

Cold Shot Chillers

INSTALLATION, OPERATION, AND MAINTENANCE INSTRUCTIONS



(ACWC-024-E-RF and ACWC-240-E indoor models shown)

**AIR-COOLED, WATER CHILLERS
UP TO 240 kBTU/HR CAPACITY**

**Model#: ACWC-060-EM-DR-LT-M20-5
Serial#: XXXXXX-X**



Marrone & Co., Inc.

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MODEL NUMBER NOMENCLATURE

Example Model#: ACWC - 60 - E - ST - LT - 40 - 5
 Position: 1 2 3 4 5 6 7

Position-Description

1. **Model Type:** ACWC: Air Cooled Water Chiller
2. Nominal Capacity in kBtu/hr
3. **Series** System
4. **Flow Design:** (_=Portable, ST=Stationary, RF=ReverseFlow, EXCH=HeatExchanger, DP=DualPump, DR=DualReturn)
5. **Leaving Fluid Temperature** (_=Standard, LT=LowTemperature-specify lowest temperature in °F)
6. Ambient Temperature Conditions:
 - IND:** Indoor use only. Casters on frame.
 - 40:** Suitable for outdoor use with an ambient of 40°F ambient. Casters, optional.
 - 0:** Suitable for outdoor use to 0°F ambient. Includes low ambient fan controls. Casters, optional.
 - M20:** Suitable for outdoor use to -20°F ambient. Hot Gas Bypass and Wind Baffles may be included. Casters, optional.
7. **Electrical Power** (See specification sheet)
(Variations of the above nomenclature exist and may not include every description).

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I. IMPORTANT

A. CODES AND REGULATIONS

The United States Environmental Protection Agency (EPA) has issued various regulations regarding the introduction and disposal of refrigerants in this unit. Failure to follow these regulations may harm the environment and can lead to the imposition of substantial fines. Because these regulations may vary due to the passage of new laws we suggest that, any work on this unit be done by a certified technician. Should you have any questions, please contact the local office of the EPA.

This product is designed and manufactured to permit installation in accordance with National Codes. It is the installer's responsibility to install the product in accordance with National Codes and/or prevailing local codes and regulations. The manufacturer assumes no responsibility for equipment installed in violation of any codes or regulations.

IMPORTANT MESSAGE TO OWNER:

These instructions should be carefully read and kept near the product, for future reference. While these instructions are addressed primarily to the installer, useful maintenance information is included. To insure proper set up, operation, and performance it is recommended that a licensed service professional start this piece of equipment. Have your installer acquaint you with the operating characteristics of the product and periodic maintenance requirements.

B. INSPECTION

This product has been inspected at the factory and released to the transportation agency without known damage. Inspect carton's exterior for evidence of rough handling in shipment. Carefully remove protective wrap and all banding to uncrate, for inspection; if damage is found, report immediately to the transportation agency and Cold Shot Chillers. Provide a report and photographs (highly recommended), if possible.

Once it is established that the unit has positive pressure, proceed to installation. Test the system service valves with refrigeration gauges to ensure refrigerant pressure is present and no undetectable damage (i.e. dropping the unit) has occurred.

C. SAFETY CONSIDERATIONS

Installation, start-up, and servicing of this equipment can be hazardous due to system pressures, electrical components, and equipment location (roofs, elevated structures, etc.) Only trained, qualified installers and service mechanics should install, start up, and service this equipment. When working on the equipment, observe precautions in the literature, tags, stickers, and labels attached to the equipment, and any other safety precautions that apply.

- Follow all safety codes.
- Wear safety glasses and work gloves.
- Use care in handling, rigging, and setting bulky equipment.
- Use care in handling electronic components.

D. REPLACEMENT PARTS

- For information on replacement parts, contact Cold Shot Chillers.
- When ordering parts, provide complete model and serial number as shown on the unit nameplate.
- Most parts will be available through local distributors.

II. INSTALLATION

A. MOVEMENT/RIGGING

1. The preferred method for movement of the chiller while on the pallet is with forklift or pallet jack.
2. For rigging, overhead rigging with spreader bars above the unit is preferred. Protect unit from being crushed. CAUTION! All panels must be in place when rigging. Failure to follow these requirements could result in personal injury or equipment damage.
3. Maneuvering of the system must be done with care to prevent damage to the panels or the internal components mounting.
4. See specification sheets for physical data and unit dimensions.

B. PLACEMENT

1. Select a location for air-cooled units with adequate air circulation that is as dust free as possible.
2. There must be a minimum of 3 ft of space for service and for unrestricted airflow on all sides of unit, and a minimum of 8 ft clear air space above unit. Select a location where air is not recirculated back into condenser. For multiple units, allow additional separation between units for airflow and service.
3. Verify ambient conditions that the system is suitable.
 - a) IND - Indoor units are suitable for indoor use only. No wet environments.
 - b) 40 - Outdoor units to 40°F (same as above) and are suitable for outdoors to 40°F ambient temperature and suitable for wet environments.
 - c) 0 - Outdoor units to 0°F (same as above) and suitable for outdoors to 0°F ambient temperature.
 - d) M20 - Outdoor units to -20°F (same as above) and suitable for outdoors to -20°F ambient temperature.
4. Avoid environments which may be corrosive to the chiller.
5. Avoid locations that may have direct spray such as from roof edges or sprinklers.
6. Select location as near to the process as possible to reduce the system piping / pressure drop.

C. MOUNTING

1. Level the unit to ensure proper oil return to compressors and fluid draining.
2. When unit is in proper location, secure unit to foundation or on vibration isolators, as needed/required by local requirements. Fasteners for mounting unit are field supplied.
3. PIPING
 - a) Connect piping or hoses to unit, making sure that the inside diameter (I.D.) of the pipe or hose is the same as or greater than unit connections and that the material is designed for the expected fluid conditions.
 - b) The fluid circuits must contain a bypass to prevent a “dead head” condition for the pump and to allow return process water to chiller tank. A bypass valve is required in the system to ensure proper flow through the evaporator and to provide adjustment of the pressure and flow to the process.
 - (1) Refer to the system Flow Diagram for details, or to the actual unit.
 - c) Typical Chiller Fluid Flow Designs:
 - (1) Stationary: Chilling system with evaporator.
 - (2) Reverse Flow: Chilling system with evaporator and circulating pump.
 - (3) Portable: Chilling system with evaporator, circulating pump, and reservoir tank.
 - (4) Extra Heat Exchanger: Same as Portable along with an extra chilled fluid heat exchanger.
 - (5) Dual Pump: Same as Portable and includes a second pump typically for process use.
 - (6) Dual Return: Same as Portable yet includes a second return direct to tank for some flow.
 - d) System Recommendations:
 - (1) Valves installed throughout the system, as needed. Typical at each load for isolation and flow/pressure balancing purposes through system.
 - (2) Use low pressure drop design components. (Such as long radius 90s or 45s elbows)
 - (3) Add piping and valve to the tank drain port.
 - (4) Temperature and pressure gauges throughout system at ideal locations for monitoring.
 - (5) Vent and drain valves to provide ability to bleed air and drain fluids from system, as needed.

- (6) Heat-trace cable. Protect any fluid system exposed to freezing ambient conditions.
- e) Systems with the process piping located above the chiller, should be aware of possible fluid returning to the chiller when the system is turned off. Typically, the chiller inlet/outlet piping is below the tank water level which will limit draining fluid to tank, however if the process piping is opened, the fluid may return to the tank and overflow. Recommend isolation valves

D. SPLIT SYSTEMS (Remote Condenser or Condensing Unit)

1. Conform to all local codes and standard practices for systems with refrigerant.
2. Systems with split refrigerant systems are typically shipped without refrigerant, however, are it is charged with nitrogen to maintain a positive pressure (typically 10-15 psi).
3. Verify and remove the nitrogen charge. Each marked section should have a positive charge (see tag/decal noted at connection point).
 - a) If no pressure is present, reapply pressure and check for leaks before charging with refrigerant.
4. Pipe the refrigerant lines of the two units together as required.
5. Pressure test the system, pull vacuum, and degas. Use proper industry practices with system.
 - a) Split systems need to be evacuated prior to charging with refrigerant.
6. Add refrigerant to the liquid line service port. See the equipment label plate for the type of refrigerant and typical amount of initial charge or check the specification sheet. Adjust as needed to set the appropriate charge as noted in Startup section.

E. ELECTRICAL POWER AND CONNECTIONS¹

1. POWER SUPPLY: Field wiring must comply with national and local codes.
 - a) Install a branch circuit fused disconnect of adequate size to handle starting current. The disconnect must be within sight from the unit and readily accessible, in compliance with National Electrical Code (NEC), Section 440-14.
 - b) Verify electrical power on the Cold Shot Chillers label plate with actual voltage.
 - c) Connect line power supply to terminal block or as noted in machine; typically, connect power leads to terminals L1, L2 and L3 on compressor contactor.
 - d) Ensure Ground wire is connected appropriately.
 - e) 208/230V/3Ø systems with high or “stinger” leg, connect this leg to L2 or middle terminal. Failure to do so will cause early control component malfunction.
 - (1) If 208V, verify that the control circuit voltage out of the transformer is the proper amount. If not, check the transformer for additional tap wires for changing to 208V, when available.
2. ACCESSORIES/EXTRA EQUIPMENT
 - a) Field-installed accessories refer to the accessory literature for installation instructions.
 - b) Wiring connections for field-supplied equipment are shown on wiring diagrams.
3. Verify that the chiller selector switch is in “Off” position before applying power.
4. ROTATION (3-PHASE) If using a phase sequence tester, electrical phase direction is clockwise.

¹ Electrical Notes:

- Factory wiring is in compliance with NEC. Any field modifications or additions must be in compliance with all applicable codes. Use copper, copper-clad aluminum for field power supply only.
- Field power supply wiring must be 75 C minimum.
- If any of the original wiring furnished must be replaced, it must be replaced with 90 C wire or its equivalent.
- Compressor thermally protected. Three-phase motors are protected against primary single-phasing condition.
- 60 Hz units have 120 volt control circuit. 50 Hz units have 230 volt control circuit. A separate source of supply at the correct voltage
- Must be field supplied through a fused disconnect device with a maximum rating of 15 A to TB2 connections L1 (Hot Side) and L2 (Neutral).
- Open control circuit disconnect switch for servicing only. Disconnect must remain closed for crankcase heater to operate.
- Transformers must be fused and grounded per applicable codes.

5. IMPORTANT: Allowing the unit to operate with a voltage imbalance in excess of 2% may void the warranty.

% Voltage Imbalance = 100 x (max voltage deviation from avg voltage) / (average voltage)			
<u>Example:</u> Expected supply voltage to unit is 240-3-60.			
Determine maximum deviation from average voltage:			
	<u>MAXIMUM DEVIATION:</u> AB = 243 _A – 239 _B = 4 volts* AC = 239 _A – 238 _C = 1 volt BC = 239 _B – 236 _C = 3 volts *MAX DEVIATION = <u>4 volts</u>	<u>AVERAGE VOLTAGE:</u> AB = 243 volts BC = 236 volts AC = 238 volts <u>AVERAGE = 717/3 = 239 volts</u>	
<ul style="list-style-type: none">Determine % voltage imbalance: <div>%Voltage Imbalance = 100 x 4 / 239 = 1.7%</div>This amount of phase imbalance is Satisfactory as it is below the maximum allowable 2%.			

6. UNBALANCED 3-PHASE SUPPLY VOLTAGE:

- Never operate a system where a phase imbalance in supply voltage is greater than 2%. Excess operation with voltage outside of tolerance (for example "Brown Outs" will result in motor damage. (This is considered abuse and is not covered under Warranty).
- If Voltage Imbalance Greater than 2%:
 - If the supply voltage phase imbalance is more than 2%, contact your local electric utility company immediately.
 - Check the voltage at the individual components such as each compressor and pump when operating.
 - A voltage imbalance may be an indication of loose wires/cable connections or faulty contactors.
 - Another issue may be the components themselves. Troubleshoot if needed.

- Verify that the crankcase heaters are warming properly by using a thermometer or by carefully placing back of hand near the base of the compressor by the heater.

F. FREEZE PROTECTION

- Protection of system components from freezing is of the utmost concern. Freezing can occur from the external ambient or internal system temperatures.
- INTERNAL: The evaporator (or other heat exchanger) is the primary component that is susceptible to freezing even during normal operation. The refrigerant side commonly operates at 8 to 12 degrees below the temperature of the chilled fluid temperature. The fluid entering the evaporator must be capable of passing through without forming ice. Ice formation can quickly restrict the flow causing further freezing and eventually expansion of internals resulting in rupture. Attention must be made towards any process involving the evaporator. The chilled fluid characteristics need to have a freeze point that is well below any temperature that the chiller is capable of cooling. (See Glycol)
- The chiller is equipped with various safety devices designed and set to assist with protecting the system from hazards.

IMPORTANT!!

DO NOT BYPASS OR ADJUST ANY SAFETY DEVICES OR PARAMETERS WITHOUT FIRST CONTACTING COLD SHOT CHILLERS.

ANY MODIFICATIONS OF THE CHILLER SYSTEM FROM THE MANUFACTURER'S DESIGN WILL REQUIRE PRIOR WRITTEN APPROVAL FROM COLD SHOT CHILLER'S, OTHERWISE ALL WARRANTIES WILL BECOME VOID.

G. GLYCOL

- Glycol and water mixtures are common methods to change a fluid's freezing point but may reduce the cooling performance of the chiller. Use of any glycol or other additives to the fluid should be carefully considered. Follow the glycol manufacturer or supplier's directions for system preparation, mixtures, disposal, and maintenance of concentrations.

2. Automatic/Manual refill or change over systems should be cautious and attentive to the specific concentration of mixtures dilution over time. Measure the system's concentration regularly.
3. Glycol concentrations affect cooling performance. As the temperature reduces, the fluid becomes thicker which may reduce heat transfer capabilities and reduces the circulating pump performance.

IMPORTANT!!

**DAMAGE CAUSED BY FLUIDS WITH INADEQUATE FREEZE POINT PROTECTION IS NOT CONSIDERED FAILURE
DUE TO PRODUCT OR WORKMANSHIP AND IS NOT COVERED BY WARRANTY.**

H. PERFORMANCE

1. The basic function of a chiller is to "chill" fluid by removing heat from one location and transferring it to another by using the special properties of refrigerants. The performance or COOLING capacity of a chiller is based on a standard set of operating conditions. Changing the conditions, results in different capacity rating of the chiller.
2. Some conditions are:
 - a) Ambient conditions (for air-cooled systems)
 - b) Condenser fluid (for water-cooled systems)
 - c) Type of fluid being chilled
 - d) Design and setup of the chiller
 - e) Leaving fluid temperature (Supply fluid to process from chiller)
 - f) The other side of the equation is the Heat load. Some of the main conditions affecting load are:
 - g) Entering fluid temperature (Return fluid to chiller from process)
 - h) Flow rate of fluid

III. PRE-STARTUP

1. **STARTUP CHECKLIST** - Review and use. (Typically located at end of this manual.)

2. **COMPRESSOR MOUNTS**

- a) As shipped, the compressor(s) is held down by mounting bolts with vibration rubber grommets.
- b) Verify bolts are tight to base and that the compressor is able to move on the rubber grommets.
 - (1) Single Compressor units: Verify that the shipping spacers (if installed) are removed from between the compressor bottom (or compressor plate) and the base of the unit.
 - (2) Tandem Compressor units: Compressors are mounted on a common plate.
 - (a) Do not loosen the compressor bolts connecting it to the plate.
 - (b) Verify that the shipping spacers (if installed) are removed from between the compressor (or compressor plate) and the base of the unit. (Typically quantity of 6).

3. **SERVICE VALVES**

- a) Verify all service valves are open. (Typical valves on these models do not have backseats.)

4. **FLUID IN SYSTEM:**

- a) Fill the system with the desired solution.
- b) A 30% glycol mixture is recommended for all standard flow units. For "Low Temperature" chilled fluid and units installed outdoors may require a higher concentration to prevent freezing. See unit nameplate for specific concentration requirements or adjust based on the ambient conditions of the chiller, fluid temperature, and/or system design.
- c) For systems with a tank, fill to within a few inches from the top edge or just to the top of the sight glass.
- d) Fill system and bleed air from the highest point of piping. Vent air from pump and piping is possible by loosening or removing the strainer blowdown plug, which will vent air as the tank is filled, as long as the bypass valve is still open. Replace plug/cap after tank is full. Ensure that the pump and evaporator are filled with fluid prior to starting.
- e) Systems with an open tank are typically capable of bleeding excess air that is returned to the tank when the system is operating. Piping in and out are typically below the water line.
- f) For stationary systems (without an integral pump and tank), ensure that there is method for ensuring flow through the chiller system, such as with the use of a flow switch. See electrical system or specifications for details.



DO NOT ATTEMPT TO START CHILLER WITHOUT FLUID IN THE SYSTEM!!
This will damage the mechanical seal in the pump and void the pump warranty. Also, potential freeze condition may exist in the evaporator.
DO NOT RESET ANY SAFETY CONTROLS UNTIL
THE CAUSE HAS BEEN DETERMINED.

- g) **ROTATION:** Check for rotation prior to start-up. Do not use pump for checking rotation unless fluid is in the tank and the pump is full of fluid. Verify 3-Phase Power Electrical Rotation:
- h) All 3-phase (3Ø) motors are wired in phase. If motors are not turning in correct direction, then reverse 2 of the incoming power wires to chiller.
- i) For systems with 3Ø pumps: Pump rotation is normally clockwise as view from the back of the motor (Refer to direction decals if available). Pumps will still pump fluid if rotating reversed, so actual verification is necessary.
 - (1) Quickly depress the pump contactor to verify proper rotation.
- j) For systems without 3Ø pumps: Attach refrigerant gauges to the test ports and verify that the discharge pressure rises and the suction pressure decreases. Loud noise may be indication of wrong rotation. Extended run time in reverse rotation will damage the compressor and lead to premature failure which is considered abuse and not covered by warranty.

5. **CRANKCASE HEATERS:**

- a) If compressor has crankcase heaters, allow the power to be applied to the heaters for at least 24 hours before starting the compressor.

IV. STARTUP

1. Verify installation is complete and all Pre-Startup steps are completed.
2. **STARTUP CHECKLIST** - Review and use. (Typically, located at end of this manual)
3. Attach refrigerant gauges to the appropriate service ports.
4. **PUMP ONLY:** Turn switch to Pump Only (or use local system pump) and operate for at least 15 minutes. Shut unit down and clean strainer to remove any debris that may have been in the system. Depending on the system cleanliness, this step may be conducted several times to help ensure all debris is removed from the system.
5. Once all the air is purged from the circuit and the system is free from debris, verify that the chilled fluid has the proper flow of 3 GPM per ton of capacity.
 - a) Typical systems with a manual bypass valve which are factory set. The valve must be open enough to ensure proper flow to the evaporator or the system will shut down on low flow safety condition.
 - b) Process systems with automatic and variable control flows will need to ensure that the bypass valve is throttled to accommodate all stopped process flow.
6. **TEMPERATURE CONTROLLER** (See Temperature Controller Section for details):
 - a) Set the controller to the desired Set point Value (lower LED readout): Push and hold the up or down scroll button for two seconds until the value starts changing. Adjust the value to the desired temperature then stop pressing any buttons. After two seconds, the new value will become operative. (Do not adjust the set point below the temperature listed on the unit nameplate).
 - b) The controller will also display "Present Value" (upper LED readout) which is an indication of the current temperature of the fluid in the chiller tank, or "Leaving Fluid Temperature" depending on the specific chiller design.
7. Unit is now ready to turn on for cooling. Move the selector switch to "Cooling Cycle" setting and the unit will begin cooling.
8. During the cooling cycle, condenser fans may turn on and off, due to changes in refrigerant pressure. This should be expected during normal operation and occurs due to ambient temperature and the amount of heat being returned in the water chiller.
9. Monitor the temperature at the process location and adjust the Set Value on the temperature controller to achieve the desired value.
10. While cooling at low load conditions, bubbles may become visible in the refrigerant sight glass. The charging procedure requires the unit to be under full load with 75°F or above water temperature with clear sight glass for optimum performance. Returning fluid temperature should not exceed 100°F on standard units or the chiller will cycle off on high pressure switch and shut down. Should this occur, allow water to cool down by running pump only and restarting chiller once water is 100°F or colder.
 - a) Refrigerant charge may need to be adjusted to achieve the proper operation of the chiller during final installation as described below. Typically, on split systems.
11. Refrigerant Charge:

CAUTION!: Never charge liquid into the low-pressure side of system. Do not overcharge. During charging or removal of refrigerant, be sure there is fluid flow through the evaporator and the condenser fan(s) are operating.

- a) Charging refrigerant during system operation should only be performed in the suction line and then only in small bursts.
- b) Continue to charge the unit through the suction line service port until the glass is clear with 70°F entering water temperature.
- c) Verify or set the expansion valve (TXV) superheat to approximately 20°F as measured 6 to 12 inches from the compressor on the suction line.
- d) While cooling at low load conditions, bubbles may become visible in the refrigerant sight glass. The charging procedure requires the unit to be under full load with 70°F or above water temperature with



clear sight glass for optimum performance. Returning fluid temperature should not exceed 90°F on standard units or the chiller will cycle off on high head pressure and not run. Should this occur, allow water to cool down and restarting chiller once water is below 90°F.

- e) If sight glass is bubbly add to charge. If clear, reduce the charge to bubbles and clear. Allow five (5) minutes run time for equalization.
- f) Re-check superheat and adjust as required.

V. SYSTEM COMPONENTS: (See your chiller's specification for details.)

IMPORTANT: Never open any switch or disconnect that de-energizes the crankcase heater unless unit is being serviced or is to be shut down for a prolonged period. After a prolonged shutdown on a service job, energize the crankcase heater for 24 hours before starting the compressor.

NOTE: Schrader valve cores: Most components connected to a refrigerant fitting include a Schrader valve for servicing. If leakage occurs during removal of a component, the valve may have been removed or damaged.

1. ACCESS PANEL

- a. Viewed facing front panel (where the Cold Shot Chillers logo is located).



- b. Panels on larger systems (≥ 120 kBtu/hr) must have all panels installed when operating.

2. COMPRESSORS

- a. Scroll compressors are hermetically sealed with internal motor overload protection.
- b. Most Copeland compressors are equipped with an advanced scroll temperature protection (ASTP). A label located above the terminal box identifies models that contain this technology.



- c. Advanced scroll temperature protection is a form of internal discharge temperature protection that unloads the scroll compressor when the internal temperature reaches approximately 300 F. At this temperature, an internal bi-metal disk valve opens and causes the scroll elements to separate, which stops compression. Suction and discharge pressures balance while the motor continues to run. The longer the compressor runs unloaded, the longer it must cool before the bi-metal disk resets. Eventually, the motor's internal

thermal electrical protection will shut down the compressor.

- d. To manually reset ASTP, the compressor should be stopped and allowed to cool. If the compressor is not stopped, the motor will run until the motor protector trips, which occurs up to 90 minutes later. Advanced scroll temperature protection will reset automatically before the motor protector resets, which may take up to 2 hours.

3. CRANKCASE HEATER

- a. This minimizes absorption of liquid refrigerant by oil in casing during brief or extended shutdown periods.

4. CONTROLLER

- a. The digital temperature controller may vary in design. For controller details, see the Controller Section of this manual.

5. CONDENSER FANS

- a. Fans operate along with the compressor operation along with the mode controls.
- b. Modes of fan cycling are:
 - a) On (whenever the compressor is on). (Typically, 3ton and under)
 - b) Cycling (with use of pressure actuated "head pressure switch". (5ton and over)
 - c) Speed Controlled (if using a low ambient fan speed controller device when operating in low ambient condition).

6. FILTER/DRIER

- a. For system cleanliness and moisture capture. Every unit will have a filter drier factory installed.

7. MOISTURE INDICATOR

- a. For system charging and moisture condition. Every unit will have a sight glass (moisture indicator) factory installed.

8. **FLOW SAFETY THERMOSTAT (FS):**



Figure 1 Low Flow / Freeze Safety

- a. Generally the cause will be low or insufficient water flow caused by a clogged “Y” strainer or restricted flow in the process. Resetting this control and not determining the cause for tripping can cause the evaporator to freeze and rupture.
- b. Indoor chillers are normally equipped with a Low Flow Safety temperature sensor that detects temperature of the refrigerant. This safety will automatically trip and requires manual resetting before the cooling cycle will resume. This safety can also be tripped by low ambient conditions overnight or during shipping.
- c. Do not reset this control unless the exact cause for its tripping is determined.

9. **FREEZE SAFETY (FZ): (IF EQUIPPED)**

- a. Indoor chillers are typically equipped with a Freeze Safety temperature sensor that detects low temperature of the fluid in the system. This safety will automatically trip and is reset automatically when the water temperature returns to the higher sensor setting difference.

10. **FLOW SWITCH SAFETY (FSS): (IF EQUIPPED)**

- a. Refer to the LOW FLOW SAFETY for explanation and cautions.
- b. Outdoor units with Low Ambient Kits are normally equipped with a mechanical flow switch which monitors the fluid entering the evaporator. This switch is automatically reset when the fluid flow returns to the proper flow rate. Adjustment should not be performed unless necessary. If adjustments are made, ensure that the flow entering the evaporator is greater than 3 gallons per minute per ton of refrigeration rating of the chiller. For example, a 2 Ton chiller will need a minimum of 6 gpm.



Figure 2 Flow Switch

11. **REFRIGERANT LOW PRESSURE SAFETY (LPS)**

- a) Monitors the pressure of the refrigerant suction line and will automatically open

when the pressure drops below the set point and will automatically reset when pressure is above the non-adjustable reset setting. (See specifications for details)

12. **REFRIGERANT HIGH PRESSURE SAFETY (HPS)**

- a) Monitors the pressure of the refrigerant and will automatically open when the pressure rises above the sensor fixed set point. (See specifications for details)
- b) Reset types are manual or automatic, depending on design and system.
 - a) Manual Reset - requires that a button be pressed.
 - b) Automatic Reset - automatically reset when pressure is below the reset setting.

13. **CAPACITY CONTROLS**

- a. System with multiple compressor permit the use of capacity control using the temperature controller system.
- b. Hot Gas Bypass (Option) - A bypass valve in the refrigerant system that permits that cooling output capacity of the chiller to vary based on the load of the system.

14. **LOW AMBIENT CONDITION CONTROLS (OPTIONS)**

- a. Low Ambient Conditions to 0°F Kit (Option)
- b. Temperature of the chiller's ambient condition is monitored and will change the operation of the chiller fans to reduce the possibility of freezing condenser fan cycling.
- c. NOTE: Low Ambient chillers typically do not have the Low Flow Safety or a Freeze Safety. They are equipped with a pressure controlled fan control system which is used to operate the fan (or Fan #2 or #3 only on multiple fan unit chillers).

15. **WIND BAFFLES** (Depending on design)

- a. Panels mounted in or on the condenser coil section to limit/control the amount of air entering the coils. (Option)
- b. Typically used with Low Ambient kit systems with controls down to -20°F Kit.

16. **LOW CHILLED WATER TEMPERATURE (Low LCWT)**

- a. Low Temperature refers to the temperature of the fluid leaving the chiller is lower than the temperature of the standard temperature machine's Leaving Chill Water Temperature (LCWT). Glycol or some other freeze protected fluid is required.
- b. The temperature controller parameters must be setup for the lower leaving temperatures that the system will generate.

- c. Also, some temperature thermostats may need to be adjusted.
- 17. **PUMP** (Depending on design)
 - a. Systems with integral pump are typically setup to provide recirculating fluid for the chiller and some flow is routed for the process system. Refer to the unit's actual design for details.
 - b. A secondary pump may be used for process specific applications, referred to as Process Pump.
- 18. **TANK** (Depending on design)
 - a. Systems with integral tank will typically be 304 Stainless Steel with Open Top with Shoebox Type Lid, Fluid Level Sight glass, Fill Port, & Drain Plug.
- 19. **HEAT EXCHANGER** (Depending on design)
 - a. A heat exchanger is used to transfer heat typically from the chiller fluid circuit to a separate process fluid circuit.
- 20. **SWITCHOVER SYSTEM (CHILLER BYPASS) (OPTIONS)**
 - a. Manual City Switchover (MCSO) (Option)
 - a) System valves which can be aligned to a backup water supply system such as the city water supply. Outlet fluid flow is normally routed to the building's drain system. Valves are connected and must be actuated simultaneously or in the proper series to operate properly. Converting back is normally performed in the reverse order.
 - b. Automatic City Switchover (See ACSO literature)
 - a) System has electrically operated valves similar to MCSO, however it can be setup to change automatically based on a system safety situation.
- 21. **TANK LEVEL (OPTIONS)**
 - a. **Float Valve**
 - a) Located inside the tank, the float valve is a mechanically float-actuated valve supplied with a makeup water source of fluid for the tank.
 - b) The makeup water (such as city water supply) is connected to the pipe connection on the outside of the tank.
 - c) Water pressure, typically, must be less than 30psi.
 - d) When the level falls below a certain level, the valve will open and fill the tank. When it reaches the top setting adjustment, the valve closes.
 - e) If the valve does not maintain level:
 - a) Verify water pressure supply.
 - b) Verify the float adjustment.
 - c) Verify the mechanical linkages are free to move.
 - d) Verify there is no dirt or debris on the valve seat.
- b. **Tank Level Float Switch and Solenoid Valve**
 - a) A float actuated switch mounted in the tank to monitor when tank is at different levels depending on design:
 - a) Low Tank Level- tank is at the low level point that will begin filling the tank.
 - b) High Tank Level- level in tank is at or near top of tank and may overflow.
- c. **Tank Level Switches**
 - a) Tank level switches may be mounted in the tank as needed for various applications for Safety or Notification purposes.
 - a) Safety – to stop the operation of something such as the chiller or pump.
 - b) Notification – to provide a signal for notification for manual refill or that another action must be performed.
 - c) Action – to provide signal for use with other system uses such as automatic fill systems.

VI. MAINTENANCE (BASIC GUIDE)

IMPORTANT

- Always disconnect and lock out the electrical power source before attempting any connection, maintenance or repairs. Failure to do so can cause electrical shocks, burns and death.
- All work must be performed by a qualified service person based on the local codes and regulations of the area.
- This guide/instruction is to be used as a guide only. An understanding of the system being worked on must be understood before performing any service. Each equipment installation is unique and must be reviewed carefully.
- This is a list of basic maintenance items for your liquid chiller. The interval for this maintenance should be determined by the duty cycle of the chiller and the environmental conditions in which it operates. Each system may be unique, so contact the systems manager or the manufacturer for assistance.

If any questions regarding the equipment, please contact Cold Shot Chillers for assistance.

NOTE: Not performing the following will cause early unit failure and considered abuse which is not covered by warranty.

1. REVIEW AND COMPARE SYSTEM OPERATING PARAMETERS

- a. Review original startup checklists and any log readings that may have been recorded to compare with existing parameters and conditions. Determine if further analysis is needed.

2. AIR COOLED CONDENSER (INSPECT AND CLEAN)

- a. INSPECT: Light should be visible through the condenser coil for dirt or airborne particle build-up. Check deep into the coils with a flashlight and, if dirty, clean as needed.
- b. CLEANING: Be careful to disconnect the power first. Protect all electrical components from water and from water entering electrical conduit lines, and then cover the pump/motor, unless motor is a TEFC, to prevent water from entering the vent ports. If it needs to be cleaned, remove the covers of the chiller and use water or compressed air to blow back through the coil in the opposite direction of air flow. Avoid any damage to coil fins such as bending fins flat.
- c. EZ CLEAN FILTERS: If included on the condenser, remove the filters from the unit, and wash with water or soapy water, rinse thoroughly, and then allow filters to dry thoroughly before reinstallation. Reattach when completely dry.

3. UNIT SURFACE CLEANLINESS (INSPECT AND CLEAN)

- a. Inspect all exposed surfaces for indications of corrosion.
- b. Metal, air, and/or water do not always mix well. When the proper concentration are in the same area, then corrosion results. Corrosion is the changing of a metal's properties from one material to another. Nearly all metals are susceptible to corrosion.

One noticeable corrosion when iron and oxygen mix resulting in Iron-Oxide or Rust. Most commonly, the corrosion can be removed with wire brush and/or abrasive clothes, and then the surface can be recoated to reduce future corrosion. For severe environments, use a durable epoxy paint that can create an oxygen barrier.

- c. Fasteners which are corroded should be replaced with stainless steel fasteners.

4. WATER QUALITY / TEST GLYCOL MIXTURE (VERIFY)

- a. System water should be clean and free of contaminants. If the chiller has a reservoir, check for debris or contaminants which could reduce the efficiency of your chiller. If the chiller has a flow-through heat exchanger, check for normal inlet and outlet fluid pressure. A large pressure differential could indicate plugged up heat exchanger passages.

5. STRAINERS, FLUID (INSPECT/CLEAN)

- a. Fluid filters should be clear enough to allow for proper flow and pressure in the system. An increased fluid pressure on the system may indicate a dirty filter.
- b. To clean, turn the system off, isolate the process piping, if possible (if the chiller is not isolated from the process and the strainer is opened, then any fluid above the strainer will drain out immediately.) After isolating the process, use a wrench to hold the strainer stationary while another wrench is placed on the strainer screen cap. The wrench on the strainer body must prevent the body from turning in the piping. Remove the cap and the strainer screen. Clean the screen and reinsert, taking care not to damage by crushing. Tighten the screen cap.
- c. Setup a schedule based on the systems cleanliness and trends of use.

6. **FLUID SYSTEM CONNECTIONS (INSPECT FOR LEAKS OR LOOSE)**

- a. Visually check for fluid leaks throughout system. Physically check for loose pipe fittings or hoses. Ensure that no plumbing parts are wearing, cracking, or chaffing.
- b. Check the pumps for leakage. Visual indication of leakage from the pump end at the pump connection to the motor is usually an indication of a seal failure. Only action is to replace the seal with a new seal. Seals are a consumable item.

7. **MOTOR LOADS (COMPRESSOR, PUMPS, FANS, ETC...) CHECK AMPS/OPERATION**

- a. Use an amp-meter to check for proper current draws on all motors and heaters. Refer to the chiller's electrical schematics or the motor nameplate for proper amp draws. Log readings.

8. **ELECTRICAL CONNECTIONS (CHECK ALL WIRING FOR LOOSE, CHAFFING, OR DAMAGE)**

- a. Disconnect power to the chiller. Check the electrical box and all junction boxes for any loose or damaged wiring. Replace any wiring that could cause problems with shorting or unintentional grounds.
- b. Check the condition of the contactor points for the compressor and pump. Replace them if the edges become jagged or splattered to avoid premature compressor and/or pump failure. Contactor points are consumable and their life is dependent on the amount of use and power characteristics at the unit.

9. **REFRIGERATION SYSTEM FOR LEAKS (INSPECT AND TEST)**

- a. If the system is operating and there is no indication of leaks, avoid accessing the system unless necessary.

- b. Have a certified refrigeration technician check the refrigeration system for proper operation.
- c. Leak check the unit, monitor operating pressures, and adjust as needed. Refer to manual for proper charging instructions.

10. **CASTER WHEELS AND SWIVELS**

- a. Wheels may require frequent lubrication based on the amount of use. Use good quality bearing grease and pump it into the grease fittings on the axle and swivel.

11. **COMPARE TEMPERATURE READOUT WITH ACTUAL TEMPERATURE**

- a. Use an independent thermometer (or multiple for averaging) and compare to the actual digital temperature display. If the temperature varies more than a few degrees, check condition of thermocouple/sensor. Variation more than a few degrees is usually not common.
- b. If the temperature controller is located in a different location than the thermocouple/sensor, then it may be necessary to adjust the offset in the controller parameters. Contact Cold Shot Chillers for assistance.

12. **WINTERIZATION**

- a. During cold operation months, the chiller piping exposed to freezing temperatures should be protected or damage will result. If the system is not needed during winter months, a possible option is to drain the system of all fluid and tag the system for non-use until needed again.
- b. All fluid must be removed from all components and piping to prevent possible damage.
- c. Follow the startup instructions in the manual for refilling and startup.

VII. TROUBLESHOOTING (BASIC GUIDE)

- The Troubleshooting Guide below is to be used as a guide only. All work should be performed by a trained technician and only with proper understanding of the system. Contact manufacturer for further assistance.
- Prior to resetting any safety devices, ensure that the issue is resolved or use care in operating the system until the cause is determined.

SYMPTOM AND PROBABLE CAUSE	PROBABLE REMEDY
COMPRESSOR DOES NOT RUN	
1. Power line open.	1. Reset circuit breaker/disconnect.
2. Contactor stuck open.	2. Replace contactor.
3. Loose terminal connection.	3. Check connections. Tighten.
4. Improperly wired controls.	4. Check and rewire.
5. Seized compressor.	5. Check motor winding for open or short. Replace compressor, if necessary. Determine cause.
6. Low line voltage.	6. Check line voltage — determine location of voltage drop and remedy deficiency.
7. Compressor motor defective.	7. Check motor winding for open or short. Replace compressor, if necessary.
8. Flow Safety Tripped	8. Determine cause of low flow issue and resolve. <ul style="list-style-type: none"> - Check reason for no flow. If flow is present, verify amount (~3 gpm/ton). - Verify flow is sufficient to the evaporator during all process circuit operations. - Adjust fluid bypass valve to increase flow. - Do not reset unless issue has been resolved. - Troubleshoot the switch. DO NOT BYPASS! IMPORTANT! This condition can occur when the fluid in the evaporator nears freezing.
9. Flow Switch Tripped (switch open)	9. Determine cause of low flow issue and resolve. (See Flow Safety Tripped)
10. Freeze Safety Tripped	10. Determine cause of low flow issue and resolve. (1) (See Flow Safety Tripped)- Typically, this is an automatic reset.
COMPRESSOR STOPS ON LOW-PRESSURE SWITCH	
1. Compressor suction shutoff valve partially closed.	1. Open valve.
2. Low refrigerant charge.	2. Determine cause of low refrigerant. Add refrigerant.
3. Liquid line solenoid valve(s) fails to open.	3. Check liquid line solenoid valve for proper operation. Replace if necessary.
4. Liquid line shutoff valve closed.	4. Open valve.
COMPRESSOR STOPS ON HIGH-PRESSURE SWITCH	
1. Compressor discharge valve partially closed.	1. Open valve or replace if defective.
2. Air in refrigerant system.	2. Purge and evacuate system, as appropriate.
3. Condenser fan(s) not operating.	3. Check, then repair or replace if defective: <ul style="list-style-type: none"> a. Motor/motor wiring. b. Head pressure switch. c. Capacitors.
4. System is overcharged.	4. Reclaim charge as needed.
5. Condenser coils dirty.	5. Clean coils, properly.
6. Ambient temperature too high for charge.	6. Reclaim charge as needed.
7. Partially plugged expansion valve or filter drier.	7. Clean or replace.
8. Condenser coils dirty.	8. Clean coils, properly.

SYMPTOM AND PROBABLE CAUSE	PROBABLE REMEDY
UNIT OPERATES TOO LONG OR CONTINUOUSLY	
9. Low refrigerant charge.	9. Add refrigerant.
10. Control contacts fused.	10. Replace control.
11. Air in system.	11. Purge and evacuate system.
SYSTEM IS NOISY	
1. Piping vibration.	1. Support piping as required.
COMPRESSOR LOSES OIL	
1. Leak in system.	1. Repair leak.
2. Crankcase heaters not energized during shutdown.	2. Check wiring and relays. Check heater and replace if defective. (Some heaters are always on.)
3. Improper interconnecting piping design.	3. Check piping for oil return. Replace if necessary.
FROSTED SUCTION LINE	
1. Expansion valve not operating properly.	1. Adjust expansion valve.
2. Low temperature operation.	2. Verify low temperature operation is proper, verify superheat.
3. Low refrigerant.	3. Determine cause of low refrigerant. Add refrigerant.
4. Low fluid flow.	4. Verify fluid flow. Clean strainer and bypass is throttled to maintain 3gpm/ton.
HOT LIQUID LINE	
1. Dirty condenser coil.	1. Clean condenser coil.
2. Expansion valve malfunctioning.	2. Verify Charge and adjust expansion valve.
3. Shortage of refrigerant due to leak.	3. Repair leak and recharge.
4. Overcharged system.	4. Remove refrigerant, adjust charge.
FROSTED LIQUID LINE AFTER DRIER	
1. Restricted filter drier.	1. Remove restriction or replace.
COMPRESSOR WILL NOT LOAD/UNLOAD – HOT GAS VALVE OPERATION	
1. Defective Hot Gas Bypass valve.	1. Replace valve/solenoid.
2. Defective Capacity Control solenoid/valve.	2. Replace valve/solenoid.
3. Weak, broken, or wrong valve body spring.	3. Replace spring.
4. Program (PLC) not sending signal to solenoid.	4. Verify PLC signal and wiring.
PUMP WILL NOT RUN	
1. No Control Circuit Power.	1. Replace Fuse or reset control circuit breaker.
2. No Power to Contactor.	2. Replace Fuse or reset main circuit breaker/disconnect.
3. Low Line Voltage.	3. Check line voltage — determine location of voltage drop and remedy deficiency. - Excess operation with voltage outside of tolerance (for example “Brown Outs” will result in motor damage. (This is considered abuse and is not covered under Warranty).
4. Contactor stuck open.	4. Verify control voltage to contactor. - No Voltage – find cause of no voltage. - Low Voltage - determine location of voltage drop and remedy. - Replace contactor.
5. Loose terminal connection.	5. Check connections. Clamp on insulation material.
6. Improperly wired remote controls.	6. Verify wiring, and rewire as needed.

7. Motor defective.	7. Check motor winding for open or short. Replace motor/pump, if necessary.
VOLTAGE IMBALANCE	
1. Voltage Imbalance over 2% - Incoming Power - (Check Voltage at front and backside of each contactor during operation.)	1. Main Incoming Voltage – - A voltage imbalance may be an indication of loose wires/cable connections or faulty contactors. - Another issue may be the components themselves. Troubleshoot if needed. (2) - If the supply voltage phase imbalance is still more than 2%, issue may require contacting local electric utility company.
2. Voltage Imbalance over 2% - Load Power - (Check Voltage at front and backside of each contactor during operation.)	2. Main Incoming Voltage – - A voltage imbalance may be an indication of loose wires/cable connections or faulty contactors. - Another issue may be the components themselves. Troubleshoot if needed. - If the supply
TEMPERATURE CONTROLLER ERROR	
1. Temperature indication not accurate.	1. Verify temperature sensor is in good condition and mounted properly. - Adjust the offset (typically it is only adjusted a few degrees.)
2. Temperature indication or sensor error on controller.	2. FOR TEST PURPOSES ONLY! - Turn system off. Disconnect power. - Disconnect the thermocouple wires from controller. - Connect a short length of copper wire between the two contacts on the controller. - Reconnect power. Turn system on. - If the controller “actual” is close in range to the ambient temperature of the controller, then the thermocouple is bad. – Replace the thermocouple. - If the controller “actual” is <u>not</u> in range to the ambient temperature of the controller, then the thermocouple may be good, the controller may have internal issues. – Replace the controller or thermocouple input device.

TEMPERATURE CONTROLLER - CHROMALOX 6040



1/16 DI



Reset or Auto/Manual Key



Lower or Down Menu Key




Raise or Up Menu Key



Function Key

Adjusting the Local Setpoint(s)

Local Setpoints can be adjusted within the limits set by the Setpoint Upper and Lower Limit parameters in Setup. Operator Mode adjustment of Setpoints is not possible if Display Strategy 6 has been selected on Configuration Mode.

Press  to select the adjustable setpoint display



Press  or  to adjust the setpoint to the required value.









Figure 37
Typical front panel and keys

Keypad

Each instrument has either three or four switches, which are used to navigate through the user menus and make adjustment to the parameter values. See - Overview Of Front Panel above

LED Functions





Table 3. Typical LED functions

LED	Function
	ON indicates the Setup Mode has been entered. This LED is labelled  on the Over Temperature / Limit Controllers
	FLASHING indicates the manual mode has been entered
	ON indicates that Controller Self Tune mode is engaged
	FLASHING indicates that Controller Pre-Tune mode is engaged
	FLASHING indicates that an alarm condition is present
	FLASHES in unison with Time Proportioning Primary outputs, or turns ON with Valve Motor “Open” outputs. For Current Proportioned outputs, ON indicates primary power is >0% It turns ON when the stored Max.
	FLASHES in unison with Time Proportioning Secondary outputs, or turns ON with Valve Motor “Close” outputs. For Current Proportioned outputs, ON secondary power is >0% It turns ON when the stored Min.

6 Messages and Error Indications

The following displays are shown when an error occurs or a hardware change is detected.

Table 4. Error/Faults conditions

Error/Faults Conditions	Upper display	Lower Display (where fitted)
Configuration & Setup is required. Seen at first turn on or if hardware configuration changed. Press  to enter Configuration Mode, next press  or  to enter the unlock code number, then press  to proceed. Configuration must be completed before return to operator mode is allowed ¹	CoLo	CoNF
Loop alarm set for Auto but Pb_P is set to 0.0% (on/off control). Loop Alarm uses the manual Loop Alarm Time until PID control is restored. Ensure that LRA is set correctly.	RErr	LREN
PV Input more than 5% over-range ²	[HH]*	Normal Display
PV Input more than 5% under-range ³	[LL]*	Normal Display
Sensor Break. Break detected in the input sensor or wiring	OPEN*	Normal Display
Auxiliary input over-range	Normal Display	[HH]*
Auxiliary input under-range	Normal Display	[LL]*
Auxiliary Break. Break detected in the auxiliary input	Normal Display	OPEN*
Option 1 module fault.	Err**	OPn1
Option 2 module fault.	Err**	OPn2
Option 3 module fault.	Err**	OPn3
Option A module fault.	Err**	OPnA
Option B module fault.	Err**	OPnb

***Note:** Input sensor and Auxiliary over/under-range or break indications will be seen wherever these values would normally be displayed.

¹ This feature does not guarantee correct configuration. It only helps to ensure that the unit will be configured before use. Use of set-up mode is not enforced but may be essential for the users application.

² If the PV display exceeds 9999 before 5% over-range is reached, an over-range indication is given.

³ Indicators will allow up to 10% under-range on non-zero based Linear ranges. If the PV display is less than - 1999 before the % under-range is reached, an under-range indication is given.

P266 Series Single-Phase Condenser Fan Speed Control

Installation Instructions

Abbreviated Version

P266xxx-x

Part No. 24-7664-2705, Rev. B

Issued April 29, 2009

Supersedes January 21, 2009

Application

IMPORTANT: Use this P266 Single-Phase Condenser Fan Speed Control only as an operating control. Where failure or malfunction of the P266 fan speed control could lead to personal injury or property damage to the controlled equipment or other property, additional precautions must be designed into the control system. Incorporate and maintain other devices, such as supervisory or alarm systems or safety or limit controls, intended to warn of or protect against failure or malfunction of the P266 fan speed control.



CAUTION: Risk of Property Damage

Use only single-phase Permanent Split Capacitor (PSC) motors approved by the manufacturer for speed control application with the P266 control. Failure to use a single-phase PSC motor may damage the motor and other property.

The P266 Single-Phase Condenser Fan Speed Control is a cost-effective, compact, weather-resistant, and durable speed control for single-phase, PSC motors used in a wide variety of low-ambient refrigeration and air conditioning condenser applications.

The P266 fan speed controls are designed to replace the Johnson Controls® P66 Series and P215 Series Fan Speed Controls and provide additional features and application flexibility.

Mounting

Location and Mounting Considerations

Observe these guidelines when locating and mounting a P266 fan speed control:

- Ensure that the mounting surface and mounting hardware can support the control and wiring.

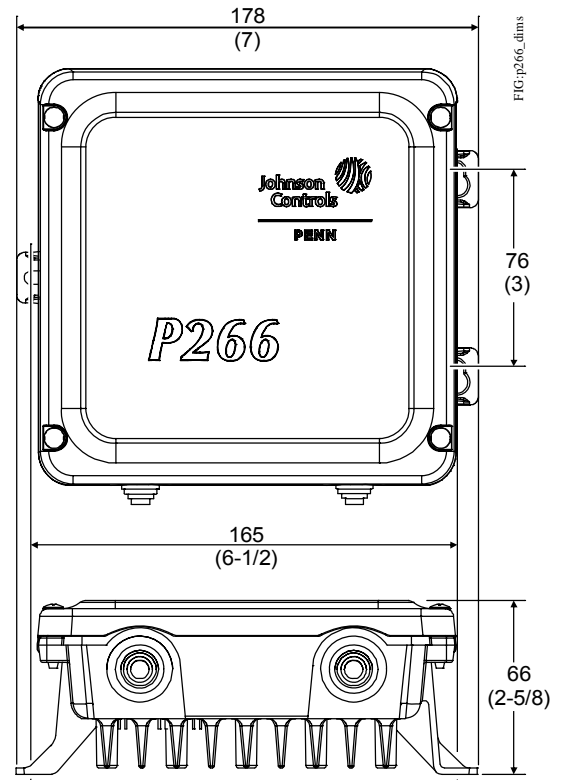


Figure 1: P266 Single-Phase Condenser Fan Speed Control Mounting Dimensions

- Mount the P266 control upright on a vertical surface with the heat sink fins oriented vertically and the conduit/electrical holes facing down.
- Ensure that air can flow through the heat sink fins and provide 10 cm (4 in.) minimum clearance around the heat sink.
- Mount the P266 control in a location away from sources of excessive heat and within the specified ambient operating conditions. See [Technical Specifications](#) for ambient operating conditions.

P266 Electronic Pressure Transducers

P266 controls are designed to reference either one or two Johnson Controls P266 Electronic Pressure Transducers to monitor condenser pressure.

P266 transducers are specialized versions of the P499 Series Electronic Pressure Transducers designed for use with P266 fan speed controls. See Table 3 for the available P266 transducer models.

Note: On P266 control applications that use two P266 transducers, the P266 control always references the transducer that is sensing the highest pressure.

IMPORTANT: When two P266 transducers are connected to a P266 control, the transducers must be the same model (product code number). Failure to connect the same P266 transducer models to the P266 control can result in erratic control behavior.

Refer to the *P499 Series Electronic Pressure Transducers Product/Technical Bulletin (LIT-12011190)* for information on installing P266 transducers.

Table 3: P266SNR Electronic Pressure Transducers

Product Code Number	Description
P266SNR-1C	Electronic Pressure Transducer: 0 to 35 bar (0 to 508 psi) total range with a 1/4 in. SAE Female Flare connection and a 2 meter (3.1 ft) cable.
P266SNR-2C	Electronic Pressure Transducer: 0 to 52 bar (0 to 754 psi) total range with a 1/4 in. SAE Female Flare connection and a 2 meter (3.1 ft) cable.

Technical Specifications

P266xxx-x

Product	P266xxx-x Single Phase Condenser Fan Speed Control
Input Supply Power	208-240 VAC 50/60 Hz or 480-575 VAC 50/60 Hz depending on model (Refer to the label inside the P266 control housing cover for rated voltage range and model-specific wiring diagram.)
Low-Voltage Power Supply	P266A and P266B Types: External 24 VAC Class 2, 20 VA Supply Transformer P266Exx Types: Low-voltage power for P266 control is provided by an onboard transformer. Note: When auxiliary fan starters are connected to P266E type controls, you must provide an external Safety Extra-Low Voltage (SELV) AC supply to power the fan starters (Figure 2).
Ambient Operating Conditions	Temperature: -20 to 60°C (-4 to 140°F) Humidity: Up to 95% RH non-condensing; Maximum Dew Point 29°C (85°F)
Ambient Shipping and Storage Conditions	Temperature: -40 to 85°C (-40 to 185°F) Humidity: Up to 95% RH non-condensing; Maximum Dew Point 29°C (85°F)
Low-Voltage Connections	1/4 in. Quick-Connect terminals, 30 m (100 ft) maximum wiring runs
Input Transducer	P266SNR-x Pressure Transducer: 5 VDC for 0.5 to 4.5 VDC ratio metric analog signal
Enclosure Type	NEMA 3R, IP54
Case Construction	Aluminum Die Casting
Cover Construction	UV Stabilized Polycarbonate/ABS
Dimensions (HxWxD)	159 x 177 x 70 mm (6-1/4 x 7 x 2-3/4 in.)
Weight	Heaviest Model Weight: 1.0 kg (2.2 lb) Approximate Shipping Weight: 1.2 kg (2.6 lb)
Compliance	Europe: Mark: CE Compliant; CENELEC EN 60947-1 & 4-2; RoHS Directive (2002/95/EC); WEEE Directive (2002/96/EC) North America: ETL, UL508C; cETL C22.2 No. 107.1; FCC Compliant to CFR47, Part 15, Subpart B, Class B Industry Canada (IC) Compliant to Canadian ICES-003, Class B limits Australia: C-Tick Compliant (N1813)

The performance specifications are nominal and conform to acceptable industry standards. For application at conditions beyond these specifications, consult Johnson Controls Application Engineering at (414) 524-5535. Johnson Controls, Inc. shall not be liable for damages resulting from misapplication or misuse of its products.



ITT

Flow Switches - Liquid

McDonnell & Miller

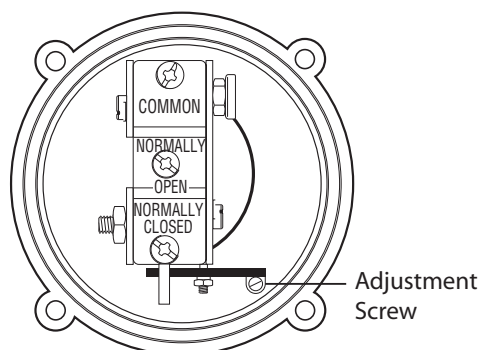
Adjustment

Adjustment is necessary only if required flow/no flow set-points are **above** factory set minimum.

- a. Turn off power. Remove electric enclosure cover.
- b. Turn the adjusting screw clockwise to increase setpoint.

IMPORTANT: Do not attempt to lower flow switch setpoint from original factory minimum setting. Lowering (turning adjusting screw counterclockwise) the setpoint from original factory setting may cause erratic flow switch operation.

- c. Place cover on flow switch and turn on power.
- d. Test the operation of the flow switch after each adjustment.



FS254 Shown

MAINTENANCE

SCHEDULE:

- Inspect paddle annually. Turbulent or high flow velocity conditions may require more frequent inspection and/or replacement.
- Replace paddle if damaged or showing signs of wear.
- Replace flow switch every 5 years or 100,000 cycles, whichever occurs first.

TROUBLESHOOTING

Problem:

1. Flow Switch Does Not Operate

Solution:

- a. Make sure power has been turned on to device and flow switch.
- b. Verify that flow rate is high enough for flow switch to activate. Measure flow rate and match with velocities shown in flow rate chart.
- c. Check to see if paddle moves freely. Some system piping disassembly may be required.

2. Flow Switch Operates Erratically

Solution:

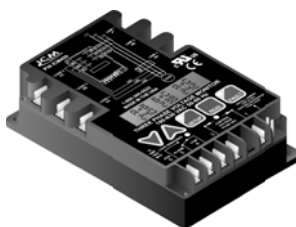
- a. Flow switch may be located in an area of high turbulence causing paddles to flutter.
- b. Adjustment screw may have been set below original factory minimum setpoint. Verify that flow rate is high enough for flow switch to activate. Measure flow rate and match with velocities shown in flow rate chart.
- c. Check to see if paddle moves freely. Some system piping disassembly may be required.

3. Flow Switch Does Not Deactivate

Solution:

- a. Check to see if paddle moves freely. Some system piping disassembly may be required.
- b. Measure flow rate and match with velocities shown in flow rate chart. Flow switch must prove flow before it can indicate no flow.





ICM450

Three Phase Voltage Monitors

Programmable, 25-Fault Memory, Protects motors from premature failure and burnouts

MODE OF OPERATION

At power up, the ICM450 evaluates the incoming power for proper phase sequence, amplitude, and symmetry (voltage unbalance). If the three phase input at the line side connections is within user-set parameters, the load energize LED is turned on and the internal relay is energized. Continuity will be across terminals 4 and 6. If connections are made to the load side terminals, the ICM450 will transfer monitoring over to the load side only.

When a critical fault condition (phase loss or phase reversal) is present, the relay will immediately de-energize, the load energized LED will turn off, the fault LED will flash, and the fault is written to memory. Continuity will be across terminals 4 and 5.






If a non-critical fault condition (unbalance, high or low voltage) is present, the ICM450 will ignore it during the interrogation delay time. If it is still present following the interrogation delay time, the relay will de-energize, the load-energized LED will turn off, the fault LED will flash, and the fault is written to memory. Continuity will be across terminals 4 and 5.

The ICM450 will store the last 25 faults in memory. The relay will not energize if any fault conditions exist. The integral adjustable delay on break timer will prevent short cycling.

SETTING THE PARAMETERS

1. Press the green SETUP button to enter Setup mode. Setup LED will light.
2. Use the ^ and v arrows to change user parameters.
3. Scroll through setup by pressing and releasing the SETUP button.
4. When the last parameter has been set, the phase average will be displayed and the Setup LED will automatically turn OFF.

BUTTON FUNCTIONS

				
Press arrows to scroll through and select user parameter settings in Setup mode. HOLD down for fast edit.		Press to enter Setup mode and select user parameters.	Hold for voltage display a->b, b->c, a->c (simultaneously).	Press to read faults. Hold for 5 seconds to clear faults and reset memory.

Parameters (See Wiring Diagram for Factory Settings)		
Parameter	Description	Range
Line Voltage	Average phase to phase line voltage	190-630
Delay On Break	Amount of time between the load de-energizing and re-energizing	0-10 mins
Fault Interrogation	Amount of time before the load de-energizes due to a non-critical fault*	0-15 secs
% Over/Under Voltage	Maximum/minimum phase to phase average voltage, respectively	2-25%
% Phase Unbalance	Amount of allowable voltage unbalance	2-20%
Reset Mode	AUTO or number of times the load can be re-energized after a load side fault before a manual reset is necessary. Note: When monitoring line side only, the reset mode will always be AUTO	AUTO, 0-10
Control Mode	With control mode set to OFF, the load will energize if no 3- phase fault conditions exist; with control mode ON, the load will energize if no fault conditions exist and control voltage is present at terminals 1 and 3 of the ICM450	ON or OFF

*Non-critical faults are faults such as *High/Low Voltage* and *Phase Unbalance*. Critical faults, such as *Phase Loss* and *Phase Reversal*, have a fault interrogation of under 2 seconds and it is **not** user adjustable.

** For best recommendations, consult manufacturer of equipment.

Marrone & Co., Inc.

14020 Interdrive West, Houston, Texas 77032 • Phone (800) 473-9178, (281) 227-8400

Fax (800) 473-9175, (281) 227-8404 • www.waterchillers.com

Fault Conditions

Press and release fault button to scroll through all saved faults.

Note: For initial setup, press and hold **FAULT** for 5 seconds to remove any previously stored faults.

Fault	Problem	Corrective Action
Back Phase Loss	Not all three of the phases on the load side are present	<ol style="list-style-type: none"> 1. Re-energize the contactor. 2. If the fault reappears after the load energizes: <ol style="list-style-type: none"> a. Turn all power OFF b. Check all load side connections c. Check the contacts of the contactor for debris or excess carbon.
Back Phase Rev	Loads 1, 2, or 3 are not in sequence (not 120° phase shifted)	<ol style="list-style-type: none"> 1. Turn OFF all power. 2. Swap any 2 phases on the load side of the unit only (example: swap load 1 and load 2) * 3. Re-apply power.
Back Phase Unbal	A voltage unbalance between the three load phases exceeds the unbalance setpoint	<ol style="list-style-type: none"> 1. Press the READ button to observe the present load voltages. Check system for unbalance cause. 2. Increase the fault interrogation time if necessary. 3. Increase the percent unbalance setting if necessary.
Front Over Volt	Average phase-phase voltage exceeds the maximum percentage	<ol style="list-style-type: none"> 1. Check system for over-voltage cause. 2. Increase the percent over-voltage setting if necessary. 3. Increase the fault interrogation time if necessary.
Front Phase Loss	Not all three of the phases on the line side are present	<ol style="list-style-type: none"> 1. Press and hold the READ button on the phase monitor or use an AC voltmeter to carefully measure all three phase-phase line voltages (example: Line 1 Line 2, Line 2 Line 3, Line 3 Line 1). 2. Repair the missing phase.
Front Phase Rev	Lines 1, 2, or 3 are not in sequence (not 120° phase shifted)	<ol style="list-style-type: none"> 1. Turn OFF all power. 2. Swap any 2 phases on the line side of the unit. For example: swap load 1 and load 2*. 3. Re-apply power.
Front Phase Unbal	A voltage unbalance between the three line phases exceeds the unbalance setpoint	<ol style="list-style-type: none"> 1. Press the READ button to observe the present load voltages. Check system for unbalance cause. 2. Increase the fault interrogation time if necessary. 3. Increase the percent unbalance setting if necessary.
Front Under Volt	Average phase-phase voltage is below the minimum percentage	<ol style="list-style-type: none"> 1. Check system for under-voltage cause. 2. Increase the percent under-voltage setting if necessary. 3. Increase the fault interrogation time if necessary.

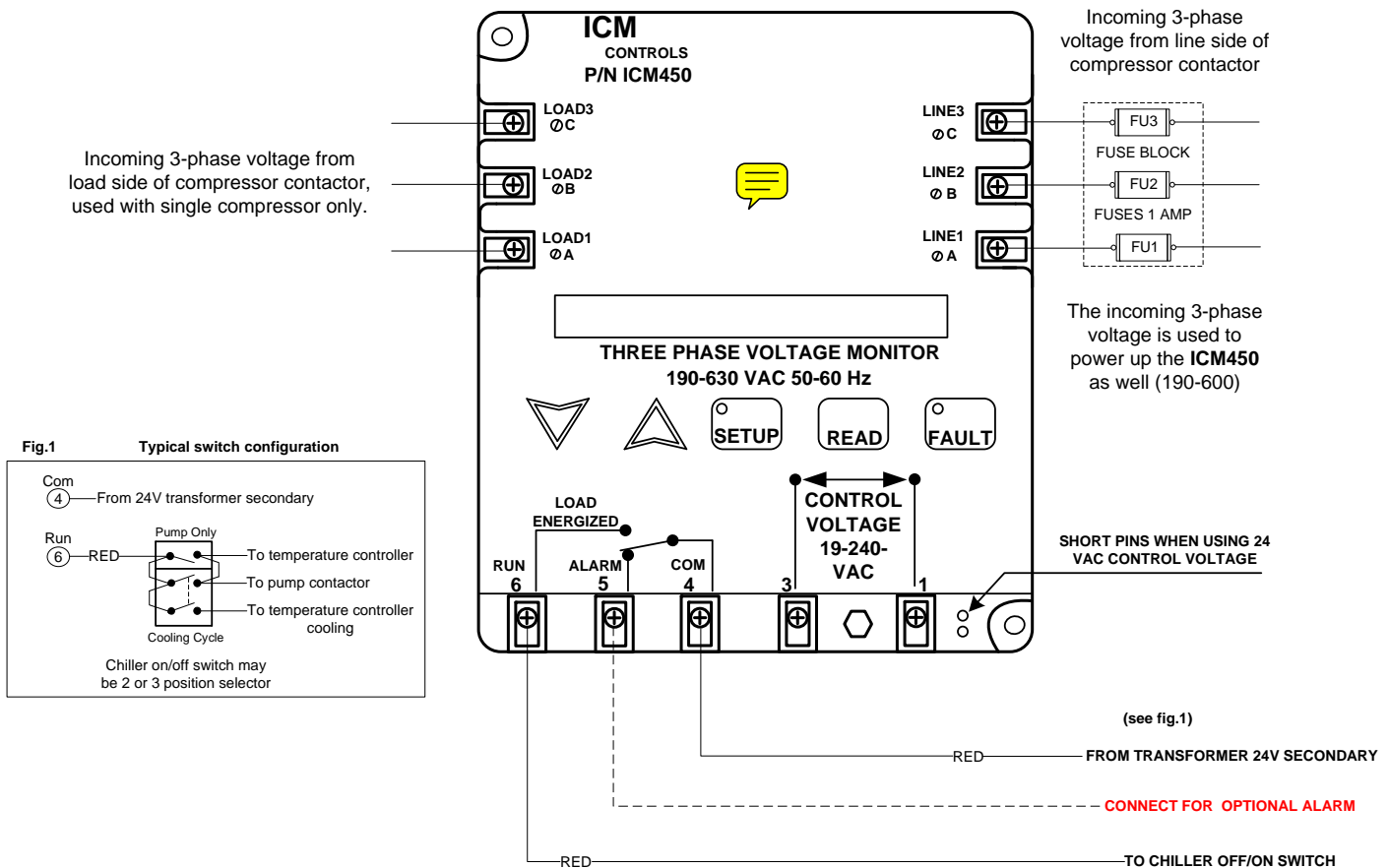
* Only swap phases during initial setup, **not** after unit has been in operation without errors.

Troubleshooting

Problem	LCD Readout	LED Status	Corrective Action
Load will not energize	Phase Avg.	All LEDs Off	Confirm that the control input is properly connected and configured
Load will not energize	Phase Avg.	Load LED Off, Fault LED Blinking	Press FAULT to observe the current fault; correct the condition of the first fault that appears (see Fault Conditions, Page 6 for a list of corrective actions)
Fault LED blinks repeatedly while load is energized	Phase Avg.	Fault LED Blinking, Load LED On	Indicates there are faults saved in the memory, press FAULT rapidly to scroll through saved faults; to clear the faults, press and hold FAULT for more than 5 seconds
Load will not de-energize when control voltage is OFF	Phase Avg.	Load LED On, Control LED Off	The control mode setting is OFF; press SETUP to get to the control mode. Press to set the control mode ON
Setup LED is on while load is being energized	Anything Other Than Phase Avg.	Setup LED On, Load LED On	To exit the setup mode, press either READ or FAULT
Load will not energize	Reset	Fault LED Blinking	Unit in lockout; maximum number of retries in manual reset mode has been reached; to reset unit, press FAULT and hold for more than 5 seconds
Load turns ON and OFF repeatedly	Readout is Irrelevant	Fault LED Blinking	Fix load side fault; press FAULT to observe condition; the delay on break period may be too short; press SETUP to enter the delay on break mode; press to lengthen the delay

Parameters				
Parameter	Description	Range	Factory Setting	
Line Voltage	Average phase to phase line voltage	190-630	220V	460V
Delay On Break	Amount of time between the load de-energizing and re-energizing	0-10 minutes	3 minutes**	3 minutes**
Fault Interrogation	Amount of time before the load de-energizes due to a non-critical fault*	0-15 seconds	8 seconds**	8 seconds**
% Over/Under Voltage	Maximum/minimum phase to phase average voltage, respectively	2-25%	13%	10%
% Phase Unbalance	Amount of allowable voltage unbalance	2-20%	2%	2%
Reset Mode	AUTO or number of times the load can be re-energized after a load side fault before a manual reset is necessary. Note: when monitoring line side only, the reset mode will always be AUTO	AUTO, 0-10	3	3
Control Mode	With control mode set to OFF, the load will energize if no 3- phase fault conditions exist; with control mode ON, the load will energize if no fault conditions exist and control voltage is present at 1 and 3 of the ICM450	ON or OFF	OFF Based on wiring	OFF Based on wiring

*Non-critical fault are faults such as High/Low Voltage and Phase Unbalance. Critical faults, such as Phase Loss and Phase Reversal have a fault interrogation of under 2 seconds and it is **not** user adjustable.



1. FAULT- PRESS TO READ FAULTS.HOLD FOR 5 SECONDS TO CLEAR AND RESET MEMORY.
2. READ- HOLD FOR VOLTAGE DISPLAY
3. SETUP-PRESS TO ENTER SETUP MODE AND SELECT USER PARAMETERS.
4. PRESS ARROWS TO SCROLL THROUGH AND SELECT USER PARAMETER SETTINGS IN SET UP MODE. HOLD DOWN FOR FAST EDIT.

Cold Shot Chillers

"ECONOMICALLY PRICED DEPENDABILITY"



TECHNICAL SPECIFICATION

Model: ACWC-060-E-__¹__²__³__⁴

Description:

Single stage air-cooled portable water chiller system. System will provide approximately 60,000 Btu/hr of cooling capacity with a leaving fluid temperature of 50°F and an ambient air temperature of 95°F.

CAPACITY ±5% AT 50° LCWT / 95°F AMBIENT		60,000 BTU /HR				
COMPRESSOR / REFRIGERANT		HERMETIC SCROLL / R410A				
CONDENSER FANS / AIRFLOW		1 / 3500 CFM				
CONDENSER COILS TYPE		COPPER TUBE / ALUMINUM FIN				
EVAPORATOR TYPE		STAINLESS STEEL / COPPER BRAZED				
FLUID CONNECTIONS		1" MNPT (IN/OUT)				
ELECTRICAL:	V - Ø - HZ	COMP RLA / LRA	FAN FLA	PUMP FLA	MCA	
-1	575 - 3 - 60	5.8	38.9	0.5	1.7	9.7
- 2	230 - 1 - 60	26.3	134	1.2	8.0	43
- 5	230 - 3 - 60	15.6	110	1.2	8.0	29
- 6	460 - 3 - 60	7.8	52	0.6	2.1	13.1
PUMP HP / OUTPUT		1.0 HP / 30 GPM @ 30 PSI				
TANK SIZE / CONSTRUCTION		25 GALLON / 304 STAINLESS STEEL TANK WITH LID				
DIMENSIONS		44" L x 32" W x 60" H				
WEIGHT (APPROX.)		500 LBS				

Note: All specifications subject to change without notice.

Specify Voltage and Ambient Condition upon ordering.

1ph Pump Motor used on -2 & -5 units.

STANDARD FEATURES:

- **Controls:** Electronic temperature controller with constant (set point & process) temperature readout on standard units, actual and programmed temperature LED readout.
- **Refrigeration Components:** Efficient scroll compressors, sight glass/moisture indicators, balance port expansion valves, filter drier, pump down valves, fan cycling head pressure controls.
- **Process Fluid Components:** Bronze "Y" strainer with 20 mesh stainless steel screen. Pumps are stainless steel centrifugal. Tanks are insulated with shoe box lid, fill port, and level sight glass. Portable systems will include a bypass flow valve.
- **Safety Controls:** High/low pressure refrigerant pressure, freeze, low water flow, overloads for compressor and fan motors, safety fuses or overloads for pump.
- **Construction:** Welded steel powder coated frame and full metal cabinet, copper piping connections.
- **Warranty:** One year parts / five year compressor.

SUITABLE AMBIENT CONDITIONS/FEATURES:

- **IND:** Indoor use only. Casters on frame.
- **40:** Suitable for outdoor use with an ambient of 40°F ambient. Casters, optional.
- **0:** Suitable for outdoor use to 0°F ambient. Includes low ambient fan speed controls with (LT) models. Casters, optional.
- **M20:** Suitable for outdoor use to -20°F ambient. Includes with low ambient fan speed controls with hot gas bypass. Internal wind baffles. Casters, optional.

¹ Flow Design (__=Portable, ST=Stationary, RF=Reverse Flow, EXCH=Extra Heat Exchanger, DP=Dual Pump, DR=Dual Return)

² Leaving Fluid Temperature (__=Standard, LT=Low Temperature-specify lowest temperature in °F)

³ Ambient Temperature Conditions (see above)

⁴ Electrical Power Code (see above)

Marrone & Co., Inc.

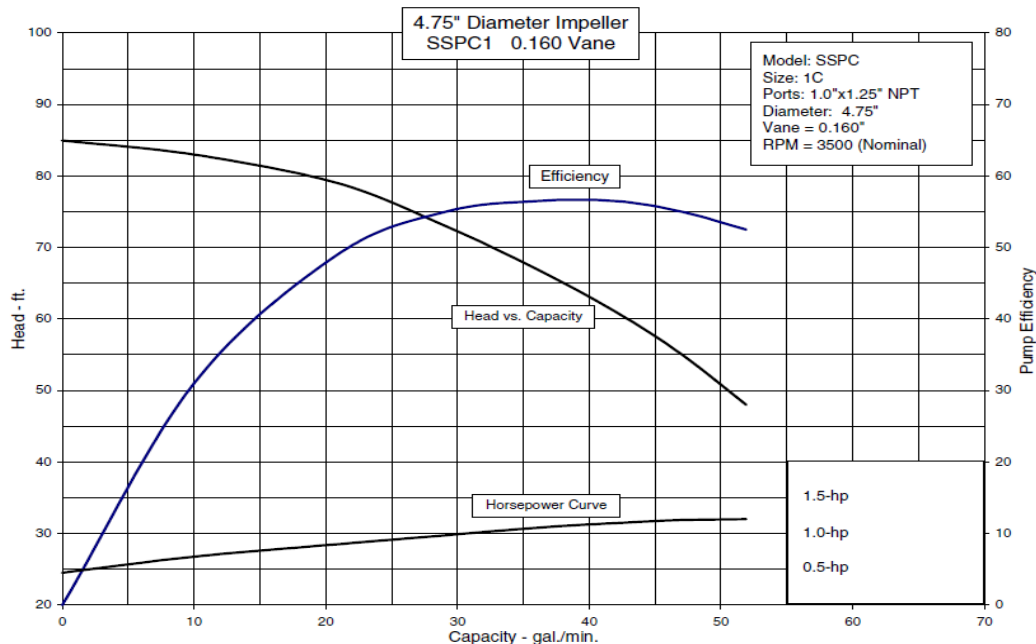
14020 Interdrive West, Houston, Texas 77032 • Phone (800) 473-9178, (281) 227-8400

Fax (800) 473-9175, (281) 227-8404 • www.waterchillers.com

PUOD-000-001-2-0

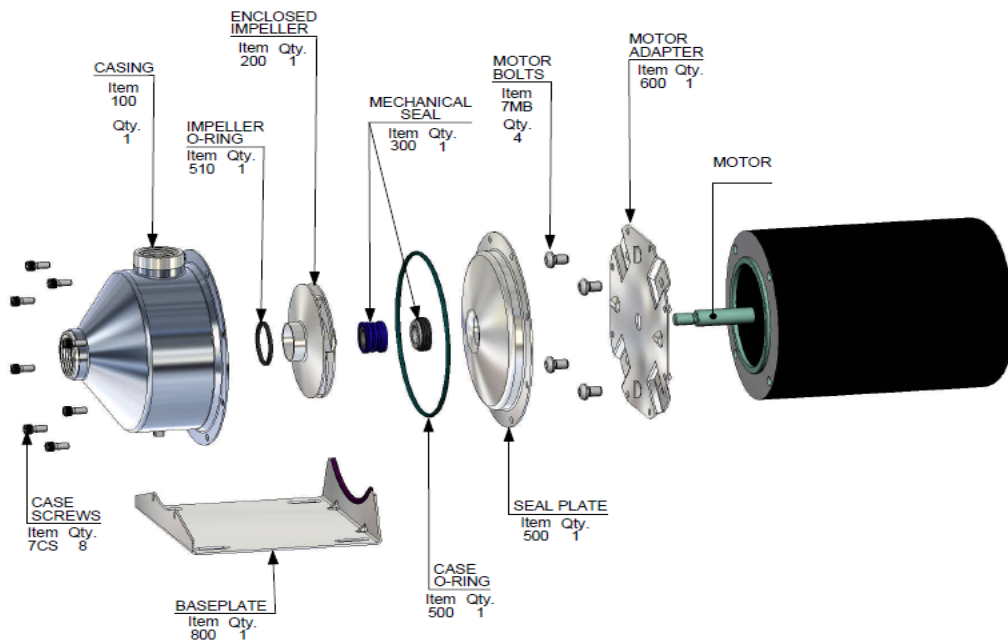
Performance Curve and Data Sheet

1-Hp (single phase-115-230V) ODP Motor / Pump with 4.75" Impeller/0.160 Vane



Clean water based performance at 60 deg. F.

3/01/01



ASP-SSPC Pump/Motor Assembly

- If needed, the pump label is located on the pump casing near outlet port under the insulation. Carefully pull insulation up near the unglued section. Pump Base (*not supplied with footed motors*)
- Reference the chiller serial number when ordering parts for specific supplied pump.

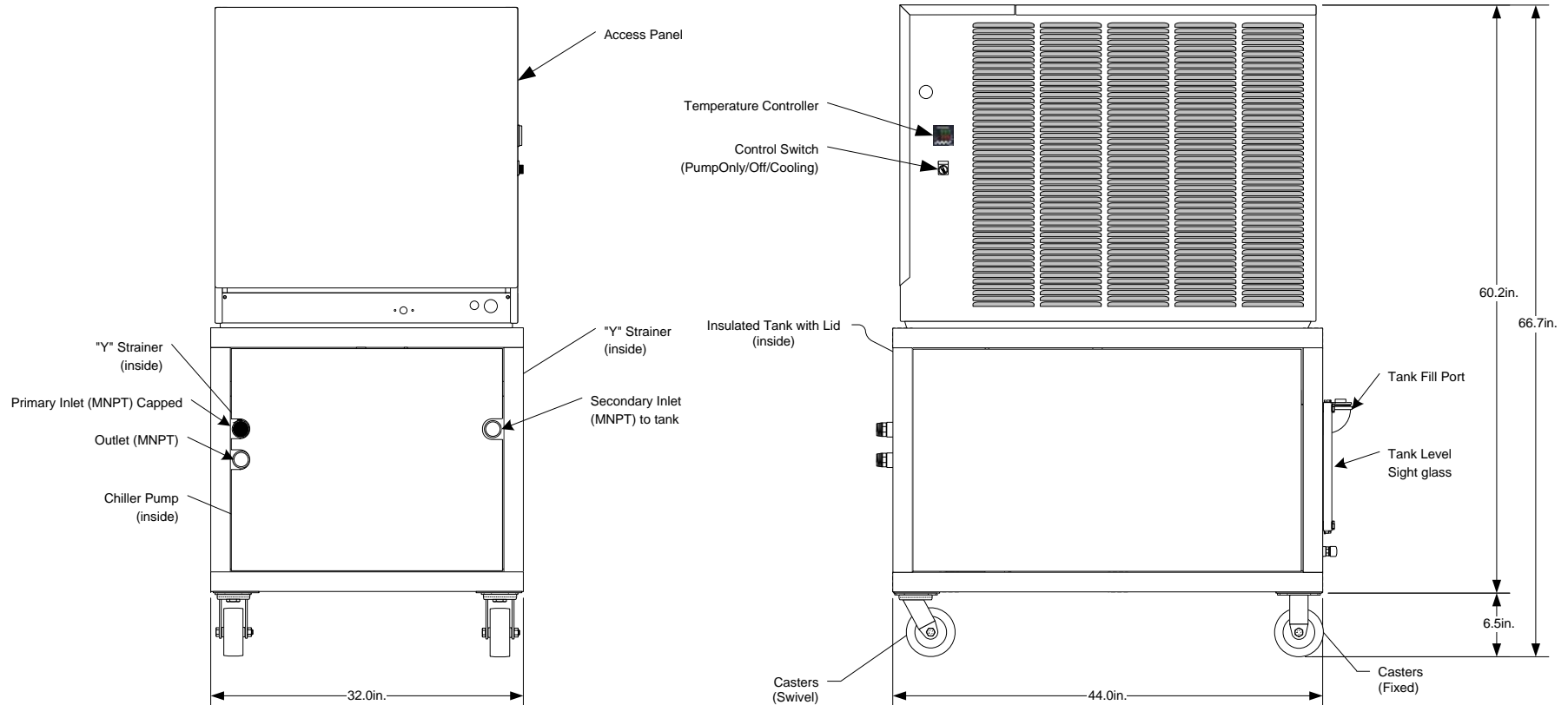
COLD SHOT CHILLERS / Marrone & Co., Inc.

14020 Interdrive West, Houston, Texas 77032 • Phone (800) 473-9178, (281) 227-8400

Fax (800) 473- 9175, (281) 227-8404 • www.waterchillers.com

FRONT VIEW

RIGHT SIDE VIEW



GENERAL NOTES

- Specifications subject to change without notice.
- Shown with Full Metal Cabinet included.
- **Casters are standard on indoor units optional for outdoors, check work order for application.**

COLD SHOT CHILLERS

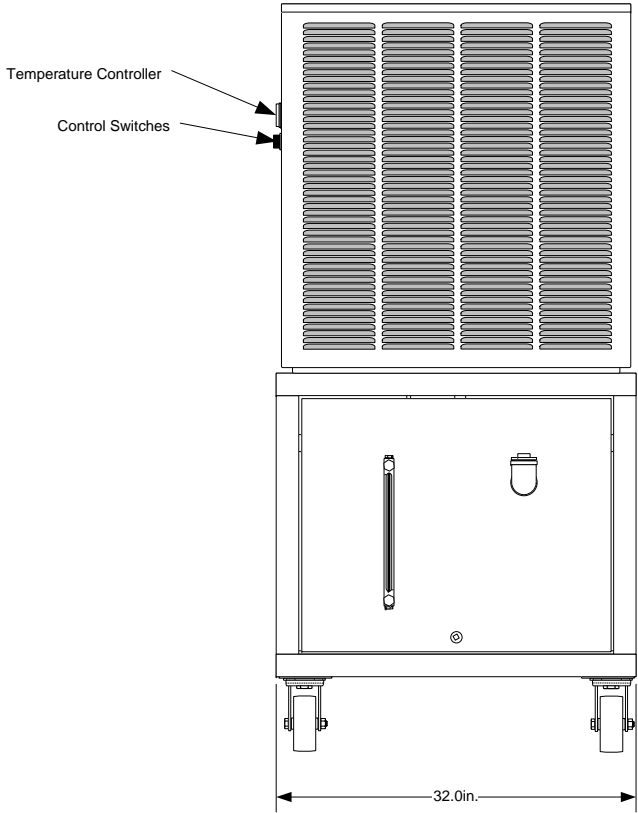
DRAWN ENGINEERING

ISSUED 15 November 2013

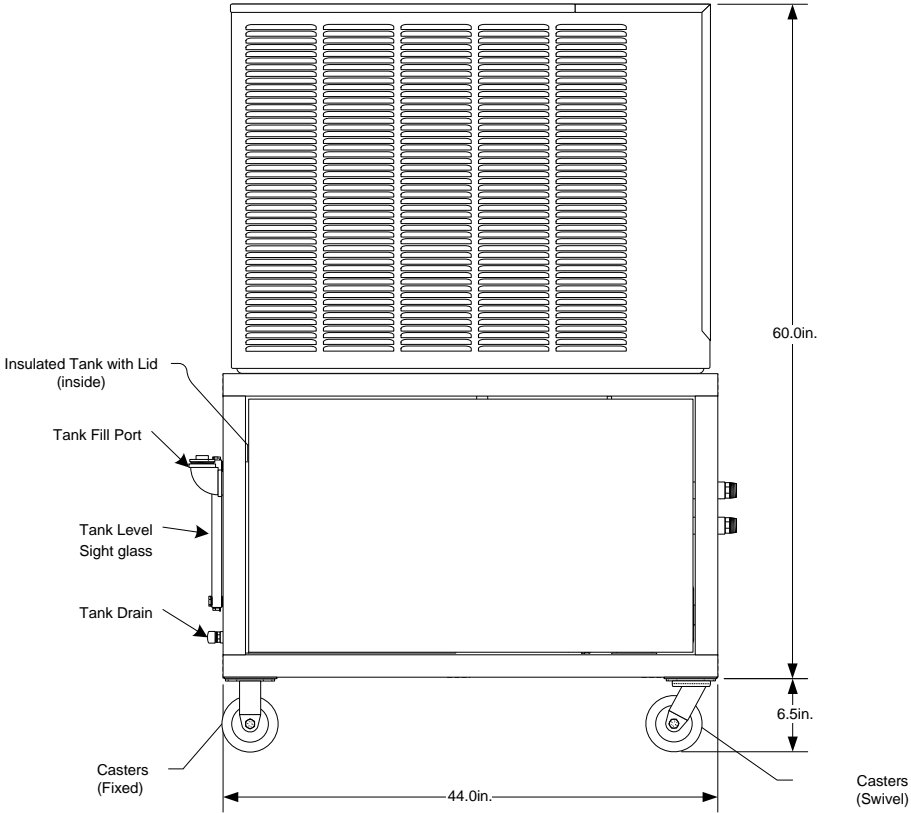
SHOP DRAWING

SIZE	DIMENSION NOTES	DWG NO	REV
A	Units are in inches. +/- 1/4"	Front-Right Drawing ACWC-\$60-\$-\$!E-DR (Typical Full Metal Cabinet)	1
SCALE	1 : 16	DWG-INST_ACWC-60-E-DR(FMC)_(0712a).vsd	SHEET 1 / Front-Right

BACK
VIEW



LEFT SIDE
VIEW



GENERAL NOTES

- Specifications subject to change without notice.
- Shown with Full Metal Cabinet included.
- Casters are standard on indoor units optional for outdoors, check work order for application.

COLD SHOT CHILLERS

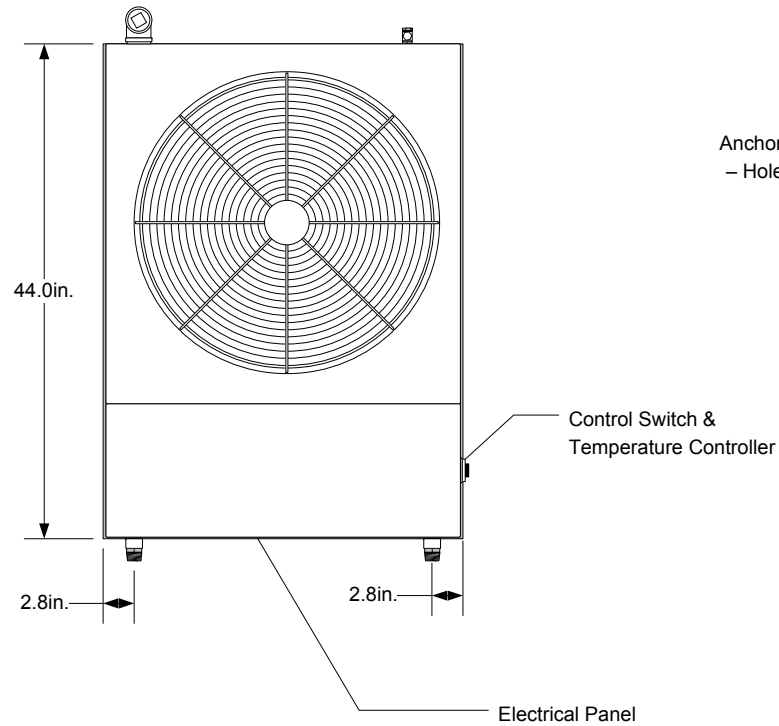
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ISSUED 15 November 2013

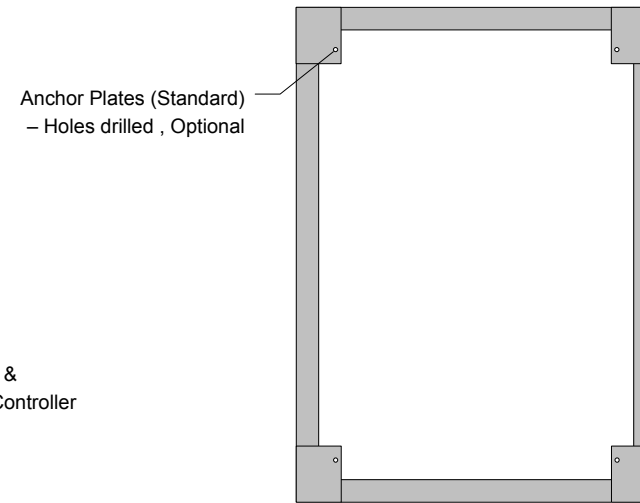
SHOP DRAWING

SIZE	DIMENSION NOTES	DWG NO	REV
A	Units are in inches. +/- 1/4"	Back-Left Drawing ACWC-\$60-\$-\$!E-DR (Typical Full Metal Cabinet)	1
SCALE	1 : 16	DWG-INST_ACWC-60-E-DR(FMC)_(0712a).vsd	SHEET 2 / Back-Left

TOP VIEW



BOTTOM VIEW



Front

GENERAL NOTES

- Specifications subject to change without notice.
- Shown with Full Metal Cabinet included.
- With Secondary no pressure return
- **Casters are standard on indoor units optional for outdoors,**

COLD SHOT CHILLERS

DRAWN

ENGINEERING

ISSUED

24 September 2013

SIZE

A

DIMENSION NOTES

Units are in inches.
+/- 1/4"

SCALE

1 : 16

DWG NO

Top-Bottom Drawing
ACWC-060-090-E-8 F (Typical Full Metal Cabinet)

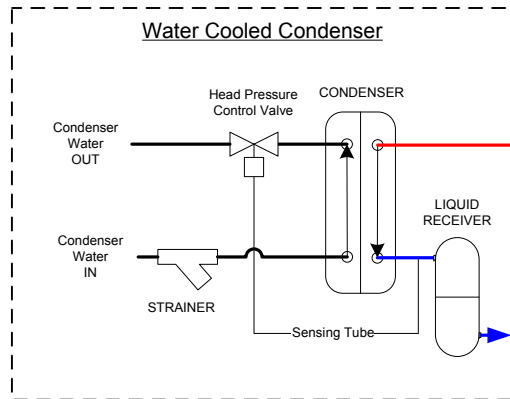
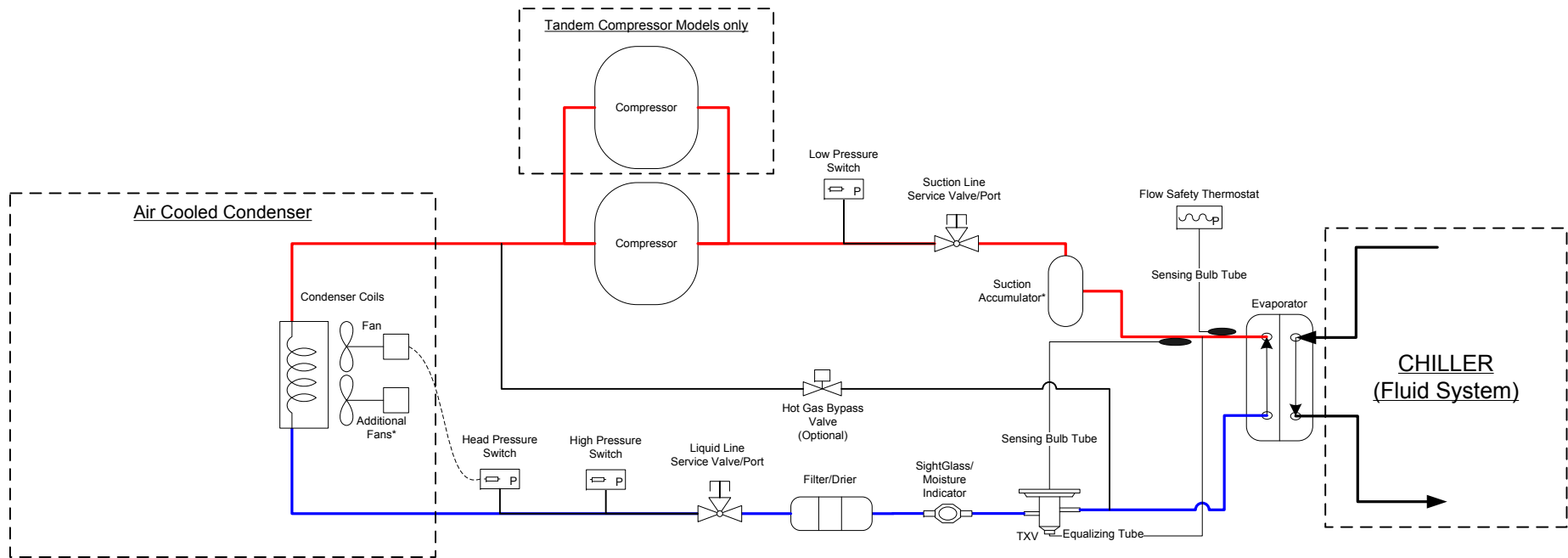
REV

1

DWG-INST-.vsd

SHEET

3 / Top-Bottom



NOTES

- All specifications and designs are subject to change without notice.
- Hot Gas Bypass optional. For capacity and/or ambient condition use.
- Temperature Controller typically monitors the tank temperature on portable models, the entering temperature (from the process) on stationary and reverse flow models.
- Flow Safety thermostat typical on indoor units or outdoors to 40F ambient, typically.
- * Dependent on system design.

COLD SHOT CHILLERS

DRAWN

ENGINEERING

ISSUED

11/12/2013

SIZE

A

DETAIL

ref.circuit

SCALE

NTS

REFRIGERATION & CHILLED FLUID CIRCUIT

Typical Air/Water-Cooled Water Chiller (ACWC and WCWC) Single Refrigerant Circuit System

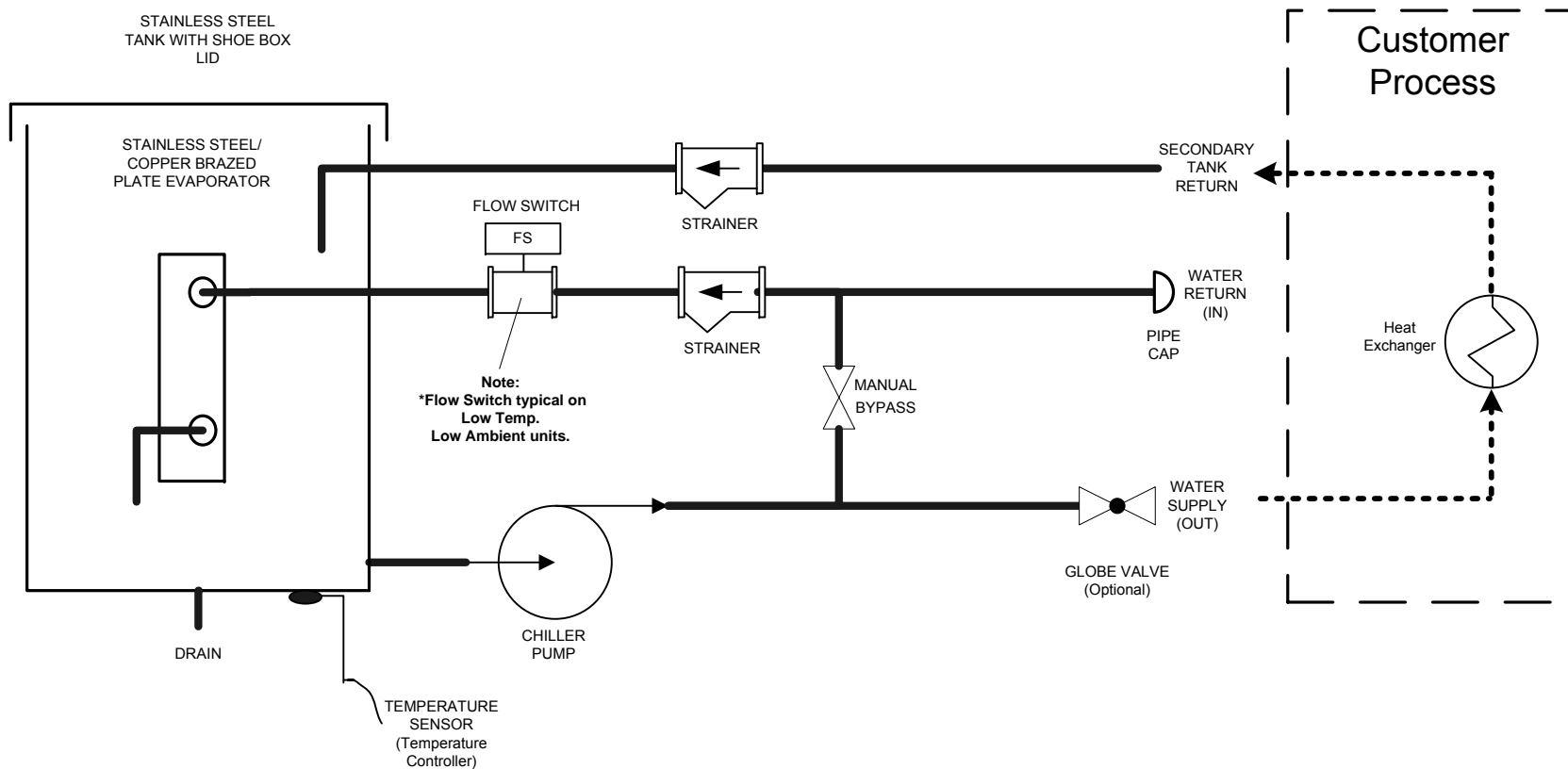
REV

2

Typical ref-circuit .vsd

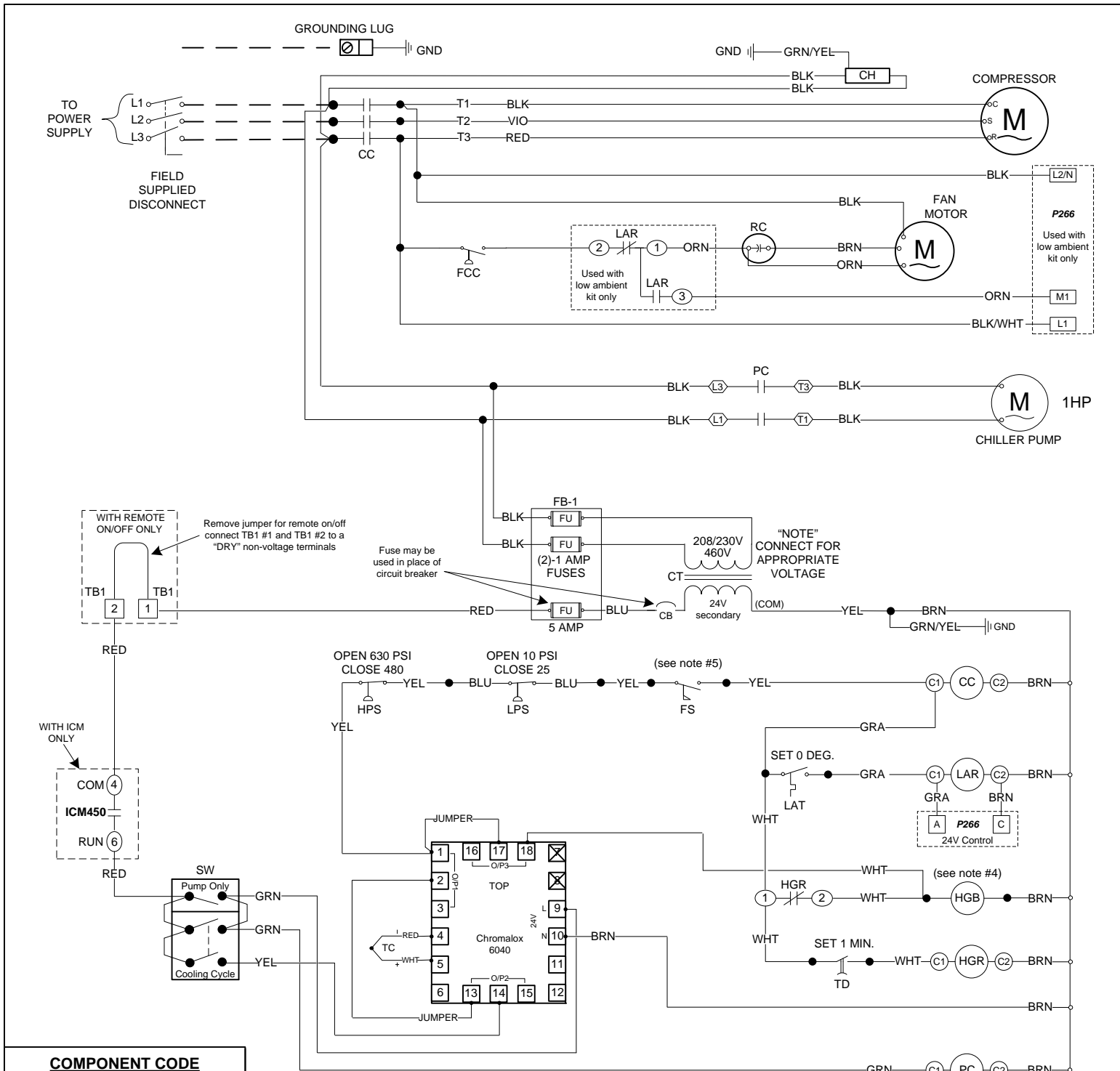
SHEET

1



COLD SHOT CHILLERS

DRAWN		ENGINEERING	SIZE	A	FSCM NO	DWG NO	CHILL WATER CIRCUIT – TYPICAL E - “Portable - Dual Return with Globe Valve and Flow Switch”	REV	1
		ISSUED	05/2011	SCALE	NA		SHEET	2	



NOTES:	<h1>COLD SHOT CHILLERS</h1>	DESCRIPTION
<ol style="list-style-type: none"> REPLACEMENT WIRE AND FUSES MUST BE THE SAME SIZE AS ORIGINAL. UNIT MUST BE PERMANENTLY GROUNDED AND CONFORM TO N.E.C. & LOCAL CODES. MINIMUM WIRE SIZE BASED ON 75 DEGREES C INSULATION COPPER WIRE. HGB FOR TEMPERATURE & CAPACITY CONTROL. SEE MANUAL IF ADJUSTMENT IS NECESSARY ABOVE FACTORY SET MINIMUM. 		<p>WIRING SCHEMATIC FOR</p> <p>ACWC-036-E-DR-LT-M20-5</p> <p>ACWC-060-E-DR-LT-M20-5</p> <p>FILE: ACWC-060-E-DR-LT-M20_Units.vsd</p>

TYPICAL START-UP CHECK LIST

EQUIPMENT MODEL#		SERIAL#	
OWNER NAME		PHONE#	
ADDRESS			
CITY		STATE	ZIP
INSTALLING CONTRACTOR		PHONE#	
ADDRESS			
CITY		STATE	ZIP
START-UP PERFORMED BY		PHONE#	

** Designates Pre-Startup items. To be performed before Startup of system.*

1. *Manual referred to for details on installation and startup (IMPORTANT). ☐ Yes ☐ No
2. *Add additional information and notes on back of form, as needed. ☐ Yes ☐ No
3. *Is there any physical damage? ☐ Yes ☐ No
 - a. Will this prevent start-up? ☐ Yes ☐ No

Description: _____

4. *Unit is installed level as per the installation instructions. ☐ Yes ☐ No
5. *Electrical circuit protection has been sized & installed properly. ☐ Yes ☐ No
6. *Power supply agrees with the unit nameplate. ____ V ____ \emptyset ____ Hz ☐ Yes ☐ No
7. *Electrical power wiring is installed properly. ☐ Yes ☐ No
8. *All terminals and plug assemblies are tight. ☐ Yes ☐ No
9. *Unit is grounded properly. ☐ Yes ☐ No
10. *Control voltage is appropriate per electrical drawing. ____ V ☐ Yes ☐ No
11. *All piping is connected properly, as appropriate. ☐ Yes ☐ No
12. *All chilled water valves are open, as appropriate. ☐ Yes ☐ No
13. *Crankcase heaters energized for 24 hours before start-up. ☐ Yes ☐ No
14. *Outdoor piping wrapped with electric heater tape, if necessary. ☐ Yes ☐ No
15. *Water loop volume greater than 6gal/ton. ☐ Yes ☐ No
16. *Proper fluid loop freeze protection provided to ____ °F
 - a. With type _____ mixture ____ % with ____ %
17. Chilled water pump is operating with the correct rotation. ☐ Yes ☐ No
18. All air has been purged from the system. ☐ Yes ☐ No
19. Evaporator flow appropriate for capacity expected.(~3gpm/ton) ☐ Yes ☐ No
20. Check the pump(s) seals for any signs of leaking. ☐ Yes ☐ No
21. Measure the following under full load with clear refrigerant sight glass. ☐ Yes ☐ No

Suction Pressure:	PSI
Discharge Pressure:	PSI
Suction Line Temp:	°F
Superheat:	°F

Ambient Temp:	°F
Entering Fluid Temp:	°F
Leaving Fluid Temp:	°F
Set Value:	°F

22. Heat Exchanger models: If an extra heat exchanger is included with the chiller, ensure flow is adjusted through the exchanger to achieve desired cooling:

Flowrate:	gpm	Temp In:	°F	Temp Out:	°F
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23. Clean any strainers, as needed. ☐ Yes ☐ No
24. Operation Manual is given to customer. ☐ Yes ☐ No

Cold Shot Chillers®

"ECONOMICALLY PRICED DEPENDABILITY"

1 YEAR COMPLETE PARTS PRODUCT WARRANTY LIMITED

EFFECTIVE WITH PRODUCT MANUFACTURED BEGINNING JANUARY 1995

Dear Consumer:

Congratulations on your purchase of this new Water Chiller. This certificate is our warranty to you. Please ensure that you have completed the reverse side of this certificate and mail a copy back to us.

COMPLETE UNIT WARRANTY

THE WATER CHILLER DESCRIBED ON THE REVERSE SIDE OF THIS CERTIFICATE IS WARRANTED AGAINST DEFECTS IN MATERIAL OR WORKMANSHIP UNDER NORMAL USE AND MAINTENANCE FOR A PERIOD OF ONE (1) YEAR FROM THE PURCHASE DATE WE WILL PROVIDE A REPLACEMENT PART FOR ANY PART FOUND TO BE DEFECTIVE. THIS WARRANTY DOES NOT INCLUDE SERVICE OR LABOR CHARGES CONNECTED WITH THE DETERMINATION OR REPLACEMENT OF DEFECTIVE PARTS OR FREIGHT CHARGES TO SHIP THESE PARTS.

EXTENDED PARTS WARRANTY

In addition to the above Complete Unit Warranty, the following extended warranties may apply to your unit:

FOUR YEAR ADDITIONAL EXTENDED WARRANTY of compressors. LIFETIME WARRANTY of tanks against leakage, base frames against rust through (20 tons and under) and casters.

Upon the expiration of the "Complete Unit Warranty", the above listed components are warranted for an additional term as listed above against defects in material or workmanship under normal use and maintenance. We will provide a replacement part for any part found to be defective. This warranty does not include service or labor charges connected with the determination or replacement of defective parts or freight charges to ship these parts.

EXCLUSIONS:

The foregoing provisions state the exclusive remedy for any breach of warranty or any other claim in respect to the product described on the reverse side of this certificate. THE EXPRESS WARRANTIES CONTAINED HEREIN ARE IN LIEU OF ALL OTHER WARRANTIES. IMPLIED WARRANTIES, INCLUDING WARRANTIES OF MERCHANTABILITY ARE LIMITED TO THE DURATION OF THE COMPLETE UNIT WARRANTY DESCRIBED ABOVE. CONSEQUENTIAL OR INCIDENTAL DAMAGES FOR BREACH OF ANY WARRANTY EXPRESS OR IMPLIED ARE EXCLUDED.

Some states do not allow limitations on how long an implied warranty lasts or the exclusions of consequential or incidental damages, so the above limitations and exclusions may not apply to you. This warranty gives you specific legal rights and you may also have other rights which vary from state to state.

This warranty shall be void if:

1. The unit is not installed, operated or serviced in accordance with the installation and operation instructions furnished, and with the recommendations of the Air Conditioning Contractors of America (ACCA). If you do not have a copy of the installation and operation instructions, please write directly to our office to receive one.
2. Components or other accessories not compatible with the unit have been used with or attached to the unit.
3. The user has otherwise abused or failed to maintain the unit.
4. The unit is installed outside the United States of America, Canada or Mexico.
5. The defect or damage is not caused by the manufacturer (see reverse side).

RETAIN THIS CERTIFICATE WITH YOUR VALUABLE DOCUMENTS

SHOULD YOU REQUIRE IN-WARRANTY PARTS UNDER THE TERMS STATED ABOVE, CONTACT US FOR REPLACEMENT PARTS.

Cold Shot Chillers®

Marrone & Co., Inc.

14020 Interdrive West • Houston, TX 77032

Tel: (281) 227-8400 • 1-800-473-9178 • Fax: (281) 227-8404

**OWNER – PLEASE RETAIN A COPY OF THIS CERTIFICATE
WITH YOUR VALUABLE DOCUMENTS**

EQUIPMENT DESCRIPTION & INSTALLATION DATA

MODEL NUMBER

INSTALLED BY (SERVICE AGENCY OR PERSON)

UNIT SERIAL NO.

ADDRESS STREET

PURCHASER

CITY

STATE

ADDRESS STREET

DATE INSTALLED

CITY STATE

AIR CONDITIONING REFRIGERATION LICENSE #, CLASS, STATE

IMPORTANT

The following are the responsibilities of the user. They are examples of defects or damages that are not manufacturing defects, and are, therefore, not included in this Limited Warranty.

1. Damage to unit or unsatisfactory operation due to improper cleaning or use of unit in corrosive atmosphere.
2. Damage to unit from unsatisfactory operation due to blown fuses, inadequate or interrupted electrical protective devices or operations of unit on power supply other than covered by name plate rating of unit.
3. Damage due to transportation or handling prior to and during installation.
4. Damage due to accident or from alteration, improper installation, or tampering.
5. Misapplication or under sizing of product.