

# DX Modulating A/C System

❖ INSTALLATION • OPERATION

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For DX Modulating SMX II Control Systems using  
SMXII and SMXir displays

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# Modulating A/C Systems • Introduction

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## **Warning**

*This manual contains essential information concerning the safe and proper installation and operation of your Cruisair air conditioning system. If there are any statements or procedures in this manual that you do not understand, contact the Dometic Applications Department for assistance. Phone 804-746-1313 (8am - 5pm US Eastern Time), Fax 804-746-7248, or email sales@dometicenviro.com, attention applications department.*

## **Notice**

*US federal law prohibits the intentional release of refrigerant gases into the environment, including the R-22 refrigerant used in most Cruisair air conditioning systems. Special care must be taken when installing, charging, and servicing Cruisair equipment to prevent any loss of refrigerant. Only EPA certified technicians with the proper equipment should perform service on the refrigerant circuit of the system.*

## **Drawings and Diagrams**

The figures that are referenced throughout this manual can be found immediately after the warranty section of the manual. In addition, some Cruisair equipment will be shipped with specific installation sheets or wiring diagrams that may supercede the information located in this manual.

## **Air Conditioner Basics**

The basic principle of an air conditioner is the movement of heat. In a direct expansion (DX) water-cooled air conditioner, heat is transferred from the cabin air to the refrigerant in the cooling unit. The refrigerant is routed back to the condensing unit where the heat is transferred to the seawater.

The heat exchange process relies on the movement of both cabin air and seawater to work effectively. If airflow or seawater flow is compromised, the efficiency of the system will drop, and the unit could shut down on one of its safety protection devices, or eventually become damaged.

Part of the cooling process, in addition to lowering the air temperature, is the removal of moisture from the air. This lowers the humidity, which makes the area feel more comfortable, and helps keep the boat dry, reducing mold growth and other moisture related problems.

## **The Effect of Seawater Temperature**

The efficiency of the system is dependent on both the seawater and cabin temperatures. The air conditioner works best when the seawater temperature is below 90°F (32°C). The unit will operate at higher water temperatures, but at reduced capacity. As the water temperature rises, so does the refrigerant pressure. A high-pressure safety switch will shut the unit down if the water temperature gets too hot, or if there is a loss of cooling water flow.

## **Warning**

*Do not operate your A/C unit in water that is colder than 38°F (3.3°C). Doing so could lead to water freezing in the condenser coil, which can cause damage to the unit.*

## **The Modulating System**

Unlike a standard DX remote condensing unit system, the Cruisair modulating system allows independent thermostatic control of up to five cooling units, all run by one compressor. The FM type modulating condensing unit is cooling only. If heat is desired, the cooling units should be ordered with the optional electric heating element. One advantage to this is that an individual unit can be in heating mode even when the rest of the system is cooling.

## **How it Works in General**

The Modulating System air conditioner consists of a special condensing unit and multiple evaporators (cooling/heating units), connected by copper refrigerant lines. The cooling/heating unit, located in the cabin or area to be cooled, consists of a blower, an evaporator coil and an optional electric heater. Each area has an SMX microprocessor control which allows independent control over that zone.

The condensing unit, located in the engine room or machinery space, consists of a compressor, seawater condenser, compressor relay, and other electrical and refrigeration components.

Refrigerant lines connect the condensing unit to each cooling unit, and a pair of signal wires run from each cooling unit to the compressor relay on the condensing unit to signal the compressor to run.

The cooling/heating unit blower draws warm humid cabin air across the fins on the evaporator where the heat from the air is transferred to the refrigerant in the evaporator coil. As this happens, moisture in the air is captured on the evaporator coil in the form of condensation and drips into the base pan. As the refrigerant absorbs the heat from the cabin air, it evaporates from a liquid into a gas. The compressor then compresses the hot gas and pumps it through the outer tube

in the condenser coil. The seawater pump circulates relatively cool seawater through the inner tube in the condenser coil. The heat from the refrigerant is exchanged to the seawater and discharged overboard. This cools the refrigerant and condenses it into a liquid. The liquid refrigerant is then passed through the evaporator coil and the cycle repeats. Removing heat and moisture from the cabin air lowers its temperature and humidity levels. In the electric heat mode, a solenoid valve on the cooling/heating unit closes and stops the flow of refrigerant through that one unit while the blower remains on. The electric heater energizes, warming the cabin air as it is drawn over the heating elements. The conditioned air is blown through the ducting and out the supply air grill(s).

The Modulating system can operate up to five independently controlled cooling/heating units at one time. Unlike the typical “split” system, the Modulating system adjusts to the number of cooling/heating units that are on line and operational. The control and setpoint of any zone can be set to the desired temperature, heating or cooling, and the Modulating system will condition that zone accordingly. Note that the cooling units must have the optional electric heaters to heat the cabin.

The cabin controls are independent of each other and relay a signal to the condensing unit, turning it on in the cooling mode. If the cabin control is set for heating, a solenoid valve stops the flow of refrigerant through the cooling/heating unit’s evaporator coil and energizes the electric heater. The Modulating system is designed to provide the most flexibility in independent zone control of any split refrigerant-based system by providing heating or cooling at the same time, but in different cabins.

## **How it Works in Detail**

### **The Condensing Unit**

The modulating condensing unit consists of the compressor, the receiver, the heat exchanger or condenser coil, a hot gas by-pass valve and a “de-superheat” valve, the associated electrical components, and the system service valves. These parts work together to compress the expanded refrigerant, flowing back from the cooling unit to the compressor, into a high-pressure state. The compressed refrigerant then passes through the heat exchanger (condenser coil) where it gives up the heat that was absorbed in the cooling (evaporator) coil. It is then condensed to a liquid state as it flows to the liquid receiver. The process is repeated as the refrigerant flows back to the cooling unit. The bypass valve senses the increased pressure when a cooling unit is removed from the system, such as when an area is thermostatically satisfied, and allows the refrigerant to flow back to the suction side of the compressor.

When cooling is called for by the thermostat control of one of the cooling/heating units, a signal is sent to the *compressor relay*. This signal relays power to the compressor allowing it to operate. As the system comes on, low-pressure refrigerant gas flows back from the cooling/heating units to the *accumulator*. The accumulator is a storage place for the refrigerant and ensures that only gas, and not liquid, refrigerant makes it back into the compressor. The *compressor* then compresses the refrigerant into a high-pressure gas and discharges it into the *condenser coil*. The high-pressure hot refrigerant gas is cooled and condenses into a high-pressure liquid as it passes through the outer tube of the condenser coil. The heat from the refrigerant gas is exchanged to the seawater, which flows through the inner tube of the condenser coil, and is pumped overboard. The refrigerant then flows into the *receiver* that stores the liquid refrigerant on its way back to the cooling/heating units.

If all cooling/heating units (up to five) are on and running then the system operates just like standard remote DX equipment. However, as cooling/heating units cycle off and the suction pressure coming back from those units starts to get lower, the Modulating System starts to compensate for the changes in refrigerant pressure and temperature extremes. The two unique components on the condensing unit that serve to balance the system are the *Hot Gas Bypass Valve* and the “*De-Superheat*” TX Valve.

The Hot Gas Bypass Valve is positioned between the suction line leading into the accumulator and the discharge line coming out of the compressor. If the *suction pressure gets to low* (<55psi) then the Hot Gas Bypass Valve opens and helps to raise the suction side pressure.

The TX Valve is positioned between the receiver and the accumulator and senses the temperature of the suction line leading into the compressor. If the *suction temperature gets too high* then the TX Valve opens and flashes cool refrigerant from the receiver to the accumulator, lowering the temperature of the gas going into the compressor. If the suction side pressure drops below 35psi then the low-pressure switch will open. The condensing unit is also equipped with a high-pressure switch that opens when the discharge pressure rises above 425psi. (See Figure 12)

### **The Refrigerant Lines and Manifolds**

The refrigerant lines are made of copper tube that is sized for the BTU load of the system. The suction lines are always larger than the discharge lines. The suction lines must be insulated. They supply both liquid and gas refrigerant to and from the evaporators and the condensing unit. Typically, the condensing unit lines are larger and will connect to a refrigerant manifold. At the manifold, the lines will reduce in size to supply the independent evaporators. (See Figure 11.)

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## The Cooling/Heating Units

The cooling/heating units are independently controlled and are located in the cabin areas. They consist of a blower, air heat exchanger, electric heat element, solenoid valve and control. In the cooling mode, the control sends a signal to the condensing unit to operate. The solenoid valve opens allowing the refrigerant to pass through the air exchanger. The fan's control and setpoint operation are typical to any thermostatically controlled system. Once the setpoint is reached, the unit slows, and then closes the solenoid valve automatically. As the temperature rises, the unit will turn on again and continue this cycle maintaining the desired room temperature.

If heat is needed, the solenoid valve closes, stopping the flow of refrigerant through the evaporator coil. The electric heat elements are energized and the fan turns on. Once the setpoint is reached, the unit slows, and then turns off automatically. This cycle will continue also, maintaining the desired room temperature.

## The SMX Control

The SMX control is a microprocessor cabin control that works in conjunction with the condensing unit's compressor relay. Once the control is set for either cooling or heating mode and the setpoint is selected, the SMX will automatically maintain the desired room temperature. It will cycle the blower on and off, conditioning the cabin air. It will also send a signal to the condensing unit energizing the compressor in the cooling mode. In the heating mode, the signal is relayed from the compressor to the electric heating elements in the air handler, heating the air in the cabin.

## The Compressor Relay

The compressor relay is located on the condensing unit and is the hub for the evaporators. It has a series of relays (called "triggers"), one for each evaporator in the system. As the evaporators call for cooling, a signal is sent to the relay box. This signal energizes a trigger, which in turn relays current to the compressor. Any number of triggers can be energized at the same time commanding the compressor to run. The triggers are independent components and can be added or replaced as needed. This control box is in addition to the standard start components required for the compressor.

## Subsystems

Subsystems are purchased separately because of the many variations and options available. These include the seawater, air distribution, and control subsystems.

## Seawater System

The seawater system consists of an inlet through-hull fitting, water shut-off valve, strainer, pump, and overboard discharge fitting, all connected by hose or piping. If a single

seawater pump serves multiple condensing units, then a pump relay and water manifold are required.

## Air Distribution System

Cabin air is drawn into the cooling unit through a return air grill. It is then cooled (or warmed if the electric heat option is installed) and blown back into the cabin through a ducting system. The air should be discharged high in the cabin and away from the return air grill to ensure good circulation. An air filter is located on the cooling unit or on the return air grill and must be cleaned regularly.

## System Controls

The SMX II microprocessor circuit board, controlled by the SMXir keypad/display, provides a comfortable environment and ensures overall system protection. With over 22 programmable functions, the SMX can be customized to suit any environmental application. The SMX monitors incoming line voltage and extremes in refrigerant pressure, and will shut the system down to prevent damage if necessary.

## Condensate Drain

When the air conditioner is running in the cooling mode, moisture is removed from the air by the evaporator coil. This condensation is then caught in a drain pan and must be drained off to a sump or overboard. In humid climates the system can produce a large amount of condensate water that could cause significant damage to your boat if the drain system doesn't work properly.



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# Modulating A/C System • Installation

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## Installation Procedures

This section covers the installation procedures for the Cruisair Modulation System, including electrical connections and SMXir control installation. Please read and understand this manual before attempting to install any equipment.

## Electrical System

Cruisair air conditioning systems are available for use with common power supplies throughout the world. In the United States and most of North and South America, the systems are 115V or 230V, 60Hz, single phase AC (alternating current). In Europe and most of Asia, power systems are typically 230V 50Hz single phase.

The compressors used in Cruisair Modulating condensing units are only available in 230V single phase, 230V 3-phase, or 380/460V 3-phase. On 380/460V 3-phase units there is a separate lower voltage circuit for the controls, either 115V or 230V. On some power systems this can be supplied by using one input line and the neutral. If not, a separate control power feed or a transformer will be required.

Running and starting loads of an air conditioning system are often the largest electrical loads on a boat. It is important that the power supply system is large enough to handle these loads. Contact an electrician if you are not sure about the proper wiring procedures. Always follow local and ABYC codes for proper wiring guidelines.

## Voltage and Frequency

The voltage rating of a unit is a nominal rating. The available power supply voltage may be higher or lower by as much as 10% and the system will still operate properly. For example, at 60 Hz, voltages may range from 110VAC to 120VAC, or 208VAC to 240VAC, or 440VAC to 480VAC. In a 50Hz environment, common voltages range from 220V to 240V, or 380V to 415V.

When choosing a system, the voltage and frequency must be known. While standard 60Hz equipment can often be run at 50Hz, it will experience a 17% drop in performance. However, 50Hz equipment can not be run at 60Hz because the 50Hz motor will run too fast and become damaged. Seawater pumps will lose even more performance at 50Hz due to the nature of centrifugal pumps.

Dedicated 50Hz units will give full performance at 50Hz, and should be used when the system is going to be run **exclusively** at 50Hz. If a boat is traveling in 50Hz and 60Hz environments, then 60Hz equipment should be installed, with special attention to sizing (especially the pumps) so that the system performs to expectations. When running 60Hz

equipment at 50Hz, the voltage should be reduced by 17% to prevent overheating a motor.

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## Installing The Condensing Unit

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### Ignition Protection Warning

*Most Cruisair remote condensing units meet federal requirements for ignition protection. However, there are some condensing units, such as those with 3-phase compressors, which are not ignition protected. Do not install non-ignition protected units in spaces containing gasoline engines, tanks, LPG/CPG cylinders, regulators, valves or fuel line fittings. Failure to comply may result in injury or death.*

## Selecting the Site

Cruisair condensing units are designed to be installed in any convenient location. The unit is normally placed in the engine room or other machinery space, but it can be located in the living areas. The condensing unit will produce condensation so a drain line from the drip pan is needed in these installations. The space around the unit can be insulated to reduce noise if desired. The unit is internally cooled and does not require ventilation. The location selected should provide for access to refrigerant, seawater, and electrical connections and be accessible for service. It should be installed on a flat, horizontal surface away from direct spray from engine air intakes or water wash-down.

## Site Location Checklist

- Adequate space for access to refrigerant, seawater and electrical connections.
- Accessible for service and maintenance.
- Flat, horizontal surface.
- Away from direct spray from engine air intakes or water wash-down.

## Mounting the Condensing Unit

Orient the condensing unit (Figure 1) so the refrigerant, electrical connections and service ports are accessible. Use the supplied “L” brackets to bolt the unit down. Fasten the mounting base pan securely in such a way that the unit can be removed for future service if need be.

Do not remove any covers, caps or fittings that may expose any wiring or refrigerant. Only remove these items when you are ready to complete the installation. Removal of any covers may result in damage to the electrical components. Removal of the caps or fittings may result in refrigerant loss.

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## **Installing the Seawater Cooling System**

The seawater system consists of a scoop-type thru-hull fitting, water shut-off valve or seacock, strainer, seawater pump, water hose and overboard discharge fitting. If more than one condensing unit is using a single seawater pump, a water manifold and pump relay are also needed.

### **Importance of a Self-Draining System**

Along with restricted ducting, a poorly plumbed seawater system is one of the most common installation problems on marine air conditioners. When water flow is lost, not only will the air conditioning units no longer cool or heat, the units and pump could be damaged from running dry.

When using a centrifugal seawater pump, it is imperative that the seawater piping be routed continually uphill from the through-hull inlet, valve, and strainer to the pump and then up to the condenser, then smoothly up or down to the overboard discharge, without any dips or loops, and with only one high point in the system (usually the condenser coil or the overboard discharge). This is said to be self-draining because all water would drain out of the piping if the boat were lifted out of the water.

Whenever air gets into the system, which can happen in heavy seas or during a sharp turn, it can become trapped in the pump. Because a centrifugal pump cannot pump air, water flow through the system is lost.

A self-draining seawater system will allow air in the piping to rise naturally through the pump and then be expelled overboard. It will also make winterizing the system much easier. Figure 6 shows a properly plumbed system and some common plumbing mistakes.

### **Through-Hull Inlet Fitting**

A separate thru-hull fitting and seacock should be used for each seawater pump. Do not attempt to draw seawater from the engine or generator thru-hull fitting. A scoop-type thru-hull is preferred for all installations. It should be installed facing forward and located as far below the water line and as close to the keel as possible, where it will always be underwater. Beware of the change of location of the thru hull fitting relative to the waterline, given the motion of the boat. The ideal location is ahead of the stuffing boxes and aft of the forward engine bulkhead.

To install the through-hull fitting, drill a properly sized hole for the fitting. Place a bead of marine, underwater sealant around the fitting and secure it through the hull. Tighten the nut onto the fitting.

### **Seacock**

A bronze, full flow seacock (ball valve type) should be installed directly onto the through-hull fitting. Use Teflon tape or other sealant on the threads. The seacock must be accessible and easy to close in case of emergency, or to clean the strainer.

### **Strainer**

A seawater strainer must be installed between the seacock and the pump, and should be situated to provide easy access for cleaning. The strainer must be located vertically above the seacock and below the pump. Make sure the water flow through the strainer is in the correct direction. Some strainers have an arrow that shows correct flow direction.

Mount the strainer to a bulkhead so it is properly supported before connecting hoses. Use Teflon tape or other sealant on pipe threads.

### **Seawater Pump**

Centrifugal pumps are not self-priming, and must be mounted so that they are below the heeled waterline in any given operating condition. The pump should be located so that it is accessible for future service.

Mount the pump so the outlet is above the pump and directed upward so air can escape thus preventing an air lock in the pump head. The head on some pumps can be rotated to allow mounting on a vertical bulkhead. (See Figure 4.)

Self-priming pumps are available if the pump cannot be mounted below the waterline.

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**Required seawater flow rate is 4 gpm per ton (12,000 Btu/hr) of condensing unit capacity.**

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### **Manifolds**

If one seawater pump is serving multiple condensing units, then a seawater manifold will be needed to supply water to each unit. This can be as simple as a TEE for two units, or a custom made manifold for three or more units. It is very important to consider manifold orientation so that all condensing units get the proper flow of water.

See Figure 5 for manifold information. A manifold can also be used on the outlets of the condensing units when using a single overboard discharge.



## Overboard Discharge

The overboard fitting should be located 1 to 2 inches (25-50 mm) above the vessel's water line. This is to facilitate visual confirmation of water flow, but close enough to the water to minimize splashing noise. If the overboard discharge fitting must be installed below the heeled water line, then a seacock must be installed per ABYC standards.

## Seawater Piping

- Use only reinforced marine grade hose or other suitable piping (PVC, CPVC, cupronickel, or stainless steel).
- Double clamp all hose connections, reversing clamps.
- Use only plastic, bronze, or stainless steel fittings (do not use brass).
- Avoid loops or dips in the hose runs.
- Make sure enough hose is used to allow future removal of components.
- Use the correct size hose, fittings, and components. See the table below for proper sizing. Note that the pump inlet piping (including through-hull and strainer) may need to be larger than the outlet pipe size. Do not use pump connections to determine hose size.
- Use larger hose when the run is longer than 16 feet (5m).
- Required seawater flow rate is 4 gpm per ton (12,000 Btu/hr) of condensing unit capacity.

## Bonding

All metallic parts in contact with seawater must be connected to the vessel's bonding system. This includes the through-hulls, strainer, bronze pumps, manifolds, and the condensing unit(s).

**Recommended Seawater Pipe Sizes**

Flow Rate (gpm)	Pump Inlet	Pump Discharge
1 - 4	5/8"	5/8"
4 - 7	3/4"	5/8"
7 - 11	1"	3/4"
11 - 15	1"	1"
15 - 20	1 1/4"	1"
20 - 25	1 1/4"	1 1/4"
25 - 30	1 1/2"	1 1/4"
30 - 40	1 1/2"	1 1/2"
40 - 45	2"	1 1/2"
45 - 65	2"	2"

## Installing The Cooling/Heating Unit

### Safety Warning

*A Cruisair cooling/heating unit should never be placed such that it can circulate carbon monoxide, fuel vapors or other noxious fumes into the boat's living spaces. Failure to follow this precaution could result in serious injury or death.*

### Ignition Protection Warning

*Cooling/heating units do not meet federal requirements for ignition protection. Do not install in spaces containing gasoline engines, tanks, LPG/CPG cylinders, regulators, valves or fuel line fittings. Failure to comply may result in injury or death.*

### Safety Warning

*Do not terminate air handler condensate drain lines within 3 feet (1m) of any outlet of engine exhaust systems, nor in a compartment housing an engine or generator, nor in a bilge, unless the drain is properly connected to a sealed condensate or shower sump pump. Exhaust and/or bilge fumes can travel up a drain line and mix with the return air blowing into living areas.*

## Selecting the Site

Typically the unit is located in the cabin under a bunk or in a locker. The discharge air must be ducted from the cooling unit to a grill as high as possible (minimum three feet [1m] above the floor) and away from the return air grill for good air circulation.

It is not necessary that the coil be placed directly behind the return air grill, but an unobstructed path must be provided for the air to get to the coil. A 2" (50mm) space in front of the coil must be maintained if it is not directly behind the return air grill.

## Site Location Checklist

- Unit is not located in an engine room or near an internal combustion engine.
- There is no obstruction of airflow from return air grill to coil.
- Accessible for service and maintenance, including the return air filter.
- Adequate space for condensate drain connections.
- Flat, horizontal and sturdy mounting location.
- Condensate drain can be run continuously downhill from unit to overboard fitting or sump.
- Space is sealed from the bilge, engine room, exhaust fumes or outside air.
- Maximum copper tubing run between condensing unit and cooling unit is 50 ft. (15m)

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## **Mounting the Cooling/Heating Unit**

Mount the cooling/heating unit (Figure 2) so the condensate drip pan is beneath the unit. Use the integral mounting brackets to secure the unit in place. Make sure the unit has access for service. The blower, solenoid valve, and the heater elements should be accessible. The electrical junction box should be mounted in a location with easy access.

Route the condensate drain hose steadily downhill so that the condensate flows freely to an overboard fitting or sump. Do not permit condensation to puddle in the bilge. Cruisair cooling/heating units have two condensate drains on opposite corners. It is recommended to use both drains for best results. If only one condensate drain is used then plug the other fitting. Use Teflon tape on the hose barbs for a watertight seal. The two drains may be teed together, providing there is a minimum drop of 2" (50mm) from the drain pan to the tee fitting. After the condensate drain installation is complete, test the installation by pouring a quart of water into the pan and checking for good flow.

## **Installing the Refrigerant Tubing**

### **Caution**

*Be careful when bending the extension tubes on the evaporators. Do not allow the tubing to kink and do not twist or bend the tubing at the connection point close to the coil or the joints may crack. If bending by hand make large radius bends. Use a tube bender if a tight bend is required.*

Use refrigerant-grade soft copper tubing to connect the cooling units to the condensing unit. See Figure 11 for correct tubing sizes. Distribution manifolds or TEE connections may be used to split the refrigerant lines from the condensing unit to the cooling units.

Only use refrigerant-grade seamless soft copper tubing. Never use any type of plastic or rubber hose.

The tubes can run uphill, downhill, or sloping as required, and can have as many bends as necessary. Avoid sharp bends that could result in kinks in the tubing.

The refrigerant distribution manifolds or TEE connections should be located to provide (as close as possible) equal length tubing runs between the manifold and each of the cooling units. All flare connections should be made in an accessible location for future service.

The suction line must be insulated with closed-cell foam insulation. Do not insulate the suction and discharge lines together. When sliding the insulation over the tubes, cover the open ends to prevent debris and moisture from contaminating the refrigerant circuit. After checking for leaks, insulate the flare joints at the condensing unit, distributors, and cooling units. Secure the tubing every 3 feet (1m) as necessary for support.

The copper tubing is connected to the condensing unit, distribution manifolds, and cooling units with flare joints. To prevent refrigerant leaks, flares must be formed correctly with the proper flaring tool. Only 45-degree single flares should be used. Flares should be made following the instructions of the particular flaring tool. Make sure to slide the flare nut onto the tube before flaring. A drop of oil on the tube can help the process. The surface of the flare must be smooth and free of defects to ensure that the joint won't leak. The flare should be large enough in diameter to fill the nut completely.

Use only forged, long-stem flare nuts, such as supplied with Cruisair equipment. Flare nuts should be tightened until the nut ceases to offer resistance to tightening. This is the point where the flared portion of the copper tubing is beginning to flow under the force of the nut being tightened.

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## **Installing The Air Distribution System**

Refer to Figure 3 for a typical installation and to Figure 7 for proper grill and duct sizes.

### **Return Air Grill**

The return air grill should be located so there is unobstructed airflow to the unit's evaporator coil. Ducting between the return air grill and the cooling unit is not normally necessary and should be avoided. The grill may be located on a side opposite the evaporator coil so long as airflow to the coil is unobstructed. Cross sectional area of the airflow path must not be less than that of the evaporator coil face.

An air filter must be used to prevent the evaporator coil from collecting dirt and lint. The filter can be located on the evaporator coil or at the return air grill. Cooling units are supplied with an air filter, but if that filter is not easily accessible for periodic cleaning, then use a filter on the return air grill.

### **Ducts**

Insulated flexible ducting or built-in ducting must be used to route air from the blower to the discharge grill.

### **Ducting Guidelines**

Secure duct to blower or transition box (plenum) with screws and duct tape. When using insulated flexible ducting, make sure inner duct is secured and sealed to the adapter before pulling insulation over connection.

Plenums, or transition boxes are used with flexible ducting to split and route the discharge air as needed. Figure 8 shows several plenum configurations.

- Ducting must be properly sized for the airflow. If the duct run is longer than 10 feet (3m), use the next larger duct size.
- Use of insulated duct is recommended, and is mandatory when used in high heat areas or where condensation might occur.
- Rotate blower in the direction of the duct run if possible.
- Install flexible ducting tightly and smoothly, with as few bends as possible.
- Keep duct runs as short as possible.
- Support ducting to prevent sagging during boat operation.
- Trim excess ducting before attaching to transition adapters.
- Make sure ducting is not crushed or kinked.
- Use a flexible transition duct between blower and any built-in ducting.

## Discharge Air Grill

Location of the discharge grill should be as high as possible in the cabin (minimum three feet (1m) above the floor), and oriented so that airflow between the discharge and return encompasses as great an area as possible. Care should be taken to avoid “short cycling,” a situation where the conditioned air is blown directly back to the evaporator coil without being substantially mixed with the cabin air.

A grill plenum should be incorporated behind the grill to provide a chamber for the air to expand and flow quietly into the living area. The plenum also provides a hose connector to attach the flexible duct behind the grill. (See Figure 8.)

## Installing the Cooling Unit Control

Each independent cooling unit in the modulating system will have its own control. Refer to the wiring diagrams in the back of this manual.

### SMX II Control System

The **SMX II** control system consists of:

**Power/Logic (P/L) module** - Monitors and controls all functions of the cooling unit.

**Keypad/Display** - The SMXir is a 10-button user interface touch pad with a digital readout and LED indicators.

**Temperature-Sensing Element** - Air temperature is monitored by a temperature-sensing element (TSEP) that plugs into the power/logic board.

**Connecting Cable** - The keypad/display connects to the P/L board with a CXP connecting cable.

### **Warning**

*Make sure all power is off before opening any electrical box. Failure to do so may result in injury or death.*

## Installing the Power/Logic Box

The Power/Logic box has a 3 ft (.9m) wire harness that must be connected to the air handler junction box. These wires can be extended if needed. Refer to installation diagrams in back of this manual.

- It is very important that the P/L box is mounted in an accessible location.
- The SMX P/L board is ignition protected, enclosed, and operates in ambient temperatures up to 130°F (54°C).
- The P/L box may be installed in any position.
- The P/L board dissipates heat when operating, and must be installed in a ventilated location.
- The P/L box is NOT waterproof and must be placed where it will NOT get wet.

## Installing the SMXir Keypad/Display

The SMXir keyboard/display should be installed so it is both visible and accessible. It should be placed in plain view and within easy reach of the operator.

Select a spot on an interior, vertical surface. This can be an inside wall, partition or other permanent structure with rear access for wiring. The SMXir control operates on low voltage DC and is certified ignition-protected. The space behind the SMXir control does not have to be ventilated since the control components do not produce heat.

The SMXir keypad is surface mounted, and only requires a hole for the CXP cable. Refer to Figure 10 in the back of this manual for installation instructions. Plug the interconnect cable in and route it to the Power/Logic (P/L) box.

## SMX Interconnect Cable

Connection between the SMXir keypad and the Power/Logic board should be made with a CXP cable. This is a shielded cable with RJ12 (phone-type) 6-pin plugs on each end.

CXP cables are available in different lengths, from 2 feet (.6m) to 80 feet (24m). Route the cable from the power/logic board to the keypad. Cable runs should be as short as possible and should not be bundled with high voltage or antenna cables. Plug the cable in at both ends, and secure per low DC voltage standards.

### **Caution**

*The CXP interconnect cable transmits low voltage DC signals. It can be affected by outside interference from high voltage cables or other sources. Do not route the SMX interconnect cable beside AC power cables or other high voltage wiring.*

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## Installing the Temperature Sensor

The TSEP temperature sensor measures the cabin air temperature and relays the information to the power/logic board. The sensor is 1" long by ¼" diameter (25mm x 7mm diameter) and is attached to a length of flat, 4-conductor cable with an RJ-11 (phone-type) plug at the end. Different lengths of TSEP cables are available, from 2 feet to 80 feet (.6m to 24m).

For best results, the sensor should be placed in the return air path, in front of the system evaporator coil. Directly behind the return air grill is often a good location. The sensor must not touch the evaporator coil, or be placed in the discharge air.

With the TSEP in the return air path, use the default mode of continuous fan operation for the most accurate temperature control. If intermittent fan operation is desired (fan on and off with the setpoint), the sensor must be wall mounted on an INSIDE surface not subject to any influence from heat outside of the area (including direct sunlight). Thermistor covers are available from Cruisair for wall mounting.

The TSEP cable plugs into the RJ-11 jack on the P/L board marked "INSIDE TSE". Coil up any excess cable, and tie out of the way.

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## Installing the Pump Relay

The following instructions apply to systems that have multiple condensing units served by a single seawater pump. If there is only one condensing unit on the vessel, or if each unit has its own seawater pump, then skip to the next section.

### Location

The pump relay is generally located in the engine room near the seawater pump, but it can be mounted anywhere that is convenient and accessible. It must be mounted in a dry location, away from any possible water spray, with room for some heat dissipation.

### Ignition Protection Warning

*PR3X and PR8X pump relays are certified ignition protected. However, pump relays with electromechanical relays or contactors (such as 3-phase pump relays) are not ignition protected and must never be installed in spaces containing gasoline engines, tanks, LPG/CPG cylinders, regulators, valves or fuel line fittings. Failure to comply may result in injury or death.*

## Operation

PR3X and PR8X pump relays are identical in operation. When any condensing unit turns on, the pump relay will turn the seawater pump on, and the pump will stay on until the last condensing unit shuts down. The PR3X can serve up to three condensing units, and the PR8X can serve up to eight condensing units. Both can operate either 115V or 230V, single phase pumps, with a maximum current of 15 amps.

## Voltage and Triggers

Triggers are used in the pump relays to isolate the pump signal from each condensing unit. Some pump relays come with pre-installed triggers, or you can buy triggers separately. Triggers come in 115V and 230V, and must match the control voltage of the condensing unit. Both 115V and 230V triggers can be used together in a single pump relay if the system requires it. The trigger is simply a relay that closes when the condensing unit turns on. Because each trigger is isolated, the polarity of the signals from the condensing units does not matter.

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## Electrical Connections

### Warning

*Make sure all power is off before opening any electrical box. Failure to comply may result in injury or death.*

## General Electrical Notes

- Failure to properly ground and bond the system will void the warranty, and may result in a dangerous installation.
- All electrical connections should be made within the electrical junction boxes supplied with the units. Most units have terminal strips that are labeled or have color-coded wiring. Open terminal strips (such as supplied with switch assemblies) require that the included terminal strip cover be installed over the terminal strip and the back of the switch after installation is complete.
- Wiring diagrams are included in the back of this manual and under the cover of the electrical boxes on all units. Contact Dometic if you have any questions about the wiring diagrams.
- Each A/C condensing unit requires its own dedicated circuit breaker of the appropriate size. See data plate on the unit for suggested breaker and wire sizes.
- If there is only one A/C unit, the seawater pump can be wired in parallel with the compressor and doesn't require it's own circuit breaker (make sure the breaker is large enough for both the compressor and pump). If multiple A/C units are served by a single pump, then a pump relay is needed, and will require a separate circuit breaker.

- Each cooling unit that has electric heat should have its own separate circuit breaker. Cooling-only cooling units have only a blower and solenoid that require electrical power and draw very low current. If desired, multiple cooling-only cooling units can be run on one breaker.
- The wiring from the cooling unit control to the condensing unit compressor relay is for signal power only. However, this control power is line voltage (230VAC).
- All units must be grounded to minimize the potential hazard of electrical shock and personal injury.
- The condensing unit must be connected to the ship's bonding system to prevent corrosion due to stray electrical current. All pumps, metallic valves and fittings in the seawater system that are isolated from the condensing unit by rubber hose or PVC plastic must be individually bonded also.
- Use ring or locking fork type wire connection terminals.
- Field wiring must comply with ABYC or local electrical codes.
- Power to the unit must be within the operating voltage range indicated on the data plate.

### **Three Phase Power**

Three phase motors will run forward or backward depending on the arrangement of the three wire connections. The scroll compressors used on Cruisair Modulating condensing units are direction sensitive. If the wire sequence is incorrect, the compressor will run backwards and not cool properly. It will also make unpleasant noises. Centrifugal pumps are also direction sensitive. Make sure 3-phase motors are running in the correct direction.

### **Safety Warning**

*To prevent a possible electrical shock in the event a component has an electrical breakdown, which could result in serious injury or death, always ground the system in the following manner:*

- Use proper wire size with a ground to feed power from the ship's electrical panel to each cooling unit junction box. Make sure the ground wire is properly connected to the ground buss in the ship's service distribution panel and to the ground lug in the cooling unit's junction box.
- Connect the junction box ground lug to the P/L box green wire (or to the switch assembly terminal strip).
- Use proper wire size with a ground to feed the power from the ship's electrical panel to the condensing unit's junction box. Make sure the ground wire is properly connected to the ground buss in the ship's service distribution panel and to the condensing unit's ground lug.
- Ground the seawater pump, and pump relay (if used) to the condensing unit's ground lug.

- Bond the ground lug on the condensing unit to the ship's grounding system.
- Check the continuity of the ground system before the system is energized.

### **Note**

*Always follow ABYC guidelines or local codes when selecting breakers and wire sizes. ABYC standards are available from: American Boat and Yacht Council, 3069 Solomon's Island Rd., Edgewater, MD 21036, Telephone: (410) 956-1050*

## **Final Inspection**

Prior to charging or energizing the system, conduct a final inspection using the following checklist.

### **Inspecting the Seawater Cooling System**

- Is the seawater pump properly sized for the system?
- Is the pump oriented correctly and mounted securely with the pump outlet above the inlet?
- Is the centrifugal seawater pump located so it is below the water line at all times?
- Are the inlet and outlet through-hulls secure, properly sealed and properly oriented?
- Are all hose clamps tight?
- Are seawater hoses double/reverse clamped?
- Are there any loops or dips in the seawater plumbing that might cause the system to become air-locked?
- Is the strainer located between the seacock and the pump, and is it correctly oriented?
- Are all metallic seawater fittings, the pump, condenser and manifold properly bonded?

### **Inspecting the Condensing Unit**

- Is the condensing unit mounted securely?
- Are the fasteners accessible for future service?

### **Inspecting the Cooling/Heating Unit**

- Is the unit securely mounted?
- Are condensate drains properly routed to an overboard discharge or sump?
- If only one condensate drain is used, have any other drain holes in the drip tray been plugged?

### **Inspecting the Refrigerant Connections**

- Are flare joints made with forged flare nuts and properly tightened?
- Are flare joints and tees properly insulated?
- Are all suction lines individually insulated?
- Are tubes fastened securely to the boat every three feet or as needed throughout their length?



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## **Inspecting the Air Distribution System**

- Is there unobstructed airflow from the return air grill to the coil?
- Is there a lint screen or filter in the return air path where it is accessible for regular cleaning?
- Have flexible ducts been pulled tight to remove bends and constrictions?
- Are grills correctly sized for the system?

## **Inspecting the Control and Electrical Wiring**

- Is the thermostat sensor or thermistor properly located and secured in the return air path and not in direct contact with any metal objects?
- Are all wiring harnesses properly secured?
- Are wiring connections made, color-to-color, correctly at terminal strips?
- Are all components properly grounded and bonded?
- Are proper sized circuit breakers installed?
- Are terminal strips located in a dry, safe place and properly covered?

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## **Charging the System with Refrigerant**

### **Special considerations when charging the Modulating system**

All cooling units must be turned on and running (solenoid valve open) in the cool mode before evacuating the system or adjusting the refrigerant charge. To ensure that all evaporators are on in the cooling mode, and the solenoid valves are open, set each cabin control's set point down to the lowest temperature setting. There is no need for the compressor to run while evacuating the system, so turn the condensing unit's circuit breaker off before turning the cooling units on.

The modulating unit is different from a standard DX condensing unit in that it has two special refrigerant valves that allow partial loads to run safely: the hot gas bypass valve and the "de-superheat" valve. These valves are factory set and do not require any field adjustment. Any field adjustments could cause the valves to operate incorrectly, causing damage to the compressor or compromising the performance of the system.

As cooling units in the system shut down, the suction pressure at the modulating condensing unit will drop. The hot gas bypass valve senses the suction pressure and will open to allow discharge gas to flow into the accumulator if the suction pressure drops below 55 psi. This will raise the suction pressure and prevent liquid refrigerant from reaching the compressor.

As more hot (high-pressure) gas is dumped into the suction line (due to cooling units shutting down), the superheat (suction gas temperature going into the compressor) can rise to unsafe levels. A thermal expansion (TX) valve is installed which acts as a "de-superheat" valve. It senses the superheat and will flash liquid refrigerant into the accumulator to cool the suction gas.

This process automatically balances the system as the load from the evaporators changes. This is why it is important to have all cooling units on and operating while charging the system. If one or two are off line, it will cause the refrigerant circuit to alter and make it impossible to correctly charge the system.

The following instructions should be followed in evacuating and charging a Cruisair modulating condensing system with R-22. Some special-order units may contain refrigerant other than R-22. Please follow the special charging procedures included with the unit.

### **Notice**

US federal law prohibits the intentional release of refrigerant gases into the environment, including the R-22 refrigerant used in most Cruisair systems. Special care must be taken when installing, charging, and servicing Cruisair equipment to prevent any loss of refrigerant. Only EPA certified technicians with the proper equipment should perform service on the refrigerant circuit.

### **Initial Charging, New System**

There are three refrigerant circuit components in a Cruisair Modulating System: the condensing unit, the cooling/heating unit (evaporator) and the copper refrigerant line-sets. The condensing unit is shipped from the factory charged with refrigerant gas.

It will be necessary to properly evacuate the cooling units and line-sets before releasing the refrigerant from the condensing unit into the system. To facilitate this evacuation procedure, there is a special vacuum port (aka: purge port, access port, evacuation port or service port) located on the condensing unit's discharge base valve. This vacuum port has a red cap and a schrader valve, and is located at the 2:00 position on the base valve.

### **Required tools to charge a modulating system:**

1. R-22 container (typically the disposable-type container color-coded green for R-22).
2. Gauge manifold with self-closing fittings on the charging hoses.
3. Vacuum pump.
4. Base valve wrench and hand tools.



5. Accurate thermometer.
6. Thermometer to measure superheat.

**Proceed as follows:**

1. Turn the condensing unit's circuit breaker OFF so the compressor will not run while the system is being evacuated.
2. Do not touch the condensing unit base valve stem covers or white port caps. Remove the red cap from the vacuum port on the discharge base valve (right side of unit, 2:00 position on base valve).
3. Connect the low side pressure gauge hose to the vacuum port on the base valve. Connect the vacuum pump hose from the center position on the gauge manifold to the vacuum pump. The high side hose is not used at this time.
4. Close all gauge manifold valves.
5. Energize (open) all cooling unit solenoid valves by turning each control on and setting the lowest possible set point.
6. Energize the vacuum pump. Open the manifold valves to the vacuum pump and the base valve vacuum port.
7. As the pump operates, the low-pressure gauge needle will fall to a vacuum. When the vacuum reaches 28 inches Hg close the vacuum pump valve and turn the vacuum pump off. Let the system sit untouched for 15 minutes and then observe the gauge. If any vacuum has been lost, look for leaks, especially at flare joints. Repair all leaks. Then return to step #4 above and evacuate the system again. Once the vacuum has been held at 28 inches Hg for at least 15 minutes, proceed to the next step.
8. Open the vacuum pump valve and leave the vacuum pump operating for at least six hours, and until a vacuum of at least 29 inches Hg is achieved. Close the vacuum pump valve and turn the vacuum pump off. Wait one hour. If no vacuum is lost, proceed with charging. If any leaks are indicated, inspect flare joints again. Repair all leaks. Then return to step #4 above and evacuate the system again. Once the vacuum has been held at 29 inches Hg for at least one hour, proceed to the next step.
9. Remove the low pressure gauge hose from the vacuum port, replace and tighten the red cap.
10. Turn off vacuum pump and disconnect that line from gauge manifold.
11. Remove both condensing unit base valve stem caps from top of base valves. Ensure that both white gauge port caps, and the red vacuum port cap, are in place and tight. Open both base valves fully by turning the valve stems fully counter-clockwise. This will allow the refrigerant in the condensing unit to enter the system. Replace and tighten the valve stem caps.
12. Turn all cooling units OFF.

The system is now partially charged and is ready for final adjustment.

***Adjusting the Charge***

After the system has been evacuated and is partially charged, the final charge must be added and adjusted. To correctly adjust the charge in a modulating system, the superheat must be measured.

1. At this time, all cooling units should be OFF. Turn the condensing unit's circuit breaker ON.
2. Remove the discharge port base valve stem cap, and make sure that the valve is in the back-seated (fully counter-clockwise) position.
3. Make sure the gauge manifold valves are closed.
4. Remove the white gauge port cap from the discharge base valve and connect the gauge manifold high side hose. Remove the port cap from the suction port near the low-pressure switch and connect the gauge manifold suction hose. Connect the refrigerant tank to the gauge manifold.
5. Attach the thermometer or temperature sensor to the suction line near the low-pressure switch. Wrap insulation over the sensor so that the ambient temperature does not affect it.
6. Open the discharge base valve to the test position by rotating the stem one turn clockwise. The high side gauge should now register a pressure reading.
7. Set all the cooling units to cooling, and the set points as low as possible to ensure that the solenoid valves are energized (open) and the blowers are on high speed. If need be, open exterior doors to ensure that the rooms do not achieve set point before charging is complete. The compressor should start as soon as the first unit is turned on.

NOTE: All the cooling units must be on so both the hot gas bypass valve and de-superheat (TX) valve do not open. The system cannot be charged properly if either valve is open.

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8. At this point the system is under-charged and may go into a low-pressure situation in which the hot gas bypass valve may open. To test if that valve is open, touch the lines leading in and out of the valve. If both are the same temperature then the valve is open. If the valve is open then slowly add refrigerant in small increments until the hot gas bypass valve closes and the incoming and outgoing lines have different temperatures.
  9. Allow the system to run for five to ten minutes so the refrigerant pressures will stabilize. Measure the superheat.  
  
NOTE: There is no ideal super heat temperature, but it should be anywhere from 10° - 20°F (5.6° - 11.1°C), depending on the load on the cooling units. On cool days, it will be lower, and on hot days it will be higher.
  10. Add refrigerant to reduce the superheat, or remove gas to increase it. Do this in very small increments and allow the system to stabilize before taking another superheat reading.
  11. Once the superheat is set properly, close the manifold gauge valves, and backseat the discharge base valve. Torque the stem-packing nut (gland nut) to 8 ft. lbs. or 96 in. lbs. Remove the manifold gauge hoses and replace the service port caps.

### ***Removing Refrigerant from the System***

When adjusting the charge in the refrigerant system, some refrigerant gas may need to be removed. It is a violation of federal law to vent (release) refrigerant into the atmosphere, and it is necessary to capture any refrigerant that is removed from the system. There are two methods of doing this:

1. Use an approved refrigerant recovery unit and refillable refrigerant container.
2. Allow refrigerant to escape from the high-pressure side into a refillable refrigerant container.

### ***Initial Start Up***

1. Open the seacock (seawater inlet valve).
2. Turn on all circuit breakers for the air conditioning system: condensing unit, cooling units, and pump (pump may or may not have its own c/b).
3. Set the system for cooling at the SMXir keypad, and adjust temperature setting so the unit will turn on.
4. Verify that water is flowing from the overboard discharge.
5. Allow unit to run for 10 minutes at high fan speed. Check the temperature differential between discharge and return air by placing an accurate thermometer in front of the discharge grill and then in front of the return air grill. In cooling, the difference between the discharge and return should be 15 - 20°F (8.3 - 11.1°C).

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# Modulating A/C Systems • Operation

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## Operating Instructions - SMX II Control Systems

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### **The SMX Keypad/Display**

The SMXir and SMX II keypad/displays are arranged for logical operation. The button layouts on the SMXir and the SMX II are similar, and the buttons perform the same respective functions.

#### **1. Data Display**

Large LED readout that provides indication of current setpoint, temperatures, programmed values and error messages.

#### **2. Cooling Indicator**

Lights when system is running in cooling mode (solenoid valve open and compressor running).

#### **3. Heating Indicator**

Lights when unit is operating in the electric heat mode.

#### **4. Setpoint Indicator (SMX II Display Only)**

Lights when setpoint is displayed. Off when inside temperature is displayed.

#### **5. SET Key**

Press the SET key to display your currently selected setpoint (the temperature you wish to maintain in the cabin). The SET key also is used to dim the data display readout.

#### **6. UP-DOWN Keys**

Press UP or DOWN to raise or lower the setpoint. Press and hold keys for large changes. Note: if inside temperature is displayed, touching the UP or DOWN key will cause the setpoint to be displayed.

#### **7. TEMP Key**

Press once to display inside temperature. Press TEMP twice, and the display will alternate between inside temperature and setpoint. Press again to return to inside temperature only.

#### **Hint**

*You can display temperature in degrees Fahrenheit or Celsius.*

#### **8. OFF Key**

Turns system off. Note that the data display remains on. You can continue to adjust setpoint, display temperature readings and activate the manual fan to circulate air while the system is in the OFF mode.

#### **9. Cool Mode Indicator**

Lights when you press the COOL key to select the cooling mode.

#### **10. Heat Mode Indicator**

Lights when you press the HEAT key to select the heating mode.

#### **11. COOL Key**

Turns the system on in the cooling mode.

#### **12. HEAT Key**

Turns the system on in the electric heat mode.

#### **Hint**

*Press both HEAT and COOL at the same time, and the system will automatically switch between cooling and heating mode. When in the automatic switchover mode, both the COOL and HEAT indicators are lit.*

#### **13. Manual Fan Indicator**

Lights when fan is running in manual mode.

#### **14. SLOW-FAST Keys**

Control fan speed when the fan is in the manual mode. Pressing SLOW or FAST key when in automatic fan mode will change the system into manual mode.

#### **15. FAN Key**

Selects manual or automatic fan control mode. Press once to select manual control. Press FAN again to select automatic fan speed control. In this mode, the fan speed is controlled by the microprocessor as a function of the difference between setpoint and inside temperature.

#### **16. Fan Speed Indicators**

Row of five small LEDs below FAN key. Indicate the current fan speed.

#### **17. Inside Temperature Indicator (SMXir Display Only)**

When illuminated, inside temperature is displayed. When light is off, setpoint is displayed.

#### **18. IR Receiver (SMXir Display Only)**

Infrared remote receiver

#### **19. Dehumid Key (Remote Control Only)**

Changes system into the Humidity Control program.

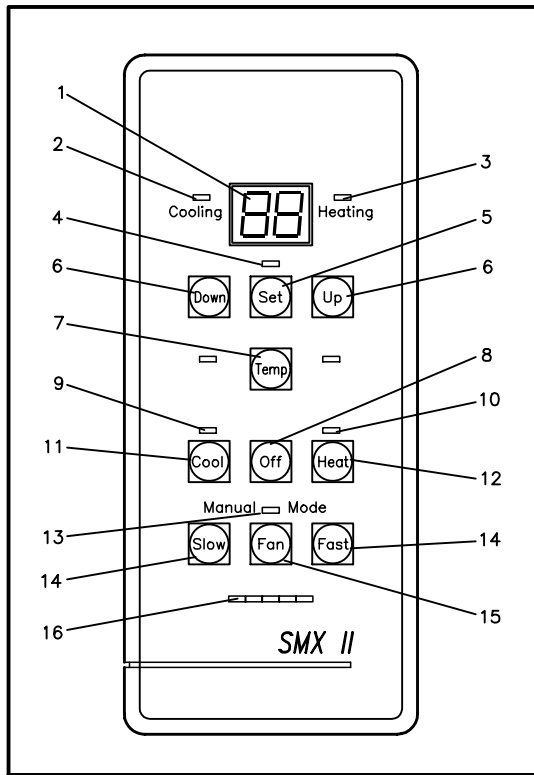
#### **20. Auto Switchover Key (Remote Control Only)**

Places the system into automatic changeover mode, so it will switch from cooling to heating as needed.

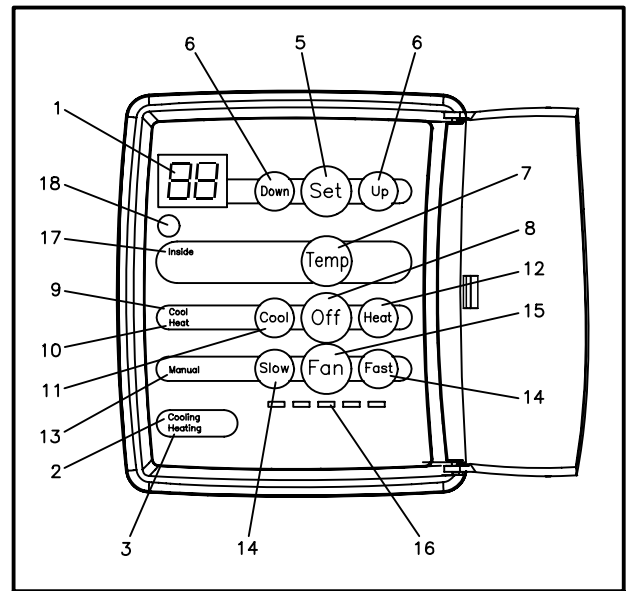
#### **Definitions**

*LED - Light Emitting Diode. An indicator light is used to denote mode or operating status.*

*Setpoint - The selected temperature you want to maintain in the area being heated or cooled.*



SMX II Keypad/Display



SMXir Keypad/Display

### The SMXir Remote Control

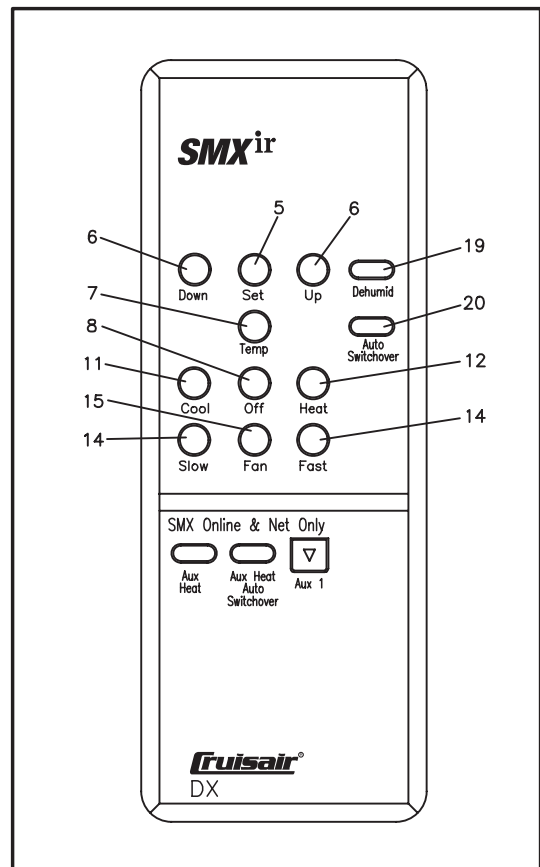
The SMXir remote control keypad has the familiar layout of the 10-button SMX keypad, and performs most of the same functions. The remote can not be used to program settings. Programming must be done at the keypad/display.

In addition to the standard keys, the SMXir remote also has two quick-hit buttons that allow easy access to the humidity control program and the automatic changeover mode.

The remote has three buttons that are not used on SMX II systems. The Aux Heat, Aux Heat Auto Switchover, and the Aux 1 buttons are for SMX Net systems only.

The SMXir remote control must be pointed at the SMXir keypad/display, which has the IR remote receiver. The remote will not work if the SMXir keypad/display has the optional full coverage door and the door is closed.

See Figure 23 for SMXir Remote control angle and distance range.



SMXir Remote Control

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## Basic Operation

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### Power On

When AC power is applied to the system at the circuit breaker, the SMX microprocessor retrieves from permanent memory the last operating configuration. This process takes about four seconds, after which the system will begin operating just as it had been when power was last turned off.

### System Off



Press the OFF key to turn the system off. Note that the data display remains energized even when the system is off. The fan can be turned on manually when the system is in the off mode.

#### Note

*The SMX has built-in protection against sudden power interruptions. The system automatically stores the current operating configuration in permanent memory every time you make changes. (The new operation mode must be in affect for 10 seconds before it is saved into permanent memory.) When AC power is lost, the SMX system retains these settings, and when AC power is restored it resumes operation using the same settings as before.*

### Selecting Setpoint



Press the SET key and the current setpoint will be displayed. Press the UP or DOWN key to change the setpoint.

### Displaying Temperature



To display cabin temperature, press the TEMP key. Press TEMP twice for an alternating display of inside temperature and setpoint. Press again to return to inside temperature only.

### Cool Mode



To enter the COOL mode, press the COOL key. The Cool Mode Indicator will light to show that you have selected the cooling mode.

The Cooling Indicator will be lit whenever the system is in the cooling mode and the control is calling for cooling (solenoid valve open and the compressor running). When the cabin temperature is satisfied, the Cooling Indicator goes off (solenoid valve is closed and the signal to the compressor relay is off).

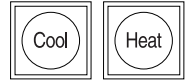
### Heat Mode



Press the HEAT key to select HEAT Mode. The Heat Mode Indicator will light to show that you have selected the heating mode.

The Heating Indicator will be lit whenever the system is in the heat mode and the electric heater is on. When the cabin temperature is satisfied, the Heating Indicator goes off (electric heater is off).

### Automatic Changeover



Press the COOL and HEAT keys simultaneously for AUTOMATIC CHANGEOVER between COOL and HEAT Modes. The mode indicators will light, indicating that the system is in the automatic changeover mode.

**For the SMXir Remote Control only** - Press the Auto Switchover key to enter automatic changeover mode.

Note that the Cooling or Heating Indicator will come on when the compressor is running to show when the system is running in the cooling or heating mode.

### Manual Fan Speed Control



Press the FAN key to select manual fan control. The Manual Fan Indicator will light to show that it is in the manual mode. Then use the SLOW and FAST keys to select the desired fan speed.

Note that the manual fan control may be used to circulate air even when the system is in the OFF mode.

### Automatic Fan Speed Control



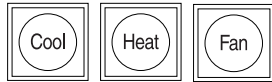
If in manual fan mode, press FAN key to select automatic fan control. The Manual Fan Indicator goes off, and the system will automatically adjust fan speed as the actual cabin temperature deviates from the setpoint. As setpoint is approached, the fan speed automatically slows. Once setpoint is reached, the compressor cycles off and the fan keeps running on low speed.

### Adjusting Brightness



Pressing the SET key repetitively will dim the LED display. Keep pressing SET to return to full brightness.

## Using The Humidity Control Routine



When engaged, the SMX humidity control routine automatically turns the air conditioning system on at timed intervals to remove moisture from the air. The system is programmed at the factory for average values. To change the factory settings, see "Humidity Control Program".

To start the dehumidification program:

- Press OFF.
- Press COOL, HEAT and FAN keys simultaneously.

For the SMXir Remote Control only - Press the Dehumid key to enter dehumidification mode.

- The data display will flash HU, indicating that the program is active.
- To halt the dehumidification program, press any key. The HU message will stop flashing.

## Programming Summary Table

Programmable Function	Keystroke Combination	Factory Setting	Range
Factory Memory Reset	OFF & SET & FAN, then SET	See table below before reset	
Fahrenheit/Celsius	DOWN & TEMP & UP	F	F or C
Auxiliary (Electric) Heat	SET & HEAT	–	– or AH
Setpoint Differential	SLOW & FAN	12	4 to 24
Fan Mode (Cont. or Int.)	DOWN & FAN & UP	C	C or I
Low Fan Speed	DOWN & SET	32	30 to 56
High Fan Speed	SET & SLOW	60	41 to 90
Fan Response Differential	COOL & SLOW	4	2 to 8
Temperature Calibration	SET & UP	–	± 1%
HU Precirculation	TEMP & DOWN	10 Min.	10 Min.
HU Dehumidification	TEMP & SET	30 Min.	See "Humidity Control Program"
HU Time Period	TEMP & UP	12 Hrs.	

## Custom Programming Record

Use table below to keep track of any program changes. If a Factory Memory Reset is performed, then all parameters will revert back to factory default settings as outlined in the Programming Summary Table above.

Unit Location (Cabin #, Salon, etc.)					
Programmable Function	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5
Fahrenheit/Celsius					
Auxiliary (Electric) Heat					
Setpoint Differential					
Fan Mode (Cont. or Int.)					
Low Fan Speed					
High Fan Speed					
Fan Response Differential					
HU Dehumidification					
HU Time Period					

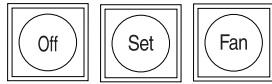
## Programming the SMX II System

SMX control systems are programmed at the factory for average values. For optimum performance, you may wish to change these settings to suit your individual preferences.

All programming steps are entered by pressing the OFF key, followed by the SET key, then simultaneously depressing the two or three keys noted in the table below. Successful entry into a programming mode is indicated by the presence of a decimal point to the right of the two displayed characters. To raise or lower a value, touch the UP or DOWN keys. To exit the programming mode, touch the OFF key. (The SMXir Remote Control cannot be used to program the system.)



## Factory Memory Reset



You can use the memory-reset sequence to restore all programmed functions to the factory default settings:

To restore programmed functions to factory setting:

- Press OFF, SET and FAN simultaneously.
- Press SET.
- After a delay, the memory will be reset from stored values. After another delay, the display will come back on normally.

### Note

If a memory reset is performed, it will be necessary to enable the auxiliary heat function again (if your system has electric heat).

## Auxiliary (Electric) Heat

(Factory Default: Disabled)



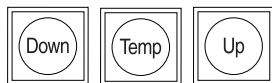
Normally the electric heat function is disabled. If the cooling unit has electric heat, the function must be enabled to operate.

To enable or disable electric heat:

- Enter the programming mode: Press OFF, Press SET
- Press HEAT and SET simultaneously.
- Use the UP or DOWN key to enable or disable electric heat. The code "AH" will be displayed when it is enabled. A double dash "--" will appear when disabled.
- Press OFF to exit programming mode.

## Fahrenheit/Celsius Display

(Factory Default: Fahrenheit)



You can choose to view temperature in degrees Fahrenheit or Celsius.

To select Fahrenheit or Celsius:

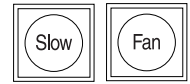
- Enter the programming mode: Press OFF, Press SET
- Press DOWN, TEMP and UP simultaneously.
- Use the UP or DOWN key to select F for Fahrenheit or C for Celsius.
- Press OFF to exit programming mode.

### Note

Changing from Fahrenheit to Celsius will affect the setpoint differential and fan response differential, since these settings are now expressed in degrees Celsius. You should reprogram these values following the instructions below.

## Setpoint Differential

(Factory Default: 12 = 1.5°)



The setpoint differential is the temperature change needed for the cooling or heating functions to cycle on and off. The factory setting of 1.5° Fahrenheit should be adequate for most applications. Differential selections are available in increments of 1/8°. Thus, to adjust by one degree, you should select 8 increments (for 8-eighths).

To program the setpoint differential:

- Enter the programming mode: Press OFF, Press SET
- Press SLOW and FAN simultaneously. The differential will be displayed.
- Use the UP or DOWN key to change the setting.
- Press OFF to exit the programming mode.

### Note

If the temperature display is switched from Fahrenheit to Celsius, the setpoint differential will also operate on degrees Celsius. Thus, the factory-set restart differential will be 1.5° Celsius, which is too wide. To correct this, reset the differential value from 12 to 6. This will provide a differential of 0.75° C, or about 1.4° F.

This will also affect the Fan Response Differential, which is factory set at a value of 4, or 0.5° Fahrenheit. When changing from Fahrenheit to Celsius, reset the Fan Response Differential from 4 to 2. This will provide a fan differential of 0.25° C, or about 0.5° F.

### Hint

Be careful not to set the restart differential too low, since that will cause the unit to start and stop more frequently. This will place an undue load on your electrical system and may damage the compressor.

## Fan Response Differential

(Factory Default: 4 = 0.5°)



When the fan is in the automatic mode, its speed is governed by how far the room temperature differs from the setpoint. The fan runs faster when the difference is greater. As the room cools or warms, the temperature approaches setpoint, and the fan slows down automatically. The amount of temperature rise in the room above setpoint needed to cause the fan to increase in speed one step is called "fan speed differential". It can be adjusted from 1/4° to 4°, in 1/8° increments.

The fan speed range is divided by the SMX microprocessor in five equal increments. If the fan response differential is set at 1/2°, the fan speed will change 20% for each 1/2° of

temperature deviation from setpoint. Lowering the fan speed differential will cause the fan to increase speed quickly as temperature changes. Raising the fan speed differential will result in slower fan speed changes for a given temperature change. The factory setting of 1/2° Fahrenheit is good for most applications, but you may wish to try a slightly higher setting in your salon and a lower setting in your stateroom.

To adjust fan response differential:

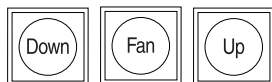
- Enter the programming mode: Press OFF, Press SET
- Press COOL and SLOW. The differential will be displayed in increments of 1/8°.
- Use the UP or DOWN key to raise or lower this value.
- Press OFF to exit the programming mode.

### Note

On SMX II systems built before 8/98, press SLOW, FAN and FAST simultaneously to adjust fan response differential.

## Continuous Or Intermittent Fan

(Factory Default: Continuous)



You can select continuous fan operation or instruct the fan to cycle on and off intermittently with the system compressor.

To select continuous or intermittent fan:

- Enter the programming mode: Press OFF, Press SET
- Press DOWN, FAN and UP simultaneously.
- Use the UP or DOWN key to select C (continuous) or I (intermittent).
- Press OFF to exit the programming mode.

### Hint

If you select intermittent fan operation, you should relocate the thermistor from the return air duct to an inside wall to best sense room temperature. Check with your dealer or call the Cruisair Applications Department for more information.

## Low Fan Speed Adjustment

(Factory Default: 32)



You can adjust the lowest fan speed to suit individual preferences. For instance, you may wish to decrease the low fan speed setting in your stateroom to minimize fan noise.

To adjust low fan speed:

- Enter the programming mode: Press OFF, Press SET
- Press DOWN and SET simultaneously. The current low speed reference number will be displayed (factory set at 32).

- Press UP or DOWN to raise or lower speed reference number.
- Press OFF to exit the programming mode.

### Hint

You should normally keep the low fan speed at the highest possible setting, consistent with a comfortable noise level, for most efficient operation of your Cruisair system.



## High Fan Speed Adjustment

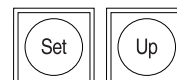
(Factory Default: 60)

A blower will often reach its highest speed at a voltage lower than full line voltage. For example, at a line voltage of 120V, the blower might reach its fastest speed at 110V. At higher voltages, the blower speed will not increase significantly.

The SMX High Fan Speed Adjustment allows you to set the maximum high-speed voltage to the threshold of the blower high-speed response (i.e., 110V). Because SMX breaks up the fan speed voltage steps into 5 equal parts (between the low-speed and high-speed adjustments), accurately setting the high-speed adjustment can help ensure that each fan speed step results in a noticeable change of fan speed.

To adjust the high fan speed:

- Enter the programming mode: Press OFF, Press SET
- Press SET and SLOW simultaneously. The current high-speed reference number will be displayed (factory default is 60).
- While listening to the fan noise level, use the UP key to raise the displayed value past the point that you can hear an increase in the fan noise level.
- Press the DOWN key to lower the voltage until you hear a drop in fan speed, then raise that number up by 2 or 3 to ensure that it is set at the highest speed.
- Press OFF to exit the programming mode.



## Temperature Calibration

Typically, the temperature sensor is within 1 or 2 degrees of actual room temperature. If the sensor is out of calibration, it can be adjusted to read actual temperature.

To calibrate the thermistor:

- Enter the programming mode: Press OFF, Press SET
- Press SET and UP simultaneously. The sensed temperature will be displayed.
- Place an accurate thermometer beside the thermistor you are using and compare the temperatures.

- Use the UP or DOWN key to adjust the displayed temperature to the correct value.
- Press OFF to exit the programming mode.

## Humidity Control Program

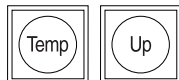
The SMX dehumidification program automatically runs the air conditioning system for a programmed time period to help control humidity in the boat. The dehumidification program works in 3 stages:

1. The fan comes on at high speed to circulate air for 10 minutes.
2. The fan then drops to low speed, and the compressor cycles on in the cooling mode to dehumidify.
3. After the dehumidification cycle, the system turns off. The process repeats according to the programmed time period.

The factory default settings are:

**Overall time period ..... 12 hours**  
**Precirculation cycle ..... 10 minutes**  
**Dehumidification cycle ..... 30 minutes**

The factory settings are adequate for most moderate climates and boats. For humid climates, you may wish to shorten the overall time period and extend the dehumidification time. In dry climates, you can select longer intervals between cycles and a shorter dehumidification time.



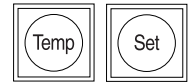
### Programming The Time Period (Factory Default: 12 hours)

The time period determines how often the system performs the dehumidification process. You can select intervals of 2, 4, 6, 8, 10, 12, 14 or 16 hours. Choose a shorter time period in climates with high humidity.

To select time period:

- Enter the programming mode: Press OFF, Press SET
- Press TEMP and UP simultaneously. The display will show the overall time period in hours.
- Use the UP or DOWN key to select the desired time period.
- Press OFF to exit the programming mode.

### Programming The Dehumidification Time (Factory Default: 30 minutes)



The dehumidification time determines how long the compressor runs in the dehumidification mode. You can select 10, 20, 30, 40, 50 or 60 minutes. Select a longer dehumidification time in humid climates.

To select dehumidification time:

- Enter the programming mode: Press OFF, Press SET
- Press TEMP and SET simultaneously. The display will show the time period in minutes.
- Use the UP or DOWN key to select the desired time period.
- Press OFF to exit the programming mode.

### Recommended Humidity Control Settings

Outside Temperature	Relative Humidity	Time Period	Dehumid. Time
Below 80° F (27°C)	75-85%	12 hrs	10 min
	Above 85%	8 hrs	20 min
80° - 90° F (27°-32°C)	75-85%	10 hrs	30 min
	Above 85%	6 hrs	40 min
Above 90° F (32°C)	75-85%	8 hrs	40 min
	Above 85%	6 hrs	60 min

## Fault Shutdowns and Error Messages

The SMX control contains a built-in self-check routine described below.

### Software Error

Whenever power is applied to the SMX, the microprocessor goes through an automatic self-check and software loading process. If all is well, the SMX loads the most recent operating configuration from its internal memory, and turns on normally. If a program fault is found during the self-check, the error message "PE" (Program Error) will be displayed.

Likewise, the self-diagnostic routine runs continuously whenever the SMX system is on. If a system fault is detected, the system shuts down, and the "PE" error message appears.

If this message occurs, contact your nearest Cruisair dealer, or call the Factory Service Department in Richmond, Virginia (804-746-1313) for assistance.

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## **Determining Your Software Version Number**

Before calling your dealer or the factory for service assistance, determine the software version number for the SMX system. To display the software version:

- Press OFF, then Set.
- Press COOL and DOWN simultaneously. The display will read the version number.
- Press UP once to display the revision level.

### **Note**

To read version number on SMX II systems built before 8/98, press OFF, SET and FAN simultaneously, then COOL twice. Then press UP once.

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## **Compressor Time Delay**

The modulating condensing unit has a compressor time delay relay built into the unit. This relay delays the starting of the compressor when power is supplied to the unit, such as when switching between generator and shore power, or if power is temporarily lost. It also will provide a delay if the high or low pressure opens to help prevent short cycling under a fault situation. It does not delay starting of the compressor with normal cycling of the cooling unit controls.

The time delay is set to three minutes and should not need adjustment.

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## **Owner Maintenance**

### **Condensate Drains**

Every three months, check the condensate drains for obstructions by pouring a quart of water rapidly into the condensate pan. If it does not drain completely within 30 seconds, check the drain outlets for clogging. Remember that many Cruisair systems have two drains and hoses, one at each end of the unit.

### **Air Filters**

At least once a month, check the lint screen or filter behind the return air grill or on the face of the cooling/heating unit and clean if necessary.

### **Seawater Connections**

Verify that all seawater connections are tight, and check for water flow from each unit's overboard discharge.

## **Seawater Pump**

If your system uses a rubber-impeller seawater pump, you should inspect the impeller after 300 hours of operation. Replace it if it is worn. If you have a centrifugal pump, regular maintenance is not needed.

## **Seawater Strainer**

Check the seawater strainer monthly. Remove any debris.

## **Refrigerant Gas**

The refrigerant gas (most likely R-22) used in your Cruisair air conditioning system is adequate for the life of the system. Routine "seasonal" charging of the system is not typically necessary.

## **Winterizing the System**

Close the seacock and remove the inlet water hose from the air conditioner. Allow all water to drain from the system.

Loosen the screws on the pump head to allow the water to drain from the pump. Drain and clean the seawater strainer.

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## **Trouble Shooting**

Before you call for service, review this list. It may save you time and expense. This list contains some common problems and possible solutions. If further help is needed, call your nearest Cruisair dealer listed in back of this manual.

**Problem:** Unit will not operate, SMX Display Not On

**Possible Solution:**

1. Check circuit breaker.
2. Check voltage, power supply.
3. Check CX/CXP cable and connections.
4. Replace SMX keypad/display.
5. Replace SMX Power/Logic board.

**Problem:** Erratic SMX Temperature Display

**Possible Solution:**

1. Perform a Factory Memory Reset.
2. Check temperature sensor, cable and connection.
3. Ensure the temperature sensor is installed properly.
4. Calibrate temperature.
5. Replace Power/Logic board.

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**Problem:** Erratic SMX operation

**Possible Solution:**

1. Perform a Factory Memory Reset.
2. Check CX/CXP cable and connections.
3. Check temperature sensor, cable and connection.
4. Replace keypad/display.
5. Replace Power/Logic board.



**Warning**

*The Power/Logic board operates at 115VAC or 230VAC. Make sure the power is off before removing the cover of the Power/Logic box.*

**Problem:** Air from the unit does not feel cool

**Possible Solution:**

1. Make sure control is set in Cool mode.
2. Check thermostat setting.
3. Confirm that the compressor is running.
4. Check solenoid valve to see that it is opening.

**Problem:** Compressor is not running

**Possible Solution:**

1. Check water flow.
2. Check compressor relay, triggers.
3. Check high and low pressure switches.
4. Check solid state relay.

**Problem:** Unit blows cool air, but fails to cool the cabin

**Possible Solution:**

1. Check air filter.
2. Check thermostat setting.
3. Check compressor for short-cycling.

**Problem:** Compressor cycles on and off

**Possible Solution:**

1. Check water flow.
2. Check high and low pressure switches.
3. Check temperature sensor to make sure it is installed properly and not touching any metal surfaces.
4. Ensure that cooling unit's discharge air is not blowing directly toward the return air grill.

**Problem:** The cooling unit won't heat

**Possible Solution:**

1. Check that control is in Heat mode, and thermostat is set properly.
2. Enable Aux Heat on the SMX control (if a Factory Memory Reset is performed, Aux Heat will need to be enabled).
3. Check the manual thermal overload on the cooling unit.

**Problem:** Water dripping inside cabin

**Possible Solution:**

1. Clean out condensate drain pan and fittings.
2. Clear blockage in drain hose.
3. Check downhill routing of hose.
4. Ensure that insulation around ducting is not compressed or crimped.

**Problem:** Condensing unit has frost buildup

**Possible Solution:**

1. This might be a normal occurrence in the modulating system operation. As cooling units shut off, the load on the unit drops and the suction line can frost up. If all cooling units are on, and there is a sufficient heat load, the suction line should not be iced over.
2. Check system charge.

Contact an authorized Cruisair servicing dealer if the problem continues, or for replacement parts.



# Limited Warranty Periods

Please read and keep this document with your important paperwork. Use it as a reference in the future. If you have any questions, please contact the Dometic Environmental Corporation Service Department at (804)746-1313 for clarification.

**Note:** Any model or replacement part that has been installed due to a warranty failure will carry **only** the remainder of the original warranty. All warranties begin when the customer takes possession of the equipment. The warranty is extended to all owners of the equipment commencing the date the original owner takes possession of it. Proof of original purchase may be required. **Replacement parts, such as filters, fuses and MOVs, are not covered under our warranty.** Fuses and MOVs are used as safety devices to protect Cruisair equipment against over-current conditions caused by lightning or inductive switching environments. We reserve the right to change our warranty policies and procedures as well as our warranty allowances without notice.

## ***Cruisair Direct Expansion (DX) and Modulating Systems***

- New, complete system installation using any member of the SMX family.

The warranty includes the pump.

### **2 year warranty including Parts and Labor**

- New, complete system installation using an electro-mechanical control (3-knob).

The warranty includes the pump.

### **1 year warranty including Parts and Labor**

- New, complete model sold as a partial system retrofit to an existing system.

Includes SMX family.

### **1 year warranty including Parts and Labor**

## ***Cruisair Tempered Water***

- New, complete system installation using any member of the SMX family.

### **2 year warranty including Parts and Labor**

NOTE: Excludes pump which has a 1 year warranty

- New, complete model sold as a partial system retrofit to an existing system.

Includes SMX family.

### **1 year warranty including Parts and Labor**

## ***Refrigerators/Freezers/Fish Boxes***

The below warranty periods do not apply to systems that are installed as described in Section II, item #7, of the Owner's Limited Warranty, document # L-0123.

- New installation of entire system including condensing unit, line sets, evaporator, etc.

### **1 year warranty including Parts and Labor**

- New complete model sold as a partial system retrofit to an existing Cruisair system.

### **1 year warranty including Parts and Labor**

- New installation of condensing unit only, with line sets, evaporators, etc. done by others i.e. not Cruisair pre-charged line sets and evaporators.

### **1 year warranty including parts and labor on mechanical and electrical parts of condensing unit only.**

## ***Ice Makers, Remote and Self-Contained***

- New installation of an entire Self-Contained Ice Maker

### **1 year warranty including Parts and Labor, including water pump.**

- New installation of an entire Remote Ice Maker, including condensing unit, remote display, auger unit, linesets

### **1 year warranty including Parts and Labor, including water pump.**

- New installation of an Remote Ice Maker Auger and Condensing unit only, with linesets done by others i.e. not Eskimo pre-charged linesets

### **1 year warranty including Parts and Labor on mechanical and electrical parts of the auger and condensing unit only.**

- New complete component sold as a partial system retro-fit to an existing Eskimo system

### **1 year warranty including Parts and Labor on new component only.**

**Note:** Use of saltwater as feedwater to make ice will void warranty on the auger section of the unit.

## ***Sentry Battery Chargers***

- New SM and FR series installation.

### **2 year warranty including Parts and Labor**

- New G-series installation.

### **1 year warranty including Parts and Labor**

## ***Replacement Parts***

- Replacement parts and components  
Example: A-509, 40401-30.

### **90 day warranty, Parts only**

- Replacement Compressors for other than Tempered Water Systems - example: R3101-16T, DX equipment - installed in an existing Cruisair system or a competitor's system.

### **1 year warranty including Parts and Labor**

- Replacement compressors for Tempered Water - example: 30130-36 installed in an existing Cruisair system.

### **1 year warranty including Parts and Labor**

- A Tempered Water compressor - example: 30130-36 installed with competitor's equipment.

### **90 day warranty, Parts only**

Revised: 7-18-06 L-0694



# Owner's Limited Warranty

As hereinafter described, Dometic Environmental Corporation limits the duration of any implied warranty to the duration of the underlying express warranty and also disclaims any liability for consequential or incidental damages arising from any application, installation, use or malfunction of any warranted product.

## Section I

### What does the Limited Warranty cover?

Products manufactured by Dometic Environmental Corporation (Dometic) are under limited warranty to be free from defects in workmanship or materials under normal use and service with the obligation of Dometic under this limited warranty being limited to replacing or repairing any component(s) which shall disclose defects within the time limits defined in **Section III** and which, upon examination by Dometic, shall appear to the satisfaction of Dometic to be defective or not up to specifications.

***This Limited Warranty is made in lieu of all other express warranties, obligations, or liabilities on the part of Dometic. In addition, Dometic shall not be responsible for any incidental or consequential damages.*** In those instances in which a cash refund is made, such refund shall effect the cancellation of the contract of sale without reservation of rights on the part of the purchaser. **Such refund shall constitute full and final satisfaction of all claims which purchaser has or may have against Dometic due to any actual or alleged breach of warranty, either express or implied, including, without limitation, any implied warranty of merchantability or fitness for a particular purpose.** Some states do not allow the exclusion or limitation of incidental or consequential damages so the above limitation may not apply to you. The terms and conditions of this warranty shall be governed by the laws of the Commonwealth of Virginia.

The Dealer is not an agent for Dometic except for the purpose of administering the above warranty to the extent herein provided, and Dometic does not authorize the dealer or any other person to assume for Dometic any liability in connection with such warranty, or any liability or expense incurred in the replacement or repair of its products other than those expressly authorized herein. Dometic shall not be responsible for any liability or expense except as is specifically authorized and provided in this section.

Dometic reserves the right to improve its products through changes in design or material without being obligated to incorporate such changes in products of prior manufacture, and to make changes at any time in design, materials, or part of units of any one year's model, without obligation or liability to owners of units of the same year's model of prior manufacture.

This warranty gives you, the purchaser, specific legal rights, and you may also have other rights which vary from state to state. You also have implied warranty rights, including an implied warranty of merchantability, which means that your product must be fit for the ordinary purposes for which such

goods are used. ***The duration of any implied warranty rights is limited to the duration of the express warranty as found in Section III.*** Some states do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you.

## Section II

### What does this Limited Warranty not cover?

#### ***This Warranty Shall Not Apply to:***

1. Failures resulting from improper installation or use contrary to instructions.
2. Failures resulting from abuse, misuse, accident, fire, or submergence.
3. Any part manufactured by Dometic which shall have been altered so as to impair its original characteristics.
4. Any parts which fail as a result of misuse, improper application or improper installation.
5. Items not manufactured by Dometic, i.e., items which are purchased from another manufacturer and supplied as received by Dometic without alteration or modification except as any part of an Dometic-manufactured unit or component.
6. Components or parts used by or applied by the purchaser as an integral part of products not manufactured by Dometic.
7. Warranty does not cover damage to components that comprise a Custom Wrapped Box Evaporator refrigeration system (aka: catch boxes, fish boxes, etc.) when the box is installed in such a way that the customer can move it. These damages may include, but are not limited to: crimped refrigerant linesets (copper tubing or flexible linesets), refrigerant leaks, moisture ingress into the refrigeration system, subsequent damage to condensing unit from being operated with low refrigerant charge or moisture in the system, broken refrigerant connections, broken thermostat sensors, and/or broken constant pressure valves.

Installation and application of Dometic components is not warranted by Dometic because Dometic has no control or authority over the selection, location, application, or installation of these components.

## Section III

### What is the period of coverage?

See the Limited Warranty Periods, document # L-0694, for the period of coverage.

All Dometic components bear a data plate on which there are model and serial numbers. The serial number is date coded. To determine whether or not any Dometic component is in warranty, proceed as follows:

1. Determine the manufacture date of the component from the serial number on the data plate. If you are not familiar with the date code, write or call the Dometic Customer Service Department at (804)746-1313, to obtain the manufacture date. The hours of the Customer Service Department are 8:00 am - 5:00 pm (USA, Eastern Time Zone) Monday through Friday excluding holidays.
2. It is possible that there might exist a considerable time lag between the date a component is manufactured and the date it is put in service. In such instances, the date of manufacture could indicate that the item is out of warranty. However, based on the date the equipment is first put in service, the item may still be covered by the Dometic warranty described in **Section I**. For proof of date put in service, Dometic will require a copy of the bill of sale of the Dometic equipment from the installer or new boat dealer to the original owner.

## **Section IV**

**How do you get service? Please Read the following Warranty Procedure.**

### **WARRANTY PROCEDURE**

If the failure of a Dometic component is determined to be covered under the Dometic warranty and the time in service is determined to be within the warranty time limit, the owner has the following three options:

1. Preferred option: Have a Dometic authorized Servicing Dealer perform the work needed. The customer should call Dometic's Service Department for a recommendation as to the closest dealer. If the customer already knows an authorized servicing dealer, the dealer should be contacted directly.
2. If the customer contacts Dometic's Service Department for a Servicing Dealer and Dometic has no one in that particular area, Dometic will authorize the use of a local service company and Dometic will work with the local company to assist in any way possible.
3. The customer may send his equipment back to the factory to have the repair work done. Dometic will make every effort to return the equipment to the customer within a three week time period. If the claim represents a legitimate warranty problem, Dometic will pay the freight both ways. Dometic prefers option one and two, if at all possible.

The customer may contact the Dometic Service Department at (804) 746-1313.

## **WARNING**

Dometic Environmental Corporation (Dometic) manufacturers of Cruisair, Dometic Auxiliary A/C, Dometic Refrigerators and Freezers, Eskimo Ice, Grunert, Marine Air, and Sentry products, makes the following safety warnings concerning the application, installation, use and care of its products. Although these warnings are extensive, there may be specific hazards which may arise out of circumstances which we have not outlined herein. Use this as a guide for developing an awareness of potential hazards of all kinds. Such an awareness will be a key factor in assuring your SAFETY and comfort.

**ELECTRICITY** - Many Dometic products operate on 115, 230 or 440 volt AC power. Such voltages can be LETHAL; therefore, the chassis, cabinets, bases, etc., on all components must be grounded together and connected to the vessel's grounding system. Sparks can occur as switches, thermostats and relays open and close in the normal operation of the equipment. Since this is the case, ventilating blowers for the removal of hazardous fumes or vapors should be operated at least 5 minutes before and during operation of any Dometic product or group of Dometic products. All electrical connections must be covered and protected so accidental contact cannot be made by persons using the equipment, as such contact could be LETHAL.

**ELECTROLYSIS** - Electrical leakage of any component can cause electrolytic deterioration (electrolysis) of thru-hull components which could result in leakage serious enough to sink a vessel which could result in loss of life. All Dometic components must be kept clean and dry and checked periodically for electrical leakage. If any electrical leakage is detected, the component should be replaced or the fault causing the leakage corrected before the component is put back into service.

**GAS** - Dometic Air Conditioning and Refrigeration components utilize R-22 (Chlorodifluoromethane), R134a refrigerant (Tetrafluoroethane), R-407C (which contains Difluoromethane [HFC-32], Pentafluoroethane [HFC125], and 1.1.1.2 - Tetrafluoroethane [HFC134a]), R404A (R125/R143a/R134 [44%/52%/4%]), or R417a, which are non-toxic, non-flammable gases; however, these gases contain no oxygen and will not support life. Refrigerant gas tends to settle in the lowest areas of the compartment. If you experience a leak, evacuate all personnel, and ventilate area. Do not allow open flames in the area of leaks because refrigerant gas, when burned, decomposes into other potentially LETHAL gases. Refrigerant components operate at high pressure and no servicing should be attempted without gloves, long-sleeved clothing and eye protection. Liquid refrigerant gas can cause severe frost burns to the skin and eyes.

**VENTILATION** - To cool or heat air, Dometic Air Conditioning and Refrigeration components are designed to move air through a heat exchanger by a blower or propeller fan. This design necessarily produces a suction on one side of the air handling component and a pressure on the other side. Air handling components must be installed so that the suction-pressure action does not: (1) pressurize an area to the extent that structural failure occurs which could cause harm to occupants or bystanders, or (2) cause a suction or low pressure in an area where hydrogen gas from batteries, raw fuel vapor from fuel tanks, carbon monoxide from operating propulsion engines, power generators or heaters, methane gas from sewage holding tanks, or any other dangerous gas or vapor could exist. If an air handling unit is installed in such a manner that allows potentially lethal gases or vapors to be discharged by the air handling unit into the living space, this could result in loss of life.

Maximum protection against the introduction of dangerous gases or vapors into living spaces can be obtained by providing living spaces which are sealed from all other spaces by use of airtight bulkheads and decks, etc., and through the introduction of clean air into the living space. Bear in mind that the advent of air conditioning, whether it be for cooling or for heating, naturally leads to the practice of closing a living space tightly. Never close all windows and doors unless auxiliary ventilating systems, which introduce clean outside air into the living space, are used. Always leave enough window and door openings to provide adequate ventilation in the event potentially lethal gases or fumes should escape from any source.

**CONDENSATE** - All cooling units produce water condensate when operating on the cooling cycle. This water must be drained from the cooling unit overboard. If condensate is allowed to drip on a wooden structure, rotting or decay and structural failure may occur which could result in loss of life. If condensate is allowed to drip on electrical components, deterioration of the electrical components could result in hazardous conditions. When an air conditioning system is in operation, condensate drains may be subjected to negative pressure. Always locate condensate drains as far as possible from points where engine waste and other dangerous gases are exhausted so no such dangerous gases can be drawn into the condensate drains.

## **Warning**

Never sleep in a closed area on a boat when any equipment, which functions as a result of the combustion of a volatile fuel, is in operation (such as engines, generators, power plants, or oil-fired heaters, etc.). At any time, the exhaust system of such devices could fail, resulting in a build-up of LETHAL gases within the closed area. Warning Revised: 6-5-06

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# Description of Figures

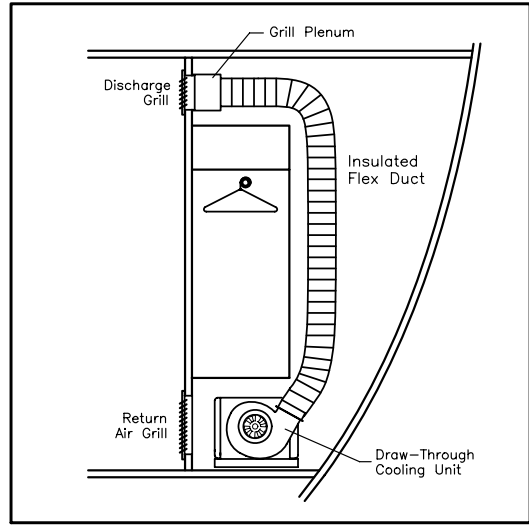
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- Fig. 1 Modulating Condensing Unit**
- Fig. 2 Typical Cooling Unit**
- Fig. 3 Typical Cooling Unit Installation**
- Fig. 4 Pump Head Orientation**
- Fig. 5 Seawater Manifolds**
- Fig. 6 Seawater Piping, Proper System and Common Mistakes**
- Fig. 7 Duct and Grill Sizes Table**
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**Fig. 1 Modulating Condensing Unit**



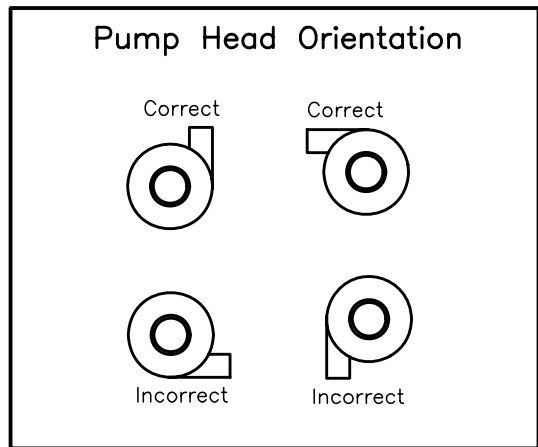
**Fig. 3 Typical Cooling Unit Installation**



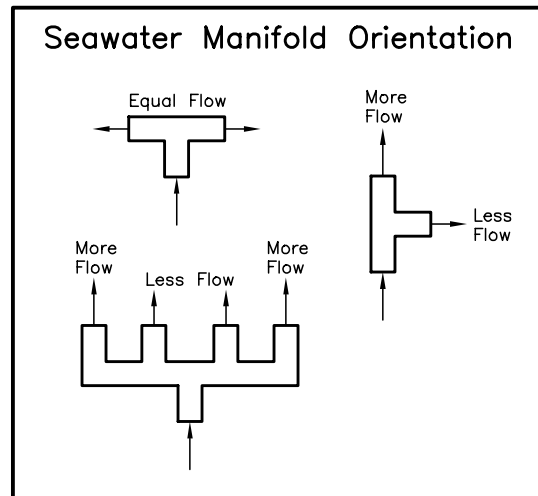
**Fig. 2 Typical Cooling Unit**



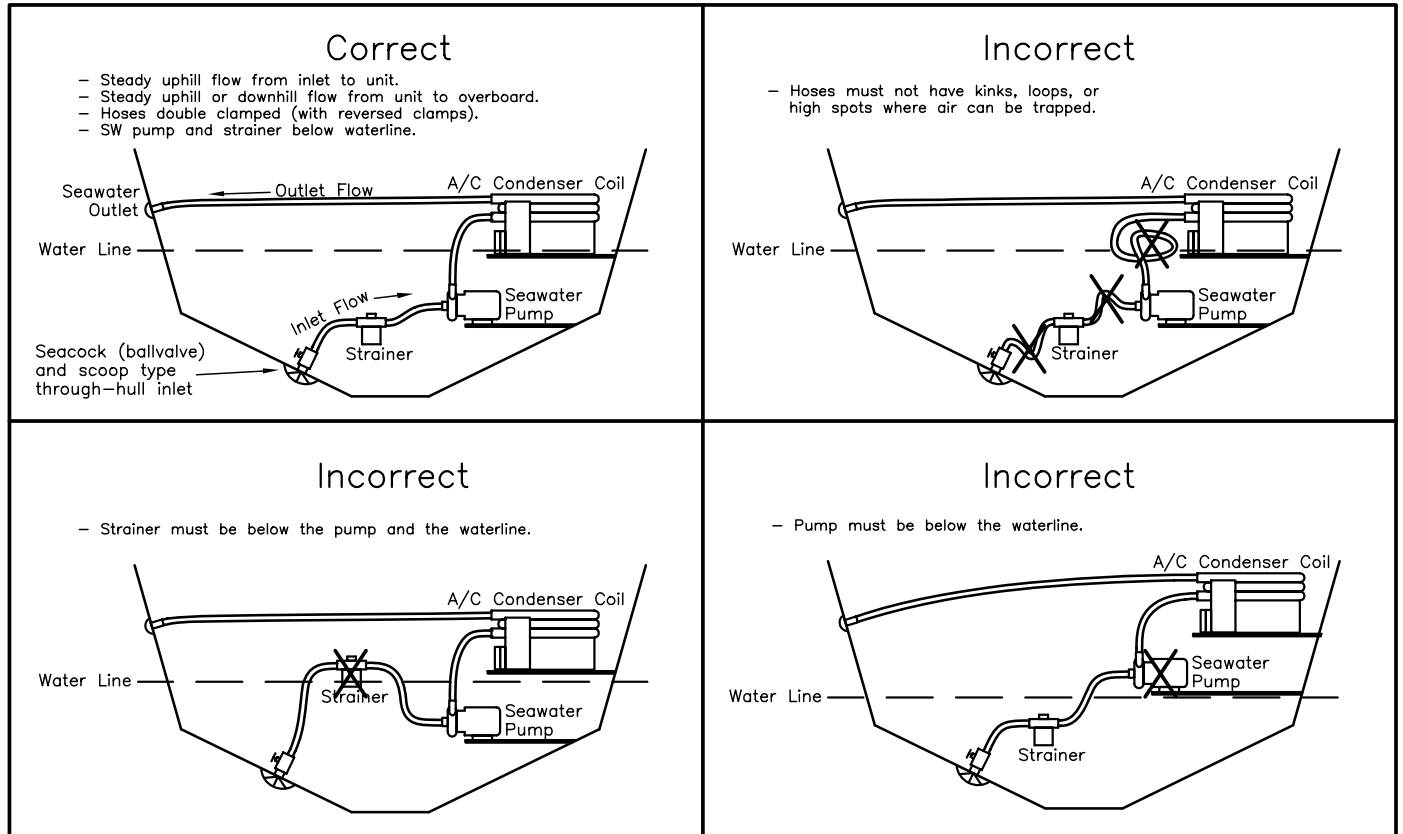
**Fig. 4 Pump Head Orientation**



**Fig. 5 Seawater Manifolds**



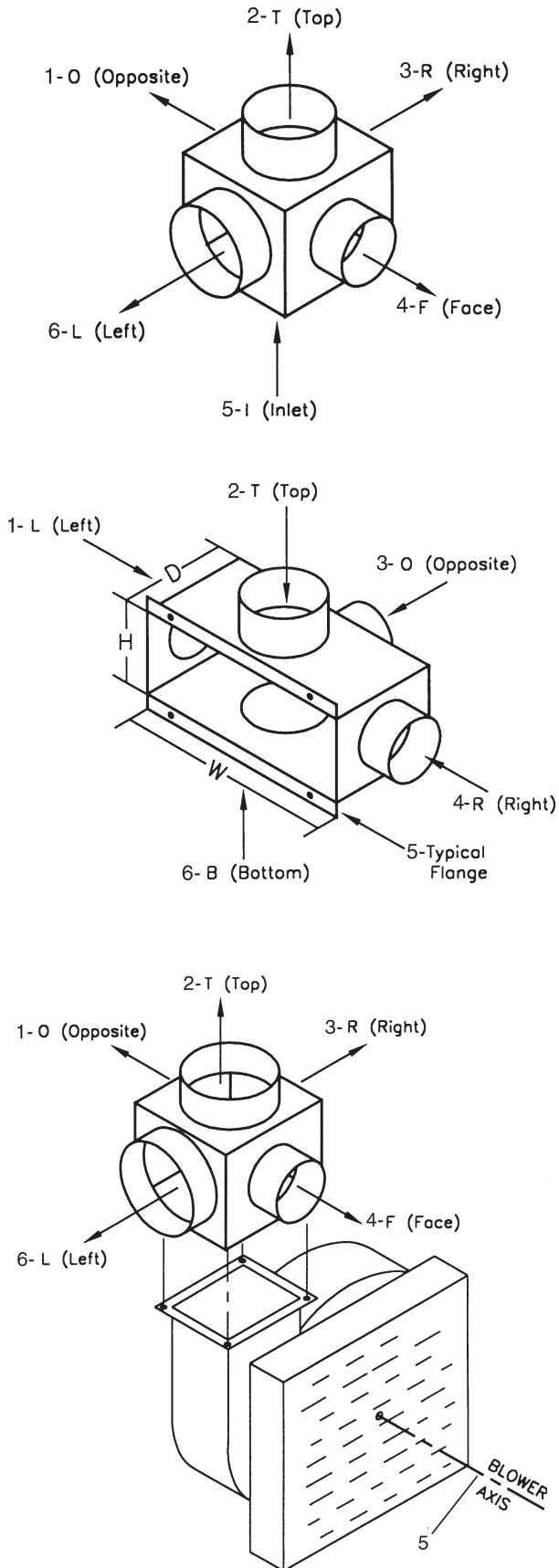
**Fig. 6 Seawater Piping, Proper System and Common Mistakes**



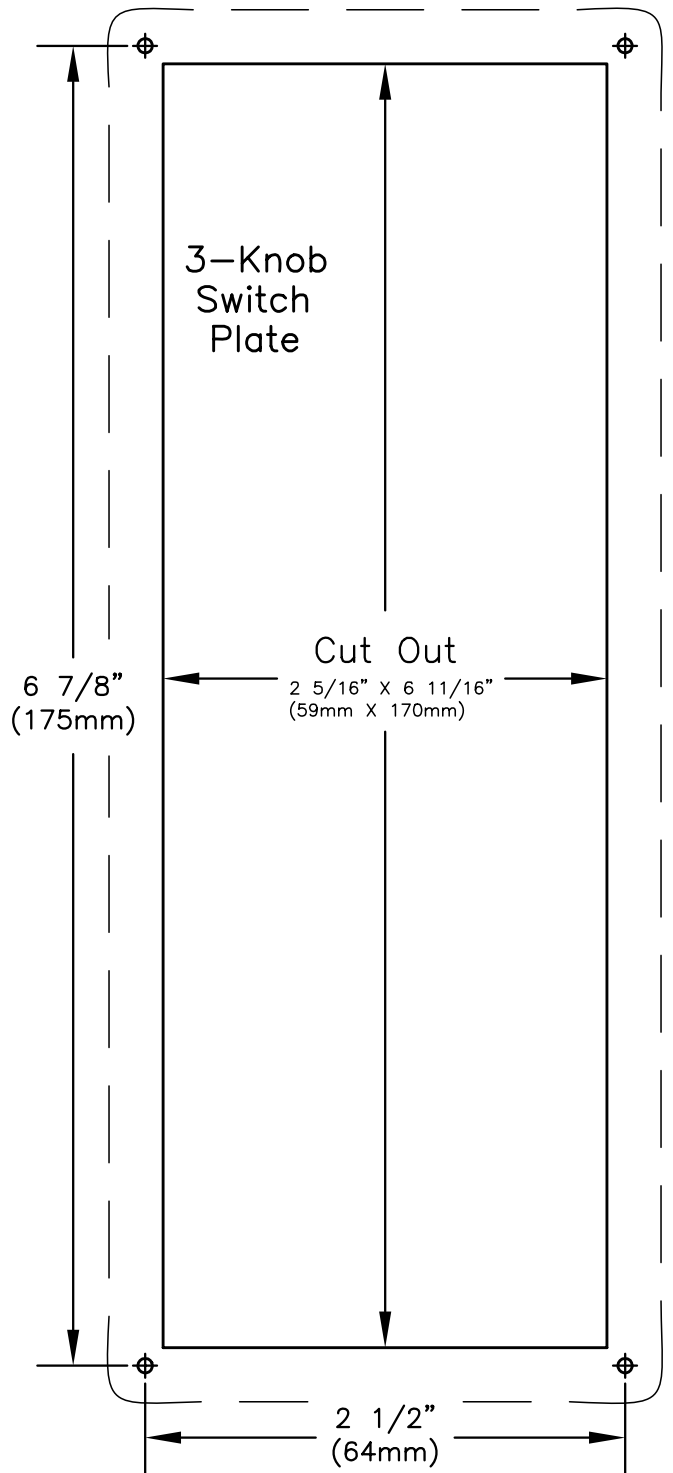
**Fig. 7 Duct and Grill Sizes Table**

Unit Capacity (Btu/hr)	Min. Return Air Grill (sq in/cm)	Min. Supply Air Grill (sq in/cm)	Duct Size (in/mm)
4,000	72/465	49/315	5/125
6,000	72/465	49/315	5/125
8,000	72/465	49/315	5/125
10,000	100/650	60/390	6/150
12,000	120/780	70/455	6/150
16,000	144/935	80/520	7/175

**Fig. 8 Plenum Configurations**



**Fig. 9 Switch Dimensions and Template**



Drill 3/32" (2mm) holes for mounting screws.



Fig. 10 SMXir Mounting Template and Instructions

The diagram shows a rectangular mounting template with a central cutout. The overall width is 4 1/4" (108mm) and the height is 2 3/4" (70mm). The central cutout has a diameter of 3" (76mm) and a depth of 70°. The template is labeled 'TOP' and has a part number '#5103200'. Four mounting holes are indicated, with a note: 'Drill four 1/32" (1mm) holes for mounting screws'. A central hole is noted: 'Drill a 1" (25mm) hole in center for CXP cable'. The diagram also includes a section for 'Mounting Instructions' and a table with drawing details.

**Mounting Instructions**

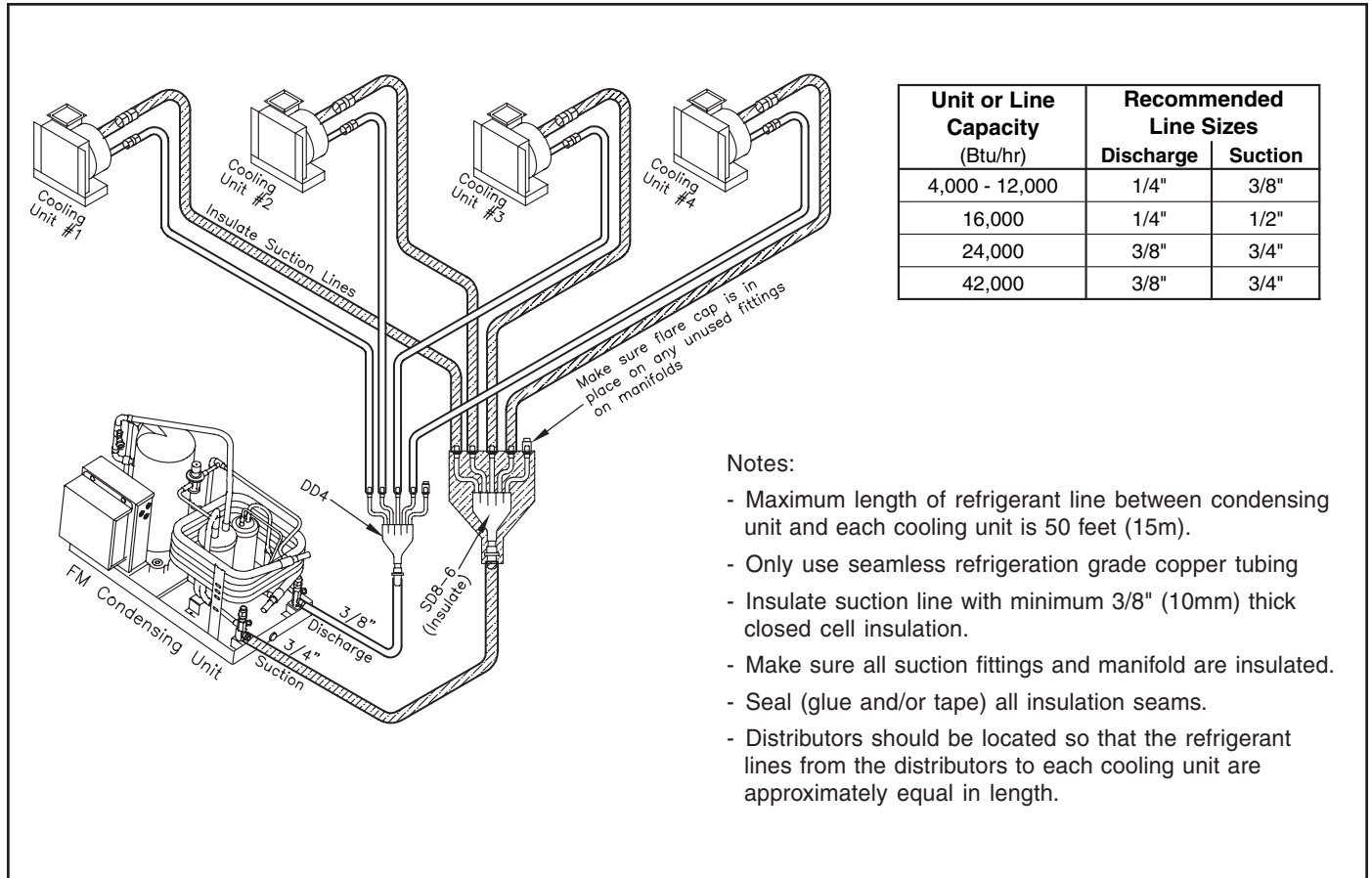
1. Remove mounting plate from back of display by pressing down on the plate top while pulling the sides away from the display.
2. Use mounting plate template to drill holes in wall.
3. Mount plate with four screws provided.
4. Route CXP cable through wall hole and mounting plate, and connect to SMXir keypad.
5. Install SMXir display on mounting plate by hooking the top of the display, at an angle, on the top mounting plate locking tabs.  
Move the display side to side while pressing down on the display top to ensure engagement of tabs. Continue to press downward on display, and press bottom of display towards the wall to latch bottom.

To remove display, push down on display top while pulling (or pry from underneath) the display bottom away from wall.

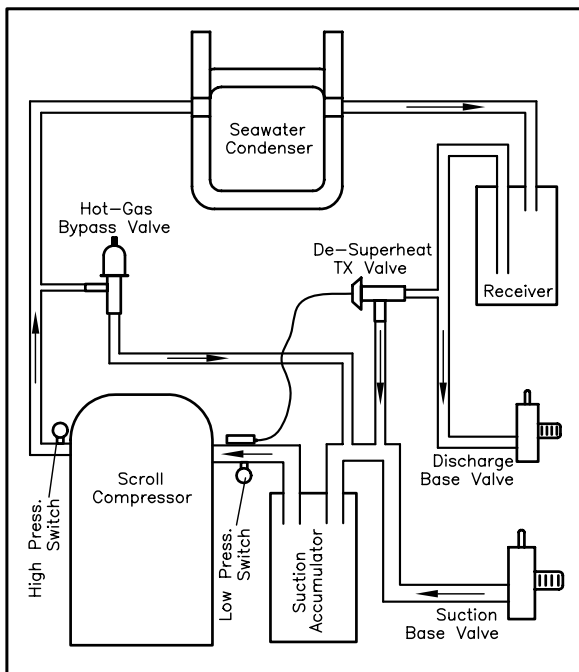
Adapter plates are available to install a SMXir Control over a 3-knob or older SMX rectangular cutout. Use #5103612 (black) or #5103612W (white).

<b>Dometic Environmental Corporation</b>	Drawn By: CE
<b>Mounting Instructions, SMXir</b>	Scale: none
<b>P-1077</b>	Date: 8/16/00
	Revised: 8/6/01
	Drawing Number: <b>086800</b>

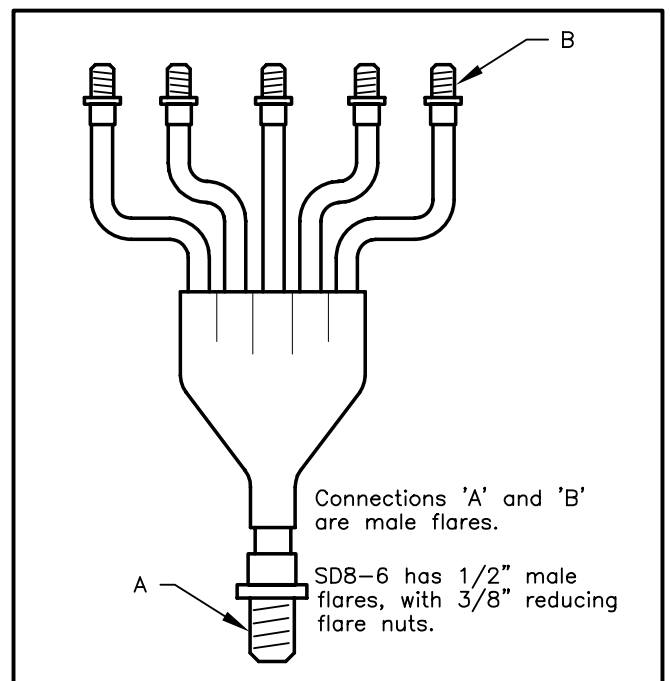
**Fig. 11 Refrigerant Line Sizes**



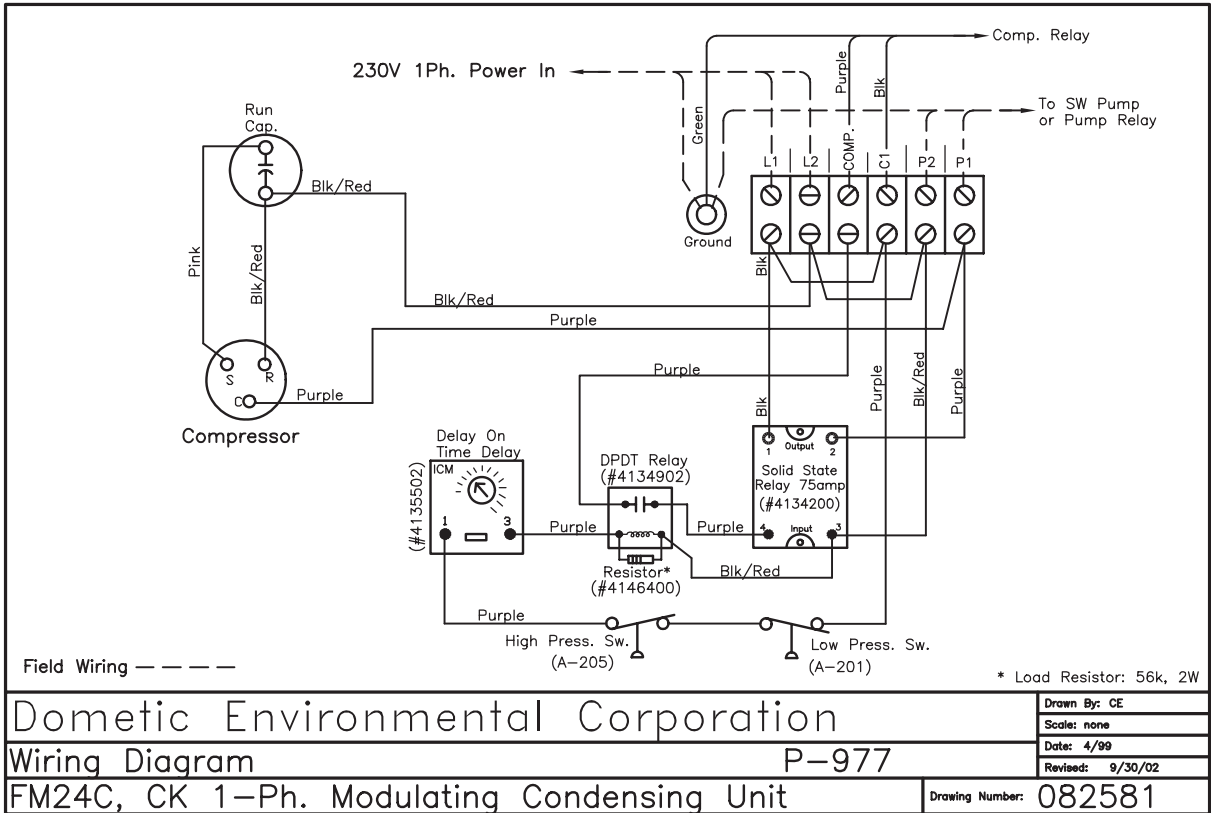
**Fig. 12 Modulating Unit Refrigerant Circuit**



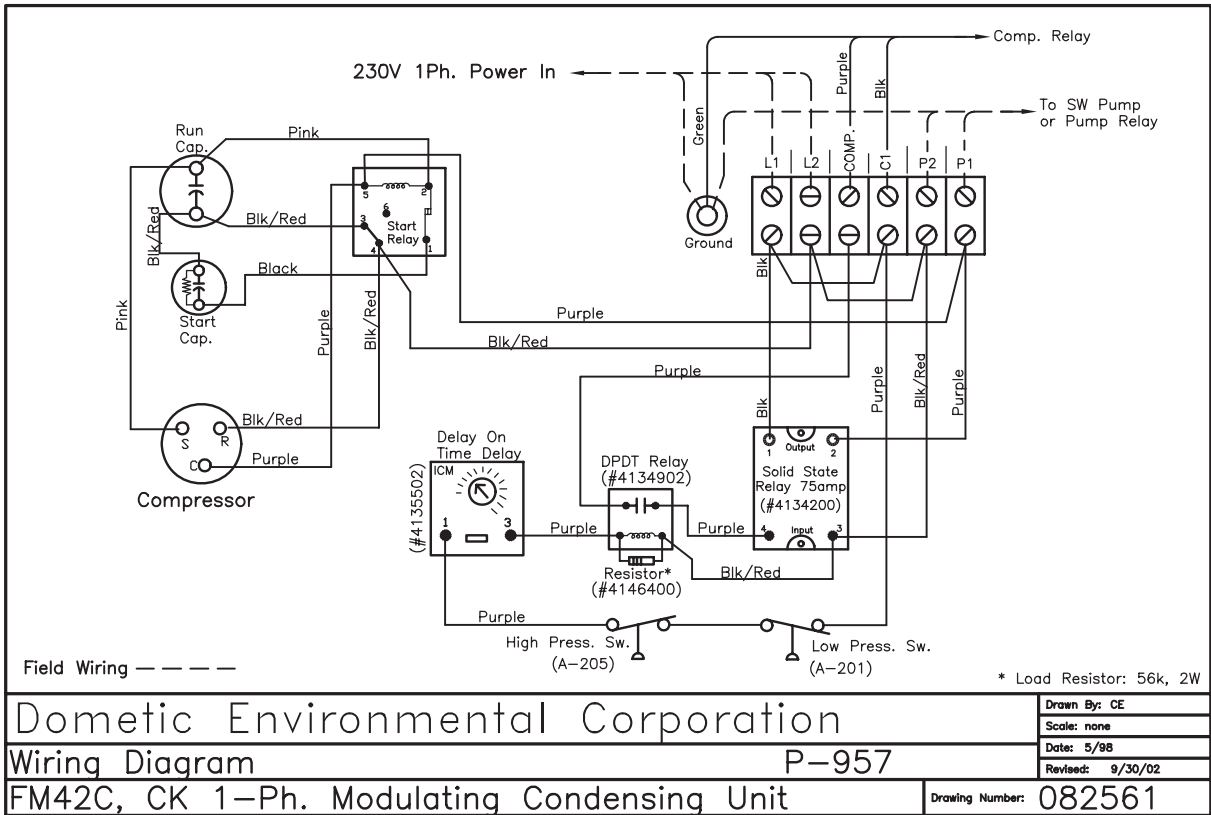
**Fig. 13 Refrigerant Distributors**



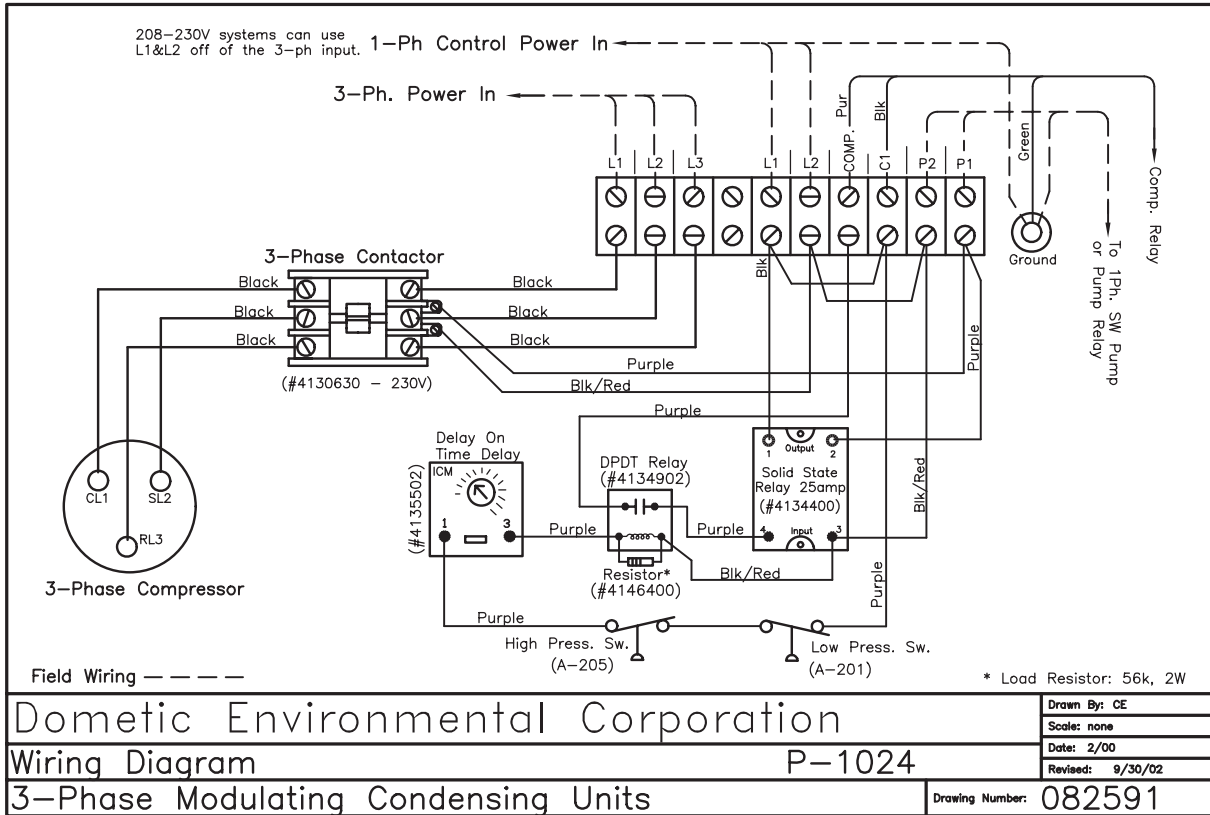
**Fig. 14 FM24C Condensing Unit Wiring**



**Fig. 15 FM42C Condensing Unit Wiring**



**Fig. 16 FM 3-Phase Condensing Unit Wiring**



**Fig. 17 FM Condensing Unit, Compressor Relay Wiring**

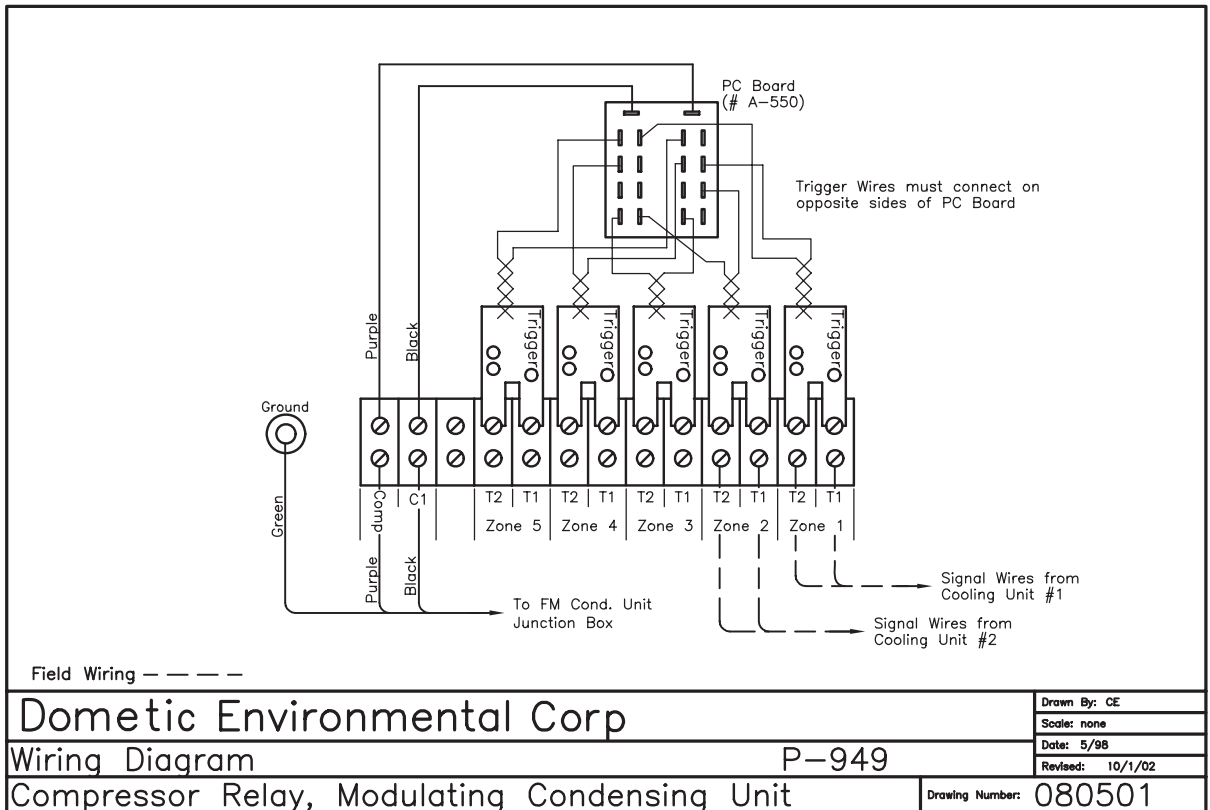


Fig. 18 EMB & EHMB Cooling Unit Wiring Diagrams

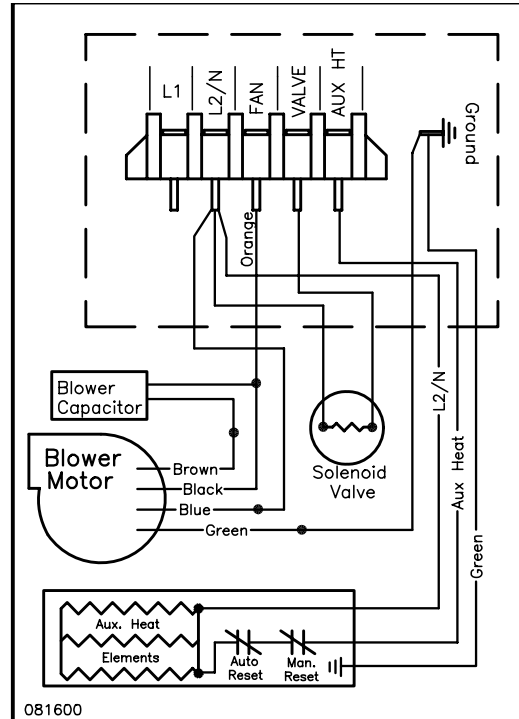
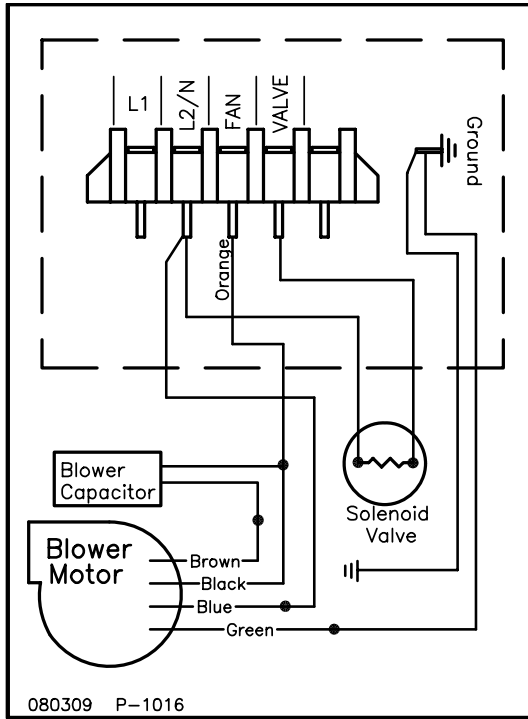
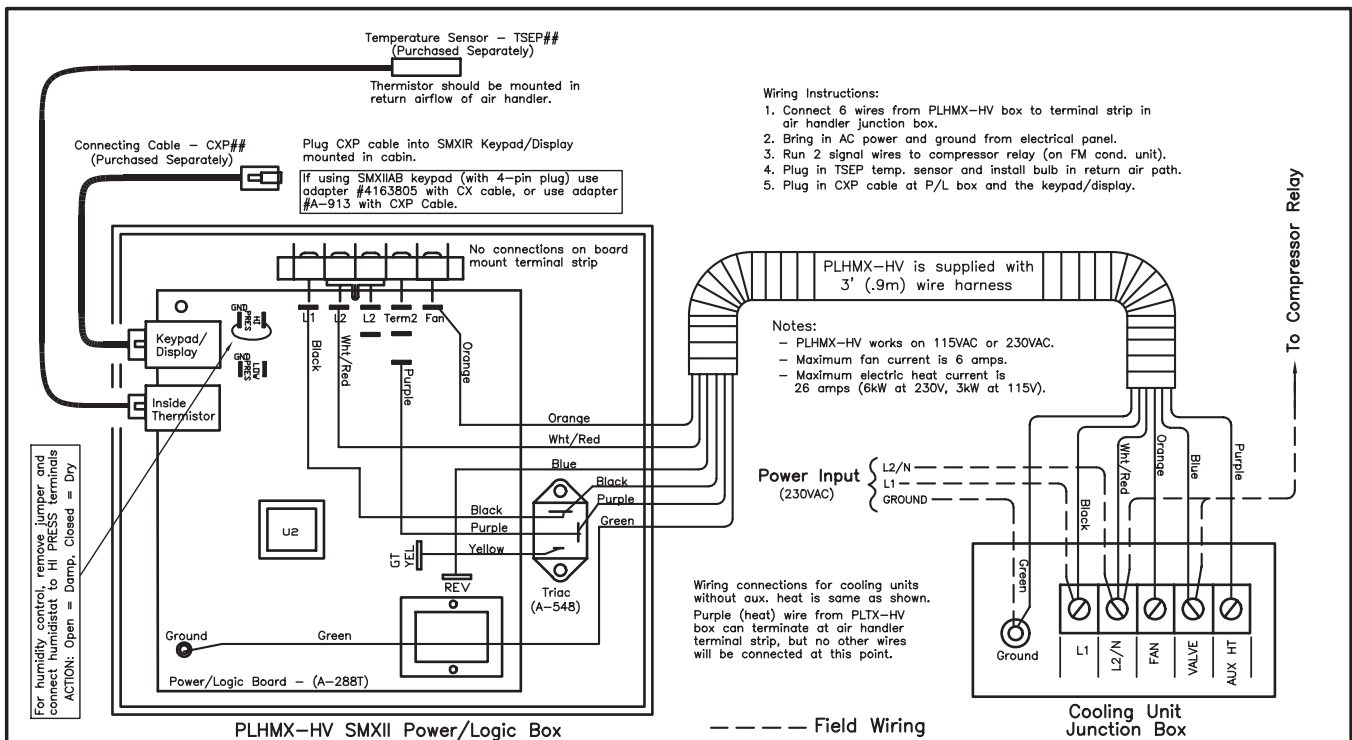
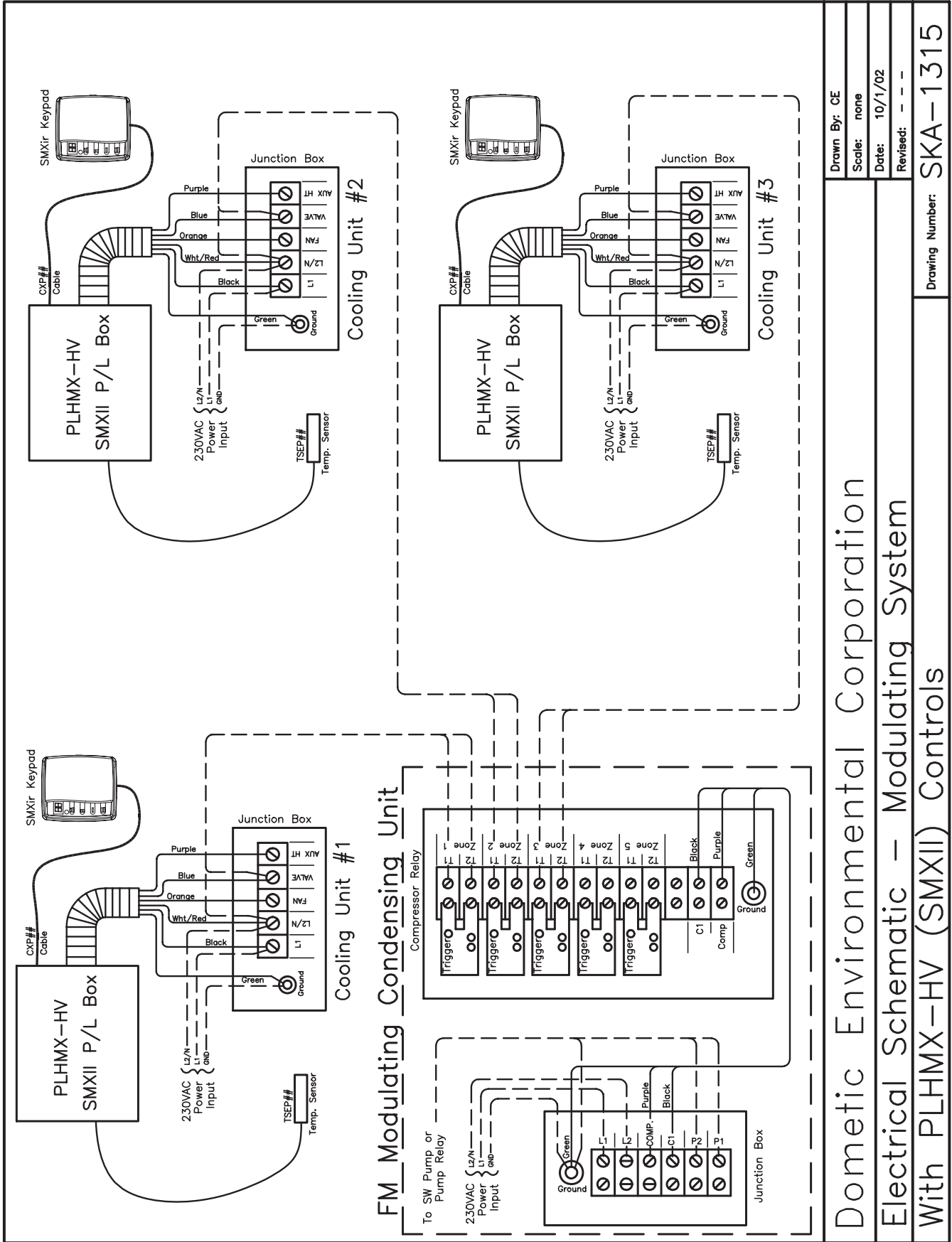


Fig. 19 PLHMV-HV Power Logic Box Wiring Diagram



Dometic Environmental Corporation		Drawn By: CE
Modulating System Wiring Diagram		Scale: none
PLHMV-HV & EHMB		Date: 7/00
P-1071		Revised: 9/30/02
Drawing Number: 082707		

Fig. 20 SMX II Control System Wiring



Dometic Environmental Corporation		Drawn By: CE
Electrical Schematic – Modulating System		Scale: none
With PLHM-X-HV (SMXII) Controls		Date: 10/1/02
		Revised: - - -
		Drawing Number: SKA-1315



**Fig. 21 Modulating Systems Schematic Diagram**

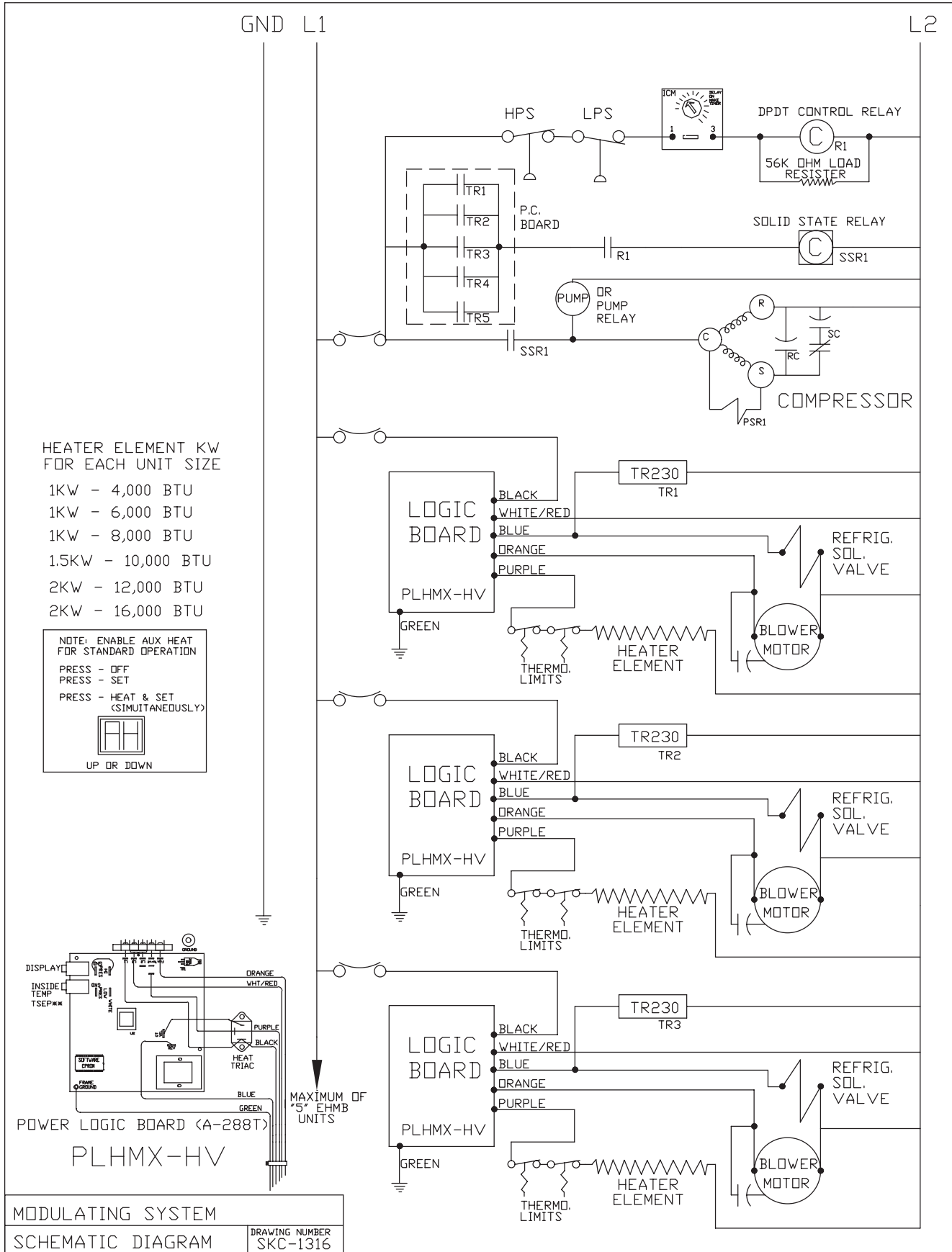
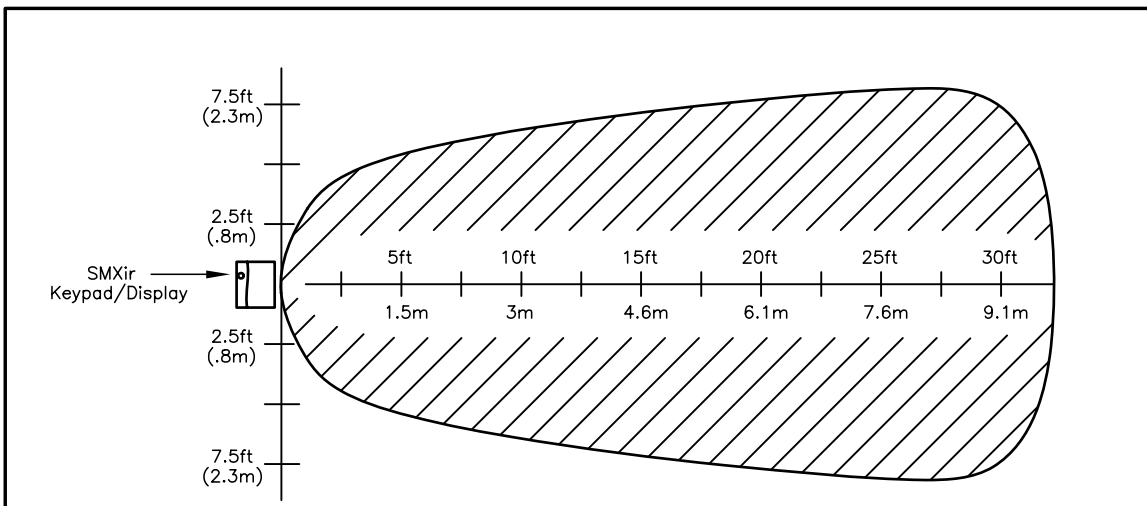


Fig. 22 Replacement SMX II Parts

Model	Description
SMXIRB	SMXir Keypad/Display, Black, 3/4 Door
SMXIRW	SMXir Keypad/Display, White, 3/4 Door
SMXIRB-F	SMXir Keypad/Display, Black, Full Door
SMXIRW-F	SMXir Keypad/Display, White, Full Door
SMXIR-REM	SMXir Remote Control
CXP##	Cable for SMXir keypad (## is length in feet)
5103400	Replacement Full Door for SMXIRB, Black
5103400W	Replacement Full Door for SMXIRW, White
PLHMX-HV	SMX II Power/Logic Box or Mod. Systems, 115/230V
SMXIIAB	SMX II Keypad/Display, Black
PXB	Snap-on cover for SMX II, Black
PXN	Snap-on cover for SMX II, Brown
PXW	Snap-on cover for SMX II, White
PXG	Snap-on cover for SMX II, Beige
CX##	Cable for SMXII keypad (## is length in feet)
TSE##	Temperature Sensor, 3-pin connector (old style)
TSEP##	Temperature Sensor, RJ-11 connector
A-288T	Replacement P/L board, 115/230V, HV
A-281T	Replacement P/L board, 115/230V, large board
<p>Note: Cables are available in lengths from 5 feet to 60 feet. See SMXCABLE drawing for different connectors.</p>	

Fig. 23 SMXir Remote Control Operation Range



# Cruisair Worldwide Service Dealer Locator

The majority of the service listings displayed for the United States are key members of the national Cruisair distributor or master dealer network. If you need service, please contact the closest company shown. In most cases they will direct you to a local dealer or service port. We have over 500 Cruisair dealers in the national Cruisair network, and one should be convenient to you.

The **international** companies listed are, in many cases, distributors and are capable of managing the majority of service requests for the countries listed. In some cases they will refer you to a local dealer.

You may also contact us directly via the web site or call us in the US at (804) 746-1313.

**For a complete and up-to-date Dealer locator list, please visit our website at <http://www.cruisair.com/cruisair/dealer.html>**

## Domestic

### USA

#### **AAP Inc.**

Location: Milford, VA, USA  
Territory: National Coach & Mobile Products Only  
Phone: 804-633-9454  
Fax: 804-633-5499  
Web: [www.aap.com](http://www.aap.com)

#### Alabama

#### **A.E.R. Supply, Inc.**

Location: Seabrook, TX, USA  
Phone: 281-474-3276  
Fax: 281-474-2714  
E-mail: [rsmiller@aersupply.com](mailto:rsmiller@aersupply.com)  
Web: [www.aersupply.com](http://www.aersupply.com)

#### **Thom Chase Heating and A/C**

Location: Chattanooga, TN, USA  
Territory: Northern Alabama, Northern Mississippi, Tennessee, Western Kentucky  
Phone: 423-344-6356  
Fax: 423-344-6356  
E-mail: [thomchase@aol.com](mailto:thomchase@aol.com)

#### Alaska

#### **Southern California Marine Enterprises**

Location: San Diego, CA, USA  
Phone: 619-224-2869  
Fax: 619-226-0496  
E-mail: [sales@southernmarine.com](mailto:sales@southernmarine.com)  
Web: [www.southernmarine.com](http://www.southernmarine.com)

#### Arizona

#### **Southern California Marine Enterprises**

Location: San Diego, CA, USA  
Phone: 619-224-2869  
Fax: 619-226-0496  
E-mail: [sales@southernmarine.com](mailto:sales@southernmarine.com)  
Web: [www.southernmarine.com](http://www.southernmarine.com)

#### Arkansas

#### **A.E.R. Supply, Inc.**

Location: Seabrook, TX, USA  
Phone: 281-474-3276  
Fax: 281-474-2714  
E-mail: [rsmiller@aersupply.com](mailto:rsmiller@aersupply.com)  
Web: [www.aersupply.com](http://www.aersupply.com)

#### California

#### **Southern California Marine Enterprises**

Location: San Diego, CA, USA  
Phone: 619-224-2869  
Fax: 619-226-0496  
E-mail: [sales@southernmarine.com](mailto:sales@southernmarine.com)  
Web: [www.southernmarine.com](http://www.southernmarine.com)

#### Colorado

#### **A.E.R. Supply, Inc.**

Location: Seabrook, TX, USA  
Phone: 281-474-3276  
Fax: 281-474-2714  
E-mail: [rsmiller@aersupply.com](mailto:rsmiller@aersupply.com)  
Web: [www.aersupply.com](http://www.aersupply.com)

#### Connecticut

#### **GDL Services, LLC**

Location: Clinton, CT, USA  
Territory: Connecticut River Area  
Phone: 860-669-5179  
Fax: 860-669-5806

#### **Nautical Air, Inc.**

Location: Copiague, NY, USA  
Territory: CT, DE (N. of Sassafras River), IO, IL, MD (N. of Baltimore), NJ, NY, PA, OH, RI,  
Phone: 631-956-3456  
Fax: 631-956-3479  
E-mail: [sales@nauticalair.com](mailto:sales@nauticalair.com)  
Web: [www.nauticalair.com](http://www.nauticalair.com)

#### Delaware

#### **Annapolis Cruisair**

Location: Annapolis, MD, USA  
Territory: In Md: Baltimore & Areas South; In Delaware: South of the Sassafras River  
Phone: 410-224-0970  
Fax: 410-224-0050  
E-mail: [cruisair45@aol.com](mailto:cruisair45@aol.com)  
Web: [www.annapolis-cruisair.com](http://www.annapolis-cruisair.com)

#### **Nautical Air, Inc.**

Location: Copiague, NY, USA  
Territory: CT, DE (N. of Sassafras River), IO, IL, MD (N. of Baltimore), NJ, NY, PA, OH, RI,  
Phone: 631-956-3456  
Fax: 631-956-3479  
E-mail: [sales@nauticalair.com](mailto:sales@nauticalair.com)  
Web: [www.nauticalair.com](http://www.nauticalair.com)

#### Florida

#### **Cruisair Southeast, A Division of T.K. Alley, Inc.**

Location: Dania Beach, FL, USA  
Territory: Southeast Florida  
Phone: 954-920-0300  
Fax: 954-920-0301  
E-mail: [tkalley@aol.com](mailto:tkalley@aol.com)  
Web: [www.cruisair-southeast.com](http://www.cruisair-southeast.com)

#### **Cruisair Suncoast, Inc.**

Location: St. Petersburg, FL, USA  
Territory: Tampa, St. Petersburg and surrounding areas  
Phone: 727-526-7875  
Fax: 727-528-9519  
E-mail: [cruisairsuncoast@yahoo.com](mailto:cruisairsuncoast@yahoo.com)

#### **Ward's Marine Electric, Inc.**

Location: Ft. Lauderdale, FL, USA  
Territory: Battery Chargers Only  
Phone: 954-523-2815  
Fax: 954-523-1967  
E-mail: [info@wardsmarine.com](mailto:info@wardsmarine.com)

#### Georgia

#### **Beard Marine/Savannah**

Location: Savannah, GA, USA  
Phone: (912) 356-5222  
Fax: (912) 692-1006  
E-mail: [infosavannah@beardmarine.com](mailto:infosavannah@beardmarine.com)  
Web: [www.beardmarine.com](http://www.beardmarine.com)

#### Hawaii

#### **Southern California Marine Enterprises**

Location: San Diego, CA, USA  
Phone: 619-224-2869  
Fax: 619-226-0496  
E-mail: [sales@southernmarine.com](mailto:sales@southernmarine.com)  
Web: [www.southernmarine.com](http://www.southernmarine.com)

#### Idaho

#### **Sure Marine Services Inc.**

Location: Seattle, WA, USA  
Phone: 206-784-9903  
Fax: 206-784-0506  
E-mail: [sales@suremarine.com](mailto:sales@suremarine.com)

#### Illinois

#### **J & S Marine Sales & Service**

Location: Detroit, MI, USA  
Phone: (586) 463-3400  
Fax: (586) 463-1762  
E-mail: [jandsmarine@sbcglobal.net](mailto:jandsmarine@sbcglobal.net)  
Web: [www.jandsmarine.com](http://www.jandsmarine.com)

#### **Midwest Marine Supply**

Location: St. Clair Shores, MI, USA  
Phone: 586-778-8950  
Fax: 586-778-6108

#### **Nautical Air, Inc.**

Location: Copiague, NY, USA  
Territory: CT, DE (N. of Sassafras River), IO, IL, MD (N. of Baltimore), NJ, NY, PA, OH, RI,  
Phone: 631-956-3456  
Fax: 631-956-3479  
E-mail: [sales@nauticalair.com](mailto:sales@nauticalair.com)  
Web: [www.nauticalair.com](http://www.nauticalair.com)

#### Indiana

#### **J & S Marine Sales & Service**

Location: Detroit, MI, USA  
Phone: (586) 463-3400  
Fax: (586) 463-1762  
E-mail: [jandsmarine@sbcglobal.net](mailto:jandsmarine@sbcglobal.net)  
Web: [www.jandsmarine.com](http://www.jandsmarine.com)

#### **Midwest Marine Supply**

Location: St. Clair Shores, MI, USA  
Phone: 586-778-8950  
Fax: 586-778-6108

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Fax: 631-956-3479  
E-mail: [sales@nauticalair.com](mailto:sales@nauticalair.com)  
Web: [www.nauticalair.com](http://www.nauticalair.com)

#### Iowa

#### **J & S Marine Sales & Service**

Location: Detroit, MI, USA  
Phone: (586) 463-3400  
Fax: (586) 463-1762  
E-mail: [jandsmarine@sbcglobal.net](mailto:jandsmarine@sbcglobal.net)  
Web: [www.jandsmarine.com](http://www.jandsmarine.com)

#### **Midwest Marine Supply**

Location: St. Clair Shores, MI, USA  
Phone: 586-778-8950  
Fax: 586-778-6108

Iowa

**Nautical Air, Inc.**

Location: Copiague, NY, USA  
Territory: CT, DE (N. of Sassafras River), IO, IL, MD (N. of Baltimore), NJ, NY, PA, OH, RI,  
Phone: 631-956-3456  
Fax: 631-956-3479  
E-mail: sales@nauticalair.com  
Web: www.nauticalair.com

Kansas

**A.E.R. Supply, Inc.**

Location: Seabrook, TX, USA  
Phone: 281-474-3276  
Fax: 281-474-2714  
E-mail: rsmiller@aersupply.com  
Web: www.aersupply.com

Kentucky

**Thom Chase Heating and A/C**

Location: Chattanooga, TN, USA  
Territory: Northern Alabama, Northern Mississippi, Tennessee, Western Kentucky  
Phone: 423-344-6356  
Fax: 423-344-6356  
E-mail: thomchase@aol.com

Louisiana

**A.E.R. Supply, Inc.**

Location: Seabrook, TX, USA  
Phone: 281-474-3276  
Fax: 281-474-2714  
E-mail: rsmiller@aersupply.com  
Web: www.aersupply.com

**Sea Chest Marine Distr.**

Location: New Orleans, LA, USA  
Territory: Gulf Coast (LA & MS)  
Phone: 800-535-8630  
Fax: 504-288-1758

Maryland

**Annapolis Cruisair**

Location: Annapolis, MD, USA  
Territory: In Md: Baltimore & Areas South; In Delaware: South of the Sassafras River  
Phone: 410-224-0970  
Fax: 410-224-0050  
E-mail: cruisair45@aol.com  
Web: www.annapolis cruisair.com

Maryland (N of Baltimore)

**Nautical Air, Inc.**

Location: Copiague, NY, USA  
Territory: CT, DE (N. of Sassafras River), IO, IL, MD (N. of Baltimore), NJ, NY, PA, OH, RI,  
Phone: 631-956-3456  
Fax: 631-956-3479  
E-mail: sales@nauticalair.com  
Web: www.nauticalair.com

Massachusetts

**World Wide Enterprises**

Location: East Falmouth, MA, USA  
Phone: 508-540-0963  
E-mail: info@worldwideent.net  
Web: www.worldwideent.net

Michigan

**J & S Marine Sales & Service**

Location: Detroit, MI, USA  
Phone: (586) 463-3400  
Fax: (586) 463-1762  
E-mail: jandsmarine@sbcglobal.net  
Web: www.jandsmarine.com

Minnesota

**Midwest Cruisair**

Location: Red Wing, MN, USA  
Territory: Minnesota and Western Wisconsin  
Phone: 651-388-4881  
Fax: 651-388-9186  
E-mail: estelter@redwing.net

Mississippi

**A.E.R. Supply, Inc.**

Location: Seabrook, TX, USA  
Phone: 281-474-3276  
Fax: 281-474-2714  
E-mail: rsmiller@aersupply.com  
Web: www.aersupply.com

**Sea Chest Marine Distr.**

Location: New Orleans, LA, USA  
Territory: Gulf Coast (LA & MS)  
Phone: 800-535-8630  
Fax: 504-288-1758

**Thom Chase Heating and A/C**

Location: Chattanooga, TN, USA  
Territory: Northern Alabama, Northern Mississippi, Tennessee, Western Kentucky  
Phone: 423-344-6356  
Fax: 423-344-6356  
E-mail: thomchase@aol.com

Missouri

**A.E.R. Supply, Inc.**

Location: Seabrook, TX, USA  
Phone: 281-474-3276  
Fax: 281-474-2714  
E-mail: rsmiller@aersupply.com  
Web: www.aersupply.com

Montana

**Sure Marine Services Inc.**

Location: Seattle, WA, USA  
Phone: 206-784-9903  
Fax: 206-784-0506  
E-mail: sales@suremarine.com

Nebraska

**A.E.R. Supply, Inc.**

Location: Seabrook, TX, USA  
Phone: 281-474-3276  
Fax: 281-474-2714  
E-mail: rsmiller@aersupply.com  
Web: www.aersupply.com

Nevada

**A.E.R. Supply, Inc.**

Location: Seabrook, TX, USA  
Phone: 281-474-3276  
Fax: 281-474-2714  
E-mail: rsmiller@aersupply.com  
Web: www.aersupply.com

**Southern California Marine Enterprises**

Location: San Diego, CA, USA  
Phone: 619-224-2869  
Fax: 619-226-0496  
E-mail: sales@southern calmarine.com  
Web: www.southern calmarine.com

New Jersey

**Nautical Air, Inc.**

Location: Copiague, NY, USA  
Territory: CT, DE (N. of Sassafras River), IO, IL, MD (N. of Baltimore), NJ, NY, PA, OH, RI,  
Phone: 631-956-3456  
Fax: 631-956-3479  
E-mail: sales@nauticalair.com  
Web: www.nauticalair.com

New Mexico

**A.E.R. Supply, Inc.**

Location: Seabrook, TX, USA  
Phone: 281-474-3276  
Fax: 281-474-2714  
E-mail: rsmiller@aersupply.com  
Web: www.aersupply.com

New York

**Nautical Air, Inc.**

Location: Copiague, NY, USA  
Territory: CT, DE (N. of Sassafras River), IO, IL, MD (N. of Baltimore), NJ, NY, PA, OH, RI,  
Phone: 631-956-3456  
Fax: 631-956-3479  
E-mail: sales@nauticalair.com  
Web: www.nauticalair.com

North Carolina

**Martin's Marine**

Location: Wilmington, NC, USA  
Territory: North Carolina and Myrtle Beach, SC  
Phone: 910-799-9362  
Fax: 910-793-4267

North Dakota

**A.E.R. Supply, Inc.**

Location: Seabrook, TX, USA  
Phone: 281-474-3276  
Fax: 281-474-2714  
E-mail: rsmiller@aersupply.com  
Web: www.aersupply.com

Ohio

**Nautical Air, Inc.**

Location: Copiague, NY, USA  
Territory: CT, DE (N. of Sassafras River), IO, IL, MD (N. of Baltimore), NJ, NY, PA, OH, RI,  
Phone: 631-956-3456  
Fax: 631-956-3479  
E-mail: sales@nauticalair.com  
Web: www.nauticalair.com

Oklahoma

**A.E.R. Supply, Inc.**

Location: Seabrook, TX, USA  
Phone: 281-474-3276  
Fax: 281-474-2714  
E-mail: rsmiller@aersupply.com  
Web: www.aersupply.com

Oregon

**Sure Marine Services Inc.**

Location: Seattle, WA, USA  
Phone: 206-784-9903  
Fax: 206-784-0506  
E-mail: sales@suremarine.com

Pennsylvania

**Nautical Air, Inc.**

Location: Copiague, NY, USA  
Territory: CT, DE (N. of Sassafras River), IO, IL, MD (N. of Baltimore), NJ, NY, PA, OH, RI,  
Phone: 631-956-3456  
Fax: 631-956-3479  
E-mail: sales@nauticalair.com  
Web: www.nauticalair.com

Rhode Island

**Cay Electronics**

Location: Portsmouth, Rhode Island, USA  
Territory: Rhode Island  
Phone: 401-683-3520  
Fax: 401-683-3633  
Web: www.cayelectronics.com

**Nautical Air, Inc.**

Location: Copiague, NY, USA  
Territory: CT, DE (N. of Sassafras River), IO, IL, MD (N. of Baltimore), NJ, NY, PA, OH, RI,  
Phone: 631-956-3456  
Fax: 631-956-3479  
E-mail: sales@nauticalair.com  
Web: www.nauticalair.com

South Carolina

**Atlantic Boat ACR**

Location: Johns Island, SC, USA  
Phone: 843-557-0788  
Fax: 843-557-0786  
E-mail: info@atlanticboatacr.com  
Web: www.atlanticboatacr.com

## South Carolina

### **Martin's Marine**

Location: Wilmington, NC, USA  
Territory: North Carolina and Myrtle Beach, SC  
Phone: 910-799-9362  
Fax: 910-793-4267

## South Dakota

### **A.E.R. Supply, Inc.**

Location: Seabrook, TX, USA  
Phone: 281-474-3276  
Fax: 281-474-2714  
E-mail: rsmiller@aersupply.com  
Web: www.aersupply.com

## Tennessee

### **Thom Chase Heating and A/C**

Location: Chattanooga, TN, USA  
Territory: Northern Alabama, Northern Mississippi, Tennessee, Western Kentucky  
Phone: 423-344-6356  
Fax: 423-344-6356  
E-mail: thomchase@aol.com

## Texas

### **A.E.R. Supply, Inc.**

Location: Seabrook, TX, USA  
Phone: 281-474-3276  
Fax: 281-474-2714  
E-mail: rsmiller@aersupply.com  
Web: www.aersupply.com

## Utah

### **A.E.R. Supply, Inc.**

Location: Seabrook, TX, USA  
Phone: 281-474-3276  
Fax: 281-474-2714  
E-mail: rsmiller@aersupply.com  
Web: www.aersupply.com

### **Southern California Marine Enterprises**

Location: San Diego, CA, USA  
Phone: 619-224-2869  
Fax: 619-226-0496  
E-mail: sales@southerncalmarine.com  
Web: www.southerncalmarine.com

## Virginia

### **Lamy Marine, Inc.**

Location: Chesapeake, VA, USA  
Phone: 757-494-3747  
Fax: 757-494-3740  
E-mail: lamy.marine@verizon.net

## Washington

### **Sure Marine Services Inc.**

Location: Seattle, WA, USA  
Phone: 206-784-9903  
Fax: 206-784-0506  
E-mail: sales@suremarine.com

## Wisconsin (East)

### **J & S Marine Sales & Service**

Location: Detroit, MI, USA  
Phone: (586) 463-3400  
Fax: (586) 463-1762  
E-mail: jandsmarine@sbcglobal.net  
Web: www.jandsmarine.com

### **Midwest Marine Supply**

Location: St. Clair Shores, MI, USA  
Phone: 586-778-8950  
Fax: 586-778-6108

## Wisconsin (West)

### **Midwest Cruisair**

Location: Red Wing, MN, USA  
Territory: Minnesota and Western Wisconsin  
Phone: 651-388-4881  
Fax: 651-388-9186  
E-mail: estelter@redwing.net

## Wyoming

### **A.E.R. Supply, Inc.**

Location: Seabrook, TX, USA  
Phone: 281-474-3276  
Fax: 281-474-2714  
E-mail: rsmiller@aersupply.com  
Web: www.aersupply.com

## International

### **Angola**

#### **Southern Power Products**

Location: Cape Town, South Africa  
Phone: 27-21-511-0653  
Fax: 27-21-510-3049  
E-mail: sales@southernpower.co.za

### **Antigua**

#### **Aboard Refrigeration**

Location: English Harbour, Antigua  
Phone: 268-460-1690  
Fax: 419-858-0544  
E-mail: aboardrf@candw.ag

#### **The Signal Locker**

Location: English Harbour, Antigua  
Phone: 268-460-1528  
Fax: 268-460-1148  
E-mail: lockers@candw.ag

### **Argentina**

#### **Trimer S.A.**

Location: Buenos Aires, Argentina  
Phone: 5411-4580-0444  
Fax: 5411-4580-0440  
E-mail: trimer@trimer.com.ar  
Web: www.trimer.com.ar

### **Australia**

#### **Seabreeze Industries**

Location: Coomera, Queensland, Australia  
Phone: 61-7-55806371  
Fax: 61-7-55806372  
E-mail: sales@seabreeze-industries.com.au  
Web: www.seabreeze-industries.com.au

### **Austria**

#### **Domestic Marine - Italy, Sales Company**

Location: Milano, Italy  
Phone: 39 0362 44182  
Fax: 39 0362 452226  
E-mail: marine.info@dometic.it

#### **Nautica Centis di Nespolo Cinzia & C. Sne**

Location: Bevazzana de Latisana (UD), Italy  
Territory: Northeast Italy, Austria, Croatia, Slovenia  
Phone: 390-431-53-644  
Fax: 390-431-53-460  
E-mail: nautica.centis@nauticacentis.it  
Web: www.nauticacentis.it

### **Bahamas**

#### **Freezing Point, Ltd.**

Location: Nassau, Bahamas  
Phone: 242-325-3589  
Fax: 242-356-5271  
E-mail: freezingpoint@bahamas.net.bs

#### **Nixon's Refrigeration**

Location: Abaco, Bahamas  
Territory: Abaco Island only  
Phone: 242-367-5219  
Fax: 242-367-5219  
E-mail: seannixon@email.com

## **Bahrain**

### **2000 Marine Stores**

Location: Manama, Bahrain  
Phone: 973-742-777  
Fax: 973-742-255

### **Mantech**

Location: Dubai, United Arab Emirates  
Phone: 971 4 333 25 42  
Fax: 971 4 333 06 49  
E-mail: mge@emirates.net.ae

## **Bangladesh**

### **Tripower Corporation Pte Ltd**

Location: , Singapore  
Phone: (65) 6861 1188  
Fax: (65) 6861 4263  
E-mail: mgt@tripower.com.sg  
Web: www.tritex.com.sg

## **Belgium**

### **Eberca**

Location: , Netherlands  
Phone: 31 186621955  
Fax: 31 186621818  
E-mail: info@eberca.nl

## **Bermuda**

### **Flatt's Marine**

Location: St. Georges, Bermuda  
Phone: 441-293-5740  
Fax: 441-293-5740

## **Botswana**

### **Southern Power Products**

Location: Cape Town, South Africa  
Phone: 27-21-511-0653  
Fax: 27-21-510-3049  
E-mail: sales@southernpower.co.za

## **Brazil**

### **Sailing Products**

Location: Rio de Janeiro, Brazil  
Phone: 55 (0) 21 3154-9990  
Fax: 55 (0) 21 2494-7223  
E-mail: sailing@sailing.com.br

### **Sailing Products**

Location: Sao Paulo, Brazil  
Phone: 55 (0) 11 81 1985  
Fax: 55 (0) 11 81 1936

## **British Virgin Islands**

### **Cay Electronics Ltd.**

Location: Tortola, British Virgin Islands  
Phone: 284-494-2400  
Fax: 284-494-5389  
E-mail: caybvi@candwbvi.net  
Web: www.cayelectronics.com

### **Parts And Power**

Location: Tortola, British Virgin Islands  
Phone: 284-494-2830  
Fax: 284-494-1584  
E-mail: info@partsandpower.com

## **British West Indies**

### **Caribbean Marine & Diesel**

Location: Turks and Caicos Islands, British West Indies  
Phone: 649-941-5903  
Fax: 649-941-5902  
E-mail: caribmarinediesel@tcway.com

### **Marine Power**

Location: Grand Cayman Island, British West Indies  
Phone: 345-947-1945  
Fax: 345-947-1909  
E-mail: mpower@candw.ky

## Canada

### British Columbia

#### Accutemp Refrigeration and Air Conditioning

Location: Victoria, BC, Canada  
Territory: Western Canada  
Phone: 250-475-2665  
Fax: 250-475-1957  
E-mail: info@accutemp.ca  
Web: www.accutemp.ca

#### Airon Heating And Air Conditioning

Location: Richmond, BC, Canada  
Territory: Western Canada  
Phone: 604-270-2040  
Fax: 604-270-3888  
E-mail: dmairon@telus.net  
Web: www.aironhvac.com

### Ontario

#### J & S Marine Sales & Service

Location: Detroit, MI, USA  
Phone: (586) 463-3400  
Fax: (586) 463-1762  
E-mail: jandsmarine@sbcglobal.net  
Web: www.jandsmarine.com

#### Northland Supply Company

Location: Queensville, ON, Canada  
Phone: 905-478-2244  
Fax: 905-478-2295  
E-mail: norsupco@aol.com  
Web: www.norsupco.com

## Caribbean Islands

#### Aboard Refrigeration

Location: English Harbour, Antigua  
Phone: 268-460-1690  
Fax: 419-858-0544  
E-mail: aboardrf@candw.ag

#### B&R Marine

Location: Santo Domingo, Dominican Republic  
Territory: Dominican Republic  
Phone: 809-562-1661 ext 7303  
Fax: 809-562-1521  
E-mail: hsosa@navierasbr.com

#### C.S. Services

Location: Martinique, French West Indies  
Phone: 596-749113  
Fax: 596-749174

#### Caraibe Greemant

Location: Le Marin, Martinique, French West Indies  
Phone: 596 596 74 80 33  
E-mail: cgmar@wanadoo.fr

#### Caribbean Marine & Diesel

Location: Turks and Caicos Islands, British West Indies  
Phone: 649-941-5903  
Fax: 649-941-5902  
E-mail: caribmarinediesel@tcwayway.tc

#### Cay Electronics Ltd.

Location: Tortola, British Virgin Islands  
Phone: 284-494-2400  
Fax: 284-494-5389  
E-mail: caybvi@candwbvi.net  
Web: www.cayelectronics.com

#### Centro Cruisair de Puerto Rico

Location: Santurce, Puerto Rico  
Phone: 787-727-3637  
Fax: 787-727-3637

#### Cool-Tech Air Conditioning

Location: Fajardo, Puerto Rico  
Phone: (787) 860-2615  
Fax: (787) 801-2050  
E-mail: cooltech@ispr.net

#### Coral Bay Marine Service

Location: St. John, U.S. Virgin Islands  
Phone: 340-776-6859  
Fax: 340-776-6859

#### Dr. Ice

Location: St. Thomas, US Virgin Islands  
Territory: St. Thomas  
Phone: 340-513-9072  
Fax: 340-775-6576  
E-mail: davidgott@hotmail.com;

#### Enertech N.V.

Location: Simpson Bay, St. Maarten/St. Martin, Netherlands Antilles  
Phone: 599-551-2145  
Fax: 305-675-5857 (USA)  
E-mail: service@enertechnv.com  
Web: www.enertechnv.com

#### Freezing Point, Ltd.

Location: Nassau, Bahamas  
Phone: 242-325-3589  
Fax: 242-356-5271  
E-mail: freezingpoint@bahamas.net.bs

#### Frostline

Location: , St. Maarten/St. Martin, Netherlands Antilles  
Phone: 599 522 9610 (Technical)  
Fax: 599 544 3263  
E-mail: paul@frostline.biz (technical); qlvn@frostline.biz

#### Hitchcraft Co.

Location: Curacao, Netherlands Antilles  
Phone: 5999 667 3349  
Fax: 501-641-2708 (US Line)  
E-mail: hcraft@attglobal.net; hitchcraft@hotmail.com

#### Iceberg Refrigeration

Location: Guadeloupe, French West Indies  
Phone: 590-24 35 35  
Fax: 590-24 35 35  
E-mail: iceberg.refrigeration@wanadoo.fr

#### Marine Power

Location: Grand Cayman Island, British West Indies  
Phone: 345-947-1945  
Fax: 345-947-1909  
E-mail: mpower@candw.ky

#### May Day Marine

Location: San Juan, Puerto Rico  
Territory: Puerto Rico, Dominican Republic  
Phone: 787-637-0756  
Fax: 787-790-2551

#### Nau-T-Kol Marine Refrigeration

Location: Chaguaramas, Trinidad  
Phone: 868-634-2174  
Fax: 868-634-2174  
E-mail: nautkol@cablet.net  
Web: www.nautkol.com

#### Nixon's Refrigeration

Location: Abaco, Bahamas  
Territory: Abaco Island only  
Phone: 242-367-5219  
Fax: 242-367-5219  
E-mail: seannixon@email.com

#### Outfitters International

Location: St. Georges, Grenada  
Phone: 473-440-7949  
Fax: 473-440-6680  
E-mail: footloos@caribsurf.com

#### Parts And Power

Location: Tortola, British Virgin Islands  
Phone: 284-494-2830  
Fax: 284-494-1584  
E-mail: info@partsandpower.com

#### Reefco

Location: St. Thomas, U.S. Virgin Islands  
Phone: 340-776-0038  
Fax: 340-776-0038  
E-mail: dennyedy@viaccess.net

#### Regis Electronics (St Lucia) LTD.

Location: St. Lucia, West Indies  
Phone: 758-452-0205  
Fax: 758-452-0206  
E-mail: stlucia@regiselectronics.com

#### St. Croix Marine Corp.

Location: St. Croix, U.S. Virgin Islands  
Phone: 340-773-0289  
Fax: 340-778-8974  
E-mail: stcroixmarine@hotmail.com

#### Sun Cool Air Conditioning Corp

Location: Carolina, Puerto Rico  
Phone: 787-791-6971  
Fax: 787-791-3885  
E-mail: suncool1@coqui.net

#### Technical House (E.T.S. Inc.)

Location: San Juan, Puerto Rico  
Territory: Sentry Battery Chargers Only  
Phone: 787-781-1313  
Fax: 787-781-2020  
E-mail: idonato@technicalhouse.com  
Web: www.technicalhouse.com

#### The Signal Locker

Location: English Harbour, Antigua  
Phone: 268-460-1528  
Fax: 268-460-1148  
E-mail: lockers@candw.ag

## China

#### Chi-Mo Inc.

Location: Shanghai, China  
Phone: 8621-5917-1111  
Fax: 8621-5917-1166  
E-mail: sales@springfieldmarine.com.cn  
Web: www.springfieldmarine.com.cn

#### Tripower Corporation Pte Ltd

Location: , Singapore  
Phone: (65) 6861 1188  
Fax: (65) 6861 4263  
E-mail: mqt@tripower.com.sg  
Web: www.tritex.com.sg

#### Tripower Corporation Pte Ltd

Location: Shanghai, Beijing, Guangzhou, Wuhan, China  
Phone: 8621-5240-2638  
Fax: 8621-5240-2153  
E-mail: tritex@public.sta.net.cn  
Web: www.tritex.com.sg

## Costa Rica

#### Gato Frío

Location: Marina Los Sueños, Costa Rica  
Territory: Costa Rica, Panama  
Phone: 506-637-7419  
Fax: 506-637-7180  
E-mail: eric@yachtshare.net

#### Metro Marine

Location: Herradura Bay, Costa Rica  
Phone: 506-643-2409  
Fax: 506-643-2409  
Web: marinemetro@racsa.co.cr

## Croatia

#### Dometic Marine - Italy, Sales Company

Location: Milano, Italy  
Phone: 39 0362 44182  
Fax: 39 0362 452226  
E-mail: marine.info@dometic.it

#### Nautica Centis di Nespolo Cinzia & C. Sne

Location: Bevazzana de Latisana (UD), Italy  
Territory: Northeast Italy, Austria, Croatia, Slovenia  
Phone: 390-431-53-644  
Fax: 390-431-53-460  
E-mail: nautica.centis@nauticacentis.it  
Web: www.nauticacentis.it



## Cyprus

### Dometic Marine - United Kingdom, Sales Company

Location: Poole, Dorset, United Kingdom  
Phone: 44 870 3306101  
Fax: 44 870 3306102  
E-mail: sales@dometicmarine.com  
Web: www.dometic.com

### Tuti Mare Trading Ltd

Location: Limassol, Cyprus  
Phone: 35 725 431313  
Fax: 35 725 431300  
E-mail: tutimare@cytanet.com.cy

## Dominican Republic

### B&R Marine

Location: Santo Domingo, Dominican Republic  
Territory: Dominican Republic  
Phone: 809-562-1661 ext 7303  
Fax: 809-562-1521  
E-mail: hsosa@navierasbr.com

### May Day Marine

Location: San Juan, Puerto Rico  
Territory: Puerto Rico, Dominican Republic  
Phone: 787-637-0756  
Fax: 787-790-2551

## Ecuador

### Navas-Bustos Representaciones

Location: Guayaquil, Ecuador  
Phone: 593-2-252542  
Fax: 593-2-251-421

## Egypt

### Climate Company

Location: Cairo, Egypt  
Phone: 20-2-2598092  
Fax: 20-2-4523028  
E-mail: climate@tedata.net.eg

## Eritrea

### DM Electrical Engineering

Location: Asmara, Eritrea  
Phone: 291-1-126737  
Fax: 291-1-127650

## France

### Dometic Marine - France, Sales Company

Location: 60 128 Plailly, France  
Phone: Cell: 0033 (0)680 415 543  
Fax: 0033 (0)344 633 518  
E-mail: marine.sales@dometic.fr

### Polymarine Distribution

Location: Cannet, Rocheville, France  
Phone: 0033 493463634  
Fax: 0033 493463634  
E-mail: polymarine.bayle@free.fr

## French West Indies

### C.S. Services

Location: Martinique, French West Indies  
Phone: 596-749113  
Fax: 596-749174

### Caraibe Greemant

Location: Le Marin, Martinique, French West Indies  
Phone: 596 596 74 80 33  
E-mail: cgmar@wanadoo.fr

### Iceberg Refrigeration

Location: Guadeloupe, French West Indies  
Phone: 590-24 35 35  
Fax: 590-24 35 35  
E-mail: iceberg.refrigeration@wanadoo.fr

## Germany

### GEMO GmbH

Location: Travemunde, Germany  
Phone: 49-4502-2466  
Fax: 49-4502-2425  
E-mail: gemo\_gmbh@t-online.de  
Web: www.gemo\_online.de

## Greece

### Aegean Diesel Electric LT

Location: , Piraeus, Greece  
Phone: 3014222484  
Fax: 3014175201  
E-mail: info@ade-marine.gr

### Dometic Marine - United Kingdom, Sales Company

Location: Poole, Dorset, United Kingdom  
Phone: 44 870 3306101  
Fax: 44 870 3306102  
E-mail: sales@dometicmarine.com  
Web: www.dometic.com

### Polfrost Technical Ltd.

Location: Piraeus, Greece  
Phone: 30-210-461-3370  
Fax: 30-210-461-4376

## Grenada

### Outfitters International

Location: St. Georges, Grenada  
Phone: 473-440-7949  
Fax: 473-440-6680  
E-mail: footloos@caribsurf.com

## Guam

### Fentress Refrigeration Service Co.

Location: Tamuning, Guam  
Phone: 671-565-4038  
Fax: 671-565-3315

## Guatemala

### Automotores y Marina, S.A.

Location: Villa Nueva, Guatemala  
Phone: 502-6631-2033  
Fax: 502-6631-2034  
E-mail: info@automotoresmarina.com

## Hong Kong

### Astral Marine, Ltd.

Location: Sai Kung, NT, Hong Kong  
Phone: 852-271 959 82  
Fax: 852-219 444 63  
E-mail: funcle@pacific.net.hk  
Web: www.astral.com.hk

### Tripower International (HK) Ltd

Location: Kowloon, Hong Kong  
Phone: (852) 2341-3329  
Fax: (852) 2343-1830  
E-mail: hk-sales@tripower.com.sg

## Indonesia

### Tripower Corporation Pte Ltd

Location: , Singapore  
Phone: (65) 6861 1188  
Fax: (65) 6861 4263  
E-mail: mgt@tripower.com.sg  
Web: www.tritex.com.sg

## Israel

### Yamit Ltd.

Location: Ramat-Gan, Israel  
Phone: 972 3 6123192  
Fax: 972 3 6123197  
E-mail: nathan@yamit-mil.com

## Italy

### Cummins Diesel Italia S.P.A

Location: Milan, Italy  
Territory: Central & Southern Italy  
Phone: 39 02 51 655 856  
Fax: 39 02 51 65 58 55  
E-mail: luigi.casaburi@cummins.com

### Dometic Marine - Italy, Sales Company

Location: Milano, Italy  
Phone: 39 0362 44182  
Fax: 39 0362 452226  
E-mail: marine.info@dometic.it

### Nautica Centis di Nespolo Cinzia & C. Sne

Location: Bevazzana de Latisana (UD), Italy  
Territory: Northeast Italy, Austria, Croatia, Slovenia  
Phone: 390-431-53-644  
Fax: 390-431-53-460  
E-mail: nautica.centis@nauticacentis.it  
Web: www.nauticacentis.it

## Japan

### Gunji Corporation

Location: Osaka, Japan  
Phone: 81-6-6451-5615  
Fax: 81-6-6454-0056  
E-mail: gunji@gunji.com  
Web: www.gunji.com

## Kuwait

### Mantech

Location: Dubai, United Arab Emirates  
Phone: 971 4 333 25 42  
Fax: 971 4 333 06 49  
E-mail: mge@emirates.net.ae

### Seas & Deserts Group

Location: Al-shawikh, Kuwait  
Phone: 965-4849212  
Fax: 965-4820913

## Luxembourg

### Eberca

Location: , Netherlands  
Phone: 31 186621955  
Fax: 31 186621818  
E-mail: info@eberca.nl

## Malaysia

### Tripower Corporation Pte Ltd

Location: , Singapore  
Phone: (65) 6861 1188  
Fax: (65) 6861 4263  
E-mail: mgt@tripower.com.sg  
Web: www.tritex.com.sg

## Maldives

### Tripower Corporation Pte Ltd

Location: , Singapore  
Phone: (65) 6861 1188  
Fax: (65) 6861 4263  
E-mail: mgt@tripower.com.sg  
Web: www.tritex.com.sg

### Wheel Engineering Services

Location: Malé, Maldives  
Territory: Maldives  
Phone: 960-3327806  
Fax: 960-3324145  
E-mail: wes@avasmail.com.mv

## Malta

### Dometic Marine - United Kingdom, Sales Company

Location: Poole, Dorset, United Kingdom  
Phone: 44 870 3306101  
Fax: 44 870 3306102  
E-mail: sales@dometicmarine.com  
Web: www.dometic.com

## Inmartech Ltd

Location: Swieqi, STJ 04, Malta  
Territory: Malta  
Phone: 356 21376476  
Fax: 356 21376476  
E-mail: inmartech@waldonet.net.mt

## Mexico

### Southern California Marine Enterprises

Location: San Diego, CA, USA  
Phone: 619-224-2869  
Fax: 619-226-0496  
E-mail: sales@southernmarine.com  
Web: www.southernmarine.com

## Monaco

### Polymarine Distribution

Location: Cannet, Rocheville, France  
Phone: 0033 493463634  
Fax: 0033 493463634  
E-mail: polymarine.baile@free.fr

## Mozambique

### Southern Power Products

Location: Cape Town, South Africa  
Phone: 27-21-511-0653  
Fax: 27-21-510-3049  
E-mail: sales@southernpower.co.za

## Myanmar

### Tripower Corporation Pte Ltd

Location: , Singapore  
Phone: (65) 6861 1188  
Fax: (65) 6861 4263  
E-mail: mgt@tripower.com.sg  
Web: www.tritex.com.sg

## Namibia

### Southern Power Products

Location: Cape Town, South Africa  
Phone: 27-21-511-0653  
Fax: 27-21-510-3049  
E-mail: sales@southernpower.co.za

## Netherlands

### Eberca

Location: , Netherlands  
Phone: 31 186621955  
Fax: 31 186621818  
E-mail: info@eberca.nl

## Netherlands Antilles

### Enertech N.V.

Location: Simpson Bay, St. Maarten/St. Martin, Netherlands Antilles  
Phone: 599-551-2145  
Fax: 305-675-5857 (USA)  
E-mail: service@enertechnv.com  
Web: www.enertechnv.com

### Frostline

Location: , St. Maarten/St. Martin, Netherlands Antilles  
Phone: 599 522 9610 (Technical)  
Fax: 599 544 3263  
E-mail: paul@frostline.biz (technical); glyn@frostline.biz

### Hitchcraft Co.

Location: Curacao, Netherlands Antilles  
Phone: 5999 667 3349  
Fax: 501-641-2708 (US Line)  
E-mail: hcraft@attglobal.net; hitchcraft@hotmail.com

## New Caledonia

### Altomarine

Location: Noumea, New Caledonia  
Phone: 687 25 96 12  
Fax: 687 25 43 30  
E-mail: altomar@altomarine.com

## New Zealand

### Whiting Power Systems

Location: Auckland, New Zealand  
Phone: 64-9-358-2050  
Fax: 64-9-358-0285  
E-mail: sales@whiting.co.nz  
Web: www.whitingpower.com

## Norway

### Refnor A.S.

Location: Østerås, Norway  
Phone: 47-67 14 07 50  
Fax: 47-67 14 70 88  
E-mail: refnor.as@c2i.net

## Oman

### Mantech

Location: Dubai, United Arab Emirates  
Phone: 971 4 333 25 42  
Fax: 971 4 333 06 49  
E-mail: mqe@emirates.net.ae

### OHI Marine LLC

Location: Muscat, Oman  
Phone: 968-712240  
Fax: 968-712085

## Pakistan

### Communications & Machinery Corp.

Location: Karachi, Pakistan  
Phone: 92-21-5678252  
Fax: 92-21-5683283  
E-mail: cmcorp@cyber.net.pk

## Panama

### Compañía Evans Masters

Location: La Chorrera, Panama  
Territory: Panama  
Phone: 507-232-7648  
Fax: 507-232-7648  
E-mail: info@evansmasters.com  
Web: www.evansmasters.com

### Gato Frío

Location: Marina Los Sueños, Costa Rica  
Territory: Costa Rica, Panama  
Phone: 506-637-7419  
Fax: 506-637-7180  
E-mail: eric@yachtshare.net

## Papua New Guinea

### Lohberger Engineering Pty

Location: Pors Moresby, Papua New Guinea  
Phone: 675-321-2122  
Fax: 675-321-2704  
E-mail: loheng@online.net.pg

## Peru

### Corporación Frío Novo SAC

Location: Lima (La Molina), Peru  
Phone: (511) 451-5052  
E-mail: frionovo@infonegocio.net.pe

## Philippines

### Tripower Corporation Pte Ltd

Location: , Singapore  
Phone: (65) 6861 1188  
Fax: (65) 6861 4263  
E-mail: mgt@tripower.com.sg  
Web: www.tritex.com.sg

## Portugal

### PowerCool LDA

Location: Albufeira, Portugal  
Phone: 351 917 866 373  
Fax: 351 289 587 005  
E-mail: info@powercool.org  
Web: www.powercool.org

## Puerto Rico

### Centro Cruisair de Puerto Rico

Location: Santurce, Puerto Rico  
Phone: 787-727-3637  
Fax: 787-727-3637

### Cool-Tech Air Conditioning

Location: Fajardo, Puerto Rico  
Phone: (787) 860-2615  
Fax: (787) 801-2050  
E-mail: cooltech@isppr.net

### May Day Marine

Location: San Juan, Puerto Rico  
Territory: Puerto Rico, Dominican Republic  
Phone: 787-637-0756  
Fax: 787-790-2551

### Sun Cool Air Conditioning Corp

Location: Carolina, Puerto Rico  
Phone: 787-791-6971  
Fax: 787-791-3885  
E-mail: suncool1@coqui.net

### Technical House (E.T.S. Inc.)

Location: San Juan, Puerto Rico  
Territory: Sentry Battery Chargers Only  
Phone: 787-781-1313  
Fax: 787-781-2020  
E-mail: idonato@technicalhouse.com  
Web: www.technicalhouse.com

## Qatar

### Al-Badi Trading Co.

Location: Doha, Qatar  
Phone: 9744320715  
Fax: 9744442888

### Mantech

Location: Dubai, United Arab Emirates  
Phone: 971 4 333 25 42  
Fax: 971 4 333 06 49  
E-mail: mqe@emirates.net.ae

## Russia

### Standarte

Location: Starbeevo, Moscow region, Russia  
Phone: 7 095 575 67 23  
Fax: 7 095 575 39 77  
E-mail: info@standarte.ru  
Web: www.standarte.ru

## Saudi Arabia

### Mantech

Location: Dubai, United Arab Emirates  
Phone: 971 4 333 25 42  
Fax: 971 4 333 06 49  
E-mail: mqe@emirates.net.ae

### Samaco Marine Division

Location: Jeddah, Saudi Arabia  
Phone: 966-2-6992300  
Fax: 966-2-6991024

## Scandinavia

### Domestic Marine - Nordic Sales, Sales Company

Location: Halmstad, Sweden  
Phone: +46 35 16 57 00  
Fax: +46 35 16 57 10  
E-mail: marine.info@domestic.se  
Web: www.domestic.com

### Refnor A.S.

Location: Østerås, Norway  
Phone: 47-67 14 07 50  
Fax: 47-67 14 70 88  
E-mail: refnor.as@c2i.net

## Singapore

### Tripower Corporation Pte Ltd

Location: , Singapore  
Phone: (65) 6861 1188  
Fax: (65) 6861 4263  
E-mail: mgt@tripower.com.sg  
Web: www.tritex.com.sg

## Slovenia

### Dometic Marine - Italy, Sales Company

Location: Milano, Italy  
Phone: 39 0362 44182  
Fax: 39 0362 452226  
E-mail: marine.info@dometic.it

### Nautica Centis di Nespolo Cinzia & C. Sne

Location: Bevazzana de Latisana (UD), Italy  
Territory: Northeast Italy, Austria, Croatia, Slovenia  
Phone: 390-431-53-644  
Fax: 390-431-53-460  
E-mail: nautica.centis@nauticacentis.it  
Web: www.nauticacentis.it

## South Africa

### Southern Power Products

Location: Cape Town, South Africa  
Phone: 27-21-511-0653  
Fax: 27-21-510-3049  
E-mail: sales@southernpower.co.za

## Spain

### Acastimar

Location: Tarragona, Spain  
Phone: 349-77-362118  
Fax: 349-77-362687  
E-mail: acastimar@acastimar.com

## Sri Lanka

### G&M Enterprises

Location: Borella-Colombo 8, Sri Lanka  
Phone: 94-11-2691966  
Fax: 94-11-2691751  
E-mail: gandm@sltnet.lk

## Sweden

### Dometic Marine - Nordic Sales, Sales Company

Location: Halmstad, Sweden  
Phone: +46 35 16 57 00  
Fax: +46 35 16 57 10  
E-mail: marine.info@dometic.se  
Web: www.dometic.com

## Switzerland

### Marine Parts Heimgartner

Location: Volketswil, Switzerland  
Phone: 41-1-997 40 90  
Fax: 41-1-997 40 94  
E-mail: info@marineparts.ch  
Web: www.marineparts.ch

## Taiwan

### Ing Hai Company, Ltd.

Location: Kaohsiung, Taiwan  
Phone: 886-7-802-1809  
Fax: 886-7-802-1809

### Ing Hai Company, Ltd.

Location: Taipei, Taiwan  
Phone: 886-2-2531-2088  
Fax: 886-2-2523-6531  
E-mail: inghai@tpts6.seed.net.tw

## Thailand

### Thai Kolon Co. Ltd.

Location: Bangkok, Thailand  
Phone: 66-2-745-6468-77 (10 lines)  
Fax: 66-2-745-6152  
E-mail: thaikolon@thaikolon.com

## Trinidad & Tobago

### Nau-T-Kol Marine Refrigeration

Location: Chaguaramas, Trinidad  
Phone: 868-634-2174  
Fax: 868-634-2174  
E-mail: nautkol@cablet.net  
Web: www.nautkol.com

## Turkey

### Dometic Marine - United Kingdom, Sales Company

Location: Poole, Dorset, United Kingdom  
Phone: 44 870 3306101  
Fax: 44 870 3306102  
E-mail: sales@dometicmarine.com  
Web: www.dometic.com

### Egamar Mühendislik Ltd

Location: Istanbul, Turkey  
Phone: 90 216 494 2168  
Fax: 90 216 494 22 18  
E-mail: sales@egemar.com.tr  
Web: www.egemar.com.tr

## U.S. Virgin Islands

### Coral Bay Marine Service

Location: St. John, U.S. Virgin Islands  
Phone: 340-776-6859  
Fax: 340-776-6859

### Dr. Ice

Location: St. Thomas, US Virgin Islands  
Territory: St. Thomas  
Phone: 340-513-9072  
Fax: 340-775-6576  
E-mail: davidgott@hotmail.com;

### Reefco

Location: St. Thomas, U.S. Virgin Islands  
Phone: 340-776-0038  
Fax: 340-776-0038  
E-mail: dennyedy@viaccess.net

### St. Croix Marine Corp.

Location: St. Croix, U.S. Virgin Islands  
Phone: 340-773-0289  
Fax: 340-778-8974  
E-mail: stcroixmarine@hotmail.com

## Ukraine

### Standarte

Location: Starbevo, Moscow region, Russia  
Phone: 7 095 575 67 23  
Fax: 7 095 575 39 77  
E-mail: info@standarte.ru  
Web: www.standarte.ru

## United Arab Emirates

### Mantech

Location: Dubai, United Arab Emirates  
Phone: 971 4 333 25 42  
Fax: 971 4 333 06 49  
E-mail: mge@emirates.net.ae

## United Kingdom

### Dometic Marine - United Kingdom, Sales Company

Location: Poole, Dorset, United Kingdom  
Phone: 44 870 3306101  
Fax: 44 870 3306102  
E-mail: sales@dometicmarine.com  
Web: www.dometic.com

## Uruguay

### Trimer S.A.

Location: Buenos Aires, Argentina  
Phone: 5411-4580-0444  
Fax: 5411-4580-0440  
E-mail: trimer@trimer.com.ar  
Web: www.trimer.com.ar

## Venezuela

### Rich Marine Center, C.A.

Location: Puerto La Cruz., Estado Anzoategui, Venezuela  
Phone: 58 281 2811630  
Fax: 58 281 2811630  
E-mail: richmarine@telcel.net.ve  
Web: www.tuyate.net

## West Indies

### Aboard Refrigeration

Location: English Harbour, Antigua  
Phone: 268-460-1690  
Fax: 419-858-0544  
E-mail: aboardrf@candw.ag

### Regis Electronics (St Lucia) LTD.

Location: St. Lucia, West Indies  
Phone: 758-452-0205  
Fax: 758-452-0206  
E-mail: stlucia@regiselectronics.com

## Zambia

### Southern Power Products

Location: Cape Town, South Africa  
Phone: 27-21-511-0653  
Fax: 27-21-510-3049  
E-mail: sales@southernpower.co.za

## Zimbabwe

### Southern Power Products

Location: Cape Town, South Africa  
Phone: 27-21-511-0653  
Fax: 27-21-510-3049  
E-mail: sales@southernpower.co.za



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