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Find the *National Instruments cFP-2120* at our website: *Click HERE*

Quick Start Guide

# FieldPoint™ cFP-21xx

## What You Need to Get Set Up

- cFP-21*xx* LabVIEW RT controller
- Mounting hardware (DIN rail, panel-mount, or rack-mount accessory)
- I/O module(s)
- cFP-BP-*x* backplane, connector blocks, cables
- 11–30 VDC power supply
- Accessories: Ethernet cable, number 2 Phillips screwdriver
- PC running Windows
- FieldPoint software 4.1.1 or later
- LabVIEW Real-Time Module

NATIONAL INSTRUMENTS™

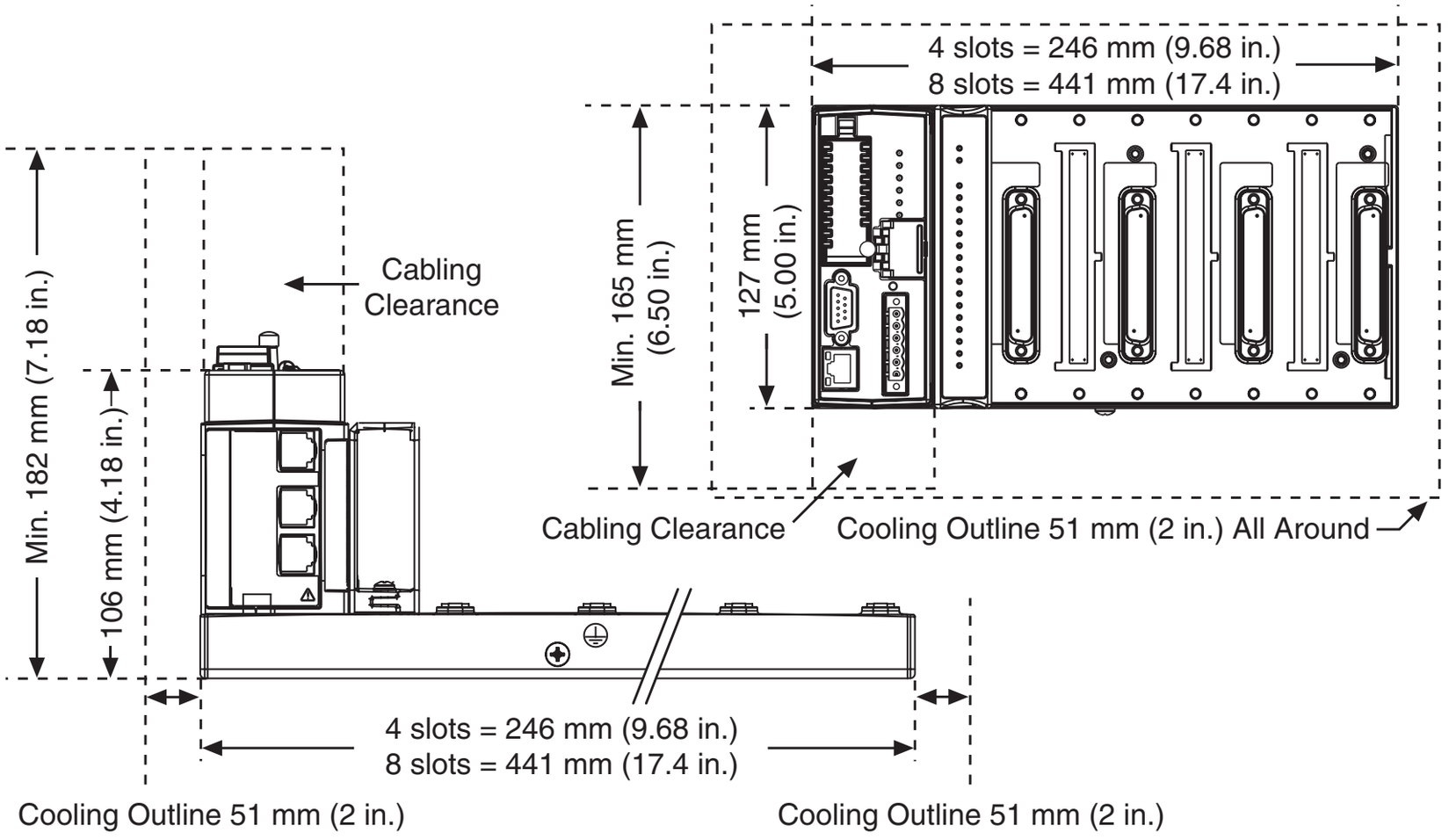
# 1. Mount the Compact FieldPoint Backplane

You can mount the cFP-BP-*x* backplane on a 35mm DIN rail, on a panel, or in a standard 19 in. rack. Before using any of these mounting methods, record the serial number from the back of the backplane.

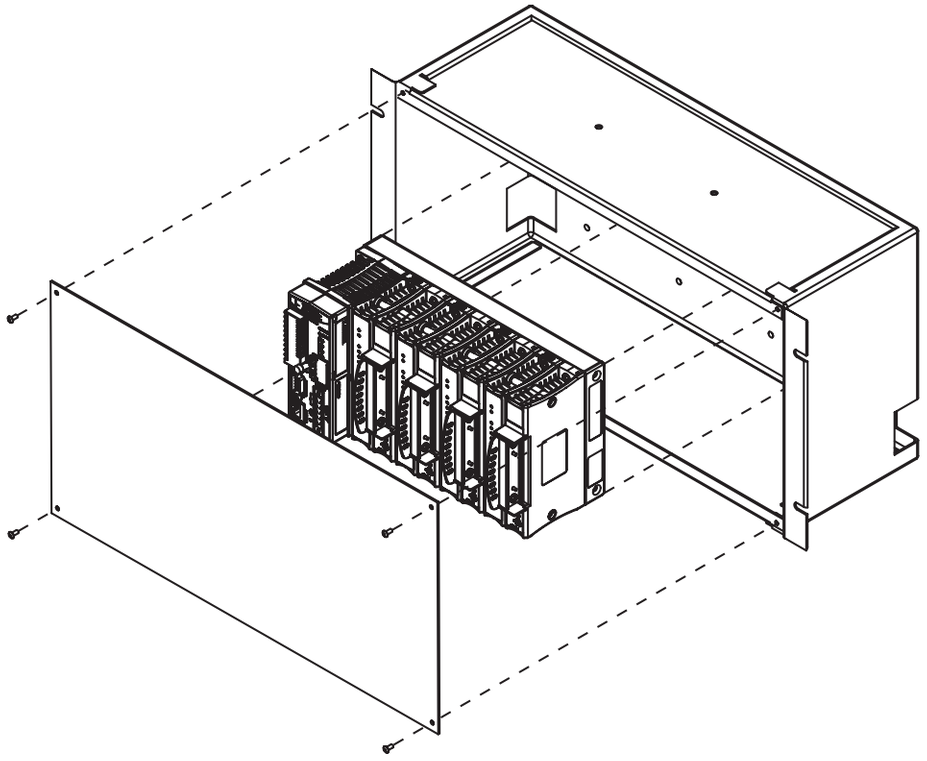
Each set of mounting instructions in this document includes an instruction to connect the protective earth (PE) ground terminal on the cFP-BP-*x* backplane to the system safety ground. The backplane PE ground terminal has the following symbol stamped beside it: ⏚. Connect the backplane PE ground terminal to the system safety ground using 14 AWG (1.6 mm) wire with a ring lug. Use the 5/16 in. panhead screw shipped with the backplane to secure the ring lug to the backplane PE ground terminal.

**Caution** Keep in mind these requirements for space and cabling clearance:

- Allow at least 51 mm (2 in.) all around the backplane for air circulation.
- Allow 38 mm (1.5 in.) below and 51 mm (2 in.) above the controller.



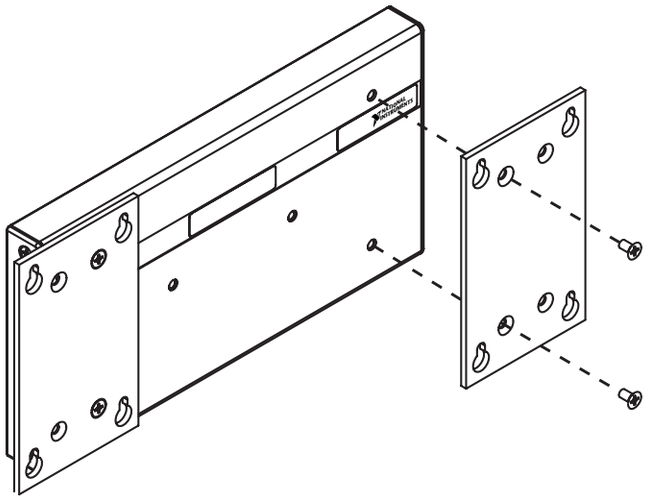

**Caution** If you are using UL Recognized I\O modules with the Compact FieldPoint system, you must install the entire system in a suitably rated, UL Listed NEMA or IP enclosure.



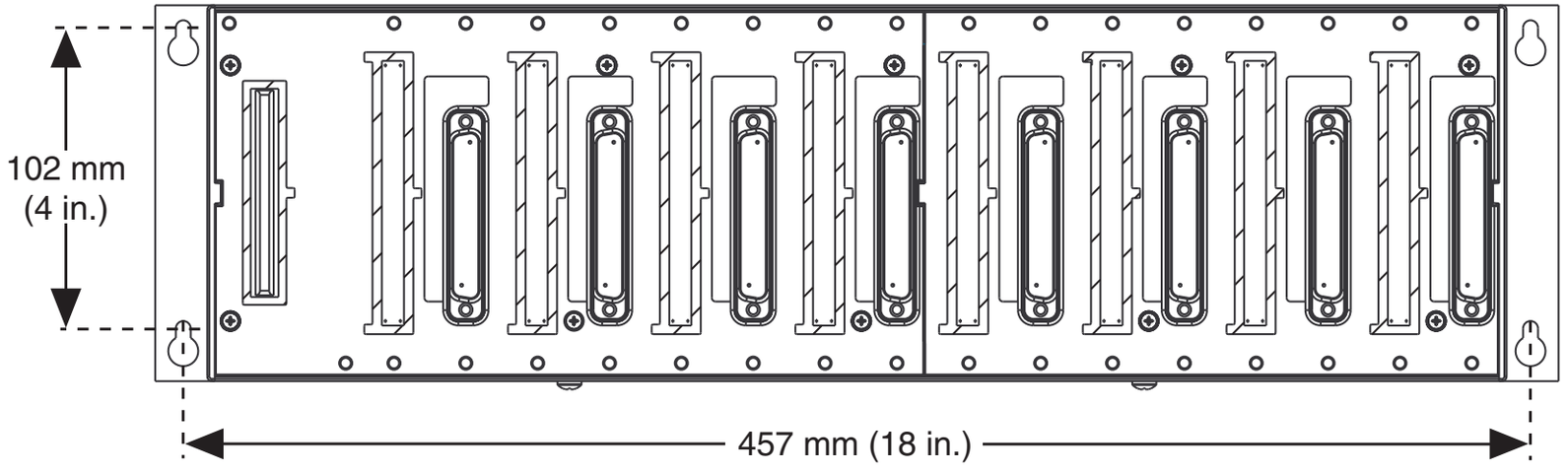
**Caution** NI recommends that you use one of the mounting systems described in this document. If you decide to use a custom mounting solution, make sure that the screws you use are short enough to fit in the holes in the backplane. The screw holes are 5 mm (0.2 in.) deep.

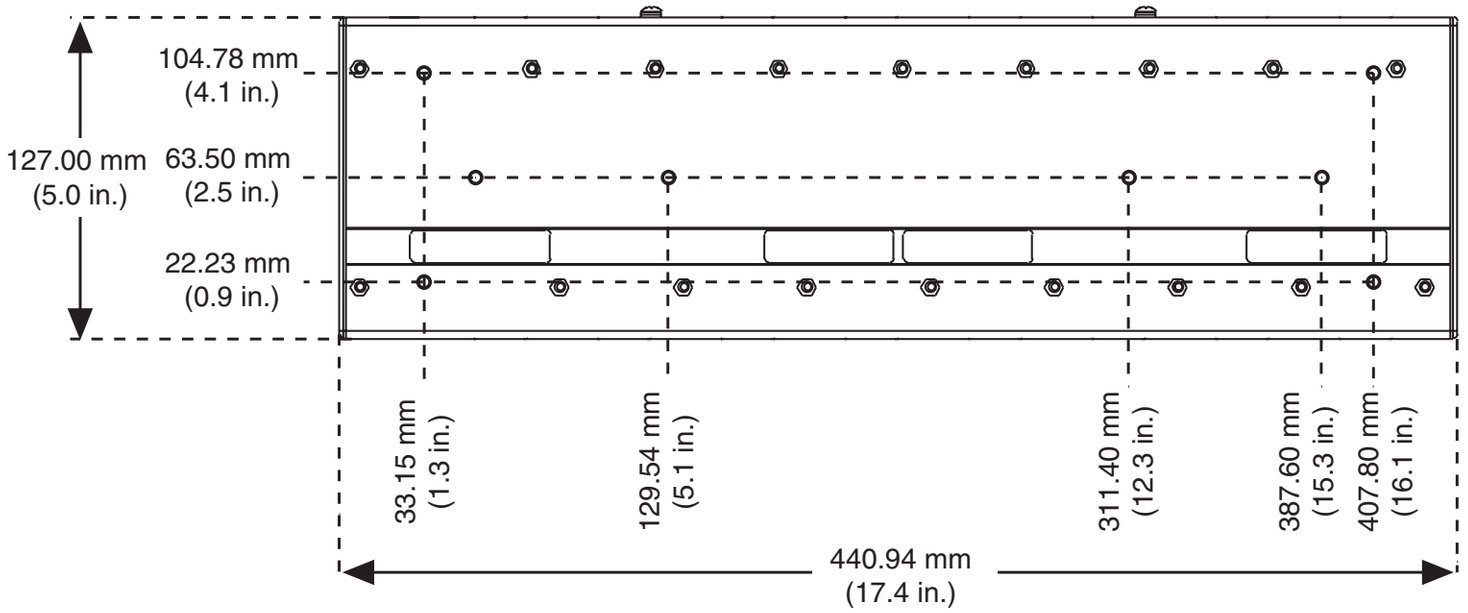
# Mounting the Backplane on a Panel

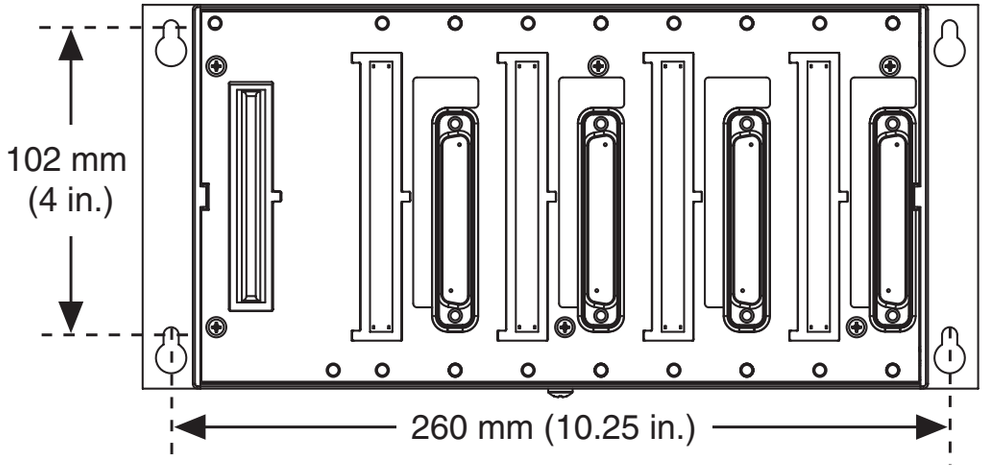
1. Fasten the panel-mount plates to the back of the cFP-BP-*x* using a number 2 Phillips screwdriver and the 8-32 × 5/16 in. countersink screws shipped with the kit.

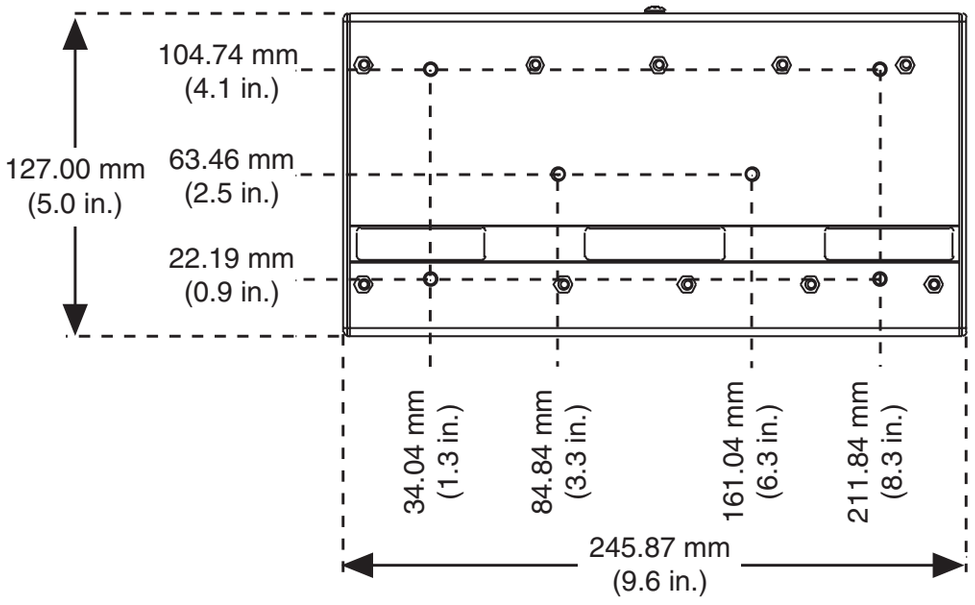


**Caution** Do not use screws longer than 5/16 in. to fasten the panel-mount plates to the backplane.




104.78 mm
(4.1 in.)
127.00 mm
(5.0 in.)
63.50 mm
(2.5 in.)
22.23 mm
(0.9 in.)
33.15 mm
(1.3 in.)
129.54 mm
(5.1 in.)
311.40 mm
(12.3 in.)
387.60 mm
(15.3 in.)
407.80 mm
(16.1 in.)
440.94 mm
(17.4 in.)


102 mm
(4 in.)
260 mm (10.25 in.)



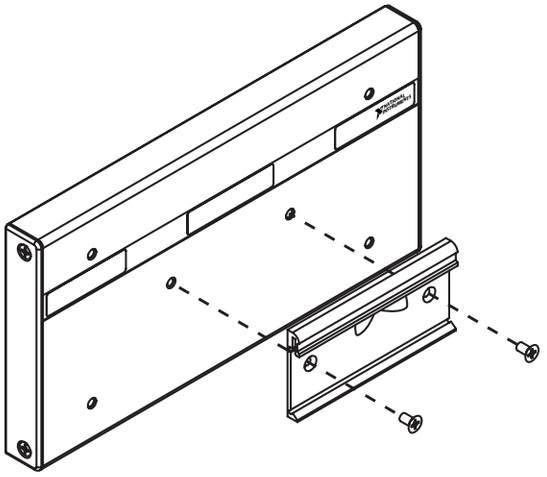

2. Bolt or screw the panel-mount accessory to a panel.
3. Connect the PE ground terminal on the cFP-BP-*x* to safety ground.

**Caution** Disconnect power before removing the backplane from the panel.

## Mounting the Backplane on a DIN Rail

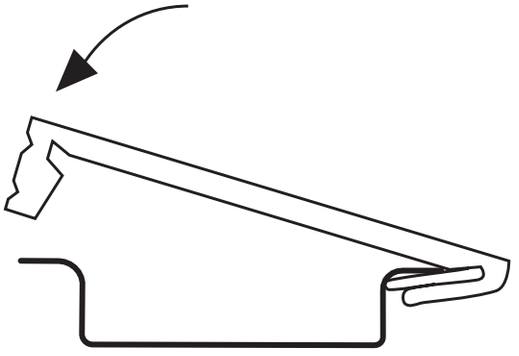
NI recommends DIN rail mounting for the cFP-BP-4 only. Use panel mounting or rack mounting for the cFP-BP-8. The DIN rail mounting kit is NI part number 778614-01.

1. Fasten the DIN rail clip to the cFP-BP-4 using a number 2 Phillips screwdriver and the 8-32 × 5/16 in. countersink screws shipped with the clip.



**Caution** Do not use screws longer than 5/16 in. to fasten the DIN rail clip to the backplane.

2. Insert one edge of the DIN rail into the deeper opening of the DIN rail clip.
3. Press down firmly on the backplane to compress the spring until the clip locks in place on the DIN rail.

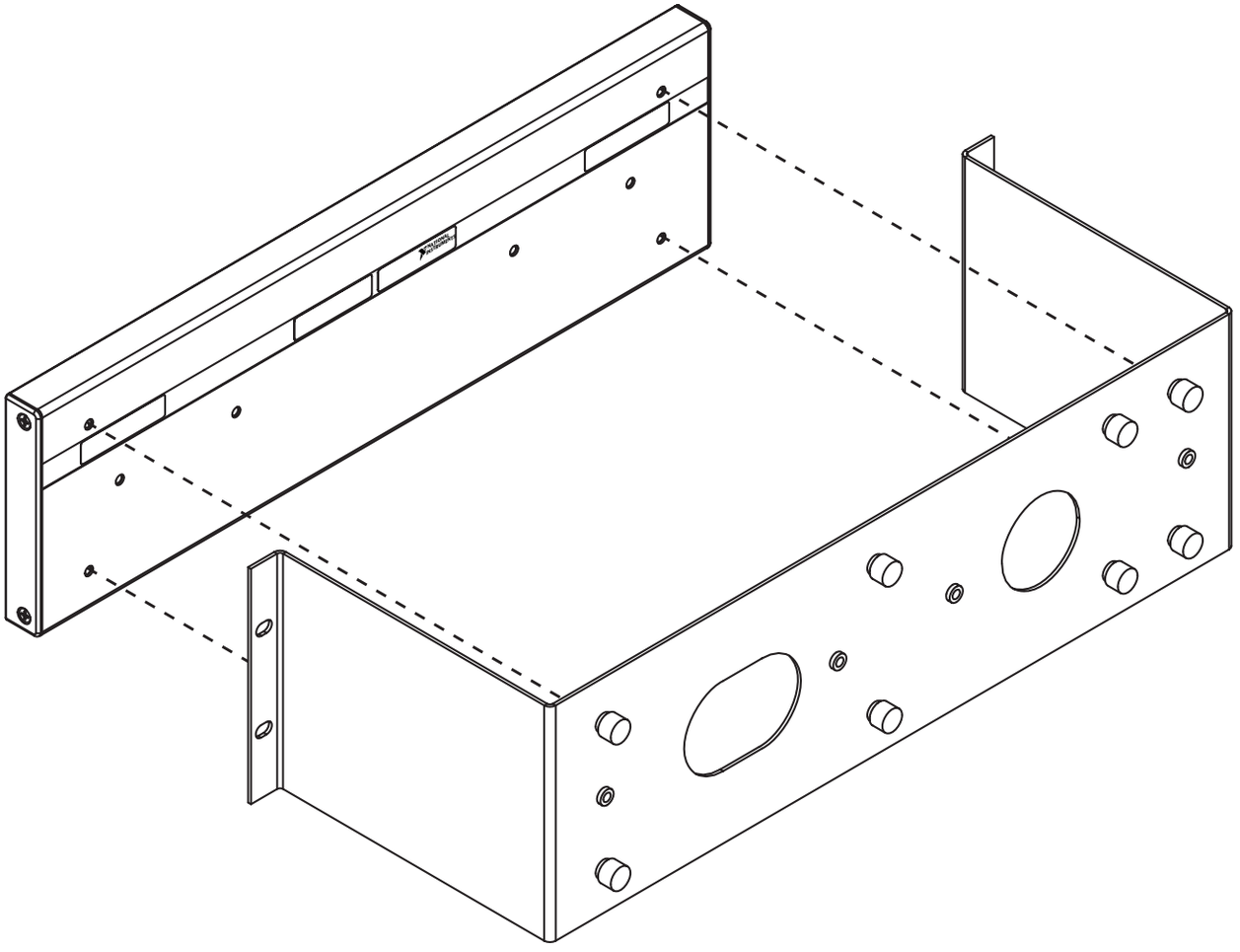


4. Connect the PE ground terminal on the cFP-BP-4 to safety ground.

**Caution** Disconnect power before removing the backplane from the DIN rail.

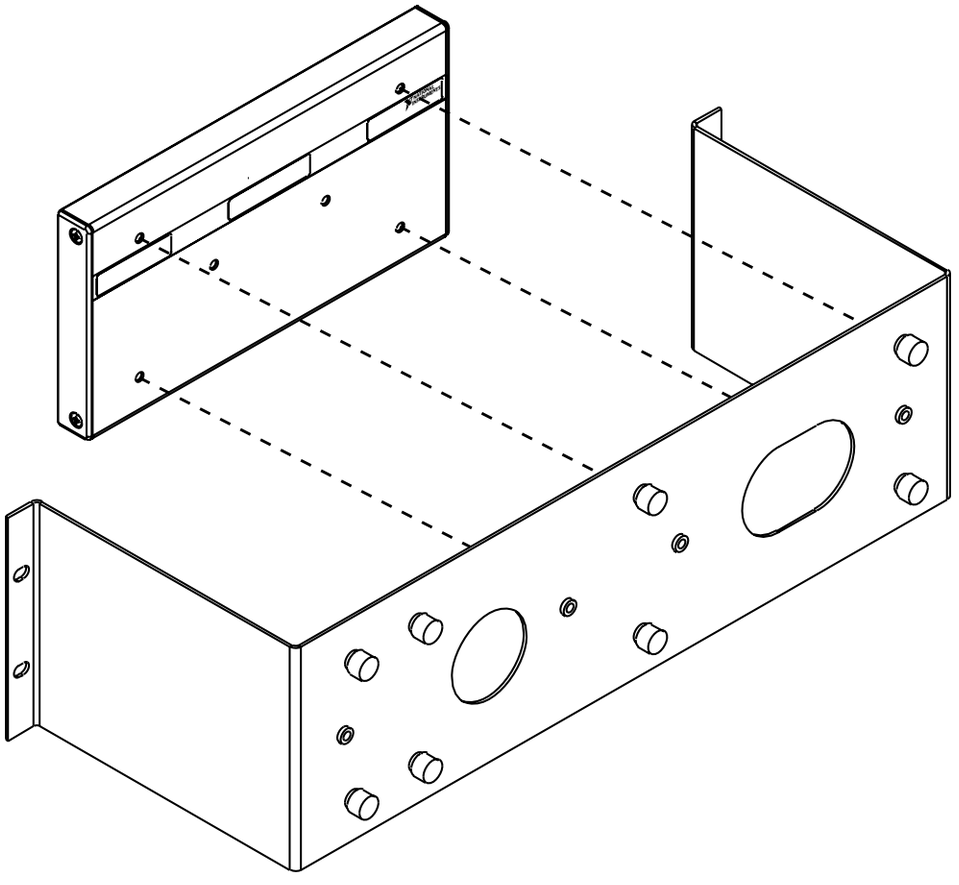
# Mounting the Backplane in a Standard 19 in. Rack

1. Fasten the rack-mount bracket to the back of the cFP-BP-*x* using the captive screws on the bracket.



2. Bolt the rack-mount accessory to a standard 19 in. rack.

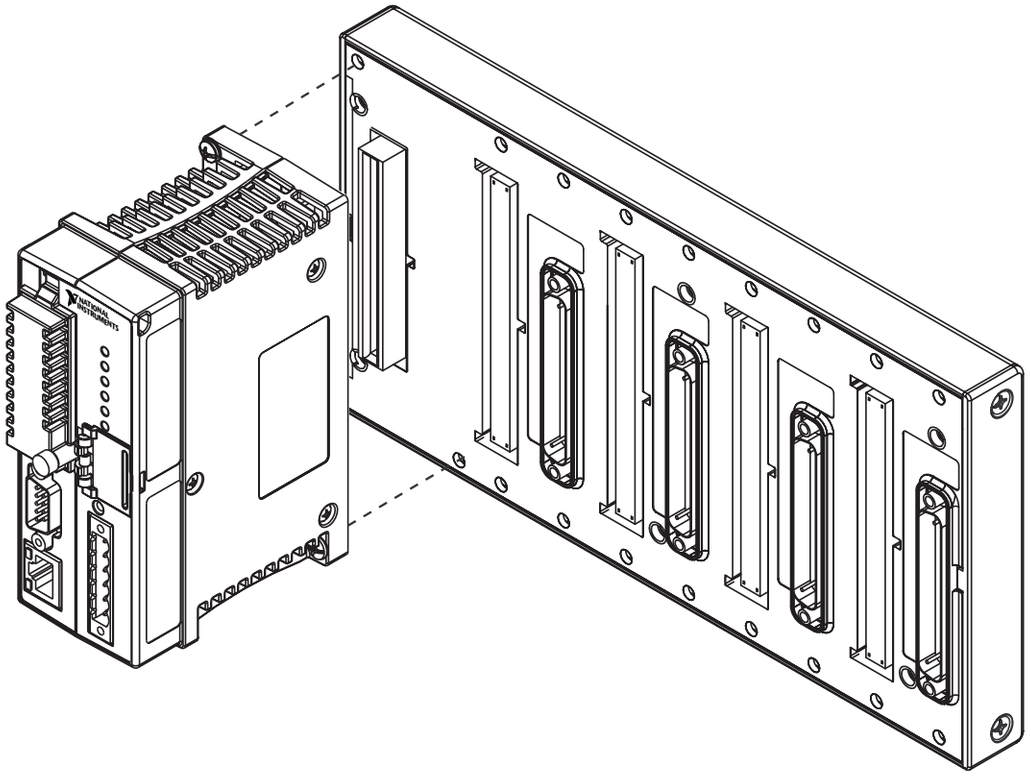
3. Connect the PE ground terminal on the cFP-BP-*x* to safety ground.



**Caution** Disconnect power before removing the backplane from the DIN rail.

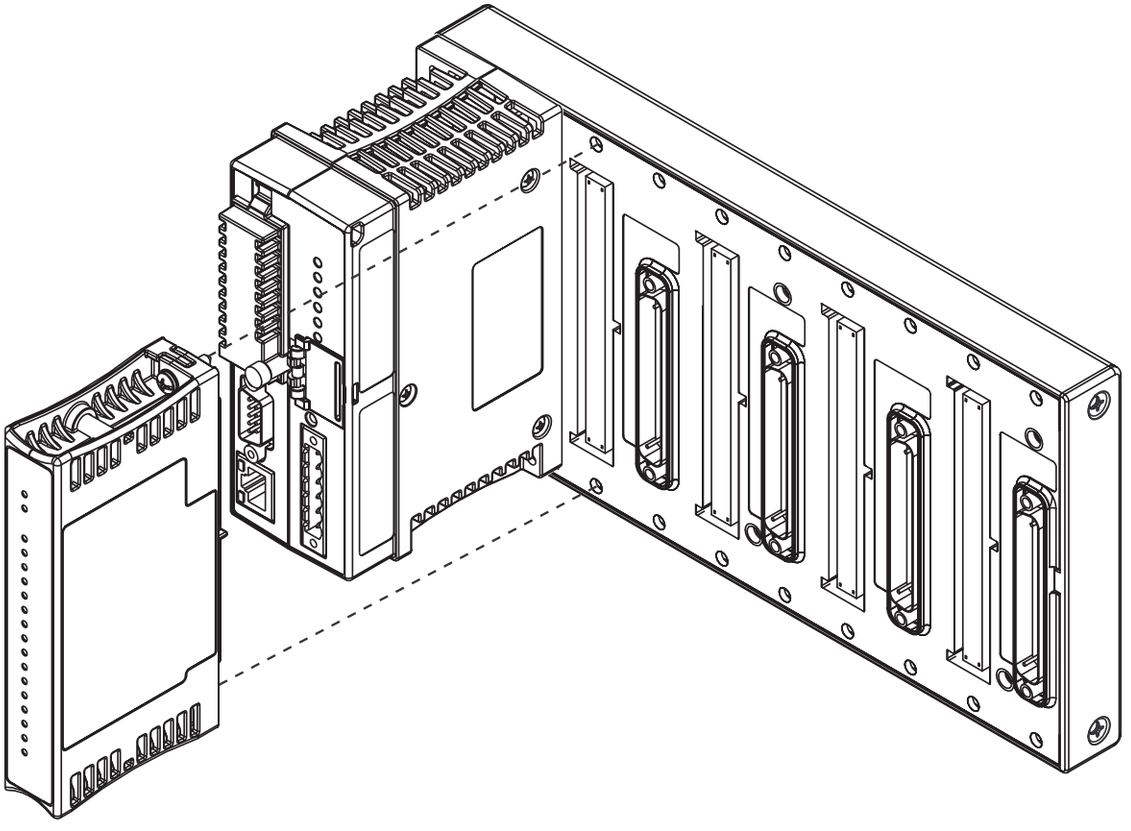
# 2. Install the cFP-21*xx* Controller on the Backplane

1. Make sure that no power is connected to the controller.
2. Make sure that the cFP-21*xx* controller is right side up with the NI logo at the top, and align the captive screws on the controller with the holes on the backplane.
3. Seat the card edge at the back of the controller in the card-edge connector on the backplane.
4. Press the controller firmly to seat it on the backplane.
5. Using a number 2 Phillips screwdriver with a shank of at least 64 mm (2.5 in.) length, tighten the captive screws to 1.1 N · m (10 lb · in.) of torque.



# 3. Install I/O Modules on the Backplane

1. Align the captive screws on the I/O module with the holes on the backplane.
2. Press firmly to seat the I/O module on the backplane.
3. Using a number 2 Phillips screwdriver with a shank of at least 64 mm (2.5 in.) length, tighten the captive screws to 1.1 N · m (10 lb · in.) of torque.
4. Repeat this procedure to install additional I/O modules on the backplane.



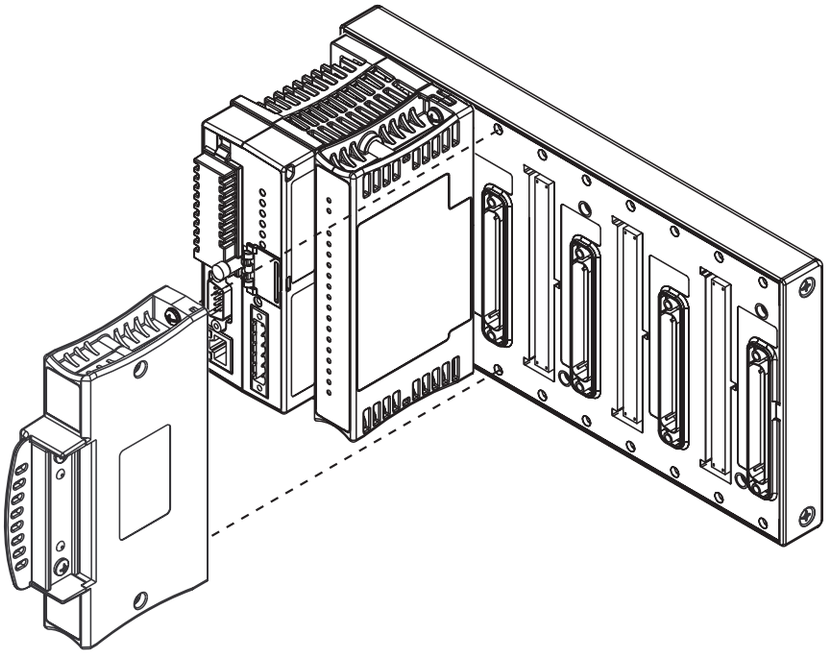
# 4. Install Connector Blocks on the Backplane

In order to connect I/O modules to input signals or to external loads, you need to install a cFP-CB-*x* connector block or other connectivity accessory for each I/O module on the backplane. Use the connector socket to the right of each I/O module socket.

**Caution** Do not insert or remove connector blocks or other connectivity accessories while power is applied to them.

1. Wire field devices as described in the I/O module and connector block operating instructions.

   **Caution** Hazardous voltage wiring should be performed by qualified personnel and in accordance with local electrical standards.



2. Align the captive screws on the connector block with the holes on the backplane.
3. Press firmly to seat the connector block on the backplane.
4. Using a number 2 Phillips screwdriver with a shank of at least 64 mm (2.5 in.) length, tighten the captive screws to 1.1 N · m (10 lb · in.) of torque.
5. Repeat this procedure to install additional connector blocks on the backplane.

# 5. Connect the cFP-21*xx* to Your Network

Connect the cFP-21*xx* controller to an Ethernet network using the RJ-45 Ethernet port on the controller. Use a standard Category 5 Ethernet cable to connect the cFP-21*xx* to an Ethernet hub, or use an Ethernet crossover cable to connect the controller directly to a computer.

**Caution** To prevent data loss and to maintain the integrity of your Ethernet installation, do not use a cable longer than 100 m. If you are using a 100 Mbps Ethernet network, National Instruments recommends using a Category 5 shielded twisted-pair Ethernet cable.

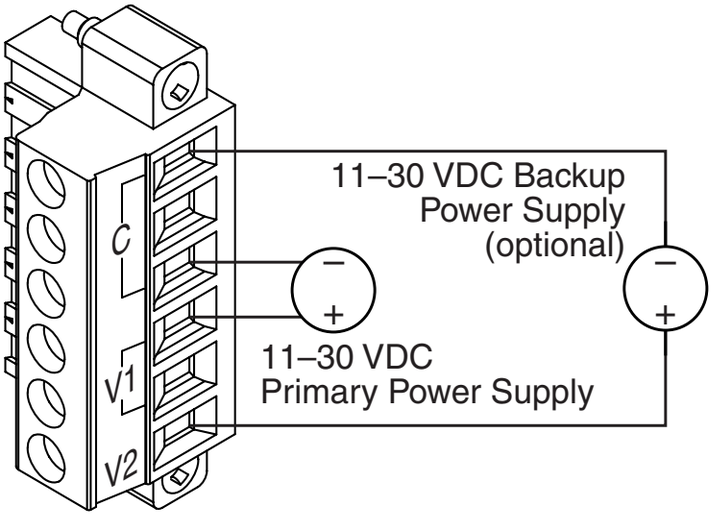
If the host PC is already configured on a network, you must configure the cFP-21*xx* on the same network. If neither is connected to a network, you can connect the two directly using a crossover cable.

In order for you to configure the cFP-21*xx*, it must reside on the same subnet as the host PC.

# 6. Wire Power to the Compact FieldPoint System

Each cFP-21*xx* on your network requires an 11–30 VDC power supply.

1. Connect the positive lead of the primary power supply to one of the V1 terminals and the negative lead to one of the C terminals.
2. If you are using a backup power supply, connect the positive lead to V2 and the negative lead to one of the C terminals. The cFP-21*xx* uses the power supply with the higher voltage level. V2 is isolated from the other V terminals.




3. Refer to the operating instructions for the power requirements of each I/O module.
4. Use a separate power supply for each module that needs external power.

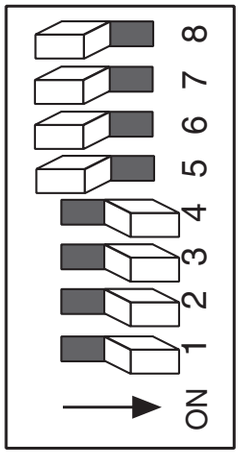
**Caution** Cascading power defeats isolation between the cascaded modules.

# 7. Power Up the cFP-21*xx*

Check the DIP switches on the controller, making sure that the RESET IP switch is in the OFF position. Plug in each power supply to the Compact FieldPoint system. The cFP-21*xx* runs a power-on self test (POST) that takes several seconds. You should see the POWER and STATUS LEDs come on. After about three seconds, the STATUS LED begins flashing steadily. The cFP-21*xx* is ready to be configured.

If you have already assigned an IP address to the cFP-21*xx*, the STATUS LED turns off. The total boot time for a configured system is 10–15 seconds.

If the STATUS LED does not light up as described here, refer to the *cFP-21xx and cFP-BP-x User Manual* at `d:\docs\Network Modules`, where *d* is the letter of your CD-ROM drive.




| DIP Switches | Functions |
|---|---|
| 1, 2 | Disabled |
| 3, 4 | User-configurable |
| 5 | CONSOLE OUT |
| 6 | DISABLE VI |
| 7 | SAFE MODE |
| 8 | RESET IP |

# 8. Install Software on the Host PC

1. Install the software packages you plan to use, such as LabVIEW, the LabVIEW Real-Time Module, Measurement Studio, VI Logger, or LabWindows™/CVI™, before you install the FieldPoint software. The FieldPoint software installation installs the LabVIEW VIs and examples and the LabWindows/CVI instrument driver only if it finds the corresponding development software installed.
2. Close all other applications.
3. Insert the National Instruments FieldPoint Software CD into the CD-ROM drive on your computer.
4. Follow the onscreen instructions to complete the installation.



**Note** If the setup does not launch automatically, select **Start»Run** from Windows, enter `d:\setup`, where *d* is the letter of your CD-ROM drive, and select **OK**.

# 9. Configure the cFP-21*xx*

Launch Measurement & Automation Explorer (MAX) to configure the cFP-21*xx*. For information about configuring the cFP-21*xx* in software, refer to the *Measurement & Automation Explorer Help for FieldPoint* (**Start»Programs» National Instruments»FieldPoint»FieldPoint Help**).

For information about using the cFP-21*xx* with the LabVIEW Real-Time Module, refer to the *cFP-21xx and cFP-BP-x User Manual*.

# Compact FieldPoint Safety Information

The following section contains important safety information that you *must* follow when installing and using Compact FieldPoint products.

Do *not* operate Compact FieldPoint products in a manner not specified in the user manual or operating instructions. Misuse of the product can result in a hazard. You can compromise the safety protection built into the product if the product is damaged in any way. If the product is damaged, return it to National Instruments for repair.

Do *not* substitute parts or modify Compact FieldPoint products. Use the products only with the modules, accessories, and cables specified in the installation instructions.

You *must* connect the protective earth (PE) ground terminal on the cFP-1808 to the system safety ground. The backplane PE ground terminal has the following symbol stamped beside it: . Connect the backplane PE ground terminal to the system safety ground using 14 AWG (1.6 mm) wire with a ring lug. Use the 5/16 in. panhead screw shipped with the backplane to secure the ring lug to the backplane PE ground terminal.

Do *not* operate Compact FieldPoint products in an explosive atmosphere or where there may be flammable gases or fumes. If you need to operate Compact FieldPoint products in such an environment, the Compact FieldPoint products *must* be in a suitably rated enclosure.

If you need to clean a Compact FieldPoint product, use a soft nonmetallic brush. The product *must* be completely dry and free from contaminants before you return it to service.

Operate the product only at or below Pollution Degree 2. Pollution is foreign matter in a solid, liquid, or gaseous state that can reduce dielectric strength or surface resistivity. The following is a description of pollution degrees:

- Pollution Degree 1 means no pollution or only dry, nonconductive pollution occurs. The pollution has no influence.
- Pollution Degree 2 means that only nonconductive pollution occurs in most cases. Occasionally, however, a temporary conductivity caused by condensation must be expected.
- Pollution Degree 3 means that conductive pollution occurs, or dry, nonconductive pollution occurs which becomes conductive due to condensation.



**Caution** You *must* insulate signal connections for the maximum voltage for which the Compact FieldPoint product is rated. Do *not* exceed the maximum ratings for the product. Do *not* install wiring while the product is live with electrical signals. Do *not* remove or add connector blocks when power is connected to the Compact FieldPoint system. Avoid contact between your body and the connector block signal wiring when hot-swapping modules.

Operate Compact FieldPoint products at or below the *measurement category*[1] marked on the hardware label. Measurement circuits are subjected to *working voltages*[2] and transient stresses (overvoltage) from the circuit to which they are connected during measurement or test. Measurement categories establish standard

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[1] Measurement categories are defined in electrical safety standard IEC 61010-1.

[2] Working voltage is the highest rms value of an AC or DC voltage that can occur across any particular insulation.

impulse withstand voltage levels that commonly occur in electrical distribution systems. The following is a description of measurement categories:

- Measurement Category I is for measurements performed on circuits not directly connected to the electrical distribution system referred to as MAINS[1] voltage. This category is for measurements of voltages from specially protected secondary circuits. Such voltage measurements include signal levels, special equipment, limited-energy parts of equipment, circuits powered by regulated low-voltage sources, and electronics.
- Measurement Category II is for measurements performed on circuits directly connected to the electrical distribution system. This category refers to local-level electrical distribution, such as that provided by a standard wall outlet (for example, 115 V for U.S. or 230 V for Europe). Examples of Measurement Category II are measurements performed on household appliances, portable tools, and similar products.
- Measurement Category III is for measurements performed in the building installation at the distribution level. This category refers to measurements on hard-wired equipment such as equipment in fixed installations, distribution boards, and circuit breakers. Other examples are wiring, including cables, bus-bars, junction boxes, switches, socket-outlets in the fixed installation, and stationary motors with permanent connections to fixed installations.
- Measurement Category IV is for measurements performed at the primary electrical supply installation (<1,000 V). Examples include electricity meters and measurements on primary overcurrent protection devices and on ripple control units.

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[1] MAINS is defined as a hazardous live electrical supply system that powers equipment. Suitably rated measuring circuits may be connected to the MAINS for measuring purposes.

## Using This Product Safely in Hazardous Locations

This product is suitable for use in U.S. and Canada: Class I, Division 2, Groups A, B, C, D, T4 hazardous locations; and nonhazardous locations.

**Caution** Explosion hazard—Substitution of components may impair suitability for Class I, Division 2.

Explosion hazard—Do not disconnect equipment unless power has been switched off or the area is known to be nonhazardous.

Equipment must be used within its electrical and environmental ratings. Refer to the *Specifications* section. Refer to the product label for manufacturing location.

This product must be installed in an enclosure rated at least IP 54.

# Specifications

## Network

Network interface ..... 10BaseT and 100BaseTX Ethernet

Compatibility ..... IEEE802.3

Communication rates ..... 10 Mbps, 100 Mbps, auto-negotiated

Maximum cabling distance ..... 100 m/segment

Maximum power to connected I/O modules ..... 9 W

Maximum number of banks ..... Determined by network topology

# Memory

cFP-2100 ..... 64 MB nonvolatile;
64 MB DRAM

cFP-2110 ..... 64 MB nonvolatile;
128 MB DRAM

cFP-2120 ..... 128 MB nonvolatile;
128 MB DRAM

Memory lifetime (nonvolatile) ..... 300,000 writes per sector

For information about the memory used by the LabVIEW Real-Time Module and the operating system, go to `ni.com/info` and enter `rdfpec`.

# Serial Ports

cFP-2100 ..... One RS-232 serial port

cFP-2110 ..... Two RS-232 serial ports

cFP-2120 ..... Three RS-232 serial ports;
one RS-485 serial port

RS-232 (DTE) serial ports

- Baud rate ..... 110 to 115,200 bps
- Data bits ..... 5, 6, 7, 8
- Stop bits ..... 1, 1.5, 2
- Parity ..... Odd, Even, Mark, Space
- Flow control ..... RTS/CTS, XON/XOFF, DTR/DSR

RS-485 (DTE) serial port

- Baud rate ..... 110 to 115,200 bps
- Data bits..... 5, 6, 7, 8
- Stop bits..... 1, 1.5, 2
- Parity ..... Odd, Even, Mark, Space
- Flow control ..... XON/XOFF
- Wire mode ..... 4-wire
- Isolation voltage, port to earth ground
  - Continuous ..... 100 $V_{rms}$
  - Dielectric withstand ..... 740 $V_{rms}$, verified by 5 s test

## Power Requirement

Power supply range..... 11–30 VDC

Recommended power supply

- cFP-BP-4 system ..... 15 W
- cFP-BP-8 system ..... 20 W

Power consumption ..... 6.1 W + 1.1 (*I/O module power requirements*)

## Physical Characteristics

Screw-terminal wiring ..... 16–26 AWG copper conductor wire with 7 mm (0.28 in.) of insulation stripped from the end

Torque for screw terminals ..... 0.5–0.6 N · m (4.4–5.3 lb · in.)

Weight..... 278 g (9.8 oz)

# Environmental

FieldPoint modules are intended for indoor use only. For outdoor use, they must be installed in a suitable sealed enclosure.

Operating temperature ..... –40 to 70 °C

Storage temperature ..... –40 to 85 °C

Humidity ..... 10 to 90% RH, noncondensing

Maximum altitude..... 2,000 m; at higher altitudes the isolation voltage ratings must be lowered

Pollution Degree ..... 2

# Shock and Vibration

Operating vibration

Random (IEC 60068-2-64)..... 10–500 Hz, 5 $g_{rms}$

Sinusoidal (IEC 60068-2-6) ..... 10–500 Hz, 5 g

Operating shock

(IEC 60068-2-27)..... 50 g, 3 ms half sine,
18 shocks at 6 orientations;
30 g, 11 ms half sine,
18 shocks at 6 orientations

# Safety

This product is designed to meet the requirements of the following standards of safety for electrical equipment for measurement, control, and laboratory use:

- IEC 61010-1, EN 61010-1
- UL 61010-1, CSA 61010-1

**Note** For UL, hazardous location, and other safety certifications, refer to the product label or visit `ni.com/certification`, search by model number or product line, and click the appropriate link in the Certification column.

## Electromagnetic Compatibility

This product meets the requirements of the following EMC standards for electrical equipment for measurement, control, and laboratory use:

- EN 61326 (IEC 61326): Class A emissions; Basic immunity
- EN 55011 (CISPR 11): Group 1, Class A emissions
- AS/NZS CISPR 11: Group 1, Class A emissions
- FCC 47 CFR Part 15B: Class A emissions
- ICES-001: Class A emissions

**Note** For EMC compliance, operate this device with shielded cabling.

## CE Compliance

This product meets the essential requirements of applicable European Directives, as amended for CE marking, as follows:

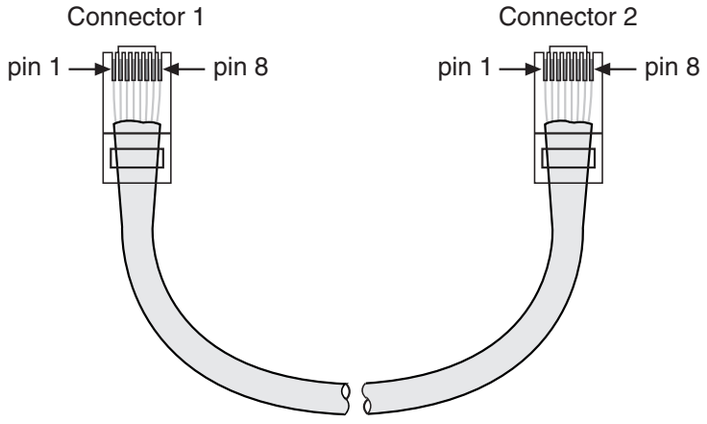
Low-Voltage Directive (safety)..... 2006/95/EC

Electromagnetic Compatibility
Directive (EMC) ..... 2004/108/EC

**Note** Refer to the Declaration of Conformity (DoC) for this product for any additional regulatory compliance information. To obtain the DoC for this product, visit `ni.com/certification`, search by model number or product line, and click the appropriate link in the Certification column.

# Cabling

The table below shows the standard Ethernet cable wiring connections for both normal and crossover cables.

| Ethernet Cable Connector Pinouts | Pin | Connector 1 | Connector 2 (Normal) | Connector 2 (Crossover) |
|---|---|---|---|---|
|  | 1 | white/orange | white/orange | white/green |
| | 2 | orange | orange | green |
| | 3 | white/green | white/green | white/orange |
| | 4 | blue | blue | blue |
| | 5 | white/blue | white/blue | white/blue |
| | 6 | green | green | green |
| | 7 | white/brown | white/brown | white/brown |
| | 8 | brown | brown | brown |

# Where to Go for Support

The National Instruments Web site is your complete resource for technical support. At `ni.com/support` you have access to everything from troubleshooting and application development self-help resources to email and phone assistance from NI Application Engineers.

National Instruments corporate headquarters is located at 11500 North Mopac Expressway, Austin, Texas, 78759-3504. National Instruments also has offices located around the world to help address your support needs. For telephone support in the United States, create your service request at `ni.com/support` and follow the calling instructions or dial 512 795 8248. For telephone support outside the United States, contact your local branch office:

Australia 1800 300 800, Austria 43 662 457990-0, Belgium 32 (0) 2 757 0020,
Brazil 55 11 3262 3599, Canada 800 433 3488, China 86 21 5050 9800,
Czech Republic 420 224 235 774, Denmark 45 45 76 26 00,
Finland 358 (0) 9 725 72511, France 01 57 66 24 24, Germany 49 89 7413130,
India 91 80 41190000, Israel 972 3 6393737, Italy 39 02 41309277,
Japan 0120-527196, Korea 82 02 3451 3400, Lebanon 961 (0) 1 33 28 28,
Malaysia 1800 887710, Mexico 01 800 010 0793,
Netherlands 31 (0) 348 433 466, New Zealand 0800 553 322,
Norway 47 (0) 66 90 76 60, Poland 48 22 328 90 10, Portugal 351 210 311 210,
Russia 7 495 783 6851, Singapore 1800 226 5886, Slovenia 386 3 425 42 00,
South Africa 27 0 11 805 8197, Spain 34 91 640 0085,
Sweden 46 (0) 8 587 895 00, Switzerland 41 56 2005151,
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