Fieldbus

NI-FBUS™ Monitor User Manual

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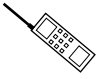

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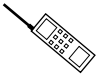

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Class A

Federal Communications Commission

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Canadian Department of Communications

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

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

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

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This device complies with the FCC rules only if used with shielded interface cables of suitable quality and construction. National Instruments used such cables to test this device and provides them for sale to the user. The use of inferior or nonshielded interface cables could void the user's authority to operate the equipment under the FCC rules.

If necessary, consult National Instruments or an experienced radio/television technician for additional suggestions. The following booklet prepared by the FCC may also be helpful: *Interference to Home Electronic Entertainment Equipment Handbook.* This booklet is available from the U.S. Government Printing Office, Washington, DC 20402.

Table of Contents

About This Manual

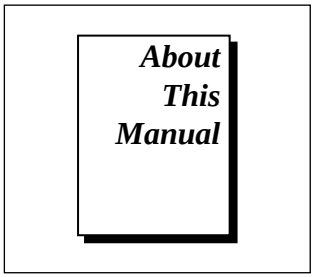
Chapter 1
Introduction

Chapter 2
Installation and Configuration

Chapter 3
Windows and Menus

Figures

Tables



This manual describes the NI-FBUS Monitor utility, its features, and how to install and use it. The NI-FBUS Monitor utility is intended for use with Windows 95 or Windows NT.

This manual assumes that you are already familiar with the Windows 95 or Windows NT operating systems.

Organization of This Manual

This manual is organized as follows:

- Chapter 1, *Introduction*, contains an overview of the NI-FBUS Monitor.
- Chapter 2, *Installation and Configuration*, contains instructions for installing and configuring your NI-FBUS Monitor software and your fieldbus interface.
- Chapter 3, *Windows and Menus*, describes each of the menus and windows in the NI-FBUS Monitor utility.
- Chapter 4, *How to Use the NI-FBUS Monitor*, describes how to perform basic tasks with the NI-FBUS Monitor.
- Appendix A, *Hardware Specifications*, describes the electrical, physical, and environmental characteristics of the AT-FBUS and PCMCIA-FBUS hardware and the recommended operating conditions.
- Appendix B, *Pinout Information*, contains information about the pinout of the fieldbus connectors.
- Appendix C, *Customer Communication*, contains forms you can use to request help from National Instruments or to comment on our products and manuals.

- The *Glossary* contains an alphabetical list and description of terms used in this manual, including abbreviations, acronyms, metric prefixes, mnemonics, and symbols.
- The *Index* contains an alphabetical list of key terms and topics in this manual, including the page where you can find each one.

Conventions Used in This Manual

The following conventions are used in this manual.

»	The » symbol leads you through nested menu items and dialog box options to a final action. The sequence **File»Page Setup»Options» Substitute Fonts** directs you to pull down the **File** menu, select the **Page Setup** item, select **Options**, and finally select the **Substitute Fonts** options from the last dialog box.
bold	Bold text denotes the names of menus, menu items, parameters, dialog boxes, dialog box buttons or options, icons, windows, Windows 95 tabs, or LEDs.
bold italic	Bold italic text denotes a note, caution, or warning.
`bold monospace`	Bold text in this font denotes the messages and responses that the computer automatically prints to the screen.
italic	Italic text denotes emphasis, a cross reference, or an introduction to a key concept. This font also denotes text for which you supply the appropriate word or value.
`italic monospace`	Italic text in this font denotes that you must supply the appropriate words or values in the place of these items.
`monospace`	Text in this font denotes text or characters that you should literally 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 for statements and comments taken from programs.
NI-FBUS	In this manual, the term *NI-FBUS*, when used alone, refers to the NI-FBUS Communications Manager.

Related Documentation

The following document contains information that you may find helpful as you read this manual:

- *Fieldbus Standard for Use in Industrial Control Systems, Part 2, ISA-S50.02.1992*

Customer Communication

National Instruments wants to receive your comments on our products and manuals. We are interested in the applications you develop with our products, and we want to help if you have problems with them. To make it easy for you to contact us, this manual contains comment and configuration forms for you to complete. These forms are in the appendix C, *Customer Communication,* at the end of this manual.

Chapter 1

Introduction

This chapter contains an overview of the NI-FBUS Monitor.

NI-FBUS Monitor Overview

The NI-FBUS Monitor is a Win32 application you can use to monitor, debug, and analyze fieldbus data packets. The NI-FBUS Monitor detects communication on the bus, capturing data packets that are passed between fieldbus devices. These packets are time-stamped and displayed in real time on the NI-FBUS Monitor's active packet view. The NI-FBUS Monitor can display data packets in decoded format or in hexadecimal format. The NI-FBUS Monitor can filter out unwanted data packets at three levels: the Fieldbus Data Link layer (FDL), the Fieldbus Messaging Specification layer (FMS), and by fieldbus addresses.

Windows of the NI-FBUS Monitor

The NI-FBUS Monitor has a Multiple Document Interface (MDI). An MDI window contains many smaller windows open concurrently that display data from different sources. These smaller windows are called *filter windows.* In the NI-FBUS Monitor, some filter windows might contain previously-captured data, while other filter windows might capture new data from different buses or the same bus.

Chapter 3, *Windows and Menus*, lists and describes the windows of the NI-FBUS Monitor.

Recommended Minimum Platform

The NI-FBUS Monitor uses a lot of processor time and memory resources during data captures. Therefore, the recommended minimum platform for the NI-FBUS Monitor is a 66 MHz 486 processor with 8 MB of RAM. If you want to run the NI-FBUS Monitor on a slower platform, see the *Improving Performance* section in Chapter 4, *How to Use the NI-FBUS Monitor*.

Chapter 2

Installation and Configuration

This chapter contains instructions for installing and configuring your NI-FBUS Monitor software and your fieldbus interface.

Install the Software

Complete the following steps to run the software installation program:

1. Insert the NI-FBUS Monitor software distribution disk into an unused drive.
2. Choose **Run...** from the **File** menu in the **Program Manager** window and type the following command into the dialog box:

   x:\setup

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

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

Continue to the next section to install the hardware.

Install the Hardware

Warning: ***Before you remove the card or board 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 fieldbus interface.***

Evaluating the Default Settings

Skip this section if you are using a PCMCIA-FBUS card and Windows 95.

Table 2-1 shows the default settings for the AT-FBUS board and the default resources the NI-FBUS software uses for PCMCIA-FBUS cards.

Table 2-1. Default Settings

Type of Setting	Default
Memory Base Address (hex)	D0000 (physical)
Interrupt Line (IRQ)	11

The default settings are suitable for most computer systems. However, if these default settings conflict with another device in your system, or if you need to install more than one fieldbus interface, you must change the default settings before you install the interface.

If you have to change the settings, continue to the following sections to locate resources for your fieldbus interface. If the default settings will work in your system, skip to the appropriate section to install the hardware.

To install your PCMCIA-FBUS card, skip to the *Installing the PCMCIA-FBUS Hardware* section. To install your AT-FBUS board, skip to the *Installing the AT-FBUS Hardware* section.

Locating Conflict-Free Resources

To locate conflict-free resources in Windows NT, you can use a utility such as Microsoft Windows NT Diagnostics. This utility lists the I/O port addresses, interrupt levels, and DMA channels that your system is currently using. The resources that this utility does *not* list are conflict-free; you can use them for your fieldbus interface. To use this utility, double-click on the **Windows NT Diagnostics** icon in the **Administrative Tools** program group.

To locate conflict-free resources in Windows 95, complete the following steps:

1. To use the Device Manager, select **Start»Settings»Control Panel»System**. Click on the **Device Manager** tab.

2. Select the **Computer** and click on the **Properties** button. The **Computer Properties** dialog box appears. You can use any resources that do *not* appear in this window.

If you cannot find a free IRQ line, you can configure your fieldbus interface to operate in polled mode, without an IRQ line. In polled mode, NI-FBUS polls your board periodically. When you reach the *Configuring the Software* section, you can configure your fieldbus interface to use polled mode.

When you find acceptable resources, write them down, so you can configure the hardware and software settings to match. Skip to the *Configuring the Hardware (Optional)* section.

Installing the PCMCIA-FBUS Hardware

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

1. Shut down your operating system and power off your system.
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.

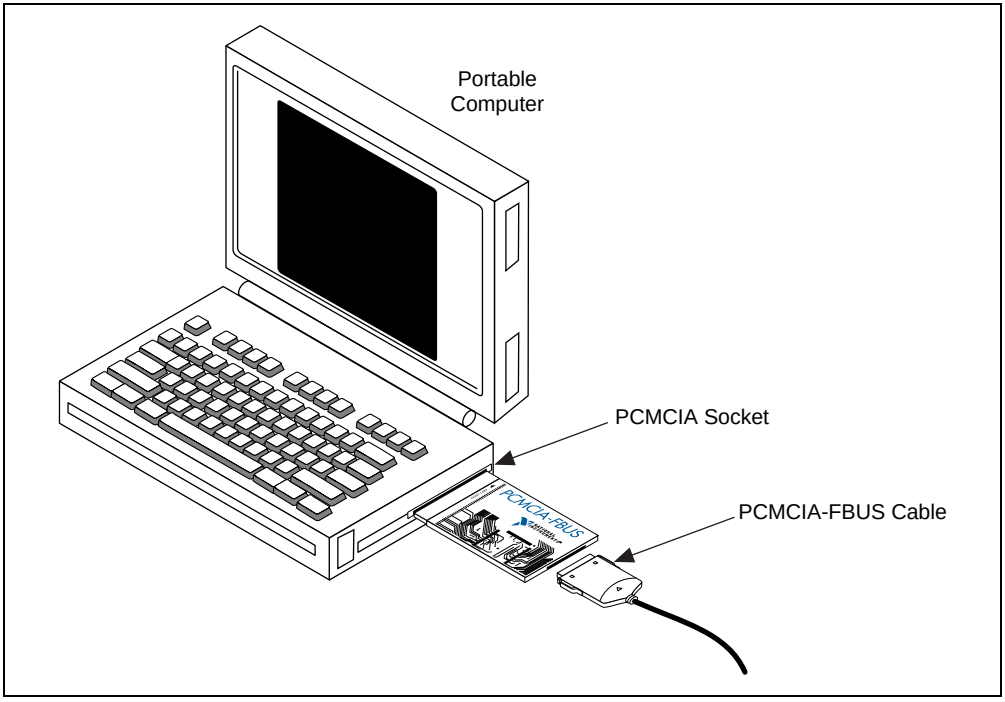


Figure 2-1. Inserting the PCMCIA-FBUS

3. Connect the PCMCIA-FBUS to the fieldbus network.

   You 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.

Skip to the *Configuring the Software* section.

Installing the AT-FBUS Hardware

Install the AT-FBUS

To install the AT-FBUS board, complete the following steps:

1. Shut down your operating system and power off your computer. Keep the computer plugged in so that it remains grounded while you install the AT-FBUS board.
2. Remove the top cover or access port of the I/O channel.
3. Remove the expansion slot cover on the back panel of the computer.
4. As shown in Figure 2-2, insert the AT-FBUS board into any unused 16-bit ISA slot with the fieldbus connector sticking out of the opening on the back panel. It might be a tight fit, but do not force the board into place.

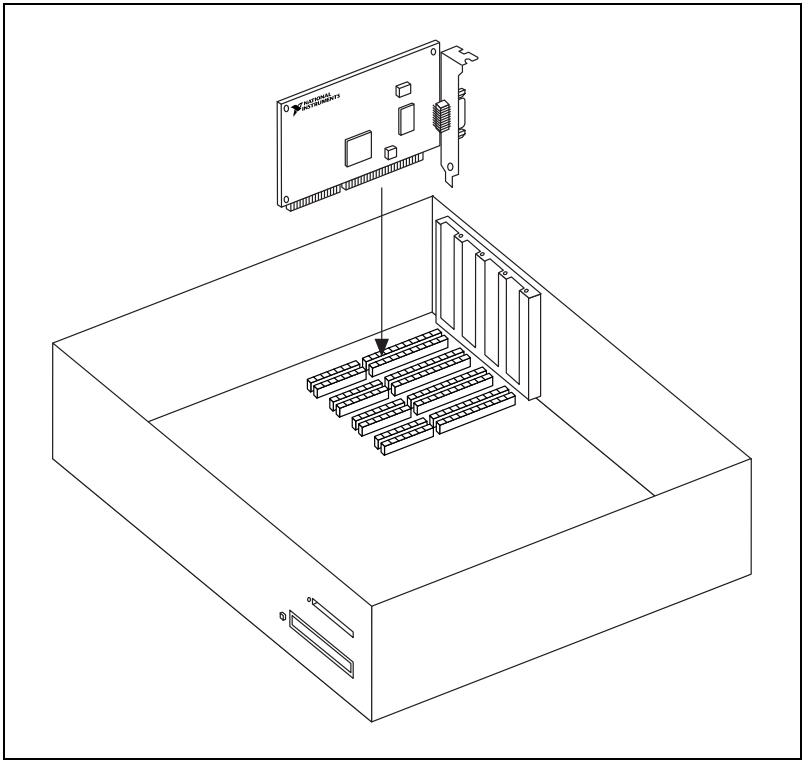


Figure 2-2. Installing the AT-FBUS Board

5. Screw the mounting bracket of the AT-FBUS board to the back panel rail of the computer.
6. Check the installation.
7. Replace the top cover or access port to the I/O channel.
8. Connect the AT-FBUS to the fieldbus network.

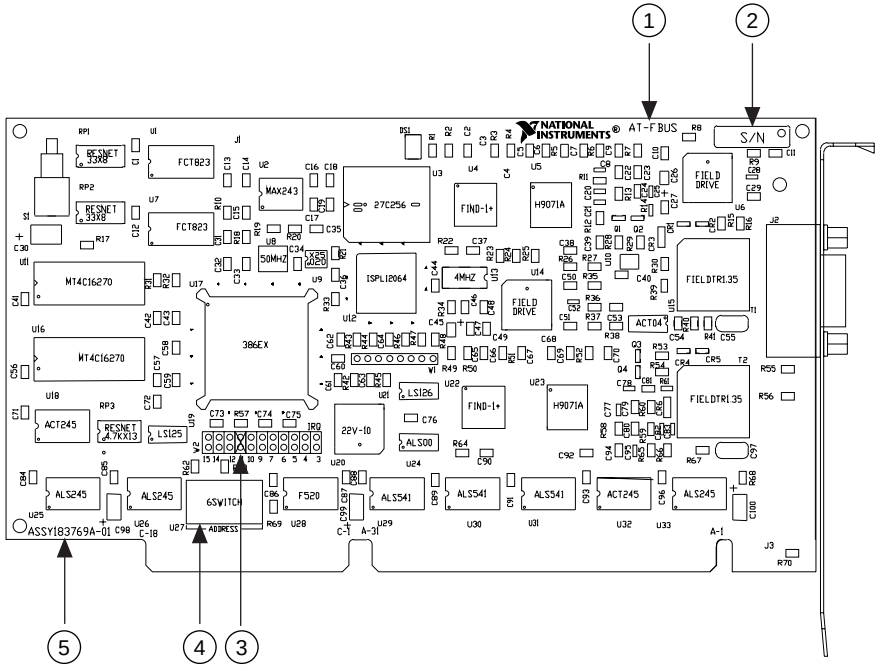
   If you want to make your own fieldbus cable, make sure that it uses pins 6 and 7 for the fieldbus signals, as specified in the *Fieldbus Standard for Use in Industrial Control Systems, Part 2, ISA-S50.02.1992*. Refer to Appendix B, *Pinout Information*, to see the fieldbus connector pinout of the AT-FBUS.
9. Power on your computer.

Skip to the *Configuring the Software* section.

Configuring the Hardware (Optional)

Follow the instructions in this section if you need to change the hardware default settings of the AT-FBUS board. Refer to the *Evaluating the Default Settings* section at the beginning of this chapter for reasons to change the default settings of your AT-FBUS board.

Figure 2-3 shows the location of the switches, jumpers, and connector on the AT-FBUS board.



1	Product Name	3	Jumpers for IRQ	5	Assembly Number
2	Serial Number	4	Switch for Base I/O Address		

Figure 2-3. AT-FBUS Parts Locator Diagram

Selecting the Memory Base Address

The AT-FBUS board is a memory-mapped device, which means that the driver software can use the AT-FBUS memory registers as if they were standard memory. The memory base address of the AT-FBUS is the first position in the total memory address space occupied by the AT-FBUS.

The AT-FBUS is configured to use memory base address D0000 hex by default. With this setting, the board uses the memory space from D0000 hex through D4000 hex. If this address range is already used by another device, or if you are installing more than one board, complete the following steps to reconfigure the memory base address setting. If you are installing more than one AT-FBUS board, each board must use a unique memory base address. Your computer's conventional DRAM and all other devices cannot use the memory space you assign to the AT-FBUS board.

1. Choose a new memory base address.

   You can configure the AT-FBUS to use lower or upper memory. Lower memory is the memory residing in the first megabyte of address space. Upper memory is any memory that resides above the first megabyte. Because the AT bus can only access the first 16 MB of address space, and the AT-FBUS must have a unique base address in memory, you must have 8 MB or less of DRAM in your machine to place the AT-FBUS in upper memory. If these conditions are met, you must locate the AT-FBUS above your conventional memory and below the 16 MB upper limit for addresses.

   Table 2-2 lists the possible switch settings, the corresponding memory base address, and the memory space used for each setting. ***Bold italic*** denotes the default setting.

Table 2-2. Memory Base Address Switch Settings

Switch Setting						
SW1	**SW2**	**SW3**	**SW4**	**SW5**	**SW6**	**Base Address**
ON	ON	OFF	ON	ON	OFF	0C0000
ON	ON	OFF	ON	OFF	OFF	0C4000
ON	ON	OFF	OFF	ON	OFF	0C8000
ON	ON	OFF	OFF	OFF	OFF	0CC000
ON	***ON***	***ON***	***ON***	***ON***	***OFF***	***0D0000***
ON	ON	ON	ON	OFF	OFF	0D4000
ON	ON	ON	OFF	ON	OFF	0D8000
ON	ON	ON	OFF	OFF	OFF	0DC000
ON	OFF	OFF	ON	ON	OFF	0E0000
ON	OFF	OFF	ON	OFF	OFF	0E4000
ON	OFF	OFF	OFF	ON	OFF	0E8000
ON	OFF	OFF	OFF	OFF	OFF	0EC000
ON	OFF	ON	ON	ON	OFF	0F0000
ON	OFF	ON	ON	OFF	OFF	0F4000
ON	OFF	ON	OFF	ON	OFF	0F8000
ON	OFF	ON	OFF	OFF	OFF	0FC000
OFF	ON	OFF	ON	ON	OFF	8C0000

Table 2-2. Memory Base Address Switch Settings (Continued)

Switch Setting						Base Address
SW1	**SW2**	**SW3**	**SW4**	**SW5**	**SW6**	
OFF	ON	OFF	ON	OFF	OFF	8C4000
OFF	ON	OFF	OFF	ON	OFF	8C8000
OFF	ON	OFF	OFF	OFF	OFF	8CC000
OFF	ON	ON	ON	ON	OFF	8D0000
OFF	ON	ON	ON	OFF	OFF	8D4000
OFF	ON	ON	OFF	ON	OFF	8D8000
OFF	ON	ON	OFF	OFF	OFF	8DC000
OFF	OFF	OFF	ON	ON	OFF	8E0000
OFF	OFF	OFF	ON	OFF	OFF	8E4000
OFF	OFF	OFF	OFF	ON	OFF	8E8000
OFF	OFF	OFF	OFF	OFF	OFF	8EC000
OFF	OFF	ON	ON	ON	OFF	8F0000
OFF	OFF	ON	ON	OFF	OFF	8F4000
OFF	OFF	ON	OFF	ON	OFF	8F8000
OFF	OFF	ON	OFF	OFF	OFF	8FC000

2. Locate the memory base address switch on your AT-FBUS board. Refer to Figure 2-3, *AT-FBUS Parts Locator Diagram.*
3. Change the switch settings to configure the AT-FBUS board to the new memory base address as shown in Table 2-2. See Figure 2-4 for an example of the switch settings.

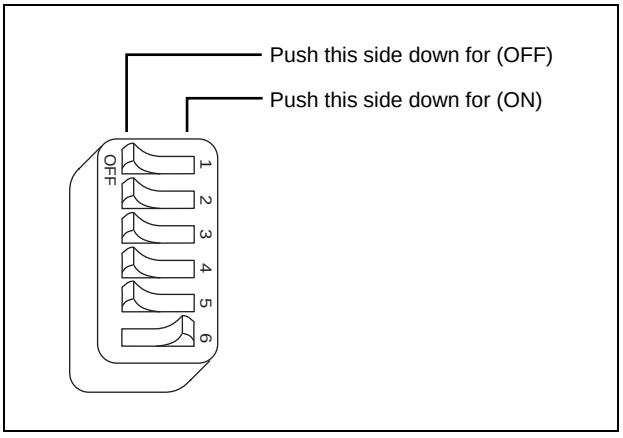


Figure 2-4. Sample Memory Base Address Switch Setting

4. Record your new settings on the *Hardware and Software Configuration Form* in the appendix, *Customer Communication*, for future reference.

Selecting the Interrupt Request Line

PC AT-compatible computers have a series of interrupt lines available to devices. Devices use interrupts to get immediate service from the CPU for asynchronous events. Your AT-FBUS board and the NI-FBUS Monitor software use interrupts to get service from the CPU when necessary.

If there are no interrupt request lines available in your system, you can configure the AT-FBUS not to use interrupts by removing the jumper completely. If you remove the jumper, NI-FBUS periodically polls your board.

By default, the AT-FBUS board uses interrupt request line 11. Figure 2-5 shows the setting for IRQ11.

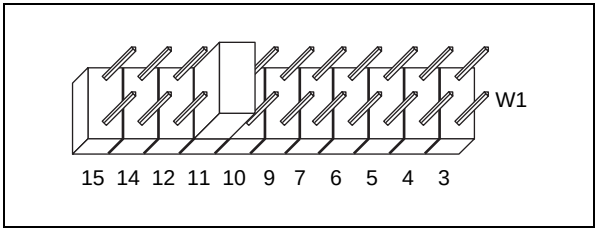


Figure 2-5. Interrupt Jumper Setting for IRQ11

If this is not an acceptable setting or if you are installing more than one board, complete the following steps to reconfigure the interrupt request line.

☞ **Note:** ***The AT-FBUS cannot use an interrupt line that another device in your system is already using.***

1. Choose a new interrupt request line (IRQ) setting.

   You can configure the AT-FBUS board to use any of the following interrupt lines: IRQ3, 4, 5, 6, 7, 9, 10, 11, 12, 14, or 15.

   If you are installing more than one AT-FBUS board, each board must be configured to use a unique IRQ level. The AT-FBUS requires the use of interrupts to work with your NI-FBUS Monitor software properly.
2. Find the jumpers that set the interrupt request line. Refer to Figure 2-3, *AT-FBUS Parts Locator Diagram.* The jumpers are located on the lower edge of your AT-FBUS board. The number on the board under each pair of pins corresponds to an AT bus interrupt level.
3. Change the jumper settings to configure the AT-FBUS board to the new interrupt request line. Place the jumper on the pair of pins directly above the number of the interrupt level you want.
4. Record your new settings on the *Hardware and Software Configuration Form* in the appendix, *Customer Communication*, for future reference.

Go back to the *Install the AT-FBUS* section to install the AT-FBUS board.

Configuring the Software

If you are installing an AT-FBUS board, the physical settings on the board must match the software settings you configure. To read your base address from your board switch settings, use Table 2-2. To read your IRQ line from your board, look at the number printed on the board under the jumper.

The configuration steps are different for Windows 95 and Windows NT. Proceed to the appropriate section to configure the NI-FBUS software.

Configuration Steps for Windows NT

1. Start the NI-FBUS Configuration utility.
   - If you are using Windows NT 3.51, double-click on the **fbconf** icon, which is part of the NI-FBUS program group, created in your Program Manager during installation.
   - If you are using Windows NT 4.0, select **Start»Programs»NI-FBUS»NI-FBUS Config**.
   - To use the command prompt, enter the command `fbconf.exe` to start the NI-FBUS Configuration utility executable, which is located in the `utils` subdirectory of your NI-FBUS installation directory.
2. Select **Add a Board**.
3. Select the correct base address.
4. Select the correct interrupt request line.

   (AT-FBUS only) If you have configured your AT-FBUS not to use interrupts, select zero from the **IRQ** drop-down list, and check the **Polled Mode** checkbox.

   (PCMCIA-FBUS only) If you want to configure your PCMCIA-FBUS to operate in polled mode (without interrupts), select a valid IRQ line from the **IRQ** drop-down list and check the **Polled Mode** checkbox. You must enter a valid IRQ for the PCMCIA card in polled mode because of the behavior of the Microsoft PCMCIA driver for Windows NT. The NI-FBUS software does not actually use an interrupt line in polled mode, but you must still enter a valid IRQ.
5. Choose **ISA** or **PCMCIA** for the **Bus Type**. The NI-FBUS Configuration utility displays the default base address and IRQ line.
6. Click on the **Add** button.
7. Select a port to configure and click on the **Edit** button.
8. Enter an interface name for the port.
9. Select **Monitor** for the **Usage**.
10. Click on the **OK** button.
11. Close the NI-FBUS Configuration utility and restart Windows NT.

Your software is now configured. Skip to the *Starting the NI-FBUS Monitor Driver (Windows NT Only)* section.

Configuration Steps for Windows 95

Follow the steps in this section to configure your NI-FBUS software for Windows 95.

Configuring Resources in Windows 95 (AT-FBUS Only)

Skip this section if you are using a PCMCIA-FBUS.

In Windows 95, you must use the Add New Hardware Wizard and the Device Manager to configure resources for your AT-FBUS.

1. To open the Add New Hardware Wizard, select **Start»Settings»Control Panel»Add New Hardware**. Click on the **Next** button.
2. In the dialog box that appears, select **No** to keep Window 95 from trying to detect the hardware automatically, and then click on the **Next** button.
3 Select **Other Devices** from the **Hardware Types** list that appears.
4. In the dialog box that appears, select National Instruments in the **Manufacturers** list on the left. In the **Models** box, select **NI-FBUS**. Click on the **Next** button.
5. Click on the **Finish** button.
6. To use the Device Manager, select **Start»Settings»Control Panel»System**. Click on the **Device Manager** tab.
7. Select the AT-FBUS board and click on the **Properties** button. The **AT-FBUS Properties** dialog box appears.
8. Click on the **Resources** tab.
9. Configure resources for your AT-FBUS board. Select a setting from the **Setting based on:** list. Basic Configurations 1 and 3 do not use an interrupt request line.

   If necessary, you can change a setting in one of the Basic Configurations by double-clicking on the setting in the **Resource settings:** list. The **Conflicting device list:** window shows if there are any conflicts with the resources you choose.
10. After you have selected nonconflicting resources, click on the **OK** button on two successive dialog boxes to save your changes.

Using the NI-FBUS Configuration Utility

1. Start the NI-FBUS Configuration utility.

   Enter the command `fbconf.exe` to start the NI-FBUS Configuration utility executable, which is located in the `utils` subdirectory of your NI-FBUS installation directory.
2. In the **NI-FBUS Config** window, select the port you want to configure and click on the **Edit** button.
3. Enter an interface name for the port.
4. Select **Monitor** for the **Usage**.
5. Click on the **OK** button.

Your software is configured.

Starting the NI-FBUS Monitor Driver (Windows NT Only)

The `nifb` kernel-mode driver is launched automatically under Windows 95. Under Windows NT, you must start the `nifb` kernel mode driver manually, as follows. The installation program defines the `StartupType` for the driver as `Manual`.

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 entering the following command at the command prompt:

   ```
   net start nifb
   ```

   You can also start `nifb` by selecting **Start»Settings»Control Panel»System»Device Manager»NIFB»Start** button.

If the process and the driver start up successfully under Windows NT, you can configure the `nifb` driver to load at system startup. Change the `StartupType` for the `nifb` driver to **Automatic** through the **Devices** window in the **Control Panel**. If you are using Windows NT 4.0, you can also move the **NIFB** shortcut to the **StartUp** folder to make it start up automatically when your computer boots or restarts.

Chapter 3

Windows and Menus

This chapter describes each of the menus and windows in the NI-FBUS Monitor utility.

List of Windows

Main Window — Multiple Document Interface (MDI) window that contains all the other windows and toolbars.

Filter Window — Displays data packets and statistical information. Each filter window has its own packet filter.

Filter — Dialog box you can use to select which data packets to capture. The options are as follows:

FDL Filter—Filters packets by the Fieldbus Data Link (FDL) layer.

FMS Filter—Filters packets by the Fieldbus Messaging Specification (FMS) layer.

Filter by Address—Filters packets by address.

Settings — Dialog box you can use to set the following NI-FBUS Monitor options:

Capture Settings—Capture options.

Display Settings—Color and font options.

Toolbar Settings—Toolbar options.

Packet View Toolbar	Gives access to view options for the packet view.
Statistics View Toolbar	Gives access to view options for the statistics view.
Standard Toolbar	Gives access to commonly-used functions in a toolbar format.

About the NI-FBUS Monitor Interface

The NI-FBUS Monitor consists of windows and data objects. The main window is the large desktop window that contains all other windows of the NI-FBUS Monitor. It has a menu bar and various toolbars. The smaller windows inside the main window are *filter windows*. Each filter window uses a *single filter* to determine what data the NI-FBUS Monitor captures. The main data object that stores these captured data packets on a disk and holds the data in memory is called the *capture document*. You can use the filter window to view the data in the capture document. You can attach several filter windows with the corresponding filters to the capture document.

When you select **New** from the **File** menu, the NI-FBUS Monitor creates a new capture document and a corresponding filter window. The filter window displays data from the capture document. Each filter window has an exclusive filter attached to it that you can view as a dialog box. To display the filter, select **Filter Settings** from the **Capture** menu. You can use the filter to determine what data the NI-FBUS Monitor displays in the filter window and what data it saves to the capture document. To add a new filter window to the document, select **New Filter Window** from the **Capture** menu. Adding a new filter window attaches a new filter window and filter to the document. You can use the new filter to filter different data.

Figure 3-1 is graphical example of the relationships between the windows and the document. The gray area represents the graphical area that appears on the desktop. The documents on the left are data objects invisible on the desktop.

☞ **Note:** ***Even if a window is split using the* Split Filter Window *function, the filter window still has only one filter attached to it.***

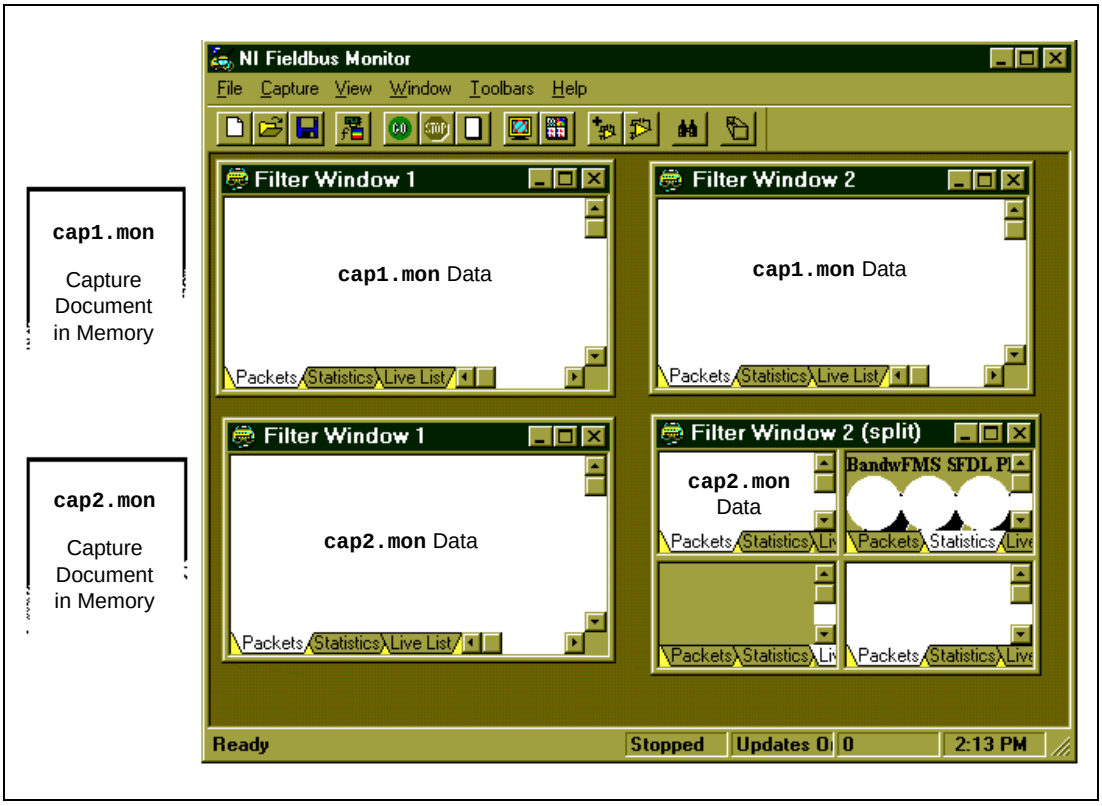


Figure 3-1. Relationship of Windows to Capture Documents

Main Window

The main window contains all the windows of the NI-FBUS Monitor. The frame of the main window contains a menu bar and a status bar. The frame can also have toolbars on it. Figure 3-2 shows the main window.

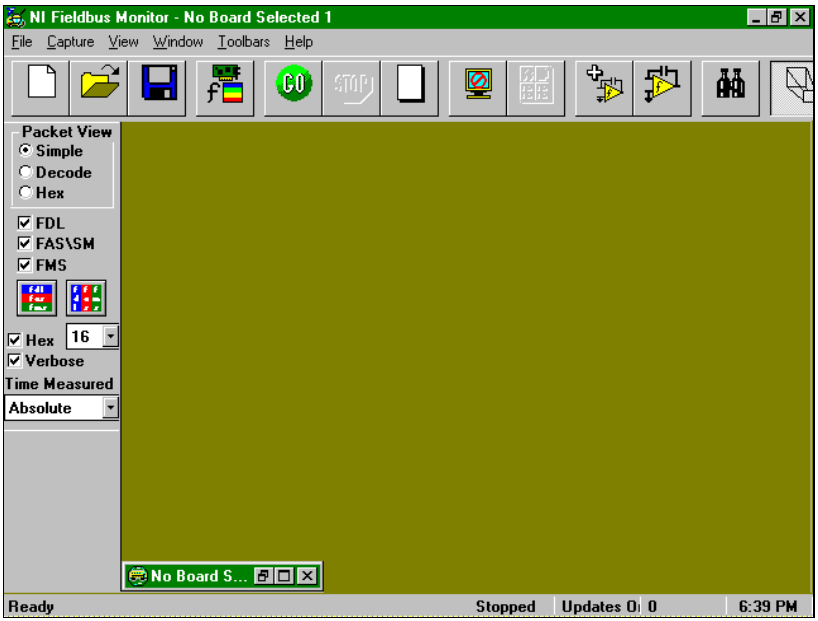


Figure 3-2. Main Window

When you start the NI-FBUS Monitor, it opens a new filter window and a new capture document. The capture document contains the actual data packets that are captured from the bus. The filter window is a graphical representation of the data stored in the capture document. The filter window is minimized in Figure 3-2. By default, the NI-FBUS Monitor opens the standard toolbar at the top and the **Packet View** toolbar on the left of the main window's frame.

Menus and the Standard Toolbar

To see help for the NI-FBUS Monitor controls, browse through the menus or pause the cursor over the standard toolbar, shown in Figure 3-3. To see a short description of a menu or toolbar function, pause your cursor over the item. The NI-FBUS Monitor displays the description in the status bar, which is located at the very bottom of the main window. Pause your cursor over an item in the toolbar to see a short description of the item in a yellow rectangle near the cursor.

Standard Toolbar

Figure 3-3 shows the standard NI-FBUS Monitor toolbar.

Figure 3-3. Standard Monitor Toolbar

Following are descriptions of the standard toolbar buttons:

New Capture	Creates a new capture document.
Open Capture	Opens an existing capture document.
Save Capture	Saves the current capture document.
Capture Settings	Sets your capture, display, and toolbar settings.
Start Capture	Starts a capture on the selected board.
Stop Capture	Stops capture on the selected board.
Reset Capture	Deletes all captured packets.
Live Updates Off	Does not update the screen. Updating the screen constantly can be a problem if you have a slow computer.
Split Filter Window	Splits the filter window into a multi-paned filter window.

Add Filter Window	Creates a new filter window and filter for the current capture document.
Filter Settings	Shows the filter settings for the current filter window.
Find Data	Finds data in the current window.
Big <-> Small Buttons	Enlarges or reduces the size of the toolbar buttons.

Main Menu Bar

The main menu bar is at the top of the main window and lists all of the operations that you can perform in the NI-FBUS Monitor. When you select an item in the menu, a short help message describing the option appears in the Status Bar at the bottom of the main window.

File Menu

The **File** menu allows you to open, save, print, and create new documents.

Following are descriptions of the **File** menu selections:

New	Creates a new capture document.
Open...	Opens an existing capture document in `*.mon` format. A text editor is included in the NI-FBUS Monitor for opening `*.txt` files.
Close	Closes the current capture document.
Save	Saves the current capture document. Two save formats are allowed: `*.mon`, which saves captured and filtered data to a binary file, and `*.txt`, which saves captured and filtered data as a text file.
Save As...	Saves the current capture document with a new name.
Print...	Prints the current capture document.
Print Setup...	Sets up the printer and printer options.

Recent File	List the most recently saved files.
Exit	Exits the NI-FBUS Monitor.

Capture Menu

The **Capture** menu allows you to control the capture. To view this menu, click on the **Capture** option at the top of the main window, or right-click on the filter window. The standard toolbar has a button for most of the items in the **Capture** menu.

Following are descriptions of the **Capture** menu selections:

Settings...	Sets your capture, display and toolbar settings.
Filter Settings...	Shows the filter settings for the current filter window.
Start Capture	Starts a capture on the selected board.
Stop Capture	Stops capture on the selected board.
Reset Capture	Deletes all captured packets.
Find Data...	Finds data in the current window.
Hexadecimal Data	Displays hexadecimal data.
Verbose Data	Displays detailed data.
High Priority Updates	Enhances live updates.
Live Updates	Turns off real-time updates. This is a useful feature if your computer is slow.
Smooth Live Updates	Shows flicker-free updates, but is slower.
Scrolling Live Updates	Scrolls data during capture, but is slower.

View Menu

You can use the **View** menu instead of the toolbars to configure the active filter window views.

Packet Menu

The **Packet** menu has the same options as the packet view toolbar. Refer to the *Packet View Toolbar* section later in this chapter for a description of each option.

Statistics Menu

The **Statistics** menu has the same options as the statistics view toolbar. Refer to the *Statistics View Toolbar* section later in this chapter for a description of each option. The **Live List View** shows the devices on the fieldbus that are active and functioning (*alive*).

Window Menu

You can use the **Window** menu to control the layout of windows contained in the main window.

Following are descriptions of the **Window** menu selections:

Add Filter Window	Creates a new filter window and filter for the current document.
Split Filter Window	Splits the filter window into a multi-paned filter window.
Cascade	Cascades the open windows.
Tile	Tiles the open windows.
Arrange Icons	Arranges the icons.
Window List	List of the open windows.

Toolbars Menu

You can use the **Toolbars** menu to show or hide the toolbars of the NI-FBUS Monitor.

Following are descriptions of the **Toolbars** menu selections:

Standard Toolbar Shows the standard toolbar.

Packet Toolbar Shows the **Packet View** toolbar.

Statistics Toolbar Shows the **Statistics View** toolbar.

Status Bar Shows the status bar.

Help Menu

You can use the **Help** menu to display information about the NI-FBUS Monitor.

Filter Window

The filter window displays the data in a capture document, and can display this data in different formats. The filter window has three tabs located in the bottom left of the window that you can use to switch between statistics view and packet view. Both the statistics view and the packet view have toolbars that allow you to choose what each view shows. Figure 3-4 shows an example of a filter window.

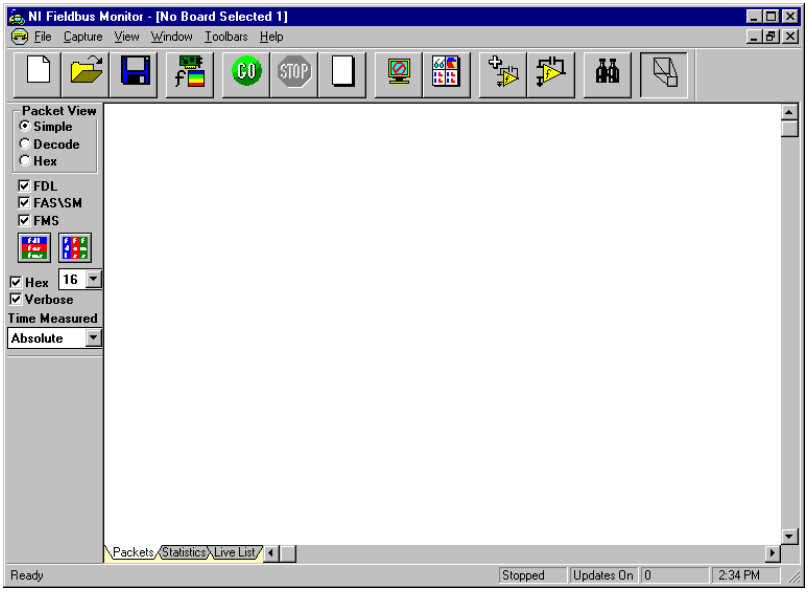


Figure 3-4. Filter Window

Packet View

You can use the packet view to display and manipulate data packets. This view is the main medium of interaction between you and the capture document. To select the packet view, click on the **Packets** tab at the bottom left of the filter window, or select **Packet View** from the **View** menu. Figure 3-5 shows the filter window in packet view.

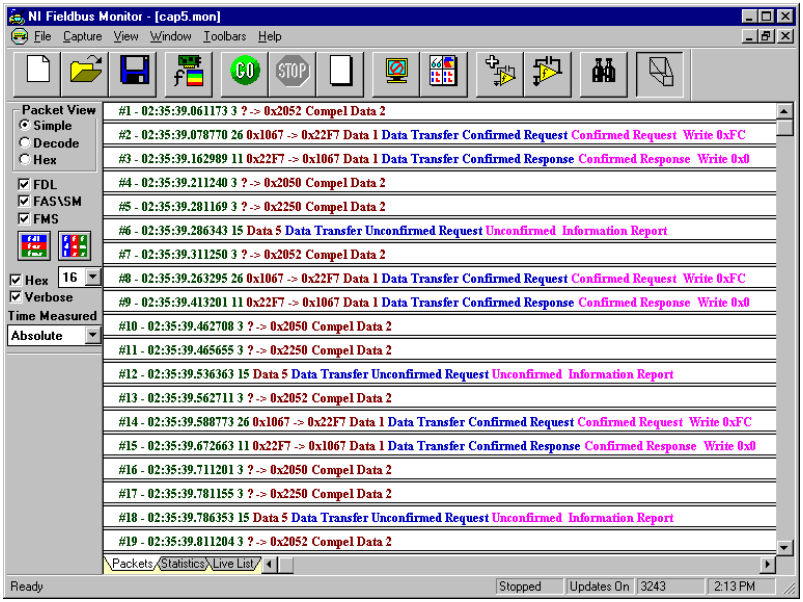


Figure 3-5. Filter Window and Captured Data in Packet View

Packet Display Formats

Packet data can be in one of three formats: simple, decode, or hex. All formats have the same header, which follows:

```
(*/#)PACKET_NUMBER - TIME(HH:MM:SS.US) LENGTH - SIZE
```

An asterisk (*) next to a packet indicates that a packet prior to that packet is missing. The asterisk indicates that, after several attempts, the monitor on the fieldbus interface could not pass the packet to the host application (the NI-FBUS Monitor). This problem might happen on slow PCs, such as 386 computers, but it rarely happens on 486 computers. If you see an asterisk, read the *Improving Performance* section in Chapter 4, *How to Use the NI-FBUS Monitor*.

A pound sign (#) next to a packet number means that the NI-FBUS Monitor received the packet that arrived right before the indicated packet.

The format of the time measurement is as follows:
Hours:Minutes:Seconds.Microseconds

The **Simple** format is a condensed version of the **Decode** format, and shows only the type of Protocol Data Units (PDUs) of the FDL, FMS, and FAS (Fieldbus Access Sublayer) layers in the packet. The **Decode** format fully decodes the data packet and formats the data according to the PDU sections of the packet. The **Hex** format performs a hexadecimal dump of the data in the PDU sections of the packet.

Packet View Toolbar

The **Packet View** toolbar is on the left of the main window in the Figure 3-5. The **Packet View** toolbar controls how the filter window displays data. To move the **Packet View** toolbar, click on it and drag it. Pause the cursor over a toolbar control to see the tool tips. Figure 3-6 shows the **Packet View** toolbar.

Figure 3-6. Packet View Toolbar

Following are descriptions of the buttons, checkboxes, and drop-down lists on the **Packet View** toolbar:

Radio Buttons

Simple Displays a short view of the data in a packet.

Decode Fully decodes the data in a packet.

Hex Displays a hexadecimal dump of the data in a packet.

Checkboxes

FDL Displays the FDL portion of a packet.

FAS\SM FAS/SM Displays the FAS portion of a packet.

FMS FMS Displays the FMS portion of a packet.

Hex Displays decoded numeric data in hexadecimal format. The drop-down list to the right is the width in bytes that the data occupies on the screen.

Verbose Displays more information about the packet.

Graphic Buttons

Horizontal Packets Displays FDL, FAS, and FMS horizontally on the screen.

Vertical Packets Displays FDL, FAS, and FMS vertically, from top to bottom, on the screen.

Drop-Down List

Time Measured Allows you to select the time calculation to perform on the packet. The options are as follows:

Absolute—Shows the absolute time relative to the start of the NI-FBUS Monitor utility.

Idle—Shows the idle time between packets.

From Start—Shows the time from the start of one packet to the start of the next packet.

From End—Shows the time from the end of one packet to the end of the next packet.

Transmission—Shows the time it took to transmit a packet.

Statistics View

The statistics view shows the volume of the types of fieldbus packets passed over the bus, and the bus time (or bandwidth) that these packets consume. To select this view, click on the **Statistics** tab at the bottom left of the filter window, or select **Statistics View** from the **View** menu. The most useful statistics chart is the Bandwidth chart. It is a pie chart showing the relative use of bandwidth for the FMS, FAS, and FDL packets as a fraction of the whole bus time. The FMS Services chart displays the volume of the different types of services transmitted from the FMS layers of the bus devices. The FMS Services chart is a breakdown of the FMS PDU section of the Bandwidth chart. The FDL PDUs chart shows the volume of the FDL PDUs transmitted over the bus. The FDL PDUs chart is a breakdown of the FDL PDU section of the Bandwidth chart. Figure 3-7 shows the statistics view.

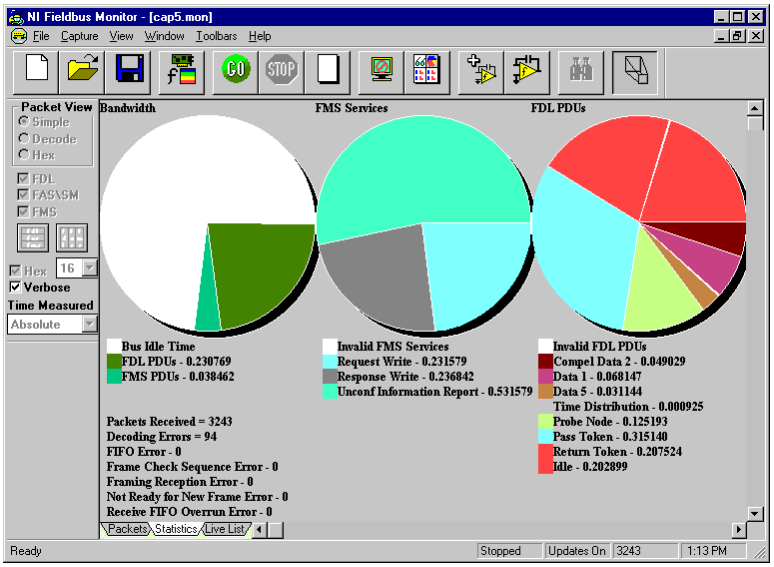


Figure 3-7. Filter Window Showing Statistics View

Statistics View Toolbar

The **Statistics View** toolbar allows you to select which graphs you would like to see. This toolbar is not visible by default. You can view this toolbar by selecting **Statistics Toolbar** from the **Toolbars** menu. Unchecking the box for a chart removes the corresponding chart from the view, and checking the box for a chart displays the chart. Figure 3-8 shows the **Statistics View** toolbar.

Figure 3-8. Statistics View Toolbar

Following are descriptions of the checkboxes on the **Statistics View** toolbar:

Bandwidth Displays the relative bandwidth between FDL, FAS, and FMS packets.

FMS Displays the FMS Service volume.

FDL Displays the FDL PDU volume.

Verbose Displays detailed statistics and spells out parameter names.

Live List View

The live list view shows what devices on the fieldbus are active. This view lists active devices as *alive* and inactive devices as *dead.* The live list view is only active during data capture.

Filters

The filter is a tool you can use interactively at capture time or after capture.

Filter Operation During Capture

During capture the filter is valid, and the NI-FBUS Monitor discards all data not matching the filter. However, if there are multiple filter windows, the NI-FBUS Monitor checks each filter to make sure that it retains the desired data. If you make changes to the filter, the NI-FBUS Monitor instantly downloads the changes to the fieldbus, so the changes take effect immediately.

Filter Operation After Capture

After capture, you can filter out more undesired data (*postfilter*) by selecting only the packets you want to view. Changes to the filter forces the NI-FBUS Monitor to refilter the data, so that only the selected packets are visible. The NI-FBUS Monitor retains all of the original captured data. To refilter the data and display the desired packets, click on the packet types that you want to view again. The data filtered out during capture is not accessible. For example, after capture, you cannot recover Pass Token (PT) FDL packets if they were not enabled during capture.

Basic Filter Logic

A filter behaves differently depending on whether you select addresses on the **Filter by Address** tab. If no addresses are selected, the filter uses all addresses and combines the **FDL Filter** and **FMS Filter** choices, and captures the types of packets checked in those dialog boxes. If any addresses are selected on the **Filter by Address** tab, incoming packets are first screened for their address. If the address is one of the selected addresses, it is then compared to the FDL filter and the FMS filter. Pseudocode for the filter follows:

If no addresses are selected in the **Filter by Address** tab:

Packets Captured = FDL Filter + FMS Filter

If addresses are selected in the **Filter by Address** tab:

Packets Captured = Address(es) * (FDL Filter + FMS Filter)

Where + stands for *or* and * stands for *and*.

Filter Dialog Box

To view the **Filter** dialog box for a filter window right-click the mouse to bring up the **Capture** menu, and select **Filter Settings**, or you can click on the **Filter Settings** toolbar button that looks like an operation amplifier filter (). The title bar of a filter displays the name of the filter window to which it is attached. The filter appears as a dialog box with three tabs: **FDL Filter**, **FMS Filter**, and **Filter by Address**. You can open the **Filter** dialog box any time before, during, and after capture, or you can hide it from view.

The following sections describe the tabs on the **Filter** dialog box.

FDL Filter Tab

The **FDL Filter** tab filters packets at the FDL layer and lists all of the FDL PDU types for easy selection. Click on the checkbox by an FDL type to capture that type of packet. The **Show Transfer Errors** checkbox enables the display of data-transfer errors. A data-transfer error can occur if a packet does not have the proper checksum attached to it, which can be caused by bus noise. The NI-FBUS Monitor displays protocol errors along with the packets. Figure 3-9 shows the **FDL Filter** tab.

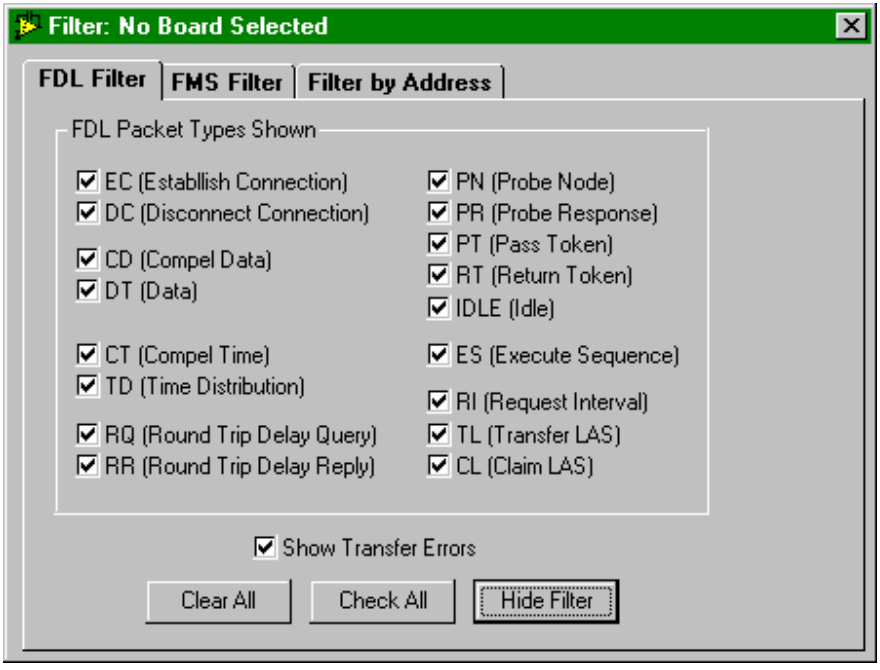


Figure 3-9. FDL Filter Tab

FMS Filter Tab

The **FMS Filter** tab filters packets by FMS service and lists all the FMS Services available. Select the **FMS PDU Type** using the radio buttons on the left of the dialog box to view the services corresponding to that PDU type in the **FMS Services** box. Click on a checkbox to enable capture of the corresponding packet type. Figure 3-10 shows the **FMS Filter** tab.

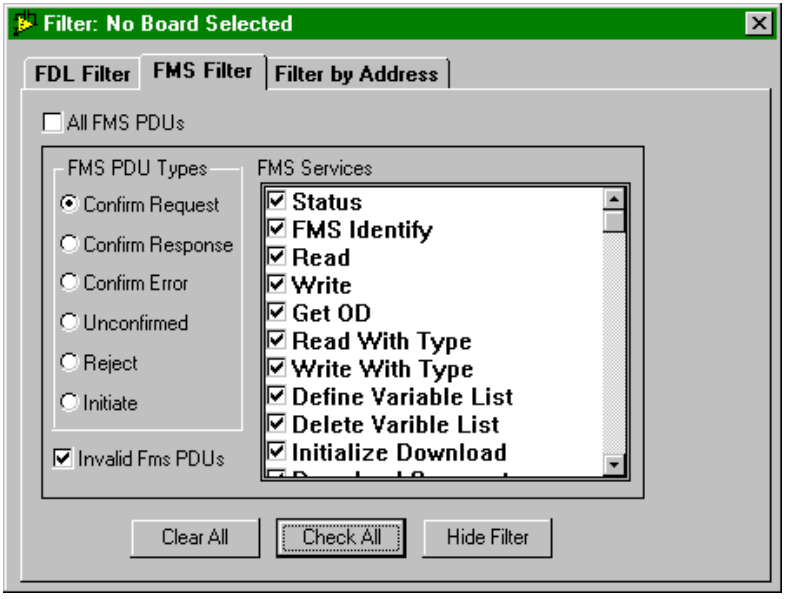


Figure 3-10. FMS Filter Tab

Filter by Address Tab

The **Filter by Address** tab filters data for a specific address or addresses. The NI-FBUS Monitor detects and lists all the currently detected addresses in the **Detected Addresses** box of the **Filter by Address** tab. The NI-FBUS Monitor captures data only for the selected addresses, and no other addresses. If you want to capture data for all addresses, click on the **Clear All** button to ensure that no other addresses are selected. If you want to configure the filter before capture, use the **User Defined** field to insert addresses into the address list. Click on the **Hex Addresses** checkbox to view the addresses in the **Detected Addresses** box in hexadecimal format. The **User Defined** field interprets data entered as hexadecimal data. Figure 3-11 shows the **Filter by Address** tab.

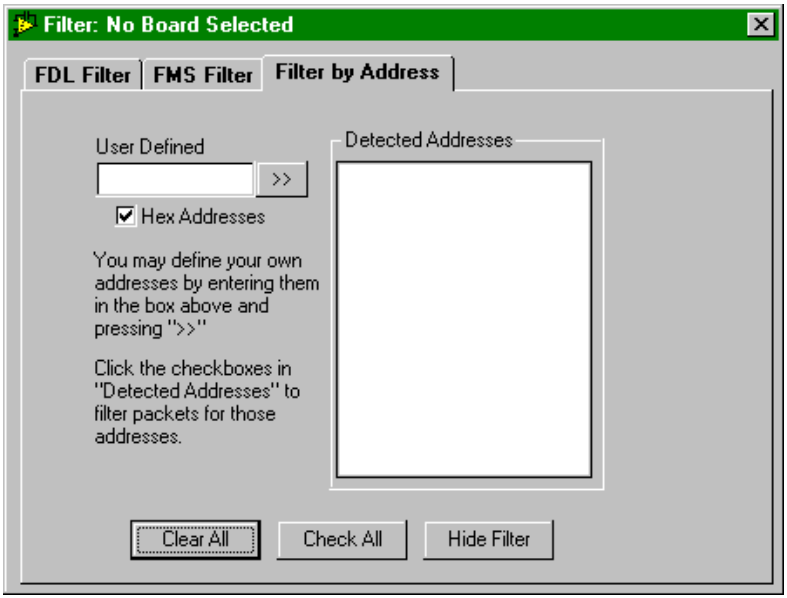


Figure 3-11. Filter by Address Tab

Settings Dialog Box

This dialog box contains optional settings for capturing data, displaying data, and changing the toolbar. To bring up the **Settings** dialog box, select **Settings** from the **Capture** menu.

Capture Settings Tab

The **Capture Settings** tab allows you to select the board to use, and to specify what you want the NI-FBUS Monitor to do after it receives the number of packets in the **Max num of packets** field. Figure 3-12 shows the **Capture Settings** tab.

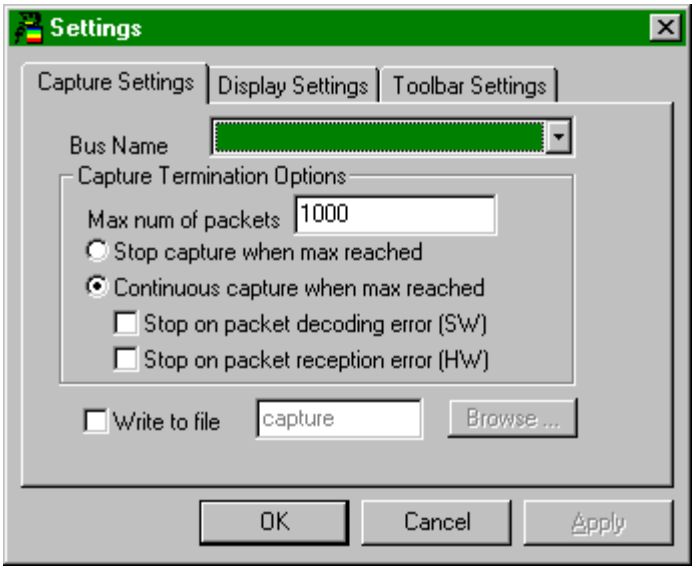


Figure 3-12. Capture Settings Tab

Following are descriptions of the options on the **Capture Settings** tab:

Bus Name — Allows you to select a fieldbus interface board.

Max num of packets — Allows you to enter the maximum number of packets you want the NI-FBUS Monitor to capture.

Stop capture when max reached — Stops capture of data after the NI-FBUS Monitor receives the **Max num of packets**.

Continuous capture when max reached — Continues capture after the NI-FBUS Monitor receives the **Max num of packets** by dumping the oldest packet from the captured data, and saving the newest packet.

Stop on packet decoding error (SW)	Stops continuous capture when a packet error occurs. Improper packet decoding format causes decoding errors.
Stop packet reception error (HW)	Stops continuous capture when a reception error occurs.
Write to file	Writes captured data directly to the file specified in the field. If you select **Continuous capture when max reached**, the NI-FBUS Monitor writes data to the file until you stop the capture. During a continuous capture, the number of packets retained in memory does not exceed the value in the **Max num of packets** field.

Display Settings Tab

The **Display Settings** tab allows you to select the colors of packet portions and the font the NI-FBUS Monitor uses to display data. To change a color, click on the color next to the field name. To change the font, click on the **Fonts...** button. To reset the colors and fonts to the NI-FBUS Monitor defaults, click on the **Default Colors** and **Default Font** buttons. Figure 3-13 shows the **Display Settings** tab.

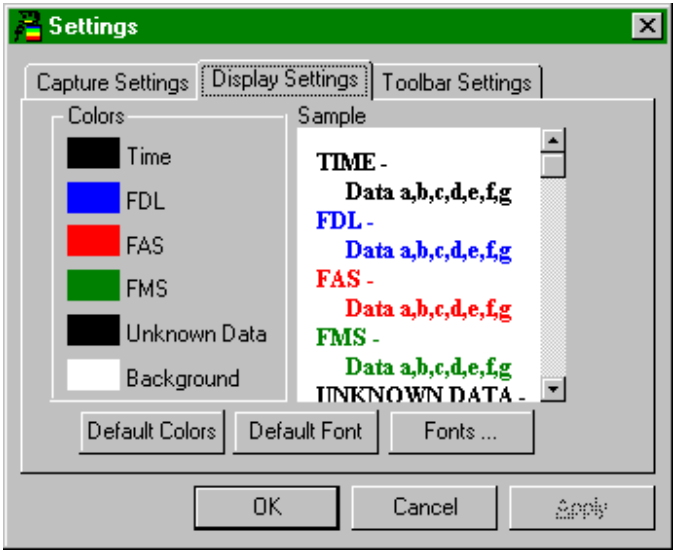


Figure 3-13. Display Settings Tab

Toolbar Settings Tab

The **Toolbar Settings** tab allows you to select which toolbars the NI-FBUS Monitor displays. Click on the **Big Buttons** checkbox to enlarge the standard toolbar buttons. Click on the **Show Tool Tips** checkbox to activate the tool tip help for most controls. To view the tips, pause your cursor over a control. Figure 3-14 shows the **Toolbar Settings** tab.

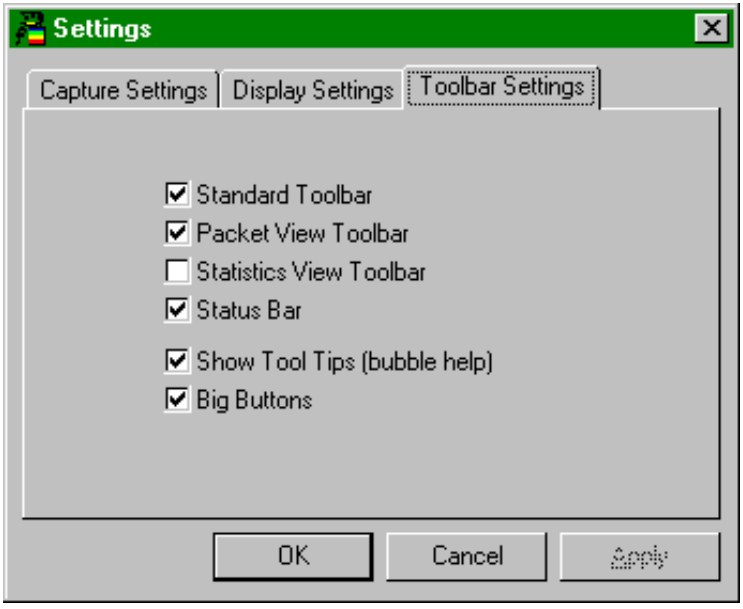


Figure 3-14. Toolbar Settings Tab

Chapter 4

How to Use the NI-FBUS Monitor

This chapter describes how to perform basic tasks with the NI-FBUS Monitor.

Starting the NI-FBUS Monitor

To launch the NI-FBUS Monitor application, double-click on the **Fieldbus Monitor** icon in the **Fieldbus Software** program group.

Starting Capture

To start capture, complete the following steps:

1. (Optional) Before starting a capture, you might want to open the filter to select specific packets to capture. To open the filter, select **Filter Settings** from the **Capture** menu or click on the **Filter Settings** button () on the standard toolbar. The filter appears as a dialog box that allows you to select which packets you want to capture. You do not have to configure the filter at the start of capture; you can configure the filter any time during the capture.
2. (Optional) To select a board to capture from, select **Capture»Settings...** and select the **Capture Settings** tab from the **Settings** dialog box.
3. To capture data, select **Start Capture** from the **Capture** menu or click on the **Start Capture** button on the standard toolbar.

Stopping Capture

You can stop data capture in one of two ways:

- Select **Stop Capture** from the **Capture** menu or click on the **Stop Capture** button () on the standard toolbar.
- Select **Capture»Settings...** and click on the **Capture Settings** tab in the **Settings** dialog box. Click on the **Stop capture when max reached** button to stop capture after the NI-FBUS Monitor receives the number of packets specified by **Max num of packets**.

Saving Data

To save the captured data, select **Save** from the **File** menu or click on the **Save Capture** button () on the standard toolbar. The NI-FBUS Monitor places the saved data in the current window. During the save operation, the NI-FBUS Monitor prompts you to save all of the captured data or just the filtered data, if there was any filtering after capture.

You can save data in two formats:

- `*.mon`, a binary format that the NI-FBUS Monitor can reload and refilter.
- `*.txt`, an ASCII format that text editors can load.

Finding Data

To find data, select **Find Data...** from the **Capture** menu or click on the **Find Data** button () on the standard toolbar. The **Find** dialog box, as shown in Figure 4-1, appears. If the NI-FBUS Monitor finds the data, it places an elliptical mark by the packet in which the data appears.

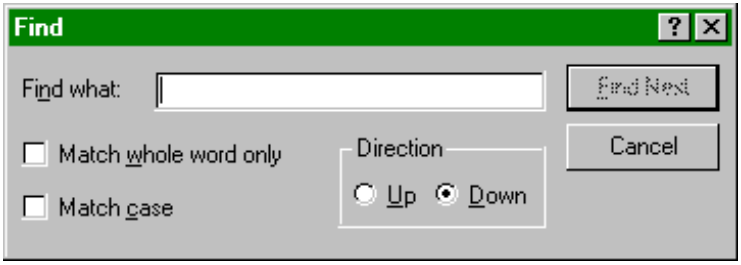


Figure 4-1. Find Dialog Box

Viewing Data

You can view data in a filter window, and switch between tabs to view all the information, or you can split the window and view all tabs at once.

To split the current Filter window into four panes, select **Window»Split Filter Window** or click on the **Split Filter Window** button ( ) on the standard toolbar. The split window allows you to look at different parts of the capture at the same time. Figure 4-2 shows an example Filter window screen split into four panes that display the data for this filter.

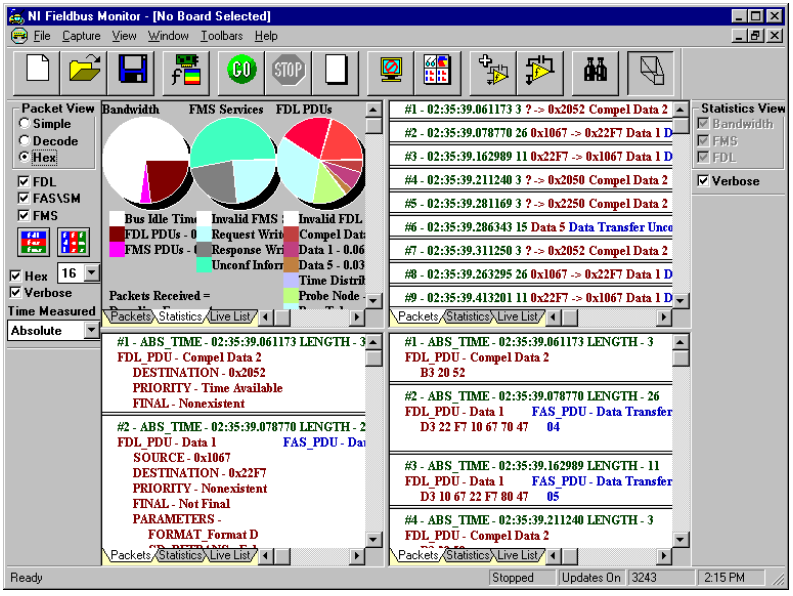


Figure 4-2. Example Filter Window Session

In Figure 4-2, the upper left pane displays statistical information about the packets on the bus, and the other three panes display the packets in the simple, decode, and hex modes, respectively. The toolbar affects the currently active view, so be sure to select a view by clicking in the view area before selecting the toolbar options.

Improving Performance

This section contains hints for improving the performance of the NI-FBUS Monitor on systems slower than the platform recommended mentioned in the *Recommended Minimum Platform* section of Chapter 1, *Introduction*.

Conserve Memory

Close unnecessary applications, and set **Max num of packets** on the **Capture Settings** tab to a low value (less than 500). To see the **Capture Settings** tab, select **Capture»Settings...** or click on the **Capture Settings** button on the standard toolbar.

Turn Live Updates Off

To prevent the NI-FBUS Monitor from updating its windows, deselect **Live Updates** on the **Capture** menu. On a slow computer, it can take a relatively long time (more than one second) to update the graphics in windows. During this time, you can lose many data packets. Lost packets are denoted by an asterisk (*) before the packet in the capture.

Filter Only for Needed Data

Pass Token (PT), Time Distribution (TD), Return Token (RT), Probe Node (PN), Probe Response (PR), and Compel Data (CD) packets occur frequently. You might not want to collect all of these, particularly the Probe Node (PN) packets.

No Split Windows

In general, the fewer open windows the NI-FBUS Monitor has to update, the faster the NI-FBUS Monitor performs.

Appendix

A

Hardware Specifications

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

Table A-1. Electrical Characteristic for the AT-FBUS

Characteristic	Specification
Power Requirement	750 mA Typical

Table A-2. Physical Characteristics for the AT-FBUS

Characteristic	Specification
Dimensions	10.7 by 19.1 cm (4.2 by 7.5 in.)
I/O Connector	DB-9 DSUB (1 per Fieldbus Channel)

Table A-3. Environmental Characteristics for the AT-FBUS

Characteristic	Specification
Operating Environment: Component Temperature Relative Humidity	 0° to 70° C 10% to 90%, Noncondensing
Storage Environment: Temperature Relative Humidity	 -40° to 125° C 5% to 90% Noncondensing
EMI	FCC Class B Verified

Table A-4. Electrical Characteristic for the PCMCIA-FBUS

Characteristic	Specification
Power Requirement	500 mA Typical

Table A-5. Physical Characteristics for the PCMCIA-FBUS

Characteristic	Specification
Dimensions	85.6 by 54.0 by 5.0 mm (3.4 by 2.1 by 0.4 in.)
I/O Connector	Cable with DB-9 DSUB and 5-Position Screw Terminal (1 per Fieldbus Channel)

Table A-6. Environmental Characteristics for the PCMCIA-FBUS

Characteristic	Specification
Operating Environment: Component Temperature Relative Humidity	 0° to 70° C 10% to 90% Noncondensing
Storage Environment: Temperature Relative Humidity	 -40° to 125° C 5% to 90% Noncondensing
EMI	FCC Class A Verified

Appendix

B

Pinout Information

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

One cable for either the PCMCIA-FBUS or AT-FBUS 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 one in your kit.

Figure B-1 shows the fieldbus connector pinout for both the AT-FBUS and PCMCIA-FBUS.

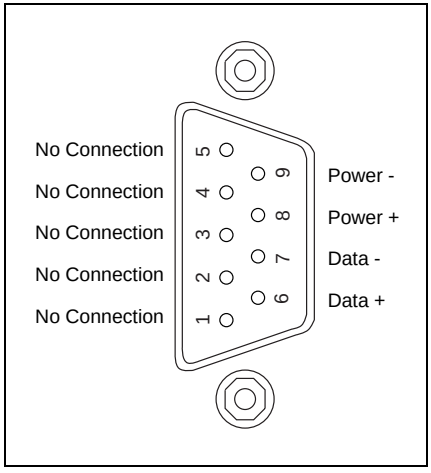


Figure B-1. Fieldbus Connector Pinout

The pinout of the fieldbus connector 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*.

Figure B-2 shows the PCMCIA-FBUS cable. An arrow on the cable points to pin 1 of the screw terminal block.

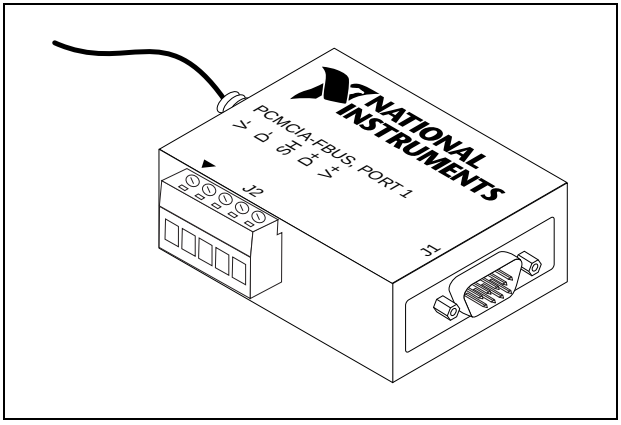


Figure B-2. PCMCIA-FBUS Cable

Figure B-3 shows J2, the screw terminal block pinout for the PCMCIA-FBUS cable.

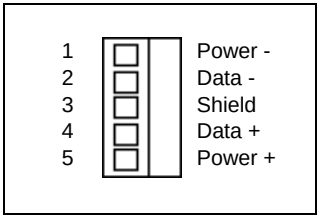


Figure B-3. Screw Terminal Block Pinout

All of the signals on the screw terminal block provide a direct connection to the 9-pin DSUB. Pins 2 and 4 of the J2 screw terminal block provide an alternate connection to the fieldbus. The screw terminal block is not a second, independent link. 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.

Appendix C

Customer Communication

For your convenience, this appendix contains forms to help you gather the information necessary to help us solve technical problems and a form you can use to comment on the product documentation. When you contact us, we need the information on the Technical Support Form and the configuration form, if your manual contains one, about your system configuration to answer your questions as quickly as possible.

National Instruments has technical assistance through electronic, fax, and telephone systems to quickly provide the information you need. Our electronic services include a bulletin board service, an FTP site, a Fax-on-Demand system, and e-mail support. If you have a hardware or software problem, first try the electronic support systems. If the information available on these systems does not answer your questions, we offer fax and telephone support through our technical support centers, which are staffed by application engineers.

Electronic Services

Bulletin Board Support

National Instruments has BBS and FTP sites dedicated for 24-hour support with a collection of files and documents to answer most common customer questions. From these sites, you can also download the latest instrument drivers, updates, and example programs. For recorded instructions on how to use the bulletin board and FTP services and for BBS automated information, call (512) 795-6990. You can access these services at:

United States: (512) 794-5422
Up to 14,400 baud, 8 data bits, 1 stop bit, no parity

United Kingdom: 01635 551422
Up to 9,600 baud, 8 data bits, 1 stop bit, no parity

France: 01 48 65 15 59
Up to 9,600 baud, 8 data bits, 1 stop bit, no parity

FTP Support

To access our FTP site, log on to our Internet host, `ftp.natinst.com`, as `anonymous` and use your Internet address, such as `joesmith@anywhere.com`, as your password. The support files and documents are located in the /`support` directories.

Fax-on-Demand Support

Fax-on-Demand is a 24-hour information retrieval system containing a library of documents on a wide range of technical information. You can access Fax-on-Demand from a touch-tone telephone at (512) 418-1111.

E-Mail Support (currently U.S. only)

You can submit technical support questions to the applications engineering team through e-mail at the Internet address listed below. Remember to include your name, address, and phone number so we can contact you with solutions and suggestions.

`support@natinst.com`

Telephone and Fax Support

National Instruments has branch offices all over the world. Use the list below to find the technical support number for your country. If there is no National Instruments office in your country, contact the source from which you purchased your software to obtain support.

	Telephone	Fax
Australia	03 9879 5166	03 9879 6277
Austria	0662 45 79 90 0	0662 45 79 90 19
Belgium	02 757 00 20	02 757 03 11
Canada (Ontario)	905 785 0085	905 785 0086
Canada (Quebec)	514 694 8521	514 694 4399
Denmark	45 76 26 00	45 76 26 02
Finland	09 527 2321	09 502 2930
France	01 48 14 24 24	01 48 14 24 14
Germany	089 741 31 30	089 714 60 35
Hong Kong	2645 3186	2686 8505
Israel	03 5734815	03 5734816
Italy	02 413091	02 41309215
Japan	03 5472 2970	03 5472 2977
Korea	02 596 7456	02 596 7455
Mexico	5 520 2635	5 520 3282
Netherlands	0348 433466	0348 430673
Norway	32 84 84 00	32 84 86 00
Singapore	2265886	2265887
Spain	91 640 0085	91 640 0533
Sweden	08 730 49 70	08 730 43 70
Switzerland	056 200 51 51	056 200 51 55
Taiwan	02 377 1200	02 737 4644
U.K.	01635 523545	01635 523154

Technical Support Form

Photocopy this form and update it each time you make changes to your software or hardware, and use the completed copy of this form as a reference for your current configuration. Completing this form accurately before contacting National Instruments for technical support helps our applications engineers answer your questions more efficiently.

If you are using any National Instruments hardware or software products related to this problem, include the configuration forms from their user manuals. Include additional pages if necessary.

Name _____

Title _____

Company _____

Address _____

_____

Fax (____) _____ Phone (___) _____

Computer brand _____ Model _____ Processor _____

Operating system (include version number) _____

Clock Speed _____ MHz RAM _____ MB Display adapter _____

Mouse _____yes ____ no Other adapters installed _____

Hard disk capacity _____ MB Brand _____

Instruments used _____

National Instruments hardware product model _____ Revision _____

Configuration _____

National Instruments software product _____ Version _____

Configuration _____

The problem is _____

_____

_____

_____

List any error messages _____

_____

_____

The following steps will reproduce the problem _____

_____

_____

Hardware and Software Configuration Form

Record the settings and revisions of your hardware and software on the line to the right of each item. Complete a new copy of this form each time you revise your software or hardware configuration, and use this form as a reference for your current configuration. Completing this form accurately before contacting National Instruments for technical support helps our applications engineers answer your questions more efficiently.

National Instruments Products

Model and Revision of FBUS Hardware _____

Interrupt Level of Hardware _____

Base I/O Address of Hardware _____

NI-FBUS Monitor Software Version _____

Other Products

Computer Make and Model _____

Microprocessor _____

Clock Frequency _____

Type of Video Board Installed _____

Operating System _____

Operating System Version _____

Operating System Mode _____

Programming Language _____

Programming Language Version _____

Other Boards in System _____

Base I/O Address of Other Boards _____

DMA Channels of Other Boards _____

Interrupt Level of Other Boards _____

Documentation Comment Form

National Instruments encourages you to comment on the documentation supplied with our products. This information helps us provide quality products to meet your needs.

Title: *NI-FBUS Monitor User Manual*

Edition Date: March 1997

Part Number: 321018B-01

Please comment on the completeness, clarity, and organization of the manual.

_____

_____

_____

_____

_____

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If you find errors in the manual, please record the page numbers and describe the errors.

_____

_____

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Thank you for your help.

Name _____

Title _____

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Phone (_____) _____ Fax (____) _____

Mail to: Technical Publications
National Instruments Corporation
6504 Bridge Point Parkway
Austin, TX 78730-5039

Fax to: Technical Publications
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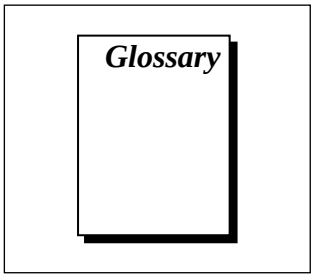
(512) 794-5678



Prefix	Meaning	Value
n-	nano-	10^{-9}
µ-	micro-	10^{-6}
m-	milli-	10^{-3}
M-	mega-	10^{6}

A

alive	Active and functioning on the fieldbus.
ASCII	American Standard Code for Information Interchange.
asynchronous	Communication that occurs at times which are not predetermined.
AT-compatible	Compatible with the 16-bit Industry Standard Architecture.

B

B	Bytes.
bandwidth	The capacity of a bus to transmit data.
binary format	A file format composed of ones and zeroes for computer use.
bus	A pathway for data between devices.

bus noise	Imperfections in data transfer caused by cable length or interference from external factors.

C

capture document	An NI-FBUS monitor document in memory that contains all the settings and data of your capture.
CD	Compel Data.
channel	A pin or wire lead to which you apply or from which you read the analog or digital signal.
checksum	A method used to ensure that data is transmitted correctly.
Communication Stack	The hierarchy of layers in a layered communications model that performs the services required to interface the User Application to the Physical Layer of the fieldbus.
CPU	Central processing unit.

D

data packet	A unit of data of a certain size.
dead	Inactive or not functioning on the fieldbus.
DMA	Direct Memory Access.
DRAM	Dynamic Random Access Memory. Memory that requires electricity and refreshing to hold data.

F

FAS	See *Fieldbus Access Sublayer*.
FDL	See *Fieldbus Data Link layer*.
fieldbus	An all-digital, two-way communication system that connects control systems to instrumentation.

Fieldbus Access Sublayer	The layer of the communication stack that provides an interface between the DLL and layer 7 of the OSI model. The FAS provides communication services such as client/server, publisher/subscriber and event distribution.
fieldbus address	Location of a board or device on the fieldbus; the fieldbus node address.
Fieldbus Data Link layer	The second lowest layer of the fieldbus communications stack.
Fieldbus Messaging Specification layer	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.
filter	A software screening device you configure to make the NI-FBUS Monitor capture only certain types of data that move across the fieldbus.
Filter window	A window inside the main window of the NI-FBUS Monitor that shows captured data with selected data filtered out.
FMS	See *Fieldbus Messaging Specification layer*.

H

hex	Hexadecimal.
Hz	Hertz.

I

I/O	Input/output.
IRQ	Interrupt request.
ISA	Industry Standard Architecture.

L

layer	See *Communication Stack.*

M

MDI	See *Multiple Document Interface.*
Multiple Document Interface	A software interface that contains many smaller windows open concurrently that display data from different sources.

P

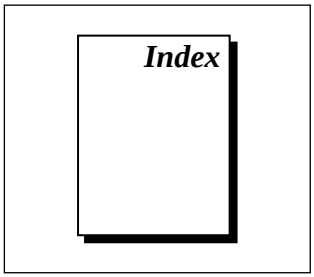
PC	Personal Computer.
PDU	Protocol Data Unit
PN	Probe Node.
PR	Probe Response.
processor	The central controlling and computing part of a computer.
protocol error	An error in data transfer that has to do with the way the data is sent.
PT	Pass Token

R

RAM	Random Access Memory
RT	Return Token.

T

TD	Time Distribution.



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