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FieldPoint™

FP-1601 User Manual

Note to Users

The contents of this document that refer to FieldPoint software are not intended for use with FieldPoint Software 4.0 or LabVIEW 7.0. Refer to the Measurement & Automation Explorer Help for FieldPoint and the FieldPoint LabVIEW Interface Help.

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Conventions

The following conventions appear 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. When this symbol is marked on the product, see the *FieldPoint Safety Information* section for precautions to take.
bold	Bold text denotes items that you must select or click on in the software, such as menu items and dialog box options. Bold text also denotes 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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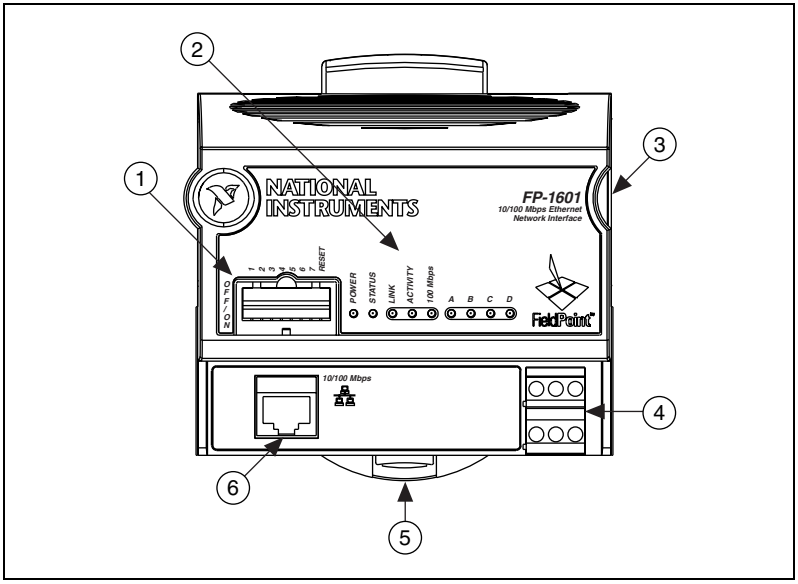
Overview of the FP-1601 Network Module

This chapter provides an overview of the FieldPoint FP-1601 network module and FieldPoint software.

FP-1601 Hardware Overview

The FieldPoint FP-1601 network module connects a 10/100 Ethernet network to FieldPoint I/O modules. Because the FP-1601 is an Ethernet device, the maximum number of FP-1601 modules you install on your Ethernet network is determined by your network topology. Each FP-1601 can support up to nine I/O modules.

The FP-1601 has LED indicators to communicate status information, and DIP switches that perform various functions. The following illustration shows where these features are located on the FP-1601.

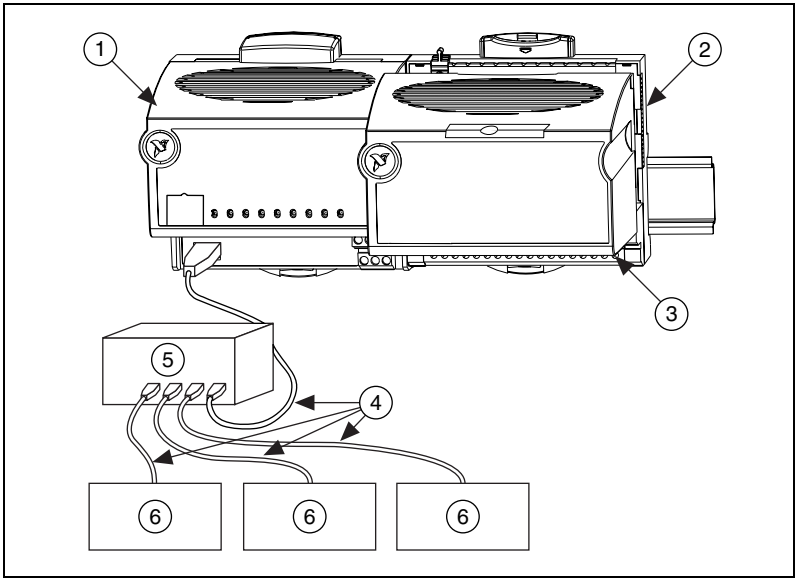


1	DIP Switches	3	Local Bus Connector	5	Rail Clip
2	LED Indicators	4	Power Connector	6	Ethernet Port

A FieldPoint bank consists of at least one network module, one or more terminal bases, and one or more I/O modules. Each FP-1601 can support up to nine I/O modules. You can access each bank by an unlimited number of host computers or LabVIEW RT enabled devices (such as FP-2000/2010 or PXI chassis). The maximum number of FP-1601 network modules that you can install on your Ethernet network is limited only by your network topology. With Ethernet, you can use an unlimited number of FieldPoint banks.

The FP-1601 network module connects directly to a 10 Mbps or 100 Mbps Ethernet network. The module auto-detects the speed of the connection and configures itself accordingly.

The following figure shows an FP-1601 connected to an Ethernet network. For detailed hardware specifications and cabling information, refer to Appendix D, *Specifications*.



1	FP-1601 Network Module	4	Ethernet Cable
2	Terminal Base	5	Ethernet Hub/Switch
3	I/O Module	6	Ethernet Devices/Computers

FieldPoint Software Overview

Your FieldPoint software includes a configuration utility as well as server and driver software for easy integration into application software packages. These software components manage the low-level communications and hardware details, simplifying programmatic access to I/O channels. Version 3.0 of the FieldPoint software runs on Windows Me/98/95, Windows 2000, or Windows NT version 4.0 (service pack 3 or later), and includes the following components:

- FieldPoint Explorer configuration utility
- LabVIEW VIs
- LabWindows/CVI Functions
- OPC Server
- Lookout driver

You can download future versions of FieldPoint software from the National Instruments FTP site at `ftp.ni.com/support/fieldpoint/Server`.

FP-1601 Setup Overview

The following list is an overview of the steps required to get up and running with your FP-1601:

1. Install the hardware as described in Chapter 2, *Hardware and Software Installation*.
   a. Mount the FP-1601, terminal bases, and I/O modules.
   b. Connect your FieldPoint system to the network.
   c. Wire power to FieldPoint system.
   d. Wire signals to the I/O modules.
2. Install the software as described in Chapter 2, *Hardware and Software Installation*.
   a. Install applications software.
   b. Install FieldPoint Explorer.
3. Configure the FieldPoint system, and verify the configuration, as described in Chapter 3, *Hardware and Software Configuration*.
   a. Configure FP-1601 network settings.
   b. Configure I/O module ranges and settings.
   c. Configure security.
   d. Test channels.
   e. Save settings.
4. Deploy system.

2

Hardware and Software Installation

This chapter explains how to install your hardware and software.

What You Need to Get Started

To set up and use the FP-1601, you need the following:

- ❑ FP-1601 network module
- ❑ Mounting hardware (DIN rail or panel mount accessory)
- ❑ Terminal base(s) and I/O module(s)
- ❑ Power supply
- ❑ Accessories: Ethernet cable, screwdriver
- ❑ FieldPoint Software CD
- ❑ A host PC running Windows Me/98/95, Windows 2000, or Windows NT version 4.0

FieldPoint Safety Information

This section contains important safety information that you *must* follow during installation and use of FieldPoint products.

Do *not* operate your 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 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 the FieldPoint product. Use the product only with the modules, accessories, and cables specified in the installation instructions.

Always operate your 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 a foreign matter in a solid, liquid, or gaseous state that can produce a reduction of 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.

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

Operate FieldPoint products at or below installation category II. The following is a description of installation categories:

- Installation Category I is for measurements performed on circuits not directly connected to MAINS[1]. This category is a signal level such as voltages on a printed wiring board (PWB) on the secondary of an isolation transformer.

  Examples of Installation Category I are measurements on circuits not derived from MAINS and specially protected (internal) MAINS-derived circuits.

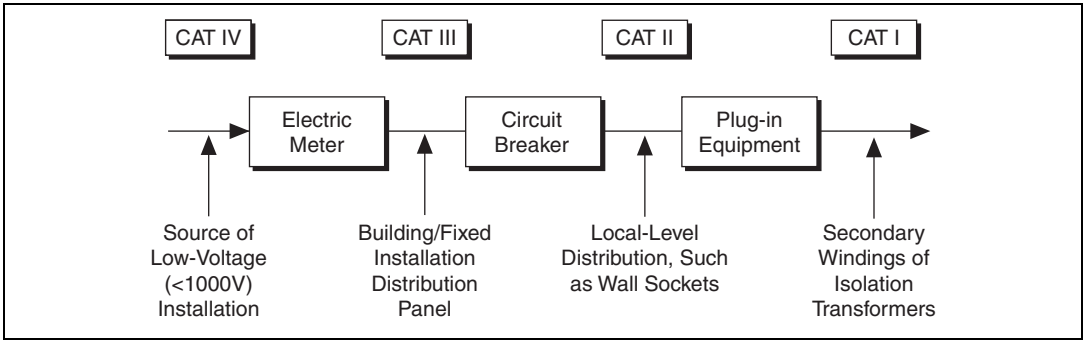
[1] MAINS is defined as the electricity supply system to which the equipment concerned is designed to be connected for either powering the equipment or for measurement purposes.

- Installation Category II is for measurements performed on circuits directly connected to the low-voltage installation. This category refers to local-level distribution, such as that provided by a standard wall outlet.

  Examples of Installation Category II are measurements on household appliances, portable tools, and similar equipment.
- Installation Category III is for measurements performed in the building installation. This category is a distribution level, referring to hard-wired equipment that does not rely on standard building insulation.

  Examples of Installation Category III include measurements on distribution circuits and circuit-breakers. Other examples of Installation Category III are wiring including cables, bus-bars, junction boxes, switches, socket-outlets in the building/fixed installation, and equipment for industrial use, such as stationary motors with a permanent connection to the building/fixed installation.
- Installation Category IV is for measurements performed at the source of the low-voltage (< 1,000 V) installation.

  Examples of Installation Category IV are electric meters, and measurements on primary overcurrent protection devices and ripple-control units.



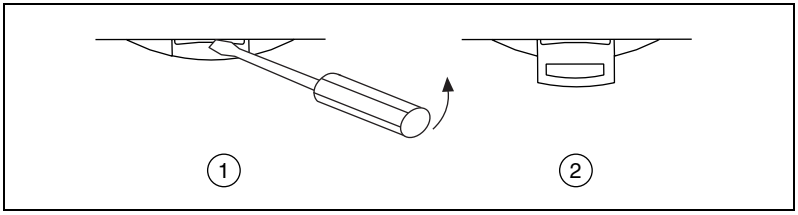
Mounting the FP-1601 and Terminal Bases

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

Mounting the FP-1601 on a DIN Rail

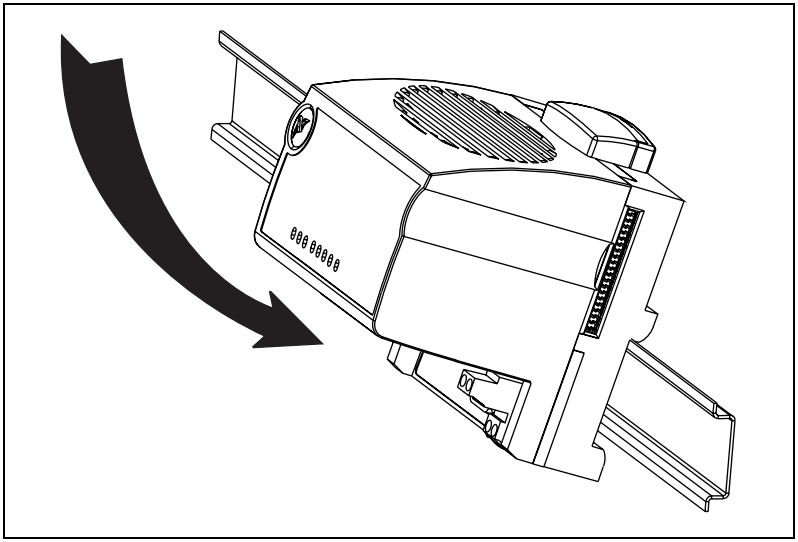
The FP-1601 network module has a simple rail clip for reliable mounting onto a standard 35 mm DIN rail. Follow these steps if you choose to mount the module on a DIN rail:

1. Write down the serial number from the back of your FP-1601 before you mount it.
2. Use a flat-bladed screwdriver to open the DIN rail clip to the unlocked position, as shown in the following illustration.

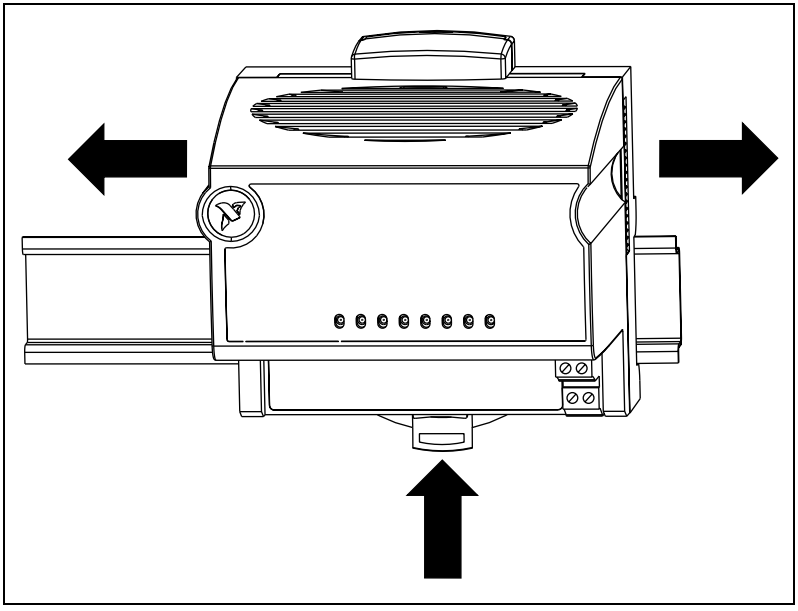


1 Rail Clip Locked	2 Rail Clip Unlocked

3. Hook the lip on the rear of the FP-1601 onto the top of a 35 mm DIN rail and press it down onto the DIN rail, as shown in the following illustration.



4. Slide the FP-1601 to the desired position along the DIN rail. After it is in position, lock it to the DIN rail by pushing the rail clip to the locked position, as shown in the following illustration.



After the FP-1601 is mounted to the DIN rail, connect the terminal base to it.

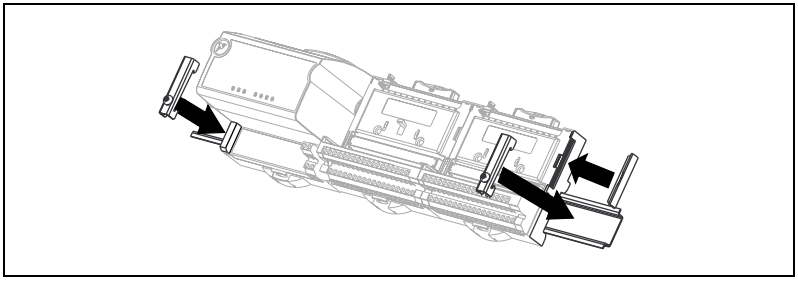
Connecting Terminal Bases with DIN Rail Mounting

Follow these steps to connect a terminal base to an FP-1601 network module using DIN rail mounting.

Caution To avoid damaging the FP-1601 and the terminal bases, make sure that power is *not* applied to them while you install or remove terminal bases.

1. Mount the terminal base onto the DIN rail in the same way you installed the network module.
2. Attach the terminal base to the FP-1601 by firmly mating 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-1601 can support up to nine terminal bases, depending on the power consumption of the I/O modules. Refer to the *Wiring Power to Your FieldPoint System* section of this chapter for more information about power requirements.

4. Place the protective cover onto the local bus connector of the last terminal base on the bank, as shown in the following illustration. Add the rail locks by sliding them on and tightening the screws.



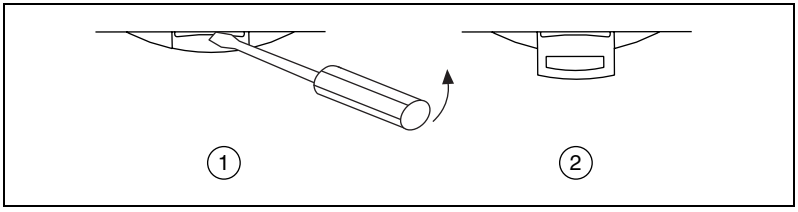
Removing the FP-1601 and Terminal Bases from the DIN Rail

Remove an I/O module from its terminal base before lifting the terminal base off the rail. To remove an FP-1601 network module or terminal base, unlock it from the DIN rail by placing a screwdriver in the slot on the rail clip and opening it to the unlocked position. After you disconnect the network module from the local bus connector of the terminal base, you can lift it off the rail.

Mounting the FP-1601 to a Panel

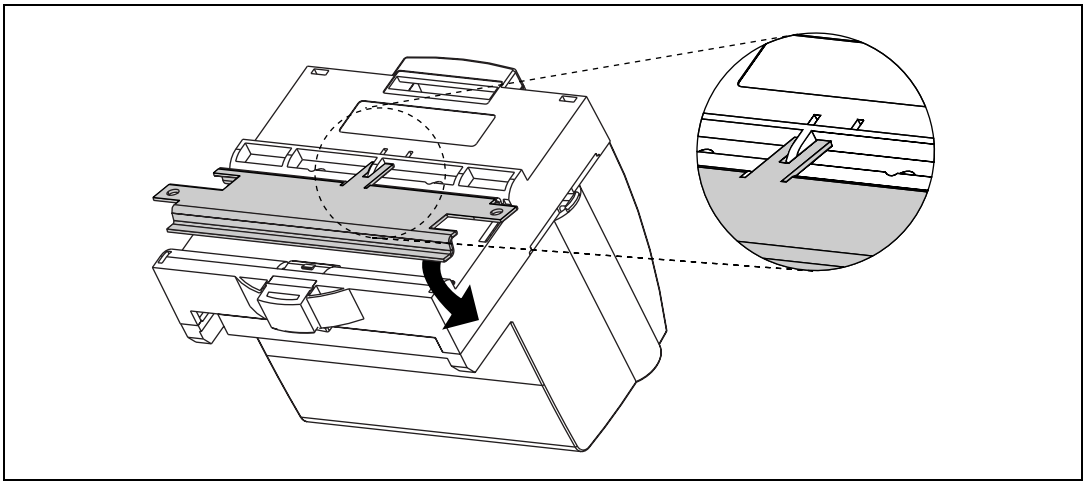
Follow these steps if you choose to install the optional FieldPoint network panel mount accessory and mount the FP-1601 network module to a panel. You can order the panel mount accessory, part number 777609-01, from NI.

1. Write down the serial number from the back of your FP-1601 before you mount it.
2. Use a flat-blade screwdriver to open the rail clip to the unlocked position, as shown in the following illustration.

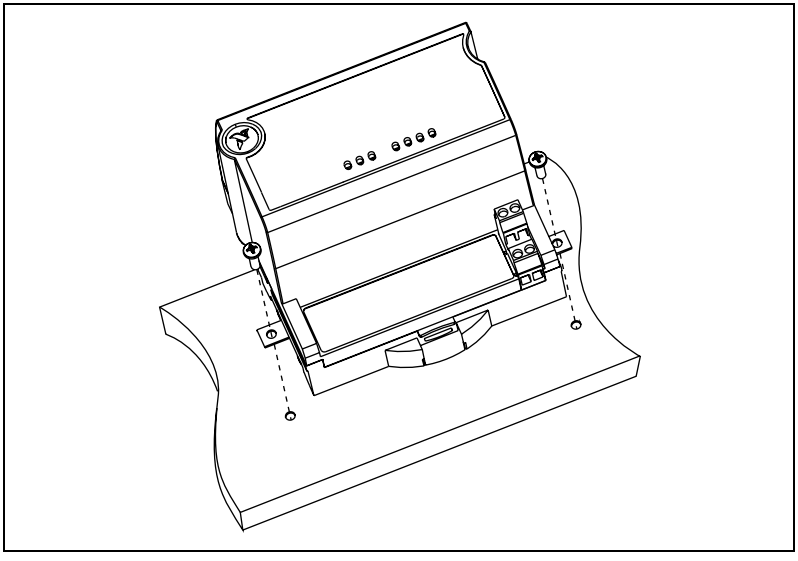


1 Rail Clip Locked	2 Rail Clip Unlocked

3. Snap the panel mount accessory onto the module, as shown in the following illustration.



4. Lock the panel mount accessory into place by pushing the rail clip to the locked position.
5. Mount the FP-1601 to your panel with the panel mount accessory, as shown in the following illustration. The installation guide that came with the panel mount accessory includes a template that you can use to drill pilot holes for mounting.

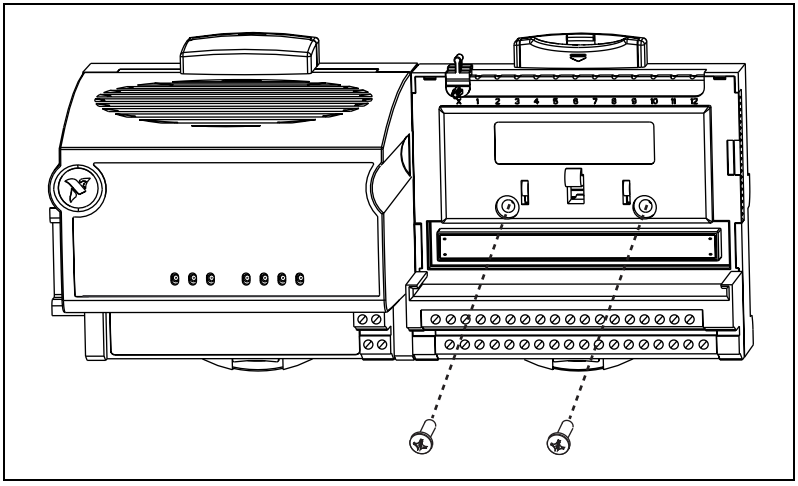


Connecting Terminal Bases with Panel Mounting

You can install terminal bases directly, without using the panel mount accessory needed to mount the FP-1601 network module. Follow these steps to connect terminal bases to the network module using panel mounting.

Caution To avoid damaging the FP-1601 and the terminal bases, make sure that power is *not* applied to them while you install or remove terminal bases.

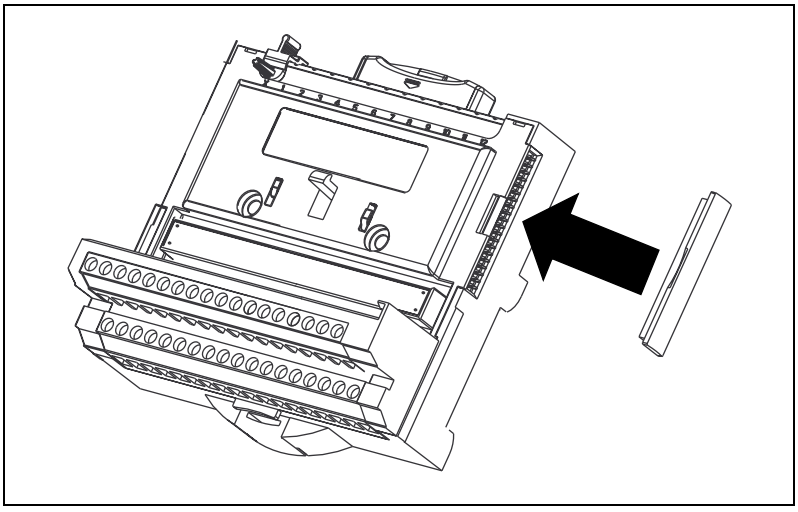
1. Drill pilot holes in the panel to mount the terminal bases. A drilling template is provided with the network module panel mount accessory.
2. Connect the terminal base to the FP-1601 by firmly mating the local bus connectors. Be careful not to bend any connector pins.
3. Bolt, screw, or otherwise fasten the terminal base to the panel. Make sure that the local bus connectors remain firmly mated after the terminal base is mounted.



4. To add more terminal bases, repeat steps 1 through 3, mating the local bus connectors of each new terminal base to the connector of the last installed base. In most cases a single FP-1601 can support up to nine terminal bases, depending on the power consumption of the I/O modules. Refer to the *Wiring Power to Your FieldPoint System* section of this chapter for more information about power requirements.

   If all the pilot holes were drilled correctly, the local bus connectors should remain firmly mated 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, as shown in the following illustration.



Removing the FP-1601 and Terminal Bases from the Panel

To remove an FP-1601 network module and terminal bases from the panel, first remove the terminal bases, starting with the last one, then remove the network module.

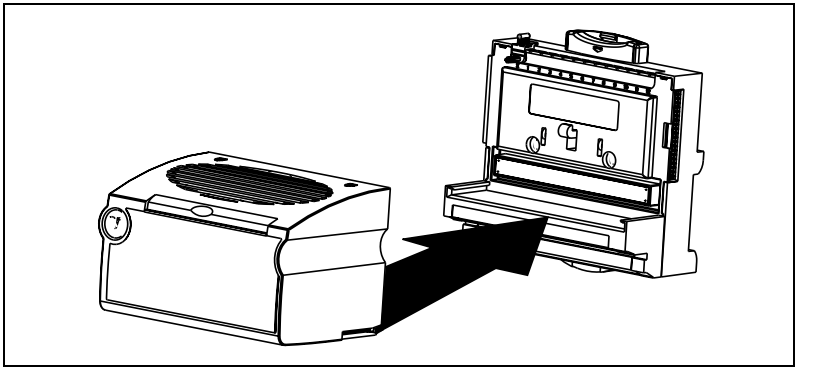
Mounting I/O Modules onto Terminal Bases

Generally, it does not matter where you install each I/O module, except for these types of situations:

- If you plan to cascade power between any I/O modules using the V and C terminals, group those modules together.
- For more accurate measurements, locate any thermocouple modules away from heat sources, including network modules or relay modules, unless you are mounting them on an FP-TB-3.

Refer to the following illustration and follow these 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.



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.

To remove a module, press the ejector button on top of the terminal base and pull off the module.

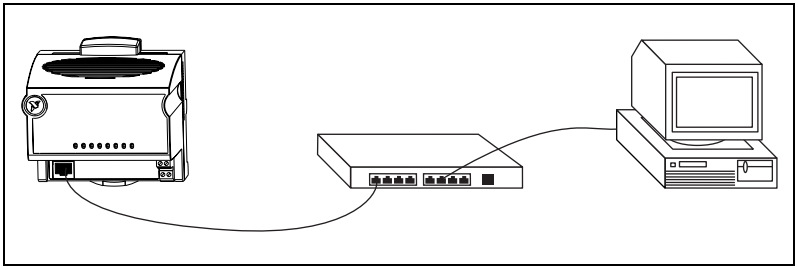
Note Some older modules may require more force to remove them from the terminal base. Make sure you firmly pull the module straight off the terminal base.

Connecting Your FP-1601 to the Network

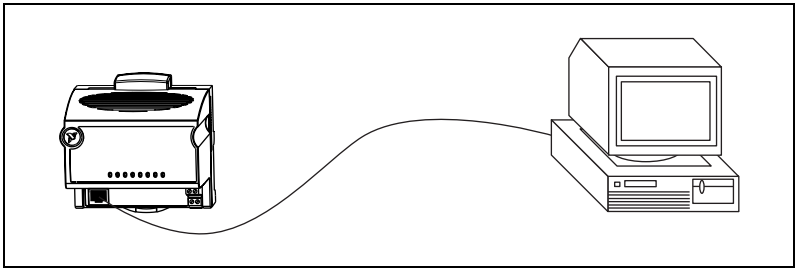
Connect the FP-1601 network module to an Ethernet network using the RJ-45 Ethernet port on the module. Connect the RJ-45 Ethernet port of the module to an Ethernet hub using a standard Category 5 Ethernet cable. You can also connect the module directly to a computer using an Ethernet crossover cable.

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, NI recommends using a Category 5 shielded twisted-pair Ethernet cable.

The following illustration shows the FP-1601 connected to an Ethernet hub.



The following illustration shows the FP-1601 connected directly using a crossover cable.



The host PC communicates to the FP-1601 over a standard Ethernet connection. If the host PC is already configured on a network, you must configure your FP-1601 on the same network. If neither is connected to a network, you can connect the two directly using a CAT-5 crossover cable. If you need to build your own cable, refer to Appendix D, *Specifications*, for more information about Ethernet cable wiring connections.

In order to configure the FP-1601, it must reside on the same subnet as your host PC. If you want to use the FP-1601 on a subnet other than the one your host PC is on, first connect and configure it on the same subnet as the host PC, then reassign a static IP address for the subnet where you want it to be and physically move it to the other subnet. Contact your network administrator if you need assistance configuring the host PC and FP-1601 on the same subnet.

Wiring Power to Your FieldPoint System

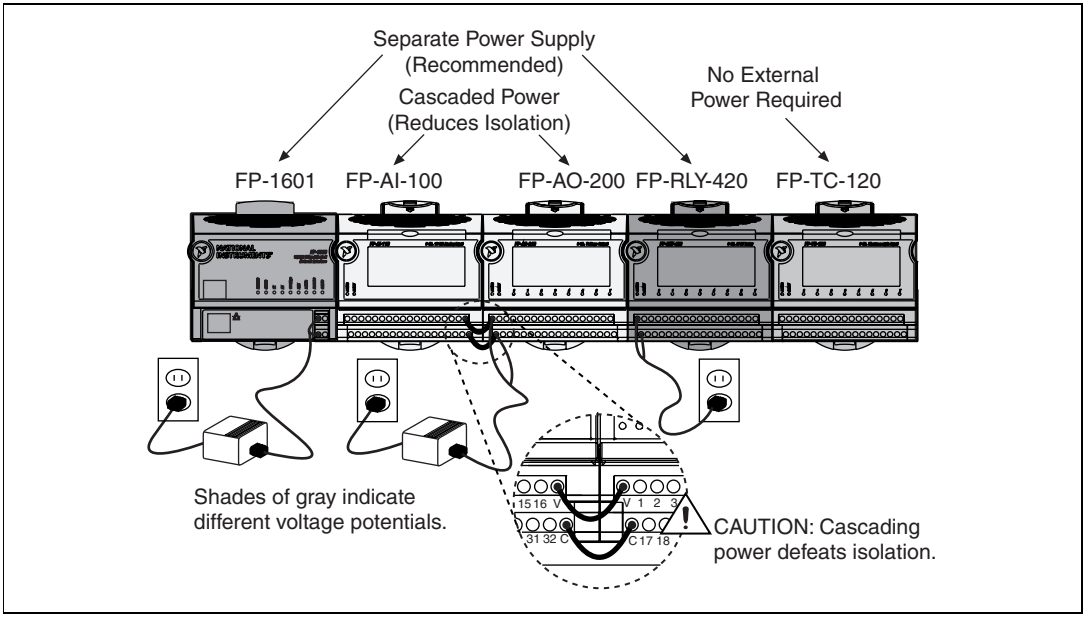
Each FP-1601 on your network requires a 12-30 VDC power supply. The FP-1601 filters and regulates this supplied power and provides power for all the I/O modules in the bank. Therefore, you do not need to provide

power separately to each FieldPoint I/O module in the bank. Follow these steps to connect power to your FieldPoint system:

1. Connect 12-30 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. To verify that your power supply is sufficient for your modules and devices, refer to the *Calculating Power for a FieldPoint Bank* section for instructions on calculating power requirements.
2. Connect power to the FieldPoint modules that require external power for inputs or outputs (may include output modules, counter modules, PWM, PG, and QUAD). Refer to the I/O module's operating instructions 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, and 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.

The following illustration shows an example of a FieldPoint system correctly wired to power sources.



Calculating Power for a FieldPoint Bank

The power requirements for a FieldPoint bank that uses an FP-1601 network module are calculated as follows:

$$Power = 4.5 \text{ Watts} + 1.1 * \sum(I/O \text{ Module Consumption})$$

This is the amount of power the FP-1601 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 FP-1601 supplies 9 W of power to the I/O modules. Using certain 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.

Connecting to Field Devices

Use each I/O module's operating instructions, or the diagram under its removable label, to help you connect your field devices.

Powering Up the FP-1601

Plug in each power supply to your FieldPoint bank. At power up, the FP-1601 runs a power-on self test (POST) that takes several seconds. You should see the **POWER** and **STATUS** LEDs come on. After about 5 seconds, the **STATUS** LED begins flashing one flash at a time. This indicates that the FP-1601 is ready for configuration, and you can proceed to installing the FieldPoint software.

If you have already assigned an IP address to the FP-1601, the **STATUS** LED turns off. When the I/O module **READY** LEDs come on, the FP-1601 is ready for use.

If the **STATUS** LED does not light as described, refer to the *STATUS LED Error Indications* section in Appendix C, *Troubleshooting*.

Installing Software on the Host PC

Follow these steps to install your FieldPoint software on the host PC:

1. Install the software packages you plan to use, such as LabVIEW, Lookout, or LabWindows/CVI, before you install your FieldPoint software. The FieldPoint software installation installs the LabVIEW VIs and examples, Lookout driver class for use with serial FieldPoint modules, and LabWindows/CVI instrument driver only if it finds the corresponding development software installed.
2. Close all other applications.
3. Insert the 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**.

The hardware and software installation is now complete. Proceed to Chapter 3, *Hardware and Software Configuration*.

3

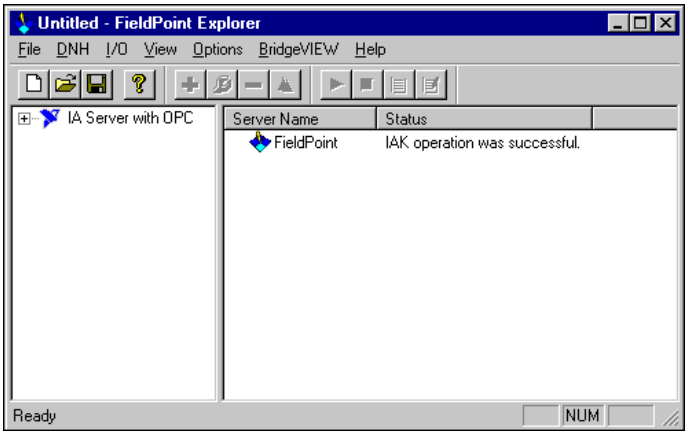
Hardware and Software Configuration

This chapter describes the details of configuring hardware and software, verifying the configuration, and accessing the channels on the FP-1601 from other software running on the host PC.

Configuring the FP-1601 in FieldPoint Explorer

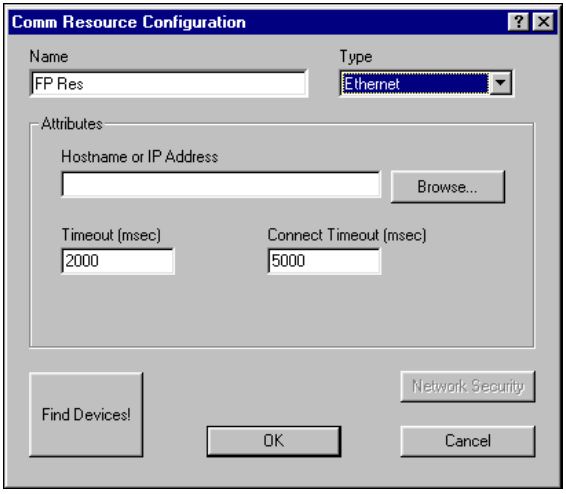
To get started with FieldPoint Explorer, follow these steps:

1. Make sure that the FieldPoint hardware and software is installed as explained in Chapter 2, *Hardware and Software Installation*. Verify that the FieldPoint system is powered on.
2. From the Windows **Start** menu, select **Programs»National Instruments FieldPoint»FieldPoint Explorer** to launch FieldPoint Explorer, shown in the following illustration.

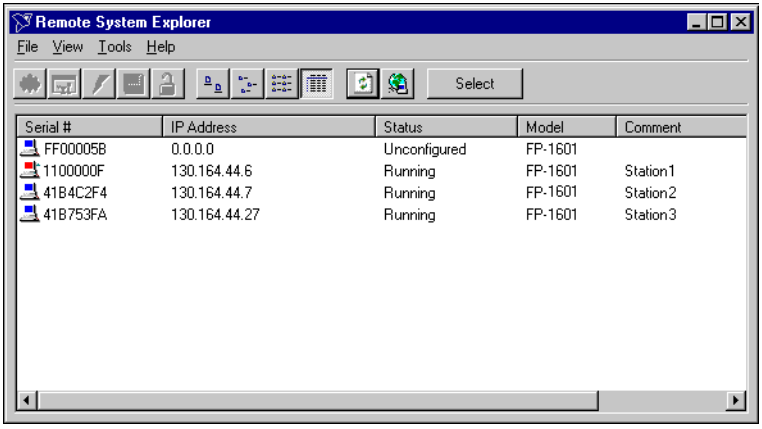


3. Click the **+** sign next to **IA Server with OPC** in the left panel to expand the view. Right-click **FieldPoint** and select **Add a comm resource to this server**. The **Comm Resource Configuration** dialog box appears.

4. To use the FP-1601, set the **Type** to **Ethernet**, as shown in the following illustration. Each Ethernet comm resource represents a single bank of FieldPoint modules on the network.

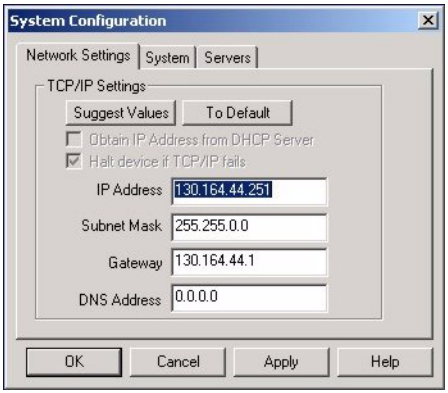


5. Click **Browse** to launch Remote System Explorer, shown in the following illustration.



Remote System Explorer launches and searches for any FP-1601 or other NI Ethernet devices on the subnet. The serial number shown corresponds to the serial number of your FP-1601. The status of the module is `Unconfigured` because you have not yet set the IP address for it.

6. Double-click the serial number of the FP-1601 you want to configure. (You can also right-click the network module and choose **Configure Device** to launch this dialog box.)
7. Enter values on the **Network Settings** tab of the **System Configuration** dialog box, shown in the following illustration. Refer to Appendix A, *Choosing Network Settings*, for more information about choosing appropriate addresses for these fields. You can also click **Suggest Values** to let the software provide default parameters. If your network does not have a gateway server or DNS server, set these parameters to `0.0.0.0`.

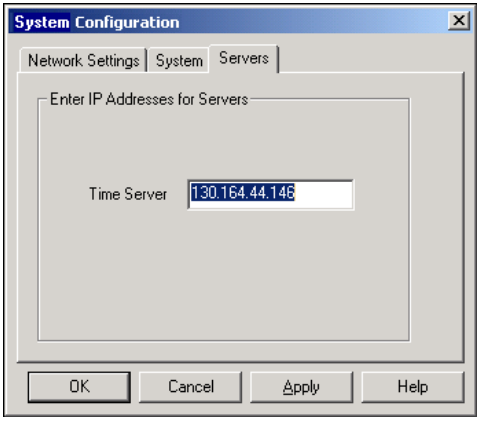


- **IP Address**—the unique, computer-readable address of a device on your network. An IP address is typically represented as four numbers separated by periods (for example, `130.164.55.112`) where the numbers can be between 0 and 255, inclusive.
- **Subnet Mask**—a code that helps the network device determine whether another device is on the same subnet or a different subnet. The most common subnet mask is `255.255.255.0`.
- **Gateway**—the IP address of a device that acts as a gateway server, which is a connection between two networks.
- **DNS Address**—the IP address of a network device that stores host names and translates them into IP addresses.

8. On the **System** tab of the **System Configuration** dialog box, enter a comment to help you identify your FP-1601. For example, you could identify your FP-1601 module as `Station 4` as shown in the following illustration.



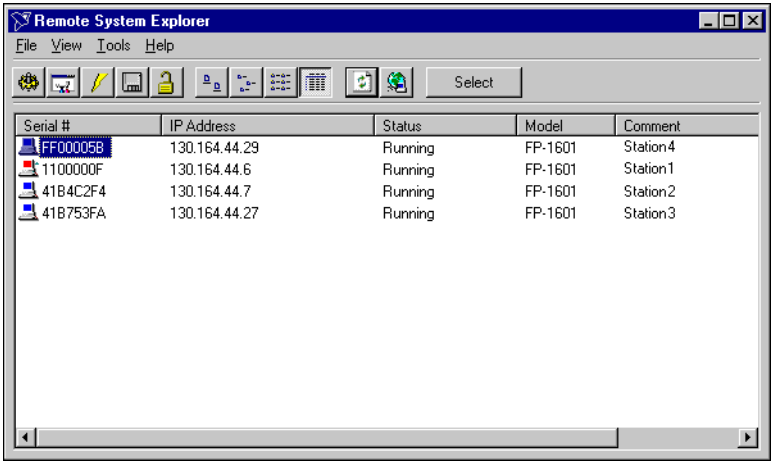
9. Enter an IP address for the **Time Server** on the **Servers** tab of the **System Configuration** dialog box, shown in the following illustration.



The **Time Server** is a networked computer that runs the NI Time Service. This is usually one of the computers that runs FieldPoint software. The FP-1601 has a battery-backed internal clock that provides accurate time stamps in the absence of a Time Server. However, the FP-1601 must contact a time server at least once to set the internal clock initially.

10. Click **OK** in the **System Configuration** dialog box. The FP-1601 reboots automatically.

    After the FP-1601 has rebooted, you should see it in Remote System Explorer with the updated IP address and comment, as shown in the following illustration. If you do not, select **View»Refresh**. Or, refer to the *FP-1601 Does Not Appear in Remote System Explorer Dialog when Browsing* section of Appendix C, *Troubleshooting*.



11. Highlight the module and click the **Select** button. When the new host name or IP address appears in the **Comm Resource Configuration** dialog box of FieldPoint Explorer, you can proceed to configuring your devices and channels.

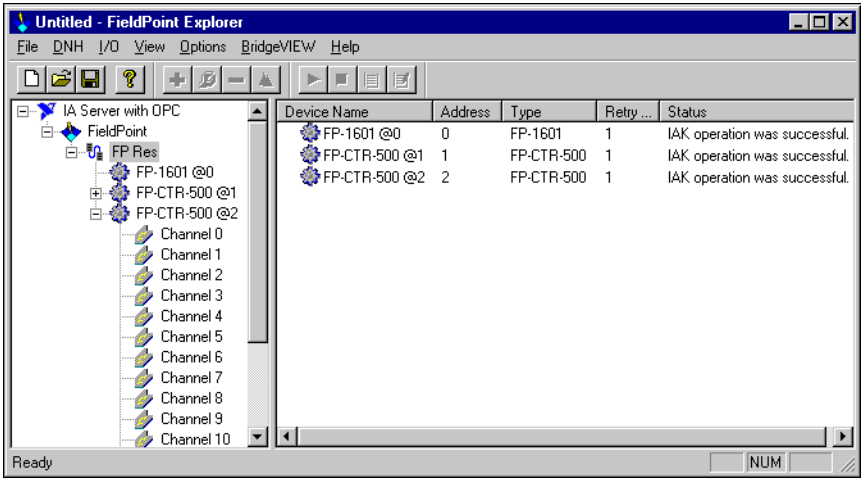
Finding and Configuring Devices and Channels

After you have configured the FP-1601 in FieldPoint Explorer, follow these steps to configure your FieldPoint devices and channels:

1. In the **Comm Resource Configuration** dialog box, click **Find Devices** to search for all of the FieldPoint devices on this communications resource. (If the **Comm Resource Configuration** dialog box is not already open, right-click your Comm Resource in FieldPoint Explorer and select **Edit this comm resource**.)

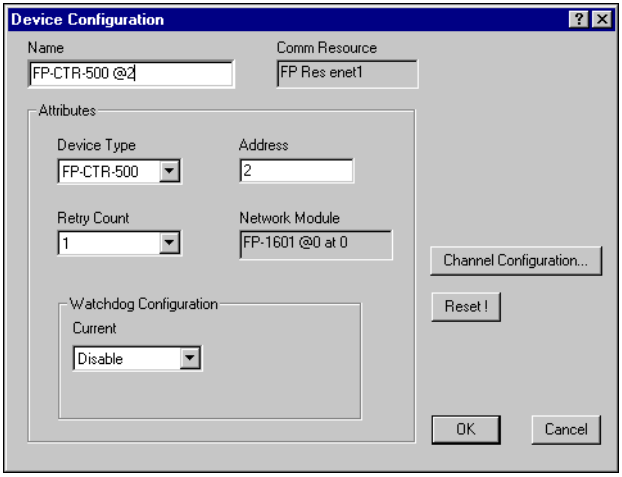
   If no devices are found, refer to the *No Modules Found Error in FieldPoint Explorer* section in Appendix C, *Troubleshooting*.

2. After the FieldPoint modules are found, click on the **+** sign next to **FP Res** in the left pane to expand the device hierarchy and display the modules found on the network, as shown in the following illustration.



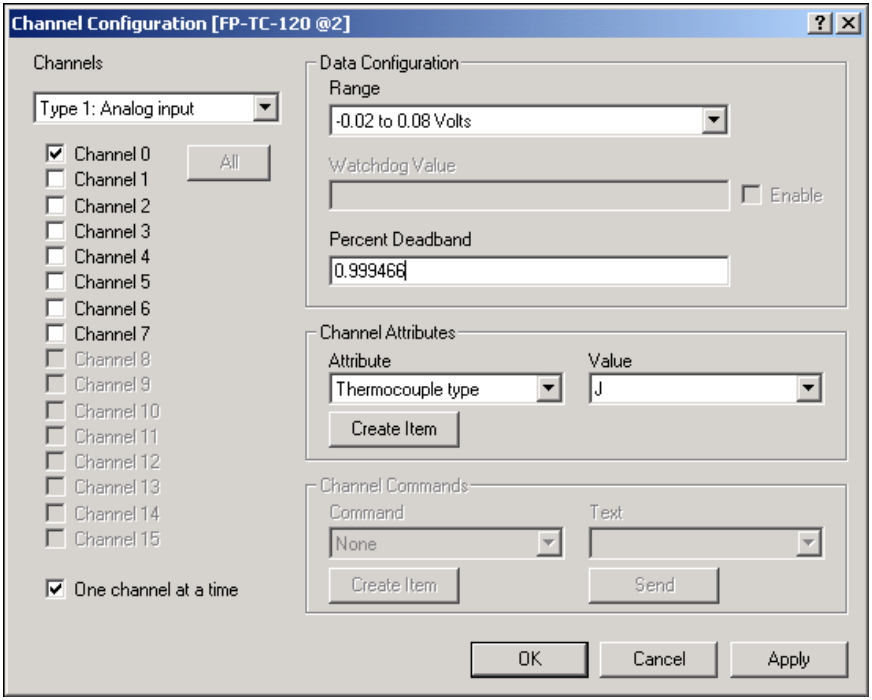
The hierarchy includes all of the modules connected to the FP-1601. The default name of each device found includes the name of the FieldPoint module, followed by a space, the @ sign, and the address of the module (for example, `FP-1601 @0`). For each module found, one I/O item is created for each channel on the module, and if all the channels are of the same type, one I/O Item is created to represent all the channels on that module collectively.

3. To configure the hardware settings of a particular I/O module, right-click the device name and select **Edit this device**. The **Device Configuration** dialog box appears, as shown in the following illustration.



For output modules, you can choose settings for **Watchdog Configuration**. Refer to the *Guarding Against Network Failures (Network Watchdog)* section in Chapter 4, *Feature Set Description*, for more information about the network watchdog feature.

4. Click the **Channel Configuration** button to access the **Channel Configuration** dialog box. In the following illustration, an FP-TC-120 thermocouple module is selected.



Note Configuration options are module-dependent. The options listed here might not be available for your particular module.

Make your selections in this dialog box as follows:

a. Select the type of channel to show, then checkmark the channel(s) that you want to change. To select more than one channel, uncheck the **One channel at a time** box.

b. Set the range and output values of the selected channel(s).

c. Set the deadband for data communication over the network. The deadband setting is a percentage of the full-scale range.

d. Set the attributes for the selected channel(s) by selecting the attribute and entering the desired value.

e. Send commands to the selected channel(s) by choosing a command and value and clicking **Send**.

f. Repeat this procedure for each channel you want to configure.

g. Click **OK**, or click **Apply** to save the changes and continue to configure channels. When you click **OK** or **Apply**, the changes are immediately sent to the device and saved in its non-volatile memory.

Saving Hardware Configuration as Power-Up State

When you are satisfied with the hardware configuration of your FieldPoint system, you can save this configuration as the new power-up state for the bank.

1. Right-click on the FP-1601 network module in the left pane of FieldPoint Explorer, and select **Edit this device**.
2. Deselect the **factory configuration** checkbox.
3. Specify the power-up settings with either of the following options:
   - If you want only the range and attribute settings you configured in the *Finding and Configuring Devices and Channels* section saved as power-up states, click the **OK** button. These settings are written to the non-volatile memory of the network module.
   - If you want to save power-up values for the range and attribute settings and also all the current output states of the output channels, click **Snapshot**. This stores the current ranges, attributes, and output values of that bank of FieldPoint modules to the power-up memory of the network module. Click **OK** when you are finished.



Caution Using the Snapshot feature overwrites any power-up values you may have specified for individual channels in the **Channel Configuration** dialog box.

Refer to the *Storing a Custom Power-Up Configuration* section in Chapter 4, *Feature Set Description*, for more information about configuring and changing the power-up values. Refer to the *Guarding Against Network Failures (Network Watchdog)* section of Chapter 4, *Feature Set Description*, for information about configuring a network watchdog to guard against network failures.

Using Other Features and Options in Remote System Explorer

You can access Remote System Explorer by right-clicking the comm resource in FieldPoint Explorer, selecting **Edit this comm resource**, then clicking the **Browse** button. You can use the Remote System Explorer toolbar buttons, **Tools** menu, or right-click menu to access the following features:

- **Configure Device**—use to configure the IP address, comment, and other parameters for the selected FP-1601.
- **Reboot Device**—use to reboot the selected FP-1601.
- **View Installed Software**—use to view driver software versions installed on the selected FP-1601.

You can use the Remote System Explorer toolbar buttons or **View** menu to access the following features:

- **Large icon view**—changes the view in the main window to large icons.
- **Small icon view**—changes the view in the main window to small icons.
- **List view**—changes the view in the main window to a list.
- **Detailed view**—changes the view in the main window to a list with additional information such as serial number, IP address, status, model, and comment.
- **Refresh Browse List**—refreshes the list of FP-1601 modules and other National Instruments Ethernet devices found on the local subnet or at the specified IP address. Changes to IP address, comment, and so on do not appear in Remote System Explorer until you reboot the selected system and click the **Refresh Browse List** button.

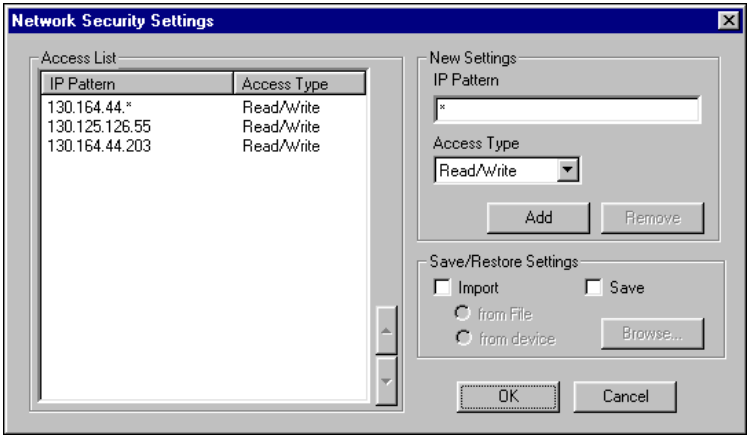
Setting up Security for the FP-1601

You can set network security options to limit host access and you can lock the settings made in Remote System Explorer.

Configuring Network Security

You can limit host access to the FP-1601 by setting access permissions for different host machines. The default setting allows Read/Write access to all host machines. To change the network security settings, follow these steps:

1. Right-click the Comm Resource in FieldPoint Explorer and select **Edit this comm resource**. The **Comm Resource Configuration** dialog box appears with the **Network Security** button enabled.
2. Click the **Network Security** button. The **Network Security Settings** dialog box appears with the current settings, as shown in the following illustration. If your host machine does not have access to the FP-1601, the **Access List** is empty and grayed out.



3. Make your additions or changes in the dialog box, as follows:
   - If you have an **IP Access List** saved in a file or you want your FP-1601 security settings to match another FP-1601 unit, you can import those settings by clicking on the **Import** checkbox. Then select the source (**from file** or **from device**). The settings read from the source are shown in the **Access List** for you to modify, if needed.
   - To add a host machine to the list, enter its IP address in the **IP Pattern** edit box, select the desired access type (Read/Write, Read Only, or Deny Access) from the **Access Type** list, then click the

Add button. You can use the * wildcard when specifying the IP address. For example, to give Read/Write access to all hosts, enter * in the **IP Pattern** edit box, or to Deny Access to all machines on the 111.222.333 subnet, enter 111.222.333.* in the **IP Pattern** box.

- To remove a host machine from the list, either click the entry or type the entry in the **IP Pattern** box, then click the **Remove** button or press the <Delete> key.

Note Once you modify the list, any IP Address that does not have any matching entry is denied access to the FP-1601.

- To change the order of the entries in the list, select an entry and click the up arrow or down arrow button that is located next to the **Access List**. A new entry is always added to the end of the list. You can have multiple matching entries for a given IP address. In that case, the first entry that matches the IP address is used, starting from the bottom of the list.
- To save the **IP Access List** to a file to be used for other FP-1601 modules, click the **Save** checkbox and enter a file name.

4. Once you are satisfied with the changes, click **OK**. A dialog box appears, prompting you for the password. After you enter the password and click **OK**, your changes are applied to the FP-1601.

Verifying the Configuration

You can try to monitor an I/O channel or write to an output channel from FieldPoint Explorer, to verify your installation and configuration.

Monitoring an I/O Channel

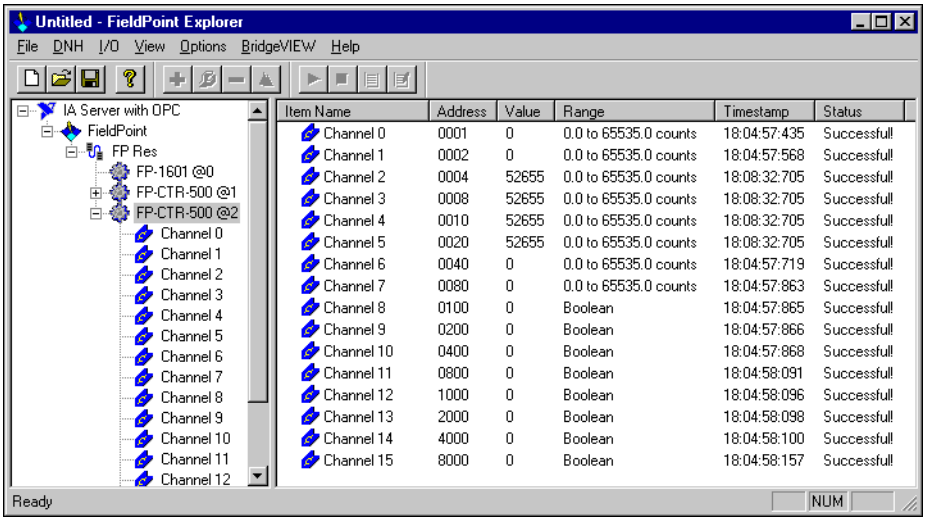


You can monitor FieldPoint devices that you have configured. In the left pane of FieldPoint Explorer, select one of the devices, then click the green arrow icon in the toolbar to start monitoring the items of that device.

The tag symbols of the items in the list view pane turn blue to show that they are being monitored. As shown in the following illustration, the **Value** column shows the current value of the I/O channels defined by the I/O Items, and the **Status** column shows any error conditions received while communicating with the FieldPoint network. **Timestamp** is the time when the FP-1601 made the value available to the host PC.



Click the red square icon in the toolbar to stop monitoring the items.



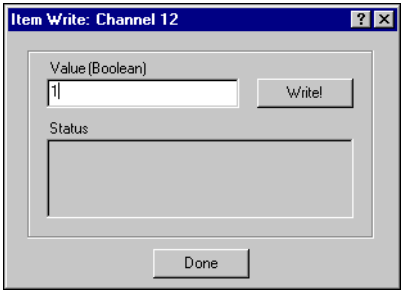
Writing to an Output Channel

You can write to output channels of I/O Items that you have configured.

1. In the left pane of FieldPoint Explorer, select a device with output channels.
2. Select the I/O item in the right-side pane that corresponds to the channel to which you want to write.



3. Click the pencil and paper icon in the toolbar to write to the I/O channel(s) represented by the I/O item.



4. Enter the value you want to write in the **Value** field and click the **Write** button to write the value out. The value must be in the range of the channel that you configured in step 4 of the *Finding and Configuring*

Devices and Channels section in this chapter. For example, if the channel was configured for a range of 0.0035 to 0.021 A, and you want to write a value of 0.010 A (10 mA), enter `0.010` in the **Value** box. For discrete I/O channels with a Boolean range, enter a 1 or a 0 in the **Value** field.

Using the FP-1601 from Host Applications

The following sections explain how to access the channels on the FP-1601 from software running on the host PC.

Lookout and the FP-1601

The FP-1601 network module integrates easily with National Instruments Lookout 4.0 and later. You can access the module the same way you would access another desktop computer running Lookout. You can access the channel data, ranges, attributes, and commands from Lookout, as well as several control variables, such as Reset and Snapshot.

To access the FP-1601 with Lookout 3.8 or earlier, use the FieldPoint OPC server. You cannot use the FieldPoint 3.8 Lookout driver class with the FP-1601.

To use the FP-1601 with Lookout 4.0 or later, follow these steps:

1. Configure your FP-1601 from FieldPoint Explorer, as described in the *Configuring the FP-1601 in FieldPoint Explorer* section of this chapter.
2. Start Lookout, and create a new process or open an existing one.
3. Register the FP-1601 as a networked computer in Lookout. Select **Object»Object Explorer** or **Object»Connection Browser** from the menu bar and right-click on the **Network** icon. Choose **Register network computer** from the pop-up menu. Type the IP Address or host name of the FP-1601 in the **Computer name** field and click **OK**.
4. When you create a Lookout object or expression, you can connect it to data on the FP-1601 network module. In the **Insert Expression** dialog box, click **Network** to browse the registered computers and FP-1601 modules. Click the IP address or host name of the network module and browse to the desired data.

An alternative method is to use the `fpoint.cbx` to access the channel data.

LabVIEW VIs and the FP-1601

When you install the FieldPoint software, a library of FieldPoint VIs is created if LabVIEW has already been installed on your computer. The FieldPoint VIs (FP Open, FP Get Configuration Info, FP Create Tag, FP Advise, FP Read, FP Write, and FP Close) directly access the I/O Items you configured in the FieldPoint Explorer program. For help using these VIs, refer to the examples in the `LabVIEW\examples` directory or use the FieldPoint LabVIEW Help, which is in the same program group on your Windows taskbar as FieldPoint Explorer. You can use this same set of VIs to access the FP-1601 from the host PC. A simple FieldPoint application to read an I/O item might only need to use four of the VIs. To create an example of such an application, complete the following steps:

1. Use FP Open to open the server. By default, the server opens with the configuration file you last saved with FieldPoint Explorer.
2. Use FP Create Tag to create a handle to an I/O item that you defined in FieldPoint Explorer. You provide three string names to this VI to indicate which I/O item you want to access. These three strings are the names given to the communications resource, the device, and the I/O item.



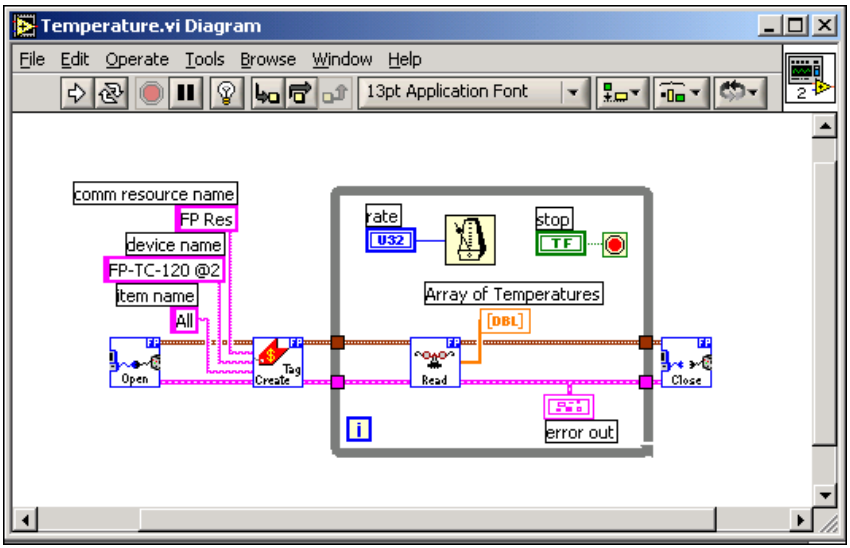
Note The strings provided to the VI must *exactly* match the names in FieldPoint Explorer, including spaces and letter case.

3. Use FP Read.vi to monitor an I/O item. You should also add a delay into the loop so that the loop operates at your desired rate. Otherwise, it can load the processor at 100% and lock the software in the module. To write to an Output Item, use FP Write instead of FP Read.



Note You can use FP Advise in place of FP Read. However, it is best not to place anything else in a while loop with FP Advise. When using FP Advise.vi, you can configure its timing as an input to the VI. Also, do not put more than one FP Advise VI in a loop. All VIs in a loop execute only once each time a loop runs, and FP Advise VIs only complete at their advise rate. If you had more than one FP Advise VI in the loop, the loop (and therefore all of the FP Advise VIs in the loop) would only execute at the slowest rate of the Advises. The loop might not execute more than once if any of the Advises is set to complete "On Data Change" and the data of the corresponding I/O item never changed.

4. Use FP Close to close the server. This action also stops all pending advise operations.
5. The following illustration gives an example of a LabVIEW diagram with FieldPoint items.



LabWindows/CVI Functions and the FP-1601

When you install the FieldPoint software, a LabWindows/CVI instrument driver for FieldPoint is installed if LabWindows/CVI has already been installed on your computer. This instrument driver includes function panels to call C functions that directly access the I/O Items you configured in the FieldPoint Explorer program. In addition, a set of sample projects is placed in your `LabWindows/CVI Samples` directory. Using these examples is the best way to get familiar with these functions. The **FieldPoint CVI Help** document is in the same program group on your Windows taskbar as the FieldPoint Explorer program. This help document describes each function in the instrument driver with a description of the C syntax, a description of each parameter, and a list of possible error codes.

Note FieldPoint CVI Interface Compatibility Modes—The FieldPoint software ships with object (`.obj`) files to support the different compiler compatibility modes that LabWindows/CVI supports (Microsoft Visual C/C++, Borland, Watcom, and Symantec). When the FieldPoint software is installed, the `.obj` file corresponding to the configured compatibility mode is installed.

FieldPoint OPC Server and the FP-1601

The FieldPoint OPC server conforms to the OPC Data Access 2.0 standard. OPC (OLE for Process Control) is an industry standard device interface specification that provides interoperability between field devices such as FieldPoint and application software packages. The FieldPoint OPC server, like the other FieldPoint interfaces, imports the I/O Items that you configured in FieldPoint Explorer and makes them available as OPC Items to any *OPC client*. Therefore, if two computers are networked together, it is possible for an OPC client on one computer to access FieldPoint hardware connected to the OPC server on another computer.

OPC clients might differ in the features they offer and their presentation of the OPC interface for the FieldPoint OPC server. Refer to the documentation on using the OPC client features of your application for detailed instructions on how to access an OPC server. However, the basic steps involved are similar for most OPC client applications.

Follow these steps to use the FieldPoint OPC server:

1. Launch your OPC client.
2. Open the FieldPoint OPC server, `National Instruments.OPCFieldPoint`, from the OPC client.

   This server was registered with Windows when you installed the FieldPoint software. OPC clients should be able to show you a list of available registered servers, but you might have to type this name in yourself. The OPC client might automatically connect to the server when you select it, but if you are given the option to explicitly connect to the FieldPoint OPC server, you should do so.
3. Create a group.

   Groups are a collection of I/O Items. Some OPC clients might not give you the option of creating groups, or they might be created for you.
4. Select the I/O Items, which you configured in FieldPoint Explorer, that you want to read or write as a part of this group.

   Many OPC clients can use the Browse Address Space feature of the FieldPoint OPC server to show you a list of all of the I/O Items you configured in FieldPoint Explorer. However, if the OPC client you are using does not support this feature, you might need to type the Item IDs of the I/O Items directly. The naming convention of the FieldPoint Item IDs is *`Comm resource name\Device Name\I/O Item name`*

where the Comm resource name, Device name, and I/O Item name are the names given in FieldPoint Explorer. For example, an Item ID associated with one of the I/O Items might be the following:

```
FP Res\FP-TC-120 @1\Channel 0
```

In most cases, the preceding steps are all that is required to configure an OPC client to read from I/O Items of the FieldPoint OPC server. In some cases, the OPC client might require more information about the FieldPoint OPC server. The following list contains additional information about the FieldPoint OPC server, which you might find helpful.

- The FieldPoint OPC server does not require an access path. Some OPC clients might expect the access path to be included in the Item ID name or might request the access path when you select I/O Items. You should be able to leave the access path blank (empty string).
- The FieldPoint OPC interface is an out-of-process server.
- The FieldPoint OPC server supports both synchronous and asynchronous reads and writes.
- The FieldPoint OPC server uses the GetErrorString method to return error and diagnostic messages from the FieldPoint server and hardware. OPC clients that do not support this method might give you error messages like “Bad, non-specific” along with an error code. Some OPC clients that do not support this GetErrorString method might still provide a way for you to manually look up the FieldPoint message corresponding to the error code using the method.

4

Feature Set Description

This chapter describes the feature set for the FP-1601 network module.

Guarding Against Network Failures (Network Watchdog)

The network watchdog feature of the FP-1601 enables you to guard your system against failures in the network connection, cables, or host computer. If the network watchdog is enabled and the FP-1601 loses communication with all hosts or clients over the network, the FP-1601 sets its output channels to your pre-defined values (the watchdog state). So in cases where you are running embedded applications on the FP-1601 that do not require communication with a host computer or clients, the network watchdog might not be appropriate.

Network watchdog output values can be different than power-up output values. For example, you might want to turn an output value on when you power up, but turn it off if network communication is lost.

By default, the network watchdog for the bank is disabled on power up. To enable the network watchdog, follow these steps:

1. In FieldPoint Explorer, right-click on an output module and select **Edit this device**.
2. Choose **Enable** or **Enable on Use** for the current watchdog configuration.
3. Click the **Channel Configuration** button, then configure these settings:
   - Enable/disable the watchdog for each channel.
   - Enter a watchdog data value for each channel.
4. Click **OK**.

5. In the left pane of FieldPoint Explorer, right-click on the FP-1601, select **Edit this device**, and configure these settings:
   - Uncheck the **factory configuration** checkbox.
   - Enable network watchdog for the bank.
   - Enter a network watchdog timer value for the bank, a value that specifies the maximum allowable period of lost communication with hosts or clients over the network.
6. Click **OK**.
7. Select **File»Save**.

Storing a Custom Power-Up Configuration

Setting a Power-Up State with the Snapshot Method

The Snapshot feature provides a single-step method for storing the current state of your FieldPoint hardware for use as the power-up state of the bank.

Caution Using the Snapshot feature overwrites any power-up values you may have specified for individual channels in the **Channel Configuration** dialog box.

1. Set the hardware to the state you want to use as a power-up state, including output values, ranges, and attributes.
2. Right-click on the FP-1601 network module in the left pane of FieldPoint Explorer, and select **Edit this device**.
3. Deselect the **factory configuration** checkbox.
4. Click the **Snapshot** button. Click **Yes** and **OK** to approve the change.
5. Click **OK** in the **Device Configuration** dialog box.
6. Select **File»Save**.

At a later time, you might want to change the power-up values of an individual channel. To make this kind of incremental change, use the procedure described in the next section, *Configurable Power-Up Method*.

Configurable Power-Up Method

With the configurable power-up state feature, you can define the power-up configuration on a module-by-module basis. You do not need to set any of the channels to the desired power-up state, as you would with the Snapshot feature. But you could use the configurable power-up method to adjust previously stored Snapshot information.

1. In FieldPoint Explorer right-click on an I/O module and select **Edit this device**.
2. Click the **Channel Configuration** button, then enter any of the following power-up values for any channel:
   - Range, attribute, and output values for each channel
   - Network watchdog data value of each channel
   - Network watchdog data enabled (or disabled) status for each channel
   - Network watchdog timer enabled (or disabled) status of each module
   - Network watchdog timeout value for the FieldPoint bank
3. Click **OK** twice.
4. Right-click on the FP-1601 network module in the left pane of FieldPoint Explorer, and select **Edit this device**.
5. Deselect the **factory configuration** checkbox and click **OK**.
6. Select **File»Save**.

Inserting, Removing, or Replacing I/O Modules (HotPnP)

The HotPnP feature simplifies system installation, configuration, and maintenance. As long as an empty terminal base is already available in the bank, you can remove or insert I/O modules into the terminal bases, even if the system is already engaged in network activity. You do not need to power down the bank or the system. In addition, you do not need to change the operation of the host computer or software to use the HotPnP feature. While one or more new or replacement I/O modules in a bank are being serviced by the HotPnP feature, the other I/O modules in the bank remain fully operational and accessible on the network without any interruptions.

When you insert an I/O module with the power on, it is automatically recognized and made available on the network with the appropriate configuration. To see the new module in FieldPoint Explorer, click **Find Devices** in the **Comm Resource Configuration** dialog box and select **File»Save**.

Caution Do *not* add or remove terminal bases while power is applied to the bank.

Commands sent to a missing module return an error response, but the FP-1601 stores the commands and applies the effects of these commands if a suitable replacement module is inserted.

When a new I/O module is connected in place of the one that was removed, the FP-1601 first verifies that the replacement I/O module is compatible with the one that was removed. If the I/O module is the same as, or is compatible with the one removed, the FP-1601 configures the replacement I/O module with the configuration of the previous module and output value settings.

Table 4-1 shows how modules are configured after HotPnP replacement.

Table 4-1. Module Configuration Results After HotPnP Replacement

Replacement Module	Start in Factory Default	Replacement Module Configuration After HotPnP
Compatible with the removed module	Either Enabled or Disabled	Same as the configuration of the removed module
Incompatible with the removed module, but compatible with the stored Snapshot information	Disabled	Same as the configuration stored in the Snapshot
	Enabled	Factory default configuration of replacement module
Incompatible with the removed module and incompatible with the stored Snapshot information	Either Enabled or Disabled	Factory default configuration of replacement module

LED Indicators

The FP-1601 has several LEDs to convey status information.

POWER LED

The green **POWER** LED is lit while the FP-1601 is powered up. This LED indicates that the power supply connected to the FP-1601 is acceptable, and that the FP-1601 is supplying power to the I/O modules.

STATUS LED

The red **STATUS** LED is off in normal operation mode. The FP-1601 indicates specific error conditions by flashing **STATUS** a specific number of times. Refer to the *STATUS LED Error Indications* section of Appendix C, *Troubleshooting*, for more information about **STATUS** LED error indications.

LINK LED

The green **LINK** LED is lit when the FP-1601 is connected to a functioning Ethernet segment.

ACTIVE LED

The green **ACTIVE** LED is lit when the FP-1601 receives data from or transmits to the Ethernet. Because of unrelated network activity, this LED blinks occasionally even when the FP-1601 is inactive.

100 Mbps LED

The yellow **100 Mbps** LED is lit when the FP-1601 is communicating at 100 megabits per second. If the **100 Mbps** LED does not light, all communications with the FP-1601 is at 10 megabits per second.

User-Accessible LEDs (A–D)

You can access LEDs **A**, **B**, **C**, and **D** through the FieldPoint VIs; they are considered count output channels 7, 8, 9, and 10 on the network module. LEDs **B**, **C**, and **D** can be sent values of 0, 1, or 2. LED **A** can be sent only 0 or 1. The values sent to these LEDs manifest as 0=off, 1=green, and 2=red.

Power-On Self Test (POST)

The FP-1601 runs a power-on self test (POST) at power up to verify its own operational status. The test takes several seconds, does not affect the operation of the network, and does not affect any of your field wiring connected to the terminal bases in the bank.

If the power-on self test fails, the FP-1601 does not participate in network communication, eliminating potential conflicts with the other banks in your network.

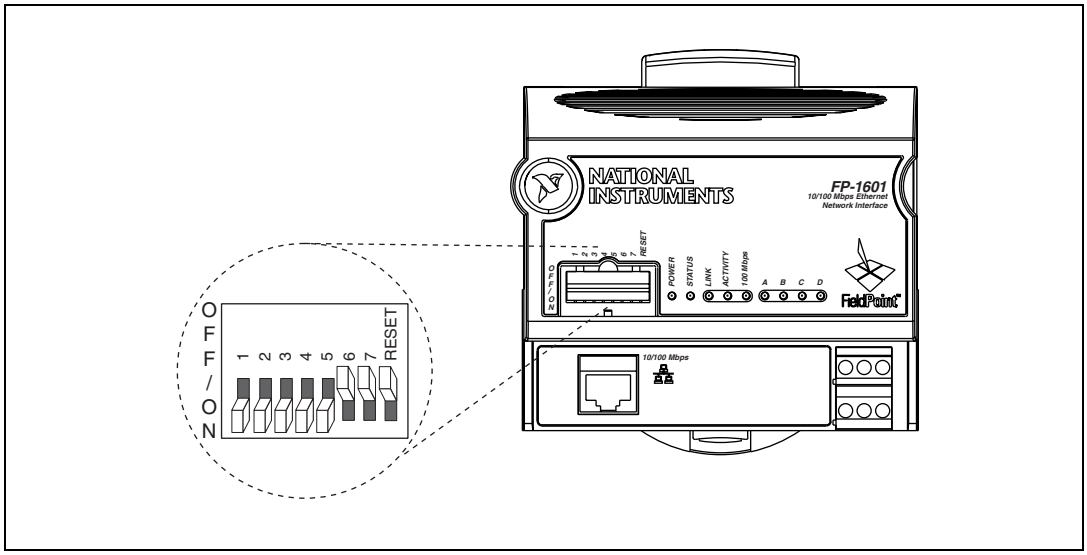
When you power up the FP-1601 successfully for use, the **POWER** and **STATUS** LEDs come on for about 5 seconds, then the **STATUS** LED

turns off. When the I/O module **READY** LEDs come on, the network module is ready for use.

The FP-1601 indicates POST failure through the **STATUS** LED. If the LEDs do not follow the sequence described here, refer to the *STATUS LED Error Indications* section in Appendix C, *Troubleshooting*, for information about possible reasons.

DIP Switches

The following illustration shows the switches on the front of the FP-1601.



Switches 1, 2, 3, 4, 5, 6, and 7 are user-accessible DIP switches. They may be read by the FieldPoint LabVIEW VIs, but have no default functionality.

RESET Switch

The position of the RESET switch determines whether the IP settings of the FP-1601 network module are reset at power up or reboot. It is necessary to reset the TCP/IP settings of the module if you are moving it from one subnet to another, or you suspect the system is inaccessible due to bad TCP/IP settings. Refer to Appendix B, *Resetting the FP-1601*, for more information about the procedure for resetting the FP-1601.

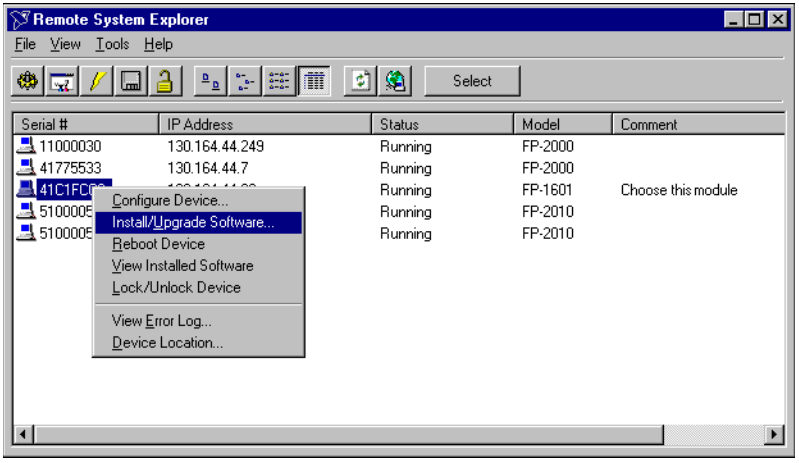
User-Accessible DIP Switches (1–7)

The user-accessible switches (1–7) can be read from any of the supported host interfaces, including FieldPoint Explorer, as discrete input channels on the network module.

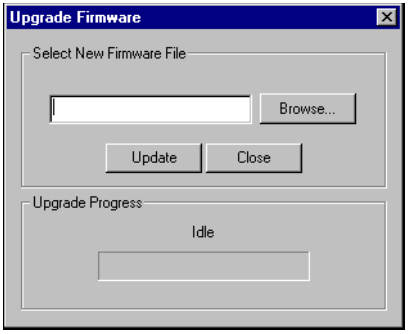
Upgrading the Firmware on the FP-1601

To upgrade the firmware on the FP-1601, follow these steps:

1. In FieldPoint Explorer, right-click the FieldPoint icon and select **Add a comm resource to this server**.
2. In the Comm Resource Configuration dialog box, select **Ethernet** as the **Type**.
3. Click **Browse** to launch Remote System Explorer. Right-click the serial number of the FP-1601 and select **Install/Upgrade Software**.



4. In the Upgrade Firmware dialog box, click **Browse**.



5. In the Open dialog box, navigate to the new `.fpf` firmware file. Click **Open**.
6. After you have selected the new firmware file, in the Upgrade Firmware dialog box, click **Update**.

A

Choosing Network Settings

This appendix describes how to choose appropriate network settings.

Choosing an IP Address

The way you choose an IP address for your FP-1601 depends on whether your network has a system administrator.

Choosing an IP Address with a Network Administrator

If you are adding the FP-1601 to an existing Ethernet network, you must choose IP addresses carefully. Consult with your network administrator to obtain appropriate values:

- Ask the administrator to provide static IP addresses to your FP-1601 and the computer running the National Instruments Time Service. Time Service is installed along with the FieldPoint software and runs automatically.
- Ask the network administrator to provide the proper subnet mask, gateway, and DNS server addresses.

Choosing an IP Address without a Network Administrator

If you are assembling your own small Ethernet network, you can choose your own IP address. The following guidelines may help you choose appropriate values:

- IP Addresses are generally in the form of `w.x.y.z` where `w`, `x`, and `y` are numbers between 0 and 255 (inclusive) and `z` is between 1 and 254; however, a `z` value of 1 is usually reserved for the IP address of a gateway.
- Local networks (those that will not be connected to the Internet) should have IP addresses assigned from the following ranges:
  - `10.0.0.0` through `10.255.255.255`
  - `172.16.0.0` through `172.31.255.255`
  - `192.168.0.0` through `192.168.255.255`

- To determine whether an IP address is already used by another device on the network, select **Start»Run**. Type `ping x.x.x.x` where `x.x.x.x` is the IP address you want to test, and click **OK**. If `ping` returns a timeout, the IP address is not used. If it returns a reply from a device, the IP address is already in use.
- A subnet is a set of systems whose IP addresses are configured such that they can communicate directly with one another. Data does not flow through an intermediate router. The most common subnet mask is `255.255.255.0`.
- Appropriate subnet masks should be chosen to divide your system into smaller subnets, as desired. The method for determining the subnet is as follows:

  The IP Address is combined in a logical AND with the subnet mask to determine the subnet. For example, a system with an IP address of `10.10.10.10` and a subnet mask of `255.255.255.0` is on the subnet of `10.10.10.x`. Thus, all systems with an IP of `10.10.10.x` and a subnet mask of `255.255.255.0` are considered to be on the same subnet. Likewise, if the systems had a subnet mask of `255.255.0.0`, all systems with an IP of `10.10.x.x` are considered part of the same subnet.
- Using the **Suggest Values** button when configuring the IP address of a network module in FieldPoint Explorer should result in values that work on your network.
- The Time Server is the address of the computer where you have installed the National Instruments Time Service. This service is installed along with the FieldPoint software, Lookout 4.0 or later, and the LabVIEW Datalogging and Supervisory Control module.
- If you are setting up your own network, you probably do not have a gateway or DNS server, so set these values to `0.0.0.0`.
- To find out the network settings for your computer, run `winipcfg` on Windows 98/95 or `ipconfig` on Windows NT/2000.

  To run `winipcfg`, select **Start»Run**, type `winipcfg` in the **Open** field, and click **OK**. The **IP Configuration** window appears, which gives you information about the network setup for your computer. Make sure that the correct Ethernet adapter appears in the field at the top of the window.

  To run `ipconfig`, open a Command window, type `ipconfig` at the prompt, and press <Enter>. If you need more information, you can run `ipconfig` with the `/all` option by typing `ipconfig /all`. Make sure you use the settings for the correct Ethernet adapter to configure your FP-1601.

Identifying Your FP-1601 to the Network

How you identify your FP-1601 to the network depends on if your network has a DNS server.

- If your network has a DNS server, follow these steps to make sure the **DNS Address** value points to the correct location.
  a. Right-click the Comm Resource in FieldPoint Explorer, and choose **Edit this comm resource**.
  b. Click **Browse** to launch Remote System Explorer.
  c. Double-click the serial number of the module for which you want to verify the DNS address.
  d. On the **Network Settings** tab of the System Configuration dialog box, make sure the **DNS Address** value points to the correct location.
  e. Ask your network administrator to add a table entry for your DNS address.
- If your network does not have a DNS server, you must set up the `hosts` files on each networked computer. A `hosts` file allows a networked computer to use host names when no DNS server is available. Each computer on the network that needs to access the FP-1601 should have a properly configured `hosts` file.

Setting up a Hosts File Under Windows NT/2000

1. Log on as an administrator to the local machine (not onto a domain).
2. Create a text file called `hosts`. Place this file in the `system32\drivers\etc` directory of the system root, for example: `c:\winnt\system32\drivers\etc\hosts`
3. The file should include the following lines, where *`hostname`* is the host name of the FP-1601 and *`12.34.56.78`* is its IP address:

```
127.0.0.1 localhost
12.34.56.78 hostname
```

Setting Up a Hosts File Under Windows 98/95

1. Create a text file called `hosts`. Place this file in the `windows` directory, for example `c:\windows\hosts`
2. The file should include the following lines, where *`fp`* is the host name of the FP-1601 and *`12.34.56.78`* is its IP address:

```
127.0.0.1 localhost
12.34.56.78 fp
```

Viewing and Editing the FP-1601 TCP/IP Settings

Follow these steps to view the TCP/IP settings:

1. In FieldPoint Explorer, right-click the Comm Resource and select **Edit this comm resource**.
2. Click **Browse** to launch Remote System Explorer.
3. In Remote System Explorer, double-click the serial number of the FP-1601 whose settings you would like to view or change.
4. When you are done, click **OK**. Click **Cancel** to discard any changes you have made.

B

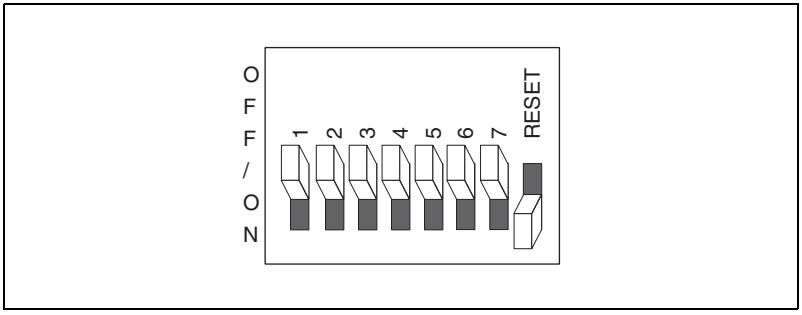
Resetting the FP-1601

If the FP-1601 is not able to communicate with the network, you can manually reset the unit to its factory settings. In this state, you should always be able to browse for the FP-1601 using Remote System Explorer if it is on the same physical subnet as your host computer. When you reset the FP-1601, the following actions occur:

- The IP address, subnet mask, DNS address, gateway, and Time Server IP are set to `0.0.0.0`.
- The normal I/O services are suspended until the FP-1601 is reconfigured, but I/O module configuration is preserved. (Send a Reset command in FieldPoint Explorer to reset an individual I/O module.)
- The device appears as `Unconfigured` in Remote System Explorer.
- The system is unlocked, and any password protection is removed for configuration settings and data points.
- Resetting does not affect power-up defaults or watchdog settings.

Follow these instructions to reset the unit:

1. Power down the FP-1601.
2. Move the RESET DIP switch on the front of the module to the ON position, as shown in the following illustration.



3. Power up the FP-1601 and wait for the red **STATUS** LED to start flashing. When it flashes, the FP-1601 is in reset mode.
4. Move the RESET switch back to the OFF position.
5. Power down the FP-1601 and power it up again.

C

Troubleshooting

This appendix gives troubleshooting instructions for the FP-1601 and FieldPoint software.

Software Configuration Problems

Error when Browsing in Comm Resource Configuration Dialog Box

Possible causes and solutions:

- Your Ethernet adapter is not installed properly. To install your Ethernet adapter, select **Start»Settings»Control Panel** and double-click on **Network**. Your Ethernet adapter should appear in the list of installed components. If it does not appear, reinstall the software that came with your Ethernet adapter. If you do not have this software, contact the Ethernet adapter manufacturer.
- Your Ethernet adapter is installed, but TCP/IP protocol is not. TCP/IP is the network protocol used to communicate over Ethernet to the FP-1601. Select **Start»Settings»Control Panel** and double-click **Network**. TCP/IP should appear in the list of installed network components. If it does not appear, select **Protocol** from the **Network Component Type** dialog box and click **Add**. In the **Select Network Protocol** dialog box that appears, select **Microsoft** as the manufacturer and **TCP/IP** from the **Network protocol** list. Click **OK**. You may need the Microsoft Windows disks or CD-ROM that came with your computer, and you may have to restart your computer after closing the **Network** control panel.

FP-1601 Does Not Appear in Remote System Explorer Dialog when Browsing

Possible causes and solutions:

- Verify that there is power to the FP-1601, and that both the module and the computer are properly connected to the Ethernet network. The module's **POWER** and **LINK** LED indicators should be lit. When you click **Browse**, the **ACTIVE** LED on the FP-1601 should flash to indicate that communications are taking place.

- Certain network devices, such as switches and routers, can filter out the directed UDP broadcast packets that FieldPoint Explorer uses to communicate with unconfigured FP-1601 modules, even if they are on the same subnet as the computer running FieldPoint Explorer. You can test this by connecting the computer running FieldPoint Explorer and the FP-1601 directly to a simple Ethernet hub or by using a crossover cable between the FP-1601 and the host PC. If the FP-1601 appears in the Remote System Explorer window using this configuration, but not when connected to the larger network, it is likely that there is a problem of this type. Consult your network administrator.
- The FP-1601 may have been configured on another network and then moved to the current network. Refer to Appendix B, *Resetting the FP-1601*, for instructions on resetting the FP-1601.
- You may be using the wrong type of Ethernet cable.
- You may have assigned an IP address to your FP-1601 that is already used by another device on the network. Either remove or reconfigure the other device, or reconfigure the FP-1601 IP address. Refer to Appendix A, *Choosing Network Settings*, for information on choosing IP settings.

Error when Configuring IP Settings for the FP-1601

Possible causes and solutions: Make sure you are entering valid values for all network parameters. If the subnet mask or IP address is not compatible with the network settings, an error is returned and the FP-1601 will not be configured.

FP-1601 Returns Invalid Timestamp Values

Possible causes and solutions:

- Verify that the IP address entered in Remote System Explorer points to a computer running National Instruments Time Service.
- Verify that the time zone settings are set correctly on the host PC and Time Server PC.
- Verify that National Instruments Time Service was installed on the computer you have specified as the Time Server. If Time Service is installed but is not running, restart it either using the Service Manager or using the following commands.
  - Under Windows Me/98/95—Open an MS-DOS prompt and enter `c:\windows\system\lktsrv -start`
    or right-click the lighthouse icon in the PC's system task tray.

– Under Windows NT/2000—Open a Command Prompt and enter `c:\winnt\system32\lktsrv -start` or use the Services Manager available through the Control Panel.

If Time Service is not installed, refer to Chapter 2, *Hardware and Software Installation*, for instructions on installing the FieldPoint software, which includes Time Services.

No Modules Found Error in FieldPoint Explorer

Possible causes and solutions:

- Make sure that the FieldPoint hardware is powered on. Make sure terminal bases are firmly mated, I/O modules are firmly seated on the terminal bases, and the cable connections are secure. The I/O module **READY** LEDs should be lit if all these connections are good.
- You may have assigned an IP address to your FP-1601 that is already used by another device on the network. Either remove or reconfigure the other device, or reconfigure the FP-1601 IP address. Refer to Appendix A, *Choosing Network Settings*, for information on choosing IP settings.
- The timeout value might be too small. Increase it and try again.

STATUS LED Error Indications

The FP-1601 indicates specific error conditions by flashing the red **STATUS** LED a specific number of times. The following table describes the **STATUS** LED flashing sequences and the corresponding error condition.

Table C-1. STATUS LED Flashes and Corresponding Error Conditions

Number of Flashes	Error Condition
0 (stays lit)	The FP-1601 did not power on correctly. Contact National Instruments for assistance.
1	The FP-1601 is in reset mode or is unconfigured. Refer to Appendix B, *Resetting the FP-1601*, for more information about reset mode. Refer to Chapter 3, *Hardware and Software Configuration*, for more information about configuration.

Table C-1. STATUS LED Flashes and Corresponding Error Conditions (Continued)

Number of Flashes	Error Condition
2	The FP-1601 has detected an error in its firmware. This usually occurs when an attempt to upgrade the firmware is interrupted. Repeat the firmware upgrade process.
3 (or more)	The FP-1601 has detected an unrecoverable error. Contact National Instruments for assistance.

D

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 Nm (4.4-5.3 in-lbs)

Network

Network interface	10BaseT and 100BaseTX Ethernet
Compatibility	IEEE802.3
Communication rates	10 Mbps, 100 Mbps, autonegotiated
Maximum cabling distance	100 m/segment (328 ft/segment)
Power supply range	12 to 30 VDC
Power consumption	4.5 watts + 1.1 * $\sum$(*I/O Module Consumption)*
Maximum terminal bases per bank	9
Maximum number of banks	determined by network topology
Weight	235 g (8.3 oz)

Maximum Working Voltage

Maximum working voltage refers to the signal voltage plus the common-mode voltage.

Channel-to-earth	250 V, Installation Category II
Channel-to-channel	0 V

Environmental

FieldPoint modules are intended for indoor use only.

Operating temperature .....–25 to +55 °C

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

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

Maximum altitude.....2,000 m (6,560 ft)

Pollution Degree 2

Safety

The FP-1601 meets the requirements of the following standards for safety and electrical equipment for measurement, control, and laboratory use:

- EN 61010-1:1993/A2:1995, IEC 61010-1:1990/A2:1995
- UL 3101-1:1993, UL 3111-1:1994, UL 3121:1998
- CAN/CSA c22.2 no. 1010.1:1992/A2:1997

Electromagnetic Compatibility

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

Electrical emissions .....EN 55011 Class A at 10 m FCC Part 15A above 1 GHz

Electrical immunity .....Evaluated to EN 61326: 1997/A1: 1998, Table 1

Note For full EMC compliance, you must operate this device with shielded cabling. See the Declaration of Conformity (DoC) for this product for any additional regulatory compliance information. To obtain the DoC for this product, click **Declaration of Conformity** at `ni.com/hardref.nsf/`.

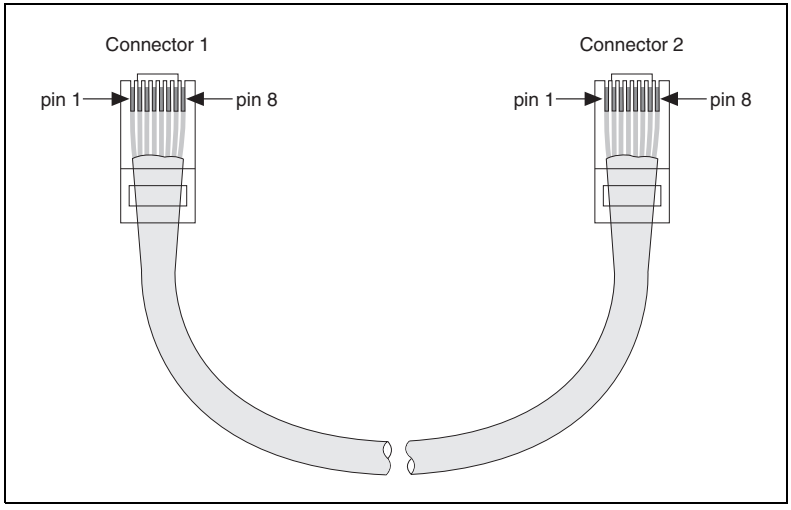
Cabling

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

Table D-1. Ethernet Cable Wiring Connections

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	orange
7	white/brown	white/brown	white/brown
8	brown	brown	brown

The following illustration shows the connector pinouts for FieldPoint Ethernet cables.



E

Technical Support and Professional Services

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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.

Glossary

Symbol	Prefix	Value
m	milli	10^{-3}
M	mega	10^{6}

%	percent.
°	degrees.
bank	The combination of one FieldPoint network module and one or more terminal bases and I/O modules.
C	Celsius.
DIP switch	Dual Inline Package switch.
DNS	Domain Name System.
FTP	File Transfer Protocol.
HotPnP	Hot Plug and Play.
IEC	International Electrotechnical Commission.
I/O	Input/Output.
LED	Light-emitting diode.
m	meters.
OPC	OLE for Process Control.
POST	Power-On Self Test.
V	Volts.
VDC	Volts direct current.

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