TECHNICAL BULLETIN

SYSTEM 450

WITH HIGH SIERRA

high sierra
COUNTER FLOW DEFROST

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Part# 08499059

System 450 overview

The System 450 is a family of compact, modular, electronic controls that can easily be programmed for a variety of applications based upon pressure, temperature or humidity. The System 450 replaces mechanical switches with an electronic version, which has the advantage of fewer leaks and better reliability. This document is intended to familiarize you with the System 450 in a High Sierra application.

The system 450 consists of a control module (user interface), power module (transformer), and expansion modules (add relay outputs). Figure 1 below shows the control module and describes the various features.

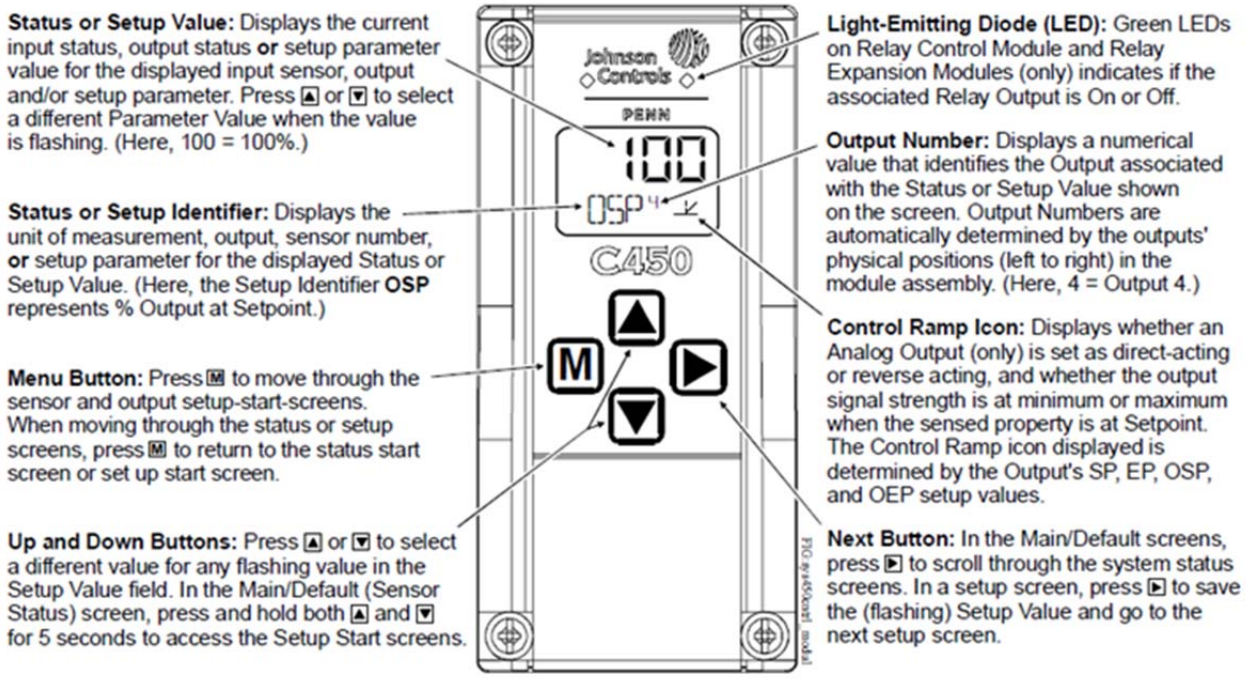


Figure 1: System 450 control module features.

The control module is always the farthest to the left on the System 450 assembly; to the right of the control module is the power module, followed by expansion module(s). The System 450 snaps together with 6-pin connectors located on the sides of the module housing. NOTE: If losing power or relay outputs, make sure System 450 is properly snapped together.

Each time the System 450 powers on the control module polls all the other modules to identify the output types and assign output numbers; relay output numbers go from 1 to 10 in left to right order (starting at control module and ending at the last expansion module). When programming the System 450, on and off values are assigned to each output number. Do not re-arrange expansion modules as the control module will link a different output number to it (giving it different program settings). NOTE: On High Sierra units, the System 450 is used for condenser fan cycling, low pressure cutout and defrost termination.

Sensors:

The System 450 is compatible with a variety of sensors and transducers for temperature, pressure and humidity. Up to three sensors can be installed on the System 450. High Sierra applications use two 0-500PSI transducers (P500), and one 0-200PSI transducer (P200). The 0-500PSI transducers have a usable range of 90PSI to 500PSI and are used for fan cycling and defrost termination. The 0-200PSI transducer has a usable range of 0PSI to 200PSI and is used for low pressure cutout. It is not possible to program setpoints that are outside of the usable range for the selected transducer (example: cannot program 89PSI on 0-500PSI transducer). "SNF" stands for Sensor Failure, and will be displayed if the sensor has failed or if sensed pressure is outside of the sensor range (example: 201PSI measured on 0-200PSI transducer will display "SNF").

On High Sierra units it is critical to have the correct sensor installed in the correct location. Sensors have a valve core depressor and are screwed directly onto a Schrader valve. The Schrader valve will have a valve core installed that way a pressure transducer can be replaced without loss of refrigerant charge. Below is a typical piping diagram for High Sierra detailing the sensor locations.

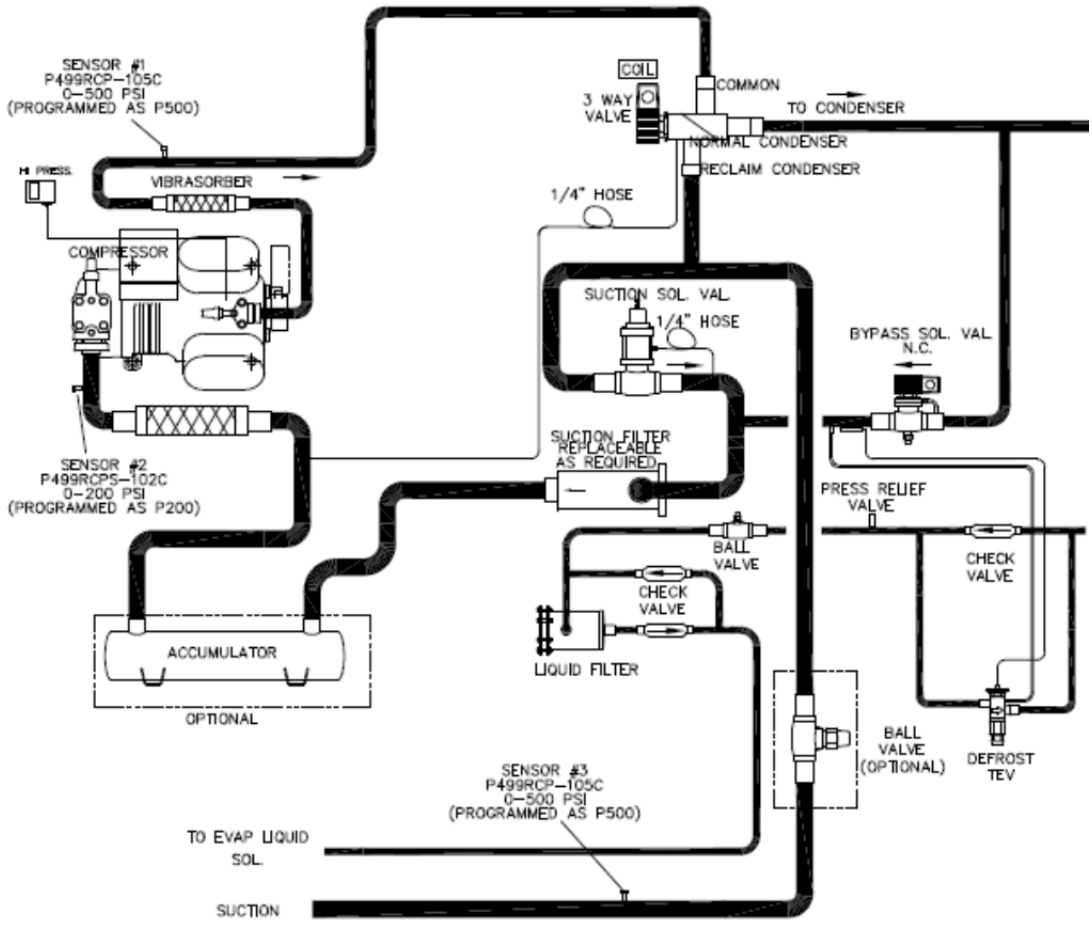


Figure 2: Sensor locations on High Sierra piping.

The System 450 control module has jumper pins to tell the control what type of sensor is being used. For a pressure transducer, the jumper should be positioned such that one pin is removed. See figure 3 for example.

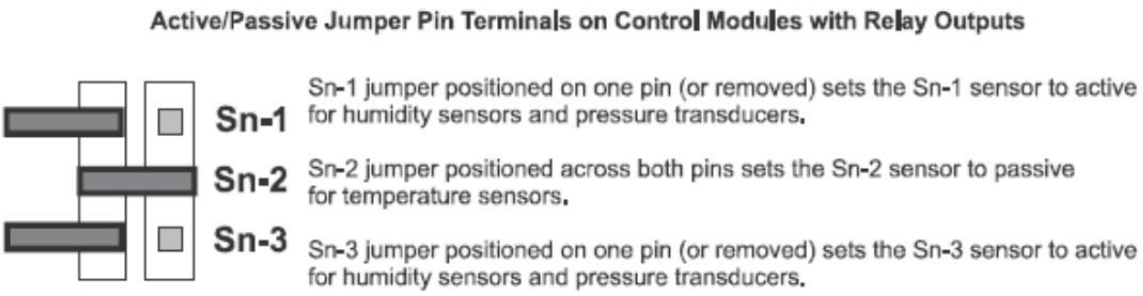


Figure 3: Control module jumper settings. NOTE: All jumpers removed for High Sierra application.

The System 450 control module coverts resistance measured in the sensor into a readable value that is displayed on the LCD screen and used for relay logic. If the jumper pin orientation is incorrect, or if the control is programmed for an incorrect sensor, the resistance scaling will be off causing an inaccurate reading. NOTE: measured values of each sensor flash across the LCD screen. During start up, check these values against a reliable pressure gauge to ensure accuracy.

Wiring:

Sensors are wired into the System 450 control module; it is critical that the sensors are wired to the correct terminals. Every High Sierra unit will have a page 2 wiring diagram that details System 450 wiring. NOTE: if sensors are wired to incorrect terminals, measured values will be inaccurate.

The System 450 control module has two relay outputs (output numbers 1 & 2). These two relay outputs are typically used for condenser fan cycling and read from sensor #1 (discharge pressure). When measured pressure from sensor #1 is above the “on” setpoint, the relay closes which allows the fan contactor to energize. Simultaneously, a green LED on the face of the System 450 control module turns on as a visual indication that the relay is closed.

The System 450 power module convents unit control voltage to 24v for the controller. The power module can transform either 240v or 120v into 24 volt. Typical High Sierra control voltage is 240v, however unit control voltage should be verified on the wiring diagram as it could vary. NOTE: if System 450 does not power on, ensure that the appropriate voltage is present at the power module.

The System 450 expansion module has two relay outputs (output numbers 3 & 4). Relay output #3 is typically used for low pressure cutout. Low pressure cutout should be read from sensor #2 (suction pressure at compressor) and opens when the measured value drops below the “off” setpoint. Relay output #4 is typically used for defrost termination. Defrost termination should read from sensor #3 (suction pressure behind suction solenoid) and closes when the measured value gets above “on” setpoint. When any relay outputs closes (turns on) a green LED on the face of the module turns on.

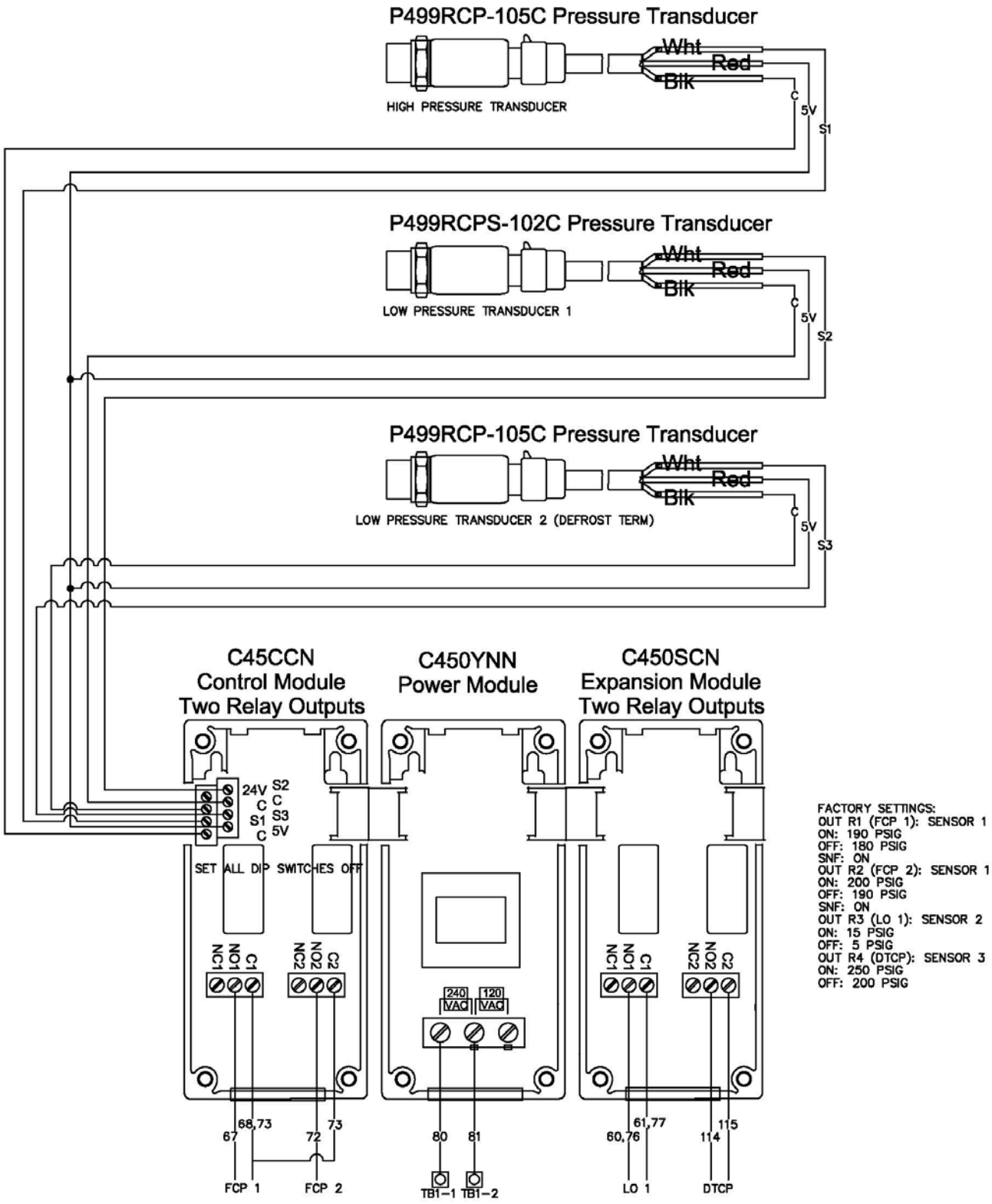


Figure 4: Typical High Sierra System 450 wiring

Programming logic:

Below is an example of the program flow logic, specific for High Sierra application:

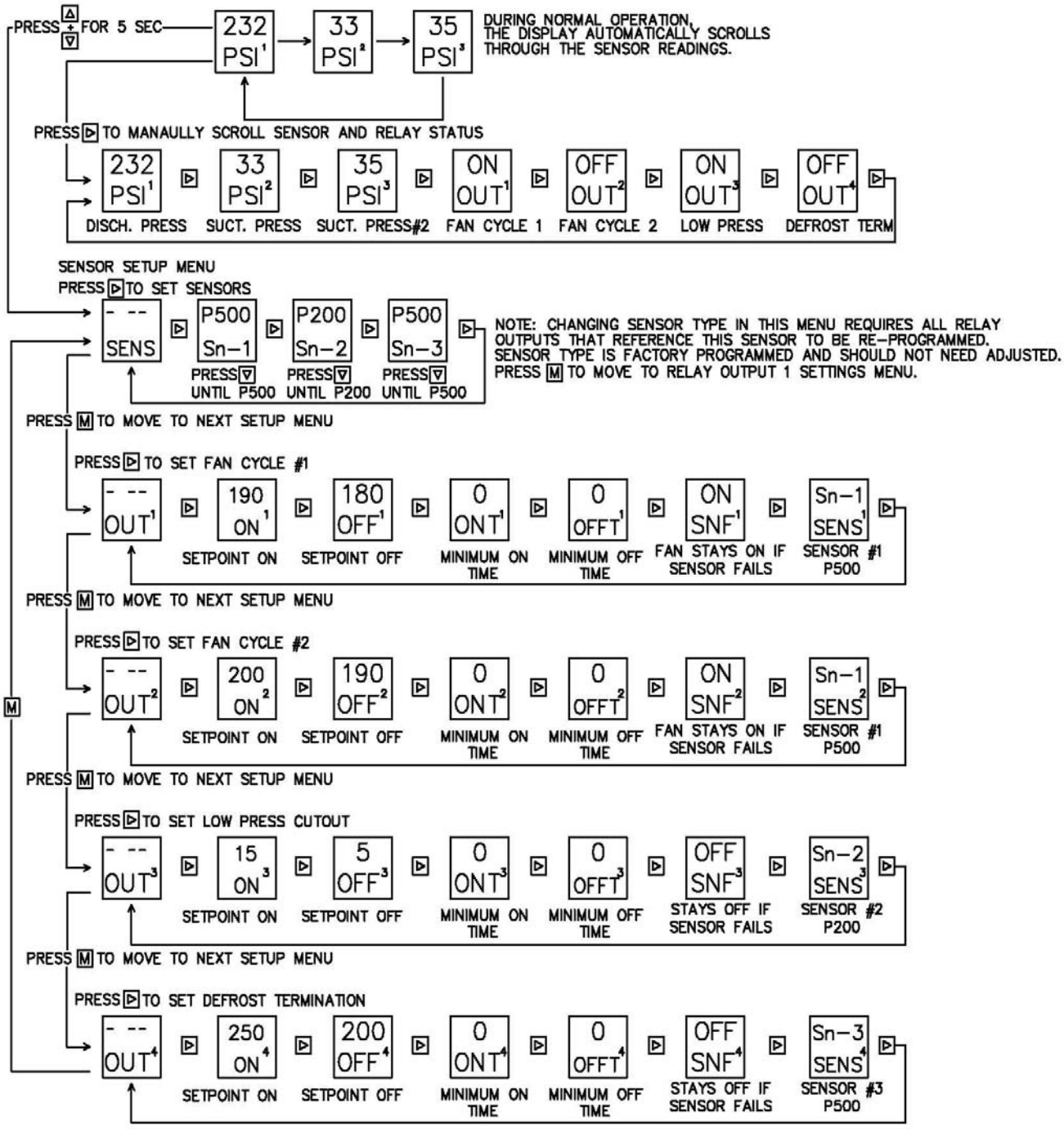


Figure 5: System 450 program flow logic for High Sierra application.

Programming example:

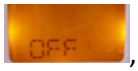
Below is an example of how to adjust Condenser Fan Cycling 1 settings.

1. Press and hold ▲ & ▼ buttons for 5 seconds to enter program mode.
2. Pressing the M button will toggle through setup menu's. Press M till you get to output 1.

3. Press ▶ button to edit output 1's on setpoint.

, use ▲ & ▼ buttons to adjust "ON" setpoint to desired cut-in setting.

4. Press ▶ button to edit output 1's off setpoint.



, use ▲ & ▼ buttons to adjust "OFF" setpoint to desired cut-out setting.

5. Press ▶ button to edit output 1's minimum on time setting.

, use ▲ & ▼ buttons to adjust "ONT" setting (leave at 0 for fan cycling).

6. Press ▶ button to edit output 1's minimum off time setting.

, use ▲ & ▼ buttons to adjust "OFFT" setting (leave at 0 for fan cycling).

7. Press ▶ button to edit output 1's sensor failure setting.

, use ▲ & ▼ buttons to adjust "SNF" setting (this should be on for FCP, elsewise off).

8. Press ▶ button to edit output 1's sensor setting.

, use ▲ & ▼ buttons to select the proper sensor (it should be Sn-1 for fan cycling). If you change to a different sensor, all values above will be re-set and need re-programmed.

9. Once desired settings are programmed, Press M to back out to main menu.
10. Press and hold ▲ & ▼ button simultaneously to exit program mode (or wait two minutes and it will exit out of program mode).
11. The same logic can be used to edit Fan Cycle Pressure 2 (output2), Low Pressure (output 3) or defrost termination (output4). Only difference is that at step 2 above, you press M until you get to the desired output relay (1=FCP1, 2=FCP2, 3=LOW PRESS, 4=DEFR TERM).

PROBLEM	SYMPTOM	POSSIBLE CAUSE	SOLUTION
NO POWER	SYSTEM 450 WILL NOT TURN ON	LOSS OF CONTROL VOLTAGE	CHECK SUPPLY VOLTAGE
		MODULES NOT PROPERLY CONNECTED	SNAP TOGETHER MODULES TIGHTLY
INCORRECT TRANSDUCER READING	DISPLAYED VALUE DOES NOT MATCH RELIABLE PRESSURE GAUGE	PROGRAMMED FOR INCORRECT TRANSDUCER	MODIFY PROGRAM FOR CORRECT TRANSDUCER
		TRANSDUCER WIRED TO INCORRECT TERMINALS	CORRECT TRANSDUCER WIRING
		INCORRECT JUMPER POSITION	REMOVE JUMPER FOR PRESSURE TRANSDUCERS
SnF	"SnF" DISPLAYED FOR ONE OR MORE SENSORS	MEASURED PRESSURE OUTSIDE OF TRANSDUCER RANGE	BRING PRESSURE TO WITHIN RANGE
		TRANSDUCER WIRING LOOSE OR INCORRECT	VERIFY SENSOR IS WIRED CORRECTLY
		FAILED TRANSDUCER	REPLACE TRANSDUCER
FLICKERING SCREEN	FLICKERING SCREEN, OCCASIONAL CONTROL RE-BOOT	POOR SUPPLY POWER	SNAP TOGETHER MODULES, CHECK POWER SUPPLY
		ELECTRICAL NOISE	RE-ROUTE TRANSDUCER WIRING HARNESS AWAY FROM HIGH VOLTAGE
		BAD TRANSDUCER OR HARNESS	REPLACE WIRE HARNESS AND TRANSDUCER
		BAD CONTROL MODULE	REPLACE CONTROL MODULE
POWER ERROR	"ERR PWR" DISPLAYED	SUPPLY VOLTAGE IS OUT OF RANGE	SUPPLY VOLTAGE MUST BE WITHIN 100-130VAC OR 200-260VAC
FANS DON'T CYCLE	CONDENSER FANS NOT CYCLING	INCORRECT PROGRAM SETTINGS	ADJUST PROGRAM SETTINGS TO DESIRED VALUES
		INCORRECT TRANSDUCER READING	SEE "INCORRECT TRANSDUCER READING" ABOVE
		INCORRECT TRANSDUCER LOCATION	VERIFY TRANSDUCER IS LOCATED ON THE COMPRESSOR DISCHARGE LINE
		ELECTRICAL OR MECHANICAL ISSUE	VERIFY WIRING, CONTACTOR AND MOTOR OPERATION
DOES NOT TERMINATE DEFROST	UNIT STAYS IN DEFROST UNTIL TIMER TIMES OUT	INCORRECT PROGRAM SETTINGS	ADJUST PROGRAM SETTINGS TO DESIRED VALUES
		INCORRECT TRANSDUCER READING	SEE "INCORRECT TRANSDUCER READING" ABOVE
		INCORRECT TRANSDUCER LOCATION	VERIFY TRANSDUCER IS LOCATED ON THE SUCTION LINE (BEHIND SUCT SOLENOID VALVE)
		MECHANICAL OR SYSTEM ISSUE	TOO MUCH AIR FLOW AROUND EVAPS DURING DEFROST 3 WAY VALVE STUCK (BYPASSING DIRECT TO COMPRESSOR)
DOES NOT CYCLE ON LOW PRESSURE	UNIT NOT TURNING ON, OR NOT TURNING OFF	INCORRECT PROGRAM SETTINGS	ADJUST PROGRAM SETTINGS TO DESIRED VALUES
		INCORRECT TRANSDUCER READING	SEE "INCORRECT TRANSDUCER READING" ABOVE
		INCORRECT TRANSDUCER LOCATION	VERIFY TRANSDUCER IS LOCATED ON THE SUCTION LINE (CLOSE TO COMPRESSOR)
		ELECTRICAL OR SYSTEM ISSUE	CHECK LIQUID LINE SOLENOID WIRING AND INTEGRITY CHECK THERMOSTAT SETTINGS AND WIRING VERIFY SYSTEM HAS REFRIGERANT CHARGE

Figure 6: Troubleshooting quick reference