

MCT-DX i4.3 User Manual

MCT-DX Controller

A controller that operates like your favorite smartphone or tablet.

EASY TO USE
TOUCH SCREEN
INTERFACE



Safety Information in this Manual

Notes, cautions and warnings appear throughout this book to draw your attention to important operational and safety information.

A “**NOTE**” marks a short message to alert you to an important detail.

A “**CAUTION**” appears with information that is important for protecting your equipment and insuring performance.

A “**WARNING**” appears with information that is important for protecting you, others and equipment from damage. Pay very close attention to all warnings that apply to your application.



This symbol (an exclamation point in a triangle) precedes a general CAUTION or WARNING statement.



This symbol (a lightning bolt in a lightning bolt in a triangle) precedes an electric shock hazard CAUTION or WARNING safety statement.

Technical Assistance

If you encounter a problem with your DX controller, review all of your configuration information to verify that your selections are consistent with your application: inputs; outputs; alarms; limits; etc. If the problem persists after checking the above, you can get technical assistance by dialing +1 (866) 342-5332 or by faxing your request to +1 (866) 332-8014, Monday thru Friday, 8:00 a.m. to 5:00 p.m. Eastern Standard Time. You can also email your request to support@futuredesigncontrols.com.

An applications engineer will discuss your application with you.

Please have the following information available:

- Complete Model #'s and/or Serial #'s for Component(s) in Question
- Complete Software Version #'s
- All Configuration Information
- All User Manuals

Warranty and return information are on the back cover of this manual.

Comments

Your comments or suggestions on this manual are welcome. Please send them to:
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1	What is the MCT-DX?	6
1.1	Features	6
2	Installation	7
2.1	Enclosure Guidelines	7
2.1.1	Locating the DX Touch Screen Interface	7
2.2	Environmental Considerations	8
2.3	Mounting Dimensions	8
2.3.1	DX 4.3" Touch Screen Interface	9
3	Wiring	10
3.1	Power Requirements	10
3.1.1	Installing the Power-On Delay Relay	10
3.2	Connecting to the MCT-DX Interface	11
3.2.1	Dixell Controller Communications	12
3.2.2	User Serial Communications	13
4	Configuring the MCT-DX	15
4.1	Probe Setup	17
4.2	Functions	18
4.3	Startup View	21
4.4	Custom Name\Address	22
5	Basic Operation	23
5.1	OEM Configuration Options	23
5.1.1	Dixell Control Buttons	23
5.2	Touch Screen Interface	24
5.3	Menu Navigation	25
5.3.1	Home Menu	26
5.3.1.1	Text Based Home Menu	26
5.3.1.2	Icon/Slide Page Based Home Menu	27
5.3.2	Device Settings Menu	28
5.3.2.1	Text Based System Setup Menu	28
5.3.2.2	Icon/Slide Page Based Device Settings Menu	29
5.3.3	Offline Menu	30
5.3.3.1	Text Based Offline Setup Menu	30
5.3.3.2	Icon/Slide Page Based Offline Menu	31
5.3.4	Data Menu	32
5.3.4.1	Text Based Data Logging Menu	32
5.3.4.2	Icon/Slide Page Based Log Menu	33
5.4	Notifications	34
5.5	Control (Regulation Set Point)	35
5.5.1	Single View	35
5.5.2	Dual View	36
5.6	Process Monitoring	37
5.6.1	Historical Minimum and Maximum	37
5.6.2	Charts	38
5.6.2.1	Chart Setup	38
5.7	System Alarms	40

5.7.1 Alarm Monitor	40
5.7.2 Alarm File	40
6 Security	42
6.1 Adding Users	43
6.2 Viewing Users	43
6.2.1 New Password Entry	43
6.3 Setting User Access	44
6.3.1 Security System User Access	44
6.4 Setting Security Options	46
6.5 Audit Trail	47
7 Data Logging	48
7.1 Selecting Points for Logging	49
7.2 Starting/Stopping Data Logging	49
7.2.1 Calculating Log File Size	50
7.3 Reviewing Historical Data	51
7.3.1 History Plot Setup	51
7.3.2 Plotting Historical Data	52
7.4 USB File Transfer	53
7.4.1 Recommended File Maintenance	54
7.5 FTP/FileWeb/DataWeb Interface	55
7.5.1 More About FTP, FileWeb and DataWeb Interfaces	56
7.5.2 FileWeb/DataWeb Server Components and Requirements	58
7.6 FDCUtil.com Web site for FTP, FileWeb and DataWeb Testing	59
7.7 Annotation	65
7.8 AddView Digital Signatures	66
8 Device Settings	67
8.1 Alarms	68
8.2 Setpoint Limits	69
8.3 Defrost	70
8.4 Control	71
8.5 Navigation	71
8.6 Communication Settings	72
8.6.1 Ethernet Settings	73
8.7 Email	74
8.7.1 Email Address Entry	74
8.7.2 Email Addresses	74
8.7.3 Email Settings	75
8.7.4 Email Message	76
9 Offline	77
9.1 Degrees C/F Units Selection	78
9.2 Clock Settings	79
9.2.1 Time Options	79
9.2.1.1 Local Time Server Settings	80
9.2.2 Daylight Savings	80
9.3 Language	81

9.4	Calibration	82
9.5	Display Settings.....	82
9.5.1	<i>Calibrate Touch</i>	82
9.5.2	<i>Backlight Settings</i>	84
9.6	Configuration	85
9.6.1	<i>Importing an OEM Default Configuration</i>	86
9.7	About MCT-DX	88
9.8	Exit Application	88
10	Communications.....	89
10.1	Ethernet Communications	89
10.1.1	<i>Guide to Smart Networking Practices</i>	89
10.1.1.1	<i>The DX and Network Security</i>	90
10.1.2	<i>Using the Web Server</i>	91
10.1.3	<i>Using the VNC Server</i>	93
10.1.3.1	<i>Recommended VNC Viewer Settings (PC/MAC)</i>	93
10.1.3.2	<i>Recommended VNC Viewer Settings for Tablets</i>	95
10.1.3.3	<i>Accessing the DX through a VNC Viewer</i>	96
10.1.4	<i>Using Modbus TCP/IP Communications</i>	98
10.2	Serial Communications Option	99
11	Alarm Codes and Troubleshooting	100
	Appendix	102
A.1	Modbus Communications	102
A.1.1	<i>DX Communications Interface</i>	102
A.1.1.1	<i>XR40, 60 and 70CX Supported Control/Monitoring Data Registers</i>	103
A.1.1.2	<i>XR75CX Supported Control/Monitoring Data Registers</i>	108
A.1.1.3	<i>Prime CX Supported Status Elements</i>	113
A.2	FTP, FileWeb, DataWeb Requirements/Installation	114
A.2.1	<i>Introduction</i>	114
A.2.2	<i>System Overview</i>	114
A.2.3	<i>System Requirements</i>	114
A.2.4	<i>MySQL Installation</i>	114
A.2.5	<i>Website Installation</i>	114
A.2.6	<i>Data Transfer Service Installation</i>	115
A.2.7	<i>HTTP vs HTTPS</i>	115
A.2.8	<i>FTP Server</i>	115
A.2.9	<i>File Transfer Service Configuration (FileWeb)</i>	116
A.2.10	<i>Database Transfer Service Configuration (DataWeb)</i>	117
A.2.11	<i>Database Field Map</i>	117
A.3	Touch Screen Interface Specifications	120
A.4	Power Supply Specifications	123
A.5	Power-On Delay Relay Specifications	127
A.6	Ordering Specifications	129
A.7	Support and Warranty Information.....	132

1 What is the MCT-DX?

The MCT-DX system combines all of the features of a Dixell Prime CX refrigeration controller, video/chart recorder and data logging system into a single/intuitive display device. Email (supporting SSL/TLS), SMS (text messaging), FTP, FileWeb, DataWeb (file transfer protocols for automated data backup and web database interface) and remote viewing/control (via Web server/VNC server) are standard with the DX and can be accessed via LAN/WAN using a PC, tablet or smart phone device.

Future Design Controls' "DX" provides a 4.3" color touch screen interface with standard "Smart Device" user interface features. All configuration and runtime user access are configurable at the device with no PC software required. OEM's have the ability to configure runtime features (screen availability, menus, language, etc...) to easily customize the system for their requirements. These configurations can be imported/exported to any other DX device for setup (from scratch) within minutes.

The MCT-DX connects to a single Dixell Prime CX control via the optional XJ485-CX for the XR40, 60 and 70CX models with V1.0 firmware via the built in RS-485 connection provided on the XR75CX models with V2.6 firmware.

1.1 Features

The MCT-DX provides a rich set of tools for control interaction and process monitoring. Views include single and dual views, charts, alarm, historical data, alarm log and audit trail views. The menu driven interface eliminates screen "clutter" by providing an easy to use "Smart Device" interface for interaction between the user and the DX.

Data file analysis tools make looking at historical data a simple task. Any control variable saved to the data file can be plotted on the historical data chart for any time frame within the data file's total time range.

The built in Ethernet functionality includes a Web Server to provides access to all DX data (view only), a VNC interface for remote control and monitoring and an NTS clock, all available via a local Intranet connection (wired or wireless), or the World Wide Web using standard software like Microsoft's Internet Explorer.

The DX can store over a year worth of data on its SD memory card. Data logging can be enabled manually or automatically on power up of the system. Data backup is provided via a USB memory stick for plug and play transfer of files to any PC and through the included FTP back-up utility.

The DX protects system access with a four-level security system (user rights based), including audit trail capability that documents all user activity and ensures data integrity by digitally signing all data files and audit trails to meet regulatory requirements.

The MCT-DX controller includes the following features:

- Touch screen, "Smart Device" user interface (UI).
- Email, SMS, FTP, FileWeb, DataWeb, VNC and Web functionality standard.
- Remote View/Control using PC, Tablet or Smartphone.
- Detailed maintenance, alarm monitoring and alarm history.
- User configurable data logging and historical data viewer.
- Four level security with digitally signed audit trails and data files.
- National time server connectivity with daylight savings.
- Multi-lingual user interface supports 11 languages.
- 30,000-hour LED display

2 Installation

The DX components is pre-loaded with all operating software and firmware before leaving the factory so it is ready to install when you receive it. Before beginning installation, completely read through this section as well as the following section (3. Power and Wiring) to gain an understanding of the entire installation process. Consider the installation carefully. Plan the power, signal and control wiring before installing the DX. Also consider the cabinet space, hardware dimensions, environmental conditions and use good wiring practices to minimize problems that may occur due to electrical interference.



WARNING:

- To avoid potential electric shock and other hazards, all mounting and wiring for the DX must conform to the National Electric Code (NEC) and other locally applicable codes.
- Special expertise is required to install, wire, configure and operate the DX controller. Personnel without such expertise should not install, wire or operate the DX.



CAUTION:

- Prevent metal fragments and pieces of wire from dropping inside the housing of any DX component. If necessary, place a cover over the components during installation and wiring. Ingress of such fragments and chips may cause a fire hazard, damage or malfunction of the device.
- Locate the DX and all related control components away from AC power/motor wiring and sources of direct heat output such as transformers, heaters or large capacity resistors.

2.1 Enclosure Guidelines

The DX must be installed correctly for reliable operation. The DX controller is designed for installation within a suitable enclosure. Do not install the DX outside of an enclosure. Care must be taken when locating components to ensure that AC power wiring, contactors, starters, relays and other sources of electrical interference are properly located to minimize their impact on the DX control system.

Particular note should be taken to the position of variable speed drives and switching power supplies. Their input and load cables should be screened and properly grounded to a central equipment grounding point to prevent radiated emissions from affecting DX operation.

2.1.1 Locating the DX Touch Screen Interface

It is recommended that the unit be mounted within the front panel of a steel enclosure, through an appropriately sized opening. Proper enclosure depth is required to ensure here is adequate spacing between the rear of the interface and the front of any high voltage devices mounted in the enclosure when the enclosure door is closed. It is required that a minimum separation of 2" be maintained, so plan a depth to accommodate at least 4" (102mm) behind the front of the panel.

Proper clearance must also be maintained above, below and on both sides of the interface to allow for heat dissipation and to facilitate mounting. A minimum of 2" is recommended. Note that additional space may be required below and to the right of the interface (looking from rear of unit) to accommodate the communications wiring depending upon the type of communication cables used.

2.2 Environmental Considerations

Do not subject the DX touch screen interface to operating temperatures below 0°C (32°F) or above 50°C (122°F). Minimum and maximum relative humidity levels are limited between 10% and 90% (non-condensing). The DX touch screen interface is to be used indoors only. The unit should not be installed where fast temperature variations may occur as this can cause condensation of water vapor on the device.

The DX should not be exposed to excessive dust, dirt, salt, direct sunlight or shock and vibration. Do not operate the DX controller in an area where chemicals or flammable gases are present. Permitted storage temperature extremes for the DX control system are limited to -10°C (14°F) and 60°C (140°F).

2.3 Mounting Dimensions

The quantities of certain components vary depending upon the application and options ordered. Make sure that you have all components required for your application prior to installation. The 4.3" touch screen interface is supplied with four mounting clips.

All clips must be installed and properly tightened to insure the IP65 protective rating. Failure to install all mounting clips may also affect touch screen operation. DO NOT over tighten the mounting clips. The clips should be tightened just enough to fully compress the gasket so that the bezel is parallel with the mounting surface. The maximum torque used should be applied evenly on all sides and not exceed 1N-m (8.9 in lb.) to prevent the LCD panel from flexing.

Top view



Bottom View

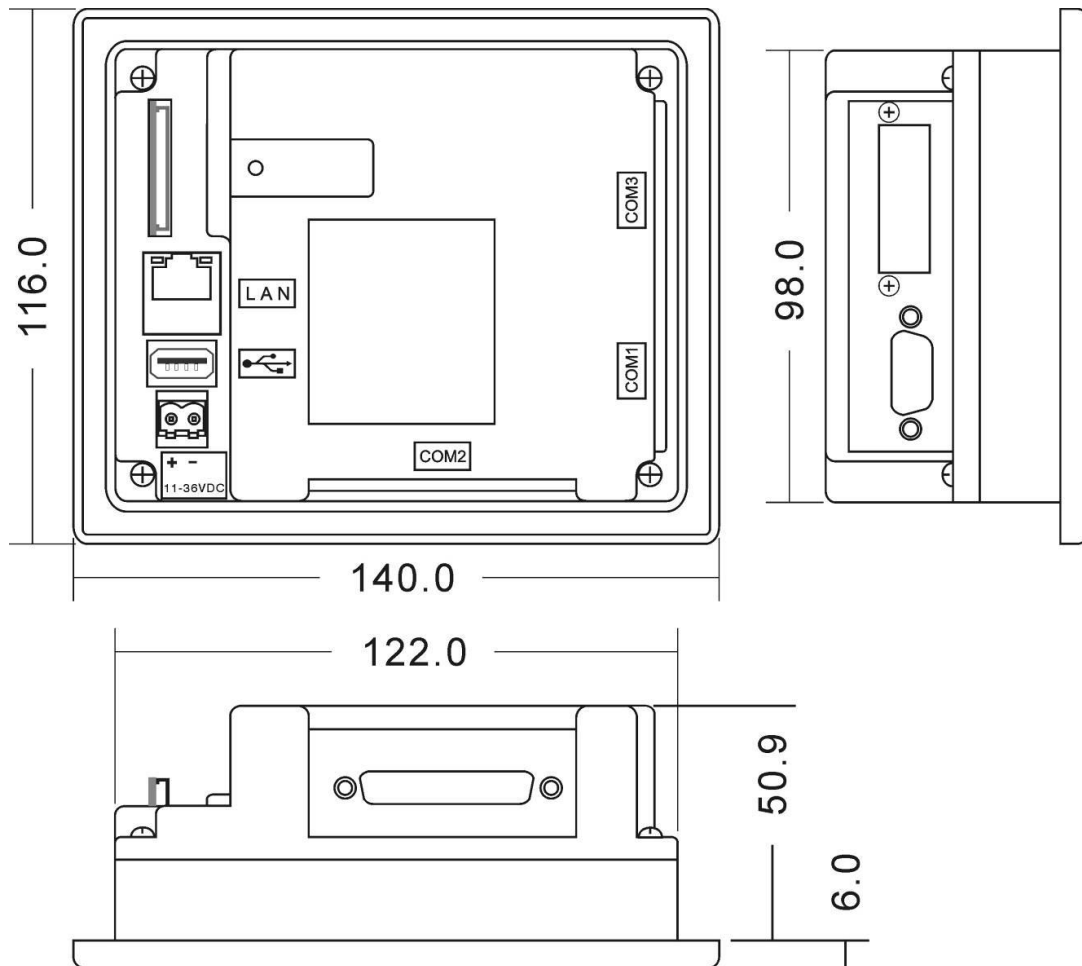


Mounting Clip Slot



Mounting Clip Installed in Slot

2.3.1 DX 4.3" Touch Screen Interface




All dimensions are in mm. Tolerance +/- 1 mm.
 Panel cutout: 123⁺¹ x 99⁺¹

COM1 DB9, Male

COM3 Not Used

 LAN, Ethernet (RJ45)

 SD slot

COM2 DB25, Female

 USB port

 Power supply

NOTE: The DX will not operate properly without the SD card installed into the SD card slot on the back of the unit. The SD card has all software required, loaded onto the card for 'Auto-Boot' operation. The slot on the back of the interface is 'keyed' so the card can only be installed in one direction. The card is pre-installed for your convenience. If the card is removed, take care when inserting the SD card and DO NOT force it into the slot. The card MUST be installed prior to application of power.

3 Wiring

This section describes the methods and precautions for wiring the DX system components.



WARNING:

- Turn off power to the DX before starting installation, removal, wiring, maintenance and inspection of the DX controller. Failure to turn off power may cause electric shock, create a fire hazard or cause damage to the DX.
- Emergency stop and interlocking circuits **MUST** be configured outside of the DX control system. If such circuits are made through the DX, failure of the DX control system may cause uncontrollable operation, damage to equipment or accidents.



CAUTION:

- This section presents recommended installation practices and procedures. Since no two applications are identical, these recommendations should be considered as guidelines. The system designer should be aware that devices in control systems could fail and thereby create an unsafe condition.
- Electrical interference in an operator interface can lead to equipment start-up, which could result in property damage and/or physical injury to the equipment operator.

If the application requires an operator or attendant, you should be aware that this potential safety hazard exists and take appropriate precautions. Consult NEMA ICS 3-304 for more information regarding safety for the installation of solid-state programmable control devices.

3.1 Power Requirements

The DX control system touch screen operates on a nominal 24Vdc supply voltage with an allowable range of 11 to 36Vdc. Do not power the DX controller components and highly inductive loads or input circuitry to other equipment with the same DC power supply used for the DX.

If the DX is installed in an area with poor power quality or frequent power interruptions, it is recommended that a time delay-on relay be installed in the power supply wiring to all components of the DX. This will prevent rapid on-off cycling of the DX during brown-out or momentary power interruptions. Rapid power cycling to DX can cause damage to the electronics and/or loss of data.

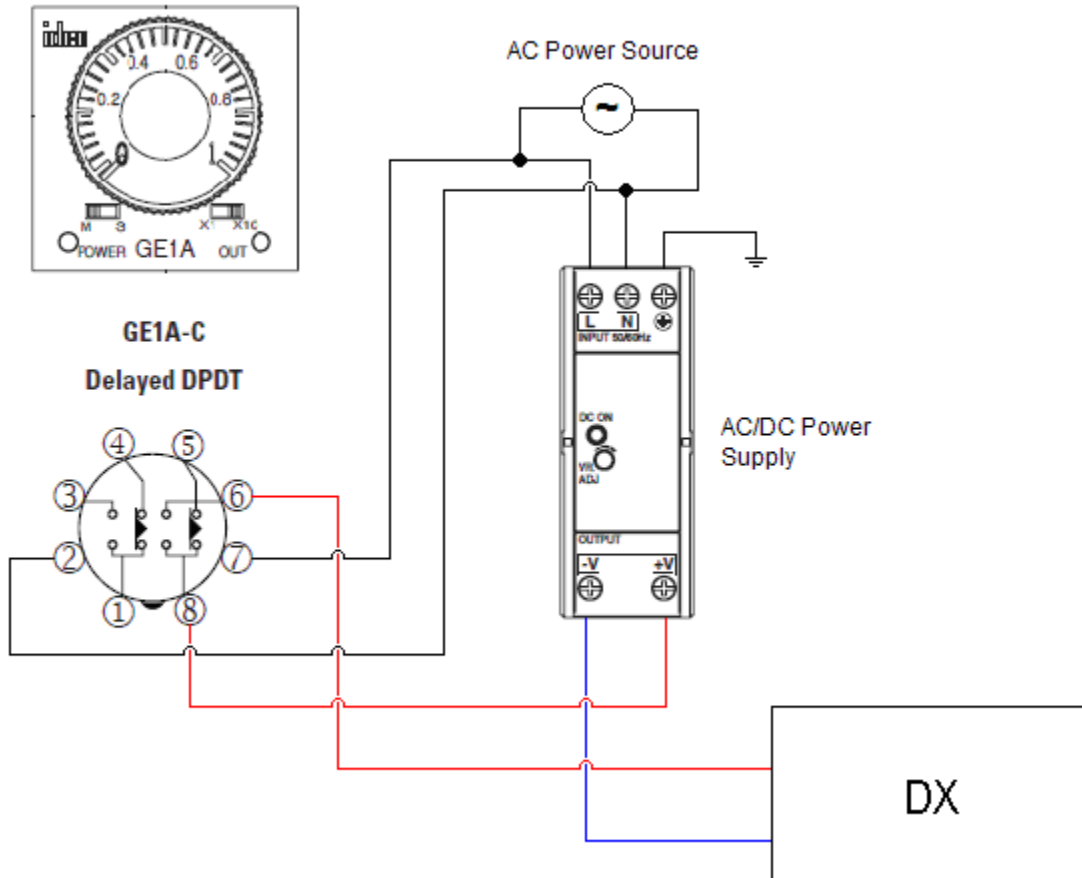
3.1.1 Installing the Power-On Delay Relay

Due to the rate at which AC/DC power supplies reach their nominal supply voltage after application of power, the relay contact of the timer should be installed between the output of the power supply and the power input of the DX control system components. This allows the power supply output voltage to reach its nominal value prior to connecting the DX to its output terminals.

In order to properly sense the loss of power, the time delay relay coil should be wired to the AC power source for the DC power supply of the DX. This will insure that the DX is turned off/on at the proper times and

prevent malfunction that can be caused by rising or falling voltage at the power supply output during power interruption.

NOTE: It is recommended that the time delay-on relay be set for a minimum period of 3 seconds.

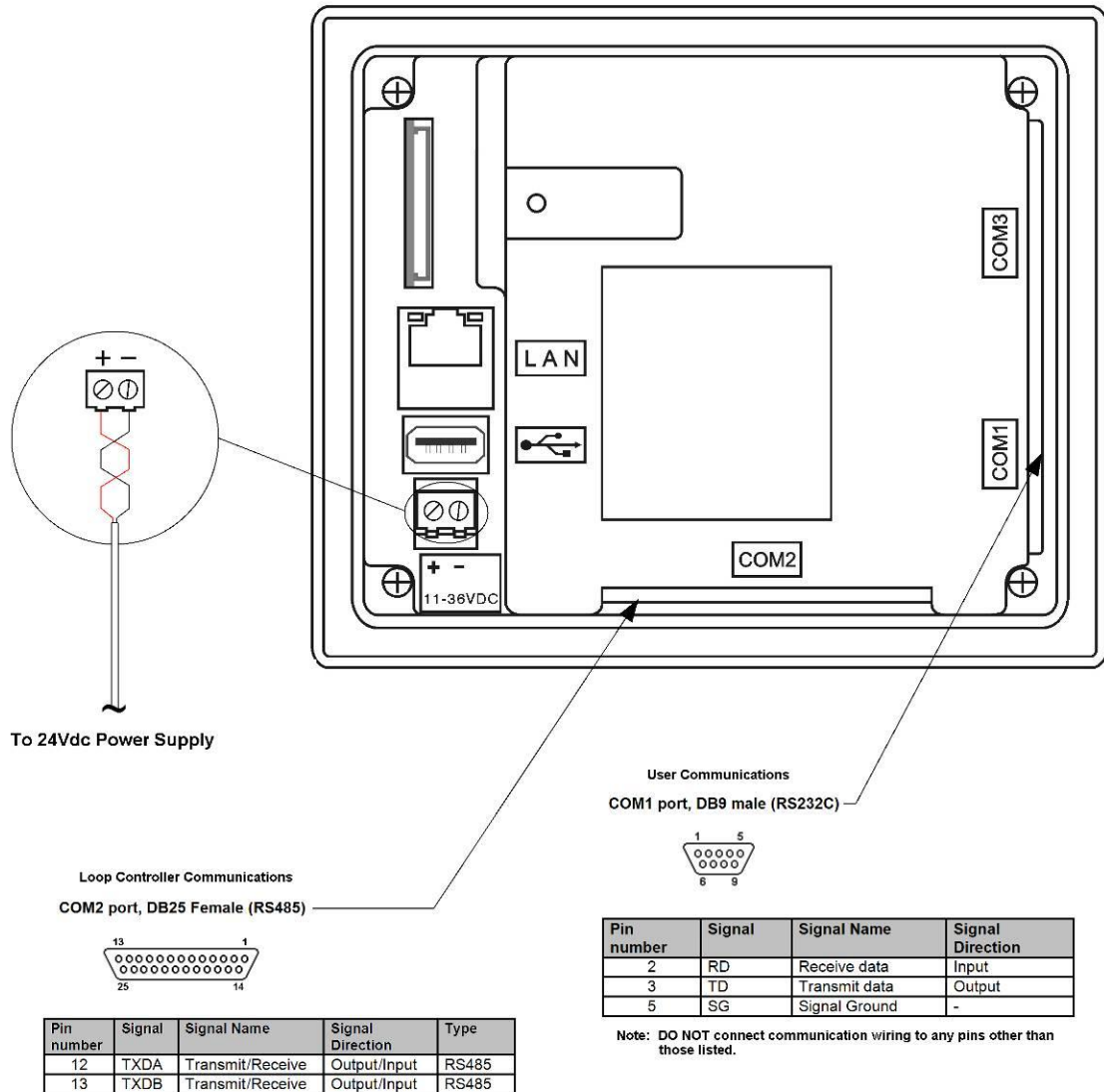


3.2 Connecting to the MCT-DX Interface

Power wiring lengths should be kept to a minimum, and it is preferable to have DC power wiring run using a minimum of 18/2 twisted, shielded cable. This keeps the “hot” and “common” wires paired to minimize the effects of external noise.

To make a connection, strip about ¼” of insulation off the end of the wire, turn the connector screw counterclockwise until the gap is wide open, insert the wire all the way in, and turn the screw clockwise until it’s tight. Connect positive DC line (hot) to the ‘+’ terminal and the negative DC line (common) to the ‘-’ terminal. The other end of the cable should be properly terminated at the 24Vdc power source, and the shield connected to the main earth ground.

NOTE: Upon application of power, if the display does not come on within 2 seconds, remove power. The interface is reverse polarity protected. Check wiring to insure proper connections and try to power up again. An Internal fuse will prevent damage for over voltage conditions; however, it isn’t guaranteed. DC voltage sources should provide proper isolation from main AC power and similar hazards.

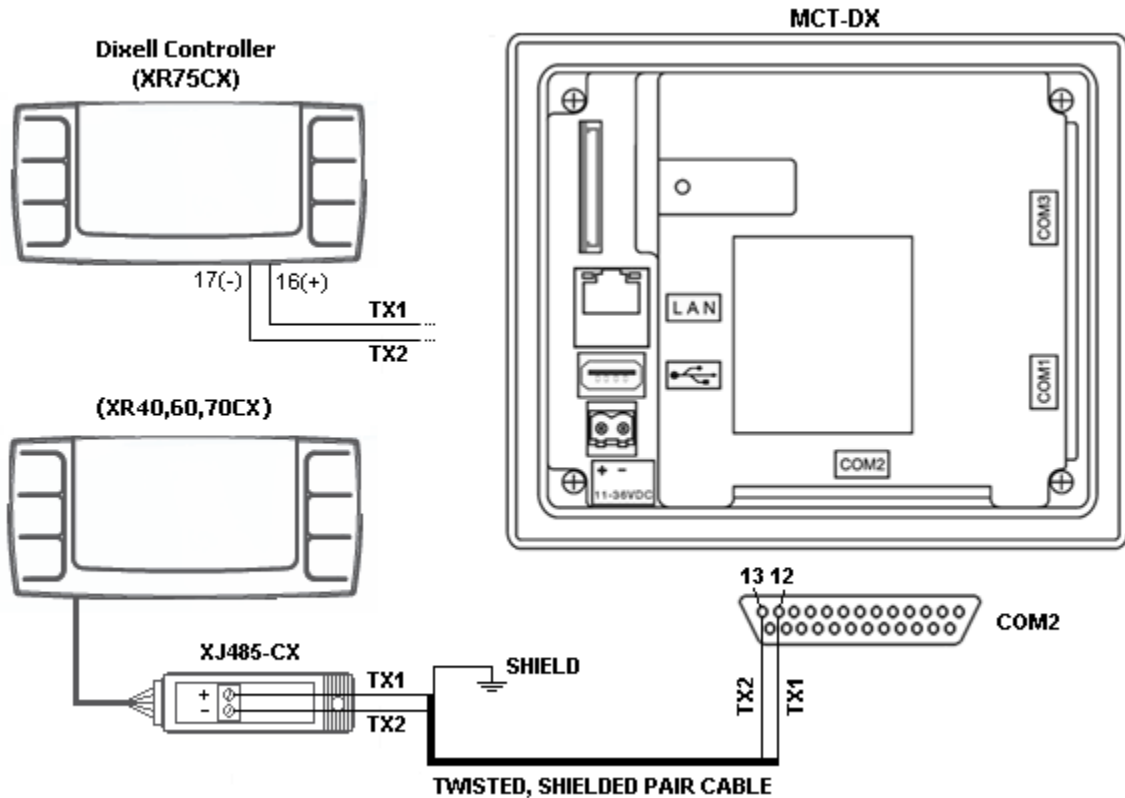


3.2.1 Dixell Controller Communications

The Dixell XR40, 60 and 70CX controllers communicate with the MCT-DX touch screen using the optional XJ485-CX external module on their HOT KEY port. This allows the controller to be connected using one 2-wire link. The DX interface communicates with the controller using the default address of 1.

Communications wiring should be run using a minimum of 24 AWG twisted-pair, copper conductors. For short runs (< 50 feet total), non-shielded wiring can be used as long as proper separation from power/control conductors is maintained. For communications wiring where the total length will exceed 50 feet, shielded twisted-pair should be used.

When using shielded twisted-pair, be sure to ground only one end of the cable, preferably at the Dixell controller. Allowing any other portion of the cable shield to come in contact with ground, or grounding both ends, will cause ground loop currents to flow in that section of the cable shield which can disrupt communications.

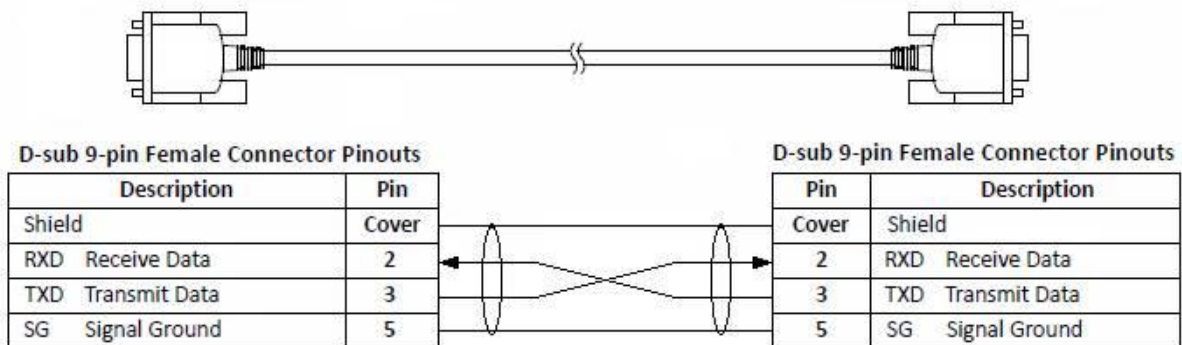


NOTE: It is important to keep the power/control and sensor/communications wiring separated from one another. Relay and/or high voltage outputs can interfere with the sensor and communication wiring as they cycle on and off, which can cause erroneous sensor readings or communications errors.

FDC recommends the use of shielded wire for all installations in order to maintain optimum performance and minimize the possibility of communications errors.

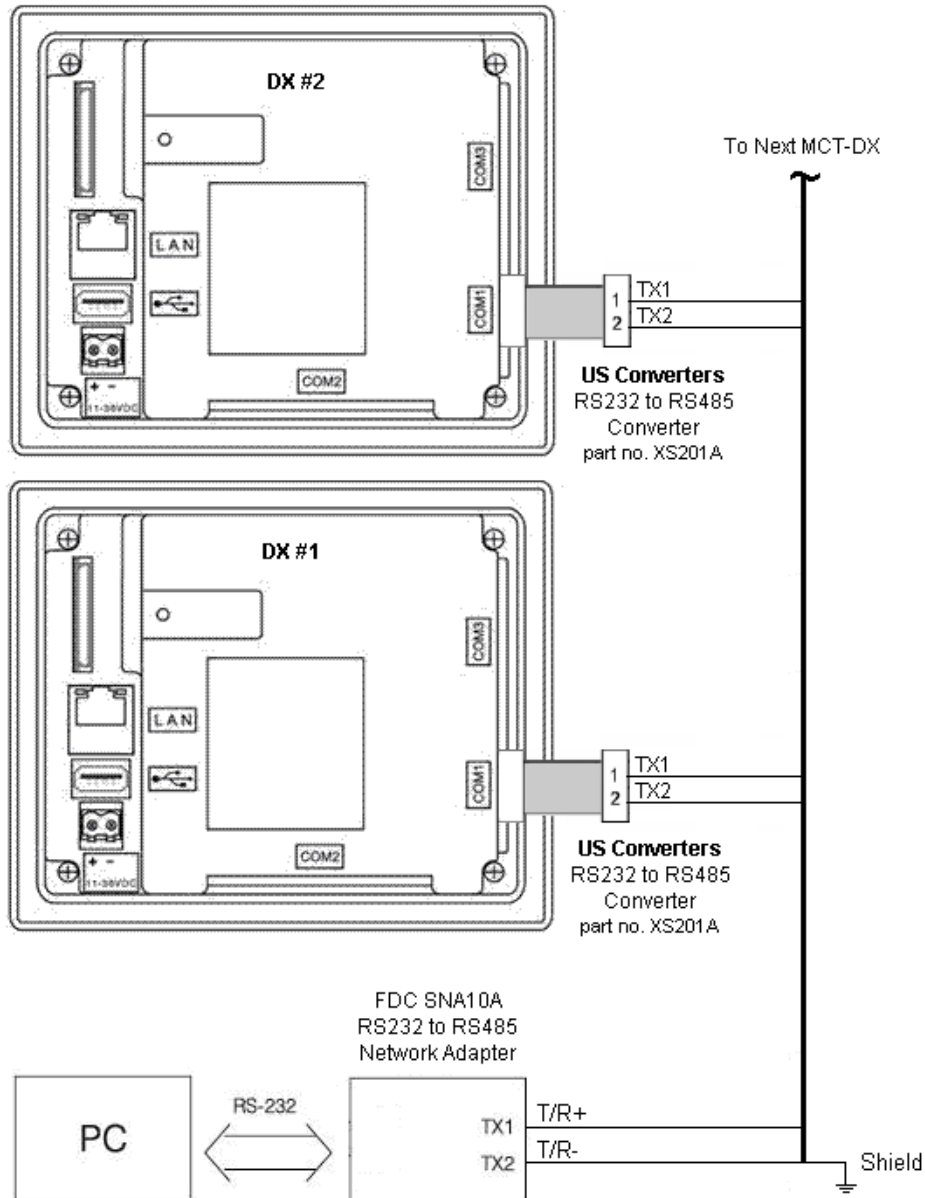
3.2.2 User Serial Communications

The DX touch screen provides an RS232C user communications port for connecting it to a PC running software such as Future Design Control's Envision software. In order to connect the DX to a PC, a cable must be fashioned according to the diagram below.



NOTE: DO NOT use a standard null-modem cable to connect the DX to a PC. Most computers do not provide a standard serial port and a USB to serial converter must be used. Incompatibilities may exist between the DX and certain USB to serial adapters which may cause the DX to malfunction when connected using a standard null-modem cable.

If more than one DX controller is to be placed on the communication link with a PC, an RS232/485 converter is required for each DX in order to convert the RS232 communications port to a RS485 multi-drop communications for connecting multiple DX controls on the same PC communications link.



NOTE: The connection requires a single twisted-pair cable that is daisy-chained from one DX to the next. When using shielded twisted-pair cable, be sure to ground only one end of the cable, preferably at the RS232 to RS485 network adapter. Allowing any other portion of the cable shield to come in contact with ground, or grounding both ends, will cause ground loop currents to flow in that section of the cable which can cause communication errors.

4 Configuring the MCT-DX

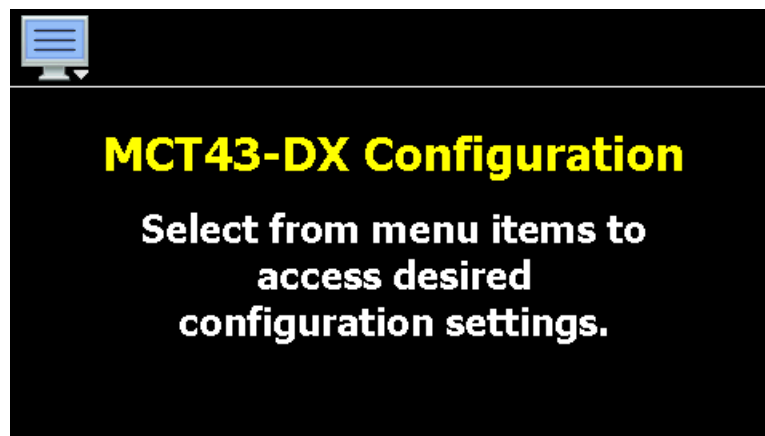
The DX Configurator is a powerful tool that is built in to the system. It is a program that allows the OEM or user to set up control system options for the DX runtime application. This allows for on-the-spot setup of the DX without the need for external hardware and software. The user or OEM must first run the Configurator prior to putting the DX into service in order to properly setup the system for its intended use. The DX Configurator provides the following functionality:

- Set the display name and enable/disable indication for each probe of the Dixell controller.
- 'Splash Screen' name editing for custom OEM or user requirements
- Enable/disable options for runtime menu and screen availability
- Set the default screen that is shown when the runtime application first starts.

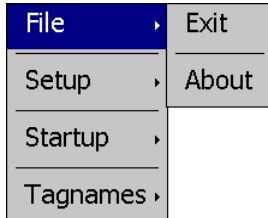
The Configurator program does not run at the same time as the main runtime software. It can be run by exiting the runtime software via the Offline Setup\Exit Application screen. When the "Exit application (configuration mode startup)" option is selected, on the next power-up, the Configurator application will automatically start.

To access the Configurator:

1. From the runtime application, press the "Home" icon to make sure you are on the main view.
2. Press the "Menu" icon (monitor) and select Device and then Settings.
3. From Settings, press the "Menu" icon (monitor) and select Offline and then Offline. Press "Yes" at the prompt to go offline.
4. From Offline, press the "Menu" icon (monitor) and select System and then Exit.
5. On the Exit Application screen, press the "Exit Application (configuration mode startup)" button. Press "Yes" at the prompt to exit the application.
6. Once the runtime application quits and the desktop is shown (black screen with the words "System Startup Please Wait..."), cycle power to the DX. Once the DX finishes its boot sequence, the Configurator application will be automatically started.

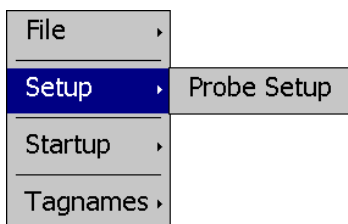


From the Configurator, the user or OEM can then setup required probe indication as well as choose from a long list of standard features to provide in the runtime application. The Configurator menu is accessed by pressing the “Monitor” icon at the top left of the screen.

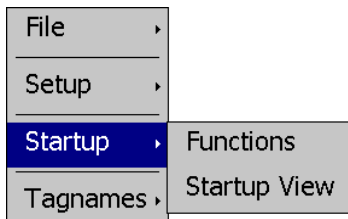


The **File** menu provides selections of “Exit” and “About”. The exit function for the Configurator saves all settings and closes the Configurator application.

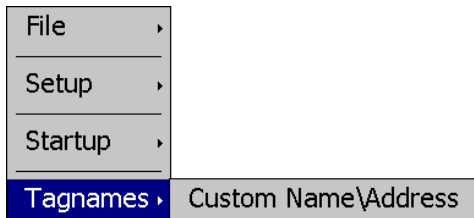
The about selection displays version information for the Configurator application and connected Dixell control.




The **Setup** menu provides access to probe setup.



The **Startup** menu provides access to enable and disable runtime screens/menus and set the desired startup view selection.



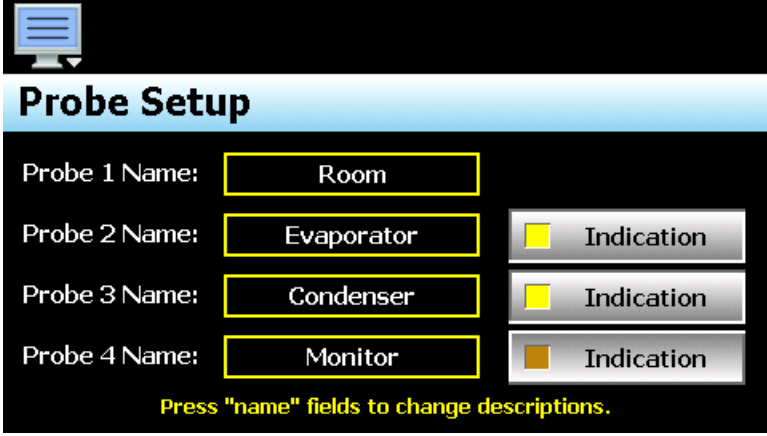
The **Tagnames** menu provides access to edit the splash screen information that is shown when the runtime application starts, and is also shown on the “About” screen.

IMPORTANT:  Once all configuration settings are made, you must select “Exit” from the File menu to exit the Configurator prior to cycling power to the DX. All configuration files are written upon exiting the Configurator. Do not cycle power prior to exiting the Configurator or settings will be lost and the DX will not operate properly once the runtime application starts.

Upon exiting the Configurator application and cycling power to the DX, the runtime application will be automatically started on the next boot sequence.

4.1 Probe Setup

The “Probe Setup” screen is accessed from the Setup menu. It provides fields for entering a display name for each probe as well as buttons for enable/disable indication of optional probes 2, 3 and 4.



Probe 1 Name: Room

Probe 2 Name: Evaporator Indication

Probe 3 Name: Condenser Indication

Probe 4 Name: Monitor Indication

Press "name" fields to change descriptions.

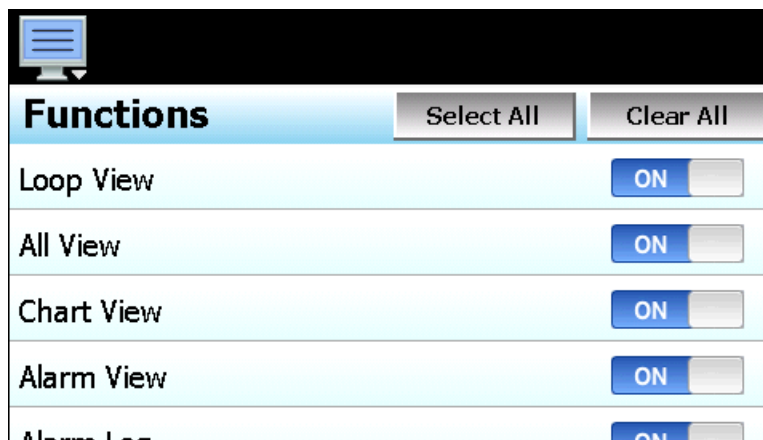
The **Probe Name** fields are used to enter a specific name for each probe up to 11 characters in length. This name will be used throughout the DX runtime application. Default tag names are Room, Evaporator, Condenser and Monitor.

The **Indication** buttons are used to set whether the corresponding probe should be displayed in the runtime application. When selected for display, the indicator on the button will be on. The button for probe indication can only be turned on if the probe is enabled in the Dixell controller connected to the DX. If the probe is not configured, indication is disabled.

NOTE: *Probe 4 is only available when using the XR75CX Prime series control. The XR0, 60 and 70CX use the Hot Key port to provide a connection for the 4th probe; however, the Hot Key must be used for the communications interface to the DX.*

4.2 Functions

The DX functions are accessed from the Startup menu and allow the user or OEM to select which screens/menu items will be enabled (shown) in the runtime application. These functions can be used to customize the system to meet specific requirements.



When functions are disabled at the Configurator level from the functions list, it will be disabled in the runtime software by removing the menu item or disabling the field so the operator cannot select the function or edit any corresponding settings related to the function. The following list provides the available DX functions, where to find the menu item(s) applicable to the function and a description of what it applies to.

IMPORTANT: *Disabling functions that are not required for the application results in a system that is clean and easy to use for the operator; however, be careful when disabling certain items. Without access to them, there may be no way to determine if the system is operating as required.*

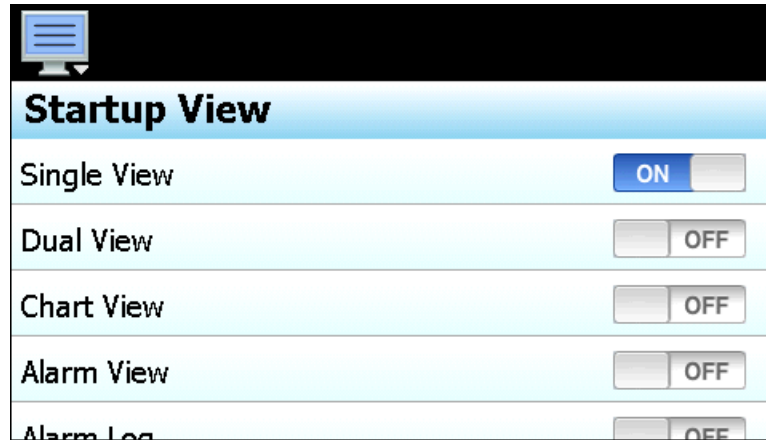
DX Function	Runtime Menu Location	Description
Single View	View\Single	View temperature, output status, set control set point. NOTE: Without access to the single view screen, the user will be unable to start a manual defrost, activate the continuous cycle or energy savings or turn the light on and off.
Dual View	View\Dual	view temperature, set control set point NOTE: Without access to at least one view screen, the user will be unable to manually adjust the set point.
Chart View	View\Chart	view and set up real time trends for loops and monitors
Alarm View	View\Alarm Notifications	view and reset current alarms current alarm status NOTE: With the function disabled, the user will only be able to access the alarm screen to reset an alarm when the alarm occurs by pressing the flashing alarm icon. If the alarm is latching and does not reset, the user will be unable to return to the screen to try and clear the alarm unless another alarm occurs to again display the flashing alarm icon.
Alarm Log	View\Alarm File	view and email alarm history files

DX Function	Runtime Menu Location	Description
Security Settings	Security Notifications	view/set security rights, view audit trails, user log on view security and audit status NOTE: If security is enabled, but system security is then disabled through this item, the user will be unable to log on. Default security (operator level) access will be used. This allows audit trails to be active while hiding all user security features. With security menu disabled, audit trail files are accessible via Log/USB File Utilities or temporarily re-enable security menu to gain access to the audit files.
Data Logging	Data\Data Notifications	enable/disable data logging, select points for logging, access to historical viewer, FTP and USB File utilities view data log status, length and interval NOTE: If data logging is set to log when the DX starts and this menu is then disabled, data logging will be disabled. This menu item must remain visible in order for the built-in data logging feature to function. The USB File utilities will not be accessible to copy or delete data, alarm or, audit files. Alarm, audit and data files may be transferred via FTP if unit is so configured.
Data Log Viewer	Data\Chart	access to view historical data log files
Annotations	Data\View\Annotation	access to add and view operator annotations to data files
Digital Signatures	Data\View\Signature	access to view and add digital signature to data log file
File Utilities	Data\Utilities\USB	access to copy/delete alarm, audit, program and data log files Note: Alarm, audit and data files may be transferred via FTP if unit is so configured.
FTP/WAN Settings	Data\Utilities\FTP\WAN	access to view/configure FTP file transfer settings NOTE: Once the FTP is configured for Auto Backup in the runtime application, this menu item can be disabled and hidden from the operator so that OEM configuration is preserved and cannot be accessed or altered. The Auto Backup to the FTP Server would occur as configured.
Defrost Settings	Device\Settings\Set\Defrost	access to defrost settings screen NOTE: With the defrost settings screen disabled, defrost will still operate and the user can still initiate a manual defrost from the single view screen. Only user adjustment of defrost settings is removed.
Alarm Settings	Device\Settings\Set\Alarm	access alarm settings NOTE: Alarms can be configured in the runtime or the Dixell controller directly and then the menu removed by disabling this function. The alarms will operate as configured in the background removing all access from the operator.
Email/SMTP Settings	Device\Settings>Email>Email	access to view/configure email settings
Communication Settings	Device\Settings\Set\Comms Notifications	access to web server, Modbus and VNC settings view web server and VNC status

DX Function	Runtime Menu Location	Description
Control Settings	Device\Settings\Set \Control	access to temperature control/continuous cycle settings
Temperature Units	Device\Settings\Offline\Set\Units	access to set temperature units
Input Calibration	Device\Settings\Offline\Calibrate\Inputs	adjust offsets of probe inputs
Import/Export Setup	Device\Settings\Offline\System\ Configuration	access import/export utility to back up current DX control system configuration or restore configuration from back-up file
Setpoint Limits	Device\Settings\Set\Limit	access set point high and low entry limits
Language	Device\Settings\Offline\Set\Language	access to set the DX display language for menus and online help
Keyboard Lock	-	Automatically activates the Dixell controller key lock when the runtime is in online to prevent direct, user access of controller settings via the Dixell controller.
On/Off Button	View\Single	enables control on/off button
Exit Application	Device\Settings\Offline\System\Exit	access to the exit application screen

4.3 Startup View

The Startup View screen is accessed from the Startup menu and allows the user or OEM to define which of the main view screens the runtime application will display when it first starts and when the “Home” icon is pressed.

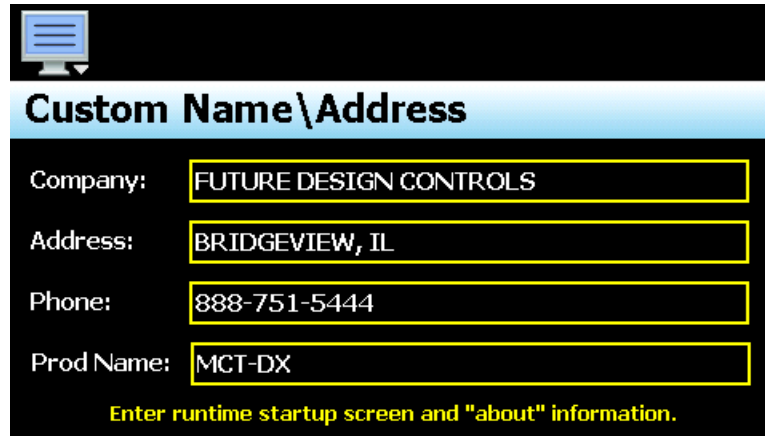


The available selections are Single View, Dual View, Chart View, Alarm View and Alarm Log.

NOTE: *If the selected screen to view on startup is disabled in the functions list, the screen will only be available when the “Home” icon is pressed.*

4.4 Custom Name\Address

The Custom Name\Address screen is accessed from the Tagnames menu and is typically used by the OEM to configure the main splash screen when the DX runtime application starts. It allows the company name and contact information to be entered and shown each time the DX is powered up. It also allows the name of the controller to be changed in order to adapt it to a specific product or market.



Custom Name\Address

Company: FUTURE DESIGN CONTROLS

Address: BRIDGEVIEW, IL

Phone: 888-751-5444

Prod Name: MCT-DX

Enter runtime startup screen and "about" information.

To edit the company, address, phone number or controller (product) name, press the field and enter the desired text. Each field can be entered with a maximum of 24 characters that will be displayed on the splash screen when the DX starts.

5 Basic Operation

This section is designed to help guide the user through the DX touch screen interface and menu structure in order to navigate through the various operation, monitor and setup screens and gain an understanding of how to use them. Subsequent sections of this manual are tailored to the special features and functions of the DX. Consult those sections of the manual for further information and specifics on how to set up and operate them.

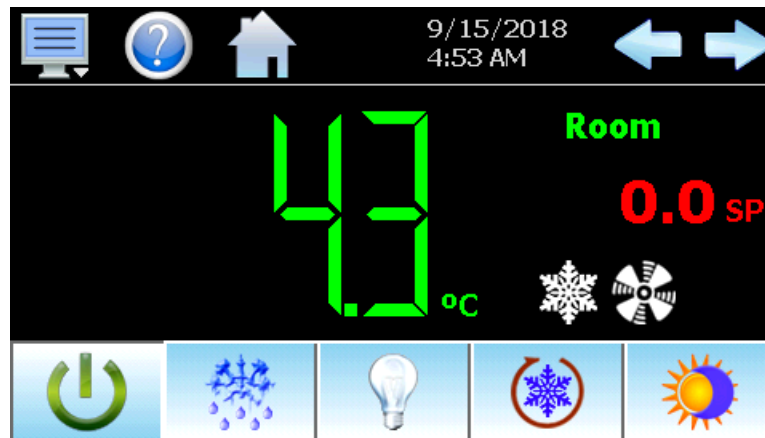
5.1 OEM Configuration Options

The availability of certain menu items, screens and the functionality of the system are determined by the configuration of the Dixell control and the MCT-DX. This manual covers all available options, some of which may not be available on your system.

If there are questions or concerns about the operation and available options on your DX controller, contact your OEM for further information. Only your OEM can address equipment related issues.

5.1.1 Dixell Control Buttons

The Single view screen provides user action buttons similar to those on the front of the Dixell control. These buttons include control on/off, manual defrost, light on/off, continuous cycle and energy savings. The availability of the buttons is based on the supplied hardware and configuration of the Dixell control attached to the DX.



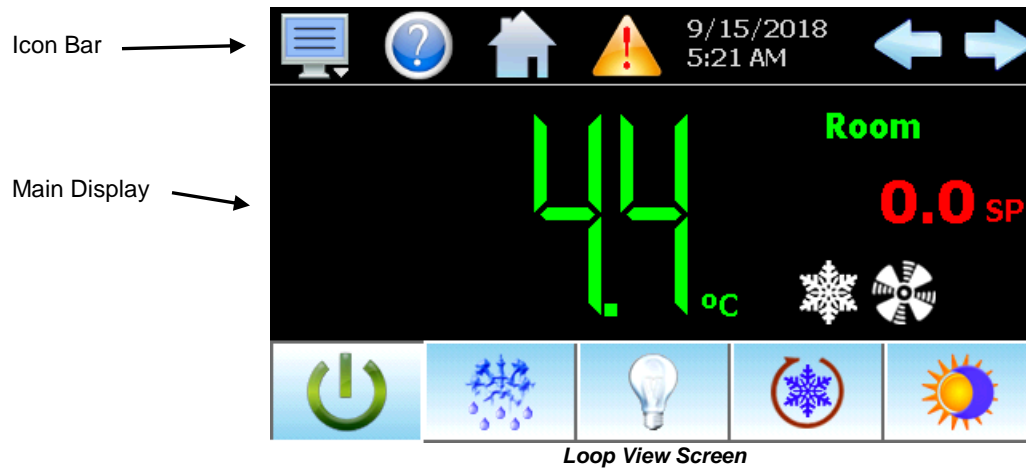
Single View Screen

The manual defrost and continuous cycle buttons are available at all times for all Prime CX models. The light on/off and energy savings buttons will be automatically disabled when the options are not present or configured in the Dixell control. The control on/off button is provided under the default configuration of the DX, but can be disabled by the user or OEM.

The control on/off button allows the user to stop the operation of the Dixell control without having to remove power from the system. The controller no longer tries to maintain the temperature set point, but will continue to monitor temperature. For information regarding the configuration and use of the functions related to the other user action buttons, refer to the "Installation and Operating Instructions" for the make and model of your Dixell control.

5.2 Touch Screen Interface

The DX display is split into two sections; the icon bar and main display area.



The menu icon will open the main menu for navigating to the different control and monitoring screens. Menu items will dynamically appear providing available options based on the system area the user is in, i.e., security, data logging, setup, etc.



The information (help) icon will display text-based help associated with the current screen. Help is available in 11 languages based on the user selection in the offline setup of section of DX.



The home icon will return the user to the main view from anywhere in the DX application. The main view is set by the OEM in the DX configuration and can be the single, dual, chart, alarm or alarm history view.



The alarm icon will appear and flash when a new system alarm occurs. Pressing the alarm icon will take the user directly to the alarm monitor screen in order to view and /or reset the active alarm condition.



The left and right navigation arrows will appear on screens that provide additional information that the user can scroll to such as the single and dual view screens, charts or alarm settings screen.

NOTE:

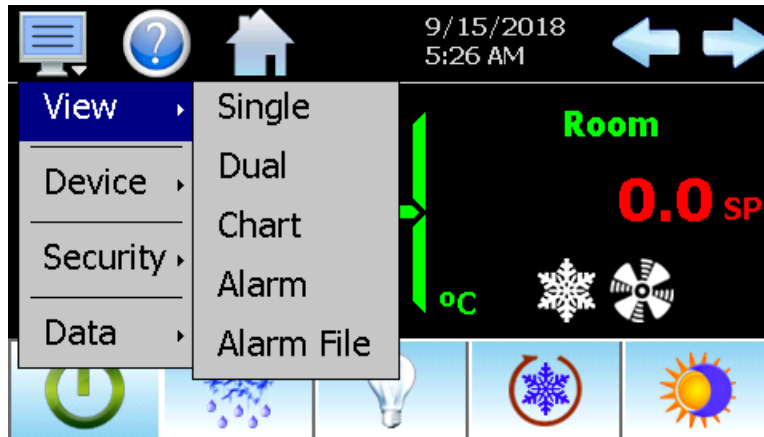
A single press of the left or right arrows will scroll screens to the next available screen option (i.e. chart number). Pressing and holding the arrow keys will continue the scrolling until the button is released.

IMPORTANT:

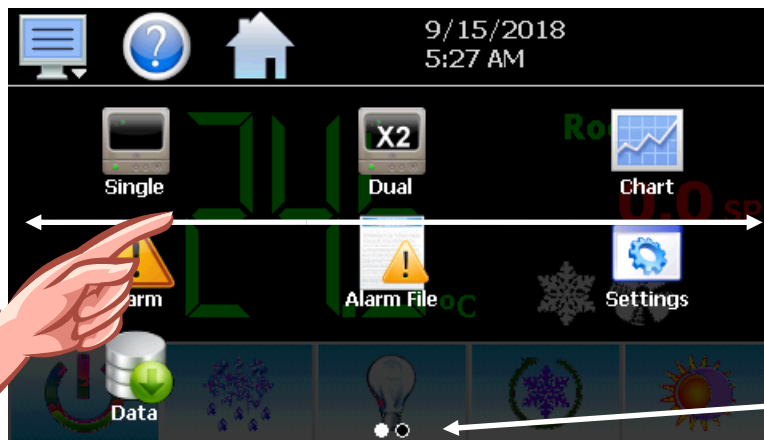
Do not use any sharp or metal objects on the touch screen as they may damage the surface. Also, be sure that hands and fingers are free from oils or chemicals which may mar the surface of the touch screen.

5.3 Menu Navigation

The DX provides the user with the ability to select text-based menu navigation, much like the typical file menu system of a PC, as well as an icon-based navigation system like that of a “smart” device. The user can switch back and forth between the two from the Setup menu.



Text Based Navigation



Touch and drag finger across screen to switch between menu pages.

Active Page Indicator (1 of 2)

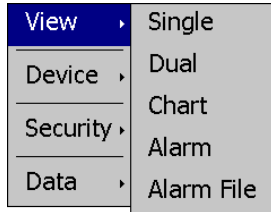
Icon Based/Slide Page Navigation

The available menu items are dependent upon the OEM configuration of the DX. Not all of the menu items shown may be available on your system. The following information is provided as an overview of the full navigational menus for the MCT-DX system.

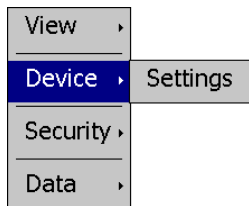
5.3.1 Home Menu

The home menu is the top level, default menu provided when DX first powers on. Pressing the menu (monitor) icon will display the main menu offering the selections shown below.

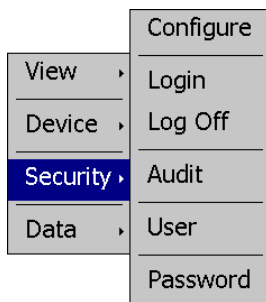
5.3.1.1 Text Based Home Menu



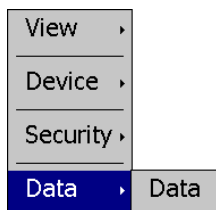
The **View** menu provides navigation to all standard view screens. These include the Single, Dual, real time Chart, Alarm monitor and Alarm File screens.



The **Device** menu provides access to the DX controller settings. These include, set point entry limits, alarm settings, communication settings, email setup as well as access to offline settings for date/time, etc.

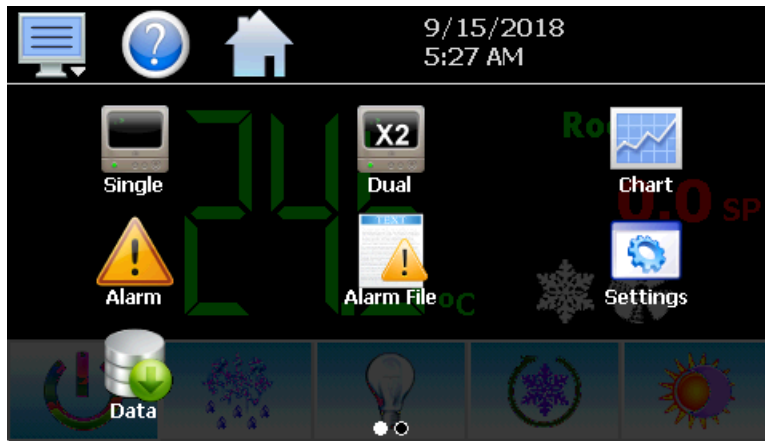


The **Security** menu provides access for user login, security settings and audit trail viewing if the security system is enabled.



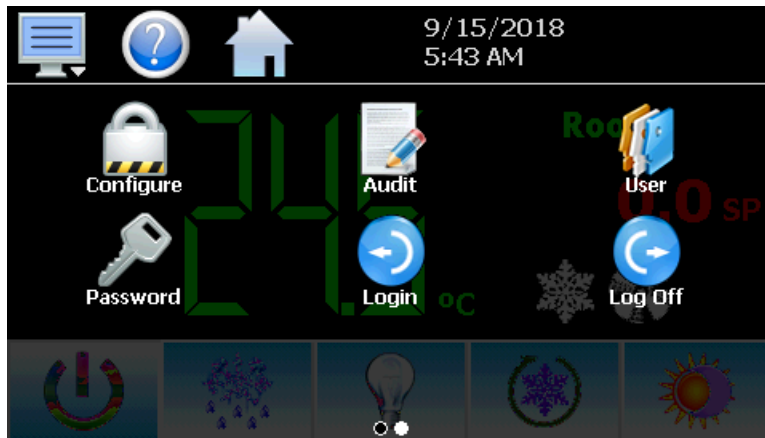
The **Data** menu provides access to data log functions, file utilities, FTP\WAN back-up settings as well as the historical data viewer.

5.3.1.2 Icon/Slide Page Based Home Menu



Slide page 1 provides navigation to all standard view screens. These include the Single and Dual views, Chart, Alarm monitor, and Alarm File.

It also provides quick access to the DX Settings and Data file functions which include file utilities, FTP\WAN back-up settings as well as the historical data viewer.

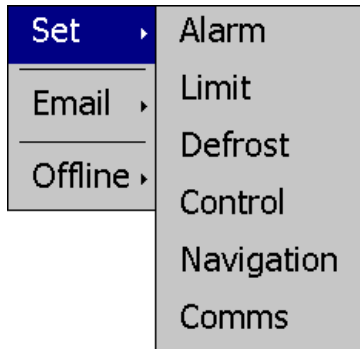


Slide page 2 provides access to Configure security settings, Audit trail viewing, current User information, user Password editing and user Login and Log Off functions.

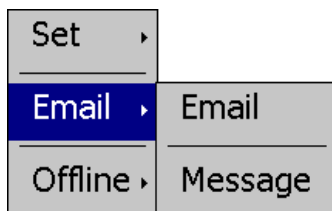
5.3.2 Device Settings Menu

The device settings menu is provided when the user selects “Settings” from the main “Device” menu. See section 9 on Device Settings for detailed information on these settings and their use.

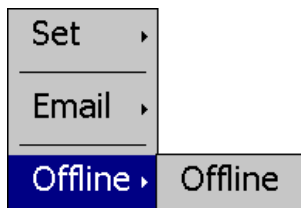
5.3.2.1 Text Based System Setup Menu



The **Set** menu provides access to setting Alarm set points, set point Limits, Defrost settings, Control settings, Navigation type selection and Communications options.

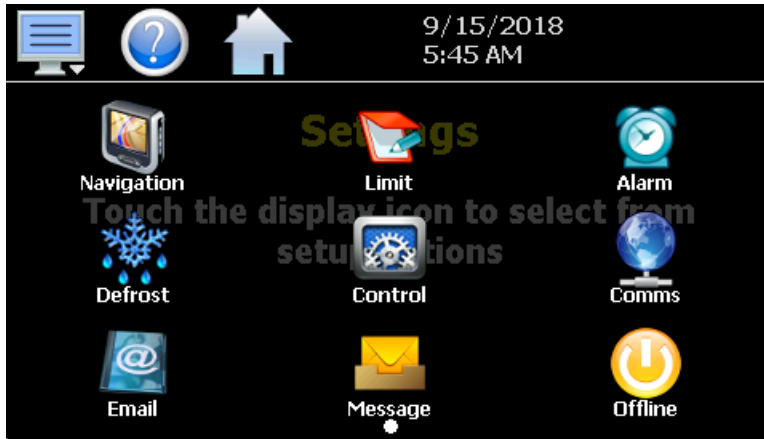


The **Email** menu provides settings for the email server to send SMS text messages and/or emails on alarm and allows the user to compose and send a Message to any user configured in the system.



The **Offline** menu provides access to the DX offline setup which provides the user with the ability to adjust the date/time, calibrate the touch screen, change languages, etc.

5.3.2.2 Icon/Slide Page Based Device Settings Menu



The Setup slide page provides access to the DX controller settings. These include options for Navigation type, set point Limits, Alarm settings, Defrost settings, Control settings and Email server settings and Messaging.

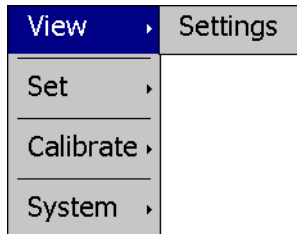
It also includes access to the communications settings for the web page, VNC server and Modbus user communications.

5.3.3 Offline Menu

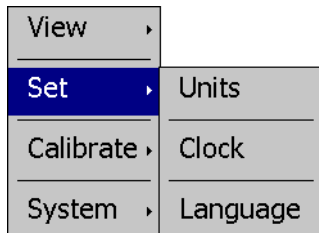
The offline menu is provided when the user selects “Offline” from the device settings “Offline” menu. See section 9 on Offline Settings for information on these settings and their use.

NOTE: *Offline settings can only be accessed when data logging is turned off.*

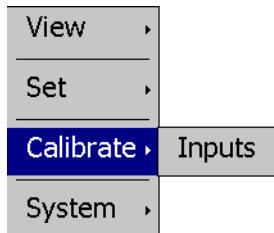
5.3.3.1 Text Based Offline Setup Menu



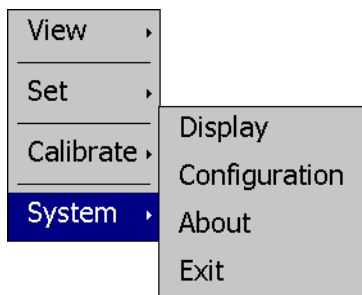
The **View** menu provides navigation back to the DX device Settings menu.



The **Set** menu provides access to the temperature Units selection, NTS Clock, and Language settings.

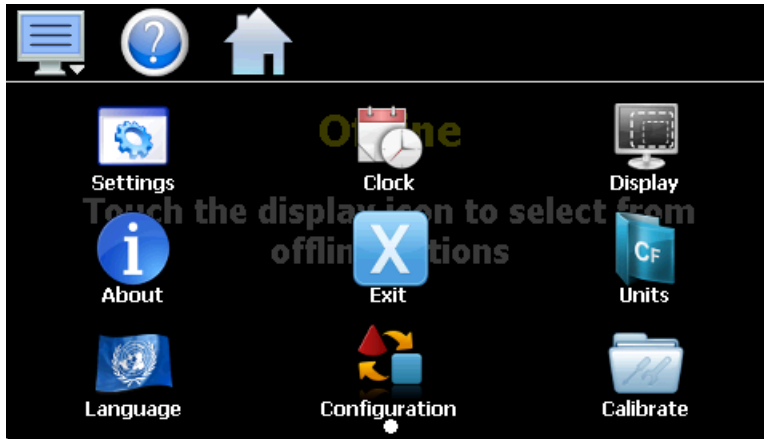


The **Calibrate** menu provides access to the probe Input offset calibration for the Dixell control.



The **System** menu provides access to the DX Display settings, import/export Configuration utility, About screen and Exit application screen.

5.3.3.2 *Icon/Slide Page Based Offline Menu*

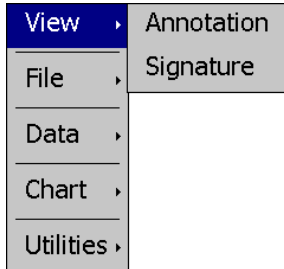


The Offline icon menu provides navigation back to the device Settings menu as well as the Clock, Display settings, About, Exit application, temperature Units, Language, Configuration utility and Calibrate inputs screens.

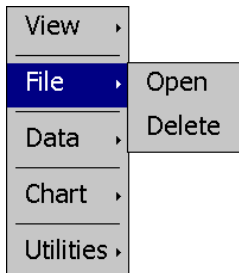
5.3.4 Data Menu

The data log menu is provided when the user selects “Data” from the main “Data” menu. See section 8 on Data Logging for information on these settings and their use.

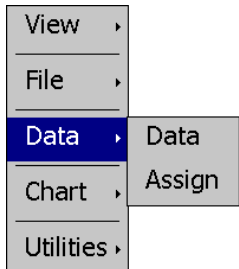
5.3.4.1 Text Based Data Logging Menu



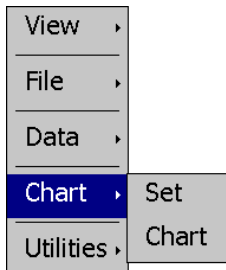
The **View** menu provides access to the data file Annotation and digital Signature screens.



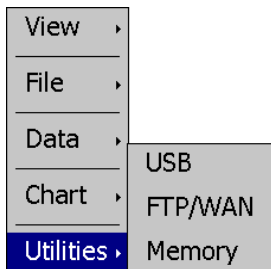
The **File** menu provides functions for opening and deleting historical data log files.



The **Data** menu provides access to the main Data screen for starting and stopping data logging and to the log point Assignment screen where the user can select which items are to be logged to the history file.

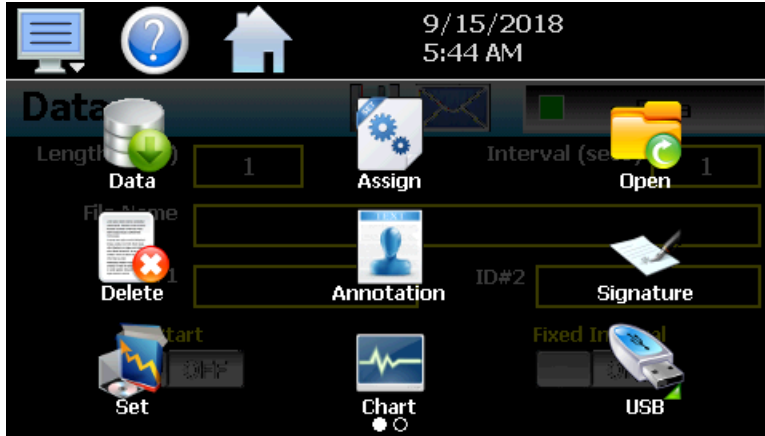


The **Chart** menu provides functions for viewing historical data files in graphical format.



The **Utilities** menu provides access to the DX file management utilities including USB file transfer and FTP/WAN back-up.

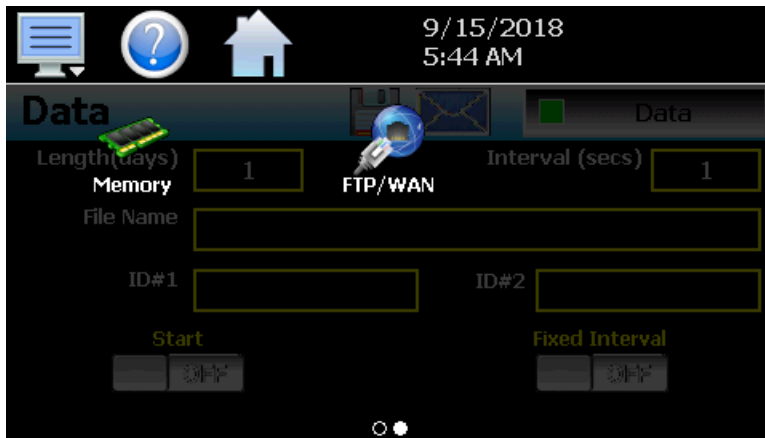
5.3.4.2 Icon/Slide Page Based Log Menu



Slide page 1 provides access to the main Data log screen and to the log point Assignment screen where the user can select which items are to be logged.

Historical data file functions are provided for Opening and Deleting historical files and viewing/setting data file Annotations and digital Signatures.

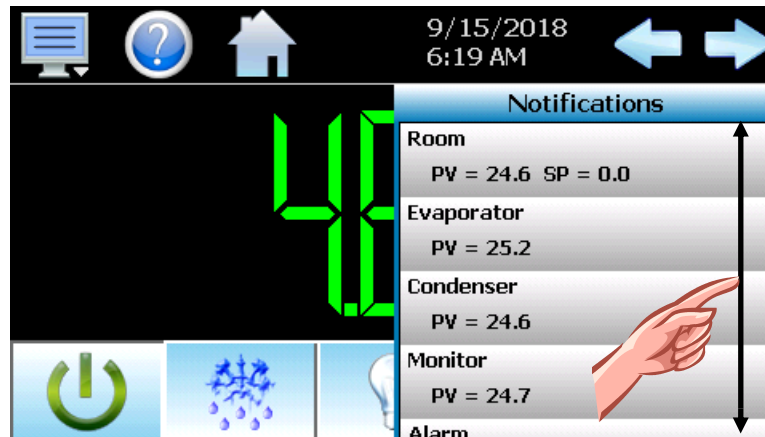
The plot Set and Chart icons provide access to the historical data viewer options.



Slide page 2 provides access to the FTP/WAN back-up settings and the memory check utility for viewing available system/storage memory space.

5.4 Notifications

The notification window is a feature that can be accessed by pressing the date/time field in the icon bar. This window provides a snapshot of current DX activity. The notification window can be closed by pressing the date/time field again, or is automatically closed if the Menu, Home or a navigation arrow icon is pressed.



A user can view all notifications by touching the screen and dragging their finger up or down on the list to scroll through all items like other lists in DX. The notifications include the following:

- Room PV and SP.
- Probe PV for all additional inputs configured.
- Active alarm status including the most recent alarm.
- Data logging status including active file name and the length and logging rate set.
- Security status including the current user.
- Audit trail active/inactive status.
- Web server active/inactive status.
- VNC server active/inactive status.
- DX network IP address.
- Available SD storage memory remaining.

The appearance of the items is based on the configuration of the DX. If data logging or security functions are disabled in the Configurator for example, their status items will be removed from the list as well.

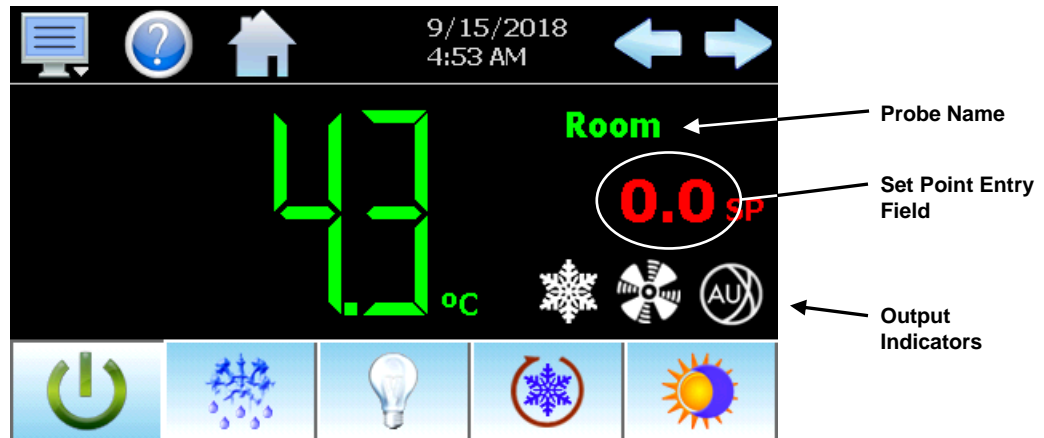
NOTE: *The notification items do not update while the list is shown. The information shown in the list is a snapshot of the data at the time the window was shown. Therefore, the PV or SP shown may not be the actual values if the notification window is left open for extended periods of time. The notification window is not available in the offline setup.*

5.5 Control (Regulation Set Point)

The Single and Dual view screens provide direct viewing options for the operation and monitoring of the Dixell control. The screens allow the user to adjust the current set point (SP) and view the process variable (PV) for each probe. The Single view also allows the user to perform various control tasks and view output status for the compressor, fan and auxiliary output (if equipped).

5.5.1 Single View

The Single view display shows one temperature probe at a time. It is accessed from the home “View” menu.



The **left and right arrow buttons** allow the user to switch between each available probe configured on the DX. If only a single probe is configured for indication, the left and right arrow buttons will not be shown.

The **probe name**, shown at the top right of the screen, will update as each probe is shown to inform the user as to which probe is currently being viewed.

The **set point entry field** is the area where the screen can be touched in order to display the numeric keypad so that a new set point can be entered. Once entered, the new set point will be shown in the set point entry field. The field is visible only when the control probe is being viewed.

NOTE: *The set point shown is the regulation set point. If the Dixell control is configured for energy saving operation and the energy save function is enabled, the set point will be offset by the energy saving set point. If the user has entered a set point of 0.0 for example, and the energy saving set point is 2.0, the indicated set point will be shown as a value of 2.0. When energy saving is then turned off, the set point will revert back to the user set point of 0.0. See Section 8.4 Control Settings for more information.*

The **output indicators** are shown when the respective output of the Dixell control is on. Available indicators include the compressor output (snowflake), the fan output and auxiliary output. Indication and activation of manual defrost, light, continuous cycle and energy saving operation are provided via the control buttons along the bottom of the screen.

Control On/Off- This button is used to turn the temperature regulation function of the Dixell controller on and off. This does not remove physical power from the controller, but turns off all of the outputs. This also disables alarm operation and will prevent the light function from operating (if configured).

- Defrost -** This button allows manual defrost operation. Once activated, defrost will continue until the defrost termination conditions are met. When defrost is activated either through the digital input or automatically based on the defrost settings, the button will activate to inform the user that defrost is active.

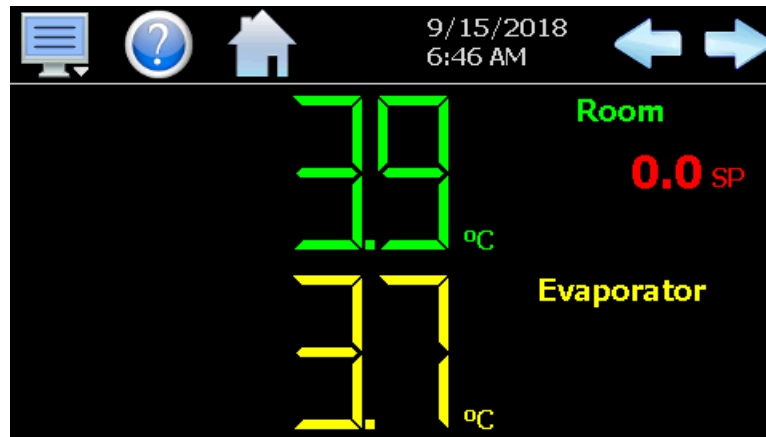
- Light -** The light control button is provided when the auxiliary output of the Dixell controller is configured as a light control output. Pressing the button will toggle the light output of the Dixell control on and off.

- Continuous Cycle -** This button toggles the continuous cycle mode on and off. Once activated, the continuous cycle will continue based on the configuration settings in the Dixell control. Once the cycle has ended, the button will deactivate. The user can also terminate the continuous cycle at any time by pressing the button again to turn it off.

- Energy Savings -** The energy save control button is provided when the on/off key enabling in the Dixell controller (parameter onF) is set to “ES” to enable the energy savings key function. Pressing the button will toggle the energy saving mode on and off.

5.5.2 Dual View

The Dual view shows up to two probes on the screen at one time. It is accessed from the home “View” menu. If the DX is configured to display only the main probe, only it will be visible on the screen. The screen also allows set point entry for the control probe when shown.



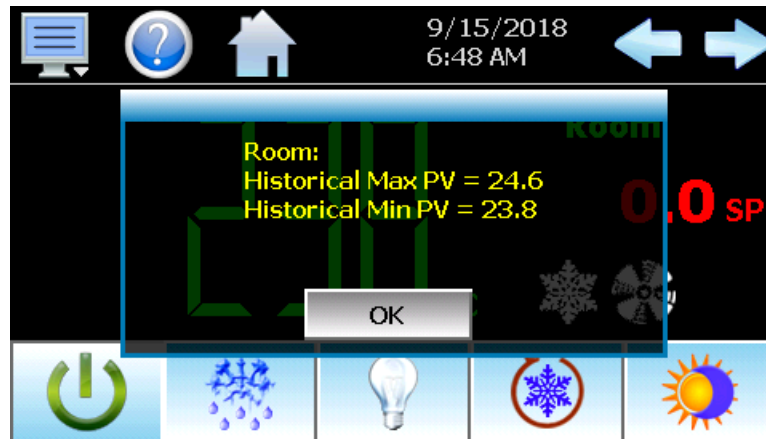
If the Dixell control is equipped with at least three probes and the DX is configured for indication of all probes, the left and right arrow buttons will be shown at the top right of the screen to allow the user to scroll through each probe for viewing.

5.6 Process Monitoring

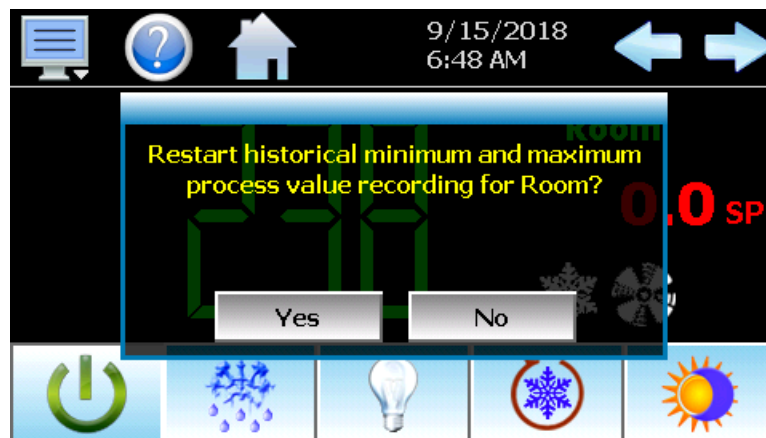
The Single and Dual view screens provide the current process values of the Dixell control. The DX also provides the ability to view the minimum and maximum temperatures reached as well as the temperatures over time via real-time charts.

5.6.1 Historical Minimum and Maximum

The DX monitors and stores the minimum and maximum process value reached during operation for each probe in the system. The current historical values can be viewed by pressing the process value display field for the desired probe.



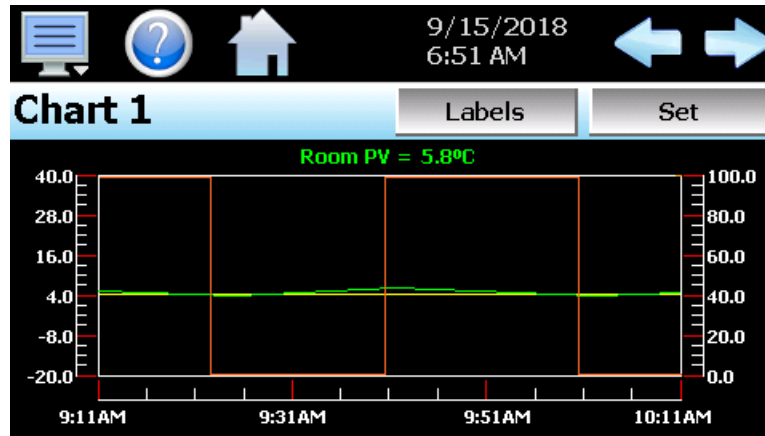
Pressing the "OK" button will close the dialog window and return to the Single or Dual view screen. The historical values are reset each time the runtime application is started, and can also be manually reset by pressing the "PV" tag on the screen.



Pressing the "Yes" button in the dialog window will reset historical minimum and maximum values and default them both to the current process value. Pressing "No" will simply close the dialog.

5.6.2 Charts

The Chart screen is accessed from the home “View” menu. The real-time charts can be configured to display the process variable (PV), set point (SP) and compressor output (%Out) over a selectable period of time. The vertical axis determines the range of displayed data while the horizontal axis determines the history period. The maximum time period that can be shown in a chart is 24 hours. The DX comes standard with 4 configurable charts.



The rate at which the chart plots a new point is based on the time period to be shown. Each buffer can hold a total of 720 readings for each of the selected channels to plot. The update rate can be calculated by the formula: $\text{time period (in minutes)} * 60 / 720$. Note that for time periods less than 72 minutes, the update rate will be held to a minimum of 6 seconds. Thus, the update rate will vary from a minimum of 6 seconds (for time periods of 72 minutes or less) up to a maximum of 120 seconds for 1440 minutes (24 hours).

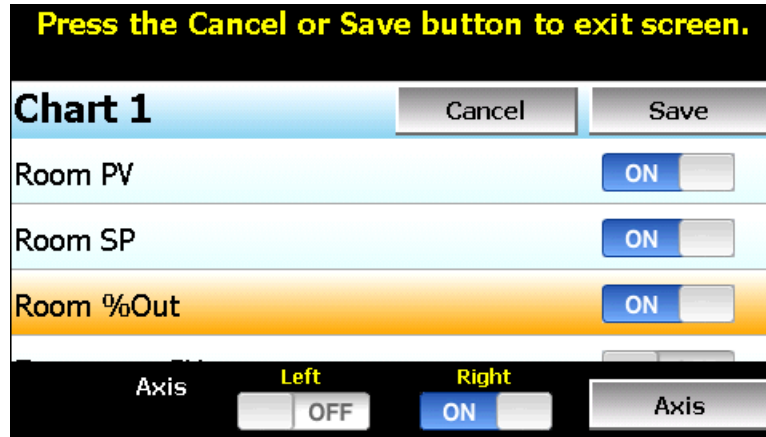
The **Labels** button allows the user to cycle through each of the configured plot channels to determine what each colored plot represents as well as view the current value without having to return to the Single or Dual view screens. The left and right scroll buttons at the upper right of the screen allow the user to cycle through each of the four available charts.

The charts also allow you to “zoom in” on a particular area to have a more detailed look at current data. By using your finger to select an area on the screen, the chart will zoom in on that area. To select a portion of the plot, touch and hold the screen with your finger. Drag your finger across the graph and a box will be drawn around the selected area. Removing your finger from the screen will cause the chart to redraw with only the selected plot area. To return to the normal view, touch the ‘X’ or ‘Y’ axis and select zoom out to return to the previous zoom setting or zoom normal to return to the full display.

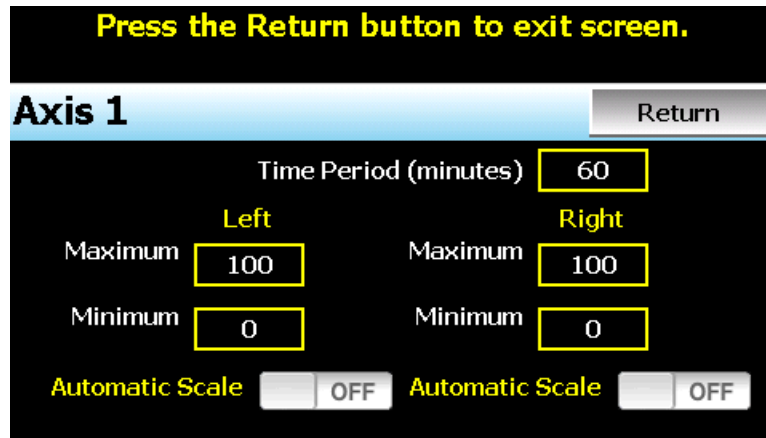
NOTE: *When a chart is zoomed in, it will not update with new information. The chart must be in normal view mode in order to update at each time interval. The chart will return to normal automatically when selecting a different screen to view.*

5.6.2.1 Chart Setup

To configure a chart, press the “Set” button in the upper right corner of the display. The setup screen will be shown. To assign channels to the chart, simply touch the on/off button for the desired items in the list to select them. Select the left or right vertical axis for each item by selecting the item in the list and press the button for the desired “Left” or “Right” axis. The left axis is the default axis selection. If none of the channels are assigned to the right axis, the axis will not be shown on the chart.



Once the channel selections have been made, press the “Axis” button to adjust the time period and vertical axis ranges of the graph.



- Time Period** Adjusts the displayed time period for the graph. The allowable range is from 4 to 1440 minutes (24 hours).
- Maximum** The maximum value sets the maximum range of the vertical access with a minimum value of -32,760 and a maximum of 32,760.
- Minimum** The minimum value sets the minimum range of the vertical access with a minimum value of -32,760 and a maximum of 32,760.
- Automatic Scale** When on, the vertical axis will automatically adjust its zero and span as needed to display the selected plot channels.

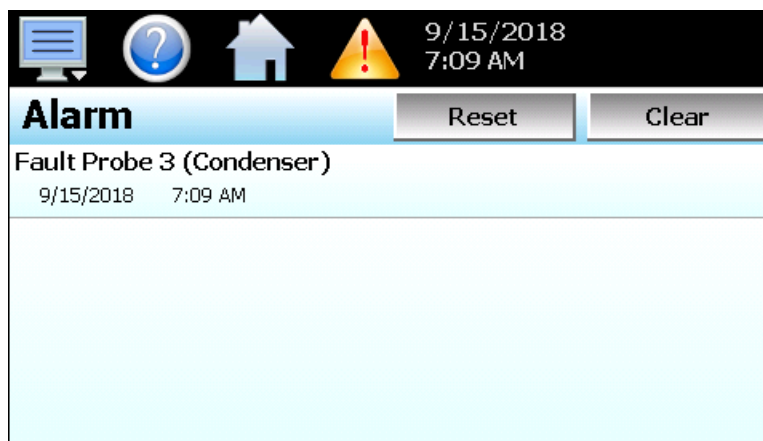
Once all settings have been made, press the “Return” button to return to the channel selection screen. Press the “Save” button to store the current channel and axis entries or the “Cancel” button to exit chart setup without altering the current chart settings. If channel selections or the time period for the chart has changed, all current chart data will be cleared when the new entries are saved. The chart will then begin plotting new data according to the new settings.

5.7 System Alarms

When an alarm condition occurs, the alarm icon flashes in the DX icon bar to provide a visual indication of an alarm condition. An audible alarm will also sound if the alarm requires immediate operator attention such as a communications failure or a process alarm set point has been exceeded. For more information on adjusting the audible alarm volume, see Section 9.6, Display Settings.

5.7.1 Alarm Monitor

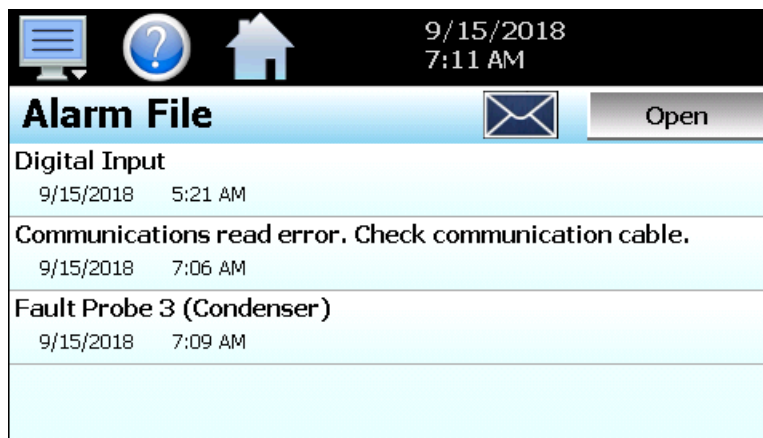
The Alarm screen is accessed from the home “View” menu. It can also be displayed by pressing the alarm icon whenever a new alarm occurs. It displays all current and/or previously acknowledged alarms according to time and date of occurrence. Once the alarm is reset, the alarm icon will be hidden; however, the alarm condition may still be present.




The alarm will be removed from the list when cleared by the operator by pressing the “Clear” button. Only alarms that are not currently active in the system can be cleared from the alarm list.

5.7.2 Alarm File

The Alarm File screen is accessed from the home “View” menu. It displays all alarms for any given day. The DX can store daily alarm files for a period of a year or longer (time based on storage usage for data history). Each time an alarm occurs the alarm is written to a file. Alarm file names are listed as month_day_year. The “Open” file button will display a dialog box where the user can select any alarm file to view.



The send email icon  allows the user to send a copy of the currently opened alarm file to any user configured in the DX. When the email icon is pressed, an “Add Recipients” window will be displayed where the user can select recipients for the file from any of the email addresses configured under the DX email settings. For information on how to add email recipients to the DX, see the section 8.7, Email.

NOTE: *If no alarms occurred on a given day, an alarm file will not be created for that day.*

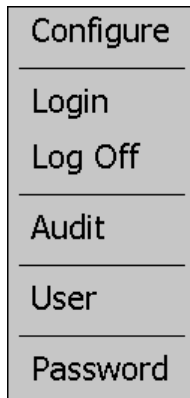
6 Security

The DX security model provides an administrator with the tools to add up to 30 users to the system. Each user must have a unique ID, full name and password. Four user levels are provided which include system, user, supervisor and administrator levels. Specific access rights can be assigned to each user level and password aging can be implemented. Verification is provided (if enabled) for any parameters that will change a control parameter, which could upset the process (i.e. change set point, start/stop energy savings, etc.).

Verification requires that the logged in user must log in again before the process value (at the controller) will actually be changed. This feature is provided for extra security. The following example will make re-authentication clearer:

A supervisor logs on the system. The supervisor then steps away from the system to take a phone call but does not log out before leaving. If another user tries to change the control set point, the system will require another login (by an authorized user for that level) before the control set point is actually changed. This provides an extra level of protection to make the system more “tamper proof”.

The Security menu is accessed from the home menu and provides access to the security section of the DX.



The Security menu provides the following functions:

Configure	Provides access to security setup to add users, set rights and options.
Login	Log on a user if security is enabled.
Log Off	Log off a user if security is enabled.
Audit	Allows the user to view any of the saved audit trail files.
User	Shows the current user logged into the system.
Password	Allows the current user to change their password.

6.1 Adding Users

The “New” user tab provides the ability to add up to 30 users to the system. Select the type of user from the drop-down list (System, User, Supervisor or Administrator). Press each field to add the user ID, full name and password (no spaces allowed, 5 character minimum and 16 characters maximum). Press the “Create” button to add the user to the system. If the passwords do not match or the user ID is already used, the DX will alert the user and not accept the entry.

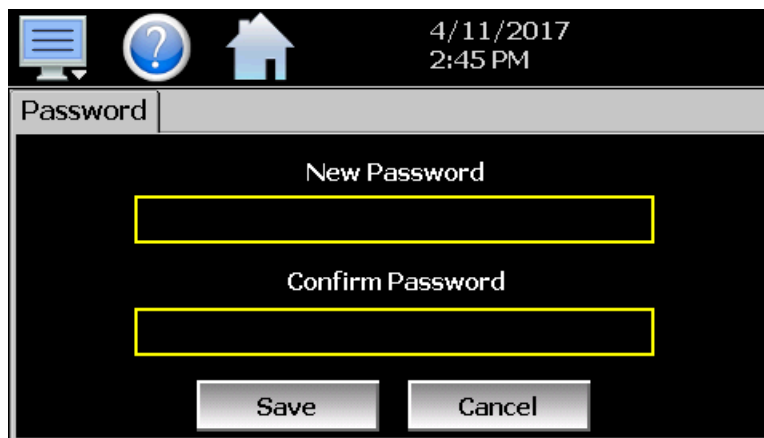
6.2 Viewing Users

The “Users” tab provides the administrator with the ability to view information on each user entered into the system. Password information is not available. The user can be deleted from this tab and a new password for each user can also be entered from this area.

To delete a user, select the user from the list and press the “Delete” button. Likewise, to change the password for a user, select the user from the list and press the “Password” button.

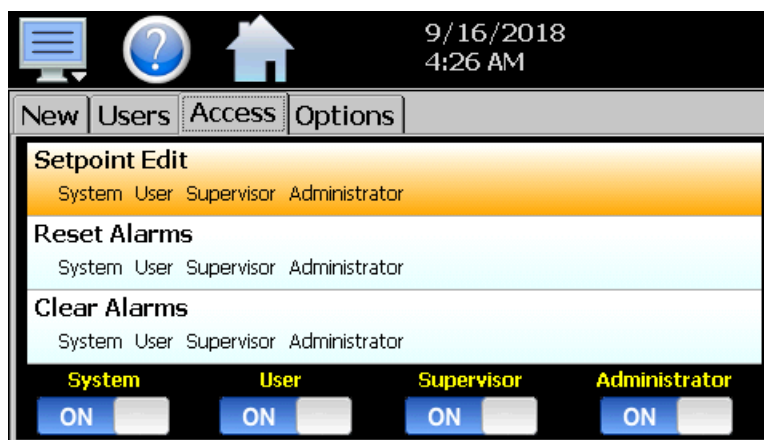
6.2.1 New Password Entry

To change a password, select the desired user by touching the User ID in the list box and press the ‘New Password’ button. Enter the new password and confirm the password. Press the “Accept” button to change the password (no spaces allowed, 5 character minimum and 16 characters maximum).



6.3 Setting User Access

The “Access” tab provides the administrator the ability to assign rights to each user level (System, User, Supervisor and Administrator). To enable or disable specific program functions (user rights) for each user level, select the user right from the list and press the corresponding on/off button for the user level you want to change access rights for. If the button is set to on, user access will be enabled for the user group.



User access for “Security” cannot be disabled for the administrator group. This is a safety feature to make sure that any administrator with the proper user ID and password can access security. If the administrator loses his/her ID or password, there is no “back door” to the system and it will have to be reset and reprogrammed in order to return to normal operation.

6.3.1 Security System User Access

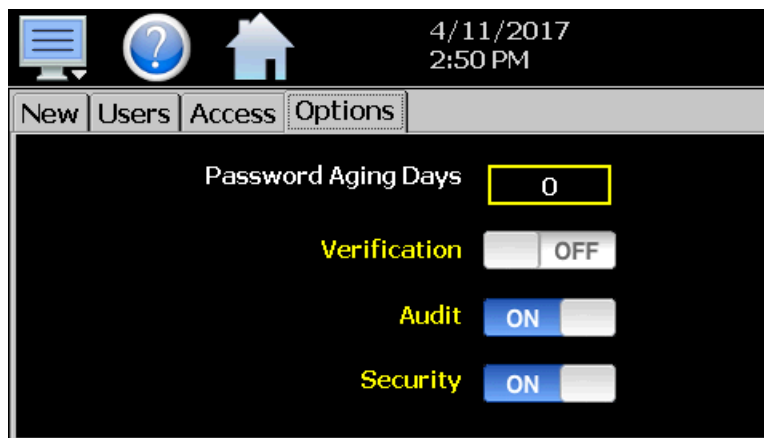
Shown below is a list of the available user rights, where to find the menu item(s) applicable to the user right and a description of what it applies to. Note that the OEM configuration allows many menu items to be disabled; in which case the menu for a specific user right may not be shown.

User Right	Menu Location	Description
Setpoint Edit	View/Single, Dual views	applies to control set point for temperature regulation
Reset Alarms	View/Alarm; Reset button	prevents alarms from being acknowledged
Clear Alarms	View/Alarm; Clear button	prevents alarm list view from being cleared
Chart Settings	View/Chart	configure plot channels, scale & time for charts
Data	Data/Data	applies to all data logging actions & settings

User Right	Menu Location	Description
Annotation	Data/View/Annotation	access to add operator messages to active log file
Signature	Data/View/Signature	access to add digital signature to active historical data file
Open	see description	alarm, audit & data files
Delete	see description	data files; note files may be deleted with File Utilities
USB	Data/Utilities/USB	allows USB memory stick to copy/delete data, alarm, program & audit trail files & to import programs
FTP/WAN	Data/Utilities/FTP/WAN	configure FTP client settings
Communications	Device/Settings/Set/Comms	configure web page, Modbus address & VNC settings
Setpoint Limits	Device/Settings/Set/Limit	edit minimum/maximum allowed set point entry
Adjust Alarms	Device/Settings/Set/Alarm	applies to all alarm settings
Email Settings	Device/Settings/Email/Email Settings	configure email settings and addresses
Email Message	Device/Settings/Email/Message	access to compose & send email message
Offline	Device/Settings/Offline	access to Off-Line menu system: Units, set Clock, Calibrate Touch, Language, Exit To Application, input Offset, Configuration
Calibrate Touch	Device/Settings/Offline/System/Display	access to the touch screen calibration utility
Backlight	Device/Settings/Offline/System/Display	access to edit backlight settings for brightness and off delay time
Alarm Volume	Device/Settings/Offline/System/Display	allows edit of alarm beeper volume
Units	Device/Settings//Offline/Set/Units	temperature unit selection - C\F
Clock	Device/Settings/Offline/Set/Clock	Set Date/Time, Time Zone, DST and NTS connection
NTP	Device/Settings/Offline/Set/Clock	enable & choose National Time Server location
Daylight Savings	Device/Settings/Offline/Set/Clock	enable Daylight Savings Time (DST)
Language	Device/Settings/Offline/Set/Language	Select help language
Security	View/Security/Configure	applies to Security Setup
Configuration	Device/Settings/Offline/System/Configuration	access to import/export setup files
Default Configuration	Device/Settings/Offline/System/Configuration; Reset Default Configuration button	function to clear system configuration and reset all to blank (default) state for reconfiguring
Exit (run mode)	Device/Settings /Offline/System/Exit; "Exit application. (automatic mode startup)." button	prevents DX application from being stopped
Exit to Configurator	Device/Settings /Offline/System/Exit; "Exit Application. (configuration mode startup)." button	prevents DX application from being stopped and access to the configurator application
Calibrate Inputs	Device/Settings /Offline/Calibrate	access to adjust probe offsets
Regulation	View/Single	enable or disable on/off control button
Start Thaw	View/Single	enable or disable manual defrost button
Continuous Cycle	View/Single	enable or disable continuous cycle button
Energy Saving	View/Single	enable or disable energy savings button
Defrost	Device/Settings/Set/Defrost	applies to all defrost settings
Control Differential	Device/Settings/Set/Control	edit compressor on/off temperature differential
Energy Save Setpoint	Device/Settings/Set/Control	edit the energy saving temperature rise
Adjust Continuous Cycle	Device/Settings/Set/Control	edit continuous cycle settings

6.4 Setting Security Options

The security “Options” tab provides the administrator the ability to set the global security options.



The **Password Aging Days** field is a global for all users. Password aging starts from the day the user is entered into the system. The value can be set from 0 to 365 days. A value of zero disables password aging.

NOTE: *When using password aging and the password expires for a user, the user will be required to change their password before access to the system is permitted. A user can change their password at any time (even if aging is not used) by selecting “Password” from the main security menu.*

When enabled, **Verification** requires that the logged in user must log in again before the entry value will actually be changed.

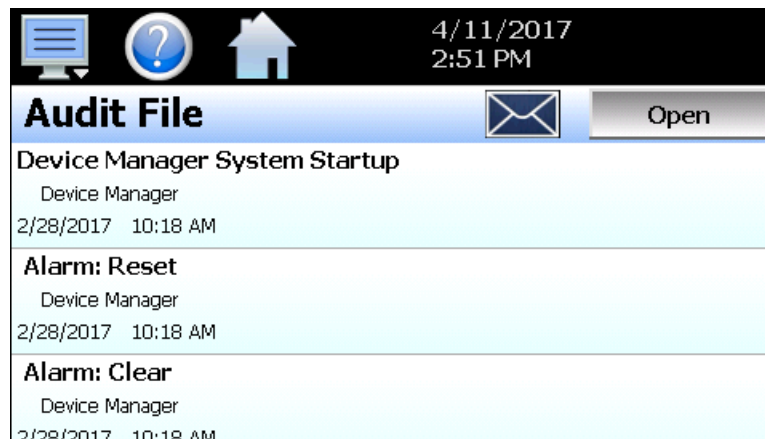
Audit is a global setting that turns the audit trail on or off. When the audit trail is turned on, all user actions are written to a daily log.

Security is the global setting that turns the DX security system on or off. The security system must be enabled for the audit trail to be enabled.


6.5 Audit Trail

The audit trail viewer is accessed by selecting “Audit” from the Security menu. It displays all user actions that affected the system for any given day. The DX can store daily audit files for a period of a year or longer (time based on storage usage for data history). Each time a user takes an action that effects the operation of the system (changing a set point, start/stop data logging, changes an alarm set point, etc.), the action is written to a file. Audit trail file names are listed as month_day_year. The “Open” file button will display a dialog box where the user can select any audit file to view.

NOTE: If no actions occurred on a given day, an audit file will not be created for that day.



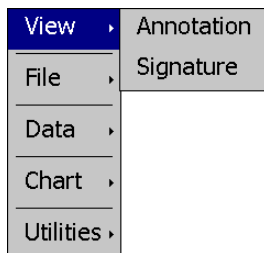
Each action recorded to the file includes the date/time it occurred as well as the user (if logged in) that made the change. If no user is logged in, the user will be listed as “Device Manager”, which is the default user account for the DX system.

The send email icon  allows the user to send a copy of the currently opened audit trail file to any user configured in the DX. When the email icon is pressed, an “Add Recipients” window will be displayed where the user can select recipients for the file from any of the email addresses configured under the DX email settings. For information on how to add email recipients to the DX, see the section 8.7, Email.

7 Data Logging

The DX data logging features are accessed via the home ‘Data’ menu item. The system data logging provides the ability to select individual points for logging, view data log files and start/stop logging operations. The logging ability of the DX provides an easy-to-use, convenient method to obtain electronic data without the need for additional data acquisition equipment.

The Data Log menu provides navigation to the following functions:



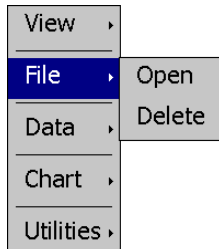
View menu

Annotation:

Allows the user to insert a notification into the currently running log file or view all annotations associated with the currently loaded historical data file.

Signature:

Allows the user to digitally sign a file to prevent data tampering and view all digital signatures associated with the currently loaded historical data file.



File menu

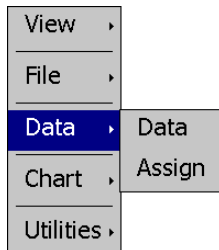
Open:

Opens a history file for review.

Delete:

Allows the user to delete the currently loaded history file.

NOTE: The “Delete” log file function does not affect data from a file that is running, only the current data log file loaded for review.



Data menu

Data:

Displays main data log screen with status of logger.

Assign:

Allows the user to select what variables are to be logged.

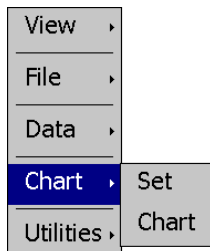


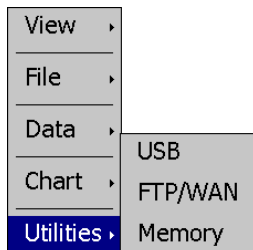
Chart menu

Set:

Selection of data file points and time period for history review.

Chart:

Plots historical data after time and points are selected.



Utilities menu

USB:

Allows the user to access file utility functions.

FTP/WAN:

Provides access to the automatic file back-up settings.

Memory:

Displays memory capacity remaining on DX.

7.1 Selecting Points for Logging

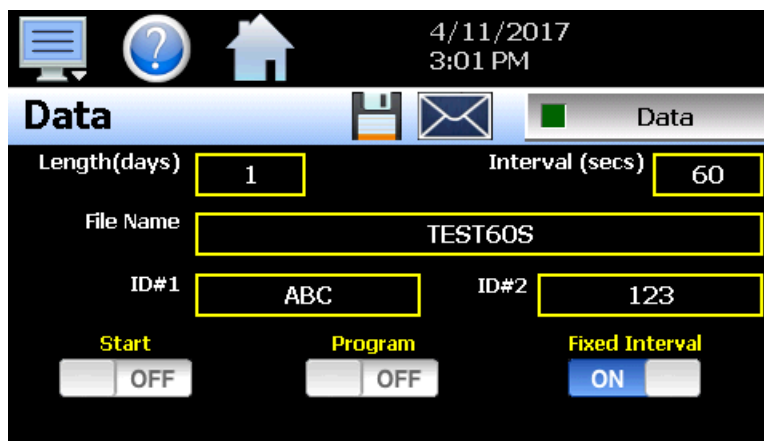
In order for the data logging function of the DX to operate, the user must first select what variables are to be logged to the data file. To choose which points are to be logged, select “Assign” from the Data menu.



Press the on/off button for each item to toggle it on/off. When on, the variable will be logged to the data file. When selections are completed, press the “Save” button to save the point selection to memory. New selections will not take effect until the Save button is pressed.

7.2 Starting/Stopping Data Logging

The DX logs data to its SD card. Current data for each variable is written to the log at a fixed interval based on the settings entered in the “Length” and “Interval” fields. File names are automatically generated using mm_dd_yyyy_hh_mm_ss format. To use a specific file name, touch the “File Name” field and enter the desired name (up to 16 characters). When a file name is entered, the file will be saved as FileName_mm_dd_yyyy_hh_mm_ss.



The data logger also provides two entry fields, ID#1 and ID#2, which allow the user to enter in information specific to the file such as a batch and/or lot number to identify product that may be associated with the new data file. These entries will be saved with the data log file for later identification.

The **Length (days)** field sets the length of a data file in number of days. It can be set for 1 to 31 days. Once the selected number of days has elapsed, a new data file will be created and logging will continue in the new file.

The **Interval (secs)** field is used to set the rate at which points are written to the log file which equates to the sample rate in seconds. When the “Fixed Interval” option is turned on, the logging interval will be automatically set to record at minute intervals based on the number of days set for the file. If the file is set for 1 day in length, the logging rate will be at 1-minute intervals. If the file is set for 7 days, then the logging rate will be every 7 minutes. This keeps the data file size manageable and able to be viewed by the DX data viewer.

The log interval can be manually set to any rate between 1 and 1860 seconds in any combination with the number of days before a new file is started. To do this, turn off the “Fixed Interval” option and enter in the desired logging rate in seconds.

NOTE: *Logging at shorter intervals allows the DX to capture fast changing processes, but the data files can become extremely large. Files that exceed the capability of the DX data viewer (>520KB in size) will have to be extracted from the DX using a USB memory stick or FTP file transfer in order to be viewed remotely on a PC.*

Files larger than the 520KB limit will not be automatically, digitally signed by the DX. If the files are to be digitally signed, this must be done manually by extracting the files and using the FDC data viewer program running on a remote PC.

To manually start data logging, press the “Data” button. Any time logging is enabled, the indicator on the Data button will be illuminated. To stop data logging, press the Data button again. Data logging can also be started automatically by turning on the “Start” or “Program” option.

The **Start** option automatically turns data logging on whenever the DX is first powered on. This action simulates that of a standard chart recorder.

The **Email** icon next to the data log on/off button allows the user to select the currently open data file and email the file to any user that has been setup to receive emails from the DX.

The **Disk** icon next to the **Email** icon allows the user to save the currently opened data file to a USB memory device connected to the DX.

7.2.1 Calculating Log File Size

The DX saves the log file in a text-based format (.csv), so the amount of memory consumed for each reading is dependent upon the number of digits required to accurately display the value. This optimizes memory usage but also makes calculating an exact file size difficult. To obtain a worst-case approximation of the resultant file size, use the following formula:

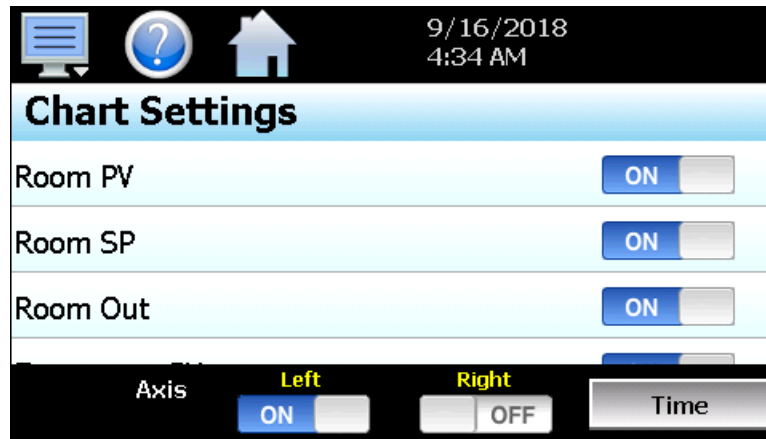
$$\text{File Size (KB)} = 1 + [0.023 + (0.006 * \text{number of log points})] * \text{number of readings}$$

7.3 Reviewing Historical Data

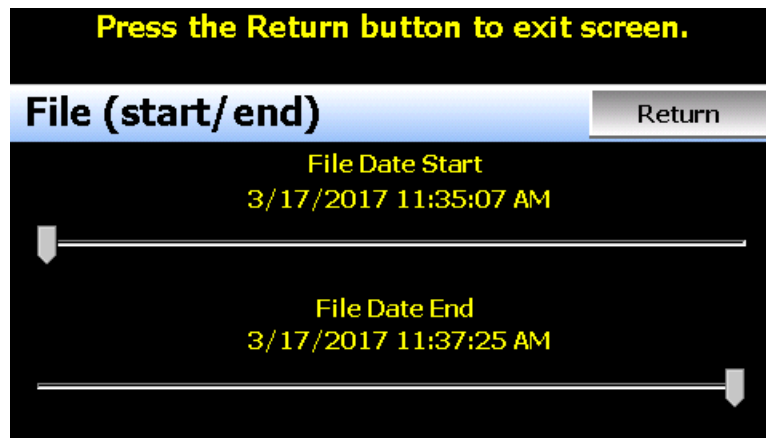
Historical files can be opened and viewed using the historical viewer. In order to view a historical data file, it must first be opened by selecting “Open” from the File menu. Once the file has been opened, the DX can automatically plot the entire historical data file or the user can choose to cancel the plot and select which channels should be plotted as well as adjust the specific time period to plot.

7.3.1 History Plot Setup

The history plot setup allows the user to select any time frame (zoom in/out) from the historical data file as well as select up to six channels of data to plot. To edit the settings for the historical plot, select “Set” from the Chart menu.



Any point from the data file can be selected along with the vertical axis to be used for each channel to be plotted. Select channels from the list by turning them on or off, and use the “Left” and “Right” axis buttons to assign the selected item to the left or right axis for the plot range. To adjust the period of time to plot from the data file, press the “Time” button.

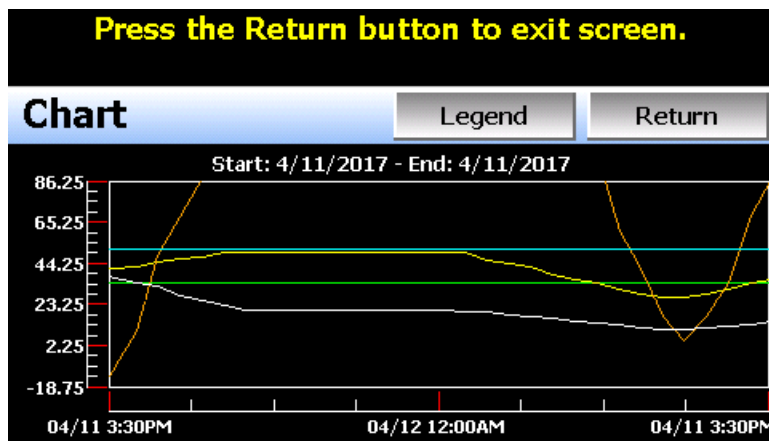


The start and end dates for the currently loaded file will be shown with time in hours, minutes and seconds. The “File Date Start” and “File Date End” sliders are used to select a time span for historical viewing. Once the desired start and end times have been set, press the “Return” button to return to the Chart Settings screen.

7.3.2 Plotting Historical Data

The history Chart plots the data from the currently opened history file according to the selections made under chart setup. If a file has not been opened or data points have not been assigned to a plot, the DX will alert the user to correct the problem. The 'X' and 'Y' axis scales are set to auto scale based on current values for each plot channel so no user action is required.

The historical graph provides the same zoom feature as the real-time charts so the user can zoom in on a particular area of the historical plot by dragging their finger across the screen to draw a rectangle around the desired plot area.



Pressing the "Legend" button will provide the user with channel information by displaying the names of the selected plot channels, which axis they are associated with and the color used to display the plot channel. Pressing the button again will toggle the display back to the historical chart.



NOTE: When pressing the Legend button to toggle between the historical chart and the legend screen, it may take several seconds for the chart to become visible depending on the size of the data file and number of channels selected to plot.

When finished viewing the historical chart, you must press the "Return" button to exit the historical data viewer and return to the main data log screen.

7.4 USB File Transfer

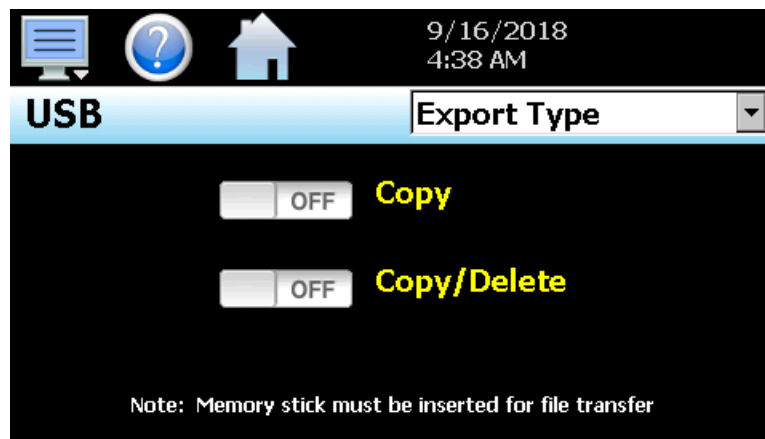
The “Utilities” section of the DX interface provides all the functionality required for retrieving files and maintaining the internal SD memory card. The internal SD card must not be removed from the DX interface. Any change to SD directory structure (moving or deleting files with a PC) may cause the DX interface to stop operating and a new SD card will need to be ordered. Never move or delete the directories unless using the provided DX file utilities functions.

NOTE: *The data log files, alarm log and audit trail directories are saved to the internal SD card (not the USB memory stick device) plugged into the DX interface. Never unplug the SD card when DX is powered up or loss of data may result.*

The USB file transfer screen allows the user to copy or erase files from the internal SD card. Complete file directories for all DX file types can be copied to the USB memory stick and erased from the internal SD card. The current status for file functions is displayed for the operator during copy/delete operations.

NOTE: *All file transfer functions can be used while data logging is running. If the operator needs to back up or delete files from the system, a large number of files could take considerable time to backup and delete from memory. The file transfer screen will be locked during file transfer so plan the timing appropriately when access to other screen functions is not required.*

When data logging is running, the current data log file will not be copied or deleted while using the file transfer functions. This protects the current file and makes sure that the data file is complete before being copied and cannot be deleted from memory while it is still in operation.



To **Copy** files, insert the USB memory stick into the USB port. Select the file type you wish to copy from the “Export Type” drop down menu. Available file selections are Program, Alarm, Audit and Data files. Once the selection is made, press the “Copy” button. All related files will be copied to the USB memory stick with progress status displayed to user.

To **Copy/Delete** files from internal memory, insert the USB memory stick into the USB port. Select the file type you wish to copy and erase from the DX internal memory by selecting it from the “Export Type” drop down menu. Available file selections are Program files, Alarm files, Audit trail files and Data files. Once the selection is made, press the “Copy/Delete” button. All related files will be copied to the USB memory stick and then deleted from the DX with progress status displayed to user.

NOTE: *The USB memory stick must be inserted into the USB port for any of the file utility operations to function. It is recommended to only use memory sticks certified by Future Design Controls for use with the DX. Future Design Controls has tested and validated these memory devices for proper operation and performance.*

Due to manufacturing variations in the USB memory sticks, it may take a few seconds up to 30 seconds for the DX to recognize the device when it is plugged in. Allow sufficient time for the device to be recognized before attempting any file utility operations or the DX will indicate a file transfer/memory stick error.

When files are being copied to the USB storage device, a directory for each file type will be created to store the copied files. The directory structure is as follows:

Alarm files directory:	Alarm Files_mm_dd_yyyy-hh_mm_ss
Audit files directory:	Audit Files_mm_dd_yyyy-hh_mm_ss
Data files directory	Data Files_mm_dd_yyyy-hh_mm_ss

The purpose for using the date and time as part of the directory name, is to make sure the user can track the date and time of the file transfer. If a user transfers a file type more than once in a single day, the files will be grouped logically by time.

When accessing the data files saved to the USB memory stick, the data files will be in “.csv” format. These files can be opened directly with Microsoft Excel or any program that opens a comma separated file format. You can copy or empty the “Data Files” directory by simply plugging the USB device into a PC’s USB port. The device then becomes like any removable disk attached to the computer and can be manipulated once plugged into the PC.

The MCT Data Viewer program is a free Windows accessory program that allows users to view, plot and print data files and is available from Future Design Controls or any manufacturer that markets the DX product. It is required when using the digital signature feature of DX.

IMPORTANT: *Once files are deleted from the DX storage devices, they are gone and cannot be retrieved. DO NOT edit, move or delete any other files from the internal SD memory card unless using the DX file utilities. The DX will not operate properly if the file/directory structure is altered.*

7.4.1 Recommended File Maintenance

A quick note about file storage; data and setup files (alarm log and audit trail files) need some maintenance every now and then. After a period of time, storage devices fill up and files require backup or file deletion when no longer needed. Due to the file directory limitations of the Microsoft CE OS, when multiple files begin with the same 8 characters it reduces the maximum number of files that are permitted in a single folder. This limit is 999 files. Alarm and audit files are recorded by date (one per day), so it would take years to reach the file limit.

Data log files; however, could reach the limit quicker based on the number of files created per day. At a frequency of 3 per day, 7 days a week, the file limit would be reached within one year. It is recommended that a quarterly maintenance schedule be adopted to copy and delete all alarm, audit and data files from the DX through either the USB file transfer or FTP backup utilities to prevent the file limit from being reached.

If the file limit is reached, the DX will display the alarm message “SD card full or missing” and data logging will be disabled. Note that there is still sufficient memory space on the SD card; however, due to the file limit being reached, no more files can be placed in the data log folder. Regular backup and removal of files from the DX will prevent this from occurring.

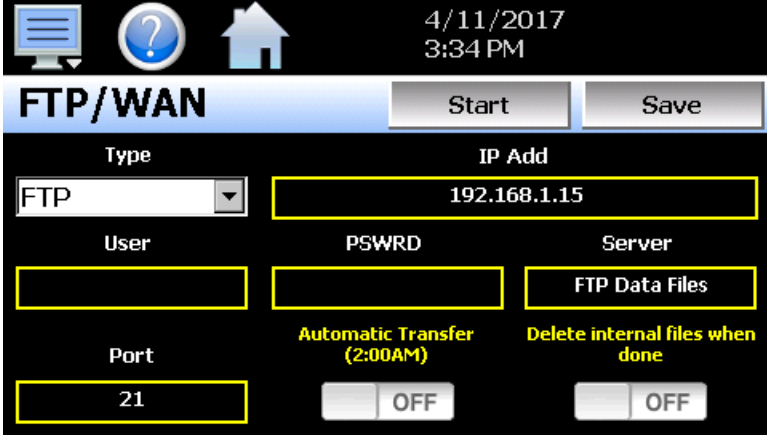
More frequent backups will also require less time to perform. The speed at which files can be transferred is more dependent on the number of files than the size of the files. A fewer number of large files takes less time than a large number of small files.

7.5 FTP/FileWeb/DataWeb Interface

The FTP/WAN screen allows the user to configure automatic back-up of all data files contained in the DX memory to a user designated FTP or secure FileWeb site (https://). When enabled, the DX will automatically back up all data log files, alarm files and audit trail files at 2:00AM each day. With the optional delete files selection, the DX will then automatically delete the files from its internal memory after back up. This will maintain DX memory automatically, so that continuous data logging can be performed without filling up the available memory space.

The DX also offers a DataWeb LAN/WAN/Cloud interface. This allows the DX to transfer data directly into a server's data base rather than using file-based data solutions. The DataWeb interface provides the transfer of secure (https://), real time data which can be shared and viewed across networks for real time manufacturing data systems interface.

NOTE: Setting up an FTP site on your network may require authorization and/or assistance from your network administrator. Contact your network administrator for proper settings and authorization from your network server (if required) to allow the DX to connect to the designated FTP site.



Type	IP Add
FTP	192.168.1.15
User	PSWRD
Port	Server
21	FTP Data Files
	Automatic Transfer (2:00AM)
	Delete internal files when done
	OFF
	OFF

The **Type** drop down is used to select the FTP/WAN interface. Choices are FTP, FileWeb and DataWeb.

The **IP Add** field is used to enter the IP address of the FTP/FileWeb/DataWeb site that DX is to interface with.

The **User** field allows you to enter a user name for site access. When the DX connects to the FTP/FileWeb/DataWeb site, the user name will be used to identify the connection. If a security login is required (FileWeb/DataWeb always require security credentials), the proper user name will have to be entered in this field. If security is not used (FTP only), this field can be left blank (blank for anonymous login using FTP only). FileWeb and DataWeb require a username and password.

The **PSWRD** (password) field is used in conjunction with the user name field and is for entering a password, so the DX can access the site. If security is not used (FTP only), this field can be left blank (blank for anonymous login using FTP only). FileWeb and DataWeb require a username and password.

The **Server** field is used to enter the server directory where the files are to be backed during FTP/FileWeb operation. This field is not used during DataWeb interface selection. When the connection occurs, the DX will place the historical data files in the "Sever" field directory structure when using FTP/FileWeb interfaces. The DX will automatically create an "Alarms" directory and an "Audit" directory within the specified server directory for backup of the alarm files and audit trail files. The "Sever" field for FTP and FileWeb must match the directory structure setup at the server.

For example, if FTP or FileWeb is used and the “root” path at the server is “Files” and the DX files will be transferred to this directory, the “Server” field will contain the text “Files”. If there is a directory inside of the server root “Files” directory named “unit1775” and the files will transfer to this directory, the “Server” field will contain the text “Files/unit1775”. The FTP/FileWeb operations will error and transfer will not be completed if the “Server” field is not entered properly or does not match the FTP/FileWeb server configuration.

When the **Automatic Transfer (2:00AM)** option is turned on, the DX will perform an automatic backup of all historical data files, alarm files and audit trail files contained in its internal memory to the designated FTP/FileWeb site. Note that if data logging is currently active, the active file will not be copied. When the **DataWeb** interface is used, real time data is transferred to a database rather than transferring actual files so this option is not used and is disabled.

When the **Delete internal files when done** option is turned on, the DX will delete all data log files, alarm files and audit trail files within its memory after completing the backup to the FTP site. Note that if data logging is currently active, the active file will not be deleted. When the DataWeb interface is used, real time data is transferred to a database rather than transferring actual files so this option is not used and is disabled.

Once all settings have been made, press the “Save” button to save the settings so that on the next power-up, the entries will be maintained. The “Start” button can be used at any time to perform a manual data backup using FTP or FileWeb interfaces. If the files already exist on the FTP/FileWeb site, they will be overwritten on each subsequent backup. If the FTP/FileWeb site is down, or the DX is not connected to the network, a local alarm message on the Alarm screen will indicate a transmission failure.

NOTE: Typically FTP/FileWeb Server connections use case sensitive alpha-numeric characters for the User name, Password and Server directory. Contact your network administrator for proper settings.

7.5.1 More About FTP, FileWeb and DataWeb Interfaces

FTP servers (File Transfer Protocol) have been around for many years and can be installed on local or network machines. The FTP server allows a client (DX) to transfer files from a local device to the FTP server once installed. This allows for manual and automatic backup of data from the DX device.

DX Field Setup	FTP Server Setup
Type = FTP	FTP server setup for passive operation (see Appendix section A.2 FTP, FileWeb, DataWeb Requirements/Installation for additional information).
IP Add = xxx.xxx.xxx.xxx	Actual IP address of FTP server
User = userName	Actual user name for login if authentication used.
Password = userPassword	Actual password for login if authentication used.
Server = myFTP	FTP server setup with a root directory named “myFTP”. The FTP server directory path must exist and match the DX setup for proper operation. If there is an additional directory within the “myFTP” root directory, its name would be appended to the path. (i.e. myFTP/Files if a “Files” directory inside the myFTP server root directory is the target for transfer).
Port = 21	Port used at DX and open at FTP server.

NOTE: Make sure proper permissions are set at the FTP server for access/creation of directories and read/write access. Also check root directory structure at Server to identify the actual root that was created for the files since there can be additional layers created by the server and displayed in the path.

The FileWeb interface allows the DX to transfer its files to a web site for download which can then be viewed using a standard web browser. This interface provides the user the ability to setup a web site to store files for local or global access without installing an FTP server. The DX supports https:// (secure) transfer of files.

DX Field Setup	FileWeb Server Setup
Type = FileWeb	FileWeb server setup (see Appendix section A.2 FTP, FileWeb, DataWeb Requirements/Installation for additional information).
IP Add = https://fdctuil.com/xxxx.svc	Actual named address of FileWeb server/service.
User = userName	Actual user name for login at FileWeb server (required).
Password = userPassword	Actual password for login at FileWeb server (required).
Server = myFileWeb	FileWeb server setup with a root directory named "myFileWeb". The FileWeb server directory path must exist and match the DX setup for proper operation. If there is an additional directory within the "myFileWeb" root directory, its name would be appended to the path. (i.e. myFileWeb/Files if a "Files" directory inside the myFileWeb server root directory is the target for transfer).
Port = 21	Port used at DX and open at FileWeb server.

NOTE: Make sure proper permissions are set at the FileWeb server for access/creation of directories and read/write access. Also check root directory structure at Server to identify the actual root that was created for the files since there can be additional layers created by the server and displayed in the path.

The DataWeb interface allows the DX to transfer data to a web data base service using MySQL and Microsoft IIS as a web platform. The DX can interface directly to a local or Web data base (Cloud) thereby allowing access to any system globally without any special "client" applications required to view the data. This allows the DX to share data with local or global manufacturing systems by storing data directly to a manufacturing database. The DX supports https:// (secure) transfer of data.

DX Field Setup	DataWeb Server Setup
Type = DataWeb	FileWeb server setup (see Appendix section A.2 FTP, FileWeb, DataWeb Requirements/Installation for additional information).
IP Add = https://fdctuil.com/xxxx.svc	Actual named address of DataWeb server/service.
User = userName	Actual user name for login at FileWeb server (required). This is the directory where the database structure will reside on the server. The DX will use this directory path for sending data to the database.
Password = userPassword	Actual password for login at DataWeb server (required).
Server = not used	The directory where the database exists uses the userName as the default location for data storage.
Port = 21	Port used at DX and open at DataWeb server.

NOTE: An IT professional with experience is required for DataWeb server setup. Future Design Controls does not support server-side programming or setup but can offer 3rd party resources to assist with or handle complete server-side projects.

The DataWeb interface does not transfer complete files for backup like the FTP and FileWeb interfaces. The DataWeb interface transfers records in real time based on the log setup interval at the DX. When logging is started at the DX, data will begin transfer to the server-side site. Data will be transferred to the server at the beginning of logging (one record) with additional records transferred based on the rate that the DX data log interval is set for.

If the data log interval rate is set for 60 seconds, the DX will populate the database with a single set of records (PV, SP, %Out determined by data log/server setup) once every 60 seconds. If the data log interval rate is set for 120 seconds, the DX will populate the database with a single set of records (PV, SP, %Out determined by data log/server setup) once every 120 seconds. Data log intervals can be set as fast as 1 second since buffering is used at the DX for faster data log rates, but in this case the database would receive a total of 60 records once per minute (one record per second). Buffering for rates faster than 1 minute is used to reduce access/overhead at the server side while still maintaining 1 second date/time stamps for database record keeping.

7.5.2 FileWeb/DataWeb Server Components and Requirements.

While the actual server-side development is more involved than this manual will cover, component overview and installation is covered in section A.2 of the Appendix.

Web Development Support:

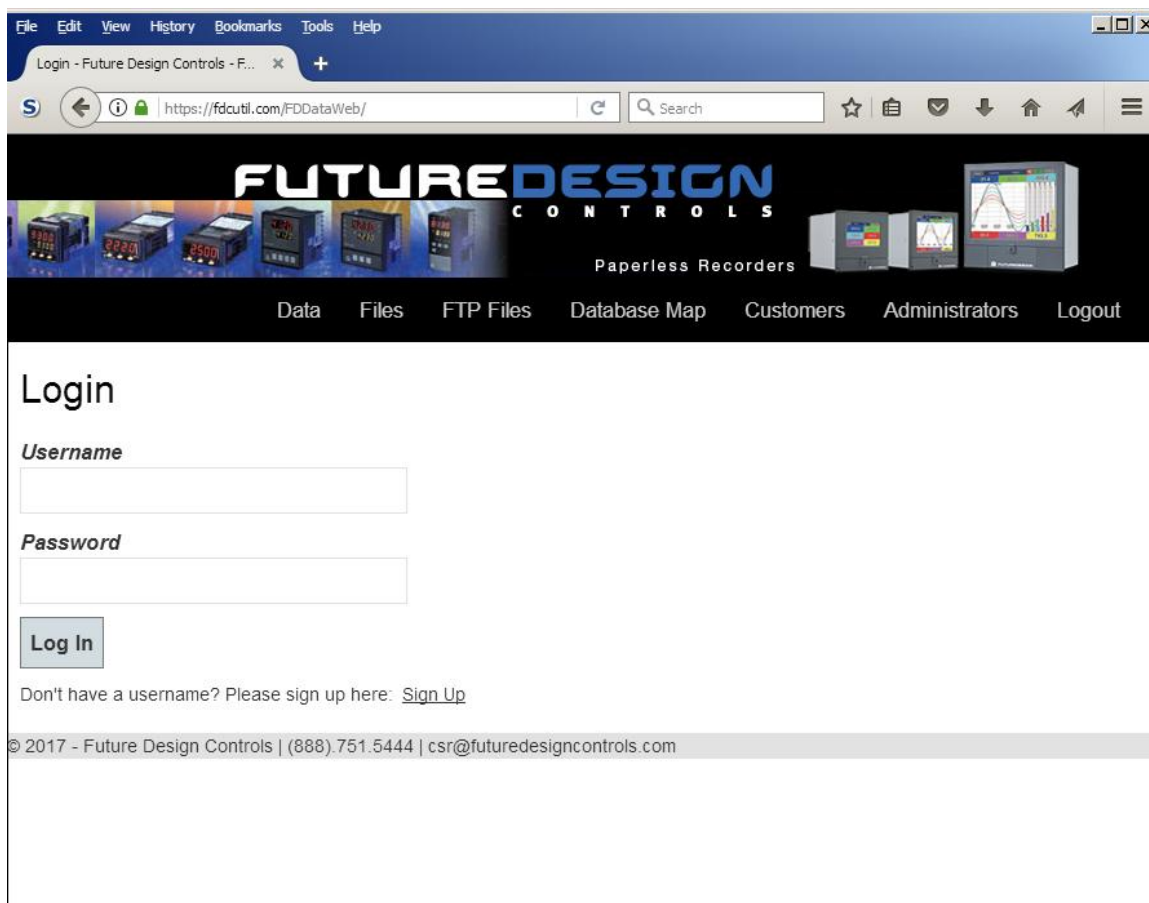
Future Design Controls does not support or develop custom server-side web solutions. We can offer 3rd party resources to assist customers in these development requirements.

7.6 FDCUtil.com Web site for FTP, FileWeb and DataWeb Testing

The FDCUtil web site is a Future Design Controls http/https site that allows customers to create a free account and test the FTP, FileWeb and DataWeb interfaces offered on the DX. The site automatically deletes files every 2 hours since this is a test site only and cannot be used for permanent web storage of files or data. The site allows customers to fully test and verify that data is being transferred properly from the DX device to the FDCUtil site, thereby providing everything needed to test the DX and the Internet connection without requiring additional software or development. This allows the customer to test the interface and pick which type of data transfer is the best for operations.

Access the Web Site and Create an Account:

Go to the following link: <https://fdcutil.com/FDDataWeb/>

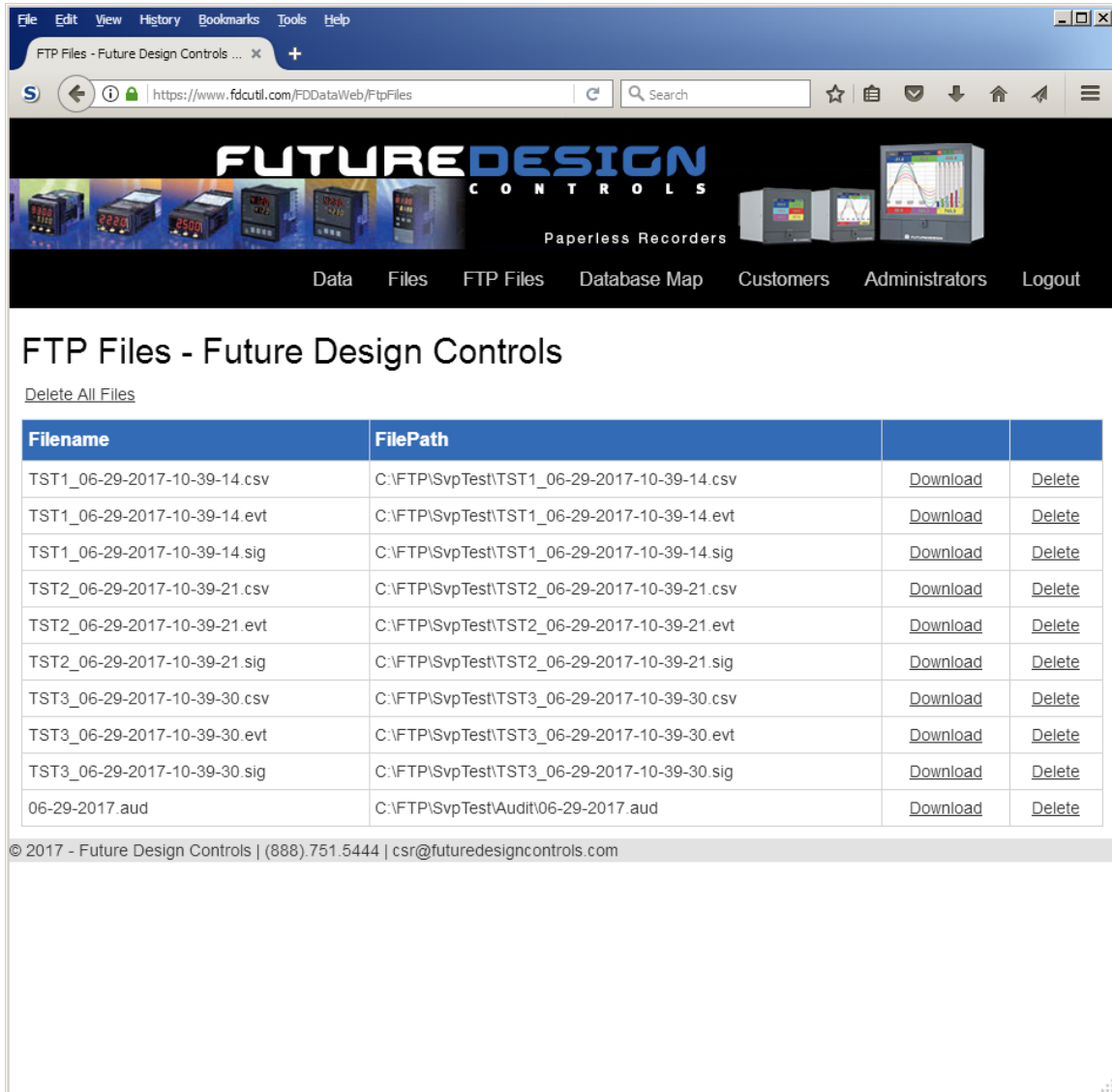


If you do not have a user already setup, click on the “Sign Up” link which will show the following page:

The screenshot shows a web browser window with the URL <https://fdcutil.com/FDDataWeb/Login/Register>. The page features the Future Design Controls logo and navigation links: Data, Files, FTP Files, Database Map, Customers, Administrators, and Logout. The main content area is titled "Sign Up" and contains four input fields: Name, Username, Password, and Confirm Password. A "Sign Up" button is located below the fields. The footer contains the copyright information: © 2017 - Future Design Controls | (888).751.5444 | csr@futuredesigncontrols.com

Enter information in the Name, UserName, Password and Confirm Password fields. The UserName, Password and Confirm Password fields will not allow space characters.

Once logged in, the main FDCutil site will be displayed with tabs for Data (DataWeb), Files (FileWeb) and FTP Files (FTP). These tabs can be clicked on and will display data after transfer from the DX device. After 2 hours, the data will be deleted from each section or the data can be manually deleted using the “Delete Data” link on each page.



FTP Files - Future Design Controls

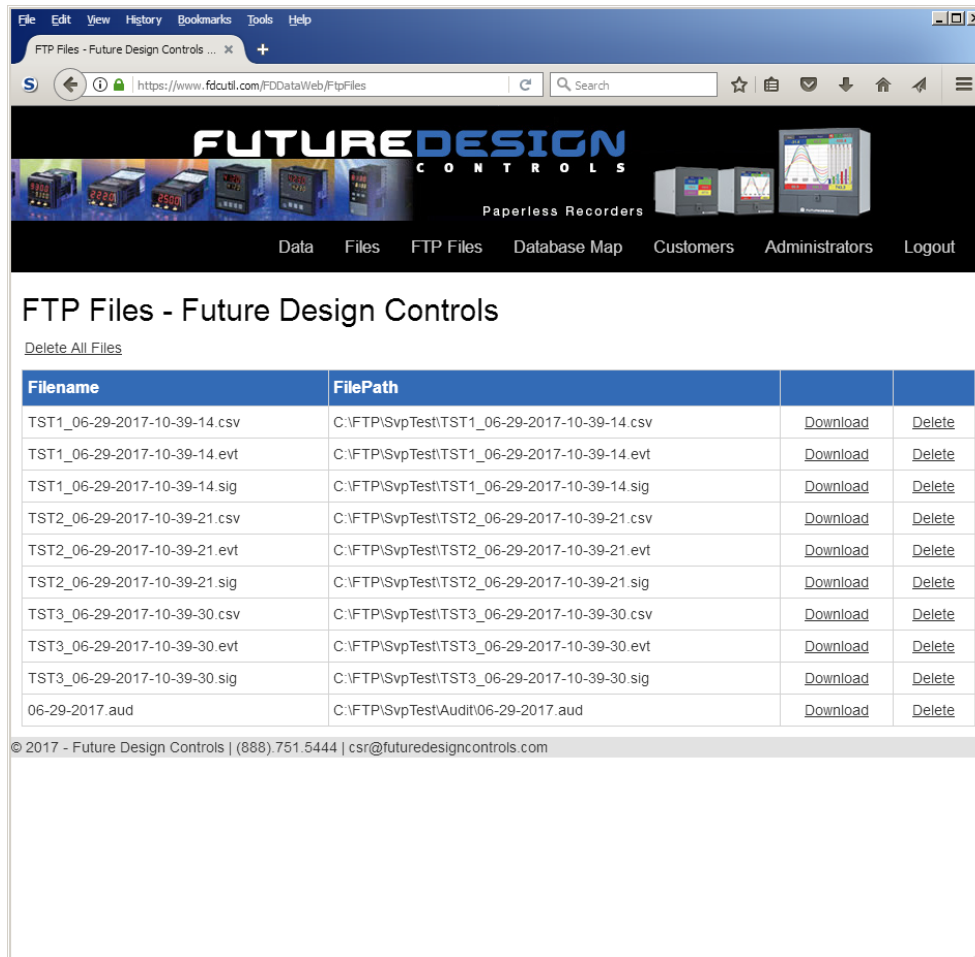
[Delete All Files](#)

Filename	FilePath	Download	Delete
TST1_06-29-2017-10-39-14.csv	C:\FTP\SvpTest\TST1_06-29-2017-10-39-14.csv	Download	Delete
TST1_06-29-2017-10-39-14.evt	C:\FTP\SvpTest\TST1_06-29-2017-10-39-14.evt	Download	Delete
TST1_06-29-2017-10-39-14.sig	C:\FTP\SvpTest\TST1_06-29-2017-10-39-14.sig	Download	Delete
TST2_06-29-2017-10-39-21.csv	C:\FTP\SvpTest\TST2_06-29-2017-10-39-21.csv	Download	Delete
TST2_06-29-2017-10-39-21.evt	C:\FTP\SvpTest\TST2_06-29-2017-10-39-21.evt	Download	Delete
TST2_06-29-2017-10-39-21.sig	C:\FTP\SvpTest\TST2_06-29-2017-10-39-21.sig	Download	Delete
TST3_06-29-2017-10-39-30.csv	C:\FTP\SvpTest\TST3_06-29-2017-10-39-30.csv	Download	Delete
TST3_06-29-2017-10-39-30.evt	C:\FTP\SvpTest\TST3_06-29-2017-10-39-30.evt	Download	Delete
TST3_06-29-2017-10-39-30.sig	C:\FTP\SvpTest\TST3_06-29-2017-10-39-30.sig	Download	Delete
06-29-2017.aud	C:\FTP\SvpTest\Audit\06-29-2017.aud	Download	Delete

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FTP Files Page:

The FTP files page, accessible from the “FTP Files” menu item, lists the files in the customer’s FTP data directory. These are only the files in the customer’s directory, not all uploads. The user can delete the files from this page.


FTP sample setup using FDCutil.com:

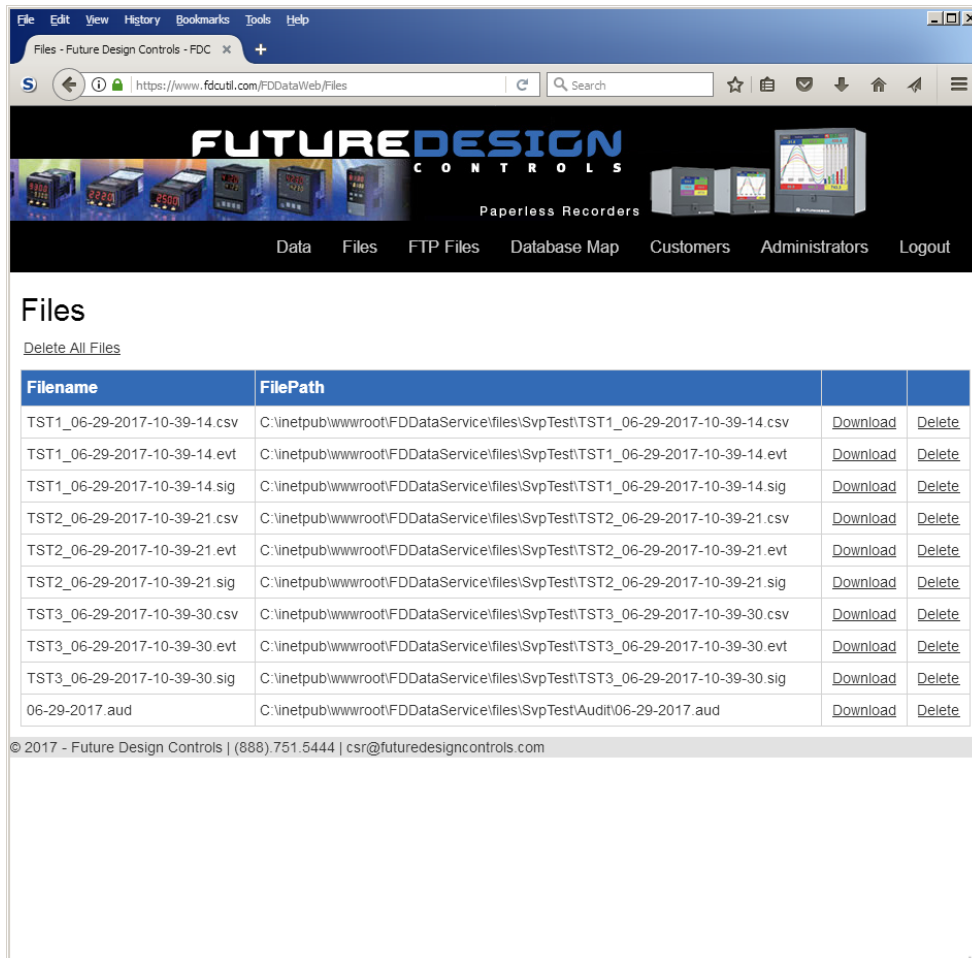
To setup the DX for use with the FDCutil.com FTP server, go to the FTP/WAN screen on the DX and enter the following data into the screen fields. Only one file/data transfer type (FTP, FileWeb or DataWeb) can be active at a time. The following example provides information to use the FTP interface and check the FDCutil.com website for proper operation. Make sure to replace the “custName” text below with the actual user name entered during the FDCutil.com signup process.

Type = FTP
 IP Add = fdcutil.com (site name or IP address of site name only – do not use prefix, i.e., “ftp://”)
 User = FTPUser
 Password = ftpFDC2016
 Server = FTP/custName
 Port = 21

Press the “Save” button to complete the setup on the DX LanWan screen. Press the “Start” button to begin a manual transfer of files from the DX to the FDCutil.com site. Login to the FDCutil.com site to view the FTP files by pressing on the FTP files link on the page (or press FTP link if already logged into FDCutil.com).

Data Files Page (FileWeb):

The data files page, accessible from the “Files” menu item, lists the files in the customer’s data directory. These are only the files in the customer’s directory, not all uploads. The user can delete the files from this page.



FileWeb sample setup using FDCutil.com:

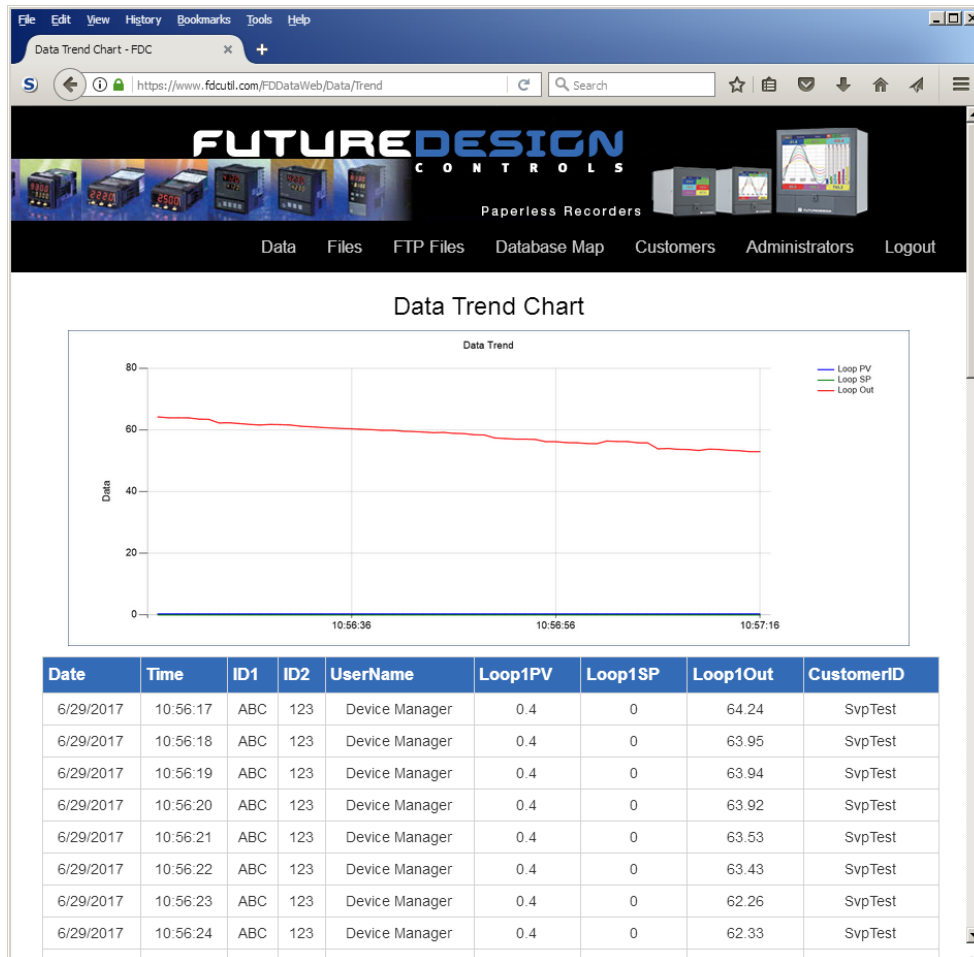
To setup the DX for use with the FDCutil.com FileWeb server, go to the FTP/WAN screen on the DX and enter the following data into the screen fields. Make sure to replace the “custName” and “custPassword” text below with the actual user name/password entered during the FDCutil.com signup process.

Type = FileWeb
 IP Add = <https://fdcutil.com/FDDataService.svc>
 User = custName
 Password = custPassword
 Server = custName
 Port = 21

Press the “Save” button to complete the setup on the DX LanWan screen. Press the “Start” button to begin a manual transfer of files from the DX to the FDCutil.com site. Login to the FDCutil.com site to view the FTP files by pressing on the Files link on the page (or press Files link if already logged into FDCutil.com)

Database Data Page (DataWeb):

Once logged in, the customer will be shown the database data page. If data has been uploaded to the database, it will be displayed on this page. They can also delete data records. Choices from the Data link allows the user to view tabular data only or tabular data with a trend of the data at the top of the page.



DataWeb sample setup using FDCutil.com:

To setup the DX for use with the FDCutil.com DataWeb server, go to the FTP/WAN screen on the DX and enter the following data into the screen fields. Make sure to replace the “custName” and “custPassword” text below with the actual user name/password entered during the FDCutil.com signup process.

- Type = DataWeb
- IP Add = https://fdcutil.com/FDDataService.svc
- User = custName
- Password = custPassword
- Server = empty (no characters)
- Port = 21

Press the “Save” button to complete the setup on the DX LanWan screen. When logging is started at the DX, data will begin transfer to the “Data” section of the server-side site. Data will be transferred to the server at the beginning of logging (one record) with additional records transferred based on the rate that the DX data log interval is set for.

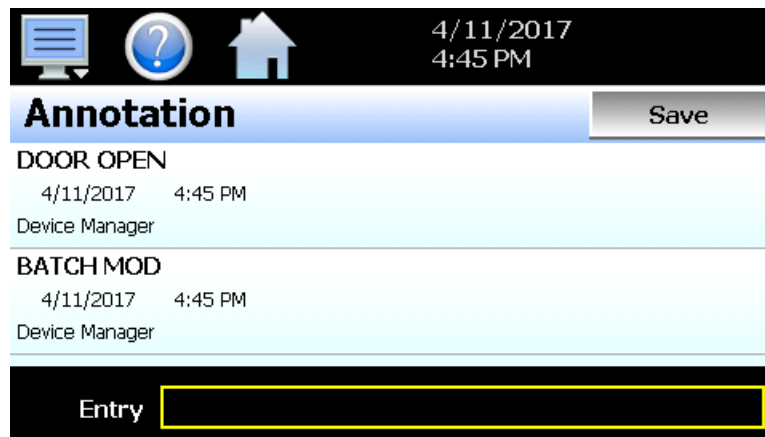
If the data log interval rate is set for 60 seconds, the DX will populate the database with a single set of records (PV, SP, %Out determined by data log/server setup) once every 60 seconds. If the data log interval rate is set for 120 seconds, the DX will populate the database with a single set of records (PV, SP, %Out determined by data log/server setup) once every 120 seconds. Data log intervals can be set as fast as 1 second since buffering is used at the DX for faster data log rates, but in this case the database would receive a total of 60 records in 1 minute (one record per second). Buffering for rates faster than 1 minute is used to reduce access/overhead at the server side while still maintaining 1 second date/time stamps for database record keeping.

NOTE: In order for the DataWeb server on the FDCutil.com website to function with your DX, the probe 1 name must be programmed for "Loop1" (with capital "L" and no spaces) in the Configurator. The FDCutil.com site is for testing only and utilizes a fixed DataWeb table for simplicity. If the probe name is not entered properly on the DX, the DataWeb interface will not operate and the data will not appear on the website.

If the name of the loop cannot be changed, the DataWeb function cannot be tested via the FDCutil.com website.

7.7 Annotation

The Annotation screen allows the user to add messages to the running data file and view any messages currently associated with a loaded historical data file.

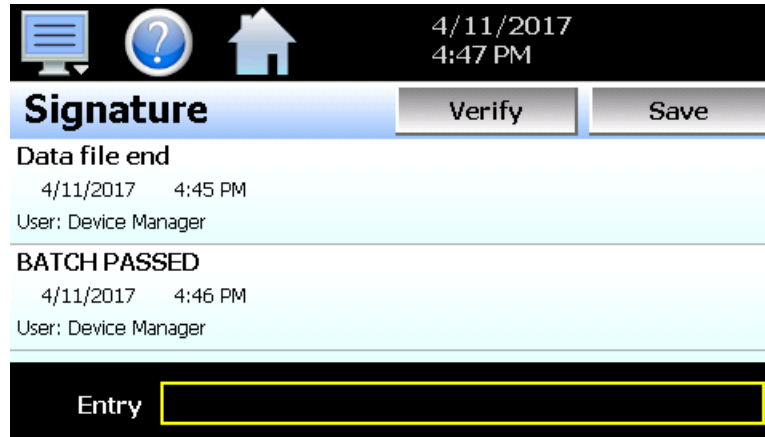


When a historical data file is loaded, the Annotation screen will display any messages that were written to the file. The date, time, user name and description of the data file annotation is shown. Note that the currently running data log file can be opened as a historical data file, and the current annotations for the running file will be shown.

To add an annotation to the running log file, touch the "Entry" field at the bottom of the screen and enter the message (up to 16 characters maximum). Press the "Add" button and the message will be added to the current log file. If the running log file was opened as the historical log file, the annotation will be shown immediately on the screen as it is added. If logging is not currently running, the entry field will be disabled.

7.8 AddView Digital Signatures

The Signature screen allows the user to add digital signatures to historical data log files and view any digital signatures currently associated with the loaded historical log file.



When a historical data file is loaded, the Signature screen will display any signatures currently associated with the file. To verify a digital signature and insure that the data file has not been altered, touch the signature in the list box and press the “Verify” button. The DX will compare the signature to the log file to see if any alterations to the data have been made. The DX will then indicate if the signature is valid or not.

If the signature is valid, the historical data file is intact and has not been altered. If the signature is invalid, the data has been altered at some time after the signature was assigned to the file. For data integrity, the DX automatically signs a data file when logging is stopped; however, this only occurs if the “Auto Interval” is selected on the Log screen. If a different logging interval is used, the DX will not automatically sign the file and it must be signed by a user.

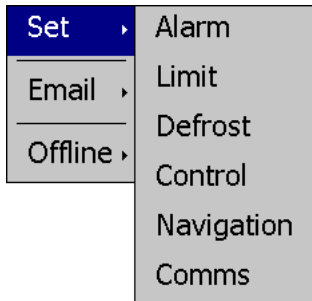
To add a digital signature to the historical log file, touch the “Entry” field at the bottom of the screen and enter in the comment line for the signature (up to 16 characters maximum). Press the “Add” button and the signature will be added to the log file. The signature includes the date and time of the signature, the user name and comment line. If a user is not logged into the system, the default user name “Device Manager” will be entered as the user.

NOTE: *The Signature screen is not available if security is disabled. The DX security module must be enabled in order to digitally sign data log files. See Section 6, Security.*

8 Device Settings

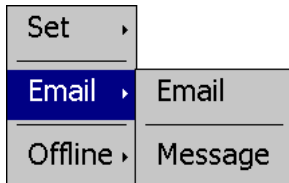
This section covers the use of extended controller features that enhance the functionality of the system. To gain access to the DX setup options, select “Settings” from the home Device menu.

The Device Settings menu provides navigation to the following functions:



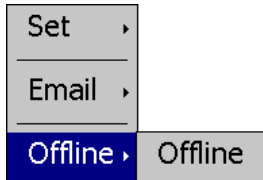
Setup menu

- Alarm: Provides access to the alarm settings.
- Limit: Sets minimum/maximum temperature set points.
- Defrost: Provides access to the defrost settings.
- Control: Provides access to temperature control settings.
- Navigation: Allows the user to choose text based or icon based/slide page navigation menus.
- Comms: Allows user to set the DX communication settings.



Email menu

- Email: Provides access to the DX email system manager.
- Message: Allows the user to send an email message to users entered in the system.



Offline menu

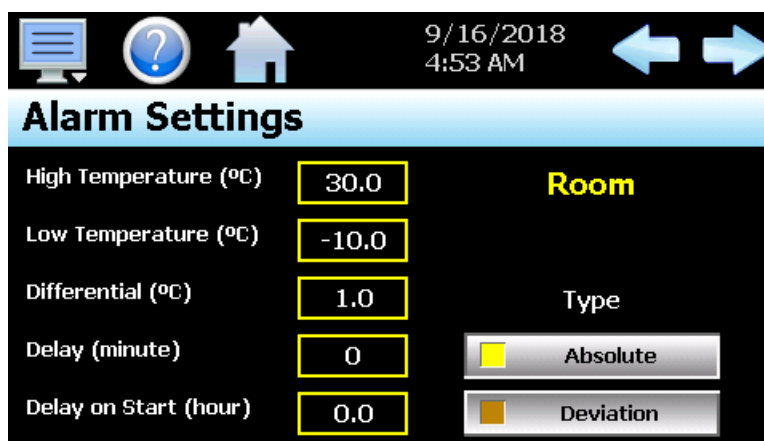
- Offline: Provides access to offline system settings.

8.1 Alarms

The alarm screen allows the user to edit the alarm set points, alarm delays and the alarm type for the temperature alarm.

NOTE: The Dixell controller can provide up to 2 alarms. The main temperature alarm is the default (room) alarm and monitors the main temperature probe (probe 1) on the XR40, 60 and 70CX. On the XR75CX, the temperature alarm can be programmed to use any of the available probes.

The “condenser alarm” can also be configured to use any of the available probes. Depending upon the configuration of the Dixell control, or probe indication selections made in the DX Configurator, only one, both or neither of the alarms may be available. If there are questions or concerns about the configuration and operation of your DX controller, contact your OEM for further information. Only your OEM can address equipment related issues.



The **left** and **right arrow buttons** allow the user to switch between both of the temperature alarms (when available). If only one alarm is configured, or the probe associated with the alarm is not configured for indication, the left and right arrow buttons will not be shown.

The alarm name shown at the upper right of the screen identifies the alarm based on the name given to the probe that it is associated with. The name will update as the user presses the left or right arrow button to go to the other alarm.

NOTE: If both alarms are configured to use the same probe in the Dixell control, they will be identified with the same name. However, only the main temperature alarm provides the selection type for Absolute or Deviation. The condenser alarm is an absolute alarm only. Consult the “Installing and Operating Instructions” for your model of Dixell control for further information.

The alarm **Type** selection is provided for the main temperature alarm only. This allows the user to select how the high and low alarm set points are used to trigger a high or low temperature alarm. When set to absolute, the alarm set points are actual temperature values. When the temperature exceeds the alarm set point, the alarm will be triggered.

The deviation selection relates the alarm set points to the temperature control set point. The alarms are then triggered when the temperature exceeds the temperature set point (SP) by the high or low deviation set point. Thus, a high alarm will be triggered when the temperature rises above (SP + high deviation) and a low alarm will be triggered when the temperature falls below (SP – low deviation).

NOTE: If the alarm type is changed, the high and low alarm set points must be re-entered to match the newly selected alarm type in order for the temperature alarm to operate properly.

The **High and Low Temperature (Deviation)** set points define the temperature at which the alarm is triggered. Enter the desired set points by touching the high and low entry fields and enter the desired values using the numeric keypad. When the alarm type is deviation (Dixell room alarm only), the set points for both fields are a positive entry from 1 to 50 degrees. When the alarm type is absolute, the entries can be either positive or negative temperatures.

The alarm **Differential** entry sets the alarm recovery temperature. This value is subtracted from the high alarm set point and added to the low alarm set point to create a dead band around the alarm trigger point. For example, if the differential is set for 1 degree and the high alarm set point is 50, the temperature will have to drop below 49 degrees in order for the alarm to clear. Likewise, if the low alarm set point is -10, the temperature would have to rise above -9 in order for the alarm to clear.

The alarm **Delay** sets the duration of time in which the temperature must exceed the high or low temperature set point before the alarm activates. The entry is made in minutes and can be set between 0 and 255 minutes (maximum of 4 hours, 15 minutes).

The **Delay on Start** sets the length of time from when the system is first powered on to when the alarm is enabled. This can be used to prevent the alarm from triggering when the system is first turned on to allow the system to bring the temperature to within the desired operating range. The entry is made in hours with a range from 0.0 to 24.0 in decimal increments of 10 minutes. For example, an entry of 1-1/2 hours would be made as 1.3 (1 hour, 30 minutes).

8.2 Setpoint Limits

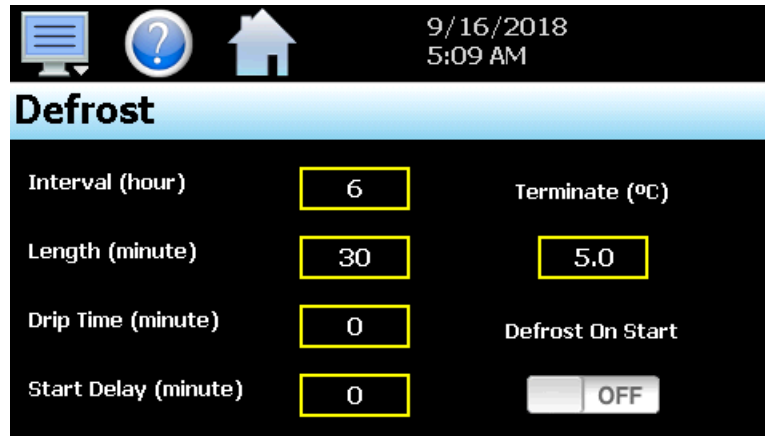
The Setpoint Limits screen allows for the adjustment of the minimum and maximum operating set points allowed to be entered for temperature regulation. These limits can be used to prevent operators from entering a value that exceeds the survivability limits of equipment or product being stored reducing the risk of property damage.



Enter the desired set point limits by touching the “Lower Limit” and “Upper Limit” entry fields and enter the desired values using the numeric keypad.

8.3 Defrost

The Defrost screen allows the user to edit the settings associated with defrost operation.



The defrost **Interval** field is used to set the time between each defrost. Time is entered in hours from 1-120. The defrost **Length** field is used to set the maximum duration of the thaw cycle. Time is entered in minutes from 0-255. If '0' is entered for the defrost length, defrost will not operate. The defrost length must be set from 1-255 minutes in order to activate defrost. Setting the field to zero allows the user to disable defrost operation for testing purposes or to prevent it from operating if its use is not required.

The **Drip Time** field is used to enter the delay between the end of defrost and when normal temperature regulation is resumed. This delay is typically used to allow time for water to drain from the evaporator that was formed during defrost. Time is entered in minutes from 0-120.

The **Start Delay** field is used in conjunction with the **Defrost on Start** selection. If defrost on start is set to "on", the first defrost cycle will begin on power up of the system. The start delay time can then be used to delay the first defrost on startup from 0-99 minutes if necessary to avoid overloading the facilities, power grid if multiple units are started at the same time, i.e., due to momentary power outages.

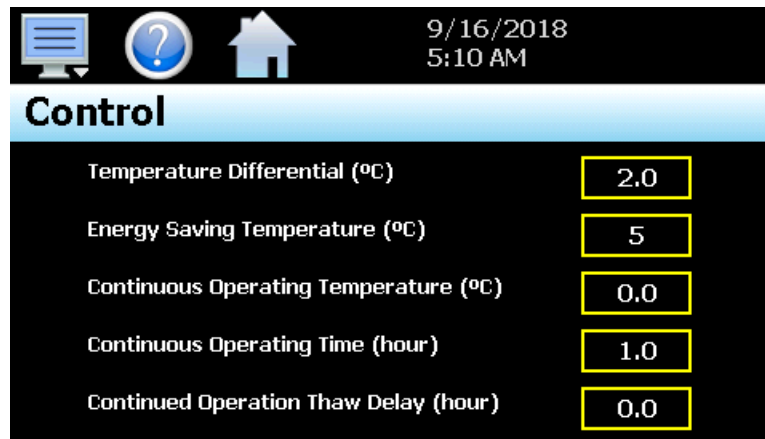
The **Terminate** field is used to set the temperature at which defrost should be terminated regardless of the defrost length setting. This field is only shown if the Dixell control is configured to use a probe for defrost termination. If no probe is selected, this field will be hidden and defrost will operate on the entered time basis only.

When a probe is configured for use, defrost will be terminated upon the selected probe reaching the terminate temperature. If the temperature is not reached within the allowed length entry for defrost, defrost will terminate. When a probe is selected for use, the defrost length entry is used as a maximum time period for defrost so that normal temperature regulation can resume.

NOTE: If a probe is selected for defrost termination and the measured temperature is above the termination set point, defrost will not activate.

8.4 Control

The Control settings screen allows the user to configure options related to temperature regulation.



The **Temperature Differential** field is used to set the compressor on/off hysteresis. This value is added to the control set point to define the temperature at which the compressor will turn back on. For example, with a differential of 2 degrees and a set point of 0, the compressor will turn off once the temperature reaches 0 and turn back on when the temperature rises to 2 degrees.

The **Energy Saving Temperature** field is provided when the on/off key parameter setting in the Dixell control (parameter onF) is set to "ES" to enable the energy savings key function. This field allows the user to enter a set point offset of -30 to 30 for the control set point. When the energy saving function is enabled, this value is added to the control set point.

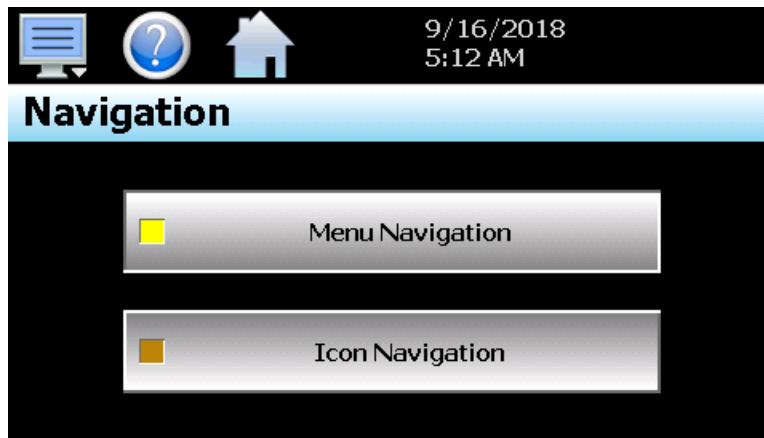
The **Continuous Operating Temperature** field is used to set the temperature that the Dixell control is to maintain when the continuous cycle is activated.

The **Continuous Operating Time** field sets maximum length that the continuous cycle remains in operation once activated. The entry is made in hours with a range from 0.0 to 24.0 in decimal increments of 10 minutes. For example, an entry of 1-1/2 hours would be made as 1.3 (1 hour, 30 minutes).

The **Continued Operation Thaw Delay** sets the time from when the continuous cycle is turned off to the point at which defrost is activated. During continuous cycle operation, defrost is prevented from occurring, so upon completion of the continuous cycle (stopped manually or based on the allowed operating time) defrost is automatically activated. This entry allows the user to delay the defrost cycle from 0.0 to 24.0 in decimal increments of 10 minutes. For example, an entry of 1-1/2 hours would be made as 1.3 (1 hour, 30 minutes).

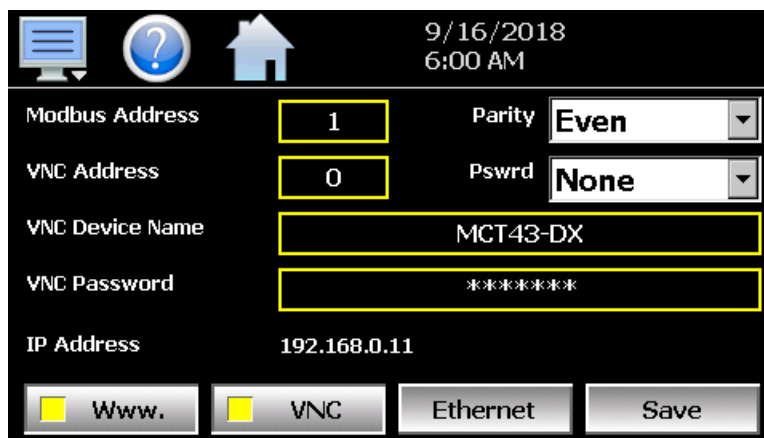
8.5 Navigation

The DX provides both text-based PC style menus and icon based/slide page navigation menus similar to today's "smart" devices. The user can select either type at any time from the Navigation screen. Press the button for the desired menu type to make the selection. The choices are mutually exclusive, so when one selection is made, the other will be de-selected. The button indicator for the active selection will illuminate to show the current selection.



8.6 Communication Settings

The “Comms” screen provides settings for the Modbus serial and TCP interfaces as well as the web server and VNC interfaces. It also provides the DX IP address, which is required for using the Modbus TCP, VNC and web server interfaces. For more information regarding the use of the DX data communications interfaces, see Section 10, Communications.



The **Modbus Address and Parity** settings are used to configure the serial interface for user communications. Valid addresses are 1 to 247. The parity setting allows the serial port to be set for Even, Odd or no parity (None). The Modbus Address is also used to specify the unit ID for Modbus TCP communications. Modbus TCP communications is provided over the Ethernet interface on port 502.

The **VNC Address and Password** set access rights to the DX VNC server. Valid addresses are from 0 to 255. The VNC password selection defines the connection mode for the server. The selections are “None” and “VncAuth” which requires users to enter the password when connecting to the DX over the VNC interface.

IMPORTANT: *When multiple DX controllers are connected to a single router (DHCP server), it is imperative that each DX have a different VNC address. If multiple DX controllers have the same VNC address, network errors may result causing the VNC server to shut down or cause the DX to “lock-up” and become non-responsive requiring the unit to be power cycled in order to return to normal operation.*

The **VNC Device Name** field is used to enter a name (up to 35 characters) that can better identify the DX to users logged into the VNC interface. The name entered here will be used on the VNC header window on a PC, so that if multiple VNC clients are open to different systems, each one can be identified.

The **VNC Password** field is used to enter the password (up to 20 characters) that a user must enter for the VNC interface to connect to the DX if the VNC password is enabled.

The **IP Address** field is a static field that provides the IP address of the DX which is required for connecting over the VNC, web and Modbus TCP server interfaces. See the following section 9.6.1 Ethernet Settings for more information on how to adjust the device IP and other LAN information.

The **Www.** (web server) pushbutton is used to enable or disable the web server interface.

The **VNC** server pushbutton is used to enable or disable the VNC server interface.

The **Ethernet** button is used to access the Ethernet settings screen.

NOTE: Any changes made to the above settings must be saved in order for them to take effect. When changes are completed, press the “Save” button. In order for any changes to the VNC server to take effect, power must also be cycled to the DX. The new VNC settings will only take effect when DX first boots up. Serial communication and web server settings take effect immediately upon save.

8.6.1 Ethernet Settings

The “Ethernet” screen provides settings for the network interface of the DX. It is accessed by pressing the Ethernet button on the Communications screen.

Press the Cancel or Save button to exit screen.

Ethernet		Cancel	Save
DHCP	<input checked="" type="checkbox"/> ON <input type="checkbox"/>	MAC: 00 0A D5 01 60 38	
IP Address	192.168.0.30		
Subnet Mask	255.255.255.0		
Default Gateway	192.168.0.1		
DNS Servers	192.168.0.1	205.171.2.26	

The **MAC** address field displays the media access control address (physical address) of the DX. This is a unique identifier for the network hardware of the DX and cannot be changed. It is for informational purposes and may be required by your network administrator when connecting the DX to your network.

The **DHCP** button is used to turn automatic addressing on and off. By default, the DX is shipped with the DHCP setting on. This means the DX will be assigned an IP address by the network router. When on, the entry fields will be disabled, but will display current connection information used by the DX. In order to enter a static address, press the button to turn it off.

To set the static network address, enter a valid **IP Address**, **Subnet Mask** and **Default Gateway**. The **DNS Servers** are not required, but typically the IP address of the network router is entered to provide one. Consult your network administrator for the proper values. The IP address must not be a duplicate of any other address on the network or the interface will not operate correctly. The entry fields except IPV4 addressing format only. The DX does not except IPV6 addressing.

NOTE: When DHCP is on and the DX is disconnected from the network, the entry fields on the Ethernet screen will continue to display connection information based on its last valid connection for diagnostic purposes. The IP address on the main Communications screen (or shown in the notifications list) always displays the current address used by the DX. If the IP address on the Communications screen displays the loop-back address of “127.0.0.1” then no connection is present.

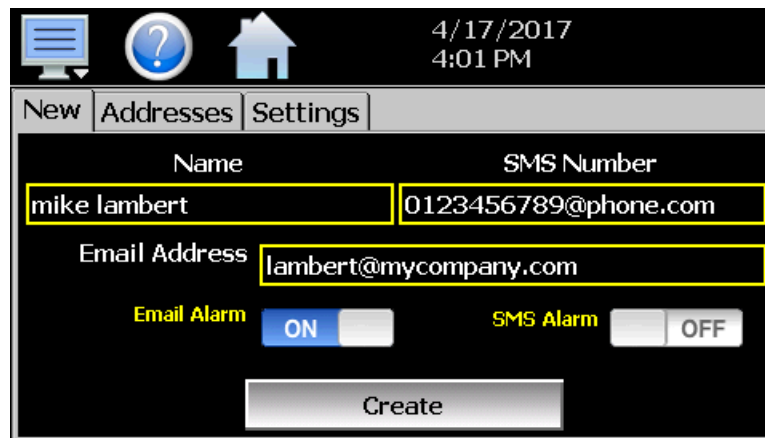
When DHCP is off, the IP address on the Communications screen will always display the user entered static IP address regardless of connection status. It does not indicate whether a valid network connection is present or not.

8.7 Email

The DX email server has the ability to send alarm messages to email and SMS addresses. Up to 30 addresses can be programmed into the system. Each one can be configured to receive emails, SMS text messages or both. When an alarm occurs, DX will send an alert to the specified address for each user in the list. The email settings are accessed by selecting “Email” from the setup “Email” menu.

8.7.1 Email Address Entry

Select the “New” tab to add new email addresses to the system. For each entry, enter the recipient’s Name, Email Address and/or SMS Number (up to 50 characters each). Turn on the Email Alarm and/or SMS Alarm options to specify which addresses the alarm messages are to be sent to. Press the “Create” button to add the user to the list.

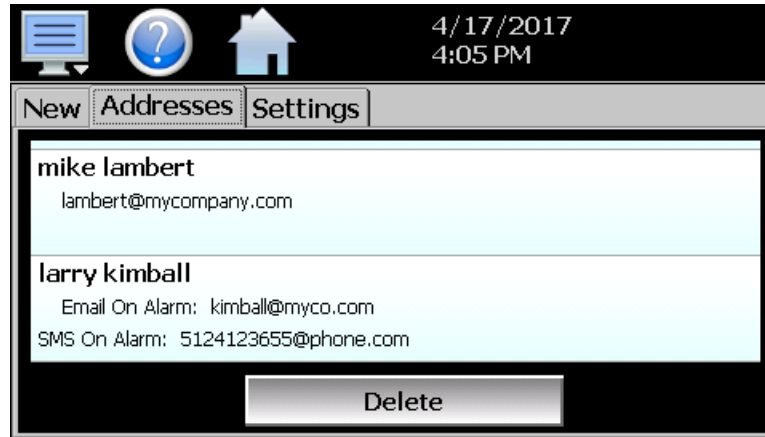


The screenshot shows a mobile application interface for adding a new email address. At the top, there are navigation icons (list, help, home) and the date/time (4/17/2017, 4:01 PM). Below the navigation is a tab bar with 'New', 'Addresses', and 'Settings'. The 'New' tab is active. The form contains three input fields: 'Name' with 'mike lambert', 'SMS Number' with '0123456789@phone.com', and 'Email Address' with 'lambert@mycompany.com'. Below the fields are two toggle switches: 'Email Alarm' (set to ON) and 'SMS Alarm' (set to OFF). A 'Create' button is located at the bottom of the form.

NOTE: The SMS address is specific to the service provider. Each service provider has their own unique address; however, the phone number is always the “name” for the address entry. There are internet sites with this information that cover most of the providers, or when in doubt, contact your service provider for the proper address format.

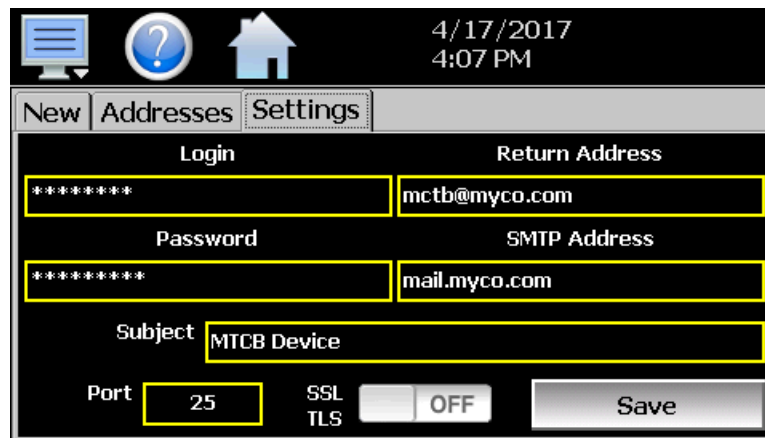
8.7.2 Email Addresses

Selecting the “Addresses” tab allows the user to view the list of email addresses entered in the DX. Each entry will be shown with the notification method and address associated with it (email/SMS). To delete a user, touch the name of the user in the list box and press the “Delete” button. This will permanently remove the user from the list.



8.7.3 Email Settings

The “Settings” tab provides access to the email server configuration, which is how the DX is able to connect and send email messages over its Ethernet connection. Each field may have up to 50 characters.



The **Login** field is used to enter the login name required by the DX to log in to your company’s mail server. You can use your login if one is not set up specifically for the DX on your network. Contact your network administrator for assistance.

The **Return Address** is the address given for the DX on your company’s mail server. The DX does not accept email messages; however, this field is required for proper email delivery for security/anti-spam purposes. If using your personal login name, you can also use your personal email address if one is not set up specifically for the DX on your network. Contact your network administrator for assistance.

The **Password** field is used for entering a password, if required by your network server, to send email. Contact your system administrator for assistance.

This **SMTP Address** field is for entering the address of the email server used for sending emails. This must be a valid mail server for which the above settings allow DX access. Contact your system administrator for assistance.

This **Subject** field is used to enter a subject line for emails and/or SMS text messages. It can be used to provide an identifier to the recipients of the alarm message to know which chamber it is coming from.

NOTE: *It is recommended to put some form of entry in this field. It can be left blank; however, many firewalls and spam filters will filter out messages without subject lines. That may prevent recipients from receiving the email. It can also be useful for identifying a particular unit on the factory floor.*

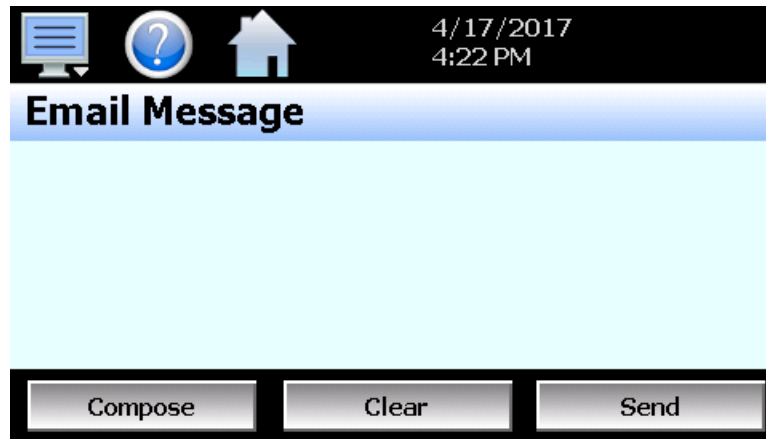
The **Port** field is used to set the port number that will be used on the device for email operations. For non-secure connections (no SSL/TLS) port 25 is the default. If SSL/TLS is used, port 587 is usually the standard port selected.

The **SSL/TLS** button is used to enable or disable **Secure Socket Layer (SSL)** and **Transport Security Layer (TLS)** functionality. These protocols are used to provide an authenticated connection between servers and clients as well as encrypt information between the two. This provides a more secure environment for email information with many public email services only allowing SSL/TLS connectivity.

Once all settings have been made, be sure to press the “Save” button to begin using the new values and store them, so that on the next power up, the settings will be retained. The body of the email/SMS text message will contain the description of the alarm condition as it would appear on the alarm screen. If the mail server is down, or the DX is not connected to the network, the message will not be sent and a local alarm message on the Alarm screen will indicate a transmission failure.

8.7.4 Email Message

The DX provides the user with the ability to send short email messages to users configured in the DX email server. To send a message, select “Message” from the device settings, Email menu.

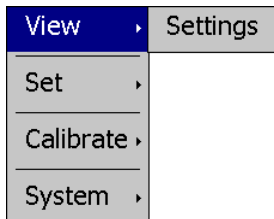


Press the “Compose” button to create a brief message using the keypad (up to 100 characters). When you are finished entering the message, press the “Done” button. The completed message will then be shown in the message window. Press the “Send” button to select the email recipients you wish to receive the message and send the message.

9 Offline

The Offline settings do not include the OEM setup of the DX. Refer to the documentation provided by your OEM regarding the DX configuration. Note that prior to entering offline setup, automated ramp/soak program operation and data logging must be manually stopped.

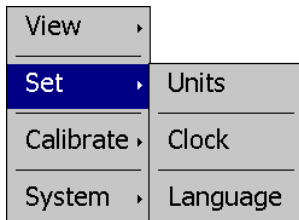
The offline menu provides navigation to the following functions:



View menu

Settings:

Navigation back to the device settings menu.



Set menu

Units:

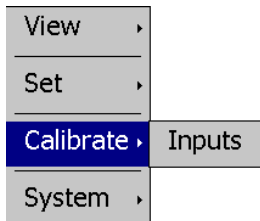
Setting for temperature units.

Clock:

Settings for system date and time

Language:

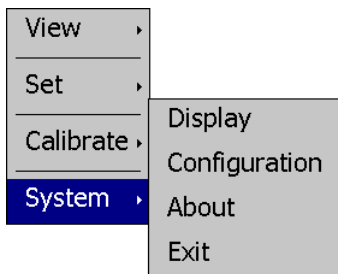
Settings for menu and help language text.



Calibrate menu

Offset:

Settings for probe offset calibration.



System menu

Display:

Access to display calibration and backlight settings.

Configuration:

Access to DX import/export utility.

About:

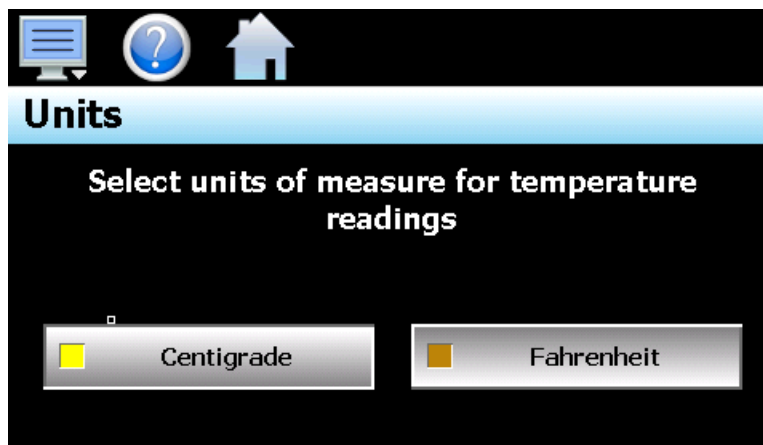
View current firmware/software version numbers.

Exit:

Exit application and access to the DX configurator.

9.1 Degrees C/F Units Selection

The DX can provide access to the Dixell control's temperature units setting to display values in either degrees Centigrade or Fahrenheit. To change the temperature units, select "Units" from the offline Set menu.



Press the button for the desired temperature units to make the selection. The choices are mutually exclusive so when one selection is made, the other will be de-selected.

IMPORTANT: *The Dixell control is not capable of converting temperature settings between degrees C and F. When the temperature unit selection is changed, the DX will first make a temporary copy of all temperature related parameters in the current temperature units. The Dixell control will then be set to the "OFF" mode. The temperature units will be changed and then the DX will convert all temperature parameters to the new selection and write them back to the Dixell control. Once complete, the Dixell control will then be set back to the "ON" mode. The entire process will take approximately 10 seconds to complete.*

Repetitive temperature conversion can cause a slight error in settings due to the one decimal resolution of units in °C compared to the no decimal resolution in °F. For example, a setting of 2.0°C converts to 36°F (35.6 rounded up) and when converted back to °C results in a value of 2.2°C. The temperature conversion process includes the following parameters:

- Regulation Setpoint (SEt)
- Compressor On/Off Differential (Hy)
- Minimum Setpoint (LS)
- Maximum Setpoint (US)
- Probe 1 Calibration Offset (Ot)
- Probe 2 Calibration Offset (oE)
- Probe 3 Calibration Offset (o3)
- Probe 4 Calibration Offset (o4)
- Setpoint for Continuous Cycle (CCS)
- Defrost Termination Temperature (dtE)
- Differential for Forced Fan Activation (FCt)
- Fan Stop Temperature (FSt)
- Maximum Temperature Alarm (ALU)
- Minimum Temperature Alarm (ALL)
- Differential for Temperature Alarm (AFH)
- Condenser Low Temperature Alarm (AL2)
- Condenser High Temperature Alarm (AU2)
- Differential for Condenser Alarm (AH2)
- Differential for Energy Savings (HES)
- Setpoint for Auxiliary Relay (SAA)
- Differential for Auxiliary Relay (Shy)

9.2 Clock Settings

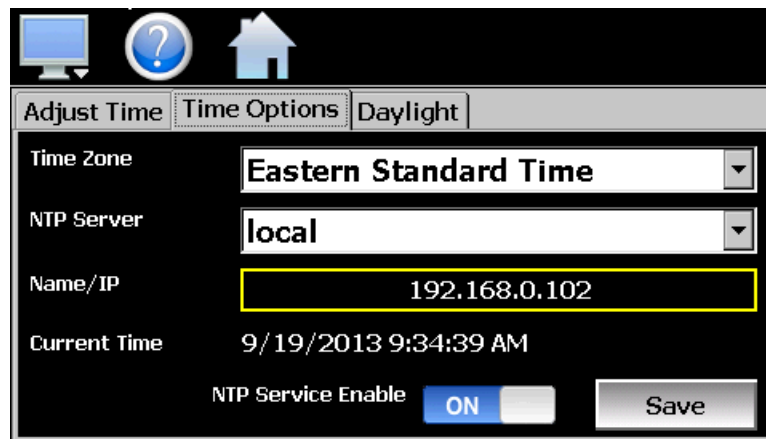
The system date and time is adjusted from the “Adjust Time” tab under the Set/Clock menu. The current date and time will be displayed in the thumb wheels as shown below.



To adjust, scroll each time wheel to adjust the month, day, year, hour, minutes, seconds and AM/PM selection. Once all adjustments have been made, press the “Save” button to set the system clock to the date and time entered.

9.2.1 Time Options

Select the “Time Options” tab to configure the time zone and national time server clock settings. If the DX is connected to the internet, these settings can be used to have the DX automatically synchronize its time with one of the nationally provided time servers.



To enable the national time server, select your time zone and which time server you wish to use from the drop-down menu selections. Turn on the “NTP Service Enable” option and press the “Save” button. The DX will then synchronize its time with the selected national time server at 2:00AM each day.

If the DX is not connected to the internet, a local alarm message will be shown on the alarm screen; “*NTP Failure. Check cable and server*” to indicate that the time server could not be located.

9.2.1.1 Local Time Server Settings

If an active internet connection is not available, or company policy prohibits internet access, the DX can be configured to use a local time server instead of one of the national time servers. To configure the use of a local time server, select "local" from the NTP server list. When selected, the "Name/IP" entry field will be shown. The computer name or IP address of the computer running the local timer server on the LAN can then be entered. The DX will then contact the local computer in order to synchronize time.

NOTE: The steps required to configure and provide NTP service from a computer on the LAN is outside the scope of this manual. Contact your network administrator for assistance.

9.2.2 **Daylight Savings**

Select the "Daylight" tab to configure daylight saving time options. The daylight savings time options allow the user to set the start date and end date for daylight savings time.

NOTE: If the NTS time server setting is enabled, and the selected time zone uses daylight savings time, daylight savings must be properly configured and enabled or the clock will not show the correct time.



If your locale utilizes daylight savings time, set the start and stop dates for daylight savings and turn on the "Daylight Savings Enable" option. Press the "Save" button to store the settings. DX will then automatically update its clock for daylight savings time.

9.3 Language

The Language screen is used to select the language for all of the online help, menus and most static display fields. Note that the keypad will remain in English, so all user text entry will still be in the English language.



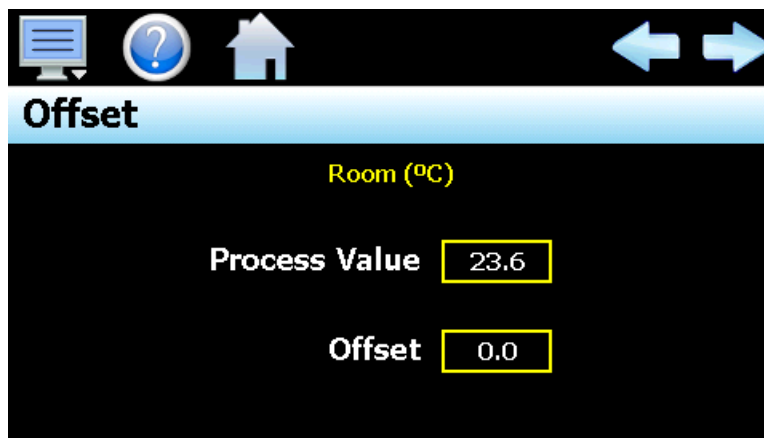
Available language selections include:

- ✓ Chinese Simplified
- ✓ Chinese Traditional
- ✓ English
- ✓ French
- ✓ German
- ✓ Italian
- ✓ Japanese
- ✓ Korean
- ✓ Portuguese
- ✓ Russian
- ✓ Spanish

DISCLAIMER: English is the default language for the DX control system. All other language selections provided through translation from the English language. FDC does not guarantee the accuracy or validity of alternative language selections and shall not be liable for any damages or losses, whether direct, indirect, incidental, special, consequential or any other damages for misinterpretation of other languages. FDC offers a free, PC based application which allows the end user or OEM to create the translation files for the desired language selection. The translation files can then be copied to the DX control system in order to provide a more accurate or desired translation.

9.4 Calibration

The offset calibration allows the user to apply an offset to each configured probe of the Dixell control.

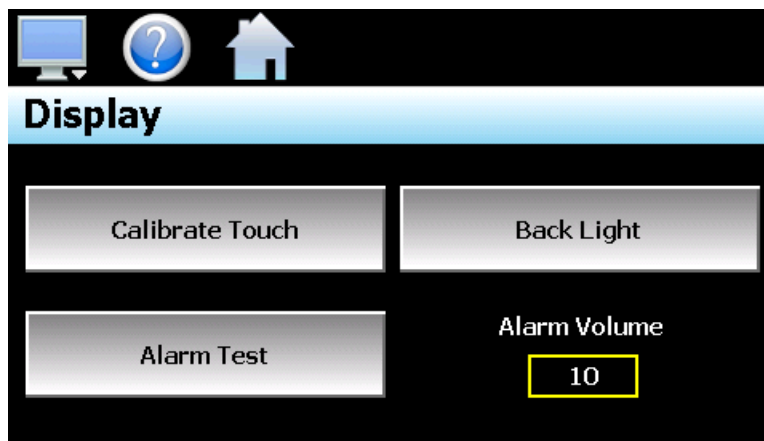


The **left** and **right arrow buttons** allow the user to cycle through each probe. If only the main control probe is installed or the other probes are not configured for indication, the left and right arrow buttons will not be shown.

The Process Value field displays the current measured value of the selected probe. To adjust the probe offset, touch the offset field and enter in the desired probe offset via the numeric keypad.

9.5 Display Settings

The Display screen provides access to the touch screen calibration utility, back light settings and alarm volume adjustment.



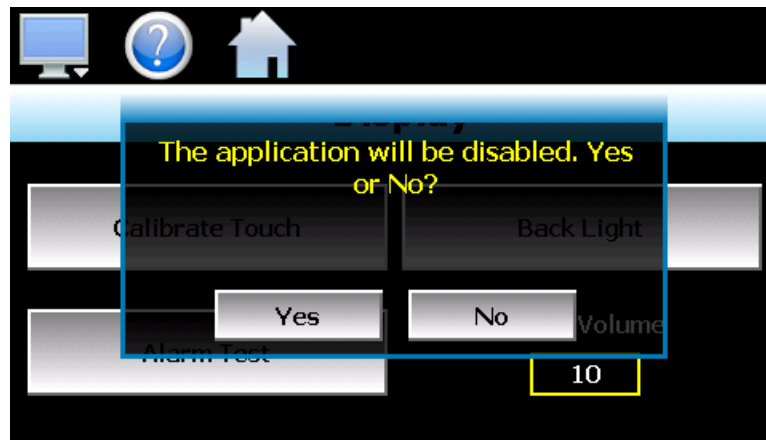
The **Alarm Volume** adjusts how loud the internal alarm buzzer of the DX will be when activated under an alarm condition. The volume can be set from 0 (off) to 100. To edit the alarm volume, touch the entry field and enter the desired volume level. To test the buzzer, press the “Alarm Test” button.

9.5.1 Calibrate Touch

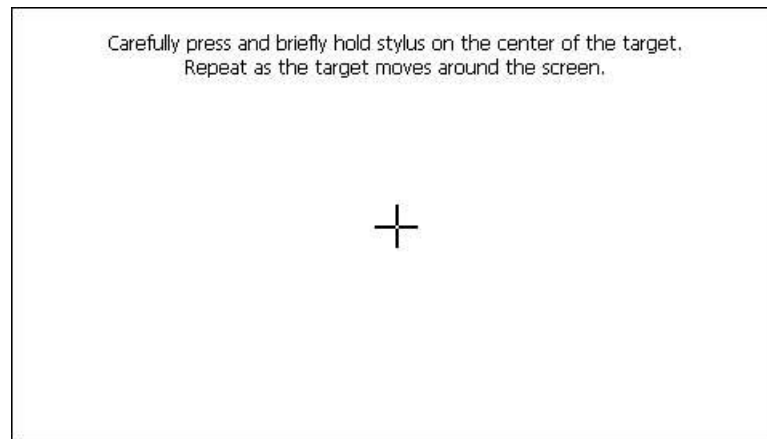
After extended use and many hours of operation, it may be necessary to recalibrate the touch screen of the DX. A typical sign that the screen may be out of adjustment, is inaccurate responses when attempting to

press buttons, check boxes or adjust fields on the display. The calibration utility is provided in order to re-adjust the screen when this happens.

To begin the calibration process, press the “Calibrate Touch” button. An alert message will appear stating that the application will be disabled to perform the calibration procedure. Press “Yes” to continue.



The calibration utility will start and crosshairs will appear on the screen. At each crosshair position, touch the screen at the center of the crosshairs. Repeat this for each position in order to set the calibration. The calibration requires five points, the center and four corners.



Once complete, the calibration utility will provide a notification message that the new calibration settings have been measured and to touch the screen to register the new calibration data; just touch anywhere on the screen to close the window and return to the DX application to resume normal operation.

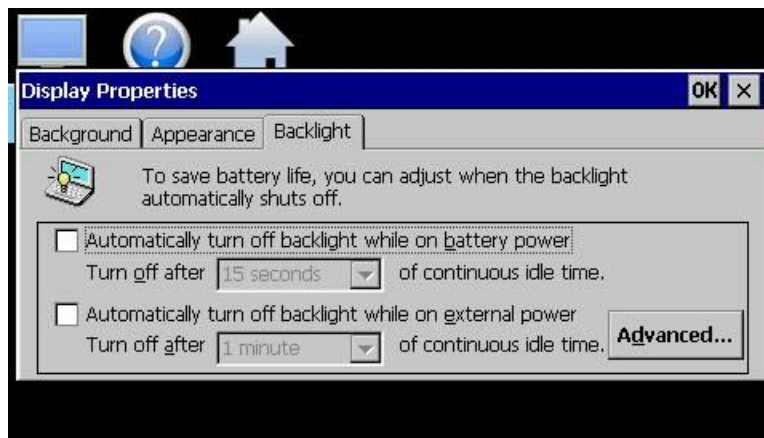


9.5.2 Backlight Settings

The backlight settings allow the user to adjust the screen brightness as well as set a time period for dimming the backlight after a period of inactivity which can extend the life of the display. To adjust the backlight settings, press the “Back Light” button. An alert message will appear stating that the application will be disabled to enter the backlight settings, press “Yes” to continue.

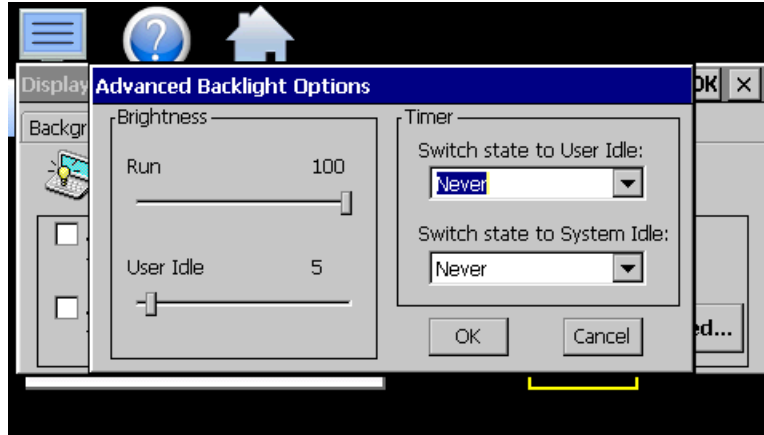
Select the “Backlight” tab from on the Display Properties window. Press the “Advanced...” button to access the settings for the backlight.

NOTE: *The checkboxes on the Backlight tab for “Automatically turn off backlight while on battery power” and “Automatically turn off backlight while on external power” have no effect on backlight operation and should be left unchecked.*



The brightness of the display during operation is set by adjusting the “Run” slider. The default setting is 100. The “User Idle” slider is used to adjust the brightness of the display during periods of inactivity. The default setting is 5. Use caution when adjusting the “Run” slider. It is possible to set the brightness to zero (0), in which case the screen will go black and you will be no longer able to see the settings. Should this occur, it is possible to tap the screen in the general area of the run slider. If you tap the screen in the proper position of the slider, it can set the slider to make the screen visible again. It is recommended that the slider not be adjusted below 20.

When adjusting the “User Idle” slider, the screen will temporarily adjust to the setting of the slider as you move it. If you choose a value of zero (0), the screen will go black. However, once you lift your finger, the screen will return to the “run” brightness level after a couple seconds.



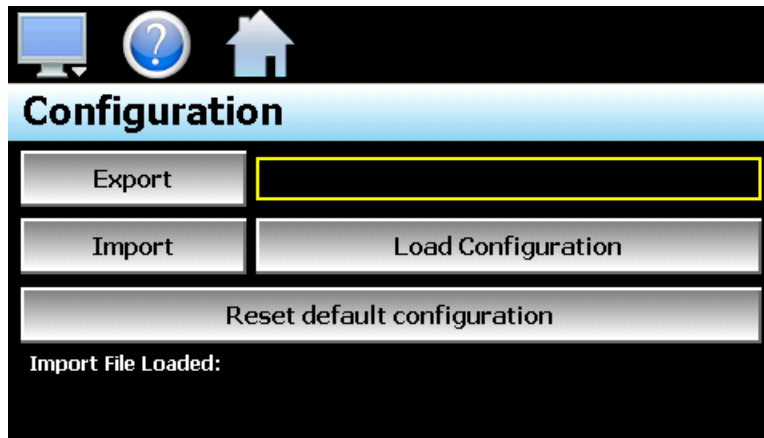
To enable the backlight dimming function, use the “Switch state to User Idle” drop-down menu and select a time period for no activity at which the screen should dim. The delay time can be set at fixed intervals from 1 minute up to 30 minutes. To disable the dimming feature, select “Never”.

Once all settings are complete, press the “OK” button and then press the “OK” button at the top right of the “Display Properties” window to return to the DX application and begin normal operation.

9.6 Configuration

The Configuration utility allows the user to back up the entire configuration of the DX and save it to a file for “safe keeping” in case of system damage due to a lightning strike, etc. The utility also allows the DX to be configured with a push of a button by selecting from a list of preconfigured setups that could be created and saved on a USB memory device for loading a configuration to a new DX system.

IMPORTANT: *Do not import configuration files that are not intended for use with the current hardware configuration of the DX as unexpected operation may result.*



When the **Export** button is pressed, the DX configuration data will be written to the USB memory device. The export file function will use the name entered in the text field to the right of the export button and create a directory on the memory stick with that name, to contain the configuration data. The filename can be entered with up to 10 characters which permits multiple configurations to be identified and saved for later retrieval.

The export file will be saved with a name format of “DX_filename_mm_dd_yy_hh_mm_ss” to identify the configuration according to the date and time it was created. This prevents multiple configuration files with the

same name from overwriting previous files. It also allows the user to identify a backup of the DX so that it could be reconfigured to a previous date if multiple back-ups are created.

The **Import** button is used to write the configuration data to the DX from the currently loaded file. To load a configuration file, the USB memory device must first be inserted into the USB port. When the **Load Configuration** button is pressed, a list of available configuration files from the memory stick will be shown. Select the desired file from the list and press “Open” to load the file. Once the file is loaded, the import process can begin. Pressing the “Import” button will begin the process. When the import is complete, you must cycle power to the DX in order for the new configuration data to be loaded into runtime memory for proper operation.

The **Reset default configuration** button can be used to clear the current DX configuration and reset the system back to default values. This function clears all user and/or OEM configuration values and returns the system to an “as new” factory state allowing the system to be configured from scratch. This function is provided as a means to start over in the event that the system configuration has been altered to an unknown state and is not operating properly, and a known good configuration is not available to import.

Rather than go through every setting of every feature to try and determine where the configuration error exists, this allows the system to be cleared so that it can be reconfigured from a clean slate.

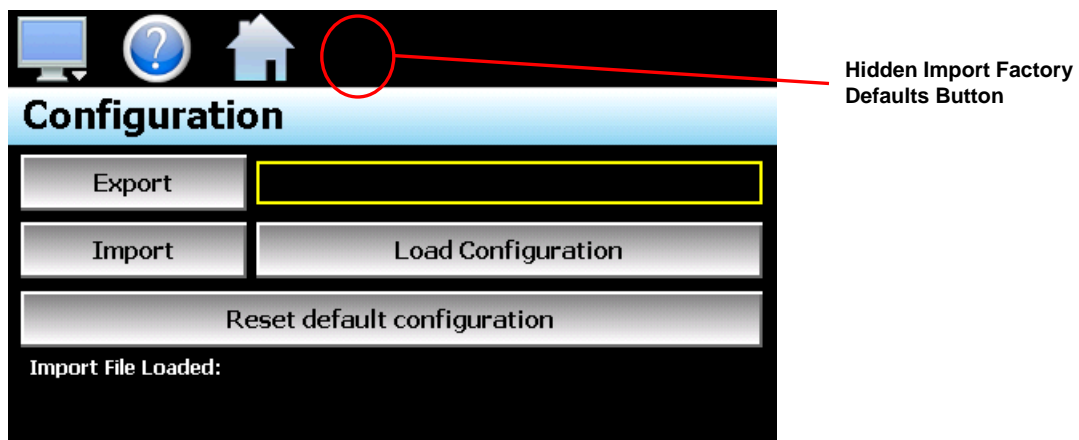
NOTE: *The configuration functions do not affect the VNC server configuration. The enable state, VNC address, device name and password fields must be manually changed as these settings are specific to each device and must be set independently for proper VNC server operation over a network.*

The network settings, i.e., DHCP/ Static IP address settings and control loop set points are also not saved to the configuration file. These settings must be done manually.

9.6.1 Importing an OEM Default Configuration

The “Reset default configuration” button loads a predefined configuration stored in memory on the DX. The factory configuration is “blank” meaning it will reset all user and/or OEM configuration settings which will require the user to reconfigure the entire device for the intended application. The factory configuration does not include any user parameter settings for the Dixell control, so it will be unaffected by the reset.

For OEM manufacturers, the DX provides a means of importing a default factory configuration. If an end user happens to make configuration changes that affect operation, or to insure the system is configured properly to OEM specifications while providing customer support, the OEM configuration can be stored in the DX and will be installed when the “Reset default configuration” button is pressed.



To import a factory default configuration, insert the USB memory device containing the desired configuration file. Next to the “Home” icon is a hidden button. Tap the location repeatedly 10 times within a period of 4 seconds. A dialog will be shown prompting to copy a configuration as factory defaults. When “Yes” is selected, the open file screen will be shown. Select the desired configuration file and press the “Open” button to import the file as factory defaults.

NOTE: *This does not affect the current configuration of the unit. This only imports a configuration file as the factory defaults file.*

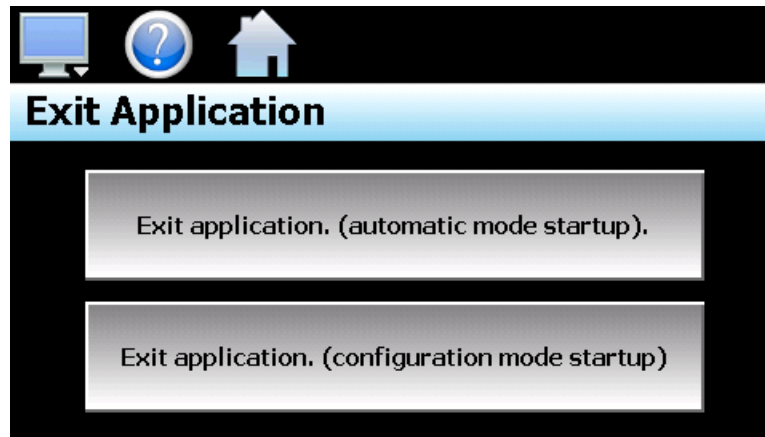
9.7 About MCT-DX

The “About” screen provides operating system version numbers for the currently installed firmware and software of both the DX and connected Dixell control. This information should be recorded prior to any service request so that proper assistance can be provided for your control model.



9.8 Exit Application

The “Exit” Application screen allows the user to quit the DX runtime software and return to the CE.Net operating system. This operation is NOT recommended with the exception of users who are in charge of system configuration due to the danger of editing or removing files by accident.



The **automatic mode startup** option will return the DX to normal operation on the next power up.

The **configuration mode startup** option will start the DX Configurator program on the next power up so that the user can access control loop and DX configuration settings.

10 Communications

This section provides instructions on how to use the DX communication interfaces. As a standard, the DX is equipped with both an Ethernet interface and an RS232 serial interface for user communications.

10.1 Ethernet Communications

The DX provides several options for remote control and monitoring over the Ethernet communications interface. The web server interface provides a monitor only connection, while the VNC server and Modbus TCP interfaces allow a user to manipulate and control the DX remotely. The VNC interface allows the user to view and observe operation of the DX display directly on their PC screen while the Modbus TCP interface allows the user to manipulate DX operation via other devices and/or software capable of Modbus TCP communications.

NOTE: *In order to use Ethernet communications, the DX must be properly connected to a network. To connect the DX to a network, connect the touch screen's Ethernet port to your network using a standard CAT5 cable connection. Note that after connecting the network cable, it may be necessary to cycle power to the DX in order for it to obtain a valid IP address.*

10.1.1 Guide to Smart Networking Practices

The expansion of Ethernet onto the industrial floor has brought forth a new realm of possibilities from the gathering of information to the inherent control of equipment from anywhere around the world. The flexibility and convenience that this provides makes it a very desirable feature for new equipment. The DX provides this ability, but there are considerations that must be taken by the end user to protect their equipment and investment.

Just like placing a personal computer on the internet opens it up to outside attack, placing your DX on a network poses the same risk. The first thing to remember is this: The most likely cause of problems is not a hacker trying to sabotage your equipment, but more often to be related to the ubiquity of PCs with Ethernet cards, the ease with which your own co-workers can “hang stuff on the network”, and careless or nonexistent internal security measures. Accidental problems are more common than deliberate ones.

Allowing anyone access to the DX by placing it on the office LAN, also opens the door for accidental shutdown, damage to equipment, loss of data, lost time, etc. This is possible even by the most well-intentioned co-workers. Thus, there are several steps that should be taken to minimize this risk.

The first is to never mix your office LAN with your control LAN. The control LAN should be a separate network that consists of your DX controller(s) and possibly any other equipment that you may have that is related to the operation of the system. It should be separated from your office LAN by a firewall, or at minimum, a bridge or router. A control network and a business network have two entirely different purposes and their interaction should be closely controlled.

It is also unwise to assume that any Ethernet capable devices themselves have any security features at all. The DX VNC server only provides minimal single-password based security access. Separating the control LAN from the office LAN using a firewall would increase security and only allow control access that is based on a combination of IP source address, destination address, and port number. This is by no means completely “hacker-proof”, but it should keep the well-meaning co-workers out.

Another hazard is connecting consumer “plug and play” devices to your control LAN. A printer for example, might flood the network with traffic in a “broadcast storm” as it tries to self-configure or advertise its presence to all nodes on the network. Faulty devices, for example defective NIC cards, can transmit large amounts of bad packets (i.e., runts, which are abnormally short Ethernet frames) into your network. Using switches instead of hubs will limit the effect of such problems.

The most commonly overlooked source of problems is cabling. Not all cables are created equal. Electrical noise generated by factory equipment or other electrical equipment in the area, could easily corrupt transmitted data over the network and cause devices to “lock up” or shut down the VNC server, both of which then require the DX to be shut down and restarted to clear the problem.

Select the right cable for the environment. Shielded twisted pair (STP) cable is naturally more noise immune and is preferable to unshielded twisted pair or UTP in noisy situations. STP should have at least 40dB CMRR and less than 0.1pF capacitance unbalance per foot. Ground STP cable, making sure the ground is connected only at one end. CAT5 STP patch panels normally provide a grounding strip or bar. Hubs and switches don't provide grounding, use cables.

It's wise to be pessimistic about a cable's ability to reject noise from 230 VAC and 460 VAC power lines and electrically “noisy” equipment in the area. Capacitance imbalance in cables greater than 70pF per 100m can introduce harmonic distortion resulting in bit errors. The cost of cable is quite small compared to total equipment cost, so if you're looking to save money, this is not a place to do it. Choose a well-designed cable to minimize bit-error rate after installation, and that will give faster throughput with fewer glitches.

10.1.1.1 The DX and Network Security

When most people think of security, they think of anti-virus programs and continuous operating system updates to insure their system is running with the “latest-and-greatest” software. For consumer devices, this is well and good, but when it comes to industrial devices not so much. How many times has an update to the OS caused an issue with an existing program that for now some reason is not working correctly or crashes inexplicably. How about an anti-virus program updating its threat definitions and now sees an application as a potential threat and blocking it from operating? To have this occur on a control device could be catastrophic to a process. So how does the DX address these concerns while still providing threat protection?

The DX software validation uses a specific OS version and revision number as part of the validation process. WinCE is not the same as Win7, 10, etc. and does not support automatic updates since the OS must be installed in a specific portion of memory using a cable or SD with the device present. The OS layout is also specific to the hardware on the device. FDC has never had an update to the OS unless the hardware changed on our units which required a driver (mostly third party) for the new hardware. This also provides stability since this is an industrial device that provides specific functionality without most of the “overhead” of the OS's that full PC's run.

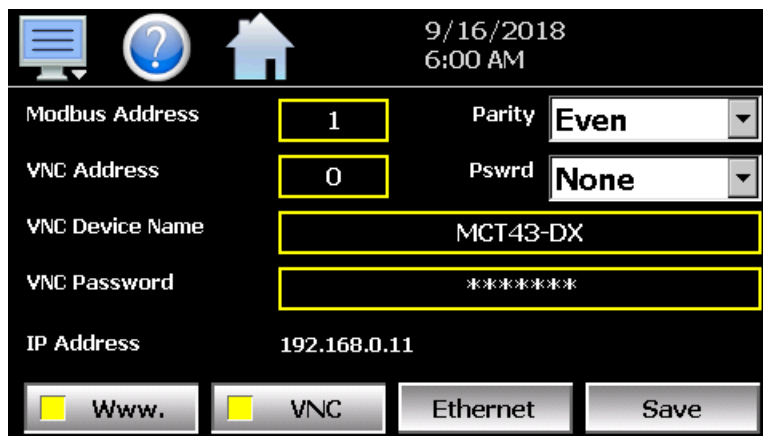
Most security issues arise from browsing or opening an email attachment that carries harmful code. The DX does not support the addition of anti-virus software: however, the DX does not have a browser or an email server to receive emails or attachments. The FTP, FileWeb and DataWeb interfaces are also client based only. They transmit files and data to remote servers, but do not receive.

The DX writes data to a web page in memory that can be accessed by an external browser. This is a read only web page (from the remote browser) that contains process values, set points, event and current program data only. The internal web page data is written over with real time data every 30 seconds. The DX does not read any data from its internal web page so any corruption of the web page would not affect DX display/control operations. There are no passwords or sensitive data sent from the remote browser to the “read only” web page.

A virus to attack Windows CE would be difficult, but not impossible. Every Windows CE device is different (by manufacturer), so not an easy standard to write the virus against. The virus would need to be built for Windows CE and the CPU that the DX runs, and the storage device doesn't have a standard name. There might be industrial devices that run anti-virus on their CE devices; however, FDC is not aware of any. As the saying goes, the best defense is a good offense. It is best to design a “smart network” to prevent intruders from gaining access in the first place than to try and fend them off once they are already in the door.

10.1.2 Using the Web Server

The DX web server allows a user to remotely monitor operations anywhere via a PC's standard web browser. When enabled, the web server provides a detailed status page of the current operating conditions. The web server can be enabled and disabled by pressing the web server (Www.) button on the communications screen (select "Comms" from the Device\Settings\Set menu).



Modbus Address	1	Parity	Even
VNC Address	0	Pswrd	None
VNC Device Name	MCT43-DX		
VNC Password	*****		
IP Address	192.168.0.11		

Www. VNC Ethernet Save

You must use the assigned IP address to access the DX. The IP address is shown on the communications screen and is also included in the notifications list. Write down the IP address so you will have it later to enter into your web browser.

NOTE: Contact your network administrator prior to enabling the web server of the DX. Company policy may prohibit the use of web servers for security reasons. Future Design Controls is not responsible for the use of, nor makes any claims as to the security of the web server interface over your network. The use of the web server is the responsibility of the end user.

To access and view the DX web page, enter the following link in your PC's browser address window: <http://IPaddress/DX.html>. Using the IP address from the sample screen, the entry would be: <http://192.168.0.11/DX.html>. The following example is typical of the DX web page appearance. The web page updates automatically every 30 seconds and provides information on each individual control loop, ramp/soak program status, alarm status and system event status.

Untitled Document

192.168.0.11/dx.html

FUTURE DESIGN CONTROLS - MCT-DX

BRIDGEVIEW, IL - 888-751-5444

TEMPERATURE DATA

Room	PV = 23.2C	SP = 0.0C
Evaporator	PV = 23.1C	-
Condenser	PV = 23.0C	-
Monitor	PV = 23.5C	-

CONTROL STATUS

Controller	On
Defrost	Off
Continuous Cycle	Off
Energy Saving	Off
Light	Off
Fan	On
Compressor	On

SYSTEM ALARMS

10.1.3 Using the VNC Server

The DX VNC server allows a user to remotely monitor and control DX by directly viewing and manipulating the touch screen over the network. You must use the assigned IP address and VNC port number to access DX. The IP address is shown on the communications screen and is also included in the notifications list. Write down the IP address and port number so you will have it to enter into your VNC viewer.

There are many VNC viewers available for both PC and tablet use. Due to the ever-changing market and availability of such applications, it is not possible to test them all for compatibility or aid with their use with the DX. It is the responsibility of the end user to test the chosen VNC client for compatibility with the DX prior to putting the unit into service. If the VNC client viewer has compatibility issues with the DX, it can cause the VNC server to stop responding and/or shut down requiring power to be cycled to the DX in order to reboot the system and restart the server.

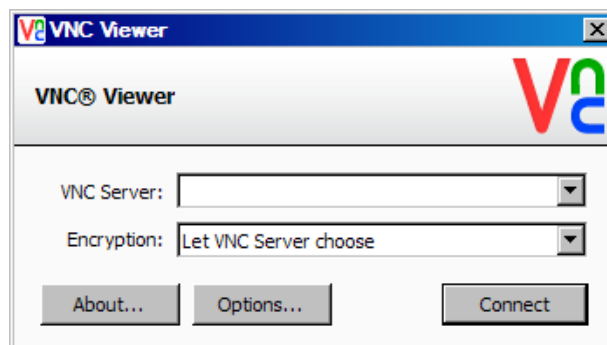
Future Design Controls has tested and recommends the use of RealVNC's viewer. It has been tested for compatibility with the DX and a free version can be obtained from <http://www.realvnc.com/> for PC/MAC use. RealVNC does offer a version for the iPad that can be obtained through the App Store for a small fee. The App Store also offers a free VNC client called Remotix for the iPad. It has also been tested for compatibility with the DX.

NOTE: Contact your network administrator prior to enabling the VNC server of the DX. Company policy may prohibit the use of VNC servers and/or viewers for security reasons. Future Design Controls is not responsible for the use of, nor makes any claims as to the security of the VNC server interface over your network. The use of the VNC server is the responsibility of the end user.

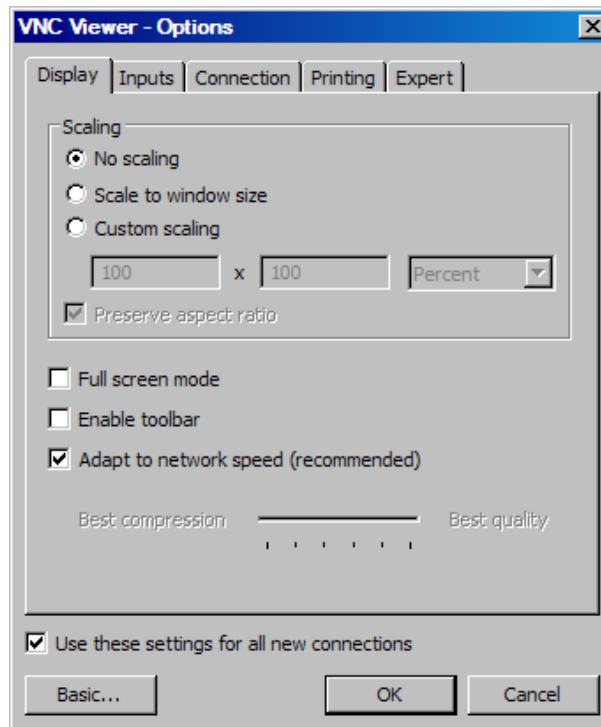
10.1.3.1 Recommended VNC Viewer Settings (PC/MAC)

This section applies to setup of the recommended RealVNC viewer for PC/MAC. These settings have been tested and evaluated in order to provide the best performance and quickest response to user input when using the VNC viewer with the DX. After installing the VNC viewer software, it is recommended that the following changes be made to the default viewer settings.

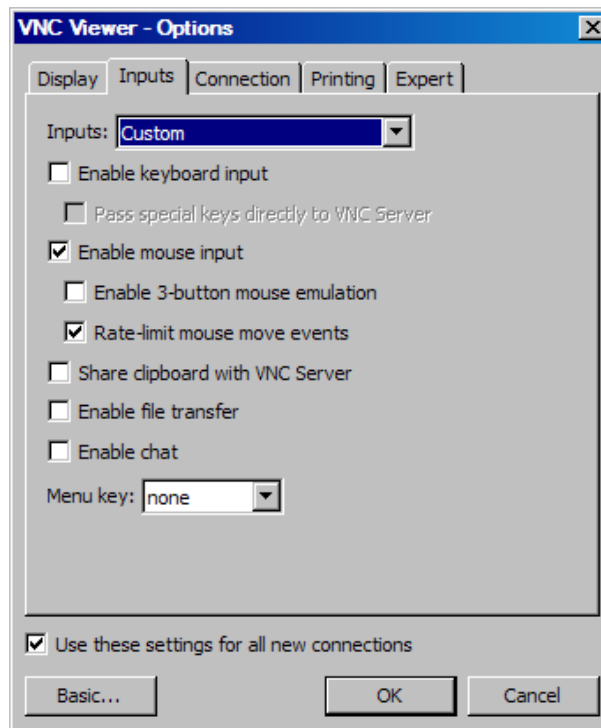
To begin, start the VNC viewer. Click on the "Options" button in order to open the VNC Viewer - Options window. Click on the "Advanced" button at the bottom left of the window in order to show the advanced setup options.



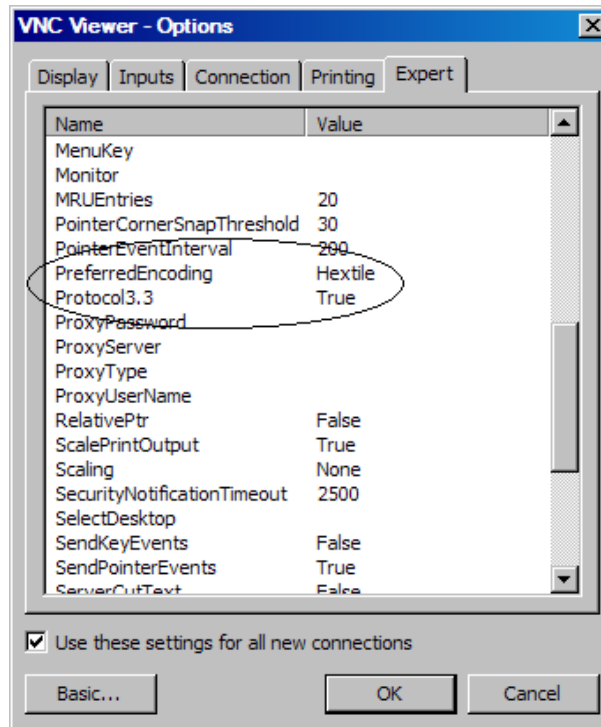
On the Display tab, make sure the scaling is set to “No scaling” and the checkbox for “Adapt to network speed (recommended)” is checked.



Next, select the Inputs tab and deselect all entries except for “Enable mouse input” and “Rate-limit mouse move events”. The “Inputs:” drop down selection box will automatically change to “Custom” when the settings are made.



Proceed to the Expert tab. Scroll down the list of settings until you find the “PreferredEncoding” and “Protocol3.3” options. Set the preferred encoding to Hextile and the Protocol 3.3 option to true. Verify that the “Use these settings for all new connections” checkbox at the bottom of the window is checked and click the OK button. This will set the selections to the default start settings for the VNC viewer.



10.1.3.2 Recommended VNC Viewer Settings for Tablets

The VNC clients for tablets have been found to offer limited flexibility for use with the DX. Most clients have default settings requiring security to be enabled on the server in order to connect. If you have trouble connecting with a VNC viewer through an iPad, iPhone or even an Android based phone, start by enabling the security on the DX VNC server and be sure to enter those settings in the client viewer.

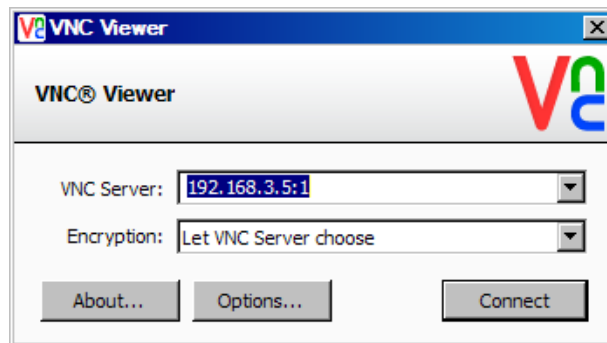
Color and encoding options can also affect the connectivity. If the client offers the option, leave color and encoding options to “automatically detect” or “server decides”. If the client is still unable to connect, try default encoding of Hextile and set the color option to limited colors such as 256-bit color. Future Design Controls does not write or create VNC clients (3rd party software), so final selection of client and testing is the end user responsibility. The following settings are provided as an example for the Remotix client for the iPad. When adding an DX server to the Remotix client, use the following settings. Note that the VNC server in the DX must have security enabled in order for this client to connect.

Connection Type: VNC
 Host/IP: IP address of DX
 Port: VNC address of DX (5900 = 0, 5901 = 1, etc...)
 Use SSH Tunnel: Off
 VNC Authentication: VNC Password
 VNC Password: VNC password of DX
 VNC Server Type: AutoDetect
 Operating System: Windows
 Preferred Encodings: Hextile
 Color Depth: 16 bits

10.1.3.3 Accessing the DX through a VNC Viewer

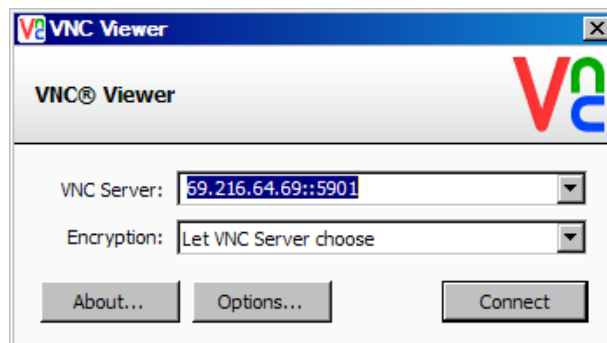
The following examples are based on the use of the RealVNC viewer for PC/MAC. Once the default settings have been entered, just enter the IP address and port number for the DX, and click the “Connect” button to access the DX over the network.

Intranet Example: If the IP address assigned is 192.168.3.5 and the configured VNC Address is 1, from the PC’s VNC Viewer address field, enter ‘192.168.3.5:1’ to access the device (address 1 relates to port 5901, address 2 to port 5902, etc., which is the port opened by the VNC server in order to allow communications with the DX over the network).



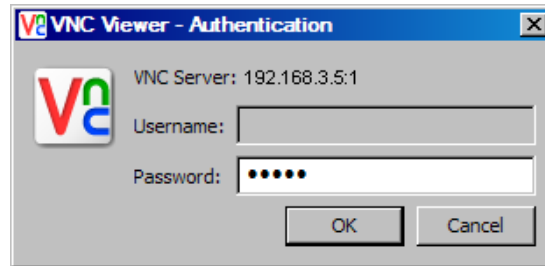
Internet Example: Internet connection usually requires a qualified network System Administrator. Typically, a permanent IP address and specific port address are assigned to the DX; support on this action is beyond the scope of this guide. *Consult your network system administrator for assistance in setting up an Internet connection.*

If the IP address of the LAN is 69.216.64.69 and the configured VNC Address is 1 (port 5901 has been opened and assigned to this specific DX controller), from the remote PC (outside of the site Servers LAN), in the VNC Viewer address field enter ‘69.216.64.69::5901’ to access the device (5901 relates to address 1, 5902 to address 2, 5903 to address 3, etc., note the double colon).

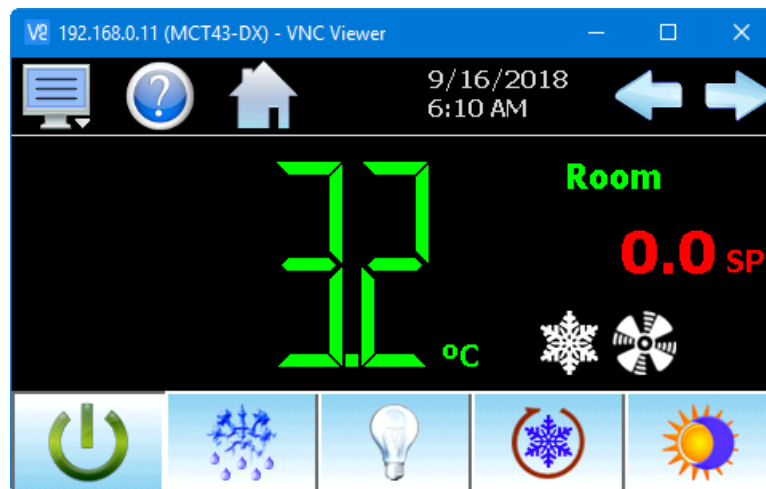


NOTE: The IP address shown on the communications screen of the DX is the local LAN address and would not typically be used for an Internet connection.

Security Example: If the VNC server password is enabled on the DX for either example above, upon pressing the “Connect” button to make the connection, the VNC viewer will prompt for the proper password. The connection will only be established once a valid password is entered.



Once the connection is established, the current DX display will be shown on your desktop. The image will be a duplicate of what is on the DX. As you manipulate the screen, the display of the DX will also be manipulated so that any local operator will be able to see what is happening and vice versa.



Multiple instances of the VNC viewer can be started on your PC. By running multiple viewers, you can have access to multiple DX controllers right from your desktop. The heading of each VNC viewer window will use the “VNC Device Name” entry for the header. By entering a unique name for each DX, you can identify each VNC connection and know which system you are accessing.

The VNC viewer is meant to be used for short term control access to the DX. It is not meant for long term monitoring of system operation. If long term monitoring access is desired, use the built-in web server of the DX or a PC with FDC software to monitor and control the DX over its serial communications port. The web server interface and PC software is designed for long term monitoring and status updates.

Due to the nature of VNC operation, and for security reasons, the VNC viewer connection should not be left open on your desktop. The viewer connection should be opened in order to perform the necessary control and/or status check of system operation, and then closed once the task is complete. Accidental manipulation of the control or erroneous network activity could cause connection problems over the VNC interface and result in the VNC server shutting down and requiring the DX to be restarted in order to regain access.

NOTE: Some viewers may also contain additional features for file transfer and other high-level functions. These functions are NOT compatible with the DX. Any attempt to use them may cause the DX VNC server to malfunction and require power to be cycled in order to reboot the system. All viewers should be used ONLY to monitor and manipulate the DX as if you were standing directly in front of the unit and touching the screen.

10.1.4 Using Modbus TCP/IP Communications

The DX Modbus TCP server interface allows a user to remotely monitor and control the DX via another device or software application compatible with Modbus TCP/IP protocol. The acronym TCP stands for Transmission Control Protocol while IP stands for Internet Protocol. These protocols are used together and handle the transfer of data over the internet. When Modbus information is sent using these protocols, the data is passed to the TCP layer where additional information is attached and then passed to the IP layer. The IP layer then places the data in a packet (or datagram) and transmits it.

Like the DX Modbus serial interface, the TCP interface is always active; however, rather than using the Modbus Address on the communications screen as the slave address, the DX IP address is used as the slave address. In order for Modbus TCP communications to function, the Master (or Client in Modbus TCP) establishes a connection with the Slave (or Server) using the IP address. In this case, the server is the DX. The DX waits for an incoming connection from the client, and once a connection is established, the DX then responds to queries from the client until the client closes the connection.

In order for a client to establish a connection with the DX, the following settings must be used by the client:

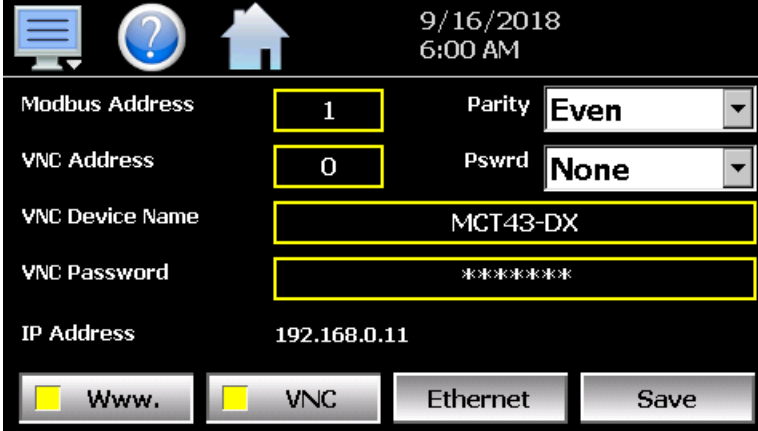
IP address (of slave) =	IP address as displayed on the Communications screen
Unit Identifier =	Modbus Address as displayed on the Communications screen.
Port Number =	502

NOTE: *The implementation and/or use of a Modbus TCP client is outside the scope of this manual. For additional information regarding Modbus TCP/IP protocol there are many resources available online (<http://www.modbus.org/specs.php>) or consult the documentation provided with your client software application.*

For a list of supported functions and data available over the Modbus TCP interface, see Appendix section A.1 Modbus Communications.

10.2 Serial Communications Option

The DX serial interface uses Modbus RTU protocol. Any device used to communicate with the DX over the serial interface must use this protocol.



Modbus Address	1	Parity	Even
VNC Address	0	Pswrd	None
VNC Device Name	MCT43-DX		
VNC Password	*****		
IP Address	192.168.0.11		

Buttons: Www. VNC Ethernet Save

The communication address and parity can be set on the communications settings screen. All other communication settings are fixed. The port settings of the device used to communicate with the DX must be set to match in order for the communications to take place.

Address: 1-247 (user selectable)
Baud Rate: 9600
Data Bits: 8
Stop Bits: 1
Parity: None, Odd, Even (user selectable)

When a multi-drop connection is used (multiple DX units on the same serial link), each controller on the link must have a different address so that each one can be identified separately. If two or more DX controllers have duplicate addresses, communications with those controllers will fail because they will each try to respond to the same message.

IMPORTANT: See appendix section A.1 Communications for details on using the serial interface.

11 Alarm Codes and Troubleshooting

This section provides explanations of standard DX alarms to help in diagnosing and resolving the alarm conditions. Note that the information provided here covers standard alarms only, and not alarms configured by the OEM. If you are unable to diagnose a problem through the use of this guide, contact your OEM for further assistance.



Some of the troubleshooting procedures may require access to live circuitry. Dangerous accidental contact with line voltage may be possible. Only qualified service personnel should be allowed to perform these procedures.

Alarm Monitor Description	Explanation/Corrective Action
"tagname" High Temperature	Indicates that the high alarm condition has been met for the alarm assigned to the probe indicated by "tagname". Check alarm set point and system for proper operation.
"tagname" Low Temperature	Indicates that the low alarm condition has been met for the alarm assigned to the probe indicated by "tagname". Check alarm set point and system for proper operation.
Fault Probe # ("tagname")	Indicates a probe failure for the probe # shown. Check the probe and its connection to the Dixell controller. Replace probe/correct wiring as necessary.
Fault EEPROM	Indicates a Dixell controller failure. Consult Dixell service/factory representative for return/repair.
Data file error. SD card full or missing.	Indicates that data logging could not be started or has been stopped due to an issue in accessing the SD memory card. This will occur if the memory card does not have any remaining memory space available or the maximum number of files has been reached in the data log directory. Use the USB file utilities or FTP to backup (copy) and delete data files from the DX in order to free up memory. Verify that an SD card is properly inserted into the DX display. Replace SD card.
Door Open	Indicates door open to storage room. Close door/check door switch/wiring. <i>Note: Alarm can occur only when Dixell control has the digital input configured as a door alarm (parameter i1F = dor).</i>
Digital Input	Indicates digital input activation. Consult OEM documentation for cause/remedy. <i>Note: Alarm can occur only when Dixell control has the digital input configured as a generic alarm (parameter i1F (i2F) = EAL).</i>

Alarm Monitor Description	Explanation/Corrective Action
Email Error! Check cable or server down.	Indicates that the DX was unable to send an alarm message through the mail server. Verify that the DX is properly connected to the network and that the email settings and addresses are valid.
FTP! Check cable or server down.	Indicates that the FTP back-up attempt of the data files failed. Verify that the DX is properly connected to the network and that the FTP settings are valid. <i>If the DX is not connected to a network, disable the FTP data back-up to prevent this alarm from occurring.</i>
Memory Error Please check SD card.	Indicates that the SD card cannot be accessed when checking available memory space. Verify that an SD card is properly inserted into the DX display. Replace SD card.
NTP Ping Failed. Check Cable.	Indicates that the DX was unable to synchronize its clock with the selected time server. Verify that the DX is properly connected to the network and the selected time server is accessible. <i>If the DX is not connected to a network, disable the NTS clock to prevent this alarm from occurring.</i>
Pressure Switch. Power off and on to reset.	Indicates compressor pressure switch exceeded allowed on/off count. Regulation stopped. Cycle power off/on to reset. <i>Note: Alarm can occur only when Dixell controller has the digital input configured for pressure switch operation (parameter i1F (i2F) = PAL).</i>
SD card damaged or missing.	Indicates that the SD card cannot be accessed for USB file transfer. Verify that an SD card is properly inserted into the DX display. Replace SD card.
SD card filled. Please use USB file transfer.	Indicates that a file was unable to be written due to lack of available free space on the memory card. Use the USB file utilities or FTP to backup (copy) and delete alarm, audit and data files from the DX in order to free up memory. Can also occur if the SD card is missing/not properly inserted.
Digital Input. Outputs off.	Indicates serious input alarm. Outputs off. Consult OEM documentation for cause/remedy. <i>Note: Alarm can occur only when Dixell controller has the digital input configured as a serious alarm (parameter i1F (i2F) = bAL).</i>
Communications write error. Check communication cable.	User entry unable to be sent to Dixell control. Check communication wiring between COM2 of the DX touch screen and the Dixell control. Verify that the control is set to the proper communications address of 1.
Communications read error. Check communication cable.	Unable to read data from the Dixell control. Check communication wiring between COM2 of the DX touch screen and the Dixell control. Verify that the control is set to the proper communications address of 1.

Appendix

A.1 Modbus Communications

The DX utilizes Modbus as its standard protocol and offers both Modbus RTU serial and Modbus TCP forms. This section provides information on the supported functions and data available over the Modbus interface. It is assumed that the user is already familiar with Modbus protocol and has a basic understanding of its implementation and use. For additional information and support, modbus.org (<http://modbus.org/tech.php>) provides an abundance of technical documents, standards and support applications.

Listed below are a few of the more common software packages that claim to support Modbus protocol. This list is provided as informational only. Contact the software manufacturer for more information on applying their software.

LabView by National Instruments
11500 N Mopac Expwy
Austin, TX 78759-3504
Phone 800-683-8411
<http://www.natinst.com>

Wonderware by Wonderware
26561 Rancho Pkwy. South
Lake Forest, CA 92630
Phone 949-727-3200
<http://www.wonderware.com>

SpecView by SpecView Corporation
13409 53rd Ave NW
Gig Harbor, WA 98332
Phone 253-853-3199
<http://www.specview.com>

A.1.1 DX Communications Interface

The DX communications interface operates as a “pass-through” to allow the DX to appear as the Dixell control to other devices. This allows the DX to be used in an existing application without losing the serial communications interface to existing software. This eliminates the need for users already familiar with their existing software to learn or develop another software package in order to communicate with the DX.




This section targets the functionality provided by the DX communications interface, and not the specifics on how to interface with a Dixell control.

IMPORTANT: *The DX pass-through interface does not support the access of the EEPROM register elements of the Dixell control. If access to these registers is required in your application, then the DX controller is not a match for your application.*

A.1.1.1 XR40, 60 and 70CX Supported Control/Monitoring Data Registers

The following list contains the register base for the XR40CX, XR60CX and XR70CX model Dixell controls with firmware version 1.0. See the Dixell “diffusion_specification modbus prime cx 1_0-2007-03-15_EN.pdf”, “MD_44_10_01_PAR-R01-2014-03-27.pdf” and “MD_44_10_01-R01-2014-03-27.pdf” documents for more information. These are holding register values and are accessed using the standard read (0x03) and write (0x06) register or write (0x10) registers commands.

Legend

-  Indicates unused element
-  Indicates not active on XR40CX
-  Indicates not active on XR40CX and XR60CX

REG #	DESCRIPTION	RANGE	NOTES
DEVICE IDENTIFICATION (READ ONLY)			
0	DEVICE IDENTIFICATION	LOW BYTE	FIRMWARE VERSION (X.X)
		HIGH BYTE	FAMILY PRODUCT CODE (44 = CX SERIES)
1	DEVICE CODE (MSWORD)	LOW BYTE	ASCII CHAR CODE " " (BLANK)
		HIGH BYTE	ASCII CHAR CODE "R"
2	DEVICE CODE (LSWORD)	BIT0-5	ASCII CHAR CODE "!" - HEX(20)
		BIT6-15	PRODUCT NUMBER (i.e. 40, 60, 70)
3	SERIES NUMBER 1		
4	SERIES NUMBER 2		
5	RELEASE FIRMWARE DATE	BIT0-6	YEAR
		BIT7-10	MONTH
		BIT11-15	DAY
6	EEPROM CONFIGURATION		
7	PROBE PRESENCE	BIT0	PROBE 1 PRESENT
		BIT1	PROBE 2 PRESENT
		BIT2	PROBE 3 PRESENT
		BIT3	PROBE 4 PRESENT
		BIT4-15	NOT ASSIGNED
8	CONFIGURATION RELAYS SECTION 1	BIT0	ON-OFF
		BIT1	DEFROST 1
		BIT2	DEFROST 2
		BIT3	ALARM
		BIT4	LIGHT
		BIT5	FAN
		BIT6	AUXILIARY
		BIT7	DEAD BAND
		BIT8	COMPRESSOR 1
		BIT9	COMPRESSOR 2
BIT10-15	NOT ASSIGNED		
9	CONFIGURATION RELAYS SECTION 2		
10	CONFIGURATION DIGITAL INPUT 1		
11	CONFIGURATION DIGITAL INPUT 2		
ANALOG INPUTS (READ ONLY)			

REG #	DESCRIPTION	RANGE	NOTES
256	REGULATION PROBE VALUE		
257	DEFROST 1 PROBE VALUE		
258	DEFROST 2 PROBE VALUE		
259	REGULATION FAN VALUE		
260	PROBE VALUE FOR ROOM TEMPERATURE ALARM		
261	PROBE VALUE FOR CONDENSER ALARM		
262	REGULATOR AUXILIARY PROBE VALUE		
263	SET DYNAMIC PROBE VALUE		
264	PROBE 1 VALUE		
265	PROBE 2 VALUE		
266	PROBE 3 VALUE		
267	PROBE 4 VALUE		
USER PARAMETERS (READ/WRITE)			
768	COMPRESSOR ON/OFF DIFFERENTIAL	0.1 - 25.5°C	
		1 - 45°F	
769	MINIMUM SETPOINT	-55.0°C	
		-67°F	
770	MAXIMUM SETPOINT	150.0°C	
		302°F	
771	THERMOSTAT PROBE CALIBRATION	-12.0 - 12.0°C	
		-21 - 21°F	
772	EVAPORATOR PROBE PRESENCE	0, 1	
773	EVAPORATOR PROBE CALIBRATION	-12.0 - 12.0°C	
		-21 - 21°F	
774	THIRD PROBE PRESENCE	0, 1	
775	THIRD PROBE CALIBRATION	-12.0 - 12.0°C	
		-21 - 21°F	
776	FOURTH PROBE PRESENCE	0, 1	
777	FOURTH PROBE CALIBRATION	-12.0 - 12.0°C	
		-21 - 21°F	
778	OUTPUTS DELAY AT STARTUP	0 - 255	(MINUTES)
779	ANTI SHORT CYCLE DELAY	0 - 50	(MINUTES)
780			
781	P1-P2 PERCENTAGE FOR REGULATION	0 - 100	(100=P1, 0=P2)
782	CONTINUOUS CYCLE DURATION	0 - 144	(SCALED 0.0 - 24.0 HOURS - 10 MIN INCREMENTS)
783	SETPOINT FOR CONTINUOUS CYCLE	-55.0 - 150.0°C	
		-67 - 302°F	
784	COMPRESSOR ON TIME WITH FAULTY PROBE	0 - 255	(MINUTES)
785	COMPRESSOR OFF TIME WITH FAULTY PROBE	0 - 255	(MINUTES)
786			
787	TEMPERATURE MEASUREMENT UNIT	0=°C, 1=°F	
788	RESOLUTION (DECIMAL/INTEGER)	0=DEC, 1=INT	(DECIMAL FUNCTION ONLY ACTIVE FOR °C)
789	PROBE DISPLAYED	0=P1, 1=P2	
790			
791	DISPLAY TEMPERATURE DELAY	0 - 120	(SCALED 0.0 - 20.0 MIN - 10 SEC INCREMENTS)
792	P1-P2 PERCENTAGE FOR DISPLAY	1 - 99	
793	DEFROST TYPE	0, 1	(0=ELECTRIC, 1=HOT GAS)
794	PROBE SELECTION FOR DEFROST TERMINATION	0 - 4	(0=nP, 1=P1, 2=P2, 3=P3, 4=P4)

REG #	DESCRIPTION	RANGE	NOTES
795			
796	DEFROST TERMINATION TEMPERATURE	-55.0 - 50.0°C -67 - 122°F	
797			
798	INTERVAL BETWEEN DEFROST CYCLES	1 - 120	(HOURS)
799	MAXIMUM LENGTH FOR DEFROST	0 - 255	(MINUTES)
800			
801	START DEFROST DELAY	0 - 99	(MINUTES)
802	DISPLAY DURING DEFROST	0 - 3	0 = REAL TEMPERATURE 1 = TEMPERATURE AT DEFROST START 2 = SETPOINT 3 = LABEL "DEF"
803	MAXIMUM DISPLAY DELAY AFTER DEFROST	0 - 255	(MINUTES)
804	DRAINING (DRIP) TIME	0 - 120	(MINUTES)
805	FIRST DEFROST AFTER STARTUP	0, 1	(0=IMMEDIATELY, 1=AFTER THE IdF TIME)
806	DEFROST DELAY AFTER CONTINUOUS CYCLE	0 - 144	(SCALED 0.0 - 24.0 HOURS - 10 MIN INCREMENTS)
807	FAN OPERATING MODE	0 - 3	0 = FAN ON WITH COMPRESSOR, OFF IN DEFROST 1 = CONTINUOUS, OFF DURING DEFROST 2 = FAN ON WITH COMPRESSOR, ON IN DEFROST 3 = CONTINUOUS MODE, ON DURING DEFROST
808	FAN DELAY AFTER DEFROST	0 - 255	(MINUTES)
809	DIFFERENTIAL FOR FORCED FAN ACTIVATION	0 - 50°C 0 - 90°F	
810	FAN STOP TEMPERATURE	-55.0 - 50.0°C -67 - 122°F	
811	FAN ON TIME WITH COMPRESSOR OFF	0 - 15	(MINUTES)
812	FAN OFF TIME WITH COMPRESSOR OFF	0 - 15	(MINUTES)
813	PROBE SELECTION FOR FAN MANAGEMENT	0 - 4	(0=nP, 1=P1, 2=P2, 3=P3, 4=P4)
814			
815			
816			
817			
818			
819			
820			
821			
822			
823			
824			
825	TEMPERATURE ALARMS CONFIGURATION	0, 1	0 = RELATED TO SETPOINT, 1 = ABSOLUTE
826	MAXIMUM TEMPERATURE ALARM	SP - 150.0°C SP - 302°F	(0.0 - 50.0°C RELATIVE TO SETPOINT) (0.0 - 90°F RELATIVE TO SETPOINT)
827	MINIMUM TEMPERATURE ALARM	-55.0°C - SP -67°F - SP	(0.0 - 50.0°C RELATIVE TO SETPOINT) (0.0 - 90°F RELATIVE TO SETPOINT)
828	TEMPERATURE ALARM RECOVERY DIFFERENTIAL	0.1 - 25.5°C 1 - 45°F	
829	TEMPERATURE ALARM DELAY	0 - 255	(MINUTES)

REG #	DESCRIPTION	RANGE	NOTES
830	DELAY OF TEMPERATURE ALARM AT STARTUP	0 - 144	(SCALED 0.0 - 24.0 HOURS - 10 MIN INCREMENTS)
831	PROBE FOR CONDENSER ALARM	0 - 4	(0=nP, 1=P1, 2=P2, 3=P3, 4=P4)
832	CONDENSER LOW TEMPERATURE ALARM	-55.0 - 150.0°C	
		-67 - 302°F	
833	CONDENSER HIGH TEMPERATURE ALARM	-55.0 - 150.0°C	
		-67 - 302°F	
834	CONDENSER ALARM RECOVERY DIFFERENTIAL	0.1 - 25.5°C	
		1 - 45°F	
835	CONDENSER TEMPERATURE ALARM DELAY	0 - 255	(MINUTES)
836	DELAY OF CONDENSER ALARM AT STARTUP	0 - 144	(SCALED 0.0 - 24.0 HOURS - 10 MIN INCREMENTS)
837	COMPRESSOR OFF ON LOW TEMP ALARM	0, 1	0 = NO, 1 = YES
838	COMPRESSOR OFF ON HIGH TEMP ALARM	0, 1	0 = NO, 1 = YES
839	ALARM RELAY SILENCING (4TH RELAY = ALARM)	0, 1	0 = NO, 1 = YES
840			
841			
842	FOURTH RELAY CONFIGURATION	0 - 8	0 = DEF - DO NOT SELECT
			1 = FAN - DO NOT SELECT
			2 = ALARM
			3 = LIGHT
			4 = AUXILIARY
			5 = ALWAYS ON WHEN INSTRUMENT ON
			6 = DB - DO NOT SELECT
			7 = CP2 - DO NOT SELECT
8 = DEF2 - DO NOT SELECT			
843	ALARM RELAY POLARITY (FOURTH RELAY = ALARM)	0, 1	0 = CLOSE ON ALARM, 1 = OPEN ON ALARM
844	DIGITAL INPUT POLARITY	0, 1	0 = OPEN, 1 = CLOSE
845	DIGITAL INPUT CONFIGURATION	0 - 8	0 = EXTERNAL ALARM ("EA" MESSAGE DISPLAYED)
			1 = SERIOUS ALARM ("CA" MESSAGE DISPLAYED)
			2 = PRESSURE SWITCH ALARM ("CA" MESSAGE)
			3 = DOOR SWITCH FUNCTION
			4 = ACTIVATE DEFROST CYCLE
			5 = AUXILIARY RELAY
			6 = INVERT CONTROL ACTION (COOL - HEAT)
			7 = FAN - DO NOT SELECT
8 = ENERGY SAVING			
846	DIGITAL INPUT ALARM DELAY	0 - 255	(MINUTES)
847	PRESSURE SWITCH ACTIVATIONS FOR ALARM	0 - 15	
848	COMPRESSOR/FAN STATUS WHEN DOOR OPEN	0 - 3	0 = NORMAL
			1 = FAN OFF
			2 = COMPRESSOR OFF
			3 = FAN AND COMPRESSOR OFF
849	REGULATION RESTART WITH DOOR OPEN ALARM	0, 1	0 = NO, 1 = YES
850	ENERGY SAVINGS SETPOINT	-30 - 30°C	
		-54 - 54°F	
851	SERIAL ADDRESS	1 - 247	
852	KIND OF PROBE	0, 1	0 = PTC, 1 = NTC
853	ENERGY SAVINGS KEY ENABLE	0 - 2	0=DISABLE, 1=OFF (DO NOT SELECT), 2=ENABLE
854			

REG #	DESCRIPTION	RANGE	NOTES
855			
856	THERMOSTAT PROBE DISPLAY		
857	EVAPORATOR PROBE DISPLAY		
858	THIRD PROBE DISPLAY		
859	FOURTH PROBE DISPLAY		
860	REAL SETPOINT		
861	SOFTWARE RELEASE	X.X	
862	MAP CODE		
863	CONTROL SETPOINT	LS - US	
FUNCTION PARAMETERS (READ ONLY)			
1536	REGULATION SETPOINT		
1537	HIGH TEMPERATURE ALARM SETPOINT		
1538	LOW TEMPERATURE ALARM SETPOINT		
1539	SETPOINT 2		
1540	HIGH TEMPERATURE ALARM SETPOINT 2		
1541	LOW TEMPERATURE ALARM SETPOINT 2		

A.1.1.2 XR75CX Supported Control/Monitoring Data Registers

The following list contains the register base for the XR75CX model Dixell control with firmware version 2.6. See the Dixell “ModBUS_Protokoll_v2_6_GB.pdf”, “MD_44_26_16_PAR-R01-2014-03-27.pdf” and “MD_44_26_16-R01-2014-03-27.pdf” documents for more information. These are holding register values and are accessed using the standard read (0x03) and write (0x06) register or write (0x10) registers commands.

Legend

 Indicates unused element

REG #	DESCRIPTION	RANGE	NOTES
DEVICE IDENTIFICATION (READ ONLY)			
0	DEVICE IDENTIFICATION	LOW BYTE	FIRMWARE VERSION (X.X)
		HIGH BYTE	FAMILY PRODUCT CODE (44 = CX SERIES)
1	DEVICE CODE (MSWORD)	LOW BYTE	ASCII CHAR CODE " " (BLANK)
		HIGH BYTE	ASCII CHAR CODE "R"
2	DEVICE CODE (LSWORD)	BIT0-5	ASCII CHAR CODE "!" - HEX(20)
		BIT6-15	PRODUCT NUMBER (i.e. 75)
3	SERIES NUMBER 1		
4	SERIES NUMBER 2		
5	RELEASE FIRMWARE DATE	BIT0-6	YEAR
		BIT7-10	MONTH
		BIT11-15	DAY
6	EEPROM CONFIGURATION		
7	PROBE PRESENCE	BIT0	PROBE 1 PRESENT
		BIT1	PROBE 2 PRESENT
		BIT2	PROBE 3 PRESENT
		BIT3	PROBE 4 PRESENT
		BIT4-15	NOT ASSIGNED
8	CONFIGURATION RELAYS SECTION 1	BIT0	ON-OFF
		BIT1	DEFROST 1
		BIT2	DEFROST 2
		BIT3	ALARM
		BIT4	LIGHT
		BIT5	FAN
		BIT6	AUXILIARY
		BIT7	DEAD BAND
		BIT8	COMPRESSOR 1
		BIT9	COMPRESSOR 2
9	CONFIGURATION RELAYS SECTION 2		
10			
11			
ANALOG INPUTS (READ ONLY)			
256	REGULATION PROBE VALUE		
257	DEFROST 1 PROBE VALUE		
258	DEFROST 2 PROBE VALUE		
259	REGULATION FAN VALUE		
260	PROBE VALUE FOR ROOM TEMPERATURE ALARM		

REG #	DESCRIPTION	RANGE	NOTES
261	PROBE VALUE FOR CONDENSER ALARM		
262	REGULATOR AUXILIARY PROBE VALUE		
263			
264	PROBE 1 VALUE		
265	PROBE 2 VALUE		
266	PROBE 3 VALUE		
267	PROBE 4 VALUE		
USER PARAMETERS (READ/WRITE)			
768			
769	COMPRESSOR ON/OFF DIFFERENTIAL	0.1 - 25.5°C 1 - 45°F	
770	MINIMUM SETPOINT	-100.0°C -148°F	
771	MAXIMUM SETPOINT	150.0°C 302°F	
772	THERMOSTAT PROBE CALIBRATION	-12.0 - 12.0°C -21 - 21°F	
773	EVAPORATOR PROBE PRESENCE	0, 1	
774	EVAPORATOR PROBE CALIBRATION	-12.0 - 12.0°C -21 - 21°F	
775	THIRD PROBE PRESENCE	0, 1	
776	THIRD PROBE CALIBRATION	-12.0 - 12.0°C -21 - 21°F	
777	FOURTH PROBE PRESENCE	0, 1	
778	FOURTH PROBE CALIBRATION	-12.0 - 12.0°C -21 - 21°F	
779	OUTPUTS DELAY AT STARTUP	0 - 255	(MINUTES)
780	ANTI SHORT CYCLE DELAY	0 - 50	(MINUTES)
781			
782	P1-P2 PERCENTAGE FOR REGULATION	0 - 100	(100=P1, 0=P2)
783	CONTINUOUS CYCLE DURATION	0 - 144	(SCALED 0.0 - 24.0 HOURS - 10 MIN INCREMENTS)
784	SETPOINT FOR CONTINUOUS CYCLE	-100.0 - 150.0°C -148 - 302°F	
785	COMPRESSOR ON TIME WITH FAULTY PROBE	0 - 255	(MINUTES)
786	COMPRESSOR OFF TIME WITH FAULTY PROBE	0 - 255	(MINUTES)
787			
788	TEMPERATURE MEASUREMENT UNIT	0=°C, 1=°F	
789	RESOLUTION (DECIMAL/INTEGER)	0=DEC, 1=INT	(DECIMAL FUNCTION ONLY ACTIVE FOR °C)
790	PROBE DISPLAYED	0=P1, 1=P2	
791	X-REP DISPLAY	0 - 5	(0=P1, 1=P2, 2=P3, 3=P4, 4=Set, 5=dtr)
792	DISPLAY TEMPERATURE DELAY	0 - 120	(SCALED 0.0 - 20.0 MIN - 10 SEC INCREMENTS)
793	P1-P2 PERCENTAGE FOR DISPLAY	1 - 99	
794	DEFROST MODE	0, 1	(0=rtC, 1=in) - AVAILABLE WHEN RTC INSTALLED
795	DEFROST TYPE	0, 1	(0=ELECTRIC, 1=HOT GAS)
796	PROBE SELECTION FOR DEFROST TERMINATION	0 - 4	(0=nP, 1=P1, 2=P2, 3=P3, 4=P4)
797			
798	DEFROST TERMINATION TEMPERATURE	-55.0 - 50.0°C -67 - 122°F	

REG #	DESCRIPTION	RANGE	NOTES
799			
800	INTERVAL BETWEEN DEFROST CYCLES	1 - 120	(HOURS)
801	MAXIMUM LENGTH FOR DEFROST	0 - 255	(MINUTES)
802			
803	START DEFROST DELAY	0 - 99	(MINUTES)
804	DISPLAY DURING DEFROST	0 - 3	0 = REAL TEMPERATURE
			1 = TEMPERATURE AT DEFROST START
			2 = SETPOINT
			3 = LABEL "DEF"
805	MAXIMUM DISPLAY DELAY AFTER DEFROST	0 - 255	(MINUTES)
806	DRAINING (DRIP) TIME	0 - 120	(MINUTES)
807	FIRST DEFROST AFTER STARTUP	0, 1	(0=IMMEDIATELY, 1=AFTER THE ldf TIME)
808	DEFROST DELAY AFTER CONTINUOUS CYCLE	0 - 144	(SCALED 0.0 - 24.0 HOURS - 10 MIN INCREMENTS)
809	FAN OPERATING MODE	0 - 3	0 = FAN ON WITH COMPRESSOR, OFF IN DEFROST
			1 = CONTINUOUS, OFF DURING DEFROST
			2 = FAN ON WITH COMPRESSOR, ON IN DEFROST
			3 = CONTINUOUS MODE, ON DURING DEFROST
810	FAN DELAY AFTER DEFROST	0 - 255	(MINUTES)
811	DIFFERENTIAL FOR FORCED FAN ACTIVATION	0 - 50°C	
		0 - 90°F	
812	FAN STOP TEMPERATURE	-55.0 - 50.0°C	
		-67 - 122°F	
813	FAN ON TIME WITH COMPRESSOR OFF	0 - 15	(MINUTES)
814	FAN OFF TIME WITH COMPRESSOR OFF	0 - 15	(MINUTES)
815	PROBE SELECTION FOR FAN MANAGEMENT	0 - 4	(0=nP, 1=P1, 2=P2, 3=P3, 4=P4)
817	KIND OF ACTION FOR AUXILIARY RELAY	0, 1	(0=CL, 1=Ht)
818	SETPOINT FOR AUXILIARY RELAY	-100.0 -150.0°C	
		-148 - 302°F	
819	DIFFERENTIAL FOR AUXILIARY RELAY	0.1 - 25.5°C	
		1 - 45°F	
820	PROBE SELECTION FOR AUXILIARY RELAY	0 - 4	(0=nP, 1=P1, 2=P2, 3=P3, 4=P4)
821	AUXILIARY RELAY SWITCHED OFF DURING DEFROST	0, 1	(0=NO, 1=YES)
822	PROBE SELECTION FOR TEMPERATURE ALARMS	0 - 4	(0=nP, 1=P1, 2=P2, 3=P3, 4=P4)
823	TEMPERATURE ALARMS CONFIGURATION	0, 1	0 = RELATED TO SETPOINT, 1 = ABSOLUTE
824	MAXIMUM TEMPERATURE ALARM	SP - 150.0°C	(0.0 - 50.0°C RELATIVE TO SETPOINT)
		SP - 302°F	(0.0 - 90°F RELATIVE TO SETPOINT)
825	MINIMUM TEMPERATURE ALARM	-100.0°C - SP	(0.0 - 50.0°C RELATIVE TO SETPOINT)
		-148°F - SP	(0.0 - 90°F RELATIVE TO SETPOINT)
826	TEMPERATURE ALARM RECOVERY DIFFERENTIAL	0.1 - 25.5°C	
		1 - 45°F	
827	TEMPERATURE ALARM DELAY	0 - 255	(MINUTES)
828	DELAY OF TEMPERATURE ALARM AT STARTUP	0 - 144	(SCALED 0.0 - 24.0 HOURS - 10 MIN INCREMENTS)
829	PROBE FOR CONDENSER ALARM	0 - 4	(0=nP, 1=P1, 2=P2, 3=P3, 4=P4)
830	CONDENSER LOW TEMPERATURE ALARM	-100.0 - 150.0°C	
		-148 - 302°F	
831	CONDENSER HIGH TEMPERATRUE ALARM	-100.0 - 150.0°C	
		-148 - 302°F	

REG #	DESCRIPTION	RANGE	NOTES
832	CONDENSER ALARM RECOVERY DIFFERENTIAL	0.1 - 25.5°C	
		1 - 45°F	
833	CONDENSER TEMPERATURE ALARM DELAY	0 - 255	(MINUTES)
834	DELAY OF CONDENSER ALARM AT STARTUP	0 - 144	(SCALED 0.0 - 24.0 HOURS - 10 MIN INCREMENTS)
835	COMPRESSOR OFF ON LOW TEMP ALARM	0, 1	0 = NO, 1 = YES
836	COMPRESSOR OFF ON HIGH TEMP ALARM	0, 1	0 = NO, 1 = YES
837	ALARM RELAY SILENCING (4TH RELAY = ALARM)	0, 1	0 = NO, 1 = YES
838			
839	SECOND RELAY CONFIGURATION	0 - 9	0 = DEF - DO NOT SELECT
			1 = FAN - DO NOT SELECT
			2 = ALARM
			3 = LIGHT
			4 = AUXILIARY
			5 = ALWAYS ON WHEN INSTRUMENT ON
			6 = DB - DO NOT SELECT
			7 = CP2 - DO NOT SELECT
			8 = DEF2 - DO NOT SELECT
9 = HES - ON WHEN ENERGY SAVING ON			
840			
841			
842	ALARM RELAY POLARITY (SECOND RELAY = ALARM)	0, 1	0 = CLOSE ON ALARM, 1 = OPEN ON ALARM
843	DIGITAL INPUT 1 POLARITY	0, 1	0 = OPEN, 1 = CLOSE
844	DIGITAL INPUT 1 CONFIGURATION	0, 1	0 = dor, 1=Def
845	DIGITAL INPUT 2 POLARITY	0, 1	0 = OPEN, 1 = CLOSE
846	DIGITAL INPUT 2 CONFIGURATION	0 - 10	0 = EXTERNAL ALARM ("EA" MESSAGE DISPLAYED)
			1 = SERIOUS ALARM ("CA" MESSAGE DISPLAYED)
			2 = PRESSURE SWITCH ALARM ("CA" MESSAGE)
			3 = DOOR SWITCH FUNCTION
			4 = ACTIVATE DEFROST CYCLE
			5 = ACTIVATE ENERGY SAVINGS
			6 = AUXILIARY RELAY
			7 = INVERT CONTROL ACTION (COOL - HEAT)
			8 = FAN - DO NO SELECT
			9 = ACTIVATE HOLIDAY DEFROST - RTC ONLY
10 = REGULATION ON-OFF			
847	DIGITAL INPUT 2 ALARM DELAY	0 - 255	(MINUTES)
848	DOOR ALARM DELAY	0 - 255	(MINUTES)
849	PRESSURE SWITCH ACTIVATIONS FOR ALARM	0 - 15	
850	COMPRESSOR/FAN STATUS WHEN DOOR OPEN	0 - 3	0 = NORMAL
			1 = FAN OFF
			2 = COMPRESSOR OFF
			3 = FAN AND COMPRESSOR OFF
851	REGULATION RESTART WITH DOOR OPEN ALARM	0, 1	0 = NO, 1 = YES
852	ENERGY SAVINGS SETPOINT	-30 - 30°C	
		-54 - 54°F	
853	HOUR	0 - 23	(CLOCK MUST BE PRESENT TO READ)
854	MINUTES	0 - 59	(CLOCK MUST BE PRESENT TO READ)
855	DAY OF WEEK	0 - 6	(CLOCK MUST BE PRESENT TO READ)

REG #	DESCRIPTION	RANGE	NOTES
856	FIRST DAY OF WEEK END	0 - 6	0=Sun, 6=SA, 7=NOT USED
857	SECOND DAY OF WEEK END		0=Sun, 6=SA, 7=NOT USED
858	WORKING DAYS ENERGY SAVINGS START TIME	0 - 143	(SCALED 0.0 - 23HRS/50MIN - 10 MIN INCREMENTS)
859	WORKING DAYS ENERGY SAVINGS DURATION	0 - 144	(SCALED 0.0 - 24.0 HOURS - 10 MIN INCREMENTS)
860	HOLIDAY ENERGY SAVINGS START TIME	0 - 143	(SCALED 0.0 - 23HRS/50MIN - 10 MIN INCREMENTS)
861	HOLIDAY ENERGY SAVINGS DURATION	0 - 143 (144)	(SCALED 0.0 - 24.0 HOURS - 10 MIN INCREMENTS)
862	1ST WORKING DAYS DEFROST START TIME	0 - 143 (144)	(SCALED 0.0 - 23HRS/50MIN - 144=NOT USED)
863	2ND WORKING DAYS DEFROST START TIME	0 - 143 (144)	(SCALED 0.0 - 23HRS/50MIN - 144=NOT USED)
864	3RD WORKING DAYS DEFROST START TIME	0 - 143 (144)	(SCALED 0.0 - 23HRS/50MIN - 144=NOT USED)
865	4TH WORKING DAYS DEFROST START TIME	0 - 143 (144)	(SCALED 0.0 - 23HRS/50MIN - 144=NOT USED)
866	5TH WORKING DAYS DEFROST START TIME	0 - 143 (144)	(SCALED 0.0 - 23HRS/50MIN - 144=NOT USED)
867	6TH WORKING DAYS DEFROST START TIME	0 - 143 (144)	(SCALED 0.0 - 23HRS/50MIN - 144=NOT USED)
868	1ST HOLIDAY DEFROST START TIME	0 - 143 (144)	(SCALED 0.0 - 23HRS/50MIN - 144=NOT USED)
869	2ND HOLIDAY DEFROST START TIME	0 - 143 (144)	(SCALED 0.0 - 23HRS/50MIN - 144=NOT USED)
870	3RD HOLIDAY DEFROST START TIME	0 - 143 (144)	(SCALED 0.0 - 23HRS/50MIN - 144=NOT USED)
871	4TH HOLIDAY DEFROST START TIME	0 - 143 (144)	(SCALED 0.0 - 23HRS/50MIN - 144=NOT USED)
872	5TH HOLIDAY DEFROST START TIME	0 - 143 (144)	(SCALED 0.0 - 23HRS/50MIN - 144=NOT USED)
873	6TH HOLIDAY DEFROST START TIME	0 - 143 (144)	(SCALED 0.0 - 23HRS/50MIN - 144=NOT USED)
874	SERIAL ADDRESS	1 - 247	
875	KIND OF PROBE	0, 1	0 = PTC, 1 = NTC
876	ENERGY SAVINGS KEY ENABLE	0 - 2	0=DISABLE, 1=OFF (DO NOT SELECT), 2=ENABLE
877			
878	DEFROST PROBE VALUE	0, 1	0 = dEF, 1 = AUS
879	PROBE 1 VALUE		
880	PROBE 2 VALUE		
881	PROBE 3 VALUE		
882	PROBE 4 VALUE		
883	REAL SETPOINT		
884	SOFTWARE RELEASE	X.X	
885	MAP CODE		
886	CONTROL SETPOINT	LS - US	
FUNCTION PARAMETERS (READ ONLY)			
1536	REGULATION SETPOINT		
1537	HIGH TEMPERATURE ALARM SETPOINT		
1538	LOW TEMPERATURE ALARM SETPOINT		
1539	SETPOINT 2		
1540	HIGH TEMPERATURE ALARM SETPOINT 2		
1541	LOW TEMPERATURE ALARM SETPOINT 2		

A.1.1.3 Prime CX Supported Status Elements

The Dixell control also provides read/write access to internal status elements. These are binary (coil) values and are accessed using the standard read (0x01) and write (0x05) coil commands.

#	ACCESS	DESCRIPTION	RANGE	NOTES
STATUS ELEMENTS (BINARY)				
512	R/W	ON – OFF		
513	R/W	DEFROST		
514	R/W	CONTINUOUS COOLING/HEATING		
515	R/W	KEYBOARD LOCK		
516	R/W	ALARM SILENCE		(ON WHEN ACTIVE - WRITE 1 TO SILENCE)
517	R/W	MASTER DEFROST		
518	R/W	ENERGY SAVING		
519	R	DIGITAL INPUT 1		
520	R	ALARM PROBE 1		
521	R	ALARM PROBE 2		
522	R	ALARM PROBE 3		
523	R	ALARM PROBE 4		
524	R	ALARM HIGH ROOM TEMPERATURE		
525	R	ALARM LOW ROOM TEMPERATURE		
526	R	ALARM HIGH CONDENSER TEMPERATURE		
527	R	ALARM LOW CONDENSER TEMPERATURE		
528	R	GENERIC ALARM DIGITAL INPUT : EAL		
529	R	SERIOUS ALARM DIGITAL INPUT : BAL		
530	R	OPEN DOOR ALARM		
531	R	EEPROM ALARM		
532	R	TEMPERATURE MEASUREMENT UNIT	0=°C, 1=°F	
533	R	TEMPERATURE RESOLUTION	0=DEC, 1=INT	
534	R	RELAY OUTPUT ON/OFF		
535	R	RELAY OUTPUT 1 DEFROST		
536	R	RELAY OUTPUT 2 DEFROST		
537	R	RELAY OUTPUT ALARM		
538	R/W	RELAY OUTPUT LIGHT		
539	R	RELAY OUTPUT FAN		
540	R/W	RELAY OUTPUT AUXILIARY		
541	R	RELAY OUTPUT DEAD BAND		
542	R	RELAY OUTPUT 1 COMPRESSOR		
543	R	RELAY OUTPUT 2 COMPRESSOR		
544	R	RELAY BUZZER		
545	R/W	WATCH DOG ACTIVATION (DEVICE RESET)		
546	R/W	HUMIDITY FUNCTION STATUS		
547	R	HOLIDAY		(AVAILABLE ON XR75CX MODELS ONLY)
548	R	DIGITAL INPUT 2		
549	R	RTC ALARM		
550	R	RTF ALARM		
551	R/W	RELAY OUTPUT ENERGY SAVING		

A.2 FTP, FileWeb, DataWeb Requirements/Installation

A.2.1 Introduction

The following describes the system requirements, components, and an installation guide for the FDC Cloud service and website. The FDC cloud service provides the ability to upload data from FDC devices to cloud storage for backup and/or further analysis. The website provides the ability to verify data, uploads, and to manage users.

A.2.2 System Overview

There are four server components; the data transfer service (FDDataService), the website (FDDataWeb), the FTP server, and a MySQL database. FDDataService and FDDataWeb are Microsoft .Net services, and use Microsoft Internet Information Services (IIS) as a web platform. The MySQL database stores user configuration information as well as providing cloud data storage if desired.

A.2.3 System Requirements

A Microsoft Windows server is required, with the following minimum capabilities:

- Windows Server 2008 or greater
- 2 GB RAM or greater
- 2 Cores or greater
- 40GB Storage or greater (this will vary depending on the user's expected uploads)
- .Net framework version 4.5 or greater
- MySQL 5.6 or greater

The server should be setup to provide the web server role.

A.2.4 MySQL Installation

MySQL can be found at <http://dev.mysql.com/downloads/mysql/>. MySQL installation instructions and documentation can be found there as well.

A.2.5 Website Installation

Create a folder for the website files. It can be anywhere, but often C:\inetpub\wwwroot is used. Set permissions on the folder to allow IIS_IUSRS Read and execute, List folder contents, and Read permissions. Copy the FDC website files into this folder.

In web.config, set values for the following keys: FDDataServicePath, FDFtpPath, and futuredesignEntitiesConnectionString. Descriptions of these values are below.

- FDDataServicePath – Found in the <appSettings> element, this is the absolute directory path to the Data Transfer Service's root folder. This is used for access to files uploaded through the data service.
- FDFtpPath – Found in the <appSettings> element, this is the absolute directory path to the FTP server's root folder. This is used for access to files uploaded through the FTP service.

futuredesignEntities ConnectionString - Found in the <connectionStrings> element, this string provides connection information to the MySQL database. Its format is similar to:

```
<connectionStrings>
  <add name="futuredesignEntities"
connectionString="metadata=res://*/Models.MySQLModel.csdl|res://*/Models.MySQLModel.ssdl|res://*/Model
s.MySQLModel.msl;provider=MySql.Data.MySqlClient;provider connection
string=&quot;server=127.0.0.1;database=futuredesign;user
id=root;password=password;oldguids=True&quot;; providerName="System.Data.EntityClient" />
</connectionStrings>
```

In the IIS Manager, add a website. Set the website's physical path to the folder you created. An App Pool will be created with the site. Verify the App Pool uses .Net framework version 4.0.

A.2.6 Data Transfer Service Installation

Create a folder for the data transfer service files. It can be anywhere, but often C:\inetpub\wwwroot is used. Do not use the same folder as the website. Set permissions on the folder to allow IIS_IUSRS Read and execute, List folder contents, and Read permissions. Copy the data transfer service files into this folder. Edit the permissions of the files and log folders to allow IUSR and IIS_IUSRS to modify.

In web.config, set values for the following keys: futuredesignEntities ConnectionString. Descriptions of these values are below.

- futuredesignEntities ConnectionString - Found in the <connectionStrings> element, this string provides connection information to the MySQL database. Its format is similar to:

```
<connectionStrings>
  <add name="FDMySQLConnection"
connectionString="Datasource=127.0.0.1;Database=futuredesign;uid=root;pwd=pwd;Old Guids=true;"
providerName="MySql.Data.MySqlClient" />
</connectionStrings>
```

For the service installation within IIS Manager, you have two choices. You can create a new website, or you can create an application within the website you already created. If you create a new website, you'll need to go into the bindings and set a port that is different than the website's (most likely port 80 or 443).

If you create an application, just note the folder name for the application. That will be necessary for the device setup.

In either case, an App Pool will be created with the site. Verify the App Pool uses .Net framework version 4.0.

A.2.7 HTTP vs HTTPS

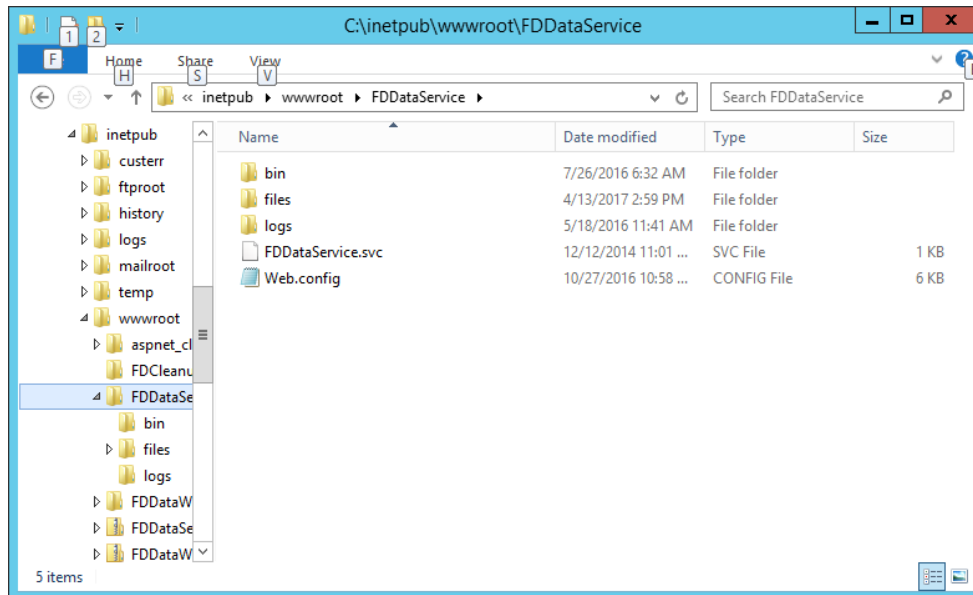
FDC Cloud Service can support either http (non-secure) or https (secure) protocols. To support https, an SSL certificate will need to be purchased. There are many certificate providers. FDC has used Network Solutions. Once the certificate is purchased, it must be installed into IIS, and the website and service bindings adjusted to use it.

A.2.8 FTP Server

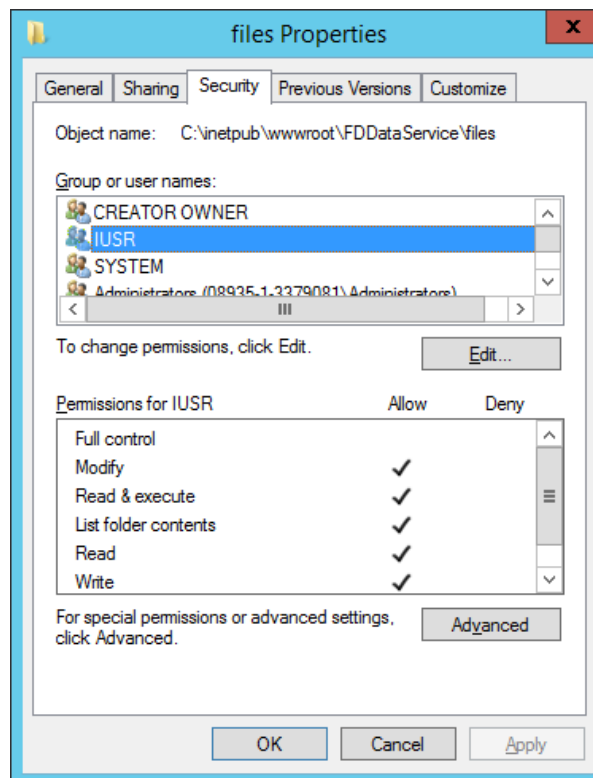
Please consult the instructions for your choice of FTP server.

A.2.9 File Transfer Service Configuration (FileWeb)

Now that the FDDataService web service is setup, the folders should look like:



Uploaded log files will be saved to the files folder. If there are any errors, logs of those errors will be saved in the logs folder. Permissions on the files and logs folders must be set to modify for IUSR and IIS_IUSRS.



A.2.10 Database Transfer Service Configuration (DataWeb)

The database service will store uploaded data logs into a database table. There are some required settings in web.config to point the service to the correct data table and map file column names to database fields. The connection string to the database was setup in the previous section. Note that the name of the connection string is "FDMySQLConnection". In the databaseMapSection, the databaseMap element has an attribute called connectionName. Set this to the name of the connection string as shown below. Also, in the databaseMap element, set the tableName attribute to the name of the database table that you want the data logs to be stored in. In the example below, the table is named datatable. (note: MySQL uses all lower case for table names).

```
<databaseMapSection>
  <databaseMap mapName="FDDData" tableName="datatable" connectionName="FDMySQLConnection">
    <fields>
    </fields>
  </databaseMap>
</databaseMapSection>
```

The SQL statement below creates our sample data table. Your table scheme and field names may vary.

```
CREATE TABLE `datatable` (
  `ID` int(11) NOT NULL AUTO_INCREMENT,
  `CustomerID` varchar(45) NOT NULL DEFAULT '0',
  `Date` varchar(15) DEFAULT NULL,
  `Time` varchar(15) DEFAULT NULL,
  `ID1` varchar(45) DEFAULT NULL,
  `ID2` varchar(45) DEFAULT NULL,
  `UserName` varchar(45) DEFAULT NULL,
  `Loop1PV` double DEFAULT NULL,
  `Loop1SP` double DEFAULT NULL,
  `Loop1Out` double DEFAULT NULL,
  PRIMARY KEY (`ID`)
) ENGINE=InnoDB DEFAULT CHARSET=utf8;
```

A.2.11 Database Field Map

The data_maps table maps the log file column names to database fields. This map must be setup correctly or there will be errors and potentially lost data. There are 4 fields in data_maps:

- DataMapID – An auto increment primary key
- CustomerID – The ID of the customer. This is the RemoteUserID
- FileColumn – The name of the column in the file
- FieldName – The name of the database field it maps to.

A sample map for the data table scheme we just setup is shown below.

DataMapID	CustomerID	FileColumn	FieldName
1	SvpTest	Date	Date
2	SvpTest	Time	Time
3	SvpTest	ID1	ID1
4	SvpTest	ID2	ID2
5	SvpTest	UserName	UserName
6	SvpTest	Loop1 PV	Loop1PV
7	SvpTest	Loop1 SP	Loop1SP
8	SvpTest	Loop1 Out	Loop1Out

NOTE: When configuring the DX control, the device data file tagnames for Date, Time, ID1, ID2 and UserName are automatically assigned and cannot be edited. The individual probe names are configurable by the user when setting up the controller (i.e. Room, Evaporator, etc...). The DX appends a space character and the text “PV, SP and Out” to the process value, set point and percent output names for each probe automatically when data logging is active at the DX.

The FileColumn field configured at the server data base must match (upper/lower case) the names + spaceChar + appended chars configured at the DX. The FieldName ID setup at the database does not have to match the tagname configuration at the DX but should not contain any space characters. Using the following table, a sample database setup for a dual loop DX is provided with naming conventions included for FileColumn and FieldName fields:

DataMapID	CustomerID	FileColumn	FieldName	DX loop name configured by user at DX
1	SvpTest (UserID or RemoteUserID used during login)	Date (Field must be named “Date” to match DX auto assign)	Date (Field can be named anything with no space characters)	Date (assigned by DX automatically)
2	SvpTest (UserID or RemoteUserID used during login)	Time (Field must be named “Time” to match DX auto assign)	Time (Field can be named anything with no space characters)	Time (assigned by DX automatically)
3	SvpTest (UserID or RemoteUserID used during login)	ID1 (Field must be named “ID1” to match DX auto assign)	ID1 (Field can be named anything with no space characters)	ID1 (assigned by DX automatically)
4	SvpTest (UserID or RemoteUserID used during login)	ID2 (Field must be named “ID2” to match DX auto assign)	ID2 (Field can be named anything with no space characters)	ID2 (assigned by DX automatically)
5	SvpTest (UserID or RemoteUserID used during login)	UserName (Field must be named “UserName” to match DX auto assign)	UserName (Field can be named anything with no space characters)	UserName (assigned by DX automatically)
6	SvpTest (UserID or RemoteUserID used during login)	Room PV (Field must match user configured tagname + spaceChar + “PV”)	RoomPV (Field can be named anything with no space characters)	Temp (assigned by user in config)
7	SvpTest (UserID or RemoteUserID used during login)	Room SP (Field must match user configured tagname +	RoomSP (Field can be named anything with no space	Temp (assigned by user in config)

DataMapID	CustomerID	spaceChar + "SP") FileColumn	characters) FieldName	DX loop name configured by user at DX
8	SvpTest (UserID or RemoteUserID used during login)	Room Out (Field must match user configured tagname + spaceChar + "Out")	RoomOut (Field can be named anything with no space characters)	Temp (assigned by user in config)
9	SvpTest (UserID or RemoteUserID used during login)	Evaporator PV (Field must match user configured tagname + spaceChar + "PV")	EvapPV (Field can be named anything with no space characters)	Evaporator (assigned by user in config)
10	SvpTest (UserID or RemoteUserID used during login)	Condenser SP (Field must match user configured tagname + spaceChar + "SP")	CondPV (Field can be named anything with no space characters)	Condenser (assigned by user in config)
11	SvpTest (UserID or RemoteUserID used during login)	Monitor PV (Field must match user configured tagname + spaceChar + "Out")	MonPV (Field can be named anything with no space characters)	Monitor (assigned by user in config)

Lastly, the database must be setup to match the data log "point" setup at the DX. The above table displays the database setup for typical 4 probe control data logging all available data values. If only the process values from all probes was being logged (not SP or %Out from the Room), the database setup would need to be setup for the four probe values only, with the additional parameters of set point and percent output being removed.

A.3 Touch Screen Interface Specifications

Technical Specifications

Description	
Size	4.3"
Resolution (W X H in pixels)	480 x 272
Display type	TFT, Wide touch Screen
Colors	65,536
Touch screen Type	Resistive analog
Active display area (W X H mm)	95 X 54
MTBF back light at 25 0C	30,000 hrs
Backlight	LED
Brightness Adjustment	Yes
Screen Saver	Yes
Language Fonts	Yes

Main Hardware

Description	
Processor, CPU speed	ARM Cortex-A8, 1GHz
Flash Memory(ROM)	128 MB
SDRAM(RAM)	256 MB
Operating system	WinCE 6.0
Real Time Clock	Yes
Buzzer	Yes
SD card slot	Yes

Communication Ports/Interfaces

Description	
RS232C, DB9 Male	1
RS232C/ RS422/ RS485, DB25 Female	1
Ethernet 10/100 Mbps, RJ45	1
USB Host	1

General Specifications

Description	
Rated Voltage	24 VDC
Power supply	11-36VDC
Rated Current	0.91A (DC)
Power Consumption	10 W
Power on LED indicator	Yes
Outer dimensions (W X H X D mm)	140 X 116 X 57
Mounting depth (mm)	51
Panel cutout (W X H mm)	123 ⁺¹ X 99 ⁺¹
Protection	IP65 front, IP20 rear
Front bezel, housing	Plastic, plastic
Installation	Panel Mount
Net Weight (Kg)	0.5

Standards, Certificates and Approvals

Description	Details
UL approval	UL 508 and CSA C22.2 No.142
Low Voltage Directive	2006/95/EC
EMC Directive	2004/108/EC
Requirements for Emission	EN 61000-6-4 :2007
Requirements for Interference Immunity	EN 61000-6-2 :2005
Tick mark for Australia	AS/NZS CISPR 11:2004
FCC	FCC Part 15, Subpart B, Class A

NOTE: The table above shows the approvals that may be available.

Base Standards for EMC & Safety

Description	Details
Electrostatic discharge	IEC 61000-4-2: 2008
Radiated radio-frequency electromagnetic fields	IEC 61000-4-3: 2006 + A1:2007 + A2:2010
Electrical fast transient/burst	IEC 61000-4-4: 2004 + A1: 2010
Surge	IEC 61000-4-5: 2005
Conducted disturbances induced by radio-frequency fields	IEC 61000-4-6: 2008
Power frequency magnetic field	IEC 61000-4-8: 2009
Voltage dips, short interruptions and voltage variations	IEC 61000-4-11: 2004
Emission from Electromagnetic fields	CISPR 11:2009 + A1:2010 Class A
Harmonics Current	IEC61000-3-2:2005 + A1:2008 + A2:2009
Voltage Fluctuation and Flicks	IEC61000-3-3:2008
Requirements for Safety	EN61010-1:2001

Protective class

Description	Details
Standard enclosures	IP 65 (Front), IP20 housing and terminals

Operating conditions

Description	Details
Temperature	0C to + 50C
Relative Humidity	10% to 90%, no condensation
Altitude	2000 meters maximum
Pollution	Degree 2
Sinusoidal vibration conforming to IEC 60068-2-6	10 to 58Hz: 0.75mm amplitude 58 to 150Hz: 1g 1oct/min. 10 sweeps
Shock conforming to IEC 60068-2-29	3 shocks per direction 11ms 10g

NOTE: In temperatures below 0°C, the response time of liquid crystal display becomes slower and color of the display will be darker than normal. Do not operate HMI in ambient temperature less than 0°C.

LCD specifications

Description	Details
Touch operations	1,000,000 times using R 0.8 Polyacetal stylus with force 250g
Vibration test	10-55 Hz, Stroke: 1.5mm, 2 hrs. for each direction of X, Y, Z
Shock test	100 G, 6 ms, +/- X, +/- Y, +/- Z, 3 times for each direction
Typical viewing angle	Vertical (up/down), 50° / 70° Horizontal (left/right), 70° / 70°

Transport & Storage conditions

Description	Details
Temperature	-20C to + 60C
Relative Humidity	10% to 90%, no condensation
Altitude	2000 meters maximum
Sinusoidal vibration conforming to IEC 60068-2-6	5 to 10 Hz: 3.5 mm amplitude 10 to 150 Hz: 2g 1oct/min. 40 sweeps
Shock conforming to IEC 60068-2-29	3 shocks per direction 11ms 15g

A.4 Power Supply Specifications

DIN Rail Mount Power Supply Specifications

Model	24V DC output	PSSR-VB24	
Output Capacity		15W	
Input	Rated Input Voltage (Single-phase two-wire) ¹	100 to 240V AC (Voltage range: 85 to 264V AC/100 to 370V DC) (Load ≤ 80% at 100-105V DC)	
	Frequency	50/60 Hz	
	Input Current (Typ.)	100V AC	0.35A
		230V AC	0.19A
	Inrush Current (Typ.) (Ta=25°C, cold start)	100V AC	18A
		230V AC	45A
	Leakage Current	120V AC	0.5mA max.
		230V AC	1.0mA max.
	Efficiency (Typ.) (at rated output) ²	100V AC	84%
		230V AC	81%
Power Factor (Typ.)	100V AC	—	
	230V AC	—	
Rated Voltage/Current		0.65A	
Adjustable Voltage Range			
Output Holding Time (Typ.) (at rated output)	100V AC	36ms	
	230V AC	230ms	
Start Time (at rated input and output)		500ms max.	
Rise Time (at rated input and output)		250ms max.	
Output Regulation	Input Fluctuation	0.4% max.	
	Load Fluctuation	1.0% max.	
	Temperature Change	0.05%/°C max. (-10 to +65°C)	
	Ripple (including noise)		4% p-p max. (-25 to -10°C)
			1.5% p-p max. (-10 to +0°C)
		1% p-p max. (0 to +65°C)	
Overcurrent Protection		105% min. (auto reset)	
Operation Indicator		LED (green)	
Dielectric Strength	Between input and output terminals	3,000V AC, 1 minute	
	Between input and ground terminals	2,000V AC, 1 minute	
	Between output and ground terminals	500V AC, 1 minute	
Insulation Resistance		Between input and output terminals: 100MΩ min. (500V DC megger) Between input and ground terminals: 100MΩ min. (500V DC megger)	
Operating Temperature ⁴ (No freezing)		-25 to +75°C	
Operating Humidity (no condensation)		20 to 90% RH	
Storage Temperature (No freezing)		-25 to +75°C	
Storage Humidity (no condensation)		20 to 90% RH	
Vibration Resistance		10 to 55Hz, amplitude 0.375mm, 2 hours each in 3 axes (when used with BNL6 end clips)	
Shock Resistance		300 m/s ² (30G), 3 times each in 6 directions	
Expected Life ⁵		8 years minimum (at the rated input, 50% load, operating temperature +40°C, standard mounting direction)	
EMC	EMI	EN61204-3 (Class B)	
	EMS	EN61204-3 (industrial)	
Safety Standards		UL508 (Listing), UL1310 Class 2, ANSI/ISA-12.12.01 CSA C22.2 No. 107.1, 213, 223 EN60950-1, EN50178	

Other Standard	SEMI F47 (at 208V AC input only)
Degree of Protection	IP20 (EN60529)
Dimensions (mm)	90H x 22.5W x 95D
Weight (approx.)	140g
Terminal Screw	M3.5

*At normal temperature and humidity unless otherwise specified.

Note 1: DC input voltage is not subject to safety standards. When using on DC input, connect a fuse to the input terminal for DC input protection.

Note 2: Under stable state.

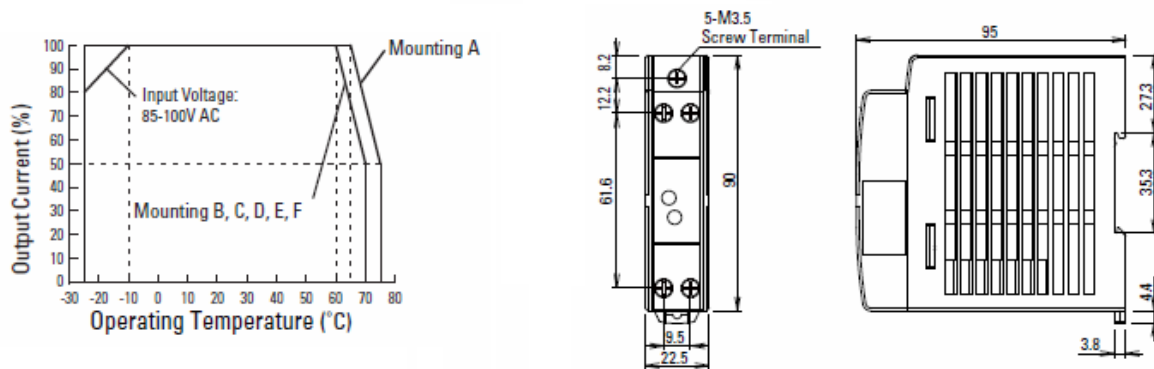
Note 3: PS5R-V805 (5V DC/2.0A) is 10W (Up to 3.0A at Ta = 0 to 40°C. Not subject to safety standards above 2.0A.)

Note 4: See the output derating curves.

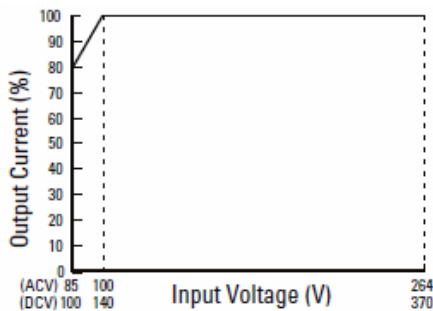
Note 5: Calculation of the expected life is based on the actual life of the aluminum electrolytic capacitor. The expected life depends on operating conditions.

Operating Temperature vs. Output Current

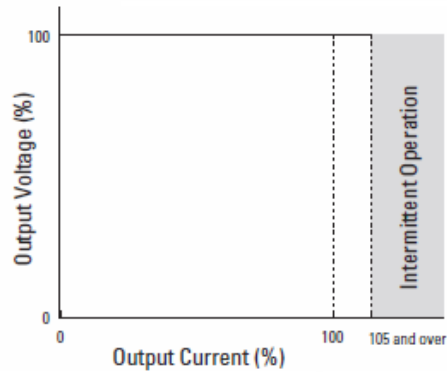
Conditions: Natural air cooling (Operating temperature is the temperature around the switching power supply.)



Input Voltage vs. Output Current Ta=25°C

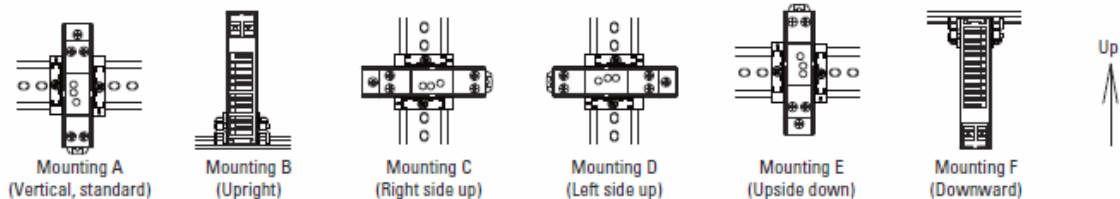


Overcurrent Protection Characteristics



Operating Temperature Approved by Safety Standards

UL508, CSA C22.2 No.107.1, ANSI/ISA12.12.01, EN60950-1, EN50178					
Mounting A	Mounting B	Mounting C	Mounting D	Mounting E	Mounting F
65	60	60	60	60	60



Open Frame Power Supply Specifications

Description		Power Supplies	[15W] PS3X-B24	
Input	Rated Input Voltage		100 to 240V AC	
	Voltage Range (Note 1)		85 to 264V AC/ 120 to 375V DC	
	Frequency		47 to 63 Hz	
	Input Current		0.5A max.	
	Inrush Current	at 115V AC	40A max.	
	(Ta = -25°C, ACV cold start)	at 230V AC	60A max.	
	Leakage Current		0.5mA max.	
Efficiency (Typ.) (230V AC at input/rated output)	5V		77%	
	12V		81%	
	24V		82%	
Output	Rated Voltage/Current		24V, 0.63A	
	Adjustable Voltage Range		±10%	
	Output Holding Time		13 ms typ. (100V AC) 60 ms minimum (230V AC)	
	Start Time		1000 ms max. (230V AC input, rated output)	
	Rise Time		50 ms max. (230V AC input, rated output)	
	Regulation	Input Fluctuation		0.5% max.
		Overvoltage Fluctuation		5V: ±2% max. 12V, 24V: ±1% max.
		Temperature Fluctuation		0.04% / °C max. (-20 to +50°C)
		Ripple (including noise)	-20 to -10°C	
	-10 to 0°C			5V: 160mV max. 12V/24V: 200mV max.
PS3X-B, C: 0 to +50°C PS3X-D, O, E: 0 to +45°C			5V: 100mV max. 12V/24V: 150mV max.	
Supplementary Functions	Overcurrent Protection		105% min. (auto reset) (Note 2)	
	Overvoltage Protection		Voltage limitation at 115% min.	
	Operation Indicator		green LED	
Dielectric Strength	Between input and output terminals		3000V AC, 1 minute	
	Between input and ground terminals		2000V AC, 1 minute	
	Between output and ground terminals		500V DC, 1 minute	
Insulation Resistance			100MΩ minimum, 500V DC megger (between input and output terminals, between input and ground terminals)	
Operating Temperature			-20 to +70°C (no freezing, see output derating)	
Operating Humidity			20 to 85% RH (no condensation)	
Storage Temperature			-40 to +85°C (no freezing)	
Storage Humidity			10 to 95% RH (no condensation)	
Vibration Resistance			10 to 55 Hz, 20m/s ² constant, 2 hours each in 3 axes	
Shock Resistance			200m/s ² , 1 shock each in 3 axes	
EMC	EMI		EN55022 Class B	
	EMS		EN55024	
Safety Standards			IEC/EN60950-1, UL60950-1, CSA C22.2 No. 60950-1	
Dimensions (H × W × D) (mm)			50.8H × 28W × 62D	
Weight (approx.)			130g	
Terminal Screw			M3	

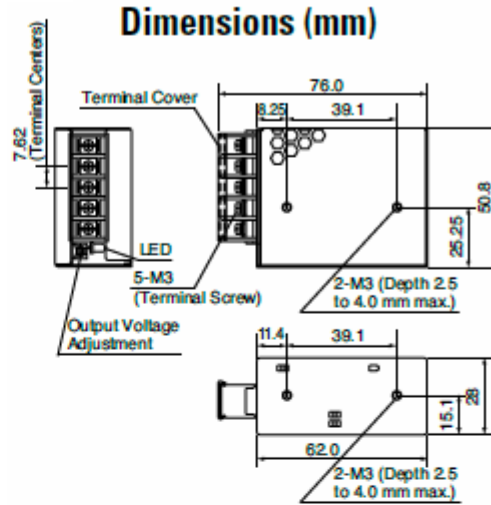
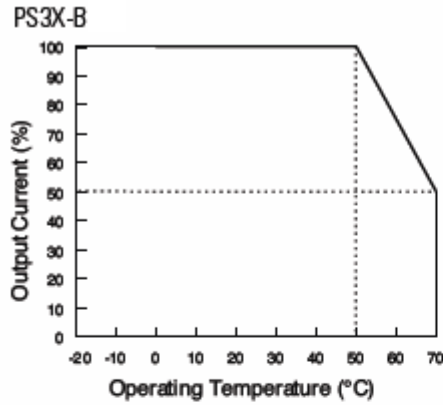
Note 1: See "Output Current vs. Input Voltage" characteristics next page. Not subject to safety standards. When using DC input, connect a fuse to the input terminal for DC input protection.

Note 2: Overload for 30 seconds or longer may damage the internal elements.

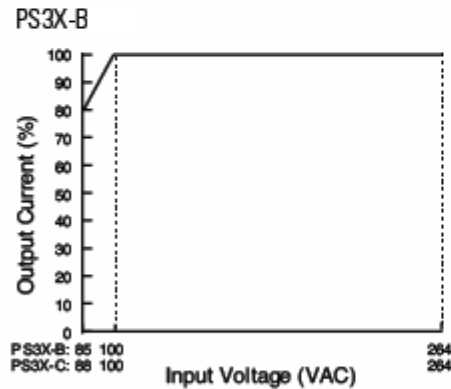
Note 3: One minute after the output has been turned off, turn on the AC input again.

Operating Temperature vs. Output Current (Derating Curves)

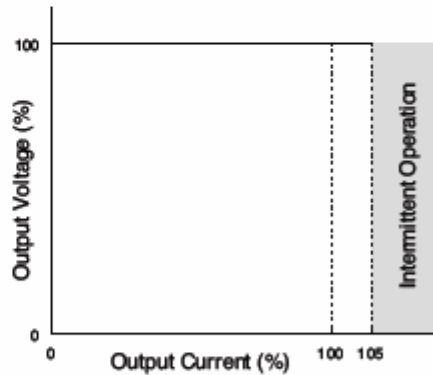
Conditions: Natural air cooling (operating temperature is the temperature around the power supply)



Output Current vs. Input Voltage (TA = 25°C)

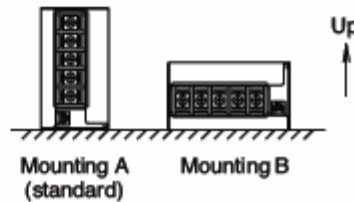


Overcurrent Protection Characteristics



Operating Temperature by Safety Standards

Power Supplies	UL/EN60950-1
	Mounting A, B
PS3X-B24	50°C



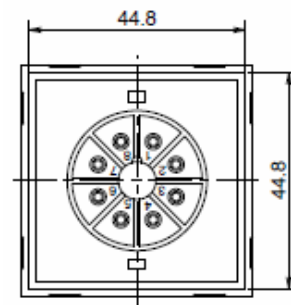
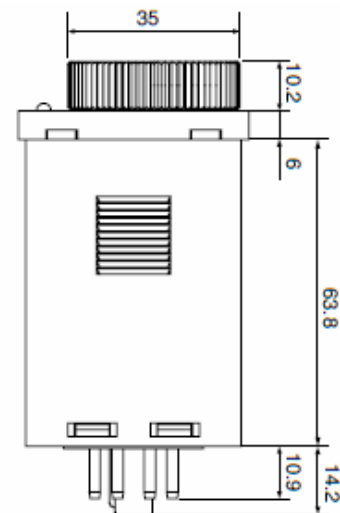
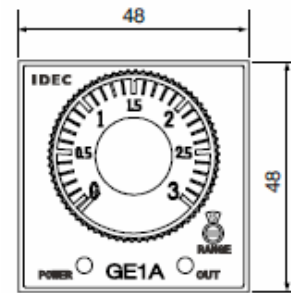
A.5 Power-On Delay Relay Specifications

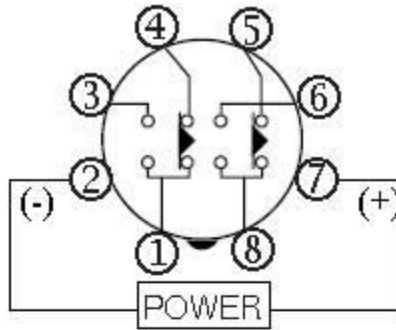
[GE1A-C10HA110]



Specifications

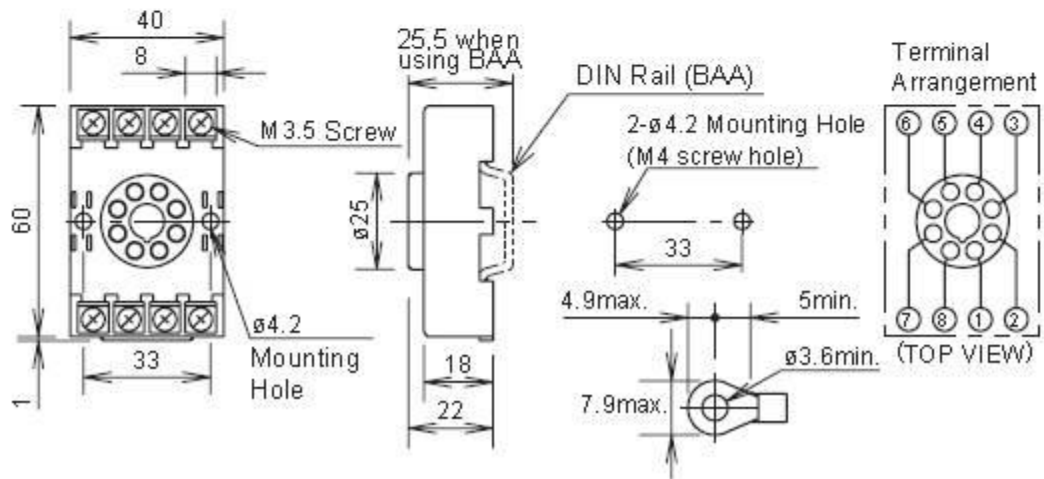
Rated Operating Voltage	24V AC/DC 100 to 120V AC 220 to 240V AC	
Voltage Tolerance	AC: 85 to 110% DC: 90 to 110%	
Contact Rating	240V AC/5A 24V DC/5A	
Contact Form	DPDT or SPDT+ instantaneous SPDT	
Repeat Error	±0.2% ±10msec maximum	
Voltage Error	±0.5% ±10msec maximum	
Temperature Error	±3% maximum	
Setting Error	±10% maximum	
Reset Time	0.1 sec maximum	
Insulation Resistance	100MΩ minimum (500V DC megger)	
Dielectric Strength	Between power and output terminals: 1,500V AC, 1 minute Between contact circuits: 750V AC, 1 minute	
Vibration Resistance	Damage limits: Amplitude 0.75mm, 10 to 55 Hz Operating extremes: Amplitude 0.5mm, 10 to 55 Hz	
Shock Resistance	Damage limits: 500m/s ² (Approx. 50G)	
Power Consumption	GE1A-B	24V AC type: 1.6 VA
		24V DC type: 1.0W
		110V AC type: 3.8 VA
	GE1A-C	220V AC type: 7.7 VA
		24V AC type: 2.0 VA
		24V DC type: 0.8W
		110V AC type: 3.5 VA
		220V AC type: 8.0 VA
Electrical Life	100,000 operations minimum (at full rated load)	
Mechanical Life	10,000,000 operations minimum	
Operating Temperature	-10 to +55°C (without freezing)	
Operating Humidity	35 to 85% RH (without freezing)	





Item	Terminal Number	Operation
Set Time		← Operation →
Power	2 - 7 (8p)	[Bar chart showing power pulse]
Delayed Contact	5 - 8 (8p) (NC)	[Bar chart showing delayed NC contact]
	6 - 8 (8p) (NO)	[Bar chart showing delayed NO contact]
Indicator	POWER	[Bar chart showing power indicator]
	OUT	[Bar chart showing output indicator]

8-Pin Screw Terminal (SR2P-06)



A.6 Ordering Specifications

MCT - **DX** -

Display/Software Type -----

4DX: FDC-0450-1011-000BN 4.3" display, 11-36 Vdc power input
with MCT-DX (SD-4DX) display software

XXX: Special Order Code

Documentation -----

0: None
C: CD
U: USB Memory Stick

Special Order Code -----

00: None
XX: Special Order Code

P.O. Box 1196 Bridgeview, IL 60455
888.751.5444 Sales 888.307.8014 Fax

Technical Support: 866.342.5332
<http://www.futuredesigncontrols.com>



RoHS Compliant

Control System Options *(ordered separately as needed)*

Display Power Supply (input 100-240VAC / Output 24VDC)

DIN Rail Mount: PS5R-VB24 15W power supply (0.6A)
Open Frame: PS3X-B24AFC 15W power supply (0.6A)

Note: Either of the above will power the FDC-0450 touch screen display

System Reset Timer

GE1A-C10HA110/SR2P-06 Reset Timer and socket (DIN RAIL)

Note: Timer is recommended for proper system restart due to momentary power interruptions (<500ms) which can cause erroneous operation.

USB Memory Stick

UDF115-8GB 8GB High Capacity USB Memory Stick (3VDC)

Replacement SD Memory Card

SD-4DX 8GB High Capacity SD Memory Card (preloaded with DX43 application software)

Printed Operators Manual

Part Number [\(MCT-DX 4.3 User Manual.pdf\)](#)
MCT-DX 4.3 User Manual

USB Cables & Accessories

WPUS-BAX-05M USB panel mount adapter
WPCVR-USB USB waterproof IP67 cover (for above)
DG9025MF3 25 pin 90° adapter
DG909MF2 9 pin 90° adapter

Cable: Touch Screen Display to Dixell Control

CA2011-3D: Cable (3 meters) from Display to Dixell control.

Note: Consult factory for other lengths & options

A.7 Support and Warranty Information

SOFTWARE VERSIONS FOR FDC DX Control System

The software version levels for the DX Control system can be viewed in the offline system setup, from the System menu; select “About”. Both the HMI (Human Machine Interface – color touch screen) and loop/limit control firmware and software versions will be displayed.



When obtaining replacement parts or to get assistance for setup and/or troubleshooting purposes, it is important to have this information available to ensure that your request is processed properly and in a timely manner. It is recommended that this information be written down and kept in a readily accessible location along with this manual, so that it is available when required.

CE Net Version: _____ CE Image Version: _____
 HMI Version: _____ CE BSP Version: _____
 Dixell Model: _____



The CE Net version of the HMI for the DX control system are proprietary and only available directly from Future Design Controls.

Using similar or like components obtained from a source other than Future Design Controls will cause unexpected operation and/or malfunction of the DX control system. Any attempts to do so will be at the user’s own risk and void any and all claims or warranties with Future Design Controls.

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