

# **Marine A/C Installation** **and User Guide**



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**FREEDOM MARINE**  
**SOLUTIONS**

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# Overview

**Congratulations! You have just purchased one the most dependable Marine Air Conditioners on the market today, an FMS.**

**FMS supplies pleasure boat owners, custom boat builders, yacht brokers, boat dealers and marinas around the world with their marine air conditioning needs.**

**FMS air conditioners are manufactured to the highest of quality standards using only top of the line components and materials assembled by long-term technicians. All of our air conditioners are modularized, self contained, prewired, precharged and mounted on a solid foundation of stainless steel. The entire unit is assembled proudly in the USA. All electrical parts are standard refrigeration components and are available around the world. Any four or five wire 24-volt digital thermostat will operate any standard FMS air conditioner.**

**Our standard electrical control box does not contain any printed circuit boards or solder. All electrical connections are "snap on" color coded wires, making part replacement simple and fast. The electrical box can be unplugged for ease of assembly and service and the entire installation can be accomplished with standard shop tools. Our upgraded controller uses state of the art electronics eliminating any contactor or relay noises. Don't forget to see our new flush mount digital controller on our website [WWW.FMMSUSA.COM](http://WWW.FMMSUSA.COM).**

**Upgrades to this controller are available at anytime.**

**Our warranty is also unsurpassed. For the first 5 years, the FMS factory warranty covers all issues with your air unit. After 5 years, any certified air conditioner technician, marine, household or commercial, can service any FMS air conditioner model.**



# Warranty Information



We offer a 5-year warranty with every new dehumidifier or A/C unit purchased. The FMS warranty covers defects in materials and workmanship for 5 years from the date the unit is purchased. FMS is the only authorized repair site for FMS products. Contact the FMS office before any work is performed, any unauthorized repairs will invalidate the FMS 5-year warranty.

Thermostats, pumps, digital controls, and accessories carry a 1-year warranty.

Service needs **within** first 6 months:

Shipping costs to our factory and return to sender are included.

Service needs **after** 6 months - 5 years (from date of purchase):

Customer pays shipping to our factory and FMS pays for return shipping

\*For our clients outside the continental U.S. the 5-year warranty is still valid. However, shipping and handling will be the responsibility of the client to and from the FMS factory.

Limitation of liability:

FMS is dedicated to manufacturing high quality custom marine and dehumidifier units. FMS makes this limited warranty expressly in lieu of all other warranties, expressed or implied, including but not limited to, the expressed warranties of merchantability and breach of any warranty the liability of FMS shall be limited to repairing or replacing the non-conforming goods. In no event shall FMS be liable for any indirect, incidental or consequential damages arising out of any sale or operation of the products sold and/or installed. The purchaser of the unit will hold FMS harmless of any incident caused by the failure of the FMS product up to and including injury or death. And in no event shall FMS's obligation exceed the value of the product(s) sold.

# **INSTALLATION AND OPERATION**

## **A.) AIR CONDITIONER INSTALLATION:**

**WARNING:** Only install the air conditioner in a dry, non-explosive environment. If the air conditioner or electrical box are: placed in an explosive environment, exposed to an explosive environment, or exposed to explosive materials, explosion could occur resulting in serious injury or death and/or destruction of the boat. This component does not meet federal requirements for ignition protection. Do not install in spaces containing gasoline engines, tanks, LPG/CPG cylinders, regulators, valves or fuel line fittings. Failure to do so may result in injury or death.

Typical unit mounting spots are under the vee berth, under settee seats, in hanging lockers, in cabinets or in outside dry lazzeretts and sail lockers. Everything must fit in and/or be accessible to the selected spot. The selected spot must accommodate the following eight requirements:

- (1) The physical size of the unit and electrical box.
- (2) Water in and out hoses.
- (3) Electrical power cable for the unit and pump connections.
- (4) Air ducting and air splitters.
- (5) Mounting of the return air grill to insure the proper volume of return air.
- (6) Access to the air conditioning unit.
- (7) Condensation removal.
- (8) Thermostat installation and wiring.

**IMPORTANT:** Read the entire installation instructions before you commit to cutting or drilling any holes. Remember “Holes are forever”. Measure, measure, then measure again before picking up any tool with a sharp edge.

**IMPORTANT:** Leave ample excess of hose, wire, and ducting when routing in to the air conditioner mounting compartment to allow for final positioning of the air conditioner after all the installation tasks are complete.

We will now address the 8 requirements in detail:

### **1.) Physical size of the unit and electrical box:**

The air conditioner needs to be mounted in an area where it will physically fit, as well as accommodate a properly sized return grill and any ducting or splitters which would be attached to the air output collar. In addition, you need to insure there is space for the water hoses to be connected.

# INSTALLATION AND OPERATION CONT'D

## Air conditioner dimensions

<u>Unit BTU</u>	<u>Length</u>	<u>Width</u>	<u>Height</u>
3,500	10-3/4 Inches	15-3/4 Inches	9-1/2 Inches
6,500	10-3/4 Inches	15-3/4 Inches	11-1/2 Inches
9,000	20 Inches	13 Inches	13-3/4 Inches
12,000	20 Inches	13 Inches	13-3/4 Inches
16,500	20 Inches	13 Inches	13-3/4 Inches
24,000	26 Inches	17 Inches	17 Inches

The air conditioner must be securely mounted on a flat surface. If the sole of the boat (cabin floor) cannot accommodate the size of the air conditioner base plate, a mounting shelf or platform must be built. Typically the shelf will be made from 3/4 inch marine grade plywood which can be either fiberglassed or mechanically attached to the boat's sole or superstructure. **Never screw directly into the hull!**

When attaching the unit to the sold of the boat, the superstructure, or a fabricated mounting shelf, always make absolutely sure that the length of the screws being used to mount the unit will not engage the hull. If there is any question as to whether the hull may be compromised, an alternative mounting method must be used or another mounting spot must be located.

The electrical box, unlike the air conditioner, can be mounted in any attitude. It is attached to the air conditioner by a detachable 40 inch electrical cable, allowing it to be mounted above the unit, on a side wall or bulkhead and, if needed, in a totally inverted position.

### Important

**It is not uncommon in air conditioning systems for condensate lines or pans to become blocked over prolonged use. When selecting the electrical box mounting spot make sure that it is not located where condensation water can come in contact with it should the condensation water over flow its pan. Never place the electrical box below the air conditioning unit**

### Warning

**If condensation water contacts the electrical box electrical shorting could occur causing fire which could result in serious injury, death, and/or destruction of the boat**

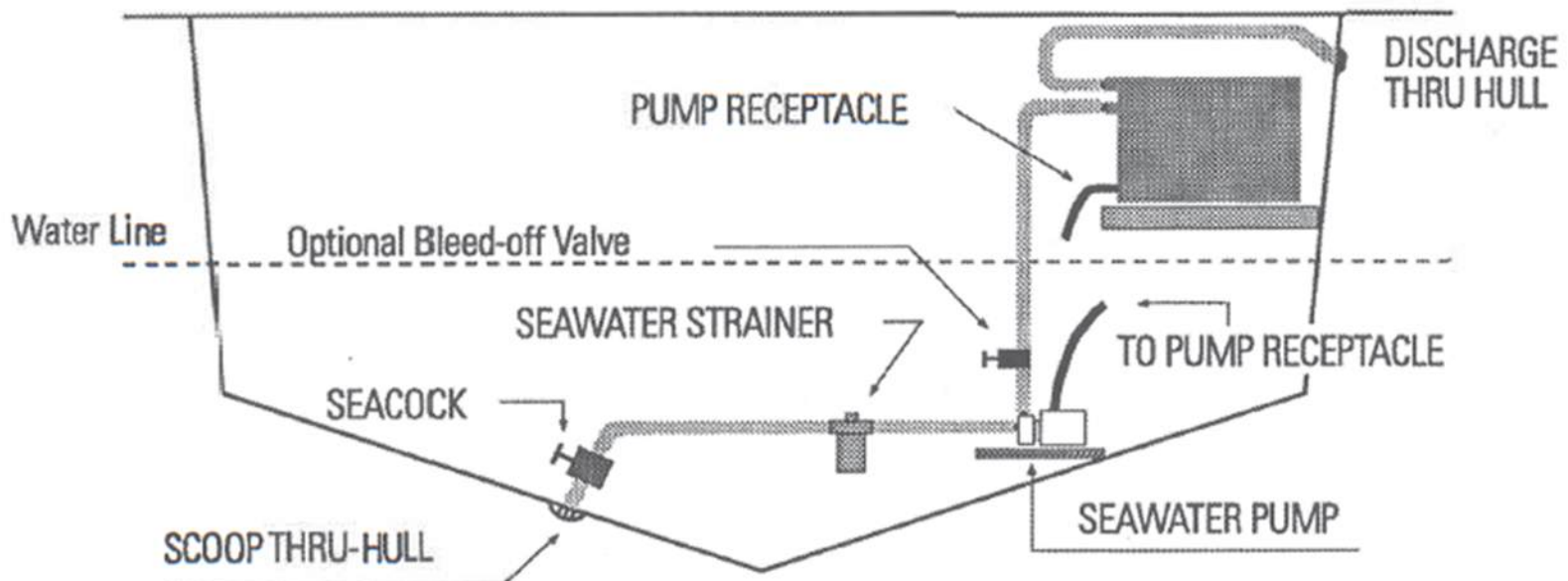
We suggest that once you are satisfied that the unit and electrical box, along with all of the other items required in the air conditioner compartment will fit, that you remove the air conditioning unit and electrical box or cover them completely until all holes and construction in the compartment are completed and the area cleanly vacuumed.

# INSTALLATION AND OPERATION CONT'D

## 2.) Cooling water in and out:

All central marine air conditioning and heating units are water cooled. Cooling water is provided to the air conditioner via a foot scoop, sea cock, water strainer and pump assembly all of which are mounted below sea level. Typically the sea cock, water strainer, and pump are installed remotely to the air conditioner. **(See Figure 1)**

## FIGURE 1



### Water in:

Generally, in power boats, the sea cock will be installed in the engine compartment. In sail boats, because of their more uniform draft characteristics, it is usually installed under a settee seat or some other compartment more convenient to the air conditioner.

Water is then routed to the air conditioner from the pump via 5/8" marine water hose (also known as 1/2" I.D. hose) where it is connected to the air conditioner condensing coil "water in" connection. Make sure that space is allowed around the unit to make this connection. The water hose is easily kinked, restricting water flow. If needed, use a hose barb 90 degree fitting to eliminate any kinking. (These can be found at any PVC supply store).

An additional length of 5/8" marine hose (1/2" I.D.) is connected to the condensing coil "water out" connection. Cooling water passes through the condensing coil and routed through this hose to the "water out" thru-hull fitting which will be installed installed above the water level in the side of the boat's hull. **(See Figure 1)**



# INSTALLATION AND OPERATION CONT'D

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## Important

**The sea cock, water strainer and water pump must be installed below sea level. The sea water pump is not self priming and relies on water seeking its own level along with the hydraulic pressure of the boat to attain priming of the pump.**

## Warning

**Before drilling the mounting hole for the sea cock the entire boat must be out of the water. Drilling the sea cock mounting hole with the boat in the water could cause extreme flooding and sink the boat or cause sever water damage to equipment in the boat.**

## Important

**When selecting the spot for the sea cock, before drilling the hole, make sure that the pump and water strainer can be installed in the same adjacent area and remain below sea level. Also check the operation of the ball valve shut off handle on the sea cock for any possible interference once installed.**

When selecting your sea cock mounting spot, you should also try to select a spot where the pump and water strainer are a maximum distance of 2 feet from the sea cock. We realize that in some boats it is not possible to incorporate the two foot rule. However, remember the closer you keep these three items together, the fewer pump priming problems you will experience. Once you are sure that all components will fit in the spot selected and remain below sea level and the boat is totally out of the water, you are ready to cut the sea cock mounting hole (see warning above). If you are using a sea cock assembly from fmms, we recommend that a 1-1/16" hole saw be used to make this hole. If you are using a sea cock purchased elsewhere, you must use the appropriate hole saw for that specific sea cock.

## Important

**Before cutting your sea cock mounting hole check the outside hull in the are you will be cutting to make sure there are no ribs or other hull variations which will not allow the sea cock foot scoop to mount flat against the hull. If there are any concerns, drill a small pilot hole first which can be easily sealed if interference exists. Drill the 1-1/16" sea cock mounting hole and pilot hole at the same angle as the hull. This will insure that the foot scoop lies flat against the hull.**

Once the sea cock hole is drilled, inspect the hole to determine if you boat has a "corded" hull. That is, a hull not of solid fiberglass, but two layers of fiberglass separated by balsa or foam. When not properly sealed, "Cording" acts like a wick absorbing sea water into the hull. If the hull is "corded", obtain a fiberglass sealing kit from your local marine supplier to seal the cording before installing the sea cock to prevent "water logging". Same goes for water thru-hulls.

# INSTALLATION AND OPERATION CONT'D

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## Important

**Failure to seal a “corded” hull may result in serious damage to the boat’s structure.**

Note: The threads on the foot scoop end about 3/8” from the actual foot scoop. If after drilling the hole for the foot scoop you discover that your hull is thinner than 3/8”, you will need to reinforce the hull with a 6“x6” pad to shim up to insure that the nut tightens correctly. We usually use 3/4” marine grade plywood to fashion the pad. Apply fiberglass on both sides of the pad and affix to the inside of the hull. After the fiberglass has cured, assuming that you had already drilled the hole for the foot scoop through the hull, then drill through the pad from the outside of the hull to insure proper alignment through the pad and hull. Do not attempt to drill through the pad from the interior of the boat.

Before installing the sea cock, apply a bead of marine sealant around the foot scoop and mounting post. We recommend “3M 5200” brand or a sealant brand of equivalent quality.

Insert the foot scoop up into the boat with the foot scoop facing toward the bow (Fore ward) and secure it to the hull with (2) 1/4” flat head s/s screws. We recommend the screw holes be pre-drilled with the appropriate size drill bit to eliminate cracking of the outer gel-coat of the hull. When drilling the holes, take care not to drill through the hull. Use a hand-held screwdriver to eliminate stripping the hole out. These screws are intended only to keep the foot scoop from turning under the boat when the inside fastening nut is not tightened down.

Inside the boat, attach the bronze retaining nut to the sea cock threaded post. Using an appropriate size tool or slip jaw pliers, tighten the nut to the hull snugly to insure that it will seal against the hull. After tightening the nut completely, cover it with a thick coat of marine sealant from the post out to about 1” from the nut onto the hull.

Now that the foot scoop is mounted, the ball valve (shut-off valve) can be attached. Generously coat the foot scoop post threads with marine sealant and screw the ball valve onto the post. After the ball valve is fully tightened to the post, check the action of the shut-off arm to make sure it can be fully articulated without obstruction. If the valve hits an obstruction, turn it on the post to a more optimal position. **Close the valve, repeat, close the valve!**

To connect your water hose you will need a 90 degree “thread to hose barb” fitting and a 3/4” “closed end nipple.” Using 3m 5200, thread the 3/4” “closed end nipple” to the sea cock, then fasten the 90 degree thread to hose barb, with 5200 on to the 3/4” nipple. The “closed end nipple” is the bronze threaded pipe open on either end.

# INSTALLATION AND OPERATION CONT'D

The water strainer and pump can now be mounted, but first you must get each component fully assembled and ready to mount. The water strainer and pump brackets must be securely mounted on a flat surface. Do not mount on the sole of the boat (cabin floor). If a nearby bulkhead cannot accommodate the size of the mounting brackets, a mounting shelf or platform must be built. Typically the shelf will be made from 3/4" marine grade plywood which can be either fiberglassed or mechanically attached to the boat's sole or superstructure.

**Never screw directly into the hull!**

When attaching the mounting brackets to the superstructure or a fabricated mounting shelf, always make absolutely positive that the length of the screws being used to mount the bracket will not engage the hull. If there is any question as to whether the hull may be compromised, an alternative mounting method must be used or another mounting spot must be located.

## The water strainer:

If you are using a FMS furnished water strainer, it will come with (2) 3/4" thread to hose barb hose fittings. Attach these fittings to the strainer using ample amounts of marine sealant on the threads. Again, if you are using an FMS strainer, locate the strainer mounting bracket. This is the bracket with a large hole in it. Unscrew the plastic bowl from the strainer body and place the strainer body in the hole. Replace the plastic bowl on the strainer body to lock the strainer in the bracket. This is meant to be a loose fit to facilitate cleaning when the strainer is dirty.

Water will flow from the sea cock through the strainer into the inlet of the pump. Ideally, the strainer and pump will be mounted so the water flow is at a slight upward grade to help eliminate air locks. Once you have settled on the mounting locations of the strainer and pump, attach each of their mounting brackets with (2) 1/2" s/s pan head screws. Note that the strainer is directional. Take notice of the stamped arrow and make sure it is pointed toward the ac unit.

Ideally, the pump should be mounted with the external 5/8" water discharge (the line that goes to the ac unit) pointed vertically. However, there is an alternative position. The pump can be mounted with the external 5/8" water discharge on the side. To accomplish this successfully, it is imperative that the actual pump discharge is at the highest level. In this position, the external 5/8" discharge will be located on the upper right corner of the pump with the 3/4" intake facing you. In this alternative position, the pump will still operate as originally designed. Failure to follow either of these recommendations will void any warranty with the pump.

**Never screw the pump directly to the hull. If a stringer or other structure is not hand, you may have to fiberglass a mounting board to the hull to accept the mounting screws.**

# INSTALLATION AND OPERATION CONT'D

**Note:** If you are supplying cooling water to more than one air conditioner a larger GPH pump is required. Follow the mounting instructions of the larger pump. Also a “tee” fitting must be used on the discharge side of the water pump to run cooling water to each unit.

Using the appropriate length of the 3 feet of 3/4” red stripe marine hose and (2) s/s hose clamps per connection, connect the sea cock, water strainer and pump together.

## **The pump:**

### **Important**

**On dual air conditioner installations, an in-line shut off valve must be installed in each of the “water in” lines to allow operation of either air conditioner if one unit is removed for service.**

### **Warning**

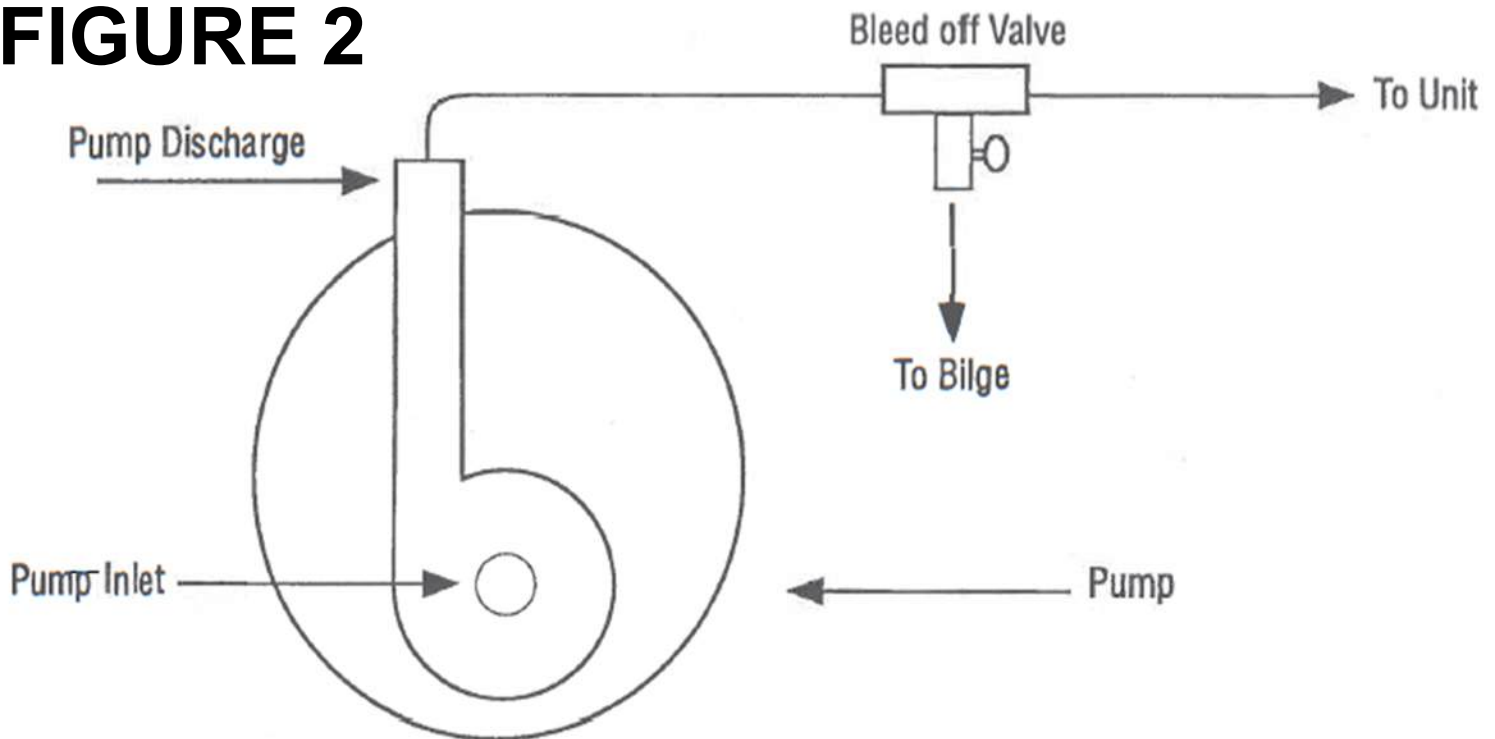
**All hose connections must be secured using (2) s/s hose clamps. Failure to double clamp all hose connections may result in a hose disconnecting which could cause flooding damage and/or sinking of the boat. Damage to the air conditioner from excessive and recurrent leaking due to failure to double clamp all connections will void the warranty.**

The 5/8” blue stripe water hose (or black reinforced hose) and the pump cord may now be routed to the air conditioner compartment. If the power cord that is permanently attached to the pump is not long enough to reach the air conditioner compartment, it must be extended using 16 gauge boat power cable. Cut off the connector on the end of the pump power cord (if present) and splice in the 16 gauge boat power cord. Appropriate electrical splicing must be used and the connection must be water proof and secured well above the bilge water level to insure that the connection will always remain dry. Heat shrink tubing is recommended after the connectors are applied. **Failure to keep this connection dry may result in fire and will void the warranty.**

**Note:** Loss of prime on the water pump is a common occurrence. An optional “bleed off” valve is available that aids in regaining pump prime. If you are using this option, it must be installed at this stage of the installation at the output of the pump (see FIGURE 2). Remember, all water hose connections must be secured using double s/s clamps. To install the bleed off valve, attach a short length of blue tracer hose to the water-out on the pump and secure the bleed off valve to the other end of the hose. Attached the blue tracer hose that you are running up to the air conditioning unit to the other end of the bleed off valve. Close the bleed off valve. At each connection point, use (2) s/s clamps to properly secure the attachment.

# INSTALLATION AND OPERATION CONT'D

## FIGURE 2



### Warning

After the installation of the “bleed off” valve, make sure valve is in the “off” position, that is, the position where water cannot flow into the bilge. Failure to close the valve will result in flooding when the boat is placed back into the water possibly causing serious damage or sinking of the boat.

After cutting off the three prong plug, temporarily combine the pump power cord and the water hose and route both items together into the air conditioner compartment (see following note). Secure both items along the way at one and two foot intervals to eliminate sagging or kinking due to boat or wave action.

Note: If you are using a single pump to supply cooling water to two air conditioners, you must install a pump relay box. before running pump power cable please see section “pump relay box”.

### Water Out:

The “water out” thru-hull can be mounted any place on the boat’s hull that is a minimum of 6” above the water line. If using a FMS supplied thru-hull fitting, the required hole size is 1-1/16” so the same hole saw used for the “water in” sea cock can be used. Typically the “water out” thru-hull will be mounted close to the air conditioner to eliminate the extra work of having to route the water hose to difficult places.

# INSTALLATION AND OPERATION CONT'D

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The water line on the outside of the hull will give a good base line to determine the lower limit of the hole location. If your boat is new or kept high and dry, you will have to place it in the water to determine the water line. Once you know the water line you can determine where on the inside of the boat you can drill, staying above the water line and out of view. This hole should always be drilled from the inside of the boat. Once you have settled on a location for the hole, check outside again to insure you will be above the water level and that you will be clear of any outside ribs or other interference which will not allow the outside lip of the fitting to lay flat against the hull. **Always drill a pilot hole and check outside before committing the larger hole!**

When installing the thru-hull fitting apply an ample amount of marine sealant to the outside lip of the fitting and its mounting post. If possible, have someone hold the outside of the fitting to keep it from turning when you attach the retaining nut from the inside. Be careful not to over tighten the nut. Use (2) s/s hose clamps to attach the hose to the thru-hull fitting. Route this hose into the air conditioner compartment where it will eventually be connected to the condensing coil “water out” fitting.

# INSTALLATION AND OPERATION CONT'D

## 3.) Electrical power:

Both the air conditioner and pump requires 110/120 VAC 60 hz power to operate. (220 vac models are available) this power is obtained from the master 110/120 vac circuit breaker panel in the boat. Power is routed from this panel to the air conditioner. The air conditioner will then supply power to the pump as required.

### Warning!

**Before proceeding further, check to insure that all power has been disconnected from the boat and circuit breaker panel! Failure to do so could cause electrical shock resulting in serious injury or death!**

Using 12 gauge boat power cable, beginning on the inside of the main circuit breaker panel, route the cable to the air conditioning compartment. Leave ample excess before cutting to allow for positioning of the unit's electrical box will be covered later.

At the circuit breaker panel locate a blank hole and install a 20 amp circuit breaker of the correct style for your panel. **(NOTE: Voltage issues may cause an installation to require a 25 amp circuit breaker if a 20 amp breaker trips during startup. Contact FMS technical support for further assistance.)** Note that all of the breakers are connected together on one side by either a buss bar or individual jumper wires. Connect the new breaker in the same manner. remove about 12 inches of the outer insulation from the end of the boat cable to expose the inner wires. This cable contains (3) inner insulated wires which are "black", "white", and "green" in color. Using the appropriate wire connections, as those currently used in the panel, connect the wires as follows: "Black" to the remaining terminal on the circuit breaker, "white" to the buss bar connecting all "white" wires together, and the "green" to the buss bar connecting all "green" wires together. Included in the installation kit, if you purchased that option, is a small FMS sticker. Place this on your breaker panel to properly denote the air conditioner circuit breaker. The main circuit breaker can now be closed up.

**For 220 vac units that have a 4-wire system (black, red, green, white) do the following:**

- Black goes to black (hot)**
- Red goes to white (neutral)**
- Green goes to ground**
- White gets cut off and not used**

# INSTALLATION AND OPERATION CONT'D

## 4.) Air ducting and splitting:

Regardless of the BTU size of the air conditioner, at least one vent must be within 4 to 5 feet of the unit. Insure though, that the airflow is not directed back towards the return air grill. In the case of 16,500 BTU unit, the largest grill is required to be the closest grill. Improper ducting accounts for the majority of marine air conditioner problems. Though there are exceptions to the rule, the following rule of thumb applies to the number and size of the supply air grills required for each BTU size air conditioner.

### These are the minimum requirements, and more is always better:

**M3- 3,500 BTU: (1) 4" duct**

**M6- 6,500 BTU: (1) 4" duct**

**M9- 9,000 BTU: (1) 6" duct or (2) 4" ducts**

**M12- 12,000 BTU: (1) 6" duct**

**M16- 16,500 BTU: (1) 6" duct**

**M24- 24,000 BTU: (2) 6" ducts**

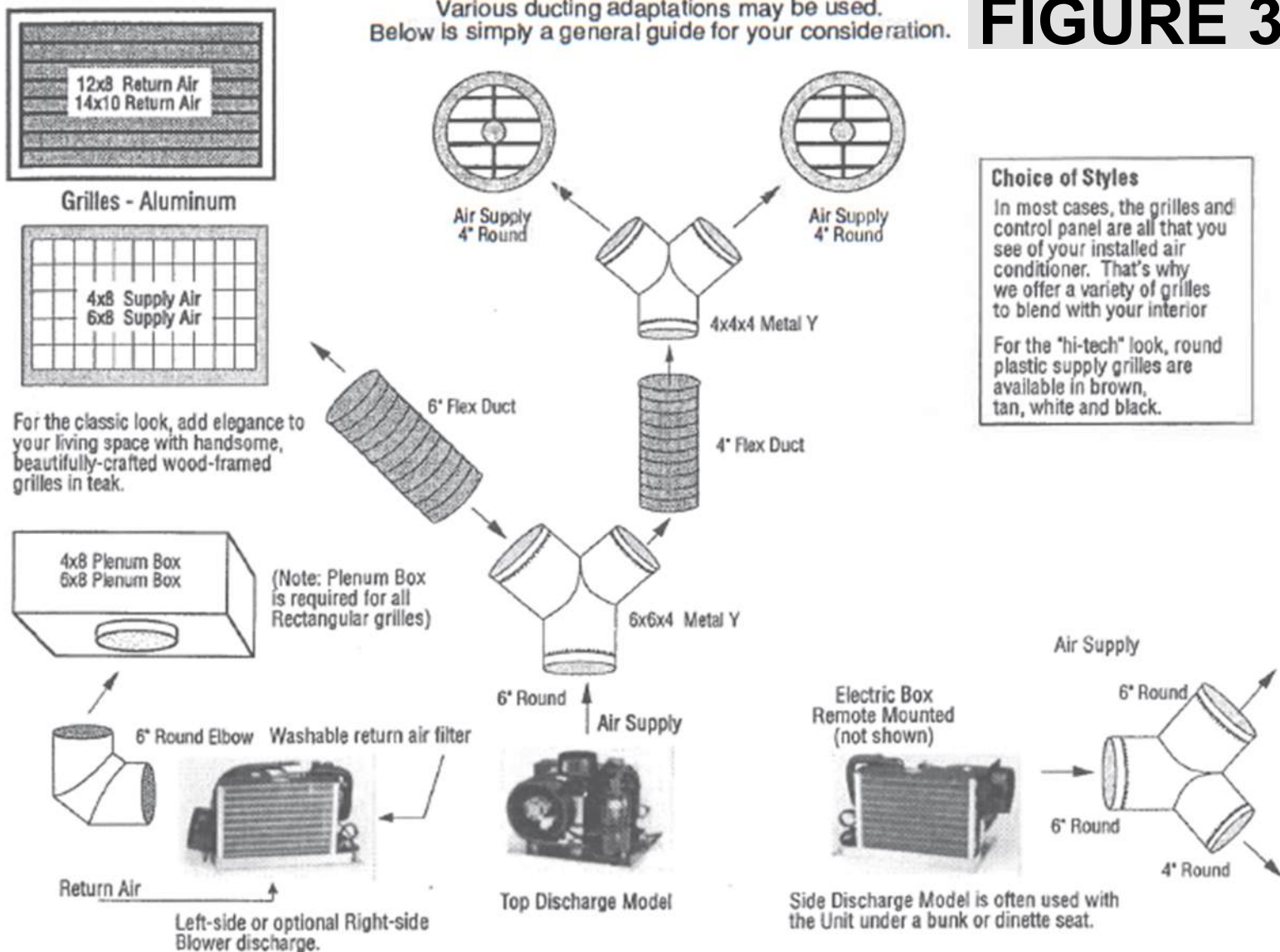
When it comes to ducting, a general rule is that more grills are always better. Any time more than one supply grill is used, an air splitter is required. Air splitters come in a variety of sizes and styles. Splitters may be mounted directly on the unit output air collar, or placed in line a short distance from the unit where space restrictions preclude mounting the splitter on the unit. Additional air splitters may be used at various intervals along the duct routing to distribute air to multiple cabins. Wye's are always preferable to tee's. We do not use tee's for air splitters. Refer to (figure 3), on the next page, for a typical ducting scheme. When surveying the boat for your air conditioner mounting spot, you must also decide what size supply air grills will be used and where they will be mounted. The size of the grill will dictate the size of the ducting. It is also important that you decide upon using insulated or non-insulated air duct before beginning. Generally the ducting will be 4", 5", or 6" diameter non-insulated duct. If you decide on insulated duct, add 2 inches to the outside diameter of the non-insulated duct. Typically power boats will use non-insulated duct and sail boats insulated. Except for passing through a hot engine room, the only benefit to using insulated duct is preventing condensation forming on the exterior of the duct (sweating) which could cause water staining on the fabrics. Because sail boats generally sit lower in the water and have less glass than power boats, they tend to produce more duct condensation than the power boat, however, space constraints may not



# INSTALLATION AND OPERATION CONT'D

Various ducting adaptations may be used. Below is simply a general guide for your consideration.

**FIGURE 3**



allow the total use of the insulated duct and you may need to use a combination of the two duct types. Some situations will require the use of non-insulated duct, but will require insulating the duct after the installation with an insulation wrap. All duct runs should be as short and straight as possible. Every 90 degree turn in a duct reduces performance by about 14%. Ducting should be tied to a permanent structure every foot or two to eliminate sagging. Using tie wraps, insure ducting is appropriately fastened to each supply air grill.

Another important consideration is the physical size of the supply air grills. 4" round grills require a 4.5" hole and the duct merely slides over the neck of the grill. a four inch rectangular grill usually measures 4"x8" for the hole size but also requires a plenum or transition box behind the grill, also measuring 4"x8" to extending approximately four inches behind the wall. These boxes are needed to attach the air duct to the grill and are required for every size rectangular supply grill.

# INSTALLATION AND OPERATION CONT'D

We suggest that you lay out a simple sketch of your boat on paper and then overlay your ducting scheme. Take this diagram on board and make measurements to be assured that the scheme is attainable. Remember once committed, "holes are forever." If you need help or would just like to discuss your installation with an experienced technician, give us a call. FMMS will be happy to aid you in the layout of your duct and venting scheme.

## 5.) Return air:

Sufficient cabin "return air" back to the air conditioner is just as important to the cooling of the boat and the performance of the air system as "supply air" is going into the cabin. Air conditioning is just that, conditioning of the air in a closed environment by continually pulling it back into the air conditioning unit, removing heat and moisture, and sending it back into the room or cabin.

It is important that the same volume of air being forced into the cabin is allowed to return to the air conditioner. As long as the physical opening of the return air grill is at least the minimum specified below for your specific air conditioner, the actual shape is not important. Where it is not possible to have a single return grill, multiple grills may be used. Make sure that the air conditioner evaporator (the part that looks like a radiator and has the foam filter) is not blocked or restricted from receiving the cabin return air. It must always be at least 3" or more from the bulkhead or any structure. Never stow items such as life preservers, bedding, or other items of this nature between the air conditioner and return grill. To allow better access to the air conditioner compartment, do not attach the return air grill until the unit has been completely installed.

## Return Air Requirements

<u>Model</u>	<u>BTU</u>	<u>SQ. INCHES OF RETURN</u>
M-3	3,500	48
M-6	6,500	96
M-9	9,000	96
M-12	12,000	140
M-16	16,500	140
M-24	24,000	168

# INSTALLATION AND OPERATION CONT'D

## **6.) Access To The Unit:**

FMMS no longer uses a manual high pressure safety switch, and now uses an automatically resetting one. Even though the unit is primarily self sustaining, access should still be retained after the installation is complete. The unit has a foam filter on the evaporator that needs to be checked and cleaned at recommended intervals (3 months for intermittent use, and once a month if you live on the boat and use the unit frequently). The unit also has a drain that needs to be checked to prevent plugging from drain pan debris. Maintenance of any ac unit is essential to its longevity and reliability. Poor maintenance will lead to efficiency loss and reduced life expectancy.

## **7.) Condensation Removal**

Depending on the BTU rating of your unit and the actual run time, the air conditioner will remove up to 5 gallons of water (condensation) from the air in a 24-hour period. This water collects in the tray of the unit to be drained out. Most boat owners will drain this water into the bilge for removal overboard by the existing bilge pumps. When running your condensation hose remember that condensation flows only by gravity and the hose must never rise up anywhere along the way or condensation will backup into the pan and overflow. This will not sink your boat, but it can get the surrounding area very wet. In many boats it is not possible to drain to the bilge, and the condensation must be removed by other means. One solution is the "FMMS Condensator Kit", which operates using a siphon effect created by the water flow from the air conditioner cooling water pump. Please contact the FMMS dealer or the factory for other options to remove condensation.

## **8.) Mounting The Standard Thermostat: (Wifi and Non-Wifi)**

Note: The optional upgrade for a flush-mount thermostat has the same consideration and steps for mounting to the wall. The primary difference is it connects with a cable that looks like a phone/ethernet cable and has a predetermined length with a plug/jack at both ends. One end of the cable plugs directly into the back of the thermostat and the other plugs into the motherboard in the "display"/"main display" port. There is only one port properly sized on the motherboard for this cable. The motherboard is located inside the control box and the cover will need to be removed when plugging the thermostat cable in.

Every FMMS air conditioner comes with a 24 volt thermostat and a 20 foot 5-wire cable as standard. The 24 volt thermostat comes in wifi and non-wifi configurations. The thermostat may be mounted on any flat wall surface with space behind the wall to run the thermostat power cable out of view and still reach the air conditioner electrical box. It is important for the thermostat to be located where it is sensing the "true" cabin temperature. Ideally, the

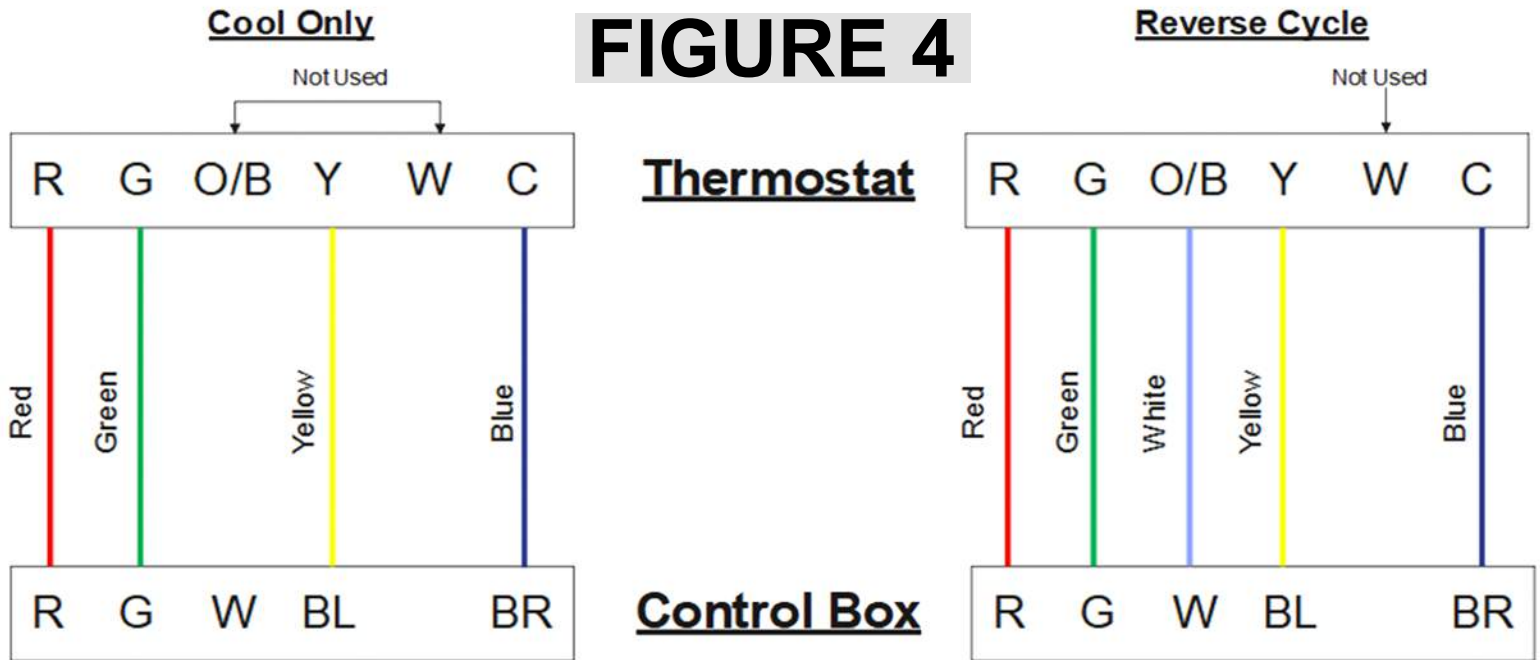
# INSTALLATION AND OPERATION CONT'D

thermostat will be about 2/3 the way up on an interior wall, out of direct sunlight, and not directly in front of a “supply air” vent or hatch. If your boat does not have an ideal location, the second best area to read temperature of the cabin is right by the air conditioner return vent. As the unit runs, the air around the return vent will be an area that is an average of the temperature in the cabin. Be aware that where the thermostat is located will determine how long and how often the air conditioner runs, and there may be uneven temperature distribution in certain places if one unit is providing air to multiple areas of the boat.

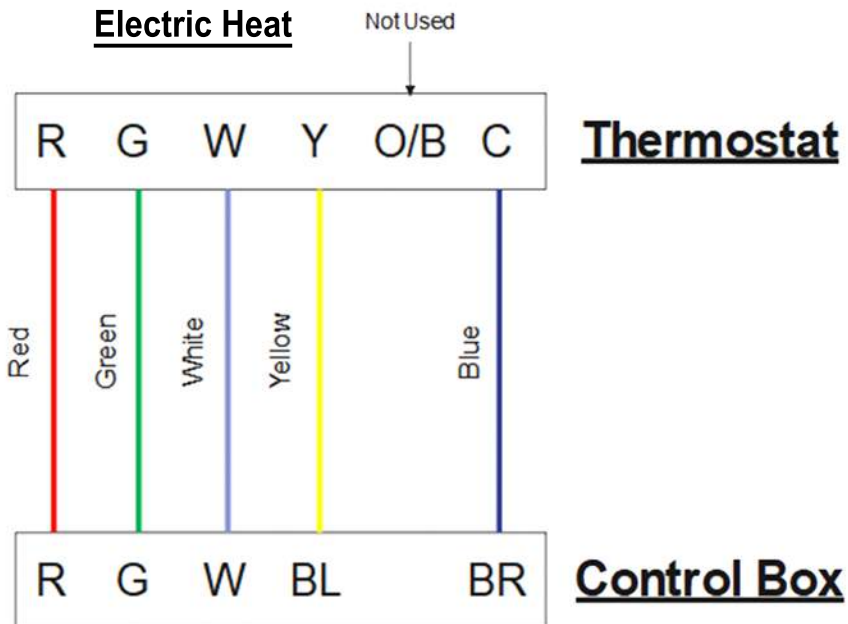
Once you have selected the thermostat location, it needs to be mounted to the wall. The thermostat will come with the brand specific instructions on how to mount it, but a brief summary of the process to mount the thermostat on the wall:

- 1.) Remove the thermostat and its components from its box.
- 2.) Locate the thermostat mounting plate, also known as the thermostat backplate, and position it on the wall where you would like the thermostat.
- 3.) Mount the thermostat back plate to the wall with anchors or screws.
- 4.) In the center of the thermostat backplate is a hole where the thermostat wire will pass to the space behind the wall. Cut a hole in the wall inside the backplate hole so that you can pass the thermostat wire from the thermostat to the AC unit.
- 5.) Run the thermostat wire through the hole so that one end is at the thermostat and the other is at the AC unit.
- 6.) The thermostat wire should be 5 strands and each is a different color. Common 5 wire thermostat cable is red, green, white, yellow, and blue. Each color has to be correctly attached to the proper thermostat terminal and the correctly paired control box terminal. The type of unit purchased will determine which terminals will be used. Consult (figure 4 and figure 5) to determine the wiring configuration you will use.
- 7.) Once you have the correct wiring configuration from (figure 4 and figure 5), the next step is to connect the wires at both the thermostat and ac control box. The wires at the control box will be attached using the spade crimps that came with the thermostat cable. Strip the wires back about 1/4” to 3/8” and crimp the spade terminals to the thermostat wires. Then connect them to the thermostat terminals on the control box, making sure to follow (figure 4 and figure 5) for correct color placement. Then strip the wires back 1/4” to 3/8” at the thermostat and insert the thermostat wires into the thermostat terminals based on (figure 4 and figure 5) for your unit’s configuration. **WARNING: Improper wiring connections will lead to the unit not operating correctly and/or damage to the thermostat, control box, and air conditioning unit.**
- 8.) Once the thermostat is hooked up to the control box, additional thermostat setup may be required. For the thermostat included with a unit purchased from FMMS, the setup is laid out in (figure 6). If the thermostat is from a different provider, the basic configuration steps are as follows:

# INSTALLATION AND OPERATION CONT'D



## FIGURE 5



### Note:

C/BR is an optional wire and not all thermostats will require it or have the terminal available. For any Wi-Fi/Smart thermostats the C/BR connection is essential for 24V power to run the thermostat when the unit has power. If thermostat requires 24V power to operate it will turn off if unit is disconnected from high voltage power in any way

# INSTALLATION AND OPERATION CONT'D

- For cool only units, very little setup is required and the only step if desired is to turn off the “heat” mode since the unit will not use it.
- For reverse cycle units, the thermostat needs to be set to “heat pump mode” with the reversing valve being energized with the “b” terminal.
- Electric heat setup will require the thermostat to be set to “electric heat” mode or changing the setting “thermostat controls fan” to “enabled”. This will ensure that the blower and electric heat strip come on at the same time to prevent damage to the electric heat strip.

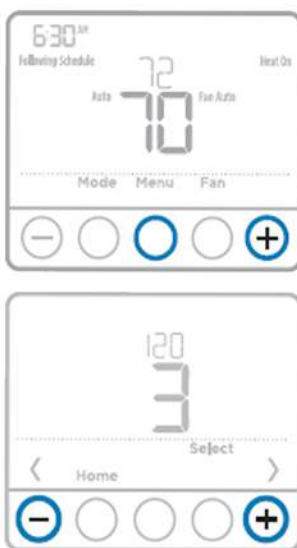
**Note:** Consult your specific thermostat manual if you are not using one provided by FMMS. For added insurance, please call FMMS technical support before first start up to consult on your setup and make sure everything is ready to go. Failure to ensure proper setup may result in personal injury, damage to your boat, and/or damage to your air conditioner, which may void your warranty or result in repairs not covered under the warranty.

## Installer setup (ISU)

- 1 Press and hold **CENTER** and **+** buttons for approximately 3 seconds to enter advanced menu.
- 2 Press **Select** to enter ISU.
- 3 Press **Select** to cycle through menu setup options.
- 4 Press **+** or **-** to change values or select from available options.
- 5 Press **Select** and confirm your settings or press **Back** to ignore changes and return to ISU menu screen to continue editing another setup option.
- 6 To finish setup process and save your setting, press **Home** and return to Home screen.

**NOTE:** A complete list of all setup (ISU) parameters and options starts below

## FIGURE 6



**Installer setup will be available at first startup, if bypassed, return using these steps**

# ISU	ISU Name	ISU Options (factory default in bold)
120	Scheduling Options	0 - Non-Programmable 2 - 5-2 Programmable <b>3 = 5-1-1 Programmable</b> 4 - 7-Day Programmable <i>Note: You can change default MO-FR, SA-SU schedule here. To edit periods during days, temperature setpoints, or to turn Schedule On/Off, touch MENU and go to SCHEDULE.</i>
125	Temperature Indication Scale	<b>0 = Fahrenheit</b> 1 - Celsius
200	Heating System Type	<b>1 = Conventional Forced Air Heat</b> 2 - Heat Pump 3 - Radiant Heat 5 - None (Cool Only) <i>Note: This option selects the basic system type your thermostat will control.</i>
205	Heating Equipment Type	<i>Conventional Forced Air Heat:</i> 1 - Standard Efficiency Gas Forced Air <b>2 = High Efficiency Gas Forced Air</b> 3 - Oil Forced Air 4 - Electric Forced Air 5 - Hot Water Fan Coil <i>Heat Pump:</i> <b>7 = Air to Air Heat Pump</b> 8 - Geothermal Heat Pump <i>Radiant Heat:</i> <b>9 = Hot Water Radiant Heat</b> 12 - Steam <i>Note: This option selects the equipment type your thermostat will control. Note: This feature is NOT displayed if feature 200 is set to Cool Only.</i>

**Personal Preference, this setting will activate or deactivate program scheduler**

-If unit is “cool only” change to “5”  
 -If unit is “reverse cycle” change to “2”  
 -If unit is “electric heat” leave on “1”

-If unit is “reverse cycle” leave on “7”  
 -If unit is “electric heat” change to “4”

# INSTALLATION AND OPERATION CONT'D

## FIGURE 6 CONT'D

# ISU	ISU Name	ISU Options (factory default in bold)
218	Reversing Valve O/B	<b>0 = 0 (O/B in Cool)</b> 1 - B (O/B in Heat) <i>Note: This option is only displayed if the Heat Pump configured. Select whether reversing valve O/B should energize in cool or in heat.</i>
220	Cool Stages / Compressor Stages 200-Conv / 200-HP	<b>0, 1</b> <i>Note: Select how many Cool or Compressor stages of your equipment the thermostat will control. Set value to 0 if you do not have Cool Stage/ Compressor Stage.</i>
221	Heat Stages / Backup Heat Stages	<b>1</b> <i>Note: Select how many Heat or Aux/E stages of your equipment the thermostat will control.</i>
230	Fan Control in Heat	1 - Equipment Controls Fan <b>2 = Thermostat Controls Fan</b> <i>Note: This ISU is only displayed if ISU 205 is set to Electric Forced Air or Fan Coil.</i>
300	System Changeover	<b>0 = Manual</b> 1 - Automatic <i>Note: Thermostat can automatically control both heating and cooling to maintain the desired indoor temperature. To be able to select "automatic" system mode on thermostat home screen, turn this feature ON. Turn OFF if you want to control heating or cooling manually.</i>
303	Auto Changeover Differential	<b>0 °F to 5 °F</b> <b>0.0 °C to 2.5 °C</b> <i>Note: Differential is NOT deadband. Differential means how far past the setpoint before switching to the mode selected. Deadband setup is not an option. Honeywell uses an advanced algorithm that fixes deadband at 0 °F. This is more advanced than previous thermostats.</i>
365	Compressor Cycle Rate (Stage 1)	1 - 6 <i>Note: This ISU is only displayed when Cool / Compressor Stage is set to 1 stage. Cycle rate limits the maximum number of times the system can cycle in a 1 hour period measured at a 50% load. For example, when set to 3 CPH, at a 50% load, the most the system will cycle is 3 times per hour (10 minutes on, 10 minutes off). The system cycles less often when load conditions are less than or greater than a 50% load.</i>
370	Heating Cycle Rate (Stage 1)	1 - 12 <i>Note: This ISU is only displayed when Heat Stage is set to 1 stage. Cycle rate limits the maximum number of times the system can cycle in a 1 hour period measured at a 50% load. For example, when set to 3 CPH, at a 50% load, the most the system will cycle is 3 times per hour (10 minutes on, 10 minutes off). The system cycles less often when load conditions are less than or greater than a 50% load. The recommended (default) cycle rate settings are below for each heating equipment type: Standard Efficiency Gas Forced Air - 5 CPH; High Efficiency Gas Forced Air - 3 CPH; Oil Forced Air - 5 CPH; Electric Forced Air - 9 CPH; Fan Coil - 3 CPH; Hot Water Radiant Heat - 3 CPH; Steam - 1 CPH.</i>
370	Heating Cycle Rate Auxiliary Heat	1 - 12
387	Compressor Protection	0 - Off 1 - 5 minutes <i>Note: The thermostat has a built in compressor protection (minimum off timer) that prevents the compressor from restarting too early after a shutdown. The minimum-off timer is activated after the compressor turns off. If there is a call during the minimum-off timer, the thermostat shows "Wait" in the display. This ISU is displayed if ISU 220 is set to at least 1 stage.</i>
425	Adaptive Intelligent Recovery	0 - No <b>1 = Yes</b> <i>Note: Adaptive Intelligent Recovery (AIR) is a comfort setting. Heating or cooling equipment will turn on earlier, ensuring the indoor temperature will match the setpoint at the scheduled time.</i>
430	Minimum Cool Setpoint	<b>50 °F to 99 °F (50 °F)</b> <b>10.0 °C to 37.0 °C (10.0 °C)</b> <i>Note: The cool temperature cannot be set below this level.</i>
431	Maximum Heat Setpoint	<b>40 °F to 90 °F (90 °F)</b> <b>4.5 °C to 32.0 °C (32 °C)</b> <i>Note: The heat temperature cannot be set above this level.</i>

← "Reverse cycle" only, change to "1"

← Change this setting for thermostat to automatically change to heating only applies to units with heat

←

← This is the time delay between cooling/heating cycles, 5 minutes is recommended. Setting to "0" will potentially harm unit

← Personal preference

← Min/Max heat and cool setpoints

# INSTALLATION AND OPERATION CONT'D

## FIGURE 6 CONT'D

# ISU	ISU Name	ISU Options (factory default in bold)																				
435	Keypad Lockout	<p><b>0 = None</b>                      1 - Partial                      2 - Full                      Note:  <b>Unlocked:</b> User has access to all thermostat settings.  <b>Partially Locked:</b> User can modify only temperature settings.  <b>Fully Locked:</b> User cannot modify any settings. Screen will be locked by default factory code and cannot be changed. This code is displayed for a short time, when you are about to lock the thermostat screen. Please note the code in safe place for future reference.</p>																				
702	Number of Air Filters	<p><b>0 - 2</b>                      Note: This ISU refers to the number of air filters in the system.</p>																				
711	Air Filter 1 Replacement Reminder	<table border="0"> <tr> <td><b>0 = Off</b></td> <td>10 - 45 Calendar Days</td> </tr> <tr> <td>1 - 10 Run Time Days</td> <td>11 - 60 Calendar Days</td> </tr> <tr> <td>2 - 20 Run Time Days</td> <td>12 - 75 Calendar Days</td> </tr> <tr> <td>3 - 30 Run Time Days</td> <td>13 - 3 Calendar Months</td> </tr> <tr> <td>4 - 45 Run Time Days</td> <td>14 - 4 Calendar Months</td> </tr> <tr> <td>5 - 60 Run Time Days</td> <td>15 - 5 Calendar Months</td> </tr> <tr> <td>6 - 90 Run Time Days</td> <td>16 - 6 Calendar Months</td> </tr> <tr> <td>7 - 120 Run Time Days</td> <td>17 - 9 Calendar Months</td> </tr> <tr> <td>8 - 150 Run Time Days</td> <td>18 - 12 Calendar Months</td> </tr> <tr> <td>9 - 30 Calendar Days</td> <td>19 - 15 Calendar Months</td> </tr> </table> <p>Note: Set a reminder for when to change your air filter. Choose either calendar or equipment run time-based reminder.</p>	<b>0 = Off</b>	10 - 45 Calendar Days	1 - 10 Run Time Days	11 - 60 Calendar Days	2 - 20 Run Time Days	12 - 75 Calendar Days	3 - 30 Run Time Days	13 - 3 Calendar Months	4 - 45 Run Time Days	14 - 4 Calendar Months	5 - 60 Run Time Days	15 - 5 Calendar Months	6 - 90 Run Time Days	16 - 6 Calendar Months	7 - 120 Run Time Days	17 - 9 Calendar Months	8 - 150 Run Time Days	18 - 12 Calendar Months	9 - 30 Calendar Days	19 - 15 Calendar Months
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712	Air Filter 2 Replacement Reminder	<table border="0"> <tr> <td><b>0 = Off</b></td> <td>10 - 45 Calendar Days</td> </tr> <tr> <td>1 - 10 Run Time Days</td> <td>11 - 60 Calendar Days</td> </tr> <tr> <td>2 - 20 Run Time Days</td> <td>12 - 75 Calendar Days</td> </tr> <tr> <td>3 - 30 Run Time Days</td> <td>13 - 3 Calendar Months</td> </tr> <tr> <td>4 - 45 Run Time Days</td> <td>14 - 4 Calendar Months</td> </tr> <tr> <td>5 - 60 Run Time Days</td> <td>15 - 5 Calendar Months</td> </tr> <tr> <td>6 - 90 Run Time Days</td> <td>16 - 6 Calendar Months</td> </tr> <tr> <td>7 - 120 Run Time Days</td> <td>17 - 9 Calendar Months</td> </tr> <tr> <td>8 - 150 Run Time Days</td> <td>18 - 12 Calendar Months</td> </tr> <tr> <td>9 - 30 Calendar Days</td> <td>19 - 15 Calendar Months</td> </tr> </table> <p>Note: Set a reminder for when to change your air filter. Choose either calendar or equipment run time-based reminder.</p>	<b>0 = Off</b>	10 - 45 Calendar Days	1 - 10 Run Time Days	11 - 60 Calendar Days	2 - 20 Run Time Days	12 - 75 Calendar Days	3 - 30 Run Time Days	13 - 3 Calendar Months	4 - 45 Run Time Days	14 - 4 Calendar Months	5 - 60 Run Time Days	15 - 5 Calendar Months	6 - 90 Run Time Days	16 - 6 Calendar Months	7 - 120 Run Time Days	17 - 9 Calendar Months	8 - 150 Run Time Days	18 - 12 Calendar Months	9 - 30 Calendar Days	19 - 15 Calendar Months
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7 - 120 Run Time Days	17 - 9 Calendar Months																					
8 - 150 Run Time Days	18 - 12 Calendar Months																					
9 - 30 Calendar Days	19 - 15 Calendar Months																					
1400	Backlighting	<p><b>0 = On Demand</b>                      1 - Continuous                      Note: Common wire needed for continuous.</p>																				
1401	Backlight brightness	<p><b>1 - 5</b>                      Note: Only displayed if continuous backlight selected.</p>																				
1410	Clock Format	<b>12 / 24</b>																				
1415	Daylight Saving Time	<p><b>0 = Off</b>  <b>1 = On</b>                      Note: Set to Off in areas that do not follow Daylight Saving Time.</p>																				
1420	Temperature Display Offset	<p>-3 to 3F (<b>0</b>)                      -1.5 to 1.5C (<b>0</b>)                      Note: 0 °F - No difference in displayed temperature and the actual room temperature. The thermostat can display up to 3 °F (1.5 C) lower or higher than the actual measured temperature.</p>																				

← Setting to prevent tampering

← Air filter reminder

← If thermostat is placed in a non-ideal location this will help adjust thermostat to read a more "accurate" space temperature



# INSTALLATION AND OPERATION CONT'D

## FIGURE 6 CONT'D

### Installer system test

To perform a System Test:

- 1 Press and hold **CENTER** and **+** buttons for approximately 3 seconds to enter advanced menu.
- 2 Use **+** to go to **TEST**. Press **Select** to enter System Test.
- 3 Use **+** to change between Heat, Cool, Fan, Em. Heat (TH4210U only), or Ver (thermostat version information). Press **Select**.
- 4 Press **+** to turn heat, cool, or fan on. Press **-** to turn them off.
- 5 Use the **Home** button to exit the System Test.



← Thermostat testing procedure to confirm proper operation

System test		System status
Heat	0	Heat Off
	1	Heat On
Cool	0	Cool Off
	1	Cool On
Fan	0	Fan Off
	1	Fan On
Em. Heat (TH4210U only)	0	Em. Heat Off
	1	Em. Heat On

Thermostat technical specifications →

### Specifications

#### Temperature Ranges

Heat: 40 °F to 90 °F (4.5 °C to 32.0 °C)

Cool: 50 °F to 99 °F (10.0 °C to 37.0 °C)

#### Operating Ambient Temperature

37 °F to 102 °F (2.8 °C to 38.9 °C)

#### Shipping Temperature

-20 °F to 120 °F (-28.9 °C to 48.9 °C)

#### Operating Relative Humidity

5% to 90% (non-condensing)

#### Physical Dimensions in inches (mm) (H x W x D)

4-1/16" H x 4-1/16" W x 1-5/32" D

103.5 mm H x 103.5 mm W x 29 mm D

#### Electrical Ratings

Terminal	Voltage (50/60Hz)	Running Current
W Heating (Powerpile)	20-30 Vac	0.02-1.0 A
(Powerpile)	750 mV DC	100 mA DC
W2 (Aux) Heating (TH4210U only)	20-30 Vac	0.02-1.0 A
E Emergency Heat (TH4210U only)	20-30 Vac	0.02-0.5 A
Y Compressor Stage 1	20-30 Vac	0.02-1.0 A
G Fan	20-30 Vac	0.02-0.5 A
O/B Changeover	20-30 Vac	0.02-0.5 A
L/A Input	20-30 Vac	0.02-0.5 A

9.) Once the thermostat is programmed and tested, move on to the remainder of the install and cleanup.

### 9.) Putting It All Together:

At this point the unit can be placed back into its compartment, and all the power, water hoses, and ducting should be available and ready to connect if they are not already. Your air conditioner is accompanied by a 7/8" thick black rubber mounting pad. This pad is to be placed directly under the air conditioning unit to aid in the isolation of any vibration. If height is a concern for your installation, the pad is not a necessity for the unit to operate properly.

# INSTALLATION AND OPERATION CONT'D

## Important

**Do not cut any excess water hose, wire, or ducting before determining that all requirements can be met when unit is secured.**

Position the air conditioning unit so “water in” and “water out” hoses can be attached without kinking. Now check the air splitter and ducting for fit. Make sure that all ducting bends are as slight as possible to keep air restriction to a minimum. Once you are satisfied with the compromises you have made between the water and the air connections, locate a place for the electric box. **Remember, this box may be mounted in any attitude, but must never get wet.** Now, before cutting any excess hose, etc. check to see that all four air conditioner mounting screws can be installed **without making contact with the hull.**

**Note: Enclosed in the kit are (4) brackets with a hole drilled in one side. These are the hold down brackets for mounting the AC unit. They can be positioned anywhere along the base.**

Next, cut the water hoses to fit and attached each hose with two s/s clamps. Make sure that each hose is placed on the proper end of the condensing coil as marked “water in” and “water out”. **Make sure to remove any plastic caps on the ends of the condensing coil that were installed for shipping purposes.**

The FMMS AC unit drain pan Connect the clear 1/2” hose to one or both of the drain nipples. This hose generally fits snugly without a hose clamp. If you are using both nipples you can either have them each drain separately into the bilge or connect them together with a “wye” or “tee” fitting for a common drain. If you are using an “FMMS Condensator Kit” it is recommended to pick one drain connection and use that. If the unit is tipping toward one drain connection lower than the other, that is the ideal drain connection to choose. If you are using one drain, plug the unused drain before the unit is operational.

## WARNING

**MAKE SURE THAT ALL AC POWER TO THE BOAT HAS BEEN DISCONNECTED! FAILURE TO REMOVE ALL BOAT AC POWER COULD RESULT IN ELECTRICAL SHOCK CAUSING SERIOUS INJURY OR DEATH!**

Using the full length of the electric box cable or unplugging the cable, bring the box out to where it is more convenient for you to work with in making all the required connections. Determine which power cable is from the pump (16 gauge cable) and strip the outside insulation back about six inches. Then strip each of the three individual wires back about 1/4 inch. Facing the white terminal block on the side of the electric box, locate the

# INSTALLATION AND OPERATION CONT'D

connection labeled "pump". Using the appropriate size flat blade screw driver, open the connections marked "white" and "black" and slide the "black" and "white" wires into the open connector slots for each color. Make sure that no bare wire is exposed outside the connector slot and tighten the screw. Pull each wire to insure it is tightly connected. Using an appropriate size electrical ring connector, attach the "green" wire to the "ground" post located on the mounting bracket.

## **WARNING**

**HAVING ANY BARE WIRE EXPOSED OUTSIDE THE WHITE TERMINAL BLOCK COULD CREATE ELECTRICAL SHOCK CAUSING SERIOUS INJURY OR DEATH**

Next, locate the 115 (or 220) VAC power cable from the Circuit Breaker Panel (12 gauge cable) and connect this cable to the electric box white terminal block by inserting the wires into the connector slots marked "power". To do this, follow the same procedure as with the pump connections. (SEE ABOVE WARNING ON EXPOSED BARE WIRE CONNECTIONS).

Locate the black terminal strip on the outside of the electrical box just above the power terminal block) and attach the thermostat power cable. This terminal strip is color coded for easy determination of which wire is attached to which connection ("RED" to "R", "GREEN" to "G" etc.). Any excess cable may be neatly coiled next to the box or cut off and shortened to fit. If excess is cut off, do not make connections with bare wires, install new connectors on each wire. Check the previous pages for thermostat wiring and programming

## **IMPORTANT**

**MAKE SURE THAT YOU SECURE ALL LOOSE WIRING AND HOSES WITH APPROPRIATE SIZE NYLON CLIPS OR CABLE TIES TO MAKE SURE THAT BOAT OR WAVE ACTION WILL NOT CAUSE STRESS OR KINKING.**

Note: The upgraded thermostat option and control box are pre-wired and use an 8-pin display cable to communicate with the display. Only the power wires and pump wires need to be connected during install and the display cable slots into a jack on the display and motherboard.

Now connect the air splitter and air ducting. You may use appropriate size cable ties or a high grade ducting tape. If the air splitter is attached directly to the unit air collar, we recommend that you secure it with (1) or (2) 1/2" s/s screws along with duct tape or foil tape.

Now, attach the return air grill and your installation is completed.

# INSTALLATION AND OPERATION CONT'D

## **B.) SYSTEM OPERATION:**

**Note:** If the boat has not been placed back in the water, do so now. The air conditioner requires proper cooling water to operate.

### **1. Priming The Pump:**

A.) Because marine air conditioner pumps are not self priming, generally, the pump may need priming each time the boat is removed from the water and then placed back into the water. Priming may also be required when the water strainer is cleaned or when the boat has returned to the dock after being used. Normally, once primed at the dock, the pump will retain its prime until used or taken in and out of the water as mentioned above.

B.) To prime the pump, open the sea cock and view the water flow through the clear red stripe hose. If the water flows into the input of the pump with no air bubbles in the strainer or hose, the pump is primed. However, if air bubbles are present you must loosen the hose clamps on the pump discharge hose (blue stripe or black reinforced) and momentarily remove the hose. Water will immediately flow from the pump breaking the air lock. Quickly replace the hose and re-tighten the hose clamps. The pump is now primed. If you have installed the optional "bleed off" valve, it is usually not necessary to remove the discharge hose from the pump. Open the "bleed off" valve until water flow is observed and then close the valve. (Ideally this water should be directed to the bilge or a container that can be later discharged overboard).

### **WARNING**

**AS STATED EARLIER, FAILURE TO CLOSE THE "BLEED OFF" VALVE WILL RESULT IN FLOODING AND POSSIBLE SINKING OF THE BOAT.**

**Note:** If water does not flow from the pump when the discharge hose is removed or from the "bleed off" valve when opened, the pump is not below the water line of the boat and must be remounted.

### **2.) Power:**

A.) With the air conditioner circuit breaker in the "off" position connect the dock power cord back to the boat.

B.) Place the main circuit breaker and the air conditioner circuit breaker in their "on" positions.

### **3.) Water Out:**

# INSTALLATION AND OPERATION CONT'D

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A.) Once the air conditioner starts, immediately go out on deck and check that water is coming out of the "water out" thru-hull. Once all of the latent air is forced from the hoses a steady stream should be present with enough force that the water stream clears the side of the boat hull.

B.) If the water flow is not present or weak, the pump was not properly primed. Shut the air conditioner off and prime the pump as described above. (You may also attempt to prime via the bleed off valve ONLY while the air conditioner is running - allowing for the pump to function). If the air conditioner is allowed to run without water for more than a minute, the high pressure switch will activate and disengage power from the entire unit. The high pressure switch is automatically resetting and does not require any interaction. The high pressure switch should reset in under 5 minutes and the unit will resume operation. Be aware that the thermostat may have its own delay once the high pressure switch resets.

## 4. Checking Out The System:

A.) Air Flow: Once the air conditioner is running and water flow is present, check each supply air vent to make sure it is open and cooling air is present. If air flow is not present, check ducting for good air tight connections and that kinking or sagging of the duct has not occurred.

B.) Water Connections: Check each water connection beginning at the sea cock, then the water strainer, pump, the air conditioner and the "water out" thru-hull. No water leaks should be present. Also, at this time, it is always good to check the hose clamps for tightness in case one may have been overlooked during installation.

C.) Condensation: By now the unit should be producing condensation. Check to make sure that condensation is flowing freely into the condensation hose. If the unit has not produced sufficient condensation to check the flow, pour water into the condensation pan to see that in fact it is flowing freely.

D.) The Air Conditioner Unit: The unit should be free of vibration noises and the sides of the evaporator should be sweating and cool all the way up. If vibration noise is present, adjust the unit mounting screws. If this does not correct the noise, use a socket wrench with an extender or a large phillips head screwdriver ( or 5/16 nut runner if applicable) and tighten down the compressor mounting bolts until the vibration noise stops. In some situations, although very rare, it may lessen the sound vibration to actually loosen the compressor bolts a very, very small amount. In some boats where a mounting shelf was installed, sound will travel through the board to the side walls and a "speaker effect" will take place. The included mounting pad should eliminate a generous portion of any known or heard vibration.

# **OPERATION AND PROGRAMMING**

## **A.) Introduction:**

Standard FMMS units come equipped with a 24V thermostat like you would find in a residential home, which allows the wiring and control components to be simpler. The leads to longer operational life and makes parts easy to acquire. With the help of FMMS factory technical support and available technical documentation, many of our customers who are mechanically able have performed repairs on their own units around the world, from busy marinas to remote destinations.

Standard features include:

- Battery back-up with (2) AA batteries
- Built in short cycle protection during normal operation (up to 5 minutes)
- Auto or manual fan control
- LCD display
- Fahrenheit or Celsius temperature scales
- 12 or 24 hour clock
- Programmable shedule

The thermostat comes with 20 feet of cable. One end will be connected to the control box and the other will be connected to the thermostat. The thermostat installation and programming was previously described in the installation and operation section, and will also be re-explained in this section.

The thermostat may be mounted on any flat wall surface with space behind the wall to run the thermostat power cable out of view and still reach the air conditioner electrical box. It is important for the thermostat to be located where it is sensing the “true” cabin temperature. Ideally, the thermostat will be about 2/3 the way up on an interior wall, out of direct sunlight, and not directly in front of a “supply air” vent or hatch. If your boat does not have an ideal location, the second best area to read temperature of the cabin is right by the air conditioner return vent. As the unit runs, the air around the return vent will be an area that is an average of the temperature in the cabin. Be aware that where the thermostat is located will determine how long and how often the air conditioner runs, and there may be uneven temperature distribution in certain places if one unit is providing air to multiple areas of the boat.

Once you have selected the thermostat location, it needs to be mounted to the wall. The thermostat will come with the brand specific instructions on how to mount it, but a brief summary of the process to mount the thermostat on the wall:

- 1.) Remove the thermostat and its components from its box.

# OPERATION AND PROG. CONT'D

- 2.) Locate the thermostat mounting plate, also known as the thermostat backplate, and position it on the wall where you would like the thermostat.
- 3.) Mount the thermostat back plate to the wall with anchors or screws.
- 4.) In the center of the thermostat backplate is a hole where the thermostat wire will pass to the space behind the wall. Cut a hole in the wall inside the backplate hole so that you can pass the thermostat wire from the thermostat to the AC unit.
- 5.) Run the thermostat wire through the hole so that one end is at the thermostat and the other is at the AC unit.
- 6.) The thermostat wire should be 5 strands and each is a different color. Common 5 wire thermostat cable is red, green, white, yellow, and blue. Each color has to be correctly attached to the proper thermostat terminal and the correctly paired control box terminal. The type of unit purchased will determine which terminals will be used. Consult (figure 4 and figure 5) to determine the wiring configuration you will use.
- 7.) Once you have the correct wiring configuration from (figure 4 and figure 5), the next step is to connect the wires at both the thermostat and ac control box. The wires at the control box will be attached using the spade crimps that came with the thermostat cable. Strip the wires back about 1/4" to 3/8" and crimp the spade terminals to the thermostat wires. Then connect them to the thermostat terminals on the control box, making sure to follow (figure 4 and figure 5) for correct color placement. Then strip the wires back 1/4" to 3/8" at the thermostat and insert the thermostat wires into the thermostat terminals based on (figure 4 and figure 5) for your unit's configuration. **WARNING: Improper wiring connections will lead to the unit not operating correctly and/or damage to the thermostat, control box, and air conditioning unit.**
- 8.) Once the thermostat is hooked up to the control box, additional thermostat setup may be required. For the thermostat included with a unit purchased from FMMS, the setup is laid out in (figure 6). If the thermostat is from a different provider, the basic configuration steps are as follows:

-For cool only units, very little setup is required and the only step if desired is to turn off the "heat" mode since the unit will not use it.

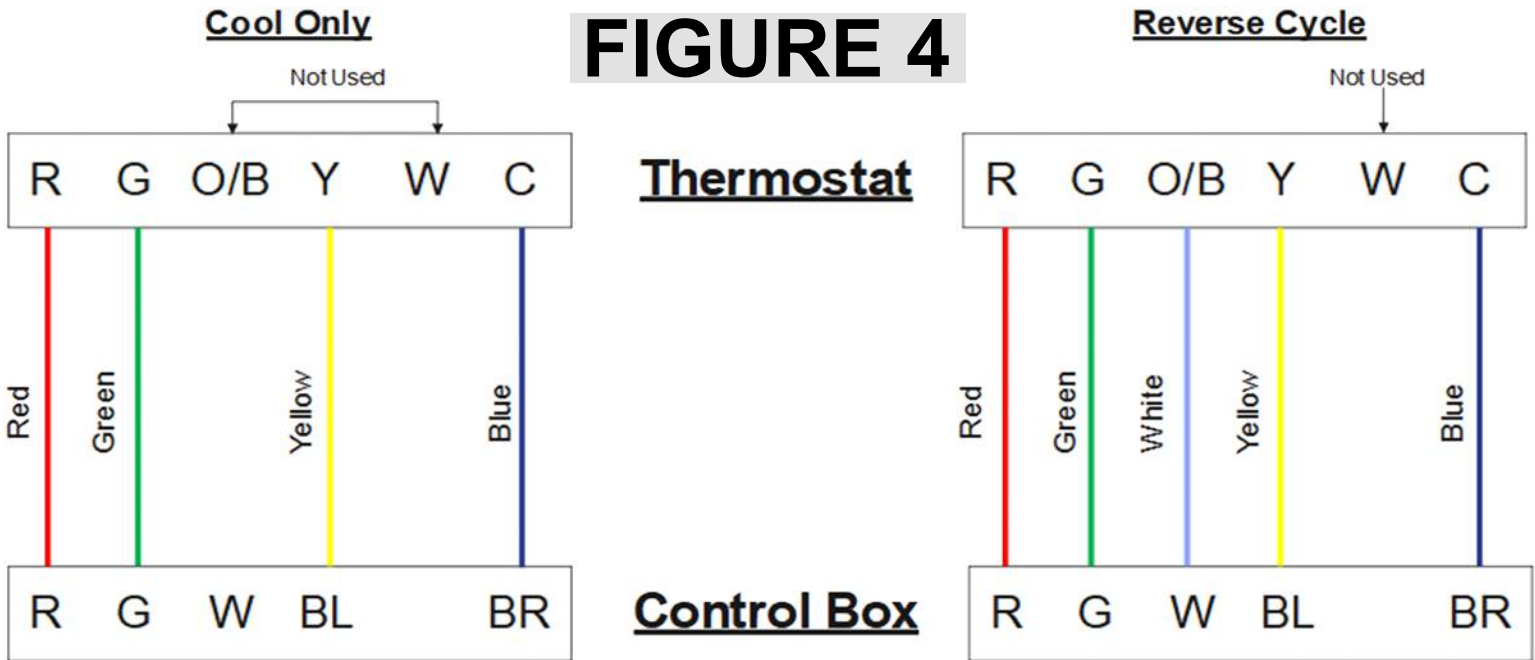
-For reverse cycle units, the thermostat needs to be set to "heat pump mode" with the reversing valve being energized with the "b" terminal.

-Electric heat setup will require the thermostat to be set to "electric heat" mode or changing the setting "thermostat controls fan" to "enabled". This will ensure that the blower and electric heat strip come on at the same time to prevent damage to the electric heat strip.

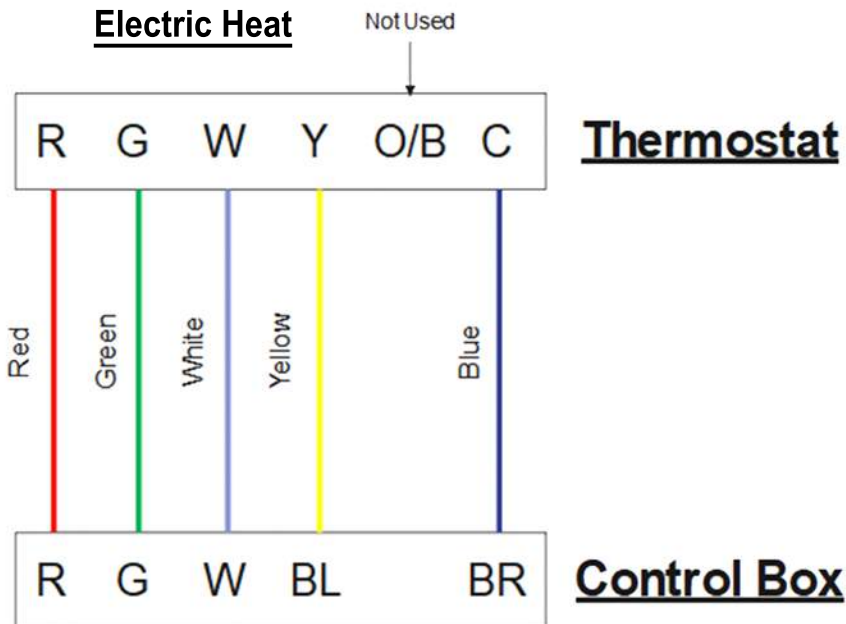
**Note: Consult your specific thermostat manual if you are not using one provided by FMMS. For added insurance, please call FMMS technical support before first start up to consult on your setup and make sure everything is ready to go. Failure to ensure proper setup may result in personal injury, damage to your boat, and/or damage to your air conditioner, which may void your warranty or result in repairs not covered under the warranty.**

# OPERATION AND PROG. CONT'D

## FIGURE 4



## FIGURE 5



### Note:

C/BR is an optional wire and not all thermostats will require it or have the terminal available. For any Wi-Fi/Smart thermostats the C/BR connection is essential for 24V power to run the thermostat when the unit has power. If thermostat requires 24V power to operate it will turn off if unit is disconnected from high voltage power in any way



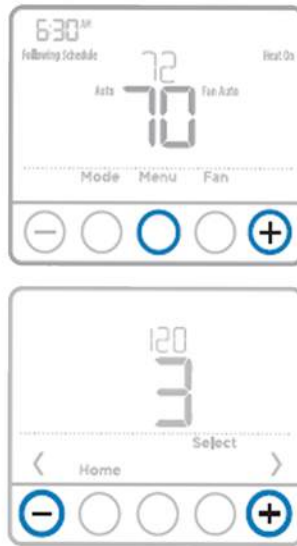
# OPERATION AND PROG. CONT'D

## Installer setup (ISU)

- 1 Press and hold **CENTER** and **+** buttons for approximately 3 seconds to enter advanced menu.
- 2 Press **Select** to enter **ISU**.
- 3 Press **Select** to cycle through menu setup options.
- 4 Press **+** or **-** to change values or select from available options.
- 5 Press **Select** and confirm your settings or press **Back** to ignore changes and return to ISU menu screen to continue editing another setup option.
- 6 To finish setup process and save your setting, press **Home** and return to Home screen.

**NOTE:** A complete list of all setup (ISU) parameters and options starts below

### FIGURE 6



**Installer setup will be available at first startup, if bypassed, return using these steps**

# ISU	ISU Name	ISU Options (factory default in bold)
120	Scheduling Options	0 - Non-Programmable 2 - 5-2 Programmable <b>3 = 5-1-1 Programmable</b> 4 - 7-Day Programmable <i>Note: You can change default MO-FR, SA-SU schedule here. To edit periods during days, temperature setpoints, or to turn Schedule On/Off, touch MENU and go to SCHEDULE.</i>
125	Temperature Indication Scale	<b>0 = Fahrenheit</b> 1 - Celsius
200	Heating System Type	<b>1 = Conventional Forced Air Heat</b> 2 - Heat Pump 3 - Radiant Heat 5 - None (Cool Only) <i>Note: This option selects the basic system type your thermostat will control.</i>
205	Heating Equipment Type	<i>Conventional Forced Air Heat:</i> 1 - Standard Efficiency Gas Forced Air <b>2 = High Efficiency Gas Forced Air</b> 3 - Oil Forced Air 4 - Electric Forced Air 5 - Hot Water Fan Coil  <i>Heat Pump:</i> <b>7 = Air to Air Heat Pump</b> 8 - Geothermal Heat Pump  <i>Radiant Heat:</i> <b>9 = Hot Water Radiant Heat</b> 12 - Steam <i>Note: This option selects the equipment type your thermostat will control. Note: This feature is NOT displayed if feature 200 is set to Cool Only.</i>

**Personal Preference, this setting will activate or deactivate program scheduler**

-If unit is "cool only" change to "5"  
 -If unit is "reverse cycle" change to "2"  
 -If unit is "electric heat" leave on "1"

-If unit is "reverse cycle" leave on "7"  
 -If unit is "electric heat" change to "4"

# OPERATION AND PROG. CONT'D

## FIGURE 6 CONT'D

# ISU	ISU Name	ISU Options (factory default in bold)
218	Reversing Valve O/B	<b>0 = 0 (O/B in Cool)</b> 1 - B (O/B in Heat) <i>Note: This option is only displayed if the Heat Pump configured. Select whether reversing valve O/B should energize in cool or in heat.</i>
220	Cool Stages / Compressor Stages 200-Conv / 200-HP	<b>0,1</b> <i>Note: Select how many Cool or Compressor stages of your equipment the thermostat will control. Set value to 0 if you do not have Cool Stage/ Compressor Stage.</i>
221	Heat Stages / Backup Heat Stages	<b>1</b> <i>Note: Select how many Heat or Aux/E stages of your equipment the thermostat will control.</i>
230	Fan Control in Heat	1 - Equipment Controls Fan <b>2 = Thermostat Controls Fan</b> <i>Note: This ISU is only displayed if ISU 205 is set to Electric Forced Air or Fan Coil.</i>
300	System Changeover	<b>0 = Manual</b> 1 - Automatic <i>Note: Thermostat can automatically control both heating and cooling to maintain the desired indoor temperature. To be able to select "automatic" system mode on thermostat home screen, turn this feature ON. Turn OFF if you want to control heating or cooling manually.</i>
303	Auto Changeover Differential	<b>0 °F to 5 °F</b> <b>0.0 °C to 2.5 °C</b> <i>Note: Differential is NOT deadband. Differential means how far past the setpoint before switching to the mode selected. Deadband setup is not an option. Honeywell uses an advanced algorithm that fixes deadband at 0 °F. This is more advanced than previous thermostats.</i>
365	Compressor Cycle Rate (Stage 1)	1 - 6 <i>Note: This ISU is only displayed when Cool /Compressor Stage is set to 1 stage. Cycle rate limits the maximum number of times the system can cycle in a 1 hour period measured at a 50% load. For example, when set to 3 CPH, at a 50% load, the most the system will cycle is 3 times per hour (10 minutes on, 10 minutes off). The system cycles less often when load conditions are less than or greater than a 50% load.</i>
370	Heating Cycle Rate (Stage 1)	1 - 12 <i>Note: This ISU is only displayed when Heat Stage is set to 1 stage. Cycle rate limits the maximum number of times the system can cycle in a 1 hour period measured at a 50% load. For example, when set to 3 CPH, at a 50% load, the most the system will cycle is 3 times per hour (10 minutes on, 10 minutes off). The system cycles less often when load conditions are less than or greater than a 50% load. The recommended (default) cycle rate settings are below for each heating equipment type: Standard Efficiency Gas Forced Air - 5 CPH; High Efficiency Gas Forced Air - 3 CPH; Oil Forced Air - 5 CPH; Electric Forced Air - 9 CPH; Fan Coil - 3 CPH; Hot Water Radiant Heat - 3 CPH; Steam - 1 CPH.</i>
370	Heating Cycle Rate Auxiliary Heat	1 - 12
387	Compressor Protection	0 - Off 1 - 5 minutes <i>Note: The thermostat has a built in compressor protection (minimum off timer) that prevents the compressor from restarting too early after a shutdown. The minimum-off timer is activated after the compressor turns off. If there is a call during the minimum-off timer, the thermostat shows "Wait" in the display. This ISU is displayed if ISU 220 is set to at least 1 stage.</i>
425	Adaptive Intelligent Recovery	0 - No <b>1 = Yes</b> <i>Note: Adaptive Intelligent Recovery (AIR) is a comfort setting. Heating or cooling equipment will turn on earlier, ensuring the indoor temperature will match the setpoint at the scheduled time.</i>
430	Minimum Cool Setpoint	<b>50 °F to 99 °F (50 °F)</b> <b>10.0 °C to 37.0 °C (10.0 °C)</b> <i>Note: The cool temperature cannot be set below this level.</i>
431	Maximum Heat Setpoint	<b>40 °F to 90 °F (90 °F)</b> <b>4.5 °C to 32.0 °C (32 °C)</b> <i>Note: The heat temperature cannot be set above this level.</i>

← "Reverse cycle" only, change to "1"

← Change this setting for thermostat to automatically change to heating only applies to units with heat

←

← This is the time delay between cooling/heating cycles, 5 minutes is recommended. Setting to "0" will potentially harm unit

← Personal preference

← Min/Max heat and cool setpoints

# OPERATION AND PROG. CONT'D

## FIGURE 6 CONT'D

# ISU	ISU Name	ISU Options (factory default in bold)																				
435	Keypad Lockout	<p><b>0 = None</b>                      1 - Partial                      2 - Full                      Note:  <b>Unlocked:</b> User has access to all thermostat settings.  <b>Partially Locked:</b> User can modify only temperature settings.  <b>Fully Locked:</b> User cannot modify any settings. Screen will be locked by default factory code and cannot be changed. This code is displayed for a short time, when you are about to lock the thermostat screen. Please note the code in safe place for future reference.</p>																				
702	Number of Air Filters	<p><b>0 - 2</b>                      Note: This ISU refers to the number of air filters in the system.</p>																				
711	Air Filter 1 Replacement Reminder	<table border="0"> <tr> <td><b>0 = Off</b></td> <td>10 - 45 Calendar Days</td> </tr> <tr> <td>1 - 10 Run Time Days</td> <td>11 - 60 Calendar Days</td> </tr> <tr> <td>2 - 20 Run Time Days</td> <td>12 - 75 Calendar Days</td> </tr> <tr> <td>3 - 30 Run Time Days</td> <td>13 - 3 Calendar Months</td> </tr> <tr> <td>4 - 45 Run Time Days</td> <td>14 - 4 Calendar Months</td> </tr> <tr> <td>5 - 60 Run Time Days</td> <td>15 - 5 Calendar Months</td> </tr> <tr> <td>6 - 90 Run Time Days</td> <td>16 - 6 Calendar Months</td> </tr> <tr> <td>7 - 120 Run Time Days</td> <td>17 - 9 Calendar Months</td> </tr> <tr> <td>8 - 150 Run Time Days</td> <td>18 - 12 Calendar Months</td> </tr> <tr> <td>9 - 30 Calendar Days</td> <td>19 - 15 Calendar Months</td> </tr> </table> <p>Note: Set a reminder for when to change your air filter. Choose either calendar or equipment run time-based reminder.</p>	<b>0 = Off</b>	10 - 45 Calendar Days	1 - 10 Run Time Days	11 - 60 Calendar Days	2 - 20 Run Time Days	12 - 75 Calendar Days	3 - 30 Run Time Days	13 - 3 Calendar Months	4 - 45 Run Time Days	14 - 4 Calendar Months	5 - 60 Run Time Days	15 - 5 Calendar Months	6 - 90 Run Time Days	16 - 6 Calendar Months	7 - 120 Run Time Days	17 - 9 Calendar Months	8 - 150 Run Time Days	18 - 12 Calendar Months	9 - 30 Calendar Days	19 - 15 Calendar Months
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712	Air Filter 2 Replacement Reminder	<table border="0"> <tr> <td><b>0 = Off</b></td> <td>10 - 45 Calendar Days</td> </tr> <tr> <td>1 - 10 Run Time Days</td> <td>11 - 60 Calendar Days</td> </tr> <tr> <td>2 - 20 Run Time Days</td> <td>12 - 75 Calendar Days</td> </tr> <tr> <td>3 - 30 Run Time Days</td> <td>13 - 3 Calendar Months</td> </tr> <tr> <td>4 - 45 Run Time Days</td> <td>14 - 4 Calendar Months</td> </tr> <tr> <td>5 - 60 Run Time Days</td> <td>15 - 5 Calendar Months</td> </tr> <tr> <td>6 - 90 Run Time Days</td> <td>16 - 6 Calendar Months</td> </tr> <tr> <td>7 - 120 Run Time Days</td> <td>17 - 9 Calendar Months</td> </tr> <tr> <td>8 - 150 Run Time Days</td> <td>18 - 12 Calendar Months</td> </tr> <tr> <td>9 - 30 Calendar Days</td> <td>19 - 15 Calendar Months</td> </tr> </table> <p>Note: Set a reminder for when to change your air filter. Choose either calendar or equipment run time-based reminder.</p>	<b>0 = Off</b>	10 - 45 Calendar Days	1 - 10 Run Time Days	11 - 60 Calendar Days	2 - 20 Run Time Days	12 - 75 Calendar Days	3 - 30 Run Time Days	13 - 3 Calendar Months	4 - 45 Run Time Days	14 - 4 Calendar Months	5 - 60 Run Time Days	15 - 5 Calendar Months	6 - 90 Run Time Days	16 - 6 Calendar Months	7 - 120 Run Time Days	17 - 9 Calendar Months	8 - 150 Run Time Days	18 - 12 Calendar Months	9 - 30 Calendar Days	19 - 15 Calendar Months
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7 - 120 Run Time Days	17 - 9 Calendar Months																					
8 - 150 Run Time Days	18 - 12 Calendar Months																					
9 - 30 Calendar Days	19 - 15 Calendar Months																					
1400	Backlighting	<p><b>0 = On Demand</b>                      1 - Continuous                      Note: Common wire needed for continuous.</p>																				
1401	Backlight brightness	<p><b>1 - 5</b>                      Note: Only displayed if continuous backlight selected.</p>																				
1410	Clock Format	<b>12 / 24</b>																				
1415	Daylight Saving Time	<p><b>0 = Off</b>  <b>1 = On</b>                      Note: Set to Off in areas that do not follow Daylight Saving Time.</p>																				
1420	Temperature Display Offset	<p>-3 to 3F (<b>0</b>)                      -1.5 to 1.5C (<b>0</b>)                      Note: 0 °F - No difference in displayed temperature and the actual room temperature. The thermostat can display up to 3 °F (1.5 C) lower or higher than the actual measured temperature.</p>																				

← Setting to prevent tampering

← Air filter reminder

← If thermostat is placed in a non-ideal location this will help adjust thermostat to read a more "accurate" space temperature

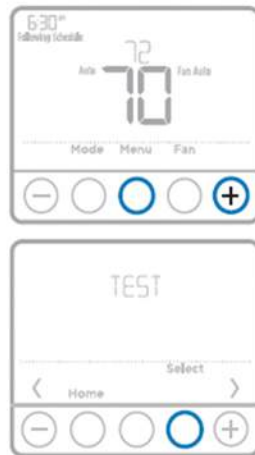
# OPERATION AND PROG. CONT'D

## FIGURE 6 CONT'D

### Installer system test

To perform a System Test:

- 1 Press and hold **CENTER** and **+** buttons for approximately 3 seconds to enter advanced menu.
- 2 Use **+** to go to **TEST**. Press **Select** to enter System Test.
- 3 Use **+** to change between Heat, Cool, Fan, Em. Heat (TH4210U only), or Ver (thermostat version information). Press **Select**.
- 4 Press **+** to turn heat, cool, or fan on. Press **-** to turn them off.
- 5 Use the **Home** button to exit the System Test.



← Thermostat testing procedure to confirm proper operation

System test		System status
Heat	0	Heat Off
	1	Heat On
Cool	0	Cool Off
	1	Cool On
Fan	0	Fan Off
	1	Fan On
Em. Heat (TH4210U only)	0	Em. Heat Off
	1	Em. Heat On

Thermostat technical specifications →

### Specifications

#### Temperature Ranges

Heat: 40 °F to 90 °F (4.5 °C to 32.0 °C)

Cool: 50 °F to 99 °F (10.0 °C to 37.0 °C)

#### Operating Ambient Temperature

37 °F to 102 °F (2.8 °C to 38.9 °C)

#### Shipping Temperature

-20 °F to 120 °F (-28.9 °C to 48.9 °C)

#### Operating Relative Humidity

5% to 90% (non-condensing)

#### Physical Dimensions in inches (mm) (H x W x D)

4-1/16" H x 4-1/16" W x 1-5/32" D

103.5 mm H x 103.5 mm W x 29 mm D

#### Electrical Ratings

Terminal	Voltage (50/60Hz)	Running Current
W Heating (Powerpile)	20-30 Vac	0.02-1.0 A
W2 (Aux) Heating (TH4210U only)	750 mV DC	100 mA DC
E Emergency Heat (TH4210U only)	20-30 Vac	0.02-1.0 A
Y Compressor Stage 1	20-30 Vac	0.02-0.5 A
G Fan	20-30 Vac	0.02-1.0 A
O/B Changeover	20-30 Vac	0.02-0.5 A
L/A Input	20-30 Vac	0.02-0.5 A

9.) Once the thermostat is programmed and tested, move on to the remainder of the install.

# 110/220 VOLT PUMP RELAY BOX

## A.) Introduction:

When two air conditioners are to be cooled using a single water pump, a relay switching box **must be used** to interface the air conditioners to the pump. Only one air conditioner can be allowed to apply power to the pump at any given time to preclude a doubling of power on the pump. The relay switching box will recognize the first air unit providing power to the pump. Whenever the pump is running, both units will receive water even if the second unit is not in operation. When the second air unit becomes operational the relay switching box will isolate this unit from the pump so double power is not applied, however, if the first air unit reaches temperature and shuts down, the relay switching box will automatically turn control of the pump operation over to the second unit allowing normal operation to continue. The second air unit will maintain control of the pump until it reaches temperature and cycles off, even if the first unit cycles back on while the second unit is operating.

### Note:

A separate 5 amp circuit breaker will be required to be installed in the main circuit breaker panel to provide 115 (or 220) vac power to the pump relay box.

On the outside of the pump relay box are two (or more) terminal blocks. One is marked "pump" and "power". This is where the incoming voltage from the breaker panel and the outgoing power to the pump will be connected. The other terminal block(s) are marked "B" and "W". This is where the control voltage coming in from each air conditioner will be connected.

## B.) Installation

Before proceeding further, put the air conditioner(s) circuit breakers in their "OFF" positions and disconnect all AC power from the boat.

### WARNING

**Failure to disable all AC power to the boat could result in electrical shock causing serious injury or death.**

### WARNING

**The pump relay box must be in a dry non-explosive environment. Exposure to explosive materials or vapors may cause explosion resulting in serious injury, death, or destruction of the boat. Exposure to water could cause electrical shorting resulting in fire and destruction of the boat.**

# **110/220 VOLT PUMP RELAY BOX**

Install a 5 amp circuit breaker in the main circuit breaker panel using 16 gauge boat power cable. Route this cable to the pump relay box which must be mounted in a dry non-explosive environment adjacent to the pump. Before cutting the cable leave a sufficient amount to properly locate the box when installation is completed. Follow the same installation procedure for this circuit breaker as with the 20 amp air conditioning unit circuit breaker described in the "Installation and Operation" section. At the pump relay box, connect this cable to the terminal block marked "power", white wire to the terminal marked "white" and the black wire to the terminal marked "black". Using a ring terminal, attach the green wire to the post marked "ground" located on the side of the relay box.

Connect the pump to the terminal block marked "pump", white wire to the terminal marked "white" and the black wire to the terminal marked "black". Using a ring terminal, attach the green wire to the post marked "ground" located on the side of the relay box.

On the first air conditioner, locate the terminal block marked "pump". Run a 16 gauge boat cable from here to the terminal block marked "B" and "W" on the pump relay box. Strip all wires back ¼". Using ring terminals, connect the green on both ends to "ground". On the air conditioner end, connect the white to the "pump" terminal marked "white" and the black wire to the "pump" terminal marked "black".

Repeat this same operation for any additional air conditioning units that are to use this same water pump. Once all wiring is completed, secure the pump relay box bracket to a convenient stringer or bulkhead and the installation is complete.

## **Note:**

FMMS pump relay boxes can run (1) pump to every (3) AC units, with a maximum of (2) pumps being controlled by the pump relay box. If you are running multiple pumps, make sure they are paired with the correct AC units. If the wrong pump comes on and a unit is being operated without receiving seawater, it could result in damage to the unit and the repairs will not be covered under warranty. It is recommended that when the installation is finished for the pump relay box and the AC units, run each unit individually and confirm that the correct pump operates at the same time and verify that the unit is receiving and flowing an adequate amount of seawater. When sizing a pump, the rule of thumb is 2 GPM or 120 GPH for every 12,000 BTUs of cooling capacity. No two installs are exactly the same, and with varying water pipe runs and a vast array of different flow restrictions from all the components in a water loop, the flow rate recommended is measured from the water outlet on the outside of the hull. For reference, a 500 GPH pump should be able to fill a 5-gallon bucket in about 45 seconds under ideal conditions.

# Maintenance and Winterization

## A.) Maintenance:

### 1.) Water System:

After the first 30 days of operation, check all water connections for leaks and all hose clamps to insure that none have become loose. It is always a good policy to make periodic checks of all water connections and to close the "water in" sea cock whenever you leave the boat for extended periods of time.

Your water strainer will require cleaning on a regular basis. The time between cleanings will be dependent on the condition of the water your boat resides in, the amount of time your air unit operates, and the physical size of the strainer you have installed. After you have had your unit for a few months you will develop a feel for how often you should clean the strainer basket.

### 2.) Air System:

There is little maintenance required for the air system. The main item is the air filter located on the front of the air unit evaporator held on by two velcro strips. This filter will require cleaning on a regular basis. As with the water strainer, the time between cleanings will be dependent on operating time and environment. For instances, if you have a pet, the time between cleanings will be shorter due to the pet hair that will be pulled onto the filter. The filter is easily cleaned by washing it in plain tap water. Never operate the air unit for extended periods of time without the air filter in place. The debris that would normally be collected by the filter will become lodged in the evaporator coil cooling fins and will gradually reduce the efficiency and performance of your air conditioner to a point that it will require professional acid bath cleaning. When cleaning the filter, also wipe the unit off with a dry cloth to eliminate dust build up. Check that the air ducting has not sagged or loosened around the air collar or air vents.

### 3.) Electrical System:

Unless you have some reason to suspect an electrical problem, there is no maintenance required for the electrical system. That being said, it is prudent to do cursory checks on all equipment on your boat as you perform your general maintenance on various equipment and systems throughout the year. Before doing any electrical system checks, make sure the air conditioner power is turned off at the main breaker panel. Check all wiring connections and make sure they have not loosened. Look for any corrosion that is forming and clean the corrosion or replace the wire/connection that is corroding. If you see any burn marks or signs of overheating contact FMMS technical support before restoring power to the air conditioner. Make sure nothing in the electrical area is wet before restoring power.

# Maintenance and Winterization

## B.) Winterization:

If your boat is in the water, you must first close the "water in" sea cock before proceeding with winterization.

### Warning

**Failure to close sea cock before removing water hoses may result in flooding causing significant water damage or sinking of the boat!**

The condensing coil, the coil that connects to cooling "water in" and cooling "water out", must be clear of any standing or trapped water. The best way to clear this coil is to remove the "water in" hose from the coil and place a short piece of the same diameter hose on the condensing coil. Blow through the short hose until no water comes out of the "water out" thru-hull fitting on the outside of the boat. A compressed air source would be ideal, should you have access to one.

Before replacing the condensing coil "water in" hose, go to where the pump is located and remove the "water in" hose to the water pump. This is the hose between the pump and the water strainer. Now return to the air unit and blow through the "water in" hose forcing any trapped water back and through the pump. Again, a compressed air source would be ideal, should you have access to one. This will clear the hose and the pump. Replace both hoses to their original connections.

If you have any doubt about not clearing the condensing coil, you can add a legally acceptable standard antifreeze or alcohol to the coil. Certain locales prohibit the use of automotive antifreeze. Should you be using alcohol, insure you do not allow alcohol to be in the water strainer. Clear plastic water strainer cups will cloud with alcohol.

Winterization is now completed. If the boat is to remain in the water, do not reopen the sea cock until you are ready to again use the air conditioning unit when freezing is no longer a threat.

### Warning

**If the sea cock is reopened with the boat in the water and freezing occurs, water hoses may rupture and flooding may occur causing significant damage or sinking of the boat. Also if freezing occurs in the air conditioner water coil, it could crack and leak all the refrigerant. This damage will not be covered under warranty and will void the warranty completely. Once water has entered the air conditioner refrigerant piping, repairs may not be possible.**



Thank you for reading this installation guide! If you need to access to our troubleshooting guide contact FMS technical support or go to our “Marine Documentation” page of our website at [FMMSUSA.COM](http://FMMSUSA.COM)