

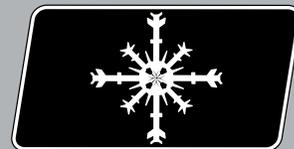


# OTDX-FX1

FX-1 Control Panel for  
Direct Expansion Systems

# OPERATOR'S MANUAL

Technicold Marine Systems | [www.technicold.com](http://www.technicold.com)



**TECHNICOLD**  
**MARINE HVAC**



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# OPERATOR'S MANUAL

## OTDX-FX1

### for FX-1 Control Panel on Direct Expansion Systems

*Read this operator's manual thoroughly before starting to operate your equipment.  
This manual contains information you will need to run and service your new unit.*

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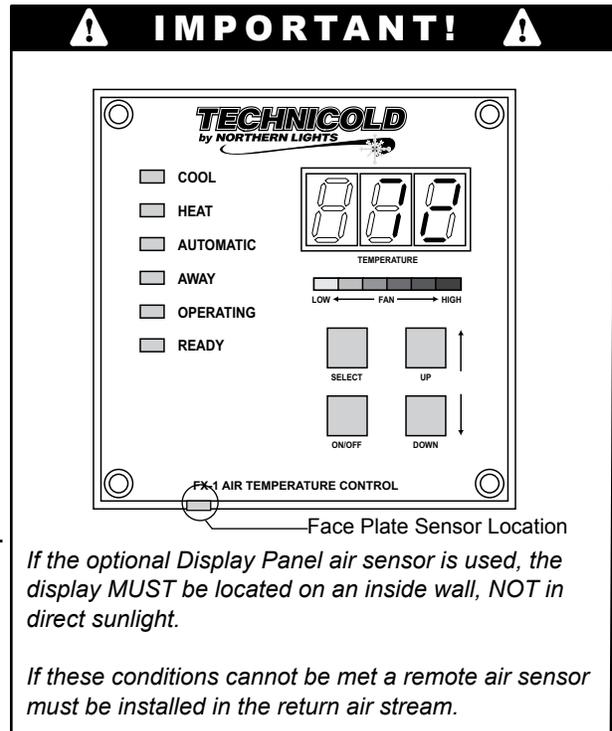
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## INTRODUCTION

The FX-1 DX Control is designed for use with Marine DX Cooling and Heating Systems. The FX-1 DX Control has a universal power supply that operates on 115, 230, 50 or 60 Hz AC power. The FX-1 DX Control includes the following standard and optional features:

## STANDARD FEATURES

- User friendly 4 button display panel requires no manual for basic operation.
- Five volt logic and micro controller located in the display.
- 3-digit 7-segment display indicates ° F or ° C.
- Room temperature sensor.
- Fan speed is adjusted automatically as the set point is approached in cooling.
- Six [6] programmable manual fan speeds.
- 17 programmable parameters for custom installations.
- Away Mode for controlling relative humidity.
- Universal AC power supply.
- Nonvolatile memory retains settings without batteries.
- Programmable display brightness control for night use.
- High and low pressure switch inputs.
- AC voltmeter to protect equipment from low voltage occurrences.
- Programmable time delay for staging multiple compressors.
- De-icing cycle to prevent evaporator coil icing.



## OPTIONAL FEATURES

The following optional items can be added by plugging the device into the appropriate jack and making the necessary programming changes.

- Alternate air temperature sensor (No programming needed)
- Outside air temperature sensor (No programming needed)
- Pump Sentry service sensor (Program P9 to On and set temperature)

### ***Read This Manual Completely Before Proceeding!***

*This manual is intended to provide information necessary to insure proper installation and operation of the FX-1 Control. Poor installation and misunderstood operating parameters will result in unsatisfactory performance and premature failure of the FX-1 DX Control.*

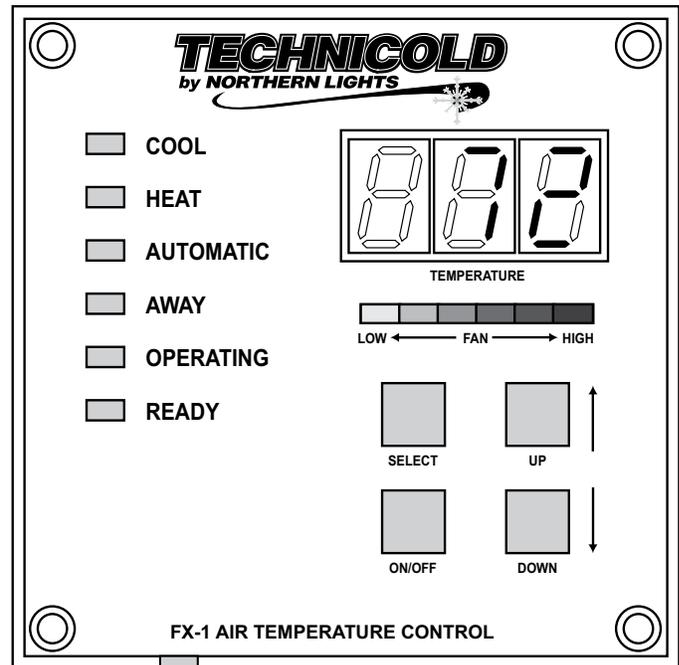
*If you require assistance prior to or during the installation of the FX-1 DX Control call Technicold by Northern Lights at 945-421-1717 or via email at [info@technicold.com](mailto:info@technicold.com). The FX-1 Direct Expansion Control is covered under existing Technicold Warranty Policy. Incorrect installation, neglect and system abuse are not covered under Technicold's warranty policy.*

**ON/OFF POWER BUTTON** Press the power button once to toggle the unit to the ON mode. Press the power button again to toggle the unit to the OFF mode.

**UP BUTTON** Momentarily press and the set point will appear in the temperature display. The set point increases one degree each time the up button is pressed and released.

**DOWN BUTTON** Momentarily press and release to display the set point. The set point is decreased one degree each time the down button is pressed and released.

**SELECT BUTTON** The select button is used to select one of four [4] Operating Modes. Press and release to advance to the next mode. Continue to press and release until the desired Operating Mode is reached. The mode selected is indicated by the Mode LED.



**THREE DIGIT DISPLAY** The inside Air temperature is displayed whenever the control is turned on. The display provides a read out of the inside air temperature.

**COOL MODE LED** The cool mode LED is lit when the Cooling is selected.

**HEAT MODE LED** The heat mode LED is lit when Heating is selected.

**AUTOMATIC LED** The automatic LED is lit when the Automatic Heating or Cooling Mode is selected. The control will automatically switch to heating or cooling when this mode is selected.

**AWAY MODE LED** The away LED is lit when the Away Mode [ Humidity Control ] is selected.

**AUTO FAN SPEEDS** The fan speeds are automatically controlled as the set point is approached.

**FAN SPEED BAR GRAPH** There are six [6] individual fan speed LED's. Each LED represents one [1] fan speed. Low fan [1] is indicated by illuminating the first LED. High fan speed is indicated by illuminating all six [6] LED's.

**MANUAL FAN SPEEDS** Manual fan speed settings are available via system programming. See the first programming item on page 10.

**OPERATING LED** The system operating status [ compressor on or off ] is indicated by the operating LED.

**READY LED** The Ready LED is illuminated when the breaker is turned on and power is applied to the control. It remains on whether the power button is in the On or Off mode.

## OVERVIEW

FX-1 DX Control is a user friendly, easy to operate, programmable temperature control. Press the ON/OFF button once to engage the system. The display indicates room temperature when the system is on and the display is blank when the system is off.

Press and release the Select Button until the desired Mode LED is illuminated. Set the room temperature by pressing the up or down button. The set point can be viewed by momentarily pressing and releasing the up or down button.

Fan speed automatically adjusts as room temperature is approached. In the cooling mode, the fan speed decreases as the set point is approached. The fan will operate at low speed when set point is satisfied. Manual fan speeds can be selected by entering the program mode and selecting the desired manual fan speed. The fan will operate at the speed selected and will not change speeds with room temperature. See page 9 of this manual for programming instructions.

The fan can be programmed to cycle on and off with demand, allowing the fan to run only when cooling or heating is required. It is not recommended to cycle the fan on and off with demand. To do so can affect system operation and comfort levels. The fan cannot be cycled when using a return air sensor. Normally the automatic fan speed operation is reversed in the heating mode, however, the fan can be programmed to operate the same as in the cooling mode.

## NORMAL HEATING OR COOLING CYCLE

Select Cool only and only cooling will be supplied. The cabin temperature will be maintained within 2 ° F of the set point. Select Heat only and only heating will be supplied. The cabin temperature will be maintained within 2 ° F of the set point.

Select Automatic and both heating and cooling will be supplied as required. While in the Automatic mode FX-1 will maintain a two degrees Fahrenheit (2 ° F) temperature variation. A four degree swing is required to cause the unit to shift into the opposite mode. Once in a given mode, heating or cooling, FX-1 will maintain a two degree differential

## REVERSING VALVE OPERATION

The reversing valve is toggled to the opposite mode when heating or cooling is required to reduce the compressor starting surge. The valve will only toggle to the opposite mode when a cooling or heating cycle is called for and if the system has been off for less than seventy-five (75) seconds. The valve will also toggle if a cycle is interrupted from the display panel by pressing the power button ON/OFF, or changing the set point. Unnecessary valve toggling has been limited to reduce reversing valve noise. Valve toggling can be totally eliminated by programming the minimum compressor staging delay at seventy-five (75) seconds or greater.

**Power on Reset**, which occurs when the system is powered up, will always initiate a valve toggle.

**Memory: FX-1** has nonvolatile memory which required no batteries or any form of backup power. When power is lost the operating parameters are retained indefinitely. When the power is restored, the control resumes operating as last programmed. All operating and programming parameters are entered into nonvolatile memory instantly and are retained indefinitely.

## OPERATOR CONTROLS AND DISPLAY PANEL

Refer to figure 1 for the button locations and display functions listed on the following pages.

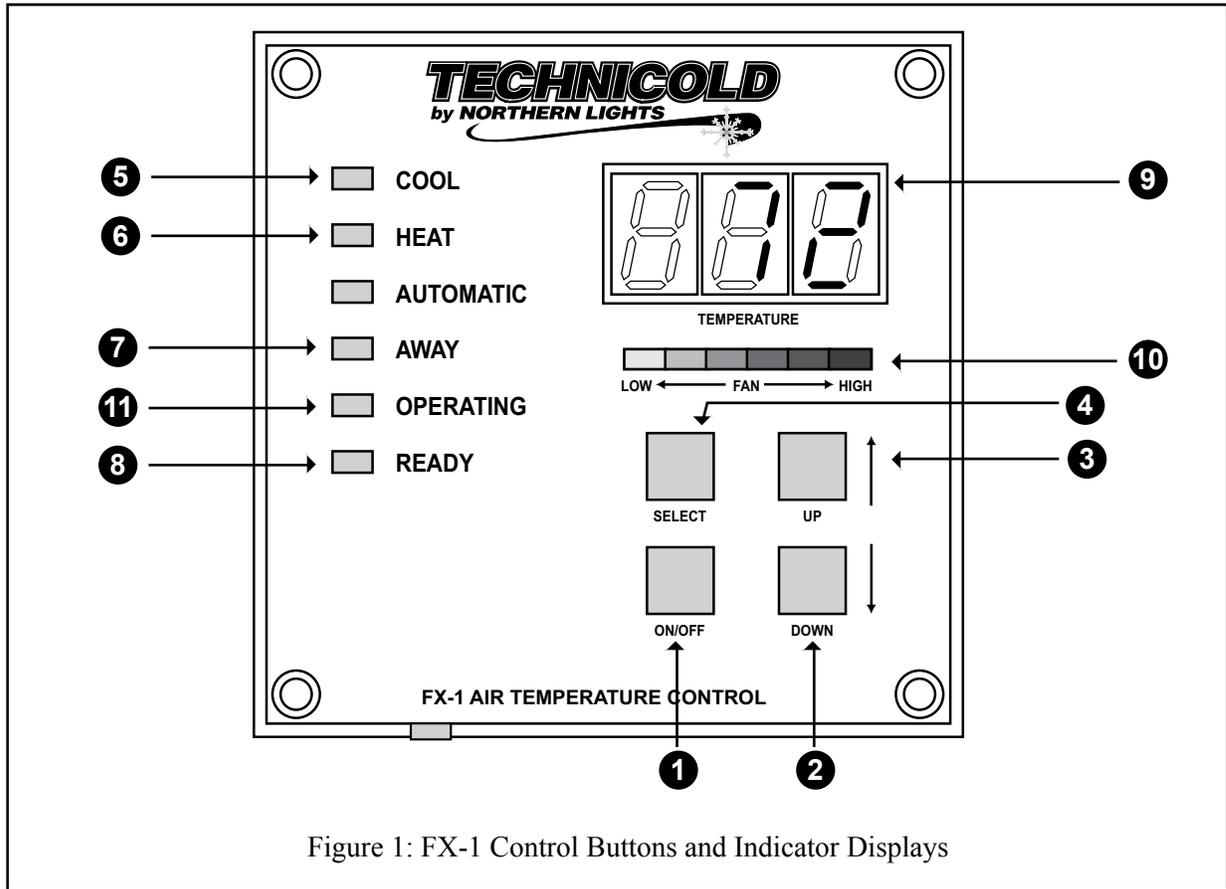


Figure 1: FX-1 Control Buttons and Indicator Displays

1. **POWER BUTTON** The power button is used to toggle between the on and off modes. Press the power button once to toggle the unit to the on mode. Press the power button again to toggle to the off mode.

2. **DOWN BUTTON** Momentarily press and release the down button to display the set point. Press and release the down button to decrease the set point. The set point is decreased one degree each time the down button is pressed and released. The lowest set point allowed is 55 ° Fahrenheit. The down button is used in conjunction with the up button to display outside air temperature when the control is on. The down button is also used to reduce program values in the program mode.

3. **UP BUTTON** Momentarily press the up button and the set point will appear in the temperature display. Press and release the up button to increase the set point one degree. The set point is increased by one degree each time the up button is pressed and released. The highest set point allowed is 85 ° F. The up button is used with the down button to display the outside air temperature when the control is on. The up button is also used to increase program values in the program mode.

4. **SELECT BUTTON** The select button is used to select one of the four operating modes. Press and release the select button and the FX-1 will advance to the next mode. Continue to press and release the select button until the desired operating mode is reached. The mode selected is indicated by the Mode LED, i.e., Cool, Heat, Automatic or Away Mode.

## OPERATOR CONTROLS AND DISPLAY PANEL

5. **COOL MODE LED** The cool mode LED will be lit when the Cooling Mode has been selected.

6. **HEAT MODE LED** The heat mode LED will be lit when the Heat Mode has been selected. The heat mode LED is also lit when the optional electric heat is installed and the heat mode is selected. Electric heater status, on or off, is indicated by the Operating LED.

7. **AWAY-MODE LED** The Away Mode LED will be lit when the Away Mode has been selected. This mode is used to control moisture during periods when the vessel is unoccupied.

8. **READY LED** The Ready LED is on whenever AC power is supplied to the control. The ready LED remains on whether the control is in the On and Off modes.

9. **THREE DIGIT SEVEN SEGMENT DISPLAY** The inside air temperature is displayed in the window whenever the control is turned on. The three digit 7 segment display provides a readout of the inside air temperature which is located on the face plate. An optional alternate air sensor is available for installations that cannot use the face plate sensor.

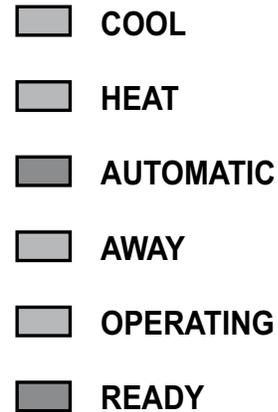
The display also indicated program information, fault codes and outside air temperature when the optional outside air sensor is installed.

The display will momentarily indicate the set point when either the up or down button is pressed and released.

When the control resumes operation after a power interruption all the display LEDs will turn in for one second. This is a normal operating condition and is referred to as "Power On Reset"/

10. **FAN SPEED BAR GRAPH** There are six [6] individual fan speed LED's in the Fan Speed Bar Graph. Each LED represents one [1] fan speed. Low fan speed [1] is indicated by illuminating the first LED. High fan speed is indicated by illuminating all six [6] LED's. Any of the six [6] fan speeds available are displayed by illuminating the appropriate LED's.

11. **OPERATING STATUS LED** The Operating LED is on when the compressor is on and off, when the compressor is off. The Operating LED also indicated when the optional electric heater is turned on.



## DUAL BUTTON FUNCTIONS

**Up & Down Buttons** Press the up and down button together and the outside air temperature will be displayed, providing the OPTIONAL OUTSIDE AIR TEMPERATURE SENSOR has been installed. No programming is required. **Press the Up & Down buttons** simultaneously, while in the program mode, to set new custom programming defaults.

**Power & Down Buttons** Simultaneously press the power and down buttons while viewing the Service Fault History Log clears the fault History Log.

## SPECIAL BUTTON FUNCTIONS

Special button functions are implemented by pressing and holding a particular button while the controls' AC power is turned on.

1. **Service History Log** View the service history log by pressing and holding the **select button** while turning on the AC power. Exit the service history log by pressing the **power button** once. Clear the service history log by simultaneously pressing the power and down buttons.
2. **Self Test Mode** Press and hold the **power button** while AC power is applied to enter the self test mode. The self test mode is used to diagnose problems and test the air conditioning system. For complete details see page 14 of this manual.
3. **View Hour Meter** To view the compressor hour meter, press and hold the down button while applying AC power. Maximum recorded time is 10,000 hours. The hour meter stops at maximum (10,000 hours) and can only be reset by Technicold. The hour meter functions are described fully on page 15 of this manual.

## MODES OF OPERATION

### Off Mode

When the FX-1 is in the **Off Mode**, all control outputs are turned off. Program parameters and user settings are saved in nonvolatile memory. The program mode can only be accessed from the off mode. The Ready LED remains lit in the off mode.

### On Mode

When the control is in the **On Mode**, power will be supplied to the appropriate control outputs and the display will indicate the current state of operation. The operating and program parameters resume based on those stored the last time the unit was operating.

### Cool Only Mode

When Cool LED is on, only the cooling systems are selected and operated as required. When the temperature drops below the set point, the system will **not automatically** switch to the heating mode. Cooling only is available for customers what do not want automatic cooling and heating operation. Systems without reverse cycle heating can have an optional electric heater installed should heating be required..

### Heating Mode Only

Heating only is supplied for customers that require the system to **not automatically** switch from the heating to the cooling mode. When the Heat LED is on, only the heating systems are selected and operated as required. Should the temperature rise above the set point, the system will not automatically switch to the cooling mode.

### Automatic Mode

When the **Automatic LED** is on, both heating and cooling are supplied as required. The **heat** and **cool** LEDs will be lit according to the mode required. When the system requires compressor operation for heating or cooling the Operating LED will turn on when the compressor is on. Temperature in a given mode will be maintained at two degrees Fahrenheit ( 2 ° F), however, a four degree difference is required to allow the control to change modes. Once in a new mode, the temperature will remain within two degrees Fahrenheit ( 2 ° F ) of the set point.

## MODES OF OPERATION (Cont'd)

### Away Mode

While in the On Mode, press the Select Button until the Away Mode LED is illuminated. The first cycle will start in one minute. Every four (4) hours, the fan is started and air circulated for thirty (30) minutes. During this time the air temperature is sampled and entered into memory. The cooling cycle is started and continues until the temperature is lowered 2 ° F. The compressor is allowed a maximum of one hour running time to reach the desired temperature. Four (4) hours after the temperature is satisfied or the compressor times out, the cycle is repeated. During the humidity cycle the Operating LED is lit while the compressor is running..

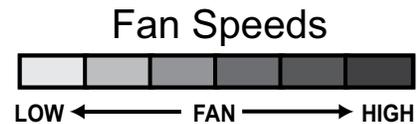
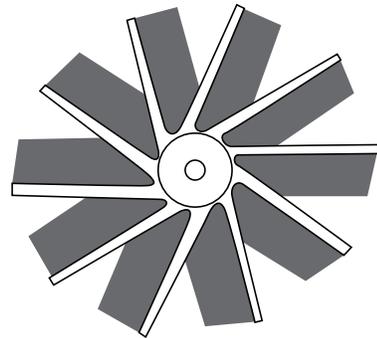
## FAN MODES

### Automatic Fan Mode

FX-1 has six automatic fan speeds available. Speed six is high, three is medium and one is low or the lowest speed. Automatic fan mode allows the FX-1 to determine the required fan speed based on room temperature. The closer the room temperature is to the set point, the slower the fan will run. This permits a balance between the most efficient temperature control and slower, quieter fan speeds. Automatic fan operation is the factory default, however, manual fan speed control is available.

### Manual Fan Mode

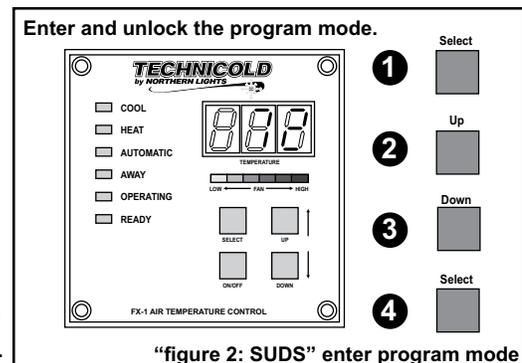
Program parameter one [1] is used to select one of the six [6] manual fan speeds available. Six [6] is the fastest and one [1] represents the slowest fan speed. Manual fan mode allows the user to select and maintain the desired fan speed manually. When a manual fan speed has been selected, the fan speed bar graph will indicate the speed selected by the number of LED's lit. Select speed 3, for example, and the first 3 LEDs in the fan bar graph will turn on. Manual Fan Mode is sometimes preferred when room temperature is constantly changing due to varying heat loads.



## PROGRAM MODE

### Program Mode Overview

The program mode is used to adjust the systems operating parameters to suit the particular needs of individual users. The program mode is also used to tailor the air-conditioning system for the most efficient operation within an installation. Installation variables such as ducting, sensor location and system layout effect the perceived operation of the overall system. The program mode allows the system to operate as efficiently as possible under all conditions. The FX-1 is shipped with factory programmable default settings which are stored in permanent memory and can be recalled at any time.

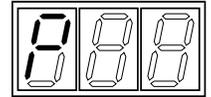


## PROGRAM MODE (CONT'D)

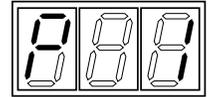
Severe electrical disturbances can sometimes upset the FX-1 operating sequences. Operator confusion related to program parameters can also cause, what seem to be, operational problems. Whenever there is any doubt as to the proper operation of the controller, Factory Default Parameters should be Re-initialized.

## ENTERING PROGRAM MODE

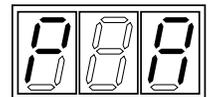
The Program Mode can **only** be entered from the **Off Mode**. From the off mode and in the following order, press the **Select, Up, Down** and the **Select** buttons. These buttons have to be pressed and released in the order given. The letter "P" appears in the display. The buttons have to be pressed in the sequence described. Remember "SUDS"... It's the key to enter and unlock the program mode. The characters "P" then "P 1" followed by the parameter setting, appear in the display. The FX-1 is now in the program mode. Exit the program mode to the **Off Mode**, by pressing and releasing the power button.



Parameter P1



Auto Fan



**NOTE:** The control will exit the program mode and return to the off mode if no programming is attempted for one [1] minute.

### Restore Memorized Default Settings

**IMPORTANT!** The memorized default settings can be **restored** by entering the program mode and setting P-17 to **rSt**. Exit the program mode and the software version number appears in the display. The **memorized default settings** are restored and the FX-1 returns to the **off mode**. The software version number is always displayed when you exit the program mode.



Software ID

## USING THE PROGRAM MODE

Increment from one **program parameter** to the next by pressing the **select button** while in the **program mode**. Press and release the select button to advance to the desired parameter. Use the **up** and **down** buttons to change the program parameter values. The **programmable parameters** range from P-1 through P-17.

### Up and Down Buttons

The **up** and **down** buttons are used to select the data or set the desired limits for the parameter being programmed. This method is followed throughout the program mode, however, special instructions are included for individual functions as required.

### Exiting the Program Mode

There are two methods to exit the program mode. Press the power button and the **FX-1** control will return to the **off mode**. Not pressing any buttons or attempting any program changes for sixty (60) seconds will allow the control to exit the program mode to the off mode. Any programming changes that were made while in the program mode will be memorized and put into operation when the program mode is exited and the control is returned to the on mode.

### Software Identification

The software version of the control is identified for one [1] second prior to the exit from the program mode. The software identification number, i.e. ["A10"] will appear in the display for one second, then the control will return to the off mode.

*Should there be any reason to contact Technicold about the system or programming the FX-1 be sure to have the software identification number available.*

## PROGRAMMABLE PARAMETERS

There are seventeen (17) programmable parameter locations with their Factory Default Settings listed in this section. The table below describes these parameters, along with the permitted values and the original Factory Default Settings..

Program #	Description	Default	Range
P-1	Fan Speed operation: Auto or Manual	A=Automatic	A=Automatic 1 thru 6 Manual Speeds
P-2	High Fan Speed Limit (arbitrary units)	85	65-95
P-3	Low Fan Speed Limit (arbitrary units)	55	30-64
P-4	Compressor Staging Time Display	15	5 - 135 seconds
P-5	Temperature Sensor Calibration	0	Ambient - 10 <sup>0</sup> F
P-6	Failsafe Modes and Mnemonic High Freon Pressure - HPF Low Freon Pressure - LPF Low AC Line Voltage - LAC	3 = 4 Failures with 90 second restart delay. Manual reset is required.	off 1 = Continuous No Display 2 = Continuous With Display 3 = 4 Failures Reset Required
P-7	Low AC Voltage Cut-Off	85 VAC (115 vac) 185 VAC (220 vac)	Off - 75 to 120 (115 vac units) Off 175 to 220 (220 vac units)
P-8	De-Icing Cycle	0	0 = Off 1 to 3 Minutes
P-9	Pump Sentry - Protect Pump and Compressor From Loss of Sea Water	OFF	OFF On = Select 100 <sup>0</sup> F to 150 <sup>0</sup> F
P-10	Display Brightness Control	13 = Maximum	4 = Low 13 = Maximum
P-11	Display <sup>0</sup> Fahrenheit or <sup>0</sup> Celsius	<sup>0</sup> F	<sup>0</sup> F = Fahrenheit Displayed <sup>0</sup> C = Celsius Displayed
P-12	Cycle Pump With Compressor or Continuous Pump	OFF = Cycle With Compressor	OFF = Cycle With Compressor On = Continuous Pump
P-13	Reverse Fan Speeds During Heating Mode	rEF = Reversed	nor = Normal Fan Operation rEF = Reversed Fan In Heating
P-14	Continuous Fan or Cycle Fan with Compressor	con = Continuous Fan Operation	CYC = Cycle Fan On Comp. con = Continuous Fan Operation
P-15	Reverse Cycle Heating or Electric Heat	nor = Reverse Cycle Heating	nor = Reverse Cycle Heating ELE = Electric Heater Installed
P-16	Fan Motor Type Selection - Shaded Pole or Split Capacitor	SP = Shaded Pole	SP = Shaded Pole Fan Motor SC = Split Cap. Fan Motor
P-17	Reset Memorized Programming Defaults	nor = Normal	rSt = Reset Defaults

*Should any programming problems or confusion occur, reset the Memorized Default Settings by entering the program mode and setting P-17 to rSt.*

**P-1: FAN SPEED AUTOMATIC OR MANUAL**

The program values allowed are A, followed by one (1) through six (6). Select "A" (factory default setting) for automatic fan speeds and the fan will operate in conjunction with room temperature. The further the room temperature is from set point, the faster the fan will run in the cooling mode. The fan speed will gradually decrease as the set point is approached and the fan will run at low speed (1) when the set point is satisfied. Select any one of six (6) manual fan speeds available, for example, select three (3) and the fan will operate at medium speed under all temperature conditions. When a manual fan speed is selected the fan will always operate at the speed selected and will not vary with room temperature.

**P-2: HIGH FAN LIMIT**

The upper fan speed limit can be tailored to suit various motors and operating conditions. The high fan limit is adjusted with the system installed and operational. The range of values are 56 through 85 and represent arbitrary units. Setting a higher number, results in a higher fan speed, setting lower numbers, lowers the high fan speed limit. Use the up and down buttons to select the desired high fan speed limit. The factory default setting is eighty-five (85).

**P-3: LOW FAN LIMIT**

The low fan limit determines the lowest output allowed for the low fan speed. The range of values for the low fan speeds are 30 through 55, in arbitrary units. Use the up and down buttons to select the desired low fan speed limit. Setting a higher number results in a higher fan speed. Setting lower numbers lowers the low fan speed limit. The factory default setting is 45.

*IMPORTANT! Once the high and low fan speed limits are set, the unit will automatically readjust to produce six [6] equally spaced fan speeds in both the automatic and manual fan speeds modes.*

**P-4: COMPRESSOR STAGING TIME DELAY**

The compressor staging time delay is provided for installations where more than one system is being operated from the same power source. Setting the staging delays at different intervals allows only one compressor to start at a time. The units should be staged at least five (5) seconds apart. The minimum delay is five (5) seconds and the maximum is one hundred thirty-five (135) seconds. The factory default setting is 15 seconds.

**P-5: TEMPERATURE CALIBRATION**

Use this feature to calibrate the air sensor within a range of  $\pm$  ten (10) °F. Enter the program mode and the ambient temperature appears in the display. Use the up and down keys to select the desired offset. The temperature in the display will increase or decrease according to the offset programmed.

The factory default setting is zero.

**P-6: FAIL-SAFE LEVEL**

The system can be configured for one of four fail-safe levels. Selecting **OFF** turns off all fail-safe protection and mnemonic display codes. Level one (1) shuts down the system, allows the system to restart after a 90 second delay and displays no failure code. Level two (2) shuts down the system, allows continual restarts after the 90 second delay and displays the appropriate mnemonic failure code. Level three (3) operates the same as level two with the addition of a system shutdown after four (4) consecutive failures... Manual reset is required to restart the system.

**P-7: LOW AC VOLTAGE CUT-OFF**

FX-1 can be programmed to protect the system against sustained low AC line voltage conditions. The compressor will be shut down and "**LAC**" flashed in the display if the line voltage goes below the programmed value for more than ten (10) minutes. Programmable values are 75 VAC to 120 VAC for 120 volt units and 175 VAC to 220 VAC for 220 volt systems. The factory default is 85 VAC for 120 volt units and 185 VAC for 220 volt systems. NOTE: Low Voltage Protection can be turned off by programming **Off** instead of selecting a voltage value.

**P-8: DE-ICING CYCLE**

FX-1 is equipped with a De-Icing Cycle to prevent ice build up on the evaporator coil during extended periods of cooling operation. Installation variables such as grille sizes, length of ducting, insulation R factors and ambient temperatures determine the cooling run time required to achieve set point. Customer usage may substantially increase run times by operating the system with the hatches and doors open. Programming unrealistic set point [55° F] and leaving the salon door open will usually cause the evaporator to ice up on warm, muggy days. De-Icing is accomplished by switching the reversing valve into Heat Mode while the system is cooling. The valve will remain energized for the programmed cycle time. The factory default setting is zero [Off].

## PROGRAMMING

### **P-9: OPTIONAL PUMP SENTRY**

FX-1 can be equipped with an optional temperature sensor that is used to monitor the condenser coil temperature. The sensor is plugged into the outside air sensor jack and parameter P-9 programmed for a temperature between 100 and 150 ° F depending on sea water temperature and the system type. When the coil temperature rises above the programmed value, the pump and compressor are shut down and "PPP" is flashed in the display. The factory default is Off, no pump sentry installed.

### **P-10: DISPLAY BRIGHTNESS CONTROL**

The display brightness can be adjusted to suit ambient cabin lighting conditions. The allowed settings are four (4) to thirteen (13), with four (4) being the dimmest and thirteen (13) the brightest. Typically a dark cabin will require a setting of four or five. A very bright cabin will require a setting of twelve or thirteen. The factory default setting is thirteen (13).

### **P-11: FAHRENHEIT OR CELSIUS SELECTION**

The unit can be programmed to display either Fahrenheit or Celsius. Programming °F selects degrees Fahrenheit and programming °C displays degrees Celsius. The factory default setting is °F, Fahrenheit. When degrees Celsius (°C) is selected the readings are displayed in tenths, i.e. 22.2 °.

### **P-12: CYCLE PUMP WITH COMPRESSOR**

to increase pump life and conserve electricity the pump can be programmed to cycle on and off with the compressor. The pump can also be programmed to operate continuously whenever the system is on. To program the pump for continuous operation turn P-12 On. The factory default is Off, which cycles the pump with the compressor.

### **P-13: REVERSE AUTOMATIC FAN SPEEDS DURING HEATING**

The automatic fan speeds can be reversed during the heating mode to improve heat output in cooler climates. The fan speed is decreased as the temperature spread increases. The fan will speed up as the set point is approached. Lowering the fan speed when the cabin is cold raises the supply air temperature. The fan switches to low speed when the set point is satisfied and the water valve cycles off. The fan can be programmed to operate the same as in cooling by programming "P-13 nor" which represents normal fan operation during the heating cycle.

The factory default is rEF, which reverses the automatic fan speeds during heating.

### **P-14: CYCLE FAN WITH COMPRESSOR**

The fan can be programmed to run continuously when the system is on or can be allowed to cycle with the compressor. When cycled with compressor, the fan will operate only when heating or cooling is called for. To cycle the fan with the compressor select CYC. To operate the fan continuously select "con". The factory default when the system is on is continuous fan operation [con].

### **P-15: REVERSE CYCLE OR ELECTRIC HEAT**

Units not equipped with reverse cycle heat may have electric heater added. Electric heat requires the compressor be turned off when heating is called for. The reversing valve outlet is used to control the optional electric heating element contractor. The valve output relay can only carry 6 amps, therefore, a heavy duty contractor must be installed to carry the heater current. Program parameter ELE for the electric heat option. The factory default is nor which is normal reverse cycle heating.

NOTE: See addendum for electric heat option. Contact factory for more information.

### **P-16: FAN MOTOR SELECTION**

There are two basic fan motor types, shaded pole and split capacitor. Each motor reacts differently to speed control and each motor requires different timing for optimum fan speed variation. The default setting is "SC" which selects the split capacitor motor type, however, "SP" should be selected if a shaded pole type of fan motor is used in the system. Most air handlers are supplied with split capacitor type fan motors. The factory default is "SC" split capacitor fan motor type.

### **P-17: RESET MEMORIZED DEFAULTS**

The default programming parameters can be reset by entering the program mode and selecting rSt. This will restore the programmable parameters to the values selected when the system was shipped. The program parameters listed on page 9 may be altered by Technicold, the installing dealer or the end user. Once new defaults are entered (see page 6, dual button functions) and memorized the NEW defaults will be reset. The original factory programmable parameters as listed on page 9 will have to be restored manually.

*Why Memorize New Defaults?*

Once the desired programming changes have been made and the system tests satisfactorily, your work can be saved as the new factory defaults. Your new defaults are initiated by simultaneously pressing and releasing the up and down buttons prior to exiting the program mode. New defaults can be initialized at any time by entering the program mode and following the above instructions. Once new defaults have been initialized the control will revert back to the new defaults whenever factory defaults are restored as described on page 8 of this manual.

**FAIL-SAFE AND FAULT HANDLING CODES**

*When a fault is detected FX-1 will display one of the following Mnemonic fault codes:*

- HPF**... indicates high Freon pressure. 15 Second Delay... Ignored in Heat Mode.
- LPF**... Indicates low Freon pressure. There is a ten minute charge time delay.
- LAC**... Indicates low AC line power
- AAA**... Indicates failed air sensor. Unit will not run until repaired.
- PPP**... Indicates the sea water pump has failed.

**FAIL-SAFE**

There are four levels of fail-safe protection including the fail-safe **off mode**. Level one monitors the sensors, takes appropriate action and allows continuous restarts after a 90 second delay. **Does not display the fault code**. Level two works the same as level one, however, the appropriate fault code mnemonic is displayed during the time-out between restarts. Level three is identical to level two with the inclusion of a four successive failures lockout routine. After four consecutive failures the system is shut down and a manual reset is required.

**LOCKOUT**

**Lockout** occurs if P-6 is programmed for level 3 and four consecutive faults are detected within a heating or cooling cycle. Lockout causes the system to shut down and flash the mnemonic fault code. **Lockout** can only be cleared by turning the unit **off**, then **on** using the **power button**.

**FAULT DISPLAY**

When a fault occurs the appropriate mnemonic code is flashed in the display. The flashing mnemonic can be removed from the display by pressing and releasing the **power button** to reset the control. Resetting the control does **not** solve the problem that caused the fault!

<b>Failsafe Level</b>	<b>Action</b>	<b>Description of Action Taken</b>
OFF	All Protection Turned Off	<b>FAILSAFE PROTECTION LEVELS TURNED OFF:</b> Air Sensor Fault: Heating/Cooling Immediately Suspended; Normal Operation Not Resumed Until Fault is Cleared. Air Sensor Fault Code "Flashing Display" NO OTHER FAILSAFE PROTECTION PROVIDED.
1	No Mnemonic Fault Code Displayed Continuous 90 Sec. Re-Starts Allowed!	<b>MINIMUM PROTECTION LEVEL:</b> All Actions Taken in Failsafe Protection Level "0" Plus: In Addition, Continuous 90 Second Compressor Restarts Allowed. FAULT Mnemonic CODE NOT DISPLAYED NO OTHER FAILSAFE PROTECTION PROVIDED.
2	Display Fault & Shut Down Compressor With Continuous 90 Second Delay Between Restarts.	<b>INTERMEDIATE PROTECTION LEVEL:</b> All Actions Taken in Failsafe Protection Level "0" & Level "1" Plus: In Addition, The FAULT MNEMONIC CODE Message Will Be Displayed With Continuous 90 Second Compressor Restarts
3	Display fault & require manual reset after 4 failures.	<b>MAXIMUM PROTECTION LEVEL:</b> FAULT CODE MESSAGES ARE DISPLAYED and The Appropriate Action is Taken According to The Problem Encountered. After 4 Consecutive Failures Manual Reset is Required.

## AUTOMATED FACTORY SELF-TEST PROGRAM

### SELF-TEST MODE

The **FX-1** software contains a self-test program to facilitate factory testing of the entire air conditioning system. Once the **self-test mode** is activated, the test cycle will continue until the AC power is interrupted or the **on/off button** is pressed once which returns the system to the off mode. Activate the self-test by pressing and holding the **on/off button** while turning on the AC power. Be sure to continue to hold the button until the **power on reset** is completed. FX-1 is now in the self test mode.

Once activated the self-test software will continuously execute the following procedure:

- 1 - Turn on in the heat mode and supply heating for ten (10) minutes.
- 2 - Stop heating and run the fan only for five (5) minutes.
- 3 - Switch to cooling and continue cooling for ten (10) minutes.
- 4 - Stop cooling and run the fan only for five (5) minutes.
- 5 - Return to step one (1) and continue until interrupted.

The test mode will continue until the power is interrupted or the test is halted by pressing the on/off button once.

## SPECIFICATIONS

SET POINT OPERATING RANGE.....	55 ° F TO 85 ° F
AMBIENT TEMPERATURE OPERATING RANGE DISPLAYED .....	55 ° F TO 85 ° F
SENSOR ACCURACY .....	± 2 °F AT 77 ° F
LOW VOLTAGE LIMIT 115 VOLT UNITS .....	75 VAC
LOW VOLTAGE LIMIT 220 VOLT UNITS .....	175 VAC
LOW VOLTAGE PROCESSOR RESET .....	60 VAC
LINE VOLTAGE .....	115 THROUGH 250 VAC
FREQUENCY .....	50 OR 60 HZ
FAN OUTPUT .....	6 AMPS @ 115 VAC
FAN OUTPUT .....	6 AMPS @ 230 VAC
VALVE OR HEATER OUTPUT.....	1/4 AMP @ 115 VAC
VALVE OR HEATER OUTPUT.....	1/4 AMP @ 230 VAC
PUMP OUTPUT .....	1/4 HP @ 115 VAC
PUMP OUTPUT .....	1/2 HP @ 230 VAC
COMPRESSOR OUTPUT .....	1 HP @ 115 VAC
COMPRESSOR OUTPUT .....	2 HP @ 230 VAC
MINIMUM OPERATING TEMPERATURE .....	0 ° F
MAXIMUM AMBIENT OPERATING TEMPERATURE .....	180 ° F
MAXIMUM RH CONDITIONS .....	99% NON CONDENSING
POWER CONSUMPTION .....	LESS THAN 5 WATTS

## DIMENSIONS

DISPLAY PANEL .....	3.75" X 3.75"
PANEL CUT OUT .....	3.150" X 3.150"

## CABLE LENGTHS

SELF CONTAINED DISPLAY CABLE.....	15' STANDARD
ALTERNATE AIR SENSOR .....	7' STANDARD
PUMP SENTRY SENSOR .....	7' STANDARD

## SYSTEM INPUTS

1 .....	AMBIENT FACE PLATE AIR TEMPERATURE SENSOR
1 .....	HIGH FREON PRESSURE
1 .....	LOW FREON PRESSURE
1 .....	OPTIONAL OUTSIDE AIR TEMPERATURE SENSOR

**NOTES:** Custom cable lengths available on special request in 5 foot increments. Maximum length of display cable is fifty ( 50 ) feet. Sensor cable lengths should be limited to 50 feet. The outside air sensor, alternate air sensor and condenser coil sensor are optional items and are not included with the standard control package.

When installing the optional Pump Sensor [ Pump Sentry ] and the Alternate Air Sensor No Outside Air Sensor is available.

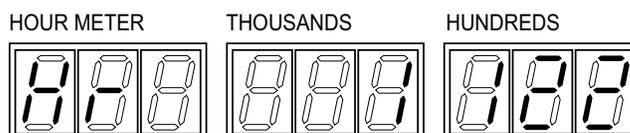
In order to continually improve and advance the FX-1 Control, Micro Air, Inc. reserves the right to change this product's basic operation, specifications and design criteria without prior notice.

## HOUR METER

Total compressor cycle time is saved in EEPROM every 6 minutes of continuous compressor running time. Cycles less than 6 minutes will be discarded to conserve memory and allow the most flexible hour-meter possible.

To view the hour meter turn off the power at the AC breaker and hold the down button depressed. While depressing the down button, restore AC power. After the Power-On reset routine is complete, the following will appear in the display:

1. The hour meter mnemonic [Hr] is displayed for one [1] second.



2. The display blanks out for one second and then displays the Thousands units for three [3] seconds.

3. The display blanks out for one [1] second and then displays the Hundreds units for three [3] seconds.

4. The unit returns to the last operating state before power was removed.

The example shown is displaying eleven-hundred twenty-two [1,122] hours.

Maximum recorded time is 10,000 hours. The hour meter stops at maximum (10,000 hrs) and can only be reset by Technicold.

## SERVICE HISTORY

FX-1 will record and remember the last eight (8) service problems or service faults detected. Each time a fault is detected, a one hour timer is started. During that hour the same recurring fault will not be recorded. Should a different fault be detected during that hour, it will be entered into the service history log.

The following events are entered into the service history log:

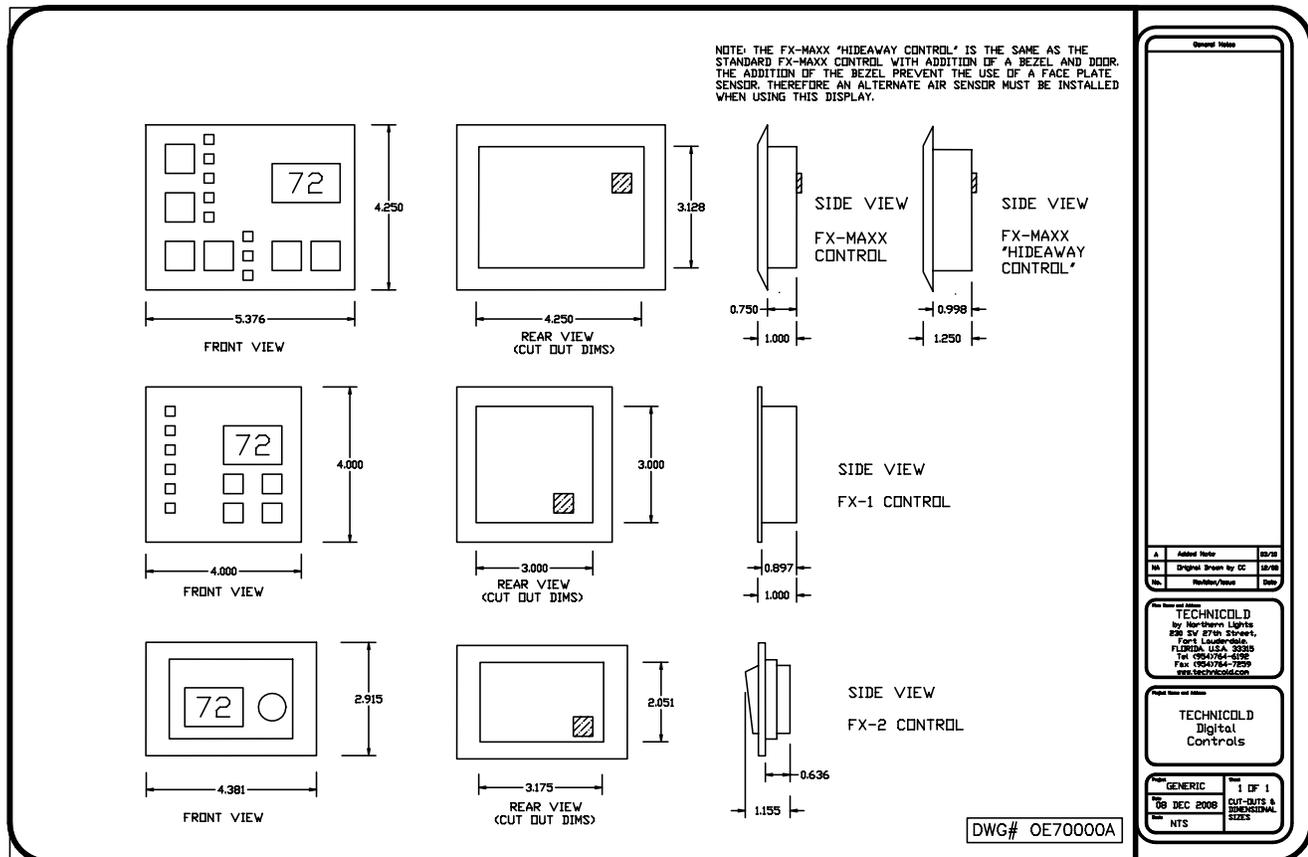
1. High Freon Pressure
2. Low Freon Pressure
3. Air Sensor Fault
4. Low AC Voltage
5. Pump or Loss of Sea Water Fault

To view the service log turn off the AC power and depress the select button. With the select button depressed turn on the AC power. Once Power-On reset is completed, the display will flash the most recent mnemonic for the fault detected, followed by the event number. To view the other events detected press either the up or down buttons.

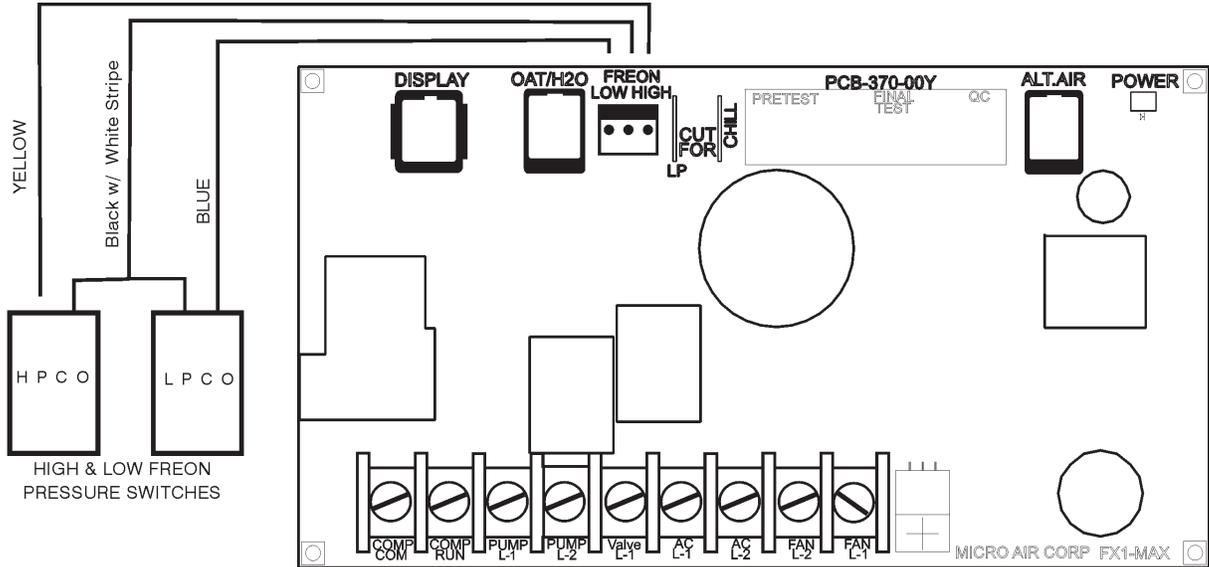
To exit the service history log press the power or the select button or wait 30 seconds without pressing any buttons.

The service log can be cleared by simultaneously pressing the power and down buttons while you are viewing the service log mode.

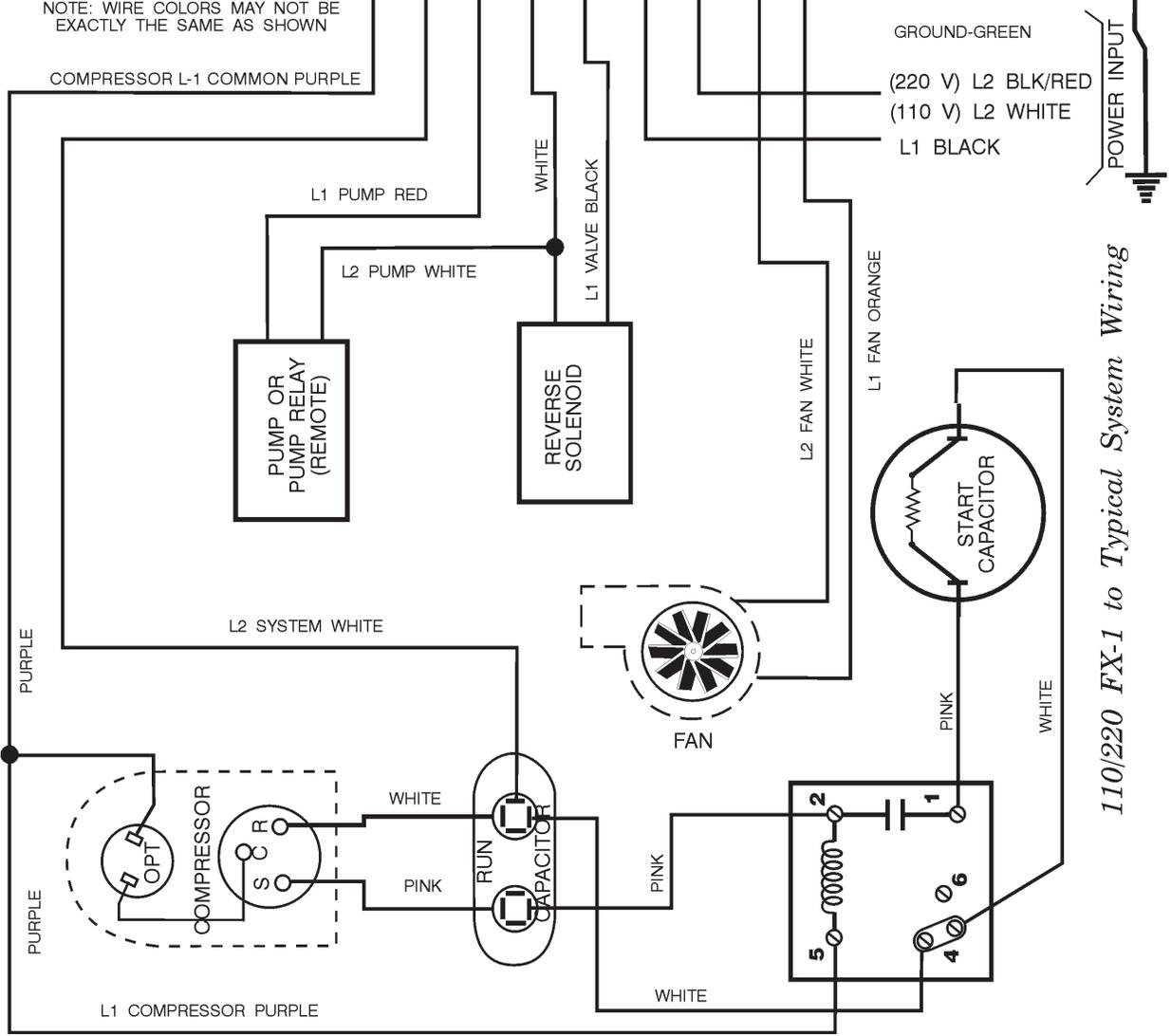
## DIGITAL CONTROLS



# FX-1 WIRING DIAGRAM



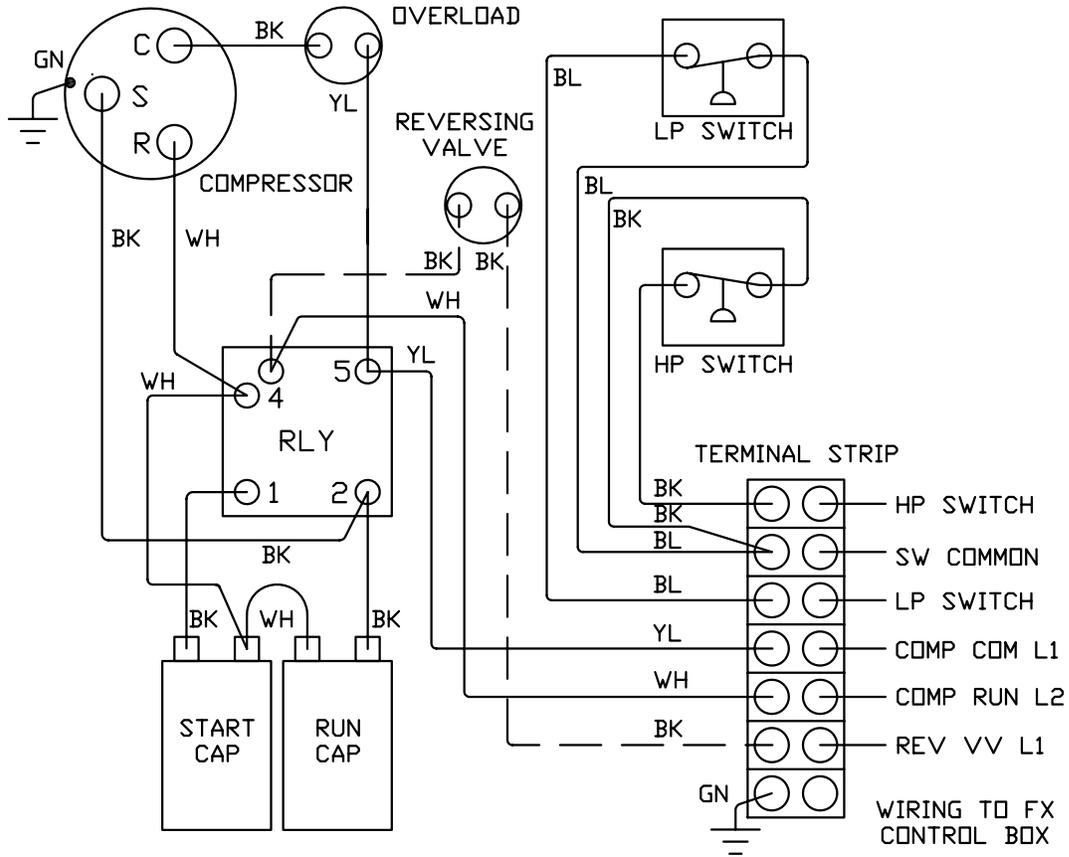
NOTE: WIRE COLORS MAY NOT BE EXACTLY THE SAME AS SHOWN



*110/220 FX-1 to Typical System Wiring*

# CONDENSING UNIT WIRING

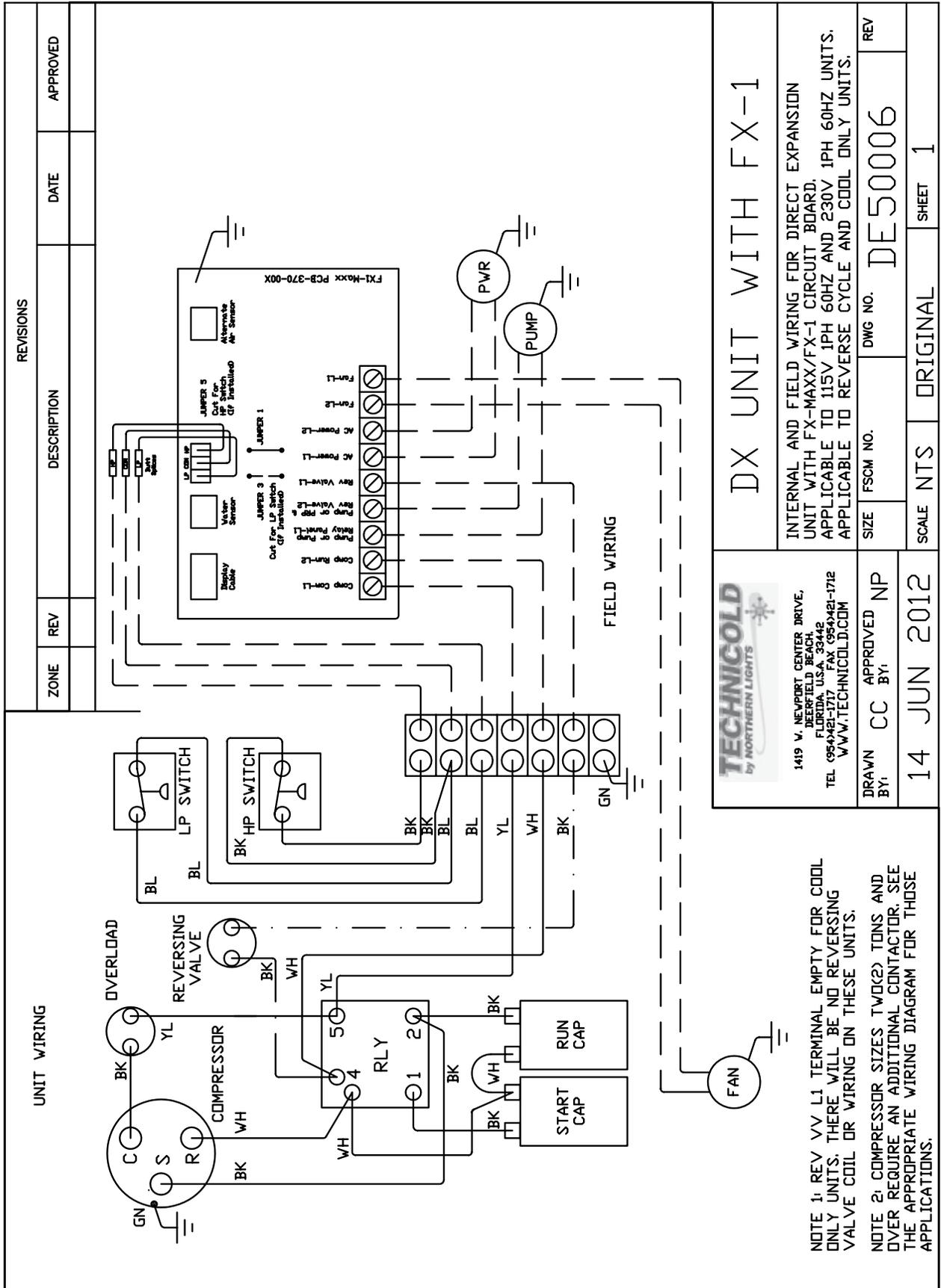
REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED



NOTE: REV VV L1 TERMINAL EMPTY FOR COOL ONLY UNITS. THERE WILL BE NO REVERSING VALVE COIL OR WIRING ON THESE UNITS.

		REMOTE CONDENSING UNIT WIRING		
1419 W. NEWPORT CENTER DRIVE, DEERFIELD BEACH, FLORIDA U.S.A. 33442 TEL (954)421-1717 FAX (954)421-1712 WWW.TECHNICOLD.COM		INTERNAL WIRING DIAGRAM WITH TERMINAL STRIP FOR REMOTE CONDENSING UNIT. APPLICABLE TO 115V 1PH 60HZ AND 230V 1PH 60HZ UNITS. APPLICABLE TO REVERSE CYCLE AND COOL ONLY UNITS.		
DWN BY:	CC	APP BY:	NP	REV
07 DEC 2011		SIZE	FSCM NO.	DWG NO. DE50002
SCALE NTS		ORIGINAL		SHEET 1

**DX UNIT WITH FX-1**



REVISIONS		DATE	APPROVED
ZONE	REV	DESCRIPTION	

**TECHNICOLD**  
by NORTHERN LIGHTS

1419 W. NEWPORT CENTER DRIVE,  
DEERFIELD BEACH,  
FLORIDA, U.S.A. 33442  
TEL (561)421-1717 FAX (561)421-1712  
WWW.TECHNICOLD.COM

**DX UNIT WITH FX-1**

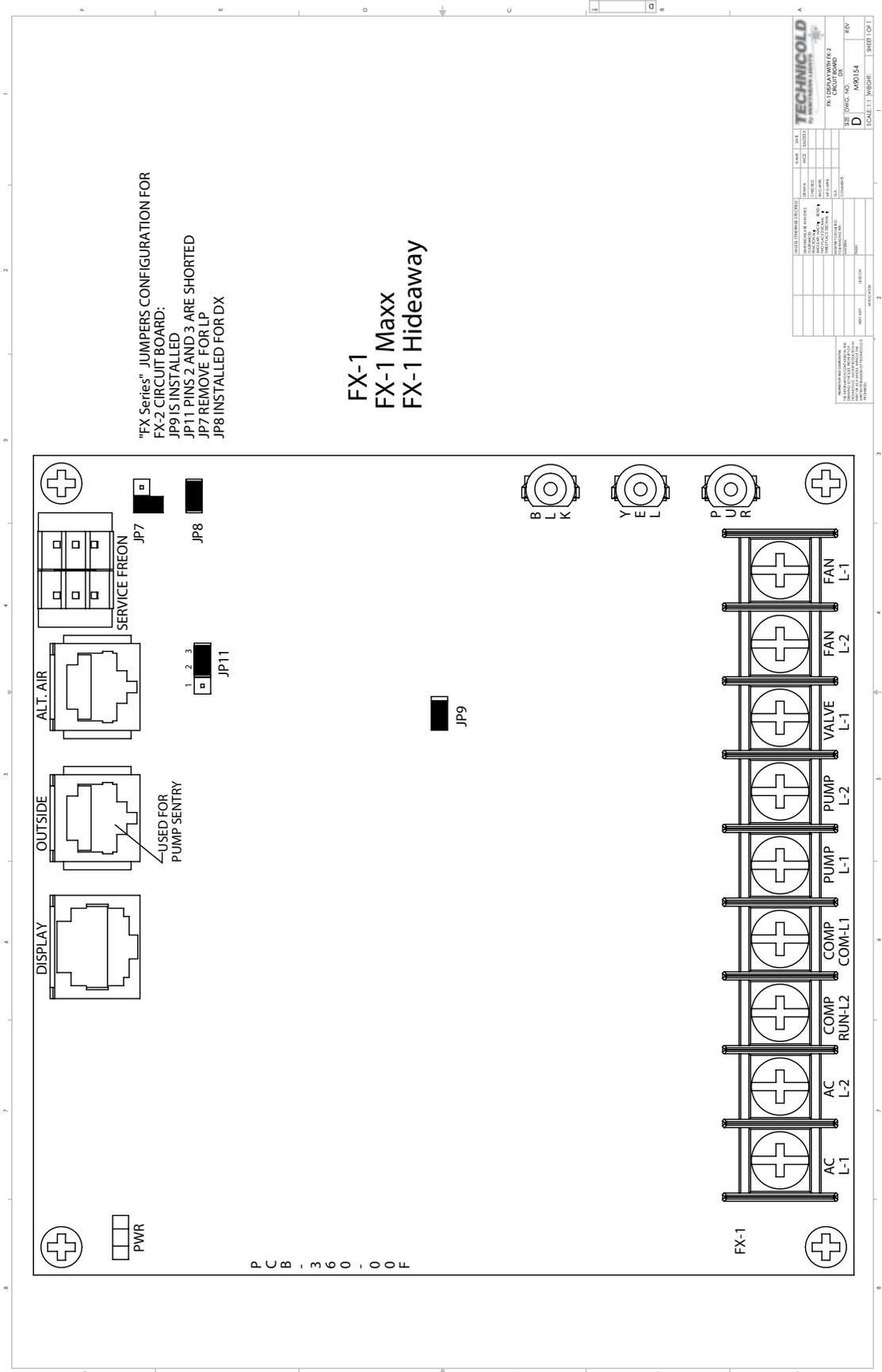
INTERNAL AND FIELD WIRING FOR DIRECT EXPANSION UNIT WITH FX-MAXX/FX-1 CIRCUIT BOARD. APPLICABLE TO 115V 1PH 60HZ AND 230V 1PH 60HZ UNITS. APPLICABLE TO REVERSE CYCLE AND COOL ONLY UNITS.

DRAWN BY:	CC	APPROVED BY:	NP	DWG NO.:	DE50006
14 JUN 2012				SCALE:	NTS ORIGINAL
				SHEET:	1

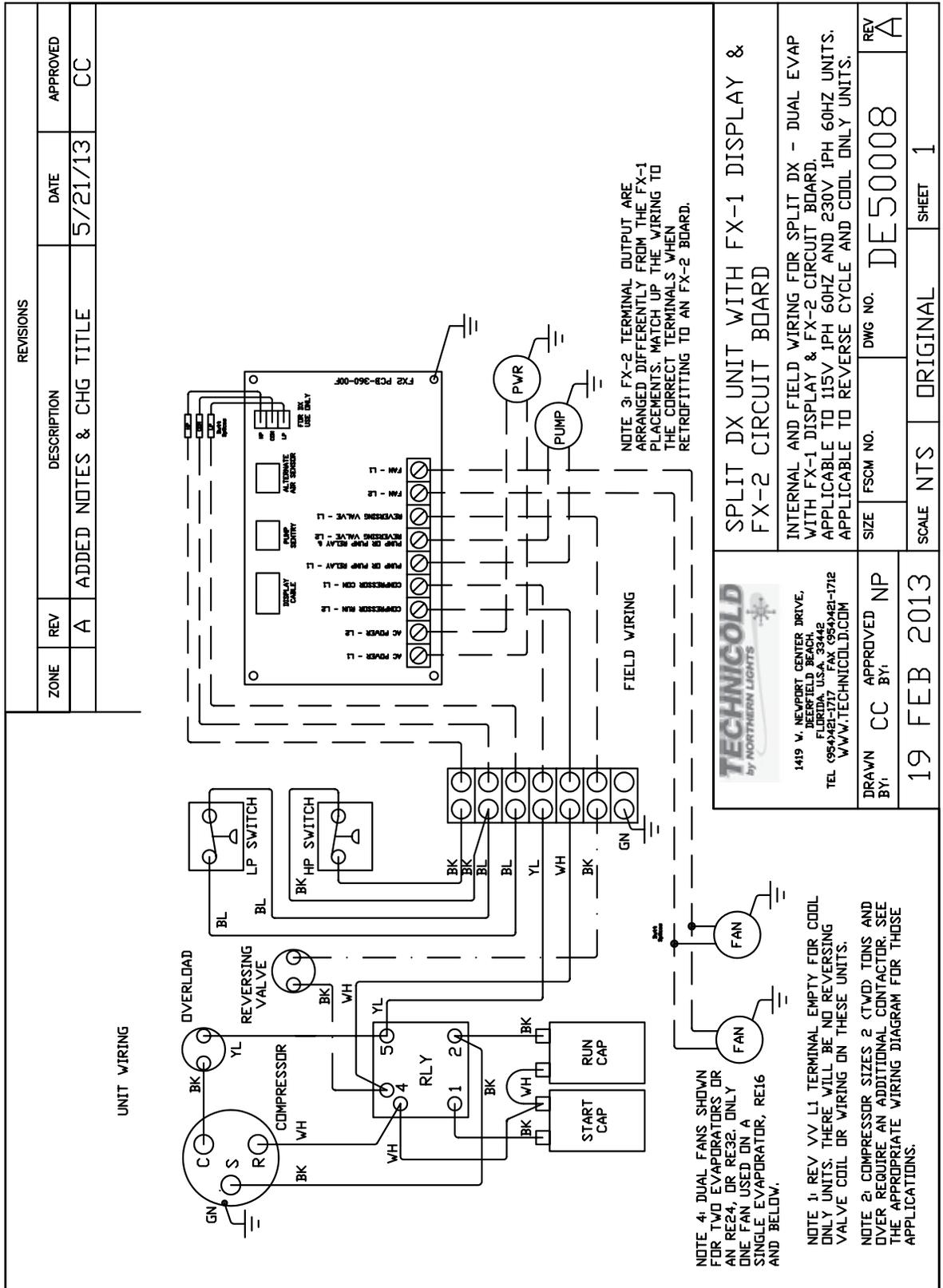
NOTE 1: REV VV L1 TERMINAL EMPTY FOR COOL ONLY UNITS. THERE WILL BE NO REVERSING VALVE COIL OR WIRING ON THESE UNITS.

NOTE 2: COMPRESSOR SIZES TWD(2) TONS AND OVER REQUIRE AN ADDITIONAL CONTACTOR. SEE THE APPROPRIATE WIRING DIAGRAM FOR THESE APPLICATIONS.

# FX-1 DISPLAY WITH FX-2 CIRCUIT BOARD



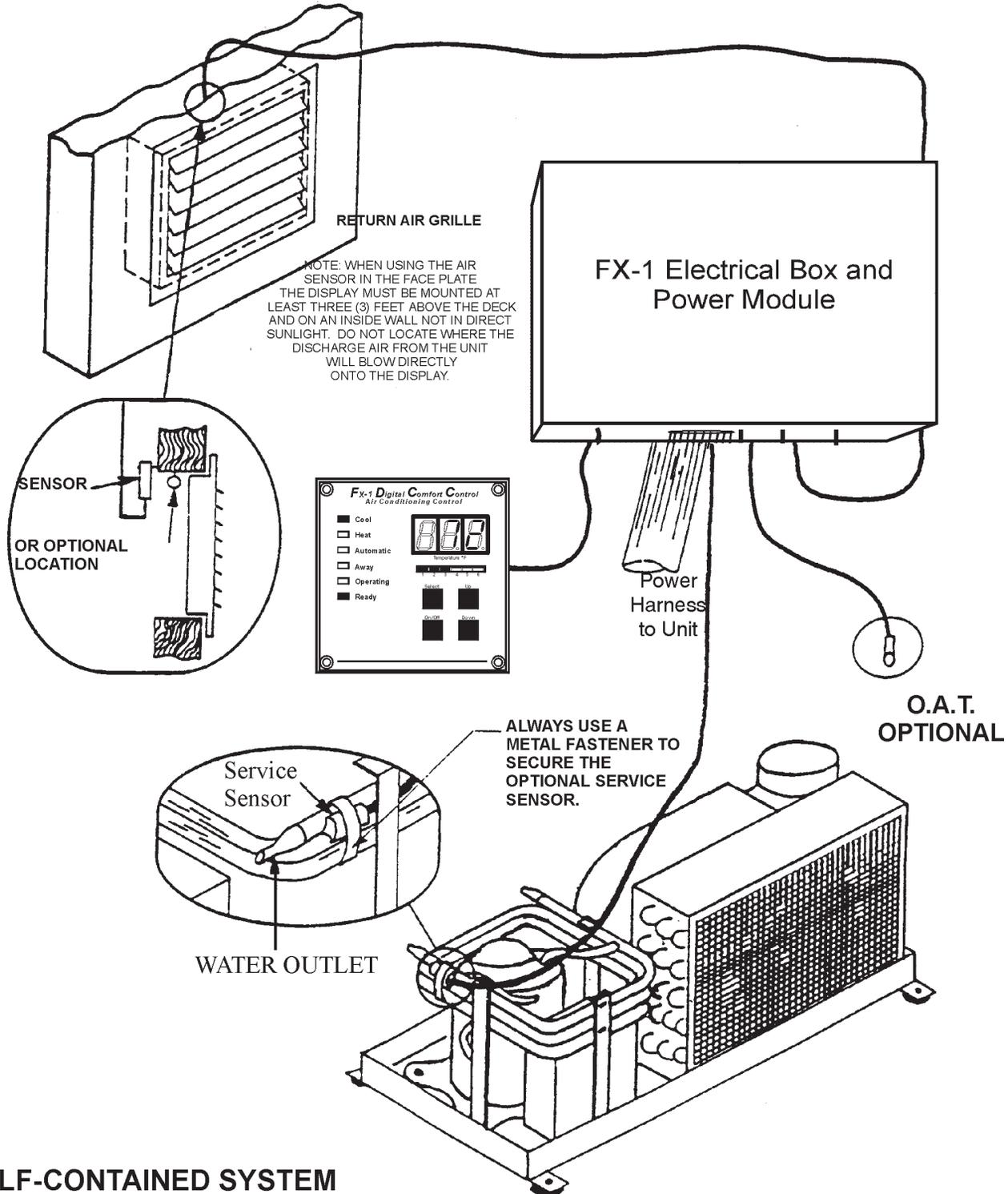
**SPLIT DX - DUAL EVAPORATORS WITH FX-1 DISPLAY & FX-2**



# INSTALLATION OVERVIEW

## Optional Sensor Locations and Cable Connections

### Optional Remote Air Sensor



## WARRANTY INFORMATION

The Limited Warranty applies to the following product lines: TECHNICALD Air Conditioning and Refrigeration Products  
Technicold manufacturer NORTHERN LIGHTS, INC. (herein "NLI") extends to the purchaser and user (herein "Owner") of the product the following limited warranty (herein "Warranty"). Please read it carefully.

Technicold Air Conditioning and Refrigeration Products	
Warranty Period	
Product	12 Months
Parts and Labor	12 Months
Parts	24 Months

### ***NLI'S WARRANTY AND RESPONSIBILITIES***

**Subject to the terms and conditions set out below, NLI warrants the product and its factory installed parts to be free from defects in material and workmanship under normal use and service.**

If the product is purchased for and used primarily in a commercial endeavor, the Warranty period shall extend from the date of delivery to the original end user for a period of twelve (12) months with no limit on hours of use. If the product is purchased for and used primarily in personal, family or household use, the warranty period shall extend from the date of delivery to the original end user for a period of twelve (12) months with no limit on hours of use. Original parts shall be warranted for a period of twenty-four (24) months from date of delivery.

**The obligation of this Warranty shall be limited to repairing or replacing any part of the product which NLI agrees is defective in materials or workmanship under normal use and service during the warranty period.** If during the warranty period the product or any of its parts are found to be defective because of workmanship or materials, it will be repaired or replaced without charge if the Owner prepays the transportation charges and returns the item to NLI's authorized warranty dealer. To find the location of the nearest NLI authorized warranty dealer, contact NLI at the address, e-mail address, or telephone or fax numbers in this publication.

Upon request by the Owner and agreement by NLI, repair of product or replacement of parts under this Warranty may be completed at a place other than at an NLI authorized warranty dealer. See "Owner's Responsibilities".

### ***NLI'S WARRANTY AND RESPONSIBILITIES***

**Within thirty (30) days of purchase, Owner or authorized agent of Owner must complete, sign and deliver to NLI the Warranty Registration Card in order to validate this warranty. Owner must break in unit as described in the "Operating Procedures" section of the Operator's Manual.**

At the time of presentation of product for service under this Warranty, the Owner or authorized agent must present evidence of the date of original purchase of the product.

If pre-approved repair of product or replacement of parts under this Warranty is completed at a place other than an NLI authorized warranty dealer, Owner shall pay NLI's or its authorized dealer's reasonable travel expenses.

Owner shall pay costs of any labor required to remove and reinstall the product and/or parts thereof, any premium for overtime labor requested by the Owner and costs for transporting the product and/or parts thereof to and from the place where warranty work is performed.

## WARRANTY INFORMATION

### WARRANTY LIMITATIONS

This warranty will not apply to equipment put into service more than twenty-four (24) months from date of shipment from factory, and will not apply in any country with which trade is restricted or banned by the U.S. Department of State, at or after the time of sale or claim.

If the product is used primarily in a commercial endeavor, neither NLI nor any company affiliated with NLI will be liable for general damages, including bodily injuries, except as set forth above, or for incidental consequential damages, including, but not limited to, loss of use, loss of profits, loss of production, expense of substitute equipment or other commercial loss or for damage to property in which equipment is installed. The same limitations shall apply to a product used for personal purposes with respect to all non-personal injuries, general, incidental and consequential damages.

Some countries or states do not fully allow the above exclusions or limitations of general, incidental or consequential damages, so the above exclusions or limitations may not apply to you. This Warranty extends only to the original parts, accessories and products.

This Warranty is transferable to a new Owner during the warranty period. No transfer forms or fees are required.

This Warranty does not extend to failure resulting from an accident or disaster or from Owner or operator abuse or neglect (such as operating without proper maintenance of equipment, including pumps, filters and electrical connections.) Service parts worn out by usage and not due to defects in workmanship or material are not covered by this Warranty.

NLI is not responsible for failure resulting from improper repair or use of defective parts or parts not approved by NLI.

NLI is not responsible for failure of product or parts resulting from improper installation or unauthorized modifications.

NLI is not responsible for failure caused by negligent handling or abuse in installation or storage in improper environment which results in corrosion or freezing damage to equipment.

NLI is not responsible for failure caused by any third party's transportation damage to NLI's product.

NLI is not responsible for damage if any warning alarm system is ignored.

### NO REPRESENTATIONS AND LIMITATIONS OF IMPLIED WARRANTY

This written Warranty is in lieu of all other express warranties, obligations or limitations. If this equipment is used primarily in a commercial endeavor, no implied warranty, including that of merchantability and fitness for a particular purpose is extended. If the product is used primarily in personal, family or household use, any implied warranty, including that of merchantability and fitness for a particular purpose, shall be limited to twelve (12) months.

Some countries or states do not allow limitations on how long an implied warranty lasts, so the above limitations may not apply to you.

No person is authorized to make any representations or promised on behalf of NLI or to modify the terms or limitations of this Warranty in any way except in writing and signed by an authorized employee of NLI.

This warranty gives you specific legal rights, and you may have additional statutory rights which vary from one country or state to another.





**TECHNICOLD**  
**MARINE HVAC**

1419 W. Newport Center Drive, Deerfield Beach, FL 33442

Tel: (954) 421-1717 • [www.technicold.com](http://www.technicold.com)

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