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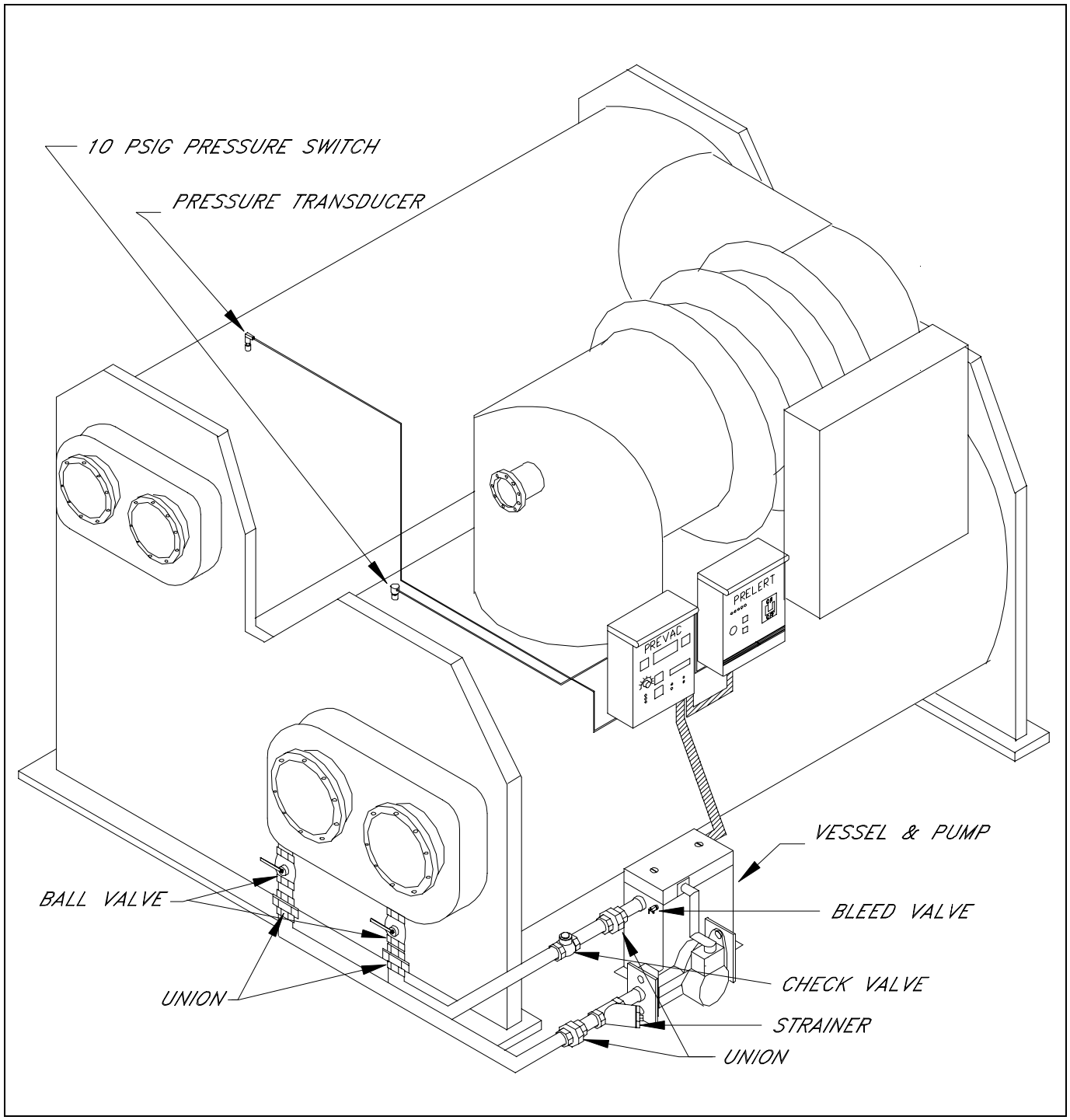
PREVAC AQUAPOWER

INSTALLATION AND INSTRUCTION MANUAL

JUNE 1998



GENERAL OVERVIEW

The PREVAC AquaPower system provides the following for idle chillers:

- 0.00 PSIG (00.0 KPAG) pressure control for minor repairs.
- Refrigerant leak prevention for contaminant free R11/R123 chillers.
- On-demand pressurization for leak testing at the touch of a button.
- Early high pressure warning to reduce the risk of catastrophic refrigerant loss.

The benefits of having a permanently installed leak-test pressurization system are:

- No redundant setup charges.
- On demand leak-test pressurization.
- Compliance with the EPA's Clean Air Act to be able to do minor repairs at zero psig.
- Permanently wired with a fuse disconnect switch that meets national and local electrical codes.

The benefits of maintaining a pressure equilibrium (keeping the chiller pressure equal to atmospheric pressure) are:

- Reduced air infiltration and acid damage.
- Minimized energy waste and harmful R-11 and R-123 losses (ozone damage).
- Less hard startups and unnecessary maintenance expenses.
- Decreased downtime due to an air-bound chiller.
- Purging cycles are drastically reduced.

The benefits of an early warning high pressure alarm and disconnect use are:

- Independent safety for pressurizing system.
- Alerts operator that a high pressure condition exists which could result in catastrophic refrigerant losses.

MAJOR COMPONENTS DESCRIPTION AND THEIR MODES OF OPERATION

I. REFRIGERANT PRESSURE CONTROLLER

The refrigerant pressure controller (RPC) provides a digital readout of the system pressure in PSIG or KPAG**.** It uses proportional control to vary the voltage to the heaters in order to maintain the pressure set point. It also controls the pump operation. The RPC consists of the following components:

- The power board containing all the high voltage components:
- The logic board containing the low voltage components.
- The pump control board

RPC MODES OF OPERATION

A) The "Leak Test" mode is a manual operation used to raise pressure for leak testing or maintenance purposes. The set point is adjustable from 0.00 to 5.99 PSIG (00.0 to 41 KPAG).

B) The "Pressure-Seal" mode is a non-adjustable set point of 0.00 PSIG or (00.0 KPAG). The "Pressure-Seal" mode automatically energizes the heaters and pump when the chiller is not in operation. This "pressure-seals" the unit by keeping the internal refrigerant pressure at the same level as the atmospheric pressure which results in a "no air in, no refrigerant out" condition.

C) The Setpoint is viewed by depressing the "Setpoint" switch. The energized red light in the "Setpoint" switch indicates that the set point is now displayed. In the “Pressure-Seal” mode the 0.00 PSIG (00.0 KPAG) will be displayed and is non adjustable. Adjusting the set point in “Leak Test” Mode involves holding the "Setpoint" switch in while turning the set point knob to the desired setting. Releasing the "Setpoint" switch returns the controller to reading actual system pressure. The red light will de-energize in this mode.

D) The bar graph indicates in percentage the amount of voltage being supplied to the heaters.

SAFETY FUNCTIONS

A secondary logic circuit analyzes the operating parameters of the system and uses its own separate set of relay contacts to assure the reliability of the various safety functions.

A) “Pressure Not Rising”: A timing circuit de-energizes the heaters and pump if the controller has not reached or maintained its set point within a preset time. This could occur if chill water was flowing while the AquaPower system was trying to heat the refrigerant. There are two built in timing periods:

1) "Pressure-Seal" mode is four hours;
2) "Leak Test" mode is eight hours.

The LED indicator will light and the reset button has to be pressed to re-energize the system.

B) "High Heater Temperature": A thermistor attached to the top of the vessel will not allow the hot water vessel's temperature to exceed 110^0F (43^0C). Once the vessel reaches 110^0F (43^0C), the voltage to the heaters will be reduced to maintain this temperature. This could occur if the refrigerant level was low or if the heat is not transferring to the refrigerant. Indication of this is evident by the "Bar Graph" showing reduced voltage to the heaters before the set point is reached. A second temperature safety will also indicate on the "High Heater Temperature" LED if the hot water vessel's temperature were to reach 130^0F (55^0C). The safety circuit de-energizes the heaters and pump. This is indicated by the "High Heater Temperature" LED and Bar Graph indicating 100%.

C) "Heaters On and Above Set Point": The safety circuit de-energizes the heaters and pump if the pressure is 2/10 of a psi (one kpa) above set point and the heaters are being supplied voltage. The indicator will light and the reset button has to be pressed to re-energize the system for safety reasons.

D) Pressure Transducer Safety: If the pressure transducer wire becomes disconnected or broken the pressure displays a "-1" and the pump and heaters are de-energized.

II. HOT WATER VESSEL

The electric hot water vessel houses the heating elements. The design includes the following features:

- Six heating elements
- Stainless steel construction
- 350 psig (2400 kpag) pressure rating
- Seal-less, magnetic drive pump
- Totally enclosed water cooled motor.
- Pumping capacity of 30 GPM

III. PRESSURE TRANSDUCER

The pressure transducer sends an electrical signal to the controller that is proportional to the gauge pressure of the chiller. The pressure transducer is constructed of stainless steel throughout for compatibility with all refrigerant types. Temperature compensation is automatic inside the transducer and a zero pressure adjustment is manual at the controller.
Standard accessories which come with the pressure transducer are;

- Shielded four conductor cable, 18 feet (5.5 meters) long.
- Pressure transducer connector which is supplied pre-wired.
- Plumbing fittings to tee into the condensers gauge line.

IV. PRELERT DISCONNECT

The PRELERT Disconnect provides early notification at 10 PSI of high-pressure conditions in a low pressure chiller so catastrophic refrigerant loss can be averted. This warning could help prevent the loss of all or part of the refrigerant charge saving thousands of dollars. The PRELERT system provides audible and visual and additional remote alarms enabling operating personnel to take necessary actions. Additionally, a 30 amp circuit breaker is incorporated. This circuit breaker is tripped when an alarm condition or a short circuit occurs. PRELERT functions as an independent safety for the PREVAC system. The PRELERT system can even initiate corrective measure to reduce the high pressure through auxiliary contacts that are provided for interlocking peripheral equipment. The PRELERT Disconnect consists of the following components:

- PRELERT Circuit Board
- 30 Amp Circuit Breaker
- 10 PSI Pressure Switch with 16 Feet of Wire

SYSTEM FEATURES

- Audible Alarm
- Visual Alarm
- "Power On" LED
- "Alarm One" LED
- "Alarm Two" LED
- "Push to Reset or Silence Alarm" Button
- "Push to Test" Button
- Auxiliary Contacts
- Alarm Memory Duration Circuit

PRELERT DISCONNECT MODES OF OPERATION

WHEN THE ALARM SOUNDS

When the alarm sounds this indicates that the pressure in the refrigerant system has reached at least a 10 PSI level and a continued rise in pressure might result in a rupture disc bursting and catastrophic refrigerant loss. The circuit breaker trips, the audible alarm sounds and the lights flash alerting service personnel. Two scenarios could occur. The first scenario is where the refrigerant pressure remains above 10 PSI and the second scenario is where the refrigerant pressure has fallen below 10 PSI.

REFRIGERANT PRESSURE STILL ABOVE 10 PSI

- Press and hold the "Push to Reset or Silence Alarm" button for two seconds.
- The alarm will silence for fifteen minutes.
- If the pressure remains in an alarm range, the lights will continue to flash and the alarm will re-energize.
- Take corrective action to reduce the pressure in the refrigerant system.

The circuit breaker can not be reset until the pressure drops below the alarm range set point. Investigate immediately to determine the cause and whether there has been a release through the relief valve. Take corrective actions to reduce the pressure.

REFRIGERANT PRESSURE FELL BELOW 10 PSI

- Press and hold the "Push to Reset or Silence Alarm" button for two seconds.
- The alarm will silence for fifteen minutes.
- The lights will go off, indicating the pressure has dropped below the alarm range.
- Check the pressure to confirm that the pressure has dropped and did not reach the release point of the relief device.

The refrigerant system is no longer in danger of releasing refrigerant at this time. Investigate the cause of the alarm to prevent an over-pressure condition from re-occurring. The circuit breaker can now be reset.

ALARM MEMORY CIRCUIT

The alarm memory circuit records the duration of time the pressure exceeds the pressure switch set point. The PRELERT does not record how long the audible alarm is energized only how long the pressure switch is open and the pressure is above the critical level. The method for retrieving the time duration periods is as follows:

- Set a voltmeter to the DC scale 20 volt setting.
- Connect the black lead to ground and the red lead to the output pin on the circuit board.
- Convert the millivolts to minutes (One millivolt equals one minute).
- To reset alarm connect a jumper momentarily from the reset pin to terminal #9 (the 6 volt supply).

You can also see the diagram on page 32.

AUXILIARY CONTACTS

The auxiliary contacts can be used to connect equipment through the two contacts on the PRELERT terminal block. (See diagrams in back of manual). The contacts can be used either by connecting directly to them or by having them connect to additional relays to control a multitude of auxiliary equipment. The ratings of the contacts are 6 amps, 300 volts with 2,000 volts of isolation. Terminal #3 is a common connection for the contacts. Between terminals #2 and #3 is a normally open contact. Terminals #1 and #3 are normally closed contacts.

An example for some uses of the contacts would be to relay a signal to a building automation system (BAS) to indicate an alarm condition. The BAS computer would be connected across terminals #1 and #3. The contacts will close switching the 4 to 20 mV signal back to the computer if an alarm occurs.

Additional equipment can be energized and de-energized using relays controlled through the auxiliary contacts and the 6 volt supply.

OPTIONAL EQUIPMENT

AUTOMATED HEAT BARRIER (AHB)

Automated heat barriers (AHB) are heaters that are either 600 watts measuring 6" x 36" (15.3cm x 91.5cm) or 200 watts measuring 5" x 12" (12.7cm x 30.5 cm). They are attached to the chiller in any area that collects refrigerant which cannot return to the evaporator. For example: The cross-over pipe of some chillers is physically located lower than the evaporator and if liquid refrigerant condenses in the pipe it cannot return by gravity to the evaporator. These conditions can result in an inability to raise the pressure in the chiller due to lack of refrigerant in the evaporator. This will cause a low limit safety to occur.

Each AHB contains circuitry which regulates its temperature at $100^{O}F$ ($38^{0}C$). Once the temperature of the area or surface is above $100^{O}F$ ($38^{0}C$) the built in circuitry will automatically de-energize the heat barrier. A relay can be used to shut off the AHB while the chiller is in operation.

Typically, AHBs are installed on cross-over pipes and compressor volutes on certain chillers. The following list references some of the more common chillers that require AHBs.

PARTIAL LIST OF CHILLERS REQUIRING HEAT BARRIERS

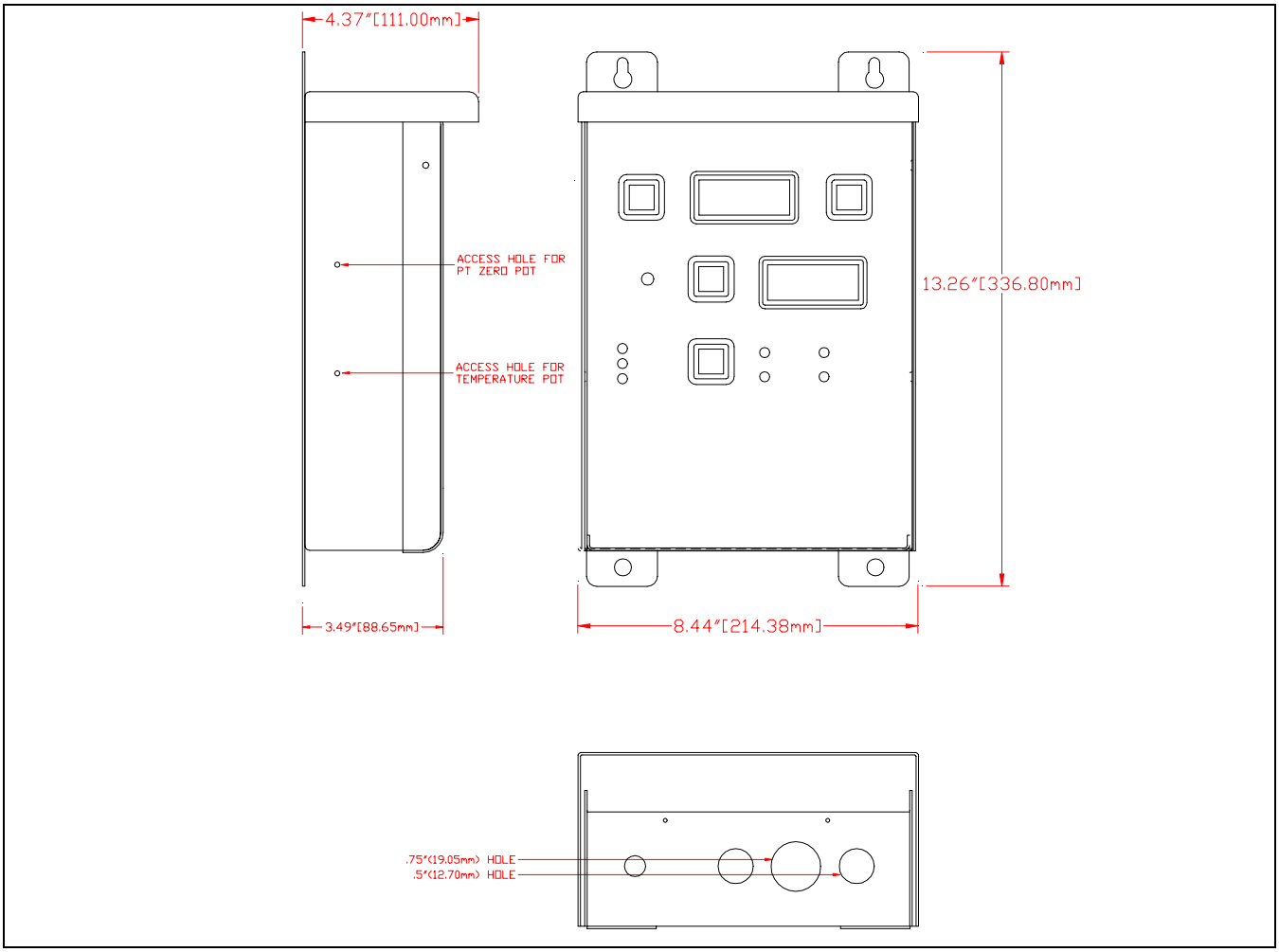
Manufacturer	Chiller Model No.	Compressor Heaters	Crossover Heaters
Carrier	17M	N/A	(1) AHB-6-115
Carrier	19C	(1) AHB-2-115	N/A
Trane	CVHB	(2) AHB-2-115	(1) AHB-6-115
Trane	CV	(2) AHB-2-115	(1) AHB-6-115
Trane	CVHE,CVHF	N/A	N/A
Trane	OCV	(2) AHB-2-115	(1) AHB-6-115
Chrysler Airtemp	C2 Series	N/A	(1) AHB-6-115
NOTE: CHILLERS NOT ON THIS LIST MAY STILL REQUIRE AHBs			

AHB INSTALLATION

AHBs use a pressure sensitive adhesive for adhering to the shell. Install them at the lowest areas where refrigerant can accumulate. The surface must be clean of all paint and dirt and above $65^{0}F$ ($18^{0}C$) for the adhesive to work. Electrical connection is a simple operation. Just find a 115 or 220 volt outlet and plug it in.

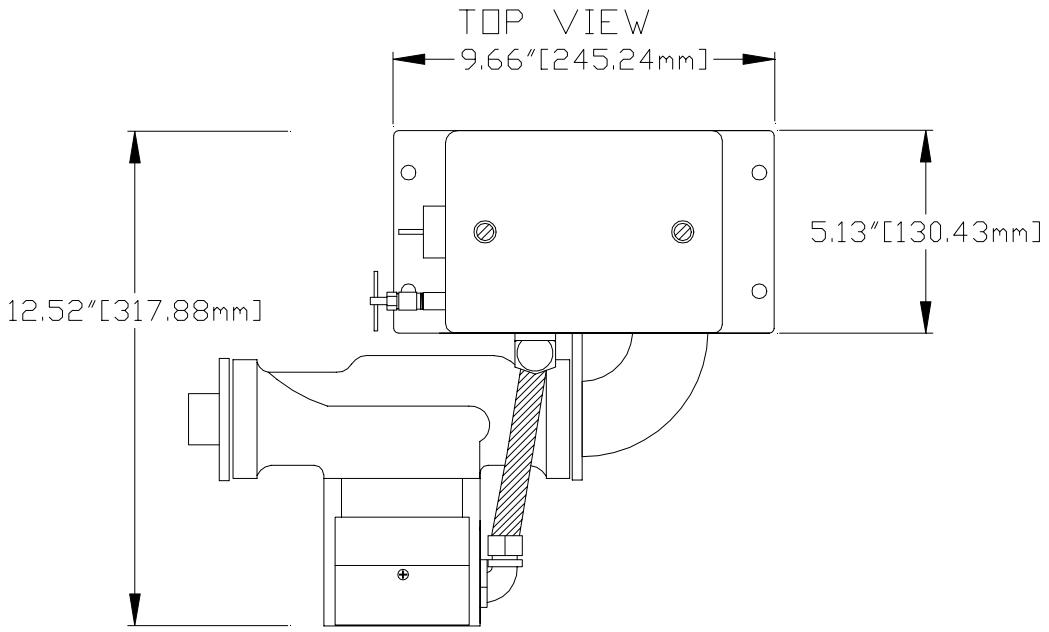
SPECIFICATIONS

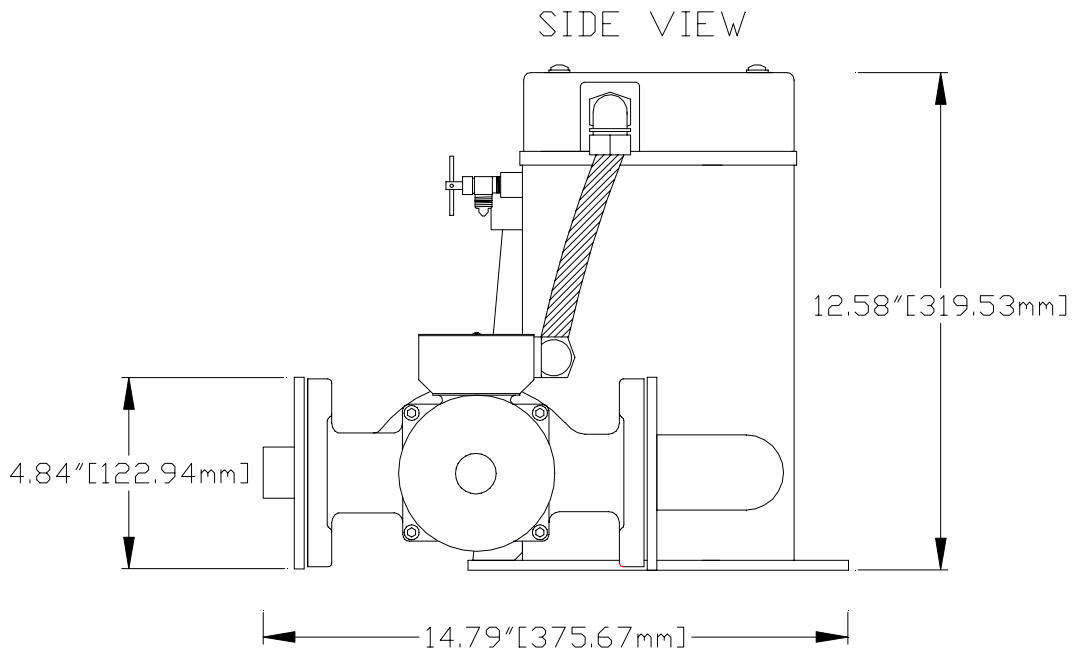
The following diagrams are to aid you in the mounting of the Refrigerant Pressure Controller (RPC), PRELERT Disconnect and Hot Water Vessel. The electrical specifications are included for each.



THREE PHASE RPC SPECIFICATIONS	
VOLTAGE:	480, 415, 380, 220, (50-60 Hz)
PEAK VOLTAGE:	520 Volts A.C. RMS
SURGE VOLTAGE	6,000 Volts
CURRENT:	25 Amps FLA
SURGE CURRENT	3,000 A, 8 x 20 us duration
MAX. PRESSURE READING:	19.99 PSIG (199.9 KPAG)
VACUUM READINGS:	-10.00 PSIG (-69 KPAG)
ACCURACY FULL SCALE:	0.9%
ACCURACY AT ZERO:	+/- .01 PSI (+/- .07 KPA)
MAXIMUM LEAK TEST PRESSURE:	+6.00 PSIG (41 KPAG)
OUTSIDE DIMENSION	8.44"(214.38mm) x 13.26"(336.8mm) x 3.49"(88.6mm)

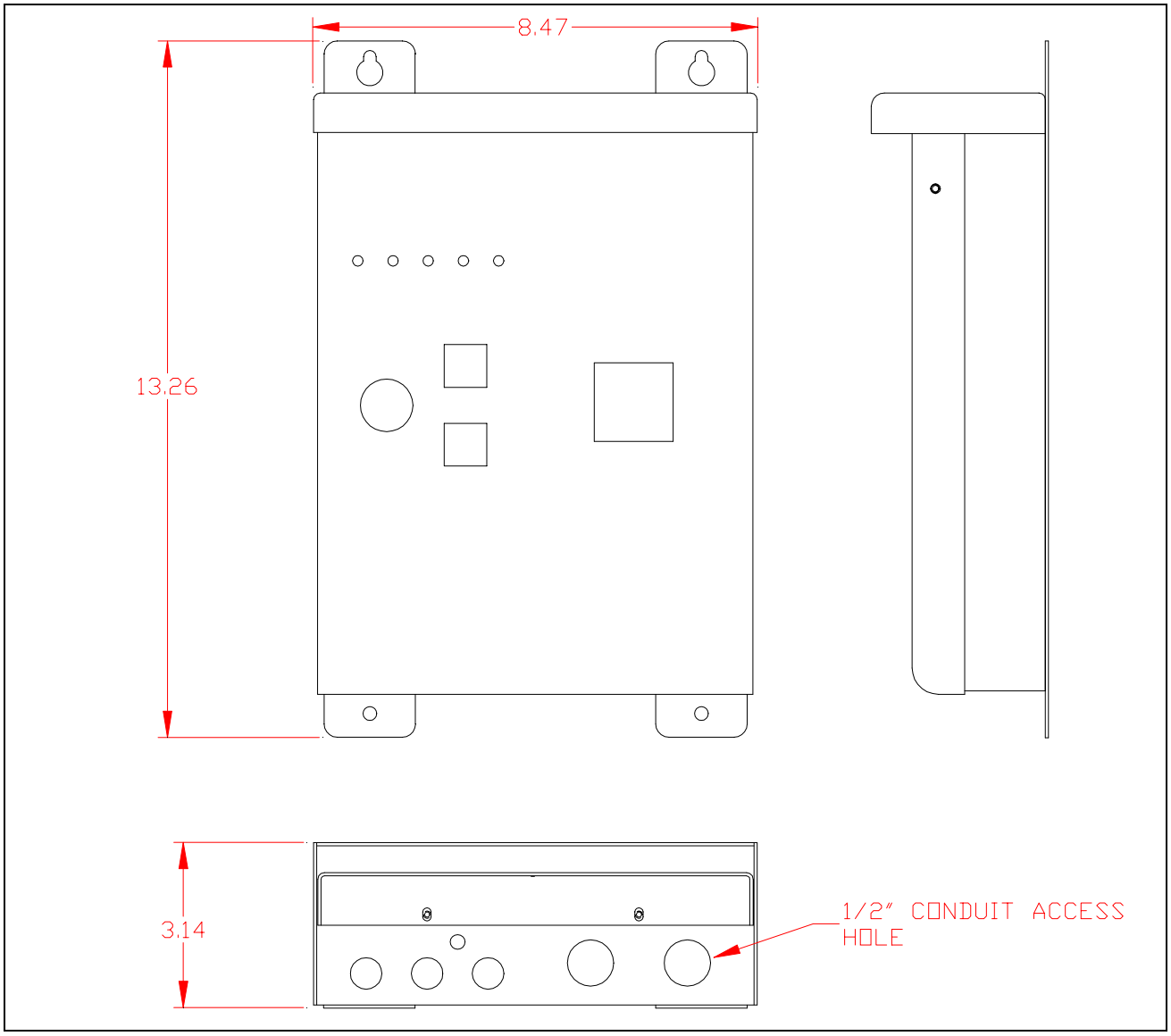
AQUAPOWER HOT WATER VESSEL SPECIFICATIONS





HOT WATER VESSEL AND PUMP SPECIFICATIONS	
VOLTAGE	480, 415, 380, 220, (50-60 Hz)
MOTOR	1/6 HP, .7 TO .9 AMPS
SIX HEATING ELEMENTS	20 KW, 18 KW, 15 KW, 12 KW
PRESSURE RATING	350 PSIG,(2400 KPAG)
DIMENSIONS	12.6"(318mm) x 14.8"(375.7mm) x 12.6(319.5mm)

PRELERT DISCONNECT SPECIFICATIONS



PRELERT DISCONNECT SPECIFICATIONS	
VOLTAGE:	480, 415, 380, 220, (50-60 Hz)
PEAK VOLTAGE:	520 Volts A.C. RMS
SURGE VOLTAGE	6,000 Volts
CURRENT:	30 Amps FLA
SURGE CURRENT	3,000 A, 8 x 20 us duration
MAX. PRESSURE FOR ALARM:	10 PSIG, 68.9 KPAG
COMPATABILITY:	R11 AND R123
PRESSURE SWITCH VOLTAGE:	6 VDC
ALL CONTROL VOLTAGES:	6 VDC
OUTSIDE DIMENSION	8.47"(215.06mm) x13.25"(336.72mm) x 3.14"(79.76mm)
MOUNTING HOLE SIZE:	5/16", .312",(.78cm)

PRE-INSTALLATION PROCEDURES

Before Traveling to The Job Site

Make sure you have all the necessary materials to install the AquaPower system.

Inspect The Package Contents

Inspect the package contents for any shipping damage. Make sure all of the parts are present inside the shipping box.

Checklist

Use the pre-installation checklist on the next page to ensure that the chiller is ready to have the system installed. This will prevent multiple trips to the installation site.

Required Materials

Use the following materials list to ensure that you have all of the tools and supplies necessary to do the job. This will prevent multiple trips to the supply store.

Materials Included With The PREVAC AquaPower System.

- PREVAC Refrigerant Pressure Controller with Pressure Transducer
- AquaPower Hot Water Vessel Motor and Pump with 15 feet of wire
- PRELERT Disconnect with 10PSI Pressure Switch
- Fuse block and three 35 amp fuses
- Suction Strainer

INSTALLATION MATERIALS REQUIRED BY INSTALLER

3/4” (19mm) pipe and fittings
Check Valve
Full flow isolation valves
Unions
Piping insulation.
Torch
Solder
Flat Stock or plate (if needed to mount controller)
Volt/Ohm Meter
Junction Boxes, Conduit - 1/2” (13mm) and 3/4” (19mm) EMT and/or Flex,
Assorted 3/4” (19mm) galvanized nipples and 90° fittings.
Drill bits for cement.
Unistrut and Lag Bolts
Nuts and bolts for controller mounting

W We recommend that you put together a separate “PREVAC Kit” which would include all the necessary installation material and tools.

PRE-INSTALLATION CHECKLIST

PRE-INSTALLATION	YES	NO
Do you have the recommended installation kit materials?		Travel Time
Does the power line voltage match the voltage printed on the PREVAC controller and the voltage printed on the AquaPower.		Call
Do you have all the necessary electrical 1/2” (13mm) and 3/4” (19mm) conduit or liquid tight, and couplings?		Get Them
Do you have all the necessary plumbing materials.		Don’t Go
Has the supply power been provided to the PRELERT Diconnect so you can start the installation?		Wasted Time

INSTALLATION

THE FOLLOWING INSTRUCTIONS ARE ONLY A GUIDE.

We realize that every installation is different and it might be necessary to change the order and/or the extent of the procedures. Our technical support is just a phone call away (732-842-8889 ext. 208) if you need additional information.

Step 1: Electrical Power

The supply power must match what is on the serial plate of the controller and the vessel. The power requirements are three or single phase. Both have a 30 amp limit. The PRELERT Disconnect location is best to be within reach of the PREVAC controller or at least within sight to comply with the National Electric Code. The 35 amp "current limiting fuses" with an "AIR" rating of 200,000 ampere should be installed as close to the power source as possible and before the PRELERT circuit breaker.

Supply voltage can be 480, 415, 380, or 220 volts. The maximum voltage is 480 volt line to line and 480 volt line to ground.

Step 2: Mounting the PRELERT Disconnect Controller

Enclosure Measurements Are 11.3" High X 8.0" Wide.

Mount the enclosure in a highly visual location within the chiller system. There are four mounting holes provided. Each measure ¼" for use with a #1/4-20 bolt.

If you mount the PRELERT near a wall or any other obstruction you must remove the screw on that side of the cover. The two screws on the bottom and the third one of the side will hold the cover in place.

Step 3: Mounting & Wiring the PREVAC Controller

Mount the controller in the area of the chiller's control panel. Provided on the controller are four mounting bolt holes, ¼ inch(6mm) in diameter.

Once the controller is in place remove the set point adjustment knob by pulling straight out and the 4 screws (two on the bottom and one on each side) and slide the front panel up and out to expose the terminal block.

Use the 3/4"(13mm) knockout provided on the bottom of the controller to fasten liquid-tite or conduit.

- **Make sure the disconnect switch is in the "Off" position before attempting any wiring.**

- **Install the fuse block for the current limiting fuses as close to the power source as possible. Run your wires from the power source to the fuse blocks. Then run your wires from the fuse block to the PRELERT Disconnect circuit**

breaker. Then run the wires from the circuit breaker to the PREVAC controller terminals marked "L1", "L2", "L3".

- **A ground wire must be installed from the power source.**
- **Fuse rating must be marked "Current Limiting, 35 amps, and a AIR rating of 200,000 ampere"**.

Step 4: Wiring The Power Supply

The PRELERT Disconnect comes with a standard three phase, 30 amp circuit breaker. Three phase or two phase can be used. The amp rating is the same for both. (See diagrams in back on manual).

The enclosure has a low and high voltage section with a barrier separating the two. Facing the enclosure, the high voltage is on the right side and the low voltage is on the left side.

The power wire must come through the knockout located at the bottom right on the enclosure. Connect the power wire to the top terminals of the circuit breaker marked "L1", "L2" and "L3" for 3 phase applications.

Connect the power wire to the top terminals of the circuit breaker marked "L1" and "L2" for 2 phase applications.

Connect the ground wire to the ground lug in the upper right of the enclosure's base.

Step 5: Wiring The Load Side of the Circuit Breaker

Connect the load side terminals marked "P1", "P2" and "P3" for 3 phase applications.

Connect the load side terminals marked "P1" and "P2" for 2 phase applications.

Replace the front cover and then turn power on to the PRELERT system.
The "Power On" LED will illuminate.

Step 6: Wiring The System

The power wires connect into the terminals marked "Line 1", "Line 2", and "Line 3" of the PREVAC controller.

The vessel and pump unit are pre-wired with 15 feet (4.58m) of wire. There is a total of eight wires supplied to the unit: three (red, blue, orange) 10 awg for the heaters, two (black and white) 16 awg for the motor, one (yellow) 18 awg for temperature control, one (orange) 18 awg for the high temperature cutout and one ground. The red, orange, and blue heater wires connect to terminals "Heat 1", "Heat 2", and "Heat 3" in the controller. The black and white motor wires connect to the terminal block (TB3) marked "pump" in the controller. The yellow wire is the temperature control wire and connect to the terminals marked "Therm" (yel) in the controller. The orange wire is high temperature shut down and connect to the terminal block marked (org) in the controller. The green ground wire connects to the controller's case.

Step 7: Mounting The AquaPower Hot Water Vessel and Pump

The following are some considerations in deciding where to place the hot water vessel and pump:

Do not place the vessel and pump higher then the evaporator header. That means not on top of the evaporator shell. Always pipe the suction and discharge into the lowest part of the evaporator's header if possible.

Also, make sure you can answer the following questions:

What length of piping and number of fittings is needed for the installation? Is the evaporator shell a single pass or double pass piping configuration?

The wiring from the Aquapower vessel to the controller use 3/4" (19mm) conduit and the wire supplied is 15 feet (7.6m) long.

- **Before connecting the piping to the chiller make sure the inlet and outlet from the chiller's header is clear so full water flow can occur.**

Step 8: Electrical Interlock With Chiller

The PREVAC system automatically brings the chiller to 0.00 psig (00.0 kpag) by either sensing condenser head pressure or by electrical interlock. In some situations the chillers head pressure might run below 0.03 psig (00.1 kpag). In this situation electrically interlocking with the chiller for automatic operation is necessary or manual on/off operation of the "Pressure-Seal" mode. To electrically interlock, you need contacts that open when the chiller is off line and contacts to close when the chiller is running. Do not apply any voltage to the auto interlock terminals.

Step 9: Piping The Hot Water Vessel To The Chiller

The AquaPower vessels inlet and outlet are ¾ inch (19mm) pipe thread. The pressure rating for the vessel and pump is 350 psig (2400 kpag). Supplied with the system is a suction strainer.

A check valve must be installed on the discharge side of the vessel to prevent flow through the vessel when the chiller is running.

If copper piping is used then the use of dielectric unions between the chiller's header and the AquaPower hot water vessel and pump is recommended to prevent electrolysis.

Install isolation valves to isolate the AquaPower from the chiller's water system.

Pipe the system into the evaporator's header. The suction side of the AquaPower pump connects to the discharge side of the evaporator. The AquaPower vessels discharge connects into the supply side of the evaporator. Refer to the piping diagram in the back of this manual (page 24).

Step 10: Wiring The Pressure Transducer

Wire the pressure transducer to the controller before connecting to the condenser. Place the pressure transducer in the best location for sensing chiller pressure. Do not connect to the chiller at this time. Route the wires back to the controller. A strain relief included with the system fits in a hole in the bottom of the RPC plate. Connect the pressure transducer wires to their corresponding terminals: "Black," "Red," "Green," and "White" inside the controller. The bare wire goes to

ground which is the “Black” terminal. This will prevent electrical noise from disturbing the pressure reading.

DO NOT INSTALL THE PRESSURE TRANSDUCER INTO THE CONDENSER GAUGE FITTING AT THIS TIME.

Step 11: Installing The Pressure Switch

Install the pressure switch on the low pressure side of the chiller.

Place the pressure switch at the vessel’s fittings or in the control panel of the machine. The pressure switch comes with 1/8” NPT threads and must be installed vertically with the threads facing down.

Connect the wire provided to the circuit board through the knockout located in the bottom left side of the enclosure.

Connect the pressure switch wire to terminals #5 and #6 marked “Alarm One”
Remove the jumper when a second input is being used by connecting terminals #4 and #5 marked “Alarm Two”.

Leave the jumper across terminals #4 and #5 in place the when second input is not being used.

Step 12: Start Up Test

Do Not Apply Power Until The Following Tests Are Completed!

A) Power Wires

The power wires must be as close to the controller’s base as possible to avoid contact with the front panel. Remove all excess power wire lengths from the enclosure to ensure a neat and clean installation process.

B) Logic Board

Install the logic board attached to the mounting plate over the two studs inside the enclosure and slightly push down into place. Make sure that the ribbon cable connecting the logic board to the power board placement is between the notch in the mounting plate so as not to pinch it between the mounting plate and the wall of the enclosure.

C) Cover Plate

Slide the cover on and secure with the four screws provided.

Step 13: Bleed Air From Hot Water Vessel and Pump

Remove any air by first opening the isolation valve on the suction side of the pump. Next open the bleed valve on the vessel to remove all the air. Close the bleed valve. Finally, open the second isolation valve on the discharge side of the vessel. Check for any leaks in the piping.

NOTE: When raising pressure in the chiller normally only one valve on the evaporator and condenser has to be shut. This stops water flow and allows for water expansion due to the increased temperature. If one valve is not adequate to stop water flow then the second valve should be shut. When either the evaporator or condenser has both the inlet and outlet valves closed water pressure must then be released manually. Always check water pressure to be sure it is not increasing. Be aware of the pumps check valve when choosing the valve to close because with one valve closed in combination with the check valve you can have a closed system and no room for water expansion.

Step 14: Power On

Turn The Power On To The PREVAC Controller And Check The Following Items:

A) Digital Display

The pressure display should illuminate indicating a pressure reading.
Pressure readings slightly above or below zero are normal before adjusting the zero pot. A reading of "-1" or jumpy readings are signs of trouble. Refer to the troubleshooting section on page 27.

B) Mode Settings

The "Leak Test" mode or the "Pressure-Seal" mode may energize when controller power comes on. Turn them off by pressing their respective buttons.
Also, during start-up it takes thirty seconds for all safeties to clear.
The bar graph in the "HEATER percentage" section must be completely off.

Step 15: Zero Adjustment

Energize the controller for 15 minutes with the pressure transducer sensing atmospheric pressure before attempting to zero the readout. You can now zero the pressure transducer to the atmosphere by turning the zero pot. Adjust the zero pot through the hole on the upper left side of the controller enclosure turning the screw clockwise to decrease pressure and counterclockwise to increase pressure.

Check that the pressure responds correctly. Blow into the pressure transducer and make sure the pressure increases. Suction on the pressure transducer must cause the pressure to go negative. A negative sign denotes a vacuum.

Step 16: Apply Power to the Hot Water Vessel and Pump

Press the "Leak Test" button. The leak test indicator light should illuminate. Rotate the "SET POINT" adjustment until the "HEATER %" bar graph fully illuminates. Full illumination indicates that full voltage is being applied to the heaters. The heaters are now getting hot and the pump is running.

- **Water temperature rise across the vessel should be from 5^0F (3^0C) to 12^0F (7^0C), if not, water flow is restricted. Check strainer, inlet and outlets on the chiller, and/or piping configuration if temperature rise is to great.**

- **The return water temperature should correspond with the chillers refrigerant pressure.**

- **Pump will run even if heaters are off. The pump will shut down only after the pressure is 0.20 psi (1.3 kpa) above set point.**

- **OVER PRESSURE WARNING: DO NOT LEAVE THE CHILLER WHILE THIS OPERATION IS BEING PERFORMED. THE CHILLER PRESSURE WILL CONTINUE TO RISE WHILE THE PRESSURE TRANSDUCER IS NOT COUPLED INTO THE CONDENSER.**

Step 17: Pressure Transducer Coupling

Remove the pressure transducer's electrical connector by first loosening the set screw. Separate the connector from the pressure transducer and install the pressure transducer into the condenser side of the chiller.

Place the pressure transducer vertically with threads facing down. This prevents liquid refrigerant from vaporizing and condensing inside the pressure transducer. This can cause the pressure readings to be inaccurate and in some cases jump around.

Reconnect the electrical connector to the pressure transducer. As always, leak check the fittings after installation.

NOTE: When a refrigerant isolation valve is not present on the condenser use the PREVAC system to manually raise pressure to zero to allow installation of the pressure transducer without allowing air in. Do not leave the chiller area during this procedure. Monitor the chiller's mechanical pressure gauge until it reaches zero. Now turn PREVAC off and install the pressure transducer. (See the "Over Pressure Warning" above).

OPERATING INSTRUCTIONS

DESCRIPTION OF KEY FEATURES

A). Digital Readout

The controller constantly senses and displays the vessel pressure in PSIG (KPAG) from the condenser. A negative sign indicates a vacuum condition. Converting inches of vacuum to PSIG is approximately 2:1. For example: -10 PSIG = 20 inches of vacuum.

B). The "Pressure-Seal" Mode

The "Pressure-Seal" mode supplies only one nonadjustable set point, which is factory set at 0.00 PSIG (00.0 KPAG), to achieve atmospheric equilibrium; "No air in, No refrigerant out." The "Pressure-Seal" mode is pressure activated by the pressure transducer located on the condenser. The controller activates the heaters and pump when the chiller is off and deactivates them when the chiller is in operation. This is all automatical as long as the condenser head pressure does not drop below the controllers set point when the chiller is running. The energized LED on the "Pressure-Seal" pad indicates PREVAC is in the "Pressure-Seal" mode.

C). The "Leak-Test" Mode

The "Leak-Test" mode is a manual operation in which the operator can adjust the set point from 0.00 to 6.00 PSIG (00.0 to 41 KPAG). The energized LED in the "Leak-Test" button indicates that the "Leak-Test" mode is operational.

D). Set Point

View the set point by pressing the "Setpoint" button. The energized LED in the "Setpoint" button indicates that the digital readout is displaying the desired set point.

E). Adjusting the Set Point in "Leak-Test" Mode

Adjusting the set point in the "Leak-Test" mode involves pressing the "set point" button while turning the set point adjustment knob to the desired setting.

F). Bar Graph

This indicates the percentage of voltage being supplied to the heater in 5% increments. It represents the amount of voltage (heat) required to achieve and then maintain the set point. Once the pressure inside the chiller is within 0.2 psi (1.3 kpa) of the set point the controller drops phase two and the wattage reduces by half. When the pressure is within 0.03 psi (.2 kpa) of the set point the voltage to the heaters will begin to decrease to the reduced voltage required to maintain the set point. Rapid pressure changes in the chiller's room such as a door opening or closing will cause a slight variation of the voltage and bar graph. The better the chiller insulation and the lower the air flow over the chiller, the less the power requirements.

A bar graph that is backing off before achieving set point is due to the temperature limiting circuit safety being energized. Possible causes could be no water flow or poor heat transfer between the water and refrigerant.

The pump will continue to run even with the bar graph completely off until the pressure reaches 0.20 psi (1.4 kpa) above set point.

THE SAFEGUARDS

A). "Pressure Not Rising"

This safety incorporates a timing circuit. For the "Pressure-Seal" mode the time duration is four hours and for the "Leak Test" mode it is an eight hour time duration. The timing circuit stops within 0.20 psi (1.4 kpa) of set point. The timer resets when the bar graph goes completely off. If the system pressure has not achieved set point value within these designated time periods the controller automatically does the following:

- De-energizes the heaters and pump.
- The "Pressure Not Rising" LED is illuminated.
- Continues to sense and display system pressure.
- The heaters can only become operational again by a manual reset.

B). "Heaters On & Above Set Point"

There is only one possible cause for the safety to trip. When the system pressure goes 0.20 psi (1.4 kpa) over the desired set point and there is still power being supplied to the heaters the controller automatically does the following:

- De-energizes the heaters and pump.
- Lights the "Heat On and Above Set Point" LED.
- Continues to sense and display system pressure.

The heaters and pump can only become operational again by a manual reset.

C). "Reset "

Manually reset the system after a safety has occurred. After a power outage the reset lights up for 20 seconds automatically clearing any safeties.

D). "High Heater Temperature"

1. Temperature Limiting

The temperature limiting circuit controls the water temperature to 110^{o}F (43^{0}C) by sensing the top plate of the vessel. The controller will try to maintain the temperature with three phases by reducing the voltage between phase one and phase three. An indication that the temperature limiting is occuring is when the bar graph reduces before set point is reached. If the bar graph reduction diminishes to fifty percent then phase two

opens and wattage is reduced by half. The full power light goes off and "High Temperature" LED goes on.

2. High Temperature Shut Down

The high temperature shut down will turn power off to the heaters and pump if the boiler temperature reaches 130^0F (55^0C). The " High Heater" lamp will come on and the Bar Graph will go to 100%. A manual reset is required. Check for blockage in the water line or an air bound pump.

EXTENDED CHILLER SHUTDOWN APPLICATION

The PREVAC system can be used for the purpose of keeping a chiller system at 0.00 psig (00.0 kpag) when a normally negative chiller is off-line. This is referred to as atmospheric equilibrium: "no air in and no refrigerant out" .This is accomplished by the "Pressure-Seal" mode which has only one set point of 0.00 psig (00.0 kpag). A possible cause that prevents maintaining 0.00 psig (00.0 kpag) could be water flow through the condenser or evaporator of the chiller or chiller room temperature cold enough to cause refrigerant to migrate out of the evaporator over a period of time.

PRESSURE SEALING

The sequence in which the PREVAC system maintains the chiller pressure at 0.00 psig (00.0 kpag) is as follows:

- The chiller shuts down.
- The chiller pressure (including the condenser) drops into a vacuum due to 45-50°F ($7\text{-}10^0$C) return water being in the evaporator.
- The controller constantly senses chiller pressure from the condenser. When the pressure drops below the "Pressure-Seal" set point the heaters and pump are energized and circulates heated water through the evaporator.
- The controller increases the refrigerant pressure to 0.00 psig (00.0 kpag). The voltage is then regulated as needed to maintain set point and is indicated on the bar graph.
- Conversely, when the chiller goes back "on-line" the condenser pressure will be above the 0.00 psig (00.0 kpag) set point and the controller will de-energize the heaters and pump.
- The "Pressure Seal" mode conforms to ASHRAE guideline 8.5 on reducing CFC emissions.

LEAK TESTING

The following procedure will guide you through a typical "Leak Testing" procedure using the PREVAC system:

- Press the "Pressure-Seal" mode switch pad which de-energizes the LED.

- Press the “Leak-Test” switch pad which energizes the LED.
- Set desired set point by pressing the “Set Point” pad and turning the Set Point” adjustment to the desired pressure setting.
- Bar graph goes to 100%.
- The PREVAC system increases the chiller’s system pressure up to the desired set point by circulating heated water through the evaporator.
- It is recommended that a chiller is not left in the “Leak Test” mode.

MAINTENANCE

Once A Year, Do The Following

•With power supply off, check the tightness of all terminal connections.

- Check the accuracy of the pressure transducer (PT) to the atmosphere. Refer back to page 19 for zeroing out the PT.

TROUBLESHOOTING

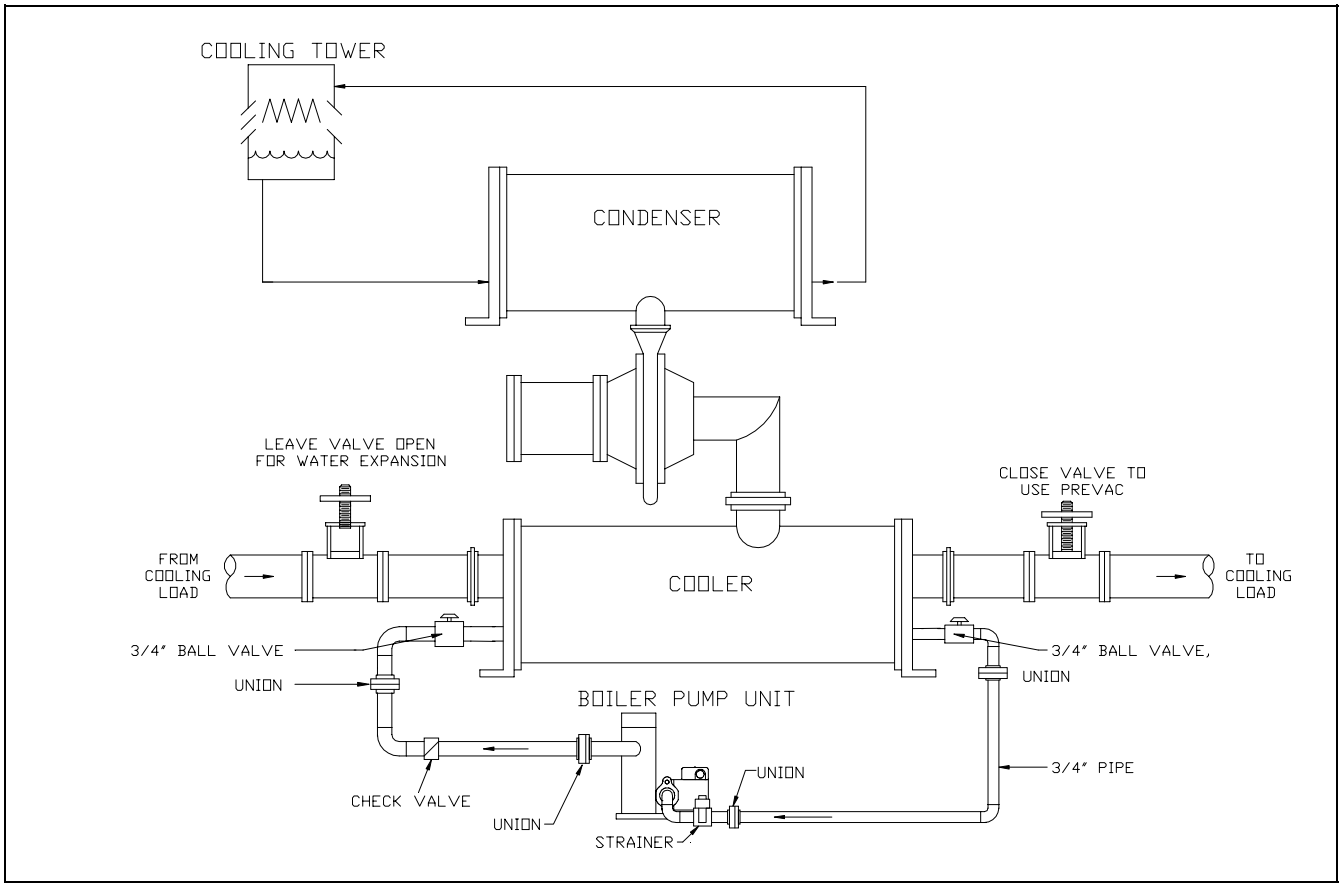
TECHNICAL SUPPORT CAN BE REACHED AT 732-842-8889, X 208.

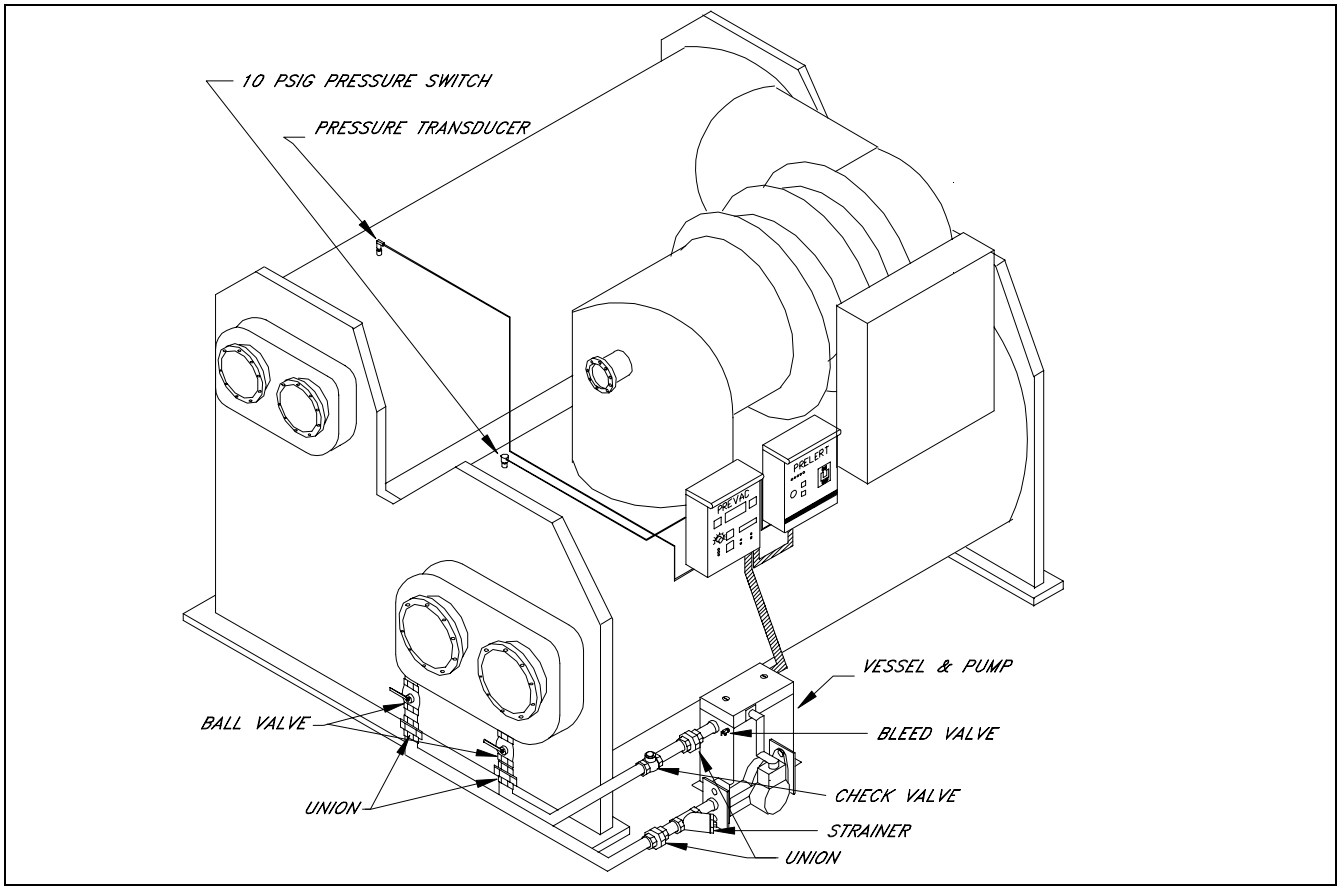
PROBLEM SECTION		
CAUSE	**SOLUTION**	**TEST POINTS**
DISPLAY IS BLANK		
No power	Check incoming power supply	Power line voltage, 480, 415, 380, 240
Flat Cable not connected	Check flat cable connection	None
Defective transformer	Check secondary of transformer	24 volts AC
JUMPING PRESSURE READING		
No ground connections	The bare wire from the pressure transducer cable must be connected to the case. Power line ground must be connected to the case. Pressure transducer must be mounted vertically threads down	None.
PRESSURE TRANSDUCER WILL NOT ZERO		
Bad connection at terminal block	Check to make sure that there is proper contact and tightness on the connections at the terminal block	None
Open or shorted red or black wire	Remove connector on top of the PT to check electrical connections	Connect voltmeter from case ground to red wire. 5.0vdc should be present. No voltage disconnect red and measure directly to the terminal block. No voltage means defective circuit board. Voltage present means shorted red to ground wire in the connector or PT

PROBLEM SECTION		
CAUSE	**SOLUTION**	**TEST POINTS**
Data Instrument's Pressure transducer is defective	Ohm check of pressure transducer from the wires	Black to Red 460 ; Black to White 780 Black to Green 200 ; White to Green 720
Sensor Tech Pressure transducer is defective.	Ohm check of pressure transducer from the wires.	Black to Red 3900 ; Black to White 2840 Black to Green 2840; White to Green 4260
Controller power supply is low or wrong.	Check power supply and power at PT terminal.	Check for power line voltage at terminal L1 and L2. Check for 5.0 volts dc supply power voltage across black and red PT wires.
HEATER BAR GRAPH DOES NOT ENERGIZE		
Pressure reading is above set point.	Press set point button. The setting must be higher than the actual pressure.	None
Thermistor circuit open or wires not connected.	Measure resistance between yellow wires in the controller, with the system off.	Thermistor ohm reading of between 30 to 60 ohms.
PRESSURE NOT RISING		
Water flow through the chillers cooler or condenser shells.	Stop the water flow and then press the reset button.	The heaters have been on for four hours and the pressure has not reached set point. Reset allows another time period.
Low charge or refrigerant migration	Check refrigerant charge.	If refrigerant charge is full see below for migration.
Temperature limiting circuit reducing the wattage.	Heater bar graph will show reduced power. The water temperature has reach 105 F.	There is restricted water flow or no flow. Check suction strainer, refrigerant migration or low refrigerant charge.
Refrigerant migration is lowering the level in the evaporator	Check if heat barriers are working or if heat barriers need to be installed.	See section for chillers that require heat barriers.
HEATERS ON AND ABOVE SET POINT		
Voltage spike or mechanical stress destroys the triac.	Check triac with ohm meter to determine the status.	Set ohm meter a lowest setting and check triac across pin 1 and pin 2. Reading should be infinity.

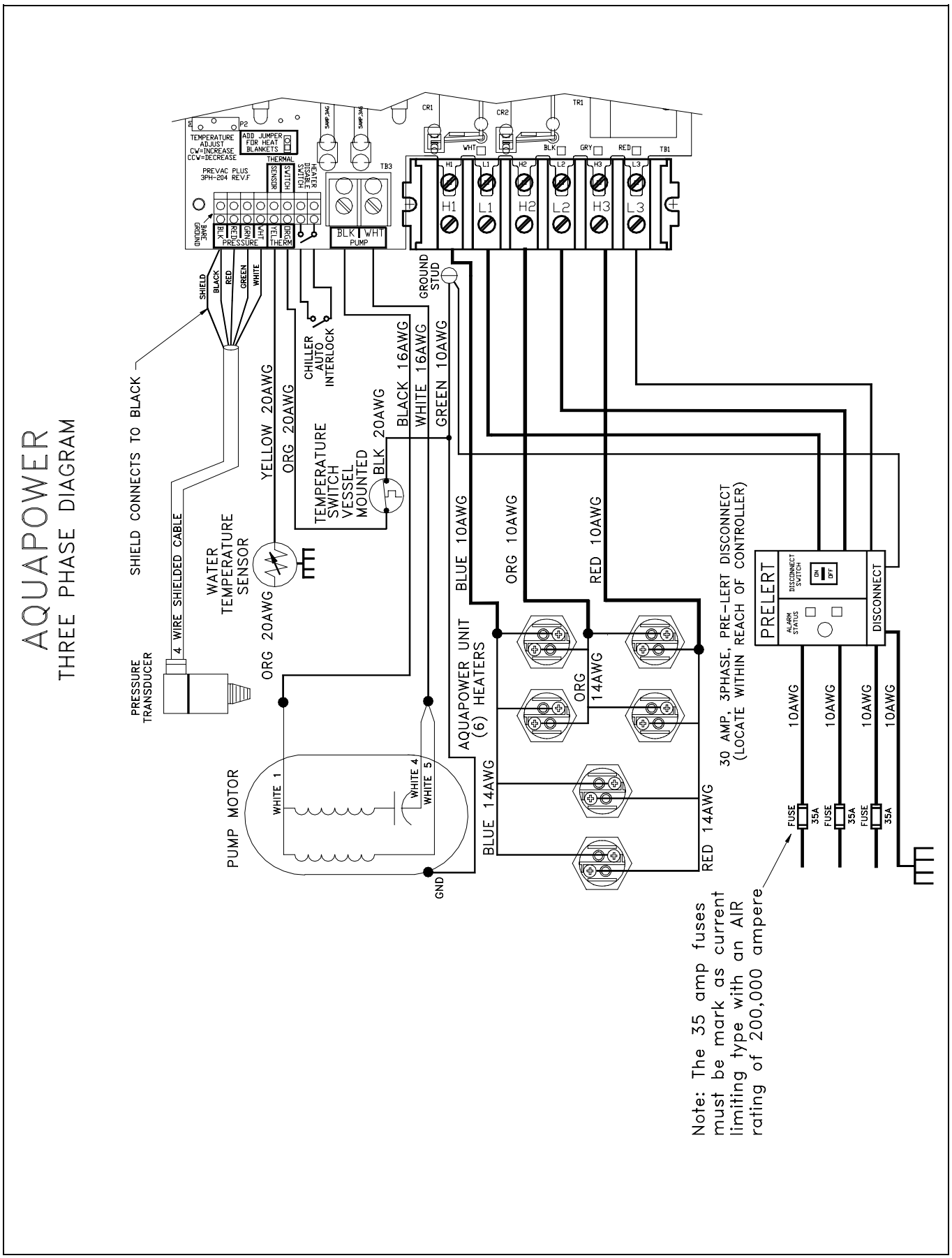
PROBLEM SECTION		
CAUSE	**SOLUTION**	**TEST POINTS**
Faulty triac or the heaters are not connected or open.	Check triac with ohm meter. Check heaters with an ohm meter.	For triac set ohm meter at lowest setting and check across pin 1 and pin 2. Reading should be infinity. The heaters ohm reading is 19.2 ohms for 480V 12kw and 9.6 phms for 6KW 240V.
PRESSURE READING OF - 1 ON THE DISPLAY		
Broken wire to the pressure transducer.	Look for broken or disconnected PT white or green wire. There are 4 wires from the controller to the PT	Measure from case ground to white wire = 2.0vdc. Measure green wire = 2.0vdc. If zero or 5v the wire is broken. If both measure O.K. the circuit board is defective.
Pressure transducer is defective.	Ohm check of pressure transducer from the wires.	Black to Red 460 ; Black to White 780 Black to Green 200; White to Green 720
HIGH WATER TEMPERATURE		
Reduce water flow	Strainer needs to be cleaned.	Remove strainer and clean. Check if valves are fully opened.
Low Refrigerant Charge	Check Charge	Return water temperature should match the chillers refrigerant pressure.
HIGH HEATER LED ON WITH FULL BAR GRAPH AND NO POWER TO HEATERS OR PUMP.		
High temperature safety switch opened	No water flow, no ground connection.	Check the vessel temperature, temperature switch opens at 130^0F, Check for water flow, bleed air from vessel, let vessel cool down. Check ground connections. Switch must be in contact with the vessel.

SUGGESTED CONFIGURATIONS

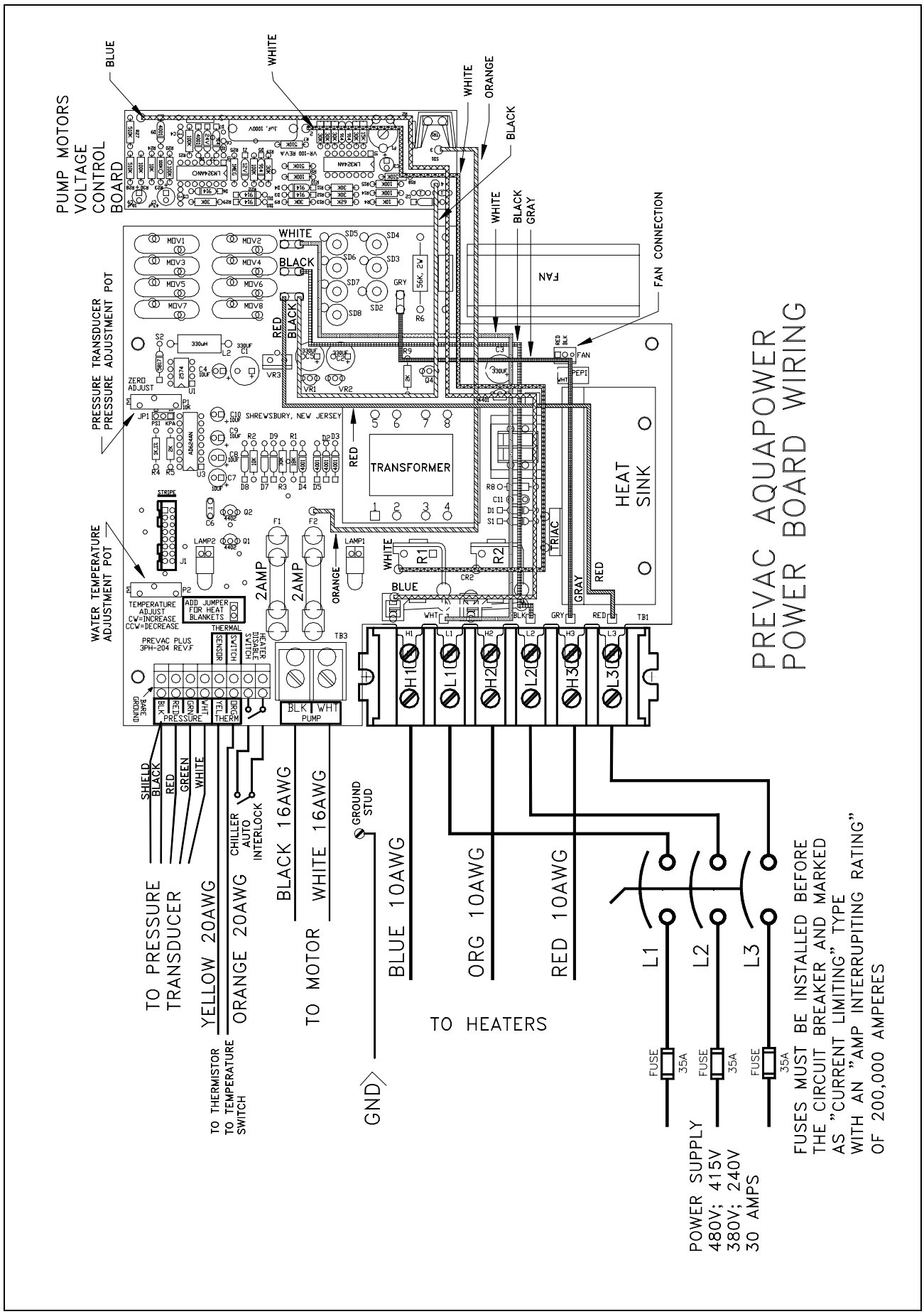




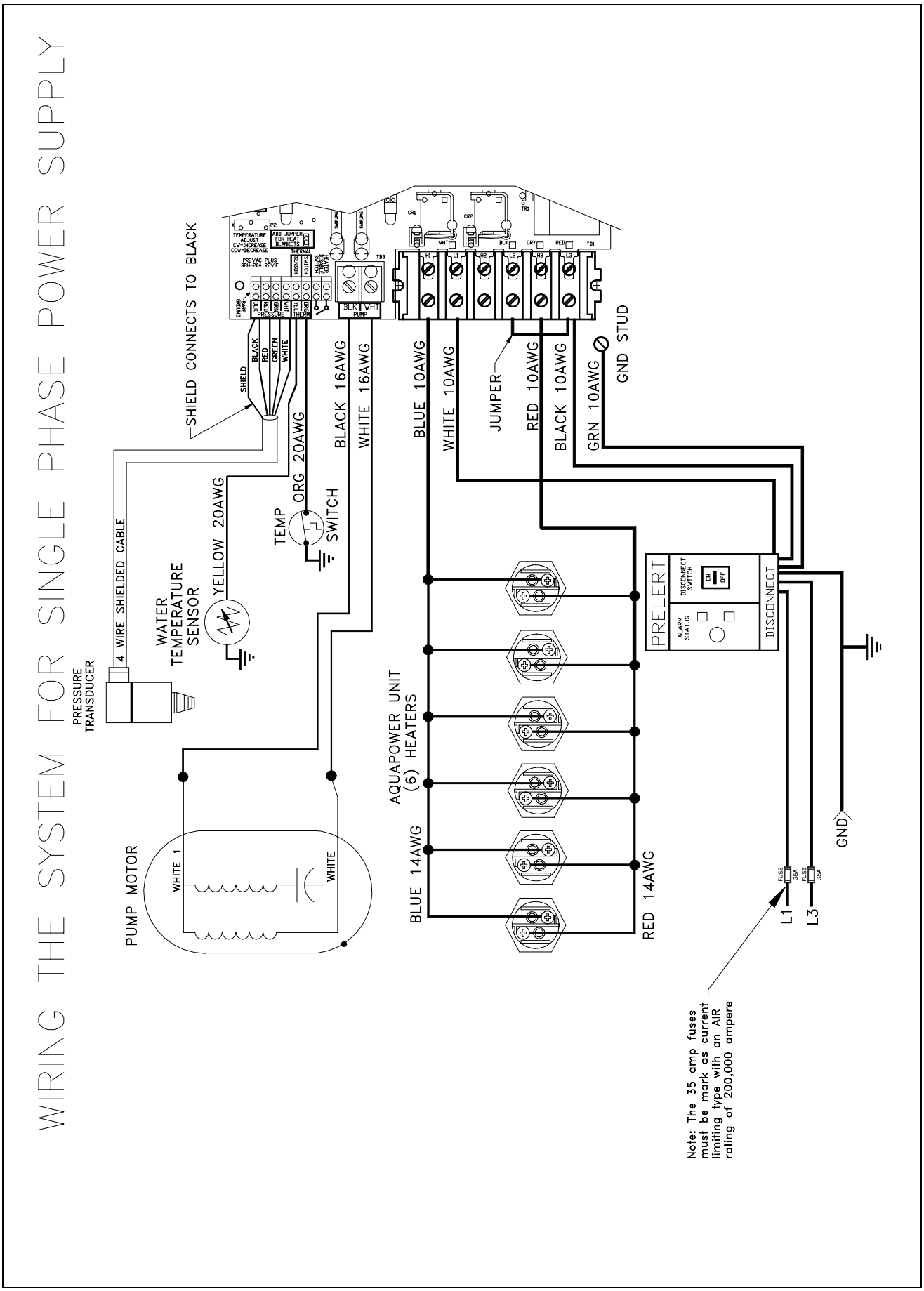
THREE PHASE WIRING DIAGRAM



THREE PHASE WIRING SCHEMATIC



SINGLE PHASE WIRING DIAGRAM



PRELERT DISCONNECT WIRING DIAGRAM