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# FieldPoint™

## FP-1300 User Manual

NATIONAL INSTRUMENTS™

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# Compliance

## FCC/Canada Radio Frequency Interference Compliance

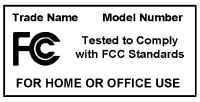
### Determining FCC Class

The Federal Communications Commission (FCC) has rules to protect wireless communications from interference. The FCC places digital electronics into two classes. These classes are known as Class A (for use in industrial-commercial locations only) or Class B (for use in residential or commercial locations). Depending on where it is operated, this product could be subject to restrictions in the FCC rules. (In Canada, the Department of Communications (DOC), of Industry Canada, regulates wireless interference in much the same way.)

Digital electronics emit weak signals during normal operation that can affect radio, television, or other wireless products. By examining the product you purchased, you can determine the FCC Class and therefore which of the two FCC/DOC Warnings apply in the following sections. (Some products may not be labeled at all for FCC; if so, the reader should then assume these are Class A devices.)

FCC Class A products only display a simple warning statement of one paragraph in length regarding interference and undesired operation. Most of our products are FCC Class A. The FCC rules have restrictions regarding the locations where FCC Class A products can be operated.

FCC Class B products display either a FCC ID code, starting with the letters **EXN**, or the FCC Class B compliance mark that appears as shown here on the right.




Consult the FCC Web site at `http://www.fcc.gov` for more information.

### FCC/DOC Warnings

This equipment generates and uses radio frequency energy and, if not installed and used in strict accordance with the instructions in this manual and the CE Marking Declaration of Conformity*, may cause interference to radio and television reception. Classification requirements are the same for the Federal Communications Commission (FCC) and the Canadian Department of Communications (DOC).

Changes or modifications not expressly approved by National Instruments could void the user's authority to operate the equipment under the FCC Rules.

### Class A

#### Federal Communications Commission

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 the 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 own expense.

#### Canadian Department of Communications

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.

### Class B

#### Federal Communications Commission

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

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### Canadian Department of Communications

This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la classe B respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

## Compliance to EU Directives

Readers in the European Union (EU) must refer to the Manufacturer's Declaration of Conformity (DoC) for information* pertaining to the CE Marking compliance scheme. The Manufacturer includes a DoC for most every hardware product except for those bought for OEMs, if also available from an original manufacturer that also markets in the EU, or where compliance is not required as for electrically benign apparatus or cables.

To obtain the DoC for this product, click **Declaration of Conformity** at `ni.com/hardref.nsf/`. This Web site lists the DoCs by product family. Select the appropriate product family, followed by your product, and a link to the DoC appears in Adobe Acrobat format. Click the Acrobat icon to download or read the DoC.

* The CE Marking Declaration of Conformity will contain important supplementary information and instructions for the user or installer.

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# Conventions

The following conventions are used in this manual:

| | |
|---|---|
| » | The » symbol leads you through nested menu items and dialog box options to a final action. The sequence **File»Page Setup»Options** directs you to pull down the **File** menu, select the **Page Setup** item, and select **Options** from the last dialog box. |
|  | This icon denotes a note, which alerts you to important information. |
|  | This icon denotes a caution, which advises you of precautions to take to avoid injury, data loss, or a system crash. |
| **bold** | Bold text denotes items that you must select or click in the software, such as menu items and dialog box options. Bold text also denotes DIP switch, LED, and parameter names. |
| *italic* | Italic text denotes variables, emphasis, a cross reference, or an introduction to a key concept. This font also denotes text that is a placeholder for a word or value that you must supply. |
| `monospace` | Text in this font denotes text or characters that you should enter from the keyboard, sections of code, programming examples, and syntax examples. This font is also used for the proper names of disk drives, paths, directories, programs, subprograms, subroutines, device names, functions, operations, variables, filenames and extensions, and code excerpts. |
| *`monospace italic`* | Italic text in this font denotes text that is a placeholder for a word or value that you must supply. |

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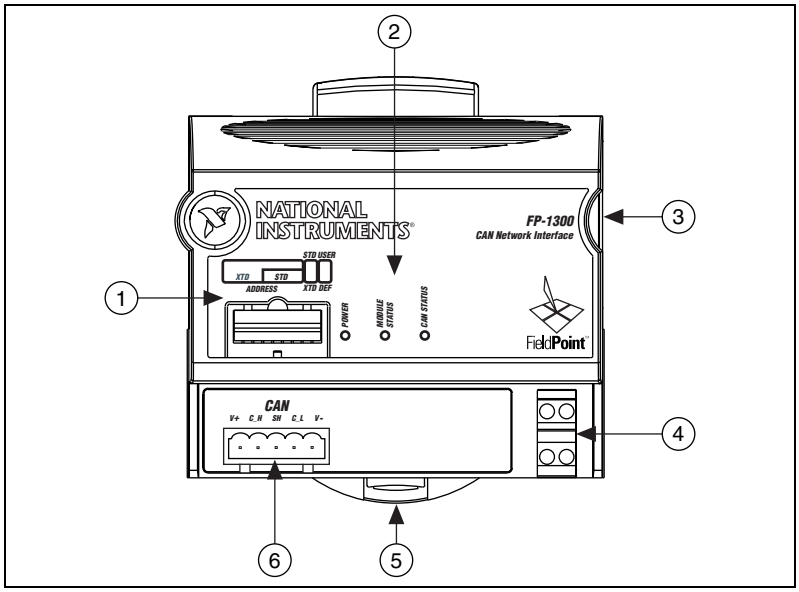
# 1

# Overview of the FP-1300 Network Module

This chapter provides an overview of the FieldPoint FP-1300 network module and the FP-1300 software.

## FP-1300 Hardware Overview

With the FP-1300 you can add configurable I/O to any CAN communication bus. Use NI-CAN hardware and NI-CAN 2.0 or later, driver software to configure the FP-1300. The FP-1300 has a CAN port, LED indicators to communicate status information, and DIP switches that perform various functions.




| | | | |
|---|---|---|---|
| 1 | DIP Switches | 4 | Power Connector |
| 2 | LED Indicators | 5 | Rail Clip |
| 3 | Local Bus Connector | 6 | CAN Port |

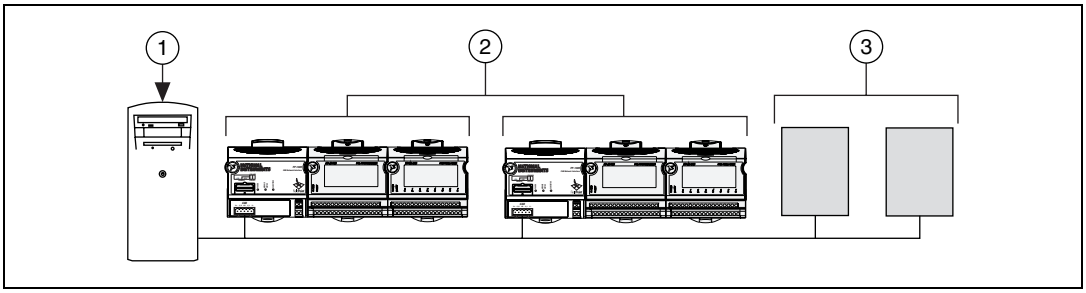
**Figure 1-1.** Overview of the FP-1300



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A FieldPoint bank consists of at least one network module, and one or more terminal base, and I/O modules. Each FP-1300 can support up to nine I/O modules. The maximum number of FP-1300 network modules that you can install on the CAN network is limited in theory by the number of unique arbitration IDs on the network. If you use standard arbitration IDs, you can install up to eight FP-1300 banks on a single network. If you use extended arbitration IDs, the number of FP-1300 banks you can install on a single network is system dependent.

The FP-1300 network module connects directly to a high-speed CAN network. If you are using NI-CAN, you can use the FP-1300 Configuration Utility to configure the baud rate of the FP-1300 to match the baud rate of the CAN network. For more information on configuring the baud rate of the FP-1300, refer to the *FP-1300 Configuration Help*. If you are not using NI-CAN, you cannot use the FP-1300 Configuration Utility and you must configure the other devices on the CAN network to use the default baud rate of the FP-1300, which is 500 Kbps. For detailed hardware specifications and cabling information, refer to Appendix C, *Specifications*.




1 PC with a CAN Card 2 FP-1300 Banks 3 Other CAN Devices

**Figure 1-2.** FP-1300 CAN Network

# FP-1300 Software Overview

The National Instruments FP-1300 software consists of NI-CAN software and the FP-1300 Configuration Utility. The FP-1300 software runs on Windows 2000/NT/XP/Me/9*x* and includes the following components:

- FP-1300 Configuration Utility
- NI-CAN software 2.0 or later

You can download the current version of the FP-1300 software from the NI FTP site at `ni.com/support/`.



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# FP-1300 Setup Overview

The following list is an overview of the steps required to set up and run the FP-1300.

1. Install the NI-CAN software and hardware as described in the *NI-CAN Hardware and Software Manual*.
2. Install the FieldPoint hardware as described in Chapter 2, *Installing and Configuring Hardware and Software*.
   a. Mount the FP-1300, terminal bases, and I/O modules.
   b. If you are not using an NI-CAN card with the FP-1300 system, configure the DIP switches on the FP-1300.
   c. Connect the FP-1300 to the CAN network.
   d. Wire power to the FP-1300 CAN port.
   e. Wire power to the FP-1300 system.
   f. Wire signals to the I/O channels.
3. Install the FP-1300 Configuration Utility as described in Chapter 2, *Installing and Configuring Hardware and Software*.
4. Launch Measurement & Automation Explorer (MAX).
5. Configure the FieldPoint system and verify the configuration, as described in the *FP-1300 Configuration Help*.
6. Deploy the system.



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# 2

# Installing and Configuring Hardware and Software

This chapter explains how to install the FieldPoint hardware and how to install and configure the software. Before you install the FieldPoint hardware, install the other CAN hardware. If you are using NI-CAN hardware, refer to the *NI-CAN Hardware and Software Manual*.

## What You Need to Get Started

To set up and use the FP-1300, you need the following items:

- ❑ FP-1300 network module
- ❑ Mounting hardware (DIN rail or panel-mount accessory)
- ❑ Terminal base(s) and I/O module(s)
- ❑ 10–30 VDC power supply to power the CAN bus
- ❑ 11–30 VDC power supply to power the FieldPoint bus
- ❑ Accessories: twisted-pair cable, Combicon-style connector, flathead screwdriver
- ❑ Optional accessories: shielded cable, two 120 Ω resistors
- ❑ Installed and configured CAN card

## FieldPoint Safety Information

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

Do *not* operate the FieldPoint product 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



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the product is damaged in any way. If the product is damaged, return it to NI for repair.

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

Always operate the FieldPoint product in a suitable enclosure that will prevent unintentional access to live terminals and will prevent the spread of fire.

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

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

You *must* insulate signal connections for the maximum voltage for which the 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 terminal bases when power is connected to the FieldPoint system. Avoid contact between your body and the terminal base signal wiring when hotswapping modules.



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Operate FieldPoint products at or below the *installation 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. Installation categories establish standard impulse withstand voltage levels that commonly occur in electrical distribution systems. The following is a description of installation categories:

- Installation Category I is for measurements performed on circuits not directly connected to the electrical distribution system referred to as MAINS[3] 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.
- Installation 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 (such as 115 V for U.S. or 230 V for Europe). Examples of Installation Category II are measurements performed on household appliances, portable tools, and similar products.
- Installation 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.
- Installation 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.

# Mounting the FP-1300 and Terminal Bases

You can mount the FieldPoint system either to a DIN rail or directly on a panel. Panel mounting is generally the more secure option. The following sections give instructions for both mounting methods.

[1] Installation categories, also referred to as *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.

[3] 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.

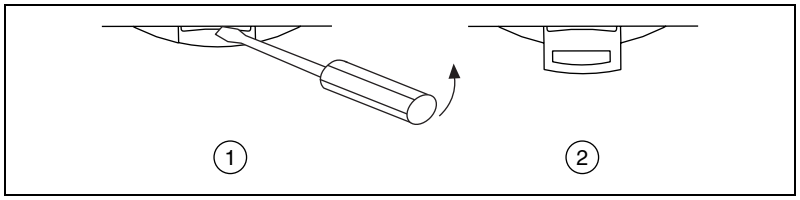


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## Mounting the FP-1300 on a DIN Rail

The FP-1300 network module has a simple rail clip for reliable mounting on a standard 35 mm DIN rail. Complete the following steps if you choose to mount the module on a DIN rail.

1. Write down the serial number from the back of the FP-1300 before you mount it.
2. Use a flathead screwdriver to open the DIN rail clip to the unlocked position.




1 Rail Clip Locked 2 Rail Clip Unlocked

**Figure 2-1.** Unlocking the Rail Clip

3. Hook the lip on the rear of the FP-1300 onto the top of a 35 mm DIN rail and press the module down onto the DIN rail.

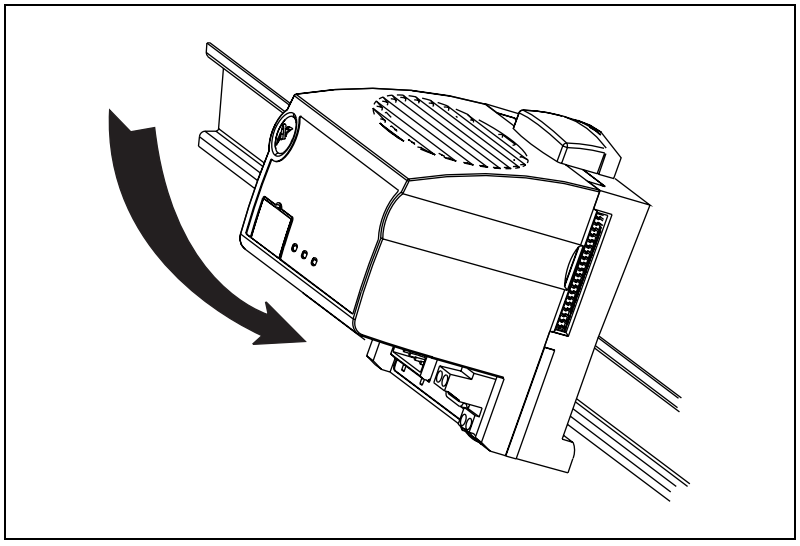


**Figure 2-2.** Mounting the FP-1300 on a DIN Rail



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4. Slide the FP-1300 to the desired position on the DIN rail. When it is in position, lock it to the DIN rail by pushing the rail clip to the locked position.

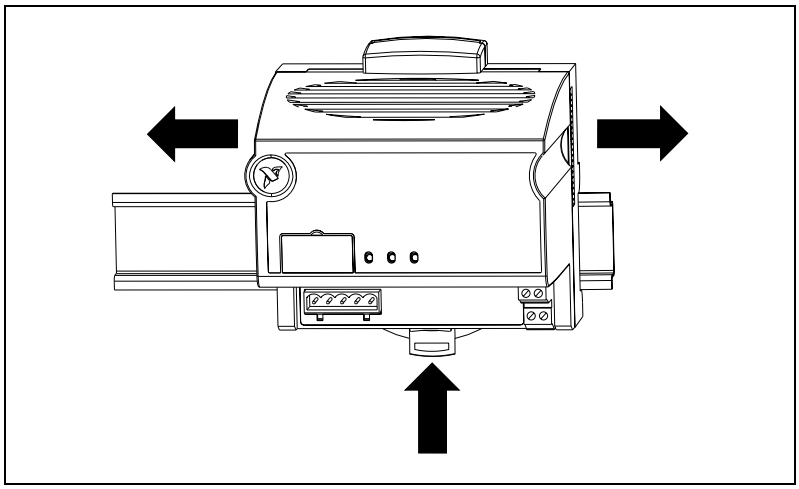


**Figure 2-3.** Locking the FP-1300 on the DIN Rail

## Connecting Terminal Bases with DIN Rail Mounting

Complete the following steps to connect a terminal base to an FP-1300 network module using DIN rail mounting.

**Caution** To avoid damaging the FP-1300 and the terminal bases, make sure that no power is applied to the system while you install or remove terminal bases.

1. Mount the terminal base on the DIN rail as detailed in the *Mounting the FP-1300 on a DIN Rail* section.
2. Attach the terminal base to the FP-1300 by firmly attaching the local bus connectors. Be careful not to bend any pins.
3. To add more terminal bases, install them on the rail and connect their local bus connectors together. In most cases, a single FP-1300 can support up to nine terminal bases, depending on the power consumption of the I/O modules. Refer to the *Powering the FieldPoint System* section for more information about power requirements.
4. Place the protective cover onto the local bus connector of the last terminal base on the bank. Add the rail locks by sliding them on and tightening the screws.



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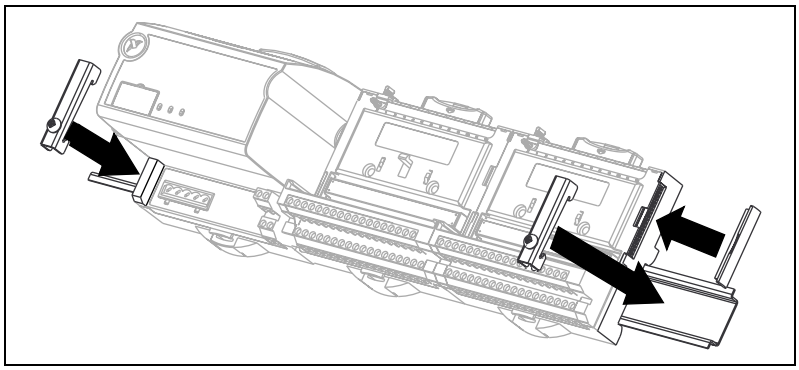


**Figure 2-4.** Installing the Bus-Protection Cover and the Rail Locks

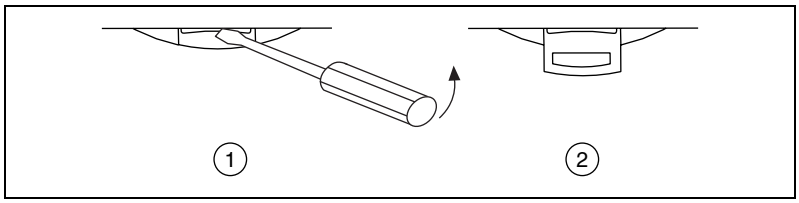
## Removing the FP-1300 and Terminal Bases from the DIN Rail

Remove an I/O module from its terminal base before lifting the terminal base off the rail. To remove an FP-1300 network module or terminal base, unlock it from the DIN rail by placing a flathead screwdriver in the slot on the rail clip and opening the clip to the unlocked position. After you disconnect the network module from the local bus connector of the terminal base, you can lift the terminal base off the rail.

# Mounting the FP-1300 to a Panel

Complete the following steps if you choose to install the optional FieldPoint network panel-mount accessory and mount the FP-1300 network module to a panel. You can order the panel-mount accessory, part number 777609-01, from NI.

1. Write down the serial number from the back of the FP-1300.
2. Use a flathead screwdriver to open the rail clip to the unlocked position.




1 Rail Clip Locked 2 Rail Clip Unlocked

**Figure 2-5.** Unlocking the Rail Clip



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3. Snap the panel-mount accessory onto the module.

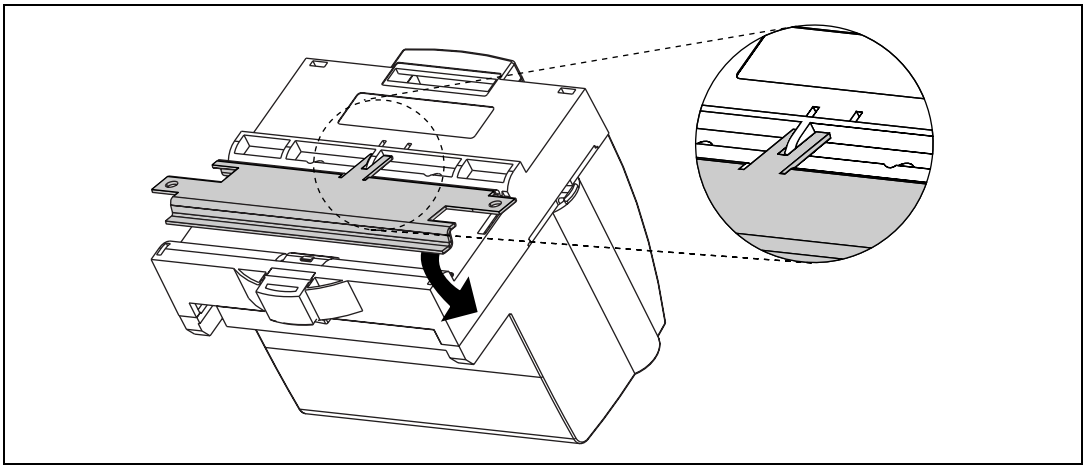


**Figure 2-6.** Installing the Panel Mount Accessory

4. Lock the panel-mount accessory into place by pushing the rail clip to the locked position.
5. Mount the FP-1300 to the panel with the panel-mount accessory. The installation guide that came with the panel-mount accessory includes a template that you can use to drill pilot holes for mounting.

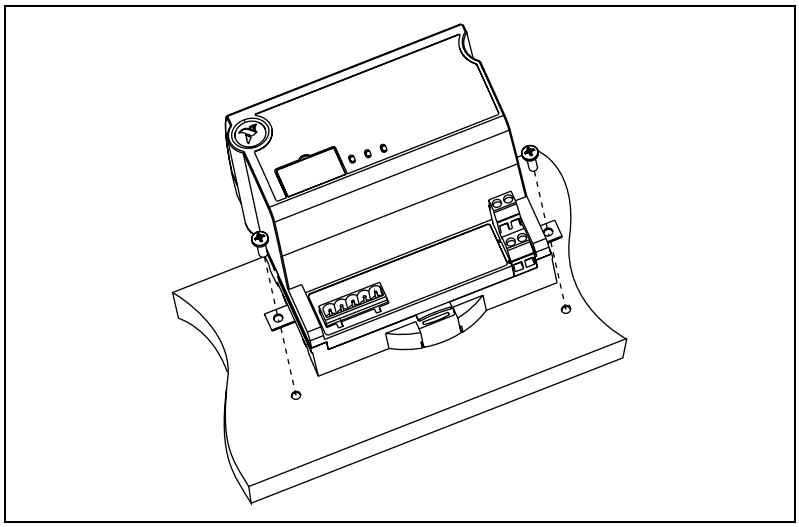


**Figure 2-7.** Attaching the FP-1300 to the Panel



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## Connecting Terminal Bases with Panel Mounting

You can install terminal bases directly, without using the panel mount accessory needed to mount the FP-1300 network module. Complete the following steps to connect terminal bases to the network module using panel mounting.

**Caution** To avoid damaging the FP-1300 and the terminal bases, make sure that no power is applied to the system while you install or remove terminal bases.

1. Drill pilot holes in the panel to mount the terminal bases. A drilling template is provided with the network module panel-mount accessory.
2. Connect the terminal base to the FP-1300 by firmly attaching the local bus connectors. Be careful not to bend any connector pins.
3. Bolt, screw, or otherwise fasten the terminal base to the panel. Make sure that the local bus connectors remain firmly attached after the terminal base is mounted.

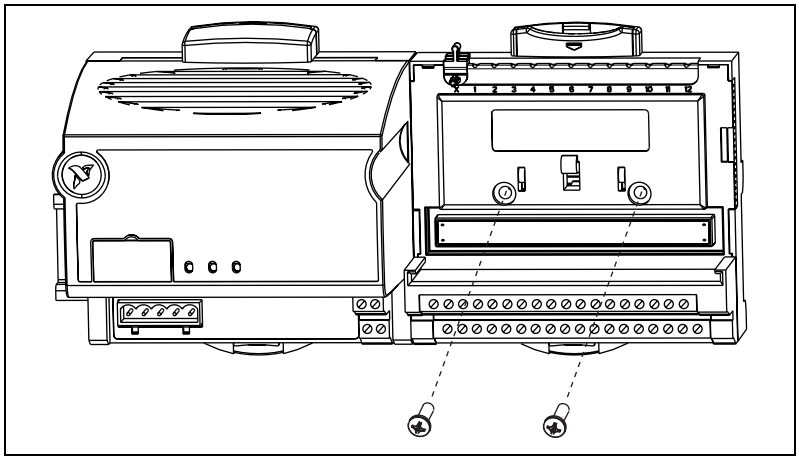


**Figure 2-8.** Attaching a Terminal Base to the Panel

4. To add more terminal bases, repeat steps 1 to 3, attaching the local bus connectors of each new terminal base to the connector of the last installed base. In most cases a single FP-1300 can support up to nine terminal bases, depending on the power consumption of the I/O modules. Refer to the *Powering the FieldPoint System* section for more information about power requirements.



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If all the pilot holes were correctly drilled, the local bus connectors should remain firmly attached after all the bases are mounted to the panel.

5. Place the protective cover onto the local bus connector of the last terminal base on the bank.

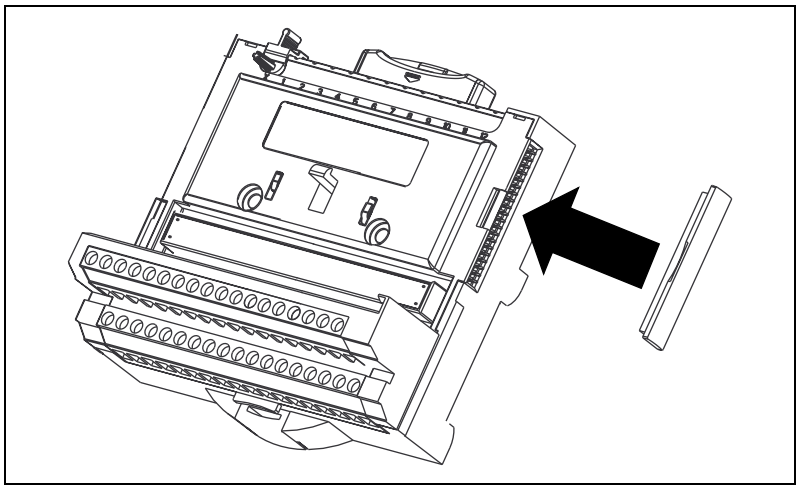


**Figure 2-9.** Installing the Bus-Protection Cover

### Removing the FP-1300 and Terminal Bases from the Panel

To remove an FP-1300 network module and terminal bases from the panel, first remove the terminal bases, starting with the last one, then remove the network module.

## Mounting I/O Modules onto Terminal Bases

Generally, it does not matter where you install each I/O module, except in the following situations:

- If you plan to cascade power between any I/O modules using the V and C terminals, group those modules together.

**Caution** Cascading power between I/O modules defeats isolation.

- For more accurate measurements, locate any thermocouple modules away from heat sources, including network modules and relay



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modules, unless you mount the thermocouple modules on FP-TB-3 isothermal bases.

Refer to Figure 2-10 and complete the following steps to connect an I/O module to a terminal base.

1. Position the first module with its alignment slots aligned with the guide rails on the terminal base.

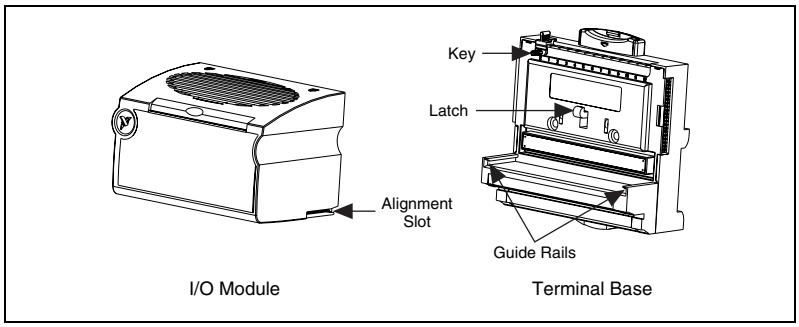



**Figure 2-10.** Installing an I/O Module

2. Firmly press the module onto the terminal base. The terminal base latch locks the I/O module into place when the ejector button pops up on top of the terminal base.
3. Repeat this procedure to install additional I/O modules onto terminal bases.

# Using DIP Switches to Configure the FP-1300

**Note** If you use the FP-1300 software to configure the FP-1300, you do not need to use DIP switches to configure the base arbitration ID. Go to the *Connecting the FP-1300 to the CAN Network* section.

To configure the base arbitration ID using the DIP switches on the FP-1300, complete the following steps:

1. Push the **USER/DEF** switch to the DEF position.
2. Use the **STD/XTD** switch to configure the arbitration ID type, standard or extended.
3. Use the remaining DIP switches to configure the base arbitration ID.



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The following sections describe the functions of the DIP switch settings.

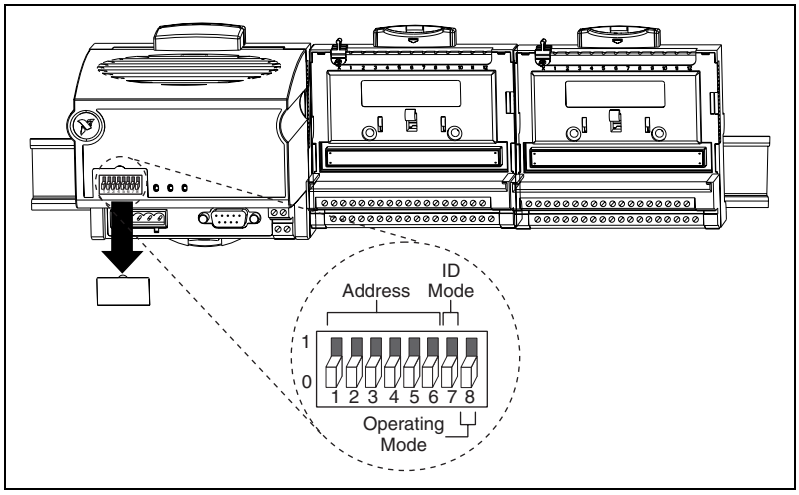



**Figure 2-11.** Overview of the FP-1300 DIP Switches

## Configuring the Operating Mode

You can configure the FP-1300 to operate in user mode (USER) or factory-default (DEF) mode using the **USER/DEF** switch.

In user mode, the FP-1300 reads its baud rate and arbitration ID from the configuration settings that were last saved in the FP-1300 software. To configure the module for user mode, push the **USER/DEF** switch to the USER position.




**Figure 2-12.** USER/DEF Switch in User Mode

In factory-default mode, the FP-1300 baud rate is 500 Kbps and the FP-1300 reads its base arbitration ID from the DIP switches on the module. For more information about configuring base arbitration IDs using DIP switches, refer to the *Configuring the Base Arbitration ID* section. To configure the FP-1300 to operate in factory-default mode, push the **USER/DEF** switch to the DEF position.



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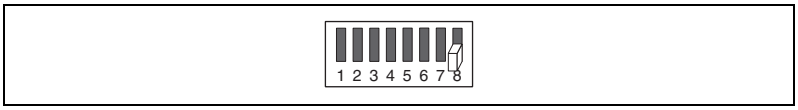



**Figure 2-13.** USER/DEF Switch in Factory-Default Mode

In factory-default mode, the FP-1300 transmits CAN messages for input I/O data periodically every 500 ms. You can configure the periodic rate as well as other CAN message transmissions using the FP-1300 Configuration Utility. Refer to *FP-1300 Configuration Help* for more information about configuring CAN messages on the FP-1300.

## Configuring the Arbitration ID Type (STD/XTD)

You can configure the FP-1300 to send and receive standard arbitration ID messages or extended arbitration ID messages. For more information on standard and extended messages, refer to the *NI-CAN Hardware and Software Manual*. If you want the FP-1300 to send 11-bit standard ID messages, push the **STD/XTD** switch to the STD position.

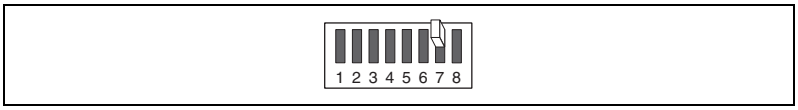



**Figure 2-14.** STD/XTD Switch in Standard Arbitration ID Mode

If you want the FP-1300 to send 29-bit extended ID messages, push the **STD/XTD** switch to the XTD position.

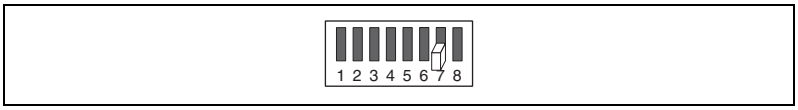



**Figure 2-15.** STD/XTD Switch in Extended Arbitration ID Mode

## Configuring the Base Arbitration ID

Each FP-1300 on a CAN network must have a unique base arbitration ID. All CAN messages sent or received by the FP-1300 have arbitration IDs that are offset from the base arbitration ID of the FP-1300. The FP-1300 configures the CAN message arbitration IDs, but you can change this configuration using the FP-1300 Configuration Utility. For more information about the CAN message arbitration IDs default configuration, refer to the *FP-1300 CAN Message Arbitration IDs* section.

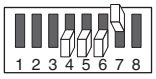


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## Configuring the Base Arbitration ID of an FP-1300 in Standard Mode

If you configure the module to operate in standard mode, use DIP switches 4, 5, and 6 to configure the three most significant bits of the base arbitration ID. The switch represents a 1 in the OFF (up) position and a 0 in the ON (down) position. Table 2-1 shows some of the possible base arbitration IDs for an FP-1300 in standard mode. Switch 7 in Table 2-1 indicates that the FP-1300 is in standard mode.

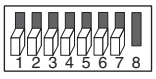
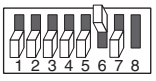
**Table 2-1.** Base Arbitration ID Switch Settings for an FP-1300 in Standard Mode

| Address Switches Positions 4–6 | Base Arbitration ID | Address Switches Positions 4–6 | Base Arbitration ID |
|---|---|---|---|
|  | 0 |  | 0x100 (256) |
|  | 0x700 (1,792) |  | 0x300 (768) |

## Configuring the Base Arbitration ID of an FP-1300 in Extended Mode

If you configure the module to operate in extended mode, use DIP switches 1–6 to configure the six most significant bits of the network address. You can configure the remaining 15 bits, which default to 0, through the FP-1300 Configuration Utility. Refer to *FP-1300 Configuration Help* for more information about configuring the remaining 15 bits. Table 2-2 shows some of the possible network addresses for an FP-1300 in extended mode. Switch 7 in Table 2-2 indicates that the FP-1300 is in extended mode.

**Table 2-2.** Base Arbitration ID Switch Settings for an FP-1300 in Extended Mode

| Address Switches Positions 1–6 | Base Arbitration ID | Address Switches Positions 1–6 | Base Arbitration ID |
|---|---|---|---|
|  | 0 |  | 0x800000 (8,388,608) |
|  | 0x1F800000 (528,482,304) |  | 0xF800000 (260,046,848) |



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## FP-1300 CAN Message Arbitration IDs

In the default mode, the FP-1300 configures the arbitration IDs of the CAN messages that contain FieldPoint I/O channel data using the base arbitration ID. Since the lower 8 bits are reserved for this purpose, a range of 255 IDs is possible. The FP-1300 reserves the first two IDs (0 and 1—offset from the base arbitration ID) for communicating configuration information with the FP-1300 Configuration Utility. Arbitration ID offsets 2–255 are used for transmitting I/O channel data. For example, if the base arbitration ID of the FP-1300 is 0x300, arbitration IDs 0x300 and 0x301 are used by the FP-1300 Configuration Utility. Arbitration IDs 0x302–0x3FF are used for transmitting I/O channel data.

The FP-1300 allocates channels to the first arbitration ID beginning with the first module and channel. Each analog channel uses 2 bytes of arbitration ID. Each discrete channel uses 1 bit of arbitration ID. Therefore, in a CAN message (8 data bytes) you can assemble a maximum of four analog channels or 64 digital channels. The FP-1300 will not mix input and output I/O channels in the same arbitration ID.

**Note** By default, the FP-1300 begins a new arbitration ID on a new module.

For example, a typical FP-1300 bank consists of the following I/O modules:

- Module 1: FP-AI-100 (8-channel analog input module)
- Module 2: FP-AO-200 (8-channel analog output module)
- Module 3: FP-DO-401 (16-channel discrete output module)

Assuming that the base arbitration ID is set to 0x300, the data IDs are configured as shown in Table 2-3.

**Table 2-3.** FP-1300 Arbitration ID Configuration

| ID | Byte | Module | Channel | Comment |
|---|---|---|---|---|
| 0x300 | Reserved for configuring the FP-1300 module using the FP-1300 Configuration Utility | | | |
| 0x301 | Reserved for configuring the FP-1300 module using the FP-1300 Configuration Utility | | | |
| 0x302 | 0, 1 | 1 | 0 | 2 bytes per analog channel |
| 0x302 | 2, 3 | 1 | 1 | 2 bytes per analog channel |



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**Table 2-3.** FP-1300 Arbitration ID Configuration (Continued)

| ID | Byte | Module | Channel | Comment |
|---|---|---|---|---|
| 0x302 | 4, 5 | 1 | 2 | 2 bytes per analog channel |
| 0x302 | 6, 7 | 1 | 3 | 2 bytes per analog channel |
| 0x303 | 0, 1 | 1 | 4 | 2 bytes per analog channel |
| 0x303 | 2, 3 | 1 | 5 | 2 bytes per analog channel |
| 0x303 | 4, 5 | 1 | 6 | 2 bytes per analog channel |
| 0x303 | 6, 7 | 1 | 7 | 2 bytes per analog channel |
| 0x304 | 0, 1 | 2 | 0 | 2 bytes per analog channel |
| 0x304 | 2, 3 | 2 | 1 | 2 bytes per analog channel |
| 0x304 | 4, 5 | 2 | 2 | 2 bytes per analog channel |
| 0x304 | 6, 7 | 2 | 3 | 2 bytes per analog channel |
| 0x305 | 0, 1 | 2 | 4 | 2 bytes per analog channel |
| 0x305 | 2, 3 | 2 | 5 | 2 bytes per analog channel |
| 0x305 | 4, 5 | 2 | 6 | 2 bytes per analog channel |
| 0x305 | 6, 7 | 2 | 7 | 2 bytes per analog channel |
| 0x306 | 0, 1 | 3 | 0–16 | 1 bit per discrete channel, 2 bytes for 16 channels |



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**Note** You can change the base arbitration ID and the method used to assemble I/O channel data into CAN messages using the FP-1300 Configuration Utility. You can place an I/O channel into only one arbitration ID.

To configure CAN messages using the FP-1300 Configuration Utility, refer to the *FP-1300 Configuration Help*.

# Connecting the FP-1300 to the CAN Network

**Caution** Before you connect the FP-1300 to a CAN network, make sure the baud rates of the FP-1300 and the CAN network are the same. If you are configuring the FP-1300 for the first time and the CAN network is operating at a baud rate other than 500 Kbps, configure the FP-1300 to operate at the appropriate baud rate before you install it on the CAN network. If you do not, CAN network errors can occur, and other CAN devices on the network can go into an error state. Refer to *FP-1300 Configuration Utility Help* for more information about configuring the baud rate.

## Connecting the CAN Cable to the FP-1300

If you connect the FP-1300 to a multiple-device CAN network that is already terminated, refer to the *Powering the FieldPoint System* section. If the FP-1300 is the only device connected to the CAN interface, complete the following steps.



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1. Plug the Combicon-style connector into the CAN port.

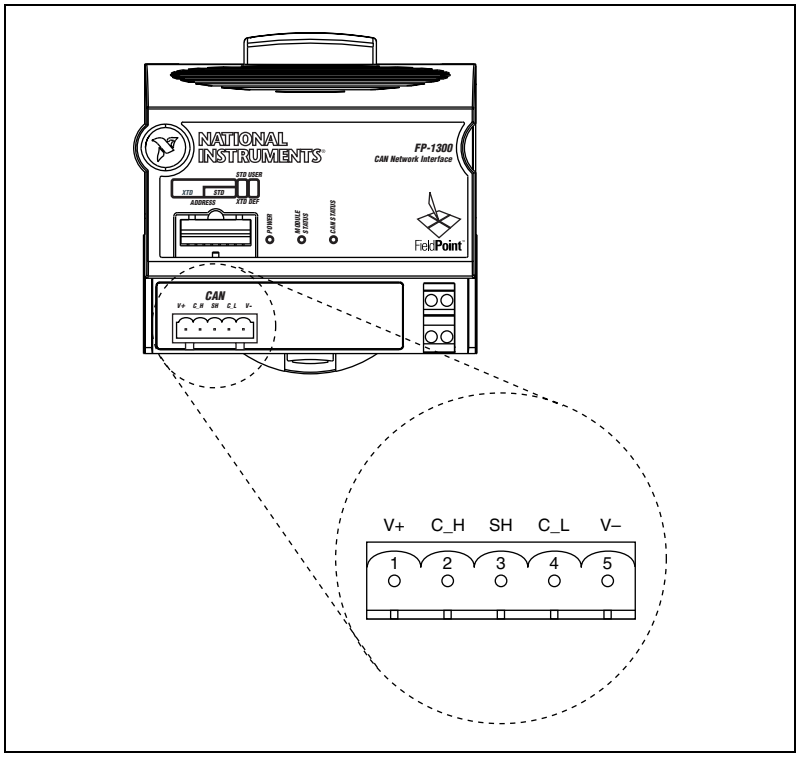



**Figure 2-16.** CAN Port Terminals on the FP-1300

2. Connect a twisted-pair cable to the CAN_H and CAN_L terminals. The maximum recommended cable length between the FP-1300 and the CAN network is 0.3 m (12 in.). CAN_H and CAN_L carry the data on the CAN network.
3. Connect a 10–30 VDC power supply to the V+ and V– terminals. V+ and V– supply bus power to the CAN bus on the FP-1300.
4. If you are using shielded cable, connect one end of the shield to the Shield terminal. This connection is not required for all CAN networks. Connecting a cable shield to the Shield terminal helps reduce noise.
5. Connect the other end of the CAN cable to a connector on the CAN network.



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## Terminating the CAN Network

If you connect the FP-1300 to a multiple-node CAN network that is already terminated, refer to the *Powering the FieldPoint System* section. If you connect the FP-1300 to a single-node CAN network, you need to terminate the network. To terminate the CAN network, complete the following steps:

1. Install a 120 Ω resistor between the CAN_H and CAN_L terminals on the FP-1300.
2. Install another 120 Ω resistor at the other end of the CAN cable between the CAN_H and CAN_L terminals.

After you have terminated the CAN network, verify that the total resistance between CAN_H and CAN_L is 60 Ω.

# Powering the FieldPoint System

Each FP-1300 on the network requires an 11–30 VDC power supply. The FP-1300 filters and regulates this supplied power and provides power for all the I/O modules in the bank. Therefore, you do not need to provide power separately to each FieldPoint I/O module in the bank.

## Calculating Power for a FieldPoint Bank

The power requirements for a FieldPoint bank that uses an FP-1300 network module are calculated as follows:

$$Power = 1\ W + 1.1 \times \Sigma(I/O\ Module\ Consumption)$$

This is the amount of power the FP-1300 network module consumes from the power supply to power itself and the I/O modules. It does not include any power consumed by devices that you wire to the terminal bases. The CAN bus requires a separate power supply.

The FP-1300 supplies 9 W of power to the I/O modules. Using I/O modules that consume more than 1 W can reduce the total number of I/O modules allowed in the bank to less than nine. Refer to the operating instructions for each I/O module for power consumption information.



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## Connecting Power to the FieldPoint System

**Caution** Before you power up the FP-1300 on a process-critical CAN network, make sure that the FP-1300 and the CAN network have the same baud rate. Also make sure that the FP-1300 is using a unique arbitration ID.

Complete the following steps to connect power to the FieldPoint system:

1. Connect the 11–30 VDC power supply leads to the V and C terminals of the network module. Connect the positive lead to V and the negative lead to C.
2. Connect power to the FieldPoint modules that require external power for inputs or outputs (such modules include output modules, counter modules, PWM, PG, and QUAD). Refer to the operating instructions of the I/O module for power requirement details. You can power a module by connecting the V and C inputs on its terminal base to a separate power supply, connecting the V and C outputs of a neighboring terminal base or network module, or using a combination of both methods. If you want to power field I/O devices from a terminal base, supply power to the terminal base, then connect the terminal base V and C output terminals to the field device.

**Caution** Cascading power from neighboring bases or network modules defeats isolation between cascaded modules.

Figure 2-17 shows an example of a FieldPoint system wired to power sources.



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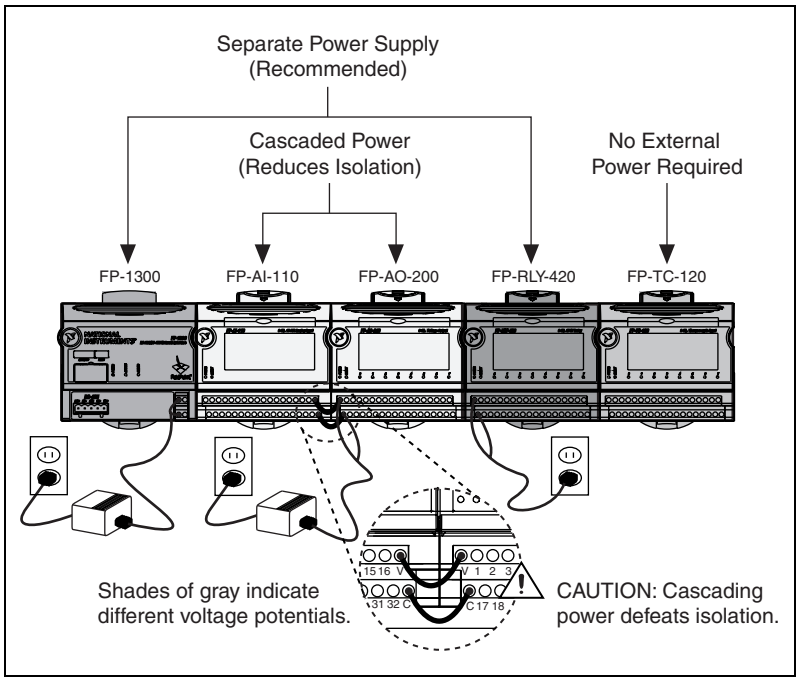



**Figure 2-17.** Connecting Power to the FieldPoint Bank

# Connecting to Field Devices

Refer to the operating instructions for each I/O module to connect the field devices.

# Powering On the FP-1300

**Caution** Before powering-on the FieldPoint system, make sure that the FP-1300 and the CAN port to which it connects are operating at the same baud rate. Also make sure that the arbitration IDs for the FieldPoint banks are unique on the CAN network.

Plug in each power supply to the FieldPoint bank and to the CAN network. At power-on, the FP-1300 runs a power-on self test (POST) that takes several seconds. You should see the **POWER** LED light up. After about five seconds, the **MODULE STATUS** and **CAN STATUS** LEDS flash green, then red, and then turn solid green indicating that the FP-1300 is transmitting messages. If the LEDs do not light up as described here, check the power supply connections and refer to Appendix A, *LED Indicators*.



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If you are using an NI-CAN card with the FP-1300, refer to the *Installing the FP-1300 Software* section. If you are not using an NI-CAN card when configuring the FP-1300, the installation is complete because you must use the FP-1300 and FieldPoint I/O modules in the default modes.

# Installing the FP-1300 Software

**Note** If you are not using an NI-CAN card when configuring the FP-1300, you cannot use the FP-1300 software.

The host computer must be running Windows 2000/NT/XP/Me/9*x*. Complete the following steps to install the FP-1300 software on the host computer:

1. Close all other applications.
2. Insert the FP-1300 Software CD into the CD-ROM drive on the host computer.
3. Follow the onscreen instructions to complete the installation.

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

# Configuring the FP-1300 Software

Complete the following steps to configure the FP-1300 software:

1. Select **Select»Programs»National Instruments»Measurement & Automation** to launch MAX.
2. If you do not see the CAN port to which the FP-1300 connects, press <F5> to refresh MAX.
3. In the MAX configuration tree, right-click the CAN port to which the FP-1300 connects and select **FP-1300 Config**.
4. Refer to the *FP-1300 Configuration Help* and complete the following tasks:
   a. Configure the baud rate.
   b. Configure the base arbitration ID.
   c. Configure the I/O module attributes and settings.
   d. Configure the CAN messages.
   e. Save the configuration.



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# A

# LED Indicators

The FP-1300 has three LEDs that communicate information. Use Table A-1 to interpret the FP-1300 LED indicators.

**Table A-1.** FP-1300 LED Indicators

| LED | Solid Green | Flashing Green | Solid Red | Flashing Red |
|---|---|---|---|---|
| *POWER* | Power is applied to the FP-1300. | — | — | — |
| *MODULE STATUS* | The FP-1300 is operating normally. | I/O data has stopped because the FP-1300 is communicating with the Configuration Utility. | The FP-1300 had an unrecoverable fault. Cycle the power. | The FP-1300 had a recoverable fault. Try using the FP-1300 Configuration Utility to resolve the issue. |
| *CAN STATUS* | The CAN bus is transmitting messages. | — | There is an error on the CAN bus and the CAN communication has stopped. | There is a message overflow on the FP-1300 CAN controller. In the Configuration Utility, select **Reset»Cycle Power**. |

**Note** Refer to Appendix B, *Troubleshooting*, for more information about the LED indicators.



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# B

# Troubleshooting

This appendix provides troubleshooting instructions for the FP-1300 and the FP-1300 Configuration Utility.

**When I startup my system the *MODULE STATUS* LED is flashing red. What causes this problem and how do I correct it?**

A *MODULE STATUS* LED that flashes red at startup indicates the FP-1300 has a recoverable fault. The most likely cause is that the current I/O does not match the saved configuration. Simply use the FP-1300 Configuration Utility to save the new I/O configuration. It can also indicate that a hotswap with an incompatible module has occurred.

**The *MODULE STATUS* and *CAN STATUS* LEDs turn red soon after startup. What causes this condition?**

This condition is usually caused when FP-1300 is configured at a different baud rate than the rest of the network. Run the FP-1300 Configuration Utility to change the baud rate of the FP-1300.

**I don't know the baud rate and/or base arbitration ID of the FP-1300. What should I do?**

1. Move the **USER/DEF** switch to the DEF setting.
2. Power the FP-1300 off, then on. The baud rate is set to 500 kb/s and the base arbitration ID is set according to the address switches.
3. Use the FP-1300 Configuration Utility to modify the baud rate and base arbitration ID of the module. For more information refer to *FP-1300 Configuration Utility Help*.
4. If you want the I/O and message configuration to revert to the default settings, double-click the device to open its I/O configuration screen and save to the device here. If you want to keep the original I/O and message configuration, do not double-click the device.
5. Move the **USER/DEF** switch to the USER setting and power the FP-1300 off, then on.



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### Can I hotswap an I/O module with a different I/O module while my FP-1300 is running?

When you are using the FP-1300, you can hotswap an I/O module only with the same model I/O module. If you need to swap an I/O module with a different model I/O module, you must reset the FP-1300 and reconfigure the I/O module using the FP-1300 Configuration Utility.



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# C

# Specifications

## Installation

Terminal wiring.....16–26 AWG copper conductor wire with 7 mm (0.275 in.) strip length

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

## Network

Network interface.....CAN

Compatibility .....ISO 11898

Communication rates .....Up to 1 Mbps

Maximum cabling distance at 1 Mbps .....Refer to ISO 11898-2

CAN bus power supply range .....10–30 VDC

CAN bus power consumption

- Typical .....0.72 W (30 mA at 24 VDC)
- Maximum.....3 W

CAN bus isolation.....250 $V_{rms}$ operational, 2,500 $V_{rms}$ breakdown

FieldPoint bank power supply range.....11–30 VDC

FieldPoint bank power consumption

$$Power = 1\ W + 1.1 \times \Sigma(I/O\ Module\ Consumption)$$

Maximum I/O terminal bases per bank.....9

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

Weight.....254 g (8.96 oz)



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## Isolation Voltage

For isolation voltage ratings, refer to the I/O module specifications and labels.

## Environmental

FieldPoint modules are intended for indoor use only. For outdoor use, they must be mounted inside a sealed enclosure.

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

Storage temperature ..... –55 to 85 °C

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

Maximum altitude ..... 2,000 m

Pollution Degree ..... 2

## Safety

The FP-1300 is designed to meet the requirements of the following standards for safety and electrical equipment for measurement, control, and laboratory use.

- EN 61010-1, IEC 61010-1
- UL 3121-1
- CAN/CSA C22.2 No. 1010.1

For certifications under regulatory standards, including hazardous location standards, refer to the product label or to `ni.com`.

## Electromagnetic Compatibility

CE, C-Tick, and FCC Part 15 (Class A) Compliant

Emissions ..... EN 55011 Class A @ 10 m
FCC Part 15A above 1 GHz

Immunity ..... EN 61326-1: 1998, Table 1



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



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## CE Compliance

This product meets the essential requirements of applicable European Directives as amended for CE Marking.

Low-Voltage Directive (safety) .....73/23/EEC

Electromagnetic Compatibility
Directive (EMC) ..... 89/336/EEC

**Note** See the Declaration of Conformity (DoC) for this product for any additional regulatory compliance information at `ni.com`. The DoC may be found using the search utility and the product model number.



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# D

# Technical Support and Professional Services

Visit the following sections of the National Instruments Web site at ni.com for technical support and professional services:

- **Support**—Online technical support resources include the following:
  - **Self-Help Resources**—For immediate answers and solutions, visit our extensive library of technical support resources available in English, Japanese, and Spanish at ni.com/support. These resources are available for most products at no cost to registered users and include software drivers and updates, a KnowledgeBase, product manuals, step-by-step troubleshooting wizards, hardware schematics and conformity documentation, example code, tutorials and application notes, instrument drivers, discussion forums, a measurement glossary, and so on.
  - **Assisted Support Options**—Contact NI engineers and other measurement and automation professionals by visiting ni.com/ask. Our online system helps you define your question and connects you to the experts by phone, discussion forum, or email.
- **Training**—Visit ni.com/custed for self-paced tutorials, videos, and interactive CDs. You also can register for instructor-led, hands-on courses at locations around the world.
- **System Integration**—If you have time constraints, limited in-house technical resources, or other project challenges, NI Alliance Program members can help. To learn more, call your local NI office or visit ni.com/alliance.

If you searched ni.com and could not find the answers you need, contact your local office or NI corporate headquarters. Phone numbers for our worldwide offices are listed at the front of this manual. You also can visit the Worldwide Offices section of ni.com/niglobal to access the branch office Web sites, which provide up-to-date contact information, support phone numbers, email addresses, and current events.



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# Glossary

| Prefix | Meaning | Value |
|---|---|---|
| p- | pico- | $10^{-12}$ |
| n- | nano- | $10^{-9}$ |
| µ- | micro- | $10^{-6}$ |
| m- | milli- | $10^{-3}$ |
| k- | kilo- | $10^{3}$ |
| M- | mega- | $10^{6}$ |
| G- | giga- | $10^{9}$ |
| T- | tera- | $10^{12}$ |

## Symbols

| | |
|---|---|
| º | degrees |
| Ω | ohms |
| % | percent |

## A

| | |
|---|---|
| arbitration ID | an 11- or 29-bit ID transmitted as the first field of a CAN frame. The arbitration ID determines the priority of the frame, and is normally used to identify the data transmitted to the frame. |

## B

| | |
|---|---|
| b | bits |
| B | bytes |



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| | |
|---|---|
| bank | the combination of one FieldPoint network module and one or more terminal bases and I/O modules |
| bps | bits per second |

## C

| | |
|---|---|
| C | Celsius |
| CAN | controller area network |
| CAN remote frame | used to request data for a CAN object from a remote node |

## D

| | |
|---|---|
| DIP switch | dual inline package switch |

## E

| | |
|---|---|
| extended arbitration ID | a 29-bit arbitration ID |

## F

| | |
|---|---|
| ft | feet |
| FTP | file transfer protocol |

## H

| | |
|---|---|
| hex | hexadecimal |
| HotPnP | hot plug and play |
| Hz | hertz |



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## I

| | |
|---|---|
| I/O | input/output |
| IEC | International Electrotechnical Commission |
| in. | inch or inches |
| ISO | International Standards Organization |

## K

| | |
|---|---|
| KB | kilobytes of memory |

## L

| | |
|---|---|
| LED | light-emitting diode |

## M

| | |
|---|---|
| m | meters |
| MB | megabytes of memory |

## P

| | |
|---|---|
| PC | personal computer |
| periodic | a type of message that transfers at regular user-specified intervals |
| polled | request/response connection in which a request for data is sent to a device, and the device sends back a response with the desired value |
| POST | power-on self test |

## S

| | |
|---|---|
| standard arbitration ID | an 11-bit arbitration ID |



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# V

| | |
|---|---|
| V | volts |
| VDC | volts direct current |
| $V_{rms}$ | volts root mean squared |



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