



OPERATION

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

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

To operate the system, proceed as follows:

- (1) Set the system switch on the switch assembly to "off"
- (2) Turn on main circuit breaker on ship's panel
- (3) Turn thermostat (right on bottom) fully clockwise for cooling and fully counter-clockwise for heating.
- (4) Set fan speed control on "high" position
- (5) Be sure the sea water inlet valve is open
- (6) Turn the top control knob to "start". This energizes the fans and the sea water pump. Check the overboard discharges to be sure that water is flowing through the condensing units.
- (7) Turn the top control 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) Select the fan speed desired. When operating on the heat cycle, allow the unit to run on low fan for 5 to 15 minutes until it begins to heat well. Then increase fan to a medium setting and run system in this position for most efficient heat output. On the cooling cycle, use any fan speed desired. 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 switch assembly 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.



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 seawater 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 should be protected from derbis 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 in fresh water.

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 antifreeze of any type to prevent freezing.



TROUBLE SHOOTING GUIDELINES

I. NOTHING WORKS AT ALL

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

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 certain 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.



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 Mate, 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

PUMP SELECTION

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

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.

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 aboard 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.

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.



115V ELECTRICAL SPECIFICATIONS

MODEL	* BREAKER SIZE	WIRE SIZE (GAUGE)	COMPRESSOR HP	RATED CAPACITY BTU/HR	COMPRESSOR AMPS	BLOWER AMPS	FULL LOAD AMPS (COOL)	FULL LOAD AMPS (HEAT)	VOLTS	WATTS SEE NOTE (1)
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
CC6H	20	12	1/2	6,000	6.5	1.6	8.0	13.5	115	1552
CC9H	20	12	3/4	9,000	8.5	3.0	11.0	14.5	115	1667
CC12H	30	12	1	12,000	10.0	1.85	12.0	23.0	115	2645
CC16H	30	12	1-1/4	16,000	12.5	1.85	16.0	23.0	115	2645
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	1-1/3	16,000	12.5	3.1	16.0	18.0	115	2070
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
X V16K-H	30	12	1-1/4	16,000	12.5	3.3	16.0	18.0	115	2070

(1) NOTE: Total watts reflect Full Load Amps (Heat)

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

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



BULLETIN

DATE: APRIL 1980

EFFECTIVE DATE:

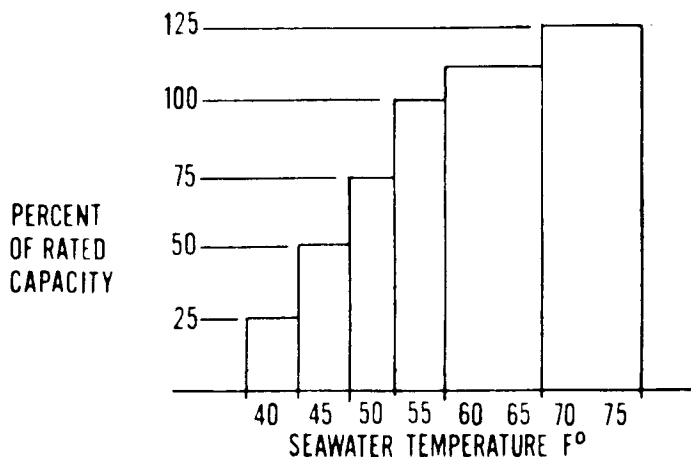
DEPARTMENT: ALL CUSTOMERS

SUBJECT: REVERSE CYCLE EQUIPMENT

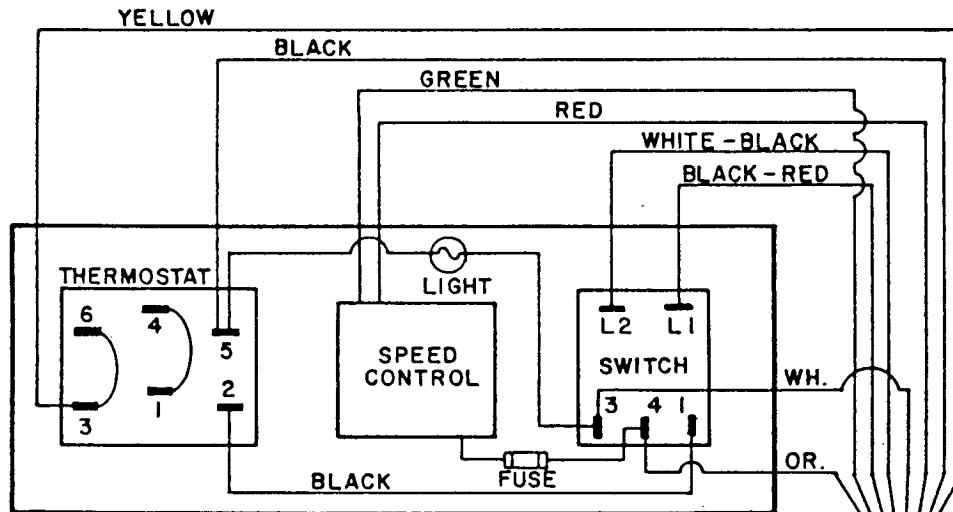
Pictured below is a chart indicating the percent of rated capacity for water cooled marine air conditioning with the reverse cycle heat pump application.

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

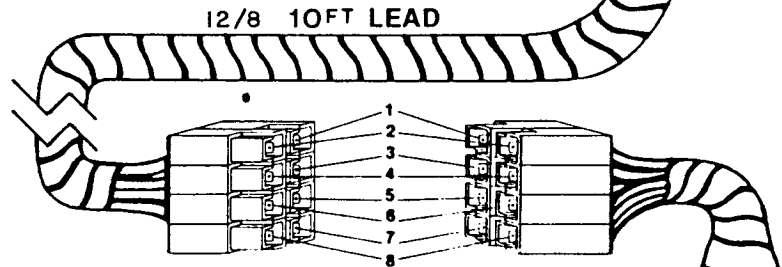
HEAT CYCLE EFFICIENCY



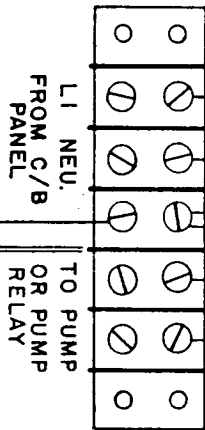
115V SELF CONTAINED WIRING DIAGRAM



- 1 GREEN
- 2 BLACK
- 3 BLACK/WHITE
- 4 RED
- 5 ORANGE
- 6 YELLOW
- 7 BLACK/RED
- 8 WHITE



RELAY SEE OVER



BLACK/RED

BLACK/WHITE

GREEN

ORANGE

WHITE

HIGH PRESS. SWITCH

BLACK

YELLOW

SOLENOID COIL

R.V.

HARD START KIT

WHITE

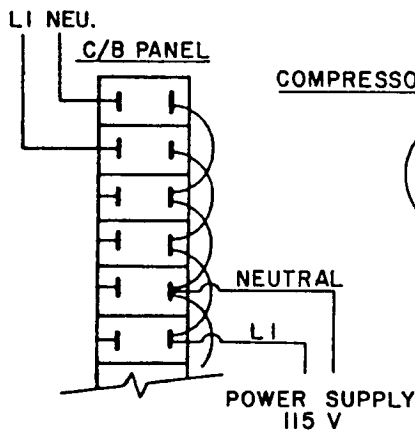
WHITE

WHITE

ORANGE

CAPACITOR

BLOWER



MARINE AIR SYSTEMS®
AIR

(OVER)

