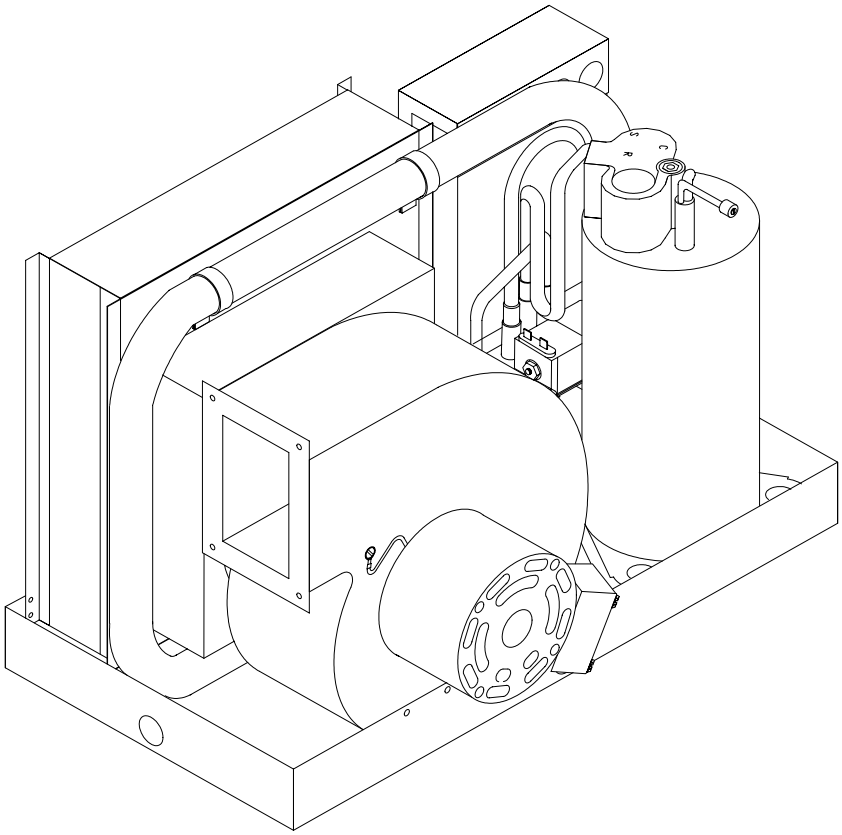
mini-kool series

INSTALLATION, OPERATION & MAINTENANCE



AQUA AIR
MARINE AIR CONDITIONING SYSTEMS

80806-1 rev 05/01

TABLE OF CONTENTS

INTRODUCTION

Thank you for purchasing the Aqua-Air® *mini-kool* ® self contained marine air conditioning system. Your new system is the most technically advanced system available, and it has been designed and manufactured by Aqua-Air®, division of the James D. Nall Co., the oldest company in the marine air conditioning industry. As the technology leader, Aqua-Air® has the experience and technical resources to continually develop and produce the innovations that result in better quality, more efficient and more cost effective marine air conditioning products. Your new *mini-kool* is just one example.

The *mini-kool* unit has been specifically designed for use in the marine environment. The configuration and all the materials and components that go into the manufacture of this unit are extensively tested for efficiency and durability in this sometimes harsh environment. With proper installation, operation and maintenance, your new *mini-kool* system should give you years of trouble free comfort on board your boat.

This manual will inform you of the different components that comprise the system and provide the basic information that you will need to correctly install a fully operational self contained air conditioning system on your boat, and to perform the minor seasonal maintenance required to keep your system in good operational condition.

PRODUCT OVERVIEW

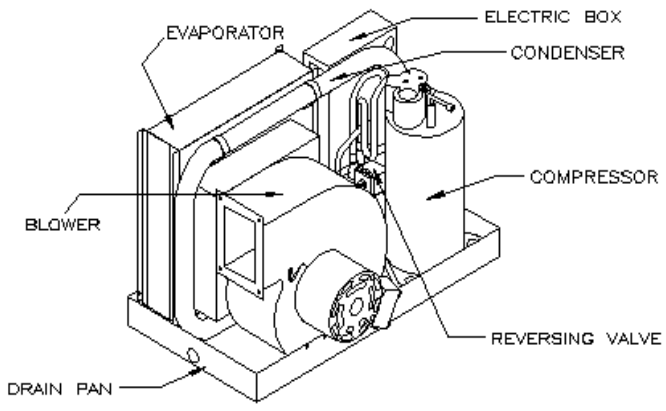
It may be helpful to familiarize yourself with the major components to your system as you unpack them. There are six basic components that make up a complete *mini-kool* marine air conditioning system:

- *mini-kool* self contained unit
- Thermostat / Controller
- Seawater Pump
- Pump Relay (if applicable)
- Seawater Kit
- Duct / Grille Kit

All of these components are available from Aqua-Air®. Following is a brief description of each major component:

The *mini-kool* self contained unit:

The *mini-kool* unit is commonly used in new installations, however it is very well suited to the replacement or retrofitting of an older, less efficient or obsolete unit, or as an upgrade. This self contained unit is a refrigerant to air heat exchanger that has all the major components mounted on one chassis. It is installed in the area of the boat that is to be heated or cooled. The basic unit is made up of the following major components: compressor, condenser, evaporator, reversing valve, blower, electric box and drain pan.



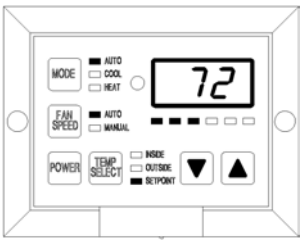
How the mini-kool self contained unit works:

In the self contained unit, refrigerant is circulated through the system. The refrigerant is pumped from the compressor as a high pressure, high temperature gas through the reversing valve to the seawater condenser. In the condenser, the gas gives off the heat acquired during compression and from the system load, to the seawater passing through the condenser. As this heat is rejected to the water the gas changes state from a gas to a liquid. This liquid then passes through the receiver to the capillary tube(s). The liquid refrigerant passes through the capillary tube(s) where it experiences a decrease in pressure. The lower pressure liquid exits the capillary tube(s) and enters the evaporator. While the cabin air is drawn across the evaporator, it is 'cooled' as the refrigerant absorbs the heat from it and the moisture condenses out of it. The now cool, dry air is supplied back to the cabin by the blower. As the refrigerant absorbs the heat from the air it begins to change state from a liquid back to a gas. This gas then passes through the reversing valve and the suction accumulator back to the compressor, where the cycle begins again. Standard units are reverse cycle, cooling and heating. In the heating mode, the refrigerant flows in the opposite direction through the reversing valve. The condenser and evaporator swap functions and the heat contained in the seawater is absorbed and given off to the air passing through the evaporator. This unit will effectively cool in water temperatures up to 90°F and heat in water temperatures as low as 40°F.

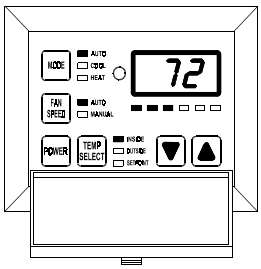
Thermostat / Controllers:

The Thermostat / Controller used to operate the *mini-kool* unit can be provided in one of four different configurations:

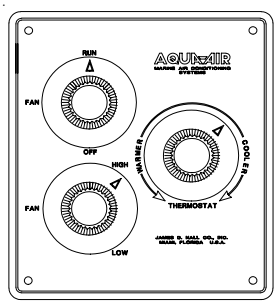
A. TW2 Digital Controller (TW2-01B/W)
With built in temperature sensor
Used with STR and STS models
TW2-01B(black) / TW2-01W(white)



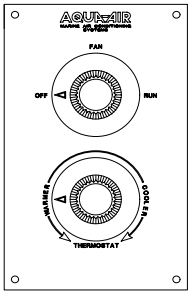
B. TW2 Digital Controller(TW2-01)
Designer model with door panel
Used with STR and STS models



C. Three Knob Control(AQS1-Z / AQS3-Z)
Electro-mechanical with sensing bulb
Used with SMR and SMS models

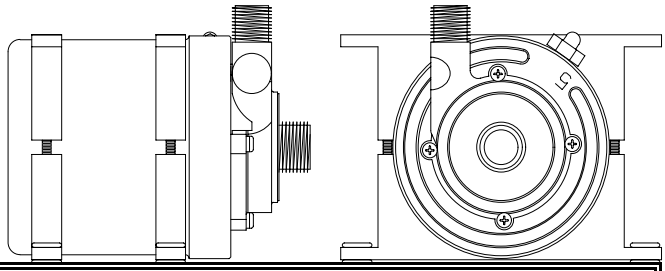


D. Two Knob Control (AQS1-BP)
Electro-mechanical with sensing bulb
Used with MC-05 only



Seawater Pump:
The seawater pump is used to circulate seawater through the condenser on the self contained unit(s). These are centrifugal pumps and are NOTself priming. This makes it necessary for the pump to be mounted below the ships running water line (under all conditions).

A self contained unit requires approximately 250 GPH for every 12,000BTU/H in capacity. The following table summarizes the seawater flow and pump requirements.



Self Contained Unit Required Seawater Flow Rates		
Unit Capacity, BTU/H	**Seawater Flow in GPH / LPH**	**Seawater Pump**
5,000 to 12,000	250 / 946	CP-02
12,001 to 24,000	500 / 1,892	CP-05
24,001 to 48,000	1,000 / 3,784	CP-10
48,001 to 72,000	1,500 / 5,677	AQPM-15
72,001 to 144,000	3,000 / 11,353	AQPM-30

Pump relays:
A pump relay is necessary when two or more self contained units are supplied water from a single seawater pump. Aqua-Air® offers three different pump relays:

AQP2R Designed for use with two self contained units and one seawater pump. Both self contained units must be on the same shore line. No external power source is needed. This relay is not ignition protected and therefore *must not be used on a gasoline powered boat.*

AQP6R This relay is a solid state module which will control a single seawater pump from as many as six separate self contained units. This relay requires an external power source. Because it is solid state it is ignition protected.

AQP8R This relay is a solid state module which will control a single seawater pump from as many as eight separate self contained units. A separate trigger (PEC-115 or 230) must be installed in the relay for each self contained unit used. This relay requires an external power source. Because it is solid state it is ignition protected.

Seawater Kit:
All of the components necessary to install the seawater circuit (except the seawater pump itself) are included in a seawater kit. There are two kits available from Aqua-Air®:

SWK-05 Seawater Kit for use with the CP-02 pump and the *mini-kool* model MC-05 self contained unit.

SWKU Seawater Kit for use with the CP-02, 05 and 10 pumps and a single *mini-kool* “S” series self contained unit.

Included in the kits are a seawater inlet thru hull with a speed scoop, ball valve, seawater strainer, overboard thru-hull, 25' of hose, hose clamps and necessary PVC fittings to complete the average installation. See Aqua-Air® brochure “Seawater Kits / SWK Series”

#80625 for a complete description of all of the components included in these kits.

Duct / Grille Kit

To transfer the air flow from the self contained unit to the area that you want to heat or cool you will need insulated flex duct, supply and return grilles, grille to flex duct transition boxes and possibly adapter tees. These items can be purchased in kit form from Aqua-Air®. We offer the Economy Duct Kit series (DKE) which includes plastic grilles or the Premium Duct Kit series (DKP) which includes wood (teak) framed grilles. A complete description of these duct kits is available in the DK Series Grille & Duct Kit brochure, # 81890. The following diagrams illustrate typical Duct / Grille Kits:

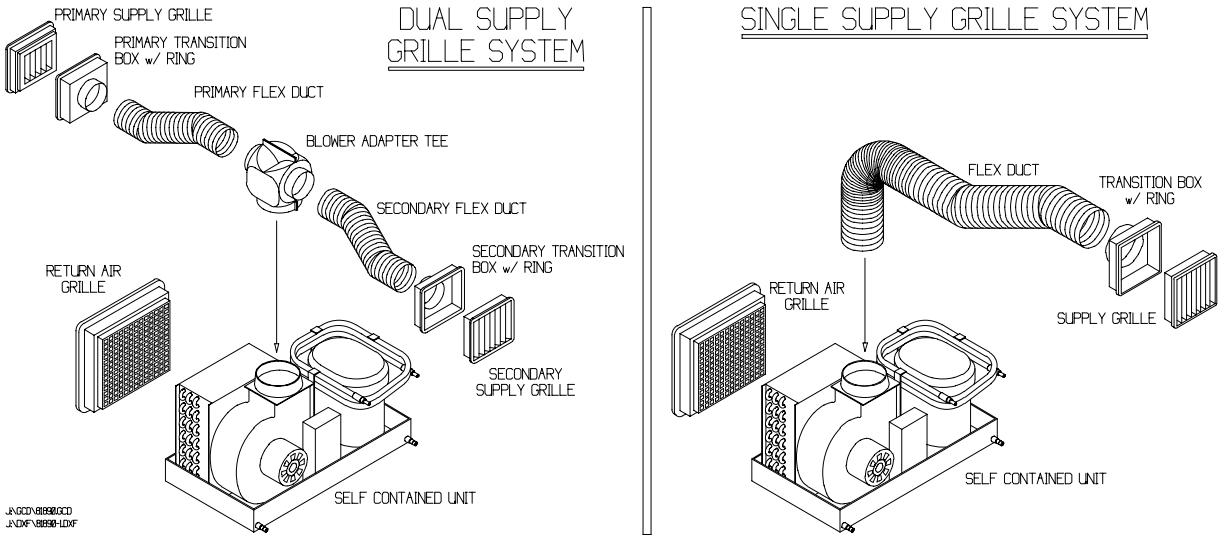


Figure 2 Typical Duct / Grille Kits

i i i WARNING i i i

FAILURE TO COMPLY WITH THE INSTALLATION INSTRUCTIONS CONTAINED IN THIS MANUAL COULD PRODUCE HAZARDOUS CONDITIONS RESULTING IN THE INJURY OR DEATH OF THE OCCUPANTS AND THE DESTRUCTION OF THE BOAT. MAKE SURE THAT THE WARNINGS AT THE END OF THIS MANUAL ARE FULLY UNDERSTOOD AND FOLLOWED.

ALL INSTALLATION TECHNIQUES SHOULD COMPLY WITH THE ABYC “STANDARDS FOR RECOMMENDED PRACTICES FOR SMALL CRAFT” SECTION A-6 and E-8.

IF THERE ARE ANY PARTS OF THIS MANUAL THAT ARE NOT CLEAR PLEASE CONTACT Aqua-Air® FOR FURTHER ASSISTANCE.

INSTALLATION OF BASIC COMPONENTS

mini-kool self contained units are ideally suited for installations in lockers, under bunks or dinette seats. In all applications the self contained unit should be installed as low as possible and the air discharge should be at least three feet above the floor. The best possible configuration is to have the air discharge at or near the ceiling level and the return air near the deck or floor. The reason for mounting in this manor is because cold air is more dense than ambient air and it's natural tendency is to fall to the lowest point in the cabin after leaving the discharge grille. This type of installation creates an ideal air flow for conditioning and dehumidifying the air, and prevent short cycling.

THEY SHOULD NEVER BE MOUNTED IN THE ENGINE ROOM OR BILGE AREA WHERE THEY COULD DRAW TOXIC FUMES INTO THE UNIT AND THEN DISCHARGE THEM INTO THE LIVING AREA.

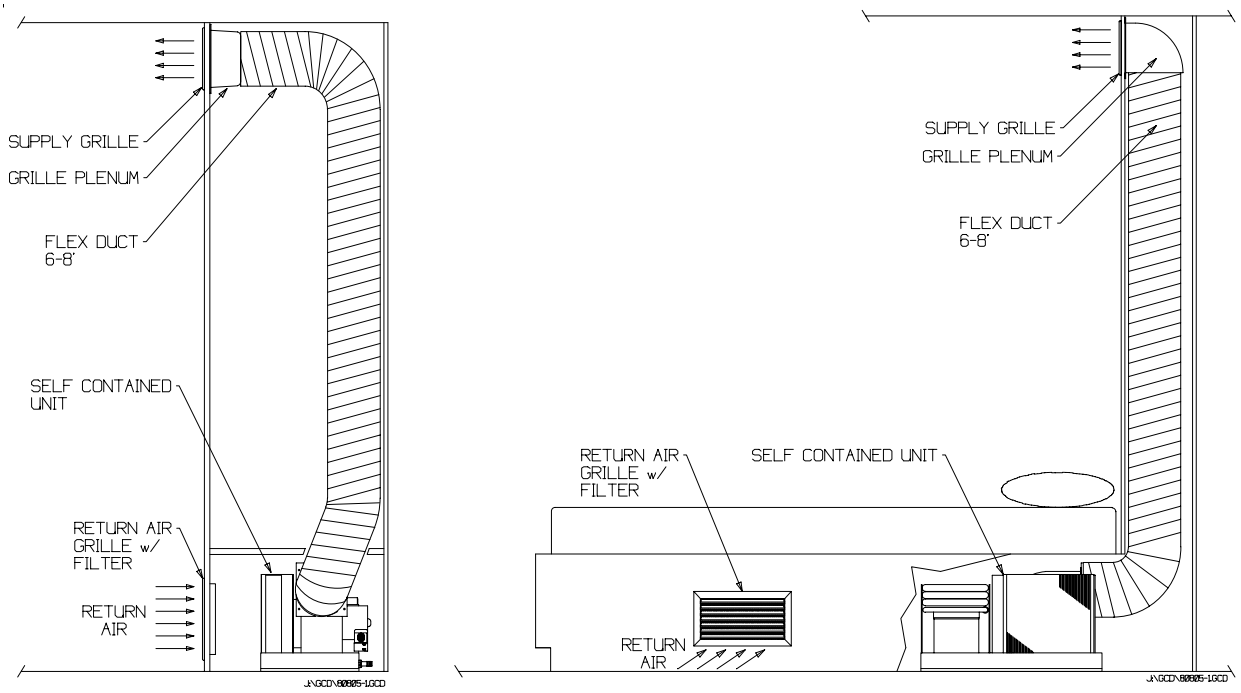


Figure 3 Typical Self Contained Unit Installations

The Self Contained Unit should be securely fastened to a firm, level surface using the four mounting clips provided. Please see Figure 4 showing the mounting clip and how it should be used to hold the unit down. There are three possible locations for the drain outlet fittings (one on the 5,000 BTU/H unit) and one drain fitting is supplied. Remove the aft-facing plug from the drain pan, and follow the guide in figure 4 to install the drain fitting. A 5/8" ID hose from the fitting should then be run, continuously downward, either overboard or into a shower sump and secured with clamps at both ends. It is not advisable to run the drain lines into the bilge where the condensate can become stagnant and foul smelling when mixed with seawater. On a hot, humid day several gallons of water per hour can be removed from the air by the self contained unit. Any lines, hoses or electric cables run between decks should be sealed away from any exhaust or bilge vapors. *Do not terminate drain lines near engine exhaust outlets nor in the bilge or engine room unless properly sealed to a sump.* After the condensate drain is installed, test it by pouring a quart of water into the pan. It should drain within 30 seconds.

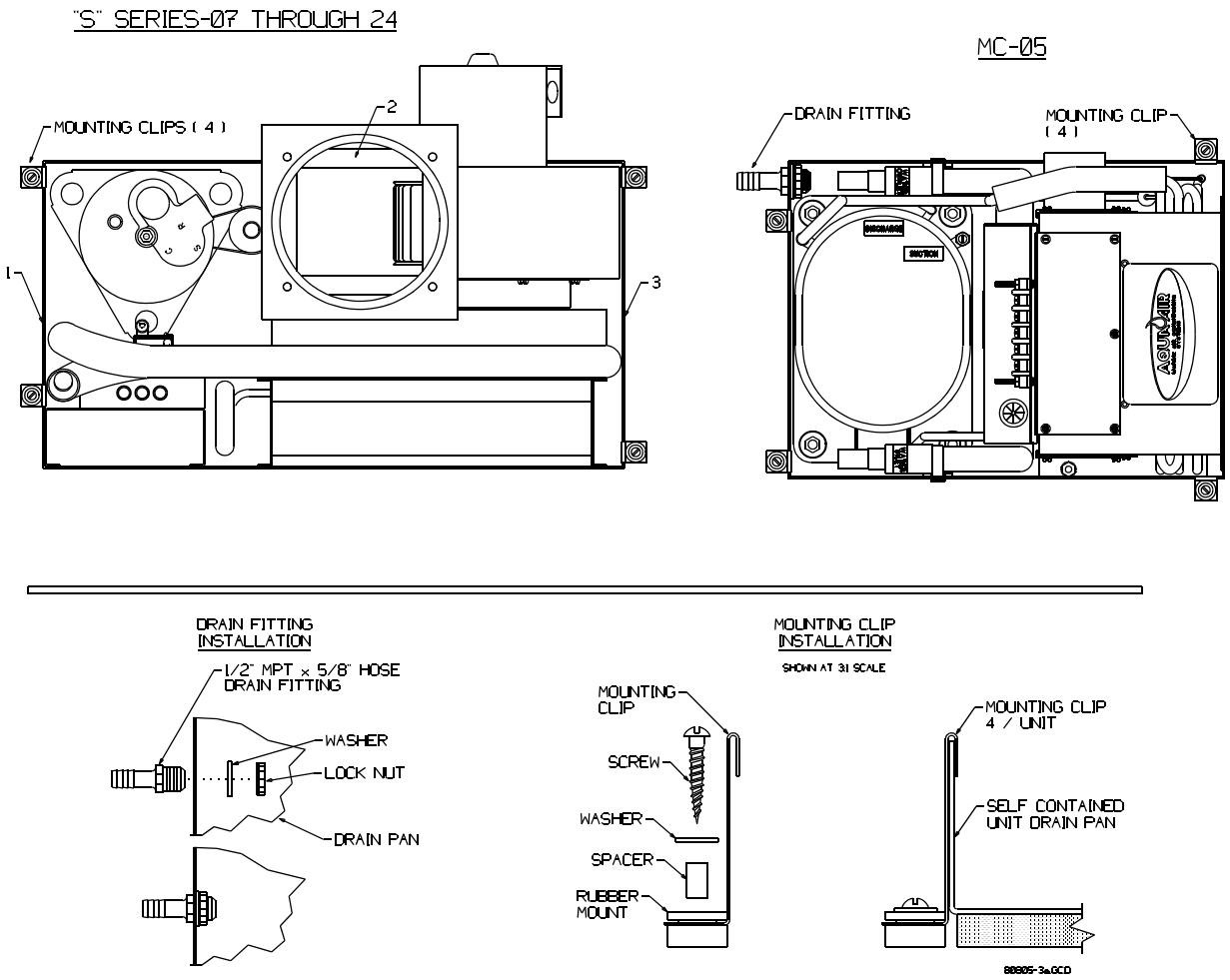


Figure 4 - Drain Fitting Locations and Unit Mounting Details

The Blower on all of the self contained units can be rotated (on the 5,000 BTU/H unit there are three possible fixed air discharge locations), allowing for a 130 rotation of air discharge. To rotate the blower remove the screw at the top of the connecting collar between the blower and the evaporator housing and two screws at the pan. Rotate the blower to the desired position. Drill a 1/8" pilot hole through the existing holes in both the collar and pan. Replace the screws and tighten. Plug the factory holes in the back of the blower if necessary. The correct size plastic blower discharge collar from the chart below, should now be fastened to the blower flange.

Blower Discharge Collar Reference Chart					
***mini-kool* unit capacity - BTU/H**	7,000	10,000	12,000	16,000	24,000
Blower collar diameter In / mm	5 / 127	5 / 127	6 / 152	6 / 152	7 / 178
Aqua-Air® part number	HA5	HA5	HA6	HA616	AQHA7-24

Insulated Flex Duct should be connected to the plastic blower discharge collar by first pulling back about two inches of the insulation on the end of the flex duct that you are going to attach to the blower. Slip the inner duct over the collar so that at least one of the duct reinforcing wires is up against the flat part of the collar. Install three sheet metal screws around the perimeter of the collar, capturing the reinforcing wire, to hold the duct in place. Wrap a piece of duct tape around the duct that is on the collar. Slip the duct insulation back over the duct that is attached to the collar and duct tape in place.

The Correct Minimum Grille sizes for each self contained unit are shown in the table below. Return air grilles can be larger than listed (this is one case where bigger is better), however, supply grilles should not be any larger than 25% over the recommended sizes. A supply grille that is too large will not properly disperse the air into the room causing hot spots. In either case the grilles must NOT be any smaller than the minimums listed. Small grilles cause decreases in system performance, evaporator coil icing or (in the heating mode) unit shut down due to high head pressures.

Minimum Grille and Flex Duct Sizes			
Unit Capacity BTU/H	**Supply Grille in^2 / cm^2**	**Return Grille in^2 / cm^2**	**Minimum Duct Diameter, in/mm**
5,000	32 / 206	64 / 412	4" / 100mm
7,000	40 / 258	72 / 464	5" / 125mm
10,000	48 / 309	100 / 645	5" / 125mm
12,000	60 / 387	120 / 774	6" / 150mm
16,000	72 / 464	144 / 929	6" / 150mm
24,000	120 / 774	200 / 1290	7" / 175mm

It Is Very Important that there is adequate space for air to return to the self contained unit. While the evaporator of the self contained unit does not have to be directly behind the return air grille there must be an air path of the same area between the return air grille and the self contained unit. Never mount the front of the unit any closer than two inches from a bulkhead as this will restrict the air flow into the evaporator coil.

A Return Air Filter must be in place in the return air grille. This will prevent dirt and lint from being drawn into the evaporator coil, reducing performance. The most common type of filter material is an expanded aluminum type. This is the type used on all return air grilles supplied by Aqua-Air® that have return air filters. These filters should be checked on a monthly basis, during normal usage, and cleaned as necessary.

Seawater Hoses are connected from the seawater pump to the self contained unit and going to the seawater overboard fitting. The hose should be (at a minimum) 5/8" ID, single braid hose. Insert the hoses on the seawater condenser tubes a minimum of 1-1/2" and double clamp in place with a stainless steel hose clamp. Proper hose and clamps are available in the correct lengths and quantities for complete installations in kit form from Aqua-Air®. (See 'Seawater Kits in the PRODUCT OVERVIEW section of this manual)

The Thermostat / Controller is the single control and information center for the *mini-kool* self contained system. There are two basic types available; electronic and mechanical. The electronic control utilizes a PC board that is factory mounted in the electric box on the *mini-kool* unit. A 15' display cable is pre-installed and normally, the only installation requirement is the routing of the cable to the location where the digital display head will be mounted and plugged in to the cable. The mechanical control (two or three knob) requires routing of a cable and a temperature sensing bulb that are both connected at the self contained unit. Following is a description of the installation of both types.
Note: Templates for mounting controls are located in the back of this book.

TW2 Digital Controller with Display Panel TW2-01(B/W) for STR, STS models:

Because the temperature sensor is built into this display panel, consideration must be given to its mounting location. This sensor will work properly when the display panel is installed in a location that is not in direct sun light or near any other heat source. The panel should be located on a cabin wall, slightly above the mid-height level of the cabin, in a place where freely circulating air will reach it, but not in the supply air stream. Pick spots where it will most accurately sense the cabins average temperature. If this guideline cannot be followed for mounting the TW2-01(B/W) display panel, the remote air sensor option must be used. (See next section for explanation) The display panel should be mounted over a suitably sized hole (see templates in the back of this manual) using the double sided tape provided and/or screws (clean mounting area with Isopropyl alcohol prior to attaching with adhesive strips). A 15' display cable is pre-installed on the self contained unit (longer cables are available from Aqua-Air®). Plug the phone type plug into the jack on the back of the display panel.

TW2 Digital Controller with TW2-01 Display Panel for STR, STS models:

The TW2-01 Designer series display panel works in conjunction with an auxiliary temperature sensor (part # TW2-SENSOR-07) that plugs into the PC board that is mounted in the electric box on the *mini-kool* self contained unit. Access the PC board by removing the retaining screw from the top of the electric box and pull the cover up vertically. Route the sensor cable through one of the spare wire ports in the cover, locate the phone type jack marked **ALT. AIR** on the PC board and plug the sensor in. Because the sensor is mounted in the return air stream, the TW2-SENSOR-07, with its 7' cable will generally be appropriate. Longer sensors are available if necessary. The sensor end is mounted on the self contained unit at the front of the evaporator with the supplied clamp and screw. Care must be taken to insure that the metal part of the sensor is not in direct contact with the metal parts of the self contained unit. The sensor should not be mounted on a surface that would be warmer than the surrounding air (i.e. an engine room bulkhead or hull side). The TW2-01 display panel should be mounted over a suitably sized hole (see templates in the back of this manual) using the double sided tape provided and/or screws (clean mounting area with isopropyl alcohol first). A 15' display cable is pre-installed on the self contained unit (longer cables are available from Aqua-Air®). Plug the phone type plug into the jack on the back of the display panel.

3 Knob Mechanical Controls AQS1-Z and AQS3-Z for SMR, SMS models:

This electro-mechanical thermostatic switch assembly is the central distribution point for the self contained units electric power. The control panel should be mounted over a suitably sized hole (see templates in the back of the manual) using four screws. The plastic cover for the rear of the control must be installed to prevent someone from accidentally touching the exposed electrical connections. The plug end of the wire harness should now be connected to the plug on the self contained unit. Verify that the two plugs are solidly connected. A loose plug connection can cause the unit to malfunction.

The copper temperature sensing bulb must be mounted in the return air flow to the self contained unit. There are two plastic clips on the face of the self contained unit evaporator that are specifically for mounting this sensor. The sensing bulb must never be mounted with the bulb in direct contact with the self contained unit. The bulb should not be mounted on a surface that would be warmer than the surrounding air (i.e. an engine room bulkhead or the hull side). *Note: do not kink or crimp the copper sensing bulb line.*

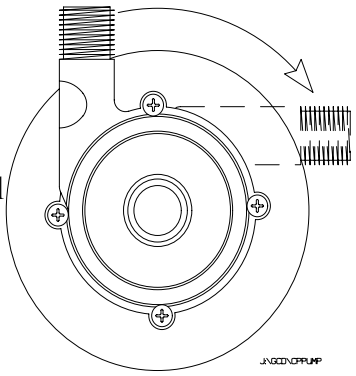
2 Knob Mechanical Control AQS1-BP for MC-05 only

The installation procedure is the same as for the AQS1-Z and AQS3-Z

Seawater Pumps supplied by Aqua-Air® are all centrifugal, non-self priming pumps. They must be installed in the described manor to insure proper trouble free operation. The pump must be mounted securely at a point in the hull that is beneath the waterline of the boat under ALL conditions (at rest, under way or in a heavy sea). The position of the pump should be as close as possible to the centerline of the boat, no further forward than the front of the engine compartment and no further aft than the propellor stuffing boxes or aft of the engine compartment bulkhead. The pump should always be mounted in a horizontal position and never on it's head or end (see figure 5).

Figure 5

Seawater Pumps can be mounted in any horizontal position (within the range shown at right) and will still be self-purging.



To make the system self purging there must be a steady uphill run from the seawater inlet to the seawater strainer through the pump up to the self contained unit condenser and then downhill to the overboard (see figure 6). This will allow any air that enters the seawater inlet to bleed off naturally through the seawater system.

Connect the pump wire to the self contained unit according to the applicable wiring diagram in the back of this manual. The ground wire must be connected to the green ground lug.

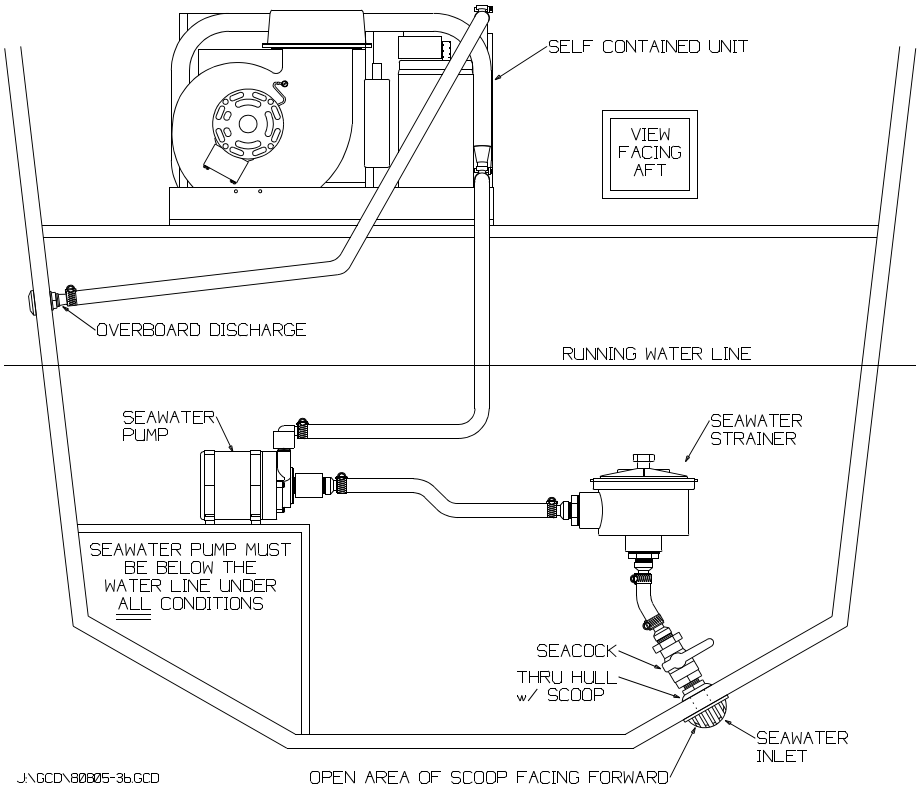


Figure 6 - Typical Seawater Plumbing Circuit

On a system with more than one self contained unit connected to a single seawater pump, the pump will be wired to the pump relay and connected according to the applicable wiring diagram.

The seawater pumps CANNOT be run without a supply of water. If they are run dry, internal damage will be caused, voiding the pumps warranty.

Electrical Connections on all *mini-kool* units, are made on the terminal strip located inside the electric box. **Turn off a/c power supply circuit breaker before opening the electric box.** To access the terminal strip, remove the screw from the top of the electric box and pull the box cover up and clear of the electric box. The terminal strip is labeled for proper connection of the electric supply, ground wires and pump circuits. Make connections according to the appropriate wiring diagram included in this book.

The correct size circuit breaker should be used to protect the system, and the correct size wire should be used to supply power to the *mini-kool* unit and the seawater pump (see table 3). If two or more self contained units use the same seawater pump, the pump wires will be connected to a pump relay. Power to the pump relay will require a separate breaker. All connections should be made with ring or fork terminals. Field wiring must comply with ABYC electrical Codes. (AMERICAN BOAT AND YACHT COUNCIL - 410-956-1050)

Recommended Wire and Circuit Breaker Sizes			
Unit Capacity BTU/H	**Voltage**	**Wire Size AWG**	**Circuit Breaker Rating, Amps**
5,000	115	14	10
7,000	115	14	15
10,000	115	12	20
12,000	115	12	20
16,000	115	10	30
7,000	230	14	10
10,000	230	12	15
12,000	230	12	15
16,000	230	12	20
24,000	230	12	20

Table 3

All self contained units must be properly grounded and connected to the ships bonding system. All pumps, metallic valves and fittings in the seawater circuit that are isolated from the unit by PVC or rubber hoses must be individually bonded to the vessels bonding system. Proper grounding and bonding will help eliminate the possibility of corrosion due to stray current or voltage. **Failure to properly ground and bond the system will void the warranty!**

3 PHASE NOTICE : It is important to insure that wiring and phase sequencing of a three phase power source is correct. Marine wiring standards call for power source phases L1, L2, and L3 to be color coded BLACK, WHITE and RED, respectively. These must be connected to the unit with the proper sequence or the unit will not operate properly. If the wiring sequence is incorrect, the unit's compressor, in the case of a scroll type, and pump if applicable, will run in the reverse direction and generate a significantly increased noise level.

SYSTEM START UP

Before starting the system for the first time, the following check list should be verified:

- T **The unit is not mounted in the engine room or bilge areas, and is sealed away from exhaust or fumes!**
- T Proper spacing is allowed around the unit.
- T The self contained unit is securely fastened in place with provided hold down clips.
- T Condensate drain outlets are properly installed and drain lines are routed down hill to a sealed sump (not the bilge).
- T The blower housing is secured if it has been rotated from the factory location.
- T The supply and return grilles meet the minimum area requirements.
- T There is a clean return air filter installed.
- T The insulated flex duct is installed with a minimum of bends and without any kinks that would restrict the air flow.
- T All electrical covers on the self contained unit, control and pump relay are in place.
- T The thermostat temperature sensing bulb or sensor is in the return air flow but not touching the evaporator coil or housing.
- T All wire harnesses or phone wires connecting the thermostat or display head are properly connected to the unit.
- T The electrical power wire is correctly connected to the self contained unit. CAUTION: MAKE SURE THAT A PROPERLY SIZED TIME DELAY TRIP CIRCUIT BREAKER IS USED IN THE CIRCUIT BREAKER PANEL.
- T Plug in connections for mechanical controls are properly connected.
- T The self contained unit, pump, relay (if used) and all metal parts in the seawater system are bonded.
- T The pump and/or pump relay wires are correctly connected to the self contained unit.
- T The seawater system is piped in the recommended manner so as to be self purging of air.
- T The pump is mounted well below the running waterline of the boat.
- T There should be a properly sized seawater strainer between the seawater inlet and the pump.
- T There should be a shut off valve (seacock) located between the seawater inlet and the seawater strainer.
- T The seawater inlet is a scoop type with the opening portion of the scoop facing forward.
- T There should be a separate overboard fitting for each self contained unit. It should be mounted no more than 2" above the waterline .
- T The seawater inlet should be no further than 6" from the centerline of the boat.

When Starting the System, the following steps should be followed:

1. Verify that the controls are in the OFF position or mode.
2. Open the seacock on the seawater inlet
3. Verify that the seawater strainer is clean and unobstructed
4. Turn on the circuit breaker(s) for the A/C unit, and the pump (if separate circuit breaker is used for the pump).

Continue the start-up according to the following applicable procedure:

TW2 DIGITAL CONTROL UNITS:

5. Press the POWER button on the display face. The LED will now indicate the current cabin temperature. This will start the fan motor and seawater pump and compressor*****. Look over the side of the boat and verify that seawater is flowing from the overboard outlet. (*If it does not after 15 seconds, press the POWER button to turn the unit off. Now find out why there is no seawater flow*). *******if the compressor does not come on, it will when you change the set point, step 6, below)*
6. Press and release the MODE button untill the desired operation mode is reached (AUTOmatic operation, COOLing only, HEATing only or MOISTURE CONTROL mode).
7. View the current thermostat set point by momentarily pressing either the • (increase temperature) or – (decrease temperature) keys. To change the set point, continue to press the • or – key until the desired set point is reached. (*The compressor will run when the cabin temperature is above the set point in the COOL mode and below the cabin temperature in the HEAT modes*).
8. Fan speed operation initially is in the AUTO mode. This means that the fan speed will be automatically selected based on how close the cabin temperature is to the set point. To change the fan speed setting, press the FAN key until the desired fan speed is achieved. Continuing to hold the FAN key will scroll through the six fan speeds and then return to the AUTO mode.
   For further operating information on the TW2 Control, please refer to the TW2 Control Operations section of this manual.

   Note: Do not turn the unit off and on rapidly. Allow at least 30 seconds for refrigerant pressure to equalize before restarting the unit.

KNOB CONTROL UNITS:

4. Turn the thermostat to the desired setting (either cooling or Heating).
5. Set the Fan speed control to HIGH. (except on 2 knob control with no fan speed)
6. Turn the OFF-FAN-RUN switch to the FAN position. This will start the fan motor and seawater pump. Look over the side of the boat and verify that the seawater is coming out of the overboard outlet. (*If it does not after 15 seconds, turn the OFF-FAN-RUN switch in the off position and find out why there is no seawater flow).*
7. Turn the OFF-FAN-RUN switch to the RUN position. The compressor will now start and begin cooling or heating.
8. To set the thermostat to maintain a certain temperature, turn the thermostat toward the center position until a single “click” is heard. The thermostat is now set to maintain the current cabin temperature. To change the cabin temperature by a few degrees, rotate the knob about 1/8" at a time and then wait 15 minutes for the cabin temperature to adjust.
9. Set the fan speed to the desired setting. On the heating cycle, run the fan on low speed for about 15 minutes and then increase to medium speed. This will allow the unit to build up temperature. In the cooling cycle the fan can be run at any speed. In either mode unit capacity decreases as fan speed decreases.

   Note: Do not turn the unit off and on rapidly. Allow at least 30 seconds for refrigerant pressure to equalize before restarting the unit.

TW2 CONTROL OPERATIONS

OPERATOR CONTROLS AND DISPLAY PANEL:

POWER BUTTON - The power button is used to toggle between the **On** and **Off** modes. Press the power button once to toggle the unit to the **On** mode. Press the power button again to toggle to the **Off** mode.

FAN SPEED BUTTON - Press and release the **fan speed button** to advance from auto fan to manual fan. Press and release the fan speed button to advance the manual fan speeds, 1 through 6. Press and release again to return to the automatic fan mode. The selected fan mode is indicated by the auto and manual fan LED's.

UP BUTTON - Momentarily press the **up button** and the set point will appear in the temperature display. Press and release the up button to increase the set point one degree. The set point Is increased by one degree each time the up button is pressed and released. The highest set point allowed is 85/ F. The up button is also used to increase program values in the program mode.

DOWN BUTTON - Momentarily press and release the **down button** to display the set point. Press and release the down button to decrease the set point. The set point is decreased one degree each time the down button is pressed and released. The lowest set point allowed is 55/ F. The down button is also used to reduce program values in the program mode.

MODE BUTTON - The mode button is used to select one of the four operating modes. Press and release the mode button and the **TW2** will advance to the next mode. Continue to press and release the Mode button until the desired operating mode is reached. The mode selected is indicated by the Mode LED, i.e., Cool, Heat, Automatic or Moisture Mode.

TEMP SELECT BUTTON - Press and release the Temp Mode Button to view inside air temperature, outside air temperature (optional) or the set point. The appropriate LED, Inside, Outside or Set Point will be lit indicating which temperature is being displayed. If no outside air sensor is installed three (3) dashes will appear in the Three Digit Display.

THREE DIGIT SEVEN SEGMENT DISPLAY - The inside air temperature is displayed in the window whenever the control is turned on. The display also indicates program information, fault codes and outside air temperature when the optional outside air sensor is installed. The display momentarily indicates the set point when the up or down button is pressed. When the control resumes operation after a power interruption all the display LEDs will turn on for one second. This is a normal operating condition and is referred to as "Power On Reset".

HEAT MODE LED - The heat mode LED will be lit when the Heat Mode has been selected.

COOL MODE LED - The cool mode LED will be lit when the Cooling Mode has been selected.

AUTO LED - The auto LED is lit when the automatic heating or cooling mode has been selected. The control will automatically switch to heating or cooling when this mode is selected.

MOISTURE CONTROL LED - The moisture mode LED is lit when the Moisture Control has been selected. This mode is used to control humidity during periods when the vessel is unoccupied.

MANUAL FAN LED - The manual fan LED will be lit when one of six manual fan speeds has been selected.

AUTO FAN LED - The auto fan LED is illuminated when automatic fan speed operation has been selected.

FAN SPEED BAR GRAPH - There are six (6) individual fan speed LED's in the Fan Speed Bar Graph. Each LED represents one (1) fan speed. Low fan speed (1) is indicated by illuminating the first LED. High fan speed is indicated by illuminating all six (6) LED's. Any of the six (6) fan speeds available are displayed by illuminating the appropriate LED's.

INSIDE LED - The inside LED is lit when the inside air temperature is being displayed.

OUTSIDE LED - The outside LED is turned on when the outside temperature is displayed (*Optional outside air sensor is required. Sensor is plugged into the TW2 circuit board*.)

SET POINT LED - The set point LED is turned on when the set point is displayed.

COMPRESSOR LED - The compressor LED, located at the bottom right hand corner of the window, is turned on when the compressor is running

DUAL BUTTON / SPECIAL BUTTON FUNCTIONS:

Up & Down Buttons....Press the Up and Down buttons together and the outside air temperature will be displayed, provided the OPTIONAL OUTSIDE AIR TEMPERATURE SENSOR has been installed. No programming is required.

Press the UP & Down Buttons simultaneously, while in the program mode, to set new custom programming defaults.

Power and Down Buttons.... Simultaneously press the power and down buttons while viewing the Service Fault History Log clears the Fault History Log.

Service History Log... View the service history log by pressing and holding the Mode Button while turning on the AC power. Exit the service history log by pressing the power button once. Clear the service history log by simultaneously pressing the power and down buttons.

Self Test Mode... Press and hold the power button while AC power is applied to enter the self test mode, The self test is used to diagnose problems and test the air conditioning system.

View Hour Meter... To view the compressor hour meter, press and hold the down button while applying AC power. Maximum recorded time is 10,000 hours. The hour meter stops at maximum (10,000 hrs) and can only be reset by Aqua-Air Manufacturing.

MODES OF OPERATION:

Off Mode - When the **TW2** is in the **Off** mode, all control outputs are turned off. Program parameters and user settings are saved in nonvolatile memory. The program mode can only be accessed from the **Off** mode.

On Mode - When the control is in the **On** mode, power will be supplied to the appropriate control outputs and the display will indicate the current state of operation. The operating and program parameters resume based on those stored the last time the unit was operating.

Cool Only Mode - When "**COOL**" LED is on, only the cooling systems are selected and operated as required. When the temperature drops below the set point, the system will not automatically switch to the heating mode.

Heating Only Mode - When the "**HEAT**" LED is on, only the heating systems are selected and operated as required. Should the temperature rise above the set point, the system will not automatically switch to the cooling mode.

Automatic Mode - When the "**AUTO**" LED is on, both heating and cooling are supplied as required. The **HEAT** and **COOL** LED's will be lit according to the mode required.
Note: Temperature in a given mode will be maintained to within two degrees Fahrenheit (2/F) of the set point temperature, however, a four degree difference is required to allow the control to change modes. Once in a new mode, the temperature will remain within two degrees Fahrenheit (2/F) of the set point.

Moisture Mode - While in the "**On**" mode, press the **MODE** Button until the Moisture Mode LED is illuminated. Every four (4) hours, the fan is started and air circulated for thirty (30) minutes. During this time the air temperature is sampled and entered into memory. The cooling cycle is started and continues until the temperature is lowered 2/F. The system is allowed maximum of one hour running time to reach the desired temperature. Four (4) hours after the temperature is satisfied or the one hour timer runs out, the cycle is repeated. During the humidity cycle the compressor LED is lit while the compressor is turned on and the system is cooling.

Automatic Fan Mode - TW2 has six automatic fan speeds available. Speed six is high, three is medium and one is low or the slowest speed. Automatic fan mode allows the **TW2** to determine the required fan speed based on room temperature. The closer the room temperature is to the set point, the slower the fan will run. This permits a balance between the most efficient temperature control and slower, quieter fan speeds. Automatic fan operation is the **factory default**, however, manual fan speed control is available.

Manual Fan Mode - Six (6) is the fastest and one (1) represents the slowest fan speed. Manual fan mode allows the user to select and maintain the desired fan speed manually. When a manual fan speed has been selected, the fan speed bar graph will indicate the speed selected by the number of LED's lit. Select speed 3, for Fan Speeds example, and the first 3 LEDs in the fan bar graph will turn on. Manual Fan Mode is sometimes preferred when room temperature is constantly changing due to varying heat loads.

PROGRAMMING:

About the Program Mode - The program mode is used to adjust the systems operating parameters to suit the particular needs of individual users. The program mode is also used to tailor the air-conditioning system for the most efficient operation within an installation. The program mode allows the system to operate as efficiently as possible under all conditions. The **TW2** is shipped with factory programmable default settings which are stored in permanent memory and can be recalled at any time.

Entering the Program Mode - The program mode can only be entered from the off mode. From the off mode, press in sequence: **TEMP SELECT** - **UP** - **DOWN - TEMP SELECT** buttons. The characters "**P**" then "**P1**" followed by the parameter setting, appear in the display. The **TW2** control is now in the program mode. *NOTE: The control will exit the program mode and return to the "**off**" mode if no programming is attempted for one (1) minute.*

Restoring Default Settings - IMPORTANT! The memorized default settings can be restored by entering the software ID program mode and setting P-16 to **"rest"**. Exit the program mode and the software version number appears in the display. The memorized default settings are restored and the **TW2** control returns to the **off** mode. The software version number is always displayed when you exit the program mode.

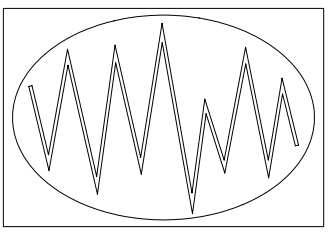
Moving in the Program Mode - Increment from one program parameter to the next by pressing the **Mode Button** while in the program mode. Press and release the **Mode Button** to advance to the desired parameter. Use the up and down buttons to change the program parameter values. The programmable parameters range from P-1 through P-16. The up and down buttons are used to select the data or set the desired limits for the parameter being programmed. This method is followed throughout the **program** mode, however, special instructions are included for individual functions as required.

Exiting the Program Mode - There are two methods to exit the **Program** mode. Press the power button and the **TW2** Control will return to the **Off** mode. Not pressing any buttons or attempting any program changes for sixty (60) seconds will allow the control to exit the **Program** mode to the **Off** mode. Any programming changes that were made while in the **Program** mode will be memorized and put into operation when the **Program** mode is exited and the control is returned to the **On** mode.

Software Identification - The software version of the control is identified for one (1) second prior to the exit from the program mode. The software identification number, i.e. "**A10**" will appear in the display for one second, then the control will return to the off mode. *Should there be any reason to contact Aqua-Air Manufacturing about the system or programming the TW2, be sure to have the software identification number available.*

Warning:

Severe electrical disturbances can sometimes upset the **TW2** operating sequences. Operator confusion related to program parameters can also cause what may seem to be operational problems. Whenever there is any doubt as to the proper operation of the controller, Factory Default Parameters should be re-initialized.



Programmable Parameters - There are eighteen (18) programmable parameter locations with their Factory Default Settings listed in this section. The table below indicates what these parameters are, along with the permitted values and the original Factory Default Settings.

Program Number	Description	Default	Range
P-1	High Fan Speed Limit (arbitrary units)	85	56 - 85
P-2	Low Fan Speed Limit (arbitrary units)	50	30 - 55
P-3	Compressor Staging Time Delay	15	5-135 seconds
P-4	Temperature Sensor Calibration	0	Ambient ± 10/F
P-5	Failsafe Modes and Mnemonic High Freon Pressure - - - HPF Low Freon Pressure - - - LPF Low AC line voltage - - - LAC	4 = 4 failures With 90 Second Re-start Delay Manual reset is required	Off 1= Continuous No Display 2= Continuous W/ Display 3 = 4 Failure Reset Required
P-6	Low AC Voltage Cut-Off	85 VAC (115V) 185 VAC (230V)	Off - 75 to 100 (115V Unit) Off - 175 to 200 (230V Unit)
P-7	De-Icing Cycle	0	0 = Off 1 - 3 Minutes
P-8	Pump Sentry ... Protects Pump and Compressor From Loss of Seawater	Off	Off On = Select 100/F to 150/F
P-9	Display Brightness Control	13 = Maximum	4 = Low 13 = Maximum
P-10	Display /F or /C	/F	/F = Fahrenheit Displayed /C = Celsius Displayed
P-11	Cycle Pump With Compressor or Continuous Pump Operation	OFF = Cycle with Compressor	OFF = Cycle with Comp. On = Continuous Operation
P-12	Reverse Fan Speeds in Heating Mode	rEF = Reversed	nor = Normal Fan Operation rEF = Reversed in Heating
P-13	Continuous Fan or Cycle Fan on Demand	con = Continuous Fan Operation	CYC = Cycle On Demand con = Continuous
P-14	Reverse Cycle Heating or Electric Heat Only Option Installed (cooling only units)	nor = Reverse Cycle Heat	nor = Reverse Cycle Heat ELE = Elect. Heat Installed
P-15	Fan Motor Type	SP = Shaded Pole	SP = Shaded Pole SC = Split Capacitor
P-16	Reset Memorized Programming Defaults	nor = Normal	nor = Normal rest = Reset Defaults

Should any programming problems or confusion occur, reset the memorized default settings by entering the program mode and setting P-16 to rest.

P-1: High Fan Limit: The upper fan speed limit can be tailored to suit various motors and operating conditions. The high fan limit is adjusted with the system installed and operational. The range of values are 56 through 85 and represent arbitrary units. Setting a higher number, results in a higher fan speed, setting lower numbers, lowers the high fan speed limit. Use the up and down buttons to select the desired high fan speed limit. The factory default setting is eighty-five (85).

P-2: Low Fan Limit: The low fan limit determines the lowest output allowed for the low fan speed. The range of values for the low fan speeds are 30 through 55, in arbitrary units. Use the up and down buttons to select the desired low fan speed limit. Setting a higher number, results in a higher fan speed, setting lower numbers, lowers the low fan speed limit. The factory default setting is 50. **IMPORTANT!** Once the high and low fan speed limits are set, the unit will automatically readjust the remaining fan speeds to produce six (6) equally spaced in both the automatic and manual fan speeds modes.

P-3: Compressor Staging Time Delay: The compressor staging delay is provided for installations where more than one system is being operated from the same power source. Setting the staging delays at different intervals allows only one compressor to start at a time. The units should be staged at least five (5) seconds apart. The minimum delay is five (5) seconds and the maximum is one hundred thirty-five (135) seconds. The factory default setting is 15 seconds.

P-4: Temperature Calibration: Use this feature to calibrate the air sensor within a range of ± ten (10) /F. Enter the program mode and the ambient temperature appears in the display. Use the up and down keys to select the desired offset. The temperature in the display will increase or decrease according to the offset programmed. The factory default setting is zero.

P-5: Fail-safe Level: The system can be configured for one of four fail-safe levels. Selecting **OFF** turns off all fail-safe protection and mnemonic display codes. Level one (1) shuts down the system, allows the system to restart after a 90 second delay and displays no failure code. Level two (2) shuts down the system allows continual restarts after the 90 second delay and displays the appropriate mnemonic failure code. Level three (3) operates the same as level two with the addition of a system lockout after four (4) consecutive failures. Lockout is cleared by switching off, then on with the power button.

P-6: Low AC Voltage Cut-Off: **TW2** can be programmed to protect the system against sustained low AC line voltage conditions. The compressor will be shut down and "LAC" flashed in the display if the line voltage goes below the programmed value for more than ten (10) minutes. Programmable values are 75 VAC to 100 VAC for 120 volt units and 175 VAC to 200 VAC for 220 volt systems. The factory default is 85 VAC for 120 volt units and 185 VAC for 220 volt systems. NOTE: Low Voltage Protection can be turned off by programming Off instead of selecting a voltage value.

P-7: De-Icing Cycle: The **TW2** is equipped with a De-Icing Cycle to prevent ice build up on the evaporator coil during extended periods of cooling operation. Installation variables such as grille sizes, length of ducting, insulation R factors and ambient temperatures determine the cooling run time required to achieve set point. Customer usage may substantially increase run times by operating the system with the hatches and doors open. Programming unrealistic set point [55' F] and leaving the salon door open will usually cause the evaporator to ice up on warm muggy days.

De-Icing is accomplished by switching the reversing valve into the Heat Mode while the system is cooling. The valve will remain energized for the programmed cycle time. The cycle is programmable from OFF through a period of 3 minutes. The factory default setting is Off.

P-8: Optional Pump Sentry: The **TW2** can be equipped with an optional temperature sensor that is used to monitor the condenser coil temperature. The sensor is plugged into the outside air sensor jack and parameter P-8 programmed for a temperature between 100/ and 150/ F depending on sea water temperature and the system type. When the coil temperature rises above the programmed value the pump and compressor are shut down and “PPP” is flashed in the display. The factory default is Off, no pump sentry installed.

P-9: Display Brightness Control: The display brightness can be adjusted to suit ambient cabin lighting conditions. The allowed settings are four (4) to thirteen (13), with four (4) being the dimmest and thirteen (13) the brightest. Typically a dark cabin will require a setting of four or five. A very bright cabin will require a setting of twelve or thirteen. The factory default setting is thirteen (13).

P-10: Fahrenheit or Celsius Selection: The unit can be programmed to display either Fahrenheit or Celsius. Programming /F selects degrees Fahrenheit and programming /C displays degrees Celsius. The factory default setting is /F, Fahrenheit. When degrees Celsius (/C) is selected the readings are displayed in tenths, i.e. 22.2/.

P-11: Cycle Pump With Compressor: To increase pump life and conserve electricity the pump can be programmed to cycle on and off with the compressor. The pump can also be programmed to operate continuously whenever the system is on. To program the pump for continuous operation turn P-11 On. The factory default is **Off**, which cycles the pump with the compressor.

P-12: Reverse Automatic Fan Speeds During Heating: The automatic fan speeds can be reversed during the heating mode to improve personal comfort in cooler climates. The fan speed is decreased as the temperature spread increases. The fan will speed up as the set point is approached. Lowering the fan speed when the cabin is cold raises the supply air temperature. The fan switches to low speed when the set point is satisfied and the water valve cycles off. The fan can be programmed to operate the same as in cooling by programming P12 **nor** which represents normal fan operation during the heating cycle. The factory default is **rEF**, which reverses the automatic fan speeds during heating.

P-13: Cycle Fan with Compressor: The fan can be programmed to run continuously when the system is on or can be allowed to cycle with the compressor. When cycled with the compressor, the fan will operate only when heating or cooling is called for. To cycle the fan with the compressor select **CYC** which stands for cycle the fan with the compressor. To operate the fan continuously select **con** which represents continuous fan operation. The factory default is [con] continuous fan operation when the system is on.

P-14: Reverse Cycle or Electric Heat: Units not equipped with reverse cycle heat may have an electric heater added. Electric heat requires the compressor be turned off when heating is called for. The reversing valve output is used to control the optional electric heating element contactor. The valve output relay can only carry 6 amps, therefore, a heavy duty contactor must be installed to carry the heater current. Program parameter **ELE** for the electric heat option. The factory default is **nor** which is normal reverse cycle heating.

P-15: Fan Motor Selection: There are two basic fan motor types, shaded pole (SP) and split capacitor (SC). Each motor reacts differently to speed control and each motor requires different timing for optimum fan speed variation. The default setting is "**SP**" which selects the shaded pole motor type, however, "**SC**" should be selected if a split capacitor type of fan motor is used. **Aqua-Air Manufacturing** supplies shaded pole type fan motors, therefore, the factory default selection is "**SP**".

P-16: Reset Memorized Defaults: The default programming parameters can be reset by entering the program mode and selecting "**rest**". This will restore the programmable parameters to the values selected when the system was shipped. The program parameters listed on page 20 may be altered by **Aqua-Air Manufacturing**, the installing

dealer or the end user. Once new defaults are entered (see page 17, dual button functions) and memorized the new defaults will be reset. The original factory programmable parameters as listed on page 20 will have to be restored manually.

Why Memorize New Defaults? - Once the desired programming changes have been made and the system tests satisfactorily, your work can be saved as the new factory defaults. Your new defaults are initiated by simultaneously pressing and releasing the up and down buttons prior to exiting the program mode. New defaults can be initialized at any time by entering the program mode and following the above instructions. Once new defaults have been initialized the control will revert back to the new defaults whenever factory defaults are restored as described on page 19 of this manual.

FAULT HANDLING CODES:

Fault Display - When a fault occurs the appropriate mnemonic code is flashed in the display. The flashing mnemonic can be removed from the display by pressing and releasing the **power button** to reset the control. Resetting the control does not solve the problem that caused the fault! Refer to the trouble shooting guide in this manual to determine the cause of the fault.
HPF...Indicates high Freon pressure. Fifteen (15) second Delay... Ignored in Heat Mode.
LPF...Indicates low Freon pressure. Ten (10) minute charge time delay.
LAC...Indicates low AC line power
AAA...Indicates failed air sensor. Unit will not run until repaired.
PPP...Indicates the sea water pump has failed.

TW2 UTILITIES:

Self-Test Mode- The **TW2** software contains a self-test program to facilitate factory testing of the entire air-conditioning system. Once the self-test mode is activated, the test cycle will continue until the AC power is interrupted or the on/off button is pressed once which returns the system to the off mode.

Activate the self-test by pressing and holding the on/off button while turning on the AC power. Be sure to continue to hold the button until the power on reset is completed. The **TW2** is now in the self-test mode.

Once activated the self-test software will continuously execute the following procedure:

1- Turn on in the heat mode and supply heating for ten (10) minutes.
2 - Stop heating and run the fan only for five (5) minutes.
3 - Switch to cooling and continue cooling for ten (10) minutes.
4 - Stop cooling and run the fan only for five (5) minutes.
5 - Return to step one (1) and continue until interrupted.

The test mode will continue until the power is interrupted or the test is halted by pressing the on/ off button once.

Hour Meter - Total compressor cycle time is saved in EEPROM every 6 minutes of continuous compressor running time. Cycles less than 6 minutes will be discarded to conserve memory and allow the most flexible hour-meter possible.

To view the hour meter turn off the power at the AC breaker and hold the down button depressed. While depressing the down button, restore AC power. After the Power-On reset routine is complete, the following will appear in the display:

1. The hour meter mnemonic [Hr] is displayed for one (1) second.
2. The display blanks out for one second and then displays the THOUSANDS units for three (3) seconds.
3. The display blanks out for one (1) second and then displays the hours for three (3) seconds.
4. The unit returns to the last operating state before power was removed.

Maximum recorded time is 10,000 hours. The hour meter stops at maximum (10,000 hrs) and can only be reset by Aqua Air Manufacturing.

Service History - **TW2** will record and remember the last eight (8) service problems or service faults detected. Each time a fault is detected, a one hour timer is started. During that hour the same recurring fault will not be recorded. Should a different fault be detected during that hour, it will be entered into the service history log. The recorded events are:

1. High Freon Pressure
2. Low Freon Pressure
3. Air Sensor Fault
4. Low AC Voltage
5. Pump or Loss of Sea Water Fault

To view the service log turn off the AC power and depress the **Mode** Button. With the **Mode** Button depressed turn on the AC power. Once Power-On reset is completed, the display will flash the most recent mnemonic for the fault detected, followed by the event number. To view the other events detected press either the up or down buttons.

To exit the service history log press the power or the Mode Button or wait 30 seconds without pressing any buttons.

The service log can be cleared by simultaneously pressing the power and down buttons while you are viewing the service log mode.

Programming Notes:

MAINTENANCE

Regular Maintenance of your *mini-kool* unit will ensure a high level of efficiency and longevity. Follow these simple routine maintenance procedures:

- T The fan motors should be lubricated on a yearly basis with SAE 20 oil
- T The drain pans should be checked for proper drainage by pouring a quart of water into the pan. The water should drain within 30 seconds.
- T Clean all return air filters on a regular basis (monthly or sooner as need dictates).
- T Sealed seawater pumps require no maintenance. Larger air cooled pumps will need occasional oiling. See manufacturers labeling on the pump for instructions.
- T Clean the seawater strainer on a regular basis to insure that your pump receives an adequate supply of water. Check the seawater intake for obstructions. Periodically check the overboard discharge for a steady stream of water.

Winterizing the system is a process that ensures that no water is trapped in the unit or seawater system to eliminate the possibility of freezing. This can be accomplished by evacuating the water from the system and/or by flooding the system with a 50/50 non-polluting biodegradable anti-freeze/water solution. Any method that causes the anti-freeze solution to flow downward is the method of choice. Choose one of the following methods:

- ☐ Use pressurized air to force water from the intake through the overboard discharge.
- ☐ Use pressurized air injected at the overboard to force the water through the seawater intake.
- ☐ Use the seawater pump to pump the antifreeze solution through the system exiting through the overboard discharge.
- ☐ Pump the anti-freeze solution into the overboard discharge thru-hull fitting, through the system, exiting at the seawater intake.

Note: All discharged antifreeze solution should be collected and properly disposed of.

TROUBLESHOOTING GUIDELINES

PROBLEM	CHECK THIS	CORRECTION
Unit not starting	Circuit breaker is off	Turn on the A/C circuit breaker
	Control is not turned on	Follow Start-Up instructions
	Incorrect wiring at the terminal strip in the electric box	Check wiring diagram and make necessary changes
	Low input line voltage; TW2 display reads LAC	Check voltages from power source, wire size and connections
	Loose wiring connections	Check all wiring connections and make corrections as necessary
	Air sensor has failed; TW2 display reads AAA	Call local service technician or Tech Support at Aqua-Air 800-328-1043

PROBLEM	CHECK THIS	CORRECTION
Low air flow	Restrictions in the duct system	Clean return air filter. Remove obstruction in return air stream. Repair any crushed or kinked areas in the ducts.
	Evaporator coil is iced	See below
Evaporator coil is iced	Thermostat set point is too low	Raise the set point on the thermostat
	Low air flow	Clean return air filter. Remove obstruction in return air stream. Repair any crushed or kinked areas in the ducts.
	Supply air too close to return	Change supply air so it is not blowing into return air stream
	Humidity is too high	Close cabin doors and hatches
	Seawater temperature is below 40	Discontinue use to avoid damage to the unit.
	TW2 low fan speed parameter	Reset program P-2
	None of the above or to defrost the coil	Activate the P-7 de-icing cycle or switch from cooling to heating mode to defrost the coil.
Systems runs continuously	Temperature set point is set too low (cooling) or too high (heating)	Adjust set point on the control.
	Cabin doors and hatches	Close cabin doors and hatches
	Seawater temperature is too high for heating or too low for cooling.	Unit will effectively cool and heat in seawater temperatures between 40 and 90 F
	Location of air sensor	Display head or temperature sensor may need to be relocated
Fan is not running	TW2 control programmed for fan to cycle on demand	Reset program P-13 to continuous fan operation
	3 Knob Control improperly set	Set OFF-START-RUN switch to START or RUN
	3 Knob Control fuse blown	Replace fuse on back of control
Fan runs Continuously	TW2 control programmed for continuous fan operation	Reset program P-13 to cycle fan on demand

PROBLEM	CHECK THIS	CORRECTION
Fan runs Continuously even though it's programmed to cycle	Triac on TW2 circuit board has failed	Call local service technician or Tech Support at Aqua-Air 800-328-1043
Fan is not running but compressor is	Fan motor or Triac on TW2 circuit board has failed	Call local service technician or Tech Support at Aqua-Air 800-328-1043
No cooling or heating	Temperature set point is above (cooling) or below (heating) ambient cabin temperature	Adjust set point on the control
	Check for a steady flow from the overboard discharge.	Remove obstruction at the seawater inlet. Clean the seawater strainer. Check for any kinks or crushed hose. Confirm pump is operating.
	Pump is air-locked	Remove hose from the pump outlet to purge air from system
	Low refrigerant gas	Call local service technician or Tech Support at Aqua-Air 800-328-1043
	TW2 control programmed for non-reverse cycle heat	Reset program P-14 to "nor"
	Seawater temperature is too high for cooling or too low for heating	Unit will effectively cool and heat in seawater temperatures between 40 and 90 F
	Evaporator coil is iced	See above
	High Pressure switch activated; TW2 display reads HPF	Follow instructions for obstructed water flow. Follow instructions for low air flow.
	Low Pressure switch activated, TW2 display reads LPF	Possible low refrigerant gas, low seawater temperatures or low return air temperatures. Try restarting after 15 minutes
	Compressor thermal overload is activated due to high pressure.	Compressor must cool down. Turn system off to cool down. (This may take up to 3 hours)
Unit switches to heat when in cooling mode	TW2 control de-icing cycle is activating due to coil icing	Verify coil icing and eliminate the cause. Otherwise reset program P-7 to "OFF"

PROBLEM	CHECK THIS	CORRECTION
TW2 display is not lit	8-pin display cable is unplugged, not making contact or is damaged	With power off, remove and inspect plugs. Inspect entire cable and replace if necessary

ï ï ï WARNING ï ï ï

Aqua-Air Manufacturing (a division of the James D. Nall Company, Inc.) hereafter referred to as the "Manufacturer" makes the following warnings in regard to the use of its products. Even though these warnings are comprehensive in nature, there are certain dangers that might arise which, at this time, are unforeseeable. A thorough understanding of the dangers outlined below will help as a guide for spotting other potentially dangerous situations. This understanding is very important in assuring your safety.

Electricity - Aqua-Air® products operate on voltages ranging from 24 to 480 volts of alternating current (A.C.) Power. Because of the danger involved with these voltages, all metal components (bases, cabinets, units) must be grounded in some manner to the ship's grounding system. Some of the relays, switches and thermostats used in the Aqua-Air® systems are not ignition protected. Because of this, the ventilation blower on a boat should be run for five minutes prior to and during the operation of any Aqua-Air® product or system. All electrical connections must be sealed or covered in such a way as to prevent contact by unauthorized personnel. Such contact could lead to permanent injury or death.

Electrolysis - Any electrical leakage of a component can cause electrolysis. This could lead to a deterioration of a thru-hull which could cause leakage of water into the boat which could result in sinking the boat. All Aqua-Air® products must be kept clean and dry. They should be periodically inspected for electrical leakage. If detected, the faulty component should either be repaired or replaced.

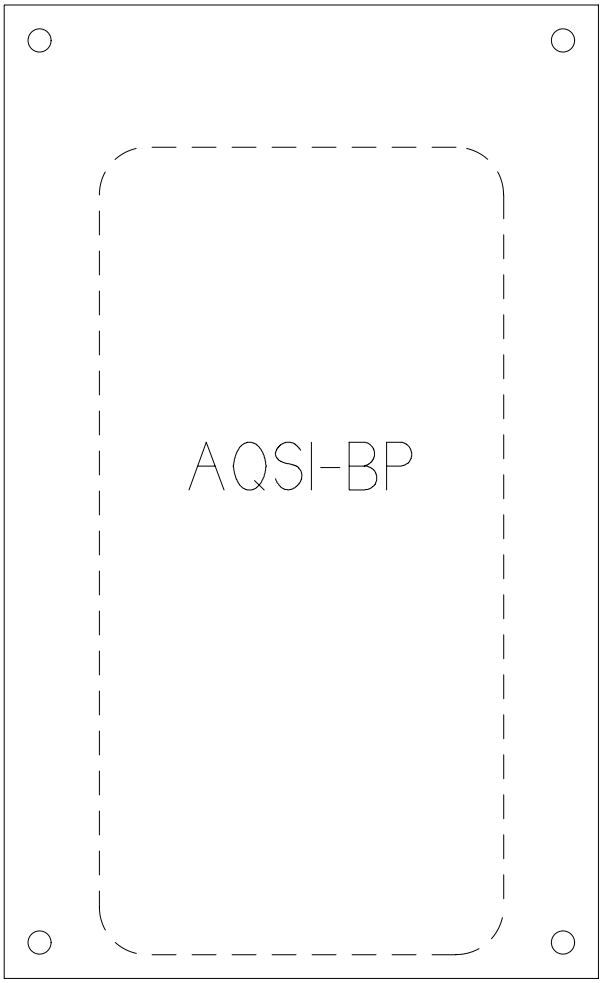
Refrigerant - All Aqua-Air® products utilize refrigerant 22 (monochlorodifluoromethane). This refrigerant is non-toxic and non-flammable. This refrigerant contains no oxygen and will therefore no support life. When burned this refrigerant deteriorates into potentially lethal gases. If a refrigerant leak is discovered, evacuate all personnel from the are and prohibit the use of any item using an open flame. Due to the high pressures involved in refrigeration systems, eye protection, gloves and long-sleeved clothes should be worn during servicing of a system. Extensive frost burns can occur to the eyes and skin if they come into contact with liquid refrigerant.

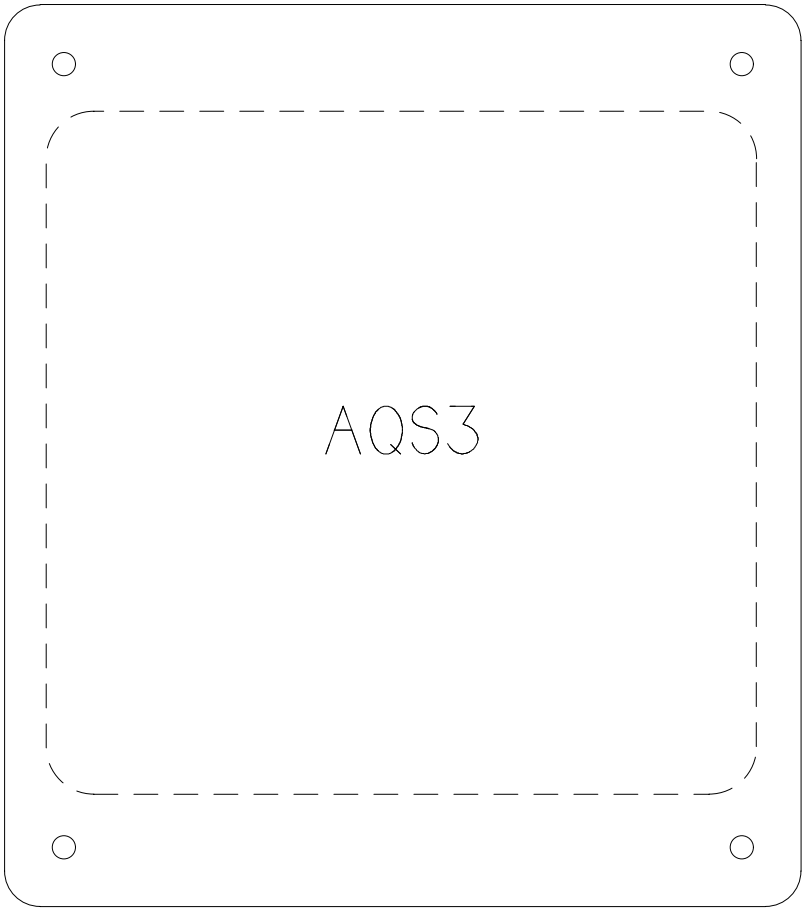
Ventilation - To either cool or heat air, Aqua-Air® systems move air through a heat exchanger by means of either a propeller fan or blower system. This process naturally causes a suction on one side of the unit and a pressurized area on the other. These heat exchangers or "cooling units" as they are referred to in our brochures must be installed so that this suction-pressure action does not (1) pressure an area to the extent of causing structural failure of the area which could cause injury and does not (2) cause a suction in an area where vapors from batteries, fuel or other operating equipment exist. If a cooling unit were installed in this way then these vapors could possibly be discharged into a living space where they could be hazardous. The best way to prevent the introduction of dangerous gases into a living space is to make sure all living spaces are carefully sealed from all other spaces. It is never advisable to completely seal an area without some sort of auxiliary ventilation in the event of lethal gas or fumes escaping from any source.

Condensate - All Aqua-Air® direct expansion cooling units and self contained units produce condensate when operated in the cooling mode. The self contained units and condensing units can produce condensate during operation in the heating mode. This water must be drained overboard. If allowed to drip on a wood, dry rot can form causing structural failure. If allowed to drip on electrical components, deterioration of the components can occur. When the cooling unit is in operation, a negative pressure is exerted on the condensate line. Always locate condensate outlets as far as possible from sources of fumes or dangerous gases. These fumes or gases could be drawn into the system due to this negative pressure resulting in a potentially hazardous situation.

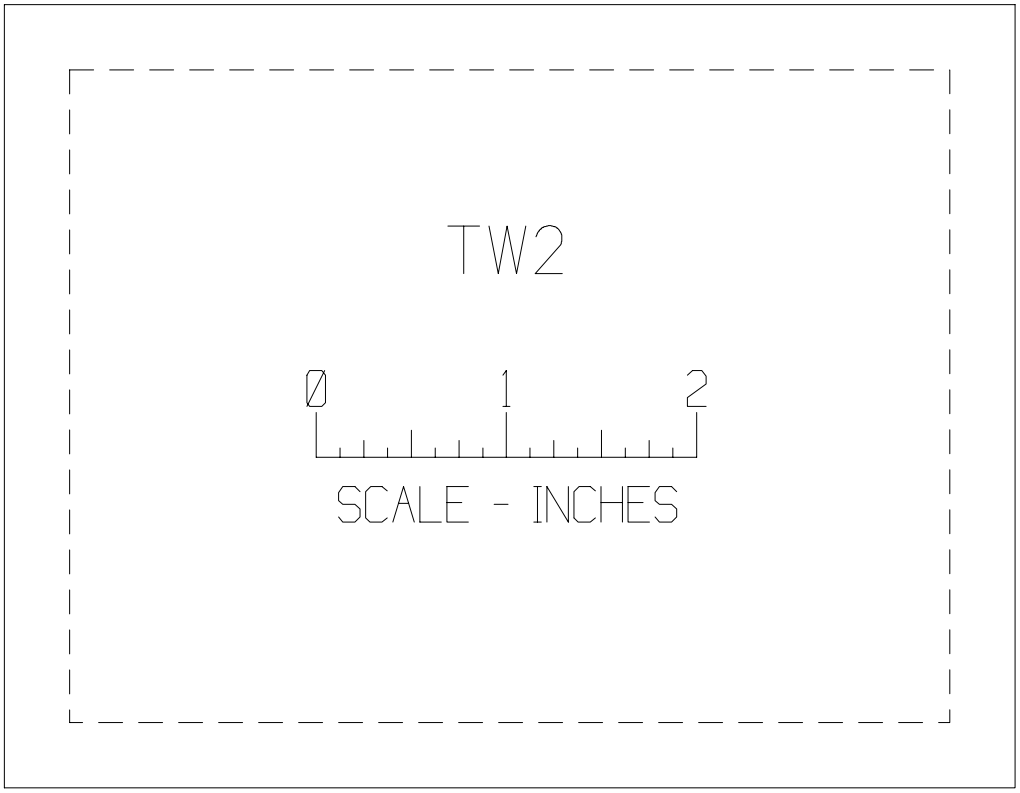
ï ï ï WARNING ï ï ï

Never sleep in an enclosed area in a boat when any equipment, which functions as a direct result of the combustion of a volatile fuel, is in operation (such as engines, generators, oil-fired heaters, etc.). At any time their exhaust system could fail leading to a build-up of dangerous gases within the enclosed area.

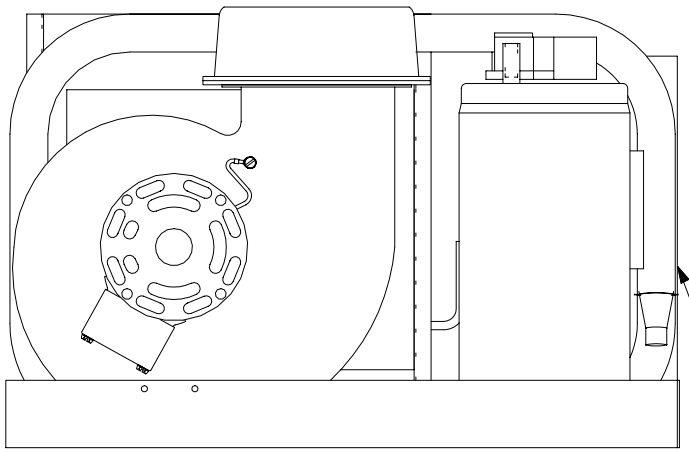




TEMPLATES
FOR
THERMOSTATS

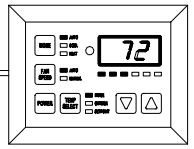


J:\GCD\TEMPLATE



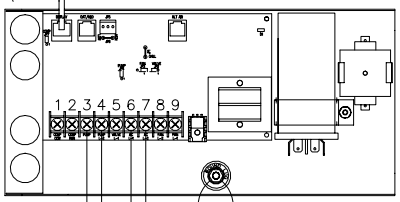
SELF CONTAINED UNIT
7-24,000 BTUH
115 or 230V

30' DISPLAY CABLE



TW2-01
DIGITAL
THERMOSTAT
DISPLAY HEAD

AIR SENSOR
IS FACTORY INSTALLED



WIRE COLORS

W	WHITE
BK	BLACK
G	GREEN

G

BK W

NOTE 1

NOTE 2

BK

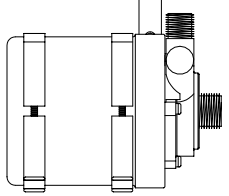
W

MAIN
POWER
FEED

SYSTEM VOLTAGE

	115v	230v
G	GROUND	GROUND
BK	LINE	LINE 1
W	NEUTRAL	LINE 2

CONNECT TO SHIP'S
CIRCUIT BREAKER PANEL
TO PROPERLY SIZED
CIRCUIT BREAKER



SEAWATER PUMP
SAME VOLTAGE AS
SELF CONTAINED UNIT

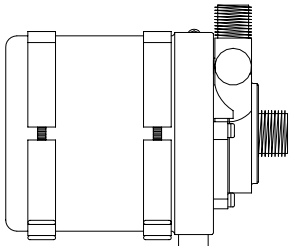
NOTE (1): WIRE FOR ALL AQUA-AIR 'CP' SERIES PUMPS SHOULD BE 16 GA MINIMUM
NOTE (2): WIRE SIZE SHOULD BE ACCORDING TO CHART IN SELF CONTAINED UNIT INSTALLATION MANUAL.
NOTE (3): ALL WIRING SHOULD BE DONE ACCORDING TO ABYC MANUAL SECTION E-8

AQUA-AIR MARINE AIR CONDITIONING SYSTEMS

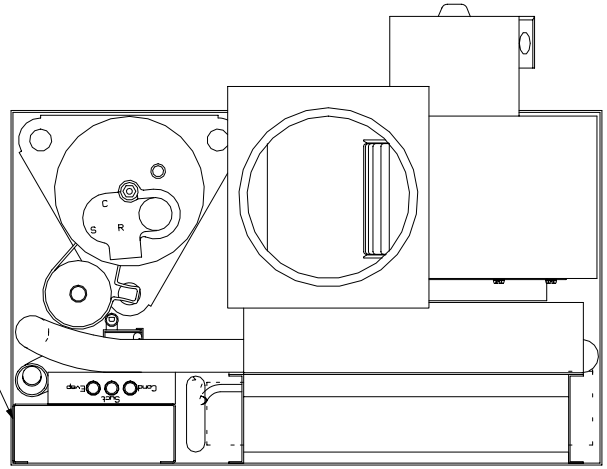
STR-07K TO 16K BTUH EXTERNAL WIRING CONNECTIONS w/ TW2-01 DISPLAY HEAD

DRAWING NUMBER	DRAWN BY	DATE
4010-03A	SB	04-05-01

SCALE	APPROVED BY	REVISION DATE	REV
NONE	DN		A



SEAWATER PUMP
SAME VOLTAGE
AS SYSTEM VOLTAGE



LOCATION OF
TERMINAL STRIP
INSIDE BOX

SELF CONTAINED UNIT
7-24,000 BTUH
115 or 230V

SYSTEM VOLTAGE

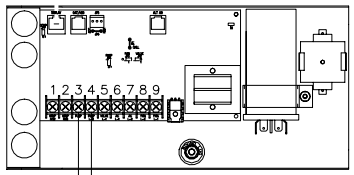
115v	230v	
GROUND	GROUND	G
LINE	LINE 1	BK
NEUTRAL	LINE 2	W

CONNECT TO SHIP'S
CIRCUIT BREAKER PANEL
TO PROPERLY SIZED
CIRCUIT BREAKER
FOR PUMP USED

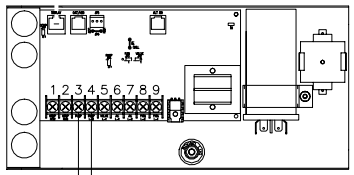
WIRE COLORS

W	WHITE
BK	BLACK
G	GREEN

SELF CONTAINED UNIT #1

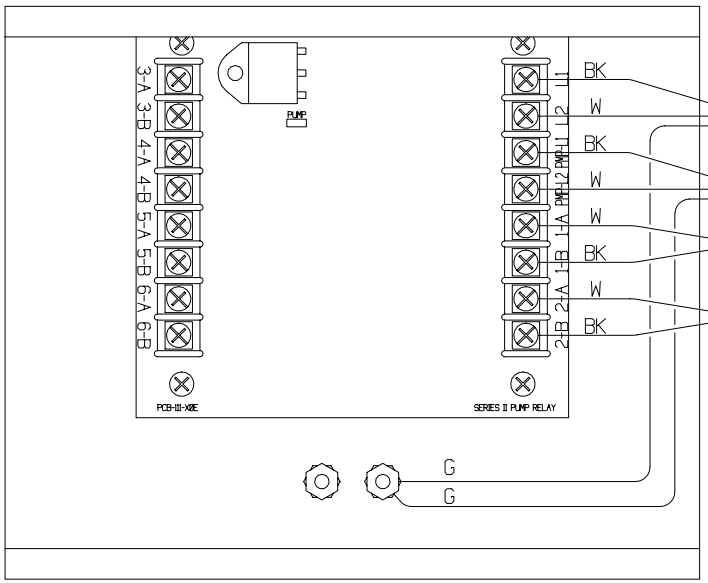


SELF CONTAINED UNIT #2



3 CON

3 CON



16/2

16/2

UP TO FOUR MORE SELF CONTAINED
UNITS CAN BE CONNECTED TO
THE AQP6R ON POSITIONS
3A/3B THRU 6A/6B
INPUTS TO 1A/1B THRU 6A/6B
CAN BE EITHER 115 or 230V

AQP6R PUMP RELAY

AQUA-AIR MARINE AIR CONDITIONING SYSTEMS

AQP6R w/2 or MORE SELF CONTAINED
UNITS STR-07K thru 16K BTUH

DRAWING NUMBER	4010-03C	DRAWN BY	SB	DATE	04-05-01
SCALE	NONE	APPROVED BY	DN	REVISION DATE	REV A

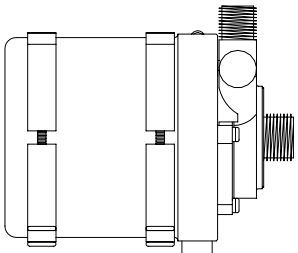
NOTE (1): WIRE FOR ALL AQUA-AIR 'CP' SERIES PUMPS SHOULD BE 16 GA MINIMUM
NOTE (2): WIRE SIZE SHOULD BE ACCORDING TO CHART IN SELF CONTAINED UNIT INSTALLATION MANUAL.
NOTE (3): ALL WIRING SHOULD BE DONE ACCORDING TO ABYC MANUAL SECTION E-8

AQUA-AIR MARINE AIR CONDITIONING SYSTEMS

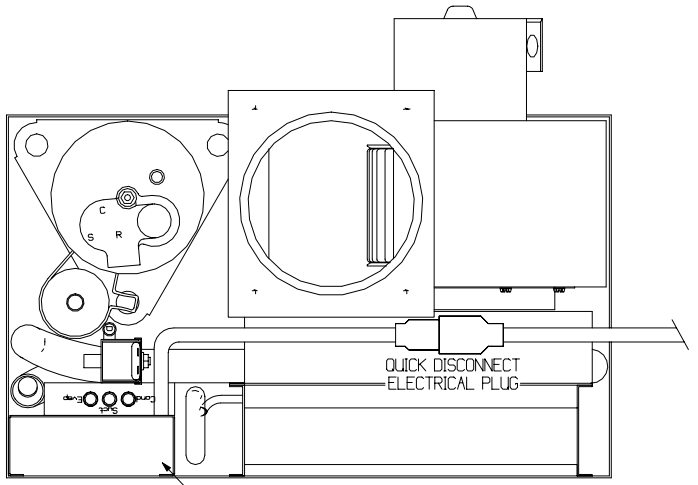
SMR-07K to 16K EXTERNAL WIRING CONNECTIONS w/ AQS3 SERIES THERMOSTAT

DRAWING NUMBER	DRAWN BY	DATE
4010-04A	SB	04-05-01

SCALE	APPROVED BY	REVISION DATE	REV
NONE			A



SEAWATER PUMP
SAME VOLTAGE
AS SYSTEM VOLTAGE



LOCATION OF TERMINAL
BLOCK ON EACH UNIT

SYSTEM VOLTAGE

115v	230v	
GROUND	GROUND	G
LINE	LINE 1	BK
NEUTRAL	LINE 2	W

CONNECT TO SHIP'S
CIRCUIT BREAKER PANEL
TO PROPERLY SIZED
CIRCUIT BREAKER
FOR PUMP USED

WIRE COLORS

W	WHITE
BK	BLACK
G	GREEN

3 CON

3 CON

SELF CONTAINED UNIT #1

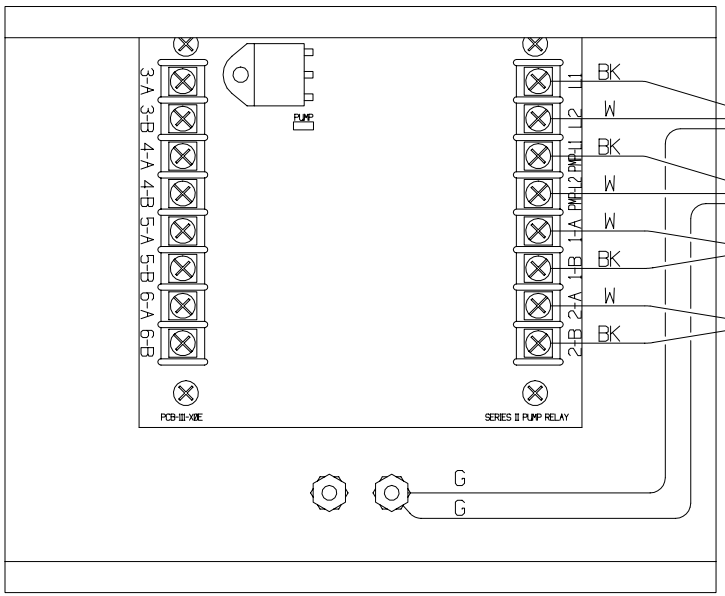
PUMP LINE

W BK

SELF CONTAINED UNIT #2

PUMP LINE

W BK



BK
W
BK
W
W
BK
W
BK

16/2

16/2

G
G

AQP6R PUMP RELAY

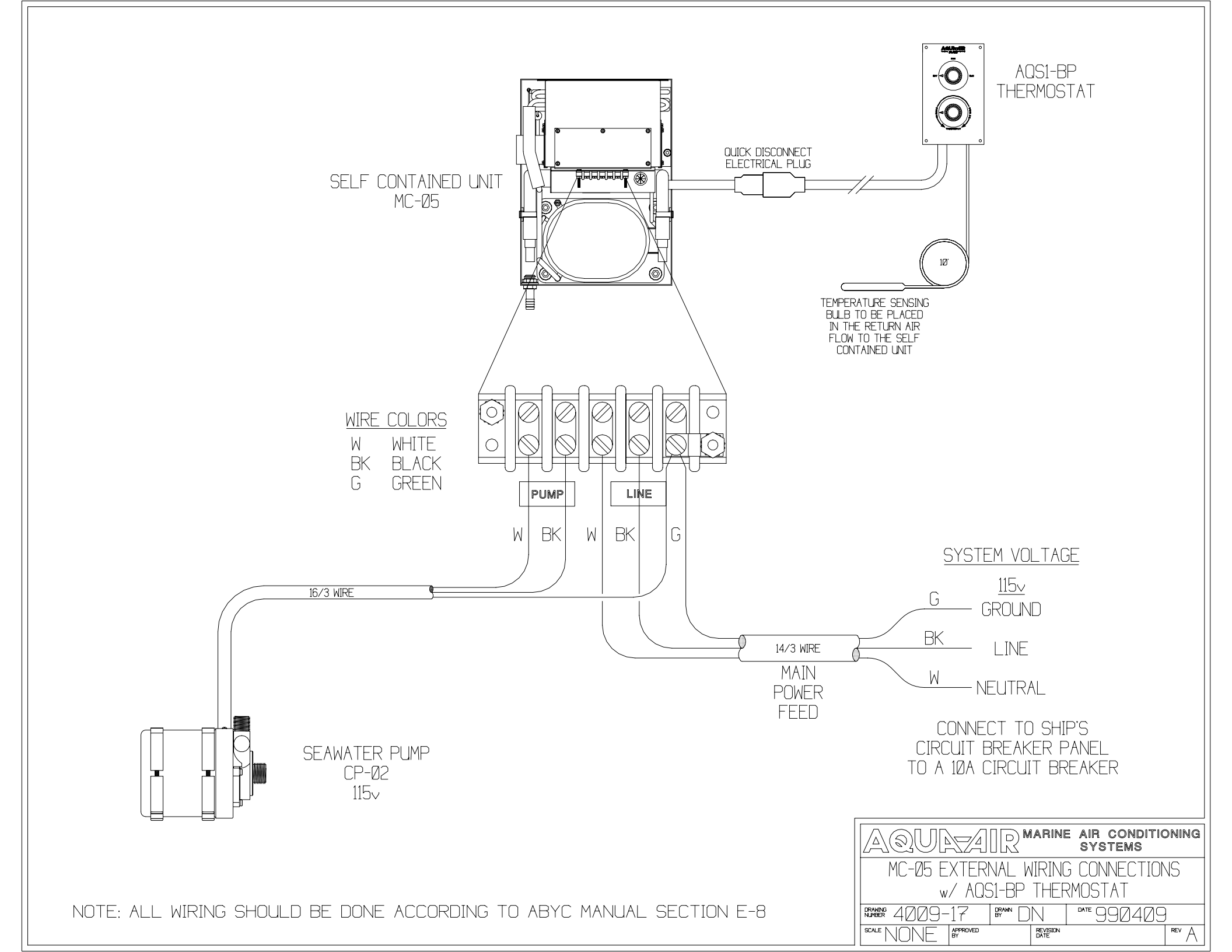
UP TO FOUR MORE SELF CONTAINED
UNITS CAN BE CONNECTED TO
THE AQP6R ON POSITIONS
3A/3B THRU 6A/6B
INPUTS TO 1A/1B THRU 6A/6B
CAN BE EITHER 115 or 230V

AQUA-AIR MARINE AIR CONDITIONING SYSTEMS

AQP6R w/ 2 or MORE SELF CONTAINED
UNITS SMR-07K TO 16K BTUH

DRAWING NUMBER	DRAWN BY	DATE
4010-04C	SB	04-05-01

SCALE	APPROVED BY	REVISION DATE	REV
NONE			A



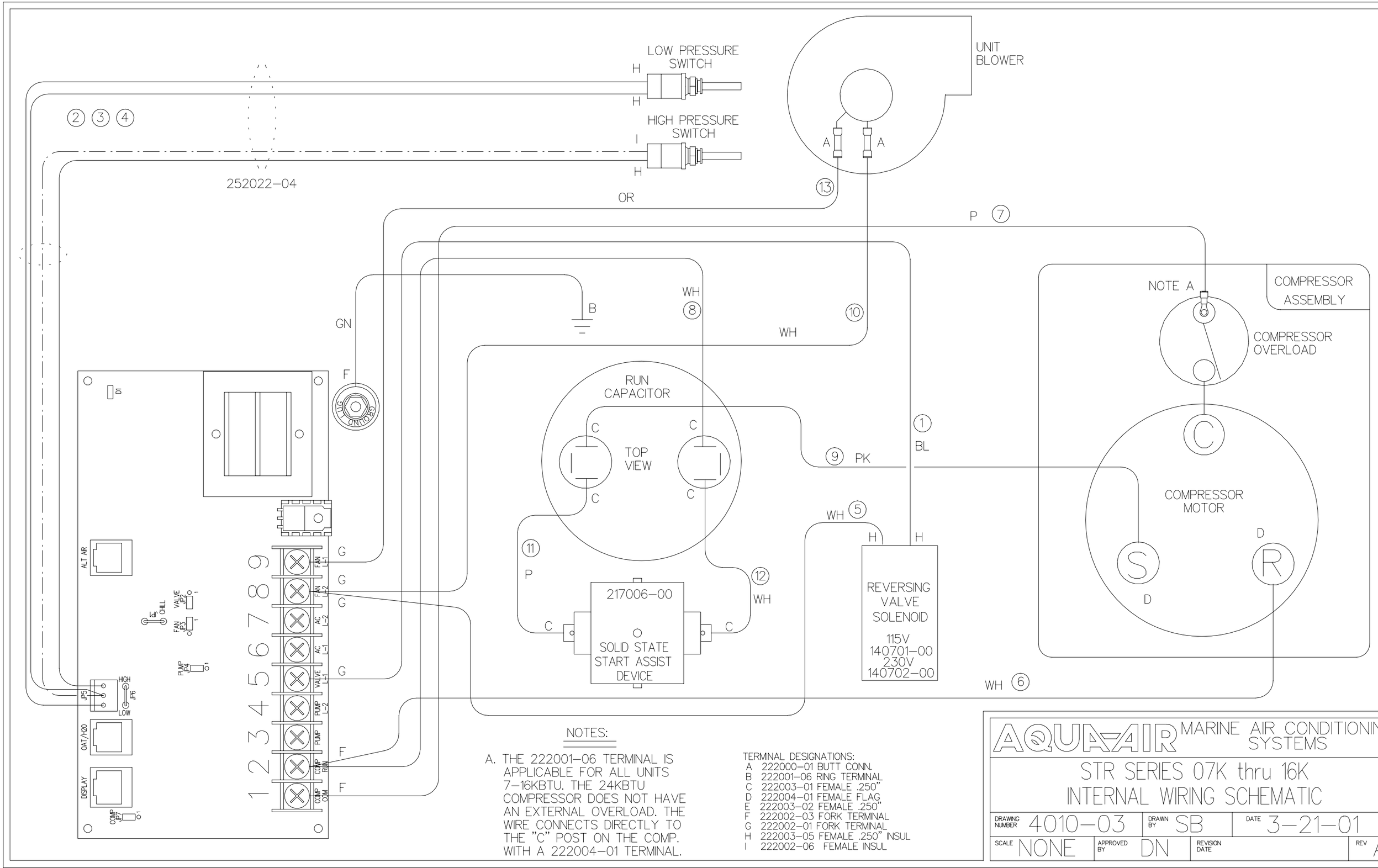
NOTE: ALL WIRING SHOULD BE DONE ACCORDING TO ABYC MANUAL SECTION E-8

AQUA-AIR MARINE AIR CONDITIONING SYSTEMS

MC-05 EXTERNAL WIRING CONNECTIONS
w/ AQS1-BP THERMOSTAT

DRAWING NUMBER	DRAWN BY	DATE
4009-17	DN	990409

SCALE	APPROVED BY	REVISION DATE	REV
NONE			A



NOTES:

A. THE 222001–06 TERMINAL IS APPLICABLE FOR ALL UNITS 7–16KBTU. THE 24KBTU COMPRESSOR DOES NOT HAVE AN EXTERNAL OVERLOAD. THE WIRE CONNECTS DIRECTLY TO THE "C" POST ON THE COMP. WITH A 222004–01 TERMINAL.

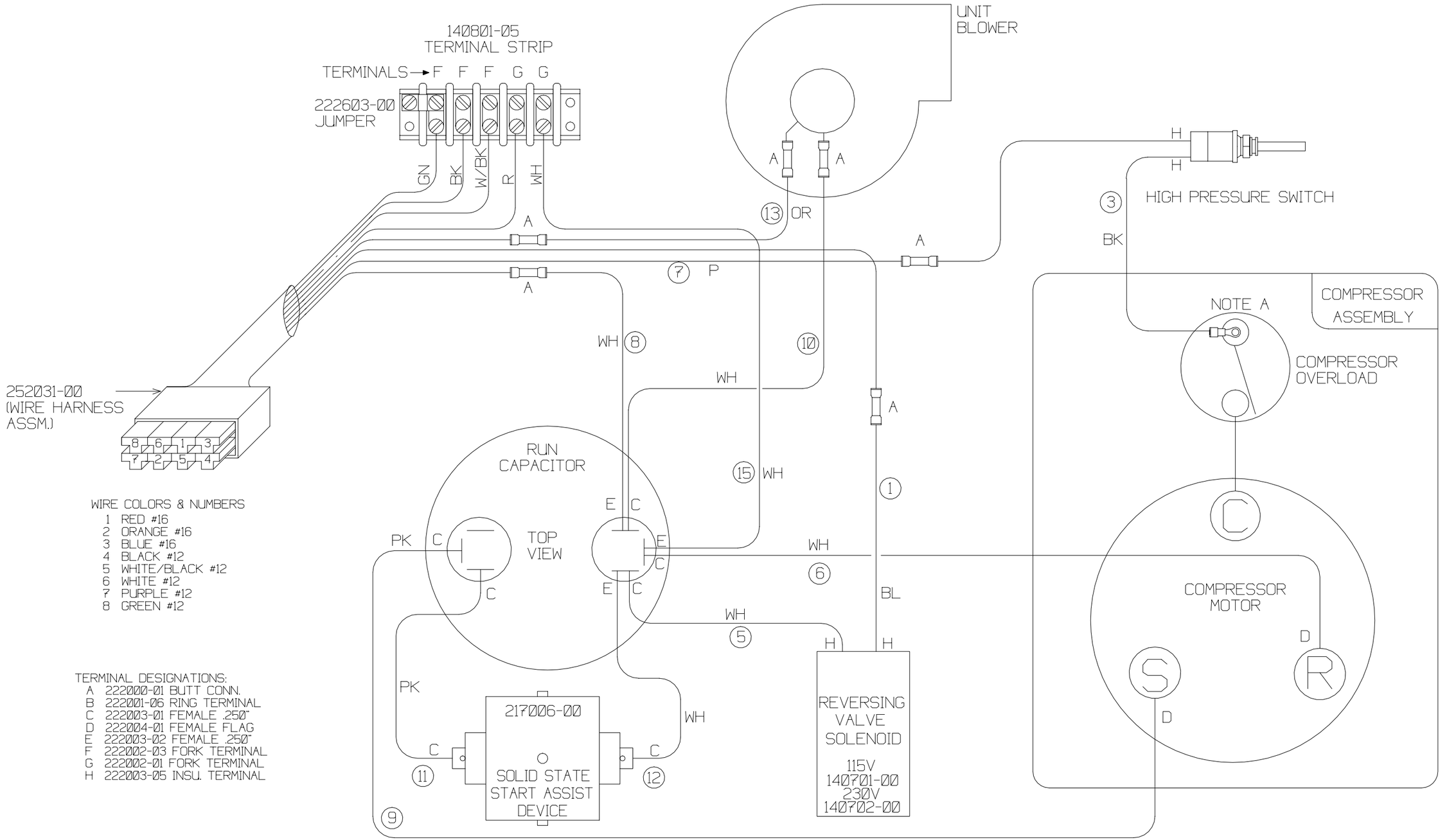
TERMINAL DESIGNATIONS:

A	222000–01 BUTT CONN.
B	222001–06 RING TERMINAL
C	222003–01 FEMALE .250"
D	222004–01 FEMALE FLAG
E	222003–02 FEMALE .250"
F	222002–03 FORK TERMINAL
G	222002–01 FORK TERMINAL
H	222003–05 FEMALE .250" INSUL
I	222002–06 FEMALE INSUL

AQUA-AIR MARINE AIR CONDITIONING SYSTEMS

STR SERIES 07K thru 16K INTERNAL WIRING SCHEMATIC

DRAWING NUMBER 4010–03	DRAWN BY SB	DATE 3–21–01	
SCALE NONE	APPROVED BY DN	REVISION DATE	REV A



WIRE COLORS & NUMBERS

1 RED #16
2 ORANGE #16
3 BLUE #16
4 BLACK #12
5 WHITE/BLACK #12
6 WHITE #12
7 PURPLE #12
8 GREEN #12

TERMINAL DESIGNATIONS:

A 222000-01 BUTT CONN.
B 222001-06 RING TERMINAL
C 222003-01 FEMALE .250"
D 222004-01 FEMALE FLAG
E 222003-02 FEMALE .250"
F 222002-03 FORK TERMINAL
G 222002-01 FORK TERMINAL
H 222003-05 INSU. TERMINAL

NOTES:

A. THE 222001-06 TERMINAL IS APPLICABLE FOR ALL UNITS 7-16KBTU. THE 24KBTU COMPRESSOR DOES NOT HAVE AN EXTERNAL OVERLOAD. THE WIRE CONNECTS DIRECTLY TO THE "C" POST ON THE COMP. WITH A 222004-01 TERMINAL.

AQUA-AIR MARINE AIR CONDITIONING SYSTEMS

SMR-07K TO 16K
INTERNAL WIRING SCHEMATIC

DRAWING NUMBER	DRAWN BY	DATE	
4010-04	SB	04-03-01	
SCALE NONE	APPROVED BY DN	REVISION DATE 07-18-02	REV B

AQUA AIR
MARINE AIR CONDITIONING SYSTEMS

DX PRODUCT LIMITED WARRANTY PERIODS

The warranty period on all Aqua-Air DX (Direct Expansion) products is **one year**. Parts and labor are covered per warranty allowance schedules.

For new Aqua-Air DX system installations using **TW2** microprocessor controls, parts will be warranted for an additional year. All equipment in the system, including pumps, pump relays and associated parts will be covered for **two years**.

The TW2 microprocessor controls used in a retrofit on Aqua-Air or any other manufacturer's marine air conditioning equipment will carry a one year warranty. New TW2 controls or components of the microprocessor control system purchased to replace out of warranty controls or components will have a one year warranty.

Non-warranty replacement parts and components, other than TW2 controls or components, will be warranted for a period of 90 days. This warranty is for parts only, no labor is included. The exception to this category is replacement compressors which carry a one year warranty, including parts and labor from the date they were sold.

Parts and components supplied by Aqua-Air Manufacturing for replacement on any Aqua-Air unit under warranty will be warranted for the remainder of the original warranty period only.

Replacement parts or components used on competitors equipment will have a 90 day warranty. The exception is those parts used in the refrigeration circuit of any competitive brand of air conditioning equipment, which will carry no warranty.

All warranties begin when the customer takes possession of the equipment. The warranty is extended to all owners of the equipment commencing the date the original owner takes possession of it. Verification of original purchase will be required. All warranties are limited to the terms and periods set forth here. Any and all implied warranties are excluded.

Fuses and MOV's are used as safety devices to protect Aqua-Air equipment against over-voltage conditions caused by induced lightning or inductive switching environments. These are not covered under warranty.

Aqua-Air will repair or replace, at its option, components found to be defective due to faulty materials or workmanship, after the component has been examined by Aqua-Air or its authorized servicing dealer. Additionally, Aqua-Air will pay labor costs, as outlined in its Schedule of Limited Allowances, for the removal and replacement of the component. This limited warranty extends to Aqua-Air DX products that have been installed, operated and maintained in accordance with written guidelines available from Aqua-Air.

Aqua-Air reserves the right to change its warranty policies and procedures as well as its warranty allowances without notice.

Aqua-Air equipment is designed and manufactured for long term, trouble free operation when properly operated and maintained. It is strongly recommended that you read your owners manual and fully understand the operations of your Aqua-Air equipment. Any questions you have regarding the operations of your Aqua-Air system or warranty coverage can be directed to your authorized Aqua-Air dealer or to Tech Support at Aqua-Air Manufacturing (800) 457-3928.

OWNERS INFORMATION

mini-kool
model#_____

Serial
#_____

Date of
Purchase_____

Purchased
from_____

Installed
by_____

Service
dealer_____

Phone_____
_

Maintenance and Service record:	
Date	Service performed

Maintenance and Service record:	

AQUA-AIR

MARINE AIR CONDITIONING SYSTEMS

AQUA-AIR MANUFACTURING, division of the James D. Nall Co., Inc.
1050 East 9th Street, Hialeah, Florida 33010 U.S.A.
Toll Free 800-328-1043 Local 305-884-8363 Fax 305-883-8549
Email sales@aquaair.com