

## FX06 Field Controller

The FX06 is a compact field controller in the Facility Explorer range of products. The controller is designed specifically for commercial Heating, Ventilating, Air Conditioning and Refrigeration (HVAC/R) applications.

The FX06 is a high performance controller with a powerful 16-bit microprocessor and state-of-the-art software for the precise control of many types of mechanical and electrical equipment. The controller has 17 physical inputs and outputs and supports a wide range of temperature sensors and actuating devices. Active sensors for the measurement of humidity, pressure, and other variables are also supported. The FX06 also includes an on board real-time clock to support the start-stop scheduling of equipment and real-time based control sequences.

The FX06 has an attractive Liquid Crystal Display (LCD) with a set of graphic status icons used in the most common HVAC/R applications. The controller also supports a remote panel or wall mounted Medium User Interface (MUI).

Communication modules are available to enable the controller to be integrated into an N2 Open or LONWORKS® network of a building automation system. For stand-alone applications, the FX06 field controller also features communications services to transmit event notification messages via Short Messaging Service (SMS).

The FX06 field controller is fully configurable or programmable, using the FX Tools software package, for a wide range of commercial HVAC/R applications including multi-compressor and scroll compressors, close control units, fan coil units, and unit ventilators.



**Figure 1: FX06 Controller**

<b>Features and Benefits</b>	
<input type="checkbox"/> <b>Freely Programmable Controller</b>	Suitable for a wide range of HVAC or refrigeration control applications using the extensive programming features of the FX Tools software package
<input type="checkbox"/> <b>Network Communication Module Options</b>	Provide cost effective solutions for both stand-alone and networked applications
<input type="checkbox"/> <b>Remote Communication Services</b>	Enable automatic reporting of events and alarms by Short Message Service (SMS) for stand-alone applications
<input type="checkbox"/> <b>Integral Liquid Crystal Display (LCD) User Interface with Four Control Buttons</b>	Provides on board user access to the controlled system parameters and clear representation of the application status using alpha-numeric display characters and graphic icons
<input type="checkbox"/> <b>On Board Real-Time Clock</b>	Enables real-time scheduling of control activities
<input type="checkbox"/> <b>Software Selectable Analog Inputs</b>	Allow choice of temperature and other sensors according to the control range and application
<input type="checkbox"/> <b>Analog Outputs with Pulse Width Modulated (PWM) Option</b>	Interface to a wide range of actuators and drives
<input type="checkbox"/> <b>Models with Various Output Configurations of Solid State Triacs and Line Voltage Relays</b>	Provide cost effective control of refrigeration, unitary, and small air handling unit equipment

## Onboard Inputs and Outputs

Up to 17 physical inputs and outputs can be connected to the FX06, including:

- 4 Analog Inputs (AIs) (software configurable)
  - A99 temperature
  - Ni 1000 temperature
  - PT1000 temperature
  - NTC 10 K temperature
  - Ratiometric (0.5-4.5 VDC)
  - 0-10 VDC
- 5 Digital (Binary) Inputs (DIs)
  - for voltage free contacts
  - with a pulse counter on DI1
- 6 Digital (Binary) Outputs (DOs) (model dependent)
  - 6 Relays (line voltage contacts)
  - 2 Triacs (24V), 3 Interlocked Relays, 1 Free Relay
  - 2 Triacs (24V), 4 Free Relays
- 2 Analog Outputs (AOs) (model dependent)
  - 2 x 0-10 VDC
  - 1 x 0-10 VDC and 1 x PWM (Pulse Width Modulation) (100Hz)

## Integral LCD User Interface

The integral LCD user interface of the FX06 features:

- 2 display rows with 4 alpha-numeric characters (13 segment)
- blue or red colored background
- graphic status icons: compressor, alarm, high pressure, low pressure, maintenance, heat, cool, defrost and electric heat symbols
- 4 pushbuttons for user control functions
- navigation menu for user guidance

The integral user interface is fully configurable within the application design and typically provides:

- display of status information
- display and modification of setpoints
- display and modification of configuration parameters
- display for clearing and acknowledging of active alarms
- background lighting with red color when an alarm condition exists.

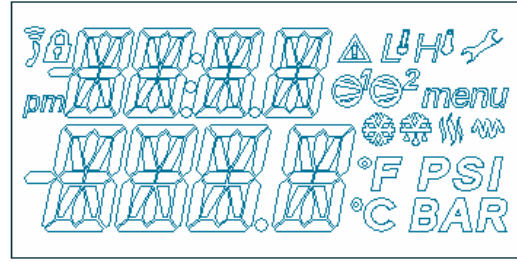


Figure 2: Detail of the LCD

## Remote User Interface

The FX06 also supports a remote user interface (MUI). The MUI has a 4 x 20 character, backlit LCD screen, 6 pushbuttons and 10 status Light-Emitting Diodes (LEDs). The display including its navigation menu is completely configurable within the FX06 application design. The following mounting styles are available:

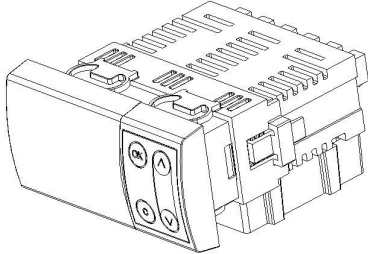
- Panel Mount: Can be mounted up to 3 m (10 ft) from the FX06 controller. This user interface is powered at 24 VAC through the FX06. A flat telephone cable is available for the connection of the power supply and data communications to the FX06 controller.
- Wall Mount: Can be mounted up to 300 m (1,000 ft) from the FX06. This user interface must be independently powered. The data communication requires a 3-wire shielded cable (not provided) for the connection to the remote display to the FX06 controller.



Figure 3: Panel or Wall Mount User Interface

## Communication Module Options

The FX06 controllers can operate stand-alone or be fitted with optional communication modules to allow connection and integration into a supervisory system. Communication modules are easily attached onto the lower part of the FX06 controller.



**Figure 4: FX06 with Communication Module**

### N2 Open Network

When fitted with an N2 Open Communication Module, the FX06 controller can be connected to the N2 Open bus of a building automation system, allowing access to its control system variables and parameters.

### LONWORKS® Network

When fitted with a LONWORKS Communication Module, the FX06 can be integrated into a LONWORKS compatible building automation system, allowing peer-to-peer communication with other LONWORKS compatible devices and access to system parameters.

## Communication Services

### RS232C Serial Card

The RS232C Serial Communication Module enables the FX06 controller to be connected to a Global System for Mobile communications (GSM) modem for event and alarm notification.

### Short Message Service (SMS)

The FX06 Field Controller can be programmed to send out text messages in SMS format when connected to a GSM modem with an appropriate transmitter and antenna. SMS messages can be sent to a telephone service center or directly to a mobile telephone.

Messages are sent when an event goes into the active or alarm state and can be directed to a prioritized list of destinations.

## Real-Time Clock

The FX06 controller has an embedded real-time clock that supports all real-time functions including the display of time and date on the user interface and the time stamping of events.

The real-time clock also enables the time scheduling of start and stop commands and setpoint changes to the plant that is being monitored and controlled. Scheduled commands may be configured to execute on one or more days of the week, and an exception day calendar allows for alternative time schedules on holidays or during special periods in the year. Time schedules may be displayed and edited on a remote user interface.

The real-time clock is battery backed with an average battery capacity of more than 10 days without power at room temperature.

## Event Management

The FX06 controller detects and displays events and alarms that are associated with up to 20 data points or variables in the control application.

Application events indicate to the user that the controlled equipment requires attention or that the controlled conditions are not within the expected limits. Examples of alarms include:

- analog value is outside of a desired range
- status value represents a condition that is not normal

Active alarms may be viewed, acknowledged, or cleared via the integral or remote user interface.

## Room Command Module

The Room Command Module is designed for use with the FX field controllers, including the FX06. All models feature an internal temperature sensor and a dial allowing the occupant to adjust the temperature setpoint value or request a warmer or cooler setpoint. Certain models also have a dial to enable the occupant to override the speed of a three-speed fan.

The push button and LED indicator are configurable within the application. A typical application is to configure the push button to allow initiation of a temporary occupancy period, at nights or weekends for example, and the LED to provide occupancy status indication.



**Figure 5: Room Command Module**

The Room Command Module for North America is marked with dual temperature units (°F and °C).

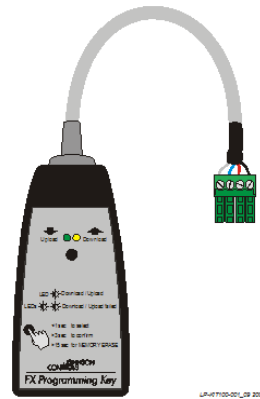
## FX Tools

FX Tools is a software suite used to program, download, test, and commission the Facility Explorer devices, including the FX06 field controller. FX Tools software is available in two versions: FX Tools Express and FX Tools Pro. They comprise one or more of the following, depending on the version:

- FX Builder Express: Used to select a standard application and configure it using a graphical user interface.
- FX Builder: Used to program an FX06 controller. FX Builder provides complete flexibility in programming the FX06 controller.
- FX CommPro: Used to download, test, and commission an FX06 controller on an N2 Open bus.
- FX CommPro LON: Used to download, test, and commission an FX06 controller on a LONWORKS network.

## Programming Key

The FX06 is a fully programmable or configurable controller and the application can be downloaded to the controller via computer with FX Tools or uploaded/downloaded via the FX Programming Key.



**Figure 6: FX Programming Key**

**IMPORTANT:** Use this FX06 controller only as an operating control. Where failure or malfunction of the FX06 could lead to personal injury or damage to the controlled equipment or other property, additional precautions must be designed into the control system. Incorporate and maintain other devices such as supervisory or alarm systems or safety or limit controls that are intended to warn of, or protect against, failure or malfunction of the FX06 controller.

### FX06 Field Controller Dimensions

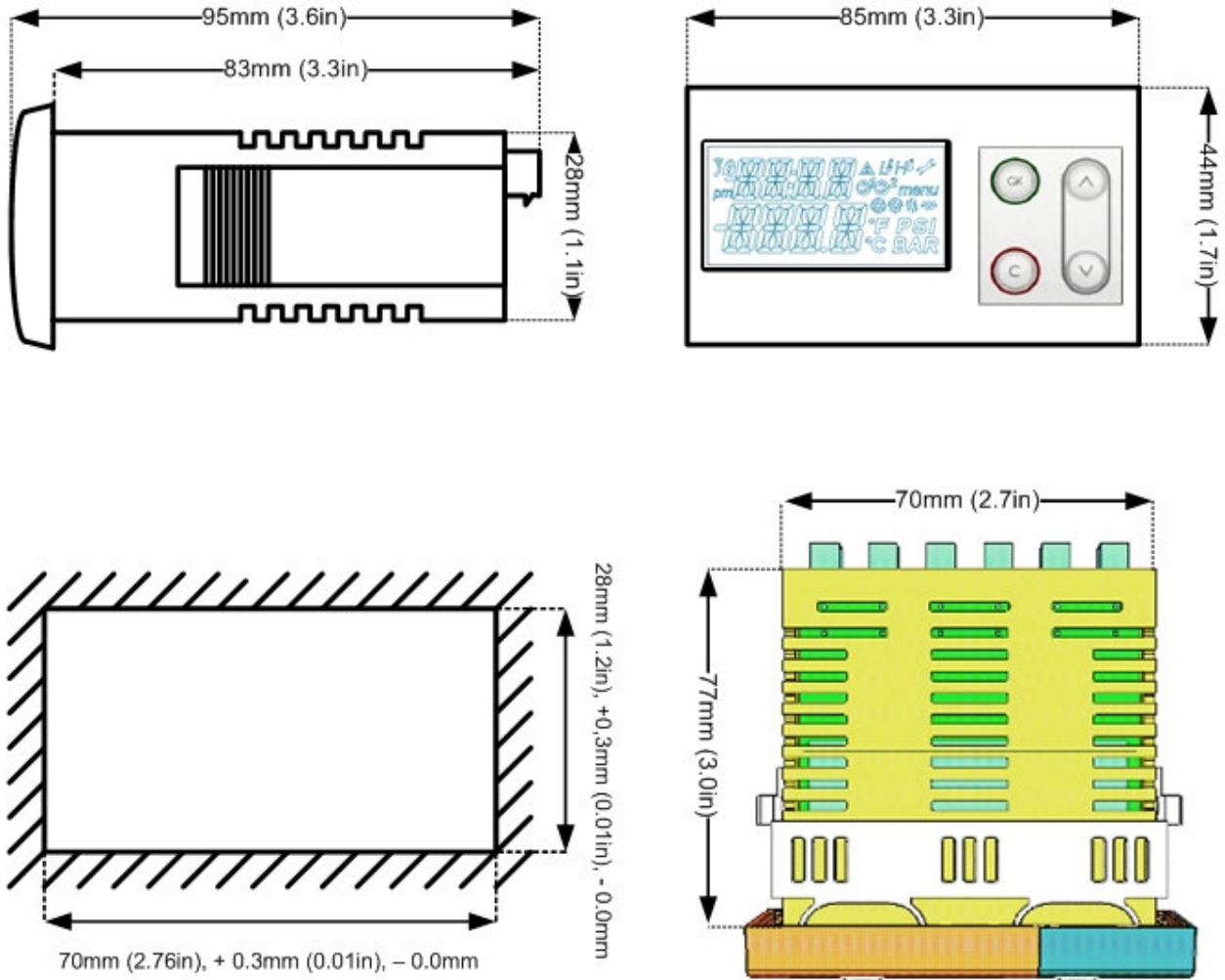


Figure 7: FX06 Controller and Panel Cut-Out Dimensions

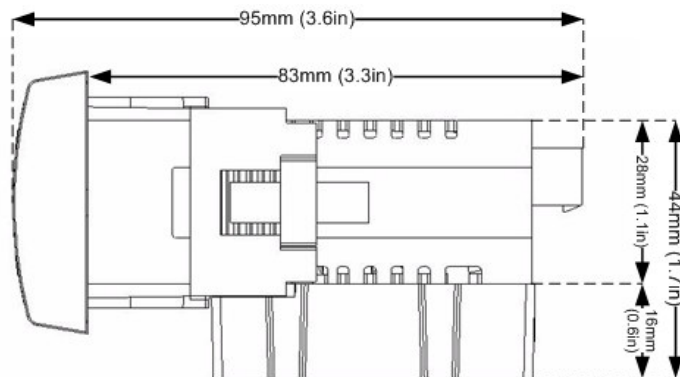


Figure 8: FX06 Dimensions Including Communication Module

## Ordering Codes

Tables 1 through 6 give ordering information for the FX06 Controllers, FX06 Accessories, Room Command Modules and Configuration Software.

**Table 1: FX06 Field Controller Ordering Information**

Product Code Number	Description
LP-FX06P00-000C	FX06 Controller: 2 AOs (0-10V), 6 BOs (Relays)
LP-FX06P00-000D	FX06 Controller: 2 AOs (0-10V), 6 BOs (Relays), Bulk package
LP-FX06P01-000C	FX06 Controller: 2 AOs (0-10V), 6 BOs (Relays), N2 Open Module, 1 cable set
LP-FX06P02-000C	FX06 Controller: 2 AOs (0-10V), 6 BOs (Relays), LONWORKS Module, 1 cable set
LP-FX06P03-000C	FX06 Controller: 2 AOs (0-10V), 6 BOs (Relays), RS232C Module, 1 cable set
LP-FX06P10-000C	FX06 Controller: 2 AOs (1 0-10V,1 PWM (Factory setting)), 6 BOs (Relays)
LP-FX06P10-000D	FX06 Controller: 2 AOs (1 0-10V,1 PWM (Factory setting)), 6 BOs (Relays), Bulk Package
LP-FX06P11-000C	FX06 Controller: 2 AOs (1 0-10V,1 PWM (Factory setting)), 6 BOs (Relays), N2 Open Module, 1 cable set
LP-FX06P12-000C	FX06 Controller: 2 AOs (1 0-10V,1 PWM (Factory setting)), 6 BOs (Relays), LONWORKS Module, 1 cable set
LP-FX06P13-000C	FX06 Controller: 2 AOs (1 0-10V,1 PWM (Factory setting)), 6 BOs (Relays), RS232C Module, 1 cable set
LP-FX06P20-000C	FX06 Controller: 2 AOs (0-10V), 6 BOs (4 Relays, 2 Triacs)
LP-FX06P20-000D	FX06 Controller: 2 AOs (0-10V), 6 BOs (4 Relays, 2 Triacs), Bulk package
LP-FX06P21-000C	FX06 Controller: 2 AOs (0-10V), 6 BOs (4 Relays, 2 Triacs), N2 Open Module, 1 cable set
LP-FX06P22-000C	FX06 Controller: 2 AOs (0-10V), 6 BOs (4 Relays, 2 Triacs), LONWORKS Module, 1 cable set
LP-FX06P23-000C	FX06 Controller: 2 AOs (0-10V), 6 BOs (4 Relays, 2 Triacs), RS232C Module, 1 cable set
LP-FX06P30-000C	FX06 Controller: 2 AOs (0-10V), 6 BOs (3 Interlocked Relays, 1 Free Relay, 2 Triacs)
LP-FX06P30-000D	FX06 Controller: 2 AOs (0-10V), 6 BOs (3 Interlocked Relays, 1 Free Relay, 2 Triacs), Bulk package
LP-FX06P31-000C	FX06 Controller: 2 AOs (0-10V), 6 BOs (3 Interlocked Relays, 1 Free Relay, 2 Triacs), N2 Open Module, 1 cable set
LP-FX06P32-000C	FX06 Controller: 2 AOs (0-10V), 6 BOs (3 Interlocked Relays, 1 Free Relay, 2 Triacs), LONWORKS Module, 1 cable set
LP-FX06P33-000C	FX06 Controller: 2 AOs (0-10V), 6 BOs (3 Interlocked Relays, 1 Free Relay, 2 Triacs) RS232C Module, 1 cable set

**Table 2: Communication Module Ordering Information**

Product Code Number	Description
LP-NET061-000C	N2 Open Communication Module
LP-NET062-000C	LONWORKS® Communication Module
LP-NET063-000C	RS232C Communication Module

**Table 3: Accessories Ordering Information**

Product Code Number	Description
LP-KIT006-010C	Cable set for LP-FX06Px0-000C OEM models delivered without a cable set.
LP-KIT007-005C	Link cable for the connection of the FX06 to the Panel Mount MUI display – 3 m (9.8 ft)
LP-KIT100-000C	FX Programming Key
DT-9100-8901	Power Supply Adapter for Programming Key: 230 VAC/12 VDC

**Table 4: Room Command Modules (80mm x 80mm, °C) Available in Europe**

Product Code Number	Description
TM-2140-0000	Room Sensor Module, temperature sensor only
TM-2150-0000	Room Sensor Module, occupancy button and LED
TM-2160-0000	Room Sensor Module, 12-28 °C setpoint dial, occupancy button and LED
TM-2160-0002	Room Sensor Module, 12-28 °C setpoint dial, occupancy button and LED, fan speed override
TM-2160-0005	Room Sensor Module, +/- setpoint dial, occupancy button and LED
TM-2160-0007	Room Sensor Module, +/- setpoint dial, occupancy button and LED, fan speed override
TM-2190-0000	Room Sensor Module, 12-28 °C setpoint dial
TM-2190-0005	Room Sensor Module, +/- setpoint dial

**Table 5: Room Command Modules (80mm x 120mm, °F/°C) Available in North America**

Product Code Number	Description
TM-2141-0000	Room Sensor Module, temperature sensor only
TM-2151-0000	Room Sensor Module, occupancy button and LED
TM-2161-0000	Room Sensor Module, 54-82 °F/12-28 °C setpoint dial, occupancy button and LED
TM-2161-0002	Room Sensor Module, 54-82 °F/12-28 °C setpoint dial, occupancy button and LED, fan speed override
TM-2161-0005	Room Sensor Module, +/- setpoint dial, occupancy button and LED
TM-2161-0007	Room Sensor Module, +/- setpoint dial, occupancy button and LED, fan speed override
TM-2191-0000	Room Sensor Module, 54-82 °F/12-28 °C setpoint dial
TM-2191-0005	Room Sensor Module, +/- setpoint dial

**Table 6: User Interfaces Ordering Information**

Product Code Numbers	Description
LP-DIS60P10-0C	Remote Medium User Interface (MUI) - Panel Mount
LP-DIS60P11-0C	Remote Medium User Interface (MUI) - Wall Mount

**Table 7: Software Ordering Information**

Product Code Number	Description
LP-FXTPRO-0	FX Tools Pro CD-Rom (FX Builder, FX Builder Express, FX CommPro N2, FX CommPro Lon)
LP-FXTEXP-0	FX Tools Express CD-Rom (FX Builder Express, FX CommPro N2)

## Technical Specifications

**Table 8: FX06 Field Controller (Part 1 of 2)**

<b>Product Codes</b>	LP-FX06xxx-xxxC		
<b>Power Requirements</b>	24 VAC/VDC $\pm 15\%$ , 50/60 Hz – SELV (Europe) – Class 2 North America		
<b>Power Consumption</b>	7 VA maximum		
<b>Housing Material</b>	ABS + polycarbonate, self-extinguishing: UL 94-5VB flammability rating		
<b>Protection Class</b>	Front Plate (when mounted in panel) IP55; Rear Enclosure IP20		
<b>Ambient Operating Conditions</b>	-20 °C (-4 °F) to 50 °C (122 °F) 10 to 95 % RH (noncondensing)		
<b>Ambient Storage Conditions</b>	-40 °C (-40 °F) to +70 °C (158 °F) 10 to 95 % RH (noncondensing)		
<b>Power Supply Outputs</b>	24VAC/DC for panel mount MUI (from controller power supply input) 15 VDC 20 mA power supply for active sensors 5 VDC 15 mA power supply for ratio-metric sensors		
<b>Analog Inputs</b>	16 bit resolution – not isolated		
	Sensor Type	Range	Accuracy at 20 °C (68 °F) (sensor not included)
	A99	-40 to 100 °C (-40 to 212 °F)	$\pm 0.5$ °C ( $\pm 1$ °F)
	NTC 10K	-20 to 70 °C (-4 to 158 °F)	$\pm 0.5$ °C ( $\pm 1$ °F)
	PT1000 Extended	-40 to 160 °C (-40 to 320 °F)	$\pm 1$ °C ( $\pm 1.8$ °F)
	Ni1000	-40 to 120 °C (-40 to 248 °F)	$\pm 1$ °C ( $\pm 1.8$ °F)
	Active Voltage	0-10 VDC	$\pm 0.1$ VDC
	Active Ratio-metric	0.5-4.5 VDC	$\pm 0.05$ VDC
<b>Display Range and Resolution</b>	-999 to 999 or -99.9 to 99.9		
<b>Digital Inputs:</b>	Voltage free contacts Transition counter function on DI1 at 50Hz (minimum 10ms ON and minimum 10ms OFF)		
<b>Analog Outputs:</b>	0...10 VDC, max. 3 mA, 16 bit resolution - not isolated	For actuating and control devices	
	Pulse Width Modulation (PWM) Signal at 100Hz cycle frequency with 15 VDC/10 mA reference signal	For fan speed controllers with PWM input	
<b>Continued on next page . . .</b>			



**FX06 Field Controller Technical Specifications (Part 2 of 2)**

<b>Relay Outputs</b>	Dielectric test voltage on open relay contact: 1,000 VAC RMS Maximum relay switching rate at nominal load: 6 operations/min Rated circuit breaking capacity at 250 VAC: 500 VA			
<b>Digital Outputs for Selected Models</b>	<b>Model</b>	<b>Channel</b>	<b>Type</b>	<b>Remark/Application</b>
	FX06P0x / P1x	DO1 – DO6	SPST 3(1)A, 250 VAC relay	Each relay contact is independent with its own common terminal.
	FX06P2x / P3x	DO1, DO2	0.5A / 24 VAC triacs	3-point incremental actuators, thermal actuators, etc
DO3 – DO6		SPST 3(1)A, 250 VAC relay	On the <b>FX06P2x</b> models, each relay contact is independent with its own common terminal. On the <b>FX06P3x</b> model, DO3, DO4, DO5 relays are physically interlocked such that only one output can be closed at one time. Application: 3-speed fan motors. The DO6 relay is independent.	
<b>Connections</b>	Molex® connectors. Mating connectors and cables provided with controller or available to order. See <i>Order Codes</i> .			
<b>Dimensions (H x W x D)</b>	See Figures 5 and 6.			
<b>Compliance</b>	<p><b>Europe</b> – 89/336/EEC, EMC Directive: EN 61000-6-3, EN 61000-6-2 – 72/23/EEC, Low Voltage Directive: EN 60730</p> <p><b>Canada</b> – UL Listed (PAZX7), CAN/CSA C22.2 No. 205, Signal Equipment. UL Recognized (XAPX8), CAN/CSA C22.2 No. 24, Temperature Indicating and Regulating Equipment. Industry Canada, ICES-003.</p> <p><b>United States</b> – UL Listed (PAZX), UL 916, Energy Management Equipment. UL Recognized (XAPX2), UL 873, Temperature Indicating and Regulating Equipment. FCC compliant to CFR 47, Part 15, Subpart B, Class A.</p>			

*The performance specifications are nominal and conform to acceptable industry standards. For application at conditions beyond these specifications, consult the local Johnson Controls office. Johnson Controls, Inc. shall not be liable for damages resulting from misapplication or misuse of its products.*



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