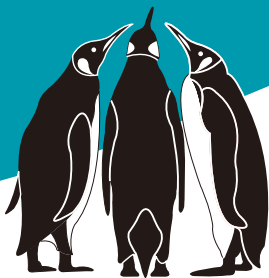


Guidelines for Selecting Air Conditioning For Your Boat



This guide will provide practical, easy to understand steps to help you select an air conditioning system for your boat. We invite you to review this information and fill in the worksheet. If you have other questions about choosing the correct Marine Air Systems air conditioning configuration, you can call your Marine Air Systems' dealer.

This guide is for Marine Air Systems installations only. Marine Air Systems builds A/C units to the rigid specs of the American Boat and Yacht Council, and to the CE specs required by the European Union. Marine Air Systems' products are used on yachts from 24' to 250', and in many military and commercial applications.

About Boat Air Conditioners

A direct-expansion seawater-cooled air conditioning system cools your boat by removing heat and humidity from the cabin. The heat is absorbed by the refrigerant, which flows through sealed tubes. It is then given off to raw seawater, which is pumped through the system and discharged overboard. When the refrigerant flow is reversed, the opposite is true. Heat is extracted from the seawater and is used to warm the air flowing into the living area.

There are three basic types of A/C systems built by Marine Air Systems. Each has a particular group or size of boat where it is best suited. In selecting the type and system to use, many factors must be considered, including capacity needed, access for routing necessary tubes, wires, and hoses, location of furnishings, and the storage space you are willing to sacrifice. We will be speaking of the Cabin Mate® and Cool Mate® self-contained units in this article. The other systems are: a) remote direct expansion systems, and b) circulated water systems. These systems are generally used on larger boats during the boatbuilding process.

Self-Contained Systems

The self-contained system is normally considered the best choice for a smaller vessel where it is impractical to route copper refrigerant tubes, and there is no space for an air conditioner unit in the engine compartment. Also, they are ideal for retrofitting an air conditioner in an existing boat. These systems are typically found in boats up to about 40 feet and are available in either cooling only (Cool Mate), or in a reverse cycle (Cabin Mate) heat pump unit. In a self-contained system, all of the major components are mounted on a single chassis, which is installed inside the living area. Installation requires only locating the unit, routing water hoses to and from it, and connecting a flexible duct to the discharge grill. The noise level expected for this type system is minimal as the unit is normally installed under a seat or bunk, and extra insulation can be added if desired.

Seawater Cooling Subassembly

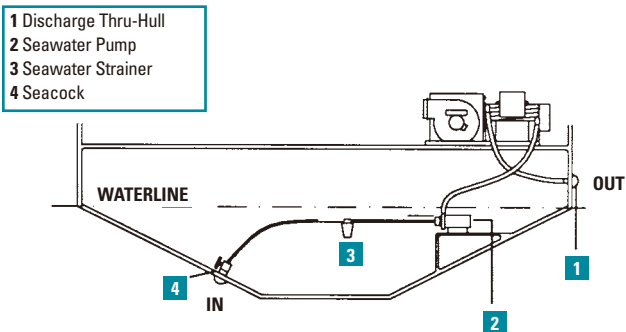
The cooling water circuit consists of a scoopthru-hull fitting, water shut-off valve or seacock, strainer, seawater pump, water hose and overboardthru-hull fitting. If more than one Marine Air Systems' unit is using a single seawater pump, a water manifold and pump relay are also needed.

Either a centrifugal or self-priming pump may be used with a Marine Air Systems' unit. Normally, we recommend a magnetically-driven centrifugal pump for quiet and efficient operation. Centrifugal pumps are not self-priming and must be mounted in a location which is below the water-line at all times. For shallow-draft boats, on which it is not possible to mount the pump below the water line, a self-priming pump must be used. It is vitally important, whenever you are using a centrifugal-type seawater pump, that the seawater plumbing system be self-draining to avoid airlocks. This means that seawater hoses must be routed continuously uphill, with no traps, from the inlet thru-hull to a single high point, which is normally the condensing unit outlet. The overboard discharge fitting should be 3-5 inches above the waterline.

Seawater hoses should be at least singlebraided. Any good-quality automotive-type heater hose works well. Note that non-reinforced plastic hoses should never be used. A typical seawater plumbing system is shown in **Figure 1**.

A cleanable seawater strainer must be placed in the seawater line between the seacock and the pump.

Figure 1: Typical Seawater Plumbing System



Electrical System

Although most Marine Air Systems' A/C units are operated on 115V or 230V, 60 HZ, single-phase power, they will operate at 50 HZ with certain restrictions. Equipment designed for operation at 50 HZ only is available on special request. Discuss this with your Marine Air Systems' dealer or with the factory if you need help. Electrical connections are made via color-coded wiring harnesses or with pre-wired plugs, depending on the models.

Control/Switches

Marine Air Systems provides two basic types of controls. They are rotary knob switch assemblies and the Elite digital controls. Both provide automatic changeover when used with a reverse cycle heat pump system. There are two types of controls, the Passport I/O and the Elite control. The Cabin Mate is equipped with the Passport I/O and the Cool Mate is supplied with the rotary knob assembly.

The rotary knob control is a manual control which provides for operating the system in a) fan only for air circulation and b) for air conditioning operation. It also has a manual thermostat for selecting the desired temperature.

The Passport I/O and Elite controls are advanced microprocessor-based systems, with many user-programmable functions including automatic dehumidification for extended periods of time when the boat is unoccupied.

Now that we know what components are needed to complete a Marine Air Systems' configuration and have an idea of the type system needed, we can proceed in selecting the items for each particular application.

Figure 2: Typical Duct installation Beneath a Settee

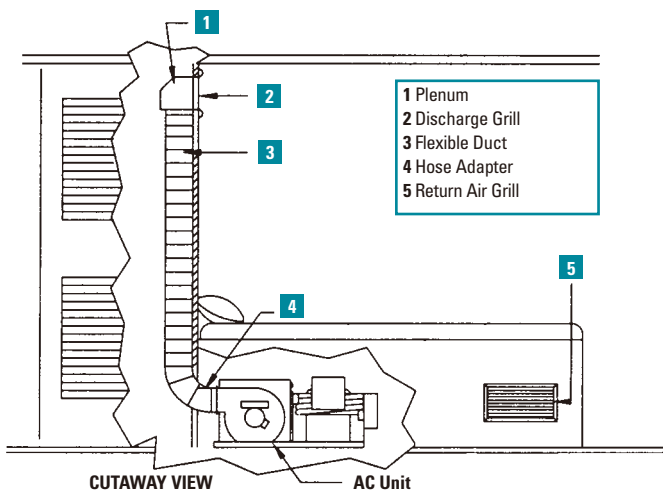
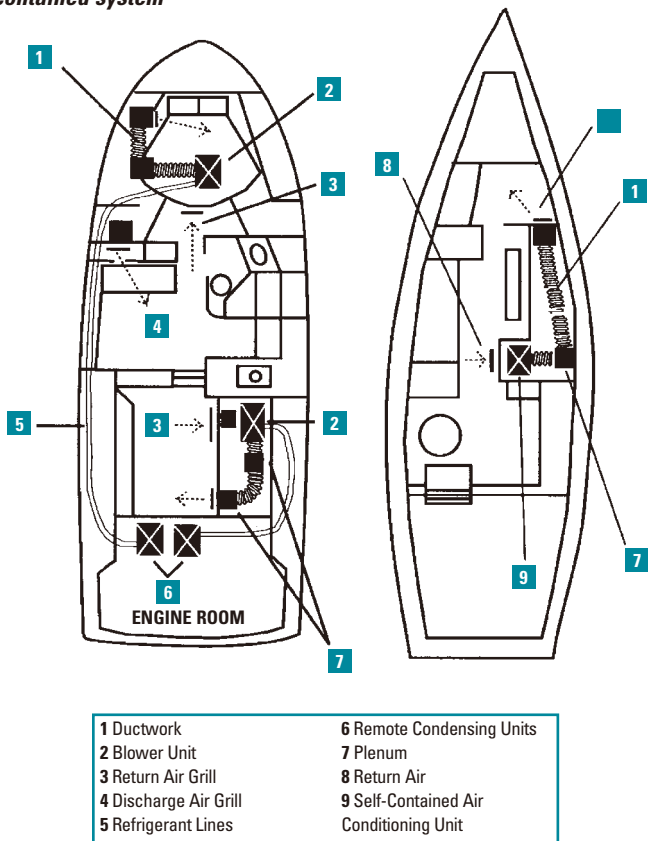


Figure 3: Comparison of a typical remote condensing and a self-contained system



Step 1 How Much Capacity is needed?

Divide your boat into three basic load areas:

- 1) below-deck cabins, where the hull slopes inward toward the keel and there are minimal port lights and hatches,
- 2) mid-deck areas, which are situated partly below and partly above the deck, and
- 3) any above-deck compartments, such as an enclosed flybridge.

Measure the length and width of each room to be conditioned to determine the square footage (area). It is assumed that your boat has average headroom of about 6-1/2 ft. and you have an average amount of furniture. If one end of the compartment is narrower than the other, take your measurement in the middle. Once you have measured all the living spaces, have determined which type of space your boat has, and decided what climate you will be boating in, use the factors in Figure 4 to determine the total capacity needed for your boat.

Step 2 How Many To Best Handle My Boat?

The layout of your boat will dictate not only the number of systems you will need to effectively cool your boat, but also will determine the location of the systems. If you have an aft stateroom, it may be desirable to put a separate unit there, along with a larger unit for the salon and forward areas. Discuss this with your Marine Air Systems' dealer if you need help.

Step 3 Where Do I Install the System?

Self-contained units should be installed low, with the discharge air ducted to one or more discharge grills located as high as possible in the area being conditioned. It is not necessary that the fan coil be placed directly behind the return air grill, but an unobstructed path must be provided for the air to get to the coil. Survey your boat and identify possible locations. Then use the dimensions shown on the various specification sheets to determine whether the unit will fit there. Provide room on all sides of the equipment for service and air circulation.

The seawater pump must be installed low in the hull of the boat in a location where the inlet is always below the water line in order to provide a constant flooded inlet. The plumbing should be a constant uphill run through the condenser of the unit, and then dip down and overboard.

Step 4 Which Seawater Components Do I Use?

It is normally recommended that you use one pump of adequate capacity for all of the air conditioning systems on board. The rule of thumb is to have 250 gallons per hour of water per ton of air conditioning. A ton is 12,000 Btu's per hour. If more than one Marine Air Systems' A/C unit shares a common pump, you will also need a pump relay. Your Marine Air Systems' dealer can give you more guidance in this area.

Step 5 Which Ducts and Grills Are Needed?

Marine Air Systems supplies kits to make the proper coordination of units and accessories easy for you. There is some choice available for grills. Consult with your dealer.

Step 6 Electrical Requirements.

The chart on page 7 provides recommended circuit breaker sizes and electrical wiring for your system. There is an amperage surge when the compressor cycles on, and you must allow for this surge.

**Figure 4: How to Determine “How Much”
Geographical areas can reflect Moderate conditions or Tropical
conditions. Requirements differ.**

AREA	FACTOR			CAPACITY
	Below Deck <i>Moderate 60</i> <i>Tropical 90</i>	Mid Deck <i>Moderate 90</i> <i>Tropical 120</i>	Above Deck <i>Moderate 120</i> <i>Tropical 150</i>	
EXAMPLES				
100 sq ft	60			6000 BTU/hr
120 sq ft		90		9000 BTU/hr
120 sq ft			90	9800 BTU/hr
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
			Total BTU/hr required	_____

**Figure 5: Recommended Circuit Breaker Sizes and Electrical Wiring
for your system**

Capacity BTU/hr	Voltage (VAC)	Running Amps	Wire Guage	Breaker Amperage
7,000	115	10.6	14	15
	230	5.5	14	10
10,000	115	14.3	12	20
	230	7.5	14	15
12,000	115	14.9	12	20
	230	7.9	14	15
16,000	115	17.3	10	30
	230	8.3	12	20

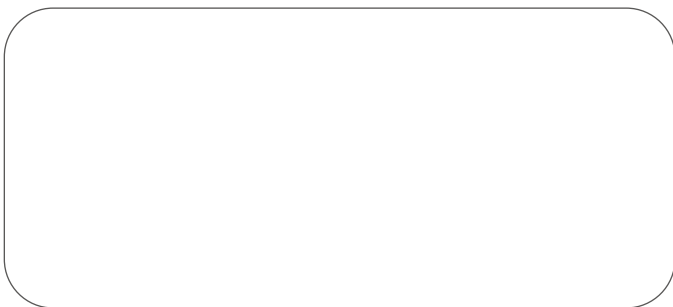
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Dometic is a customer driven, world-leading provider of innovative leisure products for the caravan, motorhome and marine markets. Dometic offers a complete range of air conditioners, refrigerators, awnings, cookers, sanitation systems, lighting, windows, doors and other equipment that makes leisure life more comfortable away from home.

Dometic also provides refrigerators for specific use in hotel rooms, offices and for storage of medical products and wine. Dometic's products are sold in almost 100 countries and are produced mainly in Dometic's own production facilities around the world. Annual sales amount to approximately 750 MEUR. Dometic has more than 4,400 employees.