Getting Started with Your PCI-Based MXI-2 Interface for Windows 95/NT

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Federal Communications Commission

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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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About This Manual

This manual contains instructions for installing and configuring the National Instruments PCI-based MXI-2 interface kit for Windows 95 and Windows NT. This manual is meant to be used with the *MXI-2 Configuration Reference Manual*.

Your kit contains either a VXI-MXI-2 or a VME-MXI-2, which plugs into your VXI or VME mainframe and links your computer to the VXIbus or VMEbus, respectively. The kit also contains either a PCI-MXI-2 or a PXI-8320 interface board, which links your PCI-based or PXI/CompactPCI computer to the MXIbus. Your software consists of the NI-VXI bus interface software, which is fully VXI*plug&play* compliant, and the NI-VISA API, which is the National Instruments implementation of the VISA I/O software standard on which all VXI*plug&play* software components are based.

Organization of This Manual

This manual is organized as follows:

- Chapter 1, *Introduction*, describes your MXI-2 interface kit, lists what you need to get started, and includes a brief description of the hardware and software.
- Chapter 2, *Setup*, contains the instructions to set up your VXI or VME system using the MXI-2 hardware and NI-VXI/VISA software.
- Chapter 3, *Developing Your Application*, discusses the software utilities that you can use to get started developing applications that use the NI-VXI/VISA driver.
- Appendix A, *Default Settings*, summarizes the hardware and software default settings for the hardware and software in your kit.
- Appendix B, *Common Questions*, addresses common questions you may have about using the NI-VXI/VISA software on the PCI-MXI-2 or PXI-8320 platform.
- 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* alphabetically lists topics covered in this manual, including the page where you can find the topic.

Conventions Used in This Manual

The following conventions are used in this manual:

<> Angle brackets enclose the name of a key on the keyboard (for example, <Enter>).

- A hyphen between two or more key names enclosed in angle brackets denotes that you should simultaneously press the named keys–for example, <Control-Alt-Delete>.

♦ The ♦ symbol indicates that the text following it applies only to a specific product, a specific operating system, or a specific software version.

☞ This icon to the left of bold italicized text denotes a note, which alerts you to important information.

⚠ This icon to the left of bold italicized text denotes a caution, which advises you of precautions to take to avoid injury, data loss, or a system crash.

bold Bold text denotes the names of menus, menu items, parameters, dialog box, dialog box buttons or options.

bold italic Bold italic text denotes a note, caution, or warning.

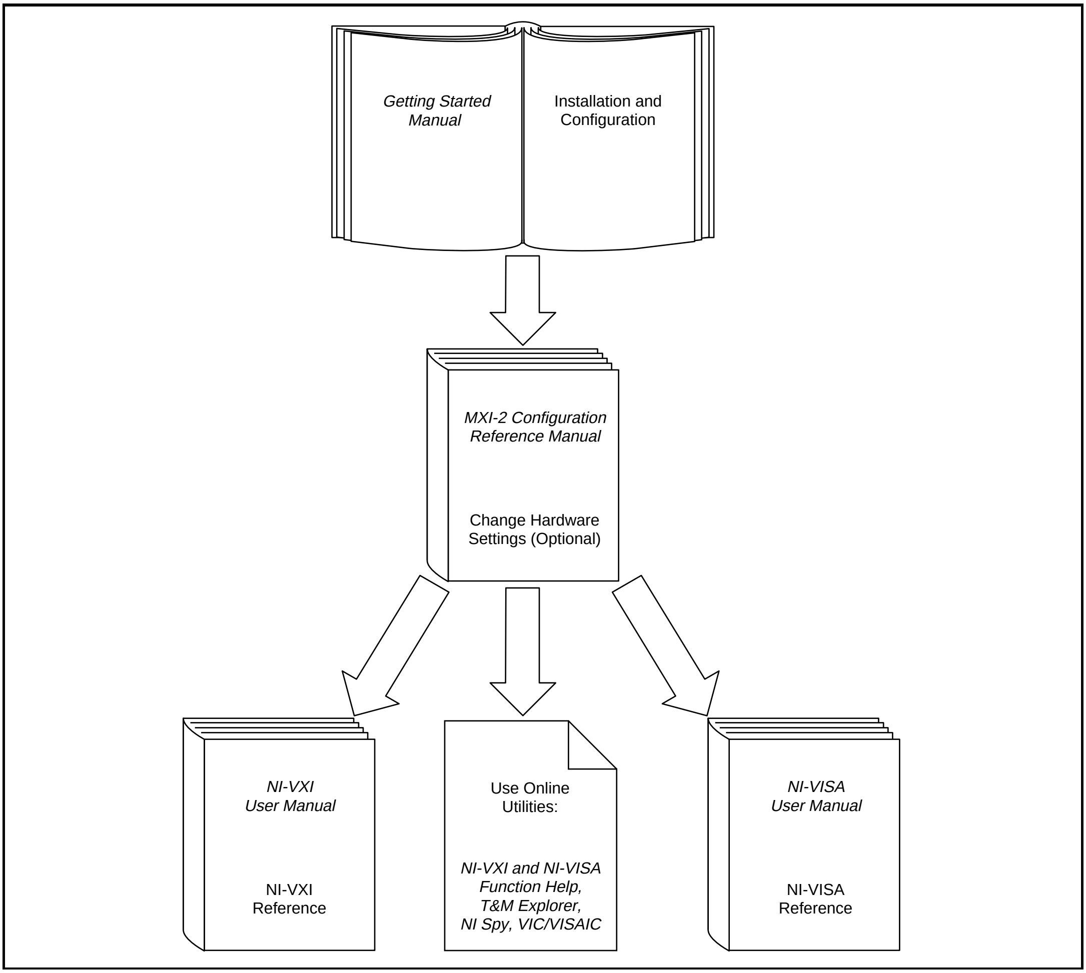
`bold monospace` Bold text in this font denotes the messages and responses that the computer automatically prints to the screen.

italic Italic text denotes emphasis, a cross reference, or an introduction to a key concept.

`monospace` Text in this font denotes text or characters that should be literally entered 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.

The *Glossary* lists abbreviations, acronyms, metric prefixes, mnemonics, symbols, and terms.

How to Use This Documentation Set


Getting Started Manual
Installation and Configuration
MXI-2 Configuration Reference Manual
Change Hardware Settings (Optional)
NI-VXI User Manual
NI-VXI Reference
Use Online Utilities:
NI-VXI and NI-VISA Function Help, T&M Explorer, NI Spy, VIC/VISAIC
NI-VISA User Manual
NI-VISA Reference

This getting started manual contains an overview of the MXI-2 hardware and the NI-VXI/VISA software, guides you through setting up your kit, and helps you get started with application development. You can also use this manual as a reference for the hardware and software default settings and to find the answers for commonly asked questions.

The *MXI-2 Configuration Reference Manual* contains information on configuring, installing, and cabling your MXI-2 hardware. You will need to use this manual in conjunction with the getting started manual.

When you have successfully set up your system, you can begin to develop applications in NI-VXI and/or NI-VISA. The *NI-VXI User Manual* presents the concepts of VXI and prepares you for detailed explanations of the NI-VXI functions. Study the descriptions of each function given in the online help utility to fully understand the purpose and syntax of each function. This manual is available in the `c:\NIVXI\manuals` directory under the name `NIVXIUM.pdf`. Use the Acrobat Reader program, Version 3 or later, to open this file. You can also access the NI-VXI online help for Windows 95/NT in the `NIVXI` folder.

Refer to the *NI-VISA User Manual* to learn about VISA and how to use it in your system. The NI-VISA online help describes the attributes, events, and operations you can use in NI-VISA. The user manual is available in the `c:\VXIpnp\`*`os`*`\NIvisa\manuals` directory (where *`os`* is either `Win95` or `WinNT`) under the name `NIVISAUM.pdf`. Use the Acrobat Reader program, Version 3 or later, to open this file.

Related Documentation

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

- ANSI/IEEE Standard 1014-1987, *IEEE Standard for a Versatile Backplane Bus: VMEbus*
- ANSI/IEEE Standard 1155-1993, *IEEE VMEbus Extensions for Instrumentation: VXIbus*
- ANSI/VITA 1-1994, *VME64*
- *CompactPCI Specification*, Revision 2.0, PCI Industrial Computers Manufacturers Group
- *Multisystem Extension Interface Bus Specification*, Version 2.0, National Instruments Corporation
- *PCI Local Bus Specification*, Revision 2.1, PCI Special Interest Group
- *PXI Specification*, Revision 1.0, National Instruments Corporation
- *VME-MXI-2 User Manual*, National Instruments Corporation
- *VXI-MXI-2 User Manual*, National Instruments Corporation
- VXI-6, *VXIbus Mainframe Extender Specification*, Rev. 1.0, VXIbus Consortium

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 Appendix C, *Customer Communication*, at the end of this manual.

Chapter 1

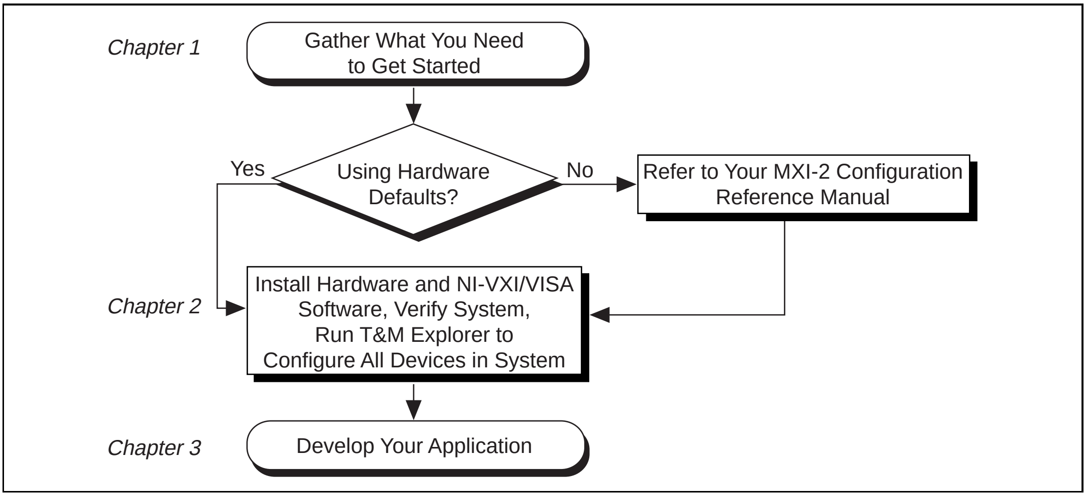
Introduction

This chapter describes your MXI-2 interface kit, lists what you need to get started, and includes a brief description of the hardware and software.

This manual uses the term *VXI/VME-MXI-2* when information applies to either the VXI-MXI-2 or the VME-MXI-2. This manual also uses the term *NI-VXI/VISA* when software information applies to both NI-VXI and NI-VISA, and the term *Windows 95/NT* when information applies to both operating systems.

The following flowchart shows where to turn for more details on configuring and using the hardware and software.

How to Use This Manual


Chapter 1
Gather What You Need to Get Started
Yes
Using Hardware Defaults?
No
Refer to Your MXI-2 Configuration Reference Manual
Chapter 2
Install Hardware and NI-VXI/VISA Software, Verify System, Run T&M Explorer to Configure All Devices in System
Chapter 3
Develop Your Application

Notice that for hardware configuration, you should refer to the *MXI-2 Configuration Reference Manual* for a full description of how to configure and install any of the MXI-2 boards and for an overview of MXI-2 itself. Then return to this manual for further information.

What You Need to Get Started

❑ A PCI-based computer or PXI/CompactPCI chassis running either Windows 95 or Windows NT

❑ VXIbus or VMEbus mainframe

❑ PCI-MXI-2 or PXI-8320 interface board

❑ VXI-MXI-2, VXI-MXI-2/B, or VME-MXI-2 interface module

❑ MXI-2 cable

❑ National Instruments software media

PCI-Based MXI-2 Interface Kit Overview

The interface kits described in this manual link a PCI-based computer or a PXI or CompactPCI chassis directly to the VXIbus or VMEbus using the high-speed Multisystem eXtension Interface bus (MXI-2). The MXI-2 kits, which include the NI-VXI/VISA software for Windows 95/NT, are as follows:

- VXI-PCI8000, containing a PCI-MXI-2 and a C-size or B-size VXI-MXI-2
- VXI-PXI8000, containing a PXI-8320 and a C-size or B-size VXI-MXI-2
- VME-PCI8000, containing a PCI-MXI-2 and a VME-MXI-2
- VME-PXI8000, containing a PXI-8320 and a VME-MXI-2

A PCI-based computer equipped with a VXI-PCI8000 interface, or a PXI/CompactPCI chassis equipped with a VXI-PXI8000 interface, can function as a VXI Commander and Resource Manager. A PCI-based computer equipped with a VME-PCI8000 interface, or a PXI/CompactPCI chassis equipped with a VME-PXI8000, can function as a VMEbus master and/or slave device. The MXI-2 interface kit makes your computer or chassis behave as though it were plugged directly into the VXI/VME backplane as an embedded CPU VXI/VME module.

The software included with the kits is for *x*86/Pentium-based computers.

Hardware Description

The PCI-MXI-2 is a half-size, PCI-compatible plug-in circuit board that plugs into one of the expansion slots in your PCI-based computer. The PXI-8320 is a 3U-size, PXI/CompactPCI-compatible circuit board that plugs into one of the peripheral slots in your PXI/CompactPCI chassis. Both boards link your computer directly to the MXIbus and vice versa.

Because the PCI-MXI-2 and PXI-8320 use the same communication register set that other VXIbus message-based devices use, other MXIbus devices view your board as a VXIbus device. The PCI-MXI-2 and PXI-8320 can also function as the MXIbus System Controller and can terminate the MXIbus signals directly. In addition, you can have up to 16 MB of onboard DRAM on your board that can be shared with the MXIbus and VXI/VMEbus and used as a dedicated data buffer.

The VXI-MXI-2 module is an extended-class, register-based VXIbus device with optional VXIbus Slot 0 capability so that it can reside in any slot in a C-size or D-size chassis. Optionally, you can use the VXI-MXI-2/B, which can reside in any B-size VXIbus slot.

☞ **Note:** ***D-size VXI mainframes have connections for a P3 connector. The VXI-MXI-2, however, does not have this connector and, if configured as a Slot 0 controller, cannot provide the necessary control for VXI devices that need P3 support.***

The VXI-MXI-2 uses address mapping to convert MXIbus cycles into VXIbus cycles and vice versa. By connecting to the PCI-MXI-2 or PXI-8320 board, the VXI-MXI-2 links the PCI bus or the PXI/CompactPCI bus to the VXIbus. The VXI-MXI-2 can automatically determine whether it is located in VXI Slot 0 and/or if it is the MXIbus System Controller.

The VME-MXI-2 module is a single-slot, double-height VMEbus device with optional VMEbus System Controller functions. It uses address mapping to convert MXIbus cycles into VMEbus cycles and vice versa, just like the VXI-MXI-2. By connecting to the PCI-MXI-2 or PXI-8320 board, it links the PCI bus or the PXI/CompactPCI bus to the VMEbus. The VME-MXI-2 can automatically determine if it is located in the first slot of a VMEbus chassis and if it is the MXIbus System Controller.

Also, the VXI/VME-MXI-2 automatically terminates the MXIbus if installed as the first or last device in the MXIbus. If installed in the middle of the MXIbus, the VXI/VME-MXI-2 automatically disables MXIbus termination. In addition, you can have up to 64 MB of onboard DRAM on the VXI/VME-MXI-2 module that either can be shared with the VXI/VMEbus and MXIbus or used as a dedicated data buffer.

VME Users

When used with a VXI-MXI-2, Resman identifies and configures the VXI devices, including the VXI-MXI-2. When used with a VME-MXI-2, Resman configures the VME-MXI-2 to allow the PCI-MXI-2 or PXI-8320 to access devices in the VME chassis. Resman does not configure VME devices. The VME specification does not include the initialization and configuration procedures that the VXI specification requires.

If you want to include VME devices in your system, you can enter information about your VME devices into the T&M Explorer utility using the **Add Device Wizard**. Resman can then properly configure the various device-specific VME address spaces and VME interrupt lines. Notice that the VME-MXI-2 itself does conform to the VXIbus register set and is therefore configured automatically by Resman.

For each address space in which your device has memory, you must create a separate pseudo-device entry with a logical address between 256 and 511. For example, a VME device with memory in both A24 and A32 spaces would require two entries. You can also specify which interrupt level(s) the device uses. Interrupt levels cannot be shared by VXI and VME devices. You can then access the device from NI-VXI/VISA just as you would a VXI device, by specifying the address space and the offset from the base at which you have configured it. NI-VISA support for VME devices includes the register access operations (both high-level and low-level) and the block move operations, as well as the ability to receive interrupts.

Software Description

The NI-VXI/VISA bus interface software includes a Resource Manager, an interactive configuration and troubleshooting program, a comprehensive library of software routines for VXI/VME programming, a logging utility you can use for debugging, and graphical interactive control programs for interacting with VXI/VME or VISA. You can use this software to seamlessly program multiple-mainframe configurations and have software compatibility across a variety of controller platforms.

NI-VISA has a comprehensive library of software routines not only for VXI/VME programming, but also for GPIB, GPIB-VXI, and serial. You can use this software to program instruments connected via different types of interfaces.

T&M Explorer helps merge NI-VXI and NI-VISA closer together. You use T&M Explorer to view your entire T&M system and configure various components, whether they are VXI, GPIB, or Serial devices. This utility not only takes the place of the NI-VXI VXIedit/VXItedit and NI-VISA VISAconf configuration utilities, but it also adopts the functionality of the NI-DAQ Configuration utility so you can configure National Instruments VXI-DAQ cards. You can also easily add VME devices to your system with T&M Explorer and view them on a screen display along with the rest of your system.

T&M Explorer also features various options of how to run the Resource Manager (Resman). You can still execute Resman independently to configure your instruments after a power cycle. But you can also perform resource manager operations directly from T&M Explorer or configure it to run Resman automatically at startup.

The NI Spy utility tracks the calls your application makes to National Instruments T&M drivers, including NI-VXI, NI-VISA, and NI-488.2. NI Spy helps you debug your application by clearly highlighting the functions that return errors. You can let NI Spy keep a log of your program’s calls to these drivers so that you can check them for errors at your convenience.

Software Configurations

There are three software configurations described in this manual:

- NI-VXI for Windows 95—this is a fully 32-bit native Plug and Play driver for Windows 95. You can run *only* 32-bit applications with this driver. Applications developed using this driver run with NI-VXI for Windows NT without the need to recompile.
- NI-VXI for Windows NT—this is a 32-bit driver designed for Windows NT. You can use this version to develop and run 32-bit applications for Windows 95/NT.

- NI-VISA for Windows 95/NT—this is a 32-bit driver designed for Windows 95/NT. Note that for VXI support, the NI-VXI driver must be installed. You can use this driver to develop and run 32-bit applications for Windows 95/NT.

National Instruments Application Software

In addition to the NI-VXI/VISA software, you can use the National Instruments LabVIEW and LabWindows®/CVI application programs and instrument drivers to ease your programming task. These standardized programs match the modular virtual instrument capability of VXI and can reduce your VXI/VME software development time. These programs are fully VXI*plug&play* compliant and feature extensive libraries of VXI instrument drivers written to take full advantage of direct VXI control. LabVIEW and LabWindows/CVI include all the tools needed for instrument control, data acquisition, analysis, and presentation.

LabVIEW is a complete programming environment that departs from the sequential nature of traditional programming languages and features a graphical programming environment.

LabWindows/CVI is an interactive C development environment for building test and measurement and instrument control systems. It includes interactive code-generation tools and a graphical editor for building custom user interfaces.

If you want to use either of these application programs, install them during the NI-VXI/VISA software installation. Both LabVIEW and LabWindows/CVI integrate the VXI and VISA libraries that are required to support your PCI-based MXI-2 products. You also get hundreds of complete instrument drivers, which are modular, source-code programs that handle the communication with your instrument to speed your application development.

Chapter 2

Setup

This chapter contains the instructions to set up your VXI or VME system using the MXI-2 hardware and NI-VXI/VISA software.

Configuring the Hardware

This section contains basic information about configuring your MXI-2 hardware.

♦ **Windows 95 users**—We recommend that you install the NI-VXI software for Windows 95 first, and then install the hardware.

The default settings for your MXI-2 hardware are acceptable for most typical applications. Refer to Appendix A, *Default Settings*, for a complete listing of the hardware and software default settings.

The *MXI-2 Configuration Reference Manual* fully describes the configuration and installation of each MXI-2 board discussed in this getting started manual. Refer to the *MXI-2 Configuration Reference Manual* if you want to try a different hardware configuration, or if you would like more information on a particular setting.

Use the T&M Explorer utility in NI-VXI/VISA to change any of the configuration settings for the PCI-MXI-2 or PXI-8320. For information on the software, including optional settings, use T&M Explorer and its online help. Use the Windows **Start** menu to open either the NI-VXI or NI-VISA program group and select T&M Explorer. To access the T&M Explorer online help, open the **Help** menu and select **Help Topics**.

Installing the Hardware

This section summarizes how to install your MXI-2 hardware.

Installing Your PCI-Based MXI-2 Interface

You received either a PCI-MXI-2 or a PXI-8320 in your kit.

Caution: ***To guard against electrostatic discharge, touch the antistatic plastic package to a metal part of your computer or chassis before removing the board from the package. Your computer or chassis should be plugged in but powered off.***

Install the PCI-MXI-2 or PXI-8320 in an available peripheral slot in your PCI-based computer or PXI/CompactPCI chassis. For more information, refer to the PCI-MXI-2 or PXI-8320 chapter in the *MXI-2 Configuration Reference Manual*.

Installing Your Mainframe Extender

You also received either a VXI-MXI-2, VXI-MXI-2/B, or VME-MXI-2 in your kit.

Caution: ***To guard against electrostatic discharge, touch the antistatic plastic package to a metal part of your chassis before removing the module from the package. Your VXI or VME chassis should be plugged in but powered off.***

Install the VXI-MXI-2 or VXI-MXI-2/B in the first slot of a VXI chassis, or install the VME-MXI-2 in the first slot of a VME chassis.

The VXI/VME-MXI-2 default configuration automatically detects whether it should be the VXI/VMEbus system controller. The VXI/VMEbus system controllers operate certain VXI/VMEbus lines as required for VXI/VME systems. Verify that any other VXI/VME devices with system controller capability that are located in the same chassis are not configured as system controller.

Caution: ***Having more than one device configured as system controller can damage the VXI/VME system.***

For VXI systems that include VME devices, ensure that the VME devices are not configured in the upper 16 KB (starting from 0xC000) of the A16 address space. This region is reserved for VXI device configuration registers, which are used for initializing, configuring, and interacting with VXI devices. The PCI-MXI-2 or PXI-8320 and VME-MXI-2 also use this region for this purpose.

Also ensure that no VXI devices in your system are configured for either logical addresses 0 or 1. These are the default configurations for the PCI-MXI-2 or PXI-8320 and the VXI-MXI-2, respectively.

For more information, refer to the VXI-MXI-2, VXI-MXI-2/B, or VME-MXI-2 chapter in the *MXI-2 Configuration Reference Manual*.

Connecting the MXI-2 Cable Properly

By default, the PCI-MXI-2 or PXI-8320 automatically detects whether it should be the system controller on the MXIbus. Verify that the correct cable end labeled *Connect This End To Device Closest To MXIbus Controller In This Daisy Chain* is attached securely to the PCI-MXI-2 or PXI-8320. The cable must be connected in this manner so that the MXI board can correctly detect whether it should be the system controller on the MXIbus. Attach the other end of the cable to the VXI/VME-MXI-2.

Installing the Software for Windows 95/NT

Use the Setup program that came with your NI-VXI/VISA software to install the entire software package or a software update, or to reinstall software in the event that your files were accidentally erased. The Setup program works in the same manner for either Windows 95 or Windows NT. You can install NI-VXI with or without NI-VISA.

Some of the utilities rely on the LabWindows/CVI Run-Time Engine. This software is installed, if necessary, during the NI-VXI/VISA installation.

Depending on the type of installation you choose, you may need up to 20 MB of free space available to accommodate the NI-VXI/VISA software. If you choose the **Custom** installation method, Setup displays the amount of memory required for the options you select.

To be compliant with VXI*plug&play* specifications, a VXI controller must provide the VISA I/O driver library standardized by VXI*plug&play*. VISA ensures that your controller can run all VXI*plug&play*-compatible software now and in the future.

The NI-VISA software in this kit is compatible with the WIN95/GWIN95 and WINNT/GWINNT frameworks. With NI-VISA installed on your computer, you can run any VXI*plug&play* software that is compatible with these frameworks. This includes instrument drivers and executable soft front panel software that are included with VXI*plug&play*-compatible instruments from a variety of vendors.

Preparing Your System (PCI-MXI-2 Only)

If you are currently using either the NI-VXI software for DOS/Windows 3.*x* or the NI-VXI Windows 95 Upgrade, you must remove it before installing the new software. You cannot have both the 16-bit and the 32-bit versions of NI-VXI installed at the same time.

☞ **Note:** ***If you plan to run both 16-bit and 32-bit applications, you should use the NI-VXI Windows 95 Upgrade version instead.***

If you have been using your PCI-MXI-2 under Windows 95 with either the NI-VXI software for DOS/Windows 3.*x* or the NI-VXI Windows 95 Upgrade, you need to remove the Plug and Play information from the Windows 95 Device Manager before installing the new NI-VXI software.

Follow these steps to remove the PCI-MXI-2 information.

1. Double-click on the **System** icon under **Start»Settings»Control Panel**.
2. Select the **Device Manager** tab from the **System Properties** dialog that appears.
3. Click on the **View devices by type** button and double-click on the **Other Devices** icon.
4. Select the PCI-MXI-2 from the list of devices under **Other Devices**. It will appear under the name **PCI Card** and will have a circled exclamation point through the **?** (question mark) icon.
5. Click on the **Remove** button.
6. Click **OK** to exit the Device Manager after removing the device information.

Installing the Software

This section describes how to install the 32-bit NI-VXI/VISA software. The Setup program works the same whether you are using Windows 95 or Windows NT. Please carefully read these directions along with any messages on the screen before making your selections.

You can quit the Setup program at any time by pressing the **Cancel** button.

Setup is an interactive, self-guiding program that installs the NI-VXI/VISA software and configures your system to use the software with the PCI-MXI-2 or PXI-8320. Follow these steps to perform the installation.

1. Insert disk 1 of your set of disks labeled *NI-VXI/VISA for PCI-Based MXI-2 for Windows xx* (where *xx* is either 95 or NT).
2. Select **Run...** from the **Start** menu and enter the following text, where *X* is your floppy drive (usually A)

   `X:\setup.exe`

   and press <Enter>.
3. Click on the **Next** button at the **Welcome** screen to start the installation and accept the license agreement.

☞ **Note:** ***If Setup detects a 16-bit (DOS or Windows 3.x) version of the NI-VXI software, it prompts you to remove it. Setup will quit so you can uninstall the old software. If you have a previous 32-bit (Windows 95 or Windows NT) version of the NI-VXI software installed, Setup installs the new version over the previous version.***

⚠ **Caution:** ***If you want to keep the manufacturer/model name tables or the VME device configuration from a previous installation, be sure to back them up before starting Setup.***

4. Select the type of installation from the **Choose Setup** screen.
   - **Express** setup is the fastest and simplest installation option. This option installs all the NI-VXI/VISA software in default directories without prompting you to make any further choices.
   - **Typical** setup prompts you to make high-level choices of which driver(s) to install and the destination directories.
   - **Custom** setup gives you complete control over which files and utilities you want installed on your system. This option is recommended for advanced users.
5. The **Express** setup completes without further questions. Follow the prompts if you select either the **Typical** or the **Custom** setup options. The final prompt displays the choices you made concerning applications, support, and destination directories. Click on the **Next** button to begin the installation.
6. Setup now copies the necessary files to your hard drive and creates program icons.

Completing the Software Installation

1. Please review the information in any `README` files that Setup prompts you to read.
2. When the installation process completes, you must reboot your computer for the changes to take effect. The NI-VXI driver is loaded at this time.
3. If you backed up the manufacturer and model name files, restore them to the `TBL` subdirectory of your NI-VXI directory before running T&M Explorer.
4. After you install the NI-VXI/VISA software, run the T&M Explorer program. It will prompt you to run Resman, the National Instruments Resource Manager. You must run Resman every time the chassis power is cycled so that your application can access devices in the VXI/VME chassis. You can also configure T&M Explorer to run Resman automatically at every computer startup.
5. After you run Resman, you are ready to use T&M Explorer to interactively configure the National Instruments hardware in your system. Use the right-click help for information about the various configuration options.

Verifying Your System Configuration

After you finish configuring the system through T&M Explorer, verify the system configuration through one of the interactive control utilities. Use VIC under NI-VXI or VISAIC under NI-VISA.

For more details about the utilities in NI-VXI/VISA, refer to Chapter 3, *Developing Your Application*.

Chapter 3

Developing Your Application

This chapter discusses the software utilities you can use to start developing applications that use the NI-VXI/VISA driver.

After installing the driver software, you can begin to develop your VXI or VISA application software. Be sure to check the `README.txt` file for the latest application development notes and changes.

Your software includes several utilities to assist you in your system development. These include T&M Explorer, Resman, NI Spy, VISAIC, and VIC. You can also access several examples to learn how to use NI-VISA or NI-VXI for certain tasks. Each of these components assists you with one of four steps of development: configuration, device interaction, programming, and debugging.

After installation, you can access these utilities through the Windows Start menu. Open either the NI-VXI or NI-VISA program group and select the utility you want to use.

Configuration

The configuration utilities in your kit are T&M Explorer and Resman. Resman is the application that performs VXI Resource Manager functions as described in the VXIbus specification. Its most important functions include configuring all devices on the VXI backplane for operation and allocating memory for devices that request it.

☞ **Note:** ***Power cycling resets all devices, so you need to run Resman to reconfigure them every time chassis power is cycled.***

T&M Explorer presents a graphical display of your entire test and measurement system to help you configure various components. When you launch T&M Explorer, you see all your VXI, GPIB, GPIB-VXI, and serial devices on the screen. You can view the properties (such as logical address, address space used, primary address, and so on) of each device by right-clicking on the device in the tree. When you view the properties of most National Instruments devices, you can configure the hardware settings directly in the property pages.

T&M Explorer and Resman are designed to work together. You can run the Resource Manager through T&M Explorer by either clicking on the **Run Resman** button on the toolbar, or by selecting **VXI Resource Manager** from the **Tools** menu. From the **Options** dialog in the **Tools** menu, you can also configure T&M Explorer to run Resman automatically when the computer boots up. Resman reports all errors that it finds in your system to T&M Explorer. When you view your system through T&M Explorer, you can easily spot any errors in your system that Resman found.

You can find more information about T&M Explorer by using its online help. From T&M Explorer, open the **Help** menu and select **Help Topics**.

Device Interaction

After Resman has detected and configured all VXI/VME devices, you can view specific information on each device in your system by using the T&M Explorer utility. This utility includes a **System View**, which contains a description for each device, including each VXI device’s logical address.

You can interact with your VXI/VME devices by using the VIC or VISAIC utility (VIC for NI-VXI or VISAIC for NI-VISA). You can use these utilities to interactively control your VXI/VME devices without having to use a conventional programming language, LabVIEW, or LabWindows/CVI.

☞ **Note:** ***You can launch VIC or VISAIC from the* Tools *menu in T&M Explorer.***

Try the following in VIC. In the **Command** entry field, type:

```
help vxiinreg
```

This help file shows you the syntax for this command, which reads VXI device configuration registers. The first argument is a logical address, and the second is the offset of the VXI device configuration register to be read.

Type:

```
vxiinreg 1,0
```

The **History** window shows the result of the command execution, such as:

```
Return Status (0): Success.
Value = 0x4ff6
```

If the value ends with `ff6`, you have successfully read the National Instruments manufacturer ID from the VXI/VME-MXI-2 ID register.

You may now want to read the configuration registers from other VXI devices in your system using the command `vxiinreg`. This command accesses only the upper 16 KB of A16 space. Try reading a register from each of the devices listed in the **Connection View** of T&M Explorer. In this way, you can verify that your PCI-MXI-2 or PXI-8320 can access each of the devices in your VXI system successfully.

You can also access VXI and VME devices that are configured in A16, A24, and A32 address space by using the `vxiin` or `vxiout` commands. For more information regarding VIC operation and commands, refer to the VIC online help.

Alternatively, you can use VISAIC to interact with your devices. VISAIC lists the available devices, similar to what T&M Explorer displays. By double-clicking on a given device, you can open a VISA session and access the device through it. For more information regarding VISAIC, use the right-click help available from all panels.

Programming with VXI

National Instruments provides two different programming interfaces for accessing your instruments: NI-VISA and NI-VXI. NI-VISA is the National Instruments implementation of the VISA API as defined by the VXI*plug&play* standard. It is very useful in situations where you have different types of instruments in your system (such as VXI, GPIB, and serial devices) because the NI-VISA functions have the same interface.

NI-VXI is the National Instruments proprietary interface for programming VXI instruments. Both NI-VXI and NI-VISA grant you register-level access of VXI instruments as well as messaging capability to message-based devices. With either interface you can service asynchronous events, such as triggers and signals, and also assert them.

The best way to learn how to program with NI-VXI or NI-VISA is by reviewing the example programs included in your software. In the examples directory you will find examples for many different types of applications. If you are just getting started, you should first learn how to access registers with high-level calls and send messages with word serial functions. The NI-VISA examples of these tasks are called `VISAhigh.c` and `VISAws.c`. The NI-VXI examples are called `VXIhigh.c` and `VXIws.c`. You should use the other examples as you try more advanced techniques. Consult the *NI-VISA User Manual* or the *NI-VXI User Manual* for additional information on these topics.

☞ **Note:** ***The*** *NI-VXI User Manual* ***can be found in the*** `NIVXI\manuals` ***directory, and the*** *NI-VISA User Manual* ***is in the*** `VXIpnp\`*`os`*`\NIvisa\manuals` ***directory, where*** *`os`* ***would be either*** `Win95` ***or*** `WinNT`***. Use the Acrobat Reader program to open and navigate through the manuals.***

Table 3-1 summarizes the topics addressed by the example programs.

Table 3-1. NI-VXI/VISA Examples

Coverage	NI-VISA Example	NI-VXI Example
Message-Based Access	`VISAws.c`	`VXIws.c`
High-Level Register Access	`VISAhigh.c`	`VXIhigh.c`
Low-Level Register Access	`VISAlow.c`	`VXIlow.c`
Sharing Memory	`VISAmem.c`	`VXImem.c`
Interrupt Handling	`VISAint.c`	`VXIint.c`
Trigger Handling	`VISAtrig.c`	`VXItrig.c`

☞ **Note:** ***T&M Explorer includes special settings that you must use for low-level functions and memory sharing. Consult the T&M Explorer online help for information on setting these up.***

Compiler Symbols for NI-VXI

You may need to define some symbols so that the NI-VXI library can work properly with your program.

☞ **Note:** ***Skip this section if you are programming with NI-VISA only. NI-VISA neither requires nor uses these symbols.***

You can define the symbols using `#define` statements in the source code or you can use either the `/D` or the `-D` option in your compiler (both the Microsoft and Borland compilers support the `/D` and `-D` options). If you use `#define` statements, you must define the symbols before including the NI-VXI header file `nivxi.h`. If you use the makefiles to compile the sample program, the makefile already defines the necessary symbols.

The following symbol is usually required. You must define it when using the Microsoft C or Borland C compiler.

- `VXINT` designates the application as a Windows 95/NT application.

☞ **Note:** ***LabWindows/CVI automatically defines the correct symbol. You do not need to define*** `VXINT` ***when using LabWindows/CVI.***

The `BINARY_COMPATIBLE` is optional. This symbol makes the application binary compatible with embedded VXI controllers, such as the National Instruments VXIpc series of embedded controllers. This option may cause a slight performance degradation when you use low-level VXIbus access functions.

If you define these symbols in your source code, your source code should look something like the following sample code:

```
#define VXINT

#define BINARY_COMPATIBLE

.

.

.

#include <nivxi.h>
```

If you define these symbols using the `/D` or `-D` compiler options, you should specify the following when invoking the compiler.

For the Microsoft C compiler:

```
/DVXINT /DBINARY_COMPATIBLE
```

For the Borland C compiler:

```
-DVXINT; BINARY_COMPATIBLE;
```

You also need to link in the appropriate import library for your code. If you are using a Microsoft C compiler, use the `nivxint.lib` in the `nivxi\win32\msc\` directory. If you are using a Borland C compiler, use the `nivxint.lib` in the `nivxi\win32\borlandc\` directory.

Refer to the documentation that came with your compiler package for detailed instructions about using the compiler and the various tools (linker, debugger, and so on). Your compiler documentation is an important and useful source of information for writing, compiling, and debugging C programs.

Debugging

NI Spy, VISAIC, and VIC are useful utilities that can aid in identifying the causes of problems in your application.

NI Spy tracks the calls your application makes to National Instruments T&M drivers including NI-VXI, NI-VISA, and NI-488.2. NI-488.2 users may notice that NI Spy is very similar to GPIB Spy. It highlights functions that return errors, so you can quickly spot which functions failed during your development. NI Spy can log the calls your program makes to these drivers so you can check them for errors at your convenience.

You can also control your instruments interactively using VISAIC and VIC. You can use VISAIC to control and communicate with your instruments with NI-VISA without having to write a program. VIC gives you a similar environment that uses NI-VXI. These utilities are an excellent platform for quickly testing instruments and learning how to communicate with them.

Refer to the online help for instructions on how to use VIC or VISAIC and to learn about their features. In VIC, click on the **?** button (beside the **Go** button) to get help for that page, or you can type `help`. You can also right-click on a component on the screen to access `What’s This` help. In VISAIC, you can right-click to reach `What’s This` help and function help.

Appendix A

Default Settings

This section summarizes the hardware and software default settings for the hardware and software in your kit. If you need more information about a particular setting, or if you want to try a different configuration, please refer to the appropriate hardware or software chapters in this documentation set. Use the *MXI-2 Configuration Reference Manual* for your hardware reference and the T&M Explorer online help for your software reference.

PCI-MXI-2/PXI-8320

This section summarizes the hardware and software default settings for the PCI-MXI-2 and PXI-8320.

Hardware Settings

Table A-1. PCI-MXI-2 Hardware Default Settings

Hardware Component	Default Setting
U17 Switch 1 (FOV)	OFF: PCI-MXI-2 boots off the user-configured half of the EEPROM
U17 Switch 2 (TST)	OFF: Factory configuration of the EEPROM is protected
U17 Switch 3 (POS)	OFF: *Do not alter this setting*
U17 Switch 4 (CT)	ON: *Do not alter this setting*
DRAM SIMM installed	Per customer order

Table A-2. PXI-8320 Hardware Default Settings

Hardware Component	Default Setting
U6 Switch 1 (FOV)	OFF: PXI-8320 boots off the user-configured half of the EEPROM
U6 Switch 2 (TST)	OFF: Factory configuration of the EEPROM is protected
U6 Switch 3 (POS)	OFF: *Do not alter this setting*
U6 Switch 4 (CT)	ON: *Do not alter this setting*
DRAM SODIMM installed	Per customer order

T&M Explorer Settings

Table A-3. Device Tab Default Settings

Editor Field	Default Setting
Logical address	0
Device class	Message based
Size of Servant area	0
Number of handlers	1
Number of interrupters	0

Table A-4. Shared Memory Tab Default Settings

Editor Field	Default Setting
Memory sharing	Don’t share memory
Shared RAM size	0 KB
Reserved physical memory	0 KB
Lower half window byte swapping	Disabled
Lower half window memory selection	System memory
Upper half window byte swapping	Disabled
Upper half window memory selection	System memory
Map upper and lower halves at same PCI address	Disabled

Table A-5. MXI-2 Bus Tab Default Settings

Editor Field	Default Setting
Bus timeout	1 ms
System controller	Auto-detect
MXI-2 auto retry	Enabled
A24/A32 write posting	Disabled
VXImove uses Synchronous MXI	Enabled
MXI transfer limit	Unlimited
MXI CLK10 signal	Receive

Table A-6. PCI Tab Default Settings

Editor Field	Default Setting
Low-level register access API support	Enabled
User window size	64 KB
Expansion ROM	Enabled

VXI/VME-MXI-2

This section summarizes the hardware and software default settings for the VXI-MXI-2, VXI-MXI-2/B, and VME-MXI-2.

Hardware Settings

Table A-7. VXI-MXI-2 Hardware Default Settings

Hardware Component	Default Setting
Logical address (U43)	1
VXIbus Slot 0/Non-Slot 0 (W2)	Automatic detection
VXIbus local bus (S8, S9)	Both OFF: single VXI-MXI-2
VXIbus CLK10 routing (W3)	From onboard oscillator
External trigger termination (S2)	OFF: unterminated
SMB CLK10 direction (S3)	OUT: drive CLK10 signal
SMB CLK10 termination (S4)	Ignored; effective only when S3 is set to IN
Polarity of external SMB CLK10 (S5)	Inverted
MXIbus CLK10 signal (S7)	Receive CLK10 from MXIbus

Table A-7. VXI-MXI-2 Hardware Default Settings (Continued)

Hardware Component	Default Setting
MXIbus termination (U35 switches 1 and 2)	Automatic MXIbus termination: switch 2 set to NO; switch 1 ignored
Configuration EEPROM (U35 switches 3 and 4)	User-modifiable; factory settings protected: both switches set to NO
DRAM SIMMs installed	Per customer order
SIMM size configuration (S6)	OFF if SIMMS are 4 M × 32 or larger; ON if smaller than 4 M × 32

Table A-8. VXI-MXI-2/B Hardware Default Settings

Hardware Component	Default Setting
Logical address (U20)	1
VXIbus Slot 0/Non-Slot 0 (W3)	Automatic detection
VXIbus local bus (W2)	Single VXI-MXI-2/B in frame
VXIbus CLK10 routing (W1)	From onboard oscillator
External trigger termination (S5)	OFF: unterminated
SMB CLK10 direction (S7)	OUT: drive CLK10 signal
SMB CLK10 termination (S6)	Ignored; effective only when S7 is set to IN
Polarity of external SMB CLK10 (S3)	Inverted
MXIbus CLK10 signal (S1)	Receive CLK10 from MXIbus

Table A-8. VXI-MXI-2/B Hardware Default Settings (Continued)

Hardware Component	Default Setting
MXIbus termination (U21 switches 3 and 4)	Automatic MXIbus termination: switch 3 set to OFF; switch 4 ignored
Configuration EEPROM (U21 switches 1 and 2)	User-modifiable; factory settings protected: both switches set to OFF

Table A-9. VME-MXI-2 Hardware Default Settings

Hardware Component	Default Setting
A16 base address (U20)	Hex C040
VME-MXI-2 intermodule signaling (W2)	No user-defined pin selected
MXIbus termination (U21 switches 3 and 4)	Automatic MXIbus termination: switch 3 OFF; switch 4 ignored
Configuration EEPROM (U21 switches 1 and 2)	User-modifiable; factory settings protected: both switches OFF
DRAM SIMMs installed	Per customer order
SIMM size configuration (S2)	OFF if SIMMS are 4 M × 32 or larger; ON if smaller than 4 M × 32

T&M Explorer Settings

Table A-10. Device Tab Default Settings

Editor Field	Default Setting
Logical address	Use DIP switch
Address space	A24 *
Requested memory	16 KB *
A24/A32 write posting	Disabled
A16 write posting	Disabled
Interlocked mode	Disabled

* Assumes no DRAM is installed. If DRAM is installed, the **Address space** should be A32, and **Requested memory** should match the amount of DRAM. If you install the DRAM yourself, you must manually specify these changes.

Table A-11. VXI/VME Bus Tab Default Settings

Editor Field	Default Setting
Bus timeout value	125 µs
Slot 0 configuration	Auto-detect
Auto retry	Disabled
Transfer limit	256
Arbiter type	Priority
Fair requester	Enabled
Arbiter timeout	Enabled
Request level	3

Table A-12. MXI-2 Bus Tab Default Settings

Editor Field	Default Setting
System controller	Auto-detect
Bus timeout value	1 ms
MXI-2 auto retry	Disabled
MXI transfer limit	Unlimited
MXI fair requester	Disabled
Perform parity checking	Enabled
MXI-2 CLK10 signal direction	Switch determines signal direction (VXI-MXI-2 only)

Appendix

B

Common Questions

This appendix addresses common questions you may have about using the NI-VXI/VISA software on the PCI-MXI-2 or PXI-8320 platform.

What are some of the differences between the old utilities and the new ones?

The old utility components are as follows:

- VXIinit—This utility initializes your National Instruments controller hardware with settings determined in VXIedit.
- Resman—This utility initializes and configures all the other devices in your VXI system.
- VXIedit—This utility configures your National Instruments hardware.
- VXItedit—This is a console-based version of VXIedit.
- VIC—Use this utility to interactively communicate with VXI devices over the VXIbus using the NI-VXI API.
- VICtext—This is a console-based version of VIC.
- VISAconf—This utility configures settings used by NI-VISA
- VISAIC—Use this utility to interactively communicate with VISA devices (GPIB, VXI, serial) using NI-VISA.

VXI system integration with the old utilities typically proceeded as follows:

1. Install components and boot the system.
2. Configure your hardware with VXIedit.
3. Reboot and run VXIinit to initialize your National Instruments Hardware.
4. Run Resman to initialize the VXIbus.
5. Optionally run VXIedit to configure any extender devices on the VXIbus.
6. Run VIC to verify device operation.

7. If you are using VISA, you have the option of running VISAconf to configure NI-VISA.
8. Run VISAIC to verify that you can communicate with your system using VISA.

The new utility components are as follows:

- T&M Explorer—Use this utility to configure, view, and initialize your system.
- Resman—You can still use this as before. However, you can perform resource manager operations directly from T&M Explorer or configure it to run Resman automatically at startup. See *What about running Resman?* later in this section.
- VIC—Use as before.
- VISAIC—Use as before.
- NI Spy—Use this utility to debug your NI-VXI or NI-VISA application.

Your setup might now include the following steps:

1. Install components and boot the system.
2. Execute VXI Resource Manager responsibilities (either run Resman or click the build button in T&M Explorer.)
3. Run VIC or VISAIC to verify communication in your system.

What happened to VXIinit?

You no longer need to run VXIinit to initialize settings on your hardware. We now take care of loading hardware settings in the driver, completely eliminating the need for VXIinit.

Where do I find the information that VXIinit used to print?

You can view information about your controller from the properties pages and the hardware configuration pages. For example, you can view logical address and user window size in the device-specific property pages in T&M Explorer.

What happened to VXIedit and VISAconf?

The functionality of these two configuration utilities has been integrated into a powerful new utility called T&M Explorer. This utility starts with a graphical view of the VISA devices (GPIB, VXI, and Serial) that it finds in your system. Right-click on an individual device in the tree structure to see its properties. You can further configure National Instruments devices by selecting the **Hardware Configuration** option. This includes National Instruments VXI-DAQ cards, which means you can configure these devices from T&M Explorer without having to run the DAQ Configuration Utility.

What about running Resman?

Resman is the name of the utility that performs the duties of a VXI Resource Manager as discussed in the VXIbus specification. When you set a National Instruments controller to Logical Address 0, you will at some point need to run Resman to configure your VXI instruments. If your controller uses a different (non-zero) logical address and is a message-based device, you need to start Resman before running it on the Logical Address 0 computer.

So when do you need to run Resman?

Run Resman whenever you need to configure your VXI instruments. For example, if you power-cycle your VXI chassis, your instruments will be reset, and you will need to run Resman to configure them. You can get into trouble if you run Resman when your devices are not in a reset state. Therefore, if you have to run Resman after running it once, you should reset all of your VXI instruments.

In our new architecture, you can perform resource manager operations from within T&M Explorer. Additionally, you can tell T&M Explorer to run Resman when the computer first boots up. In this case you may never need to run Resman explicitly again. This is common when you use an embedded PC such as the VXIpc-860. You can configure the computer to run Resman at startup, so when you power the chassis, Resman runs. If you power-cycle the chassis, the PC reboots, forcing Resman to run again.

With the PCI-MXI-2 or PXI-8320, you may need to run the Resman utility if you boot your computer before turning on your VXI chassis or if you power-cycle your VXI chassis while the external PC remains on. In these cases, the instruments would have been reset without the computer rebooting. You will need to run the Resman utility or configure your system in T&M Explorer to initialize your VXI system.

What if I have a system that requires the old utilities?

The new installer for NI-VXI/VISA gives you the option of installing the old utilities. Thus, if you have a documented procedure for configuring your system that relies on the old configuration utilities, you can install them on your system. Use the **Custom** installer option to explicitly add the old utilities.

Why do you install some of the old utilities?

The VIC and VISAIC utilities still have a lot of functionality that our new utilities do not include. Therefore, it makes sense to distribute these two utilities as part of a normal installation.

How do I handle VME devices?

Although there is no way to automatically detect VME devices in a system, you can add them easily through the **Add Device Wizard** in T&M Explorer. Through this procedure, you can reserve resources for each of your VME devices and configure T&M Explorer to show VME devices on the screen with all your other devices.

How can I determine which version of the NI-VXI/VISA software I have installed?

There are several ways to find this information.

- From T&M Explorer, select **About...** from the **Help** menu. In the **About** dialog box, press the **Software Info** button. This displays version information on NI-VXI and NI-VISA files.
- Under Windows 95 and Windows NT 4.0, you can find version information by right-clicking on any component and selecting the **Properties** option. This displays a property sheet with a version tab. This tab has version information about the product (NI-VXI) and the component (`NIVXINT.DLL`, for example).
- You can find version information about the NI-VXI driver by running the VIC utility program. Type `ver` at the prompt, and the utility displays the versions of VIC and NI-VXI, and the latest PCI-MXI-2 or PXI-8320 board revision that this NI-VXI driver supports.
- You can find version information about the VISA driver through VISAIC by selecting **About...** from the **Help** menu.

How can I determine the serial number and hardware revision of the MXI-2 boards?

Run T&M Explorer and right-click on the name of the MXI-2 board. Select **Hardware Configuration**, and the dialog box for the MXI-2 board is displayed. The title bar includes the serial number and hardware revision of the board.

Which NI-VXI utility program must I use to configure the PCI-MXI-2 or PXI-8320?

Use the T&M Explorer program to configure the PCI-MXI-2 or PXI-8320. T&M Explorer is located in the `NIVXI` program group folder.

Which NI-VXI utility program must I use to initialize the PCI-MXI-2 or PXI-8320?

Windows 95/NT automatically initializes the board at system startup.

Which NI-VXI utility program must I use to perform startup Resource Manager operations?

Use the Resman program to perform startup Resource Manager operations. It is located in the `NIVXI` directory. Resman uses the settings configured in T&M Explorer. It initializes your VXI/VMEbus system and stores the information that it collects in the `RESMAN.TBL` file in the `TBL` subdirectory of the `NIVXI` directory.

You can also run Resource Manager operations from T&M Explorer. Through T&M Explorer, you can also configure Resman to run automatically at computer startup.

What can I do to make sure that my system is up and running?

The fastest method for testing the system is to run Resman. This program attempts to access memory in the upper A16 address space of each device in the system. If Resman does not report any problems, the VXI/MXI communication system is operational.

To test individual devices, you can use the VIC or VISAIC program to interactively issue NI-VXI functions or NI-VISA operations, respectively. You can use the `VXIin()` and `VXIout()` functions or the `VXIinReg()` and `VXIoutReg()` functions to test register-based devices by programming their registers. If you have any message-based devices, you can send and receive messages with the `WSwrt()` and `WSrd()` functions. Notice that `VXIinReg()` and `VXIoutReg()` are for VXI devices only, but you can use `VXIin()` and `VXIout()` for both VXI and VME.

Finally, if you are using LabVIEW or LabWindows/CVI and you have instrument drivers for the devices in your chassis, you can use the interactive features of these programs to quickly test the functionality of the devices.

What should I do if I get a `Configuration EEPROM is Invalid` message?

There are several reasons why you might get the **`Configuration EEPROM is Invalid`** message. If you turned off the computer while the configuration update process was still in progress, the board functions normally except when running T&M Explorer. To correct these problems, reboot the computer with the Factory Override (FOV) switch set (as described in Appendix B, *EEPROM Configuration,* in the *MXI-2 Configuration Reference Manual*) and update the configuration, or load the configuration from file.

Two other reasons you might receive this error message are that the board might have an incorrect base address assigned for the driver window, or there may be a conflict with another adapter or memory management software.

What should I do if Resman hangs?

1. Ensure that the MXI-2 cable is plugged in and that the end labeled *Connect this end to the device closest to the MXIbus System Controller* is connected to the MXIbus system controller (by default the PCI-MXI-2 or PXI-8320). Because the MXI-2 cables are polarized, it matters which end is connected to which device.
2. Check for bent or broken pins on the MXI-2 connectors.
3. If you are using a VME-MXI-2 in the first slot of a VMEbus chassis, the chassis may be causing problems with the First Slot Detection circuit on the VME-MXI-2. Use T&M Explorer to change the **Slot 0 Configuration** setting of the VME-MXI-2 to **Slot 0** rather than **Auto-detect** before running `Resman` again. This can be accomplished using the **Configure as...** selection under the **Tools** menu. You must then enter the logical address of the VME-MXI-2 to configure.
4. If problems persist, run Resman with the VXI/VME-MXI-2 located in the leftmost slot of your chassis (VXI Slot 0) and no other instruments installed. If this works, try adding instruments until the problem occurs again. Contact National Instruments for further assistance.

Where can I find hardware specifications?

Refer to Appendix A, *Specifications*, in the *MXI-2 Configuration Reference Manual*.

What do the LEDs on the front of the VXI-MXI-2 or VME-MXI-2 mean?

The **SYSFAIL** LED shows the state of the VXIbus/VMEbus SYSFAIL line. This line is asserted whenever any device in the chassis has not yet passed its self test, if it has failed its self test, or if it has detected a failure after originally passing its self test. The **MXI** LED indicates that the VXI-MXI-2 or VME-MXI-2 is acting as a slave to another device on the MXIbus, such as when the PCI-MXI-2 or PXI-8320 communicates with either the VXI-MXI-2 or VME-MXI-2 or with another device in the chassis. The **VXI (VME)** LED, when lit, indicates that the VXI-MXI-2 or VME-MXI-2 is acting as a slave to another device in the VXI (VME) chassis, such as when a bus master inside the chassis wants to talk to either the VXI-MXI-2 or VME-MXI-2 or another device outside the chassis.

Are the VXI-MXI-2 and either the PCI-MXI-2 or PXI-8320 two devices or one with respect to the VXIbus?

The PCI-MXI-2, PXI-8320, and the VXI-MXI-2 are unique VXIbus devices with their own logical addresses. However, the MXIbus allows the PCI or PXI/CompactPCI computer to behave as if it is inside the chassis with the VXI-MXI-2 by transparently converting PCI bus cycles to MXIbus cycles to VXIbus cycles, and vice versa.

I have a system that requires rugged chassis and bulkhead cables. Can I still use MXIbus?

Yes, National Instruments sells MXIbus bulkhead cables. Contact National Instruments for further information.

What kind of signal is CLK10 and what kind of signal do I need for an external CLK10?

CLK10 is a differential ECL signal on the VXIbus backplane. However, the oscillator for the VXI-MXI-2 and the EXTCLK input from the front panel use TTL. Therefore, supply a TTL-level signal for EXTCLK; our voltage converters will convert the signal to differential ECL.

CLK10 is not applicable to VME.

What is the accuracy of the CLK10 signal?

The CLK10 generated by the VXI-MXI-2 is 100 ppm (0.01%) as per the VXIbus specification. If you need a more accurate CLK10 signal, you can use the EXTCLK input at the front of the VXI-MXI-2.

CLK10 is not applicable to VME.

What are the user and driver windows?

The PCI-MXI-2 and PXI-8320 driver requires the use of two PCI windows: a user window and a driver window. NI-VXI uses the driver window to perform high-level functions such as `VXIin()` and `VXIout()`, and to access registers on the MXI-2 boards in the system. The user window is reserved for low-level function calls, such as `VXIpeek()`, `VXIpoke()`, and `MapVXIAddress()`. The driver window is system defined and not configurable, but you can increase the size of your user window through T&M Explorer if you expect to initiate transfers to a wide variety of addresses in both A24 and A32 address space.

What is shared memory and dual-ported memory?

These terms refer to a block of memory that is accessible to both a client and a server. The memory block operates as a message buffer for communications. Shared memory is applicable only if you are using either A24 or A32 address space.

How should I assign logical addresses in a multiple-mainframe system?

A simple algorithm for a system containing only one level of hierarchy—a single chain of MXI cables—is to use the upper nibble (most significant four bits) as a *frame* number and the lower nibble (least significant four bits) as a *device* number. For example, the *fifth* device in the *third* mainframe would be logical address 35 (hex).

For more detailed information on this topic, refer to the *VXI-MXI-2 User Manual*, the *VME-MXI-2 User Manual*, or *VXI-6, VXIbus Mainframe Extender Specification.*

Appendix C

Customer Communication

For your convenience, this appendix contains forms to help you gather the information necessary to help us solve your 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 applications 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	09 725 725 11	09 725 725 55
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
United Kingdom	01635 523545	01635 523154
United States	512 795 8248	512 794 5678

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 ____

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 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

NI-VXI/VISA Software Version Number ____

Using Both NI-VXI and NI-VISA? ____

Using Either LabVIEW or LabWindows/CVI? ____

Using PCI-MXI-2 or PXI-8320? ____

Using VXI-MXI-2, VXI-MXI-2/B, or VME-MXI-2? ____

PCI-MXI-2 Hardware Configuration

Hardware Revision Number ____

Switch U17 Settings ____

DRAM SIMM Installed ____

PXI-8320 Hardware Configuration

Hardware Revision Number ____

Using PXI or Compact/PCI? ____

Slot Location ____

Switch U6 Settings ____

DRAM SODIMM Installed ____

C-size VXI-MXI-2 Hardware Configuration

Hardware Revision Number ____

Slot Location ____

VXIbus Logical Address Switch Setting (U43) ____

VXIbus Slot 0/Non-Slot 0 (W2) ____

VXIbus CLK10 Routing (W3) ____

SMB CLK10 (S3, S4, S5) ____

Receiving or Driving MXIbus CLK10 (S7) ____

Trigger Input Termination (S2) ____

MXIbus Termination (U35 switches 1 and 2) ____________________

EEPROM Operation (U35 switches 3 and 4) ____________________

Onboard DRAM SIMM Size (S6) ____________________

DRAM SIMMs Installed ____________________

VXIbus Local Bus (S8, S9) ____________________

B-size VXI-MXI-2/B Hardware Configuration

Hardware Revision Number ____________________

Slot Location ____________________

VXIbus Logical Address Switch Setting (U20) ____________________

VXIbus Slot 0/Non-Slot 0 (W3) ____________________

VXIbus CLK10 Routing (W1) ____________________

SMB CLK10 (S7, S6, S3) ____________________

Receiving or Driving MXIbus CLK10 (S1) ____________________

Trigger Input Termination (S5) ____________________

MXIbus Termination (U21 switches 3 and 4) ____________________

EEPROM Operation (U21 switches 1 and 2) ____________________

Onboard DRAM SIMM Size (S2) ____________________

DRAM SIMMs Installed ____________________

VXIbus Local Bus (W2) ____________________

VME-MXI-2 Hardware Configuration

Hardware Revision Number ____________________

Slot Location ____________________

VMEbus A16 Base Address (U20) ____________________

MXIbus Termination (U21 switches 3 and 4) ____________________

EEPROM Operation (U21 switches 1 and 2) ____________________

Onboard DRAM SIMM Size (S2) ____________________

DRAM SIMMs Installed ____________________

VME-MXI-2 Intermodule Signaling (W2) ____________________

PCI-MXI-2/PXI-8320 Configuration Settings in T&M Explorer

Logical Address ____________________

Device Class ____________________

Size of Servant Area ____________________

Number of Handlers ____________________

Number of Interrupters ____________________

Memory Sharing ____________________

Shared RAM Size ____________________

Reserved Physical Memory ____________________

Lower Half Window Byte Swapping ____________________

Lower Half Window Memory Selection ____________________

Upper Half Window Byte Swapping ____________________

Upper Half Window Memory Selection ____________________

Mapping Upper and Lower Halves at Same PCI Address ____________________

MXI Bus Timeout ____________________

MXI System Controller ____________________

MXI-2 Auto Retry ____________________

A24/A32 Write Posting ____________________

Synchronous MXI ____________________

MXI Transfer Limit ____________________

MXI CLK10 Signal ____________________

Low-level Register Access API Support ____________________

User Window Size ____________________

Expansion ROM ____________________

VXI/VME-MXI-2 Configuration Settings in T&M Explorer

Logical Address ____________________

Address Space ____________________

Requested Memory ____________________

A24/A32 Write Posting ____________________

A16 Write Posting ____________________

Interlocked or Normal Mode ____________________

VXI/VME Bus Timeout Value ____________________

Slot 0 Configuration ____

Auto Retry for Cycles from VXI/VMEbus to MXIbus ______________________________

Transfer Limit on VXI/VMEbus ____

VXI/VME Arbiter Type ____

VXI/VME Fair Requester ____

VXI/VME Arbiter Timeout ____

VXI/VME Request Level ____

MXI System Controller ____

MXI Bus Timeout Value ____

Auto Retry for Cycles from MXIbus to VXI/VMEbus ______________________________

Transfer Limit on MXIbus ____

MXI Fair Requester ____

Parity Checking ____

MXI-2 CLK10 Direction (VXI-MXI-2 only) ____________________________________

Other Products

Computer Make and Model ____

Mainframe Make and Model ____

Microprocessor ____

Clock Frequency ____

Type of Video Board Installed ____

Operating System ____

Operating System Version ____

Operating System Mode ____

Programming Language ____

Programming Language Version ____

VXIbus/MXIbus Resource Manager
(Make, Model, Version, Software Version) ____________________________________

List Other Boards in System

Slot	LA	DMA	IRQ	Manufacturer, Description, Function

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: *Getting Started with Your PCI-Based MXI-2 Interface for Windows 95/NT*

Edition Date: September 1997

Part Number: 321712A-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 ____

Company ____

Address ____

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Glossary

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

A

A16 space — VXIbus address space equivalent to the VME 64 KB short address space. In VXI, the upper 16 KB of A16 space is allocated for use by VXI devices configuration registers. This 16 KB region is referred to as VXI configuration space.

A24 space — VXIbus address space equivalent to the VME 16 MB *standard* address space

A32 space — VXIbus address space equivalent to the VME 4 GB *extended* address space

ACFAIL — A VMEbus backplane signal that is asserted when a power failure has occurred (either AC line source or power supply malfunction), or if it is necessary to disable the power supply (such as for a high-temperature condition)

address — Character code that identifies a specific location (or series of locations) in memory. In VISA, it identifies a resource.

address modifier
One of six signals in the VMEbus specification used by VMEbus masters to indicate the address space in which a data transfer is to take place

address space
A set of 2^n memory locations differentiated from other such sets in VXI/VMEbus systems by six addressing lines known as address modifiers. *n* is the number of address lines required to uniquely specify a byte location in a given space. Valid numbers for *n* are 16, 24, and 32. In VME/VXI, because there are six address modifiers, there are 64 possible address spaces.

address window
A portion of address space that can be accessed from the application program

ANSI
American National Standards Institute

API
Application Programming Interface; the direct interface that an end user sees when creating an application

arbitration
A process in which a potential bus master gains control over a particular bus

asynchronous
Not synchronized; not controlled by time signals

B

B
bytes

backplane
An assembly, typically a printed circuit board, with 96-pin connectors and signal paths that bus the connector pins. A C-size VXIbus system will have two sets of bused connectors called J1 and J2. A D-size VXIbus system will have three sets of bused connectors called J1, J2, and J3.

BERR*
Bus error signal

block-mode transfer
An uninterrupted transfer of data elements in which the master sources only the first address at the beginning of the cycle. The slave is then responsible for incrementing the address on subsequent transfers so that the next element is transferred to or from the proper storage location. In VME, the data transfer may have no more than 256 elements; MXI does not have this restriction.

BTO unit

Bus Timeout Unit; a functional module that times the duration of each data transfer and terminates the cycle if the duration is excessive. Without the termination capability of this module, a bus master attempt to access a nonexistent slave could result in an indefinitely long wait for a slave response.

bus error

An error that signals failed access to an address. Bus errors occur with low-level accesses to memory and usually involve hardware with bus mapping capabilities. For example, nonexistent memory, a nonexistent register, or an incorrect device access can cause a bus error.

bus master

A device that is capable of requesting the Data Transfer Bus (DTB) for the purpose of accessing a slave device

byte order

How bytes are arranged within a word or how words are arranged within a longword. Motorola ordering stores the most significant (MSB) byte or word first, followed by the least significant byte (LSB) or word. Intel ordering stores the LSB or word first, followed by the MSB or word.

C

CLK10

A 10 MHz, ± 100 ppm, individually buffered (to each module slot), differential ECL system clock that is sourced from Slot 0 of a VXIbus mainframe and distributed to Slots 1 through 12 on P2. It is distributed to each slot as a single-source, single-destination signal with a matched delay of under 8 ns.

Commander

A message-based device that is also a bus master and can control one or more Servants

CompactPCI

An adaptation of the PCI specification for industrial and/or embedded applications that require a more robust mechanical form factor than desktop PCI. CompactPCI provides a standard form factor for those applications requiring the high performance of PCI as well as the small size and ruggedness of a rack-mount system.

configuration registers

A set of registers through which the system can identify a module device type, model, manufacturer, address space, and memory requirements. To support automatic system and memory configuration, the VXIbus specification requires that all VXIbus devices have a set of such registers.

D

daisy-chain	A method of propagating signals along a bus, in which the devices are prioritized on the basis of their position on the bus
Data Transfer Bus	DTB; one of four buses on the VMEbus backplane. The DTB is used by a bus master to transfer binary data between itself and a slave device.
DMA	Direct Memory Access; a method by which data is transferred between devices and internal memory without intervention of the central processing unit
DRAM	Dynamic RAM (Random Access Memory); storage that the computer must refresh at frequent intervals
driver window	A region of PCI address space that is decoded by the PCI-MXI-2 or PXI-8320 for use by the NI-VXI software
DTB	*See* Data Transfer Bus.
dynamic configuration	A method of automatically assigning logical addresses to VXIbus devices at system startup or other configuration times
dynamically configured device	A device that has its logical address assigned by the Resource Manager. A VXI device initially responds at Logical Address 255 when its MODID line is asserted. A MXIbus device responds at Logical Address 255 during a priority select cycle. The Resource Manager subsequently assigns it a new logical address, which the device responds to until powered down.

E

ECL	Emitter-Coupled Logic
EEPROM	Electronically Erasable Programmable Read Only Memory
embedded controller	An intelligent CPU (controller) interface plugged directly into the VXI backplane, giving it direct access to the VXIbus. It must have all of its required VXI interface capabilities built in.
expansion ROM	An onboard EEPROM that may contain device-specific initialization and system boot functionality

external controller
In this configuration, a plug-in interface board in a computer is connected to the VXI mainframe via one or more VXIbus extended controllers. The computer then exerts overall control over VXIbus system operations.

F

fair requester
A MXIbus master that will not arbitrate for the MXIbus after releasing it until it detects the bus request signal inactive. This ensures that all requesting devices will be granted use of the bus.

G

GPIB
General Purpose Interface Bus (IEEE 488)

H

hex
hexadecimal; the numbering system with base 16, using the digits 0 to 9 and letters A to F

Hz
hertz; cycles per second

I

IEEE
Institute of Electrical and Electronics Engineers

I/O
input/output; the techniques, media, and devices used to achieve communication between machines and users

instrument driver
A set of routines designed to control a specific instrument or family of instruments, and any necessary related files for LabWindows/CVI or LabVIEW

interrupt
A means for a device to request service from another device

interrupt handler
A VMEbus functional module that detects interrupt requests generated by Interrupters and responds to those requests by requesting status and identify information

interrupt level
The relative priority at which a device can interrupt

K

KB

Kilobytes of memory

L

logical address

An 8-bit number that uniquely identifies each VXIbus device in a system. It defines the A16 register address of a device, and indicates Commander and Servant relationships.

M

m

meters

master

A functional part of a MXI/VME/VXIbus device that initiates data transfers on the backplane. A transfer can be either a read or a write.

master-mode operation

A device is in master mode if it is performing a bus cycle which it initiated.

MB

Megabytes of memory

MBLT

Eight-byte block transfers in which both the Address bus and the Data bus are used to transfer data

message-based device

An intelligent device that implements the defined VXIbus registers and communication protocols. These devices are able to use Word Serial Protocol to communicate with one another through communication registers.

MITE

A National Instruments custom ASIC, a sophisticated dual-channel DMA controller that incorporates the Synchronous MXI and VME64 protocols to achieve high-performance block transfer rates

MXI-2

The second generation of the National Instruments MXIbus product line. MXI-2 expands the number of signals on a standard MXIbus cable by including VXI triggers, all VXI interrupts, CLK10, SYSFAIL*, SYSRESET*, and ACFAIL*. MXI-2 also defines new higher-performance data transfer protocols.

MXIbus

Multisystem eXtension Interface Bus; a high-performance communication link that interconnects devices using round, flexible cables

MXIbus System Controller

A functional module that has arbiter, daisy-chain driver, and MXIbus cycle timeout responsibility. Always the first device in the MXIbus daisy-chain

N

NI-488 or NI-488.2

The National Instruments software for GPIB systems

NI-DAQ

The National Instruments software for data acquisition instruments

NI-VISA

The National Instruments implementation of the VISA standard; an interface-independent software that provides a unified programming interface for VXI, GPIB, and serial instruments

NI-VXI

The National Instruments bus interface software for VME/VXIbus systems

Non-Slot 0 device

A device configured for installation in any slot in a VXIbus mainframe other than Slot 0. Installing such a device into Slot 0 can damage the device, the VXIbus backplane, or both.

O

Onboard RAM

The optional RAM installed into the SIMM slots of the MXI-2 board

P

PCI

Peripheral Component Interconnect. The PCI bus is a high-performance 32-bit or 64-bit bus with multiplexed address and data lines.

PXI

PCI eXtensions for Instrumentation; an open implementation of CompactPCI that adds electrical features that meet the high-performance requirements of instrumentation applications by providing triggering, local buses, and system clock capabilities. PXI also offers two-way interoperability with CompactPCI products.

R

register-based device

A Servant-only device that supports VXIbus configuration registers. Register-based devices are typically controlled by message-based devices via device-dependent register reads and writes.

Resman

The name of the National Instruments Resource Manager in NI-VXI bus interface software. *See* Resource Manager.

Resource Manager

A message-based Commander located at Logical Address 0, which provides configuration management services such as address map configuration, Commander and Servant mappings, and self-test and diagnostic management

retry

An acknowledge by a destination that signifies that the cycle did not complete and should be repeated

S

s

seconds

Servant

A device controlled by a Commander; there are message-based and register-based Servants

Shared Memory Protocol

A communication protocol that uses a block of memory accessible to both a client and a server. The memory block operates as a message buffer for communications. This is unique to register-based interfaces such as VXI.

SIMM

Single In-line Memory Module

slave

A functional part of a MXI/VME/VXIbus device that detects data transfer cycles initiated by a VMEbus master and responds to the transfers when the address specifies one of the device’s registers

slave-mode operation

A device is in slave mode it if is responding to a bus cycle.

Slot 0 device

A device configured for installation in Slot 0 of a VXIbus mainframe. This device is unique in the VXIbus system in that it performs the VMEbus System Controller functions, including clock sourcing and arbitration for data transfers across the backplane. Installing such a device into any other slot can damage the device, the VXIbus backplane, or both.

SODIMM

Small Outline Dual In-line Memory Module

statically configured device

A device whose logical address cannot be set through software; that is, it is not dynamically configurable

SYSFAIL

A VMEbus signal that is used by a device to indicate an internal failure. A failed device asserts this line. In VXI, a device that fails also clears its PASSed bit in its Status register.

SYSRESET

A VMEbus signal that is used by a device to indicate a system reset or power-up condition

System RAM

RAM installed on your personal computer and used by the operating system, as contrasted with onboard RAM, which is installed on the MXI-2 board

T

trigger

Either TTL or ECL lines used for intermodule timing

TTL

Transistor-Transistor Logic

U

user window

A region of PCI address space reserved by the PCI-MXI-2 or PXI-8320 for use via the NI-VXI low-level function calls. `MapVXIAddress()` uses this address space to allocate regions for use by the `VXIpeek()` and `VXIpoke()` macros.

V

VIC

VXI Interactive Control Program, a part of the NI-VXI bus interface software package. Used to program VXI devices, and develop and debug VXI application programs

VISA

Virtual Instrument Software Architecture. This is the general name given to VISA and its associated architecture. The architecture consists of two main VISA components: the VISA Resource Manager and the VISA Instrument Control Resources.

VISAIC

VISA Interactive Control Program, a part of the NI-VISA software. Used to program devices, and develop and debug application programs

VME

Versa Module Eurocard or IEEE 1014

VMEbus System Controller

A device configured for installation in Slot 0 of a VXIbus mainframe or Slot 1 of a VMEbus chassis. This device is unique in the VMEbus system in that it performs the VMEbus System Controller functions, including clock sourcing and arbitration for data transfers across the backplane. Installing such a device into any other slot can damage the device, the VMEbus/VXIbus backplane, or both.

VXIbus

VMEbus eXtensions for Instrumentation

W

Word Serial Protocol

The simplest required communication protocol supported by message-based devices in a VXIbus system. It utilizes the A16 communication registers to transfer data using a simple polling handshake method.

write posting

A mechanism that signifies that a device will immediately give a successful acknowledge to a write transfer and place the transfer in a local buffer. The device can then independently complete the write cycle to the destination.

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