Installation, Start-Up, and Service Instructions

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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.

Follow all safety codes, including ANSI (American National Standards Institute) Z223.1. Wear safety glasses and work gloves. Use quenching cloth for unbrazing operations. Have fire extinguisher available for all brazing operations.

It is important to recognize safety information. This is the safety-alert symbol △. When you see this symbol on the unit and in instructions or manuals, be alert to the potential for personal injury.

Understand the signal words DANGER, WARNING, CAUTION, and NOTE. These words are used with the safety-alert symbol. DANGER identifies the most serious hazards which could result in personal injury or death. WARNING signifies hazards which may result in personal injury or death. CAUTION is used to identify unsafe practices, which may result in minor personal injury or product and property damage. NOTE is used to highlight suggestions which will result in enhanced installation, reliability, or operation.

Electrical shock can cause personal injury or death. Before installing or servicing system, always turn off main power to system. There may be more than one disconnect switch. Turn off accessory heater power if applicable.
DO NOT USE TORCH to remove any component. System contains oil and refrigerant under pressure. To remove a component, wear protective gloves and goggles and proceed as follows:

a. Shut off electrical power to unit.
b. Recover refrigerant to relieve all pressure from system using both high-pressure and low pressure ports.
c. Traces of vapor should be displaced with nitrogen and the work area should be well ventilated. Refrigerant in contact with an open flame produces toxic gases.
d. Cut component connection tubing with tubing cutter and remove component from unit. Use a pan to catch any oil that may come out of the lines and as a gage for how much oil to add to the system.
e. Carefully un-sweat remaining tubing stubs when necessary. Oil can ignite when exposed to torch flame.

Failure to follow these procedures may result in personal injury or death.

DO NOT re-use compressor oil or any oil that has been exposed to the atmosphere. Dispose of oil per local codes and regulations. DO NOT leave refrigerant system open to air any longer than the actual time required to service the equipment. Seal circuits being serviced and charge with dry nitrogen to prevent oil contamination when timely repairs cannot be completed. Failure to follow these procedures may result in damage to equipment.

### GENERAL

This Installation and Start-Up Instructions literature is for Aquazone™ water source heat pump systems. Water source heat pumps (WSHPs) are single-package 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.

Units are designed for indoor installation only. See Fig. 1-6 for overall unit dimensions.

**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.

---

**WARNING**

**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 become clogged with construction dirt and debris which may cause system damage.
<table>
<thead>
<tr>
<th>Table 1 — 50HQP,VQP Unit Physical Data</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>50HQP,VQP UNIT SIZE</strong></td>
</tr>
<tr>
<td>Compressor Type</td>
</tr>
<tr>
<td>Quantity</td>
</tr>
<tr>
<td>Air Coil Dimensions (in.) H x L (Qty)</td>
</tr>
<tr>
<td>Rows</td>
</tr>
<tr>
<td>Horizontal Filter Size (in.) (Nominal) (Qty)</td>
</tr>
<tr>
<td>Vertical Filter Size (in.) (Nominal) (Qty)</td>
</tr>
<tr>
<td>Blower Wheel Size (in.) (Dia. x W) (Qty)</td>
</tr>
<tr>
<td>Vertical Motor HP (Qty)</td>
</tr>
<tr>
<td>Type</td>
</tr>
<tr>
<td>Horizontal Water Connections (in.) FPT</td>
</tr>
<tr>
<td>Vertical Water Connections (in.) FPT</td>
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<tr>
<td>Rated Water Flow Rate (gpm)</td>
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<tr>
<td>Water Pressure Drop at Rated Flow (psig) and (FOH) Water Loop Cooling</td>
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<tr>
<td>Unit Ship Weight (Vert/Horiz) (lb)</td>
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<tr>
<td>Unit Operating Weight (Vert/Horiz) (lb)</td>
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<tr>
<td><strong>50HQP,VQP UNIT SIZE</strong></td>
</tr>
<tr>
<td>Compressor Type</td>
</tr>
<tr>
<td>Quantity</td>
</tr>
<tr>
<td>Total Refrigerant Charge (lb)</td>
</tr>
<tr>
<td>Air Coil Dimensions (in.) H x L (Qty)</td>
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<tr>
<td>Rows</td>
</tr>
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<tr>
<td>Vertical Filter Size (in.) (Nominal) (Qty)</td>
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</tr>
<tr>
<td>Rated Water Flow Rate (gpm)</td>
</tr>
<tr>
<td>Water Pressure Drop at Rated Flow (psig) and (FOH) Water Loop Cooling</td>
</tr>
<tr>
<td>Condensate Connection (in.) FPT</td>
</tr>
<tr>
<td>Unit Ship Weight (Vert/Horiz) (lb)</td>
</tr>
<tr>
<td>Unit Operating Weight (Vert/Horiz) (lb)</td>
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</tbody>
</table>

**LEGEND**

FOH — Feet of Heat
NA — Not Applicable
**Table:**

<table>
<thead>
<tr>
<th>UNIT SIZE</th>
<th>HEIGHT</th>
<th>WIDTH</th>
<th>DEPTH*</th>
<th>RETURN AIR</th>
<th>CONDENSER WATER CONNECTIONS</th>
<th>SUPPLY AIR (Blower Outlets)</th>
<th>REPLACEMENT FILTER SIZE (NOMINAL)</th>
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<td>38.00</td>
<td>78.00</td>
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<td>18.50</td>
<td>15.50 13.50 10.50</td>
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<tr>
<td>096</td>
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<td>38.00</td>
<td>78.00</td>
<td>2.00</td>
<td>20.50</td>
<td>18.50</td>
<td>15.50 13.50 10.50</td>
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<td>20.50</td>
<td>18.50</td>
<td>15.50 16.00 14.00</td>
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</table>

*When WSHP Open controller is installed increase depth by 3.00 inches.*

**NOTE:** All dimensions in inches unless otherwise noted. All dimensions within ± 0.125-in. Specifications subject to change without notice. Condensate connections are 0.75 in. FPT on sizes 072-150.

---

**Fig. 1 — 50HQP072-150 Unit Dimensions**
When WSHP Open controller is installed increase depth by 3.00 inches.

NOTE: All dimensions in inches unless otherwise noted. All dimensions within ± 0.125-in. Specifications subject to change without notice. Condensate connections are 1.25 in. FPT on sizes 180 and 242.

**Fig. 2 — 50HQP180,242 Unit Dimensions**
**Fig. 3 — 50VQP072-120 Units**

When WSHP Open controller is installed increase depth by 3.00 inches.

### NOTES:

1. All dimensions in inches unless otherwise noted. All dimensions within ± 0.125-in. Specifications subject to change without notice.
2. Condensate connections are 0.75 in. FPT on sizes 072-120.
3. Front of unit is side with water and electrical connections.

<table>
<thead>
<tr>
<th>UNIT SIZE</th>
<th>HEIGHT</th>
<th>WIDTH</th>
<th>DEPTH*</th>
<th>CONDENSER WATER CONNECTIONS</th>
<th>DUCT FLANGE</th>
<th>FILTER RACK</th>
<th>REPLACEMENT FILTER SIZE (NOMINAL)</th>
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</thead>
<tbody>
<tr>
<td>072</td>
<td>62.00</td>
<td>42.00</td>
<td>32.00</td>
<td>D 28.00 7.00 17.50 2.00</td>
<td>14.75</td>
<td>8.50</td>
<td>2.75 1</td>
</tr>
<tr>
<td>096</td>
<td>62.00</td>
<td>42.00</td>
<td>32.00</td>
<td>D 28.00 7.00 17.50 2.00</td>
<td>14.75</td>
<td>8.50</td>
<td>2.75 1</td>
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<tr>
<td>120</td>
<td>62.00</td>
<td>42.00</td>
<td>32.00</td>
<td>D 28.00 7.00 17.50 2.00</td>
<td>15.00</td>
<td>9.00</td>
<td>3.00 1.25</td>
</tr>
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</table>

* When WSHP Open controller is installed increase depth by 3.00 inches.
NOTES:
1. All dimensions in inches unless otherwise noted. All dimensions within ± 0.125-in. Specifications subject to change without notice. Condensate connections are 0.75 in. FPT on sizes 151 and 181.
2. Front of unit is side with water and electrical connections.

Fig. 4 — 50VQP151,181 Unit Dimensions
**Fig. 5 — 50VQP210-360 Unit Dimensions**

*When WSHP Open controller is installed increase depth by 3.00 inches.*

**NOTES:**
1. All dimensions in inches unless otherwise noted. All dimensions within ± 0.125-in. Specifications subject to change without notice.
2. Condensate connections are 1.25 in. FPT on sizes 210-360.
3. Front of unit is side with water and electrical connections.

<table>
<thead>
<tr>
<th>UNIT SIZE</th>
<th>HEIGHT</th>
<th>WIDTH</th>
<th>DEPTH*</th>
<th>CONDENSER WATER CONNECTIONS</th>
<th>DUCT FLANGE</th>
<th>FILTER RACK</th>
<th>REPLACEMENT FILTER SIZE (NOMINAL)</th>
</tr>
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<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>Diameter (FPT)</td>
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<td>62.00</td>
<td>80.00</td>
<td>32.00</td>
<td>18.00</td>
<td>8.75</td>
<td>2.75</td>
<td>2</td>
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<tr>
<td>240</td>
<td>66.50</td>
<td>80.00</td>
<td>32.00</td>
<td>18.00</td>
<td>8.75</td>
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<td>2</td>
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<td>300</td>
<td>66.50</td>
<td>80.00</td>
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<td>18.00</td>
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<td>17.00</td>
<td>9.00</td>
<td>3.50</td>
<td>2</td>
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</tbody>
</table>

* When WSHP Open controller is installed increase depth by 3.00 inches.

**Fig. 5 — 50VQP210-360 Unit Dimensions**
**50HQP072-150 UNITS SERVICE CLEARANCES**

- **Electrical/Compressor Access**: 36" Minimum
- **Compressor/Refrigerant Access**: 36" Minimum
- **Blower Access**: 24" Minimum

**NOTE:** The local electric codes may require 36" or more clearance at all electrical control boxes.

**50VQP072-181 UNITS SERVICE CLEARANCES**

- **Compressor Access and Electrical/Control Access**: 36" Minimum

*Blower motor and blower housing access is required on BOTH SIDES of the unit.

**50VQP210-360 UNITS SERVICE CLEARANCES**

- **Blower Wheel/Housing Access**: 18" Minimum, 24" Optimum
- **Blower Motor Sheave/Pulley/Belt Access**: 18" Minimum, 24" Optimum

*Blower motor and blower housing access is required on BOTH SIDES of the unit.

**Fig. 6 — Service Clearances**
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 fire-proof 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.

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 shipping bolts from compressor support plate to maximize vibration and sound alternation.
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.

Step 3 — Locate Unit
Consider the following guidelines when choosing a location for a WSHP:
- Units are for indoor use only.
- Locate in areas where ambient temperatures are between 40°F and 100°F and relative humidity is no greater than 75%.
- Provide sufficient space for water, electrical and duct connections.

NOTE: Water inlets/outlets and high/low voltage electrical access are available on either side of the unit. Electrical access is also available on the unit front.

Step 4 — Mount the Unit
MOUNTING VERTICAL UNITS
Vertical units up to five tons are available in left, right, front, or rear air return configurations. Vertical units should be mounted level on a vibration absorbing pad slightly larger than the base to minimize vibration transmission to the building structure. It is not necessary to anchor the unit to the floor. (See Fig. 7.) Vertical units larger than five tons should be vibration isolated according to the design engineers’ specifications.

MOUNTING HORIZONTAL UNITS
While horizontal units may be installed on any level surface strong enough to hold their weight, they are typically suspended above a ceiling by threaded rods. The rods are usually attached to the unit corners by hanger bracket kits. (See Fig. 8.) The rods must be securely anchored to the ceiling. Refer to the hanging bracket assembly and installation instructions (included with the unit) for details. Units larger than six tons include an integral angle iron frame with mounting holes present. (See unit horizontal detail drawing.) Horizontal units installed above the ceiling must conform to all local codes. An auxiliary drain pan if required by code, should be at least four inches larger than the bottom of the heat pump. Plumbing connected to the heat pump must not come in direct contact with joists, trusses, walls, etc.

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.

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

CAUTION
- Failure to remove shipping blocks under blower housing. Loosen compressor mounting bolts. Failure to do so could result in equipment damage.

Fig. 7 — Vertical Unit on Vibration Pad
Some applications require an attic floor installation of the horizontal unit. In this case the unit should be set in a full size secondary drain pan on top of a vibration absorbing mesh. The secondary drain pan prevents possible condensate overflow or water leakage damage to the ceiling. The secondary drain pan is usually placed on a plywood base isolated from the ceiling joists by additional layers of vibration absorbing mesh. In both cases, a 3/4-in. drain connected to this secondary pan should be run to an eave at a location that will be noticeable. If the unit is located in a crawl space, the bottom of the unit must be at least 4-in. above grade to prevent flooding of the electrical parts due to heavy rains.

Step 5 — Check Duct System

All units are provided with a return air duct flange, while a supply air outlet collar is provided on all models except the 6 through 12 ton horizontal models to facilitate duct connections. Refer to the individual data specification sheet for physical dimensions of the collar and flange.

A flexible connector is recommended for supply and return air connections on metal duct systems. All metal ducting should be insulated with a minimum of one inch duct insulation to avoid heat loss or gain and prevent condensate forming during the cooling operation. Application of the unit to uninsulated duct work is not recommended as the unit's performance will be adversely affected. Do not connect discharge ducts directly to the blower outlet. The factory provided air filter must be removed when using a filter back return air grille. The factory filter should be left in place on a free return system. If the unit will be installed in a new installation with new ductwork, the installation should be designed using current ASHRAE (American Society of Heating, Refrigerating, and Air-Conditioning Engineers) procedures for duct sizing. If the unit will be connected to an existing duct system, a check should be made to assure that the duct system has the capacity to handle the air required for the unit application. If the duct system is too small, larger ductwork must be installed. Be certain to check for existing leaks and repair.

The duct system and all diffusers should be sized to handle the designed airflow quietly. To maximize sound attenuation of the unit blower, the supply and return air plenums should be insulated. There should be no direct straight air path through the return-air grille into the heat pump. The return air inlet to the heat pump must have at least one 90 degree turn away from the space return air grille. If air noise or excessive airflow are a problem, the blower speed can be changed to a lower speed to reduce airflow.

Step 6 — Install Condensate Drain

A drain line must be connected to the heat pump and pitched away from the unit a minimum of 1/8-in. per foot to allow the condensate to flow away from the unit.

This connection must be in conformance with local plumbing codes. A trap must be installed in the condensate line to ensure free condensate flow. (Units are not internally trapped.) A vertical air vent is sometimes required to avoid air pockets. (See Fig. 9.) The length of the trap depends on the amount of positive or negative pressure on the drain pan.

A second trap must not be included. The horizontal unit should be pitched approximately 1/4-in. towards the drain in both directions, to facilitate condensate removal. (See Fig. 10.)

Step 7 — Pipe Connections

Supply and return piping must be as large as the unit connections on the heat pump (larger on long runs). Never use flexible hoses of a smaller inside diameter than that of the water connections on the unit. Units are supplied with either a copper or optional cupro-nickel condenser. Copper is adequate for ground water that is not high in mineral content. Should your well driller express concern regarding the quality of the well water available or should any known hazards exist in your area, we recommend proper testing to assure the well water quality is suitable for use with water source equipment. In conditions anticipating moderate scale formation or in brackish water a cupronickel heat exchanger is recommended.

Both the supply and discharge water lines will sweat if subjected to low water temperature. These lines should be insulated to prevent damage from condensation.

All manual flow valves used in the system must be ball valves. Globe and gate valves must not be used due to high pressure drop and poor throttling characteristics. Never exceed the recommended water flow rates. Serious damage or erosion of the water to refrigerant heat exchanger could occur.

⚠️ CAUTION

If equipped with float style condensate overflow switch, final adjustment must be made in the field. Failure to do so could result in equipment damage.
Always check carefully for water leaks and repair appropriately. Units are equipped with female pipe thread fittings. Consult the specification sheets for sizes. Teflon* tape sealer should be used when connecting water piping connections to the units to insure against leaks and possible heat exchanger fouling. Do not overtighten the connections. Flexible hoses should be used between the unit and the rigid system to avoid possible vibration. Ball valves should be installed in the supply and return lines for unit isolation and unit water flow balancing.

Pressure/temperature ports are recommended in both the supply and return lines for system flow balancing. The water flow can be accurately set by measuring the water-to-refrigerant heat exchangers water side pressure drop. See the unit specification sheets for the water flow and pressure drop information.

**CAUTION**

Water piping exposed to extreme, low ambient temperatures is subject to freezing.

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**WELL WATER SYSTEMS (50°F EWT [ENTERING WATER TEMPERATURE] MINIMUM)**

When a water well is used exclusively for supplying water to the heat pump, the pump should operate only when the heat pump operates. A 24 volt, double-pole single-throw contactor can be used to operate the well pump with the heat pump.

When two or more units are supplied from one well, the pump can be wired to operate independently from either unit. Two 24-volt double-pole single-throw relays wired in parallel are required. An upsized VA transformer may be required in either case.

The discharge water from the heat pump is not contaminated in any manner and can be disposed of in various ways depending on local codes (i.e., discharge well, dry well, storm sewer, drain field, stream, pond, etc.) See Fig. 11.

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* Teflon is a registered trademark of Dupont.

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**Fig. 11 — Well Water Applications**

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**WELL WATER APPLICATIONS**

*(50°F EWT MIN.)*

1. LINE VOLTAGE DISCONNECT
2. FLEX DUCT CONNECTION
3. LOW VOLTAGE CONTROL CONNECTION
4. LINE VOLTAGE CONNECTION
5. VIBRATION PAD
6. P/T PORTS
7. HOSE KITS (Optional)
8. BALL VALVES
9. SOLENOID VALVE SLOW CLOSING
10. CONDENSATE DRAIN CONNECTION
11. PRESSURE TANK (Optional)
COOLING TOWER/BOILER APPLICATION

To ensure adequate cooling and heating performance, the cooling tower and boiler water loop temperature should be maintained between 50°F and 75°F in the heating mode and 60°F and 110°F in the cooling mode. In the cooling mode, heat is rejected from the unit into the water loop. A cooling tower provides evaporative cooling to the loop fluid, thus maintaining a constant supply temperature to the unit. When utilizing an open cooling tower, chemical water treatment is mandatory to ensure the water is free of corrosive materials.

A secondary heat exchanger (plate frame between the unit and the open cooling tower) may also be used. It is imperative that all air is eliminated from the closed loop side of the heat exchanger to prevent condenser fouling. In the heating mode, heat is absorbed from the water loop to the unit. A boiler can be utilized to maintain the loop within the proper temperature range.

No unit should be connected to the supply or return piping until the water system has been completely cleaned and flushed to remove dirt, piping chips or other foreign material. Supply and return hoses should be connected together during this process to ensure the entire system is properly flushed. After the cleaning and flushing has taken place the unit may be connected to the water loop and should have all valves wide open. See Fig. 12.

---

**Fig. 12 — Cooling Tower/Boiler Application**

1. LINE VOLTAGE DISCONNECT
2. LOW VOLTAGE CONTROL CONNECTION
3. F/T PLUGS (Optional)
4. HOSE KITS
5. BALL VALVES
6. SUPPLY AND RETURN LINES OF CENTRAL SYSTEM
7. FLEX DUCT CONNECTION
8. HANGING BRACKETS ASSEMBLY (1/2 - 3½ TON MODELS)
9. THREADED ROD
EARTH COUPLED SYSTEMS

Operation of a unit on a closed loop application requires the extended range option. See Fig. 13.

NOTE: Closed loop and pond applications require specialized design knowledge. No attempt at these installations should be made unless the dealer has received specialized training.

Utilizing Ground Loop Pumping Package (GLP) makes the installation easy. Anti-freeze solutions must be utilized when low evaporating conditions are expected to occur. Refer to the installation manuals for more specific instructions.

Electrical Connections

See Tables 2 and 3 and Fig. 14-29 for electrical data.

Fig. 13 — Earth Coupled Applications
### Table 2 — 50HQP072-242 Electrical Data

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<th>50HQP UNIT SIZE</th>
<th>VOLTAGE (V-Ph-Hz)</th>
<th>COMPRESSOR (x2)</th>
<th>BLOWER MOTOR</th>
<th>MIN CIRCUIT AMPS</th>
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### Table 3 — 50VQP072-360 Electrical Data

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**FLA** — Full Load Amps  
**HACR** — Heating, Air Conditioning, and Refrigeration  
**LRA** — Locked Rotor Amps  
**RLA** — Rated Load Amps

**NOTES:**  
1. HACR circuit breaker in U.S.A. only.  
2. A voltage variation of ± 10% of nameplate rating is acceptable.  
   Phase imbalance shall not exceed 2%.
Fig. 15 — Single-Phase Deluxe D Board

DEFAULT SETTINGS FOR DELUXE D BOARD FROM FACTORY SHOWN.

DELUXE D INCLUDES BUILT IN:
- 270-300 SECOND RANDOM START
- 300 SECOND DELAY ON BREAK
- 120 SECOND LOW PRESSURE BYPASS

FACTORY WIRE
FIELD WIRE — — — —

STANDARD COMPONENTS LEGEND:
- #1 — COO/C dread
- #2 — SECOND STAGE
- AUX — AUXILIARY RELAY (FOR LOOP PUMP, ETC)
- BCA — BOILERLESS CONTROL ACTUATOR
- BC — BLOWER MOTOR CAPACITOR
- BM — BLOWER MOTOR
- BR — BLOWER RELAY
- COMP — COMPRESSOR
- CS — CONCENTRATE SENSORS (IN DRAIN PAN)
- CS — CONCENTRATE SENSORS (IN DRAIN PAN)
- EMS — EMERGENCY SHUTDOWN RELAY
- FR — FREEZE SENSOR
- HP — HIGH PRESSURE SWITCH
- HR — HEATING/COLDING RELAY
- LP — LOOP PUMP
- LPS — LOW PRESSURE SWITCH
- RV — REVERSING VALVE (HEAT PUMPS)

OPTIONAL COMPONENTS LEGEND:
- [ ] DS — DISCONNECT SWITCH
- [ ] HSL — HIGH TEMP SUCTION LIMIT (WITH HOT GAS BYPASS ONLY)

NOTES:
1. SEE UNIT NAME PLATE FOR ELECTRICAL RATINGS
2. ALL WIRE WIRING MUST BE IN ACCORDANCE WITH N.E.C.-N.F.P.A.
3. 30V/230V UNITS ARE FACTORY WIRE FOR 230V OPERATION. FOR 20V OPERATION, REMOVE ORG LEAD AND REPLACE WITH RED LEAD. CAP ALL UNUSED LEADS.
4. 30V/230V AND 460V BLOWER MOTORS HAVE 3 SPEED TAPS. 575V BLOWER MOTORS ARE SINGLE SPEED. FOR 460V BLOWER MOTORS, WIRE BLK AND ORG LEADS TOGETHER FOR 20V OR 230V OPERATION, CAP ALL UNUSED LEADS.
5. FOR ALTERNATE EMS COIL VOLTAGES CONSULT FACTORY.
6. DELUXE D INCLUDES BUILT-IN 270-300 SECOND RANDOM START
7. "TEST" DIP SWITCH REDUCES DELAYS TO 10 SEC WHEN SET TO YES. MUST BE SET TO "NO" FOR NORMAL OPERATION.
8. "FREEZE SENSOR" WILL OPERATE AT 30V BY DEFAULT. IF 15V OPERATION IS REQUIRED JUMPERS R77 & R78 MUST BE CUT IF FREEZE SENSOR IS NOT INSTALLED. JUMPERS MUST BE INSTALLED BETWEEN THE FREEZE SENSOR TERMINALS.
9. "ALARM OUTPUT" DIP SWITCH MUST BE SET TO "PULSE" IF BLINKING T-STAT SERVIGE LIGHT IS DESIRED.
10. DEFAULT SETTINGS FOR DELUXE D BOARD FROM FACTORY SHOWN.
11. ALARM OUTPUT IS NORMALLY OPEN (NO) DRY CONTACT. IF 24V AC IS NEEDED, CONNECT R TO ALR-COM TERMINAL. 24VAC WILL BE SENSED ON THE ALR-OUT WHEN THE UNIT IS IN ALARM CONDITION. OUTPUT WILL BE PULSED IF PULSE IS SELECTED.
12. CHECK FOR PROPER PHASE ROTATION ON UNITS WITH SCROLL COMPRESSORS. REVERSE ROTATION WILL DAMAGE THE COMPRESSOR AND VOID UNIT WARRANTY.
13. BCA CONTACTS R-Y OPEN ON DROP IN WATER TEMPERATURE AND R-B CLOSE.
Fig. 16 — Single-Phase Complete C with Hot Gas Reheat

**DEFAULT SETTINGS FOR COMPLETE C BOARD FROM FACTORY SHOWN.**

- **COMPLETE C INCLUDES BUILT IN:**
  - 270-300 SECOND RANDOM START
  - 300 SECOND DELAY ON BREAK
  - 120 SECOND LOW PRESSURE BYPASS

**FACTORY WIRE**
- **FIELD WIRE**

**STANDARD COMPONENTS LEGEND:**
- **1:** FIRST STAGE
- **2:** SECOND STAGE
- **AUX:** AUXILIARY RELAY FOR LOOP PUMP, ETC
- **BC:** BLOWER MOTOR CAPACITOR
- **BM:** BLOWER MOTOR
- **BR:** BLOWER RELAY
- **COMP:** COMPRESSOR
- **CAP:** COMPRESSOR CAPACITOR
- **CBR:** 24V CIRCUIT BREAKER
- **CC:** COMPRESSOR CONTACTOR
- **CPM:** COMPRESSOR PROTECTION MODULE
- **CR:** COOLING/HEATING RELAY
- **CS:** CONDENSATE SENSOR IN DRAIN PAN
- **FS:** FREEZE SENSOR
- **HGV:** HOT GAS REHEAT SOLENOID VALVE
- **HP:** HIGH PRESSURE SWITCH
- **LP:** LOOP PUMP
- **LPS:** LOW PRESSURE SWITCH
- **RH:** REHEAT RELAY
- **RV:** REVERSING VALVE (HEAT PUMPS)

**OPTIONAL COMPONENTS LEGEND:**
- **DS:** DISCONNECT SWITCH
- **HSL:** HIGH TEMPERATURE LIMIT (WITH HOT GAS BYPASS ONLY)

**NOTES:**
1. SEE UNIT NAME PLATE FOR ELECTRICAL RATING
2. ALL FIELD WIRING MUST BE IN ACCORDANCE WITH N.E.C.—N.F.P.A.
3. COPPER CONDUCTORS ONLY.
4. CLASS II FURNACE USE ONLY.
5. COMPRESSOR CAPACITORS ARE SINGLE SPEED FOR 400V BLOWER MOTORS. WIRE BLU AND ORG LEADS TOGETHER FOR 380V OR 3 PHASE OPERATION. CAP ALL UNUSED LEADS.
6. FOR ALTERNATE EMERGENCY VOLTAGES CONSULT FACTORY
7. COMPLETE C INCLUDES BUILT IN 370-390 SECOND RANDOM START
8. 300 SECOND DELAY ON BREAK
9. 120 SECOND LOW PRESSURE BYPASS
10. TEST DIP SWITCH REDUCES DELAYS TO 10 SEC WHEN SET TO YES. MUST BE SET TO NO FOR NORMAL OPERATION.
11. FREEZE SENSOR WILL OPERATE AT 30°F BY DEFAULT. IF 15°F OPERATION IS REQUIRED, JUMPER RT7 & RT8 MUST BE CUT. IF FREEZE SENSOR IS NOT INSTALLED A JUMPER SHALL BE INSTALLED BETWEEN THE FREEZE SENSOR TERMINALS.
12. ALARM OUTPUT DIP SWITCH MUST BE SET TO "PULSE" IF RUNNING T-STAT SERVICE LIGHT IS DESIRED.
13. Alarm output is normally open (NO) DRY CONTACT, IF 24 VAC IS NEEDED, CONNECT R TO ALM-OFF TERMINAL. 24 VAC WILL BE PULLED ON THE ALM-OFF WHEN THE UNIT IS IN ALARM CONDITION. OUTPUT WILL BE PULLED IF PULSE IS SELECTED.
14. CHECK FOR PROPER PHASE ROTATION ON UNITS WITH REVERSIBLE COMPRESSORS, REVERSE ROTATION WILL DAMAGE THE COMPRESSOR AND VOID WARRANTY.
19

Fig. 17 — Single-Phase Deluxe D with Hot Gas Reheat

DEFAULT SETTINGS FOR DELUXE D BOARD FROM FACTORY SHOWN.

DELUXE D INCLUDES BUILT IN:
1. 270-300 SECOND RANDOM START
2. 300 SECOND DELAY ON BREAK
3. 120 SECOND LOW PRESSURE BYPASS

STANDARD COMPONENTS LEGEND:
- # — FIRST STAGE
- # — SECOND STAGE
- AUX — AUXILIARY RELAY (FOR LOOP PUMP, ETC)
- BCA — BLOWERLESS CONTROL AQUISTAT
- BCR — BLOWERLESS CONTROL RELAY
- BM — BLOWER MOTOR CAPACITOR
- BR — BLOWER RELAY
- COMP — COMPRESSOR
- CAP — COMPRESSOR CAPACITOR
- CBR — 24V CIRCUIT BREAKER
- CC — COMPRESSOR CONTACTOR
- CPM — COMPRESSOR PROTECTION MODULE
- CR — COOLING HEATING RELAY
- CS — CONDENSATE SENSOR (IN DRAIN PAN)
- EWS — EMERGENCY SHUTDOWN RELAY
- FS — FREEZE SENSORS
- HGS — HOT GAS REHEAT SOLENOID VALVE
- HPS — HIGH PRESSURE SWITCH
- HR — HEATING COOLING RELAY
- LP — LOOP PUMP
- LPS — LOW PRESSURE SWITCH
- RH — REHEAT RELAY
- RV — REVERSING VALVE (HEAT PUMPS)

OPTIONAL COMPONENTS LEGEND:
[ ] DS — DISCONNECT SWITCH
[ ] HSL — HIGH TEMP SUCTION UNIT (WITH HOT GAS BYPASS ONLY)

NOTES:
1. SEE UNIT NAME PLATE FOR ELECTRICAL RATING
2. ALL FIELD WIRING MUST BE IN ACCORDANCE WITH N.E.C.—N.F.P.A.
3. 208/230V UNITS ARE FACTORY WIRING FOR 230V OPERATION. FOR 208V OPERATION, REMOVE ORG LEAD AND REPLACE WITH RED LEAD. CAP ALL UNUSED LEADS.
4. 208/230V AND 480V BLOWER MOTORS HAVE 3 SPEED TAPS. 575V BLOMERS ARE SINGLE SPEED. FOR 460V BLOMERS, WIRE BLK AND ORG LEADS TOGETHER FOR 208 OR 230V SPEED OPERATION. CAP ALL UNUSED LEADS.
5. FOR ALTERNATE VOLTAGES CONSULT FACTORY.

DELUXE D INCLUDES BUILT IN:
1. 270-300 SECOND RANDOM START
2. 300 SECOND DELAY ON BREAK
3. 120 SECOND LOW PRESSURE BYPASS

7. "TEST" DIP SWITCH REDUCES DELAYS TO 10 SEC WHEN SET TO YES. MUST BE SET TO "NO" FOR NORMAL OPERATION.
8. "FREEZE SENSOR" WILL OPERATE AT 20F BY DEFAULT. IF 15F OPERATION IS REQUIRED, JUMPERS R7 & R13 MUST BE CUT. IF FREEZE SENSOR IS NOT INSTALLED A JUMPER SHALL BE INSTALLED BETWEEN THE FREEZE SENSOR TERMINALS.
9. "ALARM OUTPUT" DIP SWITCH MUST BE SET TO "HUMES" IF BLUING T-STAT SERVICE LIGHT IS DESIRED.
10. DEFAULT SETTINGS FOR DELEUX D BOARD FROM FACTORY SHOWN.
11. ALARM OUTPUT IS NORMALLY OPEN (NO) DRY CONTACT. IF 24 VAC IS NEEDED, CONNECT IT TO ALR-OUT TERMINAL. 24VAC WILL BE SENSED ON THE ALR-OUT WHEN THE UNIT IS IN ALARM CONDITION. OUTPUT WILL BE PULSED IF PULSE IS SELECTED.
12. CHECK FOR PROPER PHASE ROTATION ON UNITS WITH SCROLL COMPRESSORS, REVERSE ROTATION WILL DAMAGE THE COMPRESSOR AND VOID UNIT WARRANTY.
13. BCA CONTACTS R-Y OPEN ON DROP IN WATER TEMPERATURE AND R-B CLOSE.
Fig. 18 — 3-Phase Complete C Board

COMPLETE C INCLUDES BUILT IN:
1. 270-300 SECOND RANDOM START
2. 300 SECOND DELAY ON BREAK
3. 120 SECOND LOW PRESSURE BYPASS

DEFAULT SETTINGS FOR COMPLETE C BOARD FROM FACTORY SHOWN.

STANDARD COMPONENTS LEGEND:
1. FB — FUSE BLOCK
2. DS — DISCONNECT SWITCH
3. HSL — HIGH TEMP SUCTION LIMIT (WITH HOT GAS BYPASS ONLY)
4. RVR — REVERSING VALVE RELAY

OPTIONAL COMPONENTS LEGEND:
1. 5V — FUSE BLOCK
2. 5DS — DISCONNECT SWITCH
3. HSL — HIGH TEMP SUCTION LIMIT (WITH HOT GAS BYPASS ONLY)
4. RVR — REVERSING VALVE RELAY

NOTES:
1. SEE UNIT NAME PLATE FOR ELECTRICAL RATING
2. ALL FIELD WIRING MUST BE IN ACCORDANCE WITH N.E.C. — N.F.P.A.
3. COPPER CONDUCTORS ONLY.
4. 200/230/240V UNITS ARE FACTORY WIRE FOR 230V OPERATION. FOR 208V OPERATION, REWIRE ORG LEAD AND REPLACE WITH RED LEAD. CAP ALL UNUSED LEADS.
5. BLowers MOTOR CAPACITOR
6. BR — BLOWER MOTOR
7. CC — COMPRESSOR CONTOR
8. CBR — 24V CIRCUIT BREAKER
9. CPM — COMPRESSOR PROTECTION MODULE
10. CS — CONDENSATE SENSOR (IN DRAIN PAN)
11. FS — FREEZE SENSOR
12. HPS — HIGH PRESSURE SWITCH
13. LPS — LOW PRESSURE SWITCH
14. RV — REVERSING VALVE (HEAT PUMPS)

7. "TEST" DIP SWITCH REDUCES DELAYS TO 10 SEC WHEN SET TO YES. MUST BE SET TO "NO" FOR NORMAL OPERATION.
8. "FREEZE SENSOR" WILL OPERATE AT 30°F BY DEFAULT. IF 15°F OPERATION IS REQUIRED JUMPERS R77 & R78 MUST BE CUT IF FREEZE SENSOR IS NOT INSTALLED A JUMPER SHALL BE INSTALLED BETWEEN THE FREEZE SENSOR TERMINALS.
9. "ALARM OUTPUT" DIP SWITCH MUST BE SET TO "PULSE" IF BLINKING T-STAT SERVICE LIGHT IS DESIRED.
10. DEFAULT SETTINGS FOR COMPLETE C BOARD FROM FACTORY SHOWN.
11. ALARM OUTPUT IS NORMALLY OPEN (NO) DRY CONTACT. IF 24V AC IS NEEDED, CONNECT R TO ALR-COM TERMINAL. 24VAC WILL BE SENSED ON THE ALR-OUT WHEN THE UNIT IS IN ALARM CONDITION. OUTPUT WILL BE PULSED IF PULSE IS SELECTED.
12. CHECK FOR PROPER PHASE ROTATION ON UNITS WITH SCROLL COMPRESSORS. REVERSE ROTATION WILL DAMAGE THE COMPRESSOR AND VOID UNIT WARRANTY.
13. REVERSING VALVES ARE WIRER TO A SEPARATE TRNASFORMER ON 30 TON UNITS
Fig. 19 — 3-Phase Deluxe D Board

DEFAULT SETTINGS FOR DELUXE D BOARD FROM FACTORY SHOWN.

DELUXE D INCLUDES BUILT IN:
- 270-300 SECOND RANDOM START
- 300 SECOND DELAY ON BREAK
- 120 SECOND LOW PRESSURE BYPASS

OPTIONAL COMPONENTS LEGEND:

[ ] FB — FUSE BLOCK
[ ] DS — DISCONNECT SWITCH
[ ] HSL — HIGH TEMP SUCTION LIMIT
[ ] RVR — REVERSING VALVE RELAY
[ ] TB2 — MAIN TERMINAL BLOCK (460V UNITS ONLY)
[ ] TB3 — TERMINAL BLOCK DISCONNECT SWITCH (460V UNITS ONLY)

NOTES:
1. SIZE LIMIT NAME PLATE FOR ELECTRICAL RATING
2. ALL FIELD WIRING MUST BE IN ACCORDANCE WITH N.E.C., N.F.P.A.
3. #14 COPPER CONDUCTORS ONLY.
4. 230/208V UNITS ARE FACTORY WIRED FOR 208V OPERATION. FOR 208V OPERATION, REMOVE ORG LEAD AND REPLACE WITH RED LEAD. CAP ALL UNUSED LEADS.
5. 460V UNITS AND 460V BLOWERS ARE 5 SPEED TAPS. 270V BLOWER MOTORS ARE 1-SPEED. FOR 460V BLOWER MOTORS, WIRE ORG AND ORG LEADS TOGETHER FOR W2D ON 5 SPEED OPERATION. CAP ALL UNUSED LEADS.
6. FOR ALTERNATE EMS COIL VOLTAGES CONSULT FACTORY.
7. "TEST" DIP SWITCH REDUCES DELAYS TO 10 SEC WHEN SET TO YES. MUST BE SET TO "NO" FOR NORMAL OPERATION.
8. "PULSE" DIP SWITC WILL OPERATE AT 307 BY DEFAULT. IF "PULSE" OPERATION IS REQUIRED, JUMPER ORG & RED MUST BE CUT IF FREEZE SENSOR IS NOT INSTALLED A JUMPER SHALL THEN BE INSTALLED BETWEEN THE FREEZE SENSOR TERMINALS.
10. "ALARM OUTPUT" DIP SWITC WILL OPERATE AT 307 BY DEFAULT. IF "PULSE" OPERATION IS REQUIRED, JUMPER ORG & RED MUST BE CUT IF FREEZE SENSOR IS NOT INSTALLED A JUMPER SHALL THEN BE INSTALLED BETWEEN THE FREEZE SENSOR TERMINALS.
11. "ALARM OUTPUT" DIP SWITC WILL OPERATE AT 307 BY DEFAULT. IF "PULSE" OPERATION IS REQUIRED, JUMPER ORG & RED MUST BE CUT IF FREEZE SENSOR IS NOT INSTALLED A JUMPER SHALL THEN BE INSTALLED BETWEEN THE FREEZE SENSOR TERMINALS.
12. "ALARM OUTPUT" DIP SWITC WILL OPERATE AT 307 BY DEFAULT. IF "PULSE" OPERATION IS REQUIRED, JUMPER ORG & RED MUST BE CUT IF FREEZE SENSOR IS NOT INSTALLED A JUMPER SHALL THEN BE INSTALLED BETWEEN THE FREEZE SENSOR TERMINALS.
13. "ALARM OUTPUT" DIP SWITC WILL OPERATE AT 307 BY DEFAULT. IF "PULSE" OPERATION IS REQUIRED, JUMPER ORG & RED MUST BE CUT IF FREEZE SENSOR IS NOT INSTALLED A JUMPER SHALL THEN BE INSTALLED BETWEEN THE FREEZE SENSOR TERMINALS.
14. "ALARM OUTPUT" DIP SWITC WILL OPERATE AT 307 BY DEFAULT. IF "PULSE" OPERATION IS REQUIRED, JUMPER ORG & RED MUST BE CUT IF FREEZE SENSOR IS NOT INSTALLED A JUMPER SHALL THEN BE INSTALLED BETWEEN THE FREEZE SENSOR TERMINALS.
Fig. 20 — 3-Phase Complete C Board with Hot Gas Reheat

DEFAULT SETTINGS FOR COMPLETE C BOARD FROM FACTORY SHOWN.

COMPLETE C INCLUDES BUILT IN:
- 270-300 SECOND RANDOM START
- 300 SECOND DELAY ON BREAK
- 120 SECOND LOW PRESSURE BYPASS

OPTIONAL COMPONENTS LEGEND:
- FB = FUSE BLOCK
- DS = DISCONNECT SWITCH
- HSL = HIGH TEMP SUCTION LIMIT (WITH HOT GAS BYPASS ONLY)
- RVR = REVERSING VALVE RELAY
- TB2 = MAIN TERMINAL BLOCK (460V UNITS ONLY)
- TB3 = TERMINAL BLOCK DISCONNECT SWITCH (460V UNITS ONLY)

NOTES:
1. SEE UNIT NAME PLATE FOR ELECTRICAL RATING
2. ALL FIELD WIRING MUST BE IN ACCORDANCE WITH N.E.C.—N.F.P.A.
3. COPPER CONDUCTORS ONLY.
4. 208/230V UNITS ARE FACTORY WIRED FOR 230V OPERATION. FOR 208V OPERATION, REMOVE ORG LEAD AND REPLACE WITH RCD LEAD. CAP ALL UNUSED LEADS.
5. 208/230V AND 460V BLOWER MOTORS HAVE 3 SPEED TAPS. 575V BLOWER MOTORS ARE SINGLE SPEED. FOR 460V BLOWER MOTORS, WIRE 57V AND ORG LEADS TOGETHER FOR MED OR LR SPEED OPERATION. CAP ALL UNUSED LEADS.
6. FOR ALTERNATE DIP COIL VOLTAGE, CONSULT FACTORY.
7. COMPLETE C INCLUDES BUILT IN: 270-300 SECOND RANDOM START
8. 300 SECOND DELAY ON BREAK
9. 120 SECOND LOW PRESSURE BYPASS
10. "TEST" DIP SWITCH REDUCES DELAYS TO 10 SEC. WHEN SET TO "YES," MUST BE SET TO "NO" FOR NORMAL OPERATION.
11. "FREEZE SENSOR" WILL OPERATE AT 30°F BY DEFAULT. IF 1ST OPERATION IS REQUIRED, JUMPER R77 & R78 MUST BE CUT. IF FREEZE SENSOR IS NOT INSTALLED, A JUMPER SHALL BE INSTALLED BETWEEN THE FREEZE SENSOR TERMINALS.
12. "ALARM OUTPUT" DIP SWITCH MUST BE SET TO "PULSE" IF BLANKING T—STAT SERVICE LIGHT IS DESIRED.
13. DEFAULT SETTINGS FOR COMPLETE C BOARD FROM FACTORY SHOWN.
14. ALARM OUTPUT IS NORMALLY OPEN (NO) DRY CONTACT. IF 24V AC IS NEEDED, CONNECT R TO ALR—COM TERMINAL. 24VAC WILL BE SENSED ON THE ALR—OUT WHEN THE UNIT IS IN ALARM CONDITION. OUTPUT WILL BE PULSED IF PULSE IS SELECTED.
15. CHECK FOR PROPER PHASE ROTATION ON UNITS WITH SCROLL COMPRESSORS. REVERSE ROTATION WILL DAMAGE THE COMPRESSOR AND VOID UNIT WARRANTY.
16. REVERSING VALVES ARE WIRED TO A SEPARATE TRANSFORMER ON 30 TON UNITS
17. TERMINAL BLOCK TB3 LOCATED ON SIDE DISCONNECT SWITCH BOX.
18. FACTORY MOUNTED LOOP PUMP OR TWO WAY WATER VALVE. BOTH DEVICES WILL NOT BE PRESENT IN THE SAME UNIT.
19. PUMP MOTOR IS WIRED BETWEEN LINE AND NEUTRAL FOR 300-460VAC UNITS. FOR 208/230VAC UNITS PUMP MOTOR IS WIRED BETWEEN LINES.
Fig. 21 — 3-Phase Deluxe D Board with Hot Gss Reheat

DEFAULT SETTINGS FOR DELUXE D BOARD FROM FACTORY SHOWN.

DELUXE D INCLUDES BUILT IN:
- 270-300 SECOND RANDOM START
- 300 SECOND DELAY ON BREAK
- 120 SECOND LOW PRESSURE BYPASS

OPTIONAL COMPONENTS LEGEND:
- TB — FUSE BLOCK
- DS — DISCONNECT SWITCH
- HSL — HIGH TEMP SUCTION LIMIT
- (WITH HOT GAS BYPASS ONLY)
- RV — REVERSING VALVE
- TB2 — MAIN TERMINAL BLOCK (460V UNITS ONLY)
- TB3 — TERMINAL BLOCK DISCONNECT SWITCH (460V UNITS ONLY)

NOTES:
1. All field wiring must be in accordance with NEC—NFPA.
2. Copper conductors only.
3. 208/230V units are factory wired for 208V operation. For 208V operation, remove ORG lead and replace with RED lead. Cap all unused leads.
4. 208/230V and 460V Blower Motors have 3 speed waps. 57V blower motors are single speed. For 460V blower motors, wire blk and ORG leads together for NO on LO speed operation. Cap all unused leads.
5. For alternate operation, VAC will be reversed.
6. Deluxe D includes built in 270-300 SECOND RANDOM START.
7. 120 SECOND DELAY ON BREAK.
8. "TEST" DIP SWITCH REDUCES DELAYS TO 10 SEC WHEN SET TO YES. MUST BE SET TO "NO" FOR NORMAL OPERATION.
9. THE PRESENCE SENSOR WILL OPERATE AT 30°F BY DEFAULT IF 1ST OPERATION IS REQUIRED. JUMPERS RT7 & RT8 MUST BE CUT IF PRESENCE SENSOR IS NOT INSTALLED. A JUMPER SHALL BE INSTALLED BETWEEN THE PRESENCE SENSOR TERMINALS.
10. "ALARM OUTPUT" DIP SWITCH MUST BE SET TO "PULSE" IF BUNKING T-STAT SERVICE LIGHT IS DESIRED.
11. ALARM OUTPUT IS NORMALLY OPEN (NO) DRY CONTACT. IF 24V AC IS NEEDED, CONNECT R TO ALR-CON TERMINAL. 24V AC WILL BE SENT ON THE ALR-OUT WHEN THE UNIT IS IN ALARM CONDITION. OUTPUT WILL BE PULSED IF "PULSE" IS SELECTED.
12. CHECK FOR PROPER PHASE ROTATION ON UNITS WITH SCROLL COMPRESSORS. REVERSE ROTATION WILL DAMAGE THE COMPRESSOR AND VOID UNIT WARRANTY.
13. REVERSING VALVES ARE WIRING TO A SEPARATE TRANSFORMER ON 30 TON UNITS.
14. TERMINAL BLOCK TB3 LOCATED IN SIDE DISCONNECT FRONT PANEL.
15. FACTORY MOUNTED LOOP PUMP ON TWO WAY WATER VALVE. BOTH DEVICES WILL NOT BE PRESENT IN THE SAME UNIT.
16. PUMP MOTOR IS WIRING BETWEEN LINE AND NEUTRAL FOR 380-460VAC UNITS. FOR 208/230VAC UNITS PUMP MOTOR IS WIRE BETWEEN LINES.
17. BCA CONTROLS R-Y OPEN ON DROP IN WATER TEMPERATURE AND R-B CLOSE.
Fig. 23 — Single-Phase Deluxe D Board with Water Economizer

DEFAULT SETTINGS FOR DELUXE D BOARD FROM FACTORY SHOWN.

DELUXE D INCLUDES BUILT IN:
- 270-300 SECOND RANDOM START
- 300 SECOND DELAY ON BREAK
- 120 SECOND LOW PRESSURE BYPASS

OPTIONAL COMPONENTS LEGEND:
- DS - Disconnect Switch
- HSL - High Temp Suction Limit (W/THOUT HOT GAS BYPASS ONLY)

NOTES:
1. See unit name plate for electrical rating.
2. All field wiring must be in accordance with N.E.C. - N.F.P.A.
3. 208/230V units are factory wired for 230V operation. For 208V operation, remove one lead and replace with red lead. Cap all unused leads.
4. 208/230V and 460V blowers have 3 speed taps. 575V blower motors are single speed. For 460V blower motors, wire two and ground leads together. For 208V or 230V operation, cap all unused leads.
5. For alternate EMS coil voltages consult factory.
6. DELUXE D includes built-in: 270-300 second random start
- 120 second low pressure bypass

7. "TEST" DP switch reduces delays to 10 sec. When set to yes, must be set to "no" for normal operation.
8. "FREEZE SENSOR" will operate at 30°F by default. If 15°F operation is required, jumper R17 & R18 must be cut. If freeze sensor is not installed, a jumper shall be installed between the freeze sensor terminals.
9. "ALARM OUTPUT" DP switch must be set to "PULSE" if blinking T-stat service light is desired.
10. Default settings for Deluxe D Board from factory show:
11. Alarm output is normally open (NO) dry contact. If 24V is needed, connect R to AIR-COM terminal. 24VAC will be sensed on the air-out when the unit is in alarm condition. Output will be pulsed if pulse is selected.
12. Check for proper phase rotation on units with scroll compressors. Reverse rotation will damage the compressor and void unit warranty.
13. BCA contacts R-Y open on drop in water temperature and R-B close.
Fig. 24 — Single-Phase Complete C Board with Water Economizer and Hot Gas Reheat

**Standard Components Legend:**
- #1: First Stage
- #2: Second Stage
- AQS: Aquastat
- AUX: Auxiliary Relay (for Loop Pump, etc.)
- BC: Blower Motor Capacitor
- BM: Blower Motor
- BR: Blower Relay
- COMP: Compressor
- CAP: Compressor Capacitor
- CBS: 24V Circuit Breaker
- C: Compressor Contact
- CPFM: Compressor Protection Module
- CR: Cooling/Heating Relay
- CS: Condensate Sensor (In Drain Pan)
- ER: Economizer Relay
- FS: Freeze Sensor
- HGVS: Hot Gas Reheat Solenoid Valve
- HPS: High Pressure Switch
- UP: Loop Pump
- LPS: Low Pressure Switch
- MBV: Motorized Ball Valve
- MSVR: Motorized Ball Valve Relay
- RH: Reheat Relay
- RV: Reversing Valve (Heat Pumps)

**Optional Components Legend:**
- DS: Disconnect Switch
- HSL: High Temp Suction Limit (With Hot Gas Bypass Only)

**Notes:**
1. See unit name plate for electrical rating.
2. All field wiring must be in accordance with N.E.C./N.F.P.A.
3. 24V/230V units are factory wired for 230V operation. For 208V operation, remove grid lead and replace with red lead. Cap all unused leads.
4. 208/230V and 480V blower motors have 3 speed taps. 575V blower motors are single speed. For 480V blower motors, wire BLK and ORG leads together for 240V 3 speed operation. Cap all unused leads.
5. For alternate EMV coil voltages consult factory.
6. Complete C includes built in 270-300 second random start.
7. Second low pressure bypass.
8. Test dip switch reduces delays to 10 sec when set to YES. Must be set to "No" for normal operation.
9. "Freeze Sensor" will operate at 30°F by default. If "Off" operation is required, jumper R7 & R17 must be cut. If freeze sensor is not installed, jumpers shall be installed between the freeze sensor terminals.
10. "Alarm Output" dip switch must be set to "Pulse" if blower t-stat service light is desired.
11. Default setting for complete C board from factory shown.
12. Check for proper phase rotation on units with scroll compressors. Reverse rotation will damage the compressor and void unit warranty.
Fig. 25 — Single-Phase Deluxe D Board with Water Economizer and Hot Gas Reheat

DEFAULT SETTINGS FOR DELUXE D BOARD FROM FACTORY SHOWN.

DELUXE D INCLUDES BUILT IN:
- 270-300 SECOND RANDOM START
- 300 SECOND DELAY ON BREAK
- 120 SECOND LOW PRESSURE BYPASS

STANDARD COMPONENTS LEGEND:
- #1 — FIRST STAGE
- #2 — SECOND STAGE
- AQS — AQUASTAT
- AUX — AUXILIARY RELAY (FOR LOOP PUMP, ETC)
- BCA — BOILERLESS CONTROL AQUASTAT
- BCR — BOILERLESS CONTROL RELAY
- BC — BLOWER MOTOR CAPACITOR
- BM — BLOWER MOTOR
- BR — BLOWER RELAY
- COMP — COMPRESSOR
- CAP — COMPRESSOR CAPACITOR
- CBR — 24V CIRCUIT BREAKER
- CC — COMPRESSOR CONTACTOR
- CPM — COMPRESSOR PROTECTION MODULE
- CR — COOLING/HEATING RELAY
- CS — CONDENSATE SENSOR (IN DRAIN PAN)
- EMS — EMERGENCY SHUTDOWN RELAY
- ER — ECONOMIZER RELAY
- FS — FREEZE SENSOR
- HVS — HOT GAS REHEAT SOLENOID VALVE
- HPS — HIGH PRESSURE SWITCH
- HR — HEATING/COOLING RELAY
- LP — LOOP PUMP
- LPS — LOW PRESSURE SWITCH
- MSV — MOTORIZED BALL VALVE
- MVR — MOTORIZED BALL VALVE RELAY
- RH — REHEAT RELAY
- RV — REVERSING VALVE (HEAT PUMPS)

OPTIONAL COMPONENTS LEGEND:
- [ ] DS — DISCONNECT SWITCH
- [ ] HSL — HIGH TEMPERATURE LIMIT (WITH HOT GAS BYPASS ONLY)

NOTES:
1. SEE UNIT NAMEPLATE FOR ELECTRICAL RATING.
2. ALL FIELD WIRING MUST BE IN ACCORDANCE WITH NEC—N.F.P.A.
3. 208/230V UNITS ARE FACTORY WIRE FOR 230V OPERATION. FOR 208V OPERATION, REMOVE ORG LEADS AND REPLACE WITH RED LEADS. CAP ALL UNUSED LEADS.
4. 208/230V AND 460V BLOWER MOTORS HAVE 2 SPEED TAPS. 575V BLOWER MOTORS ARE SINGLE SPEED FOR 480V BLOWER MOTORS, WIRE REL AND ORG LEADS TOGETHER FOR 3-Ph OR 5 SPEED OPERATION. CAP ALL UNUSED LEADS.
5. FOR ALTERNATE GAS COILVOLTAGES CONSULT FACTORY.
6. DELUXE D INCLUDES BUILT IN 270-300 SECOND RANDOM START
7. 300 SECOND DELAY ON BREAK ON 270-300 SECOND RANDOM START
8. "TEST DIP SWITCH" REDUCES DELAYS TO 10 SEC WHEN SET TO Y. ELT MUST BE SET TO "NO" FOR NORMAL OPERATION.
9. "FREEZE SENSOR" WILL OPERATE AT 307 BY DEFAULT. IF 125 OPERATION IS REQUIRED, JUMPER W7 & W10 MUST BE CUT IF FREEZE SENSOR IS NOT INSTALLED. A JUMPER SHALL BE INSTALLED BETWEEN THE FREEZE SENSOR TERMINALS.
10. "ALARM OUTPUT DIP SWITCH" MUST BE SET TO "PULSE" IF BLINKING "T-STATE" SERVICE LIGHT IS DESIRED.
11. "ALARM OUTPUT" IS NORMALLY OPEN (NO) DRY CONTACT. IF 24 VAC IS NEEDED, CONNECT R TO ALR-COM TERMINAL. 24VAC WILL BE SUPPLIED TO ALR-DUTY WHEN THE UNIT IS IN ALARM CONDITION. OUTPUT WILL BE PULSED IF PULSE IS SELECTED.
12. CHECK FOR PROPER PHASE ORIENTATION ON UNITS WITH SCROLL COMPRESSORS. REVERSE Rotation WILL DAMAGE THE COMPRESSOR AND VOID UNIT WARRANTY.
13. BCA CONTACTS R-Y OPEN ON DROP IN WATER TEMPERATURE AND R-B CLOSE

Diagram: Single-Phase Deluxe D Board with Water Economizer and Hot Gas Reheat.
Fig. 26 — 3-Phase Complete C Board with Water Economizer

DEFAULT SETTINGS FOR COMPLETE C BOARD FROM FACTORY SHOWN.

COMPLETE C INCLUDES BUILT IN:
- 270-300 SECOND RANDOM START
- 300 SECOND DELAY ON BREAK
- 120 SECOND LOW PRESSURE BYPASS

STANDARD COMPONENTS LEGEND:
- #1 — FIRST STAGE
- #2 — SECOND STAGE
- AUX — AUXILIARY RELAY (FOR LOOP PUMP, ETC)
- BM — BLOWER MOTOR
- BR — BLOWER RELAY
- COMP — COMPRESSOR
- CR — 24V CIRCUIT BREAKER
- CS — COMpressor CONTACTOR
- CP — COMPRESSOR PROTECTION MODULE
- CS — CONDENSATE SENSOR (IN DRAIN PAN)
- ER — ECONOMIZER RELAY
- FS — FREEZE SENSOR
- HP — HIGH PRESSURE SWITCH
- LP — LOOP PUMP
- LPS — LOW PRESSURE SWITCH
- MBV — MOTORIZED BALL VALVE
- MVR — MOTORIZED BALL VALVE RELAY
- RV — REVERSING VALVE (HEAT PUMPS)

OPTIONAL COMPONENTS LEGEND:
- FS — FUSE BLOCK
- D5 — DISCONNECT SWITCH
- HS — HIGH TEMP SUCTION UNIT (WITH HOT GAS BYPASS ONLY)
- RV — REVERSING VALVE RELAY
- TB3 — MAIN TERMINAL BLOCK (460V UNITS ONLY)
- TB5 — TERMINAL BLOCK DISCONNECT SWITCH (460V UNITS ONLY)

NOTES:
1. SEE UNIT NAME PLATE FOR ELECTRICAL RATING
2. ALL FIELD WIRING MUST BE IN ACCORDANCE WITH UL AND NFPA
3. All field conductors only.
4. 208/230V UNITS ARE FACTORY WIRED FOR 230V OPERATION. FOR 208V OPERATION, REMOVE OR Disconnect RED LEAD, CAP ALL UNDERSIZED LEADS.
5. 208/230V AND 460V BLOWER MOTORS ARE SINGLE DUTY. FOR 460V BLOWER MOTORS, WIRE AUX AND OR Disconnect LEADS TOGETHER FOR WIRING ON LO PRESSURE OPERATION. CAP ALL UNDERSIZED LEADS.
6. FOR ALTERNATE EWS COIL VOLTAGES CONSULT FACTORY.
7. COMPLETE C INCLUDES BUILT IN 270-300 SECOND RANDOM START
8. 300 SECOND DELAY ON BREAK
9. 300 SECOND LOW PRESSURE BYPASS
10. "TEST" DIP SWITCH REDUCES DELAYS TO 10 SEC WHEN SET TO "NO" FOR NORMAL OPERATION.
11. "FREEZE SENSOR" WILL OPERATE AT 30F BY DEFAULT. IF 150F OPERATION IS REQUIRED, JUMPER R77 & R78 MUST BE LEFT OUT IF FREEZE SENSOR IS NOT INSTALLED A JUMPER SHALL BE INSTALLED BETWEEN THE FREEZE SENSOR TERMINALS.
12. "ALARM OUTPUT" DIP SWITCH MUST BE SET TO "PULSE" IF BUMPING T-STAT SERVICE LIGHT IS DESIRED.
13. DEFAULT SETTINGS FOR COMPLETE C BOARD FROM FACTORY SHOWN.
14. ALARM OUTPUT IS NORMALLY OPEN (NO) DRY CONTACT. IF 24VAC IS NEEDED, CONNECT IT TO ALAROM COM TERMINAL. 24VAC WILL BE SENT ON THE ALAROM OUT WHEN THE UNIT IS IN ALARM CONDITION. OUTPUT WILL BE PULSED IF ALARM IS SELECTED.
15. CHECK FOR PROPER PHASE ROTATION ON UNITS WITH SCROLL COMPRESSORS. REVERSE ROTATION WILL DAMAGE THE COMPRESSOR AND VOID UNIT WARRANTY.
16. TIP BLOCK IS CONNECTED TO A SEPARATE TRANSFORMER ON 30 TON UNITS
17. TERMINAL BLOCK #3 LOCATED IN SIZE DISCONNECT SWITCH BOX.
18. FACTORY MOUNTED LOOP PUMP OR THE WAY WATER VALVE BOTH DESIGNS WILL NOT BE PRESENT IN THE SAME UNIT.
19. PUMP MOTOR IS WIRE BETWEEN LINE AND NEUTRAL FOR 3PH-208VAC UNITS. FOR 208/230VAC UNITS PUMP MOTOR IS WIRE BETWEEN LINES.
Fig. 27 — 3 Phase Deluxe D Board with Water Economizer

DEFAULT SETTINGS FOR DELUXE D BOARD FROM FACTORY SHOWN.

DELUXE D INCLUDES BUILT IN:
- 270-300 SECOND RANDOM START
- 300 SECOND DELAY ON BREAK
- 120 SECOND LOW PRESSURE BYPASS

STANDARD COMPONENTS LEGEND:
- 1 - FIRST STAGE
- 2 - SECOND STAGE
- ACS - AQUASTAT
- AUX - AUXILIARY RELAY (FOR LOOP PUMP, ETC)
- BCA - BOILERLESS CONTROL AQUASTAT
- BSR - BOILERLESS CONTROL RELAY
- BM - BLOWER MOTOR
- BR - BLOWER RELAY
- COMP - COMPRESSOR
- CBR - 24V CIRCUIT BREAKER
- CC - COMPRESSOR CONTACTOR
- CPM - COMPRESSOR PROTECTION MODULE
- CS - CONDENSATE SENSOR (IN DRAIN PAN)
- CR - ECONOMIZER RELAY
- EMS - EMERGENCY SHUTDOWN RELAY
- FS - FREEZE SENSOR
- HPS - HIGH PRESSURE SWITCH
- HR - HEATING/COOLING RELAY
- LP - LOOP PUMP
- LPS - LOW PRESSURE SWITCH
- MBVR - MOTORIZED BALL VALVE
- LV - PHASE MONITOR
- RV - REVERSING VALVE (HEAT PUMPS)

OPTIONAL COMPONENTS LEGEND:
- FB - FUSE BLOCK
- DS - DISCONNECT SWITCH
- HSL - HIGH TEMP SUCTION LIMIT
- (WITH HOT GAS BYPASS ONLY)
- RVR - REVERSING VALVE RELAY
- TB2 - MAIN TERMINAL BLOCK (460V UNITS ONLY)
- TB3 - TERMINAL BLOCK DISCONNECT SWITCH
- (460V UNITS ONLY)

NOTES:
- SEE UNIT NAME PLATE FOR ELECTRICAL RATING
- ALL FIELD WIRING MUST BE IN ACCORDANCE WITH N.E.C.—N.F.P.A.
- #10 C permanent wrap conductors only.
- 208/230V UNITS ARE FACTORY WIRE FOR 230V OPERATION. FOR 208V OPERATION, REMOVE ORG LEAD AND REPLACE WITH RED LEAD. CAP ALL UNIRED LEADS.
- 208/230V AND 460V BLOWER MOTORS HAVE 3 SPEED TAPS. 375V BLOWER MOTORS ARE SINGLE SPEED. FOR 460V BLOWER MOTORS, WIRE BLK AND ORG LEADS TOGETHER FOR WIR OR LO SPEED OPERATION. CUP ALL UNIRED LEADS.
- FOR ALTERNATE ORG COP VOLTAGES CONSULT FACTORY.
- DELUXE D INCLUDES BUILT IN 270-300 SECOND RANDOM START
- 300 SECOND DELAY ON BREAK
- 120 SECOND LOW PRESSURE BYPASS
- “TEST” DIP SWITCH REDUCES DELAYS TO 10 SEC WHEN SET TO YES, MUST BE SET TO "NO" FOR NORMAL OPERATION.
- FREEZE SENSOR WILL OPERATE AT 20°F BY DEFAULT. IF 1ST OPERATION IS REQUIRED JUMPERS R7 & R7 MUST BE CUT IF FREEZE SENSOR IS NOT INSTALLED A JUMPER SHALL BE INSTALLED BETWEEN THE FREEZE SENSOR TERMINALS.
- ALARM OUTPUT: DIP SWITCH MUST BE SET TO "PULSE" IF BLINKING T—START SERVICE LIGHT IS DESIRED.
- DEFAULT SETTINGS FOR DELUXE D BOARD FROM FACTORY SHOWN.
- ALARM OUTPUT IS NORMALLY OPEN (NO) DRY CONTACT. IF 24 VAC IS NEEDED, CONNECT IT TO ALR—OUT TERMINAL. 24VAC WILL BE SENSED ON THE ALR—OUT WHEN THE UNIT IS IN ALARM CONDITION. OUTPUT WILL BE PULSED IF PULSE IS SELECTED.
- CHECK FOR PROPER PHASE ROTATION ON UNITS WITH SCROLL COMPRESSORS. REVERSE ROTATION WILL DAMAGE THE COMPRESSOR AND VOID UNIT WARRANTY.
- REVERSING VALVES ARE WIRE TO A SEPARATE TRANSFORMER ON 30 TON UNITS
- TERMINAL BLOCK TB3 LOCATED IN SIDE DISCONNECT SWITCH BOX
- FACTORY MOUNTED LOOP PUMP OR TWO WAY WATER VALVE. BOTH DEVICES WILL NOT BE PRESENT IN THE SAME UNIT.
- PUMP MOTOR IS WIRED BETWEEN LINE AND NEUTRAL FOR 380-480V UNITS. FOR 208/230V UNITS PUMP MOTOR IS WIRED BETWEEN LINES.
- BCA CONTACTS R—Y OPEN ON DROP IN WATER TEMPERATURE AND R—B CLOSE.
Fig. 29 — 3-Phase Deluxe D Board with Water Economizer and Hot Gas Reheat

DEFAULT SETTINGS FOR DELUXE D BOARD FROM FACTORY SHOWN.

DELUXE D INCLUDES BUILT IN:

- 270-300 SECOND RANDOM START
- 300 SECOND DELAY ON BREAK
- 120 SECOND LOW PRESSURE BYPASS

OPTIONAL COMPONENTS LEGEND:

- FB — FUSE BLOCK
- DS — DISCONNECT SWITCH
- HAL — HIGH TEMP SUCTION LIMIT (WITH HOT GAS BYPASS ONLY)
- RV — REVERSING VALVE RELAY
- TB2 — MAIN TERMINAL BLOCK (460V UNITS ONLY)
- TB3 — TERMINAL BLOCK DISCONNECT SWITCH (460V UNITS ONLY)

NOTES:

1. SEE UNIT NAMEPLATE FOR ELECTRICAL RATING
2. ALL FIELD WIRING MUST BE IN ACCORDANCE WITH NEC-RU-F.P.A.
3. 208/230/460V UNITS ARE FACTORY WIRED FOR 208V OPERATION. FOR 230V OPERATION, REMOVE OR LEAD AND REPLACE WITH RED LEAD. CAP ALL UNLINED LEADS.
4. 300/320V AND 460V BLOWER MOTORS HAVE 3 SPEED TAPS. 320V BLOWER MOTORS AND 460V BLOWER MOTORS ARE CAPABLE OF DUAL VOLTAGE OPERATION. FOR 300V, REMOVE OR LEAD TOGETHER THREE SPACES ON BLOWER MOTOR. FOR 460V, REMOVE OR LEAD TOGETHER THREE SPACES ON BLOWER MOTOR.
5. FOR ALTERNATE EMERGENCY VOLTAGES CONSULT FACTORY.
6. USE CONNECTION BOLT IN 230/230/460/460 VOLT OPERATION. 320/320/460/460 VOLT OPERATION.
7. TEST "ON" SWITCH REDUCES RELAYS TO 10 SEC WHEN SET TO "NO" FOR NORMAL OPERATION.
8. "FIRE" SWITCH WILL OPERATE AT 10 SEC IF "Y" IS SELECTED. IF "OFF" IS SELECTED, "FIRE" SWITCH WILL OPERATE AT 10 SEC. IF "OFF" IS SELECTED, "FIRE" SWITCH WILL OPERATE AT 10 SEC.
9. "IN" SWITCH MUST BE SET TO "FIRE" IF BURNING T-STAT SERVICE UNIT IS DESIRED.
10. IF "IN" SWITCH IS DESIRED, CONNECX IS TO AUTO-LSE TERMINAL. 2HEN THE UNIT IS IN ALARM CONDITION, OUTPUT 2 WILL BE RESTORED IF THE "IN" SWITCH IS RESTORED.
11. "ALARM OUTPUT" IS NORMAL AND "IN" DRY CONTACT IF 24 VAC IS NEEDED, CONNECT 2 TO AUTO-LSE TERMINAL. 2HEN THE UNIT IS IN ALARM CONDITION, OUTPUT 2 WILL BE RESTORED IF THE "IN" SWITCH IS RESTORED.
12. "ALARM OUTPUT" IS NORMAL AND "IN" DRY CONTACT IF 24 VAC IS NEEDED, CONNECT 2 TO AUTO-LSE TERMINAL. 2HEN THE UNIT IS IN ALARM CONDITION, OUTPUT 2 WILL BE RESTORED IF THE "IN" SWITCH IS RESTORED.
13. "ALARM OUTPUT" IS NORMAL AND "IN" DRY CONTACT IF 24 VAC IS NEEDED, CONNECT 2 TO AUTO-LSE TERMINAL. 2HEN THE UNIT IS IN ALARM CONDITION, OUTPUT 2 WILL BE RESTORED IF THE "IN" SWITCH IS RESTORED.
14. "ALARM OUTPUT" IS NORMAL AND "IN" DRY CONTACT IF 24 VAC IS NEEDED, CONNECT 2 TO AUTO-LSE TERMINAL. 2HEN THE UNIT IS IN ALARM CONDITION, OUTPUT 2 WILL BE RESTORED IF THE "IN" SWITCH IS RESTORED.
15. "ALARM OUTPUT" IS NORMAL AND "IN" DRY CONTACT IF 24 VAC IS NEEDED, CONNECT 2 TO AUTO-LSE TERMINAL. 2HEN THE UNIT IS IN ALARM CONDITION, OUTPUT 2 WILL BE RESTORED IF THE "IN" SWITCH IS RESTORED.
16. "ALARM OUTPUT" IS NORMAL AND "IN" DRY CONTACT IF 24 VAC IS NEEDED, CONNECT 2 TO AUTO-LSE TERMINAL. 2HEN THE UNIT IS IN ALARM CONDITION, OUTPUT 2 WILL BE RESTORED IF THE "IN" SWITCH IS RESTORED.
17. "ALARM OUTPUT" IS NORMAL AND "IN" DRY CONTACT IF 24 VAC IS NEEDED, CONNECT 2 TO AUTO-LSE TERMINAL. 2HEN THE UNIT IS IN ALARM CONDITION, OUTPUT 2 WILL BE RESTORED IF THE "IN" SWITCH IS RESTORED.
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 40 to 80°F for heating and 50 to 110°F 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 10% solution of dishwasher detergent and water is recommended for both sides of the coil. Rinse thoroughly with water.

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.

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

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

NOTE: This equipment is designed for indoor installation only.

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 ± 10% of nameplate utilization voltage is acceptable.

UNIT STARTING CONDITIONS
All units start and operate in an ambient of 45°F with entering air at 40°F, entering water at 20°F and with both air and water at the flow rates used.

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.

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. Electrical shock can cause personal injury or death.

Start Up System
1. Set the thermostat to the highest setting.
2. Set the thermostat system switch to "COOL," and the fan switch to the "AUTO" position. The reversing valve solenoid should energize. The compressor and fan should not run.
3. Reduce the thermostat setting approximately 5 degrees below the room temperature.
4. Verify the heat pump is operating in the cooling mode.
5. Turn the thermostat system switch to the "OFF" position. The unit should stop running and the reversing valve should de-energize.
6. Leave the unit off for approximately (5) minutes to allow for system equalization.
7. Turn the thermostat to the lowest setting.
8. Set the thermostat switch to "HEAT."
9. Increase the thermostat setting approximately 5 degrees above the room temperature.
10. Verify the heat pump is operating in the heating mode.
11. Set the thermostat to maintain the desired space temperature.
12. Check for vibrations, leaks, etc.
13. Instruct the owner on the unit and thermostat operation.

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 4.

Table 4 —  50HQP, VQP Unit Operating Limits

<table>
<thead>
<tr>
<th>CONDITION</th>
<th>STANDARD RANGE UNIT (F)</th>
<th>EXTENDED RANGE UNIT (F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooling Minimum Entering Air Temperature (db/wb)</td>
<td>68/57</td>
<td>68/57</td>
</tr>
<tr>
<td>Cooling Minimum Entering Water Temperature</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Cooling Maximum Entering Air Temperature (db/wb)</td>
<td>95/85</td>
<td>95/85</td>
</tr>
<tr>
<td>Cooling Maximum Entering Water Temperature</td>
<td>110</td>
<td>110</td>
</tr>
<tr>
<td>Heating Minimum Entering Air Temperature</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Heating Minimum Entering Water Temperature</td>
<td>50</td>
<td>20°</td>
</tr>
<tr>
<td>Heating Maximum Entering Air Temperature</td>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td>Normal Water Coil Entering Fluid Range</td>
<td>50-80</td>
<td>25-80</td>
</tr>
</tbody>
</table>

LEGEND

db — Dry Bulb
wb — Wet Bulb

*With antifreeze, optional extended range insulation and low temperature cutout jumper clipped for antifreeze.

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Scroll Compressor Rotation

It is important to be certain compressor is rotating in the proper direction. To determine whether 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. See Table 5.

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.

Table 5 — 50HQP,VQP Typical Unit Operating Pressures and Temperatures

<table>
<thead>
<tr>
<th>UNIT SIZE</th>
<th>WATER FLOW (GPM/ton)</th>
<th>COOLING</th>
<th>HEATING</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40</td>
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<td></td>
<td></td>
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<tr>
<td>50</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>70</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>80</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>90</td>
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<td></td>
</tr>
<tr>
<td>100</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

LEGEND

DB — Dry Bulb
<table>
<thead>
<tr>
<th>UNIT SIZE</th>
<th>ENTERING WATER TEMP (°F)</th>
<th>WATER FLOW (GPM/ton)</th>
<th>COOLING</th>
<th>HEATING</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Suction Pressure (psig)</td>
<td>Discharge Pressure (psig)</td>
</tr>
<tr>
<td>30</td>
<td>22.0</td>
<td>—</td>
<td>183-224</td>
<td>14-18</td>
</tr>
<tr>
<td></td>
<td>38.0</td>
<td>—</td>
<td>171-210</td>
<td>10-8</td>
</tr>
<tr>
<td>40</td>
<td>22.0</td>
<td>—</td>
<td>214-261</td>
<td>14-18</td>
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<tr>
<td></td>
<td>38.0</td>
<td>—</td>
<td>201-245</td>
<td>8-10</td>
</tr>
<tr>
<td>50</td>
<td>22.0</td>
<td>—</td>
<td>244-298</td>
<td>14-17</td>
</tr>
<tr>
<td></td>
<td>38.0</td>
<td>—</td>
<td>230-261</td>
<td>8-10</td>
</tr>
<tr>
<td>60</td>
<td>22.0</td>
<td>—</td>
<td>275-336</td>
<td>14-17</td>
</tr>
<tr>
<td></td>
<td>38.0</td>
<td>—</td>
<td>258-316</td>
<td>8-10</td>
</tr>
<tr>
<td>70</td>
<td>22.0</td>
<td>—</td>
<td>310-378</td>
<td>14-17</td>
</tr>
<tr>
<td></td>
<td>38.0</td>
<td>—</td>
<td>291-356</td>
<td>8-10</td>
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<tr>
<td>80</td>
<td>22.0</td>
<td>—</td>
<td>349-426</td>
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<tr>
<td></td>
<td>38.0</td>
<td>—</td>
<td>328-401</td>
<td>8-9</td>
</tr>
<tr>
<td>90</td>
<td>22.0</td>
<td>—</td>
<td>392-480</td>
<td>13-16</td>
</tr>
<tr>
<td></td>
<td>38.0</td>
<td>—</td>
<td>369-451</td>
<td>8-9</td>
</tr>
<tr>
<td>100</td>
<td>25.0</td>
<td>—</td>
<td>394-429</td>
<td>14-18</td>
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<tr>
<td></td>
<td>45.0</td>
<td>—</td>
<td>254-311</td>
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<td>45.0</td>
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<td>298-358</td>
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<td>180/181</td>
<td>25.0</td>
<td>—</td>
<td>319-390</td>
<td>14-18</td>
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<tr>
<td></td>
<td>45.0</td>
<td>—</td>
<td>332-406</td>
<td>14-18</td>
</tr>
<tr>
<td>210</td>
<td>25.0</td>
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<td>349-426</td>
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<td>45.0</td>
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<td>349-426</td>
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<td>240/242</td>
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<td>182-223</td>
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<td>40.0</td>
<td>—</td>
<td>171-210</td>
<td>10-12</td>
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<td>50.0</td>
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<td>259-316</td>
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<td>243-297</td>
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<td>70.0</td>
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<td>291-356</td>
<td>14-18</td>
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<td></td>
<td>80.0</td>
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<td>100.0</td>
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</tr>
<tr>
<td></td>
<td>240.0</td>
<td>—</td>
<td>284-347</td>
<td>12-14</td>
</tr>
</tbody>
</table>

Table 5 — 50HQP, VQP Typical Unit Operating Pressures and Temperatures (cont)
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. Adjust the water control valve until the flow of 1.5 to 2 gpm 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 until the flow of 1.5 to 2 gpm is achieved. Since the flow rate can be determined, the water control valve until the flow of 1.5 to 2 gpm is achieved.

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. Follow the steps below to properly flush the loop:

1. Verify power is off.
2. Fill loop with water from hose through flush cart before using flush cart pump to ensure an even fill. Do not allow the water level in the flush cart tank to drop below the pump inlet line to prevent air from filling the line.
3. Maintain a fluid level in the tank above the return tee to avoid air entering back into the fluid.
4. Shutting off the return valve that connects into the flush cart reservoir will allow 50 psig surges to help purge air pockets. This maintains the pump at 50 psig.
5. To purge, keep the pump at 50 psig until maximum pumping pressure is reached.
6. Open the return valve to send a pressure surge through the loop to purge any air pockets in the piping system.
7. A noticeable drop in fluid level will be seen in the flush cart tank. This is the only indication of air in the loop.

NOTE: If air is purged from the system while using a 10 in. PVC flush tank, only a 1 to 2 in. level drop will be noticed since liquids are incompressible. If the level drops more than this, flushing should continue since air is still being compressed in the loop. If level is less than 1 to 2 in., reverse the flow.

1. Repeat this procedure until all air is purged.
2. 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 40 to 50 psig for winter months or 15 to 20 psig 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.

**Antifreeze**

In areas where entering loop temperatures drop below 40°F 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 15°F below the lowest expected entering loop temperature. For example, if the lowest expected entering loop temperature is 30°F, the leaving loop temperature would be 22 to 25°F. Therefore, the freeze protection should be at 15°F (30°F – 15°F = 15°F).

Calculate the total volume of fluid in the piping system. See Table 6. Use the percentage by volume in Table 7 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.

**Table 6 — Approximate Fluid Volume (gal.) per 100 Ft of Pipe**

<table>
<thead>
<tr>
<th>PIPE</th>
<th>DIAMETER (in.)</th>
<th>VOLUME (gal.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copper</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>4.1</td>
</tr>
<tr>
<td>1.25</td>
<td></td>
<td>6.4</td>
</tr>
<tr>
<td>1.5</td>
<td></td>
<td>9.2</td>
</tr>
<tr>
<td>Rubber Hose</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3/4 IPS SDR11</td>
<td></td>
<td>2.8</td>
</tr>
<tr>
<td>1 IPS SDR11</td>
<td></td>
<td>4.5</td>
</tr>
<tr>
<td>1 1/4 IPS SDR11</td>
<td></td>
<td>8.0</td>
</tr>
<tr>
<td>1 1/2 IPS SDR11</td>
<td></td>
<td>10.9</td>
</tr>
<tr>
<td>2 IPS SDR11</td>
<td></td>
<td>18.0</td>
</tr>
<tr>
<td>1 1/4 IPS SCH40</td>
<td></td>
<td>8.3</td>
</tr>
<tr>
<td>1 1/2 IPS SCH40</td>
<td></td>
<td>10.9</td>
</tr>
<tr>
<td>2 IPS SCH40</td>
<td></td>
<td>17.0</td>
</tr>
</tbody>
</table>

**Table 7 — Antifreeze Percentages by Volume**

<table>
<thead>
<tr>
<th>ANTIFREEZE</th>
<th>MINIMUM TEMPERATURE FOR FREEZE PROTECTION (F)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10</td>
</tr>
<tr>
<td>Methanol (%)</td>
<td></td>
</tr>
<tr>
<td>100% USP Food Grade Glycol (%)</td>
<td>38</td>
</tr>
<tr>
<td>Ethanol (%)</td>
<td>29</td>
</tr>
</tbody>
</table>

**Cooling Tower/Boiler Systems**

These systems typically use a common loop maintained at 60 to 90°F. 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.

**Ground Coupled, Closed Loop and Plateframe Heat Exchanger Well Systems**

These systems allow water temperatures from 30 to 110°F. The external loop field is divided up into 2 in. 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.

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**OPERATION**

**Power Up Mode**

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

**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 270 to 300 second random start delay and a 5-minute anti-short cycle protection time delay. After both delays are complete, the compressor is energized.

**HEATING STAGE 1**

Terminal Y is active in heating stage 1. After power up, the first call to the compressor will initiate a 270 to 300 second random start delay and a 5-minute anti-short cycle protection time delay. After both delays are complete, the compressor is energized.

**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.

**EMERGENCY HEAT**

In Emergency Heat mode, terminal W is active while terminal Y is not. Terminal G must be active in the 50HP, VQ units; the fan will be run if W is energized. EH1 is immediately turned on. EH2 will turn on after 10 minutes of continual stage 2 demand.

**LOCKOUT MODE**

The status LED will flash fast in Lockout mode and the compressor relay will be turned off immediately. Lockout mode can be “soft” reset via the Y input or can be reset via the disconnect depending on the DIP switch settings. The last fault causing the lockout is stored in memory and can be viewed by entering test mode.

**LOCKOUT WITH EMERGENCY HEAT**

While in Lock-out mode, if W becomes active, then Emergency Heat mode will occur.

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EMERGENCY HEAT
In Emergency Heat mode, the Fan Enable and Fan Speed relays are turned on. The EH1 output is turned on immediately.

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 immediately once the Cooling Stage 2 demand is removed. The control reverts to Cooling Stage 1 when the thermostat removes all Y2 call.

Retry Mode
In Retry mode, the staus LED will flash the code for the corresponding fault. If the fault clears and the thermostat call (Y) is still present the Complete C or Deluxe D control will run the compressor once the ASC (anti-short cycle) timer has expired and will try to satisfy the call. If the call is satisfied, the unit will resume its normal operation.

If 2 or 4 consecutive faults occur (depending on the DIP switch setting) within 1 hour, the controller will lock the compressor operation out and will flash the alarm code on the status LED as well as alarm dry contact output. When the Complete C or Deluxe D control enters lockout mode, the alarm will also be shown on the panel mounted LED.

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.

**CAUTION**

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.

**WARNING**

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.

**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.

Inspect heat exchangers regularly, and clean more frequently if the unit is located in a “dirty” environment. The heat exchanger should be kept full of water at all times. Open loop systems should have an inverted P trap placed in the discharge line to keep water in the heat exchanger during off cycles. Closed loop systems must have a minimum of 15 psig during the summer and 40 psig during the winter.

Check P trap frequently for proper operation.

**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. 30.
Fig. 30 — Gravity Flow Method

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. 31.

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

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.

Fig. 31 — Forced Circulation Method

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.

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.

TROUBLESHOOTING

When troubleshooting problems with a WSHP, consider the following and see Table 8:

Thermistor

A thermistor may be required for single-phase units where starting the unit is a problem due to low voltage. See Fig. 32 for thermistor nominal resistance.

Fig. 32 — Thermistor Nominal Resistance
## Table 8 — Troubleshooting

<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible Cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Entire Unit Does Not Run</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power supply off</td>
<td>Apply power, close disconnect</td>
<td></td>
</tr>
<tr>
<td>Blown fuse</td>
<td>Replace fuse or reset circuit breaker. Check for correct fuses.</td>
<td></td>
</tr>
<tr>
<td>Voltage supply low</td>
<td>If voltage is below minimum voltage specified on unit data plate, contact local power company.</td>
<td></td>
</tr>
<tr>
<td>Thermostat</td>
<td>Set the fan to &quot;ON&quot;, the fan should run. Set thermostat to &quot;COOL&quot; and lowest temperature setting, the unit should run in the cooling mode (reversing valve energized). Set unit to &quot;HEAT&quot; and the highest temperature setting, the unit should run in the heating mode. If neither the blower or compressor run in all three cases, the thermostat could be mis-wired or faulty. To ensure mis-wired or faulty thermostat verify 24 volts is available on the condensing section low voltage terminal strip between &quot;R&quot; and &quot;C&quot;, &quot;Y&quot; and &quot;C&quot;, and &quot;G&quot; and &quot;C&quot;. If the blower does not operate, verify 24 volts between terminals &quot;G&quot; and &quot;C&quot; in the air handler. Replace the thermostat if defective.</td>
<td></td>
</tr>
<tr>
<td><strong>Blower Operates But Compressor Does Not</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thermostat</td>
<td>Check setting, calibration, and wiring.</td>
<td></td>
</tr>
<tr>
<td>Wiring</td>
<td>Check for loose or broken wires at compressor, capacitor, or contactor.</td>
<td></td>
</tr>
<tr>
<td>Safety controls</td>
<td>Check Complete C/Deluxe D board red default LED for Blink Code</td>
<td></td>
</tr>
<tr>
<td>Compressor overload open</td>
<td>If the compressor is cool and the overload will not reset, replace compressor.</td>
<td></td>
</tr>
<tr>
<td>Compressor motor grounded</td>
<td>Internal winding grounded to the compressor shell. Replace compressor. If compressor burnout, install suction filter drier.</td>
<td></td>
</tr>
<tr>
<td>Compressor windings open</td>
<td>After compressor has cooled, check continuity of the compressor windings. If the windings are open, replace the compressor.</td>
<td></td>
</tr>
<tr>
<td><strong>Unit Off On High Pressure Control</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discharge pressure too high</td>
<td>In &quot;COOLING&quot; mode: Lack of or inadequate water flow. Entering water temperature too warm. Scaled or plugged condenser. In &quot;HEATING&quot; mode: Lack of or inadequate airflow. Blower inoperative, clogged filter or restrictions in ductwork.</td>
<td></td>
</tr>
<tr>
<td>Refrigerant charge</td>
<td>The unit is overcharged with refrigerant. Recover refrigerant, evacuate and recharge with factory recommended charge.</td>
<td></td>
</tr>
<tr>
<td>High pressure</td>
<td>Check for defective or improperly calibrated high pressure switch.</td>
<td></td>
</tr>
<tr>
<td><strong>Unit Off On Low Pressure Control</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Suction pressure too low</td>
<td>In &quot;COOLING&quot; mode: Lack of or inadequate air flow. Entering air temperature too cold. Blower inoperative, clogged filter, or restrictions in ductwork. In &quot;HEATING&quot; mode: Lack of or inadequate water flow. Entering water temperature too cold. Scaled or plugged condenser.</td>
<td></td>
</tr>
<tr>
<td>Refrigerant charge</td>
<td>The unit is low on refrigerant. Check for refrigerant leak, repair, evacuate and recharge with factory recommended charge.</td>
<td></td>
</tr>
<tr>
<td>Low pressure switch</td>
<td>Check for defective or improperly calibrated low-pressure switch.</td>
<td></td>
</tr>
<tr>
<td><strong>Unit Short Cycles</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unit oversized</td>
<td>Recalculate heating and or cooling loads.</td>
<td></td>
</tr>
<tr>
<td>Thermostat</td>
<td>Thermostat installed near a supply air grille, relocate thermostat. Readjust heat anticipator.</td>
<td></td>
</tr>
<tr>
<td>Wiring and controls</td>
<td>Loose connections in the wiring or a defective compressor contactor.</td>
<td></td>
</tr>
<tr>
<td>Unit undersized</td>
<td>Recalculate heating and or cooling loads. If excessive, possibly adding insulation and shading will rectify the problem.</td>
<td></td>
</tr>
<tr>
<td>Loss of conditioned air by leaks</td>
<td>Check for leaks in ductwork or introduction of ambient air through doors or windows.</td>
<td></td>
</tr>
<tr>
<td>Airflow</td>
<td>Lack of adequate airflow or improper distribution of air. Replace dirty filter.</td>
<td></td>
</tr>
<tr>
<td>Refrigerant charge</td>
<td>Low on refrigerant charge causing inefficient operation.</td>
<td></td>
</tr>
<tr>
<td>Compressor</td>
<td>Check for defective compressor. If discharge is too low and suction pressure is too high, compressor is not pumping properly. Replace compressor.</td>
<td></td>
</tr>
<tr>
<td>Reversing valve</td>
<td>Defective reversing valve creating bypass of refrigerant from discharge to suction side of compressor. Replace reversing valve.</td>
<td></td>
</tr>
<tr>
<td>Operating pressures</td>
<td>Compare unit operating pressures to the pressure / temperature chart for the unit.</td>
<td></td>
</tr>
<tr>
<td>TXV/Capillary Tube</td>
<td>Check for possible restriction or defect. Replace if necessary.</td>
<td></td>
</tr>
<tr>
<td>Moisture, noncondensables</td>
<td>The refrigerant system may be contaminated with moisture or noncondensables. Recover refrigerant, evacuate and recharge with factory recommended charge. Note: a liquid line drier may be required.</td>
<td></td>
</tr>
</tbody>
</table>

### Legend

LED — Light Emitting Diode  
TXV — Thermostatic Expansion Valve
NOTE: To avoid injury to personnel and damage to equipment or property when completing the procedures listed in this start-up checklist, use good judgment, follow safe practices, and adhere to the safety considerations/information as outlined in preceding sections of this Installation Instructions.

I. PRELIMINARY INFORMATION
CUSTOMER: ______________________________
JOB NAME: ______________________________
MODEL NO.: ______________________________
SERIAL NO.: ______________________________
DATE: ____________________________________

II. 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) ________

III. 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.

<table>
<thead>
<tr>
<th>COAXIAL HEAT EXCHANGER</th>
<th>COOLING CYCLE:</th>
<th>F</th>
<th>FLUID OUT</th>
<th>F</th>
<th>PSI</th>
<th>F</th>
<th>FLOW</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HEATING CYCLE:</td>
<td>F</td>
<td>FLUID OUT</td>
<td>F</td>
<td>PSI</td>
<td>F</td>
<td>FLOW</td>
</tr>
<tr>
<td>AIR COIL</td>
<td>COOLING CYCLE:</td>
<td>F</td>
<td>AIR OUT</td>
<td>F</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>HEATING CYCLE:</td>
<td>F</td>
<td>AIR OUT</td>
<td>F</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
HEATING CYCLE ANALYSIS

COOLING CYCLE ANALYSIS

HEAT OF EXTRACTION (ABSORPTION) OR HEAT OF REJECTION =

FLOW RATE (GPM) x TEMP. DIFF. (DEG. F) x FLUID FACTOR* = (BTU/HR)

SUPERHEAT = SUCTION TEMPERATURE – SUCTION SATURATION TEMPERATURE = (DEG F)

SUBCOOLING = DISCHARGE SATURATION TEMPERATURE – LIQUID LINE TEMPERATURE = (DEG F)

*Use 500 for water, 485 for antifreeze.