



OPERATION

The Marine Air air conditioning systems have three (3) basic controls:

- (1) System Switch
- (2) Fan Speed
- (3) Thermostat

Follow these procedures for operation of the system:

- (1) Set the system switch on the control panel to 'off.'
- (2) Turn on main circuit breaker on ship's panel.
- (3) Turn thermostat fully clockwise for cooling and fully counter-clockwise for heating.
- (4) Set the fan speed control on 'high' position.
- (5) Be sure the sea water inlet valve is open.
- (6) Turn the system switch to 'start'. This energizes the fans and the sea water pump. Check the overboard discharge to be sure that water is flowing through the condensing units.
- (7) Turn the system switch knob to 'run'. The compressor will start to cool or heat according to the setting of the thermostat.
- (8) To set the thermostat, allow sufficient time for the unit to operate to heat or cool the area to the desired temperature. When the area is sufficiently heated or cooled, turn the thermostat knob slowly to the center position until it 'clicks' once. The thermostat is now set to maintain a constant temperature.
- (9) On the cooling cycle, use any fan speed desired. When operating in the heat cycle, set the fan speed control to the high position. Decrease fan to medium setting and run system in this position for the most efficient heat output.
NOTE: If ambient temperatures are less than 50°F, allow the unit to run on low for 5 to 10 minutes, until it begins to heat well. Keep in mind, however, that the lower the fan speed, the less capacity the system has.
- (10) To turn the system off, turn the system switch on the control panel to 'off.'

THERMOSTATS

The thermostat serves to cycle the compressor on and off. Thermostats on Marine Air Systems cooling and heating systems provide an automatic change-over from cooling to heating with a 3-1/2°F differential. Rotating the thermostat to the left after it has been set for cooling will cause the unit to heat. If you rotate the thermostat to the right, the unit will cool. If the thermostat is left stationary after being set, the unit will cycle from cooling to neutral if cooling is needed, or it will cycle from neutral to heating if heating is needed.

MARINE AIR SYSTEMS®
AIR 
BULLETIN

DATE: July 30, 1987

EFFECTIVE DATE: July 30, 1987

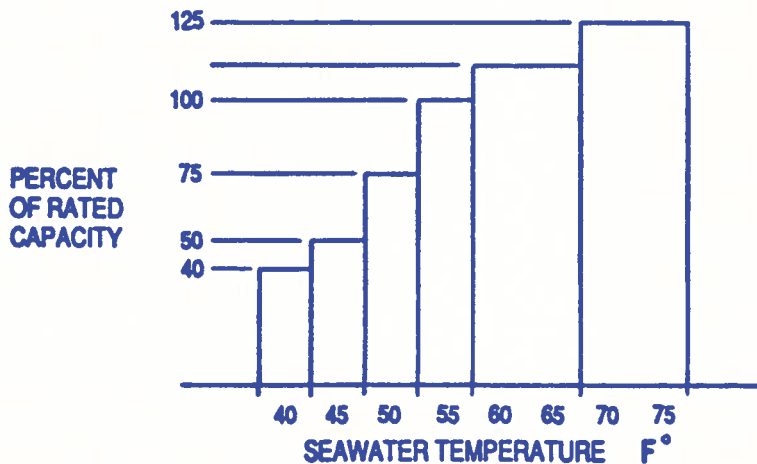
DEPARTMENT: All Customers

SUBJECT: Reverse Cycle Equipment
(Rotary Compressor)

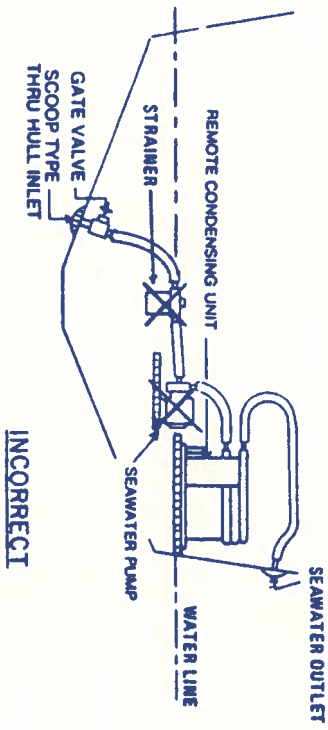
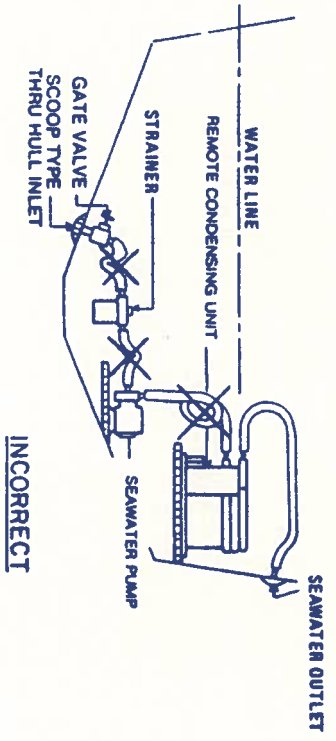
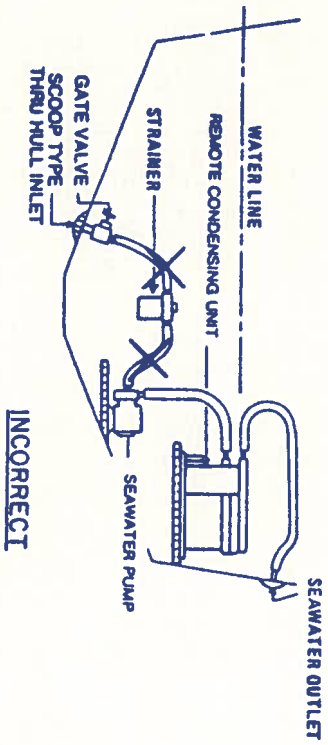
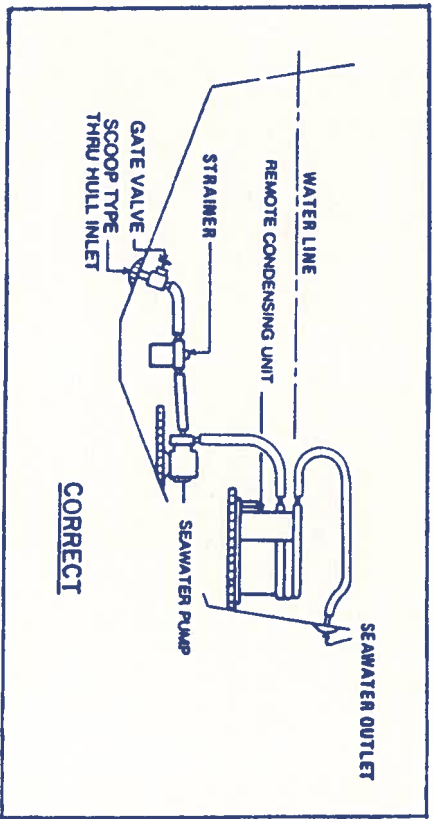
Pictured below is a chart indicating the percent of rated capacity for water cooled marine air conditioning with the reverse cycle heat pump application.

Reverse cycle operation is effected by the water temperature that is cycled through the equipment and thus, as the water temperature is reduced, so is the capacity of the output of warm air.

HEAT CYCLE EFFICIENCY



SEAWATER PUMP INSTALLATION



All of Marine Air Systems air conditioning equipment is sea water cooled and requires a continuous flow of raw water of approximately 3 to 4 gallons per minute per unit. Multi-ton equipment requires 3 to 4 GPM per 12,000 BTU. I.E., 24,000 BTU unit - 6 to 8 GPM.

PUMP SELECTION

Marine Air Systems supplies pumps of two (2) different types: Centrifugal and Rubber Impeller Positive Displacement.

CENTRIFUGAL PUMP - It is a quieter pump, requires the least amount of maintenance and has a longer life span. However, this pump is NOT a self-priming pump and this must be located well below the water line in order to assure continuous sea water flow, otherwise an air lock may take place in the sea water circuit and will require purging of this air from the system before the pump will again operate. The disadvantages of this installation are offset by the long life and quiet operation of this type pump.

POSITIVE DISPLACEMENT PUMP - Due to the fact that this pump requires positive contact impeller, it is noisier than the centrifugal type pump in operation and requires intermediate service to replace worn impellers. We recommend using this pump only in those applications where a centrifugal pump cannot be properly installed (well below the water line) such as in the case with smaller, shallow draft boats.

NOTE: Multiple air conditioning systems may be supplied from one (1) central water pump, in which case a relay panel and spud manifold must be used to couple the multiple units to the central pump.

** All sea water pumps should be wired on a separate circuit breaker.

Contact Marine Air Systems/ Engineering Department for proper model pump for your specific application.

ELECTRICAL

Prior to making any decisions concerning the electric source, please refer to your specification sheet on your boat and note the total amperage draw to operate the necessary air conditioning systems. With this information at hand, now consider the following possibilities:

1. Generally speaking, most boats come standard with a single 30 amp shore line connection.
2. Unless the boat is equipped with such electrical items that require substantial electrical supply (such as electric stove, water heater, refrigerator/freezer, etc.) the air conditioning system may be wired to this existing 30 amp 110V service as long as the total requirement does not exceed 30 amp. In such cases where there are these accessories that draw high amperage, it is recommended that an additional 30 amp shore line service be installed to handle the additional electrical load that the air conditioning system will require.

** All Marine Air Systems air conditioning equipment must be wired through a circuit breaker systems which will adequately handle the maximum operating load of the system.



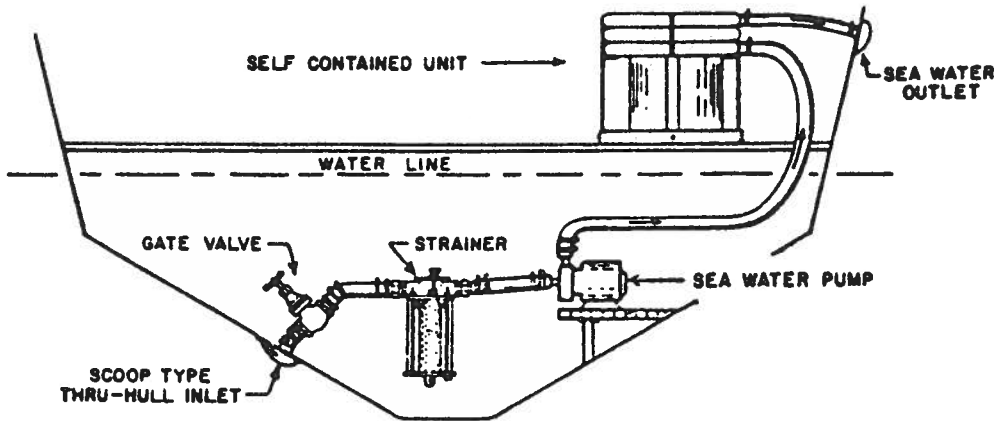
Marine Air Systems recommends using a separate thru hull fitting for the sea water supply to the air conditioning system and individual overboards for each condensing unit so that you can visually check the discharge water flow.

RECOMMENDED SIZE OF THRU HULL FITTING:

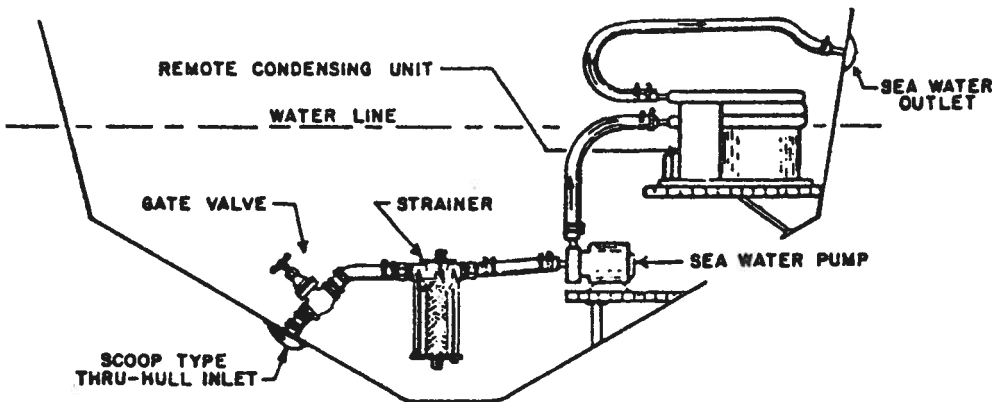
For 1 or 2 Condensing units or self contained systems, we recommend using a 3/4" thru-hull fitting, speed scoop type, 3/4" gate valve or seacock and a 3/4" raw water strainer.

For 3 or More Condensing units or self contained systems, we recommend using a 1" thru-hull fitting, speed scoop type, 1" gate valve or seacock and a 1" raw water strainer

SEA WATER FLOW SELF CONTAINED SYSTEM



SEA WATER FLOW CENTRAL SYSTEM



NOTE: 5/8" I.D. inlet and outlet hoses should be used, however, it is our recommendation that reinforced hose be used. We also recommend using double hose clamps at all water couplings below the water line. When using Centrifugal pumps, this hose should be plumbed so there are no loops or vertical bends in the hoses. In other words, the hoses must be installed so that they are self-draining and consequently self-purging.



MAINTENANCE

EVAPORATOR/BLOWER ASSEMBLIES

Fan and blower motors on Marine Air Systems cooling units have sealed bearings and require no lubrication. Switch contacts are self-cleaning and require no maintenance.

After the beginning of each boating season, check the condensate drains on each cooling unit for obstruction by pouring a quart of water into the drip tray. The water should drain within 30 seconds. Filter material should have been located in the return air path to the cooling unit. This is usually installed in the return air grille. Locate the filter and clean it if there is a visible accumulation of lint or dust.

No 'winterizing' is required on the evaporator/blower assemblies.

CONDENSING UNITS

The condensing unit has no exposed or moving parts or bearings and needs no maintenance at all. The refrigeration circuit is hermetically sealed and is charged with oil at the factory. No oil should be added. The Refrigerant 22 gas in the system is adequate for the life of the system and should not be changed unless the unit was charged improperly when originally installed or unless there is a leak in the system, allowing the gas to escape.

SEA WATER PUMPING SYSTEM

If the sea water pump is a centrifugal type, no maintenance is required. However, if the pump happens to be a positive displacement type, the rubber impeller should be checked periodically and lubricated when necessary.

The sea water system must be protected from debris by an inboard strainer. Inspect the strainer often and clean if necessary. The cupro-nickel condensers or heat exchangers are of the high-flow velocity design and no scale-buildup is experienced.

To winterize the condensing unit, close the thru-hull seacock and loosen the screws on the pump head. This allows the water to drain from the pump.

The system, if installed properly, is self-purging; however, in some instances all water will not drain from the water circuit and thus must be expelled by air pressure to assure that all plumbing is drained.

Remove the water inlet hoses from the inlet side of the condenser or heat exchanger on the condensing units and allow the water to drain. If preferred, the system can be filled with anti-freeze of any type to prevent freezing.



TROUBLE SHOOTING GUIDELINES

I. NOTHING WORKS AT ALL

- A. Check power to boat, fuse or circuit breaker at ships Panel.

II. FAN RUNS BUT PUMP DOES NOT (THIS SHOULD BE DETERMINED WHEN THE SYSTEM SWITCH IS IN THE "START" POSITION)

- A. Water intake valve is closed
- B. Strainer or intake plugged
- C. Hose collapsed, kinked or pinched
- D. Pump is defective

III. FAN AND PUMP RUNS, BUT NO COOLING OR HEATING, COMPRESSOR NOT RUNNING OR TRYING TO START

- A. Selector switch may not be in "run" position but rather in start mode.
- B. Thermostat may not be set properly thus not signaling compressor to start. Turn clockwise for cooler and counter-clockwise for warmer.
- C. Wiring terminals to thermostat or selector switch may be disconnected - check schematic wiring diagram before reconnecting loose terminals.

IV. FAN AND PUMP RUNS, BUT NO COOLING OR HEATING. COMPRESSOR OPERATES ONLY FOR SHORT PERIODS OF TIME

- A. Sea water intake valve may be closed
- B. Sea water strainer or intakes could be plugged. Check hoses from intake to pump, pump to condensing unit, and condensing unit to overboard to make certian that they have not collapsed, pinched or kinked.
- C. Water pump may be defective; could be either the pump head, impeller, motor or the entire assembly.

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NOTE: All Marine Air Systems air conditioning equipment must be wired through a circuit breaker system which will adequately handle the maximum operating load of the system.



SCHEDULE OF LIMITED WARRANTY ALLOWANCES

This schedule lists the maximum dollar allowance payable by Marine Air Systems for labor costs and refrigerant gas. Labor cost is determined by multiplying the service factor (labor and travel charges) by the accepted labor rate in the area. Sales tax, mileage charges, tolls, phone calls, etc., are not covered by warranty. Refrigerant gas (R-22) will be refunded to the dealer at a cost of \$3.00 per pound not to exceed four (4) pounds.

<u>SERVICE (Repair or Replacement)</u>	<u>Refrigerant</u>	<u>Labor Allowance</u>	<u>Travel Allowance</u>	<u>Total Service Factor</u>
1. Condensing Unit (Central)	Up to \$12.00	3.0	1.0	4.0
Cabin Maté, Cabin Comfort	-----	3.0	1.0	4.0
Vector, WC16	-----	3.0	1.0	4.0
Compressor	Up to \$12.00	4.5	1.0	5.5
Condenser Coil	Up to \$12.00	3.5	1.0	4.5
Reversing Valve	Up to \$12.00	4.0	1.0	5.0
High or Low Pressure Cut Out	Up to \$12.00	1.5	1.0	2.5
Faulty Solder Joint	Up to \$12.00	2.5	1.0	3.5
Overload Protector (Klixon)	-----	1.0	1.0	2.0
Start Assist Kit (6,000-24,000 BTU)	-----	1.0	1.0	2.0
Run Capacitor	-----	1.0	1.0	2.0
Start Relay (Multi-Ton)	-----	1.0	1.0	2.0
Start Capacitor (Multi-Ton)	-----	1.0	1.0	2.0
Solenoid Coil (Reversing Valve)	-----	1.0	1.0	2.0
2. Evaporator/Blower Assembly	Up to \$12.00	3.0	1.0	4.0
Fan Motor	-----	3.5	1.0	4.5
Blower Wheel	-----	3.5	1.0	4.5
Capillary Tube/Strainer	Up to \$12.00	2.5	1.0	3.5
Dex Valve (Direct Expansion Valve)	Up to \$12.00	2.5	1.0	3.5
3. Master Control Panel	-----	1.0	1.0	2.0
3-Position Switch	-----	1.0	1.0	2.0
Fan Speed Control	-----	1.0	1.0	2.0
Thermostat	-----	1.5	1.0	2.5
Calibration of Thermostat	-----	.5	1.0	1.5
Additional Thermostats	-----	-	-	.5
4. Relay Panel - 2RP, 2RP(SS), 2-6RP	-----	1.5	1.0	2.5
Relay	-----	1.0	1.0	2.0
Potted Control Module	-----	1.0	1.0	2.0
5. Sea Water Pump	-----	1.5	1.0	2.5
Wet End Assembly, Impeller	-----	1.5	1.0	2.5
Spud Manifold	-----	1.5	1.0	2.5

LIMITED WARRANTY POLICY

Products manufactured by Marine Air Systems are covered under limited warranty to be free from defects in workmanship and/or materials under normal use and service.

Components comprising a complete system carry a limited warranty of 12 months from the date of installation or date first put into service, not to exceed 20 months from the date of shipment from the Marine Air Systems Factory.

Components other than a complete system carry a limited warranty of 90 days. Replacement parts and components for out-of-warranty systems are also warranted for 90 days, but no allowance for the repair or replacement costs of such components are covered. Components or parts not used as an integral part of a system manufactured by Marine Air Systems are not covered by this warranty.

This warranty does not apply to:

1. Any part(s) which fail as a result of misuse, improper application or improper installation.
2. Any part(s) manufactured by Marine Air Systems which has been altered so as to change or impair its original design characteristics.
3. Failures resulting from submersion of components.
4. Inadequate cooling or heating capacity resulting from the selection of improperly sized or undersized equipment.

Marine Air Systems will repair or replace, at it's option, components found to be defective because of faulty materials or workmanship, provided such components, when examined by an authorized service dealer or the factory service manager, are found to have a defect for which the company is responsible. In addition to furnishing replacement parts found to be defective, Marine Air Systems will pay labor costs as outlined in it's warranty schedule for removal and re-installation of such components within the specified warranty period.

This policy extends only to the original purchaser (other than for the purpose of resale) of Marine Air Systems equipment covered by this warranty.

No warranty claim can be honored unless the owner registration card is on file at Marine Air Systems. This card should therefore be returned to Marine Air Systems immediately upon purchase of items covered by this warranty.

Your responsibility as an owner of Marine Air Systems equipment is to contact the Marine Air Systems Factory for authorization prior to having repair work performed. From outside Florida, call toll-free 1-800-327-3137; within Florida call (305) 973-2477 for service authorization, or the name of your nearest authorized service dealer. If service is performed by a non-authorized service dealer or without prior authorization from the factory in the event a local authorized service dealer is not available, Marine Air Systems responsibility shall be limited solely to the repair or replacement of returned defective parts. You are also responsible for any travel charges in excess of one (1) hour required to go to and from the boat or to obtain parts, unless prior authorization is given from Marine Air Systems. Premium pay (overtime, nights, weekends, etc.) is your responsibility and would be determined by your specific needs.

Marine Air Systems will absorb freight costs for repair or replacement one way. This includes regular UPS, regular air mail and motor freight charges only - not UPS 2nd day or next day, air freight, express mail or special courier (i.e., Purolator). Such charges are your responsibility. After contacting the factory for return authorization, ship defective items to: 2000 North Andrews Avenue Extension, Pompano Beach, Florida, 33069.

In order to validate a warranty claim, defective parts must be returned to Marine Air Systems within thirty (30) days of replacement.



115V ELECTRICAL SPECIFICATIONS

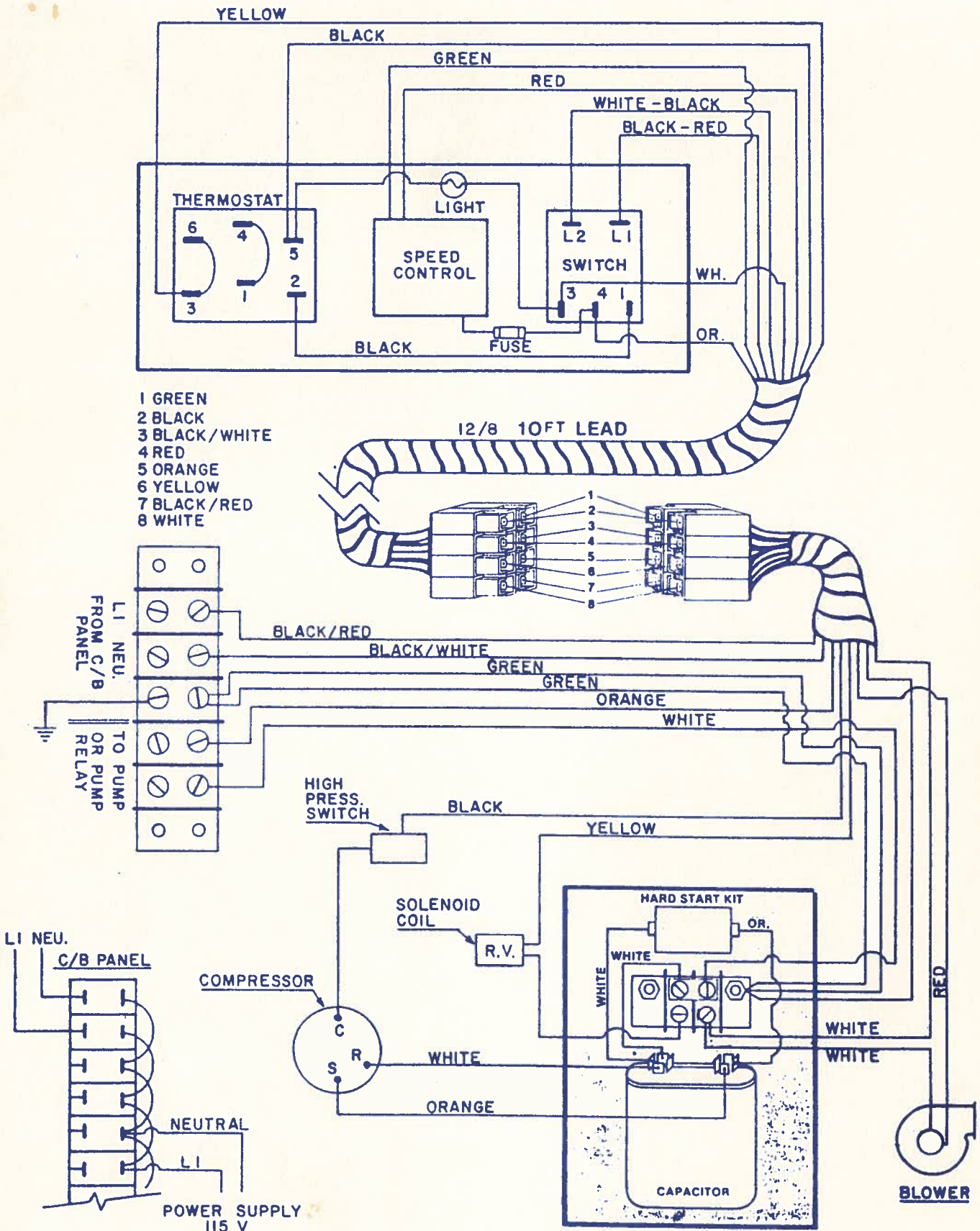
		<u>Model</u>	<u>*Breaker Size</u>	<u>Wire Size (Gauge)</u>	<u>Compressor HP</u>	<u>Rated Capacity BTU/Hr.</u>	<u>Compressor Amps</u>	<u>Blower Amps</u>	<u>Full Load Amps (Cool)</u>	<u>Full Load Amps (Heat)</u>	<u>Volts</u>	<u>**Watts</u>
Compressor	Rotary	VR6K-H	15	12	1/2	6,000	3.8	1.95	4.0	5.5	115	633
		VR9K-H	20	12	3/4	9,000	6.1	2.9	8.4	8.4	115	966
		VR12-H	25	12	1	12,000	8.2	2.9	10.2	10.2	115	1173
		VR16-H	30	12	1 1/4	16,000	8.9	3.25	12.0	12.0	115	1380
	Reciprocating	V9K-H	20	12	3/4	9,000	8.5	1.85	10.0	12.0	115	1380
		V12K-H	25	12	1	12,000	9.0	1.85	11.0	14.0	115	1610
		V16K-H	30	12	1 1/4	16,000	12.5	3.3	16.0	18.0	115	2070
		CM6H	15	12	1/2	6,000	6.5	1.6	7.0	9.0	115	1035
		CM9H	20	12	3/4	9,000	8.5	3.0	10.0	12.0	115	1380
		CM12H	25	12	1	12,000	9.0	3.0	11.0	14.0	115	1610
		CM16H	30	12	1 1/4	16,000	12.5	3.45	16.0	18.0	115	2070
		C6H	15	12	1/2	6,000	6.0	1.2	8.0	10.0	115	1150
		C9H	20	12	3/4	9,000	7.5	1.85	10.5	12.5	115	1437
		C12H	25	12	1	12,000	9.0	1.85	11.0	14.0	115	1610
		C16H	30	12	1 1/4	16,000	12.0	3.3	16.0	18.0	115	2070
		C12H Dual	25	12	1	12,000	9.0	2.4	13.0	15.0	115	1552
C16H Dual	30	12	1 1/4	16,000	12.5	3.1	16.0	18.0	115	2070		

*Time delay breakers should be used to allow for start up loads

**Total watts reflect full load amps (heat)

Above ratings will vary as the water temperature, air temperature and voltage fluctuate.

115V SELF CONTAINED WIRING DIAGRAM



From:

.....

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PLACE
STAMP
HERE



2000 N. ANDREWS AVE. EXT., POMPANO BEACH, FL 33069

LIMITED WARRANTY AGREEMENT

Marine Air Systems protects the original purchaser of its water cooled heat pump air conditioning systems, under terms and conditions outlined herein, against defective materials and/or workmanship.

Components comprising of a complete system on a new installation carry a limited warranty of 12 months from date of installation or date first put into service. Component parts other than a complete system carry a limited warranty of 90 days.

Terms and Conditions: Marine Air Systems will repair or replace at its option, components found to be defective because of faulty materials or workmanship, provided such components when examined by the selling dealer or factory service manager finds that there is a defect for which the company is responsible. In addition to furnishing replacement parts, found to be defective, Marine Air Systems will pay the labor costs as outlined in its schedule for removal and reinstallation of such components for the first 12 months.

The manufacturer does not warrant installation of its air conditioning systems or the effectiveness of any installation.

