

# FX70 Supervisory Controller

## Installation Instructions

LP-FX7011N-0

Part No. 24-10564-17, Rev. C

Issued April 9, 2014

Supersedes June 15, 2012

Refer to the [QuickLIT Web site](#) for the most up-to-date version of this document.

### Application

The FX70 Supervisory Controller manages networks of field controllers using open communication protocols, such as N2, LONWORKS®, and BACnet® protocols.

For information on software installation and configuration required for a supervisory controller, refer to the *FX Workbench User's Guide (LIT-12011149)*.



Figure 1: FX70 Supervisory Controller

### North American Emissions Compliance

#### United States

This equipment has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of the 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 is required to correct the interference at his/her own expense.

### Canada

This Class (A) digital apparatus meets all the 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.

### Installation

Unpack the controller and inspect the package contents for damaged or missing components. If damaged, notify the appropriate carrier at once and return any damaged components for immediate repair or replacement.

### Parts Included

Included in this package you should find the following items:

- An FX70 Supervisory Controller.
- These *FX70 Supervisory Controller Installation Instructions (Part No. 24-10564-17)*.
- A hardware bag containing the following items:
  - Two 6-position screw terminal plugs: one for integral contact inputs (door tamper, Uninterruptible Power Supply [UPS] battery OK, and UPS AC present), and one end-mount to wire RS-485/power to optional remote expansion devices.
  - One 2-position screw terminal plug for external Sealed Lead-Acid (SLA) rechargeable battery (not provided).
  - One grounding wire, with quick-disconnect 0.187 in. (4.74 mm) female connector.
- Power module (if ordered). The power module may be one of the following:
  - LP-FXPM263-0 (90-263 VAC, DIN rail mountable)
  - LP-FXPMUS-0 (90-240 VAC, with U.S. wall adapter)
  - LP-FXPMEU-0 (90-240 VAC, with European wall adapter)

- LP-FXPMUK-0 (90-240 VAC, with U.K. wall adapter)
- Communication cards (if ordered)
  - LP-FXLONFTT-1
  - LP-FXRS232-0
  - LP-FXRS485-0
  - LP-FXMMDM-0
  - LP-FXWTC-0
  - LP-FXGPRS-0
  - LP-FXGPRSW-0
  - LP-FXSED-0
- Expansion Input/Output (NDIO) Modules (if ordered)
  - LP-FXRIO16-0

### **Materials and Special Tools Needed**

The following supplies and tools are typically required for installation:

- LP-FXPM263-0 universal AC power supply module, 90-263 VAC input, 15 VDC 30 W output, DIN-mount capable, with grounding wire.
- Alternatively, an LP-FXPMxx-0 wall-mount AC adapter, which can power the controller only. You must cut off the adapter's barrel plug end, and then wire leads into the controller's end connector. A multimeter is needed to check polarity.
- DIN rail, type NS35/7.5 (35 mm x 7.5 mm) and DIN rail end-clips (stop clips), unless using panel mounting method with screws through mounting tabs.
- Suitable tools and fasteners for mounting unit and accessories.
- #2 Phillips screwdriver: used to install and remove an optional option card.
- Small flat-blade screwdriver: used for making wiring connections to removable screw terminal plugs.
- (Optional) One or two 12 V Sealed Lead-Acid (SLA) rechargeable backup batteries, with wire harness for connecting to the 2-position connector on the unit. Should be sized as required by the system. See [External 12 V Backup Battery](#) on page 14.

## **Safety Precautions**



### **WARNING: Risk of Electric Shock.**

Disconnect the power supply before making electrical connections. Contact with components carrying hazardous voltage can cause electric shock and may result in severe personal injury or death.

**AVERTISSEMENT: Risque de décharge électrique.** Débrancher l'alimentation avant de réaliser tout branchement électrique. Tout contact avec des composants conducteurs de tensions dangereuses risque d'entraîner une décharge électrique et de provoquer des blessures graves, voire mortelles.

**IMPORTANT:** Use copper conductors only. Make all wiring in accordance with local, national, and regional regulations. Do not exceed the FX70 Supervisory Controller's electrical ratings.

**IMPORTANT:** To reduce the risk of fire or electrical shock, install in a controlled environment relatively free of contaminants.

**IMPORTANT:** Use this FX70 Supervisory Controller only as an operating control. Where failure or malfunction of the FX70 could lead to personal injury or property 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, intended to warn of or protect against failure or malfunction of the FX70.

### **Static Discharge Precautions**

Static charges produce voltages high enough to damage electronic components. The microprocessors and associated circuitry within the FX70 are sensitive to static discharge.

**IMPORTANT:** Work in a static-free area. Discharge any static electricity you may have accumulated. Discharge static electricity by touching a known, securely grounded object. Do not handle the Printed Circuit Board (PCB) without proper protection against static discharge. Use a wrist strap when handling PCBs. Secure the wrist strap clamp to earth ground.

## Battery Precautions

**IMPORTANT:** The Nickel Metal-Hydrate (NiMH) battery used in this device may present a risk of fire or chemical burn if mistreated. Do not disassemble, heat above 122°F (50°C), or incinerate. Replace battery pack with type LP-KITFX7BAT-0 only. Use of another battery may present a risk of fire or explosion.

**IMPORTANT:** Dispose of used battery promptly. Keep away from children. Do not disassemble and do not dispose of in fire.

**IMPORTANT:** Replace external backup battery with Listed Power Source Battery Only.

## Mounting

Mount the controller in a location that allows clearance for wiring, servicing, and module removal.

**Note:** This product is intended for indoor use only. The unit should not be exposed to ambient conditions outside of the range of 32 to 122°F (0 to 50°C), or relative humidity outside the range of 10 to 90% at 77°F (25°C), noncondensing.

**Note:** Avoid mounting the controller in a manner that would make it difficult to operate the disconnect device.

**Note:** Before mounting the controller, install any option card(s).

## Environmental Requirements

Note the following requirements for the controller mounting location:

- If mounting inside an enclosure, that enclosure should be designed to keep the unit within its required operating range considering a 20-watt dissipation by the controller, plus dissipation from any other devices installed in the same enclosure. Maintaining the proper operating ambient conditions is especially important if the controller is mounted inside an enclosure with other heat producing equipment.

Do not mount the unit:

- in an area with excessive moisture, corrosive fumes, or explosive vapors.
- where vibration or shock is likely to occur.
- in a location subject to electrical noise. This includes the proximity of large electrical contractors, electrical machinery, welding equipment, spark igniters, and variable frequency drives.

## Physical Mounting

The following information applies when you physically mount the unit.

- You can mount the controller in any orientation. It is not necessary to remove the cover before mounting.
- Mounting on a 35 mm (1.37 in.) wide DIN rail is recommended. The FX70 unit base has a molded DIN rail slot and locking clip, as does the LP-FXPM263-0 power supply module and any Input/Output (I/O) expansion modules. Mounting on a DIN rail ensures accurate alignment of connectors between all modules.
- If DIN rail mounting is impractical, you can use screws in mounting tabs on the LP-FXPM263-0 module and the FX70, as well as any end-connected accessory. See [Tab Mounting Dimensions](#).

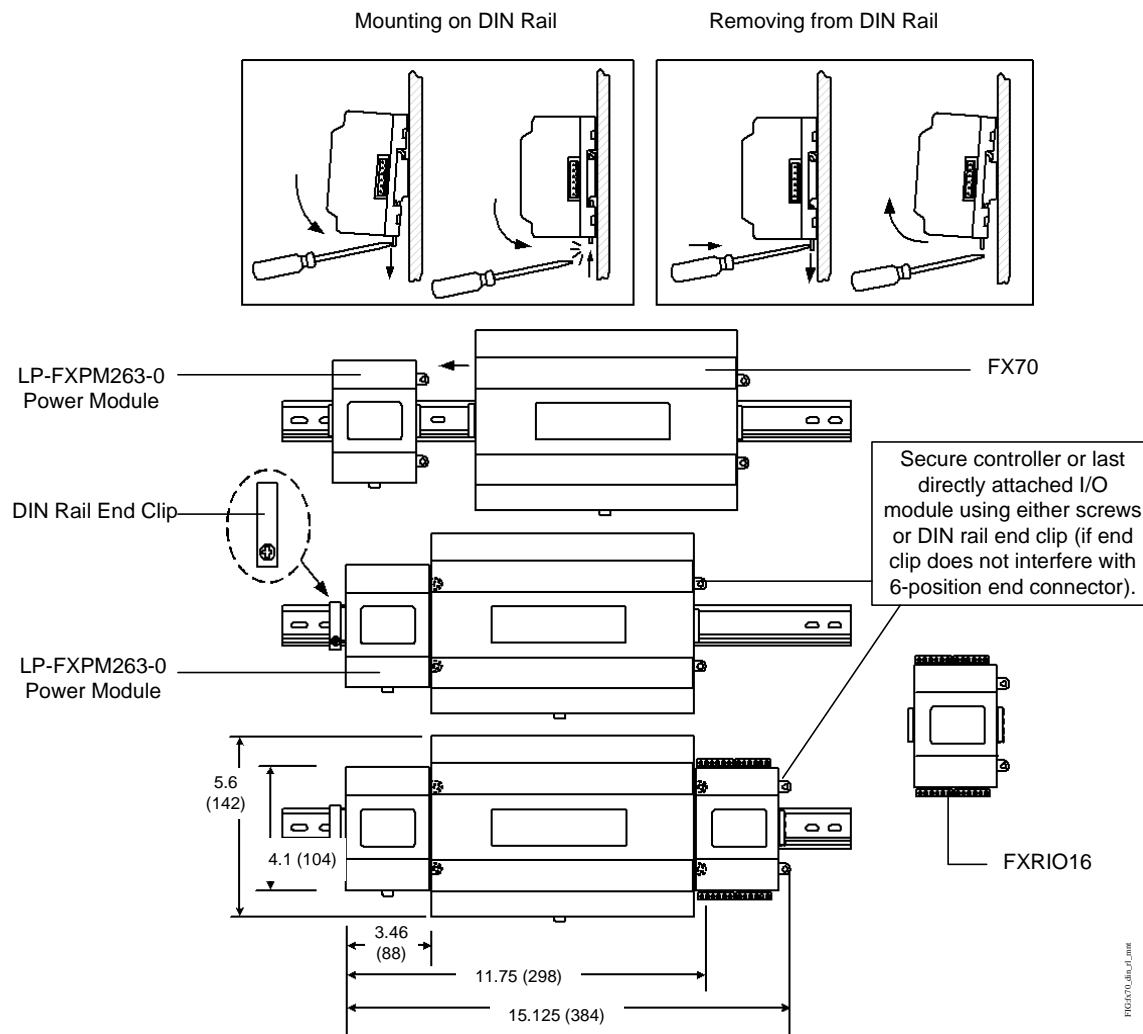
## DIN Rail Mounting Instructions

Figure 2 and the following procedure provides step-by-step DIN rail mounting instructions for the controller.

**Note:** Mount the LP-FXPM263-0 power supply first, then the controller, then any directly attached I/O expansion module.

To mount on DIN rail:

1. Securely install the DIN rail with at least two screws, near the two rail ends.
2. Position the LP-FXPM263-0 power supply module on the rail, tilting to hook DIN rail tabs over one edge of the DIN rail (Figure 2).
3. Use a screwdriver to pry down the plastic locking clip, and push down and in on the module, to force the locking clip to snap over the other edge of the DIN rail.
4. Mount the controller onto the DIN rail in the same way, such that its left 6-position end connector faces the LP-FXPM263-0 power supply.
5. Slide the two devices together along the DIN rail to connect their 6-position connectors.
6. If installing any I/O expansion modules, repeat this for each one, until all are mounted on the DIN rail and firmly connected into one assembly.
7. To keep the final assembly together, secure at both ends with DIN rail end-clips provided by the DIN rail vendor. This procedure also prevents the assembly from sliding on the DIN rail. See Figure 2.



**Figure 2: FX70 and Accessory DIN Rail Mounting Details and Dimensions, in. (mm)**

### Tab Mounting Dimensions

DIN mounting is recommended over tab mounting. See Figure 3 and Figure 4.

**Note:** Electronic and printed versions of this guide may not show the dimensions to scale. Verify all measurements before drilling.

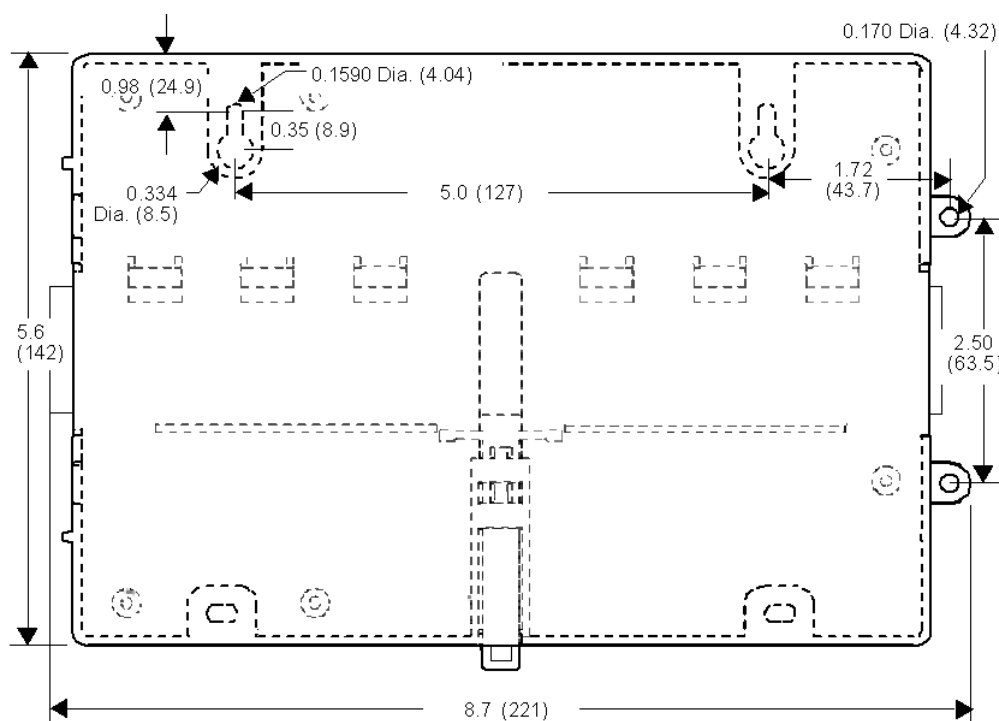


Figure 3: FX70 Tab Mounting Dimensions, in. (mm)

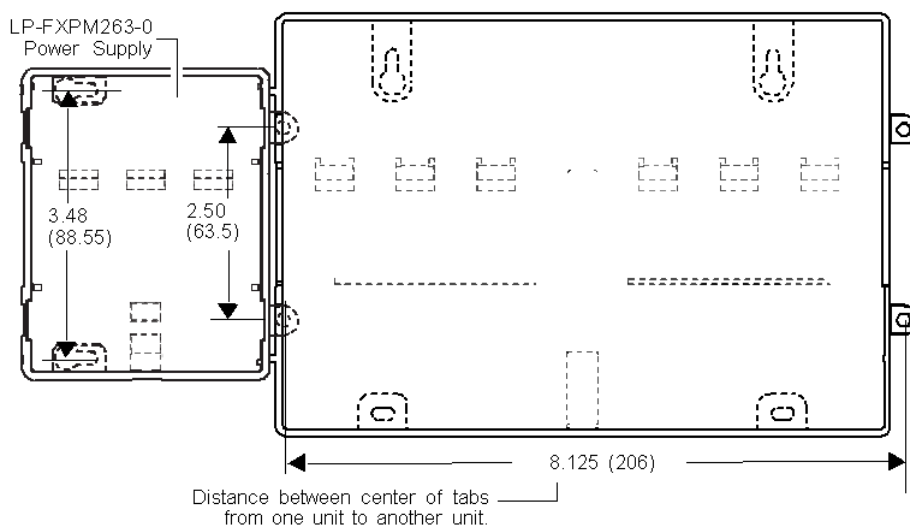


Figure 4: FX70 Tab Mounting with Power Supply Attached Dimensions, in. (mm)

## Removing and Replacing the Cover

You must remove the controller's cover to connect the battery (new unit), and/or to install any option cards, or replace the NiMH battery. The cover snaps onto the base with four plastic end tabs—two on each end.

**IMPORTANT:** A Light-Emitting Diode (LED) ribbon cable connects the cover to the main board. Be careful when lifting the cover off. If the controller is on a flat work surface, you can leave the cable connected, with the cover next to the unit. See Figure 5.

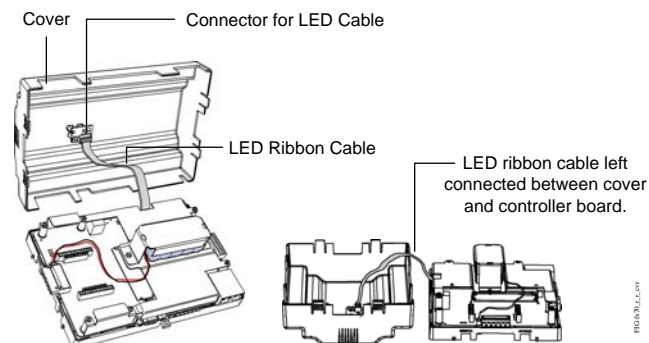


Figure 5: Removing FX70 Cover

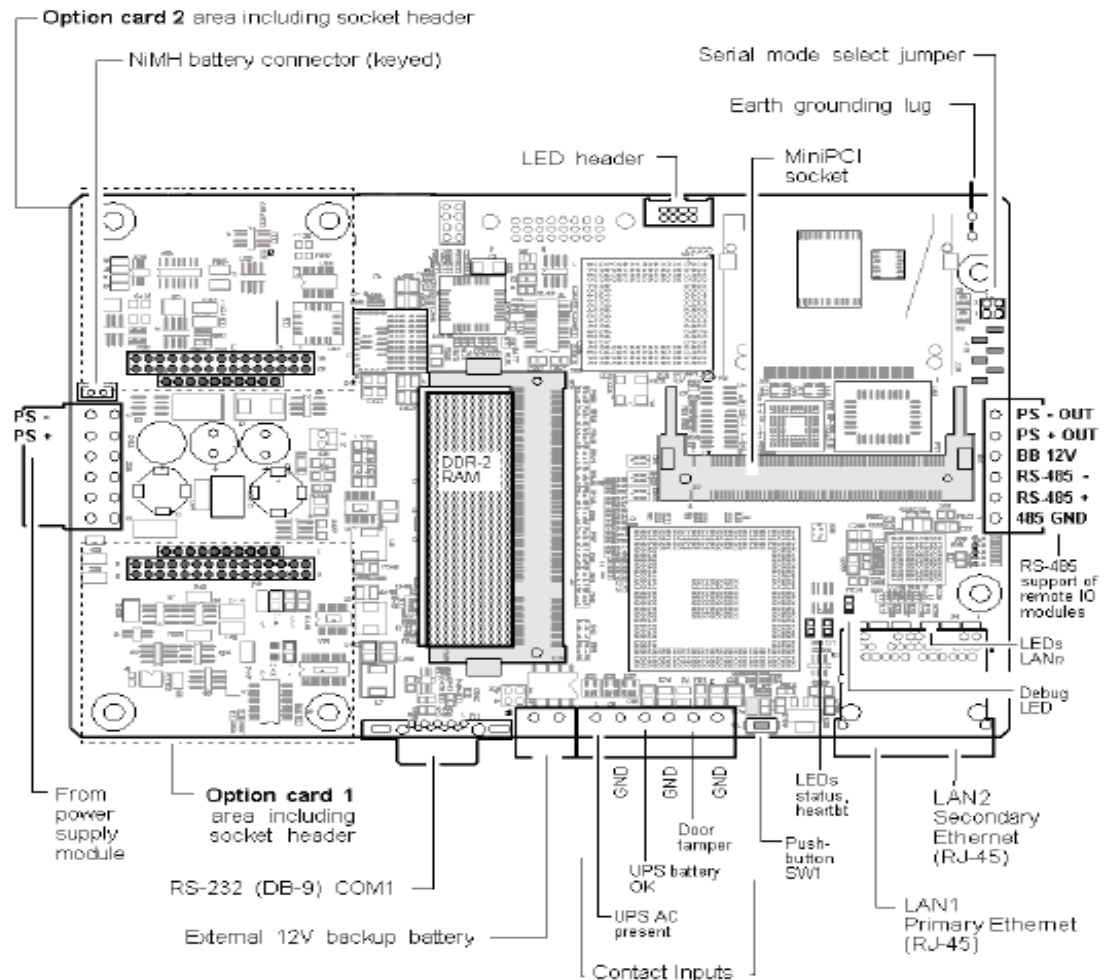
**Note:** If accessory modules are plugged into the controller, you may need to slide them away from the unit to get to the end cover tabs.

- To remove the cover, press in the tabs on both ends of the unit, and carefully lift it off (see the Important statement in this section). If necessary, unplug the LED cable from the cover, at the connector on the back of the cover (see Figure 4).
- To replace the cover, make sure that the LED cable is connected and not folded outside the base. Orient the cover so the cutout area for comm ports is correct, then push inwards to snap in place.

## Board Layout

Figure 6 shows the location of connectors, option slots, and other features of the main board in the FX70. For side views of communications ports and other features, see Figure 8.

The FX70 ships with both option card slots 1 and 2 open. The Double Data Rate 2 Random Access Memory (DDR-2 RAM) socket is populated with a 1 GB module. A variety of communications option cards are available.



**Figure 6: FX70 Main Board Layout Details**

### **Expansion Options**

The FX70 provides for field-installable expansion using these types of options:

- **Option card** — Install on connectors inside the controller's base unit.
- **Remote I/O modules** — To wire to the controller's right-side 6-pin connector.
- **MiniPCI option card** — 802.11Wi-Fi wireless option.

### **Option Cards**

The FX70 has two available option slots to accept a custom option card, compatible with either of these types:

- FX20/FX60 option cards: 30-pin, 2 row connector, or
- Future release FX70 option cards: 40-pin, 3 row connector.

To accept either, both option slots on the controller's base board have a 40-pin connector. See Figure 6. Installing an option card is recommended before mounting the unit. See *Installing an Option Card* on page 9.



**WARNING: Risk of Electric Shock.**

Disconnect the power supply before making electrical connections. Contact with components carrying hazardous voltage can cause electric shock and may result in severe personal injury or death.

**AVERTISSEMENT: Risque de**

**décharge électrique.** Débrancher l'alimentation avant de réaliser tout branchement électrique. Tout contact avec des composants conducteurs de tensions dangereuses risque d'entraîner une décharge électrique et de provoquer des blessures graves, voire mortelles.

**IMPORTANT:** Power to the controller must be OFF when installing or removing option cards, or damage occurs. Also, you must be very careful to plug an option card into its connector properly (pins aligned).

Option cards typically provide additional communications features, with the following available models (with others still in development) listed in Table 1.

**Table 1: FX70 Supervisory Controller Option Cards**

Order Codes	Description	Number of Option Cards Allowed per Controller
LP-FXRS485-0	Dual, optically isolated, RS-485 adapter with two 3-position removable screw-terminal connector plugs.	One or two
LP-FXLONFTT-1	FTT-10A LONWORKS adapter with a 2-position removable screw-terminal connector plug.	One or two
LP-FXRS232-0	Single port RS-232 adapter, with a DB-9M connector. Supports baud rates up to 115,200.	One or two
LP-FXGPRSW-0	GSM cellular modem card using General Packet Radio Service (GPRS), with onboard socket for SIM card, and a Wyless SIM. Includes a stub SMA antenna.	One
LP-FXGPRS-0	GPRS Modem card	One
LP-FXWTC-0	Wireless TEC Option Card includes option card, mounting bracket, and direct-mount antenna.	One
LP-FXSED-0	Sedona Framework™ option card with both wireless IPv6 over LoW Power Wireless Area Networks (6LoWPAN) and wired RS-485 port, based on the Jennic JN5139 wireless microcontroller. Includes stub antenna.	One
LP-FXMDM-0	56 Kbps Auto-dial/Auto-answer Modem <sup>1</sup> with one RJ-11 connector for phone line.	One <sup>1</sup>
LP-FX70WIFI-0	Wi-Fi Mini-PCI option card	One
LP-FXSRAM-0	Static RAM option card: provides battery-less backup	One



1. Unlike with an FX22/FX62 with a LP-FXMDM-0 installed in slot 1, the onboard RS-232 COM1 port (DB9) remains operational. Also, any LP-FXMDM-0 option is unaffected by the mode jumper position for serial shell access (jumper in serial shell position affects the operation of the onboard RS-232 COM1 port only).

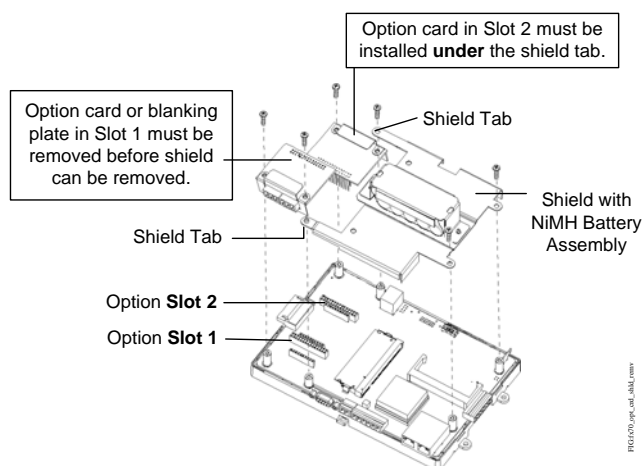
### Option Card COM Port Assignments

For a list of supported COM port and slot assignments for the option cards, see Table 6.

### Installing an Option Card

For option-specific details, refer to the installation instructions that accompany the particular option card. The following procedure provides a basic set of steps.

**IMPORTANT:** Installing an option card in option Slot 2 requires careful attention—you must carefully pry up the shield tab to install the option card under the tab. Do not install an option card in Slot 2 with the card resting on top of the shield tab. Otherwise, an electrical short or some other issue from misaligned card header pins may result.



**Figure 7: FX70 Option Card and Shield Removal**

1. Remove power from the controller, including any external battery.

**Table 2: Remote I/O Modules Compatible with the FX70 Supervisory Controller**

Model	Description	Notes
LP-FXRIO16-0	Remote I/O RS-485 Module DIN-mountable RS-485 comm module that provides 16 points I/O, with I/O point types as noted.	Provides the following I/O points: 8 - Universal Inputs (UIs). 4 - Digital Outputs (DOs), Single-Pole Single-Throw (SPST) relay type. 4 - Analog Outputs, 0–10 VDC type. Up to 16 (maximum) LP-FXRIO16-0 accessory modules are supported. Wiring is covered in a separate document. Refer to the <i>LP-FXRIO16 Input/Output Module Installation Instructions (Part No. 24-10564-41)</i> .

2. Remove the cover. See [Removing and Replacing the Cover](#) on page 6.
3. Remove the blanking plate for the option slot, retaining the two screws. Retain the blanking plate in case the option card must be removed later.
4. Carefully insert the pins of the option card into the socket headers of the option card slot.

**Note:** If installing in Slot 2, first carefully pry up the shield tab that goes over the standoff. Option card 2 must be installed under the shield tab. See Figure 7 for an exploded view.

The mounting holes on the option board should line up with the standoffs on the base board. If they do not, the connector is not properly aligned. Press until the option card is completely seated.

5. Place the custom end plate for the option card over the connector(s) of the option card. With some option cards, the card's end plate is pre-fastened.
6. With the mounting holes aligned with the standoffs, place the two screws through the end plate, and into the standoffs on the controller's base board. Using a screwdriver, hand tighten these screws.
7. Replace the cover on the controller.

### Remote I/O Modules

The FX70 has an integral 6-pin connector to support remote I/O modules. The connector provides both 15 VDC power and RS-485 communications to modules on that connected trunk, and is located on the right side of the unit.

Each remote I/O module has a DIN-mount base, and provides two 6-pin connectors that allow you to daisy-chain multiple modules together into one assembly. Table 2 lists the currently available modules.

## MiniPCI Cards

The controller has one available MiniPCI slot (see Figure 6). This slot supports a specific 802.11 wireless (Wi-Fi) adapter option.

## Wiring

See Figure 6 to locate connectors and components on the controller.

**Note:** The FX70 requires FX Supervisory Software Release 4.0 (Niagara AX 3.6 or later) for Wi-Fi support.

Make connections to the controller in the following order:

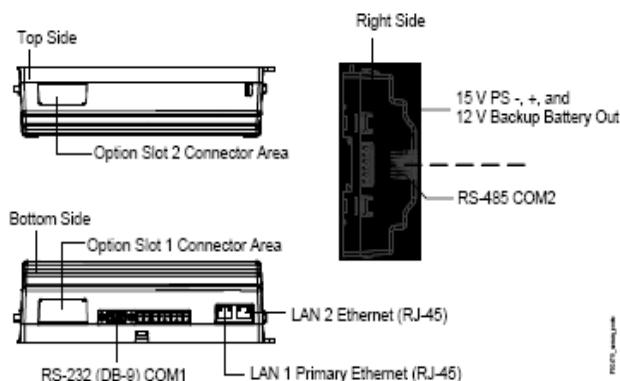
1. Install any option board (LONWORKS, RS-485, RS-232, and so on) in the available option slots. See *Installing an Option Card* on page 9 for a procedure. For complete details, refer to the specific documentation that accompanied the option.
2. Connect communications cables. See *Communications Wiring* on page 10 for ports available on the controller's base unit. For ports on any installed option board (485-PWR, LONWORKS, RS-485, modem), refer to the specific installation instructions for any additional details.
3. Apply power to the unit. See *Powerup and Initial Checkout* on page 15.

## Communications Wiring

Communications ports on the controller are primarily on the bottom side of the unit, with ports also on the right side and top (Figure 8). Communications port types include:

- Ethernet
- Serial

**Note:** Prior to connecting cables, provide strain relief for them to prevent damage to the controller.



**Figure 8: FX70 Communication Ports**

## Ethernet

Two, female 1-Gigabit Ethernet connections are provided on the controller. These are RJ-45 connectors labeled LAN1 and LAN2. Use a standard Ethernet patch cable for connecting to a hub or Ethernet switch.

The supervisory controller's factory-default Internet Protocol (IP) address for PRI (LAN1) is 192.168.1.149, and the subnet mask is 255.255.255.0. By default, LAN2 is disabled.

Refer to the *JACE Niagara<sup>AX</sup> Install and Startup Guide* (in the docs folder in FX Workbench) for details on changing IP address.

**Note:** Typically, you only use LAN1 (primary port), unless you have a specific application for the other LAN2 port. For example, isolating a driver's network traffic, using LAN2. Do not use LAN2 as the primary port.

## Serial

There are two Recommended Standard (RS) serial ports on the controller's base board. Each has a Universal Asynchronous Receiver/Transmitter (UART) capable of operation up to 115,200 baud. At the bottom of the board (see Figure 8) is an RS-232 port using an DB-9 plug (male) connector. On the right side of the unit is an isolated RS-485 port, using the bottom three terminals of a 6-position screw-terminal connector plug.

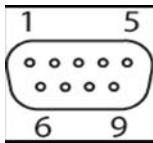
**Note:** Additional serial ports may be added with option card(s) in Option Slot 1 and Slot 2, such as an LP-FXRS232-0 card or LPFXRS485-0 card (note the last option actually adds two serial ports).

## RS-232

An RS-232 serial port using a male DB-9 connector always operates as COM1. You can use standard DB-9 serial cables with this port. The controller is a serial Data Terminal Equipment (DTE) device. Another DTE device (a computer, for example) requires a null modem cable. If connecting to a Data Circuit-Terminating Equipment (DCE) device (a modem, for example), use a straight-through cable. Table 3 provides standard serial DB-9 pinouts.

**Note:** If rebooted with the mode jumper in the Serial Shell position (see Figure 6), the RS-232 port provides system shell access. Refer to the *JACE Niagara<sup>AX</sup> Install and Startup Guide* (in the docs folder in FX Workbench) for related details.

**Table 3: Serial Port (RS-232 and RS-485) Pinouts**

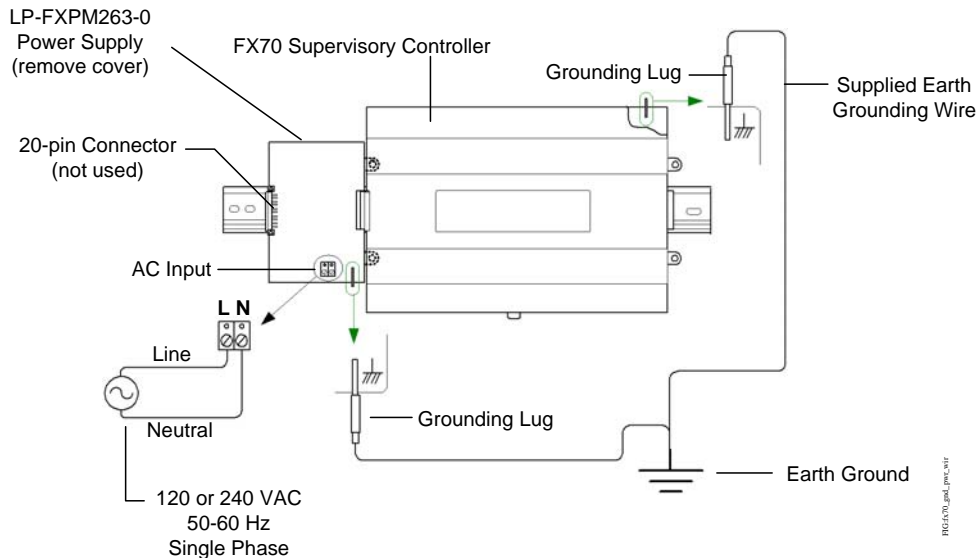
Base RS-232 DB-9 Port (COM1)				Base RS-485 Port (COM2)
Pinout Reference		Signal	DB-9 Pin	Pinouts
<b>DB-9 Plug (male)</b> 	DCD	Data carrier detect	1	<b>6-Position end connector (male)</b>
	RXD	Receive data	2	
	TXD	Transmit data	3	
	DTR	Data terminal ready	4	
	GND	Ground	5	
	DSR	Data set ready	6	
	RTS	Request to send	7	
	CTS	Clear to send	8	
	not used on the FX70		9	

#### RS-485

An RS-485 optically isolated port is available on three pins of the 6-position right-side connector, and always operates as COM2. As shown in Table 3, the screw terminals are minus (–), plus (+), and shield. Wire in a continuous multidrop fashion to other RS-485 devices, meaning minus-to-minus, plus-to-plus, and shield-to-shield. Connect the shield to earth ground at one end only (such as the FX70).

## Grounding

An earth ground spade lug 0.187 in. (4.74 mm) is provided on the controller for connection to earth ground. For maximum protection from electrostatic discharge or other forms of Electromagnetic Interference (EMI), connect the supplied earth grounding wire to this lug and a nearby earth ground. Keep this wire as short as possible (see Figure 9).



**Figure 9: FX70 Grounding and Power Wiring Connections to LP-FXPM263-0 Module**

## Power Wiring

There are two power options for the controller: the LP-FXPM263-0 power supply module (typical), or a LP-FXPMxx-0 (Wall Mount AC Adapter).

### LP-FXPM263-0

The LP-FXPM263-0 module lets you power the controller (and if installed, connected I/O modules) from AC line power, with a universal input range from 90–263 VAC. The LP-FXPM263-0 module provides 15 VDC to the controller, and installs on the left side of the controller (see Figure 9).



#### **WARNING: Risk of Electric Shock.**

Disconnect the power supply before making electrical connections. Contact with components carrying hazardous voltage can cause electric shock and may result in severe personal injury or death.

#### **AVERTISSEMENT: Risque de décharge électrique.**

Débrancher l'alimentation avant de réaliser tout branchement électrique. Tout contact avec des composants conducteurs de tensions dangereuses risque d'entraîner une décharge électrique et de provoquer des blessures graves, voire mortelles.

**IMPORTANT:** Use copper conductors only. Make all wiring connections in accordance with local, national, and regional regulations. Do not exceed the FX70 Supervisory Controller electrical ratings.

Make power input connections to the terminals on the LP-FXPM263-0 circuit board (cover removal is required). Use the supplied earth grounding wires to make a connection from a nearby earth ground to the grounding lug on both the LP-FXPM263-0 power supply and the controller (see Figure 9).

#### **Wiring LP-FXPM263-0 Input Power and Earth Ground**

1. Remove power from the AC circuit being wired to the LP-FXPM263-0.
2. Remove the LP-FXPM263-0 cover.  
To do this, press in the four tabs on both ends of the unit, and lift the cover off. If the FX70 is plugged into the unit, you may need to slide it away to get to the cover tabs.
3. Connect the supplied earth grounding wire to a nearby grounding point (see Figure 9).
4. Make AC circuit connections line (mains) and neutral to the terminals labeled **INPUT PWR**.
5. Replace the cover on the LP-FXPM263-0 module.

Make sure all modules in the mounted assembly are firmly connected together and secured.



#### **CAUTION: Risk of Property Damage**

Do not apply power to the system before checking all wiring connections. Short circuited or improperly connected wires may result in permanent damage to the equipment.

#### **MISE EN GARDE : Risque de dégâts matériels.**

Ne pas mettre le système sous tension avant d'avoir vérifié tous les raccords de câblage. Des fils formant un court-circuit ou connectés de façon incorrecte risquent d'endommager irrémédiablement l'équipement.

**IMPORTANT:** Do not energize the AC circuit wired to the LP-FXPM263-0 until all other controller mounting and wiring is completed. See *Powerup and Initial Checkout* on page 15.

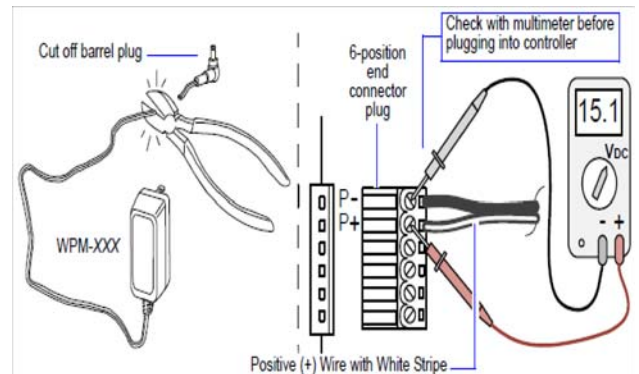
Power and ground is also provided in wiring to remote I/O modules through the 6-position connector. However, note for each remote I/O module, you should also connect its earth ground spade lug to earth ground at that module's location.

#### **LP-FXPMxx-0 (Wall Mount AC Adapter)**

You can order and adapt a wall mount AC adapter (model LP-FXPMxx-0, where XX is either US, EU, or UK) to power only the FX70. To use the adapter, you must cut off its barrel plug end, then wire the two leads into the top positions of the 6-position end connector plug, observing proper + and – polarity.

**Note:** I/O modules cannot be powered by the LP-FXPMxx-0 adapter.

**Note:** Before plugging the wired connector plug into the controller, check for 15 VDC at the proper polarity using a multimeter (see Figure 10).



**Figure 10: Adapting a LP-FXPMxx-0 Wall Mount AC Adapter to Power the FX70**

Do not power the controller until all other mounting and wiring is completed. See *Powerup and Initial Checkout* on page 15.

## Contact Inputs

Three contact inputs (CIs) are on a 6-position connector next to the 2-position external battery connector. CIs typically monitor normally closed (N.C.) alarm contacts, if available on a UPS and/or the door tamper switch of a nearby enclosure. These CIs are unsupervised—no end-of-line resistors are required. Figure 11 shows example wiring to all three CIs of the controller.

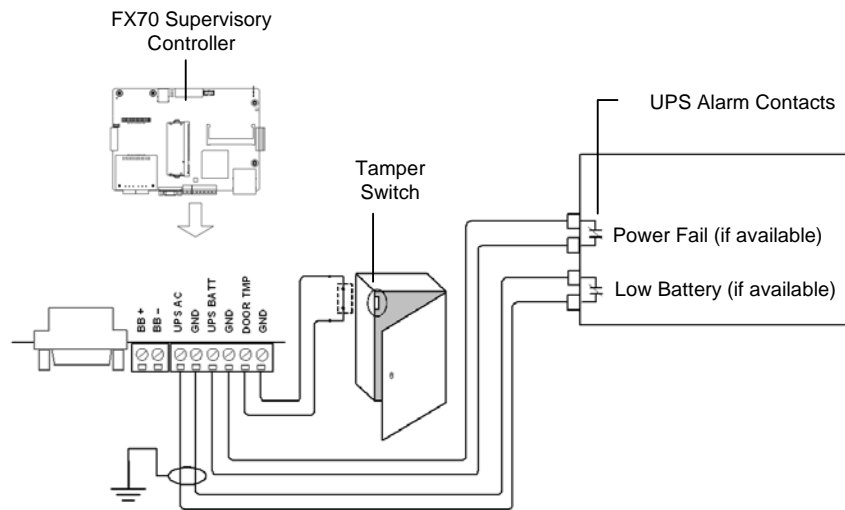


Figure 11: Contact Input Wiring to an FX70

## External 12 V Backup Battery

A 2-position connector provides support for an external 12 V SLA type rechargeable battery. For more details, see [Backup Batteries](#) on page 16.

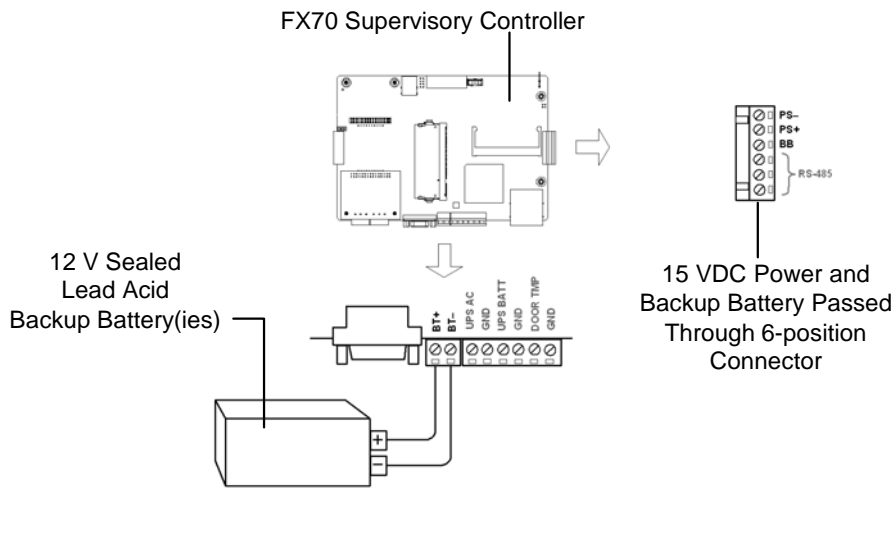


Figure 12: Sealed Lead-Acid (SLA) Backup Battery Connection on FX70

**Note:** The minimum wire size for battery connections: • 18 AWG (1.0 mm<sup>2</sup>) for up to 4 ft (1.22 m)

- 16 AWG (1.29 mm<sup>2</sup>) for up to 12 ft (3.66 m)

### Wiring to Remote I/O Modules

Wiring to remote I/O modules typically provides both 15 VDC power and 12 V battery backup, along with RS-485 communications to the modules (see Figure 13).

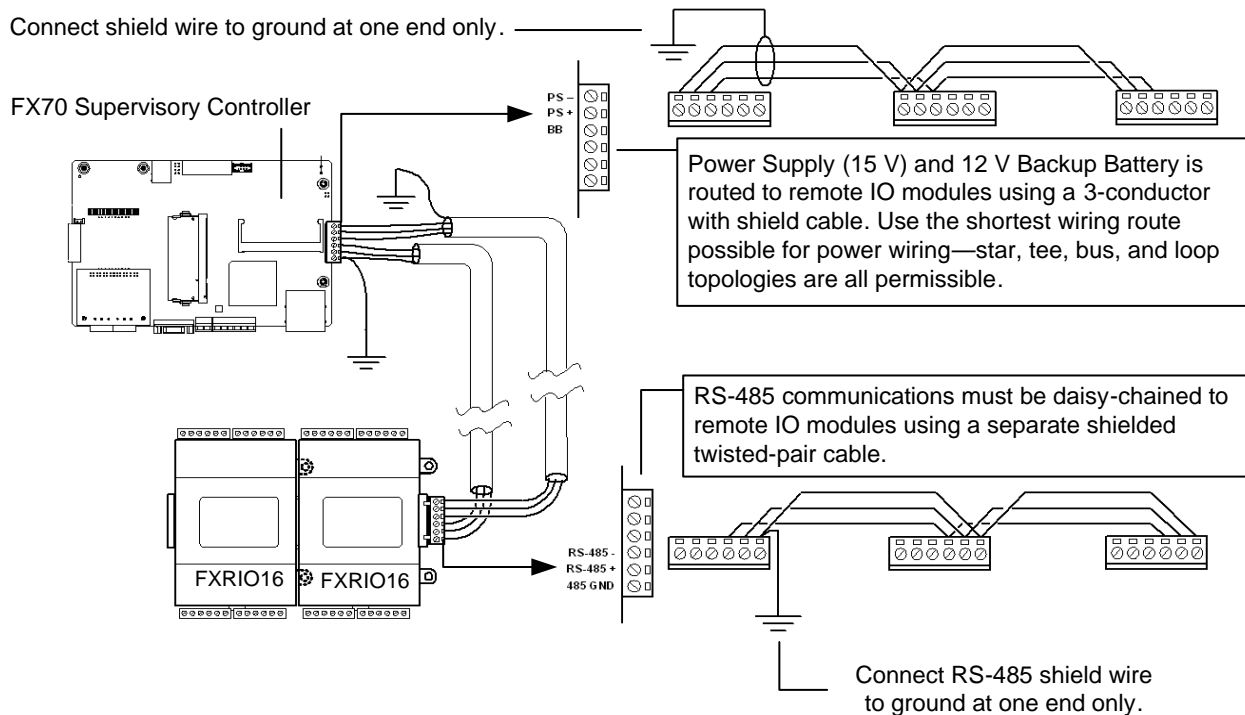


Figure 13: Power and RS-485 Cabling Between FX70 and FXRIO16 Modules

## Setup and Adjustments

### Default Communication and Login Properties

The new FX70 is pre-configured with default properties as defined in Table 4.

Table 4: FX70 Default Properties

Name	Default Property
Internet Protocol (IP) Address	192.168.1.149
Subnet Mask	255.255.255.0
Default Gateway	192.168.1.1
Remote User Name	jci
Remote Password	explorer

### Powerup and Initial Checkout

Following all mounting and wiring, perform the following:

- Apply Power.
- Check the Status LED.

Also see the section [Backup Batteries](#) on page 16.

## Operation

### Apply Power

**CAUTION: Risk of Property Damage**

Do not apply power to the system before checking all wiring connections. Short circuited or improperly connected wires may result in permanent damage to the equipment.

**MISE EN GARDE : Risque de dégâts matériels.**

Ne pas mettre le système sous tension avant d'avoir vérifié tous les raccords de câblage. Des fils formant un court-circuit ou connectés de façon incorrecte risquent d'endommager irrémédiablement l'équipement.

The FX70 does not include an on/off switch. To apply power, you simply energize the AC circuit (90–263 VAC) wired to the attached LP-FXPM263-0 power supply module. If remote I/O modules are wired to the unit, they are also typically powered by the controller as well.

If powering the FX70 (only) with a LP-FXPMxx-0 (Wall Mount AC Adapter), simply plug the AC adapter into a nearby wall outlet.

### Check the Status LED

When power is applied, the front cover STATUS LED lights green. This indicates that the system is OK and that power is applied. The STATUS LED may be blinking until the QNX OS has finished loading and the Niagara platform daemon is running.

Once this boot sequence has finished, the STATUS LED should remain lit (steady), and the BEAT LED should start blinking, at a typical rate of 1 Hz. Typically, this is about 30 seconds after power is applied.

If after applying power, the STATUS LED goes out, or if the BEAT LED comes on (steady) and stays lit longer than 2 minutes, contact your technical support representative for assistance. See also [LEDs](#) on page 17.

### Backup Batteries

The FX70 has two different backup batteries:

- An on-board NiMH battery pack, and
- An optional external, sealed lead-acid, rechargeable Backup Battery (or batteries).

For continuous system operation during loss of primary power (to the LP-FXPM263-0 module powering the unit), unless power loss is only a few seconds, both batteries should be installed. Station alarms are generated if either battery is uncharged or unable to hold a sufficient charge, as well as whenever primary power is lost. You should always investigate any alarm related to backup batteries.

### NiMH Battery Pack

A custom 10-cell NiMH battery pack is inside the controller, mounted atop the shield, and is secured by a metal bracket and two keps. This battery allows the controller to continue station operation (only) through very short power bumps, meaning a few seconds in duration. If a longer outage, the NiMH battery provides enough run time for the unit to backup data and then shutdown. Typically, this process takes about 1 minute. Shutdown occurs automatically, after data is backed up to on-board flash memory.

Upon startup (boot), a test of the NiMH battery is performed. A system alarm is generated if the NiMH battery voltage level is found to be bad. A charge is also initiated upon startup, which lasts from 3 hours minimum, and can range up to 18 hours if the battery is completely discharged. During this NiMH battery charge period, neither the NiMH battery or the external Backup Battery is tested. After the startup NiMH charge period, a periodic test of both batteries occurs, and the appropriate battery alarm is generated if either battery is found to be bad.

**Note:** If the last NiMH battery test is bad, the controller performs an immediate shutdown upon loss of primary power, backing up data and powering off (including attached readers, and expansion modules).

**Note:** A NiMH battery characteristic loses charge if not left in charge mode (trickle charge). Leaving the battery unconnected (or powered off in the unit) causes the battery to fully discharge in a matter of weeks. Note that a new controller ships from the factory with a completely discharged battery. Therefore, allow at least 18 hours for the battery to charge if it has not been in a powered unit.

You should replace the NiMH battery pack approximately every 3 years, or more often if the unit is in a high temperature environment. For more information on the use and replacement of the battery, refer to the [Required NiMH Battery Maintenance](#) on page 18.



## Backup Battery

The optional sealed lead-acid backup battery is an external, 12 V, rechargeable battery (or multiple batteries). The battery is sized to operate the system during loss of primary power, for a period of time. This method includes the controller, as well as power to attached I/O expansion modules.

You connect the backup battery to the controller using a 2-position connector (see Figure 12). Whenever primary-powered, the controller supplies a constant trickle charge to this battery, at 200 mA maximum. At startup (boot), a test of the backup battery is performed, as well as a periodic test. A system alarm is generated if a battery test deems the backup battery to be bad.

Providing that the backup battery tests well, the system operates from this backup battery power upon loss of primary power until the charge level of the on-board NiMH battery pack reaches 0. Note that both batteries discharge in parallel. However, as the sealed lead-acid backup battery capacity is much greater, the NiMH battery pack discharges much slower than if these backup battery(ies) were bad or not present.

**Note:** If the backup battery test was bad, upon loss of primary power, the controller performs an immediate shutdown, backing up data and powering off (including attached readers, expansion modules).

You should replace the sealed lead-acid backup battery(ies) approximately every 3 years, or more often if the unit is in a high temperature environment.

## LEDs

The FX70 provides a number of LEDs on its main board, of which only the Status and Heartbeat LEDs are visible on the cover. Checking other LEDs requires first removing the cover.

LEDs include the following types:

- Status
- Heartbeat
- Debug
- Ethernet Ports

For the location of LEDs on the main board, see Figure 6.

## Status

The green STATUS LED is located on the cover. On the main board, it is also the green SYSOK LED next to the HBEAT LED—both are found near the Ethernet connector housing. The status LED should remain lit whenever the controller is powered, or else be blinking during the boot sequence. If the status LED does not light while power is applied, contact your technical support representative for technical support.

## Heartbeat

The yellow heartbeat HBEAT LED is located on the cover, as well as on the main board next to the SYSOK Status LED. The heartbeat LED blinks about once per second. If the heartbeat LED stays on constantly, does not light, or blinks very fast (more than once per second), contact your technical support representative for technical support.

## Debug

The yellow DEBUG LED is located on the main board near the Ethernet connector housing, and remains lit when the controller has been rebooted with the serial mode select jumper in the serial shell position (see Figure 6). This LED indicates that the DB-9 RS-232 port is operating in serial shell mode.

## Ethernet Ports

Two LEDs for each of the two LAN ports are provided on the back of the metal LAN connector housing, and operate as follows:

The left-side green activity LED indicates activity on that port as follows:

- **Off** — No Ethernet link is made
- **On** — Ethernet link is present, but no activity on the LAN
- **Blinking** — Ethernet link is present with data activity on the LAN.

The right-side yellow speed LED indicates Ethernet connection speed, as either:

- **Off** — Fast Ethernet/Ethernet (100 Mbps /10 Mbps).
- **On** — Gigabit Ethernet speed (1000 Mbps).

## Cleaning

If dust or metal filings are present inside the unit, clean with vacuum or compressed air. Otherwise, no cleaning inside the unit is required. Optionally, if the cover becomes dirty, you can wipe it with a damp cloth and mild detergent.

## Required NiMH Battery Maintenance

Battery life expectancy is a function of its discharge cycles (the number of discharges and their depth) and the ambient temperature of the battery during normal operation. In most applications, the NiMH battery should see relatively few discharges. Therefore, ambient temperature has more to do with the life expectancy of the battery than does any other factor. If the controller is installed in a conditioned space, this battery should provide dependable service for approximately 3 years (average). In an environment where the operating temperature is higher (that is, 50°C or 122°F), you should only expect the battery to last approximately 1 year.

The NiMH battery in the controller is fully discharged when factory shipped. Additionally, NiMH batteries lose charge over time if not kept trickle-charged (for more details, see [NiMH Battery Pack](#) on page 16). Therefore, even a new unit (or replacement battery) requires up to 18 hours of powered operation before it can provide reliable backup power (is at full charge).

The controller monitors the NiMH battery and periodically loads the battery to test its ability to maintain battery-backed functions. Investigate any battery trouble message, and check the battery connections to the unit. Replace the battery as required. To order a new battery, see [Standard Replacement Parts](#) on page 19. See [Replacing the NiMH Battery](#) on page 18 for a replacement procedure.

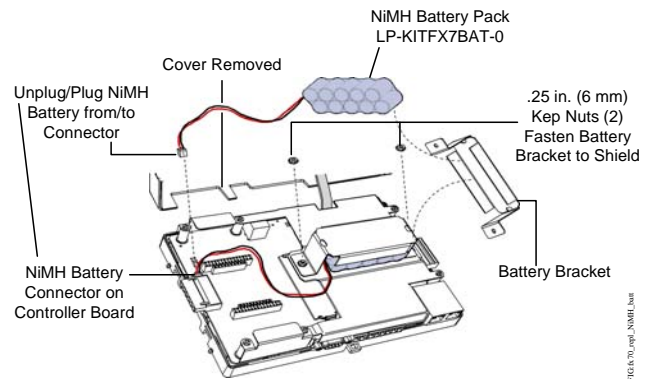
## Replacing the NiMH Battery

The replacement NiMH battery is an assembly that is a custom battery pack with an attached cable and connector plug (see Figure 11). To replace the battery, you must remove power to the unit and remove its cover.

**IMPORTANT:** Use only NiMH battery packs approved for use with the FX70 Supervisory Controller.

1. Back up the controller's configuration to your computer using FX Workbench.
2. Remove all power from the controller, including any sealed lead-acid battery. Wait for LED activity to stop—after a couple of minutes, all LEDs on the unit should be off.
3. Remove the cover. See [Removing and Replacing the Cover](#) on page 6.

At this point you have access to the NiMH battery assembly (Figure 14).



**Figure 14: Replacing the FX70 NiMH Battery Pack**

4. Unplug the NiMH battery from the main board connector (see Figure 14).
5. Use a 1/4 in. (6 mm) nutdriver to unfasten and retain the two kep nuts that secure the metal battery bracket to the shield, and remove the shield and battery pack.
6. Put the replacement battery into the metal shield, and refasten back into place on the shield, using the two kep nuts. Hand tighten with a nutdriver.
7. Plug the battery connector plug of the replacement battery into the NiMH battery connector on the main board of the controller. The connector is keyed; you cannot plug the battery in reversed position.
8. Replace the cover.
9. Restore power to the controller and verify normal operation.

## Battery Disposal

**IMPORTANT:** Do not incinerate or mutilate the battery, as this may cause it to burst or release toxic materials.

**Note:** Batteries removed from this device must be recycled or disposed of in accordance with local, national, and regional regulations. Only certified technicians or qualified building maintenance personnel should service Johnson Controls® products.

## Repair Information

Servicing the FX70 may call for replacement parts. There are three categories of parts.

## Non-replaceable Parts

The controller contains a non-replaceable 2.5 A slow-blow fuse, soldered on the main circuit board. This fuse provides protection from internal shorts or connection to incorrect power supplies. If the fuse circuitry is suspect, contact technical support for assistance.

## Standard Replacement Parts

Table 5 lists the standard replacement parts. Standard replacement parts cannot be returned for credit and should be disposed of in an appropriate manner.

**Table 5: FX70 Standard Replacement Parts**

Part Number	Description
LP-KITFX7BAT-0	NiMH Battery Pack (see <i>Required NiMH Battery Maintenance</i> on page 18).
LP-FX70EX1GB-0	1 GB DDR-2 333MHz Small Outline Dual In-line Memory Module (SODIMM) RAM (replacement part)
LP-KITFX7HW-0	Hardware Bag for FX70, containing screw terminal connector plugs (two 6-position, one 2-position, earth grounding wire).

## New Replacement Unit

To replace a faulty FX70, order a new one. To ensure proper credit for a FX70 still under warranty, contact the Johnson Controls Product Sales Operations Team for return authorization.

**Note:** Before ordering a new controller, it is strongly recommended that you contact your normal technical support resource to eliminate the possibility of a software issue or mis-configuration problem.

## Replacing the FX70 Supervisory Controller



### **WARNING: Risk of Electric Shock.**

Disconnect the power supply before making electrical connections. Contact with components carrying hazardous voltage can cause electric shock and may result in severe personal injury or death.

### **AVERTISSEMENT: Risque de décharge électrique.**

Débrancher l'alimentation avant de réaliser tout branchement électrique. Tout contact avec des composants conducteurs de tensions dangereuses risque d'entraîner une décharge électrique et de provoquer des blessures graves, voire mortelles.

**IMPORTANT:** Before handling circuit boards, discharge any accumulated static by touching a nearby earth ground. For details, see the *Static Discharge Precautions* on page 2.

To replace an FX70 with a new replacement unit, proceed as follows:

1. Use FX Workbench to back up the FX70 configuration to your computer.
2. Remove power to the controller, including any external 12 V battery. The unit should power down automatically. Wait for all LEDs to remain off.
3. Remove the front cover. See *Removing and Replacing the Cover* on page 6.
4. Note positions of all communications and other wiring cables going to the controller. If necessary, label connectors and accessory modules to avoid mis-connection later, after the controller is replaced.
5. Unplug all Ethernet, serial, LONWORKS, modem, and I/O connectors from the controller. Note the position of installed option cards, if any. You must transfer them to the replacement FX70.
6. Remove the controller from its mounting (DIN rail, panel mount tabs, or other).
7. Remove any option cards from the old controller and install them into the replacement FX70, if applicable. See *Installing an Option Card* on page 9 for more details.
8. Mount the replacement controller as it was previously, using the same DIN rail location and/or screws.

9. Reconnect the earth ground wire to the controller's grounding lug and any installed accessory modules.
10. Reconnect any Ethernet, serial, modem, and I/O connectors.
11. If using IO modules, and any of your I/O points have voltage, turn the devices back on, or reconnect power to them.
12. Replace the cover. See *Removing and Replacing the Cover* on page 6.
13. Restore power to the unit. It should boot up as a new unit (see *Check the Status LED* on page 16).
14. Use FX Workbench to re-commission the FX70 and install the saved station database.

### COM Slot Assignments

Table 6 lists the COM slot assignments for the FX70 Controller.

**Table 6: COM Slot Assignments for the FX70 Supervisory Controller (Part 1 of 2)**

Option Slot 1	Option Slot 2	Onboard RS-232	Onboard RS-485
None	None	COM1	COM2
RS-232 = COM5	None	COM1	COM2
RS-232 = COM5	RS-232 = COM6	COM1	COM2
RS-232 = COM5	RS-485 = COM6, COM7	COM1	COM2
RS-232 = COM5	LON = LON1	COM1	COM2
RS-232 = COM5	Sedona = COM6	COM1	COM2
RS-232 = COM5	Modem = COM4	COM1	COM2
RS-232 = COM5	GPRS = COM6, COM7	COM1	COM2
RS-485 = COM5, COM6	None	COM1	COM2
RS-485 = COM5, COM6	RS-232 = COM7	COM1	COM2
RS-485 = COM5, COM6	RS-485 = COM7, COM8	COM1	COM2
RS-485 = COM5, COM6	LON = LON1	COM1	COM2
RS-485 = COM5, COM6	Sedona = COM7	COM1	COM2
RS-485 = COM5, COM6	Modem = COM4	COM1	COM2
RS-485 = COM5, COM6	GPRS = COM7, COM8	COM1	COM2
LON = LON1	None	COM1	COM2
LON = LON1	RS-232 = COM5	COM1	COM2
LON = LON1	RS-485 = COM5, COM6	COM1	COM2
LON = LON1	LON = LON2	COM1	COM2
LON = LON1	Sedona = COM5	COM1	COM2
LON = LON1	Modem = COM4	COM1	COM2
LON = LON1	GPRS = COM5, COM6	COM1	COM2
Sedona = COM5	None	COM1	COM2
Sedona = COM5	RS-232 = COM6	COM1	COM2
Sedona = COM5	RS-485 = COM6, COM6	COM1	COM2
Sedona = COM5	LON = LON1	COM1	COM2
Sedona = COM5	Modem = COM6	COM1	COM2
Sedona = COM5	GPRS = COM6, COM7	COM1	COM2
Modem = COM3	None	COM1	COM2
Modem = COM3	RS-232 = COM5	COM1	COM2
Modem = COM3	RS-485 = COM5, COM6	COM1	COM2
Modem = COM3	LON = LON1	COM1	COM2
Modem = COM3	Sedona = COM5	COM1	COM2

**Table 6: COM Slot Assignments for the FX70 Supervisory Controller (Part 2 of 2)**

Option Slot 1	Option Slot 2	Onboard RS-232	Onboard RS-485
GPRS = COM5, COM6	None	COM1	COM2
GPRS = COM5, COM6	RS-232 = COM7	COM1	COM2
GPRS = COM5, COM6	RS-485 = COM7, COM8	COM1	COM2
GPRS = COM5, COM6	LON = LON1	COM1	COM2
GPRS = COM5, COM6	Sedona = COM7	COM1	COM2



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