



Frigoboat Marine Refrigeration, renowned world-wide as the best possible solution to your on-board refrigeration needs, large or small.

Convert your ice box into an always-cold box with Frigoboat easy-to-install components. All components come pre-charged with R134a, so it's a simple matter of plug-and-play. No more warm beer or time-wasting searches for ice!



Design your System:

Step 1:

Choose the right size evaporator for the insulated refrigerator or freezer box based on the interior volume of the box, in cubic feet.

Measure the interior depth from front to back, the width from side to side, and the height from top to bottom, in inches. Multiply all three numbers together and divide by 1728 to find the cubic feet of the box.

Refer to the box volumes listed in the Selection Guide and find the evaporator that best suits the insulated box. Check and assure that this evaporator will fit through the hatch or opening where it will be installed.

Step 2:

Choose the compressor/condenser unit, either air-cooled, water-cooled with a pump, keel-cooled, or both air and water cooled condensers.

Step 3:

Choose the thermostat, mechanical or digital.

Step 4:

Choose options and accessories, including an upgrade to automatic compressor speed control for increased energy efficiency.

Evaporator Selection

If the box is to be all refrigerator, or all freezer, then a Flat (F) evaporator should be used. For a freezer, the general rule is to install the largest plate that is practical to install. For a refrigerator, consult the Selection Guide to see which size evaporator will be applicable.



Flat Evaporator (bent to fit)

If there are two adjoining boxes separated by an insulated barrier, a Spillover system can be installed. In this case, halve the refrigerator area volume, add it to the freezer volume and treat the box as all freezer. Example: 3 cu ft. freezer, 6 cu ft. refrigerator. Calculating, $6/2 + 3 = 6$, so consider the system as a 6 cu ft. freezer and ensure that the chosen evaporator, i.e. the largest practical, is rated for that volume freezer or above. The evaporator will be mounted in the freezer section with a Spillover Device (sold separately) installed in the barrier which will deliver cold air to the refrigerator section under control of the thermostat.

If a Bin (B) or Horizontal (H) evaporator is being used, again consult the specifications to see which size model is best for the application. The evaporator size is chosen based on the interior volume of the refrigerator. The interior of the evaporator will be the freezer section. However, if one wishes to install a larger B or H model than is recommended, i.e. to utilize a larger freezer section, it may be necessary to cover some of the evaporator surface with some stick-on insulation or similar material to force the system to run longer. This is necessary to ensure that the contents of the freezer section remain frozen solid. Suitable insulation materials can be found in DIY stores, etc.



Bin Evaporator



Horizontal Evaporator with Door

Condensing Unit Selection



Capri 35F

Air Cooled systems are less expensive and easier to install, but are not as efficient as water cooled systems. To achieve maximum efficiency, air cooled condensing units need to draw in cool air, which is then forced by the fan across the condenser, picking up heat as it passes through. Consequently, the heated air should be expelled away, ideally into a different area. The Frigoboat Capri and Paris condensing units feature a duct ring on the condenser discharge to facilitate adding a flexible duct so that the heated air can be discharged to a remote area where it has little or no chance to return to the intake of the condenser fan. The fan can also be reversed so that it will then draw cool air in through the duct ring. This is to enable an air cooled condensing unit to be installed in an engine room or other hot or poorly ventilated area where cool air can be drawn in from another location. A Keel Cooler can always be added later to an air cooled Frigoboat system when the boat is hauled out, using basic tools and with no refrigeration experience necessary.



W50F

Water Cooling should be a serious consideration if the vessel is to be based in or travel to warmer waters or tropical climates. If the system is to be a freezer, then water cooling is highly recommended regardless of where the vessel is located. Water is a far denser medium than air, and much better for heat transfer, having 23 times more heat transfer capacity. Sea water typically stays at a fairly constant and lower temperature than the air inside the boat in tropical areas, but utilizing it normally involves installing a **water pump**, so the gains in efficiency must outweigh the added power requirement. The water pump that Frigoboat specifies for the W35 and W50 adds approximately 1 amp (at 12 volt) to the total system current draw, but one pump can be used to support up to three water cooled systems, thereby minimizing the extra current draw for the pump. As with any system using pumped sea water as a cooling medium, there is also the probability of leaks, clogged strainers and/or pump failures.



K50F



Keel Cooled Condenser T

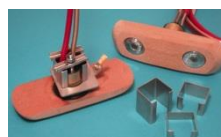
The **Keel Cooler** is the logical step up from a pump-fed water cooled system, as now the condenser is outside the vessel, and instead of pumping water into the boat and back out over the side, we take the refrigerant outside the boat to be cooled, and then back in again. The only moving part of this system is the compressor, which results in the Keel Cooled system being the quietest, most reliable, and most efficient system of all. There are some boat owners that are concerned with “putting another hole in the boat”, but it should be remembered that in a Keel Cooler installation the Keel Cooler itself is simply a tough and sturdy plug, and there is absolutely no water coming on board. The water stays where it belongs; i.e. outside the boat!

Occasionally, concern is raised by long-range cruisers regarding not being able to operate a Water Cooled system when hauled out for repairs. If the haul out is for one or two days, something can be rigged to drip water from a hose onto the Keel Cooler, but that arrangement may not be workable for longer stays on the hard. If this is a major concern, a simple solution is to install a Keel Cooled system, but with an air-cooled condensing unit instead of a K35 or K50 compressor. The fan is wired via a manually operated switch, the fan is only operated when the vessel is hauled out. This is a simple solution that is gaining popularity in cruising circles, where a little extra initial outlay buys considerable peace of mind.



Capri 50F

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Keel Cooled Condenser SZ

Thermostat Selection

A **thermostat** is a device that senses the temperature of the evaporator plate or the air and tells the compressor when to turn on and off. Two types are available from Frigoboat. Both types are designed to keep box temperatures within a range of 2° Fahrenheit of the set point entered by the operator.

Mechanical Thermostat

Mechanical Thermostats operate on the principle that gas in a sealed capillary tube expands and contracts with temperature. One end of the tube is attached with good thermal contact to a mounting point on the evaporator, and the pressure expands or contracts bellows within the thermostat. The bellows then acts on a switch to open or close the thermostat contacts. The setting is made with a knob that is graduated 0 through 7, with zero being "off" and 7 being the coldest setting. The Mechanical Thermostat must be mounted at a location that is within reach of the capillary tube end that attaches to the evaporator, which is approximately 5' long. This tube cannot be lengthened, which often requires that the thermostat is mounted within the box itself. Mechanical Thermostats are designated as either Refrigerator (white housing), or Freezer (blue housing). When using a Bin (B) or Horizontal (H) evaporator, the Refrigerator Thermostat is used.



Refrigerator



Freezer

Digital Thermostat/Thermometer

As opposed to the Mechanical Thermostat, the Digital version senses air temperature inside the box, not evaporator temperature. A sensor is mounted in a location within the box where it will pick up average air temperature and convey this information to a remote digital display. The display and keypad of the Digital Thermostat/Thermometer allows the user to monitor box temperatures as well as set the desired box temperature and range (differential). With this model, very accurate and steady temperatures can be achieved without the guesswork associated with Mechanical Thermostats, and the digital display of box temperature is a convenient and popular feature.

The "Coastal Mk3" has a digital display and a small keypad. The Coastal Mk3 (3-1/2" x 2") offers a temperature display, precise temperature control, a compressor status light, temperature alarms and an emergency operation feature. The Coastal Mk3 also has a diagnostic LED for troubleshooting purposes.

The optional Merlin II can be installed which features automatic compressor speed control for increased system efficiency.

For most installations the Coastal Mk3 represents very good value for money. The Mk3 require a dedicated 12- or 24-volt power supply and are supplied with a bezel to aid mounting into a vertical bulkhead, mounting screws, push-on wire terminals, a sensor with 10' wire leads and a fused 10' wiring harness.



Coastal Mk II

Options and Accessories

The **Merlin II** is a small printed circuit board that mounts on the control module attached to the compressor. It provides compressor automatic speed control. The longer and slower a compressor runs, the more efficient it will be. Merlin II will automatically select the most efficient speed based on the time of the previous compressor cycle. It can be added to either mechanical or digital thermostats.



A **Ducting Kit** can be added to the Capri or to the add-on air-cooled condenser to duct cooler air from a remote area to the condenser, or to exhaust warm air from the condensing unit. It includes 6' of 4" diameter flexible ducting, a reducing collar, and a 4" diameter plastic grill.



The **Add-on Air Cooled Condenser** is a pre-charged fan forced air-cooled condenser that can easily be added to a water-cooled system to allow system operation when cooling water is unavailable due to the boat being hauled out of the water.



With the **AC/DC Control Module**, when both 115/230 volt, 50/60 Hz AC and 12 or 24-volt DC power sources are connected, the system will operate from the AC source. If the AC source is disconnected, the system will operate from the DC source.



A **Condenser Water Pump** for W50F and similar water-cooled condensing units is necessary to move water through the condenser. It draws about one amp at 12 volts, is self-priming to 6', has 5/8" hose fittings, and is very quiet. It requires a raw water strainer, hose, and wiring to complete the installation. It has the capacity to cool three systems with an additional pump interface.



Pre-charged **Extension Lines** to lengthen liquid or suction lines are available in 3, 6 and 10' lengths. They have the correct Frigoboat self-sealing couplings and are used to extend the distance between components in a Frigoboat refrigeration system.



Spillover Fans use a mechanical or digital thermostat to control the fan that pulls cold air from a freezer into an adjoining refrigerator box.



Door Kits are used to mount a vertical bin evaporator horizontally and use the interior for freezing and easy ice making in the evaporator interior. (no photo available.)

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MARINE REFRIGERATION