronic air cleaners, humidifiers, etc. This signal operates with the compressor terminal. See Fig. 19. Refer to the specific unit wiring schematic for details.

**NOTE:** The A terminal should *only* be used with 24 volt signals — not line voltage signals.



AQUAZONE CONTROL (Complete C Control Shown)  
**Fig. 18 — Typical Aquazone™ Control Board Jumper Locations**

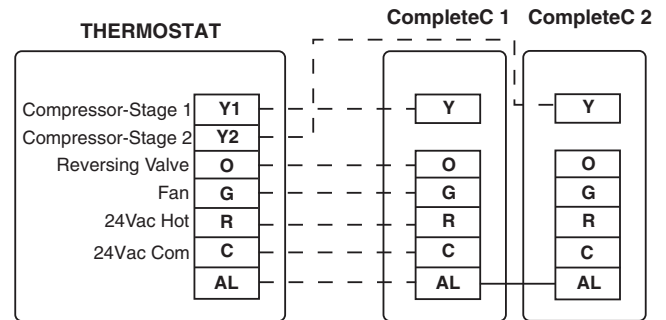


**Fig. 19 — Typical Aquazone Accessory Wiring (Control D Shown)**

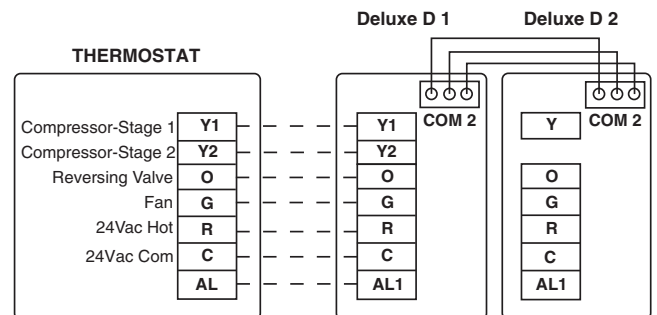
**WATER SOLENOID VALVES** — Water solenoid valves may be used on variable flow systems and ground water installations. A typical well water control valve wiring which can limit waste water in a lockout condition is shown in Fig. 18. A slow closing valve may be required to prevent water hammer. When using a slow closing valve, special wiring conditions need to be considered. The valve takes approximately 60 seconds to open (very little water will flow before 45 seconds) and it activates the compressor only after the valve is completely opened by closing its end switch. When wired as shown, the valve will have the following operating characteristics:

1. Remain open during a lockout.
2. Draw approximately 25 to 35 VA through the “Y” signal of the thermostat.

**IMPORTANT:** The use of a slow-closing water solenoid valve can overheat the anticipators of electromechanical thermostats. Only use relay based electronic thermostats.



**Fig. 20 — Thermostat Wiring to Complete C Board**



**Fig. 21 — Thermostat Wiring to Deluxe D Board**

## PRE-START-UP

**System Checkout** — When the installation is complete, follow the system checkout procedure outlined below before starting up the system. Be sure:

1. Voltage is within the utilization range specifications of the unit compressor and fan motor and voltage is balanced for 3-phase units.
2. Fuses, breakers and wire are correct size.
3. Low voltage wiring is complete.
4. Piping and system flushing is complete.
5. Air is purged from closed loop system.
6. System is balanced as required. Monitor if necessary.
7. Isolation valves are open.
8. Water control valves or loop pumps are wired.
9. Condensate line is open and correctly pitched.
10. Transformer switched to lower voltage tap if necessary.
11. Blower rotates freely — shipping support is removed.
12. Blower speed is on correct setting.
13. Air filter is clean and in position.
14. Service/access panels are in place.
15. Return-air temperature is 4.4 to 26.7 C for heating and 10.0 to 43.3 C for cooling.
16. Air coil is clean.
17. Control field selected settings are correct.

**AIR COIL** — To obtain maximum performance, the air coil should be cleaned before starting the unit. A ten percent solution of dishwasher detergent and water is recommended for both sides of the coil. Rinse thoroughly with water.

**Airflow and External Static Pressure** — The 50HQP units are available with standard, low, and high-static factory-installed options. These options will substitute a different blower drive sheave for each static range. In addition, certain static ranges may require the optional large fan motor.

**SHEAVE ADJUSTMENT** — The 50HQP units are supplied with a variable sheave drive on the fan motor to adjust for differing airflows at various ESP (external static pressure) conditions. See Tables 5-7 for unit airflows. When fully closed, the sheave will produce the highest static capability (higher rpm).

To adjust sheave position, follow the procedure outlined below:

1. Loosen belt tension and remove belt.
2. Loosen set screw on fan motor.
3. Open sheave to desired position.
4. Retighten set screw and replace belt.

NOTE: Set belt tension as outlined below.

**BELT TENSION ADJUSTMENT** — An overly loose belt will, upon starting motor, produce a slippage “squeal” and cause premature belt failure and or intermittent airflow. An overly tight belt can cause premature motor or blower bearing failure. To adjust the belt tension, follow the procedure outlined below:

1. Remove belt from motor sheave.
2. Lift motor assembly.
3. Loosen the  $\frac{5}{16}$ -in. hex nuts on the grommet motor adjustment bolts (2 per bolt). To increase the belt tension loosen the top hex nut. To decrease the belt tension loosen the bottom hex nut.
4. Turn the bolts by hand to the desired position then tighten the  $\frac{5}{16}$ -in. hex nuts (2 per bolt).
5. Lower the motor assembly.
6. Install the belt.
7. The belt tension can be adjusted by using one of the following methods:
  - a. Tighten until belt deflects approximately 13 mm with very firm finger pressure.
  - b. Grasp belt midway between two pulleys and twist for a 90-degree rotation.  
NOTE: Adjusting less than 90 degrees will overtighten the belt and adjusting more than 90 degrees will loosen belt.
  - c. Set proper belt tension to 32 to 36 kg.

NOTE: The motor position should not need adjustment. Motor sheave position is at mid position of each sheave. For example, the motor sheave is 2.5 turns open on a 5-turn sheave. The belt tension adjustment can also be accomplished by turning the  $\frac{5}{16}$ -in. hex nuts to the desired position.

NOTE: Available airflows for all units are shown in Tables 5-7.



**Table 5 — Blower Data — 50HQP072**

AIRFLOW (l/s)		EXTERNAL STATIC PRESSURE (Pa)															
		0	25	50	75	100	125	150	175	200	225	250	275	300	325	350	375
614	BkW	—	—	0.09	0.12	0.14	0.17	0.19	0.21	0.24	0.25	0.27	0.29	0.31	0.32	0.34	0.35
	Sheave/Mtr	—	—	B	A	A	A	A	A	C	C	C	C	C	C	C	C
	RPM	—	—	505	563	615	655	695	730	765	790	815	840	870	890	910	925
	Turns Open	—	—	3	5	3.5	3	2	1	5	4.5	4	3.5	2.5	2.5	2	1.5
661	BkW	—	0.12	0.14	0.17	0.19	0.22	0.24	0.26	0.29	0.30	0.33	0.34	0.36	0.38	0.40	—
	Sheave/Mtr	—	B	A	A	A	A	C	C	C	C	C	C	C	C	C	—
	RPM	—	526	578	635	675	715	755	785	815	840	870	890	910	930	950	—
	Turns Open	—	2	4.5	3	2.5	1.5	5	4.5	4	3.5	3	2	2	1.5	1	—
708	BkW	0.12	0.14	0.17	0.19	0.22	0.25	0.27	0.29	0.32	0.34	0.36	0.38	0.41	0.43	—	—
	Sheave/Mtr	B	B	A	A	A	A	C	C	C	C	C	C	C	C	—	—
	RPM	500	547	604	650	695	735	775	805	835	865	890	915	940	960	—	—
	Turns Open	3	1.5	4	3	2	1	4.5	4	3.5	3	2.5	2	1.5	1	—	—
755	BkW	0.14	0.17	0.19	0.22	0.25	0.27	0.29	0.32	0.34	0.37	0.39	0.41	0.44	—	—	—
	Sheave/Mtr	B	B	A	A	A	A	C	C	C	C	C	C	C	—	—	—
	RPM	510	568	620	665	710	750	785	820	855	885	910	935	960	—	—	—
	Turns Open	2.5	1	3.5	2.5	1.5	1	4.5	3.5	3	2.5	2	1.5	1	—	—	—
802	BkW	0.16	0.19	0.22	0.24	0.27	0.29	0.32	0.34	0.36	0.39	0.42	0.44	—	—	—	—
	Sheave/Mtr	B	A	A	A	A	C	C	C	C	C	C	C	—	—	—	—
	RPM	531	583	635	680	720	765	800	835	870	900	925	950	—	—	—	—
	Turns Open	2	4.5	3.5	2.5	1.5	5	4	3.5	2.5	2	1.5	1	—	—	—	—
850	BkW	0.15	0.18	0.21	0.24	0.26	0.29	0.31	0.34	0.36	0.39	0.42	0.45	—	—	—	—
	Sheave/Mtr	B	B	A	A	A	A	C	C	C	C	C	C	—	—	—	—
	RPM	500	547	599	645	690	735	775	815	850	885	910	940	—	—	—	—
	Turns Open	3	1.5	4	3	2	1	5	4	3	2.5	2	1.5	—	—	—	—
897	BkW	0.18	0.21	0.23	0.27	0.30	0.33	0.36	0.40	0.43	0.46	0.49	0.52	—	—	—	—
	Sheave/Mtr	B	B	A	A	A	A	C	C	C	C	C	C	—	—	—	—
	RPM	510	557	604	655	695	740	780	820	855	890	920	950	—	—	—	—
	Turns Open	2.5	1.5	4	3	2	1	4.5	3.5	3	2	1.5	1	—	—	—	—
944	BkW	0.21	0.23	0.26	0.29	0.33	0.37	0.41	0.44	0.48	0.50	0.54	0.56	—	—	—	—
	Sheave/Mtr	B	B	A	A	A	C	C	C	C	C	C	C	—	—	—	—
	RPM	521	568	615	660	705	750	785	825	865	895	930	960	—	—	—	—
	Turns Open	2.5	1	3.5	2.5	1.5	5.5	4.5	3.5	2.5	2	1.5	1	—	—	—	—
991	BkW	0.25	0.28	0.32	0.34	0.37	0.40	0.44	0.48	0.52	0.55	0.58	—	—	—	—	—
	Sheave/Mtr	B	A	A	A	A	C	C	C	C	C	C	—	—	—	—	—
	RPM	536	583	630	670	715	755	795	835	875	905	940	—	—	—	—	—
	Turns Open	2	4.5	3.5	2.5	1.5	5	4	3.5	2.5	2	1	—	—	—	—	—
1038	BkW	0.28	0.30	0.34	0.37	0.41	0.45	0.48	0.52	0.56	0.59	0.62	—	—	—	—	—
	Sheave/Mtr	A	A	A	A	A	C	C	C	C	C	C	—	—	—	—	—
	RPM	557	599	645	685	730	770	810	850	885	915	950	—	—	—	—	—
	Turns Open	5	4	3	2	1	5	4	3	2.5	1.5	1	—	—	—	—	—
1086	BkW	0.32	0.35	0.38	0.42	0.45	0.48	0.52	0.56	0.60	0.63	0.67	—	—	—	—	—
	Sheave/Mtr	A	A	A	A	A	C	C	C	C	C	C	—	—	—	—	—
	RPM	573	620	660	705	745	785	820	860	895	925	960	—	—	—	—	—
	Turns Open	4.5	3.5	3	1.5	1	4.5	3.5	3	2	1.5	1	—	—	—	—	—
1133	BkW	0.36	0.39	0.43	0.46	0.49	0.54	0.58	0.62	0.65	0.69	—	—	—	—	—	—
	Sheave/Mtr	A	A	A	A	C	C	C	C	C	C	—	—	—	—	—	—
	RPM	609	645	690	730	765	805	845	880	910	945	—	—	—	—	—	—
	Turns Open	4	3	2.5	1.5	5	4	3	2.5	2	1	—	—	—	—	—	—
1180	BkW	0.39	0.42	0.46	0.49	0.54	0.58	0.62	0.66	0.70	0.73	—	—	—	—	—	—
	Sheave/Mtr	A	A	A	A	C	C	C	C	C	C	—	—	—	—	—	—
	RPM	620	660	700	740	780	815	850	885	920	950	—	—	—	—	—	—
	Turns Open	3.5	3	2	1	4.5	4	3	2.5	1.5	1	—	—	—	—	—	—

**LEGEND**

- — Operation Not Recommended
- BkW — Brake Kilowatts
- ESP — External Static Pressure
- RPM — Revolutions Per Minute
- A — Units with Standard Rpm/Standard Motor Option
- B — Units with Low Rpm/Standard Motor Option
- C — Units with High Rpm/Standard Motor Option

**NOTES:**

1. A = Standard Rpm/Standard Motor, B = Low Rpm/Standard Motor, C = High Rpm/Standard Motor.
2. Unit factory shipped with standard static sheave and drive at 2.5 turns open. Other speed require field selection.
3. For applications requiring higher static pressures, contact your local representative. Performance data does not include drive losses and is based on sea level conditions.
4. All airflow is rated at lowest voltage if unit is dual voltage rated, i.e., 380V for 380/420V units.
5. Airflow in l/s with wet coil and clean filter.

**Table 6 — Blower Data — 50HQ096**

AIRFLOW (l/s)		EXTERNAL STATIC PRESSURE (Pa)															
		0	25	50	75	100	125	150	175	200	225	250	275	300	325	350	375
850	BkW	—	0.15	0.18	0.21	0.24	0.27	0.30	0.32	0.34	0.36	0.39	0.42	0.46	0.49	0.52	0.55
	Sheave/Mtr	—	B	B	B	A	A	A	A	A	A	C	C	C	C	C	C
	RPM	—	500	552	604	655	700	745	780	820	855	890	915	945	970	995	1020
	Turns Open	—	4.5	3	1.5	5.5	4.5	3.5	2.5	2	1	4	3.5	3	2.5	2	1.5
897	BkW	0.19	0.21	0.24	0.28	0.31	0.34	0.38	0.41	0.44	0.47	0.50	0.53	0.55	0.58	0.61	—
	Sheave/Mtr	B	B	A	A	A	A	A	A	A	C	C	C	C	C	C	—
	RPM	521	573	625	670	710	755	795	830	870	900	930	960	990	1015	1040	—
	Turns Open	4	2.5	6	5	4	3	2.5	1.5	1	3.5	3	2.5	2	1.5	1	—
944	BkW	0.20	0.22	0.25	0.28	0.32	0.36	0.39	0.42	0.46	0.49	0.52	0.55	0.58	0.60	0.63	—
	Sheave/Mtr	B	B	B	A	A	A	A	A	A	C	C	C	C	C	C	—
	RPM	500	542	594	640	685	730	770	805	845	880	915	945	975	1005	1030	—
	Turns Open	4.5	3.5	2	5.5	4.5	3.5	3	2	1	4	3.5	2.5	2	1.5	1	—
991	BkW	0.24	0.27	0.30	0.33	0.36	0.39	0.43	0.47	0.51	0.54	0.57	0.60	0.63	0.66	0.69	—
	Sheave/Mtr	B	B	B	A	A	A	A	A	A	C	C	C	C	C	C	—
	RPM	516	563	615	655	700	740	780	820	860	895	925	960	990	1020	1045	—
	Turns Open	4	3	1.5	5.5	4.5	3.5	2.5	2	1	4	3	2.5	2	1	1	—
1038	BkW	0.26	0.29	0.32	0.36	0.40	0.43	0.47	0.51	0.54	0.58	0.61	0.64	0.67	0.71	—	—
	Sheave/Mtr	B	B	A	A	A	A	A	A	C	C	C	C	C	C	—	—
	RPM	536	583	630	670	715	755	795	835	870	905	935	970	1000	1030	—	—
	Turns Open	3.5	2.5	6	5	4	3	2.5	1.5	4	3.5	3	2	1.5	1	—	—
1086	BkW	0.30	0.34	0.37	0.40	0.43	0.47	0.51	0.55	0.59	0.62	0.66	0.69	0.73	0.77	—	—
	Sheave/Mtr	B	B	A	A	A	A	A	A	C	C	C	C	C	C	—	—
	RPM	557	604	650	690	730	770	810	845	885	915	950	980	1010	1040	—	—
	Turns Open	3	2	5.5	4.5	3.5	3	2	1	4	3.5	2.5	2	1.5	1	—	—
1133	BkW	0.34	0.37	0.41	0.44	0.47	0.51	0.56	0.60	0.64	0.67	0.71	0.74	0.78	—	—	—
	Sheave/Mtr	B	A	A	A	A	A	A	A	C	C	C	C	C	—	—	—
	RPM	583	625	665	705	745	785	825	860	895	925	960	990	1020	—	—	—
	Turns Open	2.5	6	5	4	3.5	2.5	1.5	1	4	3	2.5	2	1	—	—	—
1180	BkW	0.38	0.41	0.44	0.48	0.52	0.56	0.61	0.65	0.69	0.72	0.75	0.79	0.83	—	—	—
	Sheave/Mtr	B	A	A	A	A	A	A	C	C	C	C	C	C	—	—	—
	RPM	604	645	685	725	765	800	835	875	905	940	970	1005	1030	—	—	—
	Turns Open	2	5.5	4.5	4	3	2	1.5	4	3.5	3	2	1.5	1	—	—	—
1227	BkW	0.41	0.45	0.48	0.51	0.55	0.60	0.64	0.69	0.72	0.76	0.80	0.85	—	—	—	—
	Sheave/Mtr	A	A	A	A	A	A	A	C	C	C	C	C	—	—	—	—
	RPM	625	665	700	740	775	815	850	885	915	950	985	1015	—	—	—	—
	Turns Open	6	5	4.5	3.5	3	2	1	4	3.5	2.5	2	1.5	—	—	—	—
1274	BkW	0.45	0.49	0.52	0.56	0.60	0.64	0.68	0.73	0.77	0.81	0.85	0.90	—	—	—	—
	Sheave/Mtr	A	A	A	A	A	A	A	C	C	C	C	C	—	—	—	—
	RPM	645	685	720	760	795	830	865	900	930	960	995	1025	—	—	—	—
	Turns Open	5.5	4.5	4	3	2.5	1.5	1	3.5	3	2.5	1.5	1	—	—	—	—
1322	BkW	0.49	0.53	0.57	0.61	0.65	0.69	0.74	0.78	0.82	0.86	0.91	0.96	—	—	—	—
	Sheave/Mtr	A	A	A	A	A	A	C	C	C	C	C	C	—	—	—	—
	RPM	665	705	745	780	810	845	880	910	945	975	1005	1035	—	—	—	—
	Turns Open	5	4	3.5	2.5	2	1	4	3.5	2.5	2	1.5	1	—	—	—	—
1369	BkW	0.53	0.57	0.61	0.65	0.69	0.73	0.77	0.82	0.87	0.91	0.96	1.02	—	—	—	—
	Sheave/Mtr	A	A	A	A	A	A	C	C	C	C	C	C	—	—	—	—
	RPM	685	720	760	795	825	860	890	920	955	985	1015	1045	—	—	—	—
	Turns Open	4.5	4	3	2.5	1.5	1	4	3	2.5	2	1.5	1	—	—	—	—
1416	BkW	0.58	0.62	0.67	0.71	0.75	0.79	0.84	0.88	0.93	0.97	1.03	—	—	—	—	—
	Sheave/Mtr	A	A	A	A	A	C	C	C	C	C	C	—	—	—	—	—
	RPM	700	735	775	810	845	875	910	940	970	1000	1030	—	—	—	—	—
	Turns Open	4.5	3.5	2.5	2	1	4	3.5	3	2	1.5	1	—	—	—	—	—
1463	BkW	0.64	0.68	0.72	0.76	0.80	0.85	0.90	0.97	1.02	1.07	1.12	—	—	—	—	—
	Sheave/Mtr	A	A	A	A	A	C	C	C	C	C	C	—	—	—	—	—
	RPM	720	755	790	825	860	890	920	955	985	1015	1040	—	—	—	—	—
	Turns Open	4	3	2.5	1.5	1	4	3	2.5	2	1.5	1	—	—	—	—	—
1510	BkW	0.70	0.75	0.80	0.85	0.90	0.94	0.99	1.03	1.08	1.13	—	—	—	—	—	—
	Sheave/Mtr	A	A	A	A	C	C	C	C	C	C	—	—	—	—	—	—
	RPM	740	775	810	840	875	905	935	965	995	1025	—	—	—	—	—	—
	Turns Open	3.5	2.5	2	1.5	4	3.5	3	2.5	1.5	1	—	—	—	—	—	—

**LEGEND**

- — Operation Not Recommended
- BkW** — Brake Kilowatts
- ESP** — External Static Pressure
- RPM** — Revolutions Per Minute
- A** — Units with Standard Static/Standard Motor Option
- B** — Units with Low Static/Standard Motor Option
- C** — Units with High Static/Standard Motor Option

**NOTES:**

1. A = Standard Rpm/Standard Motor, B = Low Rpm/Standard Motor, C = High Rpm/Standard Motor.
2. Unit factory shipped with standard static sheave and drive at 2.5 turns open. Other speed require field selection.
3. For applications requiring higher static pressures, contact your local representative. Performance data does not include drive losses and is based on sea level conditions.
4. All airflow is rated at lowest voltage if unit is dual voltage rated, i.e., 380V for 380/420V units.
5. Airflow in l/s with wet coil and clean filter.

**Table 7 — Blower Data — 50HQP120**

AIRFLOW (l/s)		EXTERNAL STATIC PRESSURE (Pa)															
		0	25	50	75	100	125	150	175	200	225	250	275	300	325	350	375
1038	BkW	—	0.29	0.31	0.35	0.39	0.42	0.46	0.50	0.54	0.57	0.60	0.63	0.67	0.70	0.73	0.76
	Sheave/Mtr	—	B	B	B	B	A	A	A	A	A	A	C	C	C	C	C
	RPM	—	573	620	665	705	745	785	825	865	900	930	960	995	1020	1050	1075
	Turns Open	—	4.5	3.5	2.5	1.5	5.5	4.5	3.5	3	2	1.5	3.5	3	2.5	2	1.5
1086	BkW	0.30	0.33	0.37	0.40	0.43	0.46	0.50	0.54	0.58	0.61	0.65	0.68	0.72	0.76	0.80	0.85
	Sheave/Mtr	B	B	B	B	A	A	A	A	A	A	A	C	C	C	C	C
	RPM	547	594	640	680	720	760	800	840	875	910	940	975	1005	1035	1060	1090
	Turns Open	5	4	3	2	6	5	4	3.5	2.5	2	1.5	3.5	3	2	1.5	1
1133	BkW	0.34	0.37	0.40	0.43	0.47	0.50	0.55	0.59	0.63	0.66	0.70	0.73	0.77	0.82	0.86	—
	Sheave/Mtr	B	B	B	B	A	A	A	A	A	A	C	C	C	C	C	—
	RPM	573	615	660	700	740	775	815	855	890	920	955	985	1015	1045	1075	—
	Turns Open	4.5	3.5	2.5	2	5.5	4.5	4	3	2.5	1.5	1	3	2.5	2	1.5	—
1180	BkW	0.37	0.40	0.44	0.47	0.51	0.55	0.60	0.64	0.68	0.71	0.75	0.78	0.82	0.87	0.91	—
	Sheave/Mtr	B	B	B	A	A	A	A	A	A	A	C	C	C	C	C	—
	RPM	594	635	675	715	755	790	830	865	900	930	965	995	1025	1055	1085	—
	Turns Open	4	3	2.5	6	5	4.5	3.5	3	2	1.5	3.5	3	2.5	1.5	1	—
1227	BkW	0.40	0.44	0.47	0.51	0.55	0.59	0.63	0.67	0.72	0.75	0.79	0.83	0.88	0.92	0.96	—
	Sheave/Mtr	B	B	B	A	A	A	A	A	A	A	C	C	C	C	C	—
	RPM	615	655	690	730	770	805	840	875	910	940	975	1005	1035	1065	1095	—
	Turns Open	3.5	3	2	5.5	5	4	3.5	2.5	2	1	3.5	3	2	1.5	1	—
1274	BkW	0.44	0.47	0.51	0.55	0.59	0.63	0.67	0.71	0.75	0.79	0.84	0.88	0.93	0.97	—	—
	Sheave/Mtr	B	B	B	A	A	A	A	A	A	A	C	C	C	C	—	—
	RPM	635	670	710	750	785	820	855	885	920	950	985	1015	1045	1075	—	—
	Turns Open	3	2.5	1.5	5	4.5	3.5	3	2.5	1.5	1	3	2.5	2	1.5	—	—
1322	BkW	0.47	0.51	0.55	0.59	0.64	0.67	0.72	0.76	0.80	0.84	0.89	0.94	1.00	1.05	—	—
	Sheave/Mtr	B	B	A	A	A	A	A	A	A	C	C	C	C	C	—	—
	RPM	650	690	725	765	800	830	865	900	930	960	995	1025	1055	1085	—	—
	Turns Open	3	2	6	5	4	3.5	3	2	1.5	3.5	3	2.5	1.5	1	—	—
1369	BkW	0.52	0.55	0.59	0.63	0.67	0.71	0.75	0.80	0.85	0.89	0.94	0.99	1.04	1.10	—	—
	Sheave/Mtr	B	B	A	A	A	A	A	A	A	C	C	C	C	C	—	—
	RPM	670	705	745	780	810	845	875	910	940	970	1000	1030	1060	1090	—	—
	Turns Open	2.5	1.5	5.5	4.5	4	3	2.5	2	1	3.5	3	2	1.5	1	—	—
1416	BkW	0.57	0.60	0.65	0.68	0.73	0.77	0.82	0.86	0.91	0.95	1.00	1.05	1.11	—	—	—
	Sheave/Mtr	B	A	A	A	A	A	A	A	A	C	C	C	C	—	—	—
	RPM	685	720	760	790	825	860	895	925	955	985	1015	1045	1075	—	—	—
	Turns Open	2	6	5	4.5	3.5	3	2	1.5	1	3	2.5	2	1.5	—	—	—
1463	BkW	0.61	0.66	0.70	0.75	0.79	0.82	0.89	0.94	0.99	1.05	1.09	1.15	1.20	—	—	—
	Sheave/Mtr	B	A	A	A	A	A	A	A	C	C	C	C	C	—	—	—
	RPM	700	735	775	810	845	875	910	940	970	1000	1025	1055	1085	—	—	—
	Turns Open	Open	2	5.5	4.5	4	3	2.5	2	1.5	3.5	3	2.5	1.5	—	—	—
1510	BkW	0.68	0.73	0.77	0.82	0.88	0.92	0.96	1.01	1.05	1.10	1.16	1.20	1.26	—	—	—
	Sheave/Mtr	A	A	A	A	A	A	A	A	C	C	C	C	C	—	—	—
	RPM	725	760	790	825	860	890	920	950	980	1010	1040	1065	1095	—	—	—
	Turns Open	6	5	4.5	3.5	3	2	1.5	1	3.5	2.5	2	1.5	1	—	—	—
1558	BkW	0.74	0.79	0.83	0.88	0.94	0.98	1.02	1.07	1.11	1.16	1.21	1.26	—	—	—	—
	Sheave/Mtr	A	A	A	A	A	A	A	C	C	C	C	C	—	—	—	—
	RPM	740	775	805	840	875	905	935	965	995	1020	1050	1075	—	—	—	—
	Turns Open	5.5	4.5	4	3.5	2.5	2	1.5	3.5	3	2.5	2	1.5	—	—	—	—

**LEGEND**

- — Operation Not Recommended
- BkW** — Brake Kilowatts
- ESP** — External Static Pressure
- RPM** — Revolutions Per Minute
- A** — Units with Standard Static/Standard Motor Option
- B** — Units with Low Static/Standard Motor Option
- C** — Units with High Static/Standard Motor Option

**NOTES:**

1. A = Standard Rpm/Standard Motor, B = Low Rpm/Standard Motor, C = High Rpm/Standard Motor.
2. Unit factory shipped with standard static sheave and drive at 2.5 turns open. Other speed require field selection.
3. For applications requiring higher static pressures, contact your local representative. Performance data does not include drive losses and is based on sea level conditions.
4. All airflow is rated at lowest voltage if unit is dual voltage rated, i.e., 380V for 380/420V units.
5. Airflow in l/s with wet coil and clean filter.

**Table 7 — Blower Data — 50HQP120 (cont)**

AIRFLOW (l/s)		EXTERNAL STATIC PRESSURE (Pa)															
		0	25	50	75	100	125	150	175	200	225	250	275	300	325	350	375
1605	BkW	0.79	0.85	0.89	0.94	0.99	1.04	1.08	1.12	1.17	1.23	1.29	1.35	—	—	—	—
	Sheave/Mtr	A	A	A	A	A	A	A	C	C	C	C	C	—	—	—	—
	RPM	755	790	820	855	890	920	945	975	1005	1035	1060	1090	—	—	—	—
	Turns Open	5	4.5	3.5	3	2	1.5	1	3.5	3	2	1.5	1	—	—	—	—
1652	BkW	0.87	0.91	0.96	1.02	1.06	1.11	1.15	1.20	1.24	1.29	1.34	—	—	—	—	—
	Sheave/Mtr	A	A	A	A	A	A	C	C	C	C	C	—	—	—	—	—
	RPM	780	810	845	880	910	940	970	1000	1025	1050	1080	—	—	—	—	—
	Turns Open	4.5	4	3	2.5	2	1	3.5	3	2.5	2	1	—	—	—	—	—
1699	BkW	0.94	0.99	1.04	1.09	1.15	1.20	1.25	1.30	1.35	1.40	1.45	—	—	—	—	—
	Sheave/Mtr	A	A	A	A	A	C	C	C	C	C	C	—	—	—	—	—
	RPM	805	835	870	900	930	960	990	1015	1045	1070	1100	—	—	—	—	—
	Turns Open	4	3.5	2.5	2	1.5	3.5	3	2.5	2	1.5	1	—	—	—	—	—
1746	BkW	1.01	1.05	1.10	1.16	1.21	1.26	1.32	1.37	1.43	1.49	—	—	—	—	—	—
	Sheave/Mtr	A	A	A	A	A	C	C	C	C	C	—	—	—	—	—	—
	RPM	825	855	885	915	945	975	1005	1030	1060	1085	—	—	—	—	—	—
	Turns Open	3.5	3	2.5	1.5	1	3.5	3	2	1.5	1	—	—	—	—	—	—
1794	BkW	1.07	1.11	1.17	1.22	1.27	1.33	1.38	1.45	1.51	1.57	—	—	—	—	—	—
	Sheave/Mtr	A	A	A	A	C	C	C	C	C	C	—	—	—	—	—	—
	RPM	840	870	900	930	960	990	1015	1045	1070	1095	—	—	—	—	—	—
	Turns Open	3.5	2.5	2	1.5	3.5	3	2.5	2	1.5	1	—	—	—	—	—	—
1841	BkW	1.17	1.21	1.27	1.32	1.38	1.43	1.49	1.55	1.62	—	—	—	—	—	—	—
	Sheave/Mtr	A	A	A	A	C	C	C	C	C	—	—	—	—	—	—	—
	RPM	860	885	915	945	975	1005	1030	1055	1085	—	—	—	—	—	—	—
	Turns Open	3	2.5	1.5	1	3.5	3	2	1.5	1	—	—	—	—	—	—	—
1888	BkW	1.23	1.29	1.35	1.41	1.48	1.53	1.60	1.66	1.72	—	—	—	—	—	—	—
	Sheave/Mtr	A	A	A	C	C	C	C	C	C	—	—	—	—	—	—	—
	RPM	875	900	930	960	990	1015	1045	1070	1095	—	—	—	—	—	—	—
	Turns Open	2.5	2	1.5	3.5	3	2.5	2	1.5	1	—	—	—	—	—	—	—

**LEGEND**

- — Operation Not Recommended
- BkW** — Brake Kilowatts
- ESP** — External Static Pressure
- RPM** — Revolutions Per Minute
- A** — Units with Standard Static/Standard Motor Option
- B** — Units with Low Static/Standard Motor Option
- C** — Units with High Static/Standard Motor Option

**NOTES:**

1. A = Standard Rpm/Standard Motor, B = Low Rpm/Standard Motor, C = High Rpm/Standard Motor.
2. Unit factory shipped with standard static sheave and drive at 2.5 turns open. Other speed require field selection.
3. For applications requiring higher static pressures, contact your local representative. Performance data does not include drive losses and is based on sea level conditions.
4. All airflow is rated at lowest voltage if unit is dual voltage rated, i.e., 380V for 380/420V units.
5. Airflow in l/s with wet coil and clean filter.

**FIELD SELECTABLE INPUTS**

Jumpers and DIP (dual in-line package) switches on the control board are used to customize unit operation and can be configured in the field.

**IMPORTANT:** Jumpers and DIP switches should only be clipped when power to control board has been turned off.

**Complete C Control Jumper Settings (See Fig. 12)**

**WATER COIL FREEZE PROTECTION (FP1) LIMIT SETTING** — Select jumper 3, (JW3-FP1 Low Temp) to choose FP1 limit of -12.2 C or -1.1 C. To select -1.1 C as the limit, DO NOT clip the jumper. To select -12.2 C as the limit, clip the jumper.

**AIR COIL FREEZE PROTECTION (FP2) LIMIT SETTING** — Select jumper 2 (JW2-FP2 Low Temp) to choose FP2 limit of -12.2 C or -1.1 C. To select -1.1 C as the limit, DO NOT clip the jumper. To select -12.2 C as the limit, clip the jumper.

**ALARM RELAY SETTING** — Select jumper 1 (JW1-AL2 Dry) for connecting alarm relay terminal (AL2) to 24 vac (R) or to remain as a dry contact (no connection). To connect AL2 to R, do not clip the jumper. To set as dry contact, clip the jumper.

**Complete C Control DIP Switches** — The Complete C Control has 1 DIP switch block with five switches. See Fig. 12.

**PERFORMANCE MONITOR (PM)** — DIP switch 1 will enable or disable this feature. To enable the PM, set the switch to ON. To disable the PM, set the switch to OFF.

**STAGE 2** — DIP switch 2 will enable or disable compressor delay. Set DIP switch to OFF for stage 2 in which the compressor will have a 3-second delay before energizing.

**NOTE:** The alarm relay will not cycle during Test mode if switch is set to OFF, stage 2.

**DIP SWITCH 3** — not used.

**DIP SWITCH 4** — not used.

**DIP SWITCH 5** — DIP switch 5 is used to initiate 1 or 3 tries for the FP1 fault. If water freeze protection for the water coil then DIP switch 5 can be set to lockout on the FP1 fault after one try.

**Deluxe D Control Jumper Settings (See Fig. 13)**

**WATER COIL FREEZE PROTECTION (FP1) LIMIT SETTING** — Select jumper 3, (JW3-FP1 Low Temp) to choose FP1 limit of -12.2 C or -1.1 C. To select -1.1 C as the limit, DO NOT clip the jumper. To select -12.2 C as the limit, clip the jumper.

**AIR COIL FREEZE PROTECTION (FP2) LIMIT SETTING** — Select jumper 2 (JW2-FP2 Low Temp) to choose FP2 limit of -12.2 C or -1.1 C. To select -1.1 C as the limit, DO NOT clip the jumper. To select -12.2 C as the limit, clip the jumper.

**ALARM RELAY SETTING** — Select jumper 4 (JW4-AL2 Dry) for connecting alarm relay terminal (AL2) to 24 vac (R) or to remain as a dry contact (no connection). To connect AL2 to R, do not clip the jumper. To set as dry contact, clip the jumper.

**LOW PRESSURE SETTING** — The Deluxe D Control can be configured for Low Pressure Setting (LP). Select jumper 1 (JW1-LP Norm Open) for choosing between low pressure input normally opened or closed. To configure for normally closed operation, do not clip the jumper. To configure for normally open operation, clip the jumper.

**Deluxe D Control DIP Switches** — The Deluxe D Control has 2 DIP switch blocks. Each DIP switch block has 8 switches and is labeled either S1 or S2 on the circuit board. See Fig. 13.

**DIP SWITCH BLOCK 1 (S1)** — This set of switches offers the following options for Deluxe D Control configuration:

**Performance Monitor (PM)** — Set switch 1 to enable or disable performance monitor. To enable the PM, set the switch to ON. To disable the PM, set the switch to OFF.

**Compressor Relay Staging Operation** — Switch 2 will enable or disable compressor relay staging operation. The compressor relay can be set to turn on with stage 1 or stage 2 call from the thermostat. This setting is used with dual stage units (units with 2 compressors and 2 Deluxe D controls) or in master/slave applications. In master/slave applications, each compressor and fan will stage according to its switch 2 setting. If switch is set to stage 2, the compressor will have a 3-second delay before energizing during stage 2 demand.

NOTE: If DIP switch is set for stage 2, the alarm relay will not cycle during Test mode.

**Heating/Cooling Thermostat Type** — Switch 3 provides selection of thermostat type. Heat pump or heat/cool thermostats can be selected. Select OFF for heat/cool thermostats. When in heat/cool mode, Y1 is used for cooling stage 1, Y2 is used for cooling stage 2, W1 is used for heating stage 1 and O/W2 is used for heating stage 2. Select ON for heat pump applications. In heat pump mode, Y1 used is for compressor stage 1, Y2 is used for compressor stage 2, W1 is used for heating stage 3 or emergency heat, and O/W2 is used for RV (heating or cooling) depending upon switch 4 setting.

**O/B Thermostat Type** — Switch 4 provides selection for heat pump O/B thermostats. O is cooling output. B is heating output. Select ON for heat pumps with O output. Select OFF for heat pumps with B output.

**Dehumidification Fan Mode** — Switch 5 provides selection of normal or dehumidification fan mode. Select OFF for dehumidification mode. The fan speed relay will remain OFF during cooling stage 2. Select ON for normal mode. The fan speed relay will turn on during cooling stage 2 in normal mode.

**Switch 6** — Not used.

**Boilerless Operation** — Switch 7 provides selection of boilerless operation and works in conjunction with switch 8. In boilerless operation mode, only the compressor is used for heating when FP1 is above the boilerless changeover temperature set by switch 8 below. Select ON for normal operation or select OFF for boilerless operation.

**Boilerless Changeover Temperature** — Switch 8 on S1 provides selection of boilerless changeover temperature set point. Select OFF for set point of 10.0 C or select ON for set point of 4.4 C.

If switch 8 is set for 10.0 C, then the compressor will be used for heating as long as the FP1 is above 10.0 C. The

compressor will not be used for heating when the FP1 is below 10.0 C and the compressor will operate in emergency heat mode, staging on EH1 and EH2 to provide heat. If a thermal switch is being used instead of the FP1 thermistor, only the compressor will be used for heating mode when the FP1 terminals are closed. If the FP1 terminals are open, the compressor is not used and the control goes into emergency heat mode.

**DIP SWITCH BLOCK 2 (S2)** — This set of DIP switches is used to configure accessory relay options. See Fig. 13.

**Switches 1 to 3** — These DIP switches provide selection of Accessory 1 relay options. See Table 8 for DIP switch combinations.

**Switches 4 to 6** — These DIP switches provide selection of Accessory 2 relay options. See Table 9 for DIP switch combinations.

**Auto Dehumidification Mode or High Fan Mode** — Switch 7 provides selection of auto dehumidification fan mode or high fan mode. In auto dehumidification fan mode the fan speed relay will remain off during cooling stage 2 if terminal H is active. In high fan mode, the fan enable and fan speed relays will turn on when terminal H is active. Set the switch to ON for auto dehumidification fan mode or to OFF for high fan mode.

**Switch 8** — Not used.

**Table 8 — DIP Switch Block S2 — Accessory 1 Relay Options**

ACCESSORY 1 RELAY OPTIONS	DIP SWITCH POSITION		
	1	2	3
Cycle with Fan	On	On	On
Digital NSB	Off	On	On
Water Valve — Slow Opening	On	Off	On
OAD	On	On	Off

LEGEND

NSB — Night Setback  
OAD — Outside Air Damper

NOTE: All other DIP switch combinations are invalid.

**Table 9 — DIP Switch Block S2 — Accessory 2 Relay Options**

ACCESSORY 2 RELAY OPTIONS	DIP SWITCH POSITION		
	4	5	6
Cycle with Fan	On	On	On
Digital NSB	Off	On	On
Water Valve — Slow Opening	On	Off	On
OAD	On	On	Off

LEGEND

NSB — Night Setback  
OAD — Outside Air Damper

NOTE: All other switch combinations are invalid.

**Deluxe D Control Accessory Relay Configurations** — The following accessory relay settings are applicable for both Deluxe D controls only:

**CYCLE WITH FAN** — In this configuration, the relay will be ON any time the Fan Enable relay is on.

**CYCLE WITH COMPRESSOR** — In this configuration, the relay will be ON any time the Compressor relay is on.

**DIGITAL NIGHT SET BACK (NSB)** — In this configuration, the relay will be ON if the NSB input is connected to ground C.

NOTE: If there are no relays configured for digital NSB, then the NSB and override (OVR) inputs are automatically configured for mechanical operation.

**MECHANICAL NIGHT SET BACK** — When NSB input is connected to ground C, all thermostat inputs are ignored. A thermostat set back heating call will then be connected to the OVR input. If OVR input becomes active, then the Deluxe D control will enter Night Low Limit (NLL) staged heating mode. The NLL staged heating mode will then provide heating during the NSB period.

**WATER VALVE (SLOW OPENING)** — If relay is configured for Water Valve (slow opening), the relay will start 60 seconds prior to starting compressor relay.

**OUTSIDE AIR DAMPER (OAD)** — If relay is configured for OAD, the relay will normally be ON any time the Fan Enable relay is energized. The relay will not start for 30 minutes following a return to normal mode from NSB, when NSB is no longer connected to ground C. After 30 minutes, the relay will start if the Fan Enable is set to ON.

## START-UP

### ⚠ CAUTION

To avoid equipment damage, DO NOT leave system filled in a building without heat during the winter unless anti-freeze is added to system water. Condenser coils never fully drain by themselves and will freeze unless winterized with antifreeze.

Use the procedure outlined below to initiate proper unit start-up.

NOTE: This equipment is designed for indoor installation only.

### ⚠ WARNING

When the disconnect switch is closed, high voltage is present in some areas of the electrical panel. Exercise caution when working with the energized equipment.

## Operating Limits

**ENVIRONMENT** — This equipment is designed for indoor installation ONLY. Extreme variations in temperature, humidity and corrosive water or air will adversely affect the unit performance, reliability and service life.

**POWER SUPPLY** — A voltage variation of  $\pm 10\%$  of name-plate utilization voltage is acceptable.

**UNIT STARTING CONDITIONS** — All units can start and operate in an ambient of 7.2 C with entering-air at 10.0/7.2 C (db/wb), entering water at -1.1 C and with both air and water at the flow rates used. All other conditions are the same as shown in Table 10.

NOTE: These operating conditions are not normal or continuous operating conditions. It is assumed that such a start-up is for the purpose of bringing the building space up to occupancy temperature.

**Air Coil Cleaning** — To obtain maximum performance, the air coil should be cleaned before start-up. A 10% solution of dishwasher detergent and water is recommended for both sides of the coil. A thorough water rinse should follow. Ultra-violet based anti-bacterial systems may damage e-coated air coils.

## Start Up System

1. Restore power to system.
2. Turn thermostat fan position to ON. Blower should start.
3. Balance airflow at registers.
4. Adjust all valves to the full open position and turn on the line power to all heat pump units.
5. Operate unit in the cooling cycle. Room temperature should be approximately 7.2 to 43.3 C dry bulb. Loop

water temperature entering the heat pumps should be between 10.0 and 43.3 C.

NOTE: Three factors determine the operating limits of a unit: (1) entering-air temperature, (2) water temperature and (3) ambient temperature. Whenever any of these factors are at a minimum or maximum level, the other two factors must be at a normal level to ensure proper unit operation. See Table 10. Extreme variations in temperature and humidity and/or corrosive water or air will adversely affect unit performance, reliability, and service life.

**Table 10 — Operating Limits**

AIR LIMITS	COOLING (C)	HEATING (C)
Minimum Ambient Air db	7	4
Rated Ambient Air db	27	20
Maximum Ambient Air db	43	29
Minimum Entering Air db/wb	16/10	10
Rated Entering Air db/wb	27/19	20
Maximum Entering Air db/wb	35/24	27
WATER LIMITS		
Minimum Entering Water	-1	-6.7
Normal Entering Water	10 to 43	-1 to 21
Maximum Entering Water	49	32
Normal Water Flow	1.6 to 3.2 L/m per kW	

### LEGEND

db — Dry Bulb  
wb — Wet Bulb

**Scroll Compressor Rotation** — It is important to be certain compressor is rotating in the proper direction. To determine whether or not compressor is rotating in the proper direction:

1. Connect service gages to suction and discharge pressure fittings.
2. Energize the compressor.
3. The suction pressure should drop and the discharge pressure should rise, as is normal on any start-up.

If the suction pressure does not drop and the discharge pressure does not rise to normal levels:

1. Turn off power to the unit. Install disconnect tag.
2. Reverse any two of the unit power leads.
3. Reapply power to the unit and verify pressures are correct.

The suction and discharge pressure levels should now move to their normal start-up levels.

When the compressor is rotating in the wrong direction, the unit makes an elevated level of noise and does not provide cooling.

After a few minutes of reverse operation, the scroll compressor internal overload protection will open, thus activating the unit lockout. This requires a manual reset. To reset, turn the thermostat on and then off.

NOTE: There is a 5-minute time delay before the compressor will start.

## Unit Start-Up in Cooling Mode

1. Adjust the unit thermostat to the warmest position. Slowly reduce the thermostat position until the compressor activates.
2. Check for cool air delivery at unit grille a few minutes after the unit has begun to operate.
3. Verify that the compressor is on and that the water flow rate is correct by measuring pressure drop through the heat exchanger using pressure/temperature plugs. Check the elevation and cleanliness of the condensate lines; any dripping could be a sign of a blocked line. Be sure the condensate trap includes a water seal.

4. Check the temperature of both supply and discharge water.
5. Air temperature drop across the coil should be checked when compressor is operating. Air temperature drop should be between -9.4 and -3.9 C.

### Unit Start-Up in Heating Mode

NOTE: Operate the unit in heating cycle after checking the cooling cycle. Allow 5 minutes between tests for the pressure or reversing valve to equalize.

1. Turn thermostat to lowest setting and set thermostat switch to HEAT position.
2. Slowly turn the thermostat to a higher temperature until the compressor activates.
3. Check for warm air delivery at the unit grille within a few minutes after the unit has begun to operate.
4. Check the temperature of both supply and discharge water.
5. Air temperature rise across the coil should be checked when compressor is operating. Air temperature rise should be between -6.7 and -1.1 C after 15 minutes at load.
6. Check for vibration, noise and water leaks.

**Flow Regulation** — Flow regulation can be accomplished by two methods. Most water control valves have a flow adjustment built into the valve. By measuring the pressure drop through the unit heat exchanger, the flow rate can be determined using Table 11. Adjust the water control valve until the flow of 0.09 to 0.13 L/s is achieved. Since the pressure constantly varies, two pressure gages may be needed in some applications.

An alternative method is to install a flow control device. These devices are typically an orifice of plastic material designed to allow a specified flow rate that are mounted on the outlet of the water control valve. Occasionally these valves produce a velocity noise that can be reduced by applying some back pressure. To accomplish this, slightly close the leaving isolation valve of the well water setup.

### ⚠ WARNING

Electrical shock can cause personal injury and death. Shut off all power to this equipment during installation. There may be more than one disconnect switch. Tag all disconnect locations to alert others not to restore power until flushing is completed.

**Table 11 — Coaxial Water Pressure Drop**

50HQP UNIT SIZE	L/s	PRESSURE DROP (kPa)			
		-1 C	10 C	21 C	32 C
072	0.6	8.3	6.2	3.4	2.1
	0.9	22.8	19.1	14.5	12.4
	1.3	42.7	36.5	29.0	26.2
096	0.8	45.4	14.5	11.7	9.0
	1.1	68.1	36.5	31.0	24.8
	1.5	90.9	64.1	54.5	45.5
120	0.9	56.8	27.6	22.1	15.2
	1.4	85.2	59.3	49.6	37.9
	1.9	113.6	100.0	83.4	67.6

**Flushing** — Once the piping is complete, final purging and loop charging is needed. A flush cart pump of at least 1.5 hp is needed to achieve adequate flow velocity in the loop to purge air and dirt particles from the loop. Flush the loop in both directions with a high volume of water at a high velocity. Cleaning and flushing the piping system is the single most important step

to ensure proper start-up and continued efficient operation of the system. Follow the steps below to properly flush the loop:

1. Verify power is off.
2. Install the system with the supply hose connected directly to the return riser valve. Use a single length of flexible hose.
3. Open all air vents. Fill the system with water. DO NOT allow system to overflow. Bleed all air from the system. Pressurize and check the system for leaks and repair as appropriate.
4. Verify that all strainers are in place. Carrier recommends a strainer with a no. 20 stainless steel wire mesh. Start the pumps, and systematically check each vent to ensure that all air is bled from the system.
5. Verify that make-up water is available. Adjust makeup water as required to replace the air which was bled from the system. Check and adjust the water/air level in the expansion tank.
6. Set the boiler to raise the loop temperature to approximately 30 C. Open a drain at the lowest point in the system. Adjust the make-up water replacement rate to equal the rate of bleed.
7. Refill the system and add trisodium phosphate in a proportion of approximately 0.5 kg per 750 L of water (or other equivalent approved cleaning agent). Reset the boiler to raise the loop temperature to 38 C. Circulate the solution for a minimum of 8 to 24 hours. At the end of this period, shut off the circulating pump and drain the solution. Repeat system cleaning if desired.
8. When the cleaning process is complete, remove the short-circuited hoses. Reconnect the hoses to the proper supply, and return the connections to each of the units. Refill the system and bleed off all air.
9. Test the system pH with litmus paper. The system water should be in the range of pH 6.0 to 8.5 (see Table 2). Add chemicals, as appropriate to maintain neutral pH levels.
10. When the system is successfully cleaned, flushed, refilled and bled, check the main system panels, safety cutouts and alarms. Set the controls to properly maintain loop temperatures.  
  
DO NOT use “Stop Leak” or similar chemical agent in this system. Addition of chemicals of this type to the loop water will foul the heat exchanger and inhibit unit operation.
11. Restore power.

Antifreeze may be added before, during or after the flushing process. However, depending on when it is added in the process, it can be wasted. Refer to the Antifreeze section for more detail.

Loop static pressure will fluctuate with the seasons. Pressures will be higher in the winter months than during the warmer months. This fluctuation is normal and should be considered when charging the system initially. Run the unit in either heating or cooling for several minutes to condition the loop to a homogenous temperature.

When complete, perform a final flush and pressurize the loop to a static pressure of 275 to 345 kPa for winter months or 100 to 140 kPa for summer months.

After pressurization, be sure to remove the plug from the end of the loop pump motor(s) to allow trapped air to be discharged and to ensure the motor housing has been flooded. Be sure the loop flow center provides adequate flow through the unit by checking pressure drop across the heat exchanger.

NOTE: Carrier strongly recommends all piping connections, both internal and external to the unit, be pressure tested by an appropriate method prior to any finishing of the interior space

or before access to all connections is limited. Test pressure may not exceed the maximum allowable pressure for the unit and all components within the water system. Carrier will not be responsible or liable for damages from water leaks due to inadequate or lack of a pressurized leak test, or damages caused by exceeding the maximum pressure rating during installation.

**Antifreeze** — In areas where entering loop temperatures drop below 4.4 C or where piping will be routed through areas subject to freezing, antifreeze is needed.

Alcohols and glycols are commonly used as antifreeze agents. Freeze protection should be maintained to 8.3° C below the lowest expected entering loop temperature. For example, if the lowest expected entering loop temperature is -1.1 C, the leaving loop temperature would be -5.6 to -3.9 C. Therefore, the freeze protection should be at -9.4 C (-1.1 C - 8.3 C = -9.4 C).

**IMPORTANT:** All alcohols should be pre-mixed and pumped from a reservoir outside of the building or introduced under water level to prevent alcohols from fuming.

Calculate the total volume of fluid in the piping system. See Table 12. Use the percentage by volume in Table 13 to determine the amount of antifreeze to use. Antifreeze concentration should be checked from a well mixed sample using a hydrometer to measure specific gravity.

**FREEZE PROTECTION SELECTION** — The -1.1 C FP1 factory setting (water) should be used to avoid freeze damage to the unit.

Once antifreeze is selected, the JW3 jumper (FP1) should be clipped on the control to select the low temperature (antifreeze -12.2 C) set point to avoid nuisance faults.

**Cooling Tower/Boiler Systems** — These systems typically use a common loop maintained at 15.6 C to 32.2 C. The use of a closed circuit evaporative cooling tower with a secondary heat exchanger between the tower and the water loop is recommended. If an open type cooling tower is used continuously, chemical treatment and filtering will be necessary.

**Table 12 — Approximate Fluid Volume (L) per 30 M of Pipe**

PIPE	DIAMETER (in.) [mm]	VOLUME (gal.) [L]
<b>Copper</b>	1 [25.4]	4.1 [15.5]
	1.25 [31.8]	6.4 [24.2]
	1.5 [38.1]	9.2 [34.8]
<b>Rubber Hose</b>	1 [25.4]	3.9 [14.8]
<b>Polyethylene</b>	3/4 IPS SDR11	2.8 [10.6]
	1 IPS SDR11	4.5 [17.0]
	1 1/4 IPS SDR11	8.0 [30.8]
	1/2 IPS SDR11	10.9 [41.3]
	2 IPS SDR11	18.0 [68.1]
	1 1/4 IPS SCH40	8.3 [31.4]
	1 1/2 IPS SCH40	10.9 [41.3]
	2 IPS SCH40	17.0 [64.4]

**LEGEND**

- IPS** — Internal Pipe Size
- SCH** — Schedule
- SDR** — Standard Dimensional Ratio

NOTE: Volume of heat exchanger is approximately 3.78 liters.

**Table 13 — Antifreeze Percentages by Volume**

ANTIFREEZE	MINIMUM TEMPERATURE FOR FREEZE PROTECTION (C)			
	-12.2	-9.4	-6.7	-3.9
<b>Methanol (%)</b>	25	21	16	10
<b>100% USP Food Grade Propylene Glycol (%)</b>	38	30	22	15
<b>Ethanol (%)</b>	29	25	20	14

**Ground Coupled, Closed Loop and Plateframe Heat Exchanger Well Systems** — These systems allow water temperatures from -1.1 to 43.3 C. The external loop field is divided up into 51 mm polyethylene supply and return lines. Each line has valves connected in such a way that upon system start-up, each line can be isolated for flushing using only the system pumps. Air separation should be located in the piping system prior to the fluid re-entering the loop field.

**OPERATION**

**Power Up Mode** — The unit will not operate until all the inputs, terminals and safety controls are checked for normal operation.

NOTE: The compressor will have a 5-minute anti-short cycle upon power up.

**Units with Aquazone™ Complete C Control**

**STANDBY** — Y and W terminals are not active in Standby mode, however the O and G terminals may be active, depending on the application. The compressor will be off.

**COOLING** — Y and O terminals are active in Cooling mode. After power up, the first call to the compressor will initiate a 5 to 80 second random start delay and a 5-minute anti-short cycle protection time delay. After both delays are complete, the compressor is energized.

NOTE: On all subsequent compressor calls the random start delay is omitted.

**HEATING STAGE 1** — Terminal Y is active in heating stage 1. After power up, the first call to the compressor will initiate a 5 to 80 second random start delay and a 5-minute anti-short cycle protection time delay. After both delays are complete, the compressor is energized.

NOTE: On all subsequent compressor calls the random start delay is omitted.

**HEATING STAGE 2** — To enter Stage 2 mode, terminal W is active (Y is already active). Also, the G terminal must be active or the W terminal is disregarded. The compressor relay will remain on and EH1 is immediately turned on. EH2 will turn on after 10 minutes of continual stage 2 demand.

NOTE: EH2 will not turn on (or if on, will turn off) if FP1 temperature is greater than 7.2 C and FP2 is greater than 43.3 C.

**EMERGENCY HEAT** — In emergency heat mode, terminal W is active while terminal Y is not. Terminal G must be active or the W terminal is disregarded. EH1 is immediately turned on. EH2 will turn on after 5 minutes of continual emergency heat demand.

**Units with Aquazone Deluxe D Control**

**STANDBY/FAN ONLY** — The compressor will be off. The Fan Enable, Fan Speed, and reversing valve (RV) relays will be on if inputs are present. If there is a Fan 1 demand, the Fan Enable will immediately turn on. If there is a Fan 2 demand, the Fan Enable and Fan Speed will immediately turn on.

NOTE: DIP switch 5 on S1 does not have an effect upon Fan 1 and Fan 2 outputs.

**HEATING STAGE 1** — In Heating Stage 1 mode, the Fan Enable and Compressor relays are turned on immediately. Once the demand is removed, the relays are turned off and the control reverts to Standby mode. If there is a master/slave or dual compressor application, all compressor relays and related functions will operate per their associated DIP switch 2 setting on S1.

**HEATING STAGE 2** — In Heating Stage 2 mode, the Fan Enable and Compressor relays are remain on. The Fan Speed relay is turned on immediately and turned off



immediately once the demand is removed. The control reverts to Heating Stage 1 mode. If there is a master/slave or dual compressor application, all compressor relays and related functions will operate per their associated DIP switch 2 setting on S1.

**HEATING STAGE 3** — In Heating Stage 3 mode, the Fan Enable, Fan Speed and Compressor relays remain on. The EH1 output is turned on immediately. With continuing Heat Stage 3 demand, EH2 will turn on after 10 minutes. EH1 and EH2 are turned off immediately when the Heating Stage 3 demand is removed. The control reverts to Heating Stage 2 mode.

Output EH2 will be off if FP1 is greater than 7.2 C AND FP2 (when shorted) is greater than 43.3 C during Heating Stage 3 mode. This condition will have a 30-second recognition time. Also, during Heating Stage 3 mode, EH1, EH2, Fan Enable, and Fan Speed will be ON if G input is not active.

**EMERGENCY HEAT** — In Emergency Heat mode, the Fan Enable and Fan Speed relays are turned on. The EH1 output is turned on immediately. With continuing Emergency Heat demand, EH2 will turn on after 5 minutes. Fan Enable and Fan Speed relays are turned off after a 60-second delay. The control reverts to Standby mode.

Output EH1, EH2, Fan Enable, and Fan Speed will be ON if the G input is not active during Emergency Heat mode.

**COOLING STAGE 1** — In Cooling Stage 1 mode, the Fan Enable, compressor and RV relays are turned on immediately. If configured as stage 2 (DIP switch set to OFF) then the compressor and fan will not turn on until there is a stage 2 demand. The Fan Enable and compressor relays are turned off immediately when the Cooling Stage 1 demand is removed. The control reverts to Standby mode. The RV relay remains on until there is a heating demand. If there is a master/slave or dual compressor application, all compressor relays and related functions will track with their associated DIP switch 2 on S1.

**COOLING STAGE 2** — In Cooling Stage 2 mode, the Fan Enable, compressor and RV relays remain on. The Fan Speed relay is turned on immediately and turned off once the Cooling Stage 2 demand is removed. The control reverts to Cooling Stage 1 mode. If there is a master/slave or dual compressor application, all compressor relays and related functions will track with their associated DIP switch 2 on S1.

**NIGHT LOW LIMIT (NLL) STAGED HEATING** — In NLL staged Heating mode, the override (OVR) input becomes active and is recognized as a call for heating and the control will immediately go into a Heating Stage 1 mode. With an additional 30 minutes of NLL demand, the control will go into Heating Stage 2 mode. With another additional 30 minutes of NLL demand, the control will go into Heating Stage 3 mode.

## SYSTEM TEST

System testing provides the ability to check the control operation. The control enters a 20-minute Test mode by momentarily shorting the test pins. All time delays are increased 15 times.

**Test Mode** — To enter Test mode on Complete C or Deluxe D controls, cycle the fan 3 times within 60 seconds. The LED (light-emitting diode) will flash a code representing the last fault when entering the Test mode. The alarm relay will

also power on and off during Test mode. See Tables 14-16. To exit Test mode, short the terminals for 3 seconds or cycle the power 3 times within 60 seconds.

**NOTE:** The Deluxe D control has a flashing code and alarm relay cycling code that will both have the same numerical label. For example, flashing code 1 will have an alarm relay cycling code 1. Code 1 indicates the control has not faulted since the last power off to power on sequence.

**Retry Mode** — In Retry mode, the status LED will start to flash slowly to signal that the control is trying to recover from an input fault. The control will stage off the outputs and try to again satisfy the thermostat used to terminal Y. Once the thermostat input calls are satisfied, the control will continue normal operation.

**NOTE:** If 3 consecutive faults occur without satisfying the thermostat input call to terminal Y, the control will go into lockout mode. The last fault causing the lockout is stored in memory and can be viewed by entering Test mode.

**Aquazone™ Deluxe D Control LED Indicators** — There are 3 LED indicators on the Deluxe D control: **STATUS LED** — Status LED indicates the current status or mode of the Deluxe D control. The Status LED light is green.

**TEST LED** — Test LED will be activated any time the Deluxe D control is in Test mode. The Test LED light is yellow.

**FAULT LED** — Fault LED light is red. The fault LED will always flash a code representing the last fault in memory. If there is no fault in memory, the fault LED will flash code 1 on the and appear as 1 fast flash alternating with a 10-second pause. See Table 16.

**Table 14 — Complete C Control Current LED Status and Alarm Relay Operations**

LED STATUS	DESCRIPTION OF OPERATION	ALARM RELAY
<b>On</b>	Normal Mode	Open
	Normal Mode with PM Warning	Cycle (closed 5 sec., Open 25 sec.)
<b>Off</b>	Complete C Control is non-functional	Open
	Fault Retry	Open
<b>Slow Flash</b>	Over/Under Voltage Shutdown	Open (Closed after 15 minutes)
	Lockout	Closed
<b>Flashing Code 1</b>	Test Mode — No fault in memory	Cycling Code 1
<b>Flashing Code 2</b>	Test Mode — HP Fault in memory	Cycling Code 2
<b>Flashing Code 3</b>	Test Mode — LP Fault in memory	Cycling Code 3
<b>Flashing Code 4</b>	Test Mode — FP1 Fault in memory	Cycling Code 4
<b>Flashing Code 5</b>	Test Mode — FP2 Fault in memory	Cycling Code 5
<b>Flashing Code 6</b>	Test Mode — CO Fault in memory	Cycling Code 6
<b>Flashing Code 7</b>	Test Mode — Over/Under shutdown in memory	Cycling Code 7
<b>Flashing Code 8</b>	Test Mode — PM in memory	Cycling Code 8
<b>Flashing Code 9</b>	Test Mode — FP1/FP2 Swapped fault in memory	Cycling Code 9

### LEGEND

**CO** — Condensate Overflow  
**FP** — Freeze Protection  
**HP** — High Pressure  
**LED** — Light-Emitting Diode  
**LP** — Low Pressure  
**PM** — Performance Monitor

### NOTES:

1. Slow flash is 1 flash every 2 seconds.
2. Fast flash is 2 flashes every 1 second.
3. EXAMPLE: "Flashing Code 2" is represented by 2 fast flashes followed by a 10-second pause. This sequence will repeat continually until the fault is cleared.

**Table 15 — Complete C Control LED Code and Fault Descriptions**

LED CODE	FAULT	DESCRIPTION
1	No fault in memory	There has been no fault since the last power-down to power-up sequence
2	High-Pressure Switch	HP open instantly
3	Low-Pressure Switch	LP open for 30 continuous seconds before or during a call (bypassed for first 60 seconds)
4	Freeze Protection Coax — FP1	FP1 below Temp limit for 30 continuous seconds (bypassed for first 60 seconds of operation)
5	Freeze Protection Air Coil — FP2	FP2 below Temp limit for 30 continuous seconds (bypassed for first 60 seconds of operation)
6	Condensate overflow	Sense overflow (grounded) for 30 continuous seconds
7 (Autoreset)	Over/Under Voltage Shutdown	"R" power supply is <19VAC or >30VAC
8	PM Warning	Performance Monitor Warning has occurred.
9	FP1 and FP2 Thermistors are swapped	FP1 temperature is higher than FP2 in heating/test mode, or FP2 temperature is higher than FP1 in cooling/test mode.

LEGEND

- FP — Freeze Protection
- HP — High Pressure
- LED — Light-Emitting Diode
- LP — Low Pressure
- PM — Performance Monitor

**Table 16 — Aquazone™ Deluxe D Control Current LED Status and Alarm Relay Operations**

DESCRIPTION	STATUS LED (Green)	TEST LED (Yellow)	FAULT LED (Red)	ALARM RELAY
<b>Normal Mode</b>	On	Off	Flash Last Fault Code in Memory	Open
<b>Normal Mode with PM</b>	On	Off	Flashing Code 8	Cycle (closed 5 sec, open 25 sec, ...)
<b>Deluxe D Control is non-functional</b>	Off	Off	Off	Open
<b>Test Mode</b>	—	On	Flash Last Fault Code in Memory	Cycling Appropriate Code
<b>Night Setback</b>	Flashing Code 2	—	Flash Last Fault Code in Memory	—
<b>ESD</b>	Flashing Code 3	—	Flash Last Fault Code in Memory	—
<b>Invalid T-stat Inputs</b>	Flashing Code 4	—	Flash Last Fault Code in Memory	—
<b>No Fault in Memory</b>	On	Off	Flashing Code 1	Open
<b>HP Fault</b>	Slow Flash	Off	Flashing Code 2	Open
<b>LP Fault</b>	Slow Flash	Off	Flashing Code 3	Open
<b>FP1 Fault</b>	Slow Flash	Off	Flashing Code 4	Open
<b>FP2 Fault</b>	Slow Flash	Off	Flashing Code 5	Open
<b>CO Fault</b>	Slow Flash	Off	Flashing Code 6	Open
<b>Over/Under Voltage</b>	Slow Flash	Off	Flashing Code 7	Open (closed after 15 minutes)
<b>HP Lockout</b>	Fast Flash	Off	Flashing Code 2	Closed
<b>LP Lockout</b>	Fast Flash	Off	Flashing Code 3	Closed
<b>FP1 Lockout</b>	Fast Flash	Off	Flashing Code 4	Closed
<b>FP2 Lockout</b>	Fast Flash	Off	Flashing Code 5	Closed
<b>CO Lockout</b>	Fast Flash	Off	Flashing Code 6	Closed

LEGEND

- CO — Condensate Overflow
- ESD — Emergency Shutdown
- FP — Freeze Protection
- HP — High Pressure
- LP — Low Pressure
- PM — Performance Monitor

NOTES:

1. If there is no fault in memory, the Fault LED will flash code 1.
2. Codes will be displayed with a 10-second Fault LED pause.
3. Slow flash is 1 flash every 2 seconds.
4. Fast flash is 2 flashes every 1 second.
5. EXAMPLE: "Flashing Code 2" is represented by 2 fast flashes followed by a 10-second pause. This sequence will repeat continually until the fault is cleared.

**SERVICE**

Perform the procedures outlined below periodically, as indicated.

**IMPORTANT:** When a compressor is removed from this unit, system refrigerant circuit oil will remain in the compressor. To avoid leakage of compressor oil, the refrigerant lines of the compressor must be sealed after it is removed.

**IMPORTANT:** All refrigerant discharged from this unit must be recovered without exception. Technicians must follow industry accepted guidelines and all local, state and federal statutes for the recovery and disposal of refrigerants.

**IMPORTANT:** To avoid the release of refrigerant into the atmosphere, the refrigerant circuit of this unit must only be serviced by technicians which meet local, state and federal proficiency requirements.

**IMPORTANT:** To prevent injury or death due to electrical shock or contact with moving parts, open unit disconnect switch before servicing unit.

**Filters** — Filters must be clean for maximum performance. Inspect filters every month under normal operating conditions. replace when necessary.

**IMPORTANT:** Units should never be operated without a filter.

Washable, high efficiency, electrostatic filters, when dirty, can exhibit a very high pressure drop for the fan motor and reduce air flow, resulting in poor performance. It is especially important to provide consistent washing of these filters (in the opposite direction of the normal air flow) once per month using a high pressure wash.

**Water Coil** — Keep all air out of the water coil. Check open loop systems to be sure the well head is not allowing air to infiltrate the water line. Always keep lines airtight.

**DIRECT GROUND WATER APPLICATIONS** — If the system is installed in an area with a known high mineral content (125 ppm or greater) in the water, it is best to establish a periodic maintenance schedule with the owner 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 material and copper water lines. Generally, the more water flowing through the unit, the less chance for scaling. Therefore, 1.6 L/m per kW is recommended as a minimum flow. Minimum flow rate for entering water temperatures below 10.0 C is 2.2 L/m per kW.

**ALL OTHER WATER LOOP APPLICATIONS** — Generally, water coil maintenance is not needed for closed loop systems. However, if the piping is known to have high dirt or debris content, it is best to establish a periodic maintenance schedule with the owner so the water coil can be checked regularly. Dirty installations are typically the result of deterioration of iron or galvanized piping or components in the system. Open cooling towers requiring heavy chemical treatment and mineral buildup through water use can also contribute to higher maintenance. Should periodic coil cleaning be necessary, use standard coil cleaning procedures, which are compatible with both the heat exchanger material and copper water lines. Generally, the more water flowing through the unit, the less chance for scaling. However, flow rates over 3.9 L/m per kW can produce water (or debris) velocities that can erode the heat exchanger wall and ultimately produce leaks.

**IMPORTANT:** To avoid fouled machinery and extensive unit clean-up, DO NOT operate units without filters in place. DO NOT use equipment as a temporary heat source during construction.

**Condensate Drain Pans** — Check condensate drain pans for algae growth twice a year. If algae growth is apparent, consult a water treatment specialist for proper chemical treatment. The application of an algicide every three months will typically eliminate algae problems in most locations.

**Refrigerant System** — Verify air and water flow rates are at proper levels before servicing. To maintain sealed circuitry integrity, do not install service gages unless unit operation appears abnormal.

**Condensate Drain Cleaning** — Clean the drain line and unit drain pan at the start of each cooling season. Check flow by pouring water into drain. Be sure trap is filled to maintain an air seal.

**Air Coil Cleaning** — Remove dirt and debris from evaporator coil as required by condition of the coil. Clean coil with a stiff brush, vacuum cleaner, or compressed air. Use a fin

comb of the correct tooth spacing when straightening mashed or bent coil fins.

**Condenser Cleaning** — Water-cooled condensers may require cleaning of scale (water deposits) due to improperly maintained closed-loop water systems. Sludge build-up may need to be cleaned in an open water tower system due to induced contaminants.

Local water conditions may cause excessive fouling or pitting of tubes. Condenser tubes should therefore be cleaned at least once a year, or more often if the water is contaminated.

Proper water treatment can minimize tube fouling and pitting. If such conditions are anticipated, water treatment analysis is recommended. Refer to the Carrier System Design Manual, Part 5, for general water conditioning information.

**CAUTION**

Follow all safety codes. Wear safety glasses and rubber gloves when using inhibited hydrochloric acid solution. Observe and follow acid manufacturer's instructions. Failure to follow these safety precautions could result in personal injury or equipment or property damage.

Clean condensers with an inhibited hydrochloric acid solution. The acid can stain hands and clothing, damage concrete, and, without inhibitor, damage steel. Cover surroundings to guard against splashing. Vapors from vent pipe are not harmful, but take care to prevent liquid from being carried over by the gases.

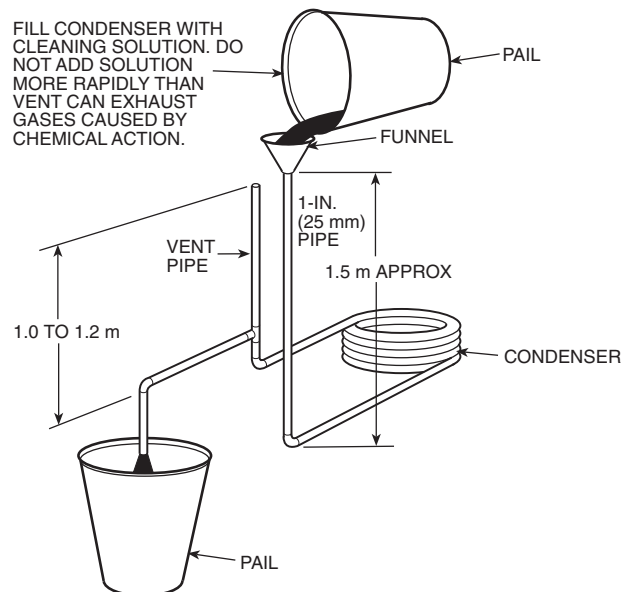
Warm solution acts faster, but cold solution is just as effective if applied for a longer period.

**GRAVITY FLOW METHOD** — Do not add solution faster than vent can exhaust the generated gases.

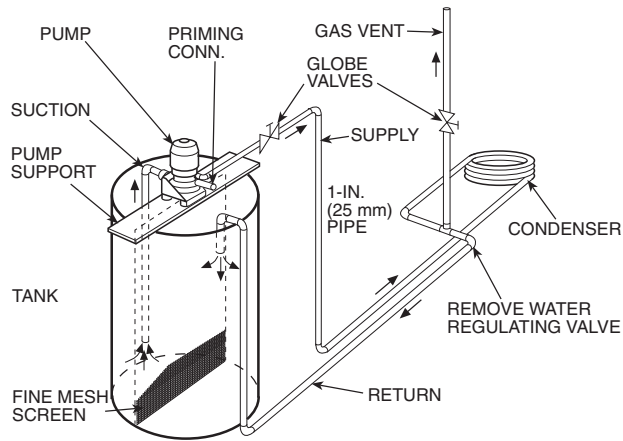
When condenser is full, allow solution to remain overnight, then drain condenser and flush with clean water. Follow acid manufacturer's instructions. See Fig. 22.

**FORCED CIRCULATION METHOD** — Fully open vent pipe when filling condenser. The vent may be closed when condenser is full and pump is operating. See Fig. 23.

Regulate flow to condenser with a supply line valve. If pump is a nonoverloading type, the valve may be fully closed while pump is running.



**Fig. 22 — Gravity Flow Method**



**Fig. 23 — Forced Circulation Method**

For average scale deposit, allow solution to remain in condenser overnight. For heavy scale deposit, allow 24 hours. Drain condenser and flush with clean water. Follow acid manufacturer's instructions.

**Compressor** — Conduct annual amperage checks to insure that amp draw is no more than 10% greater than indicated on the serial plate data.

**Fan Motors** — All units have lubricated fan motors. Fan motors should never be lubricated unless obvious, dry operation is suspected. Periodic maintenance oiling is not recommended, as it will result in dirt accumulating in the excess oil and cause eventual motor failure. Conduct annual dry operation check and amperage check to ensure amp draw is no more than 10% greater than indicated on serial plate data.

**Belt** — Check that the belt is tight. Retighten if needed. Replace if it is split or cracked.

**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 clean. Care must be taken not to damage the aluminum fins while cleaning.

**Checking System Charge** — Units are shipped with full operating charge. If recharging is necessary:

1. Insert thermometer bulb in insulating rubber sleeve on liquid line near filter drier. Use a digital thermometer for all temperature measurements. **DO NOT** use a mercury or dial-type thermometer.
2. Connect pressure gage to discharge line near compressor.
3. After unit conditions have stabilized, read head pressure on discharge line gage.

NOTE: Operate unit a minimum of 15 minutes before checking charge.

4. From standard field-supplied Pressure-Temperature chart for R-410A, find equivalent saturated condensing temperature.
5. Read liquid line temperature on thermometer; then subtract from saturated condensing temperature. The difference equals subcooling temperature.

## Refrigerant Charging

### ⚠ WARNING

To prevent personal injury, wear safety glasses and gloves when handling refrigerant. Do not overcharge system — this can cause compressor flooding.

NOTE: Do not vent or depressurize unit refrigerant to atmosphere. Remove and recover refrigerant following accepted practices.

## Air Coil Fan Motor Removal

### ⚠ CAUTION

Before attempting to remove fan motors or motor mounts, place a piece of plywood over evaporator coils to prevent coil damage.

Motor power wires need to be disconnected from motor terminals before motor is removed from unit.

1. Shut off unit main power supply.
2. Loosen bolts on mounting bracket so that fan belt can be removed.
3. Loosen and remove the 2 motor mounting bracket bolts on left side of bracket.
4. Slide motor/bracket assembly to extreme right and lift out through space between fan scroll and side frame. Rest motor on a high platform such as a step ladder. Do not allow motor to hang by its power wires.

**Blower Fan Sheaves** — Factory-supplied drives are pre-aligned and tensioned, however, it is recommended that the belt tension and alignment be checked before starting the unit. Always check the drive alignment after adjusting belt tension. Sheave and belt information is shown in Table 17.

Each factory-assembled fan, shaft, and drive sheave assembly is precision aligned and balanced. If excessive unit vibration occurs after field replacement of sheaves, the unit should be rebalanced. To change the drive ratio, follow the steps in the Blower Fan Performance Adjustment section.

After 1 to 3 minutes of operation, check the belt tension. Also check tension frequently during the first 24 hours of operation and adjust if necessary. Periodically check belt tension throughout the run-in period, which is normally the initial 72 hours of operation.

**ALIGNMENT** — Make sure that fan shafts and motor shafts are parallel and level. The most common causes of misalignment are nonparallel shafts and improperly located sheaves. Where shafts are not parallel, belts on one side are drawn tighter and pull more than their share of the load. As a result, these belts wear out faster, requiring the entire set to be replaced before it has given maximum service. If misalignment is in the sheave, belts enter and leave the grooves at an angle, causing excessive belt and sheave wear.

**Shaft Alignment** — Check shaft alignment by measuring the distance between the shafts at 3 or more locations. If the distances are equal, then the shafts are parallel.

### Sheave Alignment

1. To check the location of the fixed sheaves on the shafts, use a straightedge or a piece of string. If the sheaves are properly aligned, the string will touch them at the points indicated by the arrows in Fig. 24. Rotate each sheave a half revolution to determine whether the sheave is wobbly or the drive shaft is bent. Correct any misalignment.
2. With sheaves aligned, tighten cap screws evenly and progressively.

NOTE: There should be a 3 to 6 mm gap between the mating part hub and the bushing flange. If the gap is closed, the bushing is probably the wrong size.

3. With taper-lock bushed hubs, be sure the bushing bolts are tightened evenly to prevent side-to-side pulley wobble. Check by rotating sheaves and rechecking sheave alignment. When substituting field-supplied sheaves for factory-supplied sheaves, only the motor sheave should be changed.

**Blower Fan Performance Adjustment** — The unit is supplied with variable sheave drive on the fan motor to adjust for differing airflows at various ESP conditions. Select an airflow requirement on the left side of the table, then move horizontally to right under the required ESP for the sheave turns open, rpm and horsepower for that condition. Fully closed, the sheave will produce the highest static capability (higher rpm).

To change fan speeds from factory settings:

1. Shut off unit power supply.
2. Remove belt from motor sheave.
3. Lift motor assembly.

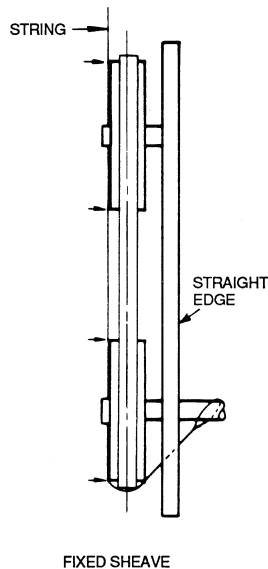


Fig. 24 — Sheave Alignment

4. Loosen the  $\frac{5}{16}$ -in. hex nuts on the grommet motor adjustment bolts (2 per bolt). To increase the belt tension loosen the top hex nut. To decrease the belt tension loosen the bottom hex nut.
5. Turn the bolts by hand to the desired position then tighten the  $\frac{5}{16}$ -in. hex nuts (2 per bolt).
6. Lower the motor assembly.
7. Install the belt.
8. Tension the belt per section below.
9. Restore power to the unit.

**BELT TENSION ADJUSTMENT** — Using a gage, apply 4 lb of force to the center of the belt and adjust the tension until a deflection of  $\frac{1}{64}$ -in. is achieved for every inch of shaft center distance. See Fig. 25.

Ideal belt tension is the lowest value under which belt slip will not occur at peak load conditions.

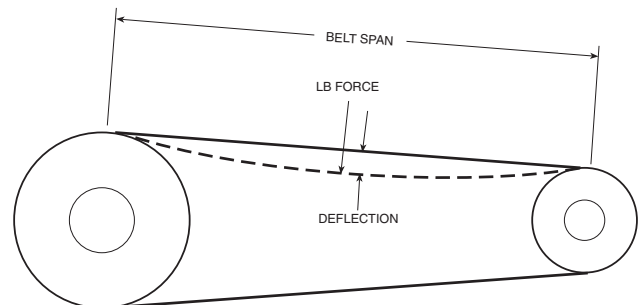


Fig. 25 — Fan Belt Tension

Table 17 — Blower Sheave and Belt Specifications

UNIT SIZE 50HQP	COMPONENT	DRIVE PACKAGE		
		A*	B†	C**
072	BLOWER SHEAVE	BK67 X 1	BK85 X 1	BK67 X 1
	MOTOR SHEAVE	1VP34 X 7/8	1VP34 X 7/8	1VP44 X 7/8
	MOTOR HP	1	1	1
	BELT	B X 46	B X 50	B X 48
096	BLOWER SHEAVE	BK67 X 1	BK77 X 1	BK62 X 1
	MOTOR SHEAVE	1VP40 X 7/8	1VP34 X 7/8	1VP44 X 7/8
	MOTOR HP	2	2	2
	BELT	B X 46	B X 48	B X 46
120	BLOWER SHEAVE	BK67 X 1	BK67 X 1	BK67 X 1
	MOTOR SHEAVE	1VP44 X 7/8	1VP34 X 7/8	1VP50 X 7/8
	MOTOR HP	3	3	3
	BELT	B X 48	B X 46	B X 48

\*Airflow configurations J, K, N, and P.

†Airflow configurations Q, T, U, and V.

\*\*Airflow configurations W, X, Z, and 1.

## TROUBLESHOOTING

When troubleshooting problems with a WSHP, see Table 18.

**Thermistor** — A thermistor may be required for single-phase units where starting the unit is a problem due to low voltage. See Fig. 26 for thermistor nominal resistance.

**Control Sensors** — The control system employs 2 nominal 10,000 ohm thermistors (FP1 and FP2) that are used for freeze protection. Be sure FP1 is located in the discharge fluid and FP2 is located in the air discharge. See Fig. 27.

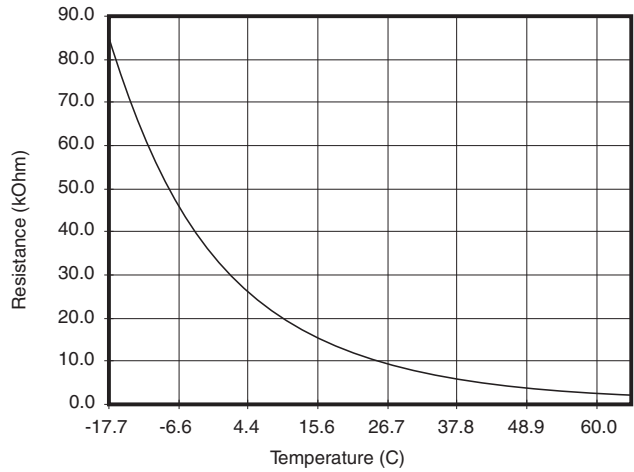


Fig. 26 — Thermistor Nominal Resistance

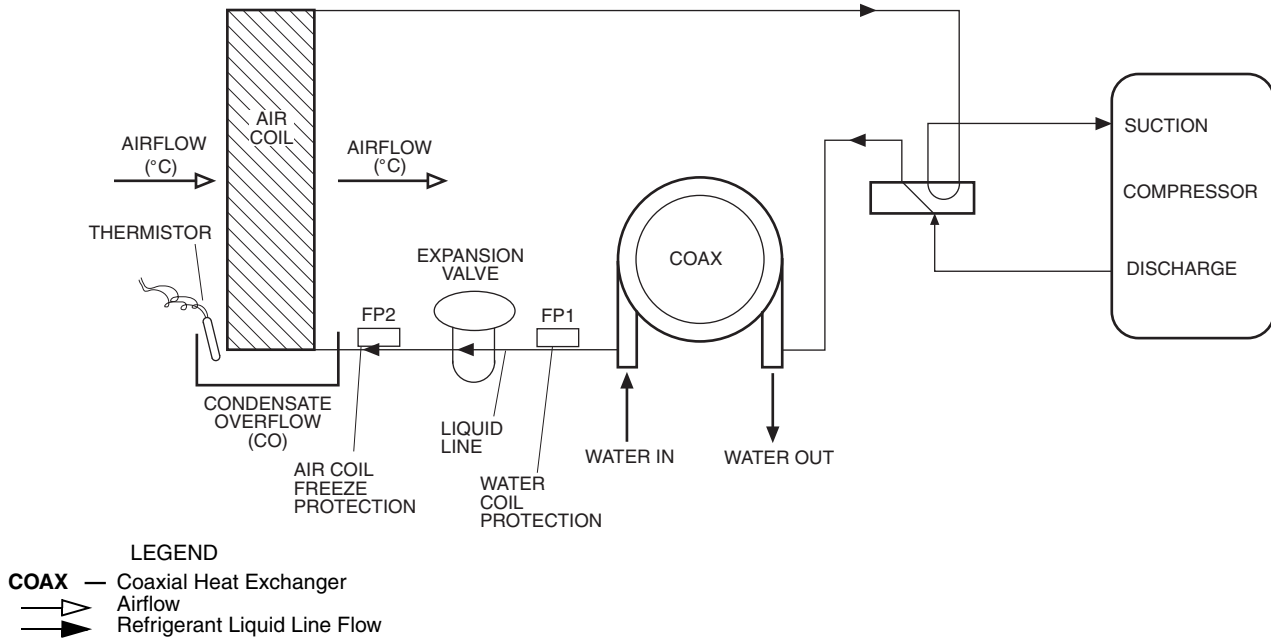


Fig. 27 — FP1 and FP2 Thermistor Location

**Table 18 — Troubleshooting**

FAULT	HEATING	COOLING	POSSIBLE CAUSE	SOLUTION			
<b>Main Power Problems</b>	X	X	Green Status LED Off	Check line voltage circuit breaker and disconnect.			
				Check for line voltage between L1 and L2 on the contactor.			
				Check for 24-vac between R and C on controller.			
				Check primary/secondary voltage on transformer.			
<b>HP Fault — Code 2 High Pressure</b>		X	Reduced or no water flow in cooling	Check pump operation or valve operation/setting. Check water flow adjust to proper flow rate.			
		X	Water temperature out of range in cooling	Bring water temperature within design parameters.			
	X		Reduced or no airflow in heating	Check for dirty air filter and clean or replace. Check fan motor operation and airflow restrictions. Dirty air coil — construction dust, etc. Perform preventative maintenance; Clean air coil. High external static. Check duct design and downstream interference.			
	X		Air temperature out of range in heating	Bring return-air temperature within design parameters.			
	X	X	Overcharged with refrigerant	Check superheat/subcooling vs. typical operating condition.			
	X	X	Bad HP switch	Check switch continuity and operation. Replace.			
<b>LP Fault — Code 3 Low Pressure/Loss of Charge</b>	X	X	Insufficient charge	Check for refrigerant leaks.			
	X		Compressor pump down at start-up	Check charge and start-up water flow.			
<b>FP1 Fault — Code 4 Water Freeze Protection</b>	X		Reduced or no water flow in heating	Check pump operation or water valve operation/setting. Plugged strainer or filter. Clean or replace. Check water flow adjust to proper flow rate.			
		X	Inadequate antifreeze level	Check antifreeze density with hydrometer.			
		X	Improper freeze protect setting (-1.1 C vs -12.2 C)	Clip JW3 jumper for antifreeze (-12.2 C) use.			
	X		Water temperature out of range	Bring water temperature within design parameters.			
	X	X	Bad thermistor	Check temperature and impedance correlation.			
	<b>FP2 Fault — Code 5 Air Coil Freeze Protection</b>		X	Reduced or no airflow in cooling	Check for dirty air filter and clean or replace. Check fan motor operation and airflow restrictions. High external static. Check duct design and downstream interference.		
		X	Air temperature out of range	Too much cold vent air. Bring entering-air temperature within design parameters.			
		X	Improper freeze protect setting (-1.1 C vs -12.2 C)	Normal airside applications will require -1.1 C only.			
X		X	Bad thermistor	Check temperature and impedance correlation.			
<b>Condensate Fault — Code 6</b>	X	X	Blocked drain	Check for blockage and clean drain.			
	X	X	Improper trap	Check trap dimensions and location ahead of vent.			
		X	Poor drainage	Check for piping slope away from unit. Check slope of unit toward outlet. Poor venting. Check vent location.			
		X	Moisture on sensor	Check for moisture shorting to air coil.			
<b>Over/Under Voltage — Code 7 (Auto Resetting)</b>	X	X	Under voltage	Check power supply and 24-vac voltage before and during operation. Check power supply wire size. Check compressor starting. Check 24-vac and unit transformer tap for correct power supply voltage.			
				X	X	Over voltage	Check power supply voltage and 24 vac before and during operation. Check 24-vac and unit transformer tap for correct power supply voltage.
<b>Performance Monitor — Code 8</b>	X		Heating mode FP2> 51.7 C	Check for poor airflow or overcharged unit.			
		X	Cooling mode FP1> 51.7 C OR FP2< 4.4 C	Check for poor water flow or airflow.			
<b>No Fault Code Shown</b>	X	X	Compressor overload	Check and replace if necessary.			
	X	X	Control board	Reset power and check operation.			
<b>Unit Short Cycles</b>	X	X	Dirty air filter	Check and clean air filter.			
	X	X	Unit in Test mode	Reset power or wait 20 minutes for auto exit.			
	X	X	Unit selection	Unit may be oversized for space. Check sizing for actual load of space.			
	X	X	Compressor overload	Check and replace if necessary.			
<b>Only Fan Runs</b>	X	X	Thermostat position	Ensure thermostat set for heating or cooling operation.			
	X	X	Unit locked out	Check for lockout codes. Reset power.			
	X	X	Compressor overload	Check compressor overload. Replace if necessary.			
	X	X	Thermostat wiring	Check Y and W wiring at heat pump. Jumper Y and R for compressor operation in Test mode.			

**LEGEND**

- FP** — Freeze Protection
- HP** — High Pressure
- LED** — Light-Emitting Diode
- LP** — Low Pressure
- RV** — Reversing Valve

**Table 18 — Troubleshooting (cont)**

FAULT	HEATING	COOLING	POSSIBLE CAUSE	SOLUTION
<b>Only Compressor Runs</b>	X	X	Thermostat wiring	Check G wiring at heat pump. Jumper G and R for fan operation. Check Y and W wiring at heat pump. Jumper Y and R for compressor operation in Test mode.
	X	X	Fan motor relay	Jumper G and R for fan operation. Check for line voltage across BR contacts. Check fan power enable relay operation (if present).
	X	X	Fan motor	Check for line voltage at motor. Check capacitor.
<b>Unit Does Not Operate in Cooling</b>		X	Reversing valve	Set for cooling demand and check 24-vac on RV coil and at control. If RV is stuck, run high pressure up by reducing water flow and while operating engage and disengage RV coil voltage to push valve.
		X	Thermostat setup	Check for 'O' RV setup not 'B'.
		X	Thermostat wiring	Check O wiring at heat pump. Jumper O and R for RV coil.
<b>Insufficient Capacity/ Not Cooling or Heating Properly</b>	X	X	Dirty filter	Replace or clean.
	X		Reduced or no airflow in heating	Check for dirty air filter and clean or replace.
				Check fan motor operation and airflow restrictions.
				High external static. Check duct design and downstream interference.
		X	Reduced or no airflow in cooling	Check for dirty air filter and clean or replace.
				Check fan motor operation and airflow restrictions.
				High external static. Check duct design and downstream interference.
	X	X	Leaky ductwork	Check supply and return-air temperatures at the unit and at distant duct registers if significantly different, duct leaks are present.
	X	X	Low refrigerant charge	Check superheat and subcooling.
	X	X	Restricted metering device	Check superheat and subcooling. Replace.
		X	Defective reversing valve	Perform RV touch test.
	X	X	Thermostat improperly located	Check location and for air drafts behind thermostat.
	X	X	Unit undersized	Recheck loads and sizing check sensible cooling load and heat pump capacity.
X	X	Scaling in water heat exchanger	Perform scaling check and clean if necessary.	
X	X	Inlet water too hot or cold	Check load, loop sizing, loop backfill, ground moisture.	
<b>High Head Pressure</b>	X		Reduced or no airflow in heating	Check for dirty air filter and clean or replace.
				Check fan motor operation and airflow restrictions.
				High external static. Check duct design and downstream interference.
		X	Reduced or no water flow in cooling	Check pump operation or valve operation/setting.
				Check water flow adjust to proper flow rate.
		X	Inlet water too hot	Check load, loop sizing, loop backfill, ground moisture.
	X		Air temperature out of range in heating	Bring return-air temperature within design parameters.
		X	Scaling in water heat exchanger	Perform scaling check and clean if necessary.
	X	X	Unit overcharged	Check superheat and subcooling. Reweigh in charge.
X	X	Non-condensables in system	Vacuum system and reweigh in charge.	
<b>Low Suction Pressure</b>	X		Reduced water flow in heating	Check superheat and subcooling. Replace.
				Check pump operation or water valve operation/setting.
				Plugged strainer or filter. Clean or replace.
			Check water flow adjust to proper flow rate.	
	X		Water temperature out of range	Bring water temperature within design parameters.
		X	Reduced airflow in cooling	Check for dirty air filter and clean or replace.
		Check fan motor operation and airflow restrictions.		
		High external static. Check duct design and downstream interference.		
	X	Air temperature out of range	Too much cold vent air. Bring entering air temperature within design parameters.	
X	X	Insufficient charge	Check for refrigerant leaks.	
<b>Low Discharge Air Temperature in Heating</b>	X		Too high airflow	Check blower.
	X		Poor performance	See 'Insufficient Capacity' above.
<b>High Humidity</b>		X	Too high airflow	Check blower.
		X	Unit oversized	Recheck loads and sizing check sensible cooling load and heat pump capacity.

**LEGEND**

- FP — Freeze Protection
- HP — High Pressure
- LED — Light-Emitting Diode
- LP — Low Pressure
- RV — Reversing Valve







## START-UP CHECKLIST

CUSTOMER: \_\_\_\_\_ JOB NAME: \_\_\_\_\_  
MODEL NO.: \_\_\_\_\_ SERIAL NO.: \_\_\_\_\_ DATE: \_\_\_\_\_

### I. PRE-START-UP

DOES THE UNIT VOLTAGE CORRESPOND WITH THE SUPPLY VOLTAGE AVAILABLE? (Y/N) \_\_\_\_\_

HAVE THE POWER AND CONTROL WIRING CONNECTIONS BEEN MADE AND TERMINALS TIGHT? (Y/N) \_\_\_\_\_

HAVE WATER CONNECTIONS BEEN MADE AND IS FLUID AVAILABLE AT HEAT EXCHANGER? (Y/N) \_\_\_\_\_

HAS PUMP BEEN TURNED ON AND ARE ISOLATION VALVES OPEN? (Y/N) \_\_\_\_\_

HAS CONDENSATE CONNECTION BEEN MADE AND IS A TRAP INSTALLED? (Y/N) \_\_\_\_\_

IS AN AIR FILTER INSTALLED? (Y/N) \_\_\_\_\_

### II. START-UP

IS FAN OPERATING WHEN COMPRESSOR OPERATES? (Y/N) \_\_\_\_\_

IF 3-PHASE SCROLL COMPRESSOR IS PRESENT, VERIFY PROPER ROTATION PER INSTRUCTIONS. (Y/N) \_\_\_\_\_

#### UNIT VOLTAGE — COOLING OPERATION

PHASE AB VOLTS \_\_\_\_\_ PHASE BC VOLTS \_\_\_\_\_ PHASE CA VOLTS \_\_\_\_\_  
(if 3 phase) (if 3 phase)

PHASE AB AMPS \_\_\_\_\_ PHASE BC AMPS \_\_\_\_\_ PHASE CA AMPS \_\_\_\_\_  
(if 3 phase) (if 3 phase)

#### CONTROL VOLTAGE

IS CONTROL VOLTAGE ABOVE 21.6 VOLTS? (Y/N) \_\_\_\_\_.  
IF NOT, CHECK FOR PROPER TRANSFORMER CONNECTION.

#### TEMPERATURES

FILL IN THE ANALYSIS CHART ATTACHED.

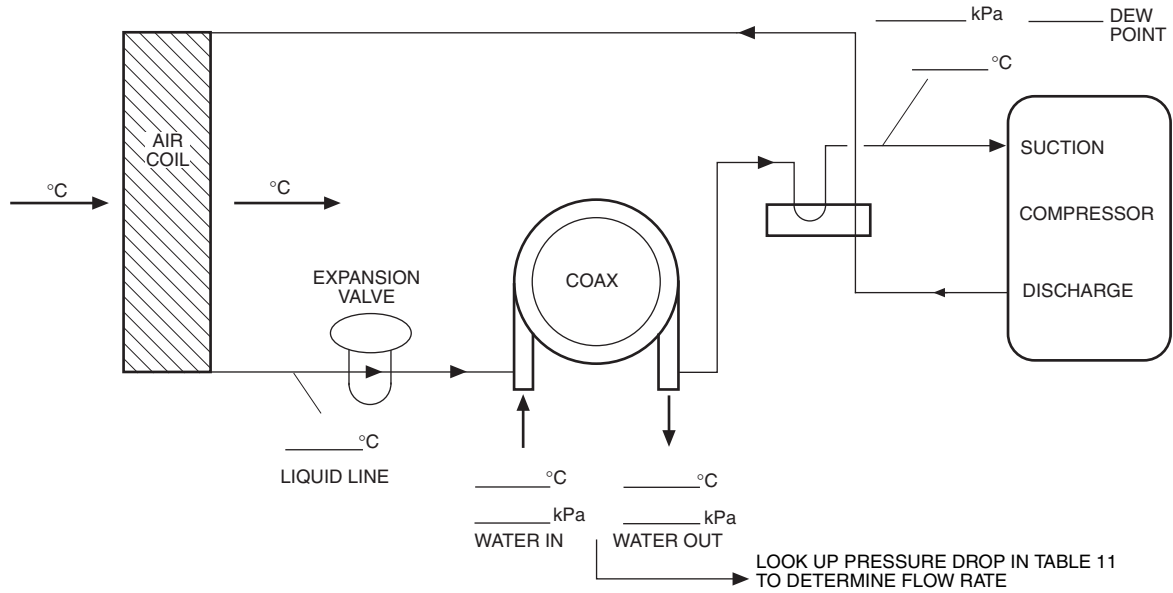
COAXIAL HEAT EXCHANGER COOLING CYCLE:  
FLUID IN \_\_\_\_\_ C FLUID OUT \_\_\_\_\_ C \_\_\_\_\_ kPa \_\_\_\_\_ L/s

HEATING CYCLE:  
FLUID IN \_\_\_\_\_ C FLUID OUT \_\_\_\_\_ C \_\_\_\_\_ kPa \_\_\_\_\_ L/s

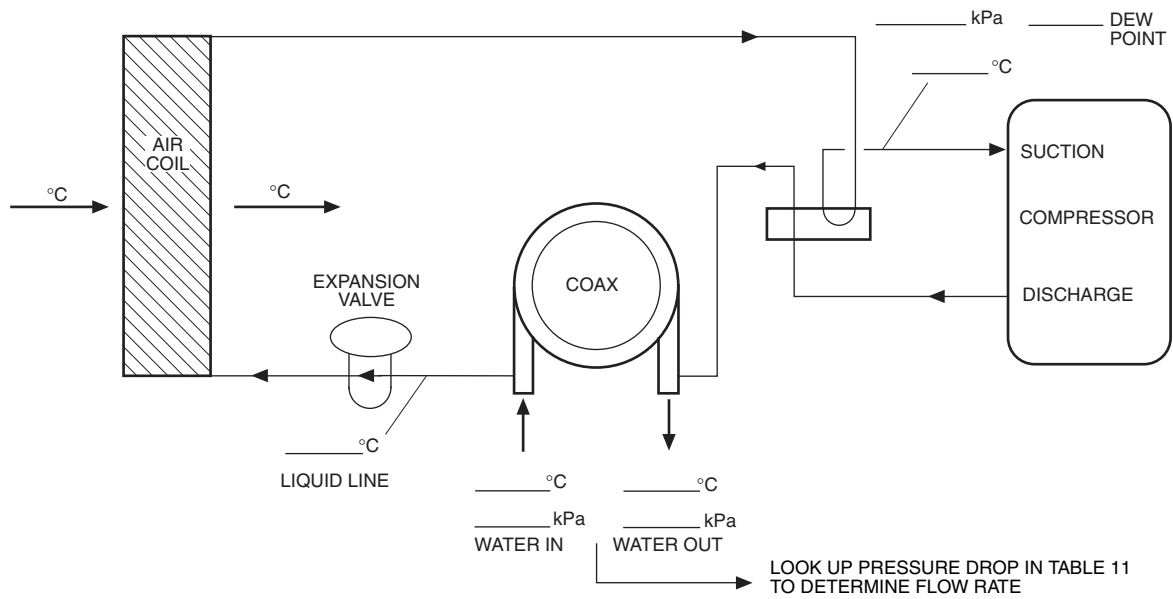
AIR COIL COOLING CYCLE:  
AIR IN \_\_\_\_\_ C AIR OUT \_\_\_\_\_ C

HEATING CYCLE:  
AIR IN \_\_\_\_\_ C AIR OUT \_\_\_\_\_ C

# HEATING CYCLE ANALYSIS



# COOLING CYCLE ANALYSIS



## HEAT OF EXTRACTION (ABSORPTION) OR HEAT OF REJECTION =

$$\text{FLOW RATE (L/s)} \times \text{TEMP. DIFF. (DEG C)} \times \text{FLUID FACTOR*} = \text{(kW)}$$

**SUPERHEAT** = SUCTION TEMPERATURE – SUCTION SATURATION TEMPERATURE  
 = \_\_\_\_ (DEG C)

**SUBCOOLING** = DISCHARGE SATURATION TEMPERATURE – LIQUID LINE TEMPERATURE  
 = \_\_\_\_ (DEG C)

\*Use 500 for water, 485 for antifreeze.

CUT ALONG DOTTED LINE

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