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FX15 Field Controller

The FX15 Field Controller (FX15 Classic) is a high performance field controller in the Facility Explorer system specifically designed for commercial Heating, Ventilating, and Air Conditioning (HVAC) and refrigeration applications such as chillers and rooftops, indoor packaged air conditioning units, Air Handling Units (AHUs), and close control units.

The FX15 has 27 physical inputs and outputs and supports a wide range of temperature sensors and actuating devices. Up to 64 additional physical inputs and outputs may be achieved by adding the XT/XP expansion modules on the Local N2 Open bus.

The FX15 is fully programmable or configurable, using the FX Tools software package, for a wide range of commercial HVAC and refrigeration applications. The FX15 controller can be fitted with an optional communication card for integration into an N2 Open or LONWORKS® compatible Building Automation System.

The FX15 also includes an onboard Real-Time Clock to support the start-stop scheduling of equipment and real-time based control sequences.



Figure 1: FX15 with Integrated Medium User Interface (MUI) Display

Features and Benefits	
Modular Communication Card Options	Provides cost effective method for either stand-alone or networked capabilities
Onboard Real-Time Clock	Allows real-time scheduling of control activities
Freely Programmable or Configurable Using FX Tools Software Package	Adapts to a wide range of HVAC or refrigeration control applications using the extensive programming features of the FX Tools software package
Software Selectable Analog Inputs	Allows choice of temperature sensor according to the control range and application
User Interfaces, Integrated or Remote	Provides clear data presentation in numerical and text format on Liquid Crystal Display (LCD) 4 x 20 character display to manage the controlled system

Onboard Inputs and Outputs (I/Os)

Up to 27 physical inputs and outputs can be connected to the FX15, including:

- 6 Analog Inputs (AIs)
- 8 Digital (Binary) Inputs (DIs) - for voltage free contacts
- 9 Digital Outputs (DOs) (4 Relays - line voltage contacts - and 5 Relays - line voltage contacts - or 5 Triacs - 24 VAC)
- 4 Analog Outputs (AOs) (0 - 10 V)

Scalable I/O Expansions

The input/output capacity of the FX15 may be extended by connecting up to four XT extension modules via the Local Link N2 Bus. Expansion modules provide input/output capability for the XT extension modules.

The available connectable expansions modules are:

- XT91D00 Extension Module
- XP91D02 6 universal AIs + 2 AOs
- XP91D03 8 DOs (triacs)
- XP91D04 4 DIs + 4 DOs (triacs)
- XP91D05 8 DIs
- XP91D06 4 DOs (Relays) 230 VAC (Europe only)
- XP91D07 4 DOs (Relays) 24 VAC (North America only)

User Interfaces

The FX15 allows for two types of user interfaces: Medium or Large.

Medium User Interface (MUI)

The MUI includes a 4 x 20 character, backlit LCD, 6 pushbuttons, and 10 discreet status Light-Emitting Diodes (LEDs). The MUI display and navigation is completely customizable within the FX15 application. The following mounting styles are available:

- Integrated: Can be mounted directly on top of the controller.
- Local: Can be mounted up to 3 m (10 ft) from the FX15 controller. This user interface is powered by the FX15. The LP-KIT007-000C is a flat telephone cable needed for connection of power supply and data communications to the FX15.

- Remote: Can be mounted up to 300 m (1,000 ft) from the FX15. This User Interface (UI) must be independently powered. The data communication requires a 3-wire shielded cable (not provided) connected to the Remote Display Connection of the FX15.



Figure 2: Remote or Local MUI

Large User Interface

The Large User Interface (LUI) includes a 4 x 20 character, backlit LCD, 28 pushbuttons, and 66 discreet status LEDs. The Large User Interface must be independently powered, and can be flush mounted, wall mounted, or hand held. The LUI display and navigation is completely customizable for the FX15 application using the FX Tools software package. Custom front plate templates may be ordered, based on minimum quantity.



Figure 3: Large User Interface

Alarm Management

The FX15 manages and records alarms associated with up to 12 data points or variables in the control application.

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

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

The table of active alarms may be viewed on the available UIs.

Supervisory Options

The FX15 can be integrated into a supervisory building automation system for continuous monitoring of the control system. The FX15 supports two methods of integration:

N2 Open Network

When fitted with an N2 Open Communication Card, the FX15 can be connected to an N2 Open compatible building management system, allowing access to its control system variables and parameters.

LONWORKS® Network

When fitted with a LONWORKS Communication circuit card, the FX15 can be connected to a LONWORKS compatible building management system, allowing peer-to-peer communication with other LONWORKS compatible devices.

Real-Time Clock

The FX15 has an embedded real-time clock that supports all real-time functions, including the display of time and date on the optional user interface and the time stamping of events. The real-time clock enables the time scheduling of start and stop commands and set point changes to the equipment 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 the available UI.

The real-time clock has a battery backup with an average life of more than 2 years.

FX Tools

FX Tools Pro is a software suite used to program, download, test, and commission the FX devices, including the FX15. FX Tools is available in two versions: FX Tools Express and FX Tools Pro. They consist of one or more of the following, depending on the version:

- FX Builder Express: Used to select an FX15 application and configure it using graphical plug-ins
- FX Builder: Used to fully program an FX15. FX Builder provides complete flexibility in programming the FX15.
- FX CommPro N2: Used to download, test, and commission an FX15 on an N2 bus.
- FX CommPro LON: Used to download, test, and commission an FX15 on a LONWORKS network.

Application Upload/Download

The FX15 is a fully programmable or configurable controller and the application can be downloaded to the controller via computer with the FX Tools Pro or uploaded/downloaded via the FX programming key (Figure 4).

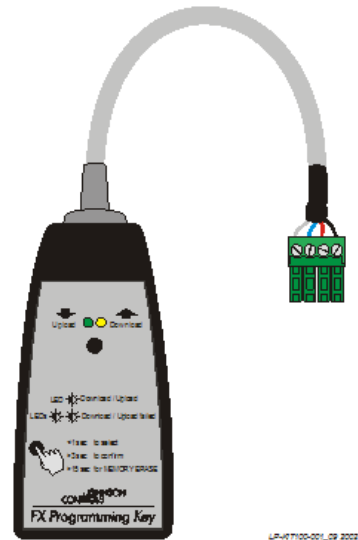


Figure 4: FX Programming Key

FX15 Controller Dimensions

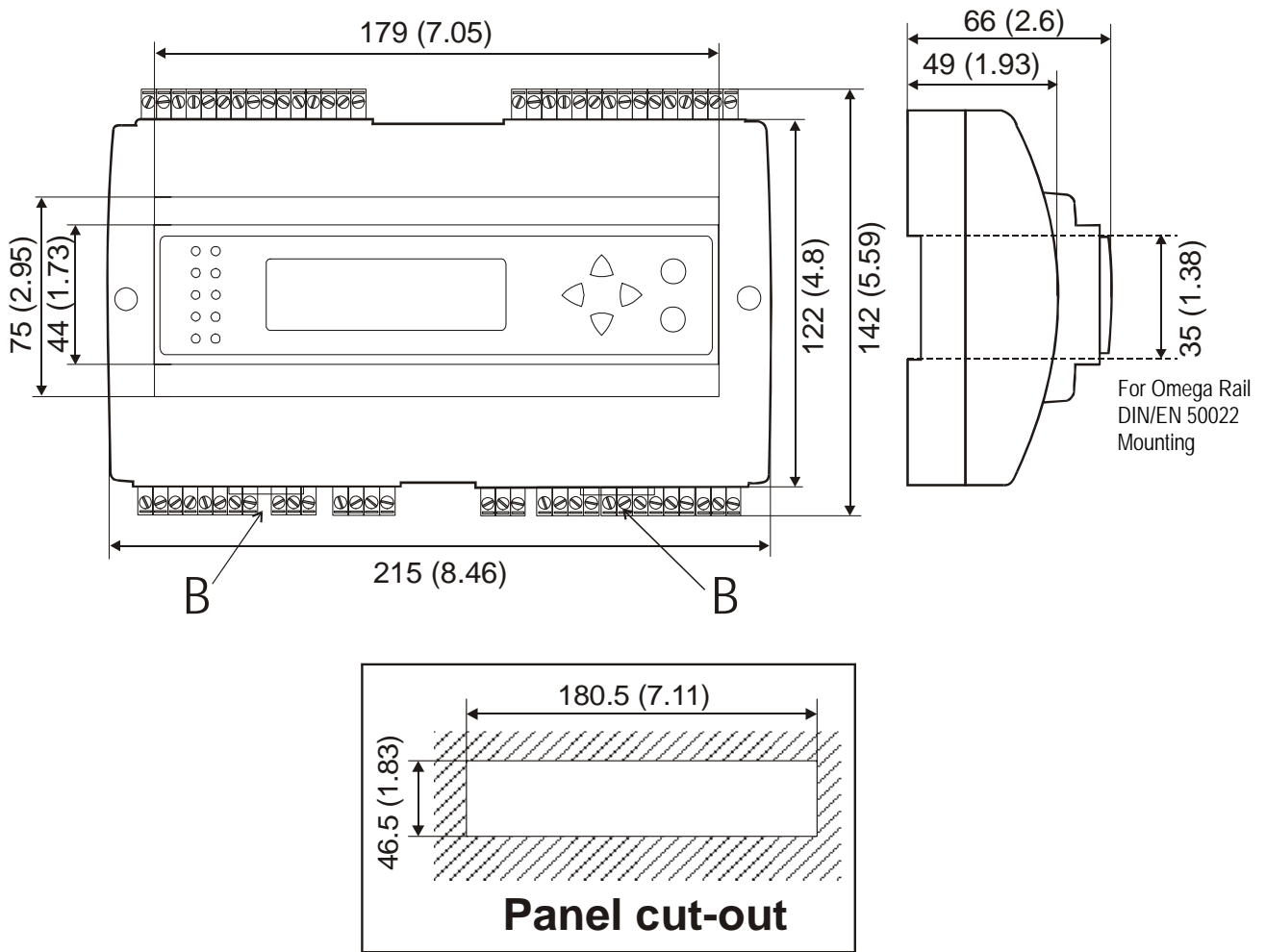


Figure 5: FX15 with Integrated MUI and Panel Cut-Out Dimensions, mm (in.)

Ordering Codes

Table 1: Standard Temperature Range Controllers Ordering Information

Product Code Number	Description
LP-FX15D10-000C	FX15: Digital Outputs: 4 Relays + 5 Triacs
LP-FX15D11-000C	FX15: Digital Outputs: 4 Relays + 5 Triacs. Includes N2 Open Card.
LP-FX15D12-000C	FX15: Digital Outputs: 4 Relays + 5 Triacs. Includes LONWORKS Card.
LP-FX15D60-000C	FX15: Digital Outputs: 4 Relays + 5 Triacs. Includes Integrated MUI.
LP-FX15D61-000C	FX15: Digital Outputs: 4 Relays + 5 Triacs. Includes N2 Open Card and Integrated MUI.
LP-FX15D62-000C	FX15: Digital Outputs: 4 Relays + 5 Triacs. Includes LONWORKS Card and Integrated MUI.
LP-FX15D20-000C	FX15: Digital Outputs: 9 Relays
LP-FX15D21-000C	FX15: Digital Outputs: 9 Relays. Includes N2 Open Card.
LP-FX15D22-000C	FX15: Digital Outputs: 9 Relays. Includes LONWORKS Card.
LP-FX15D70-000C	FX15: Digital Outputs: 9 Relays. Includes Integrated MUI.
LP-FX15D71-000C	FX15: Digital Outputs: 9 Relays. Includes N2 Open Card and Integrated MUI.
LP-FX15D72-000C	FX15: Digital Outputs: 9 Relays. Includes LONWORKS Card and Integrated MUI.

Table 2: Extended Temperature Range Controllers Ordering Information

Product Code Numbers	Description
LP-FX15X10-000C	FX15: Digital Outputs: 4 Relays + 5 Triacs
LP-FX15X11-000C	FX15: Digital Outputs: 4 Relays + 5 Triacs. Includes N2 Open Card.
LP-FX15X12-000C	FX15: Digital Outputs: 4 Relays + 5 Triacs. Includes LONWORKS Card.
LP-FX15X20-000C	FX15: Digital Outputs: 9 Relays
LP-FX15X21-000C	FX15: Digital Outputs: 9 Relays. Includes N2 Open Card.
LP-FX15X22-000C	FX15: Digital Outputs: 9 Relays. Includes LONWORKS Card.

Table 3: Communications Cards Ordering Information

Product Code Numbers	Description
LP-NET151-010C	N2 Open Communication Card
LP-NET152-010C	LONWORKS Communication Card

Table 4: Accessories Ordering Information

Product Code Numbers	Description
LP-KIT007-000C	Link Interface cable (3 m/9.8 ft) for the connection of the FX15 to the MUI/LUI user interfaces
DT-9100-8902	LUI Wall Mounting Kit
NP-PWR1209	LUI Power Adapter (120 VAC/12 VDC)
DT-9100-8901	LUI Power Adapter (230 VAC/12 VDC)
LP-KIT015-000C	Kit of Female Screw Connectors
LP-KIT015-001C	Kit of Female Cage Clamp Connectors
LP-KIT100-000C	FX Programming Key

Table 5: Demo Case Ordering Information

Product Code Numbers	Description
DEMO-FX15-071	Demo Case: Includes FX15 Demo Controller with Integrated MUI and N2 Open Card, 230 V.
DEMO-FX15-072	Demo Case: Includes FX15 Demo Controller with Integrated MUI and LONWORKS Card, 230 V.
DEMO-FX15-081	Demo Case: Includes FX15 Demo Controller with Integrated MUI and N2 Open Card, 120 V.
DEMO-FX15-082	Demo Case: Includes FX15 Demo Controller with Integrated MUI and LONWORKS Card, 120 V.
LP-FX15DEM-010C	FX15 Demo Controller: Includes Integrated MUI and N2 Open Card, with DEMO ID.
LP-FX15DEM-011C	FX15 Demo Controller: Includes Integrated MUI and LONWORKS Card, with DEMO ID.

Table 6: User Interfaces Ordering Information

Product Code Numbers	Description
LP-DIS65P10-0C	Large User Interface
LP-DIS60P10-0C	Medium User Interface (Local Mount)
LP-DIS60P11-0C	Medium User Interface (Remote Mount)
LP-DIS60U10-C	Medium User Interface (Integral Mount)

Table 7: Expansion I/O Modules Ordering Information

Product Code Numbers	Description
LP-XT91D00-000C	Extension Module
LP-XP91D02-000C	Expansion Board: 6 AIs, 2 AOs
LP-XP91D03-000C	Expansion Board: 8 DOs (triacs)
LP-XP91D04-000C	Expansion Board: 4 DIs, 4 DOs (triacs)
LP-XP91D05-000C	Expansion Board: 8 DIs
LP-XP91D06-000C	Expansion Board: 4 DOs (relays) 230 VAC (Europe only)
LP-XP91D07-000C	Expansion Board: 4 DOs (relays) 24 VAC (North America only)

Table 8: Software Tools Ordering Information

Product Code Numbers	Description
LP-FXTPRO-0	FX Tools Pro CD (FX Builder, FX Builder Express, FX CommPro N2, FX CommPro LON)
LP-FXTEXP-0	FX Tools Express CD (FX Builder Express, FX CommPro N2)

Technical Specifications

Table 9: I/O Details

Terminals	Channel	Type	Remark/Application
Analog Input (AI)			
TB1	AI1, AI2, AI3, AI4, AI5, AI6	See table below. 16-bit resolution	Freely software configurable. Application: temperature, humidity, or pressure
3, 8	EXT-VDC	+16 V, 80 mA	0 - 10 V Sensors or max no. 4 0/4 - 20 mA Sensors
13	AVPS/ EXT-VDC	AVPS = +5 V, 20 mA EXT-VDC = +16 V, 80 mA	To power directly from the FX15 ratiometric sensors, with AVPS or 0 - 10 V, 0/4 - 20 mA Sensors with EXT-VDC. The selection between AVPS and EXT-VDC is done by jumpers.
Digital Input (DI)			
TB2	DI1, DI2, DI3, DI4, DI5, DI6, DI7, DI8	Potential free contacts	The insulation from the microprocessor is achieved if a different 24 VAC power supply from the one used to power the controller is used to power the digital inputs (through Terminals 34, 35). Transition counter function maximum 500 ms on and 500 ms off (1 Hz). For quicker counter function, use the LP-XP91D05 module.
Digital Output (DO)			
TB3	DO1, DO2, DO3	SPST 8(3)A, 250 V power relays	There is double insulation between the relays, and they can be used at different voltages from one another.
TB4	DO4, DO5	SPST 5(3)A, 250 V power relays or 0.5A, 24 VAC triacs	This group is double insulated from the other relays, but they share the same common between them; therefore, they have to be connected at the same voltage.
TB5	DO6, DO7, DO8	SPST 5(3)A, 250 V power relays or 0.5A, 24 VAC triacs	This group is double insulated from the other relays, but they share the same common between them; therefore, they have to be connected at the same voltage.
TB6	FAIL	SPDT 8(3)A, 250 V power relay	Fail relay for enhanced security. The relay returns to its NC position not only at power fail, but also in case the microprocessor should fail: watch-dog, brown-out, etc.
Analog Output (AO)			
TB7	AO1, AO2	0...10 VDC 16 bit resolution	The insulation from the microprocessor is achieved if a different 24 VAC power supply from the one used to power the controller is used to power the analog outputs.
TB8	AO3, AO4	0...10 VDC 16-bit resolution	The insulation from the microprocessor is achieved if a different 24 VAC power supply from the one used to power the controller is used to power the analog outputs (through Terminals 79, 80).

Table 10: Available Sensor Types

Sensor Type	Linearization Range	Accuracy @ 20°C (68°F) ambient
Ni1000 JCI	-45°C (-49°F) to 120°C (248°F)	+/- 0.5°C (+/- 1°F)
Ni1000 JCI Extended	20°C (68°F) to 287°C (548.6°F)	+/- 0.5°C (+/- 1°F)
Ni1000 Siemens™	-50°C (-58°F) to 160°C (320°F)	+/- 0.5°C (+/- 1°F)
Ni1000 DIN	-60°C (-76°F) to 180°C (356°F)	+/- 0.5°C (+/- 1°F)
Pt1000	-50°C (-58°F) to 605°C (1121°F)	+/- 0.5°C (+/- 1°F)
A99	-50°C (-58°F) to 110°C (230°F)	+/- 0.5°C (+/- 1°F)
NTC 2.2K	-40°C (-40°F) to 150°C (302°F)	+/- 0.5°C (+/- 1°F)
0 to 5 VDC ratiometric	10 to 90% of supply voltage	0.3%
0 to 10 VDC	0 to 10 Volts	0.3%
0 to 20 mA	0 to 20 mA	0.3%

Table 11: FX15 Standard and Extended Range Models (Extended Range Information in Bold)

Product Codes	LP-FX15Dxx-000C (see Table 1 for Standard Range Models) LP-FX15Xxx-000C (see Table 2 for Extended Range Models)	
Power Supply Requirements	24 VAC ±15%, 50/60 Hz - Class 2 Power Supply – SELV in Europe	
Power Consumption	15 VA at max load	
Protection Class	IP20 controller IP40 integrated MUI	
Ambient Operating Conditions	STD controller: -20°C (-4°F) to +50°C (122°F), 10 to 95% RH (noncondensing) Extended range controller: -40°C (-40°F) to +60°C (140°F), 10 to 95% RH (noncondensing)	
Ambient Storage Conditions	-20°C (-4°F) to +70°C (158°F), 10 to 95% RH (noncondensing)	
Dimensions (H x W x D)	142 mm (5.6 in.) x 215mm (8.5 in.) x 49 mm (1.9 in.)	
Weight (with package)	0.74 kg (1.6 lb)	
Connection Terminals for Signals and Power Supply	Screw terminals for max 1 x 1.5 mm ² (AWG16) wires, included in the package.	
LON/N2 Open Bus Connection Terminals	Screw terminals, cable size 0.2 to 1.5 mm ² , AWG24 to AWG16, included in the package. Belden cable, 2-core twisted pair with shield ≥ 0.8 mm (AWG20)	
Connection Terminals for Extension Bus and Remote Display	Screw terminals, cable size 0.2 to 1.5 mm ² , AWG24 to AWG16, included in the package.	
Single Cable Lengths <i>Digital Inputs DI1 - DI8</i> <i>Analog Inputs AI1 - AI6</i> <i>Triac outputs (when present)</i> <i>Analog Outputs AO1 - AO4</i> <i>Remote Display</i> <i>Extension Modules</i> Display and Extensions Cable Type	Max. 100 m (328 ft) with wire ≥ 0.6 mm (AWG22) Max. 100 m (328 ft) with wire ≥ 0.6 mm (AWG22) Max. 100 m (328 ft) with wire = 1.5 mm ² (AWG16) Max. 100 m (328 ft) with wire + 1.5 mm ² (AWG16) Max. 3 m (10 ft) if display is powered by controller. Max. 1 km (0.6 miles) if display independently powered. Max. 1 km (0.6 miles) Belden 4-core, twisted pair, shielded, ≥ 0.8 mm (AWG20)	
Compliance	Europe	– 89/336/EEC, EMC Directive: EN 61000-6-3, EN 61000-6-1 – 72/23/EEC, Low Voltage Directive: EN 60730
	Canada	– 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
	United States	– 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

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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