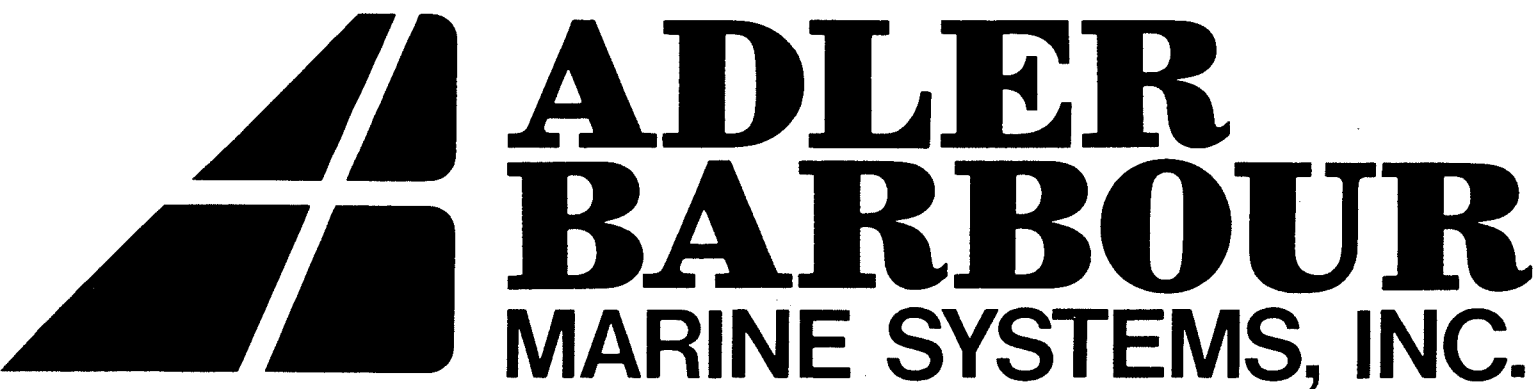
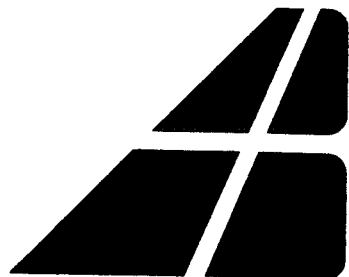


080180

THE COLDMACHINE MANUAL

- **Installation**
- **Operation**
- **Troubleshooting**





ADLER-BARBOUR™

ADLER/BARBOUR Marine Systems, Inc.
511 Fifth Avenue
Pelham, NY 10803
(914) 738-6201
Cable: "ADLERBARB"

080181

OWNER'S INSTALLATION AND OPERATING MANUAL

FOR

THE COLDMACHINE™ REFRIGERATION SYSTEM

<u>MODEL DCM-12</u>	{	SFV-1	VERTICAL MODEL FREEZER
		SFH-1	HORIZONTAL MODEL FREEZER
<u>MODEL DCM-12L</u>		LFV-1	LARGE VERTICAL MODEL FREEZER

PLEASE READ COMPLETELY BEFORE INSTALLING!

UNPACK: Save all packaging materials. Check for shipping damage.

IDENTIFY ALL COMPONENTS:

1. compressor unit
2. freezer unit
3. thermostatic control
4. accessory/hardware package
5. hole location template for freezer unit
6. ice cube trays:
 - 2 Standard type for SFH-1
 - 2 VertiCube for SFV-1 (includes retainer)
 - 3 VertiCube for LFV-1 (includes retainer)

TOOLS & MATERIALS REQUIRED:

Normal hand tools: electric drill, assorted small drill bits, "stubby" screwdriver, hole saw 2-1/2" diameter, electrical wire (2 conductor) size to suit (see Table), 9/64" drill bit, 12" and 10" adjustable wrenches (2).

BEFORE YOU PROCEED: READ THIS BOOKLET FROM COVER TO COVER!

WE KNOW YOU ARE ANXIOUS TO GET STARTED. BUT WE ALL KNOW THE OLD ADAGE: "WHEN ALL ELSE FAILS, READ THE INSTRUCTIONS"!

IF YOUR COLDMACHINE IS TO OPERATE PROPERLY, FOUR THINGS ARE ESSENTIAL:

- GOOD VENTILATION
- GOOD ELECTRICAL POWER
- TIGHT COUPLINGS
- GOOD INSULATION

LOCATE AND MOUNT COMPRESSOR UNIT: Keep in mind:

- Connecting tube set is 15' long.
- Decide on route of tubing through boat to ice box, keep clear of bilge water, protect from chafe and damage
- Ventilation openings required if compressor unit is located in small enclosed compartment: 2 separate openings, 100 square inches minimum area each (approximately 10" x 10"): 1 for air inlet, 1 for air outlet.
- Engine room location O.K., 125°F continuous environment O.K.
- Cooler location = less running time = lower average amp draw.
- Accessibility, protection from bilge water, spray and damage.

Handle unit carefully, don't pick it up by tubing! Cooling fins are very thin for maximum efficiency and bend easily. They can be "combed" straight again if necessary.

Use 4 (owner supplied) fasteners to mount compressor unit on suitable horizontal platform. 1/4" diameter wood screws, self-tapping screws, machine screws and nuts, etc. may be used depending upon the type of mounting platform being used.

VENTILATION:

THIS IS MOST IMPORTANT! The ColdMachine is a device that moves heat from one place to another. It does not "create cold". The heat it removes from your ice box via the Freezer Unit is transferred to the air flow that you provide to the Compressor Unit.

If you put the Compressor Unit in a small/sealed/hot confined compartment in your boat it will suffocate. Its built-in fan will have to re-circulate hotter and hotter air, round and round. It will run continuously, draw lots of amps, and not cool efficiently. It will never shut off, and you will not be pleased with its performance.

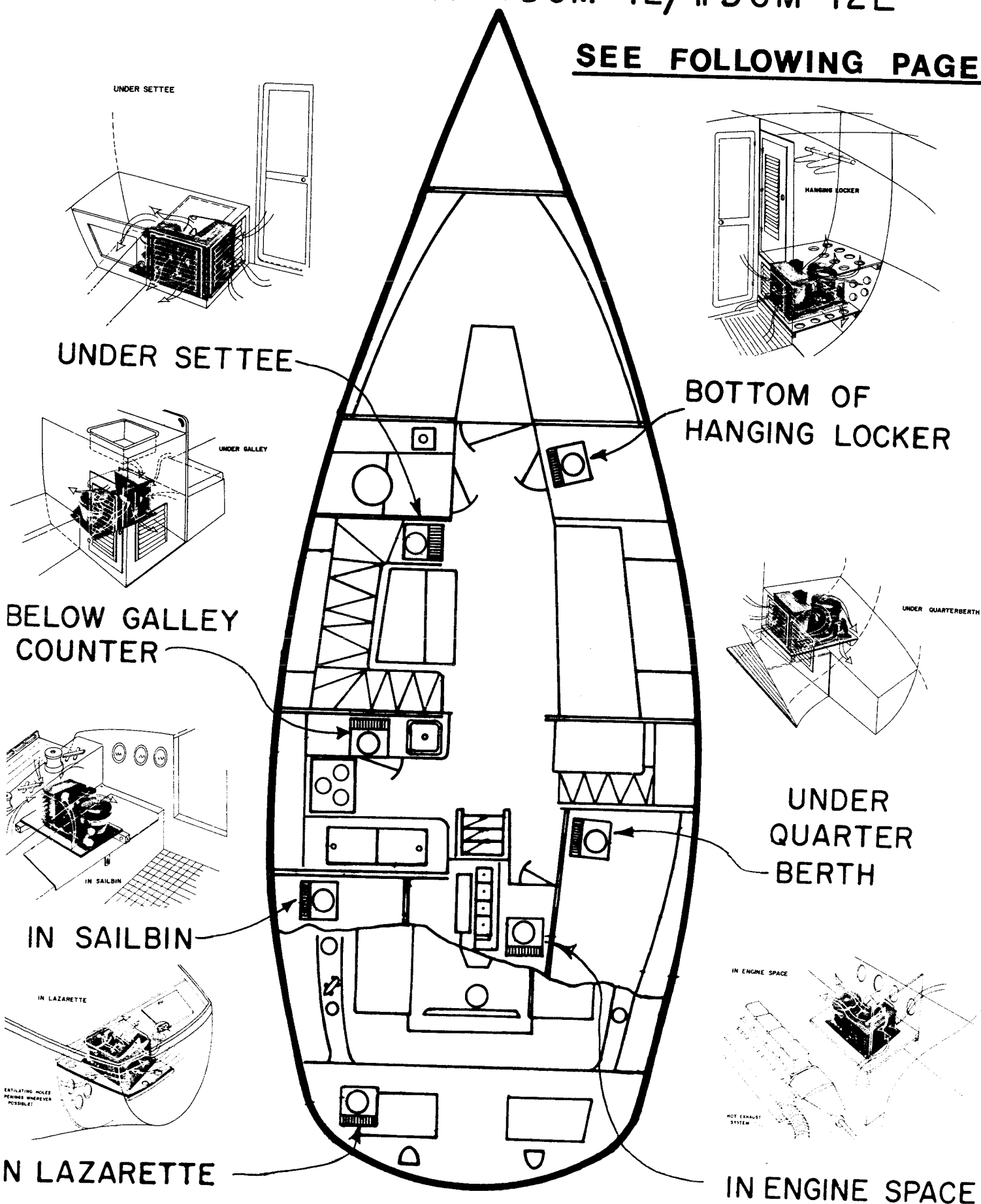
LET IT BREATHE!

The more air the better. Every hour, your ColdMachine will be taking heat OUT of your refrigerator and putting it IN to the air surrounding the Compressor Unit, and the Cooler this space is, the less the unit will run -- which means fewer amps and less engine running to charge batteries.

TEAK LOUVRE GRILLES are available in various stock sizes - check your marine dealer or catalog house.

TYPICAL LOCATIONS FOR YOUR COLDMACHINE COMPRESSOR UNIT #DCM-12/#DCM-12L

SEE FOLLOWING PAGES...



SEE LOCATION DRAWINGS ON NEXT 5 PAGES

Find the coolest possible location, in the largest compartment available (note the connecting tube set is 15' long).

If in the Engine Compartment: Mount unit as far as possible from the engine and particularly the hot exhaust pipe sections and route the connecting tubing away from hot spots - engine - manifold, hot water pipes, etc. If the ColdMachine tubing must be run close enough to local hot spots to become noticeably heated, protect tubing with insulated sponge tubing (Armaflex, etc.).

If in a sailbin: Position the unit so that it can still move air freely with an occasional sail bag or two in place.

If under a Settee, berth, locker, etc: Position the unit so that it can positively draw air in from one space and discharge it into another.

TRY NOT TO RECIRCULATE THE SAME AIR!

Whenever possible, position the Compressor unit so its fan can intake air from one space and Discharge it into another space.

PROVIDE PLENTY OF VENTILATING HOLES, SLOTS, LOUVRES, CUT-OUTS, ETC. (see hanging locker location drawing)

IF IT IS IN A CLOSED, SINGLE VOLUME OF SPACE:

Generally O.K. provided there is at least 70 cu. ft. of volume, that air flow into and out of the condenser grille is unabstructed, and at least 2 walls of the space are generally cooler than the air in the space. A Sailbin in a typical 35 ft. auxiliary, or a large lazarette will generally be O.K. without additional ventilation.

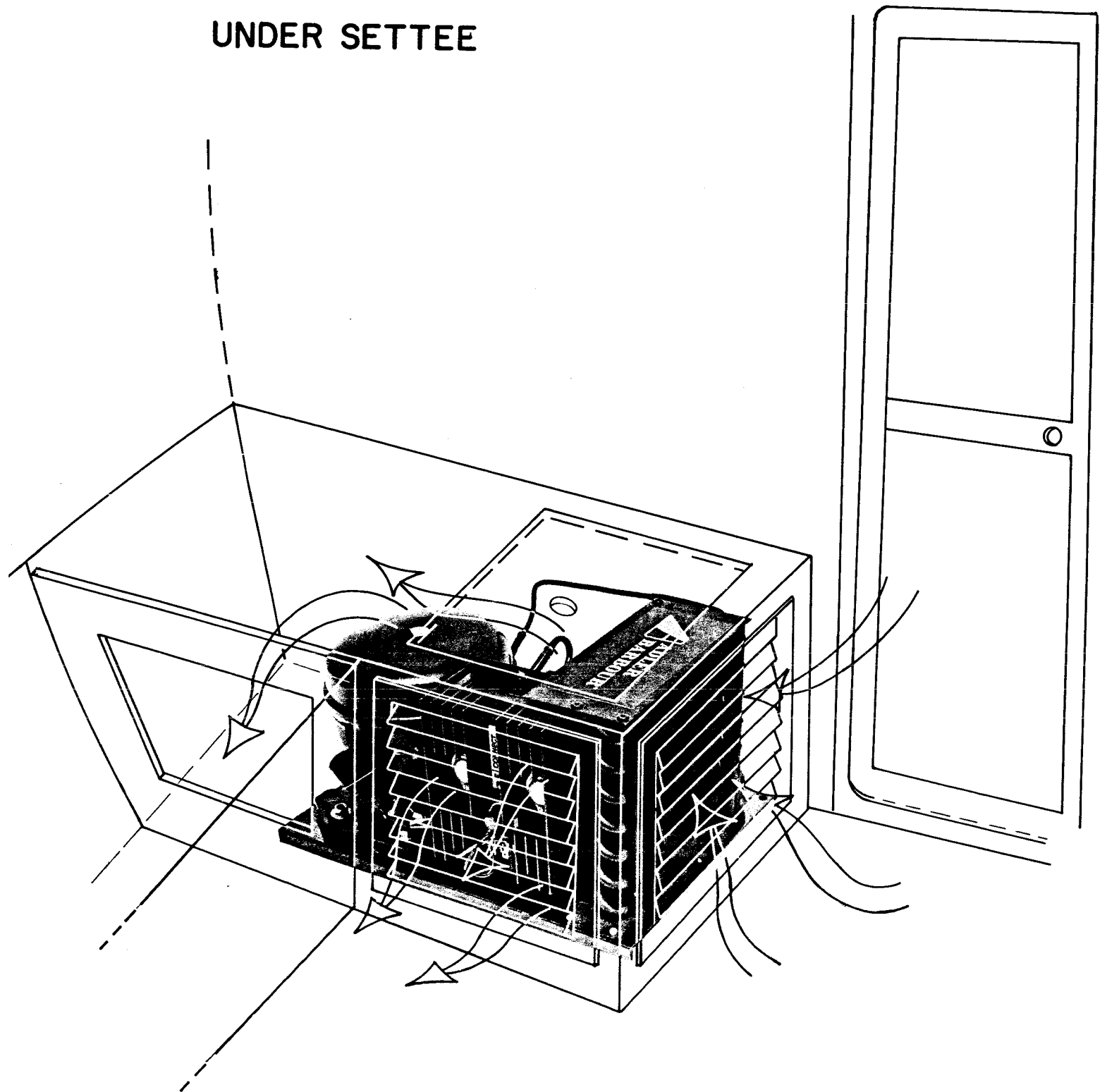
For example:

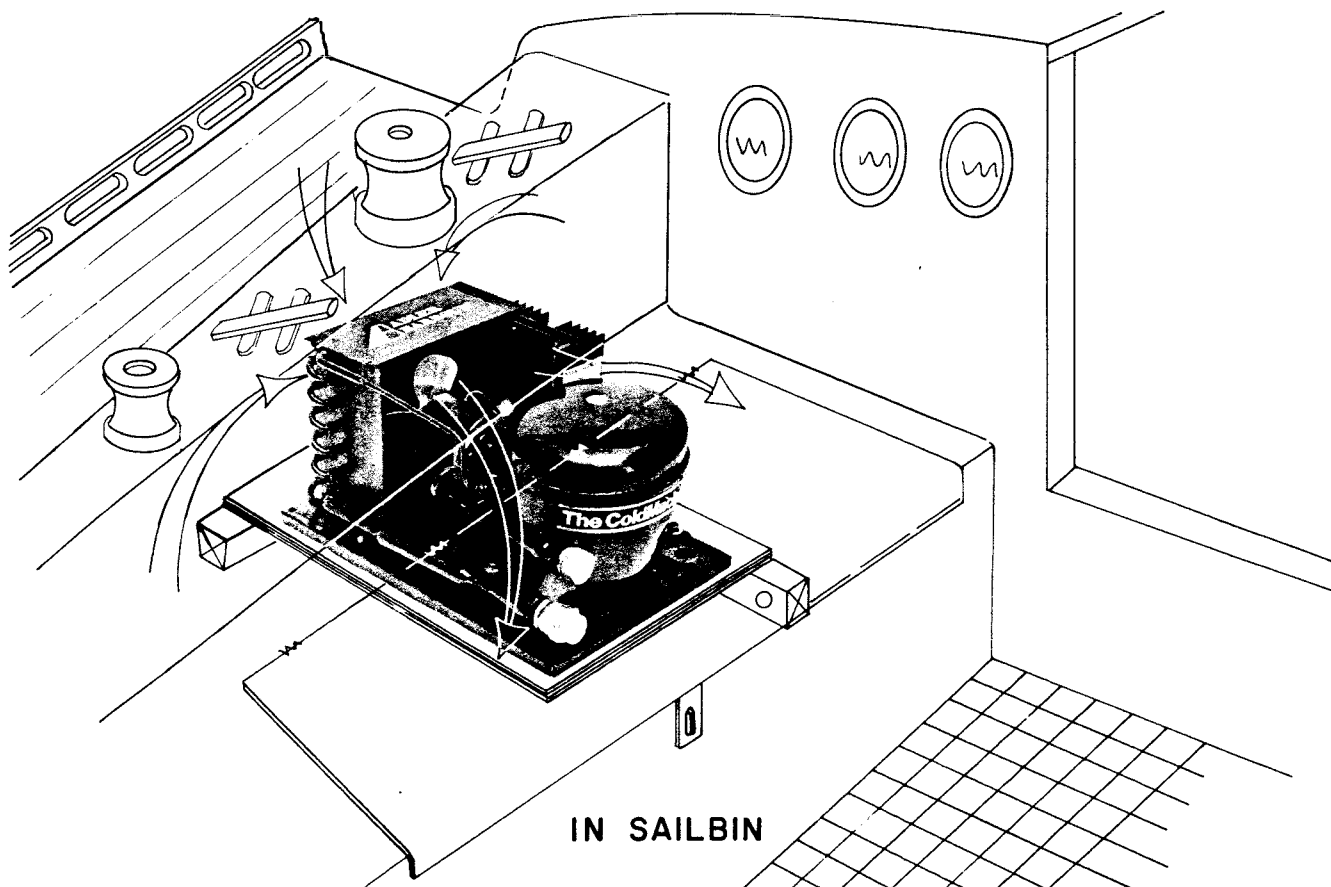
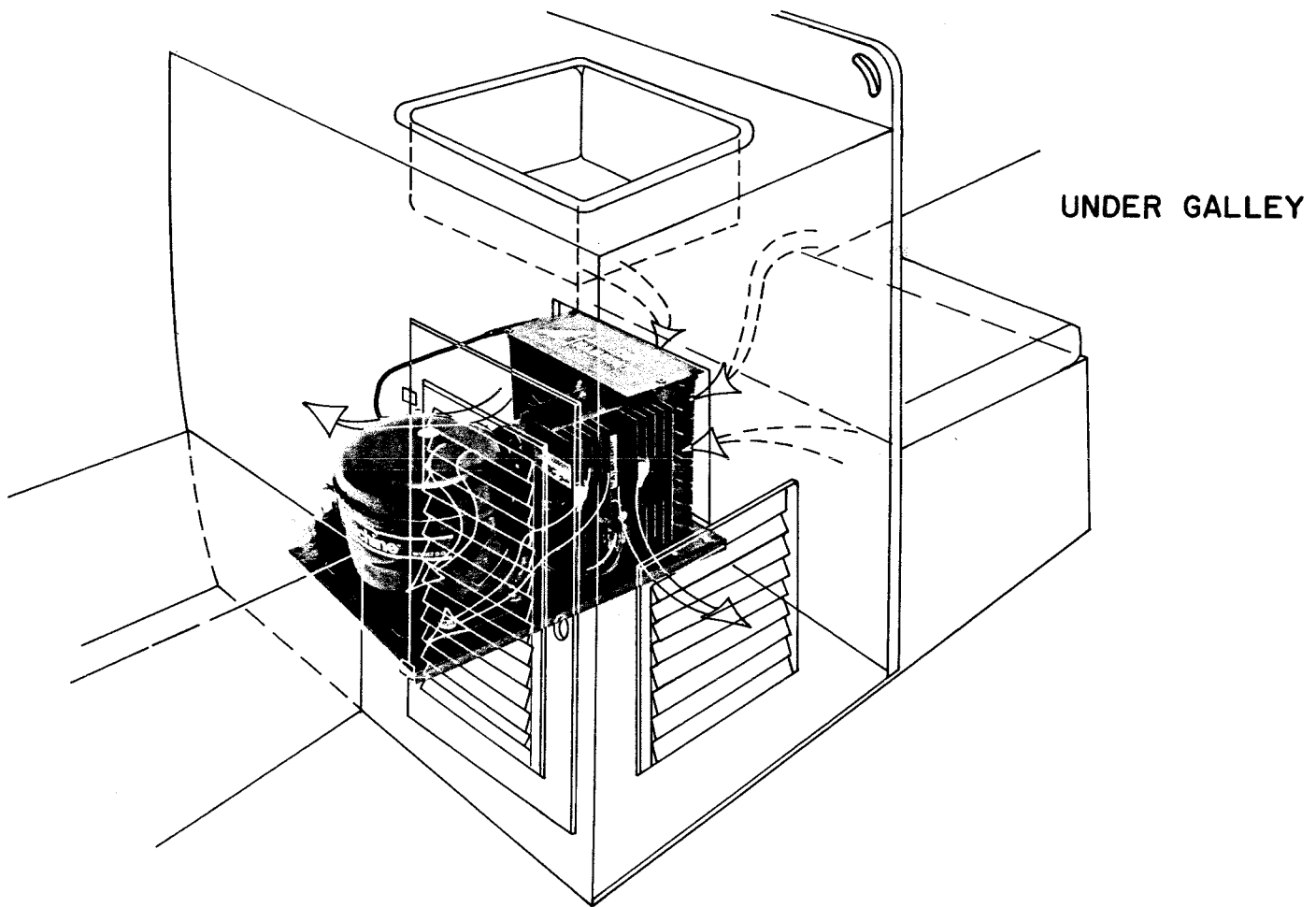
The fan draws air in through the Condenser (radiator like object) and blows back over the Compressor. So: Cut a rectangular opening in your bulkhead equal in size to the Condenser (10" x 10"). Mount the unit with its Condenser up against the opening. Now provide another opening of at least equal size at the other end (or either side) of the unit so that warm air can escape.

Use this same approach wherever you locate the unit, i.e. draw from one compartment and discharge into another.

If the Compressor is in a space of over 70 cu. ft. (or so) this may not be as critical because much of the heat transferred to the air inside its compartment can be transferred outside via conduction through the walls of the compartment. This heat transfer cannot be predicted with any degree of accuracy due to all the variables in boat design; therefore: Provide as much ventilation as you can. Your ColdMachine will run less frequently and draw less amperage.

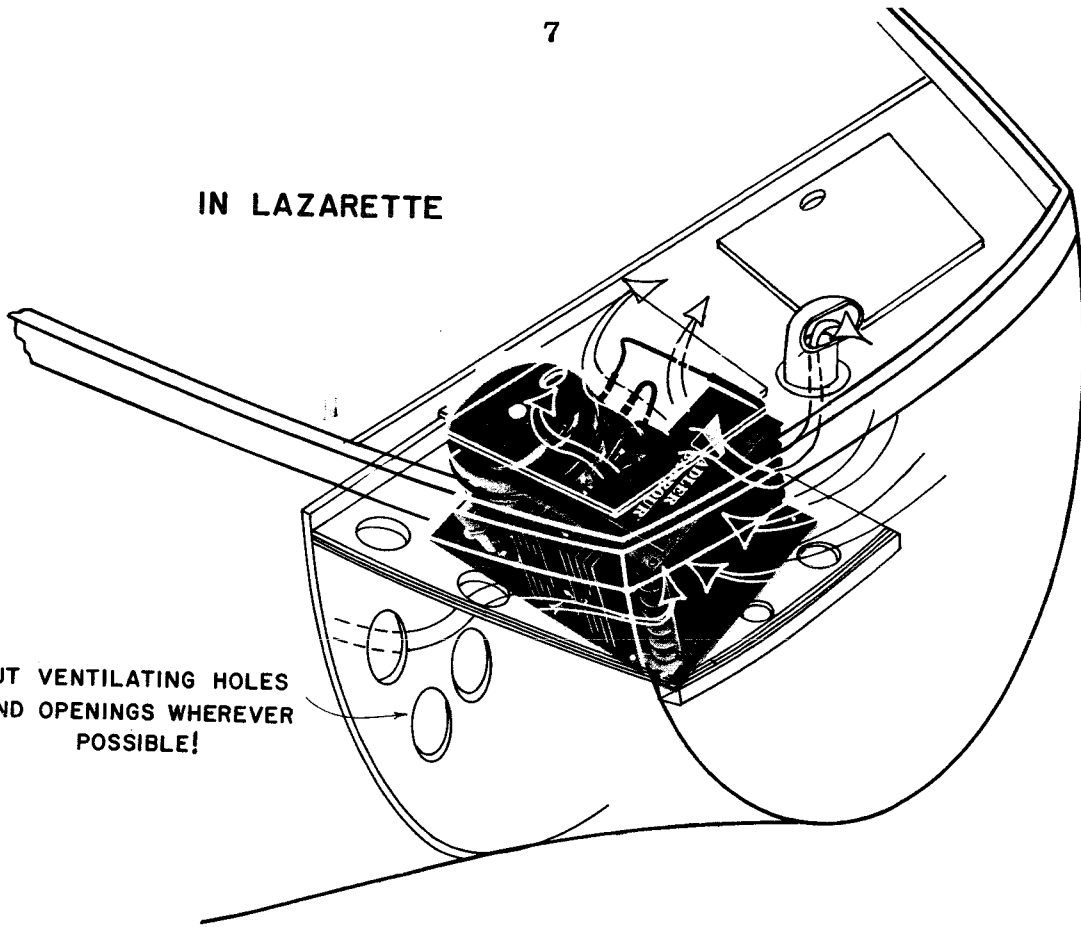
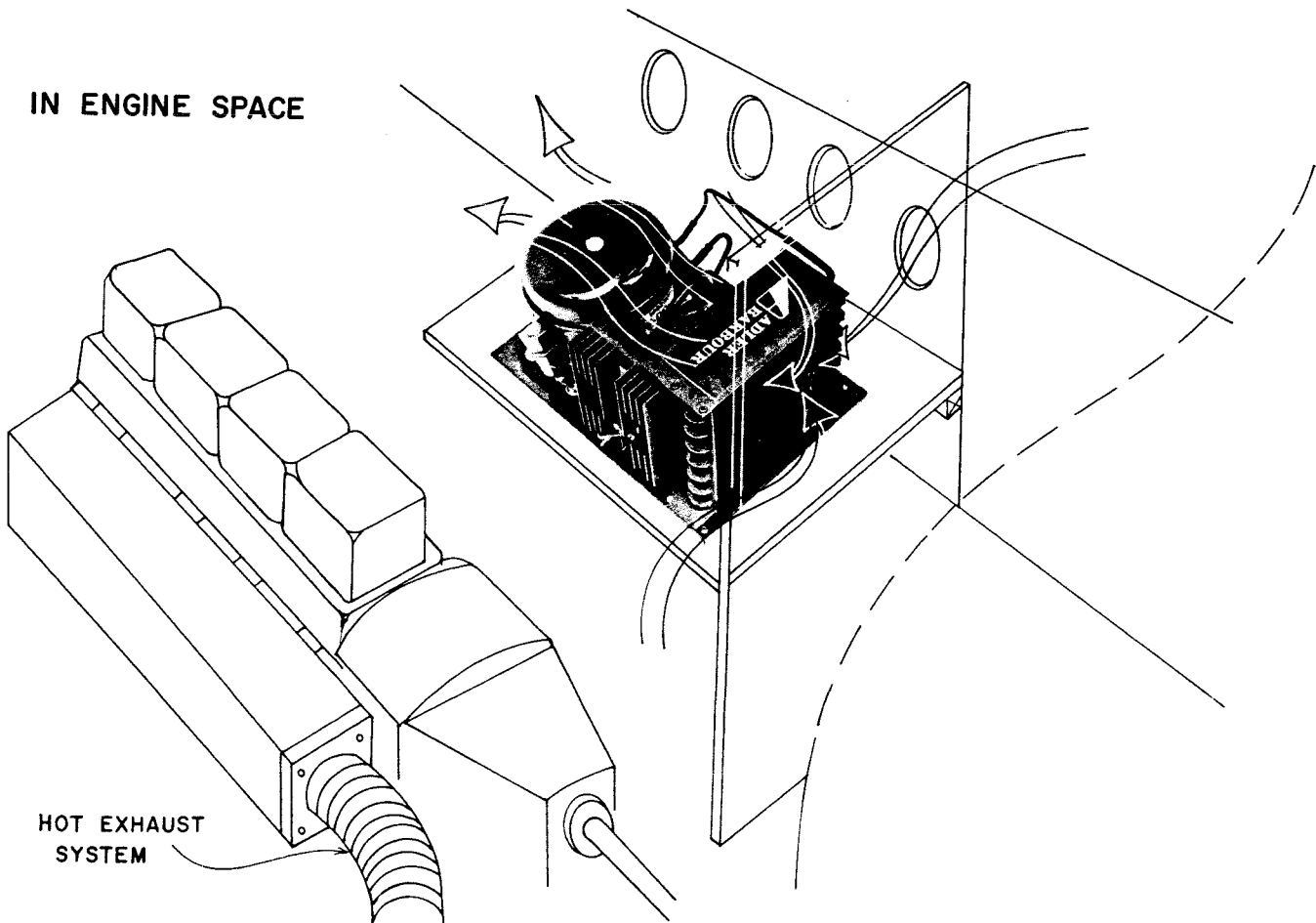
UNDER SETTEE

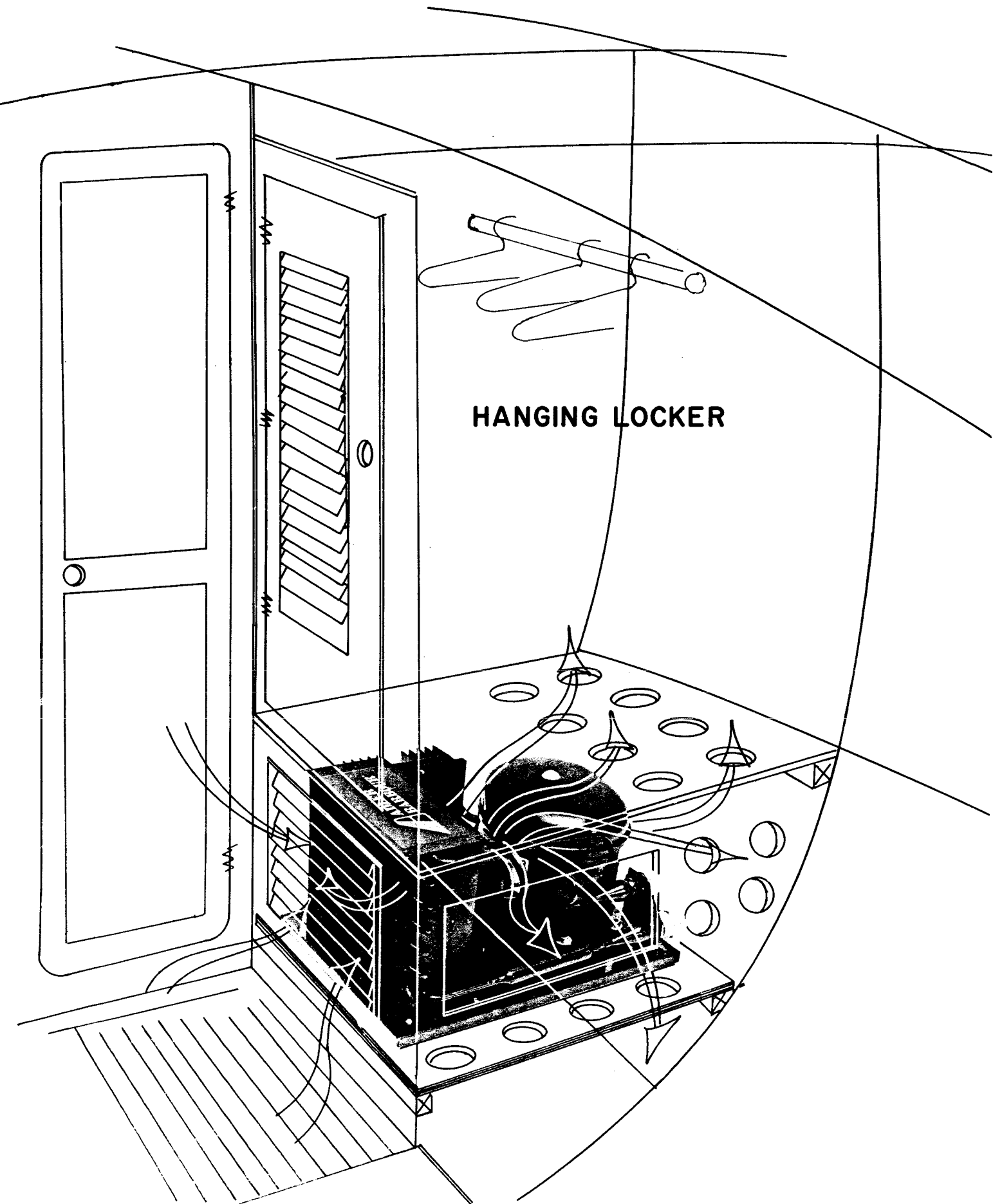


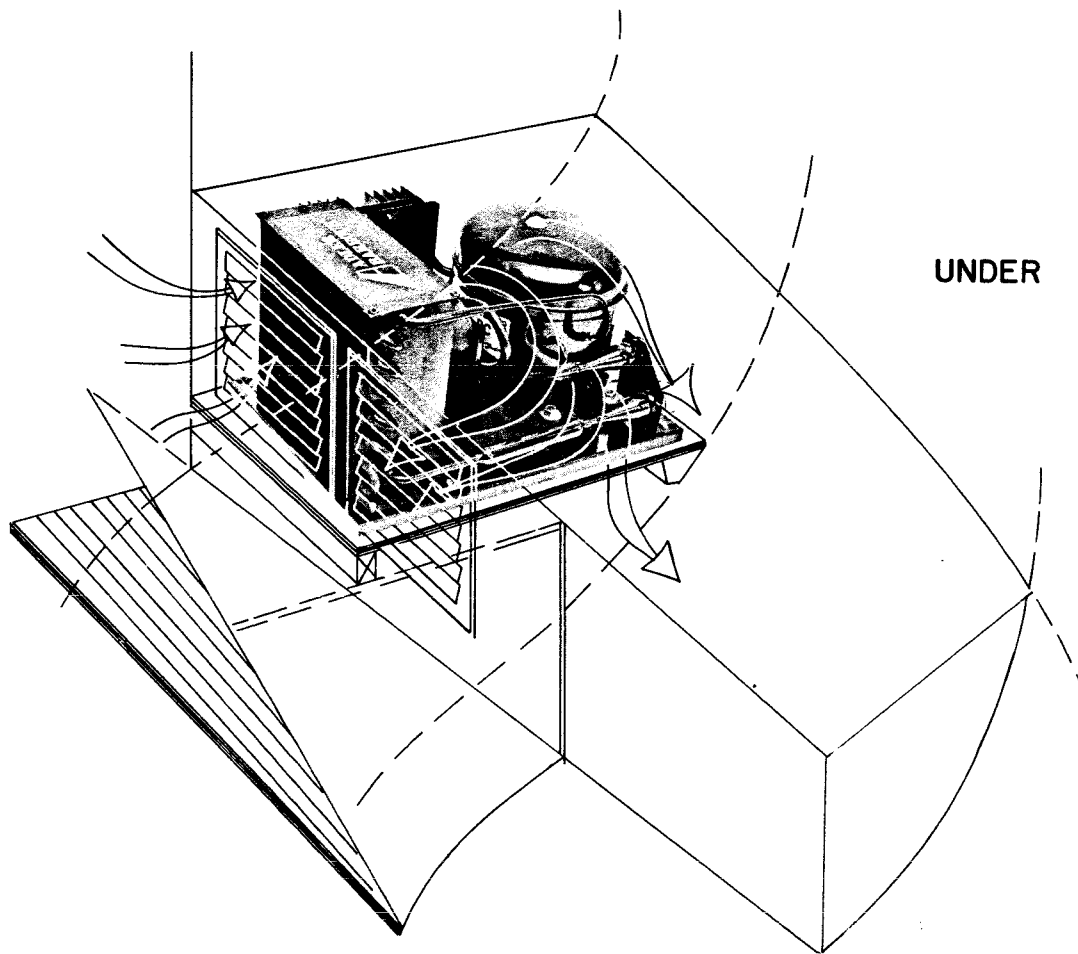


IN LAZARETTE

CUT VENTILATING HOLES
AND OPENINGS WHEREVER
POSSIBLE!

**IN ENGINE SPACE**





UNDER QUARTERBERTH

LOCATE FREEZER UNIT IN ICEBOX:

SFV-1 and LFV-1 Vertical Model Freezers: Keep in mind:

- Locate on any side wall, as high as possible, 1" standoffs and 1-3/4" screws (supplied).
- Access to Freezer interior.
- Cleanability, access beneath unit.
- Position of tubing exit hole for minimum bending and strain.
- Minimum modification of existing shelving.
- Location and access to Thermostatic Control Unit.

SFH-1 Horizontal Model Freezer: Keep in mind:

- Mount from roof of box, 1" standoffs and 1-3/4" screws (supplied).
- Clearance for freezer door to swing open.
- Position of tubing exit hole for minimum bending and strain.

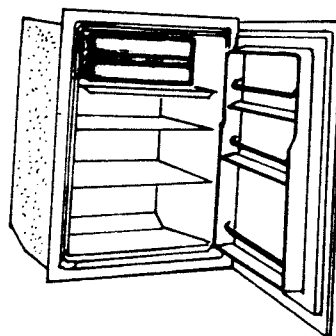
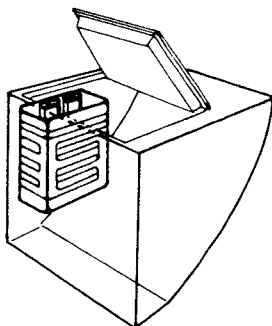
PROCEDURE: Remove all packed items from interior of Freezer Unit:

- Mark location of 4 mounting holes - use paper hole location template (supplied)
- Mark location of 2-1/2" diameter tubing exit hole.
- Drill all holes (9/64" drill bit and 2-1/2" hole saw).
- Unroll entire tubing set - DO NOT KINK, FLATTEN OR STRAIN JOINTS
- Make sure Metal Sealing Caps are in place over refrigerant couplings. KEEP DIRT OUT OF COUPLINGS!
- Feed tubing set through boat to compressor unit location.
- Fasten freezer to icebox liner with 4 1-3/4" stainless steel screws and 1" plastic standoffs (spacers) (supplied).
- Position rubber insulation on tubing so that it ends flush with the inside liner of the icebox, with the balance extending outside.
- Excess tubing (if any) should be formed into an 18" (approximate) diameter coil (in the horizontal plane) above unit or at other convenient location. DO NOT KINK OR FLATTEN TUBING.

A FEW TIPS:

An assistant is very helpful here - it is often easiest if you unroll the entire tube set and stretch it out inside the boat. You can then feed the tube set and couplings through the holes in the icebox, bulkheads, etc. while your helper supports the Freezer Unit and keeps the tubing feeding smoothly without damage to it or the boat.

You may wish to tape a plastic bag in place over both couplings together, to keep them together and protected from dust, bilge water, etc.



IF YOU HAVE PURCHASED THIS UNIT THE MATERIAL BELOW (REPRODUCED FROM THE LFV-1 SALES BROCHURE) WILL BE HELPFUL.

SPECIFICATIONS AND APPLICATION GUIDE

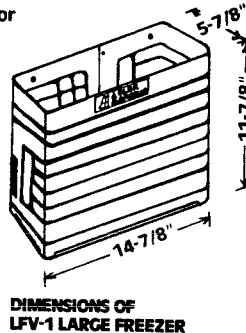
ColdMachine™ Model DCM-12L Specifications

Current Draw: 2.2-2.7 amps per hour based on typical 20-30 minute "on" time for average 9-16 cu. ft. boxes (5.4 amps per hour while running under full load).

Battery Size: 100 amp hours "Deep Cycle" recommended minimum.

Ice Box Size: 9-16 cu. ft.

Supply Voltage: 12 Volts DC nominal (10.5 to 15 Volt operating range). For dock-side use add any small (6 amp or larger) AC automatic battery charger. Unit becomes automatic AC/DC.



System for Boxes 9 to 16 Cubic Feet

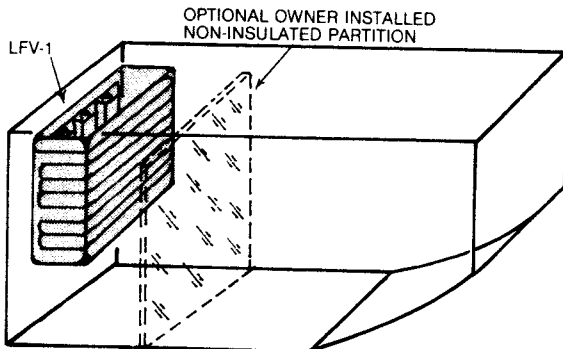
DCM-12L Compressor Unit: 10" wide x 13-1/2" long x 7-3/4" high. Weight 26 lbs.

LFV-1 Freezer Unit (Vertical): 5-7/8" wide x 14-7/8" long x 11-7/8" high. Weight 9 lbs. 3 Verticube™ trays standard.

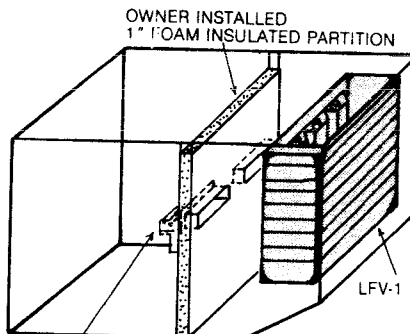
Remote Installation: Compressor unit can be mounted up to 15 feet from freezer unit in ice box.

Circuit Protection: Compressor has built-in automatic low voltage cut-off at 10.5 volts; cuts back in at 11.5 volts. Built-in protection against accidental reverse polarity.

Ignition Protection: Designed to meet or exceed applicable government standards.



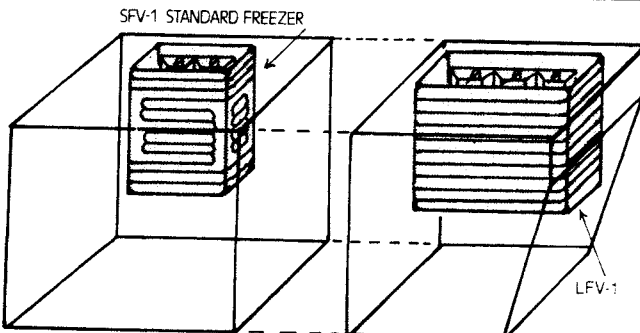
LARGE REFRIGERATOR (9-16 CU. FT.) utilizing the DCM-12L Compressor/LFV-1 Freezer with ample capacity for 6 ice trays (3 standard) plus frozen foods. A minimum of 3" insulation is recommended. The drawing illustrates a customer-installed plexiglass partition providing additional Freezer capacity (up to approximately 2 cu. ft.)



AUTOMATIC SHUTTER #7230

REFRIGERATOR/FREEZER spillover arrangement for **Freezer** compartment up to **4 cu. ft.** and **Refrigerator** up to **6 cu. ft.**, utilizing the DCM-12/LFV-1 system. The partition is constructed of 1" foam core with fiberglass or formica faces, with 1" opening across top convection for air flow return.

Our optional Automatic Shutter #7230, (thermostatically controlled, non-electrical) provides adjustable temperature control for the Refrigerator, mounts on slot through partition. One Automatic Shutter is used for up to 4 cu. ft. of refrigerator; two for larger volumes. A minimum of 4" insulation is recommended for this application.



SEPARATE REFRIGERATOR AND FREEZER boxes utilizing two separate, independent ColdMachine systems. Use this arrangement for a single, large, fully-partitioned ice box, or two separate boxes in different locations.

FREEZER: The large capacity DCM-12/LFV-1 system is used for freezer applications up to **6 cu. ft.** with box insulation of 4" or better (up to 8 cu. ft. with insulation of 6" or better).

REFRIGERATOR: The Standard DCM-12/SFV-1 or SFH-1 (Vertical of Horizontal Freezer) is used for Refrigerators up to **9-1/2 cu. ft.** The DCM-12L/LFV-1 Cold-Machine is for larger boxes **9-16 cu. ft.**

NOTE: Since each box is completely independent and adjustable in temperature, either unit can be shut off and the other used as a Refrigerator with small Freezer — useful when only one or two people are aboard

LOCATE AND MOUNT THERMOSTATIC CONTROL UNIT: Keep in mind:

- Accessibility, visibility, protection from damage.
- Capillary sensing tube is 36" long and must reach clamping plate on side of the freezer, must be routed along icebox wall clear of food, shelving, etc.
- Mount high in box, away from moisture and spillage.
- 15' electrical wire harness must exit with tubing and go to compressor unit plug-in. Protect from bilge water, chafe and damage.
- O.K. to mount unit outside of refrigerated space if your prefer. At least 12" of capillary sensing tube must be inside of icebox.

MOUNTING THERMOSTATIC CONTROL UNIT: (adhesive and/or screws supplied)

Mounting area must be clean and dry. Peel off protective backing from adhesive foam on both mounting flanges, position carefully, press firmly to adhere.

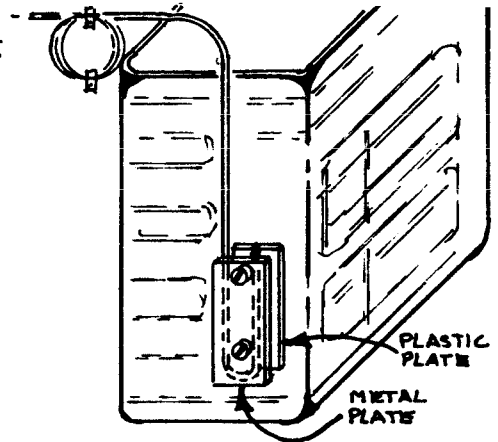
If you wish, also drill (2) 9/64 holes through thermostat flange holes and secure with (2) 1/2" stainless steel screws (provided).

EXTEND & SECURE CAPILLARY SENSING TUBE:

Via this tube, the control unit "feels" the temperature of the freezer. The tube end is shaped in a "U" which fits completely beneath the metal plate on the side of the freezer. 4" of tubing must be clamped under the metal plate or the unit will not control properly.

The plastic plate is always between the sensing tube and the freezer (this prevents the unit from shutting off too soon and "short-cycling").

Carefully unroll just enough tubing to reach the clamp plates, slide the "U" between the metal plate and the plastic plate and fasten screws firmly. Leave the excess coiled up. Secure the coil and tube from rattling and chafing. The tube must not touch the Freezer at any point except the clamp plate or else erratic control cycle will result!

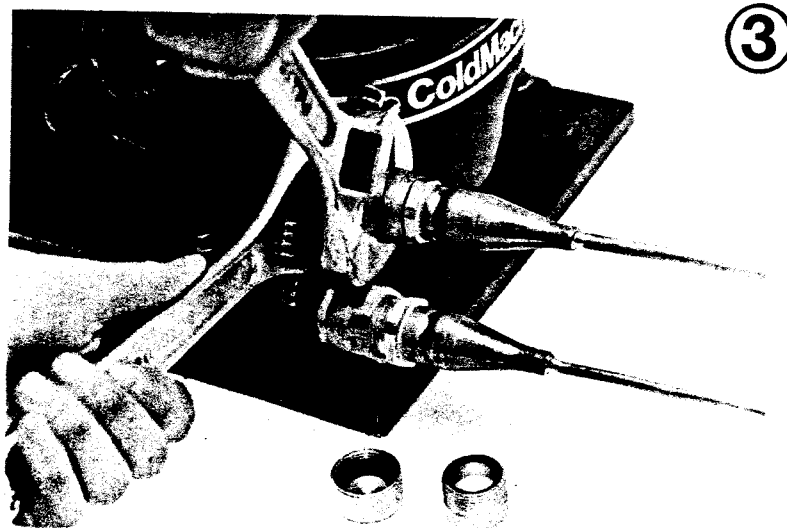
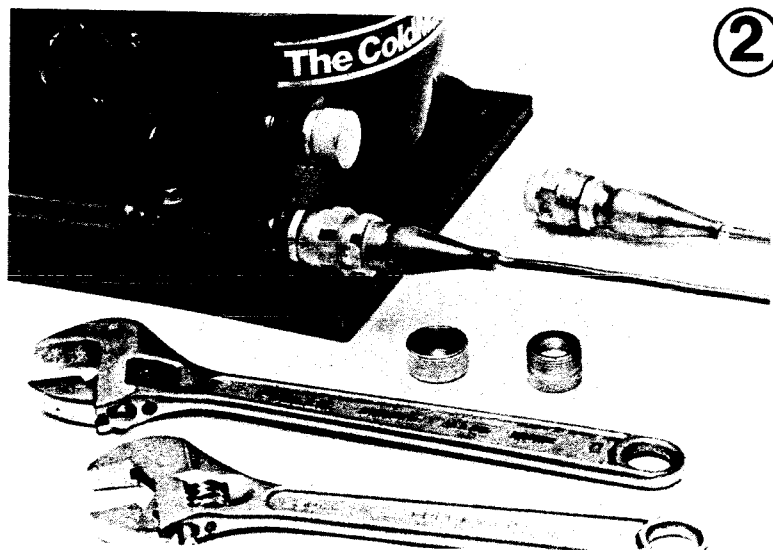
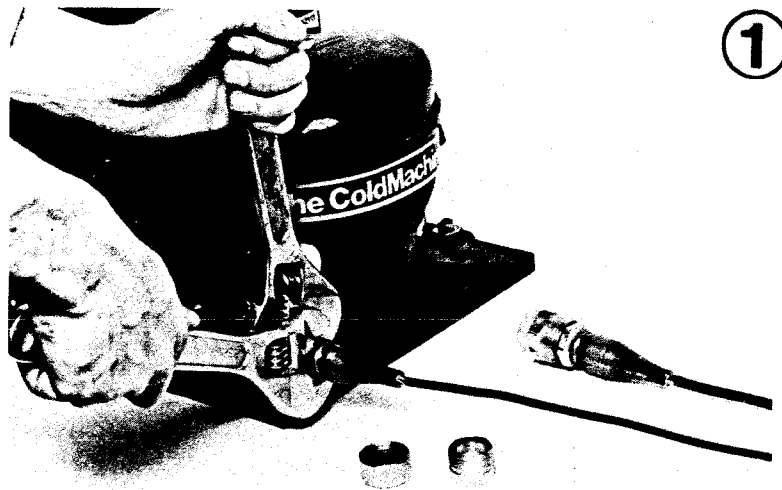


Uncoil the 15' electrical harness, run along side the tubing set to the Compressor Unit and connect to its mating plug.

CONNECT THE REFRIGERANT COUPLINGS: Please note:

- Keep them dry and clean, keep dirt out!! Leave metal sealing caps in place.
- Align them carefully, avoid strain or crossthreading.
- Prepare yourself by having at hand 2 SEPERATE OPEN END WRENCHES OR ADJUSTABLE WRENCHES:
 - One: 1-3/8" Hex or 30mm Or 12" Adjustable
 - One: 1-1/8" Hex or 29mm Or 10" Adjustable

CONNECTING THE REFRIGERANT COUPLINGS



- Connect the lower fittings first!
- Only turn the female coupling. Do not turn the male coupling!!
This is important! If you twist the male coupling from its base, you will have a refrigerant leak. This is why you must use 2 wrenches. You must not turn or twist the bases of the couplings which are soldered to the copper tubing.

NOW:

- ① ● Carefully wipe off fittings with caps and plugs in place to remove dirt, dust and moisture.
- Remove metal sealing caps from the lower pair of couplings.
- Thread coupling halves together by hand to insure proper mating of threads. (If necessary to align properly, remove compressor unit mounting screws to shift unit for best alignment). Use 1-1/8" Hex wrench on male coupling body hex and 1-3/16" Hex wrench on female union nut. Tighten female union nut (holding the male coupling body hex fast) until the coupling body halves bottom out or until definite resistance is felt.
- ② ● Utilizing a marker pen or crayon, draw a line from the male coupling body to and over the female union nut to act as a reference point. THIS PROCEDURE IS EXTREMELY IMPORTANT. IF NOT PERFORMED CORRECTLY YOU WILL NOT HAVE MADE A LEAK-PROOF JOINT.
- Tighten female union nut (still holding the male coupling body Hex fast) one Hex flat (1/6 turn) utilizing the lines you have drawn as reference points. This 1/6 turn is necessary to insure that the metal to metal seal bites into the brass seat of the coupling half forming a leak proof joint.
- ③ ● Repeat procedure for other pair couplings.

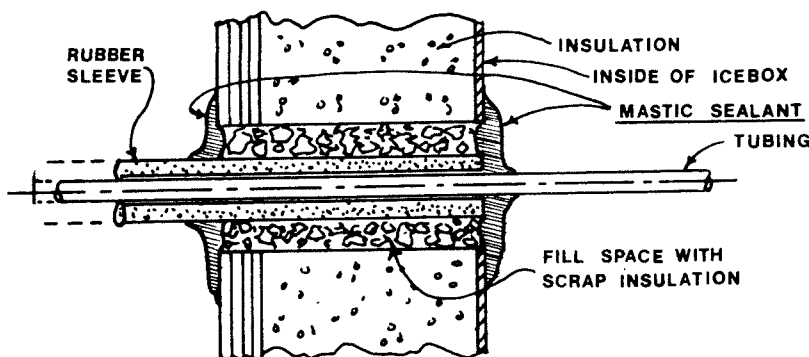
Work rapidly to minimize possible escape of refrigerant. There may be a slight hiss mixed with a few drops of refrigerant oil, but this will stop when the couplings are tightened.

KEEP THE METAL SEALING CAPS in case the unit must ever be returned for service.

THE SYSTEM IS FULLY CHARGED WITH REFRIGERANT AT OUR FACTORY AND REQUIRES NO CHARGING IN THE FIELD.

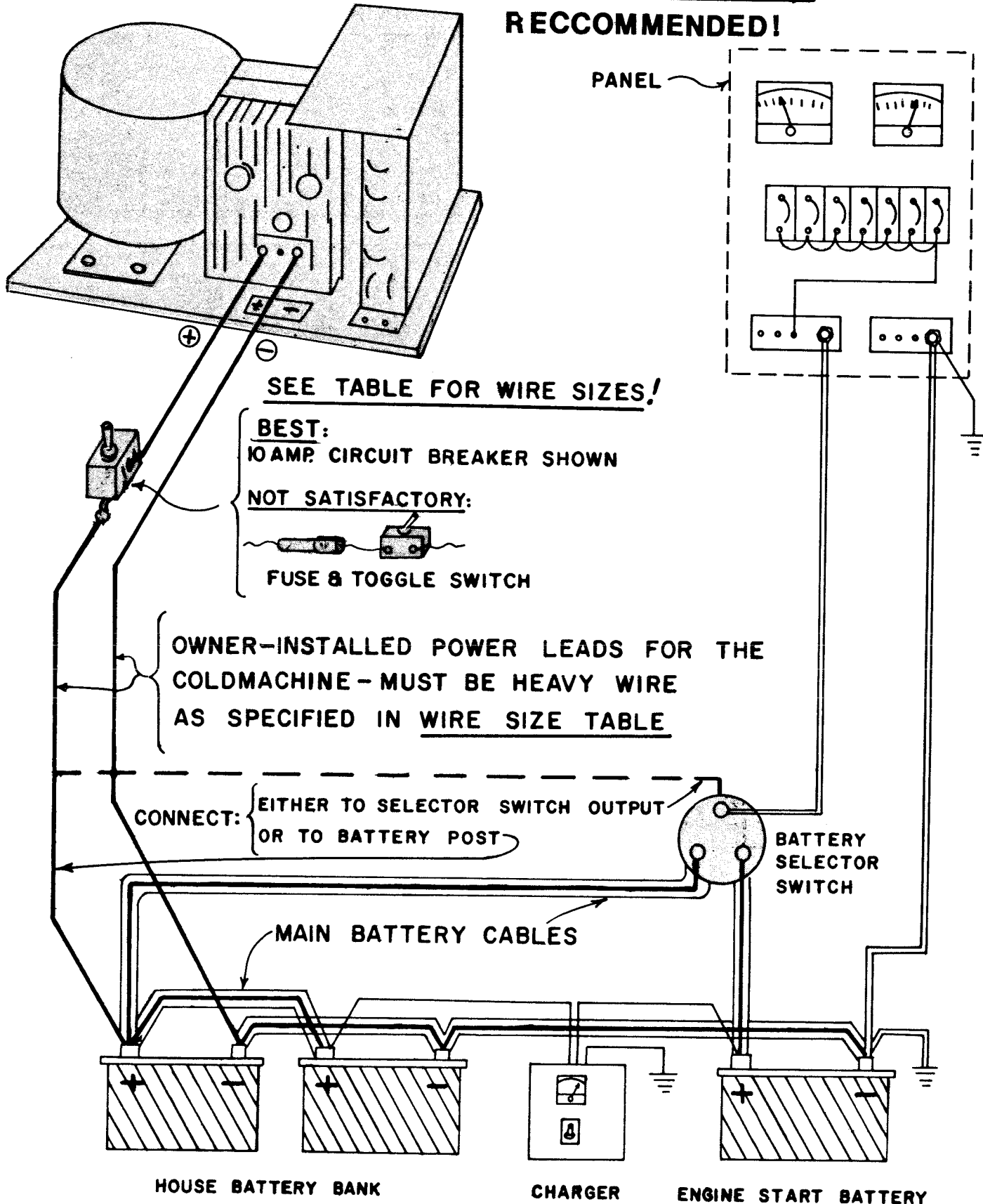
SECURE TUBING AND WIRING HARNESS:

Support properly with clamps, wire ties (4 supplied), etc. as needed to keep tubing and wiring out of bilge water and protected from chafe and vibration. Wire tie the wire harness to the tubing at intervals as required. Coil excess tubing/wiring -- secure (inhorizontal orientation) with wire ties, etc. to prevent rattling and damage. Seal exit hole in icebox with mastic (supplied). ↗

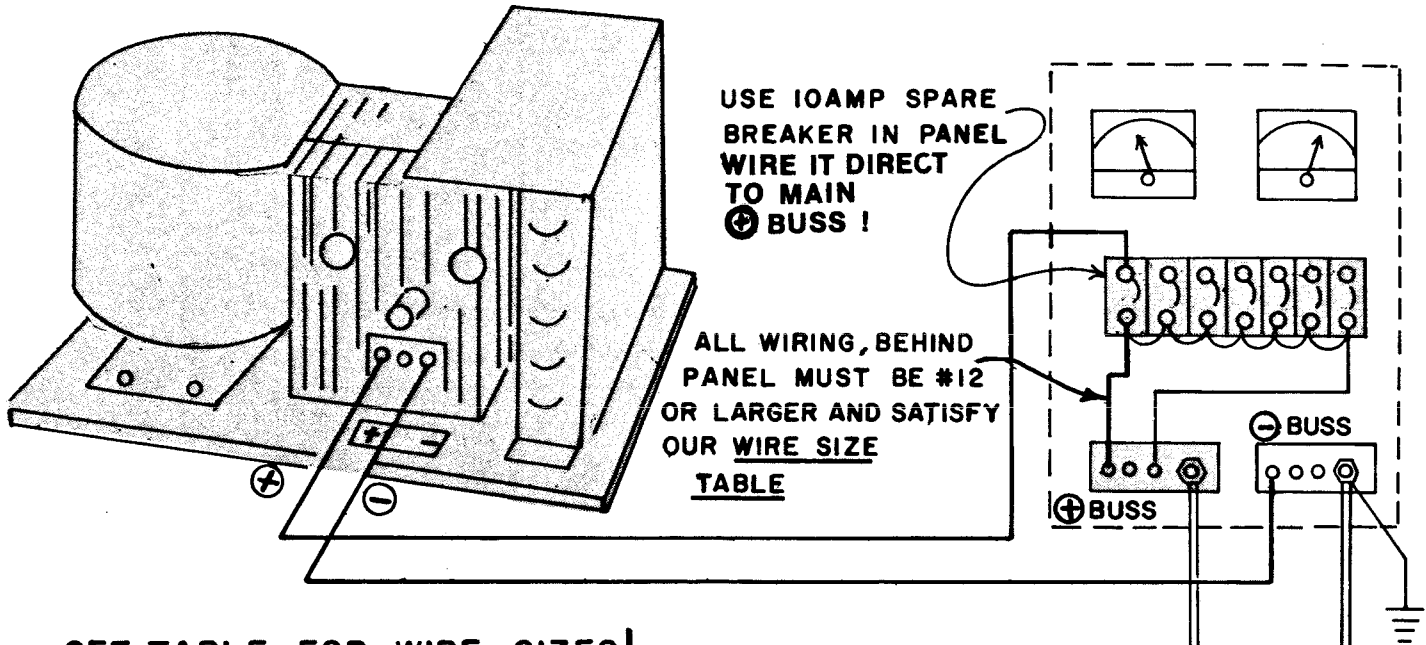


"A" DIRECT CONNECTION TO BATTERY

RECOMMENDED!



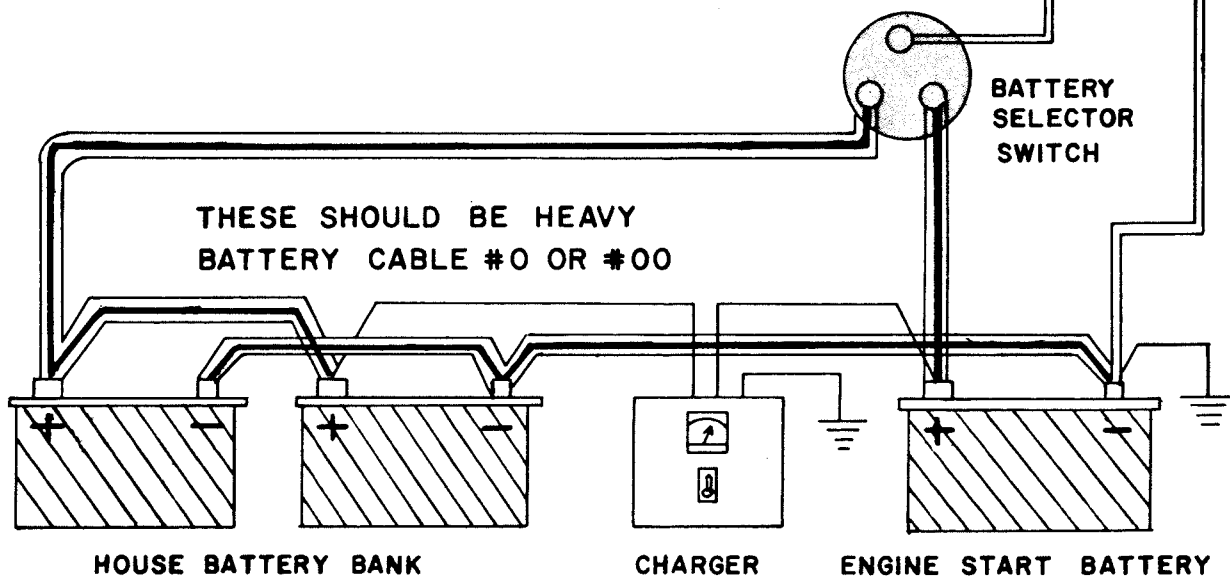
"B" - CONNECTION TO EXISTING PANEL BREAKER



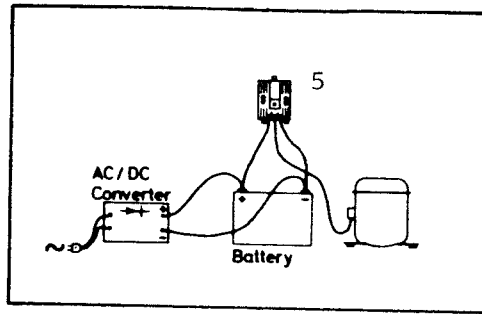
SEE TABLE FOR WIRE SIZES!

THESE PANEL FEEDER CABLES MUST BE MINIMUM
= 8 AWG WIRE SIZE.

2/10 VOLT MAXIMUM TOLERABLE VOLTAGE DROP AT
COLDMACHINE TERMINALS, WITH ALL OTHER D.C.
LOADS ON, MEASURED WHEN COLDMACHINE STARTS.

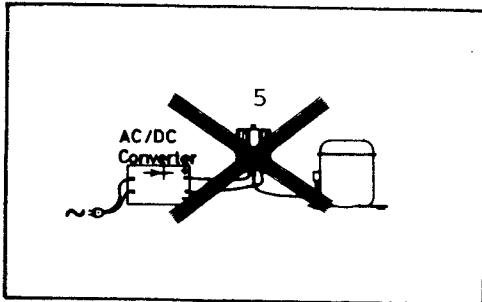


DCM-12/DCM-12L ELECTRICAL CONNECTIONS

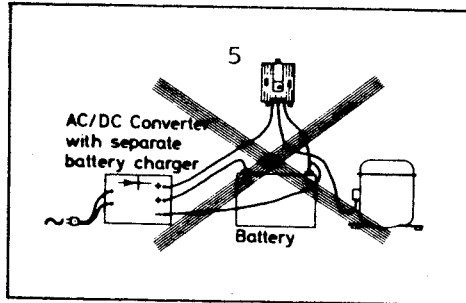


RIGHT!

DO NOT CONNECT AC/DC BATTERY CHARGER ("CONVERTER")
DIRECTLY TO COLDMACHINE!



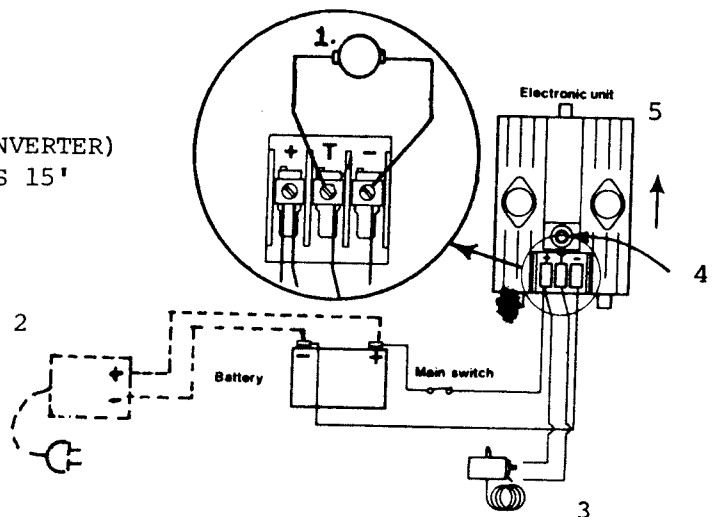
WRONG!



WRONG!

COMPLETE ELECTRICAL SCHEMATIC

1. FAN MOTOR
2. OPTIONAL AC/DC BATTERY CHARGER (CONVERTER)
3. THERMOSTATIC CONTROL UNIT (INCLUDES 15' WIRING HARNESS WITH MATING PLUGS)
4. FUSE (BUSS GLN-10)
5. ELECTRONIC MODULE



ELECTRICAL CONNECTIONS:

- POLARITY: Use color-coded wire so you know which is + positive and which is - negative before you connect wiring and blow the unit's fuse (there is a spare on the compressor wiring harness)!
- WIRE SIZE: If you use undersized wire, your system will run erratically, often fail to start, not produce normal cooling any may fail early in its service life. Use a wire gauge size (as listed below) based on the total distance from compressor unit to the battery or battery selector switch.

WIRE SIZE TABLE

MAXIMUM DISTANCE FROM COMPRESSOR UNIT TO BATTERY	WIRE GAUGE AWG
4 feet and under	#14
5 feet to 10 feet	#12
11 feet to 17 feet	#10
18 feet to 27 feet	# 8
28 feet to 35 feet	# 6
36 feet to 50 feet	# 4

CONNECTING THE COLDMACHINE TO YOUR 12 V.D.C. SUPPLY

WE STRONGLY RECOMMEND WIRING THE UNIT TO THE SERVICE BATTERY OR THE BATTERY SELECTOR SWITCH ALONG THE SHORTEST POSSIBLE ROUTE. This is necessary to avoid unnecessary voltage drops that may occur at distribution panels (due to insufficient wiring or too great an accessory load) but not at the battery. It is recommended that a suitable switch/circuit breaker of 10 amps be installed in the positive leg when wiring directly to the battery. The 10 amp circuit breaker should be installed as close to the battery as possible. Its purpose is to protect the wiring (and the boat) in case of an electrical short. The Compressor Unit has its own fuse for system protection.

SEE LAYOUT "A" FOR "DIRECT CONNECTION TO BATTERY"

Q. CAN YOU EVER CONNECT THE COLDMACHINE TO AN EXISTING BREAKER IN YOUR CONTROL PANEL?

ANS. Conditionally, Yes. See Layout "B" "Wiring To Existing Panel". If the cables from Selector Switch to Panel, and the wiring behind the panel from bussbar to circuit breakers and back to the battery negative post are all extra heavy, all connections are tight and free from corrosion and high resistance, you may get away with it.

The ColdMachine will probably run normally at the dock, with fully-charged batteries and the battery charger running, and most ship-board D.C. devices turned off.

But it may fail to start and/or may run erratically when you are sailing, or anchored, with batteries less than fully charged, engine off, and various D.C. loads turned on and producing voltage drops at the panel and, therefore, at the ColdMachine.

Let us assume you have inspected your wiring and decide to connect to your panel. If the unit malfunctions as described, simply run a temporary feeder to the ColdMachine DIRECTLY FROM THE BATTERY, using wire sizes per Table. If this promptly cures the problem, and it usually does, you should be advised to switch to the "A" arrangement.

A SWITCH IS MANDATORY: With the thermostat set on OFF, there is still a voltage applied to the Electronic Module. Current flow is in the milliamp range, nevertheless a switch/circuit breaker or the battery selector switch is necessary for long off or storage periods.

Make certain that the switch and its connectors do not introduce any voltage drops into the supply circuit!

Be careful not to install any voltage dropping devices such as indicator lights, volt and amp meters in the 12 volt D.C. wiring circuit.

BATTERY CONSIDERATIONS:

We strongly recommend a second battery, exclusive of the engine starting battery, in every boat that has other D.C. electrical devices, lights, etc., plus standard marine battery selector switch.

The "House" or "Service" battery or battery bank should provide at least 100 amp/hour capacity. More is desirable. The larger the bank, the longer you can operate all your loads between engine charging, and the faster you can recharge, because the alternator's actual output in amps is greater into a larger battery bank.

Elsewhere in this manual, we have included a section on "The Care and Feeding of Marine Batteries and Electrical Systems".

"DEEP CYCLE" OR "DEEP DISCHARGE" type batteries are strongly recommended as they are, by design, better able to cope with the constant discharge and charging cycles common to boats.

VOLTAGE DROPS DUE TO UNDERSIZE WIRING AND POOR CONNECTIONS ARE THE MAJOR CAUSE OF CUSTOMER PROBLEMS WITH THIS EQUIPMENT:

- WHEN IN DOUBT USE HEAVIER WIRE!
- NO TWISTED CONNECTIONS!
- ALL CONNECTOR PARTS MUST BE CLEAN, TIGHT, AND FREE FROM CORROSION!

REASONS FOR ELECTRICAL CONNECTION DIRECT TO BATTERY:

The ColdMachine has a D.C. motor with electronic commutation. This completely eliminates the brushes and commutator ring assembly and makes possible its truly HERMETIC Compressor design.

This means that the Electronic Module sends current back to the battery for short intervals during each motor rotation.

Prevention of this current return by any AC/DC Converter, battery charger or any other D.C. source will damage the Electronic Module. Therefore, the following rules for connection must be observed:

THE ELECTRONIC UNIT MUST BE CONNECTED DIRECT TO THE BATTERY AND/OR BATTERY SELECTOR SWITCH TERMINALS!

THE LEADS BETWEEN THE ELECTRONIC UNIT AND THE BATTERY AND/OR BATTERY SELECTOR SWITCH MUST NOT BE CONNECTED TO OTHER UNITS LIKE AC/DC CONVERTERS, BATTERY CHARGERS, TRICKLE CHARGERS, "CONSTAVOLTS", D.C. GENERATORS, D.C. ALTERNATORS, ETC. CONNECT THESE DEVICES DIRECT TO BATTERY!

This also means that you or your mechanic must never momentarily lift the battery cable terminals off the battery posts while the engine and alternator are running, or operate any switch circuits which may momentarily have the same effect; i.e. of removing the battery from its normal position: connected across the output of any other D.C. source. THIS IS IMPORTANT. An Electronic Module damaged by violating these rules will show characteristics identifying cause of failure, and will not be warranted.

BATTERY LOCATED PROTECTIVE DEVICES:

Recent boat building standards may require that a fuse or circuit breaker be installed at the battery location by the manufacturer. In such case we consider the output side of such fuse or circuit breaker to be suitable for ColdMachine connection.

SO: Connect the ColdMachine directly to the Service Battery ⊕ and ⊖ terminals or the Main/Battery Selector switch (+ terminal on the battery side or the output side) with the negative (-) lead to the battery negative (-) terminal.

CONNECTING 12 VOLT D.C. SUPPLY TO UNIT:

- First: Turn the thermostat control knob all the way counter-clockwise (CCW) to the off/defrost position. Resistance will be felt. Keep turning until a sharp click is heard.
- Run wiring: connect to the ⊕ and ⊖ terminals on the Electronic Module of the Compressor Unit. Note polarity label on unit base!

- DO NOT REVERSE POLARITY!

LEFT TERMINAL IS \oplus ; MIDDLE TERMINAL: DON'T TOUCH!; RIGHT TERMINAL IS \ominus .

If you connect in reverse, the fuse located in the Electronic Module will blow, the compressor will not start and the condenser fan will not run. A spare fuse is bagged and stapled to the compressor wire harness (Buss GLN-10; replacements available from factory). Rewire and replace fuse.

If you connect the middle terminal, you will damage the printed circuit board in the Electronic Module.

2 crimp terminals are supplied for #14 or #12 wire. For heavier wire, use appropriate terminals (locally available at hardware and marine stores).

YOUR COLDMACHINE SYSTEM IS NOW READY TO OPERATE.

OPERATING INSTRUCTIONS FOR DC COLDMACHINE SYSTEMS

DESCRIPTION: This unit is designed for 12 volt D.C. operation. Operating range is 10.5 - 15 volts. The Electronic Module will automatically shut off the Compressor if battery voltage falls below 10.5 volts. The Condenser Fan will continue to run (so long as the Thermostat is in the "on" mode and main switch is on). As the battery recharges, the Electronic Module will automatically turn the Compressor on as voltage reaches 11.5 volts. This circuitry protects the battery from damaging effects of a complete discharge. (NOTE: The Condenser Fan Motor draws only 2/10ths of an amp.)

AC/DC OPERATION:

The ColdMachine will also operate automatically from 115 volt A.C. shore power, provided a Battery Charger is installed in your boat. An inexpensive 6 amp charger will suffice, so long as it is not expected to furnish lights, stereo and other on-board D.C. needs as well! For permanent constant duty installations, we recommend a larger marine type charging system (Constavolt, Sentry, etc.) properly sized to handle ColdMachine (5.4 amps while operating, 1.8 - 2.4 amps aver hourly draw in normally insulated 4 - 6 cubic foot boxes) plus your other on-board D.C. needs.

MOST IMPORTANT: DO NOT CONNECT A BATTERY CHARGER OR ANY OTHER D.C. POWER SUPPLY DIRECTLY TO THE COLDMACHINE!

OPERATING THE COLDMACHINE SYSTEM:

Turn the Thermostatic Control clockwise (CW) to about #2 or #3. #1 on the Thermostat Control is the warmest setting: #7 is the coldest.

Compressor and Condenser Fan will start. Within a few minutes, the Freezer Unit will begin to frost. The system will operate continuously until cabinet, contents, icecubes, etc., have been brought to selected temperature. It will then cycle off, and thenceforth cycle on and off to maintain proper temperature (just like a home refrigerator).

The ColdMachine's unique D.C. Compressor is different from the common 115 volt A.C. Compressor in several ways:

- It is exceedingly quiet. In fact, its often difficult to tell if it is running or not - the little Condenser Fan is more audible than compressor. A slight vibration and low humming indicates operation.
- When starting: The Condenser Fan will start and run immediately. The Compressor may start simultaneously, or it may not. The Electronic Module contains an Integrated Circuit that controls the Compressor's starting and relates it to: BATTERY VOLTAGE, INTERNAL FREON PRESSURES, AND TIME. When the Thermostat cuts in, up to 120 seconds may elapse before the Compressor starts. The Compressor Rotor may "inch" several times until it is in the correct position to start.

ELECTRONIC MODULE PROTECTION SYSTEM:

The Compressor is protected against overloading, starting failure and excessive battery discharge which would otherwise damage the battery.

If the system goes into its protective mode, it will "try to start every 45 seconds until starting within 1/2 second becomes possible, and will start and run normally. Condenser fan will run continuously in this mode.

If system fails to start after 3 attempts it will "wait" 45 minutes and then make 3 more attempts. You may shorten this time by turning Thermostat to OFF waiting 5 - 10 minutes for refrigerant pressures to equalize, and then turning back to ON.

If the above does not produce normal operation, check battery voltage at the Electronic Module between the ⊕ and ⊖ terminals (see TROUBLE-SHOOTING SECTION.)

NORMAL OPERATION AND MAINTENANCE:

With the Thermostatic Control turned to the approximate middle of its range, the unit will freeze icecubes, refrigerate the cabinet and cycle on and off automatically whenever 12 V.D.C. power is available.

Do not expect the system to cycle when initially started until it has been running several hours and until all icecubes have been frozen.

If you disconnect power while the unit is running, wait 5 - 10 minutes before turning power back on again (see preceding section on Protection System).

EXCESSIVELY COLD CABINET: (SEE SECTION ON LFV-1 LARGE FREEZER UNIT)

Unlike your home refrigerator, there is no definitive separation between the Freezer Unit and the rest of the icebox. Therefore, in smaller or better insulated iceboxes, the unit will tend to freeze the produce load. This is not so apparent in larger or poorly insulated iceboxes due to the higher heat load. An effective way of eliminating this problem is to simply divide the icebox into two sections, a refrigerator and a freezer, divided by a sheet of plexiglass. Space allotted to the freezer/refrigerator would be based on your discretion. We recommend drilling a three inch (3") diameter hole halfway up in the separator and another three inch (3") hole at the top to aid in natural convection airflow from the freezer section to the refrigerator section. The end result is a larger more useable freezer (capacity) and a better performing refrigerator section. The necessary plexiglass materials are obtainable locally and the material itself is fairly easy to work with. This partitioning will not work in all boxes, or if freezer is made too large. A "Trial and Error" approach is required.

For Horizontal freezers mounted in stock front opening boxes (General Thermetics, Marvel, etc.), full-width drip pan/separator is generally required to prevent the bottom section from getting too cold.

DEFROSTING:

Defrost your refrigerator when frost gets over 1/2" thick. This should not occur in less than a week or so (excessively fast or thick frost formation is an indication of leaking, poorly sealing door seals or gaskets). Best way is to turn your thermostatic control to "OFF" position (counter-clockwise until it "clicks"), or disconnect from power source, open hatch or door. Allow Freezer Unit to defrost naturally. NEVER use an ice pick, knife or other metal object. You may pierce the refrigerant coils if you do.

MAINTENANCE:

No regular or seasonal maintenance is normally needed. No maintenance is required for winter storage or decommissioning. You should wash the Freezer Unit as required and before winter storage (Joy or Ivory). The Condenser (radiator-like object on the Compressor Unit) can become clogged with dirt and should be carefully vacuumed clean with a soft brush attachment seasonally. Be careful not to bend the cooling fins.

WINTER OPERATION:

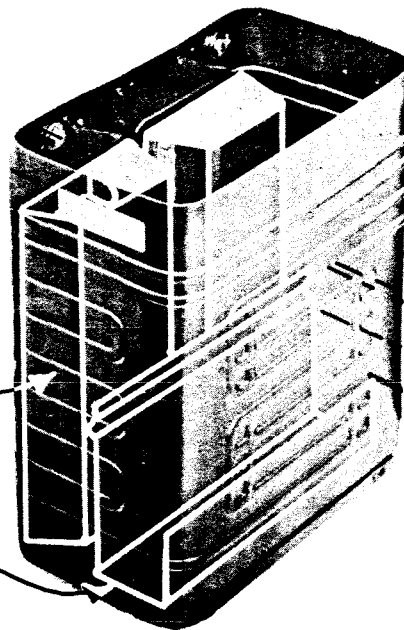
When ambient temperatures drop below 60°F in the operational area of the Compressor unit, it becomes necessary to block off approx-

imately 1/2 of the condenser coil with a piece of cardboard to keep up system efficiency. The cardboard must be removed when seasonal temperatures return to above 60°F.

USE OF TRAY SEPARATOR

VERTICUBE TRAYS

SEPARATOR



TROUBLE SHOOTING GUIDE

GENERAL:

This is a general guide for simple field-level trouble-shooting and repair. It covers diagnosis and replacement of fuse, fan motor, thermostatic control unit and adjustment of refrigeration pressures. These repairs/replacements can be done by the average owner or mechanic. Service kits and manuals are available for these procedures from the Customer Service Department at Adler-Barbour. Please call or write:

ADLER-BARBOUR Marine Systems, Inc.
511 Fifth Avenue
Pelham, New York 10803

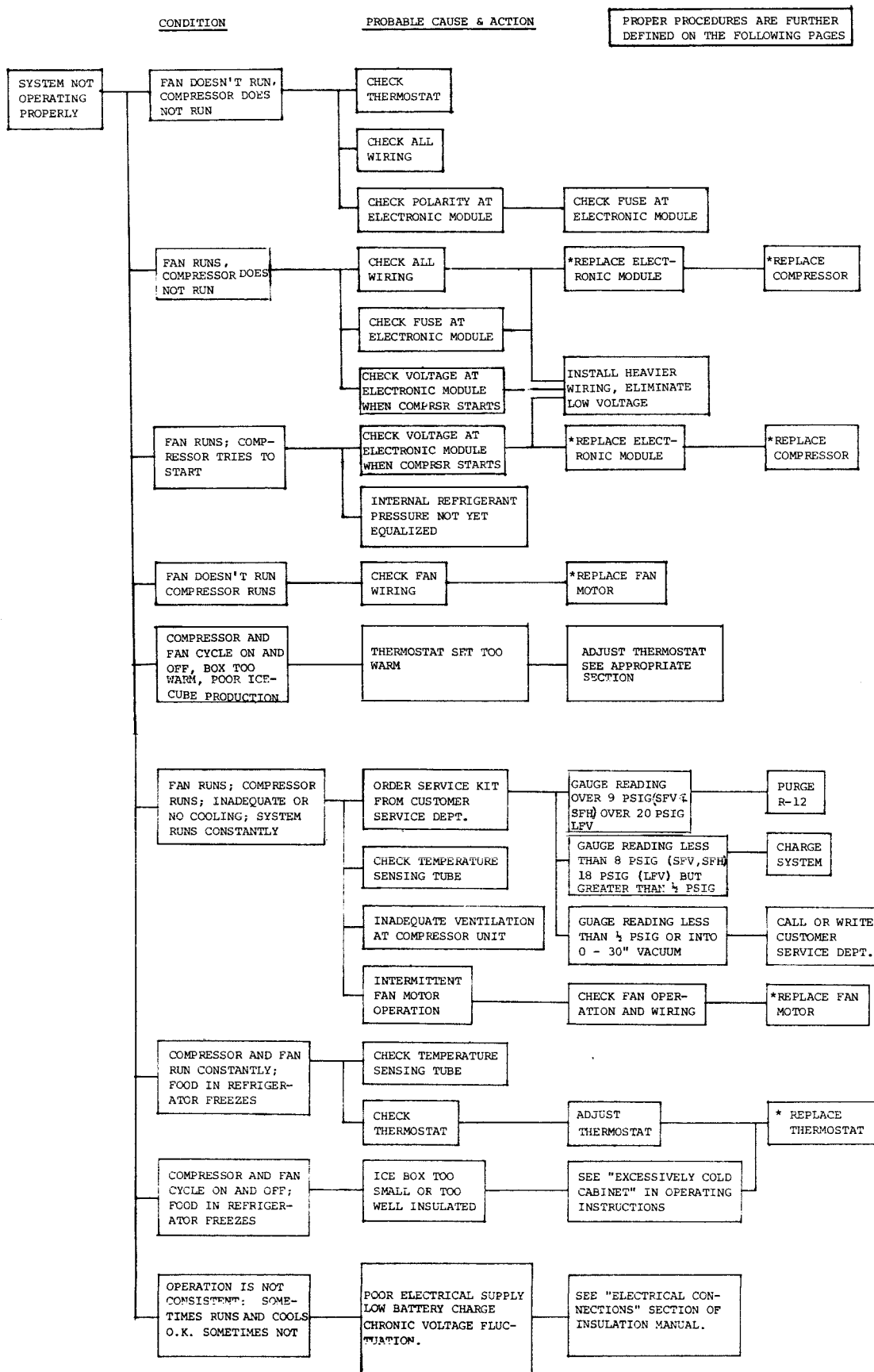
Attention: Customer Service Department

Telephone: (914) 738 - 6201

- (*) We do not authorize field service of the Compressor, Electronic Module, Refrigerant Circuit or Freezer Unit. These items must be returned to our factory or authorized factory service center, prepaid, in original factory cartons.

see: "RETURNING THE UNIT FOR SERVICE" and "SHIPPING INSTRUCTIONS"

- (*) Except as noted herein; using our service kit for refrigerant circuit, and replacing the Electronic Module complete.



DESCRIBED IN DETAIL BY SERVICE LITERATURE
ACCOMPANYING SERVICE KIT AND GAUGE.

* CALL OR WRITE: CUSTOMER SERVICE DEPT.

ADLER-BARBOUR Marine Systems, Inc.
511 Fifth Avenue
Pelham, New York 10803

(914) 738 - 6201

TROUBLE SHOOTING GUIDE MODELS DCM-12, DCM-12L

SYMPTOM	POSSIBLE CAUSE(S)	FIELD CORRECTION
No cooling, fan & compressor do not run	Electricity disconnected	Check breaker, switch, and/or fuse in supply circuit. Check wiring for breaks, poor/loose/corroded connections.
	Thermostatic control turned off.	Turn on. (Between #1 and #7. A sharp click beyond #1 indicates "OFF")
	Thermostatic control defective.	Turn off power. Unplug the black electrical plug set, (1 ft. from Compressor Unit). "Jump" the plug, shorting across the male (protruding) and female (recessed) contacts in the Compressor half of the plug. This replaces the Thermostat in the circuit. If unit runs and cools normally, order new Thermostatic Control (less box, knob, wire harness). If within one year warranty, return original unit postpaid.
	Low supply voltage.	Check D.C. voltage at the Compressor Unit's Electronic Module (Note: left terminal \oplus positive, right terminal \ominus negative. <u>Do not touch middle terminal!</u>). Module automatically shuts off Compressor at 10.5 volts, turns it back on at 11.5 volts (Fan runs <u>continuously</u> in this protective mode.)
	Loose/high resistance/corroded/connections in supply wiring, defective switches, weak battery, undersized wiring (see Table of wire sizes).	Check battery voltage and condition, specific gravity, corrosion on posts & terminals, check entire supply circuit for faults.
	Reverse polarity connection, fuse blown.	Turn main supply switch to OFF. Disconnect both terminals from Electronic Module. Use voltmeter, check polarity, reconnect correctly. Check fuse (only controls Compressor) Replace fuse with new Buss #GLN-10. A spare fuse is bagged and stapled to the Module output cable. Do not substitute any other fuse type! Turn power back on.

No cooling, Fan runs, Compressor does not "try" to start.	Low supply voltage	<p>Check D.C. voltage at the Compressor Unit's Electronic Module (Note, left terminal \oplus positive, right terminal \ominus negative. Do not touch middle terminal!). Module automatically shuts off Compressor at 10.5 volts, turns it back on at 11.5 volts (Fan runs continuously in this protective mode). Correct your Low Voltage condition by rewiring, recharging or replacing battery etc. as appropriate.</p>
	Fuse blown.	<p>Turn main supply switch to OFF. Disconnect both terminals from Electronic Module. Use voltmeter, check polarity, reconnect correctly. See section on Electrical Connections. Replace fuse with new Buss #GLN-10. A spare fuse is bagged and stapled to the Module output cable. Do not substitute any other fuse type! Turn power back on.</p>
	Battery Charger/Converter/Alternator/Generator is connected directly to Compressor unit contrary to instruction manual	<p>Turn main supply switch to OFF. Disconnect both terminals from Electronic Module. Use voltmeter, check polarity, reconnect correctly. See section on Electrical Connections. Replace fuse with new Buss #GLN-10. A spare fuse is bagged and stapled to the Module output cable. Do not substitute any other fuse type. Turn power back on.</p>
No cooling, Fan runs, Compressor "tries" to start but does not succeed.	Internal refrigerant pressures not yet equalized	<p>Turn Thermostat to "OFF" (ccw until "click"), wait 10 minutes, turn back on. (Read section "<u>Protection System</u>").</p>
	Low supply voltage.	<p>Check D.C. voltage at the Compressor Unit's Electronic Module (Note: left terminal \oplus positive, right terminal \ominus negative. Do not touch middle terminal!). Module automatically shuts off Compressor at 10.5 volts, turns it back on at 11.5 volts. (Fan runs continuously in this protective mode). When Compressor "tries" to start, (or when meter needle "dips") voltage must be above 11.5 or Compressor will not start. Check equivalent voltage at Battery. A voltage drop of more than 1/2 volt is unacceptable and will produce erratic operation even when batteries are not depleted.</p>

<p>Loose/high resistance/corroded/connections in supply wiring, defective switches weak battery, undersized wiring (see Table of Wire Sizes).</p> <p>Compressor Defective</p> <p>Electronic Module Defective.</p>	<p>Check Battery Voltage and condition, specific gravity corrosion on posts & terminals, check entire supply circuit for faults.</p> <p>Correct your Low voltage condition by rewiring, recharging, or replacing battery etc. as appropriate.</p> <p>Call or write Customer Service Department.</p> <p>Call or write Customer Service Department.</p>
<p>Compressor Defective</p> <p>Electronic Module Defective</p> <p>Battery Charger/Converter/Alternator/Generator is connected directly to Compressor Unit in violation of Installation Instructions. Electronic Module may be damaged.</p>	<p>Call or write Customer Service Department.</p> <p>Call or write Customer Service Department.</p> <p>Call or write Customer Service Department.</p>
<p>No cooling, Fan runs, Compressor "tries" to start, may or may not shake or vibrate, does not succeed.</p> <p>Voltage drops due to inadequate wire sizes high resistance/corroded connections, low batteries other D.C. loads, or combination of factors.</p> <p>When Compressor attempts to start it puts a momentary (1/2 second) 10-15 amp load on its wiring causing the voltage AT THE ELECTRONIC MODULE to fall from the no-load voltage of 11.5 or higher to less than 11.5 volts. The Compressor will, therefore,</p>	<p>With an accurate voltmeter measure voltage at Electronic Module AT THE INSTANT COMPRESSOR TRIES TO START. Do same AT THE BATTERY. If this test confirms excessive voltage drop run a temporary #10 wire \oplus and \ominus feeder directly from battery to ColdMachine. If system starts and runs make this direct connection PERMANENT, adding a 15 amp circuit breaker. See "A" - Direct Connection To Battery and Wire Size Table.</p>

not start but will go into its programmed low-voltage protection mode, try to start 3 times at 45 second intervals, shut down 45 minutes, try 3 times, etc. (switch main power off and then back on again to eliminate 45 minute waiting period).

Poor cooling, unit runs constantly, Freezer frosts, ice-cubes freeze, refrigerator temperatures not cool enough.

Insufficient insulation or cabinet too large for system.

Test for normal system operation by isolating Freezer Unit from excessive heat load of cabinet: -Loosen Freezer carefully from wall of box. -Wrap it in insulation of some sort- fiberglass batts, layers of corrugated carton material, etc. Re-insulate box by adding minimum 1" thick urethane foam all surfaces, more where possible.

Replace/repair hatch gaskets. Confirm box not larger than 9 cubic feet unless insulation is 4" plus urethane, in which case 12 cubic feet o.k.

Temperature sensing tube disconnected (or loose) from Freezer Unit.

Re-clamp securely. Check 4" of tube length is securely clamped, with the plastic panel BETWEEN the tube and the Freezer Unit.

Food in refrigerator freezes, Compressor & Fan run constantly

Temperature sensing tube disconnected (or loose) from Freezer Unit.
Unit too large for ice-box, (i.d. box to small)

Re-clamp securely. Check that 4" of tube length is securely clamped, with the plastic panel BETWEEN the tube and the Freezer Unit.

Turn Thermostatic Control to warmest setting (ccw until slight resistance is felt, before "click"). If refrigerator section still freezes food, refer to "excessively cold cabinet" section in the "operating instruction" section of this manual. For SFH-1 Horizontal Freezers in stock front-opening boxes, (G.T., Marvel, etc.) a full width drip pan/separator just below the Freezer will usually suffice.

Thermostatic Control defective/out of calibration.

Replace Control: Order from Customer Service Department.
Adjust Control: See section "Adjusting the Thermostatic Control".

IMPORTANT INFORMATION FOR COLDMACHINE OWNERS

(mostly for sailboat owners . . . but powerboaters can read it too!)

RUN YOUR BOAT TO MAXIMIZE BATTERY CHARGING AND MINIMIZE BATTERY DRAIN!

YOUR BATTERY SELECTOR SWITCH: When you are running the engine switch it is "Both" (or "All") so you are charging your House Batteries and your Engine Battery.

If the Engine Start Battery is fully charged, select the House Battery only (May be #1, or #2 - check it out) so all the charging current goes to the batteries that provide power for your lights, ColdMachine, electronics, etc.

TAKE GOOD CARE OF YOUR BATTERIES!

They are the most neglected items on most boats and yet how we get upset when they finally give up the ghost from neglect and abuse!

- Keep the tops of the batteries clean and dry!
A damp battery can loose 20% of its charge in a day!
- Keep the battery posts tight, clean and free from corrosion.
- Check the specific gravity of the electrolyte in each cell regularly.
- Use distilled water only.
- Use Deep Cycle ("Deep Discharge") type batteries only, for the "House Bank".

Boats, after all, are not like automobiles. We run our engines slowly and not very often, our batteries tend to be buried in the bilge, neglected, damp and dirty, and chronically undercharged. Boat wiring is subject to corrosion at various connections, which creates voltage drops, and we all keep adding more and more wonderful electrical devices to our boats every season. All of which is fine and make boating safer and more enjoyable, and the companies that manufacture marine equipment try their best to keep the electrical appetite of their products to an absolute minimum.

But at the electrical loads on your boat grow and grow YOU THE BOATOWNER should keep your battery and charging system operating at top efficiency!

And if you feel your present setup requires charging too often or too long, plan now to add more battery capacity and/or a larger alternator.

LOAD-TEST YOUR BATTERIES!

Batteries are sometimes deceptive: they may look good and read

normal voltage but have deteriorated internally and are no longer able to deliver much power for very long.

A BATTERY LOAD TESTER (your boatyard or marine mechanic probably has one):

Tests the battery's capability and condition under an actual load. If yours do not test "in the green" replace them. You are just wasting valuable time, fuel and engine hours trying to charge them!

Get tired old batteries or automotive batteries off your boat and replace with "Deep Cycle" batteries - you will be surprised at the difference. They are designed for hundreds of charge/discharge cycles. They offer much, much more available power for your house battery loads. They are not specifically for starting engines, although they are often used for that purposes, quite satisfactorily.

BATTERIES: HOW BIG, HOW MANY?

We recommend the following amperage/hour capacity for the "House Battery Bank", which handles the ColdMachine, lights, and other D.C. loads aboard your boat:

For the "Casual Cruiser": 25 - 35 ft., seldom away from dock more than overnight. minimum 100 amp/hours

For the "Serious Cruiser": 30 - 50 ft., often cruising for a week or more, seldom at dockside. minimum 200 amp/hours

For the "Charter Yacht" (or tropical-based "Serious Cruiser"): operating in hot climates, requiring unusual quantities of ice-cubes, etc. minimum 300 amp/hours

A.C. BATTERY CHARGER: Use any marine type unit that is specifically built for the marine environment, and shuts off automatically and completely when the batteries are fully charged, rated 6 amps or more output. If you install an automobile-type charger (substantially less costly) you should know that they continually "trickle charge", and can overcharge and damage batteries if left for days and days unattended.

ALTERNATOR RECOMMENDATIONS

These days a 55 amp alternator is pretty standard on most cruising yachts, and for the "Casual Cruiser" and most "Serious Cruisers" it is adequate to charge the House Battery Bank and engine starting battery.

For the "Charter Boat" we strongly suggest a larger alternator of 90 amps or more rated capacity.



050181

REPLACEMENT PARTS LIST (FOR FIELD SERVICE)

<u>PART NO.</u>	<u>DESCRIPTION</u>	<u>RETAIL</u>
10003	FAN MOTOR, 12 VOLT D.C.	\$ 30.91
10015	THERMOSTATIC CONTROL COMPLETE W/HARNESS	27.27
10018	STANDARD HORIZONTAL ICE CUBE TRAY W/GRID	5.25 each
10019	VERTICUBE ICECUBE TRAY WITH GRID	26.00 each
10031	SHIPPING CARTON COMPRESSOR UNIT	6.36
10032	SHIPPING CARTON FREEZER UNIT	6.36
10038	FUSE GLH-10 BOX OF 5	4.55
10045	REPLACEMENT ELECTRONIC MODULE	130.00
10050	FREEZER UNIT, LARGE (LFV-1)	SPECIAL ORDER \$240.00
10054	FREEZER UNIT (SFV-1/SFH-1)	SPECIAL ORDER 190.00
10055	COMPRESSOR UNIT, DCM-12	SPECIAL ORDER 525.00
10060	COMPRESSOR UNIT, DCM-12L	SPECIAL ORDER 525.00
10020	SERVICE KIT (INCLUDING GAUGE TEE, R-12, ETC.)	65.00*
10027	SFH DOOR ASSEMBLY	23.18

*Service kit may be "borrowed" for field service with a deposit of the full purchase price. Deposit less shipping costs will be refunded upon return of the kit.

PROCEDURE FOR REMOVING COMPRESSOR UNIT:

1. Turn off D.C. power supply to unit.
2. Disconnect mating plugs of thermostatic control wire harness (about one foot from Compressor unit).
3. Remove both D.C. power terminals from Electronic Module
4. Disconnect both Refrigerant Couplings:
 - A. Use two open-end wrenches:
 - One: 1-3/8 hex - to turn the female coupling.
 - One: 1-1/8 hex - to hold the male coupling.
5. Turn only the female coupling. Don't turn the male coupling! This is important! If you loosen the coupling from its base, you will have a Refrigerant leak. This is why you must use two wrenches, and you must not turn or twist the bases of the couplings, which are soldered to the copper tubing.
6. Work quickly to avoid loss of refrigerant gas. A slight hiss for a few seconds is normal, and stops when the coupling halves are completely separated.

Screw Metal Caps into the couplings to keep dirt out of them.

7. Now remove the compressor unit from the boat. Handle carefully, don't pick it up by the tubing or Electronic Module. Be careful not to cut your fingers on the cooling fins, and do not bend them, as they are soft and thin for maximum efficiency.

PROCEDURE FOR REMOVING FREEZER UNIT:

1. Turn Thermostatic Control to off. (CCW till "click".)
2. Disconnect 12 volt D.C. power supply to Compressor Unit. Carefully remove sensing tube of Thermostatic Control from its clamp on side of Freezer by loosening two screws and sliding out the "U" bend section of the tube.
3. Now disconnect both pairs of Refrigerant Couplings at Compressor Unit (see item 4 of "Procedure for Removing Compressor Unit").
4. Disconnect mating plugs of Thermostatic Control unit (about 1 foot from Compressor unit).
5. Remove soft mastic caulking Material from exit hole in icebox where tubing and wire harness pass through.
6. Using "stubby" screwdriver, unscrew four mounting screws (save these) and carefully withdraw entire Freezer and its 15 ft. tubing set from boat.
7. Be careful not to kink or flatten tubing! Screw Metal Caps into the couplings to keep them clean.
8. Now carefully roll up the entire coil by rolling it around a cylindrical object of about 12" in diameter.

RETURNING THE UNIT FOR SERVICE

In the event factory repair or replacement is necessary per Trouble-shooting Guide, (either in or out of warranty), we require that you return the specified component(s) to our factory (or our Authorized Factory Service Center after receiving prior authorization).

SHIPPING INSTRUCTIONS

Pack the unit very carefully to avoid damage in transit, preferably in its original carton, (If the original carton is not available, use a sturdy carton with at least 6 inches of crumpled newspaper or other packing material packed tightly around the unit to avoid any chance of damage in shipment.) We will ship you a complete original factory shipping carton, with protective inserts upon request - See Parts List attached. Note that we reserve the right to refuse to repair any returned components which show evidence of damage in shipping. In such cases, we will notify shipper of damage and its repair cost. Be sure to use strong cord or tape around carton. If this unit is being returned under warranty, it must be accompanied by a copy of the original sales ticket or shipping documents to establish date of purchase. Also, include with the unit a letter explaining exactly what difficulties you have encountered (remember to add extra First Class postage and indicate on the outside of the carton that First Class Mail is enclosed). Ship by prepaid express and mark DELICATE EQUIPMENT . . . FRAGILE. Clearly address the carton as follows:

ADLER-BARBOUR Marine Systems, Inc.
511 Fifth Avenue
Pelham, New York 10803

(914) 738 - 6201

BULLET PIERCING VALVE

MODELS 34, 78

INSTRUCTIONS

1. Separate the 2 half sections by removing the 4 hollow head Cap Screws (Use enclosed Key.) **DO NOT TURN THE CENTER PIERCING SCREW.** The Piercing Screw has been Pre-Set at the factory and is **READY FOR INSTALLATION.**
2. Install the two halves over tubing and tighten the 4 hollow head Cup Screws.
3. Using the same key turn the Center Piercing Screw all the way in (clockwise) until it is firmly seated. Now turn the needle back 1 or two full turns to operate valve. **DO NOT TURN THE CENTER SCREW BACK MORE THAN 4 FULL TURNS.** The valve is fully opened at 2 full turns. Turning it more than 4 turns may remove the needle from the housing.
4. To secure the valve - turn the Piercing Needle clockwise until it is firmly seated.

(Instructions for smaller sizes on opposite page)