

# CRUISAIR® MARINE A/C SYSTEMS TROUBLESHOOTING GUIDE

A Service of  **FLIGHT SYSTEMS**

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**DISCLAIMER:** This Troubleshooting Guide assumes that the person doing the work has basic mechanical skills, is familiar with electrical testing procedures using a multi-meter and is aware of the risks and hazards inherent in A/C system troubleshooting. Flight Systems will not assume any liability for personal injury or damage to property or equipment, direct, indirect or consequential, as a result of using this Troubleshooting Guide. Use at your own risk. We recommend using the Crusair© Installation and Operation manual for reference if possible.

## General System Description

This description is generalized to cover several models. The Crusair© marine A/C system consists of several component parts, each of which has a specific function. Heating or cooling is a two-step process involving heat transfer to or from the compartment by the air handler(s) and then heat transfer to or from the sea water by the central unit. Fresh water is used as the heat transfer medium between the air handling units and the central unit. The central unit either draws heat from the seawater (heating mode) or disposes of heat to the seawater (cooling mode). Water is circulated in a closed loop between the central unit and one or more air handling units. The water is either heated or cooled by the central unit depending on the mode selected. In the heating mode, heated water gives up some of its heat via the coils and fan in the compartment's air handling unit. In the cooling mode, chilled water absorbs heat via the coils and fan in the compartment's air handling unit.

The central unit consists of a compressor, two heat exchangers and a circulating pump. The central unit functions as a reverse cycle heat pump so it can provide either heating or cooling by simply reversing the flow of refrigerant. In the heating mode, heat is absorbed from the sea water by the refrigerant as it vaporizes in the coaxial raw water heat exchanger. The refrigerant vapor is compressed and then as it condenses back to liquid, transfers most of its heat to the circulating water in the plate coil heat exchanger. In the cooling mode, the opposite process takes place. Heat is absorbed by the refrigerant as it vaporizes in the plate coil heat exchanger, thereby cooling the water. The refrigerant vapor is then compressed and then as it condenses back to liquid in the coaxial raw water heat exchanger, transfers most of its heat to the sea water.

The system is controlled by a microprocessor, transformer, triacs, a relay and several other components located in the power/logic box. The return air temperature sensor connects to the power/logic box. The user interface is a keypad assembly connected to the power/logic box by means of a four-wire cable. The keypad assembly is powered (5 VDC) by this cable and also communicates with the power/logic box via a serial port. The keypad functions only as a user terminal and display. All data, status, temperature information, fan speed and decisions are functions of the power/logic unit.

## Troubleshooting Air Handlers

Air handler cooling performance may be checked by measuring the air temperature drop between the inlet and outlet grills, with the temperature set to coldest and the fan speed set at high. A digital thermometer is preferred, however a glass bulb type may be used. Check the following:

- Air handler coil may be air locked – bleed if necessary. A gurgling sound indicates air in the system. If frequent bleeding is necessary, check for air leaks. Make sure bleed valve is tightly closed.
- Bypass valve motor may not be operating. Valve bypass lever should automatically move to open position when system is calling for cooling. It may be moved manually.
- Check for blockage in water piping that would restrict flow.
- Check for restrictions in air ducting.

- Make sure air return filter is clean.
- Check air handler coil and clean if necessary.
- Make sure that there are no unusual noises coming from the ducting and that the blower is running.
- A clicking sound with the air handler off, but circulating pump running, may be a bad flow control valve, or possibly a circulating pump problem.

## Troubleshooting Central Unit

**CIRCULATING PUMP:** The circulating pump should come on as soon as the system is put in either heating or cooling mode. If not, check:

- Breakers at AC power panel. The AC voltage at the breaker must be at least 180 VAC on 240 volt systems, or 85 VAC on 120 volt systems.
- Circulating pump relay circuit.

**AIR IN LOOP:** Air in the piping can block water flow and seriously impair heat transfer efficiency in both heating and cooling modes. If the fault light goes on and off intermittently, the cause is likely air in the system. Refer to the Filling and Bleeding section of the operation manual. Make sure that the circulating pump is not air locked, especially if the pump outlet is not in a vertical position. It may be necessary to install a bleeder valve on the pump if not already equipped. A gurgling sound is an indication of air in the system.

**WATER PIPING:** In addition to air in the piping (see above), also check:

- All valves in the loop must be open.
- Spare pump (if installed) must be OUT of loop.
- Water is flowing in the proper direction (installation issue).
- Pipe is of the proper size (installation issue).

**WATER STRAINER:** Inspect the water strainer and clean if necessary. A strainer partially clogged with debris will restrict water flow to the air handler(s) and will reduce both heating and cooling capacity.

**FLOW SWITCH:** All of the above checks assume that the flow switch is working properly. The flow switch senses flow in the water piping when it is properly adjusted and the flow sensing paddle is not stuck. Check:

- Correct microswitch position is away from plate coil; the normally open position (NO).
- The arrow on the flow switch should point away from the plate coil.
- If sliding the microswitch towards the plate coil (NC) turns off the fault light when there is no flow (circulating pump off), then the switch paddle may be stuck.

## Troubleshooting the SMX II System

The following procedure will guide you through troubleshooting some of the more common problems with this system. Locating the problem and possibly repairing it yourself may save you time, money and inconvenience.

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

**SYMPTOM:** Unit will not operate and/or SMX display not on.

- Make sure there is AC power on the boat.
- Check circuit breaker for the SMX A/C system.
- Check CX/CXP cable (power/logic to keypad) and connections.
- Measure 5 VDC at the keypad connector pins (see illustration).
- If necessary, check for AC power at the L1-L2 terminals inside of the power/logic box (with cover removed and power on).
- Repair or replace SMX keypad assembly (see NOTE 1 next page).
- Repair or replace SMX power/logic board (see NOTE 2 next page).

**SYMPTOM:** Erratic or Erroneous SMX Temperature Display.

- Perform a Factory Memory Reset (Press OFF/SET/FAN together, then SET).
- Check temperature sensor, cable and connection.
- Make sure the temperature sensor is installed properly in air return.
- Calibrate temperature: Press OFF then SET. Press SET and UP together. Sensed temperature is displayed. Use UP or DOWN to adjust sensed temperature to match actual temperature as measured at air return. Press OFF to exit calibration mode.
- Repair or replace power/logic board (see NOTE 2 below).

**SYMPTOM:** Erratic SMX operation.

- Perform a Factory Memory Reset (Press OFF/SET/FAN together, then SET).
- Check CX/CXP cable (power/logic to keypad) and connections.
- Check temperature sensor, cable and connection.
- Check change-over thermostat in air handler (if equipped).
- Repair or replace SMX keypad assembly (see NOTE 1 below).
- Repair or replace SMX power/logic board (see NOTE 2 below).

**SYMPTOM:** Water dripping inside cabin or compartment.

- Check/clean out condensate drain pan and fittings.
- Clear blockage in drain hose.
- Make sure hose is routed downhill for drainage.
- Make sure insulation around ducting is not missing or compressed.
- Check for leaks in water loop and/or piping.

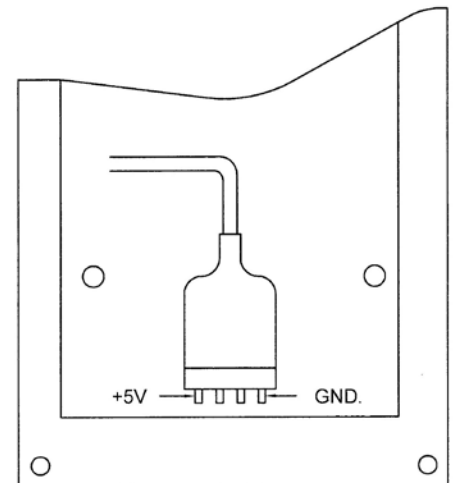
**NOTE 1:** The SMX II keypad can fail in several different ways, each presenting certain symptoms. One or more functions may become erratic or inoperative. This is usually due to cracks developing in the flexible circuit traces which are an integral part of the membrane switch portion of the keypad assembly. Occasionally, the UP temperature button will make contact by itself, thereby running the set temperature up to the maximum, with the result of shutting down the A/C and possibly turning on the heat. This problem is caused by tiny “whiskers” that grow between the contacts of the UP membrane switch. For diagnostic purposes, the keypad assembly can be easily swapped out with a known good one from another part of the boat (or borrowed). To remove the keypad, lift up on the bottom edge of the plastic bezel. Remove the four mounting screws. Carefully remove the keypad from the bulkhead and unplug the four-pin connector. Flight Systems offers a repair/rebuild program that features a completely new upgraded keypad with extended life and an improved tactile feel.

**NOTE 2:** The power/logic board and other associated components are housed in a metal box located on the central unit (compressor). Before removing the box for service, make sure the power is off and take a digital photo of the wiring connections. Unplug the temperature sensor and keypad cables. Carefully disconnect the other wires and then remove the mounting screws and wire ties. Flight Systems offers a repair/rebuild program for this unit.

### FAULT CODE DISPLAYS

| Fault Code | Meaning  | Result   |
|------------|--|----------|
| LO/AC      | Operating voltage remained below Shutdown 100V for 3 min. or more (or 200V for 230V system).         | Shutdown |
| HI/PS      | Head pressure above 400 to 425 PSI - Indicates pump failure or loss of water flow.                   | Shutdown |
| LO/PS      | Suction Pressure below 30 PSI - Indicates loss of gas; or on heat cycle, water too cold for heating. | Shutdown |
| PE         | Program error in software  | Shutdown |

*We hope this guide has been a help to you. We are continually updating our service information and welcome your feedback.*



**SMX KEYPAD - REAR VIEW**