

FX20/FX60 Supervisory Controllers

The FX20 and FX60 are Web-based supervisory-class controllers in the Facility Explorer product family. The FX20/FX60 manages networks of field controllers using open communication protocols, such as N2, LONWORKS®, and BACnet® protocols. The FX20/FX60 supports a full set of building automation features specifically designed for commercial facilities such as scheduling, alarming, histories, data sharing, energy management, totalization, and customized control routines.

The FX20/FX60 includes a graphical system user interface and configuration tool that you can access with a Web browser. Remote access is easily achieved from an Internet, intranet, or dial-up connection. Multiple users can concurrently connect to the FX20/FX60. Security and presentation preferences are managed through user profiles, logon IDs, and passwords.

The FX20 and FX60 are very similar in physical size and overall capabilities. The main difference between the controllers is the superior capacity of the FX60.

In addition, the FX20/FX60 hardware and software design is modular, so you can add accessories such as communications cards, input and output modules, and software options if needed. This also allows you to select the controller most appropriate for the size of your facility and those options best needed to control it.



Figure 1: FX60 Supervisory Controller

Features and Benefits	
<input type="checkbox"/> Web-Based User Interface	Provides rich, graphical displays for system operation and analysis.
<input type="checkbox"/> Adoption of Industry Standard Communication Protocols	Allows for the integration of a wide variety of field controllers. This includes Facility Explorer field controllers and controllers provided by others without intermediate gateways or translators.
<input type="checkbox"/> Embedded Configuration Tool	Requires no proprietary or desktop software to configure the FX20/FX60. You only need a Web browser for basic configuration and monitoring.
<input type="checkbox"/> Modular Design	Allows you to select only those components needed to meet specific project requirements.
<input type="checkbox"/> Small, Compact Design	Installs easily.
<input type="checkbox"/> FX Workbench	Reduces engineering and installation time by easily and quickly creating the FX20/FX60 database from field controller configurations.

Overview

The FX20/FX60 provides integrated control supervision and network management services for one or more local networks of field controllers. The FX20/FX60 monitors and controls Heating, Ventilating, and Air Conditioning (HVAC); lighting; and other electrical systems to:

- provide system-wide coordination
- improve occupant comfort
- reduce energy usage
- optimize operating efficiencies

The FX20/FX60 organizes system information into displays, reports, and graphics that users can access via a Web browser.

The FX20/FX60 is housed in a compact, DIN rail mount enclosure. The controller capacity and performance requirements make it ideally suited for:

- supervisory control of small- to large-sized facilities
- distributed supervisory control within larger facilities or between facilities
- direct control of equipment

Communication Interfaces

The FX20/FX60 supports multiple embedded and optional communication interfaces. This enables the FX20/FX60 to integrate many different types of field controllers, as well as provide different methods of remote access.

Embedded communication interfaces include the following:

- 2 Ethernet ports: 10/100 Mbps
- 1 RS-485 port: non-isolated
- 1 RS-232 port

In addition, the FX20/FX60 has two option slots to add communication cards to expand its networking capabilities. Optional communication cards include the following:

- LONWORKS: 78 Kbps FTT-10A
- Dual port RS-485: electrically isolated
- Single port RS-232: up to 115,200 baud rate
- Modem: 56 kbps auto-dial/auto-answer (maximum of one) Wireless TEC communications

Supported Networking Protocols

As a default, the FX20/FX60 includes an N2 driver that enables the integration of a wide variety of N2 field controllers, including:

- Facility Explorer Field Controllers fitted with an N2 Open Communication Card (for example, FX05, FX06, FX07, FX10, FX14, FX15, FX16, MD20, or FXVMA)
- Metasys® Application-Specific Controller (ASC) devices (Air Handling Unit [AHU], Unitary [UNT], Variable Air Volume [VAV])
- Metasys System 91 Devices (DX-9100)
- Metasys Variable Air Volume Modular Assembly (VMA1400)
- XTM-105 Extension Modules
- third-party devices supporting N2 Open protocol (VND)

Optionally, you can add protocol drivers as needed to integrate various field devices or have remote access. The optional drivers include the following:

- LONWORKS
- BACnet Master-Slave/Token-Passing (MS/TP) and BACnet Internet Protocol (IP)
- MODBUS® Transmission Control Protocol (TCP), and Remote Terminal Unit (RTU)
- M-Bus
- Simple Network Management Protocol (SNMP)
- Short Message Service (SMS)

Optional Input/Output (I/O) Modules

Optional Input/Output (I/O) modules enable the FX20/FX60 to locally monitor and control devices such as sensors, actuators, alarm indicators, and energy meters.

A single multi-pin plug connects the I/O modules to the FX20/FX60. Removable screw terminals are provided for all input and output wiring connections.

Two versions of the I/O modules are available:

- **NDIO34:** includes 16 universal inputs, 10 relay outputs, and 8 analog outputs. Up to one NDIO34 module can be added to an FX20/FX60. This module also provides power to the attached FX20/FX60, using an externally supplied 24 VAC transformer or 24 VDC power supply.
- **NDIO16:** includes 8 universal inputs, 4 relay outputs, and 4 analog outputs. Up to four NDIO16s can be added to an FX20/FX60 (or up to two, if combined with an NDIO34).

Building Automation Control Features

The FX20/FX60 includes a full set of building automation control features, including scheduling, alarming, histories, energy management, totalization, and custom control logic. You can apply these features to almost all data points, regardless of their source.

Scheduling

You can configure the FX20/FX60 to automate various functions within a facility based on a time schedule. Some examples include:

- determining the expected occupancy periods
- starting or stopping HVAC equipment
- turning lights on and off

You can link any writable point in the FX20/FX60 system database to a schedule. The scheduler interface (Figure 2) provides a visually intuitive method for you to configure the daily, weekly, and exception (holiday) schedules.

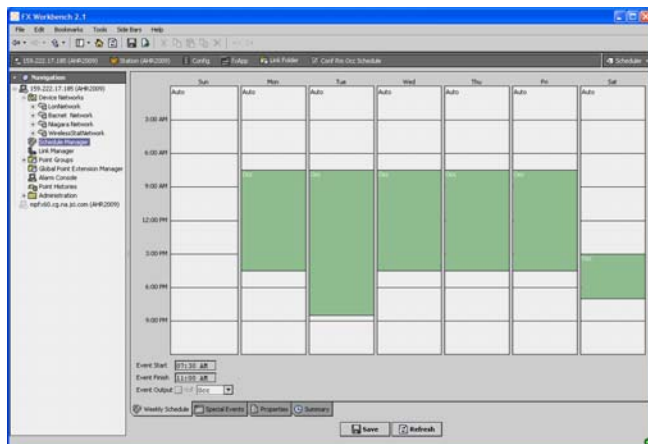


Figure 2: Scheduler

Histories

The Histories feature (Figure 3) allows the FX20/FX60 to collect, store, and display pertinent system data for analysis. This may include control performance indication, energy consumption, and system troubleshooting. You can configure the FX20/FX60 to create a history on any data point in its system database. Histories are presented either graphically or in a sortable table, and you can export the data in a TXT, PDF, or CSV format.

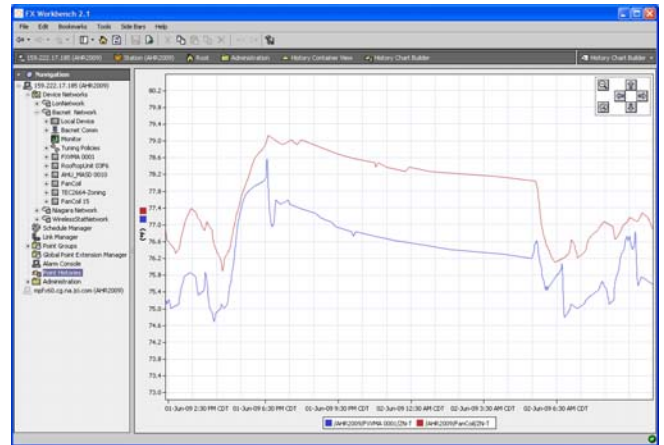


Figure 3: Histories

Alarming

The Alarming feature (Figure 4) enables the FX20/FX60 to initiate, route, and manage alarms and events according to user-defined criteria. You can configure the FX20/FX60 to generate alarms on any data point in its system database. Each alarm record contains valuable information, including the alarm and return-to-normal time and date, time duration in current state, text description, and alarm class.

You can classify alarms so that alarms with similar characteristics are routed to common recipients. You can also create multiple alarm classes to provide a variety of alarm routing options, such as to the browser-based Alarm Console or to an e-mail address. Alarm recipients have a variety of options to manage alarms, including sorting, acknowledging, silencing, and tagging.

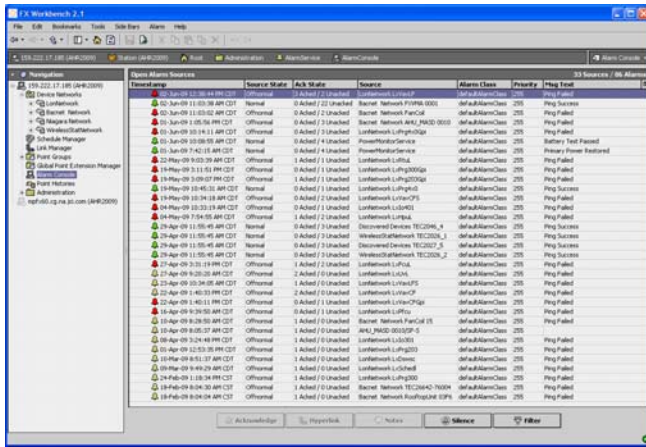


Figure 4: Alarm Console

Energy Management

The FX20/FX60 features several energy management functions, which you can enable and configure, including:

- electrical demand limiting/load shedding
- optimized start/stop
- free cooling determination

Totalization

The Totalization feature enables the FX20/FX60 to accumulate data over a period of time. You can add a totalization extension to any data point in the FX20/FX60 system database to summarize runtime, to accumulate change of state counts, or to summarize dynamic analog data. Totalized data is presented in a sortable table, and you can export it in a TXT, PDF, or CSV file format.

Customized Control Logic

The FX20/FX60 includes a library of control logic modules that you can enable, configure, and link together to create your own customized control routines. Some examples of the available control logic modules include the following:

- Boolean logic (AND, OR, XOR, NOT)
- comparative (greater than, less than, equal, not equal)
- mathematical (add, subtract, multiply, divide, average, negative)
- sequencers
- Proportional plus Integral plus Derivative (PID) control
- on/off control

Web-Based User Interface

The FX20/FX60's Web-based User Interface (Web UI) provides system-wide monitoring and controlling capability via a Web browser. The Web UI capability is embedded in every FX20/FX60. This allows users to access the system via a Web browser over an Ethernet Local Area Network (LAN), Internet, or dial-up modem connection.

You can format the Web UI according to specific user preferences. The presentation of the information can be as rich or as limited as needed to support a variety of user types and interface hardware (computer, Personal Digital Assistant [PDA], or cell phone). When you design Web UI pages, you can choose from a full library of symbols including:

- HVAC equipment
- duct work
- coils
- piping
- control devices (for example, dampers or valves)
- widgets (for example, buttons, tables, or hyperlinks)

Alternatively, you can include your own customized graphics (for example, floorplan.jpg).

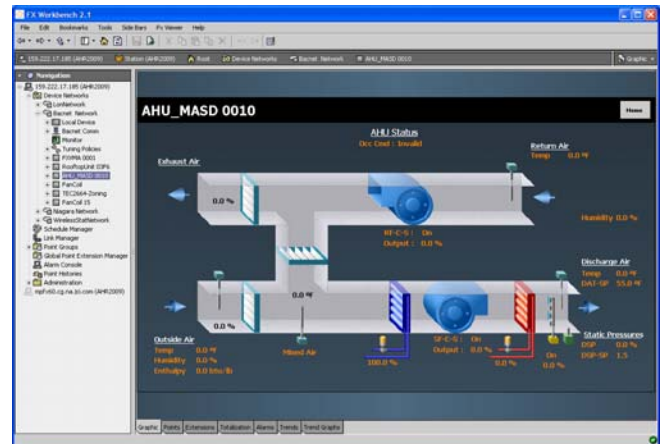


Figure 5: Web-Based User Interface

FX Workbench

FX Workbench is a software application that allows users to configure the FX20/FX60. FX Workbench is embedded in every FX20/FX60 and is served up to Web browsers of authorized users. In addition, you can purchase FX Workbench as a separate software application to reside on a computer.

Users can configure the FX20/FX60 online while directly or remotely connected with FX Workbench.

FX Workbench includes many labor-saving configuration features, such as:

- online discovery of LONWORKS and BACnet devices and points
- online discovery of N2 devices with assisted importing of N2 points
- a check box method to enable and disable points and create point extensions, such as alarms, histories, and totalizations
- intuitive managers for grouping points, creating master schedules, and linking points
- a library of predefined systems, with associated graphics, points list, and default features

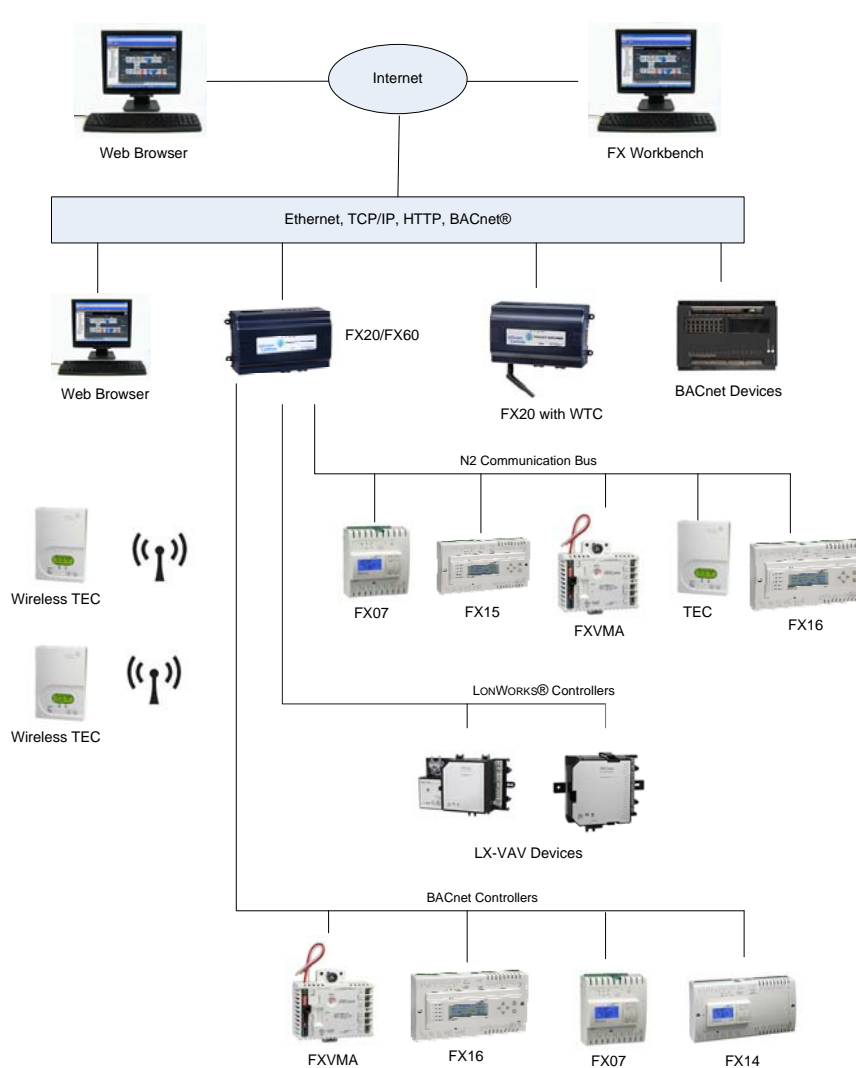


Figure 6: Example of an FX20/FX60 Configuration

Table 1: FX20/FX60 Ordering Information

Part Number	Description
LP-FX2011N-0	FX20: includes 128 MB RAM, 64 MB Flash, 2 Ethernet ports, 1 non-isolated RS-485 port, 1 RS-232 port, 1 Niagara ^{AX} Direct Input/Output (NDIO) port, 2 communication card slots, Niagara driver, oBIX® driver, N2 driver, embedded FX Workbench, embedded Web UI
LP-FX6011N-0	FX60: includes 128 Mb RAM, 128 Mb Flash, 2 Ethernet ports, 1 non-isolated RS-485 port, 1 RS-232 port, 1 NDIO port, 1 Universal Serial Bus (USB) port, 2 communication card slots, Niagara driver, oBIX driver, N2 driver, embedded FX Workbench, embedded Web UI

Table 2: FX Workbench Ordering Information

Part Number	Description
LP-FXTSPE-0	FX Tools Supervisor Pro Software on CD-ROM: End user version. Includes FX Workbench, FX Workbench Pro, and FX Alarm Portal.
LP-FXTSPE-6	FX Tools Supervisor Pro Software Upgrade on CD-ROM. Used to upgrade any copy of FX Tools Supervisor Pro which is within the software maintenance agreement period.
LP-FXALMPTL-0	FX Alarm Portal Client Software on CD-ROM. Provides Alarm Portal functions only.
LP-FXSWMA-0	License file enabling 1 year of software maintenance for one copy of FX Tools Supervisor Pro.
LP-FXSWUPG-0	License file enabling a one-time software upgrade for one copy of FX Tools Supervisor Pro.

Table 3: FX20/FX60 Hardware Accessories Ordering Information

Part Number	Description
LP-FXNDIO16-0	16 channel input/output module for FX20/FX60: Includes 8 universal inputs, 4 relay outputs, and 4 0-10 V analog outputs, maximum of 4 per FX20/FX60, or 2 if combined with NDIO34
LP-FXNDIO34-0	34 channel input/output module for FX20/FX60: Includes 16 universal inputs, 10 relay outputs, and 8 0-10 V analog outputs, maximum of 1 per FX20/FX60. Also provides power to FX20/FX60 using externally connected 24 VAC transformer or 24 VDC power supply.
LP-FXLONFTT-0	LON communication card for FX20/FX60: 78 kbps, FTT-10A, 2-position removable screw-terminal connector plug
LP-FXRS485-0	Dual port RS-485 communication card for FX20/FX60: electrically isolated, two 3-position removable screw-terminal connector plugs
LP-FXWTC-0	Wireless TEC Option Card includes option card, mounting bracket, and direct-mount antenna
TEC20-A-1	Replacement antenna for Wireless TEC Option Card
TEC20-RA-1	Remote antenna for Wireless TEC Option Card when it is installed inside a metal cabinet or when remote antenna mounting is required by physical installation, includes 0.53 m (1.75 ft) cable
LP-FXRS232-0	Single port RS-232 communication card for FX20/FX60: 115,200 max baud rate, DB-9M connector
LP-FXMDM-0	56 kbps, auto-dial/auto-answer modem for FX20/FX60: RJ-11 connector, disables onboard RS-232 port, maximum of one per FX20/FX60
LP-FXPMUS-0	Power module for FX20/FX60: 90-240 VAC, 50/60 Hz, U.S. wall adapter
LP-FXPMEU-0	Power module for FX20/FX60: 90-240 VAC, 50/60 Hz, European wall adapter
LP-FXPMUK-0	Power module for FX20/FX60: 90-240 VAC, 50/60 Hz, U.K. wall adapter
LP-FXPM24-0	Power module for FX20/FX60: 24 VAC/DC, DIN rail mountable
LP-FXPM263-0	Power module for FX20/FX60: 90-263 VAC/DC, 50/60 Hz DIN rail mountable

Table 4: FX20/FX60 Software Accessories Ordering Information

Part Number	Description
LP-FX60EX256-0	License enabling 256 Mb memory expansion for one FX60
LP-FXBACIPC-0	License enabling BACnet IP client (import) driver for one FX20/FX60
LP-FXBACIPS-0	License enabling BACnet IP server (export) driver for one FX20/FX60
LP-FXBACMS-0	License enabling BACnet MS/TP driver for one FX20/FX60
LP-FXLONIP-0	License enabling LONWORKS IP driver for one FX20/FX40/FX60
LP-FXMBUS-0	License enabling M-Bus driver for one FX20/FX40/FX60
LP-FXMDBRTU-0	License enabling MODBUS RTU client (import) driver for one FX20/FX40/FX60
LP-FXMDBRTUS-0	License enabling MODBUS RTU server (export) driver for one FX20/FX40/FX60
LP-FXMDBTCP-0	License enabling MODBUS TCP client (import) driver for one FX20/FX40/FX60
LP-FXMDBTCPS-0	License enabling MODBUS TCP server (export) driver for one FX20/FX40/FX60
LP-FXSNMP-0	License enabling Simple Network Management Protocol (SNMP) driver for one FX20/FX40/FX60
LP-FXSMS-0	License enabling Simple Messaging Service driver for one FX20/FX40/FX60
LP-FXSSL-0	License enabling Secure Socket Layer (SSL) for one FX20/FX40/FX60
LP-FX40MA-0	License enabling one year of annual software maintenance for one FX20/FX40/FX60. Includes new releases and interim service releases for 1 year from the date of purchase.
LP-FX40UPG-0	License enabling one-time, new release software upgrade for one FX20/FX40/FX60

Technical Specifications

Table 5: FX20/FX60 Controller

Product Codes	LP-FX2011N-0, LP-FX6011N-0
Power Requirements	See Ordering Codes for approved power modules
Environment	<ul style="list-style-type: none"> • Operating Temperature: 0 to 50°C (32 to 122°F) • Storage Temperature: 0 to 60°C (32 to 140°F) • Relative Humidity: 5 to 95%, noncondensing
Platform	<p>FX20:</p> <ul style="list-style-type: none"> • IBM® PowerPC™ 405EP 250 MHz processor • 128 MB Synchronous Dynamic Random Access Memory (SDRAM), 64 Mb Serial Flash <p>FX60:</p> <ul style="list-style-type: none"> • IBM PowerPC 440 524 MHz processor • 128 MB SDRAM, 128 MB Serial Flash • Optional 256 Mb DDR RAM <p>Battery backup: 5 minutes typical, shutdown begins within 10 seconds Real-time clock: 3 month backup maximum (via battery)</p>
Operating System	<ul style="list-style-type: none"> • QNX Real Time Operating System (RTOS) • IBM J9 Java® Virtual Machine (JVM) • Niagara
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Communications (Cont.)	<ul style="list-style-type: none"> • Two 10/100 Mb Ethernet ports, RJ-45 connectors • One RS-232 port: 9-pin, D-shell connector • One RS-485 non-isolated port: 3-position, removable, screw-terminal connector plug • See Ordering Codes for optional communication cards
Chassis	<ul style="list-style-type: none"> • Mounting: DIN rail or screw mount • Cooling: Internal air convection • Dimensions: 6.315 x 4.820 x 2.437 in. (16.04 x 12.24 x 6.19 cm)
Agency Listing	<ul style="list-style-type: none"> • United States – UL Listed, File E107041, CCN PAZX, under UL 916, Energy Management Equipment • FCC compliant to CFR 47, part 15, subpart B, class A • Canada - UL Listed, File E107041, CCN PAZX7, under CSA C22.2 No. 205, Signal Equipment • Industry Canada compliant to ICES-003 • Europe – CE Mark • EMC Standards Applied: <ul style="list-style-type: none"> – EN 61000-6-4 EMC Emissions Generic (Complies) – EN 61000-6-2 and EN 61000-6-1 EMC Immunity (Complies, as documented below) – EN50081-2 Generic Emissions Standard for Residential, Commercial, and Light Industrial Environment – CISPR-11 Limits of Radio Disturbance-Radiated Emissions (Pass Class A) – CISPR-11 Limits of Radio Disturbance-Conducted Emissions (Pass Class A) – IEC 61000-4-2 ESD (Pass Criteria B) – IEC 61000-4-3 Radiated Field Immunity (Pass Criteria A) – IEC 61000-4-4 Electrical Fast Transients Immunity-Signal Ports (Pass Criteria B) – IEC 61000-4-4 Electrical Fast Transients Immunity -AC Power (Pass Criteria B) – IEC 61000-4-5 Surge Immunity (Pass Criteria A) – IEC 61000-4-6 Conducted Immunity (Pass Criteria A) – IEC 61000-4-11 Voltage Dips (Pass Criteria A) – IEC 61000-4-11 Voltage Interrupts (Pass Criteria A) – IEC 61010-10-1: 90 + A1:92 + A2:95 Safety requirement for electrical equipment for measurement, control, and laboratory use (Pass)

Table 6: Input Output Modules

Product Codes	LP-FXNDIO34-0: 16 universal inputs, 10 relay outputs, 8 analog outputs LP-FXNDIO16-0: 8 universal inputs, 4 relay outputs, 3 analog outputs
Dimensions	NDIO34: 6.313 x 4.820 x 2.438 in. (16.04 x 12.24 x 6.19 cm) NDIO16: 3.2 x 4.828 x 2.437 in. (8.2 x 12.24 x 6.19 cm)
Universal Input Types Supported	<ul style="list-style-type: none">• 10k ohm Type 3 thermistors. Thermistor Sensor Range: -23.3 to 115.5°C (-10 to 240°F). Input accuracy is in the range of $\pm 1\%$ of span. Characteristic curve is customizable.• 0-10 V; accuracy is $\pm 2\%$ of span, without user calibration; uses an external resistor for current input (four provided, mounted by installer on terminal connections)• 4-20 mA current loop; accuracy is $\pm 2\%$ of span, without user calibration; self-powered or board-powered sensors accepted• Dry contact: V open circuit, 300- μA short-circuit current• Pulsing dry contact at a rate of up to 20 Hz; 50% duty cycle
Digital Outputs	<ul style="list-style-type: none">• Form A relay contacts suitable for on/off control only; floating control not supported• Max voltage 30 volts AC or DC• 1/2 A max current rating
Analog Outputs	<ul style="list-style-type: none">• 0-10 V DC• Minimum load supported per output is 2,500 ohms minimum or 4 mA drain maximum

Table 7: FX Workbench Requirements

Processor	Intel® Pentium® 4, 1 GHz or higher
Operating System	Microsoft® Windows NT® Version 4.0 with Service Pack (SP) 4.0 or later Microsoft Windows® 2000 Microsoft Windows XP® Professional 32-bit Operating System Microsoft Windows Vista™ 32-bit Operating System. The Tunneling Service does not start automatically if installed on Microsoft Vista operating system; however, you can manually start the Tunneling Service.
Web Browser	Microsoft Internet Explorer® Version 5.0 or later Netscape Communicator® Version 4.5 or later
Memory	512 MB minimum
Hard Disk	1 GB minimum, 5 GB recommended
Network Support	Ethernet 10/100 Mb with RJ-45 connector

The performance specifications are nominal and conform to acceptable industry standards. For application at conditions beyond these specifications, contact a Facility Explorer technical support resource. Johnson Controls, Inc. shall not be liable for damages resulting from misapplication or misuse of its products.

Federal Communications Commission (FCC) Statement

This equipment has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of FCC Rules. These limits are designed to provide reasonable protection against harmful interference when this equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his/her own expense.

Industry Canada (IC) Statement

*This Class (A) digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.
Cet appareil numérique de la Classe (A) respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.*



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