

# Getting Started with Your VXIpc™ -486 Model 500 Series and the NI-VXI™ Software for Microsoft Windows



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**National Instruments Corporate Headquarters**

6504 Bridge Point Parkway

Austin, TX 78730-5039

(512) 794-0100

Technical support fax: (800) 328-2203

(512) 794-5678

**Branch Offices:**

Australia (03) 879 9422, Austria (0662) 435986, Belgium 02/757.00.20, Canada (Ontario) (519) 622-9310,

Canada (Québec) (514) 694-8521, Denmark 45 76 26 00, Finland (90) 527 2321, France (1) 48 14 24 24,

Germany 089/741 31 30, Italy 02/48301892, Japan (03) 3788-1921, Netherlands 03480-33466, Norway 32-848400,

Spain (91) 640 0085, Sweden 08-730 49 70, Switzerland 056/20 51 51, U.K. 0635 523545

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### Federal Communications Commission

This device complies with Part 15 of the Federal Communications Commission (FCC) Rules for a Class A digital device. Operation is subject to the following two conditions:

1. This device may not cause harmful interference in commercial environments.
2. This device must accept any interference received, including interference that may cause undesired operation.

### Canadian Department of Communications

This device complies with the limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications (DOC).

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de classe A prescrites dans le règlement sur le brouillage radioélectrique édicté par le ministère des communications du Canada.

### Instructions to Users

These regulations are designed to provide reasonable protection against harmful interference from the equipment to radio reception in commercial areas. 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.

There is no guarantee that interference will not occur in a particular installation. However, the chances of interference are much less if the equipment is installed and used according to this instruction manual.

If the equipment does cause interference to radio or television reception, which can be determined by turning the equipment on and off, one or more of the following suggestions may reduce or eliminate the problem.

- Operate the equipment and the receiver on different branches of your AC electrical system.
- Move the equipment away from the receiver with which it is interfering.
- Reorient or relocate the receiver's antenna.
- Be sure that the equipment is plugged into a grounded outlet and that the grounding has not been defeated with a cheater plug.

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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: *How to Identify and Resolve Radio-TV Interference Problems*. This booklet is available from the U.S. Government Printing Office, Washington, DC 20402, Stock Number 004-000-00345-4.

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# About This Manual

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This manual contains instructions for installing and configuring the National Instruments VXIpc-486 Model 500 Series embedded computer and the NI-VXI bus interface software for Microsoft Windows. The Model 500 Series consists of the VXIpc-486 Models 500, 566, and 599 computers.

## How to Use This Documentation Set

We suggest that you begin by reading this manual to guide you through the installation and configuration of the hardware and software. The software configuration requires that you first complete the installation and configuration of the hardware.

When you are familiar with the material in this manual, you can begin to use the *NI-VXI Software Reference Manual for C*. Chapter 1, *Introduction to VXI*, and Chapter 2, *Introduction to the NI-VXI Functions*, present the concepts of VXI and prepare you for detailed explanations of the NI-VXI functions. Study the descriptions of each function given in Chapters 3 through 13 to fully understand the purpose and syntax of each function. Use the interactive utilities described in the *NI-VXI DOS Utilities Reference Manual* and the *NI-VXI Text Utilities Reference Manual* to learn more about the capabilities of the NI-VXI software.

Use the *NI-488.2 Software Reference Manual for MS-DOS* as a guide for installing, configuring, and using the NI-488.2 GPIB Talker/Listener/Controller software. Because the GPIB port on the VXIpc-486 is compatible with the National Instruments AT-GPIB plug-in board for ISA computers, we have included manuals entitled *Getting Started with Your AT-GPIB* and the *NI-488.2 Software for MS-DOS* and *Using Your NI-488.2 Software with Microsoft Windows* with your VXIpc-486 kit. Refer to the *VXIpc-486 Documentation Notice: AT-GPIB and Microsoft Windows Compatibility* for more information about using this documentation.

## Organization of This Manual

This manual is organized as follows:

- Chapter 1, *Introduction*, describes the VXIpc-486 Model 500 Series kit, lists what you need to get started, and lists optional equipment and software.
- Chapter 2, *VXIpc-486 Configuration and Installation*, describes how to configure and install the VXIpc-486 Model 500 Series embedded computer.
- Chapter 3, *BIOS Setup*, describes how to set up the basic input/output system (BIOS) for the VXIpc-486 Model 500 Series computer.

- Chapter 4, *NI-VXI Software Installation and Configuration*, contains instructions for installing and configuring the NI-VXI software for the VXIpc-486 Model 500 Series computer.
- Chapter 5, *Using NI-VXI with Microsoft Windows*, discusses programming information for you to consider when developing applications that use the NI-VXI driver.
- Appendix A, *Specifications*, lists various module specifications of the VXIpc-486 Model 500 Series computer, such as physical dimensions and power requirements.
- Appendix B, *NI-VXI Software Overview*, lists all the programs and files located on the NI-VXI distribution diskettes.
- Appendix C, *Front Panel Indicators*, describes the function of the seven front panel LED indicators on the VXIpc-486 Model 500 Series computer.
- Appendix D, *Connectors*, describes the front panel and VXIbus connector pinouts on the VXIpc-486 Model 500 Series computer.
- Appendix E, *Modifying and Installing I/O Expansion Boards*, explains how to modify and install commercially available PC/XT and PC AT I/O boards in a VXIpc-486/2 Model 500 Series computer equipped with the I/O expansion kit.
- Appendix F, *VXIpc-486 Plug-in Boards*, discusses several considerations with regard to the height and length of plug-in boards used in an expansion kit for the VXIpc-486.
- Appendix G, *VXIpc-486 Hardware Configuration*, contains hardware configuration information about the VXIpc-486 Model 500 Series computer regarding memory map locations, I/O address map locations, interrupt lines, and DMA channels.
- Appendix H, *Configuring the Super VGA Option*, describes the Super VGA driver option you can use with your Model 500 Series VXIpc-486 and contains instructions for configuring your system to use this option.
- Appendix I, *Common Questions*, answers common questions you may have when using the NI-VXI bus interface software on the VXIpc-486 platform.
- Appendix J, *Troubleshooting*, addresses system-related problems you may encounter when using the NI-VXI bus interface software on the VXIpc-486 platform.
- Appendix K, *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 acronyms, abbreviations, metric prefixes, mnemonics, and symbols.
- The *Index* contains an alphabetical list of key terms and topics in this manual, including the page where you can find each one.

## Conventions Used in This Manual

The following conventions are used in this manual:

<b>bold</b>	Bold text denotes menus, menu items, LEDs, or dialog box buttons or options.
<i>italic</i>	Italic text denotes emphasis, a cross reference, or an introduction to a key concept.
monospace	Text in monospace font is used for the proper names of programs, subprograms, filenames, and extensions.
<b><i>bold italic</i></b>	Bold italic text denotes a note, caution, or warning.
Model 500 Series	The term <i>Model 500 Series</i> is used in this manual to refer to the VXIpc-486 Models 500, 566, and 599 embedded computers. When there are any differences among the three models, this manual describes them specifically.
◊	Angle brackets enclose the name of a key on the keyboard—for example, <Esc>.
<Tab>	Key names are capitalized.

Abbreviations, acronyms, metric prefixes, mnemonics, symbols, and terms are listed in the *Glossary*.

## Related Documentation

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

- *IEEE Standard for a Versatile Backplane Bus: VMEbus*, ANSI/IEEE Standard 1014-1987
- *VXI-1, VXIbus System Specification*, Rev. 1.4, VXIbus Consortium
- *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 using 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 K, *Customer Communication*, at the end of this manual.

# Chapter 1

## Introduction

---

This chapter describes the VXIpc-486 Model 500 Series kit for Microsoft Windows, lists what you need to get started, and lists optional equipment and software.

The VXIpc-486, an embedded computer based on the Industry Standard Architecture (ISA), is a high-performance, easy-to-use platform for VXIbus systems, featuring complete VXI functionality through interactive utilities and C function calls. In addition, the VXIpc-486 has an IEEE 488 interface that is compatible with the NI-488.2 architecture.

This manual describes VXIpc-486 Models 500, 566, and 599 as the Model 500 Series. The major difference in the three models is the type and speed of the microprocessor.

- The Model 500 uses the 50 MHz version of the Intel 80486DX2 microprocessor
- The Model 566 uses the 66 MHz version of the Intel 80486DX2 microprocessor
- The Model 599 uses the 100 MHz version of the Intel 80486DX4 microprocessor

### What You Need to Get Started

- Microsoft Windows version 3.1 or higher, and MS-DOS version 5.0 or higher installed on your computer
- VXIpc-486 Model 500 Series Module (one of the following):
  - Model 500 one-slot (with onboard video)
  - Model 500 two-slot (with or without onboard video)
  - Model 566 one-slot (with onboard video)
  - Model 566 two-slot (with or without onboard video)
  - Model 599 one-slot (with onboard video)
  - Model 599 two-slot (with or without onboard video)
- Keyboard adapter cable
- NI-VXI distribution disks for the VXIpc-486 200/500 Series and Microsoft Windows

## Optional Equipment

Contact National Instruments for ordering information for any of the following optional equipment.

- VXIpc-EFD external 3.5 in. floppy drive (compatible with models without an internal floppy drive)
- COM2 adapter cable
- I/O expansion slot panel bracket, blank
- Type X1 single-shielded GPIB cables (1 m, 2 m, or 4 m)
- Type X2 double-shielded GPIB cables (1 m, 2 m, or 4 m)

## Optional Software

You can order the Super VGA Video Option for your VXIpc-486 Model 500 Series. You can benefit from the improved graphic image from Super VGA if you want to edit or view an especially complex image in graphics or CAD programs. If you ordered your VXIpc-486 with Super VGA already installed, you must modify the system settings as described in Appendix H, *Configuring the Super VGA Option*. This appendix also includes installation instructions in case you order this option at a later date.

Component	Part Number
Super VGA Video Option	920005-02

If you want to use LabVIEW with your VXIpc-486, you can order the LabVIEW for Windows VXI Development System. It contains the following components:

Software	Part Number
LabVIEW for Windows VXI Development System: LabVIEW for Windows Full Development System, LabVIEW for Windows VXI Library, LabVIEW for Windows/Sun VXI Instrument Library	776674-21

If you want to use LabWindows with your VXIpc-486, you can order either the LabWindows for DOS, VXI Development System, or the LabWindows/CVI for Windows, VXI Development System. The following table lists the subcomponents of the two kits.

Software	Part Number
LabWindows for DOS, VXI Development System: LabWindows for DOS Full Development System, LabWindows for DOS VXI Libraries, LabWindows for DOS VXI Instrument Library	776729-21
LabWindows/CVI for Windows, VXI Development System: LabWindows/CVI for Windows Full Development System, LabWindows/CVI for Windows VXI Libraries, LabWindows/CVI for Windows VXI Instrument Library	776804-21

## Hardware Description

The VXIpc-486 Series computers are custom VXI computers that you install directly in your VXI mainframe to achieve the smallest possible physical size for a VXI system. An embedded computer can take full advantage of the VXI high-performance backplane capabilities and give you direct control of VXI registers, memory, and triggers.

The VXIpc-486 computers are available in one-slot and two-slot versions. The VXIpc-486/1 requires one VXIbus slot and contains an internal hard disk drive. An optional external floppy drive is available for transferring files between the VXIpc-486 and other PCs. The VXIpc-486/2 is available in various combinations of internal hard disk drive, internal floppy disk drive, and PC-compatible I/O expansion kits. The optional external floppy drive is compatible with VXIpc-486/1 and VXIpc-486/2 models without an internal floppy drive.

All models have connectors for an external floppy drive, a VGA or Super VGA monitor, a GPIB interface, serial and parallel ports, and VXI clock and trigger signals.

## Software Description

The VXIpc-486 Series computers are compatible with numerous software packages and tools available for general-market computers. To program VXI directly, you can use the NI-VXI bus interface software included with this kit. The NI-VXI software for the VXIpc-486 and Microsoft Windows includes a Resource Manager, an interactive VXI resource editor program, a comprehensive library of software routines for VXI/VME programming, and an interactive control program for interacting with the VXIbus. You can use this software to seamlessly program multiple-mainframe configurations and have software compatibility across a variety of VXI/VME controller platforms. You can use the same software with the Model 200 Series.

The NI-488.2 software kit for the VXIpc-486 and MS-DOS/Windows gives you accessibility to the industry-standard NI-488.2 software for controlling external GPIB instruments through the GPIB port on the front panel of your VXIpc-486. The *VXIpc-486 Documentation Notice: AT-GPIB and Microsoft Windows Compatibility* directs you to the appropriate sections of the NI-488.2 documentation for information about using the capabilities of the AT-GPIB in your system.



# Chapter 2

## VXIpc-486 Configuration and Installation

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This chapter describes how to configure and install the VXIpc-486 Model 500 Series embedded computer. Your VXIpc-486 is shipped with software already installed on the hard disk. Refer to Chapter 4, *NI-VXI Software Installation and Configuration* should you need to reinstall any of the software. Because the VXIpc-486 built-in GPIB port is compatible with the industry-standard AT-GPIB plug-in GPIB interface board for PC AT computers, please refer to *Getting Started with Your AT-GPIB and the NI-488.2 Software for MS-DOS* for information about using the capabilities of the AT-GPIB in your system.

**Note:** *This chapter discusses the VXIpc-486 Models 500, 566, and 599 together as the Model 500 Series. The illustrations in this chapter apply to all models in the series.*

### Factory Configuration

The VXIpc-486 Model 500 Series is factory-configured to function as a VXIbus Slot 0 System Controller. This is the most commonly used configuration. Table 2-1 shows the details of the factory configuration.

Table 2-1. VXIpc-486 Model 500 Series Factory Configuration

Item	Factory Configuration
Slot 0: System Controller	Enabled (Bus Arbiter and Bus Timer Soft-Configured)
CLK10 MODID Terminator	Onboard source drives backplane 16.9 k $\Omega$ pull-up
External CLK10 I/O Termination	Disabled Not terminated
External Trigger Input	Not terminated
External Audio/Trigger Out	Trigger Out
System RAM	Per customer order

The System Controller functions include the System Clock (SYSCLK) driver, System Reset (SYSRESET) driver, Bus Arbiter, and Bus Timer. The Bus Arbiter and Bus Timer are soft-configured, but are enabled or disabled by the Slot 0 System Controller configuration.

You can alter the VXIpc-486 factory configuration, if necessary, to match your system requirements by changing the jumper settings as described in this chapter, and by running the VXIEDIT application as described in Chapter 4. The configurable features not listed in Table 2-1 are soft-configured by VXIEDIT.

## Configuring the VXIpc-486

This section describes how to modify the VXIpc-486 Model 500 Series factory configuration.

Unless you have special system configuration requirements, you can install and use the VXIpc-486 without altering the factory configuration. Unless you need to alter the configuration shown in Table 2-1, skip the following sections and continue with *Installing and Starting Up the VXIpc-486*, later in this chapter.

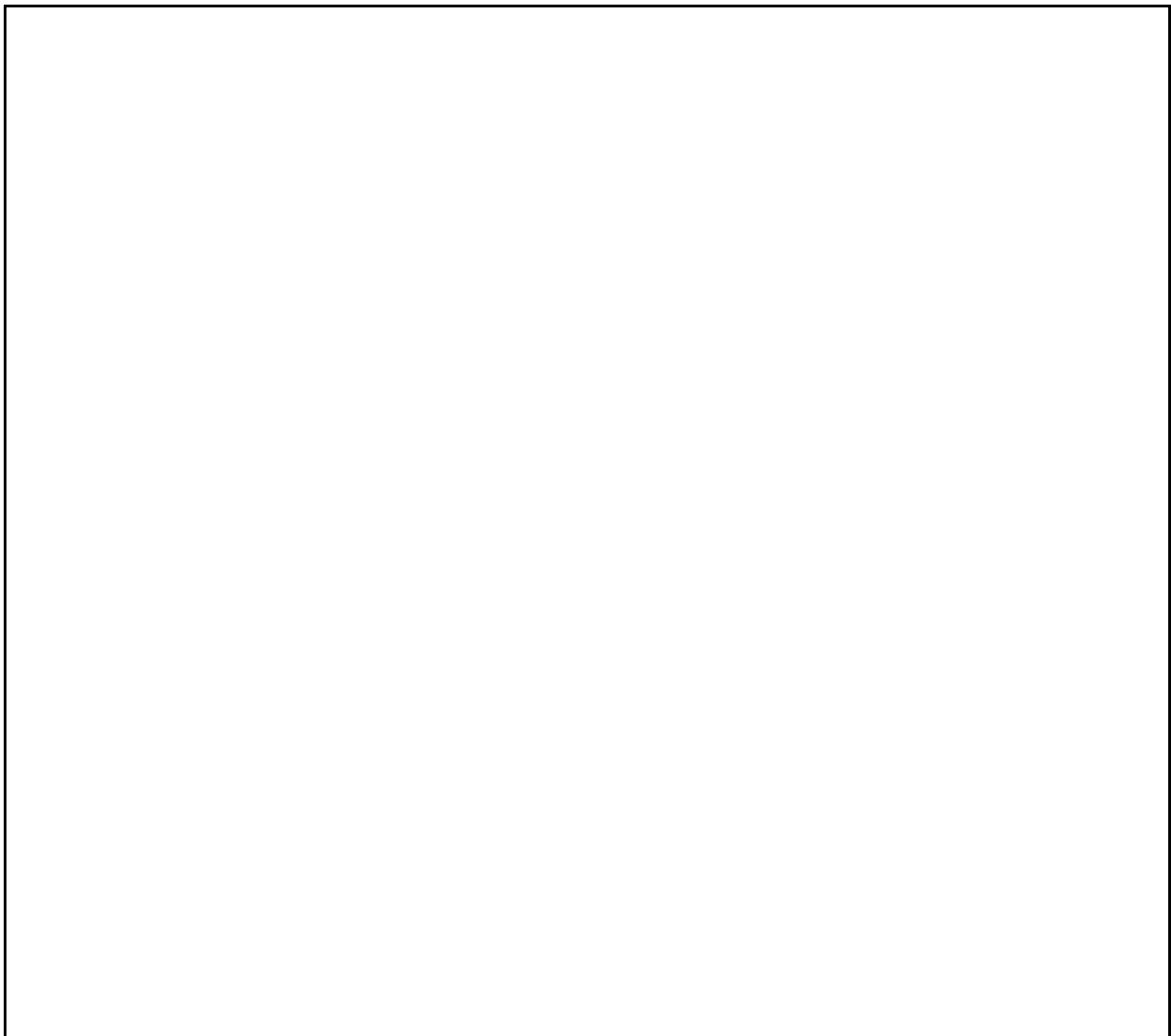


Figure 2-1. VXIpc-486 Model 500 Series Parts Locator Diagram (Continues)

## Configuration Procedure

Follow these steps to modify the factory configuration:

1. Ground yourself and the VXIpc-486. The VXIpc-486 can be damaged by static discharge. You are less likely to damage the VXIpc-486 if you place it on a properly grounded anti-static mat and use a wriststrap.
2. Remove the screws that secure the right side cover. Remove the cover to expose the circuit board.
3. Alter the configuration as required, as described in the following section.
4. Replace the cover and the screws.



Figure 2-1. VXIpc-486 Model 500 Series Parts Locator Diagram (Continued)

## Configuration Options

Figure 2-1 shows the location of the VXIpc-486 Model 500 Series configurable components and their physical location relative to some of the major circuit components. The factory jumper settings are indicated in Figure 2-1 by the black rectangles. The jumper headers not shown in Figure 2-1 are not user configurable and should not be populated with shunt jumpers.

Shunt jumpers should always be installed on W25 and W21. You may change the position of these jumpers as required, but do not remove them completely.

Depending on the hardware changes you make to your VXIpc-486, you may need to make some corresponding changes to the software by running one of the VXI resource editor configuration programs. Refer to Chapter 4, *NI-VXI Software Installation and Configuration*, for instructions on using either the VXIEDIT or VXITEDIT program. These programs are described in greater detail in the *NI-VXI DOS Utilities Reference Manual* and the *NI-VXI Text Utilities Reference Manual*, respectively.

### VXIbus Slot and External CLK10 Configuration Options

Because the VXIbus slot and external CLK10 configuration options are interdependent, they are discussed together in this section.

The external CLK10 interface is the SMB connector labeled *CLK* on the VXIpc-486 front panel. The external CLK10 signal is a TTL-level signal.

Table 2-2 presents six different configuration options of the slot position and external CLK10, including the factory default settings. Refer to the applicable configuration figures (Figures 2-2 through 2-7) that illustrate how to set up these options.

Table 2-2. VXIbus Slot Position and External CLK10 Configuration Options

Configuration	VXIbus Slot	External CLK10	Applicable Configuration Figures					
			W26	W25	W24	W32, W33, W35, W36	W20	J16
A*	Slot 0	Disabled	2-2a	2-3a	2-4a	2-5a	2-6a	2-7a
B	Slot 0	Output	2-2a	2-3a	2-4a	2-5a	2-6b	2-7a
C	Slot 0	Input, Unterminated	2-2a	2-3a	2-4b	2-5a	2-6c	2-7a
D	Slot 0	Input, 50 $\Omega$ Terminated	2-2a	2-3a	2-4b	2-5a	2-6c	2-7b
E	Non-Slot 0	Disabled	2-2b	2-3b	2-4a	2-5b	2-6a	2-7a
F	Non-Slot 0	Output	2-2b	2-3b	2-4a	2-5b	2-6b	2-7a
* Factory Configuration								

## Slot 0 Configurations

Configurations A through D from Table 2-2 are Slot 0 settings. Do not install the VXIpc-486 in any other slot if you are using any of these four configuration options.

**Warning:** *Installing a VXIpc-486 configured for Slot 0 operation into any slot other than Slot 0 can damage the VXIpc-486, the backplane, and the Slot 0 device.*

- Configuration A is the factory default mode of the VXIpc-486 Model 500 Series. Use this mode when the VXIpc-486 is the Slot 0 device and does *not* need to use the external CLK10 SMB connector on the front panel to receive or send the CLK10 signal. In this configuration, the onboard CLK10 reference (derived from an oscillator) source drives the differential ECL CLK10 backplane signals, and the CLK10 is disabled. Use configurations B, C, or D if the VXIpc-486 is the Slot 0 device and *does* need to use the external CLK10 connector.
- Configuration B is similar to A, except that the CLK10 SMB is driven with a TTL level CLK10 derived from the ECL CLK10 driven on the backplane.
- In configuration C, the CLK10 SMB can be connected to a TTL CLK10 source to generate the ECL CLK10 on the backplane.
- Configuration D is similar to C, except that the external CLK10 reference is terminated with a 50  $\Omega$  resistor to ground.

The four Slot 0 settings are useful in multiple-mainframe configurations. For example, to synchronize multiple mainframes together, you can use a VXIpc-486 as the clock source and configure it to configuration B. Configure other Slot 0 controllers in other mainframes to configuration C and connect the CLK10 SMBs together. The frames now have synchronized CLK10 signals, which can be used in conjunction with the external trigger lines to synchronize devices in multiple mainframes.

## Non-Slot 0 Configurations

If you will be installing the VXIpc-486 Model 500 Series in any slot other than Slot 0, use either configuration E or F from Table 2-2. As a Non-Slot 0 device, the VXIpc-486 accepts the CLK10 signal from the backplane.

- In configuration E, the VXIpc-486 Model 500 Series accepts the CLK10 signal from the backplane, and terminates the differential ECL CLK10 signals with 50  $\Omega$  resistors to -2V.
- Configuration F is similar to E, except that the VXIpc-486 also drives the external CLK10 connector with a TTL CLK10 reference signal.

As mentioned earlier, some hardware configurations require that you make a corresponding change in the software. For example, when you configure the VXIpc-486 as a Non-Slot 0 device, you need to use the Bus Configuration Editor in the VXIEDIT or VXITEDIT program to change both the **Local Bus Timeout** and **VXI Bus Timeout** values to DISABLED. (The default values are 32  $\mu$ s for the **Local Bus Timeout** and 128  $\mu$ s for the **VXI Bus Timeout** because the VXIpc-486 is factory configured to be a Slot 0 device.)

Additionally, if you do not want the VXIpc-486 to be the system Resource Manager, use the Logical Address Configuration Editor to change the **Logical Address** field to a non-zero, unused logical address. (The default logical address of the VXIpc-486 is 0.)

### MODID Signal Termination

W26 configures the MODID signal termination for Slot 0/Non-Slot 0 operation. When configured for Slot 0 operation (Figure 2-2a), W26 causes the MODID signal to be terminated with a 16.9 k $\Omega$  pull-up resistor. When configured for Non-Slot 0 operation (Figure 2-2b), W26 causes the MODID signal to be terminated with an 825  $\Omega$  pull-down resistor.

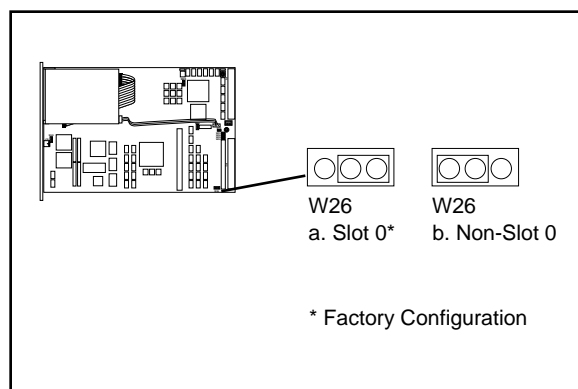


Figure 2-2. MODID Signal Termination Settings

### System Controller

W25 configures the System Controller for Slot 0/Non-Slot 0 operation. When configured for Slot 0 operation (Figure 2-3a), W25 enables the VXIpc-486 Model 500 Series System Controller functions—SYSCLK and SYSRESET drivers, the Bus Arbiter and Bus Timer. When configured for Non-Slot 0 operation (Figure 2-3b), W25 disables the System Controller functions.

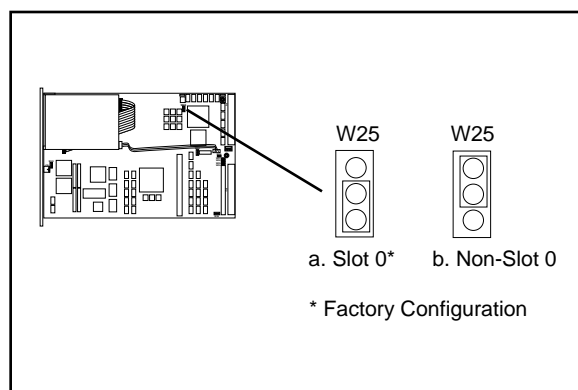


Figure 2-3. System Controller Settings

## CLK10 Generation

W24 configures the receiving source for the CLK10 reference. For internal clock generation, set the jumper as shown in Figure 2-4a. When the source is from the CLK10 SMB connector on the front panel of the VXIpc-486, set the jumper as shown in Figure 2-4b. Notice that when configured for Non-Slot 0, CLK10 will always be received from the backplane.

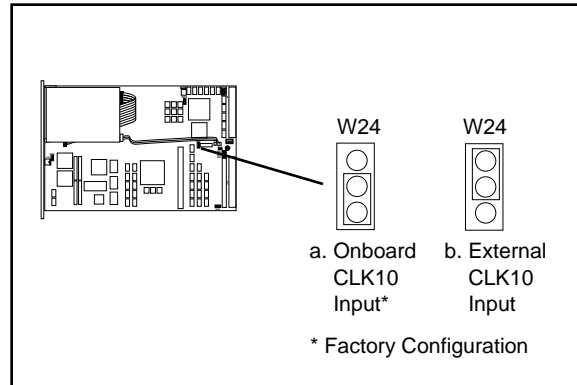


Figure 2-4. CLK10 Generation Settings

## VXIbus CLK10

This jumper block configures the CLK10 transceivers. Figure 2-5(a) shows the default Slot 0 configuration in which the VXIpc-486 sources the CLK10 signal. If you want to configure the VXIpc-486 as a Non-Slot 0 device, you should choose the setting in Figure 2-5(b). In this configuration, the VXIpc-486 does not drive the CLK10 signal onto the bus.

**Warning:** *Do not set the W32, W33, W35, W36 jumper block to any setting other than those shown in Figure 2-5. Any other settings could result in damage to the VXIpc-486 and any other devices installed on the backplane.*

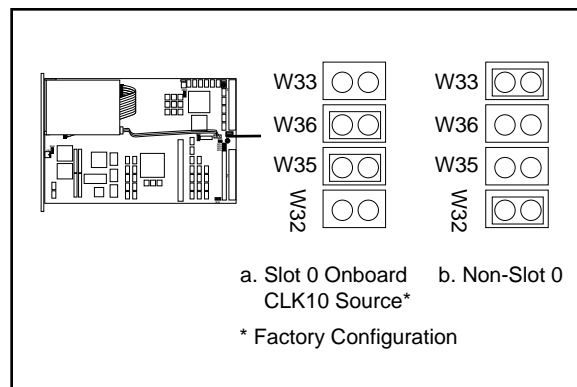


Figure 2-5. VXIbus CLK10 Settings

### External CLK10

The W20 jumper configures the CLK SMB connector on the front panel. Keep the default configuration shown in Figure 2-6(a) if the CLK connector is disconnected and used as neither an input nor an output for the CLK10 signal. Figure 2-6(b) shows the configuration to use if you want the CLK10 signal that appears on the backplane to also appear on the CLK SMB connector. The configuration in Figure 2-6(c) is useful only if you have configured the W24 jumper to use the external CLK10 input. In this setting, the signal supplied to the CLK SMB connector is driven onto the VXIbus backplane as CLK10.

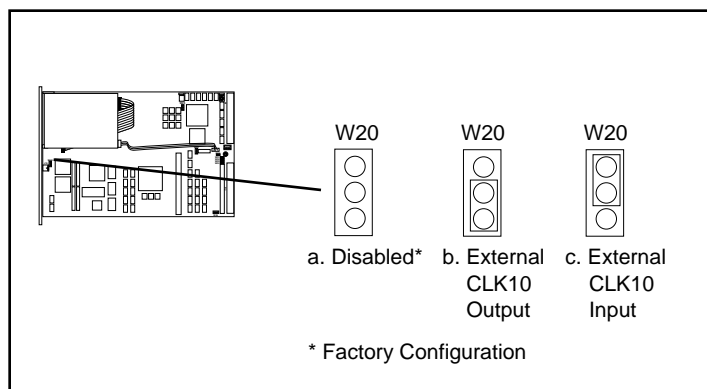


Figure 2-6. External CLK10 Settings

### External CLK10 Termination

The J16 jumper configures whether the CLK10 signal is terminated. This is important only if you are daisy-chaining the CLK10 signal among multiple chassis. The source of the CLK10 and the last chassis in the daisy-chain should be terminated to prevent electrical reflections. Notice that this option is useful only if you have selected the external CLK by jumpers W20 and W24.

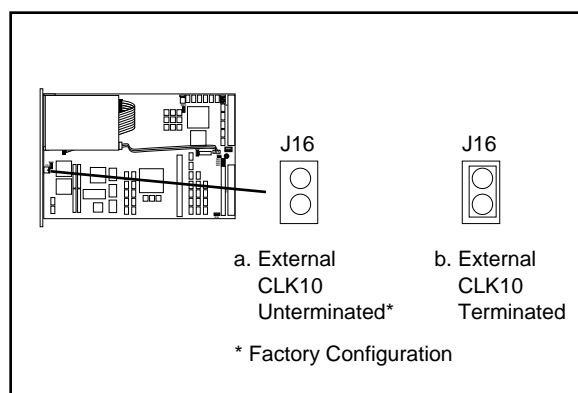


Figure 2-7. External CLK10 Termination Settings



## External Trigger Input Configuration

The external TTL trigger input interface is the SMB connector labeled *TRG IN* on the VXIpc-486 front panel. Figure 2-8 shows the external trigger input circuit.

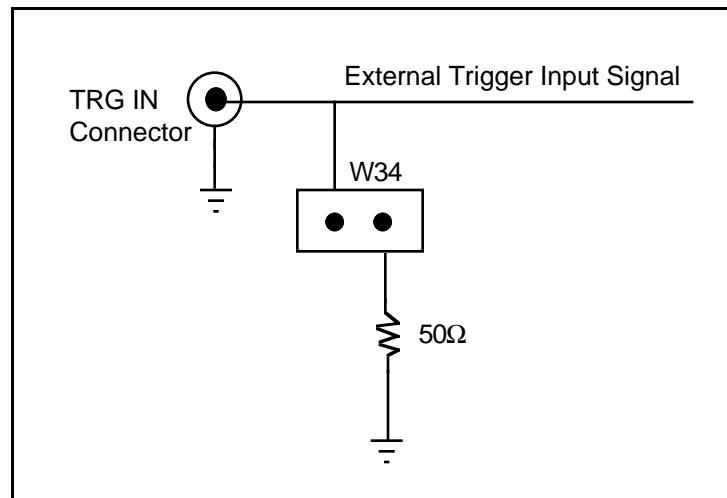


Figure 2-8. External Trigger Input Circuit

The W34 jumper configures whether the external TTL trigger input is terminated with a 50  $\Omega$  resistor to ground. This is important only if you are daisy-chaining the external trigger input among multiple chassis. The source of the trigger input and the last chassis in the daisy-chain should be terminated to prevent electrical reflections. Figure 2-9 shows the external trigger input termination settings.

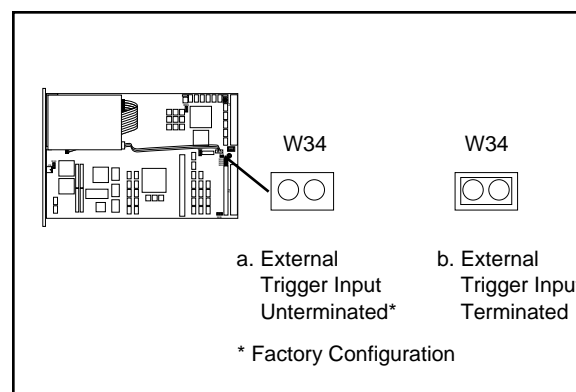


Figure 2-9. External Trigger Input Termination Settings

## External Audio/Trigger Output Configuration

The external audio/trigger output interface is the SMB connector labeled *AUDIO/TRG OUT* on the VXIpc-486 front panel.

You can configure the external audio/trigger output as either an audio output or a TTL trigger output. The audio/trigger output is connected to the circuit card by a twisted-pair cable. You can configure the audio/trigger output by connecting the cable to either J13 or J17. Table 2-3 shows the configuration options.

Table 2-3. External Audio/Trigger Output Configuration Options

External Audio/ Trigger Output	Connected to
Trigger Out*	J17
Audio Out	J13
* Factory configuration	

## Installed System RAM Configuration

The amount of installed RAM is factory configured per customer order. You can change the amount of installed RAM on VXIpc-486/1 models by installing dynamic RAM single in-line memory modules (DRAM SIMMs) in positions A1 and A2, as shown in Table 2-4 and Figure 2-1.

**Warning:** *Do not attempt to change the factory RAM configuration of the VXIpc-486/2. Disassembling the internal brackets in an attempt to expose the DRAM SIMM sockets will void your warranty.*

Table 2-4. Installed RAM Configuration Options

Installed RAM	A2	A1
1 MB	256 KB x 36	Not Installed
2 MB	256 KB x 36	256 KB x 36
4 MB	1 MB x 36	Not Installed
5 MB	1 MB x 36	256 KB x 36
8 MB	1 MB x 36	1 MB x 36
16 MB	4 MB x 36	Not Installed
32 MB	4 MB x 36	4 MB x 36

National Instruments recommends the following DRAM SIMMs for use with the VXIpc-486/1:

- Hitachi part number HB56G25636B-7AL or equivalent 256 KB x 36 SIMMs
- Toshiba part number THM361020ASG-70 or equivalent 1 MB x 36 SIMMs
- Toshiba part number THM364020SG-70 or equivalent 4 MB x 36 SIMMs.

**Note:** *Always reconfigure the VXIpc-486/1 to the factory DRAM configuration shown on the ID label before returning it to the factory for repairs or upgrades.*

## Installing and Starting Up the VXIpc-486

The following installation instructions apply to the VXIpc-486 Model 500 Series. Refer to your mainframe user manual for further instructions regarding mainframe configuration and module installation. Figure 2-10 shows the location of the VXIpc-486 front panel connectors. Refer to Appendix D, *Connectors*, for pinout details about each connector.

1. Turn off the mainframe power.

**Warning:** *Installing a VXIpc-486 Model 500 Series configured for Slot 0 operation into any slot other than Slot 0 can result in damage to the VXIpc-486, the backplane, and the Slot 0 device.*

2. If the VXIpc-486 is configured for Slot 0 operation, install it in Slot 0. If the VXIpc-486 is configured as a Non-Slot 0 device, install it in any slot other than Slot 0. The *VXibus Slot and External CLK10 Configuration Options* section, earlier in this chapter, describes the different configuration options for Slot 0 and non-Slot 0 applications. Refer also to your mainframe user manual for instructions regarding slot configuration.
3. Tighten the retaining screws at the top and bottom of the front panel.
4. Connect the keyboard to the KEYBOARD connector. Use the keyboard adapter cable that you received with your kit to adapt AT-style keyboards to the VXIpc-486 mini-DIN connector.
5. Connect the VGA monitor video cable to the VGA connector and tighten the screws.
6. On VXIpc-486 models without an internal floppy drive, connect the optional external floppy drive (EFD) to the DISK DRIVE connector. The EFD is not compatible with models that have an internal floppy drive.
7. Connect serial devices to the COM1 or COM2 connectors, if required by your system configuration. Use the COM2 adapter cable (available as an accessory) to attach serial devices to COM2.
8. Connect parallel devices to the LPT connector, if required by your system configuration.

9. Connect the external CLK10 signal to the CLK connector, if required by your system configuration.
10. Connect the external trigger input signal to the TRG IN connector, if required by your system configuration.
11. Connect the external audio or trigger output signal to the AUDIO/TRG OUT connector, if required by your system configuration.
12. To start up the VXIpc-486, turn on the mainframe power. Also apply power to any peripherals, such as the monitor. The basic input/output system (BIOS) boot sequence should now begin to display startup messages on the monitor. Chapter 3, *BIOS Setup*, contains information on BIOS that you may need in case you either have special BIOS configuration requirements or you encounter a BIOS-related error message.

The front panel LED indicators also provide information about the VXIpc-486 and VXIbus system status. The **SYSFAIL** and **FAILED** LEDs remain lit until the VXIpc-486 initialization program `VXIINIT.EXE` is run. See Appendix B, *NI-VXI Software Overview*, for more information about `VXIINIT`. See Appendix C, *Front Panel Indicators*, for more information about the front panel LED operation.

Figure 2-10 shows the front panel of a two-slot VXIpc-486 equipped with the floppy drive option.

Figure 2-10. VXIpc-486 Model 500 Series Front Panel

# Chapter 3

## BIOS Setup

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This chapter describes how to set up the basic input/output system (BIOS) for the VXIpc-486 Model 500 Series computer. The VXIpc-486 uses the Quadtel AT Compatible Enhanced BIOS. The BIOS defines the way in which software interacts with the VXIpc-486 hardware. The BIOS has a number of setup parameters that contain the VXIpc-486 system configuration information.

The BIOS setup parameters are stored in the CMOS RAM, which is backed up by battery. You use the BIOS utility *Setup* (part of the Quadtel Extended BIOS Software System) to modify the time-of-day, date, floppy and hard disk types, processor speed, and shadow RAM operation.

The BIOS parameters are factory-configured for proper operation. Unless you have special BIOS configuration requirements, you can proceed to Chapter 4, *NI-VXI Software Installation and Configuration*.

### Running Setup

Occasionally, you may encounter a BIOS-related error message that requires you to run *Setup*. You may also need to change one or more of the BIOS parameters for compatibility with a software application. If you need to run *Setup*, follow these steps:

1. Press <F2> after power-on to display the Extended BIOS Software main window. This window also appears if you press <F2> after a power-on self-test error is displayed.
2. Select *Setup*, using the Up/Down Arrow and <Enter> keys, to display the Extended BIOS Setup window.
3. Use the Up/Down Arrow or <Tab> keys to select the item you want to change. Press <F5> to select the previous (smaller) value, <F6> to select the next (larger) value, or <F9> to automatically configure the selected item.
4. Press <F10> to save the configuration parameters you edited.
5. Press <Esc> to exit *Setup*. If you have not saved your changes, you can do so at this time.
6. Press <Esc> to exit the Extended BIOS Software main window. The VXIpc-486 will restart.

Table 3-1 shows the default BIOS configuration parameters.

Table 3-1. Default BIOS Setup Configuration Parameters

Parameter	Configuration
System Memory	Press <F9> to Auto Configure
Extended Memory	Press <F9> to Auto Configure
EMS Memory	Press <F9> to Auto Configure
Power-up Speed	Normal
BIOS Shadow	System in RAM Video in RAM
Disk Drive 0 Internal Floppy Disk or EFD No Floppy Disk Drive	1.44 MB 3.5 in. Not installed
Disk Drive 1	Not installed
Fixed Disk 0 Type	As shown on the ID label <AUTO>
Fixed Disk 1 Type	None

## Extended Features

The Quaddel BIOS contains some extended features. You can access and modify these features by following these steps.

1. Press <F2> after power-on to display the Extended BIOS Software main window.
2. Use the Up/Down Arrow keys to select the appropriate feature and press <Enter>.
3. Use the Up/Down Arrow or <Tab> keys to select the item you want to change. Press <F5> to select the previous (smaller) value, <F6> to select the next (larger) value, or <F9> to automatically configure the selected item.
4. Press <F10> to save the configuration parameters you edited.
5. Press <Esc> to exit Setup. If you have not saved your changes, you can do so at this time.
6. Press <Esc> to exit the Extended BIOS Software main window. The VXIpc-486 will restart.

Table 3-2 shows the default BIOS configuration parameters for the extended features.

Table 3-2. Extended BIOS Configuration Parameters

<b>Parameter (Extended)</b>	<b>Configuration</b>
Auto Park Disk	No
Quick Boot	No
Screen Saver	Disabled
Keyboard Click	No
Keyboard Delay	1/2 sec
Keyboard Rate	13/sec
Numlock Boot State	Auto



# Chapter 4

## NI-VXI Software Installation and Configuration

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This chapter contains instructions for installing and configuring the NI-VXI software for the VXIpc-486 Model 500 Series computer. Your VXIpc-486 is shipped from the factory with MS-DOS, Windows, NI-VXI, and NI-488.2 software already installed on the hard disk. The information on installing the NI-VXI software is included in this chapter should you ever need to reinstall it. For instructions on installing MS-DOS and Windows, refer to the documentation included in your Microsoft DOS and Windows kit. Because the VXIpc-486 built-in GPIB port is compatible with the industry-standard AT-GPIB plug-in GPIB interface board for PC AT computers, please refer to *Getting Started with Your AT-GPIB and the NI-488.2 Software for MS-DOS* and to *Using Your NI-488.2 Software with Microsoft Windows* for information about using the capabilities of the AT-GPIB and the NI-488.2 software in your system.

For a list of all the files and program, refer to Appendix B, *NI-VXI Software Overview*. If you encounter problems using the NI-VXI software, consult Appendix I, *Common Questions*, and Appendix J, *Troubleshooting*.

### Installing the Software

The VXIpc-486 is shipped with Microsoft Windows and the NI-VXI software installed on the hard disk. Unless you need to reinstall part or all of the NI-VXI files, skip this section and continue with *Configuring the NI-VXI Software*, later in this chapter.

The NI-VXI distribution disks that came with your VXIpc-486 contain the NI-VXI files as well as an INSTALL program. The INSTALL program is used to install a software update or to reinstall software in the event that your files were accidentally erased. Follow these steps to reinstall all or part of the NI-VXI software.

1. The NI-VXI software requires approximately 3 MB of free space on your hard disk. Create the necessary free space on the hard disk before starting the installation.
2. Run INSTALL.EXE on distribution disk 1. You can run this program from the Windows Program Manager's **File** menu, **Run** option, or from the DOS prompt (which loads Windows and then runs INSTALL). However, it *cannot* be run from the Windows DOS Shell. INSTALL is a graphical, interactive, self-guiding program, which will install all the necessary files (for a complete or partial installation, as user-specified) on the hard disk. In addition, it will optionally modify the AUTOEXEC.BAT, PROGMAN.INI, SYSTEM.INI, and WIN.INI initialization files accordingly. The program prompts you to enter the following information:
  - Environments to install: You can choose whether to install NI-VXI for DOS, Windows, or both. The default is to install both.

- **Languages to install:** You can choose whether to install the Microsoft C, Borland C, and/or QuickBASIC libraries. The default is to install all of them, but if you are using only one compiler, you can select only that compiler.
- **Destination directory:** This is the complete pathname of the directory where you want to install the software.
- **Modifying DOS initialization files:** You can choose whether `INSTALL` modifies the `AUTOEXEC.BAT` file to reflect the location of the NI-VXI library. If you choose to let `INSTALL` do this, you must also enter the drive where `AUTOEXEC.BAT` can be found.
- **Modifying Windows initialization files:** You can choose whether `INSTALL` modifies the `PROGMAN.INI`, `SYSTEM.INI`, and `WIN.INI` files to reflect the location of the NI-VXI library. If you choose to let `INSTALL` do this, you must also enter the directory in which the Windows files can be found.

You can quit the `INSTALL` program at any time by choosing **Exit** from the initial screen, or by pressing the **Cancel** button once installation has begun. If you do not have a mouse, pressing the `<Esc>` key performs the same action. In either case, `INSTALL` will prompt you to be certain you really want to quit at that time. If you choose to run the `INSTALL` program again, it starts over and recopies all the necessary files. Of course, if you made any changes from the default configuration, you will need to specify those changes once again.

As mentioned previously, `INSTALL` *optionally* modifies the `AUTOEXEC.BAT`, `PROGMAN.INI`, `SYSTEM.INI`, and `WIN.INI` files. For each file that you *do* modify, it changes the old file's extension to `.BAK` and keeps it for safety purposes. For each file that you do *not* modify, it creates a file in the NI-VXI directory with the changes it proposes you make to the files. The files that it creates in this situation have the same filename but with the extension `.VXI`. For example, if you choose not to let `INSTALL` modify `AUTOEXEC.BAT`, it will create a file in the NI-VXI directory called `AUTOEXEC.VXI`, with changes you will need to make to `AUTOEXEC.BAT`.

## Modifying the AUTOEXEC.BAT File

If you choose to let `INSTALL` modify your `AUTOEXEC.BAT` file, it updates the setting of environment variables `PATH`, `LIB`, and `INCLUDE` to include the relevant subdirectories of the NI-VXI directory. The previously specified directories in `PATH`, `LIB`, and `INCLUDE` remain unchanged. `INSTALL` also adds a new environment variable `NIVXIPATH`, and appends a command line to execute `VXIINIT.EXE` automatically.

If you choose not to let `INSTALL` modify your `AUTOEXEC.BAT` file, refer to the `AUTOEXEC.VXI` file in your NI-VXI directory for suggestions on how to change the following lines manually.

- The `PATH` variable should include the full path to the subdirectory where the NI-VXI utilities and `NIVXI.DLL` are located, in addition to whatever other directories you have already specified in `PATH`. The path must be specified so that Windows can locate the executable

code when the library needs to be loaded. Normally, these files reside in the root of the NI-VXI directory, and also the WIN subdirectory.

- The LIB variable should include the full path to the subdirectories that contain the C libraries for the compiler you choose to install.
- The INCLUDE variable should include the full path to the subdirectory that contains the NI-VXI include files. By default, the include files reside in the INCLUDE subdirectory of the NI-VXI directory.
- The NIVXIPATH variable should contain the full path to the NI-VXI directory.

## Modifying the PROGMAN.INI File

If you choose to let INSTALL modify your PROGMAN.INI file, it specifies the NIVXI.GRP folder file as shown below.

```
[Settings]
Order= x <etc>

[Groups]
Groupx= <NI-VXI directory>\WIN\NIVXI.GRP
```

where <etc> represents the numbers already on this line, and where *x* is a new number between 1 and 99 and is the same on both of the preceding lines.

## Modifying the SYSTEM.INI File

If you choose to let INSTALL modify your SYSTEM.INI file, it adds a line to the [386Enh] section to load a device driver that NI-VXI needs for shared memory accesses. The file, which must be loaded at Windows startup, is called NIVXIPHM.386 and is normally located in the WIN subdirectory of the NI-VXI directory as shown below. INSTALL also adds a line that keeps Windows from using the VXI space for its own purposes. In addition, a new section [NIVXI] is created, which NIVXIPHM.386 uses during Windows system startup.

```
[386Enh]
DEVICE= <NI-VXI directory>\WIN\NIVXIPHM.386
EMMexclude= A000-EFFF

[NIVXI]
NIVXIPATH= <NI-VXI directory>
LoadData=6Bytes
```

If you choose not to let INSTALL modify your SYSTEM.INI file, refer to the SYSTEM.VXI file in your NI-VXI directory for suggestions on how to make the necessary changes yourself.

## Modifying the WIN.INI File

If you choose to let `INSTALL` modify your `WIN.INI` file, it adds the following lines to the `WIN.INI` file:

```
[NIVXI ]
NIVXIPATH= <NI-VXI directory>
```

In this situation, the `NIVXIPATH` variable is used by the `NIVXI.DLL` dynamic link library in addition to the application programs that come with NI-VXI (for example, `RESMAN.EXE`) to locate the NI-VXI configuration and help files.

If you choose not to let `INSTALL` modify your `WIN.INI` file, refer to the `WIN.VXI` file in your NI-VXI directory for suggestions on how to make the necessary changes yourself.

**Notes:** *The `NIVXIPATH` variables in the `SYSTEM.INI`, `WIN.INI`, and `AUTOEXEC.BAT` files should point to the same subdirectory.*

*After you execute `INSTALL`, you should exit and reenter Windows before running any of the NI-VXI software. In fact, once you have exited Windows, it is advisable to reboot your machine (or at least run `AUTOEXEC.BAT`) to make your system aware of the NI-VXI directory.*

*Once the NI-VXI package is installed, run `VXIINIT.EXE` and then `RESMAN.EXE`.*

## Configuring the NI-VXI Software

Run `VXIINIT` from DOS or the Windows DOS shell to initialize and display the VXIpc-486 configuration settings. The default configuration is Slot 0 System Controller, Resource Manager, Message-Based device. To change the current settings, or to view the configuration options, run `VXIEDIT` or `VXITEDIT` and select the **Configuration Editor** from the **Main** menu.

You can use `VXIEDIT` or `VXITEDIT` to edit the description of the VXIpc-486 or any other device that is installed in the system. You can easily modify the configuration tables required for VXIbus and MXIbus operation. You can also configure interrupts, triggers, and the utility bus for single- or multiple-mainframe system configurations. The `VXIEDIT` program, which you can access from DOS or the Windows DOS shell, uses a series of interactive graphical screens to display information for the various editors. You can use the text-based `VXITEDIT` program within Windows to accomplish the same tasks by entering commands at the keyboard.

For more details on how to use `VXIEDIT`, refer to the *NI-VXI DOS Utilities Reference Manual*. For more details on how to use `VXITEDIT`, refer to the *NI-VXI Text Utilities Reference Manual*.

## Running VXIEDIT from DOS or the Windows DOS Shell

VXIEDIT.EXE is the VXI resource editor program that runs in DOS or the Windows DOS shell. You can use this program to configure the system and to edit the manufacturer name and ID numbers, the model names of VXI and non-VXI devices in the system, and the system interrupt configuration information. This program also displays the system configuration information generated by the Resource Manager.

To run VXIEDIT from any directory, make sure that both the PATH and NIVXIPATH environment variables have the destination directory of the NI-VXI software added to it. PATH is used to find the application itself, while NIVXIPATH is used by the application to find the different configuration files (\*.CFG), table files (\*.TBL), and help files (\*.HLP) during its execution. The default pathname used by the program if NIVXIPATH is not set is C:\NIVXI.

Figure 4-1 shows the functions available under VXIEDIT.

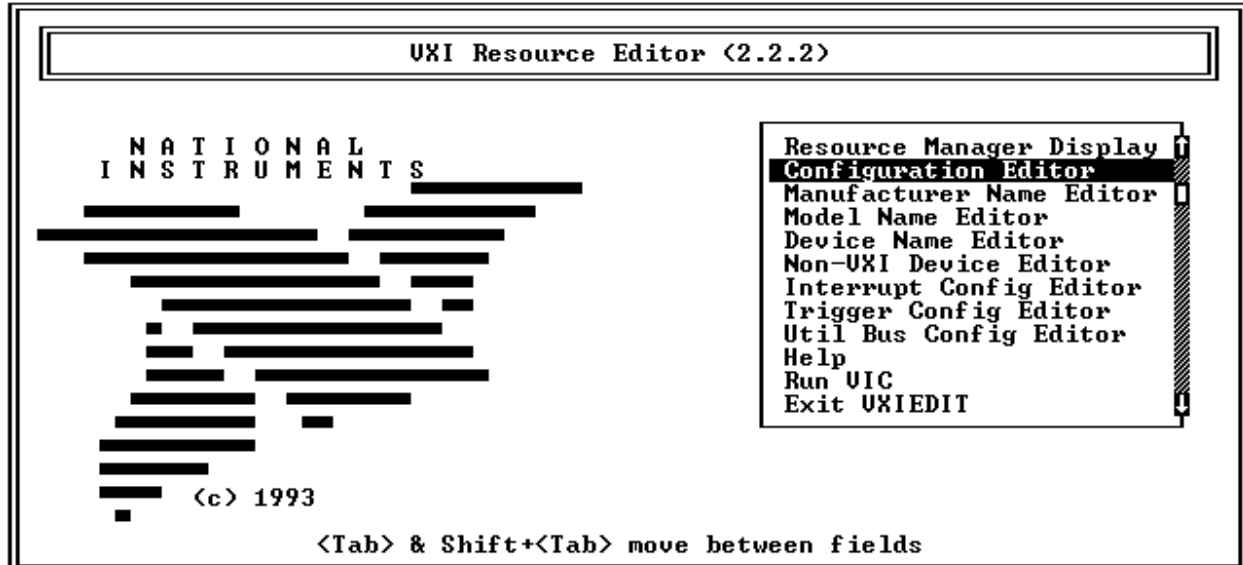


Figure 4-1. VXIEDIT Main Menu (from DOS)

When you select the **Configuration Editor** from the **Main** menu, the Logical Address Configuration Editor menu (shown in Figure 4-2) is displayed. The following sections describe the various configuration options available under the Logical Address Configuration, Bus Configuration, and Device Configuration Editor menus.

Select **Next** and **Previous** to move between the three configuration editors. You can change the default settings to any value within the range shown to the right of each item by using the left and right arrow keys.

You can save your changes by selecting **Save**. Saving the changes updates files VXILA.CFG, VXIBUS.CFG, and VXIDEV.CFG. VXIINIT.EXE uses these files to update the soft-configured

settings, including board interrupts, shared RAM size, VXI register contents, and bus interface. You can exit the program at any time without saving any changes you have made by selecting **Abort**.

## Logical Address Configuration

The following paragraphs describe options available under the Logical Address Configuration Editor. Figure 4-2 shows the Logical Address Configuration Editor (**VXIla**) menu.

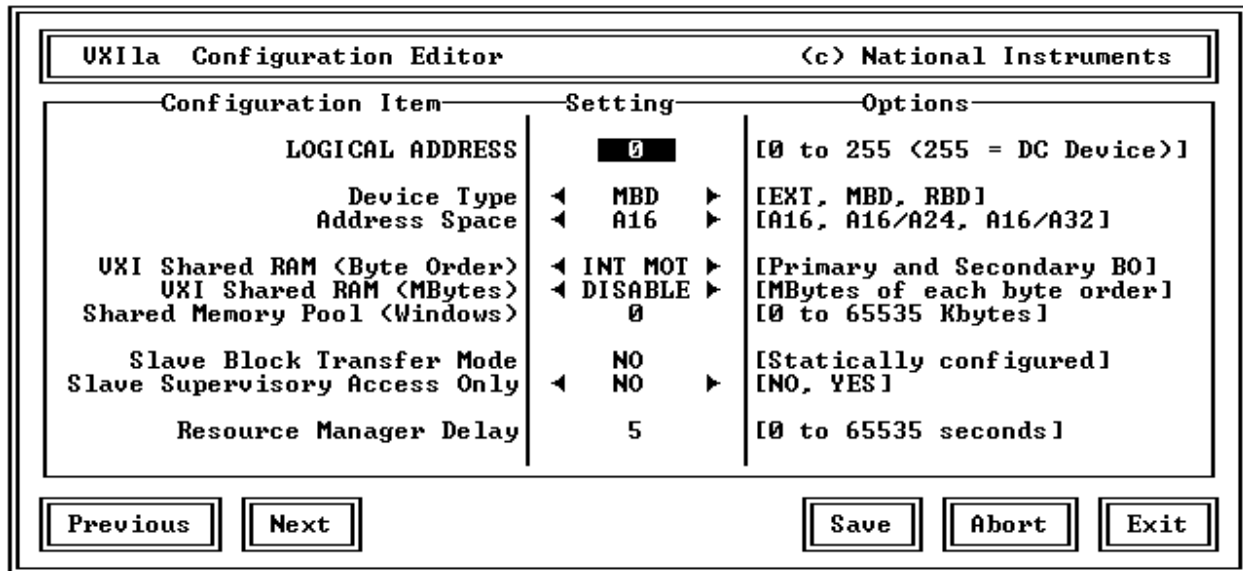


Figure 4-2. VXIpc-486 Logical Address Configuration Editor (from DOS)

### Logical Address

The logical address is an 8-bit number that uniquely identifies the VXIpc-486. It can be configured as a static device with a logical address range from 0 through 254. Logical address 255 configures the VXIpc-486 as a dynamic device, as specified in the *VXIbus System Specification*. The default logical address is 0. If you do not want the VXIpc-486 to be the system Resource Manager, change this value to an unused logical address other than 0.

### Device Type

This field indicates the classification of the VXIbus device. The options are Extended Device (EXT), Message-Based Device (MBD), and Register-Based Device (RBD). The default is MBD.

The VXIpc-486 Device Type affects only the contents of the Device Class field in the Device Type register. The functionality of the other registers does not change.

## Address Space

This field indicates the addressing mode(s) of the device's operational registers. The VXIpc-486 can be configured as an A16 only, A16/A24, or A16/A32 device. The default is A16 only.

## VXI Shared RAM (Byte Order)

The local RAM of the VXIpc-486 Model 500 Series computer can be slave-accessed in either A24 or A32 space in D08, D16, and D32 data transfer modes. You can set this field, which indicates the primary and secondary byte swapping schemes for slave accesses to the local RAM space, to either Intel (INT, Little Endian) or Motorola (MOT, Big Endian). The default primary byte ordering is Intel for backward compatibility reasons. When the addressing mode is A16 only, this field is ignored.

## VXI Shared RAM (MBytes)

This field indicates the number of megabytes of local RAM that are shared in either A24 or A32 space. The VXIpc-486 can be set up to have either one or two windows into the local RAM. When set up with one window, all slave accesses through this window use the primary byte order scheme. When there are two windows, accesses through the first (lower) window see the local RAM using the primary byte order scheme, and accesses through the second (upper) window see the same local RAM but use the secondary byte order scheme. In Table 4-1, *primary* and *secondary* byte order refer to the setting of the previous field. When the addressing mode is A16 only, this field should be set to DISABLED.

Table 4-1. VXI Shared RAM Options

Address Space	Options	Description
A16	DISABLED	VXI Shared RAM disabled
A16/A24	4, 0	Four megabytes of local RAM are shared in A24 space. Slave accesses to this RAM are in the primary byte order.
	4, 4	In this option, 4 MB of local RAM are shared, but 8 MB are requested in A24 space. Accesses to the lower 4 MB are in the primary byte order, and accesses to the upper 4 MB see the same local RAM in the secondary byte order.
	8, 0	Eight megabytes of local RAM are shared in A24 space, and slave accesses to this RAM are in the primary byte order.

(continues)

Table 4-1. VXI Shared RAM Options (Continued)

Address Space	Options	Description
A16/A32	4, 0	Four megabytes of local RAM are shared in A32 space. Slave accesses to this RAM are in the primary byte order.
	4, 4	In this option, 4 MB of local RAM are shared, but 8 MB are requested in A32 space. Accesses to the lower 4 MB are in the primary byte order, and accesses to the upper 4 MB see the same local RAM in the secondary byte order.
	8, 0	Eight megabytes of local RAM are shared in A32 space, and slave accesses to this RAM are in the primary byte order.
	8, 8	In this option, 8 MB of local RAM are shared, but 16 MB are requested in A32 space. Accesses to the lower 8 MB are in the primary byte order, and accesses to the upper 8 MB see the same local RAM in the secondary byte order.
	ALL, 0	Thirty-two megabytes of local RAM are shared in A32 space, and slave accesses to this RAM are in the primary byte order.

### Shared Memory Pool (Windows)

This field indicates the size of memory in kilobytes that is allocated on Windows startup to be used exclusively by `VXImemAlloc` function calls from both DOS and Windows applications. The allowable range is from 0 to 65535 KB. The default value is 0 KB.

### Slave Block Transfer Mode

The VXIpc-486 does not currently support block transfers in either slave or master mode accesses. This field is statically configured to `NO`, and cannot be changed.

### Slave Supervisory Access Only

When `YES` is selected, the VXIpc-486 will acknowledge only supervisory accesses. Nonprivileged accesses will result in a bus error. This is true for all A16, A24, and A32 slave accesses. When `NO` is selected, the VXIpc-486 will acknowledge both supervisory and nonprivileged accesses. The default option is `NO`.



## Resource Manager Delay

This field specifies the time in seconds that the Resource Manager (RM) waits before accessing any other VXIbus device's A16 configuration registers. The allowable range is from 0 to 65535 seconds. The default value is 5 seconds.

## Bus Configuration

The following paragraphs describe options available under the Bus Configuration Editor. Figure 4-3 shows the VXIbus Configuration Editor (**VXIbus**) menu.

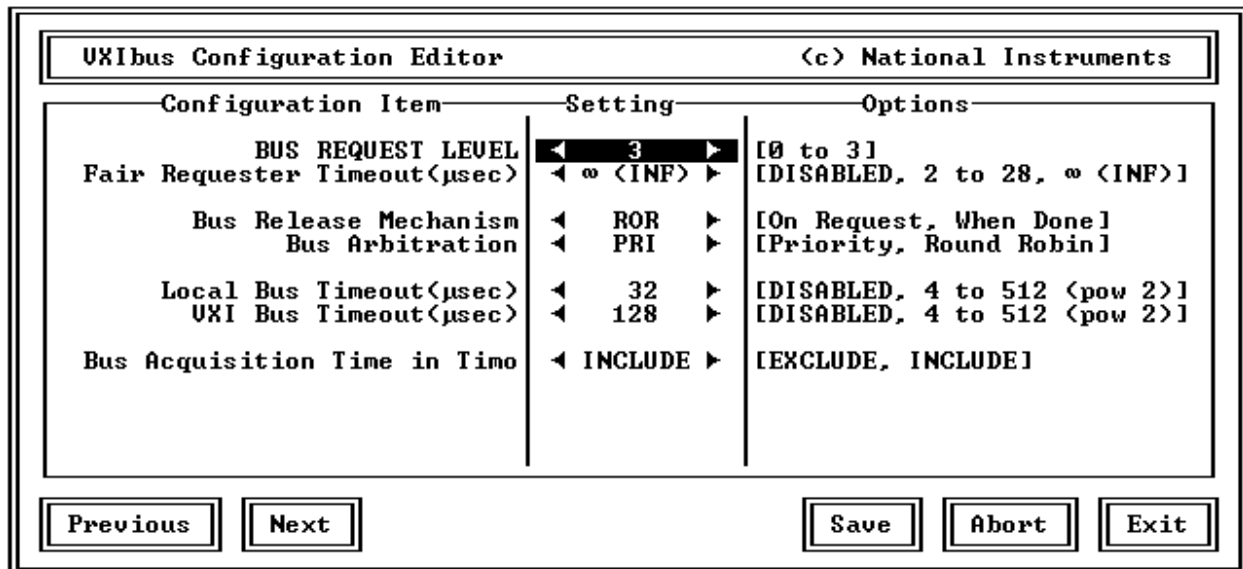


Figure 4-3. VXIpc-486 Bus Configuration Editor (from DOS)

## Bus Request Level

This field sets the VXIbus request level (BR0-3) for the VXIpc-486. The default value is level 3.

## Fair Requester Timeout

You can configure the VXIpc-486 as a fair requester (Request On No Request, or RONR) with a timeout period of either infinity or within the range of 2 to 28  $\mu$ s (increments of 2  $\mu$ s), or you can configure it as an unfair requester by selecting the field value of DISABLE. The default value is  $\infty$  (INF), specifying an infinite timeout period.

## Bus Release Mechanism

This field sets the VXIbus release mechanism, which can be Release On Request (ROR) or Release When Done (RWD). The default value is ROR.

## Bus Arbitration

The field sets the VXIbus arbitration mode. The two options are Priority (PRI) or Round Robin Select (RRS). The default value is PRI. The bus arbitration mode is relevant only when the VXIpc-486 is the Slot 0 device.

## Local Bus Timeout

This field sets the timeout period for the VXIpc-486 local bus. You can set the timeout within the range from 4 to 512  $\mu$ s, in powers of 2 (4, 8, 16, 32, 64, 128, 256, and 512), or you can disable this function. The default value is 32  $\mu$ s. When the VXIpc-486 is not the System Controller, you should select DISABLE. In such a case, the VXIpc-486 should be configured as a Non-Slot 0 device as described in Chapter 2.

## VXIbus Timeout

This field sets the timeout period for the VXIbus bus timeout (BTO) unit. When the VXIpc-486 is the System Controller, you can set the BTO period within the range from 4 to 512  $\mu$ s in powers of 2 (4, 8, 16, 32, 64, 128, 256, and 512). The default value is 128  $\mu$ s. When the VXIpc-486 is not the System Controller, you should select DISABLE. In such a case, the VXIpc-486 should be configured as a Non-Slot 0 device as described in Chapter 2.

## Bus Acquisition Time in Timeout

This field determines whether the arbitration time to acquire the VXIbus is included in the local bus timeout. In embedded-only systems, the default is to include bus acquisition time. In MXI systems, however, the arbitration time may be excessively long. In such a case, it may be preferable to exclude the bus acquisition time from the overall timeout.

## Device Configuration

The following paragraphs describe options available under the Device Configuration Editor. Figure 4-4 shows the Device Configuration Editor (**VXIdev**) menu.

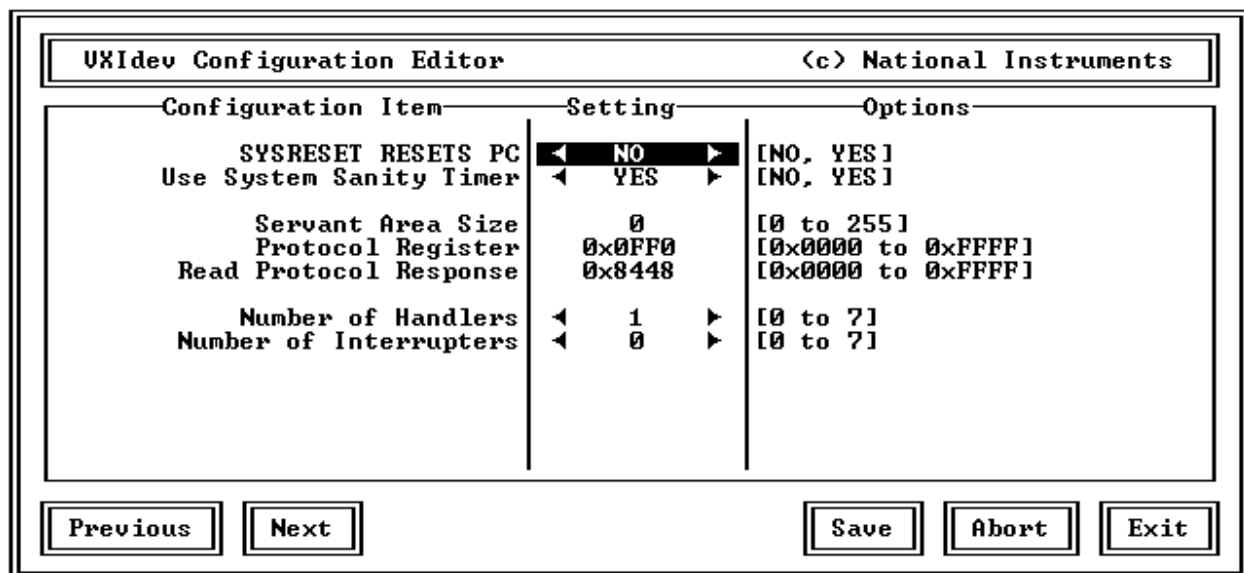


Figure 4-4. VXIpc-486 Device Configuration Editor (from DOS)

### SYSRESET Resets PC

When YES is selected, a SYSRESET on the backplane causes the VXIpc-486 to reboot. When NO is selected, a SYSRESET on the backplane does not reboot the VXIpc-486. The default value for this field is NO.

### Use System Sanity Timer

When YES is selected, if a misbehaved NI-VXI application causes the system to hang, the VXIpc-486 asserts the SYSFAIL\* signal on the backplane. When NO is selected, if the system hangs, the VXIpc-486 does not assert SYSFAIL\*. In general, the sanity timer is useful by alerting you that your application has gone awry. However, you should turn off the sanity timer when debugging an NI-VXI application because some debuggers conflict with the sanity timer mechanism. The default value for this field is YES.

### Servant Area Size

This field designates the Servant Area size, which is supplied to the Resource Manager in response to the *Read Servant Area* command (if the VXIpc-486 is *not* the Resource Manager in your system). The Servant Area size is an 8-bit value (0 through 255) that indicates the

VXIpc-486 Servant area. The Servant area begins at the logical address following the VXIpc-486 logical address, and includes  $N$  contiguous logical addresses, where  $N$  is the value of the Servant Area size. This field is meaningful only when the VXIpc-486 is configured as a Message-Based device. You can set the Servant Area size within the range 0 to 255. The default value is 0.

**Note:** *If the VXIpc-486 is the Resource Manager, this setting is irrelevant.*

### Protocol Register

This field specifies the contents of the Protocol register, indicating which protocols the device supports. This field is meaningful only when the VXIpc-486 is configured as a Message-Based device. The default value is 0x0FF0 (Commander, Signal Register, Master).

### Read Protocol Response

This field specifies the response value to a *Read Protocol* command received by the VXIpc-486 from the Resource Manager (if the VXIpc-486 is *not* the Resource Manager in your system). This field is meaningful only when the VXIpc-486 is configured as a Message-Based device. The default value is 0x8448 (Response Generation, Event Generation, Programmable Handler, Word Serial Trigger, Instrument, Extended Longword Serial, Longword Serial).

### Number of Handlers

This field gives the number of interrupt handlers that the VXIpc-486 supports, which can range from 0 to 7. The default value is 1.

### Number of Interrupters

This field gives the number of interrupters that the VXIpc-486 supports, which can range from 0 to 7. The default value is 0.

## Exiting VXIEDIT from DOS and Reinitializing the Hardware

Select **Exit** or press the <Esc> key to quit the VXIEDIT program. If you changed any of the software configuration information, VXIEDIT prompts you to save your changes before exiting the configuration menu. Saving the configuration information updates the configuration files VXILA.CFG, VXIBUS.CFG, and VXIDEV.CFG. Run VXIINIT.EXE to reinitialize the hardware according to the new settings.

If you changed any of the software configuration settings from the default, record the new settings on the *VXIpc-486 Model 500 Series Hardware and Software Configuration Form* in Appendix K.

## Running VXITEDIT from Windows

As an alternative to VXIEDIT you can use VXITEDIT, a text-based VXI resource editor that runs in the Windows environment. It uses the NIVXIPATH variable set in the WIN.INI file to locate the configuration files, table files, and help files. When NIVXIPATH is not specified in WIN.INI, it assumes the default directory C:\NIVXI.

To run VXITEDIT, select the **File** menu, **Run** command from the Windows Program Manager and type VXITEDIT.EXE. Refer to the *NI-VXI Text Utilities Reference Manual* for further information on how to use VXITEDIT.

## Exiting VXITEDIT from Windows and Reinitializing the Hardware

To exit VXITEDIT, type `exit` or the number 11 when the main menu is displayed. If you changed any information, you are prompted to save your changes before exiting the menu. Saving the configuration information updates the configuration files VXILA.CFG, VXIBUS.CFG, and VXIDEV.CFG. Run VXIINIT.EXE to reinitialize the hardware according to the new settings.

If you changed any of the software configuration settings from the default, record the new settings on the *VXIpc-486 Model 500 Series Hardware and Software Configuration Form* in Appendix K.

# Chapter 5

## Using NI-VXI with Microsoft Windows

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This chapter discusses programming information for you to consider when developing applications that use the NI-VXI driver.

After you have verified that the driver software has been installed successfully, you can begin to develop your VXI application software. Be sure to check the README .DOC file for the latest application development notes. Remember that you must run the VXIINIT initialization program before performing any VXI operations and after each computer reset. You must also run RESMAN each time the chassis power is cycled.

The *NI-VXI Software Reference Manual for C* contains an overview of NI-VXI functionality in Chapter 2, *Introduction to the NI-VXI Functions*. Chapters 3 through 13 contain overviews and detailed descriptions of the NI-VXI functions.

### Interactive Control of NI-VXI

The easiest way to learn how to communicate with your instruments is by controlling them interactively. Use the VXI interactive control program (VIC from DOS or VICTEXT from Windows) to write to and read from your instruments. This program helps you learn how to communicate with devices, troubleshoot problems, and develop your application. Both programs display the status of your VXI transactions and inform you of any errors that occur.

The VIC or VICTEXT command set includes most of the capability of NI-VXI function calls in addition to unique auxiliary commands. You can use this utility to send data and Word Serial commands to devices and to display data received from devices on the screen. After each function executes, the program displays the device's response and the status.

The VIC and VICTEXT utilities are designed to help you learn how to use the NI-VXI functions to program devices. Once you develop a sequence of steps that works successfully for your system, you can easily incorporate the sequence into an application program using the appropriate language and syntax.

**Caution:** *If NIVXI.DLL is loaded in memory, do not attempt to execute VIC or any DOS program that uses the NI-VXI library in a DOS shell. Conflict occurs if both the DOS and Windows NI-VXI drivers are active at the same time, and may cause a system failure. To guard against this conflict, the safest approach is to always exit Windows before attempting to execute any DOS program that uses the NI-VXI Library, including VIC. You can execute VIC from a Windows DOS shell, however, if you ensure that no other Windows application that uses the NIVXI.DLL file is executing.*

Refer to the *NI-VXI DOS Utilities Reference Manual* on how to use VIC from DOS and to learn about its features, and to the *NI-VXI Text Utilities Reference Manual* on how to use VICTEXT from Windows and to learn about its features.

## Example Programs

The EXAMPLES subdirectories contain various example programs along with makefiles that show how to use various functions in the NI-VXI software and how to develop application programs using these functions. Make certain that the environment variables LIB and INCLUDE are set correctly as described in the *Installing the Software* section in Chapter 4. Also refer to the *NI-VXI Software Reference Manual for C* for additional examples.

**Note:** *When compiling NI-VXI applications, you must define the macro VXIWIN (if you are developing a Windows application) or the macro VXIDOS (if you are developing a DOS application) in your makefile/project. Refer to the example programs for more details.*

## Memory Model

The NI-VXI libraries were compiled using the large memory model. All DOS applications must also be compiled for the large memory model. However, Windows application programs that link with the NI-VXI library can also use the medium, compact, or small memory models. Because of this ability to use different memory models for your application, you can not only take advantage of the efficiency inherent in small memory model programs, but also run multiple instances of the application as well. (Normally, you cannot run multiple instances of an application if it is a large memory model application.)

## Multiple Applications Using the NI-VXI Library

Multi-application support is another feature in the NI-VXI library. You can have several applications that use the NI-VXI library running simultaneously. In addition, you can have multiple instances of the same application that uses the NI-VXI library running simultaneously. The NI-VXI functions perform in the same manner whether you have only one application that uses the NI-VXI library or several applications (or several instances of an application) all trying to use the NI-VXI library. Because the NI-VXI functions execute to their completion without yielding control of the microprocessor, function calls from different applications do not inadvertently conflict with one another.

However, you do need to be careful in cases when you have multiple applications using the low-level VXIbus access functions. The memory windows used to access the VXIbus are a limited resource. You should follow the protocol of calling the MapVXIAddress ( ) function with Owner Access first before attempting to perform low-level VXIbus access with VXIpeek ( ) or VXIpoke ( ). The MapVXIAddress ( ) call prevents the hardware interface setting of the VXIpc-486 from being altered by other applications. Your application should always call the UnMapVXIAddress ( ) function immediately after the accesses are complete so that you free up the memory window for other applications.

## Low-Level Access Functions

The function `MapVXIAddress()` returns a pointer for use with low-level access. On the VXIpc-486, it is possible to directly dereference this pointer. However, you must use the `VXIpeek()` and `VXIpoke()` functions when working with the AT-MXI. If you want your source code to be portable between these two platforms, it is strongly recommended that you use the NI-VXI low-level access functions to access memory. See Chapter 6, *Low-Level Access Functions*, in the *NI-VXI Software Reference Manual for C* for more information.

## Local Resource Access Functions

By using the VXI Resource Editor program (`VXIEDIT` from DOS or `VXITEDIT` from Windows), it is possible to have local resources such as RAM directly accessible from the VXIbus without intervention from the local CPU. This can be accomplished by setting the appropriate parameters to share the local resources. Regardless of the amount of RAM that you have selected for sharing, the amount of contiguous memory available to your application is limited by the **Shared Memory Pool (Windows)** field.

Therefore, when using local resource access functions, you must start by calling `VXImemAlloc()` to obtain the VXI shared RAM region. Any calls to `VXImemAlloc()` that succeed will receive a block of memory to the nearest 16-byte boundary. See Chapter 8, *Local Resource Access Functions*, in the *NI-VXI Software Reference Manual for C* for more information.

When having multiple applications or multiple instances of the same application all calling `VXImemAlloc()`, it is important to remember that the amount of memory you assign to the **Shared Memory Pool (Windows)** field is a pool for the entire system, not per application. This means that if one or more applications combined allocate the total amount of memory specified in that field, all other applications will receive a failure from `VXImemAlloc()` until the original applications free the memory with `VXImemFree()`.



# Appendix A

## Specifications

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This appendix lists various module specifications of the VXIpc-486 Model 500 Series computer, such as physical dimensions and power requirements. Unless otherwise indicated, the specifications apply to all models in the VXIpc-486 Model 500 Series.

### CPU

Microprocessor	50 MHz 80486DX2 (Model 500) 66 MHz 80486DX2 (Model 566) 100 MHz 80486DX4 (Model 599)
RAM	4, 5, 8, 16, or 32 MB
Hard Disk Options	80, 127, 220, 240, 525, or 1050 MB

### Physical

#### C-size VXIbus Module

Slot Requirements	486/1: one slot 486/2: two slots
-------------------	-------------------------------------

Local Bus Keying	Class 1, TTL
------------------	--------------

#### Front Panel Indicators

- **SYSFAIL** (red)
- **FAILED** (red)
- **TEST** (green)
- **ON LINE** (green)
- **ACCESS** (yellow)
- **DRIVE** (yellow)
- **TURBO** (green)

#### Front Panel Connectors

- VGA
- Keyboard
- COM1
- COM2

- LPT
- External floppy disk (EFD)
- IEEE 488
- CLK10 I/O
- Trigger Input
- Audio/Trigger Output

## Power Requirements

Source	1-Slot Module Direct Current (max)	Dynamic Current (max)	2-Slot Module Direct Current (max)
+5 VDC	6.5 A	Not Available	8 A
+12 VDC	20 mA	Not Available	200 mA
-12 VDC	20 mA	Not Available	20 mA
-5.2 VDC	150 mA	Not Available	150 mA
-2 VDC	200 mA	Not Available	200 mA

## Cooling Requirements

Power Dissipation, max

Refer to ID label

## Emissions

EMI

FCC Class A Verified

## Operating Environment

Temperature

Refer to ID label

Relative Humidity

0% to 95% noncondensing

## Storage Environment

Temperature

Refer to ID label

Relative Humidity

0% to 100% noncondensing

## Functionality

### IEEE 488

Capability Code	Description
SH1	Source Handshake
AH1	Acceptor Handshake
T5, TE5	Talker, Extended Talker
L3, LE3	Listener, Extended Listener
SR1	Service Request
PP1, PP2	Local/Remote Parallel Poll
C1, C2, C3, C4, C5	Controller
E1, E2	Tri-State Bus Drivers with Automatic Switch to Open Collector during Parallel Poll

### VMEbus Master/Slave

- A16/A24/A32 Addressing
- D08(E0)/D16/D32 Data Paths
- Read-Modify-Write

### VMEbus System Controller

- System Clock (SYSCLK) Driver
- System Reset (SYSRESET) Driver
- Priority or Round-Robin Arbiter
- Bus Timeout Driver

## **VXIbus**

- VXIbus System Specification Compatible
- Multiframe Resource Manager (defeatable)
- Slot 0 Support (defeatable)
- Message-Based Commander and Servant
- Dynamically Configurable
- Programmable Interrupter (any combination of seven levels)
- Programmable Handler (any combination of seven levels)
- Trigger Source/Acceptor (SYNC, SEMI-SYNC, ASYNC, STST protocols)
- External Trigger I/O
- External CLK10 I/O

# Appendix B

## NI-VXI Software Overview

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This appendix lists all the programs and files located on the NI-VXI distribution diskettes.

### Main Programs and Files

The main programs and files of the NI-VXI software package are found in the C:\NIVXI directory.

- **VXIINIT.EXE** is the VXIpc-486 initialization program. This is a DOS program that removes the FAILED LED and initializes the board interrupts, shared RAM, VXI register configurations, and bus configurations. **VXIINIT.EXE** must be executed from DOS (or the Windows DOS shell). It is typically included in the DOS batch file **AUTOEXEC.BAT** so that the VXIpc-486 is automatically initialized at startup. The configuration settings can be modified using the **VXIEDIT.EXE** or **VXITEDIT.EXE** program.
- **RESMAN.EXE** is the National Instruments multimainframe Resource Manager. You can execute **RESMAN** from DOS, Windows, or the Windows DOS shell, although the latter is not recommended. **RESMAN.EXE** may be executed only after **VXIINIT.EXE** has been run and must be run every time the mainframe is reset.
- **VIC.EXE** is an interactive control program that executes functions you enter from the keyboard. **VIC** helps you learn the functions, program your VXI devices, and develop and debug your application program. You can execute **VIC** from DOS or the Windows DOS shell, although the latter is not recommended. If you do use **VIC** from the Windows DOS shell, ensure that no other Windows application that uses NI-VXI functions is executing. This program is described in detail in the *NI-VXI DOS Utilities Reference Manual*.
- **VICTEXT.EXE** is a text-based interactive control program that is functionally equivalent to **VIC.EXE**. You can execute **VICTEXT** from DOS, Windows, or the Windows DOS shell, although the latter is not recommended. If you run **VICTEXT** as a Windows application, you can use it at the same time that other Windows applications that use NI-VXI functions are executing. This program is described in detail in the *NI-VXI Text Utilities Reference Manual*.
- **VXIEDIT.EXE** is the VXI resource editor program that runs in DOS or the Windows DOS shell. You can use this program to configure the system, edit the manufacturer name and ID association, and edit the information about the model names of VXI and non-VXI devices in the system, as well as the interrupt configuration information for the system. This program also displays the system configuration information devised by the Resource Manager. This program is described in detail in the *NI-VXI DOS Utilities Reference Manual*.
- **VXITEDIT.EXE** is the text-based VXI resource editor program that is functionally equivalent to **VXIEDIT.EXE**. You can execute **VXITEDIT** from DOS, Windows, or the Windows DOS shell. This program is described in detail in the *NI-VXI Text Utilities Reference Manual*.
- **README.DOC** contains the latest updates and corrections to the manual when appropriate.

## Additional Programs and Files

The C:\NIVXI\HLP directory contains various help files used by the VIC.EXE and VXIEDIT.EXE programs.

The C:\NIVXI\TBL directory contains the following files:

- MFNAMEID.TBL contains the database of manufacturer names and their ID numbers.
- MODEL.TBL contains the database of model names, manufacturer names, and the model codes numbers.
- DEVICE.TBL contains the database of device names, manufacturer names, model names, and frame and slot associations for devices in the system.
- NONVXI.TBL contains the database for all non-VXI devices in the system.
- INTCFG.TBL contains the system interrupt configuration information.
- TRIGCFG.TBL contains the system trigger configuration information.
- UTILBUS.TBL contains the utility bus configuration information.
- CREG.TBL contains system information used by the Resource Manager.
- REGS.TBL contains the register names of VXI devices.
- WSCMDS.TBL contains the VXI Word Serial command values.
- VXIBUS.CFG contains the VXIpc-486 VXIbus configuration information.
- VXILA.CFG contains the VXIpc-486 logical address configuration information.
- VXIDEV.CFG contains the VXIpc-486 device-specific configuration information.
- VXIMF.CFG, if present, contains information specific to the board manufacturer.
- DVXI.CFG contains information for internal use by the driver.

The C:\NIVXI\INCLUDE directory contains files for the Microsoft C, Borland C, and QuickBASIC language interfaces. The include files are as follows:

- NIVXI.H is the main header file containing the C prototypes for the NI-VXI functions.
- DATASIZE.H contains data size specifications.
- BUSACC.H contains parameter and return values for the bus access functions.

- DEVINFO.H contains parameter and return values for the device information and system configuration functions.
- VXIINT.H contains parameter and return values for the interrupt and signal functions.
- SYSINT.H contains parameter and return values for the system interrupt functions.
- TRIG.H contains parameter and return values for the trigger functions.
- WS.H contains parameter and return values for the Word Serial Commander and Servant functions.
- NIVXI.INC is the include file for the Microsoft QuickBASIC Language interface.

The C:\NIVXI\DOS directory contains the following files:

- RESMAND.EXE is used by RESMAN in the DOS environment. RESMAN calls this file directly.
- VICD.EXE is used by VIC in the DOS environment. VIC calls this file directly.
- VICTEXTD.EXE is used by VICTEXT in the DOS environment. VICTEXT calls this file directly.
- VXIEDITD.EXE is used by VXIEDIT in the DOS environment. VXIEDIT calls this file directly.
- VXITEDID.EXE is used by VXITEDIT in the DOS environment. VXITEDIT calls this file directly.

The C:\NIVXI\DOS directory contains up to three subdirectories.

The C:\NIVXI\DOS\BORLANDC subdirectory is installed if you choose to install both the DOS environment and the Borland C libraries. It contains the following file and subdirectory:

- NIVXIDOS.LIB is the NI-VXI library, which must be included along with other DOS libraries when linking your application program from Borland C. The NI-VXI library uses the large memory model.
- The C:\NIVXI\DOS\BORLANDC\EXAMPLES subdirectory contains various example programs that show how to use the NI-VXI software with Borland C.

The C:\NIVXI\DOS\MSC subdirectory is installed if you choose to install both the DOS environment and the Microsoft C libraries. It contains the following file and subdirectory:

- NIVXIDOS.LIB is the NI-VXI library, which must be included along with other DOS libraries when linking your application program from Microsoft C. The NI-VXI library uses the large memory model.
- The C:\NIVXI\DOS\MSC\EXAMPLES subdirectory contains various example programs that show how to use the NI-VXI software with Microsoft C.

The C:\NIVXI\DOS\QB subdirectory contains the following object, library, and batch files to generate the Microsoft library for QuickBASIC:

- QBNIVXI.LIB contains the NI-VXI function library for the QuickBASIC interface.
- QBNIVXI.OBJ contains the NI-VXI symbols used to generate the QuickBASIC library for all versions.
- MKQLB\*.BAT and MKQLB\*.LNK are batch and response files used to generate a QuickBASIC library for the desired version.
- MKAPPBC.BAT and MKAPPBC.LNK are batch and response files that contain an example of how to build a BASIC application using NI-VXI functions.

Also included are the following files containing system functions used in the generation of QuickBASIC libraries for version 4.5 (default) and version 7.0 (7F and 7N):

- QB.OBJ
- QBMEM.OBJ
- QB1.LIB
- QB1\_7F.LIB
- QB1\_7N.LIB
- QB2.LIB
- B1\_71F.LIB
- B1\_71N.LIB
- B2\_71.LIB

The C:\NIVXI\WIN directory contains the following files:

- NIVXI.DLL is the NI-VXI dynamic link library executable file, which contains the executable code for all the NI-VXI functions. This file is loaded when any Windows application that uses the NI-VXI library is executed. The directory where it resides should be added to the PATH variable to ensure that it is loaded properly.
- RESMANW.EXE is used by RESMAN in the Windows environment. RESMAN calls this file directly.
- VICTEXTW.EXE is used by VICTEXT in the Windows environment. VICTEXT calls this file directly.
- VXITEDIW.EXE is used by VXITEDIT in the Windows environment. VXITEDIT calls this file directly.
- NIVXIPHM.386 is a virtual memory driver that the NI-VXI library uses for shared memory under Windows only.
- NIVXI.GRP is a Windows group (folder) which contains icons for easy execution of NI-VXI utilities (such as RESMAN and VICTEXT).
- NIVXI.PIF is a Windows Program Information File that lets you run the DOS NI-VXI utilities in a Windows DOS shell.



The C:\NIVXI\WIN directory contains up to two subdirectories.

The C:\NIVXI\WIN\BORLANDC subdirectory is installed if you choose to install both the Windows environment and the Borland C libraries. It contains the following file and subdirectory:

- NIVXIWIN.LIB is the NI-VXI library, which must be included along with other Windows libraries when linking your application program from Borland C. The NI-VXI library uses the large memory model. However, you are not restricted to using only the large memory model for your application. You can also use the medium, compact, or small memory models.
- The C:\NIVXI\WIN\BORLANDC\EXAMPLES subdirectory contains various example programs that show how to use the NI-VXI software with Borland C.

The C:\NIVXI\WIN\MSC subdirectory is installed if you choose to install both the Windows environment and the Microsoft C libraries. It contains the following file and subdirectory:

- NIVXIWIN.LIB is the NI-VXI library, which must be included along with other Windows libraries when linking your application program from Microsoft C. The NI-VXI library uses the large memory model. However, you are not restricted to using only the large memory model for your application. You can also use the medium, compact, or small memory models.
- The C:\NIVXI\WIN\MSC\EXAMPLES subdirectory contains various example programs that show how to use the NI-VXI software with Microsoft C.

# Appendix C

## Front Panel Indicators

---

This appendix describes the function of the seven front panel LED indicators on the VXIpc-486 Model 500 Series computer. The significance of each LED is determined by its color: red, green, or yellow. Red indicates a system failure, while green indicates an active state, and yellow indicates that a board resource is being accessed.

The red **SYSFAIL** LED is lit whenever the VMEbus signal SYSFAIL is asserted. The **SYSFAIL** LED does not indicate which VXIbus module is asserting the signal. It indicates only that one of the modules is driving SYSFAIL on the VXIbus backplane.

When the **FAILED** LED is lit, the VXIpc-486 is driving the SYSFAIL signal. The **FAILED** LED, together with the green **TEST** and **ON LINE** LEDs, indicate the status of the VXIpc-486. The status LED indications are shown in Table C-1. A successful system startup will sequence through the first six states. The point of failure is indicated for states where the **FAILED** LED is lit for an extended period of time.

Table C-1. Front Panel LED Indications

Sequence	FAILED	TEST	ON LINE	State	Point of Failure
1	OFF	OFF	OFF	No power	
2	ON	OFF	OFF	Booting DOS	Failed to boot DOS or waiting to run self-test/VXIINIT
3	ON	ON	OFF	In self-test/VXIINIT	Failed self-test/VXIINIT
4	OFF	ON	OFF	Self-test passed, VXIINIT complete	
5	OFF	ON	ON	Performing Startup RM operations	
6	OFF	OFF	ON	Online, Startup RM operations complete	
	ON	ON	ON	Failed	Failed Startup RM
	ON	OFF	ON	Failed	Failed while online

The yellow **ACCESS** LED is lit when the VXIpc-486 MODID line is asserted or when the VXIbus registers or shared memory are accessed by another bus master.

The yellow **DRIVE** LED is the hard disk drive access light. It is lit when the internal hard drive is in use.

The green **TURBO** light is not used and is never lit on the VXIpc-486 Model 500 Series computer.

# Appendix D

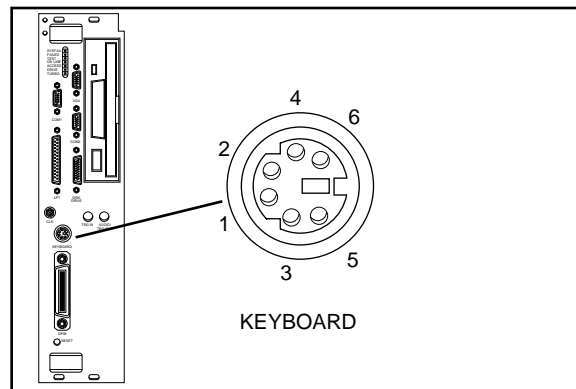
## Connectors

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This appendix describes the front panel and VXIbus connector pinouts on the VXIpc-486 Model 500 Series computer.

**Note:** *The illustrations in this appendix show the mating face of the connectors.  
An asterisk suffix (\*) on a signal name indicates that the signal is active low.*

### Keyboard



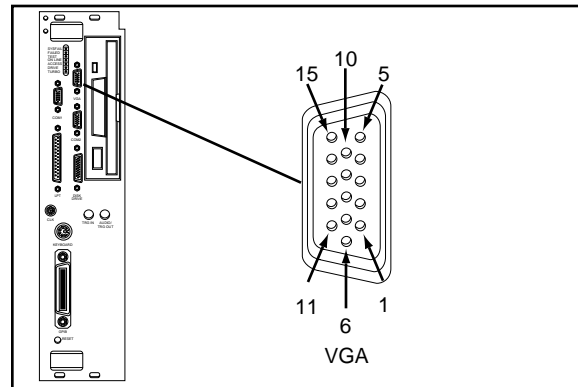
Connector Type:  
6-pin Mini DIN

Figure D-1. KEYBOARD Connector

Table D-1. KEYBOARD Connector Signals

Pin	Signal Name	Signal Description
1	DATA	Data
2	GND	Ground
3	GND	Ground
4	+5V	+5 volts
5	CLK	Clock
6	GND	Ground

# VGA



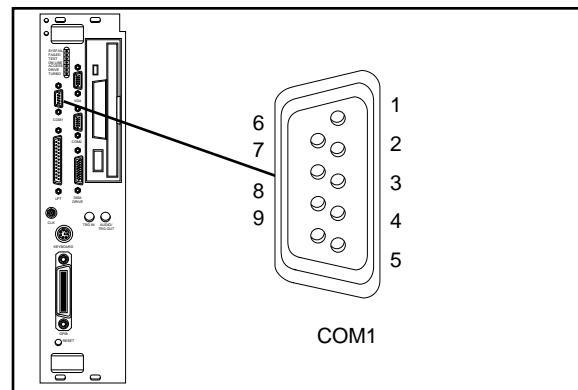
Connector Type:  
15-pin Subminiature  
DHD-22

Figure D-2. VGA Connector

Table D-2. VGA Connector Signals

Pin	Signal Name	Signal Description
1	R	Red
2	G	Green
3	B	Blue
4	n.c.	Not Connected
5	GND	Ground
6	GND	Ground
7	GND	Ground
8	GND	Ground
9	n.c.	Not Connected
10	GND	Ground
11	n.c.	Not Connected
12	n.c.	Not Connected
13	HSync	Horizontal Sync
14	VSynC	Vertical Sync
15	n.c.	Not Connected

# COM1



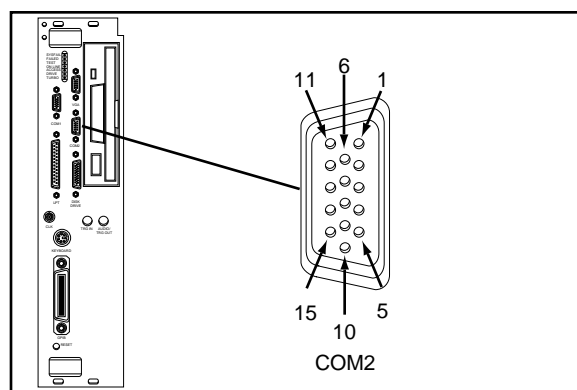
Connector Type:  
9-pin Subminiature  
DHD-20

Figure D-3. COM1 Connector

Table D-3. COM1 Connector Signals

Pin	Signal Name	Signal Description
1	GND	Ground
2	RXD*	Receive Data
3	TXD*	Transmit Data
4	DTR*	Data Terminal Ready
5	GND	Ground
6	DSR*	Data Set Ready
7	RTS*	Ready to Send
8	CTS*	Clear to Send
9	GND	Ground

## COM2/GPIO



Connector Type:  
15-pin Subminiature  
DHD-22

Figure D-4. COM2/GPIO Connector

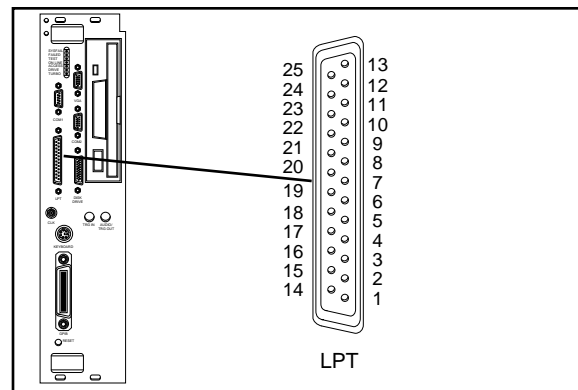
Table D-4a. COM2/GPIO Connector COM2 Signals

Pin	Signal Name	COM2 Signal Description
1	RXD*	Receive Data
2	DSR*	Data Set Ready
3	TXD*	Transmit Data
4	RTS*	Ready to Send
5	GND	Ground
6	CTS*	Clear to Send
15	DTR*	Data Terminal Ready

Table D-4b. COM2/GPIO Connector GPIO Signals

Pin	Signal Name	GPIO Signal Description
7	n.c.	not connected
8	GPIO 7	General Purpose Input/Output 7
9	GPIO 5	General Purpose Input/Output 5
10	n.c.	not connected
11	GPIO 9	General Purpose Input/Output 9
12	GPIO 8	General Purpose Input/Output 8
13	GPIO 6	General Purpose Input/Output 6
14	GPIO 4	General Purpose Input/Output 4

# LPT



Connector Type:  
25-pin Subminiature  
DHD-20

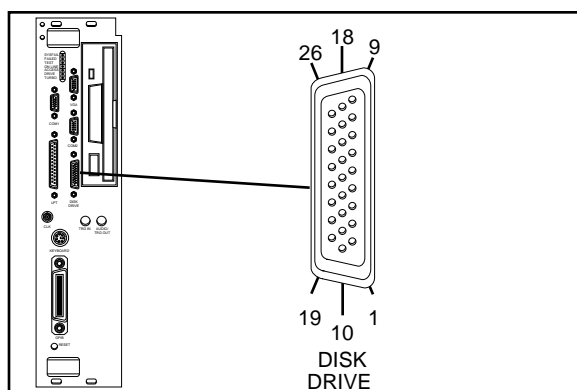
Figure D-5. LPT Connector

Table D-5. LPT Connector Signals

Pin	Signal Name	Signal Description
1	STROBE*	Data Strobe
2	D0	Data Bit 0
3	D1	Data Bit 1
4	D2	Data Bit 2
5	D3	Data Bit 3
6	D4	Data Bit 4
7	D5	Data Bit 5
8	D6	Data Bit 6
9	D7	Data Bit 7
10	ACK*	Acknowledge
11	BUSY*	Device Busy
12	PE	Paper End
13	SLCT	Select
14	AUTOFD*	Auto Linefeed
15	ERROR*	Error
16	INIT*	Initialize Printer
17	SLCTIN*	Select Input
18	GND	Ground
19	GND	Ground
20	GND	Ground
21	GND	Ground
22	GND	Ground
23	GND	Ground
24	GND	Ground
25	GND	Ground



## Floppy Disk Drive



Connector Type:  
26-pin Subminiature  
DHD-22

Figure D-6. DISK DRIVE Connector

Table D-6. DISK DRIVE Connector Signals

Pin	Signal Name	Signal Description
1	+5V	+5 volts
2	GND	Ground
3	GND	Ground
4	GND	Ground
5	FRWC*	Reduced Write Control
6	INDEX*	Index
7	MO1*	Motor on 1
8	GND	Ground
9	FDS2*	Drive Select 2
10	FDS1*	Drive Select 1
11	MO2*	Motor on 2
12	GND	Ground
13	FDIRC*	Direction Control
14	GND	Ground
15	FSTEP*	Step
16	GND	Ground
17	FWD*	Write Data
18	FWE*	Write Enable
19	FTK0*	Track 0
20	FWP*	Write Protect
21	GND*	Ground
22	FRDD*	Read Data
23	GND*	Ground
24	FHS*	Handshake
25	DCHG*	Diskette Change
26	GND*	Ground

# GPIB

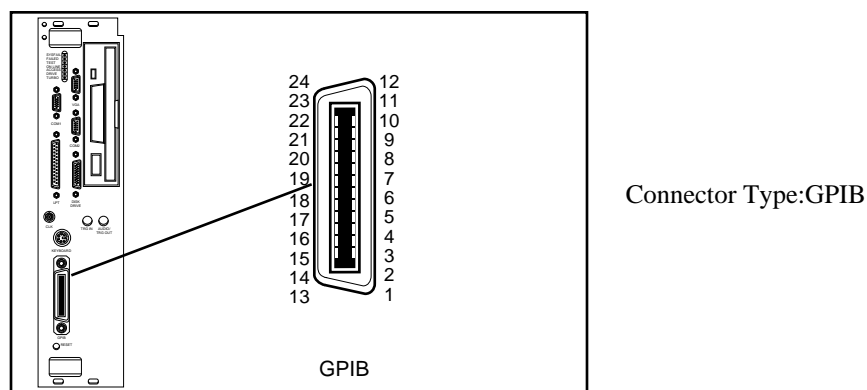
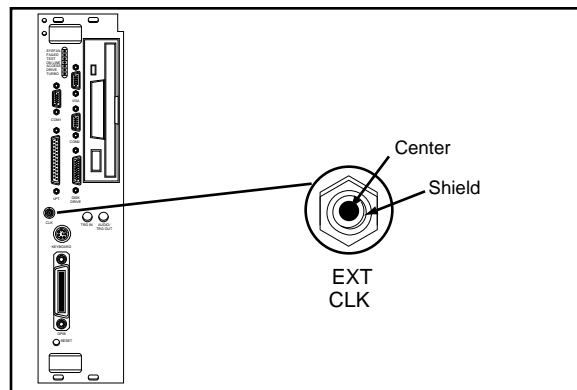


Figure D-7. GPIB Connector

Table D-7. GPIB Connector Signals

Pin	Signal Name	Signal Description
1	DIO1*	Data Bit 1
2	DIO2*	Data Bit 2
3	DIO3*	Data Bit 3
4	DIO4*	Data Bit 4
5	EOI*	End or Identify
6	DAV*	Data Valid
7	NRFD*	Not Ready for Data
8	NDAC*	Not Data Accepted
9	IFC*	Interface Clear
10	SRQ*	Service Request
11	ATN*	Attention
12	SHIELD	Chassis ground
13	DIO5*	Data Bit 5
14	DIO6*	Data Bit 6
15	DIO7*	Data Bit 7
16	DIO8*	Data Bit 8
17	REN*	Remote Enable
18	GND	Logic Ground
19	GND	Logic Ground
20	GND	Logic Ground
21	GND	Logic Ground
22	GND	Logic Ground
23	GND	Logic Ground
24	GND	Logic Ground

## External CLK10



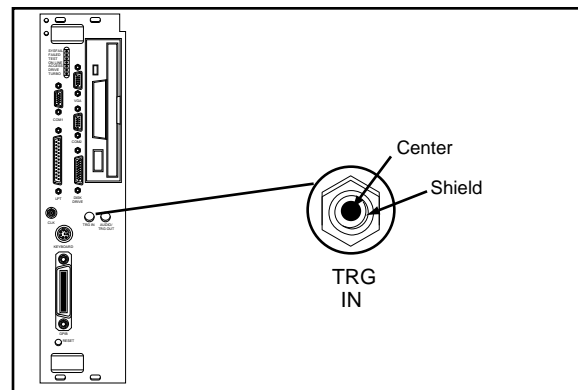
Connector Type: SMB

Figure D-8. EXT CLK Connector

Table D-8. EXT CLK Connector Signals

Pin	Signal Description
Center Shield	TTL CLK10 I/O Signal Ground

## External Trigger Input



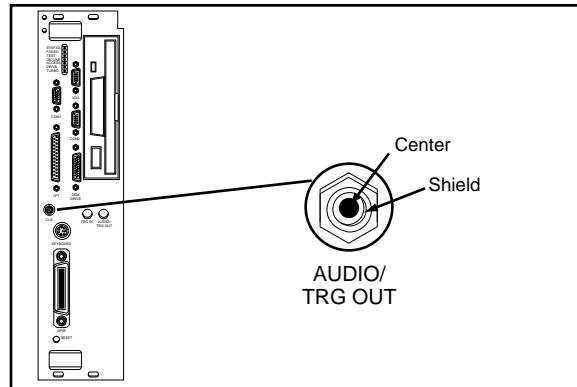
Connector Type: SMB

Figure D-9. TRG IN Connector

Table D-9. TRG IN Connector Signals

Pin	Signal Description
Center Shield	Trigger Input Signal Ground

## External Audio/Trigger Output



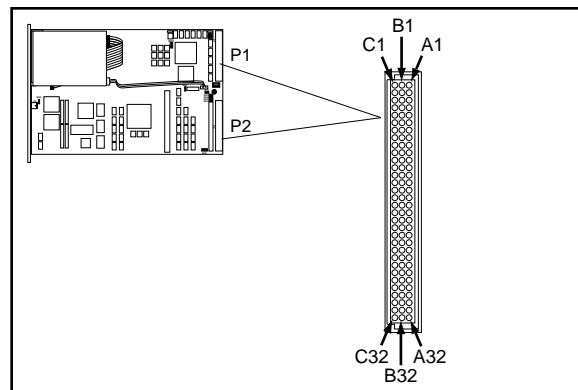
Connector Type: SMB

Figure D-10. AUDIO/TRG OUT Connector

Table D-10. AUDIO/TRG OUT Connector Signals

Pin	Signal Description
Center	Audio/Trigger Output Signal
Shield	Ground

## VXIbus P1 and P2



Connector Type:  
96-pin DIN

Figure D-11. VXIbus Connector

Table D-11. VXIbus P1 Connector Signals

Pin	Row A Signals	Row B Signals	Row C Signals
1	D00	BBSY*	D08
2	D01	BCLR*	D09
3	D02	ACFAIL*	D10
4	D03	BG0IN*	D11
5	D04	BG0OUT*	D12
6	D05	BG1IN*	D13
7	D06	BG1OUT*	D14
8	D07	BG2IN*	D15
9	GND	BG2OUT*	GND
10	SYSCLK	BG3IN*	SYSFAIL*
11	GND	BG3OUT*	BERR*
12	DS1*	BR0*	SYSRESET*
13	DS0*	BR1*	LWORD*
14	WRITE*	BR2*	AM5
15	GND	BR3*	A23
16	DTACK*	AM0	A22
17	GND	AM1	A21
18	AS*	AM2	A20
19	GND	AM3	A19
20	IACK*	GND	A18
21	IACKIN*	not connected	A17
22	IACKOUT*	not connected	A16
23	AM4	GND	A15
24	A07	IRQ7*	A14
25	A06	IRQ6*	A13

(continues)

Table D-11. VXIbus P1 Connector Signals (Continued)

Pin	Row A Signals	Row B Signals	Row C Signals
26	A05	ORQ5	A12
27	A04	IRQ4	A11
28	A03	IRQ3	A10
29	A02	IRQ2	A09
30	A01	IRQ1	A08
31	-12 V	not connected	+12 V
32	+5 V	+5 V	+5 V

Table D-12. VXIbus P2 Connector Signals

Pin	Row A Signals	Row B Signals	Row C Signals
1	ECLTRG0	+5 V	CLK10+
2	-2 V	GND	CLK10-
3	ECLTRG1	not connected	GND
4	GND	A24	-5.2 V
5	MODID12	A25	not connected
6	MODID11	A26	not connected
7	-5.2 V	A27	GND
8	MODID10	A28	not connected
9	MODID09	A29	not connected
10	GND	A30	GND
11	MODID08	A31	not connected
12	MODID07	GND	not connected
13	-5.2 V	+5 V	-2 V
14	MODID06	D16	not connected
15	MODID05	D17	not connected
16	GND	D18	GND
17	MODID04	D19	not connected
18	MODID03	D20	not connected
19	-5.2 V	D21	-5.2 V
20	MODID02	D22	not connected
21	MODID01	D23	not connected
22	GND	GND	GND
23	TTLTRG0*	D24	TTLTRG1*
24	TTLTRG2*	D25	TTLTRG3*
25	+5 V	D26	GND
26	TTLTRG4*	D27	TTLTRG5*
27	TTLTRG6*	D28	TTLTRG7*
28	GND	D29	GND
29	not connected	D30	not connected
30	MODID00	D31	GND
31	GND	GND	not connected
32	not connected	+5 V	not connected

# Appendix E

## Modifying and Installing I/O Expansion Boards

---

This appendix explains how to modify and install commercially available PC/XT and PC AT I/O boards in a VXIpc-486/2 Model 500 Series computer equipped with the I/O expansion kit.

Some VXIpc-486/2 models are equipped with an expansion kit that accommodates installation of either two PC/XT-height boards, or one PC/XT-height and one PC AT-height board. National Instruments offers several plug-in expansion boards you can use. Please contact National Instruments to find out what is currently available to expand your VXIpc-486.

When installing an I/O board you must use a panel bracket, as shown in the reference drawing following this page, with the appropriate additional cutouts necessary to accommodate the connectors. The connector cutouts must fall within the shaded connector window shown in the drawing. The connector window is compatible with the VXIpc-486/2 front panel cutouts, as well as the connector window specified for 16-bit Industry Standard Architecture (ISA) bus I/O boards.

**Note:** *In the drawing, all vertical dimensions are referenced to the bottom (connector) edge of the printed wiring board (PWB). Horizontal dimensions are referenced to the top (component) side of the PWB.*

The panel should be manufactured according to the following specifications:

- Material: .030 ± .003 1010 Cold Rolled Steel
- Finish: Bright Nickel Plate

Alternatively, you can modify the blank panels provided with the VXIpc-486/2. Blank panels are also available from National Instruments as an accessory (P/N 181300-01). Custom panel design services are available from National Instruments for a nominal fee.

The two holes in the bracket align with existing holes in the VXIpc-486 front panel. To affix the panel bracket to the front panel, you can either install a PEM nut on the back (far) side of the bracket, or use a 4-40 nut with lock washer. In either case, use a 4-40 x 1/4 in. stainless steel panhead screw to mount the board/bracket assembly to the front panel. If you use a nut/lock washer, notice that the hole diameter should be 0.125 in. P/N 181300-01 is provided with PEM nuts installed.

To install your I/O board, replace the manufacturer-supplied panel bracket with the flat bracket. Seat it firmly in one of the expansion bus connectors, and affix it to the front panel with the two screws.



# Appendix F

## VXIpc-486 Plug-in Boards

---

The VXIpc-486 Model 500 Series computer has several configurations that include an expansion kit for installing plug-in boards. There are several considerations for these plug-in boards that may be a bit confusing. This appendix contains information intended to clarify the different configurations by describing the considerations for plug-in boards for the VXIpc-486.

### Height of VXIpc-486 Plug-in Boards

The key issue to consider for plug-in PC boards for the VXIpc-486 is the *height* of the plug-in PC board. Our literature distinguishes between a *PC board* and a *PC AT board* in describing the different expansion kit configurations. When our literature refers to PC versus PC AT, it is a reference to the height of the board, rather than whether the board has a 16-bit or 8-bit interface to the PC bus. Both connectors for plug-in boards support both 8-bit and 16-bit boards. The issue is the physical space requirements. The height of a plug-in board is defined as the overall dimension from the bottom of the bus connector to the top of the board, as shown in Figure F-1.

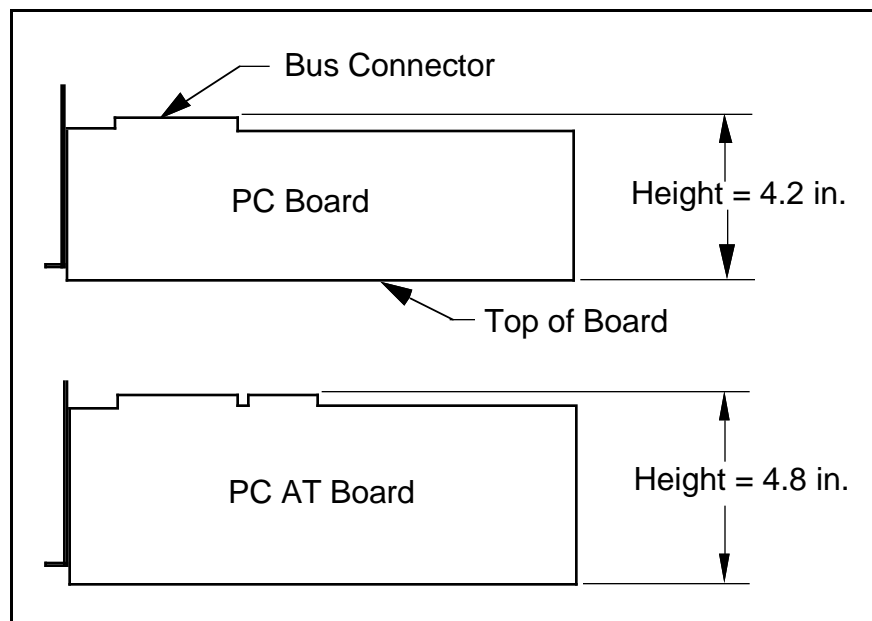


Figure F-1. Height Comparison of PC Boards Versus PC AT Boards

As Figure F-1 shows, a *PC board* is less than or equal to 4.2 in. in height, while a *PC AT board* is 4.2 in. or 4.8 in. in height. Figure F-2 shows how PC-height boards are installed in the VXIpc-486 expansion kit for the Model 500 Series.

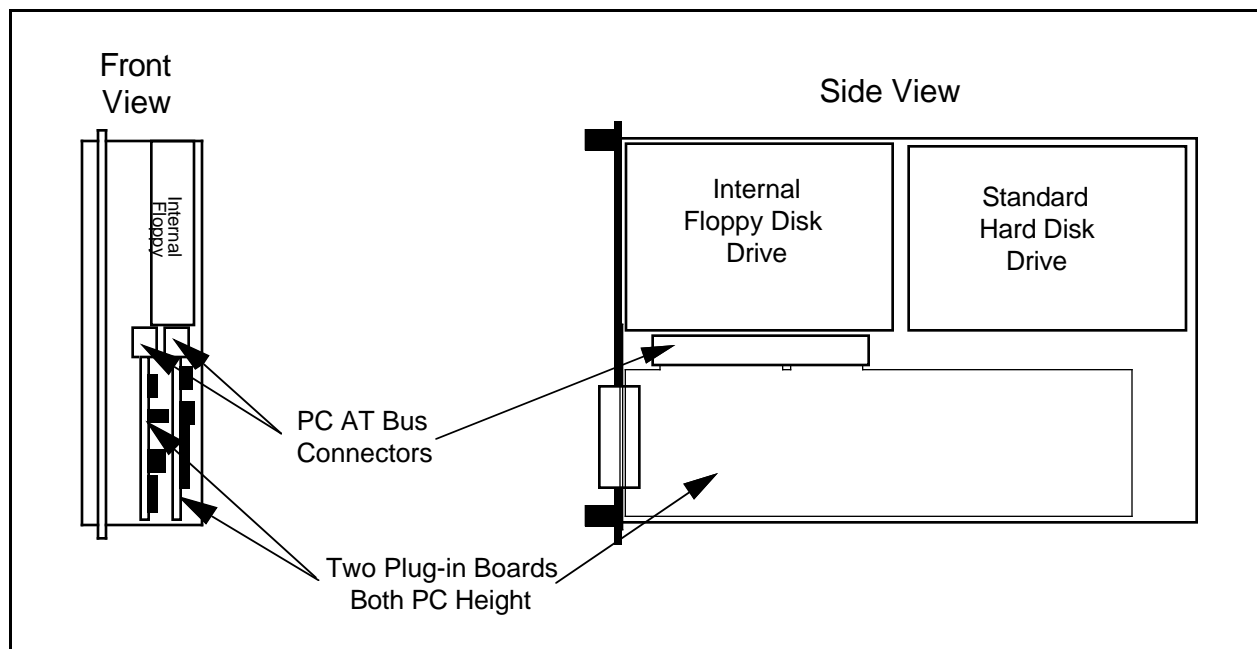


Figure F-2. Installing PC-Height Boards in a VXIpc-486 System

Notice that with an internal floppy and hard disk drive only PC-height boards (4.2 in.) can be installed (PC-height boards with a 16-bit PC AT bus interface can be used, however). A PC AT-height board (4.8 in.) will not fit.

To accommodate a PC AT-height board, one of the connectors for the plug-in boards is moved into the floppy drive area as shown in Figure F-3. From the front view, the leftmost plug-in board (first one installed) must still be PC height while the rightmost (second one installed) can be PC AT height. This is an important distinction because there are also restrictions on the length of the boards, as described in the following section.

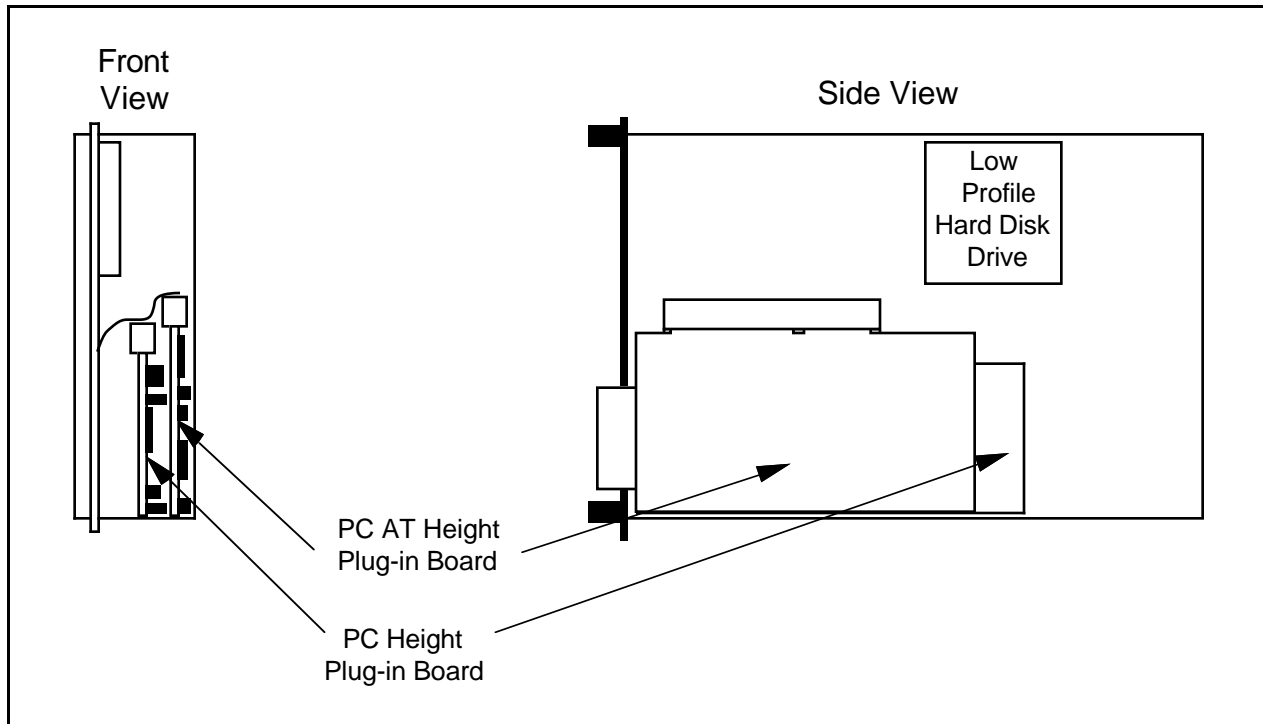


Figure F-3. Installing PC AT-Height Boards in a VXIpc-486 System

## Length of VXIpc-486 Plug-in Boards

This section discusses the restrictions on the length of the boards that can be installed into the expansion kit on a VXIpc-486 Model 500 Series computer. When you install a plug-in board, the front end of the board (the end that sticks out of the VXIpc-486 front panel) is firmly supported because it is screwed to the front panel of the VXIpc-486. A user-defined bracket is required on the expansion boards per National Instruments drawing 181300-01, *PC/AT Card Blank Panel*. The considerations on the length of the plug-in boards regard support for the back end of the board.

Figure F-4 shows the VXIpc-486 expansion kit with no boards installed. Notice that the expansion kit has a metal plate and moveable brackets that can move along the metal plate to support the back end of the plug-in boards (refer to Figure F-5). Two moveable brackets are required to support two boards. The one-board version is installed while the two-board version is available separately as kit number 776713-02. The longest board that the moveable bracket can support is 8.2 in. Notice, however, that there are fixed supports for the PC AT board at the back of the module.

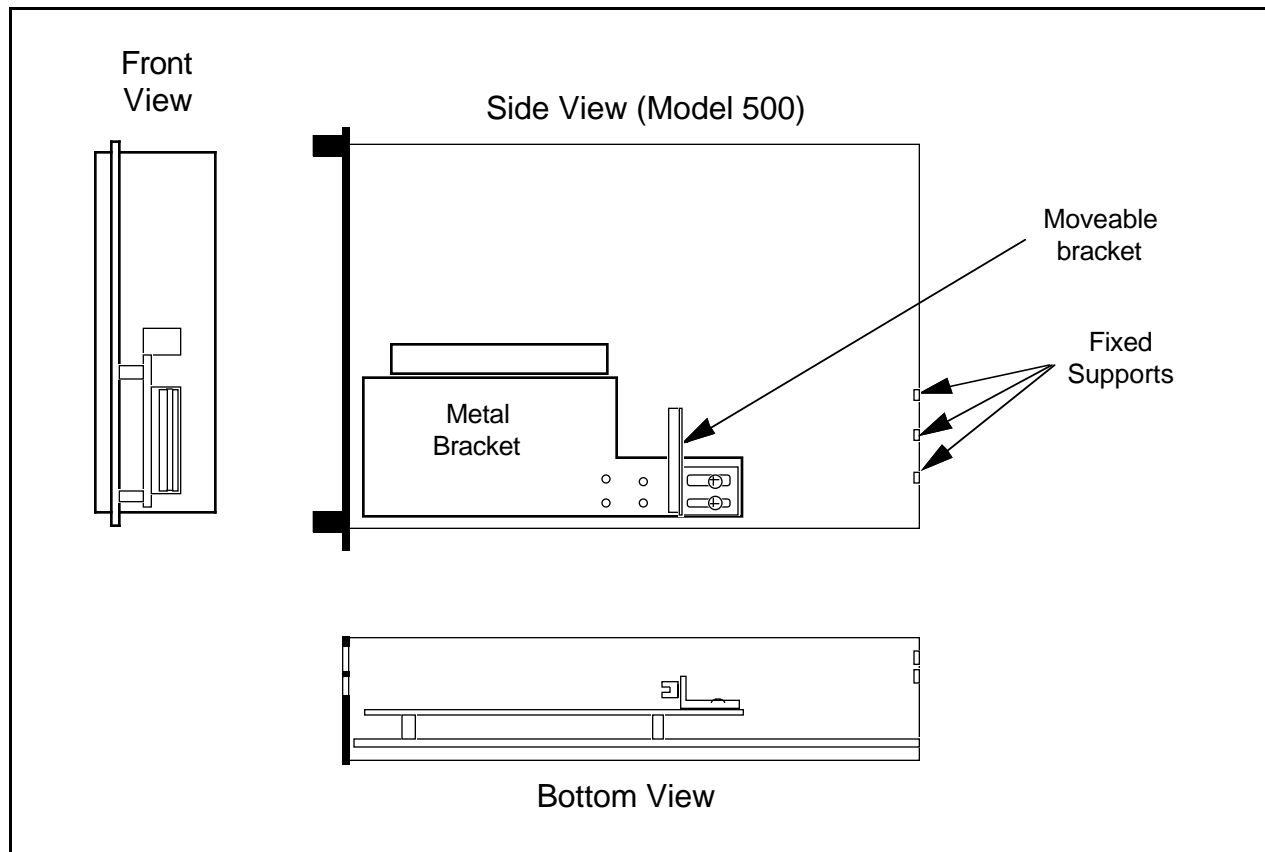


Figure F-4. VXIpc-486 Expansion Kit with No Boards Installed

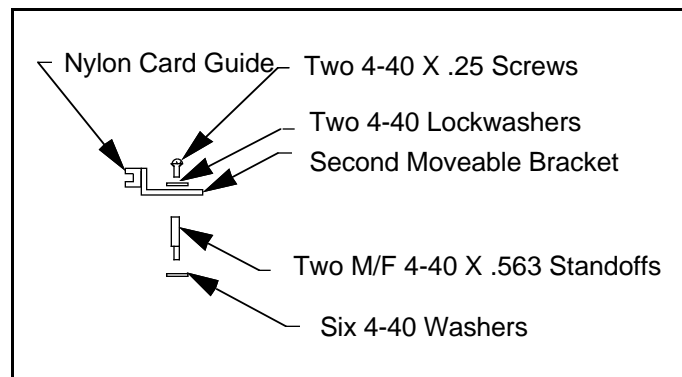


Figure F-5. Kit Number 776713-02 for Two-Board Expansion (Model 500 Series)

The first board you install into a VXIpc-486 expansion kit can be less than or equal to 8.2 in. and can be supported using a moveable bracket, as shown in Figure F-6.

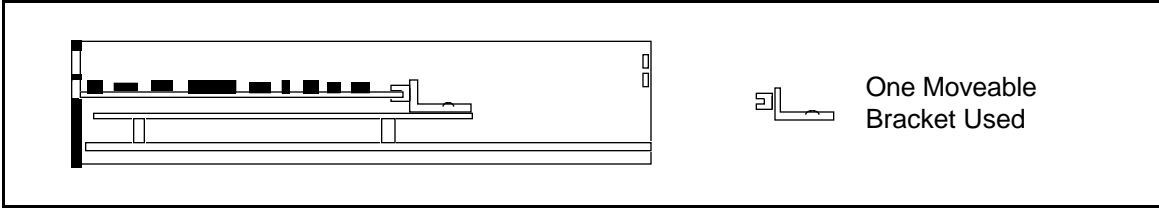


Figure F-6. First Board 8.2 in. Long or Less

While you can physically install a board that is between 8.2 in. and 13.4 in. long into the VXIpc-486, the back end will not be supported inside the VXIpc-486 (see Figure F-7). This may not be an issue in some applications, but if the application expects rugged handling it may be inadvisable to install the board without a support.

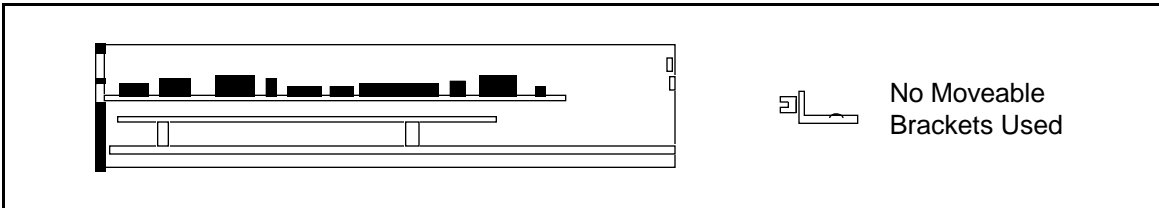


Figure F-7. First Board between 8.2 in. and 13.4 in. Long

After installing the first board, you can install the second board above it. If the second board is less than or equal to 8.2 in. long, you can use the second moveable bracket to support it. Figures F-8 and F-9 show configurations that require the use of both brackets.

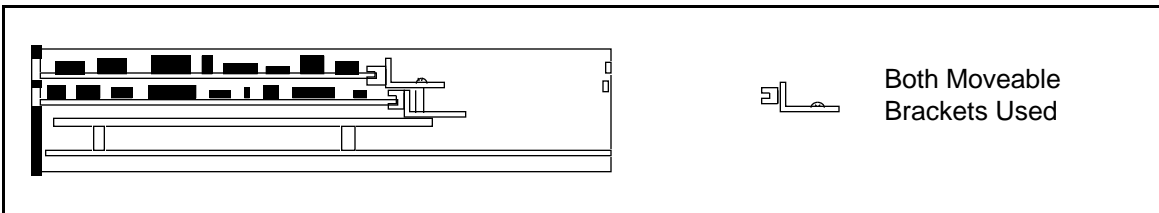


Figure F-8. Both Boards 8.2 in. Long or Less

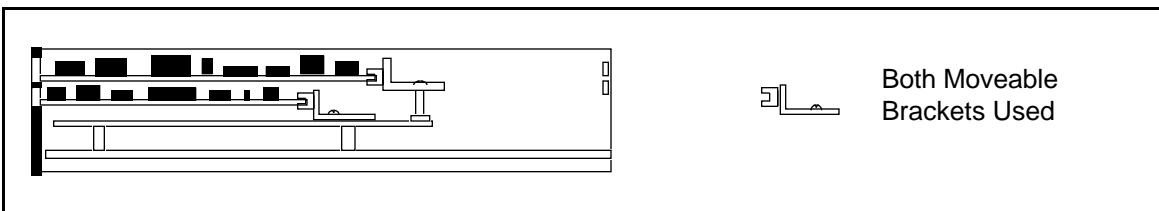


Figure F-9. First Board Less than 8.2 in. Long,  
Second Board 8.2 in. Long or Less, but Longer than the First Board

The second board cannot be supported if it is shorter than the first board by a difference greater than one inch, as shown in Figure F-10. Remember that PC AT-height boards can be used in the second expansion slot only.

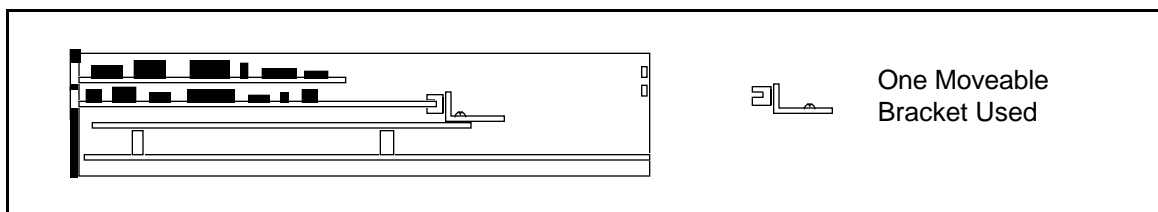


Figure F-10. First Board 8.2 in. Long or Less,  
Second Board over One Inch Shorter than First Board

While you can physically install a board that is between 8.2 in. and 13.4 in. long, the back end will not be supported. This may not be an issue in some applications, but if the application expects rugged handling it may be inadvisable to install the board without a support. Figures F-11 and F-12 show two examples in which the second board is unsupported because it is between 8.2 in. and 13.4 in. long.

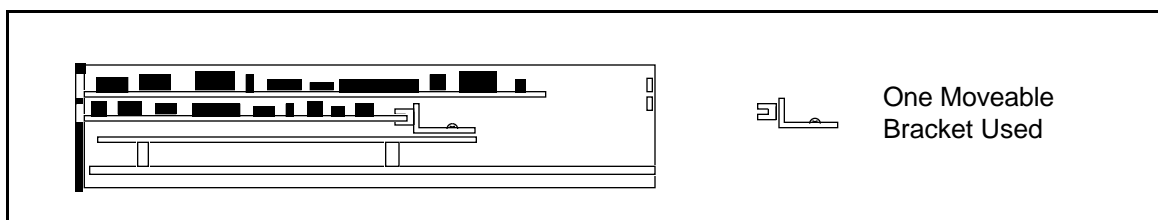


Figure F-11. First Board 8.2 in. Long or Less,  
Second Board between 8.2 in. and 13.4 in. Long

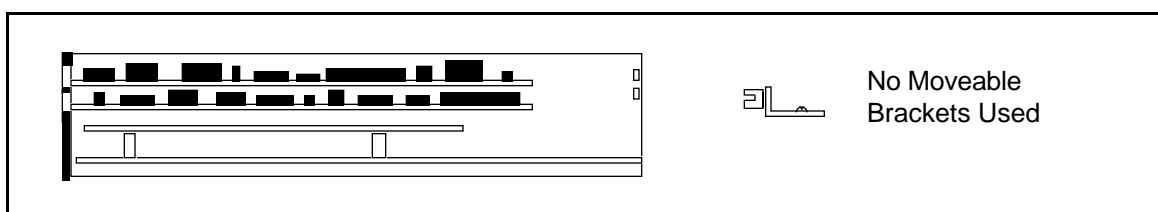


Figure F-12. Both Boards Between 8.2 in. and 13.4 in. Long

Finally, you can install a full-length (13.4 in.) board and utilize the fixed supports at the back of the VXIpc-486 Model 500 Series computer, as shown in Figures F-13 through F-15.

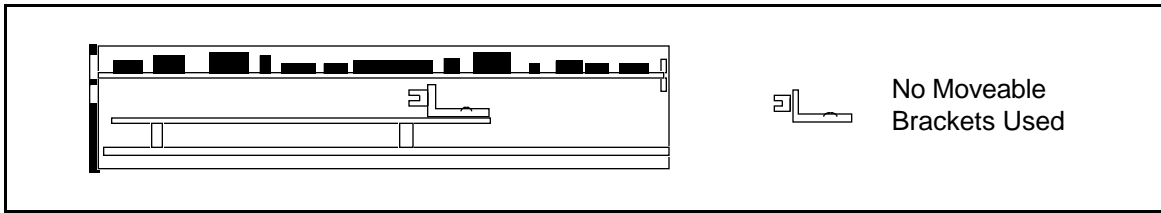


Figure F-13. Second Board Full 13.4 in. Long

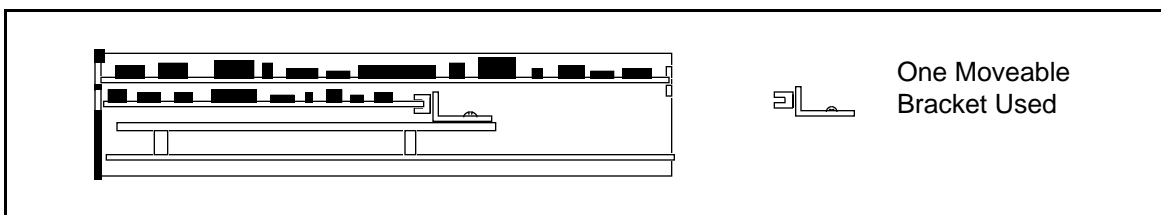


Figure F-14. First Board 8.2 in. Long or Less,  
Second Board Full 13.4 in. Long



Figure F-15. First Board between 8.2 in. and 13.4 in. Long,  
Second Board Full 13.4 in. Long

# Appendix G

## VXIpc-486 Hardware Configuration

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This appendix contains hardware configuration information about the VXIpc-486 Model 500 Series computer regarding memory map locations, I/O address map locations, interrupt lines, and DMA channels.

Table G-1 shows the memory map locations used by the VXIpc-486 hardware windows to the VXIbus, and plug-in PC board expansion slots. Table G-2 lists the I/O addresses that are used by the VXIpc-486 and the Ethernet option. Table G-3 lists the hardware interrupt lines used by the VXIpc-486, along with the corresponding functionality assigned to each line. Table G-4 lists the PC AT DMA channels used by the VXIpc-486, along with the corresponding functionality assigned to each channel.

When installing plug-in PC AT boards into a VXIpc-486 expansion slot, be careful to avoid conflicts with the VXIpc-486 hardware setting. All other VXIpc-486 motherboard I/O devices are mapped according to industry-standard PC AT conventions.

Table G-1. VXIpc-486 Model 500 Series Memory Map

<b>Start-End Address</b>	<b>Size</b>	<b>VXIbus Access</b>
A0000–BFFFF	128 KB	Super VGA
C8000–CFFFF	32 KB	VXI A16 Space Window
D0000–DFFFF	64 KB	For Plug-In PC Expansion Boards
E0000–EFFFF	64 KB	VXI A24/A32 Space Window



Table G-2. VXIpc-486 Model 500 Series I/O Address Map

<b>Address</b>	<b>Device</b>
00H - FFH	Reserved
100H - 17FH	Available
180H - 19FH	GPIB
1A0H - 1EFH	Available
200H - 207H	Reserved
208H - 21FH	Available
220H - 23FH	Ethernet Option Default
240H - 277H	Available
278H - 27FH	Reserved
280H - 2F7H	Available
2F8H - 32FH	Reserved
330H - 35FH	Available
360H - 3FFH	Reserved

Table G-3. VXIpc-486 Model 500 Series Interrupt Line Use

<b>PC AT Interrupt Line Number</b>	<b>Functionality</b>
0	System Timer
1	Keyboard
2	Cascade
3	COM2
4	COM1
5	Free for Plug-In PC Boards (Used if Option 920100-xx Installed)
6	Floppy Disk
7	Printer
8	Clock
9	Free for Plug-In PC Boards
10	Free for Plug-In PC Boards
11	GPIB
12	VXI (MIGA, VMEbus Interrupts, Triggers)
13	Reserved
14	Hard Drive
15	Free for Plug-In PC Boards

Table G-4. VXIpc-486 Model 500 Series DMA Channel Use

<b>PC AT DMA Channel Number</b>	<b>Functionality</b>
0	Free for Plug-In PC Boards
1	Free for Plug-In PC Boards
2	Floppy Disk Drive
3	Free for Plug-In PC Boards
4	Reserved
5	GPIB
6	Free for Plug-In PC Boards
7	Free for Plug-In PC Boards

# Appendix H

## Configuring the Super VGA Option

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### Introduction

This appendix describes the Super VGA (video graphics adapter) driver option you can use with your VXIpc-486 Model 500 Series embedded computer. The standard VGA graphics format is 640 by 480 pixels, with 16 available colors. You can use Super VGA to improve the graphic image in one of two ways—either by increasing your color options to 256 colors or by substantially increasing the resolution to 1024 by 768 pixels. You can benefit from the clarity of Super VGA when you want to edit or view an especially complex image in graphics or CAD programs.

If you ordered your VXIpc-486 with the Super VGA option installed, you only need to modify the system settings according to the following section. If your Super VGA option was not installed at the factory, refer to the installation instructions later in this appendix.

The Super VGA option is not available for the VXIpc-486 Model 200 Series computers.

**Warning:** *The Chips & Technology Super VGA video output is specified for monitors having a horizontal scan rate of at least 50 kHz with a vertical scan rate of 60 Hz. Be certain your monitor meets this specification. There are a variety of low-cost monitors on the market that have a horizontal scan rate less than 50 kHz. Enabling the Super VGA option on a monitor that does not meet this specification will cause damage to your monitor.*

### Modifying the System Settings

You must modify the system settings of Windows 3.x to change the application video to Super VGA. For example, to display all of the available Windows graphics drivers in Windows 3.1, perform the following steps. The Super VGA option must already be installed.

1. From the **Main** folder, open the **Windows Setup** window by double-clicking on the icon. The window displays your current hardware and software settings.
2. From the **Options** menu, select the **Change System Settings** dialog box. The **Display** field reads VGA by default.
3. Use your mouse or the <Alt-Down Arrow> keys to scroll through the options for the **Display** field. Among several other options you will find three Chips & Technology entries available for the VXIpc-486 after the Super VGA option is installed.

- \* **CHIPS 452 VGA 640x480 256 Color**  
This option changes the default of 16 colors to 256 colors. The resolution remains at 640 by 480 pixels.
  - \* **CHIPS 452 VGA 800x600 16 Color**  
This option increases the resolution to 800 by 600 pixels. The color option remains at 16 colors.
  - \* **CHIPS 452 VGA 1024x768 16 Color**  
This option increases the resolution to 1024 by 768 pixels. The color option remains at 16 colors.
4. Highlight the Super VGA option you want to use and press the **OK** button.
  5. The program prompts you to restart Windows. Follow the instructions as given by the prompts. The Super VGA resolution is now in effect.

## Installing the Super VGA Drivers

If you did not order the Super VGA drivers with your VXIpc-486 kit, follow these steps to install the Super VGA drivers.

1. Insert the VXIpc-486/500 SVGA Drivers Disk 1 of 3 into drive A of the VXIpc-486.
2. Change to drive A by typing the following command at the C:\> prompt in the root directory.  
A:           <Enter>
3. From the A:\> prompt, type the following command.  
setup       <Enter>
4. Press any key when directed by the following prompt.  
**<< Press Any Key to Continue >>**
5. The main menu appears. At this point you can select the appropriate graphics driver. For instance, to install the Windows 3.1 Super VGA driver, use the cursor keys to highlight the selection **Windows Version 3.1**, then press <Enter>.
6. Once you have selected a driver, a screen appears prompting you to select a video resolution to install. The default is **All Resolutions**. Press <Enter> to install.
7. To install the Super VGA driver, press <End>.
8. The program prompts you to insert the remaining installation diskettes as needed. After the installation completes, press <Esc> to exit the installation program.
9. Modify the system settings as described previously.

# Appendix I

## Common Questions

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This appendix answers common questions you may have when using the NI-VXI bus interface software on the VXIpc-486 platform. This material does not cover problems that you may have with the system. Please see Appendix J, *Troubleshooting*, if you have system-related problems.

### **How can I determine which version of the NI-VXI software I have installed?**

Run the NI-VXI interactive control utility program, either VIC or VICTEXT. (If you run VIC, stay in the Text Window.) At the prompt type `ver`, and the program will display the versions of VIC/VICTEXT and NI-VXI, and the hardware revision of the VXIpc-486 that the NI-VXI software supports. However, this may not reflect the actual hardware revision of your VXIpc-486.

### **How can I determine what is the revision of the VXIpc-486 hardware I have in my system?**

Running the NI-VXI interactive control utility program as described above will display the versions of VIC/VICTEXT and NI-VXI, and the hardware revision of the VXIpc-486 that the NI-VXI software supports. Because this may not reflect the actual hardware revision, to determine the actual hardware revision is to check the label affixed to the module.

### **Which NI-VXI utility program must I use to configure the VXIpc-486?**

You must use one of the VXI Resource Editor programs, VXIEDIT or VXITEDIT, to configure the VXIpc-486. You will find this program in the NIVXI directory.

### **Which NI-VXI utility program must I use to initialize the VXIpc-486 hardware?**

You must use the hardware initialization program, VXIINIT, to initialize the VXIpc-486. You will find this program in the NIVXI directory. VXIINIT uses the settings in the Configuration Editor of the VXI Resource Editor program, either VXIEDIT or VXITEDIT.

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

You must use the RESMAN program to perform startup Resource Manager operations. You will find this program in the NIVXI directory. RESMAN uses the settings in the Configuration Editor of the VXI Resource Editor program, either VXIEDIT or VXITEDIT. 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.

### 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 VXIbus communication system is operational.

To test individual devices, you can use the VIC or VICTEXT program to interactively issue NI-VXI functions. 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.

Finally, if you are using LabVIEW, LabWindows/CVI, or LabWindows for DOS, 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 VXIpc-486 mean?

- The **SYSFAIL** light shows the state of the VXIbus SYSFAIL line. This line is asserted whenever any device in the chassis has not yet passed its self test, failed its self test, or has detected a failure after originally passing its self test.
- The **FAILED** light indicates whether the VXIpc-486 has passed its own self test.
- The **TEST** light indicates that the Resource Manager has not yet run and verified the VXIpc-486. The **TEST** light will go off when the test is complete, and the **ON LINE** light will come on.
- The **ON LINE** light means that the VXIpc-486 is ready for operation across the VXIbus.
- The **ACCESS** light indicates whether the VXIpc-486 is currently accessing the VXIbus.
- The **DRIVE** light indicates whether the Hard Disk is being accessed.
- The **TURBO** light is not used by the VXIpc-486 Model 500 series.

Refer also to Appendix C, *Front Panel Indicators*.

### Is there something wrong with the VXIpc-486 if the red SYSFAIL and FAILED LEDs stay lit after booting the VXIpc-486?

Most likely, the VXIpc-486 has not yet run the hardware initialization program, VXIINIT. After it runs this program successfully, the **FAILED** LED should definitely turn off and, if no other devices are asserting the backplane SYSFAIL line, the **SYSFAIL** LED should also turn off. Perform the following procedure if either the **SYSFAIL** or **FAILED** LED remains lit.

1. Power down the mainframe.
2. Remove all other modules from the mainframe.

3. Make sure that the VXIpc-486 jumper settings are set correctly.
4. Make sure that the VXIpc-486 is seated properly in the mainframe.
5. Power on the mainframe and observe whether the **SYSFAIL** and **FAILED** LEDs become unlit after running VXIINIT.

Refer also to Appendix C, *Front Panel Indicators*.

### **Why is the TURBO light never lit on the VXIpc-486 Model 500 Series?**

The **TURBO** light is never lit on the VXIpc-486 Model 500 Series because models in this series do not have a **TURBO** or *enhanced* CPU speed. The Model 500 Series computers are always running the CPU at the fastest possible speed. However, the VXIpc-486 Model 200 Series—Models 200 and 240—have the option of running the CPU at a slower speed if you change a parameter in the BIOS *Setup* utility. If you choose the slower speed for the Model 200 Series computers, the **TURBO** LED will not be lit. Because the Model 500 Series and the Model 200 Series share the same front panel faceplate and LEDs, the **TURBO** LED exists on the Model 500 Series, but it will never be lit.

### **I have a system that requires ruggedized chassis and bulkhead cables. Can I still use MXIbus to have multiple VXIbus chassis?**

Yes, National Instruments sells MXIbus bulkhead cables. Contact National Instruments and ask for Technical Note 30, *Planning a MXIbus System Using MB Series Bulkhead Cables*, which describes the cables and discusses how to design the system.

### **Can I access 32-bit registers in my VXIbus system from the VXIpc-486?**

Yes. Although the VXIpc-486 supports the ISA bus, it does not use the bus for communication with the VXIbus backplane. National Instruments has a specialized bus dedicated to the communication to the VXIbus backplane. This bus is a full 32 bits wide, and you can use it for D32 accesses.

### **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 backplane. However, the oscillator for the VXIpc-486 and the EXTCLK input from the front panel use TTL. 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?**

The CLK10 signal generated by the VXIpc-486 is  $\pm 100$  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 VXIpc-486.



**If I boot the computer without video, and then plug in the video, why it is in black and white?**

When the computer first boots, the video chips try to synchronize with the monitor. If the monitor is not there, the video chips cannot synchronize and establish color. You need to have the monitor attached at boot time to get color.

**How do I connect a SCSI device to the VXIpc-486?**

You will need to install an ISA bus SCSI board in one of the ISA bus slots of the VXIpc-486. This means that you must have a two-slot VXIpc-486 and that one of the slots must be available. Also, check if your VXIpc-486 possesses either two PC-height (<4.2 in.) slots or one PC-height and one AT-height (<4.8 in.) slot. Make sure that the SCSI board can fit in the slot, given the height restrictions. For proper installation, you must remove the AT bracket mounted on the board. Refer to Appendix F, *VXIpc-486 Plug-in Boards*, for more information.

National Instruments offers two SCSI interface options that you can consider when ordering a VXIpc-486. You can order part number 920100-13 for a SCSI adapter *without* BIOS if you do not intend to boot from an external SCSI hard drive. You can order part number 920100-14 for a SCSI adapter *with* BIOS if you do want to boot from an external SCSI hard drive. These SCSI boards are 16-bit and use programmed I/O for data transfers. They are not SCSI-2 compatible boards.

When you configure the SCSI board base I/O address, memory address, interrupt levels, and DMA channels, make sure that the settings do not conflict with those already used by the VXIpc-486. For more information about the VXIpc-486 settings, refer to Appendix G, *VXIpc-486 Hardware Configuration*.

**How do I connect the VXIpc-486 to a network?**

You will need to install an ISA bus Ethernet board in one of the ISA bus slots of the VXIpc-486. This means that you must have a two-slot VXIpc-486 and that one of the slots must be available. Also, check if your VXIpc-486 possesses either two PC-height (<4.2 in.) slots or one PC-height and one AT-height (<4.8 in.) slot. Make sure that the Ethernet board can fit in the slot, given the height restrictions. For proper installation, you must remove the AT bracket mounted on the board.

National Instruments offers two Ethernet interface options that you can consider when ordering a VXIpc-486. You can order part number 920100-01 for an Ethernet adapter with a coaxial (BNC) connector. You can order part number 920100-02 for an Ethernet adapter with a twisted pair connector, which resembles a telephone jack. Both Ethernet boards also have generic Access Unit Interface (AUI) connectors that can connect to other Ethernet media through third-party Media Access Unit (MAU) boxes. These can be purchased from almost any Ethernet board manufacturer.

When you configure the Ethernet board base I/O address, memory address, interrupt levels, and DMA channels, make sure that the settings do not conflict with those already used by the VXIpc-486. For more information about the VXIpc-486 settings, refer to Appendix G, *VXIpc-486 Hardware Configuration*.

**What type of video interface is present onboard the VXIpc-486? What video drivers are included with the VXIpc-486? Can I use Super VGA with my VXIpc-486? If my application requires a special type of video display, how do I configure my VXIpc-486?**

The VXIpc-486 uses the Chips & Technology 452 video chip set, which is compatible with the Standard VGA video output MS Windows video driver, as well as the Chips & Technology CHIPS 452 VGA drivers for 640 by 480 (256 color), 800 by 600 (16 color), and 1024 by 768 (16 color). For information on the Super VGA video driver, refer to Appendix H, *Configuring the Super VGA Option*.

If your application requires a special type of video display, you can order the two-slot VXIpc-486 module without onboard video and install a specialized ISA bus video card in one of the ISA bus slots. Make sure that the video card can fit in the ISA bus slot, given the height restrictions. For proper installation, you must remove the AT bracket mounted on the board.

When you configure the video board base I/O address, memory address, interrupt levels, and DMA channels, make sure that the settings do not conflict with those already used by the VXIpc-486. For more information about the VXIpc-486 settings, refer to Appendix G, *VXIpc-486 Hardware Configuration*.

**Are there any limitations on the types of monitors that can be connected to the VXIpc-486?**

VXIpc-486 Model 500 Series computers that use Super VGA video output will work only with monitors having a horizontal scan rate of at least 50 kHz and a vertical scan rate of 60 Hz.

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

**What type of connector must my keyboard possess to plug directly into the VXIpc-486? Is there a keyboard adapter cable available if my keyboard does not have this type of connector?**

You can plug keyboards that have a 6-pin Mini DIN PS/2 type connector directly into the VXIpc-486. You can use the keyboard adapter cable that is included with every VXIpc-486 kit to adapt the larger AT keyboard connector to the 6-pin Mini DIN connector.

**How do I connect a serial device to the COM2/GPIO connector on the VXI-pc486?**

The easiest way to connect a serial device to the COM2/GPIO connector is to purchase the COM2 adapter cable (part number 182188-01), which brings out the serial port signals from the 15-pin COM2/GPIO connector to a standard 9-pin Subminiature DHD-20 connector. You can try to connect directly to the serial port signals on the COM2/GPIO connector. Refer to Appendix D for the connector pin descriptions.

**How do I connect an external speaker to the VXIpc-486 to get audio capability?**

A twisted-pair cable connects the front panel AUDIO/TRG OUT connector to the VXIpc-486 motherboard. By default, this cable is connected to two pins at J17 on the motherboard. With this configuration, TTL trigger signals can be passed out the front panel connector. For audio capability, connect the cable to the two pins at J13. Connect the external speaker to the front panel connector. The center pin of the SMB connector provides the audio signal. The shield of the SMB connector is GROUND.

**How do I add more RAM to the VXIpc-486? What is the maximum amount of RAM that I can have on the VXIpc-486?**

To add more RAM to the VXIpc-486, you need have to change the SIMMs that reside in slots A1 and A2 of the VXIpc-486. The SIMMs used for the VXIpc-486 Model 200 Series differ from those used for the Model 500 Series. The maximum amount of RAM on a VXIpc-486 Model 500 Series is 32 MB.

**Note:** *Do NOT attempt to change the factory RAM configuration of a two-slot VXIpc-486 module. You must return your VXIpc-486/2 module to National Instruments for SIMM installation or else you will void your warranty.*

National Instruments recommends the following types of SIMMs for use with the VXIpc-486 Model 500 Series controllers:

- 1 MB: Hitachi part number HB56G25636B-7AL or equivalent 256 KB x 36 SIMMs
- 4 MB: Toshiba part number THM361020ASG-70 or equivalent 1 MB x 36 SIMMs
- 16 MB: Toshiba part number THM364020SG-70 or equivalent 4 MB x 36 SIMMs

The physical dimensions of the 1 MB and 4 MB SIMMs are as follows:

- 107.95 mm in length
- 5.08 mm in thickness
- 25.4 mm in height

The physical dimensions of the 16 MB SIMM are as follows:

- 107.95 mm in length
- 9.4 mm in thickness
- 25.4 mm in height

Do not exceed these physical dimensions when choosing an equivalent SIMM.

**I am trying to install an ISA bus board in one of the ISA bus slots and it is too tall for the metal cover to fit on the VXIpc-486. What options do I have if I must use this board?**

You could consider getting a VXIpc-486 without an internal floppy drive, so that you can use the AT-height slot for any ISA bus board (<4.8 inches). If you choose the latter option, you can use an external floppy drive instead of an internal floppy drive. To arrange to have your VXIpc-486 reconfigured with an AT-height slot, contact your National Instruments Inside Sales Representative or Regional Sales Manager.

**Which interrupt levels are free to be used by ISA bus boards?**

Interrupt levels 5, 9, 10, and 15 are free to be used by ISA bus boards. See Appendix G, *VXIpc-486 Hardware Configuration* for information on the available port I/O register space, upper memory area, interrupts, and DMA channels.

**Which area of upper memory (adapter space) is free for use by ISA bus boards or expanded memory manager software programs?**

The upper memory from D000h to DFFFh is free for use by ISA bus boards or expanded memory manager software programs. The VXIpc-486 needs upper memory from C800h to CFFFh and from E000h to EFFFh so that it can access the devices in VXI address space. See Appendix G, *VXIpc-486 Hardware Configuration* for information on the available port I/O register space, upper memory area, interrupts, and DMA channels.

**How do I install the VXIpc-486 in a slot other than Slot 0?**

The VXIpc-486 is factory configured as a Slot 0 device. If you want to install the VXIpc-486 in a different slot of your mainframe, you must perform the following steps. Refer also to Chapter 2, *VXIpc-486 Configuration and Installation*, for explanations and illustrations that show both the configurations and the location of the jumpers.

1. Move the W26 jumper to the leftmost two pins. The new configuration causes the MODID signal to be terminated with an 825  $\Omega$  pull-down resistor.
2. Move the W25 jumper to the upper two pins. The new configuration disables the default System Controller functions.
3. Move the jumpers from jumpers W35 and W36 to jumpers W32 and W33 in the jumper block of pins. In the new configuration, the VXIpc-486 accepts the CLK10 signal from the backplane.
4. Install the board in a slot other than Slot 0.

**How do I install the VXIpc-486 in a slot other than Slot 0 and prevent the VXIpc-486 from being the Resource Manager?**

1. Perform the same hardware changes as described in the previous question.
2. Run the VXI Resource Editor program, either VXIEDIT or VXITEDIT, and select the Configuration Editor.
3. In the Logical Address Configuration Editor, change the **Logical Address** parameter from 0 to a non-zero value.
4. In the Bus Configuration Editor, change the **Local Bus Timeout** parameter to DISABLE.
5. In the Bus Configuration Editor, change the **VXI Bus Timeout** parameter to DISABLE.
6. Save your changes and rerun VXIINIT and RESMAN.

**Notes:**

1. If your board is set up as a Message-Based device, it must wait for the Word Serial command *Begin Normal Operation* from the actual Resource Manager device (the device at Logical Address 0).
2. If your board is set up as a Register-Based device, you don't have to run RESMAN. But running RESMAN will not cause any problems.
3. To set whether your board is Message-Based or Register-Based, use the Logical Address Configuration Editor in the VXI Resource Editor program to edit the **Device Type** field.

MBD	Message-Based Device
RBD	Register-Based Device
EXT	Extended Device

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

Follow these steps to view the BIOS setup parameters.

1. Reboot the VXIpc-486.
2. During the memory tests, press the <F2> key.
3. After hitting the <F2> key, you will get a menu listing the screens that you can enter. Select the Setup screen, which shows all the important parameters concerning your system.

Refer to Chapter 3, *BIOS Setup*, for more information.

**How do I disable the automatic memory check when booting the VXIpc-486? Are there any side effects to disabling the automatic memory check?**

Follow these steps to make the change in BIOS.

1. Reboot the VXIpc-486.
2. During the system tests, press the <F2> key.
3. Select **Extended BIOS Features** from the menu.
4. From this menu select the **Quick Boot** parameter and set it to **Yes**.
5. Press <F10> to save the configuration.
6. Press <Esc> until you exit the BIOS Setup utility.

The only side effect of disabling the automatic memory check is that you cannot boot off a floppy disk. One advantage is that you can leave a floppy disk in the floppy drive when rebooting the VXIpc-486.

# Appendix J

## Troubleshooting

---

This appendix addresses system-related problems you may encounter when using the NI-VXI bus interface software on the VXIpc-486 platform. This material covers the following issues:

- Running the VXIINIT initialization program results in an error message or causes the system to hang.
- Running the RESMAN Resource Manager program results in incorrect data or causes the system to hang.
- The mouse degrades system performance.
- The VXIpc-486 and/or its installed components (such as GPIB, COM Port) fail to work once ISA bus plug-in cards are installed.
- The network card installed does not operate properly.
- The Hard Disk Drive reports failures or other errors.

If you encounter any of these problems, your system may have a conflict with one of the VXIpc-486 configuration settings. For proper operation, the VXIpc-486 requires the allocation of the following system resources:

- One interrupt level that cannot be shared with another device
- Two blocks of memory space in the upper memory region of the PC AT address space

In addition, the VXIpc-486 components require Port I/O register space, interrupts and DMA channels. These resources are statically allocated. For more details, refer to Appendix G, *VXIpc-486 Hardware Configuration*.

If you are unable to resolve your problem, and you have checked Appendix I, *Common Questions*, for a solution to your problem, please fill out the appropriate forms in Appendix K, *Customer Communication*, and contact National Instruments.

### What information should I have before I call National Instruments?

Make sure that none of the following questions relate to the problem you are having, or the suggestions contained in the answers have not corrected the problem. Appendix I, *Common Questions*, may also contain the solution to your problem. When you call National Instruments, make sure you have filled out the *VXIpc-486 Model 500 Series Hardware and Software Configuration Form* in Appendix K. Also, if you are having problems with RESMAN, you can get RESMAN to create a file of its output by issuing

```
resman -o
```

from the Program Manager **Run** option, a Windows MS-DOS Shell, or by changing the Command Line to the above statement in the **Program Item Properties** window of the **RESMAN** icon. This creates a file `RESMAN.OUT` in the TBL subdirectory of the NIVXI directory.

### **What does VXIINIT mean by File *filename* not found?**

When VXIINIT runs, it attempts to access some of the configuration or table files, such as `VXILA.CFG`, `VXIBUS.CFG`, and `VXIDEV.CFG`. If VXIINIT cannot find any of these files, you have two options.

1. The file(s) may have been deleted accidentally. If the file does not exist in your TBL directory after you installed your software, you will need to reinstall NI-VXI from your software distribution media.
2. You can modify the NIVXIPATH environment variable. Check the `AUTOEXEC.BAT` file in your root directory. Make sure that the user environment variable NIVXIPATH points to the right directory. By default this directory is `C:\NIVXI`, but you may have chosen another destination directory during the installation process.

### **What does VXIINIT mean by Error writing configuration to file?**

This is only a warning message, and does not indicate a problem with the configuration. Either the log file could not be created, or only a partial log was written.

VXIINIT creates a file `VXIINIT.OUT` in the TBL subdirectory. This file is a text file that contains the same configuration information you see printed to the screen. The likely cause of this message is that the disk drive is full.

### **Why does RESMAN report warning/errors about devices that don't exist in my system?**

If the VXIINIT program runs successfully but you encounter problems with RESMAN, the Resource Manager program, the cause is probably that your system contains a device that already occupies all or some of the upper memory area that is allocated for the Master Windows. The Master Windows consist of 32 KB and 64 KB blocks of contiguous memory in the PC AT upper memory space that the VXIpc-486 uses to access the VXI/VME bus. The upper memory space of a PC AT is the region from 640 KB (A000h) to 1024 KB (FFFFh). Several system resources, such as system ROM and video memory, reside in this area. On a VXIpc-486, the Master Windows occupy the memory regions from a base address of C800h to CFFFh, and E000h to EFFFh.

To solve this problem, first determine what area of upper memory your devices use. Then move your device to the unused area of upper memory from D000h to DFFFh. If you have Ethernet networking cards, be aware that many of them occupy upper memory. Many Ethernet cards have an upper memory base address of D000h or E000h.

In addition to the above problems, your system may contain an expanded-memory manager or an expanded-memory emulator that uses a block of upper memory within the range that is allocated for the master-mode windows.



To solve this problem, verify which expanded-memory manager or emulator you are using, and prevent it from using upper memory within the address ranges for the master-mode windows. The following examples show how to prevent various expanded-memory managers or emulators from using upper memory within the address ranges for the master-mode windows, from C800h to CFFFh and E000h to EFFFh.

If you are using EMM386, which is included with MS-DOS, prevent it from using the address ranges for the master-mode windows by editing the `CONFIG.SYS` file and appending the flags `X=C800-CFFF` and `X=E000-EFFF` to the line `DEVICE=EMM386.EXE`.

If you are using QEMM386 from Quarterdeck, prevent it from using the address ranges for the master-mode windows by editing the `CONFIG.SYS` file and appending the flags `X=C800-CFFF` and `X=E000-EFFF` to the line `DEVICE=QEMM386.SYS`.

If you are using 386MAX from Qualitas, prevent it from using the address ranges for the master-mode windows by editing the `386MAX.PRO` file located in the `386MAX` directory, and inserting the lines `RAM=C800-CFFF` and `RAM=E000-EFFF`.

If you are using any other expanded-memory manager, refer to its documentation to learn how to prevent it from using the address ranges for the master-mode windows.

### **Why does VXIINIT work fine but RESMAN hangs the system?**

This is most likely caused by a conflict with the Master Window. See the previous question, *Why does RESMAN report warning/errors about devices that don't exist in my system?*

### **Why is it that when I install my mouse driver, the system performance degrades?**

If your mouse appears to slow down system performance, add the `/y` option to your mouse command. This action switches off the hardware cursor and gives you full system performance.

### **Why does the VXIpc-486 and/or its installed components (GPIB, COM Port) fail to work once ISA bus plug-in cards are installed?**

The VXIpc-486 and its components use Port I/O register space, interrupts and DMA, just like a desktop PC. If installing an ISA bus card causes something to stop working, it is very likely that you have a conflict of these resources between the VXIpc-486 and the plug-in card. See Appendix G, *VXIpc-486 Hardware Configuration* for the resources that the VXIpc-486 uses.

### **Why does my network not work properly?**

There can be a possible conflict with the network card in your system. See the question *Why does the VXIpc-486 and/or its installed components (GPIB, COM Port) fail to work once ISA bus plug-in cards are installed?* above.

In addition, most network cards use some portion of the upper memory area, usually between D000h to EFFFh, for their operation. Because the VXIpc-486 also uses some of this memory area, the computer and the network card may be conflicting. See *Why does RESMAN report warning/errors about devices that don't exist in my system?* earlier in this section for more information.

**When my computer boots, it says that it cannot access the Hard Disk (HDD), or says System Not Found, or Fixed Disk Failure. Is my HDD damaged?**

It is not uncommon for the computer to be unable to access the HDD if the system loses power during certain times of operation. Try the following procedure to fix the problem.

1. Reboot the VXIpc-486 and, during the system tests, press the <F2> key.
2. Select **Setup** from the menu.
3. Press the <F9> key to Auto Configure the system.
4. Press <F10> to save the configuration.
5. Press <Esc> until you exit the BIOS Setup utility.
6. If the errors do not go away, power down your mainframe, remove the VXIpc-486, and check the hard drive settings on its label.
7. Reinsert the VXIpc-486, power on the mainframe, get back into the BIOS setup, and make sure that the hard drive parameters match those printed on the label.
8. If the errors do not go away, open up the VXIpc-486 and make sure the hard drive cable and power cable are securely attached to the hard drive.

If this did not fix the problem, check to see if you can boot off a floppy DOS disk and then change drive to C. If not, your HDD is probably damaged and may need to be reformatted or repaired.

**Caution:** *You should NOT reformat the disk unless directed by National Instruments support personnel. The HDD controller may have a problem, or a fuse may have blown, causing the HDD to fail. Reformatting the drive prematurely may not fix the problem but could result in a loss of data. Contact National Instruments for repair information.*

# Appendix K

## Customer Communication

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For your convenience, this appendix contains forms to help you gather the information necessary to help us solve technical problems you might have as well as a form you can use to comment on the product documentation. Filling out a copy of the *Technical Support Form* before contacting National Instruments helps us help you better and faster.

National Instruments provides comprehensive technical assistance around the world. In the U.S. and Canada, applications engineers are available Monday through Friday from 8:00 a.m. to 6:00 p.m. (central time). In other countries, contact the nearest branch office. You may fax questions to us at any time.

### Corporate Headquarters

(512) 795-8248

Technical support fax: (800) 328-2203  
(512) 794-5678

<b>Branch Offices</b>	<b>Phone Number</b>	<b>Fax Number</b>
Australia	(03) 879 9422	(03) 879 9179
Austria	(0662) 435986	(0662) 437010-19
Belgium	02/757.00.20	02/757.03.11
Denmark	45 76 26 00	45 76 71 11
Finland	(90) 527 2321	(90) 502 2930
France	(1) 48 14 24 00	(1) 48 14 24 14
Germany	089/741 31 30	089/714 60 35
Italy	02/48301892	02/48301915
Japan	(03) 3788-1921	(03) 3788-1923
Netherlands	03480-33466	03480-30673
Norway	32-848400	32-848600
Spain	(91) 640 0085	(91) 640 0533
Sweden	08-730 49 70	08-730 43 70
Switzerland	056/20 51 51	056/20 51 55
U.K.	0635 523545	0635 523154

# Technical Support Form

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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. Use additional pages if necessary.

Name \_\_\_\_\_

Company \_\_\_\_\_

Address \_\_\_\_\_

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

The problem is \_\_\_\_\_

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List any error messages \_\_\_\_\_

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The following steps will reproduce the problem \_\_\_\_\_

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# VXIpc-486 Model 500 Series Hardware and Software Configuration Form

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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

- VXIpc-486 Model 500 Series ID Label Information

- Model Number        \_\_\_\_\_ 500        \_\_\_\_\_ 566        \_\_\_\_\_ 599
- Complete Part Number (including 3-digit suffix)        \_\_\_\_\_
- Serial Number        \_\_\_\_\_
- Revision Number        \_\_\_\_\_
- Fixed Disk Type (See ID label on module cover)        \_\_\_\_\_

- VXIpc-486 Model 500 Series Configuration Information (see Chapter 2)

- Factory Configuration        \_\_\_\_\_ yes        \_\_\_\_\_ no

If no, give the following information.

VXIbus Slot/External CLK10 Configuration (Table 2-2)

\_\_\_\_\_ A\*        \_\_\_\_\_ B        \_\_\_\_\_ C        \_\_\_\_\_ D        \_\_\_\_\_ E        \_\_\_\_\_ F

- External Trigger Input Configuration (Figure 2-9)  
\_\_\_\_\_ Underminated\*        \_\_\_\_\_ Terminated
- External Audio/Trigger Output Configuration (Table 2-3)  
\_\_\_\_\_ Trigger Out\*        \_\_\_\_\_ Audio Out

- VXIpc-EFD External Floppy Drive

\_\_\_\_\_ Not Installed        \_\_\_\_\_ Installed

If installed, give the following information

Serial Number        \_\_\_\_\_

Revision        \_\_\_\_\_

\* Factory Configuration

- Software Information
  - NI-488.2 Software for MS-DOS/Windows Version \_\_\_\_\_
  - NI-VXI for VXIpc-486 and MS-DOS/Windows Version \_\_\_\_\_
  - Microsoft Windows Version \_\_\_\_\_
  - Microsoft Windows Mode (Enhanced, Standard or Real) \_\_\_\_\_
- NI-VXI Software Configuration Information (see Chapter 4)
  - VXI a Configuration
    - Logical Address \_\_\_\_\_
    - Device Type \_\_\_\_\_
    - Address Space \_\_\_\_\_
    - VXI Shared RAM (Byte Order) \_\_\_\_\_
    - VXI Shared RAM (Mbytes) \_\_\_\_\_
    - Shared Memory Pool (Windows) \_\_\_\_\_
    - Slave Block Transfer Mode \_\_\_\_\_
    - Slave Supervisory Access Only \_\_\_\_\_
    - Resource Manager Delay (seconds) \_\_\_\_\_
  - VXIbus Configuration
    - Bus Request Level \_\_\_\_\_
    - Fair Requester Timeout ( $\mu$ s) \_\_\_\_\_
    - Bus Release Mechanism \_\_\_\_\_
    - Bus Arbitration \_\_\_\_\_
    - Local Bus Timeout ( $\mu$ s) \_\_\_\_\_
    - VXIbus Timeout ( $\mu$ s) \_\_\_\_\_
    - Bus Acquisition Time in Timeout \_\_\_\_\_
  - VXIdev Configuration
    - SYSRESET Resets PC \_\_\_\_\_
    - Use System Sanity Timer \_\_\_\_\_
    - Servant Area Size \_\_\_\_\_
    - Protocol Register \_\_\_\_\_

Read Protocol Response \_\_\_\_\_

Number of Handlers \_\_\_\_\_

Number of Interrupters \_\_\_\_\_

- Super VGA Option

\_\_\_\_\_ Not Installed      \_\_\_\_\_ Factory-Installed      \_\_\_\_\_ User-Installed

If installed, give the following information.

System Settings Modified for Super VGA? \_\_\_\_\_

Super VGA Option Selected \_\_\_\_\_

- Any Other Software In System \_\_\_\_\_

## Other Products

- I/O Expansion Cards–VXIpc-486/2 only  
(Manufacturer, Model) \_\_\_\_\_

\_\_\_\_\_

- Monitor (Manufacturer, Model) \_\_\_\_\_

- Keyboard (Manufacturer, Model) \_\_\_\_\_

- Mouse (Manufacturer, Model) \_\_\_\_\_

- VXIbus Mainframe Manufacturer and Model \_\_\_\_\_

- Other VXIbus Devices

Manufacturer	Model	Function	Slot	Logical Address

Continue on a separate sheet, if necessary.

- Interrupt Level(s) of Other VXI Devices  
(Handler/Interrupter)

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- IEEE 488 Devices (Manufacturer, Model, GPIB Address)

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# Documentation Comment Form

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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 Model 500 Series VXIpc™-486 and the NI-VXI™ Software for Microsoft Windows**

Edition Date: **May 1994**

Part Number: **320523-01**

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 \_\_\_\_\_

\_\_\_\_\_

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

Mail to: Technical Publications  
National Instruments Corporation  
6504 Bridge Point Parkway, MS 53-02  
Austin, TX 78730-5039

Fax to: Technical Publications  
National Instruments Corporation  
MS 53-02  
(512) 794-5678

# Glossary

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Prefix	Meaning	Value
μ-	micro-	10 <sup>-6</sup>
m-	milli-	10 <sup>-3</sup>
k-	kilo-	10 <sup>3</sup>
M-	mega-	10 <sup>6</sup>
g-	giga-	10 <sup>9</sup>

## Symbols

°	degrees
%	percent
Ω	ohms
<b>A</b>	
A	amperes
A16 space	VXIbus address space equivalent to the VME 64 KB <i>short</i> 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 <i>standard</i> address space.
A32 space	VXIbus address space equivalent to the VME 4 GB <i>extended</i> address space.
ANSI	American National Standards Institute
ASIC	Application Specific Integrated Circuit (a semi-custom chip)
<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.
BIOS	Basic Input/Output System

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.
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 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

C Celsius

CLK10 A 10 MHz,  $\pm 100$  ppm, individually buffered (to each module slot), differential ECL system clock that is sourced from Slot 0 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 which is also a bus master and can control one or more Servants.

## D

DMA Direct Memory Access

DRAM Dynamic RAM (Random Access Memory); storage that the computer must refresh at frequent intervals.

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
EFD	External Floppy Disk
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.
EMI	electromagnetic interference
extended controller	A mainframe extender with additional VXIbus controller capabilities.
Extended Longword Serial	A form of Word Serial communication in which Commanders and Servants communicate with 48-bit data transfers.
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.
----------------	--

FCC	Federal Communications Commission
-----	-----------------------------------

**G**

GPIB	General Purpose Interface Bus; the industry-standard IEEE 488 bus.
GPIO	General Purpose Input/Output, a module within the National Instruments TIC chip. GPIOs are used for connecting external signals to the TIC chip for routing/conditioning to the VXIbus trigger lines.

**H**

Hz	hertz; events per second.
----	---------------------------

**I**

IEEE	Institute of Electrical and Electronics Engineers
in.	inches
I/O	input/output; the techniques, media, and devices used to achieve communication between entities.

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.
ISA	Industry Standard Architecture
<b>K</b>	
KB	1,024 or $2^{10}$ ; kilobytes of memory
<b>L</b>	
LED	light emitting diode
logical address	An 8-bit number that uniquely identifies the location of a VXIbus device's configuration registers in a system. The A16 base address of a device is $C000h + \text{Logical Address} * 40h$ .
Longword Serial	A form of Word Serial communication in which Commanders and Servants communicate with 32-bit data transfers instead of 16-bit data transfers as in the normal Word Serial Protocol.
<b>M</b>	
MB	1,048,576 or $2^{20}$ ; megabytes of memory
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.
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.
MIGA	Message-Based Interface Gate Array; a proprietary National Instruments chip.
MODID	A set of 13 signal lines on the VXI backplane that VXI systems use to identify which modules are located in which slots in the mainframe.

**N**

NI-VXI The National Instruments bus interface software for VME/VXIbus systems.

nonprivileged access One of the defined types of VMEbus data transfers; indicated by certain address modifier codes. Each of the defined VMEbus address spaces has a defined nonprivileged access mode.

**P**

PC AT Personal Computer Advanced Technology

PRI Priority

privileged access See *supervisory access*.

**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.

RONR Request On No Request

ROR Release On Request; a type of VMEbus arbitration where the current VMEbus master relinquishes control of the bus only when another bus master requests the VMEbus.

RRS Round Robin Select

RWD Release When Done

**S**

s seconds

Servant A device controlled by a Commander.

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

supervisory access	One of the defined types of VMEbus data transfers; indicated by certain address modifier codes.
SYSCLK	System Clock Driver; a VMEbus functional module that provides a 16 MHz timing signal on the utility bus.
SYSFAIL	System Failure Driver; asserts a signal to indicate an internal failure.
SYSRESET	System Reset Driver; asserts a signal to indicate a system reset or power-up condition.
System Controller	A functional module that has arbiter, daisy-chain driver, and MXIbus cycle timeout responsibility.

## T

TIC	Trigger Interface Chip; a proprietary National Instruments chip used for direct access to the VXI trigger lines. The TIC contains a 16-bit counter, a dual 5-bit tick timer, and a full crosspoint switch.
trigger	Either TTL or ECL lines used for intermodule communication.
tristated	Defines logic that can have one of three states: low, high, and high-impedance.
TTL	Transistor-Transistor Logic

## V

V	volts
VDC	volts direct current
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.
VICTEXT	Text-based VXI Interactive Control program, functionally equivalent to VIC.
VME	Versa Module Eurocard or IEEE 1014
VXIbus	VMEbus Extensions for Instrumentation
VXIINIT	A program in the NI-VXI bus interface software package that initializes the board interrupts, shared RAM, VXI register configurations, and bus configurations. This program must be run at least once after rebooting your machine to initialize the system.

VXIEDIT	VXI Resource Editor program, a part of the NI-VXI bus interface software package. Used to configure the system, edit the manufacturer name and ID numbers, edit the model names of VXI and non-VXI devices in the system, as well as the system interrupt configuration information, and display the system configuration information generated by the Resource Manager.
VXITEDIT	Text-based VXI Resource Editor program, functionally equivalent to VXIEDIT.
<b>W</b>	
W	watts
Word Serial Protocol	The simplest required communication protocol supported by Message-Based devices in the VXIbus system. It utilizes the A16 communication registers to transfer data using a simple polling handshake method.



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