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**VME-MXI-2**

# VXI/VME

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## Getting Started with Your VXI/VMEpc™ 600 Series for Windows 95/NT

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# Important Information

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## FCC/DOC Radio Frequency Interference Class A Compliance

This equipment generates and uses radio frequency energy and, if not installed and used in strict accordance with the instructions in this manual, may cause interference to radio and television reception. Classification requirements are the same for the Federal Communications Commission (FCC) and the Canadian Department of Communications (DOC). This equipment has been tested and found to comply with the following two regulatory agencies:

### 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.

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

*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.

### 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

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Use this manual to get started with the VXI/VMEpc 600 Series embedded computers and the NI-VXI/VISA software for Windows 95/NT. This manual summarizes the setup instructions and default settings for the hardware and software. You may find that these sections contain all the information you need to get started.

## Organization of This Manual

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This manual is organized as follows:

- Chapter 1, *Introduction*, describes the VXI/VMEpc 600 Series of embedded computers along with the NI-VXI/VISA software, lists what you need to get started, lists optional software, and gives an overview of the directory on your hard drive.
- Chapter 2, *Setting up Your VXI/VME System*, contains basic instructions for setting up the VXI/VMEpc 600 Series and the NI-VXI/VISA software.
- Chapter 3, *Developing Your Application*, discusses the software utilities you can use to start developing applications that use the NI-VXI/VISA driver.
- Appendix A, *Default Settings*, summarizes the 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 VXI/VMEpc platform.
- Appendix C, *Reinstalling the NI-VXI/VISA Software*, contains the instructions on how to reinstall your NI-VXI/VISA software. Your VXI/VMEpc 600 Series controller was shipped with the NI-VXI/VISA software already installed. It is unlikely that you will ever need to use these instructions.
- Appendix D, *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 used in this manual, including the page where you can find each one.

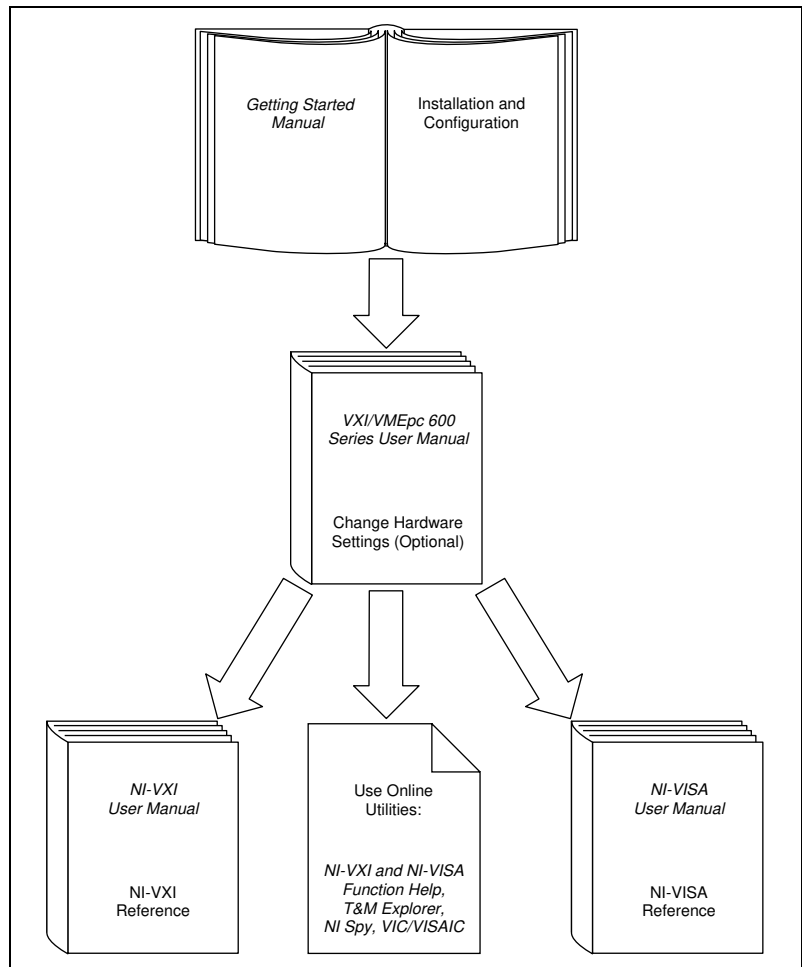
## Conventions Used in This Manual

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The following conventions are used in this manual:

◆	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.
	This icon to the left of bold italicized text denotes a warning, which advises you of precautions to take to avoid being electrically shocked.
<b>bold</b>	Bold text denotes the names of menus, menu items, or dialog box buttons or options.
<b><i>bold italic</i></b>	Bold italic text denotes a note, caution, or warning.
<i>italic</i>	Italic text denotes emphasis, a cross reference, or an introduction to a key concept. This font also denotes text from which you supply the appropriate word or value.
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, device names, functions, variables, filenames, and extensions.
<b>monospace bold</b>	Bold text in this font denotes the messages and responses that the computer automatically prints to the screen.
<i>monospace italic</i>	Italic text in this font denotes that you must enter the appropriate words or values in the place of these items.
VXI/VMEpc 600 Series	The term <i>VXI/VMEpc 600 Series</i> refers to a series of B-size, two-slot VXI or VME embedded controllers. Currently, this series consists of the VXIpc-650 and VMEpc-650. This term is used when information applies equally to the VXI and VME models.

# How to Use This Documentation Set



Begin by reading this manual, *Getting Started with Your VXI/VMEpc 600 Series for Windows 95/NT*, to get basic instructions for setting up the hardware and software. This brief quick-start manual describes how to get started with your kit using the default hardware and software settings. Refer to the following manuals for more information about the hardware or software.

The *VXI/VMEpc 600 Series User Manual* contains more details about changing the hardware installation or configuration from the defaults, and using the hardware.

When you are familiar with the material in these manuals, you can begin to use the *NI-VXI User Manual*. This manual presents the concepts of VXI and prepares you for detailed explanations of the NI-VXI functions. The NI-VXI online help describes the NI-VXI functions to help you fully understand the purpose and syntax of each function. You can find this same information in the *NI-VXI Programmer Reference Manual*. These two manuals are available in the `c:\NIVXI\Manuals` directory under the names `NI-VXIUsersMan.pdf` and `NI-VXIProgrammerMan.pdf`, respectively. Use the Acrobat Reader program, Version 3 or later, to open these files.

You can also access the NI-VXI online help for Windows 95/NT in the `NIVXI` folder.

Refer to the *NI-VXI Graphical Utilities Reference Manual* and the *NI-VXI Text Utilities Reference Manual* to learn more about the NI-VXI utilities.

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. You can find this same information in the *NI-VISA Programmer Reference Manual*. These two manuals are available in the `c:\Vxipnp\os\NIvisa\Manuals` directory (where `os` is either `Win95` or `WinNT`) under the names `NI-VISAUsersMan.pdf` and `NI-VISAProgrammersMan.pdf`, respectively. Use the Acrobat Reader program, Version 3 or later, to open these files.

## 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*
- VXI-6, *VXIbus Mainframe Extender Specification*, Rev. 1.0, VXIbus Consortium

# Customer Communication

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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 D, *Customer Communication*, at the end of this manual.

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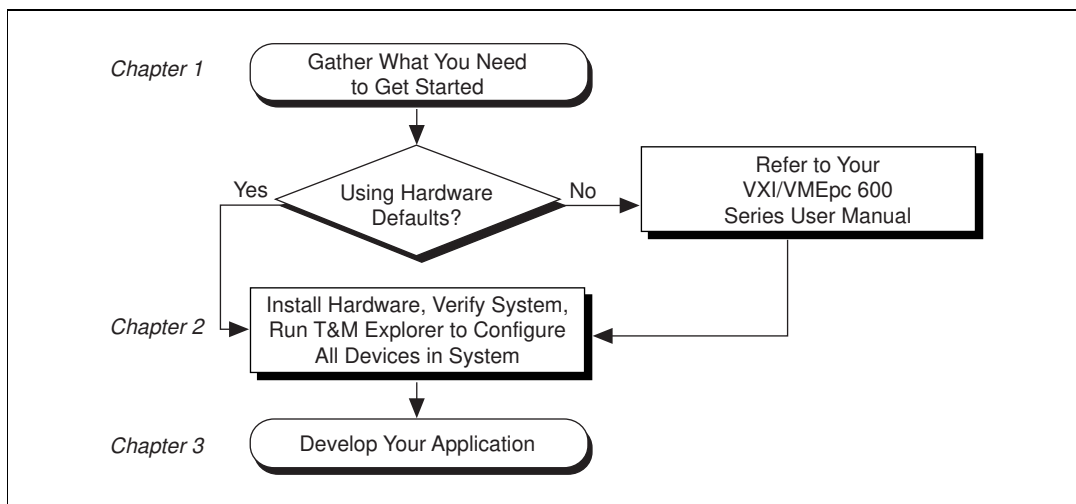
# Introduction

This chapter describes the VXI/VMEpc 600 Series of embedded computers along with the NI-VXI/VISA software, lists what you need to get started, lists optional software, and gives an overview of the directory structure on your hard drive.

---

## How to Use This Manual

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



---

## What You Need to Get Started

- VXI/VMEpc-650 embedded controller
- VXIbus or VMEbus mainframe
- Keyboard (and included adapter cable)
- Mouse

- Monitor with VGA or better resolution
- National Instruments software media for the VXI/VMEpc 600 Series

The NI-VXI/VISA software is already installed on your VXI/VMEpc-650 computer. It is also included on disk in the event that you need to reinstall your software. For installation instructions, please refer to Appendix C, [Reinstalling the NI-VXI/VISA Software](#).

## Hardware Description

---

The VXI/VMEpc 600 Series models are B-size embedded computers based on x86 processor architecture and on the Peripheral Component Interface (PCI) bus. These computers are high-performance, easy-to-use platforms for controlling VXIbus or VMEbus systems, featuring complete VXI and VME functionality through interactive utilities and C function calls. These embedded computers can take advantage of the VXI/VME high-performance backplane capabilities and give you direct control of VXI/VME registers, memory, interrupts, and triggers.

All models in the VXI/VMEpc 600 Series are fully *VXIplug&play* compliant and can be used with PC-compatible software tools, the National Instruments LabVIEW and LabWindows/CVI application software, and the NI-VXI, NI-VISA, and NI-488.2 bus interface software.

For in-depth details on the VXI/VMEpc 600 Series hardware—including a description of the differences between the various models in their respective series—refer to the *VXI/VMEpc 600 Series User Manual*.

## Software Description

---

NI-VXI is the name of the VXI/VME bus control library for your VXI/VMEpc 600 Series. You can create applications using NI-VXI to control your VXI and VME devices. NI-VXI gives you complete VXI/VME functionality, including an API for performing basic VXI/VME data transfers and handling VXI/VME interrupts as well as VXI-specific functionality, such as doing message-based communication and handling VXIbus triggers.

NI-VISA is the National Instruments implementation of the VISA specification. VISA is a uniform API for communicating and controlling Serial, GPIB, VXI, and VME instruments. This API aids in the creation of more portable applications and instrument drivers.

The NI-VXI/VISA software for the VXI/VMEpc 600 Series is already installed on your hard drive. It includes an interactive configuration and troubleshooting program, libraries of software routines for test and measurement (T&M) programming, interactive control programs for both NI-VXI and NI-VISA, a logging utility you can use for debugging your applications, and a VXI Resource Manager. You can use this software to seamlessly program multiple-mainframe configurations and have software compatibility across a variety of controller platforms.

National Instruments also includes the NI-488.2 software kit, which gives you access to the industry-standard NI-488.2 software for controlling external GPIB instruments through the GPIB port on the front panel. The GPIB interface on your VXI/VMEpc controller is fully compatible with the NI-488.2 driver for a variety of operating systems. Any software using NI-488.2 will run on the VXI/VMEpc-650.

Use T&M Explorer to view your entire T&M system and configure various components, whether they are Serial, GPIB, VXI, or VME devices. This utility also adopts the functionality of the NI-DAQ Configuration utility so you can configure National Instruments VXI-DAQ cards.

For VXI users, T&M Explorer also features various options of how to run the VXI 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 VME and 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

Your VXI/VMEpc 600 Series kit comes with the NI-VXI/VISA bus interface software already installed for you. In addition, you can use the National Instruments LabVIEW and LabWindows/CVI application programs and instrument drivers to ease your programming tasks. These standardized programs match the modular virtual instrument capability of VXI/VME and can reduce your VXI/VME software development time. These programs are fully *VXIplug&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.

When you boot your system for the first time, you can insert a configuration disk to access either or both of these application programming environments. Refer to the *Booting Your System for the First Time* section in Chapter 2, *Setting up Your VXI/VME System*, for more information. Both LabVIEW and LabWindows/CVI integrate the VXI and VISA libraries that are required to support your VXI/VMEpc-650. 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.



# Files and Directories Installed on Your Hard Drive

---

Your hard drive includes a directory called `images` in its root that contains software and soft copies of manuals for the operating system and for the peripherals. The directory structure under the `images` directory is logically organized into several levels.

In the `images` directory itself, you will find a `manuals` directory, an `os` directory, and directories for each of the peripherals of your computer.

The `manuals` directory contains quick reference guides, technical reference manuals, and National Instruments software manuals, all in Adobe Acrobat portable document format (PDF). Use the Acrobat Reader program, version 3 or later, to open and read these manual files on your computer, and to print them if desired. To access any of these manuals, change your directory to `c:\images\Vxx600>manuals` and list the contents of that directory.

The `os` directory contains a subdirectory corresponding to the operating system installed on your computer. That subdirectory contains an image of the CD from which your operating system was installed. As a result you do not have to insert the CD when you install a new peripheral. When you are asked to insert the CD, you can simply direct the system to look in the `images\os` directory instead.

For example, if your system has Windows 95 installed, you should find an image of the Windows 95 CD in `c:\images\os\win95`.

The rest of the directories correspond to each of the peripherals in your system. Within each of these directories are the drivers for the peripherals. These files and directories are copied exactly from the distribution disks of the manufacturers, so the naming conventions vary from peripheral to peripheral.

Because the naming conventions may not be completely straightforward, National Instruments provides a text file named `drivers.txt` in the `images` directory. The `drivers.txt` file explains how to install support for each peripheral. You may want to print this file for reference when you install your peripheral device drivers.

---

# Setting up Your VXI/VME System

This chapter contains basic instructions for setting up the VXI/VMEpc 600 Series and the NI-VXI/VISA software.

You can use this material as a guide to quickly configure and operate your VXI/VME system using the VXI/VMEpc 600 Series. This chapter assumes that you intend to perform a basic configuration as follows:

- You have one VXI/VMEbus chassis in which you will be using the VXI/VMEpc-650 as System Controller.
- You will be using the NI-VXI/VISA software for initialization, configuration, and device interaction.
- You will use the default hardware and software settings.

---

## Configuring the Hardware

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

The *VXI/VMEpc 600 Series User Manual* fully describes the configuration and installation of each embedded computer in the VXI/VMEpc 600 Series. Refer to this 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 VXI/VMEpc. 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

---



**Caution** *To prevent electrostatic discharge, touch the antistatic plastic package to a metal part of your VXI/VMEbus chassis before removing the VXI/VMEpc-650 from the package.*



**Warning** *To protect both yourself and the chassis from electrical hazards, the chassis should remain off until you are finished installing the VXI/VMEpc module.*

Plug in your chassis but leave the power turned off. Install the VXI/VMEpc-650 in the first slot of the VXI/VME chassis—designated as Slot 0 in VXI systems, or as Slot 1 in a VME chassis. In its default configuration, the VXI/VMEpc 600 Series automatically detects whether it should be the system controller. Although you can use the module in other slots as non-system controller, this example describes the basic installation as system controller. The system controller operates certain VXI/VMEbus lines as required for VXI/VME systems. Verify that any other 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 will 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.

Also ensure that no VXI devices in your system are configured for logical address 0, which is the default configuration for the VXI/VMEpc 600 Series.

Complete your installation as follows:

1. Attach cables for your keyboard, mouse, video, and any devices you want to connect to your system. Refer to the *VXI/VMEpc 600 Series User Manual* if you are not certain about any of these connections.
2. Turn on power to the chassis.
3. Follow the prompts in the Setup program.

## Installed Software

---

Your VXI/VMEpc 600 Series kit comes with the NI-VXI/VISA bus interface software already installed. However, if you receive a software update, or if you need to reinstall software in the event that your files were accidentally erased, refer to Appendix C, *Reinstalling the NI-VXI/VISA Software*. This appendix explains how to use the Setup program.

If you need to reinstall LabVIEW or LabWindows/CVI, use the CD or diskette package that came with these programs.

## Booting Your System for the First Time

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At Windows 95/NT startup, you are prompted to insert a disk to configure the system for LabVIEW or LabWindows/CVI. These programming environments are already installed on your system but you must insert a configuration disk when prompted so that you can access and use them. If you ordered either of these programming environments, select the appropriate checkbox and insert the configuration disk. Follow the instructions as prompted.

Do not select either checkbox if you did not order LabVIEW or LabWindows/CVI. Continue with the rest of the Setup program.

**Caution**

***Do not disregard the prompt to configure the system for LabVIEW or LabWindows/CVI. The Setup program assumes you do not need these programs and deletes them from your hard drive unless you insert the configuration disk during the initial setup. If you neglect to do this, you will need to install LabVIEW or LabWindows/CVI from the CD or diskette set if you want to use either program.***

If your system includes *any* VXI devices, you should now run T&M Explorer. It prompts you to run Resman, which is 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 configure T&M Explorer to automatically run Resman on power-up. T&M Explorer contains right-click help that leads you through your configuration tasks.

Whether you are a VXI or VME user, please continue with Chapter 3, *Developing Your Application*, for information about using T&M Explorer in your system.

## 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 an example on how to use VIC, refer to the *Device Interaction* section in Chapter 3, *Developing Your Application*.

---

# Developing Your Application

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

After verifying your system configuration, you can begin to develop your VXI/VME 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.

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 VXI devices on the VXI/VME backplane for operation and allocating memory for devices that request it.

**Note**

***Because power cycling resets all devices, run Resman to reconfigure them every time chassis power is cycled.***

Resman must be run on any system that contains VXI devices (including systems containing VXI-MXI-2 or VME-MXI-2 mainframe extender devices). Because VME devices normally do not have configuration registers as defined in the VXIbus specification, the Resource Manager is unable to detect VME devices. Because of this, when using systems containing a mixture of VME devices and VXI devices, you need to

manually add your VME devices in T&M Explorer using the **Add VME Device Wizard** to reserve system resources when the Resource Manager runs.

Systems consisting of only a VMEpc 600 Series controller, a VME chassis, and VME boards do *not* need to run Resman when using NI-VXI software even though the devices do not appear in the T&M Explorer connection tree. However, you would not be able to use VISA without manually adding the VME devices to the system by using T&M Explorer as described above and then running Resman. This is because NI-VISA uses the Resource Manager to create instrument sessions for VXI/VME device communication. If this is not an issue for you, you can skip Resman.

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 add devices that cannot be detected dynamically by T&M Explorer through the **Add Device Wizard** in the **Edit** menu. Such devices include VME devices, certain GPIB devices, and serial ports. 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 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

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After Resman has detected and configured all VXI 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 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 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 vxiin`.

This help file shows you the syntax for this command, which reads VME address space. The first argument is the access parameters for selecting the address space, byte order, and so on. The second is the VME address to read, and the third is the width of the data to read.

Type:

```
vxiin 1,0xC000,2
```

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

```
Return Status (0): SUCCESS.  
value = 0x9ff6
```

If the value ends with `ff6`, you have successfully read the National Instruments manufacturer ID from the VXI/VMEpc-650 ID register. Because this is the first configuration register present for all VXI devices, the VXI device at Logical Address 0 has its manufacturer ID register located at A16 address `0xC000`—the beginning of the VXI configuration space.

You may now want to read the registers from other devices in your system using the command `vxiin`. Try reading a register from each of the devices listed in the **Address Map View** of T&M Explorer. In this way, you can verify that your VXI/VMEpc-650 can access each of the devices in your system successfully.



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 *VXIplug&play* standard. It is very useful when you have different types of instruments in your system (such as VXI, VME, GPIB, and Serial devices) because the NI-VISA functions have the same interface.

NI-VXI is the National Instruments proprietary interface for programming VXI/VME instruments. Both NI-VXI and NI-VISA grant you register-level access of VXI/VME instruments as well as messaging capability to message-based devices. With either interface you can service asynchronous events, such as triggers and interrupts, 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 resides in the `NIVXI\manuals` directory, and the NI-VISA User Manual is in the `VXIinp\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.*

## Notes about VME Support

To use VME devices in your system, configure NI-VXI to see these devices by using the **Add Device Wizard** in T&M Explorer. VME devices with two blocks of memory in the same address space require two entries. You can also specify which interrupt levels the device uses. VXI and VME devices cannot share interrupt levels. You can then access the VME device from NI-VXI or NI-VISA just as you would a register-based 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.

## 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 does not use 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 `VXINT` symbol is 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` symbol is optional. It makes the application binary compatible with embedded VXI controllers, such as the National Instruments VXI/VMEpc series of embedded controllers. This option may cause a slight performance degradation when using 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 will 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

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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 (next to 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.

# Default Settings

This appendix summarizes the 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 *VXI/VMEpc 600 Series User Manual* for your hardware reference and the T&M Explorer online help for your software reference.

Because you can also use T&M Explorer to configure a VXI-MXI-2 or a VME-MXI-2, this appendix also summarizes the software default settings for the VXI/VME-MXI-2.

## VXI/VMEpc 600 Series

This section summarizes the hardware and software default settings for the VXI/VMEpc 600 Series. Notice that some of the jumpers described in Table A-1 are for VXI configuration only.

**Table A-1.** VXI/VMEpc 600 Series Hardware Default Settings

Jumper Description	Default Setting Description
W1—Power On MITE Self Configuration	Enabled. <i>Do not alter this setting.</i>
W2—External Trigger Input Termination (VXI only)	Do not terminate
W3—SCSI Bus Termination	Enabled
W4—CLK10 SMB Direction (VXI only)	Receive CLK10
W5—CLK10 SMB Termination (VXI only)	Do not terminate
W6—CLK10 Source (VXI only)	Source from onboard oscillator

**Table A-1.** VXI/VMEpc 600 Series Hardware Default Settings (Continued)

<b>Jumper Description</b>	<b>Default Setting Description</b>
W7—CLK10 SMB Polarity (VXI only)	Not inverted
W8—Ethernet EEPROM	Enabled. <i>Do not alter this setting.</i>
W9—MITE User Configuration EEPROM	Load values from user side
W11—System Controller Slot Detection Mode	Automatically detect slot
W20—Clear CMOS	Disabled. Change only when clearing CMOS.

**Table A-2.** VXIpc T&M Explorer Device Tab Default Settings

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

**Table A-3.** VXIpc T&M Explorer Shared Memory Tab Default Settings

<b>Editor Field</b>	<b>Default Setting</b>
Memory sharing	Don't share memory
Shared RAM size	64 KB (when sharing memory)
Reserved physical memory	64 KB (when sharing memory)
Lower half window byte swapping	Disabled

**Table A-3.** VXIpc T&M Explorer Shared Memory Tab Default Settings (Continued)

Editor Field	Default Setting
Upper half window byte swapping	Disabled
Map upper and lower halves at same PCI address	Disabled

**Table A-4.** VXIpc T&M Explorer PCI Tab Default Settings

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

## VXI/VME-MXI-2

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This section summarizes the software default settings for the VXI-MXI-2 and VME-MXI-2. This information is useful if you have either of these modules in your system.

**Table A-5.** VXI/VME-MXI-2 T&M Explorer 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 <b>Address space</b> should be A32, and <b>Requested memory</b> should match the amount of DRAM. If you install the DRAM yourself, you must manually specify these changes.	

**Table A-6.** VXI/VME-MXI-2 T&M Explorer VXI/VME Bus Tab Default Settings

<b>Editor Field</b>	<b>Default Setting</b>
Bus timeout value	125 $\mu$ s
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-7.** VXI/VME-MXI-2 T&M Explorer MXI-2 Bus Tab Default Settings

<b>Editor Field</b>	<b>Default Setting</b>
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)



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# Common Questions

This appendix addresses common questions you may have about using the NI-VXI/VISA software on the VXI/VMEpc 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.
- **VXIedit**—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/VME 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. The loading of hardware settings now takes place 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, 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/VME 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.

Systems consisting of only a VMEpc 600 Series controller, a VME chassis, and VME boards do *not* need to run Resman when using NI-VXI software even though the devices do not appear in the T&M Explorer connection tree. However, you would not be able to use VISA without manually adding the VME devices to the system by using T&M Explorer as described above and then running Resman. This is because NI-VISA uses the Resource Manager to create instrument sessions for VXI/VME device communication. If this is not an issue for you, you can skip Resman.

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. 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.

### **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?**

Following 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 VXI/VMEpc hardware 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 VXI/VMEpc embedded computers?**

Run T&M Explorer and right-click on the name of the VXI/VMEpc. Select **Hardware Configuration**, and T&M Explorer displays the dialog box for the device. The title bar includes the serial number and hardware revision.

### **Which NI-VXI utility program must I use to configure the VXI/VMEpc 600 Series?**

Use the T&M Explorer program to configure the VXI/VMEpc. T&M Explorer is located in the NIVXI program group folder.

### **Which NI-VXI utility program must I use to initialize the VXI/VMEpc 600 Series?**

In Windows 95/NT, the VXI/VMEpc embedded computer is automatically initialized 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 to 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/VME 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 do the LEDs on the front of the VXI/VMEpc 600 Series mean?**

Refer to Appendix B, *LED Indicators*, in your *VXI/VMEpc 600 Series User Manual*, for a description of the front panel LEDs.

### **Is something wrong if the red SYSF and FAIL LEDs stay lit after booting the VXI/VMEpc 600 Series?**

If either the **SYSF** or **FAIL** LED remains lit, refer to Appendix B, *LED Indicators*, in your *VXI/VMEpc 600 Series User Manual*, for troubleshooting steps.

### **Can I access 32-bit registers in my VXI/VMEbus system from the VXI/VMEpc 600 Series?**

Yes. The VXI/VMEpc uses the 32-bit PCI bus to interface to the VXI/VMEbus. In fact, its VXI/VMEbus circuitry also supports the new VME64 standard for D64 accesses.

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

- ◆ **VXI Only**—CLK10 is a differential ECL signal on the backplane. However, the oscillator and the EXTCLK input on the front panel use TTL levels; therefore, you need to supply a TTL-level signal for EXTCLK. Our voltage converters convert the signal to differential ECL.

**What is the accuracy of the CLK10 signal?**

- ◆ **VXI Only**—The CLK10 signal generated by the VXIpc-650 is  $\pm 100$  ppm (0.01%) as per the VXIbus specification. If you need a more accurate CLK10 signal, you can use the external CLK connector on the front panel.

**What type of video interface is onboard the VXI/VMEpc-650? What video drivers are included? If my application requires a special type of video display, how do I configure my VXI/VMEpc-650?**

The VXI/VMEpc 600 Series uses the Cirrus Logic CL-GD5446 chip, a 64-bit graphics accelerator. The chip is compatible with the Standard VGA video output Microsoft Windows video driver, as well as the Cirrus Logic video driver. For more information on the video driver, refer to the `c:\images\manuals` directory.

**What kind of monitor can I use with the VXI/VMEpc 600 Series? Can I use Super VGA?**

VXI/VMEpc 600 Series computers use Super VGA video output. They work only with monitors having a horizontal scan rate of at least 50 kHz and a vertical scan rate of 60 Hz.



**Caution** *Make sure your monitor meets this specification. Enabling the Super VGA option on a monitor that does not meet this specification will damage your monitor.*

**What should I do if my keyboard connector does not fit into the keyboard port on the VXI/VMEpc-650?**

You can plug keyboards that have a 6-pin Mini DIN PS/2 type connector directly into the VXI/VMEpc. You can use the keyboard adapter cable that is included with every VXI/VMEpc 600 Series kit to adapt the larger AT keyboard connector to the 6-pin Mini DIN connector.

**What must I do if I want to install the VXI/VMEpc-650 in a slot other than the System Controller slot?**

The VXI/VMEpc 600 Series automatically detects whether it is in the System Controller slot (first slot) of a VXI/VMEbus mainframe. You do not need to change jumper settings to install the VXI/VMEpc controller in a different slot unless you have defeated the first slot detector (FSD) circuitry by changing the appropriate jumper setting on the VXI/VMEpc.

Remember that devices in all other slots must not be manually configured as system controller; they should be configured either for automatic detection or manual non-System Controller.

Refer to Chapter 3, *Configuration and Installation*, in the *VXI/VMEpc 600 Series User Manual* for information on enabling and defeating the FSD circuitry.

**How do I check the configuration of the memory, floppy drive, hard drive, time/date, and so on?**

You can view these parameters in the BIOS setup. To enter the BIOS setup, reboot the VXI/VMEpc controller and press the <DEL> key during the memory tests. Refer to Chapter 4, *BIOS*, in the *VXI/VMEpc 600 Series User Manual* for more information.

**Can I upgrade my VXI/VMEpc 600 Series?**

You can upgrade the CPU to 233 MHz if you have the 166 MHz model. Contact National Instruments for information.

**Can I use the internal IDE drive and an external SCSI hard drive at the same time?**

Yes, but you can only boot from the internal IDE drive in this configuration.

**My CMOS is corrupted. How do I set it back to default?**

1. Enter the BIOS setup program as described in Chapter 4, *BIOS*, in your *VXI/VMEpc 600 Series User Manual*.
2. Select **Auto Configuration with Optimal Settings**.
3. Answer **Y** (Yes) to the verification prompt.
4. Select **Save Settings and Exit**.



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# Reinstalling the NI-VXI/VISA Software

This appendix contains the instructions on how to reinstall your NI-VXI/VISA software. Your VXI/VMEpc 600 Series controller was shipped with the NI-VXI/VISA software already installed. It is unlikely that you will ever need to use these instructions.

## Preparing for Installation

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.



### Note

*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 panels that are included with VXI*plug&play*-compatible instruments from a variety of vendors.



## Installing the Software

This section describes how to install the 32-bit NI-VXI/VISA software for the VXI/VMEpc 600 Series. 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 VXI/VMEpc-650. Follow these steps to perform the installation:

1. Insert disk 1 of your set of disks labeled *NI-VXI/VISA for VXI/VMEpc 600 Series and Windows 95/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, by copying the TBL directory into another folder.*

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 drivers 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

After Setup completes, please review the information in any README files that Setup prompts you to read. Complete your software installation as follows:

1. 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.
2. 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.
3. 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 mainframe. You can also configure T&M Explorer to run Resman automatically at every computer startup.
4. 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.

---

# 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 USA 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.

<b>Country</b>	<b>Telephone</b>	<b>Fax</b>
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
Brazil	011 288 3336	011 288 8528
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 6120092	03 6120095
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: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

# VXI/VMEpc 600 Series 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 LabVIEW or LabWindows/CVI? \_\_\_\_\_

## VXI/VMEpc 600 Series Hardware Settings

VXIpc 600 Series Model Number \_\_\_\_\_

Part Number \_\_\_\_\_

Serial Number \_\_\_\_\_

Hard Drive Size \_\_\_\_\_ Video Memory \_\_\_\_\_

Processor Speed \_\_\_\_\_

Slot Location \_\_\_\_\_

W1 Setting: MITE Self-Configuration \_\_\_\_\_

W2 Setting: External Trigger SMB Termination \_\_\_\_\_

W3 Setting: SCSI Termination \_\_\_\_\_

W4 Setting: CLK10 SMB Direction \_\_\_\_\_

W5 Setting: CLK10 SMB Termination \_\_\_\_\_

W6 Setting: CLK10 Source \_\_\_\_\_

W7 Setting: CLK10 SMB Polarity \_\_\_\_\_

W8 Setting: Ethernet EEPROM \_\_\_\_\_

W9 Setting: MITE Configuration EEPROM \_\_\_\_\_

W11 Setting: System Controller Slot Detection \_\_\_\_\_

W20 Setting: CMOS Clear \_\_\_\_\_

## **VXI/VMEpc Configuration Editor Settings (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 \_\_\_\_\_  
Upper Half Window Byte Swapping \_\_\_\_\_  
Low-level Register Access API Support \_\_\_\_\_  
User Window Size \_\_\_\_\_

## **VXI/VME-MXI-2 Configuration Editor Settings (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 \_\_\_\_\_

Microprocessor \_\_\_\_\_

Clock frequency or speed \_\_\_\_\_

Type of video board installed \_\_\_\_\_

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:** *Getting Started with Your VXI/VMEpc™ 600 Series for Windows 95/NT*

**Edition Date:** *May 1998*

**Part Number:** *321882A-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 \_\_\_\_\_

E-Mail Address \_\_\_\_\_

Phone ( \_\_\_\_ ) \_\_\_\_\_ Fax ( \_\_\_\_ ) \_\_\_\_\_

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

**Fax to:** Technical Publications  
National Instruments Corporation  
512 794 5678

# Glossary

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Prefix	Meanings	Value
p-	pico	$10^{-12}$
n-	nano-	$10^{-9}$
$\mu$ -	micro-	$10^{-6}$
m-	milli-	$10^{-3}$
k-	kilo-	$10^3$
M-	mega-	$10^6$
G-	giga-	$10^9$
t-	tera-	$10^{12}$

## 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
- address** Character code that identifies a specific location (or series of locations) in memory. In VISA, it identifies a resource.
- 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
ASIC	application-specific integrated circuit
<b>B</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
BIOS	Basic Input/Output System. BIOS functions are the fundamental level of any PC or compatible computer. BIOS functions embody the basic operations needed for successful use of the computer's hardware resources.
BTO	<i>See</i> Bus Timeout Unit.
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 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.
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, $\pm 100$ 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.
CMOS	Complementary Metal Oxide Semiconductor; a process used in making chips
Commander	A message-based device that is also a bus master and can control one or more Servants
configuration registers	A set of registers through which the system can identify a module device type, model, manufacturer, address space, and memory requirements. In order to support automatic system and memory configuration, the VXIbus specification requires that all VXIbus devices have a set of such registers.

**D**

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 address space that is decoded by the VXI/VMEpc for use by the NI-VXI software
DTB	<i>See</i> Data Transfer Bus.

**E**

ECL	Emitter-Coupled Logic
EEPROM	Electrically 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.

## F

**fair requester** A VXIbus device that will not arbitrate for the VXIbus 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

**IRQ\*** Interrupt signal

**K**

KB kilobytes of memory

**L**

LED light-emitting diode

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**

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

MB megabytes of memory

MBD Message-Based Device

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

**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.

## P

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

**PCMCIA** Personal Computer Memory Card International Association

**POSC** Power On Self Configuration

## R

**RBD** Register-Based Device

**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 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
SMB	Sub Miniature Type B connector that features a snap coupling for fast connection
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 VXI/VMEbus system in that it performs the VXI/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 VXI/VMEbus backplane, or both.
<b>T</b>	
trigger	Either TTL or ECL lines used for intermodule communication
TTL	Transistor-Transistor Logic
<b>U</b>	
user window	A region of address space reserved by the VXI/VMEpc for use via the NI-VXI low-level function calls. <code>MapVXIAddress()</code> uses this address space to allocate regions for use by the <code>VXIpeek()</code> and <code>VXIpoke()</code> macros.
<b>V</b>	
VIC	VXI Interactive Control Program, a part of the NI-VXI bus interface software. 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 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 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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