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Fieldbus

**Getting Started with
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All Class A products display a simple warning statement of one paragraph in length regarding interference and undesired operation. The FCC rules have restrictions regarding the locations where FCC Class A products can be operated.

Consult the FCC Web site at 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 NI 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 is required to correct the interference at their 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.

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* The CE marking Declaration of Conformity contains important supplementary information and instructions for the user or installer.

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About This Manual

This manual contains instructions on how to install and configure the National Instruments PCMCIA-FBUS card and the NI-FBUS software. The PCMCIA-FBUS card is intended for use in laptop computers equipped with a Type II PCMCIA socket.

In this manual, the term *PCMCIA-FBUS* refers to the PCMCIA-FBUS card and the PCMCIA-FBUS Series 2 card.

How To Use the Manual Set

Use the *Foundation Fieldbus Overview* to learn the basics of Fieldbus. The *Foundation Fieldbus Overview* also includes tutorials to lead you through developing a simple Fieldbus application.

Use this getting started manual to install and configure your PCMCIA-FBUS card and the NI-FBUS software. To install your PCMACIA-FBUS card in the Windows 2000/XP system environment, use the *Installation Guide: Foundation Fieldbus Hardware and NI-FBUS Software for Windows 2000/XP*.

If you are using the NI-FBUS Configurator, use the *NI-FBUS Configurator User Manual* to install and use the NI-FBUS Configurator software.

If you are using the NI-FBUS Communications Manager Application Programmer Interface (API), use the *NI-FBUS Communications Manager User Manual* to learn how to use the NI-FBUS Communications Manager API for your application. Use the *NI-FBUS Communications Manager Function Reference Manual* to look up specific information about NI-FBUS Communications Manager functions, such as syntax and error messages.

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 tip, which alerts you to advisory information.



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 parameter names and hardware labels.

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.

`monospace bold` Bold text in this font denotes the messages and responses that the computer automatically prints to the screen. This font also emphasizes lines of code that are different from the other examples.

`monospace italic` Italic text in this font denotes text that is a placeholder for a word or value that you must supply.

NI-FBUS software In this manual, the term *NI-FBUS software* refers to either the NI-FBUS Communications Manager or NI-FBUS Configurator software.

PCMCIA-FBUS In this manual, the term *PCMCIA-FBUS* refers to both the single-port PCMCIA-FBUS card and the dual-port PCMCIA-FBUS/2 card, unless otherwise indicated.

Platform Text in this font denotes a specific platform and indicates that the text following it applies only to that platform.

Related Documentation

The following documents contain information that you might find helpful as you read this manual:

General Fieldbus Web sites:

- Fieldbus Foundation—Responsible for the definition of the Foundation Fieldbus specification. www.fieldbus.org
- Relcom, Inc.—Wiring and test equipment for Foundation Fieldbus. www.relcominc.com/fieldbus
- Fieldbus, Inc.—Device developers and Foundation Fieldbus consulting. www.fieldbusinc.com

Fieldbus system development documentation:

- Fieldbus Foundation resources
 - *Wiring and Installation 31.25 kbit/s, Voltage Mode, Wire Medium*
- Relcom Fieldbus resources online
 - *Wiring Design and Installation Guide*
 - Online Tutorial
 - FAQ
 - Sample Fieldbus Topologies
- *Fieldbus Standard for Use in Industrial Control Systems, Part 2, ISA-S50.02.1992*

Fieldbus device development documentation:

- *Developing Your First Foundation Fieldbus Device*, available from the Fieldbus, Inc. Web site at www.fieldbusinc.com
- *Foundation Specification: 31.25 kbit/s Physical Layer Profile* for the Foundation Fieldbus Physical Layer Specifications
- *Function Block Application Process, Part 1*

- *Function Block Application Process, Part 2*
- IEC Standard 1158-2 and ISA Standard ISA S50.02

Other related documentation:

- *PC Card Standard, Release 2.1*, Personal Computer Memory Card International Association (PCMCIA)

Introduction

This chapter lists what you need to get started and includes a brief description of the PCMCIA-FBUS card and the NI-FBUS software.

What You Need to Get Started

To install your NI-FBUS software, you need the following items:

- PCMCIA-FBUS card
- PCMCIA-FBUS cable
- Installation CD kit
- Windows 2000/NT/XP installed on your computer

Hardware Description

The PCMCIA-FBUS is a Type II PC card that handles communication between a PCMCIA-compatible computer and one or more network-configurable devices that comply with the Fieldbus Foundation H1 specification. The PCMCIA-FBUS uses the Intel 386EX embedded processor, shared memory, and an interrupt to communicate with its driver. The PCMCIA-FBUS supports the Fieldbus transfer rate of 31.25 kb/s.

The single-port PCMCIA Fieldbus card is called the *PCMCIA-FBUS* and the dual-port PCMCIA Fieldbus card is called the *PCMCIA-FBUS/2*. In this manual, the term *PCMCIA-FBUS* refers to both the single-port PCMCIA-FBUS card and the dual-port PCMCIA-FBUS/2 card, unless otherwise indicated.

Software Description

Your kit includes either the NI-FBUS Communications Manager software or the NI-FBUS Configurator software. Depending on the system you purchase, you may receive both disks. If this is the case, use the NI-FBUS Configurator software.

The NI-FBUS Communications manager software is used by the interface boards to communicate over the bus. Additionally, it provides a high-level API advanced users can use to interface with the National Instruments Foundation Fieldbus communication stack and hardware.

Most users use the NI-FBUS Configurator. In addition to providing the functionality of the NI-FBUS Communications Manager in a graphical format, it includes additional functionality to allow you to configure a Fieldbus network. It can automatically generate the schedule for the network and configure field devices and hosts to transmit and receive alarms and trends.

Choosing Configuration Software

Foundation Fieldbus links must be configured. Only with configuration software can you do things like set device addresses, clear devices, and download (necessary if you are setting up a system for the first time). Your configuration software must match the interface card your computer is using to connect to the bus. National Instruments offers the NI-FBUS Configurator with a National Instruments Foundation Fieldbus interface card to let you configure your Fieldbus links.

Interface cards and configuration software are sold separately because multiple interface cards can reside in the same computer. The NI-FBUS Configurator, by default, is licensed for use on one machine, with up to four Fieldbus links (segments). If you have more than four links (ports on the cards), you need to purchase a link upgrade for each link in excess of four. To do so, download the order form from ni.com/fieldbus.



Note The connection to one interface port on the interface card is viewed as one link by the NI-FBUS Configurator, regardless of how many links might actually be joined by repeaters. This is important for software licensing of the NI-FBUS Configurator.

If you only want to use the card to read and write values only (not configure) and you are a programmer, you can make calls to the API in the NI-FBUS Communications Manager and do not need the NI-FBUS Configurator. This is possible only if you have already used third-party hardware and configuration software to configure the link.

Table 1-1 describes the National Instruments Fieldbus software.

Table 1-1. National Instruments Fieldbus Software

| Software Application | Short Name | Description | File Name |
|---|---|--|--------------------|
| NI-FBUS Communications Manager | NIFB process | This must be running for you to use your PCMCIA-FBUS card as a Fieldbus interface to communicate between the card and the bus. | nifb.exe |
| NI-FBUS Interface Configuration Utility | Interface Config | Used to configure your PCMCIA-FBUS card. | fbconf.exe |
| NI-FBUS Configurator | NI-FBUS Configurator | Used to configure the devices on the bus, set the parameters for control loops, and other Fieldbus configuration tasks. | fcs.exe |
| NI-FBUS Dialog System | NI-FBUS Dialog | Used to view the devices on the bus and manually read and write parameter values. Not for configuration. | nifbdlg.exe |
| NI-FBUS Fieldbus Monitor | NI-FMON (also known as NI Fieldbus Monitor) | Functions as a bus monitor, letting you view all packets sent over the bus. Primarily used by developers to debug new devices. | ni-fmon.exe |
| Server Explorer | Server Explorer | Lets you configure the attributes of the communication resource, device, and items of your network, and the groups and items of your OPC server. | serverexplorer.exe |

Optional Fieldbus Network Tools

Your kit includes either the NI-FBUS Communications Manager software, the NI-FBUS Configurator software, or both. In addition, you can order the NI-FBUS Monitor, LabVIEW DSC, and/or Lookout from National Instruments. If you have not already done so, you also can order the NI-FBUS Configurator.

The NI-FBUS Monitor helps you monitor and debug Fieldbus data traffic. It is primarily used to debug the development of device and host applications. It symbolically decodes data packets from the Fieldbus, monitors the live list (devices currently on the bus), and performs statistical analysis of packets.



Note If you are using this interface as a bus monitor, the other interface (if this is a two-port card) cannot be used for NI-FBUS. This means that you must have another link master on the link—either another PCMCIA-FBUS card, or a device with link master capabilities. An interface card can either run NI-FBUS software or NI-FMON software at any given time. If the card has two ports, they both must have the same usage. This is because a different stack is downloaded to the card for it to be used in conjunction with NI-FMON. Your interface card must be running NI-FBUS to act as the Link Active Scheduler. This means that if your interface card is the only link master on the link, you cannot use that card for running NI-FMON (even if the card has two ports) since that would leave the link without a link master. In this situation, you would need to obtain either a link master field device or another link master interface card in order to use NI-FMON.

LabVIEW DSC helps you perform data acquisition and analysis, create a human-machine interface (HMI), or develop an advanced supervisory control application in a graphical development environment. LabVIEW DSC includes real-time process monitoring, historical trending, alarm and event reporting, online configuration, and PLC connectivity.

Lookout helps you create graphical representations on a computer screen of real-world devices such as switches, dial gauges, chart recorders, pushbuttons, knobs, sliders, and meters. After linking these images to your field instruments, you can configure Lookout to generate alarms, log data to disk, animate custom graphics, print reports, automatically adjust setpoints, historically trend information, warn operators of malfunctions, and so on.

Installation and Configuration

These installation and configuration instructions are for Windows 2000/NT. If you are using the Windows XP operating system, refer to the *Installation Guide: Foundation Fieldbus Hardware and NI-FBUS Software for Windows 2000/XP*.

Installing the Software

Complete the following steps to install your NI-FBUS software.



Caution If you are reinstalling the NI-FBUS software over an existing version, write down your card configuration and any port configuration parameters you changed from their defaults. Reinstalling may cause you to lose any existing card and port configuration information.

1. Log in as `Administrator` or as a user that has Administrator privileges.
2. Insert installation disk 1 or your NI-FBUS program CD.
3. Select **Start»Run**.
4. In the **Run** dialog box, type the following:

`x:\setup`

where `x` is the letter of the drive containing the disk (usually `a` or `b`).

The interactive setup program takes you through the necessary steps to install the software.

The installation program copies `nifb.dll` and `drvintf.dll` into your `\System32` directory, and it copies the `nifb.sys` driver into the `\drivers` directory. The installation program also adds information to the Windows Registry.

Continue to the *Installing the Hardware* section to configure and install your card.

Installing the Hardware



Caution Before you remove the card from the package, touch the antistatic plastic package to a metal part of your system chassis to discharge electrostatic energy, which can damage several components on your PCMCIA-FBUS card.

To install the PCMCIA-FBUS card, complete the following steps:

1. Shut down your operating system and power off your computer.
2. Insert the card into a free PC Card (PCMCIA) socket. The card has no jumpers or switches to set. Figure 2-1 shows how to insert the PCMCIA-FBUS and how to connect the PCMCIA-FBUS cable and connector to the PCMCIA-FBUS card. However, the PCMCIA-FBUS/2 card has two connectors. Refer to Appendix B, [Pinout Information](#), for more information about these two connectors.

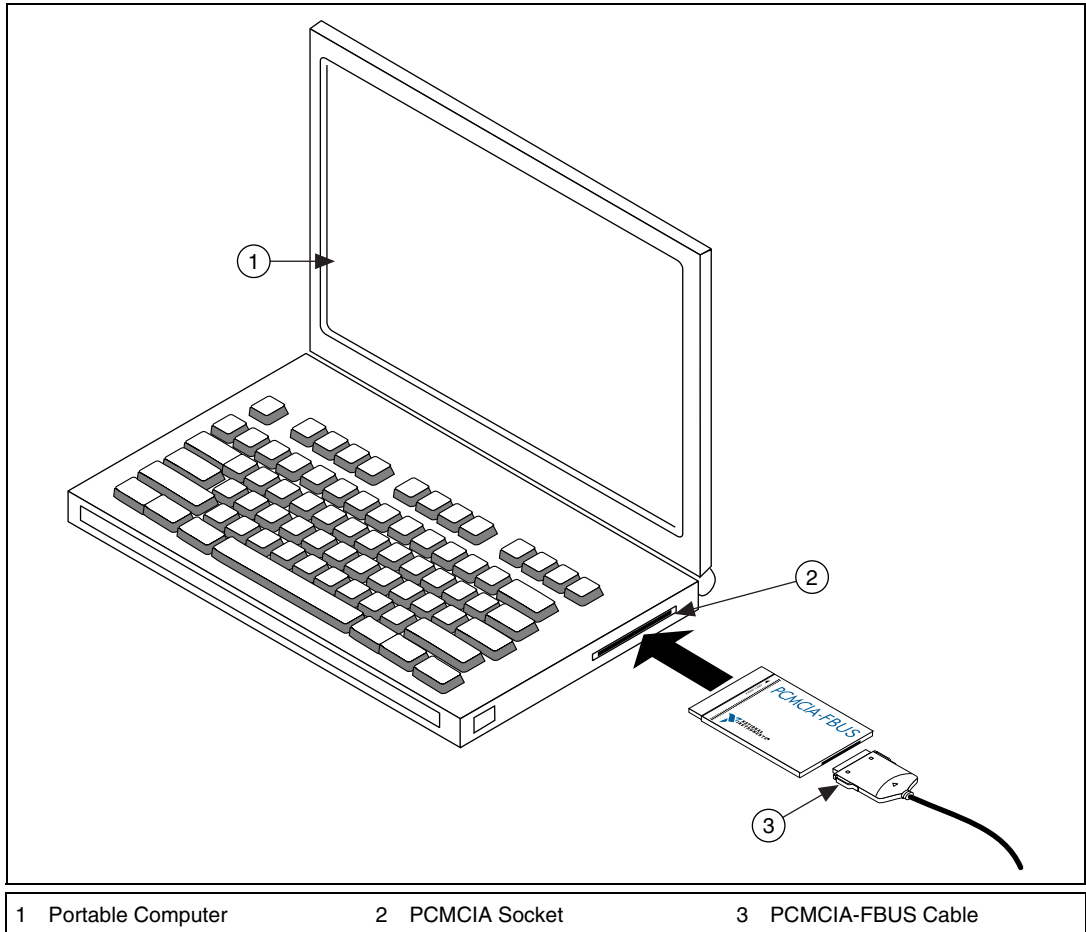


Figure 2-1. Inserting the PCMCIA-FBUS

3. Connect the PCMCIA-FBUS to the Fieldbus network.
Your kit contains one PCMCIA-FBUS cable. Refer to Appendix B, *Pinout Information*, if you need to make a longer cable than the PCMCIA-FBUS cable provided.
4. Power on your computer.

Setting the Base Address and IRQ



Note You can connect only one NI-FBUS port to a link or Fieldbus.

Complete the following steps to use the NI-FBUS Interface Configuration utility to add, view, or change your base address or IRQ settings.

1. Start the NI-FBUS Interface Configuration utility by selecting **Start» Programs» National Instruments FBUS» Interface Config**.
2. In the **Interface Config** window, select the icon of the card you want to change and click the **Edit** button. If you are adding a card, click the **Add Interface Device** button.
3. Choose **PCMCIA** as the **Bus Type**. The NI-FBUS Interface Configuration utility displays the default base address and IRQ line.
4. Change the default base memory address and interrupt request settings if they do not match the settings on your card.

If you have configured your PCMCIA-FBUS card not to use interrupts, select **No Interrupt** from the **IRQ** drop-down list, and select the **Polled Mode** checkbox.

5. Select the number of ports that matches your PCMCIA-FBUS. For example, select two ports for the PCMCIA-FBUS/2.
6. After verifying the information you just entered, click the **OK** button or the **Add** button. The dialog box for entering port information for the Fieldbus interface opens.
7. Click the **OK** button.

Proceed to the [Setting the Communication Parameters and Interface Name](#) section.

Setting the Communication Parameters and Interface Name

Complete the following steps to use the NI-FBUS Interface Configuration utility to set the Fieldbus communication parameters and interface name.

1. Start the NI-FBUS Interface Configuration utility by selecting **Start»Programs»National Instruments FBUS»Interface Config**.
2. Select the port you want to edit, and click the **Edit** button.
The NI-FBUS Interface Configuration utility displays the default interface name and some configuration information.
3. Enter an interface name for the port, or use the default name.
The interface name is for local use on the PC.
4. Enter a unique tag in the **Device Tag** field, or use the default device tag. The device tag is the name visible on the Fieldbus to the other devices.
5. Your interface must be given either a fixed or visitor device address for you to start using NI-FBUS. This address must be unique on the link to which the interface is connected.
 - a. To assign a fixed address to your Fieldbus interface, choose **Fixed Address** and enter a value in the range 0x10 to 0xF7.
By convention, the lower addresses starting at 0x10 are usually used for interface boards and link masters. Upper addresses, starting at 0xF7 and working down, are generally used for other devices. Using a lower address for your interface will reduce the likelihood that the interface will conflict with another device on the bus.
 - b. If you want your interface to be a temporary device that you do not intend to connect to the Fieldbus for an extended time, choose **Visitor Address**. Over a long period of time, using a visitor address could break VCR endpoints and cause `VCR_FULL_ERROR` errors.
 - c. If you want third-party Fieldbus configuration software to assign an address to your interface over the Fieldbus, choose **Default Address**. You should only choose to use a default address when you want third-party configuration software to assign a permanent address. A device at a default address cannot be communicated with until a permanent address has been assigned by the configuration software.
6. Select a Device Type. You should choose to use **Link Master Device**.

7. Make sure that **NI-FBUS** is selected for **Usage**, unless you will be using the board in conjunction with the NI-FMON software.

If you are using this interface as a bus monitor, the other interface (if this is a two-port board) cannot be used for NI-FBUS. This means that you must have another link master on the link—either another AT-FBUS board or a device with link master capabilities. Refer to the *Optional Fieldbus Network Tools* section of Chapter 1, *Introduction*, for more information.

NI-FBUS assigns default values for other network communication parameters.



Caution Do *not* modify the **Advanced** parameters without good reason. If you must modify parameters for certain devices, the device manufacturer will recommend settings. Modifying these parameters can have an adverse affect on data throughput rates. If settings are incorrectly modified, some devices might disappear off the bus.

8. Click **OK**, and then click **OK** again to exit the configuration utility.
9. Restart the NIFB process to make the changes you made in the NI-FBUS Interface Configuration utility take effect.
10. **(Windows NT)** If you change or delete the interface configuration, you must stop and restart the `nifb.sys` driver so that the new configuration will take effect. You can start or stop the driver by selecting **Start»Settings»Control Panel»Devices»Nifb** and clicking the **Stop/Start** button.
11. Replace the top cover on your computer, if you have not done so already.

Testing the Installation

(Windows 2000) Start the NIFB process by selecting **Start»Programs»National Instruments»NI-FBUS»Nifb**.

(Windows NT) To make sure that your NI-FBUS software is installed correctly and is working properly, complete the following steps:

1. After you configure your installation, restart Windows NT. You must restart your computer before you can use the NI-FBUS software.
2. Start the kernel-mode device driver NIFB by selecting **Start»Settings»Control Panel»Devices»Nifb** and clicking the **Start** button.

You also can start NIFB by entering the following command at the command prompt:

```
net start nifb
```



Tip You can have the device driver start automatically when your computer boots. Refer to Chapter 3, *Starting the NIFB Process*, for instructions.

3. Start the NIFB process selecting **Start»Programs»National Instruments FBUS»NIFB**.

If NI-FBUS does not start up successfully, the base memory address, IRQ line, or Fieldbus network address is incorrect. If the NIFB process does not start up successfully, refer to Appendix C, *Troubleshooting and Common Questions*.

Changing the Resources to Eliminate Conflicts



Note If you do not suspect you have resource conflicts, proceed to Chapter 3, *Starting the NIFB Process*.

If you discovered resource conflicts when testing the installation, you need to change your base address or IRQ settings.

(Windows 2000) You do not normally need to modify the resources that Windows 2000 assigns to your PCMCIA-FBUS.

To change resources to eliminate conflicts in Windows 2000, complete the following steps:

1. Select **Start»Settings»Control Panel** and double-click the **System** icon.
2. Click the **Hardware** tab, then click the **Device Manager** button.

3. Locate your card under the heading **National Instruments Fieldbus Interfaces**.
4. Click the name of the card, then click the **Properties** button.
5. Use the **Resources** tab to view or edit the resources assigned to the card.

(Windows NT) Windows NT usually assigns conflict-free resources automatically. To view assigned resources in Windows NT, complete the following steps:

1. Select **Start»Programs»Administrative Tools (Common)»Windows NT Diagnostics**, and select the **Resources** tab.
2. Click the **Devices** button.
3. Double-click **nifb**.
4. Make sure the settings shown match the settings configured on your card.
5. Click **OK** twice.

Changing or Deleting Existing Interface Information

To change or delete information about any interface that you have already entered, complete the following steps:

1. Select **Start»Programs»National Instruments FBUS»Interface Config**.
2. Click the **Board x** icon, where x refers to the board number of the interface you want to change or delete.
3. Click the **Edit** button. You can edit the interface configuration information that you entered earlier, or click **Delete** to delete this interface entirely.

Interfaces are numbered beginning with zero. If you delete an interface, the NI-FBUS Interface Configuration utility renumbers all the remaining interfaces. For example, if you delete **Board0**, it appears that you deleted the last interface, because all the remaining interface numbers are decreased by one automatically.

Table 2-1. Board Renumbering

| Original Address | Address after Deleting Board1 |
|------------------|-------------------------------|
| Board0 | Board0 |
| Board1 | (deleted) |
| Board2 | Board1 |
| Board3 | Board2 |

Run the NI-FBUS Interface Configuration utility once to make sure the interface has been removed.

To reinstall the interface, refer to the installation and configuration instructions earlier in this chapter.

Importing Device Descriptions

The device description files contain information about the types of blocks and parameters supported by your Fieldbus device, along with online help describing the uses of given parameters. If your Fieldbus device uses manufacturer-specific device description files, you must import the device description files shipped with the device or available from the device manufacturer. To do so, complete the following steps:

1. Insert the device description disk or CD, if supplied by your Fieldbus device manufacturer, into the disk drive of the host computer.
2. Select **Start»Programs»National Instruments FBUS»Interface Config** to run the Interface Configuration utility.
3. Click the **DD Info** button. The **DD Info** dialog box opens.
4. If the base directory field is blank, enter a base directory. The base directory you enter here will be where NI-FBUS looks for all device descriptions. Do not change the base directory after you have started importing device descriptions. Otherwise, NI-FBUS will not be able to find the device descriptions you previously imported. Your device description files will automatically be placed in the appropriate manufacturer ID subdirectory under this base directory.

Your base directory will include one folder for each different manufacturer for which you have imported device description. For example, if you import the device description for the National Instruments FP-3000 device, you will find a folder called 4e4943. This is the National Instruments Foundation Fieldbus device manufacturer ID number.

The next layer of folders is the device type. For example, the FP-3000 has a device type ID number of 4005.

Underneath this layer of directories you will find the individual device description files (.ffo and .sym).

5. If necessary, click the **Browse** button to select the standard text dictionary, provided with NI-FBUS. The text dictionary has a .dct extension.
6. Click the **Import DD** button. The Import DD dialog box opens.
7. Click the **Browse** button, browse to the .ffo device description file path, and click **Open**. Typically, the device description for your Fieldbus device is supplied on a disk from the manufacturer. For each device, there are two device description files, one that ends in .ffo and one that ends in .sym. Select the .ffo file, and the corresponding .sym file will be imported automatically. The file name will be in the form *Digit Digit Digit Digit.ffo* (for example, 0101.ffo).



Note If you are importing device descriptions for multiple devices, you might see that they can have the same filenames. Each file contains information about the device and its manufacturer, and will be placed appropriately in the hierarchy under the base directory.

8. Click **OK**. A window that gives the full path to which the .ffo and .sym files were copied opens.
9. Click on **OK**.

For more information on device descriptions, refer to the *The Role of Device Descriptions* section of the *Foundation Fieldbus Overview* document.

Starting the NIFB Process

The NIFB process must be running any time you want to use your PCMCIA-FBUS card as a Fieldbus interface to communicate between **the card and the bus.**

(Windows 2000) Start the NIFB process by selecting **Start»Programs»National Instruments»NI-FBUS»Nifb.**

(Windows NT) If the NIFB kernel-mode driver has not already been started, you must do so manually by completing the following steps:

1. Start the kernel mode driver NIFB by selecting **Start»Settings»Control Panel»Devices»Nifb** and clicking the **Start** button.
2. Start the NIFB process by selecting **Start»Programs»National Instruments NIFB»Nifb.**



Note You also can start the driver by entering `net start nifb` at the command prompt.

If you receive the message **System error 31 has occurred**, the cause is most likely an interrupt or memory address conflict. Set the device to poll mode or change the memory address value.

Configuring NIFB to Load at System Startup

If the driver and the process start up successfully, you can configure the kernel-mode driver (Windows NT only) and NIFB process to start automatically when you boot or restart your computer.



Note To do this on a Windows NT machine, you must be running Windows NT 4.0 or later.

(Windows NT) Select **Start»Settings»Control Panel»Devices»Nifb**. Click the **StartUp** button. Select **Automatic**.



Note In Windows 2000, the WDM driver and the process start up automatically.

Beginning to Use Your NI-FBUS Software

If you are using the NI-FBUS Communications Manager, refer to the *NI-FBUS Communication Manager User Manual* for information on using your software. If you are using the NI-FBUS Configurator, refer to the *NI-FBUS Configurator User Manual* for information on using your software.

If NI-FBUS is unable to connect to and initialize an interface device and you decide to continue NI-FBUS startup, NI-FBUS will not try to reconnect to that interface again. This is true of all interface types supported by this software.

If a PCMCIA-FBUS interface is configured as a basic device, a link master device must be present on this link before NI-FBUS will start up.

Specifications

This appendix describes the electrical, physical, and environmental characteristics of the PCMCIA-FBUS hardware and the recommended operating conditions.

Power Requirement

+5 VDC ($\pm 5\%$)

PCMCIA-FBUS 350 mA typical; active

PCMCIA-FBUS/2 350 mA typical; active

Physical

Dimensions..... 8.56 cm \times 5.40 cm \times 0.5 cm
(3.4 in. \times 2.1 in. \times 0.2 in.)

I/O connector..... PCMCIA-FBUS cable with 9-pin
male D-Sub and pluggable screw
terminal for each port

Operating Environment

Indoor use only

Ambient temperature..... 0 to 55 °C

Relative humidity..... 10 to 90%, noncondensing
(tested in accordance with
IEC-60068-2-1, IEC-60068-2-2,
EC-60068-2-56)

Altitude..... 2,000 m

Pollution Degree 2

Storage Environment

| | |
|---------------------------|--|
| Ambient temperature | -20 to 70 °C |
| Relative humidity | 5 to 95%, noncondensing (tested in accordance with IEC-60068-2-1, IEC-60068-2-2, EC-60068-2-56) |

Safety

This product is designed to meet the requirements of the following standards of safety for information technology equipment:

- IEC 60950, EN 60950
- UL 1950, UL 60950
- CAN/CSA C22.2 No. 60950



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

Electromagnetic Compatibility

| | |
|-----------------|--|
| Emissions | EN 55011 Class A at 10 m FCC Part 15A above 1 GHz |
| Immunity | EN 61326:1997 + A2:2001, Table 1 |
| EMC/EMI | CE, C-Tick, and FCC Part 15 (Class A) compliant |



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

CE Compliance

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

| | |
|--|------------|
| Low-Voltage Directive (safety) | 73/23/EEC |
| Electromagnetic Compatibility Directive (EMC) | 89/336/EEC |



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

Pinout Information

This appendix contains information about the pinout of the Fieldbus connectors.

One PCMCIA-FBUS cable is included in your kit. The following figures show the pinout of the Fieldbus connectors so you can make your own cable if you need a longer cable than the PCMCIA-FBUS cable in your kit.

Figure B-1 shows the PCMCIA-FBUS cable. An arrow on the cable points to pin 1 of the screw terminal block.

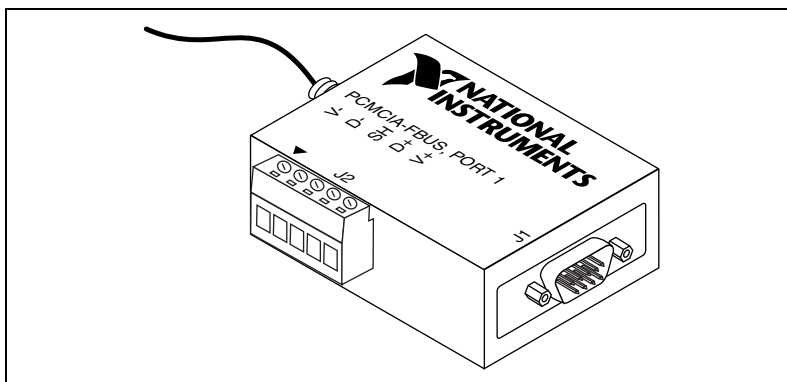


Figure B-1. PCMCIA-FBUS Cable

The PCMCIA-FBUS/2 cable has two Fieldbus connectors that are similar to the one shown in Figure B-1. The connector labeled **PCMCIA-FBUS, PORT 1** is the connector for Fieldbus port 1 and the connector labeled **PCMCIA-FBUS, PORT 2** is the connector for Fieldbus port 2. Refer to Figure B-2 and Figure B-3 for the pinout of both connectors.

Figure B-2 shows J1, the Fieldbus connector pinout.

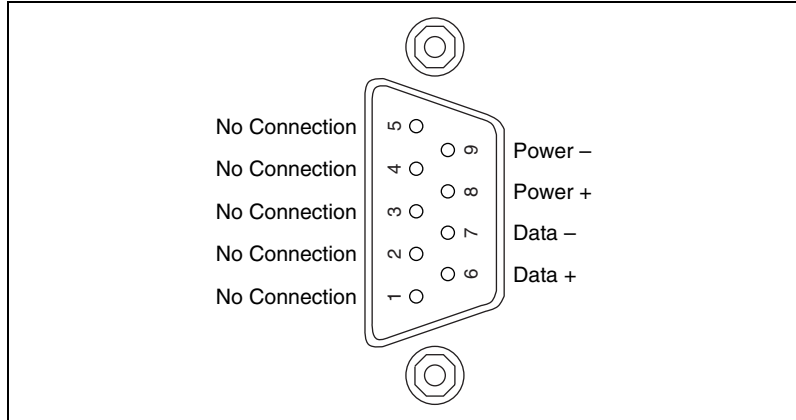


Figure B-2. Fieldbus Connector Pinout

Figure B-3 shows J2, the screw terminal block pinout.

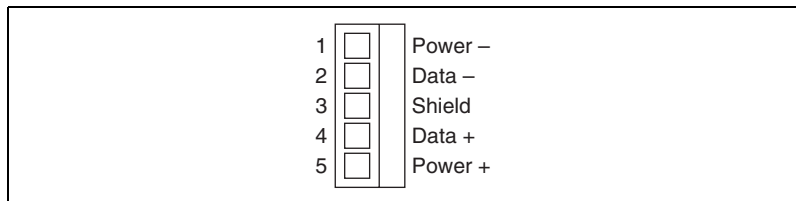


Figure B-3. Screw Terminal Block Pinout

The pinout of the PCMCIA-FBUS uses pins 6 and 7 of the J1 connector for the Fieldbus signals, as specified in the *Fieldbus Standard for Use in Industrial Control Systems, Part 2, ISA-S50.02.1992*. Pins 2 and 4 of the J2 screw terminal block provide an alternate connection to the Fieldbus. However, the screw terminal block is not a second, independent link.

All of the signals on the screw terminal block provide a direct connection to the 9-pin DSUB. National Instruments provides the Power+ and Power- connections as passive connections from the DSUB to the screw terminal. The PCMCIA-FBUS itself does not supply power to, or draw power from, these pins.



Troubleshooting and Common Questions

This appendix describes how to troubleshoot common problems that occur while getting started with Fieldbus.

Error Messages

Unable to download stack to board X.

You might have a memory base address conflict. Try configuring your card to use a different base address, as described in Chapter 2, *Installation and Configuration*.

Utility could not access or locate the registry.

- If using Windows 2000/NT, make sure you are logged in to Windows 2000/NT with administrator privileges.
- Your registry entries for NI-FBUS may have been deleted or corrupted. Uninstall, then reinstall the NI-FBUS software as described in the *Installing the Software* section of Chapter 2, *Installation and Configuration*.

NIFB could not locate any usable Fieldbus boards.

Stop the card, remove it, then reinsert it.

Board cannot be found.

1. Verify the base address and IRQ settings as described in the *Setting the Base Address and IRQ* section of Chapter 2, *Installation and Configuration*.
2. Select **Start»Programs»National Instruments FBUS»Interface Config**. Make sure your card appears under the list of interfaces.
3. Make sure the kernel-mode driver is started. To start the driver, select **Start»Settings»Control Panel»Devices»Nifb**. Click the **Start** button. To avoid manual startup in the future, click **Startup** and select **Automatic**.

VCR_FULL_ERROR

Delete the card from the Interface Configuration utility, then reinstall.

NIFB Problems

When using the PCMCIA-FBUS card with Windows 2000/NT, Nifb returns an error message stating that the board cannot be found.

- Verify the base address and IRQ settings as described in the *Setting the Base Address and IRQ* section of Chapter 2, *Installation and Configuration*.
- Select **Start»Programs»National Instruments FBUS»Interface Config**. Make sure your card appears under the list of interfaces.
- Make sure the kernel-mode driver is started. To start the driver, select **Start»Settings»Control Panel»Devices»Nifb**. Click the **Start** button. To avoid manual startup in the future, click **Startup** and select **Automatic**.

When a Fieldbus device is connected to the bus, the NIFB process often hangs when the title bar reads `Waiting for Startup Completion`. If I disconnect the cables, it starts fine.

This is probably due to a device address conflict. In the NI-FBUS Interface Configuration utility, make sure that the interface is not at the same address as anything else on the link. You also can temporarily give the interface a visitor address to troubleshoot this problem.

The NIFB process hangs, does not start up, or never shows that it is running.

- The card's base memory address conflicts with another device. Try using a different base memory address. Windows does not always detect all conflicts. Even if Windows reports no conflicts, trying a different address after you have eliminated the IRQ or Fieldbus network address often will resolve the problem. You must restart the machine each time you change base address and/or IRQ.
- The card's IRQ conflicts with another device. Try setting the card to polled mode.
- The Fieldbus network address is not unique. Remove the cable from the card. Restart the NIFB process. If it runs successfully, there is probably a Fieldbus network address conflict. If you have FP-3000 network modules on the bank, powering them off and then back on will cause them to look on the bus for available addresses and change

addresses if necessary. If this does not solve the problem, you can try to change the card's address. In the Interface Configuration utility, select the port and click **Edit**. Make sure that the port does not have an address that conflicts with another device on the bus. You also can set the interface to a visitor address. In this case, the card will find and take an unused address. If this corrects the problem, find and change the address of one of the conflicting devices. Return the card to a fixed address.

- Check for multiple copies of `ni fb.dll` on the machine. If multiple copies are found, NI-FBUS was incorrectly reinstalled. Uninstall NI-FBUS, search for any remaining copies of `ni fb.dll`, delete them, then reinstall the software.
- You can check the Windows Device Manager to see if Windows has detected any problems or conflicts in the resources assigned to your card. Your card(s) will appear under the **Fieldbus Adapters** category. The Device Manager displays an exclamation mark (!) on the icon of any card that has resource conflicts.
- Check how many cards are showing up in the Interface Configuration utility. Make sure that this matches the number of cards in the system. Also check that the number of ports match the physical hardware (one port versus two port cards).
- Link masters do not always get along together if you have another link master on the link. Try setting the card to be a basic device in the Interface Configuration utility.

If a PCMCIA-FBUS interface is configured as a basic device, another link master device must be present on this link before the NI-FBUS process will start up. For more information about Basic and Link Master devices, refer to the *Fieldbus Overview* document.

Interface Configuration Problems

When using the NI-FBUS Interface Configuration utility on a Windows 2000/NT machine, the error message utility could not access or locate the registry appears.

- Make sure you are logged in to Windows 2000/NT with Administrator privileges.
- Your registry entries for NI-FBUS may have been deleted or corrupted. Uninstall, then reinstall the NI-FBUS software as described in the *Installing the Software* section of Chapter 2, *Installation and Configuration*.

- For PCMCIA-FBUS cards, removing third-party card manager software also has been known to correct such problems.
- There is a thermal issue seen with the PCMCIA card in some laptops with insufficient ventilation. Some laptops even place the PCMCIA slots over the hard disk or power supply. National Instruments PCMCIA-FUBS cards are within the PCMCIA specification for current draw. However, if the laptop builds up heat, this may become a problem.

In the Interface Configuration Utility, I see more boards than what physically exist in the machine.

Select **Edit** for the extra card. In the next window, select **Delete**.



Caution Do *not* attempt to make unguided changes in the Windows registry. Doing so can cause many problems with your system.

Add New Hardware Problems

In Add New Hardware on Windows 2000/NT, there is no category for Fieldbus.

The category **Fieldbus Adapters** will not appear under the type of hardware listing in **Add New Hardware** unless you restart the computer twice after installing the software. After you install your first card, it will always show up. If the **Fieldbus Adapters** category does not appear, you still can follow the instructions in the [Setting the Base Address and IRQ](#) section of Chapter 2, [Installation and Configuration](#).

Resolving Resource Conflicts

Assign Each Card a Unique Base Address

In Windows NT, the base address for PCMCIA adapters is assigned based on the board ID, which is identical for all PCMCIA cards from a given manufacturer. To fix this problem, either use only one PCMCIA controller, or use Windows 2000.

Use a Different Memory Address

The Device Manager in Windows 2000 (NT Diagnostics in Windows NT) does not report all resource conflicts. If you are having problems with your current resource settings, try different ones. Memory base address 0x0D4000 is free on many systems.

Put the Card in Polled Mode

Putting the card in polled mode is a good way to eliminate one variable. Use the Interface Configuration utility to put the card in polled mode by completing the following steps:

1. Select **Start»Programs»National Instruments FBUS»Interface Config**.
2. In the **Interface Config** window, select the icon of the card you want to change and click the **Edit** button. If you are adding a card, click the **Add Interface Device** button.
3. Select the **Polled Mode** checkbox.
4. Note the memory base address your card is using. Select a different Basic Configuration that does not include an IRQ. This is the polled mode option. Then, change the memory base address back to its original setting.

Use a Visitor Address

Using a visitor address is a good way to troubleshoot an address conflict since the card will find and take an available address.

Problems Using Manufacturer-Defined Features

NI-FBUS uses identifying information in the actual device to locate the device description for the device. The identifying information includes four resource block parameters: `MANUFAC_ID`, `DEV_TYPE`, `DEV_REV`, and `DD_REV`. If the identifying information is incorrect, NI-FBUS will not be able to locate the device description for the device. When it has located the device description, NI-FBUS matches the block types in the device description with the actual blocks in the device by using the Item ID of the block characteristics record.

If the blocks in the device do not match the blocks in the description, or if there is no appropriate device description for the manufacturer, device type, device revision, and device description revision being returned by the device, then there is a device description mismatch. In either case,

NI-FBUS uses only the standard dictionary (`nifb.dct`) and you will be unable to use any manufacturer-supplied functionality.

These parameters can be read from the device resource block. The following procedure will help you troubleshoot a `DD_SIZE_MISMATCH_ERROR` by finding out if there is a device description available on your computer that matches what your device expects.

Complete the following steps to use the NI-FBUS Dialog utility to check device description files:

1. Start the NIFB process. Wait until the process has finished initializing.
2. Select **Start»Programs»National Instruments FBUS»NI-FBUS Dialog**.
3. Right-click **Open Descriptors** and choose **Expand All**.
4. After the expansion is complete, click **Cancel** to close the **Expand All** window.
5. Right-click the resource block for your device by selecting **Read Object** from **Open Descriptors»Session»Interface Name»Device Name»VFD Name»Resource Block Name**.
6. Select the **Read by Name** radio button and enter `MANUFAC_ID` as the name. Click the **Read** button. Write down the hexadecimal number found in parenthesis (0xnumber) in Table C-1.
7. Repeat step 6 for the name `DEV_TYPE`.
8. Repeat step 6 for the name `DEV_REV`.
9. Repeat step 6 for the name `DD_REV`.
10. Repeat steps 5 through 9 for each device, then close the NI-FBUS Dialog utility.

Table C-1. Device Names

| Resource Block Parameter | Name |
|---------------------------------|-------------|
| MANUFAC_ID | |
| DEV_TYPE | |
| DEV_REV | |
| DD_REV | |

11. In the Interface Configuration utility, click the **DD Info** button. Write down the base directory specified for device descriptions. Close the Interface Configuration utility.
12. Use Windows Explorer to view the contents of the base directory specified in the Interface Configuration utility. The Fieldbus specification defines the directory hierarchy for storing device descriptions. There is a different subdirectory for each device manufacturer. Under the base directory, you should see a directory with the number from step 6 for the first device.
13. Under the appropriate manufacturer directory, there is a directory for each device type that you have from that manufacturer. Make sure that you see a directory with the number from step 7.
14. Under the appropriate device type directory, there are the individual device descriptions. The device description file name is a combination of the device revision (the number from step 8) and the device description revision (the number from step 9). The device revision is the first two digits, and the device description revision is the second two digits. For example, if your number from step 8 was 2 and from step 9 was 1, you should see files called `0201.ffo` and `0201.sym`. Device descriptions are backwards compatible. This means that instead of seeing 0201, you might see 0202. This is allowed by the Fieldbus specification. Also, having additional files in this directory is not a problem. The Configurator will use the most recent device description revision for a given device revision. If you do not have the appropriate `.ffo` and `.sym` files, you must obtain them from the device manufacturer. Be sure to import them properly by clicking **DD Info** and using the **Import DD** button in the Interface Configuration utility.
15. Repeat steps 12 through 14 for each device.

The second cause for this problem is when the contents of the file do not accurately describe the device characteristics, even if the device identification information matches the file identification information. This problem is caused when a device manufacturer makes a change to the firmware of the device without incrementing the device revision, in violation of the Foundation Fieldbus recommendation. If this is the case, you must contact your device manufacturer for a resolution.

Configuring Advanced Parameters



Caution Do *not* modify the **Advanced** parameters without good reason. If you must modify parameters for certain devices, the device manufacturer will recommend settings. Modifying these parameters can have an adverse affect on data throughput rates. If settings are incorrectly modified, some devices might disappear from the bus.

In the NI-FBUS Interface Configuration utility, click the **Advanced** button on the dialog box for the port you want to configure. Figure C-1 shows the **Advanced Stack Configuration** dialog box.

| Dlme Link Master Info | |
|-----------------------------------|------|
| Max Scheduling Overhead | 4 |
| Def Min Token Deleg | 84 |
| Def Token Hold Time | 700 |
| Target Token Rot Time | 4096 |
| Link Maint Tok Hold Time | 0x0 |
| Time Distribution Period | 5000 |
| Max Inactivity To claim Las Delay | 100 |
| Las DB Spdu Distri Period | 200 |

| System Management Info | |
|------------------------|----------|
| Primary Time Master | 0x1a |
| T1 | 0x75300 |
| T2 | 0x2bf200 |
| T3 | 0x15f900 |
| Clock Sync Interval | 10 |

Device ID: NIC_AT-FBUS/2_A5308D_0

| Configured Link Settings | |
|--------------------------|------|
| Slot Time | 8 |
| Dl pdu Phl Overhead | 0 |
| Max Response Delay | 10 |
| First Unpolled Node | 0x25 |
| This Link | 0 |
| Min Inter-Pdu Delay | 16 |
| Num of Unpolled Node | 0xba |
| Preamble Extension | 0 |
| Post Trans Gap | 0 |
| Max Inter Chan Signal | 0 |
| Time Sync Class | 1 ms |

Figure C-1. Advanced Stack Configuration Dialog Box

The parameters involved in setting addresses are T1 and T3. These parameters represent delay time values that your card uses to compensate for the delays inherent in the device and in the set address protocol itself. T1 describes the expected response delay of the device at a given address. T3 describes the expected time for the device to respond at its new address.

Uninstalling the Software

To uninstall your NI-FBUS software, select **Start»Settings»Control Panel»Add/Remove Programs**.

If you are only using the Communications Manager, select **NI-FBUS Communications Manager** to uninstall. If you are using the NI-FBUS Configurator, select **NI-FBUS Configurator**.

The uninstall utility does not remove the NI-FBUS directory itself or any files in the \Data\Nvm directory. To completely uninstall the software, manually remove the files in the \Data\Nvm directory and the NI-FBUS directory structure.

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 and Certification**—Visit ni.com/training for self-paced training, eLearning virtual classrooms, interactive CDs, and Certification program information. 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.

Glossary

| Symbol | Prefix | Value |
|--------|--------|-----------|
| m | milli | 10^{-3} |
| k | kilo | 10^3 |

Numbers

4-20 mA system

Traditional control system in which a computer or control unit provides control for a network of devices controlled by 4-20 mA signals.

A

Address

Character code that identifies a specific location (or series of locations) in memory.

Alarm

A notification the NI-FBUS Communications Manager software sends when it detects that a block leaves or returns to a particular state.

API

Application Programmer Interface.

Attribute

Properties of parameters.

B

b

Bits.

Bank

The combination of one FieldPoint network module and one or more terminal bases and I/O modules.

Basic device

A device that can communicate on the Fieldbus, but cannot become the LAS.

Block A logical software unit that makes up one named copy of a block and the associated parameters its block type specifies. The values of the parameters persist from one invocation of the block to the next. It can be a resource block, transducer block, or function block residing within a virtual field device.

Bus The group of conductors that interconnect individual circuitry in a computer. Typically, a bus is the expansion vehicle to which I/O or other devices are connected. Examples of PC busses are the ISA and PCI buses.

C

C Celsius.

Cable A number of wires and shield in a single sheath.

Communication stack Performs the services required to interface the user application to the physical layer.

Control loop A set of connections between blocks used to perform a control algorithm.

Control strategy See [Function Block Application](#).

Controller An intelligent device (usually involving a CPU) that is capable of controlling other devices.

D

DD See Device Description.

Descriptor A number returned to the application by the NI-FBUS Communications Manager, used to specify a target for future NI-FBUS calls.

Device A sensor, actuator, or control equipment attached to the Fieldbus.

Device address A memory address that you use to access a device in a computer system.

Device Description A machine-readable description of all the blocks and block parameters of a device.

Device tag A name you assign to a Fieldbus device.

| | |
|----------------------|--|
| Directory | A structure for organizing files into convenient groups. A directory is like an address showing where files are located. A directory can contain files or subdirectories of files. |
| DLL | <i>See</i> Dynamic Link Library. |
| Driver | Device driver software installed within the operating system. |
| Dynamic Link Library | A library of functions and subroutines that links to an application at run time. |

E

| | |
|-------|---|
| EMI | Electromagnetic interference. |
| Event | An occurrence on a device that causes a Fieldbus entity to send the Fieldbus event message. |

F

| | |
|-----------------------------------|---|
| Field device | A Fieldbus device connected directly to a Fieldbus. |
| Fieldbus | An all-digital, two-way communication system that connects control systems to instrumentation. A process control local area network defined by ISA standard S50.02. |
| Fieldbus cable | Shielded, twisted pair cable made specifically for Fieldbus that has characteristics important for good signal transmission and are within the requirements of the Fieldbus standard. |
| Fieldbus Foundation | An organization that developed a Fieldbus network specifically based upon the work and principles of the ISA/IEC standards committees. |
| Fieldbus Messaging Specification | The layer of the communication stack that defines a model for applications to interact over the Fieldbus. The services FMS provides allow you to read and write information about the OD, read and write the data variables described in the OD, and perform other activities such as uploading/downloading data and invoking programs inside a device. |
| Fieldbus Network Address | Location of a board or device on the Fieldbus; the Fieldbus node address. |
| FMS | <i>See</i> Fieldbus Messaging Specification. |
| Foundation Fieldbus specification | The communications network specification that the Fieldbus Foundation created. |

| | |
|----------------------------|--|
| FP-3000 | National Instruments network interface module for the FieldPoint I/O system. |
| Function block | A named block consisting of one or more input, output, and contained parameters. The block performs some control function as its algorithm. Function blocks are the core components you control a system with. The Fieldbus Foundation defines standard sets of function blocks. There are ten function blocks for the most basic control and I/O functions. Manufacturers can define their own function blocks. |
| Function Block Application | The block diagram that represents your control strategy. |

H

| | |
|-----|---|
| H1 | The 31.25 kbit/second type of Fieldbus. |
| hex | Hexadecimal. A base-16 numbering system which uses 0–9 and A–F. |
| HMI | Human-Machine Interface. A graphical user interface for the process with supervisory control and data acquisition capability. |
| Hz | Hertz. |

I

| | |
|-----|---|
| I/O | Input/output. |
| IEC | International Electrotechnical Commission. A technical standards committee which is at the same level as the ISO. |
| in. | Inches. |
| IRQ | Interrupt request. |
| ISA | Industry Standard Architecture. |

K

| | |
|-------------|--|
| Kb | Kilobytes. |
| Kbits | Kilobits. |
| Kernel | The set of programs in an operating system that implements basic system functions. |
| Kernel mode | The mode in which device drivers run on Windows NT. |

L

| | |
|-----------------------|---|
| LabVIEW DSC | The LabVIEW Datalogging and Supervisory Control (DSC) Module builds on the power of LabVIEW for high channel count and distributed applications. It adds easy networking, channel and I/O management, alarm and event management, historical datalogging, real-time trending, and OPC integration to the LabVIEW environment. |
| LAS | <i>See</i> Link Active Scheduler. |
| Link | A Foundation Fieldbus network is made up of devices connected by a serial bus. This serial bus is called a link (also known as a segment). |
| Link Active Schedule | A schedule of times in the macrocycle when devices must publish their output values on the Fieldbus. |
| Link Active Scheduler | The Fieldbus device that is currently controlling access to the Fieldbus. A device that is responsible for keeping a link operational. The LAS executes the link schedule, circulates tokens, distributes time, and probes for new devices. |
| Link master device | A device that is capable of becoming the LAS. |
| Live list | The list of all devices that are properly responding to the Pass Token. |
| Lookout | National Instruments Lookout is a full-featured object-based automation software system that delivers unparalleled power and ease of use in demanding industrial measurement and automation applications. |
| Loop | <i>See</i> Control loop . |

M

| | |
|-------------------------------|---|
| m | Meters. |
| Manufacturer's identification | An identifier used to correlate the device type and revision with its device description and device description revision. |
| Menu | An area accessible from the command bar that displays a subset of the possible command choices. In the NI-FBUS Configurator, refers to menus defined by the manufacturer for a given block. |
| Method | Methods describe operating procedures to guide a user through a sequence of actions. |
| Mode | Type of communication. |

N

| | |
|---------------------------------------|---|
| Network address | The Fieldbus network address of a device. |
| Nifb.exe | The NIFB process that must be running in the background for you to use your AT-FBUS or PCMCIA-FBUS interface to communicate between the board and the Fieldbus. |
| NI-FBUS API | The NI-FBUS Communications Manager. |
| NI-FBUS Communications Manager | Software shipped with National Instruments Fieldbus interfaces that lets you read and write values. It does not include configuration capabilities. |
| NI-FBUS Configurator | National Instruments Fieldbus configuration software. With it, you can set device addresses, clear devices, change modes, and read and write to the devices. |
| NI-FBUS Fieldbus Configuration System | <i>See</i> NI-FBUS Configurator. |
| NI-FBUS process | Process that must be running in the background for you to use your AT-FBUS or PCMCIA-FBUS interface to communicate between the board and the Fieldbus. |

O

| | |
|-------------------|--|
| Object | An element of an object dictionary. |
| Object Dictionary | A structure in a device that describes data that can be communicated on the Fieldbus. The object dictionary is a lookup table that gives information such as data type and units about a value that can be read from or written to a device. |
| OD | <i>See</i> Object Dictionary. |
| OPC | OLE for Process Control. |

P

| | |
|-----------|--|
| Parameter | One of a set of network-visible values that makes up a function block. |
| PC | Personal Computer. |
| PCMCIA | Personal Computer Memory Card International Association. |

| | |
|-------------------------------|--|
| Physical Layer | The layer of the communication stack that converts digital Fieldbus messages from the communication stack to actual physical signals on the Fieldbus transmission medium and vice versa. |
| PLC | <i>See Programmable Logic Controller.</i> |
| Poll | To repeatedly inspect a variable or function block to acquire data. |
| Port | A communications connection on a computer or remote controller. |
| Program | A set of instructions the computer can follow, usually in a binary file format, such as a .exe file. |
| Programmable Logic Controller | A device with multiple inputs and outputs that contains a program you can alter. |

R

| | |
|----------------|---|
| Repeater | Boost the signals to and from the further link. |
| Resource block | A special block containing parameters that describe the operation of the device and general characteristics of a device, such as manufacturer and device name. Only one resource block per device is allowed. |
| Roundcard | A hardware interface for developing Foundation Fieldbus-compliant devices. |

S

| | |
|---------|--|
| s | Seconds. |
| Segment | <i>See Link.</i> |
| Sensor | A device that responds to a physical stimulus (heat, light, sound, pressure, motion, flow, and so on), and produces a corresponding electrical signal. |
| Server | Device that receives a message request. |
| Session | A communication path between an application and the NI-FBUS Communications Manager. |
| Shield | Metal grounded cover used to protect a wire, component or piece of equipment from stray magnetic and/or electric fields. |

| | |
|----------------|--|
| Signal | An extension of the IEEE 488.2 standard that defines a standard programming command set and syntax for device-specific operations. |
| Stack | A set of hardware registers or a reserved amount of memory used for calculations or to keep track of internal operations. |
| Static library | A library of functions/subroutines that you must link to your application as one of the final steps of compilation, as opposed to a Dynamic Link Library, which links to your application at run time. |

T

| | |
|-------|---|
| Tag | A name you can define for a block, virtual field device, or device. |
| Trend | A Fieldbus object that allows a device to sample a process variable periodically, then transmit a history of the values on the network. |

V

| | |
|------------------------------------|---|
| V | Volts |
| VCR | <i>See</i> Virtual Communication Relationship. |
| VFD | <i>See</i> Virtual Field Device. |
| Virtual Communication Relationship | Preconfigured or negotiated connections between virtual field devices on a network. |
| Virtual Field Device | The virtual field device is a model for remotely viewing data described in the object dictionary. The services provided by the Fieldbus Messaging Specification allow you to read and write information about the object dictionary, read and write the data variables described in the object dictionary, and perform other activities such as uploading/downloading data and invoking programs inside a device. A model for remotely viewing data described in the object dictionary. |

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