VXI

VXIpc™ 870 Series User Manual

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Worldwide Technical Support and Product Information

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Federal Communications Commission

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

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

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Canadian Department of Communications

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

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

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About This Manual

This manual contains instructions for installing and configuring the National Instruments VXIpc 870 Series embedded computer kit. The VXIpc 870 Series includes all the models of the VXIpc 870 embedded computers.

Organization of This Manual

This manual is organized as follows:

- Chapter 1, *Introduction*, describes the VXIpc 870 Series of embedded VXI computers, lists standard equipment, and describes driver and application software.
- Chapter 2, *Configuration and Installation*, contains the instructions to configure and install the VXIpc 870 Series.
- Chapter 3, *Configuration and Default Settings*, summarizes the hardware default settings for the VXIpc 870 Series for easy reference.
- Chapter 4, *Developing Your Application*, discusses the software utilities you can use to start developing applications that use the NI-VXI/VISA driver.
- Chapter 5, *Functional Overview*, contains functional descriptions of each major logic block on the VXIpc 870 Series.
- Chapter 6, *BIOS*, contains information on the BIOS (Basic Input Output System), the low-level interface between the hardware and PC software that configures and tests your hardware at boot up.
- Appendix A, *Specifications*, lists the specifications for the VXIpc 870 Series embedded computer.
- Appendix B, *LED Indicators*, describes how to read the LEDs on the front panel to interpret the status of the VXIpc 870 Series.
- Appendix C, *Front Panel and Connectors*, describes the front panel and connectors on the VXIpc 870 Series.
- Appendix D, *Modifying and Installing I/O Expansion Boards*, explains how to modify and install an I/O board in the VXIpc-872. This information does not apply to the VXIpc-871.
- Appendix E, *Common Questions*, answers common questions you may have when using the VXIpc 870 Series.

- Appendix F, *Customer Communication*, contains forms you can use to request help from National Instruments or to comment on our products and manuals.
- The *Glossary* contains an alphabetical list and description of terms used in this manual, including abbreviations, acronyms, metric prefixes, mnemonics, and symbols.
- The *Index* contains an alphabetical list of key terms and topics used in this manual, including the page where you can find each one.

Conventions Used in This Manual

The following conventions are used in this manual:

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

 This icon denotes a note, which alerts you to important information.

 This icon denotes a caution, which advises you of precautions to take to avoid injury, data loss, or a system crash.

 This icon denotes a warning, which advises you of precautions to take to avoid being electrically shocked.

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

italic — Italic text denotes variables, emphasis, a cross reference, or an introduction to a key concept. This font also denotes text that is a placeholder for a word or value that you must supply.

`monospace` — Text in this font denotes text or characters that you should literally enter from the keyboard, sections of code, programming examples, and syntax examples. This font is also used for the proper names of disk drives, paths, directories, programs, subprograms, subroutines, device names, functions, variables, filenames, and extensions.

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

VXIpc 870 Series — The term *VXIpc 870 Series* refers to a series of C-size, two-slot VXI embedded controllers. Currently, this series consists of the VXIpc-871, VXIpc-872 and the VXIpc-873.

How to Use This Documentation Set

Begin by reading the *Read Me First VXIpc 870 Series for Windows NT/98* manual.

This manual, the *VXIpc 870 Series User Manual*, contains more details about changing the installation or configuration from the defaults, and using the hardware.

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

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

Refer to the *NI-VISA User Manual* to learn about VISA and how to use it in your system. The NI-VISA online help describes the attributes, events, and operations you can use in NI-VISA. You can find this same information in the *NI-VISA Programmer Reference Manual*. These two manuals are available in the `c:\Vxipnp\os\NIvisa\Manuals` directory (where `os` is either `Win95` or `WinNT`) under the names `NI-VISAUsersMan.pdf` and `NI-VISAProgrammersMan.pdf`, respectively. Use the Acrobat Reader program, Version 3 or later, to open these files.

Related Documentation

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

- ANSI/IEEE Standard 1014-1987, *IEEE Standard for a Versatile Backplane Bus: VMEbus*
- ANSI/IEEE Standard 1155-1998, *IEEE VMEbus Extensions for Instrumentation: VXIbus*

- ANSI/VITA 1-1994, *VME64*
- VXI-6, *VXIbus Mainframe Extender Specification*, Rev. 2.0, VXIbus Consortium

Customer Communication

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

1

Introduction

This chapter describes the VXIpc 870 Series of embedded VXI computers, lists standard equipment, and describes driver and application software.

Overview

The VXIpc 870 Series consists of the VXIpc-871, VXIpc-872, and the VXIpc-873 models which are functionally equivalent in many ways. These three models differ in that the VXIpc-871 has an internal CD-ROM drive while the VXIpc-872 comes with one AT/PCI expansion slot and the VXIpc-873 has a removable flash drive.

The following three figures show the models with their covers removed. Refer to Appendix C, *Front Panel and Connectors*, for information about the location and pinout assignment of each connector on the modules.

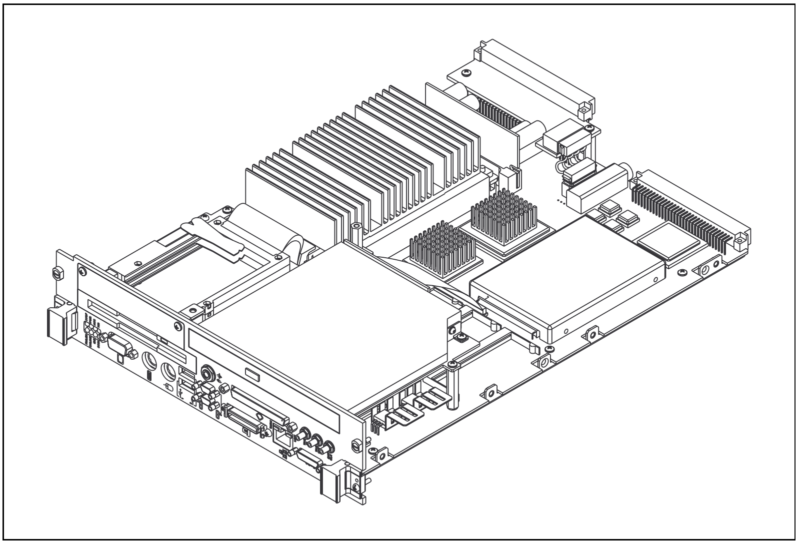


Figure 1-1. VXIpc-871 Embedded Controller

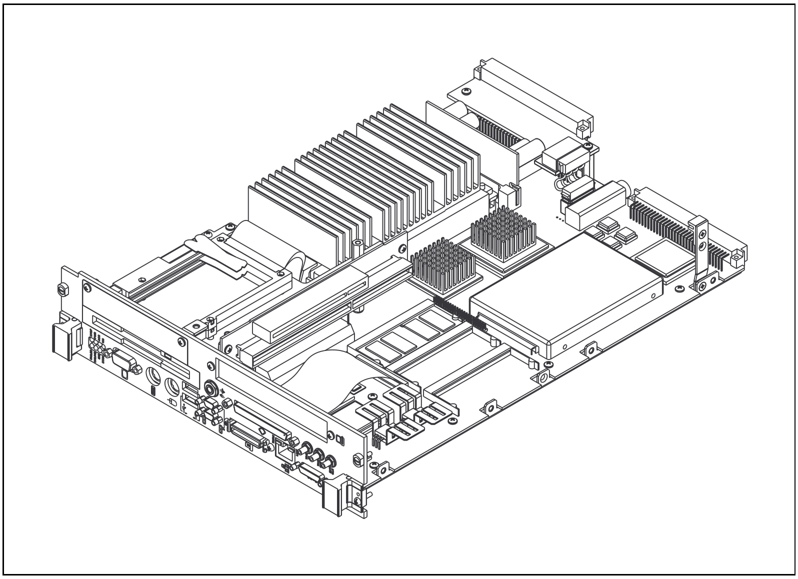


Figure 1-2. VXIpc-872 Embedded Controller

The VXIpc 870 Series controllers are C-size, embedded computers based on the *x*86 Processor architecture, the Peripheral Component Interface (PCI) bus, and the Advanced Graphics Port (AGP). These computers are high-performance, easy-to-use platforms for controlling VXIbus systems, featuring complete VXI functionality through interactive utilities and C function calls. In addition, the VXIpc 870 Series has Ethernet capability plus an IEEE 488.2 interface that is compatible with the NI-488.2 architecture.

The VXIpc 870 Series is a custom computer that you install directly in two C-size slots of your VXI mainframe. An embedded computer can take full advantage of the VXI high-performance backplane capabilities and give you direct control of VXI registers, memory, interrupts, and triggers.

All models in the VXIpc 870 Series are fully VXI*plug&play* compliant and are compatible with PC-compatible software tools, the National Instruments LabVIEW and LabWindows/CVI application software, and the NI-VXI, NI-VISA, and NI-488.2 bus interface software.

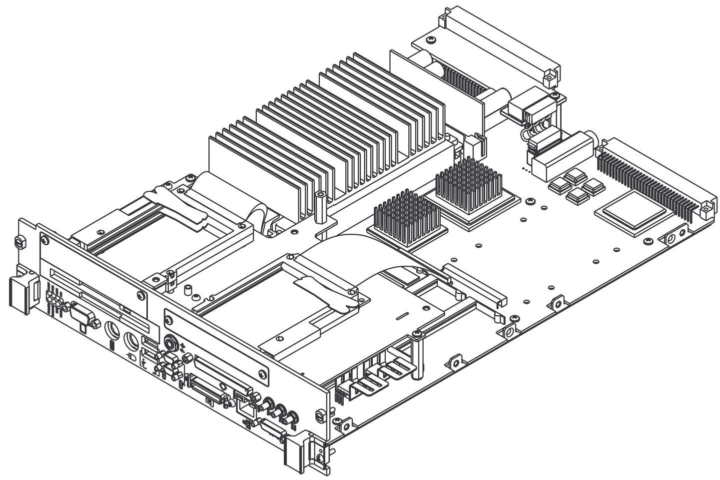


Figure 1-3. VXIpc-873 Embedded Controller

Standard Equipment

Your hardware includes the VXIpc 870 Series controller, which you install in your VXI mainframe. You also receive the following accessories:

- COM1/2 adapter cable
- Enhanced parallel port adapter cable
- Single-shielded 2 m GPIB cable
- AT-PS/2 cable

National Instruments Software

National Instruments has developed several software kits you can use with the VXIpc 870 Series.

Driver Software

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

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

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

The NI-488.2M software kit gives you access to the industry-standard NI-488.2M software for controlling external GPIB instruments through the GPIB port on the front panel of your VXIpc 870 Series. The GPIB interface on your VXIpc controller is fully compatible with the NI-488.2M driver for a variety of operating systems. Any software using NI-488.2M will run on the VXIpc 870 Series.

Application Software

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

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

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

2

Configuration and Installation

This chapter contains the instructions to configure and install the VXIpc 870 Series. Unless otherwise noted, these instructions apply to all models in the VXIpc 870 Series, which currently consists of the VXIpc-871, VXIpc-872 and the VXIpc-873.

Caution Electrostatic discharge can damage several components on your VXIpc 870 Series module. To avoid such damage in handling the module, touch the antistatic plastic package to a metal part of your VXI mainframe before removing the module from the package.

What You Need to Get Started

- ❑ VXIpc 870 Series embedded controller
- ❑ VXIbus mainframe
- ❑ Keyboard
- ❑ Mouse
- ❑ Monitor with VGA or better resolution
- ❑ National Instruments software media for the VXIpc 870 Series

The NI-VXI/VISA software is already installed on your VXIpc-870 computer. It is also included on CD-ROM in the event that you need to reinstall your software. The CD-ROM includes disk images if you need to make floppies for reinstallation.

Installing the VXIpc 870 Series

This section contains general installation instructions for the VXIpc 870 Series. Consult your VXIbus mainframe user manual or technical reference manual for specific instructions and warnings.

1. Plug in your mainframe before installing the VXIpc 870 Series. The power cord grounds the mainframe and protects it from electrical damage while you are installing the module.

Warning To protect both yourself and the mainframe from electrical hazards, the mainframe should remain off until you are finished installing the VXIpc 870 Series module.

2. Remove or open any doors or covers blocking access to the mainframe slots.

Caution If the VXIpc 870 Series is not configured for automatic System Controller detection, be certain that the slot you select in your VXIbus mainframe matches the VXIpc 870 Series configuration as either a System Controller device or a Non-System Controller device. Installing the VXIpc 870 Series into a slot that does not correspond with the jumper setting can damage the VXIpc 870 Series, the VXIbus backplane, or both.

3. Insert the VXIpc 870 Series in the slot you have selected by aligning the top and bottom of the module with the card-edge guides inside the mainframe. Slowly push the VXIpc 870 Series straight into the slot until its plug connectors are resting on the backplane receptacle connectors. Using slow, evenly distributed pressure, press the module straight in until it seats in the expansion slot. The front panel of the VXIpc 870 Series should be even with the front panel of the mainframe.
4. Tighten the retaining screws on the top and bottom edges of the front panel.
5. Check the installation.
6. Connect the keyboard and mouse to the appropriate connectors. Use the keyboard adapter cable that you received with your kit to adapt AT-style keyboards to the VXIpc 870 Series mini-DIN connector.
7. Connect the VGA monitor video cable to the VGA connector.
8. Connect devices to ports as required by your system configuration. Some ports, such as the COM and LPT ports, have adapter cables that came in your kit.

9. Replace or close any doors or covers to the mainframe.
10. Turn on the VXI mainframe.
11. The VXIpc 870 Series should now boot into either Windows 98 or NT.
12. On the first boot of the VXIpc 870 Series, a setup program automatically runs.
13. Follow the prompts in the setup program to fully configure your VXIpc 870 Series.
14. When prompted for the NT/98 serial number, enter the serial number of the operating system from the included certificate.
15. The next prompt asks if you purchased LabVIEW or LabWindows/CVI. Select the appropriate boxes and insert the disks when prompted.
16. Your VXIpc 870 Series is now ready for development.
17. Refer to Chapter 4, *Developing Your Application*, for more information.

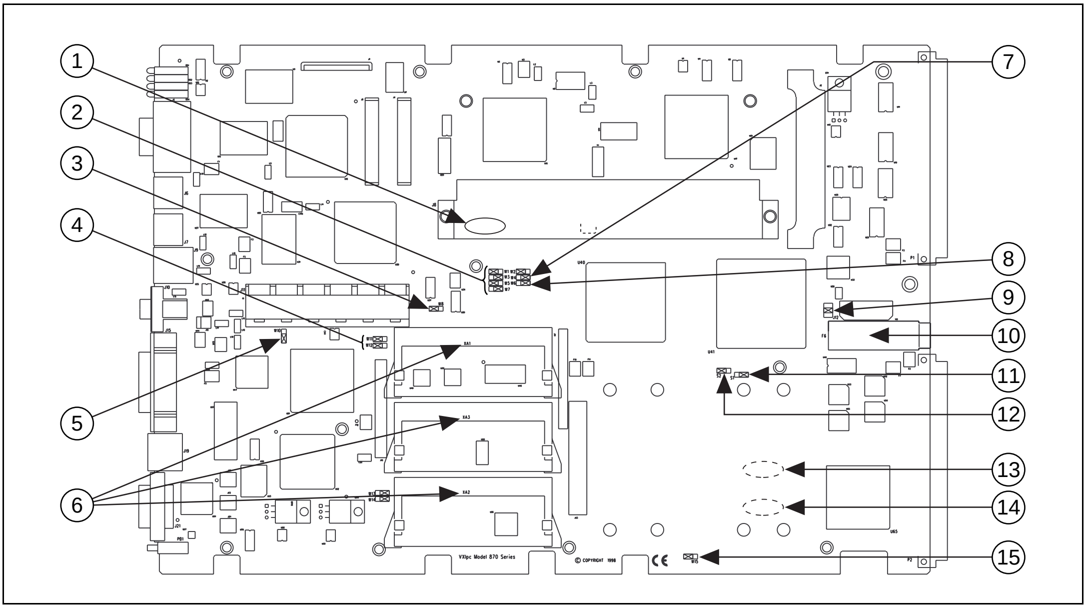
3

Configuration and Default Settings

Hardware Default Settings

This chapter summarizes the hardware default settings for the VXIpc 870 Series for easy reference. The module is set at the factory for the most commonly used configuration.

Figure 3-1 shows the location of the user-configurable jumpers and switches on the VXIpc 870 Series. The diagram also shows the location of the serial and assembly numbers



1 Ethernet Address
2 CPU Bus Factor (W1, W3, W5, W7)
3 Flash Protect (W8)
4 SCSI Termination Enable (W11-W12)
5 Ethernet Serial EEPROM Enable (W10)
6 SO-DIMM Sockets
7 Bus Speed (W4)
8 CMOS (W6)
9 Automatic Slot Detection (J22)
10 Fuse Location
11 MITE User Configuration (S1)
12 MITE Configuration Enable (S2)
13 Assembly Number (Back Side)
14 Serial Number (Back Side)
15 Power Monitor (W15)

Figure 3-1. VXIpc 870 Series Parts Locator Diagram

Table 3-1 lists the factory-default settings and options for the onboard jumpers and switches.

Table 3-1. VXIpc 870 Series Hardware Default Settings

Jumper	Default Setting	Optional Setting
J12	Enable automatic Slot 0 detection	Force Slot 0; Force Non-Slot 0
S1	MITE user configuration	MITE factory configuration
S2	Enable MITE self-configuration	Disable MITE self-configuration

Table 3-1. VXIpc 870 Series Hardware Default Settings (Continued)

Jumper	Default Setting	Optional Setting
W1,3,5,7	CPU bus factor	**Note:** Refer to *CPU Bus Factor* section later in this chapter.
W4	100 MHz CPU bus speed	66 MHz CPU bus speed
W6	Normal CMOS operation	Clear CMOS
W8	Flash write enable	Flash Protection
W10	Enable Ethernet Serial EEPROM configuration	Disable Ethernet Serial EEPROM configuration (uses default power on values)
W11-12	Enable 16-bit SCSI termination	SCSI termination
W15	Voltage monitor only required voltages	Voltage monitor all voltages

Note Please do not adjust any jumpers or switches not listed in Table 3-1 or that are not documented in this manual unless directed by National Instruments. Other configuration jumpers are shown in the event National Instruments Technical Support needs to make adjustments to your settings.

Software Default Settings

In this section, Table 3-2, Table 3-3, and Table 3-4 contain summaries of default settings for VXIpc T&M Explorer. Because you can also use T&M Explorer to configure a VXI-MXI-2, for your convenience, Table 3-5, Table 3-6, and Table 3-7 contain a summary of the software default settings for the VXI-MXI-2.

Table 3-2. VXIpc T&M Explorer Device Tab Default Settings

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

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

Editor Field	Default Setting
Memory sharing	A32
Shared RAM size	64 KB (when sharing memory)
Reserved physical memory	64 KB (when sharing memory)
Lower half window byte swapping	Disabled
Upper half window byte swapping	Disabled
Map upper and lower halves at same PCI address	Disabled

Table 3-4. VXIpc T&M Explorer PCI Tab Default Settings

Editor Field	Default Setting
Low-level register access API support	Enabled
User window size	128 MB

VXI-MXI-2

This section summarizes the software default settings for the VXI-MXI-2. Table 3-5 contains VXI-MXI-2 T&M Explorer Device Tab Default Settings, Table 3-6 contains VXI Bus Tab Default Settings and Table 3-7 contains MXI-2 Bus Tab Default Settings. This information is included for your convenience in case you have any of these modules in your system.

Table 3-5. VXI-MXI-2 T&M Explorer Device Tab Default Settings

Editor Field	Default Setting
Logical address	Use DIP switch
Address space	A24 *
Requested memory	16 KB *
A24/A32 write posting	Disabled
A16 write posting	Disabled
Interlocked mode	Disabled
* Assumes no DRAM is installed. If DRAM is installed, the **Address space** should be A32, and **Requested memory** should match the amount of DRAM. If you install the DRAM yourself, you must manually specify these changes.	

Table 3-6. VXI-MXI-2 T&M Explorer VXI Bus Tab Default Settings

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

Table 3-7. VXI-MXI-2 T&M Explorer MXI-2 Bus Tab Default Settings

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

Configuring the VXIpc 870 Series

This section describes how to configure the following options on the VXIpc 870 Series:

- VXI Controller/Non-System Controller
- VXIbus CLK10 routing and termination
- Trigger input termination
- MITE EEPROM

Accessing the Hardware Switches

The VXIpc 870 Series is housed in a metal enclosure comprised of a top and bottom cover to improve EMC performance and to provide easy handling. You need to remove the top cover to change many of the switch and jumper settings. You must also remove the top cover to change the amount of DRAM installed on the module.

Remove the top cover by removing the screws that attach it to the module.

VXIbus System Controller/Non-System Controller

The VXIpc 870 Series is configured at the factory to automatically detect if it is installed in Slot 0 of a VXIbus mainframe. With automatic System Controller slot detection, you can install the module into any VXIbus slot.

You can manually configure the VXIpc 870 Series for either System Controller or Non-System Controller operation by defeating the automatic-detection circuitry. Use the three-position jumper J12 to select automatic detection, System Controller, or Non-System Controller operation. Figure 3-2 shows these three settings.

Caution Do not install a device configured for System Controller into another slot without first reconfiguring it to either Non-System Controller or automatic-detection configuration. Neglecting to do this could result in damage to the device, the VXIbus backplane, or both.

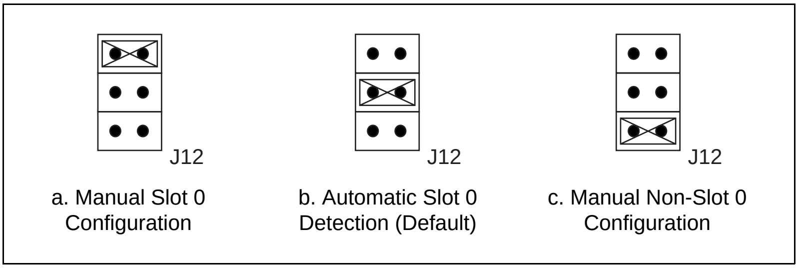


Figure 3-2. System Controller Slot Configuration

When the VXIpc 870 Series is installed in Slot 0 of a VXI system, it becomes the VXIbus System Controller. In this role, it has VXIbus Data Transfer Bus Arbiter circuitry that accepts bus requests on all four VXIbus request levels, prioritizes the requests, and grants the bus to the highest priority requester. As VXIbus System Controller, the VXIpc 870 Series also drives the 16 MHz VXIbus system clock by an onboard 16 MHz oscillator.

As required by the VXIbus specification, the VXIpc 870 Series drives the 10 MHz signal CLK10 on a differential ECL output when installed in Slot 0. When not installed in Slot 0, the VXIpc 870 Series only receives the CLK10 signal.

VXIbus CLK10 Routing and Termination

When the VXIpc 870 Series is installed in Slot 0 of your mainframe, it supplies the VXIbus CLK10 signal. The VXIpc 870 Series can use two different sources to generate this signal—an onboard oscillator or the external CLK SMB connector. The VXIpc 870 Series can also be configured to drive the external CLK10 SMB from the VXIbus CLK10 signal when in Non-Slot 0.

The VXIpc 870 Series has onboard logic that helps configure the VXIbus CLK10 routing and termination. You can route the CLK10 signal from the front panel to the backplane or from the backplane to the front panel. You also have the option to add a 50 Ω termination to the signal.

All settings for CLK10 routing and termination are handled through software. Use T&M Explorer to configure these settings.

Trigger Input Termination

You have the option to terminate the external trigger input SMB with 50 Ω to ground to match the driving source, if necessary. Use T&M Explorer to set this option.

MITE EEPROM

The VXIpc 870 Series has an onboard EEPROM, which stores default register values for the VXI circuitry. These values are loaded when you power up the computer. These values read from the EEPROM program the PCI interface and the VXIbus registers so that the VXI interface is ready to respond to Resource Manager accesses within the required 5 s of SYSRST* deasserting.

You can disable this power-on self-configuration (POSC) circuit by changing switch S2. Although this makes the VXI circuitry unusable, it is sometimes helpful in debugging address and interrupt conflicts with add-in boards. In general, however, you should leave switch S2 in its factory-default setting. Figure 3-3 shows the possible configurations for S2.

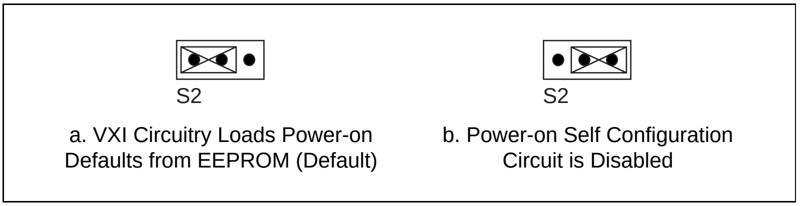


Figure 3-3. Power-on Self Configuration Status

The EEPROM is divided into two halves—one half is factory configured and one half is user configurable. Use switch S1 to control the operation of the EEPROM. The setting of this switch determines whether the VXIpc 870 Series boots off the factory-configured half or the user-modified settings. In its default setting, the VXIpc 870 Series boots off the user-configurable half.

This switch is useful in the event that the user-configured half of the EEPROM becomes corrupted in such a way that the VXIpc 870 Series boots to an unusable state. By altering this switch setting, you can return to the factory configuration and get up and running again. Use the procedure as described in the following section, *How to Fix an Invalid EEPROM Configuration*.

Figure 3-4 shows the configuration settings for EEPROM operation.

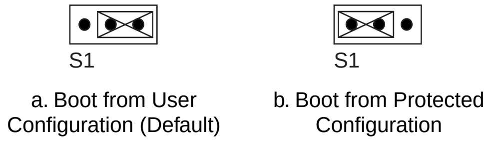


Figure 3-4. EEPROM Configuration

How to Fix an Invalid EEPROM Configuration

Use T&M Explorer under Windows NT/ 9*x* to edit the configuration of the VXIpc 870 Series. Some of these settings are stored in files that are read by the NI-VXI software, while other settings are stored directly in the VXIpc 870 Series EEPROM.

Certain EEPROM configurations, including invalid configurations, can lock up your computer while it is booting up. Generally, only the size and location of the memory windows can cause your VXIpc 870 Series to lock up your system. For example, many PCI-based computers will not boot if a board in its system requests more memory space than the computer can allocate. If you encounter this situation you should reduce the size of the VXIpc 870 Series user window. The EEPROM can become corrupted if the VXIpc 870 Series is shut down while it is updating the EEPROM.

If this situation occurs after you change the configuration, perform the following steps to reconfigure the VXIpc 870 Series:

1. Turn off your computer.

Warning To protect both yourself and the mainframe from electrical hazards, the mainframe should remain off until you are finished changing the settings on the VXIpc 870 Series.

2. Change switch S1 to the position shown in Figure 3-4b to restore the factory configuration.

3. Turn on the computer. The computer should boot this time because the factory-default configuration is being used to initialize the VXIpc 870 Series.
4. Run your software configuration utility to re-adjust the VXIpc 870 Series configuration.
5. After saving the configuration, exit Windows and turn off the computer.
6. Change switch S1 to the default position, as shown in Figure 3-4a.
7. Turn on the computer. If the computer does not boot with this configuration, you will have to repeat these steps, modifying your configuration until a final configuration is reached.

Configuring the PC

This section describes how to configure the following options on the PC:

- SCSI termination
- System CMOS
- CPU bus speed
- CPU bus factor
- Flash Protection
- Ethernet Serial EEPROM
- Voltage Monitor
- NI WatchDOG
- Installing additional memory

This section also explains how to change the main power fuse.

SCSI Termination

The VXIpc 870 Series uses active termination on the SCSI-3 bus. Because the VXIpc 870 Series is always an end device, you should not need to disable the termination; however, for informational purposes Figure 3-5 shows the jumper settings for both enabled and disabled termination.

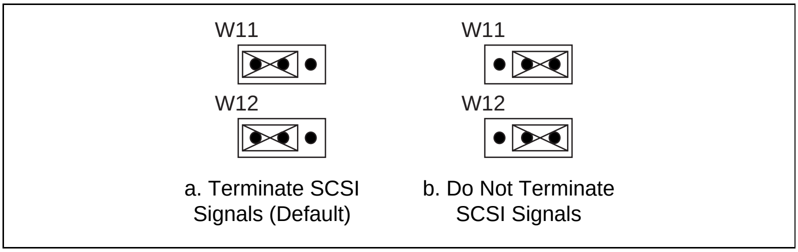


Figure 3-5. SCSI Termination

System CMOS

The VXIpc 870 Series contains a backed-up memory used to store BIOS defaults and configuration information:

To clear the CMOS contents,

1. Place the jumper as shown in Figure 3-6b to short the pins of W6.

Caution Do not keep these two pins shorted because the CMOS memory cannot be sustained when the power is turned off in this state.

2. Power-on the VXIpc 870 Series. The screen should briefly appear, and then go black.
3. Power-off the VXIpc 870 Series.
4. Remove the jumper as shown in Figure 3-6a to restore normal operation.

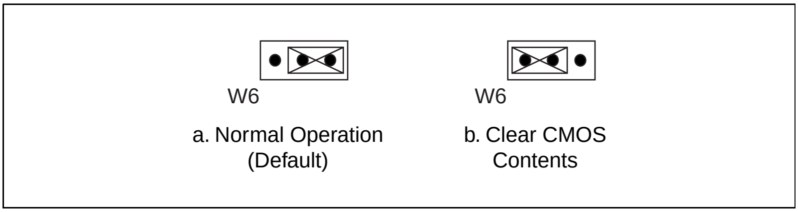


Figure 3-6. System CMOS

CPU Bus Speed

The VXIpc 870 Series supports CPU bus speeds at 66 MHz and 100 MHz. Under most circumstances 100 MHz delivers the best performance. However, if you want to use a lower bus speed, W4 overrides the 100 MHz setting as shown in Figure 3-7.

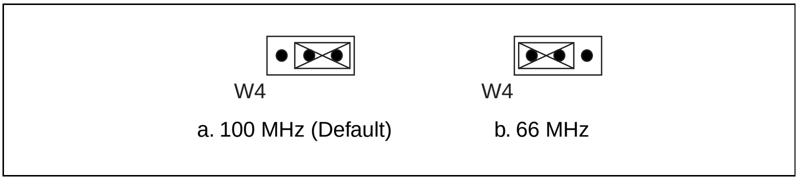


Figure 3-7. CPU Bus Speed Configuration

CPU Bus Factor

All Pentium II CPUs are supported as of the release date of this document. The jumper settings in Figure 3-8 are provided to allow the user to upgrade as newer CPUs enter the market. Contact National Instruments for jumper settings as new CPUs are released.

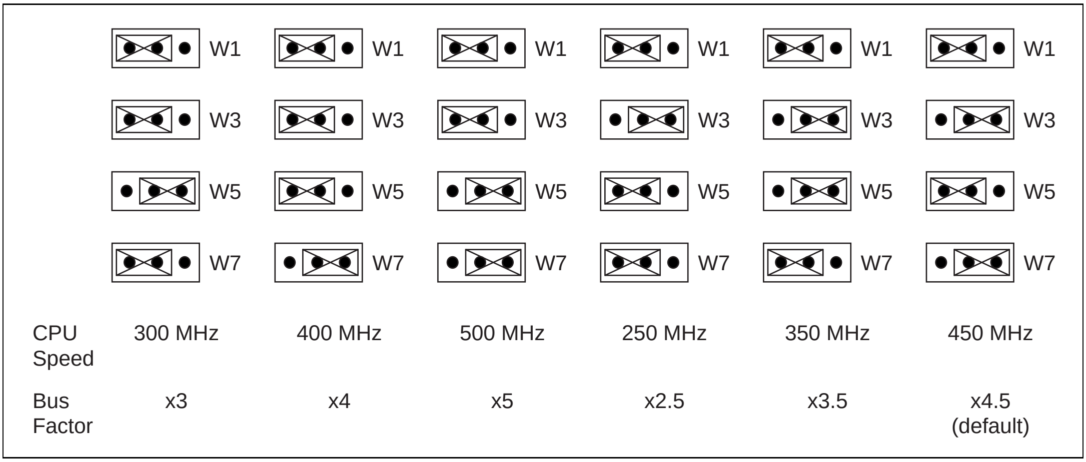


Figure 3-8. CPU Bus Factor Jumper Settings

Flash Protection

The VXIpc 870 Series uses a standard 2M bit flash with write protection. Under normal use, this jumper should not be changed. Figure 3-9 shows default and disabled settings.

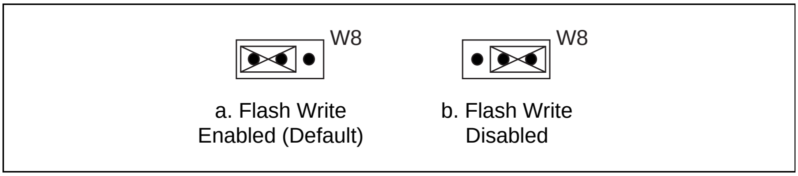


Figure 3-9. Flash Protection Settings

Ethernet Serial EEPROM

A serial EEPROM loads the Ethernet power-on settings. Under normal use this jumper should not be changed. Figure 3-10 shows default and disabled settings.

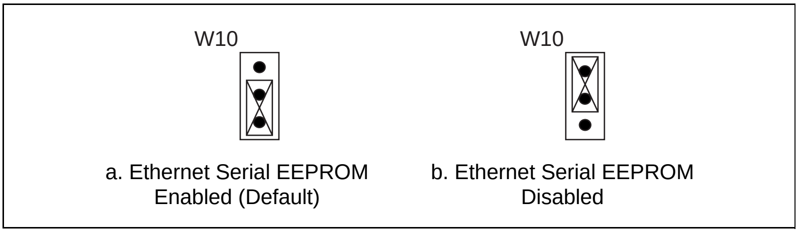


Figure 3-10. Ethernet Serial EEPROM Settings

Voltage Monitor

You can monitor all backplane voltages or only those required to boot on the VXIpc 870 Series with built-in voltage-monitor circuitry as shown in Figure 3-11.

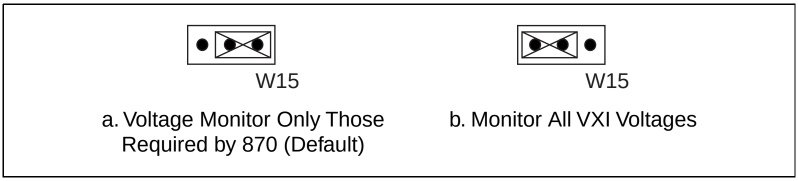


Figure 3-11. Voltage Monitor Settings

NI WatchDOG

The NI WatchDOG is an onboard, general-purpose counter/timer. You can it use to monitor running applications and reset the embedded controller or assert a signal should the system lock up. All WatchDOG timer features are configured through T&M Explorer. See the *NI WatchDOG* section in Chapter 5, *Functional Overview*, for more information.

Installing Additional Memory

The VXIpc 870 Series uses 144 pin 100 MHz SDRAM and supports 16, 32, and 64 MB SO-DIMM for a total of 192 MB maximum. As DRAM technology improves, the maximum amount of RAM supported may increase.

To add RAM to the VXIpc 870 Series, do the following.

1. Remove the unit from the VXI mainframe.
2. Remove the screws that hold the cover in place and remove the cover.
3. Add SO-DIMM modules to the empty SO-DIMM sockets.

National Instruments recommends the following types of SO-DIMMs for use with the VXIpc 870 Series controller (SDRAM):

32 MB:	4 MB × 64 SO-DIMMs—10 ns, 1.05 in. max.
64 MB:	8 MB × 64 SO-DIMMs—10 ns, 1.05 in. max.
128 MB:	16 MB × 64 SO-DIMMs—10 ns, 1.05 in. max.

Note National Instruments has tested and verified that the SO-DIMMs we sell work with the VXIpc 870 Series. We recommend you purchase your SO-DIMM modules from National Instruments. Other off-the-shelf SO-DIMM modules are not guaranteed to work properly.

Changing the Main Power Fuse

The VXIpc 870 Series is equipped with a user-replaceable fuse on the main power, +5 V from the VXIbus. All other voltages are fused with a resettable-style circuit breaker. The resettable-style circuit breakers do not require user intervention. When a short circuit condition is removed, they automatically reset themselves.

The main power, +5 V, is too high of a current for resettable fuse technology, so your kit includes a replaceable fuse of type 3AG, 15A, Slowblow.

You can replace this fuse without having to remove the cover. The fuse is accessible through the rear of the unit as shown in Figure 3-12.

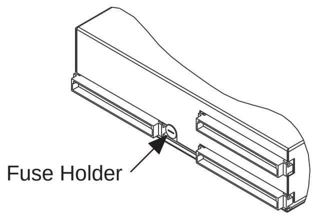


Figure 3-12. Main Power Fuse Replacement

1. Turn off the VXI mainframe and remove the VXIpc 870 Series module.
2. Using a small flathead screwdriver, turn the fuse holder counter-clockwise until the fuse and holder start to come out of the unit.
3. Replace the fuse with the same type fuse.

Caution Do not replace with a higher-rated fuse. This could cause damage to the VXIpc 870, the VXI mainframe, or both.

4. Insert the fuse and hold back into the fuse housing, pushing it all the way in.
5. Screw the fuse holder clockwise until the fuse holder is flush with the fuse housing.
6. Re-install the VXIpc 870 and apply power.

Note If the fuse continues to blow, contact National Instruments for assistance.

4

Developing Your Application

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

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

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

You can access these utilities through the Windows **Start** menu. Open either the National Instruments VXI or VXIpnp program group and select the utility you want to use.

Configuration

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

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

Resman must be run on any system that contains VXI devices (including systems containing VXI-MXI-2 or VME-MXI-2 mainframe extender devices). Because VME devices normally do not have configuration registers as defined in the VXIbus specification, the Resource Manager is unable to detect VME devices. Because of this, when using systems containing a mixture of VME devices and VXI devices, you need to manually add your VME devices in T&M Explorer using the **Add VME Device Wizard** to reserve system resources when the Resource Manager runs.

Systems consisting of only a VMEpc 870 Series controller, a VME chassis, and VME boards do *not* need to run Resman when using NI-VXI software even though the devices do not appear in the T&M Explorer connection tree. However, you would not be able to use VISA without manually adding the VME devices to the system by using T&M Explorer as described above and then running Resman. This is because NI-VISA uses the Resource Manager to create instrument sessions for VXI/VME device communication. If this is not an issue for you, you can skip Resman.

T&M Explorer presents a graphical display of your entire test and measurement system to help you configure various components. When you launch T&M Explorer, you see all your VXI, GPIB, GPIB-VXI, and serial devices on the screen. You can add devices that cannot be detected dynamically by T&M Explorer through the **Add Device Wizard** in the **Edit** menu. Such devices include VME devices, certain GPIB devices, and serial ports. You can view the properties (such as logical address, address space used, primary address, and so on) of each device by right-clicking on the device in the tree. When you view the properties of most National Instruments devices, you can configure the hardware settings directly in the property pages.

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

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

Device Interaction

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

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

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

Try the following in VIC:

In the **Command** entry field, type `help vxiin`.

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

Type:

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

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

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

If the value ends with `ff6`, you have successfully read the National Instruments manufacturer ID from the VXIpc-870 ID register. Because this is the first configuration register present for all VXI devices, the VXI device at Logical Address 0 has its manufacturer ID register located at A16 address 0xC000—the beginning of the VXI configuration space.

You may now want to read the registers from other devices in your system using the command `vxiin`. Try reading a register from each of the devices listed in the **Address Map View** of T&M Explorer. In this way, you can verify that your VXIpc-870 can access each of the devices in your system successfully.

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

Programming with VXI

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

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

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

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

Table 4-1 summarizes the topics addressed by the example programs.

Table 4-1. NI-VXI/VISA Examples

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

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

Notes about VME Support

To use VME devices in your system, configure NI-VXI to see these devices by using the **Add Device Wizard** in T&M Explorer. VME devices with two blocks of memory in the same address space require two entries. You can also specify which interrupt levels the device uses. VXI and VME devices cannot share interrupt levels. You can then access the VME device from NI-VXI or NI-VISA just as you would a register-based VXI device, by specifying the address space and the offset from the base at which you have configured it. NI-VISA support for VME devices includes the register access operations (both high-level and low-level) and the block move operations, as well as the ability to receive interrupts.

Compiler Symbols for NI-VXI

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

Note Skip this section if you are programming with NI-VISA only. NI-VISA does not use these symbols.

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

The `VXINT` symbol is required. You must define it when using the Microsoft C or Borland C compiler. `VXINT` designates the application as a Windows NT/98 application.

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

Debugging

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

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

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

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

5

Functional Overview

This chapter contains functional descriptions of each major logic block on the VXIpc 870 Series.

VXIpc 870 Series Functional Description

The VXIpc 870 Series is a VXIbus embedded controller in a C-size form factor. It includes many high-performance peripherals that normally require add-in cards on desktop PCs. In addition, it has a VXIbus interface that is controlled from the PCI local bus, providing extremely high performance and reliability.

Figure 5-1 is a functional block diagram of the VXIpc 870 Series. Following the diagram is a description of each logic block shown.

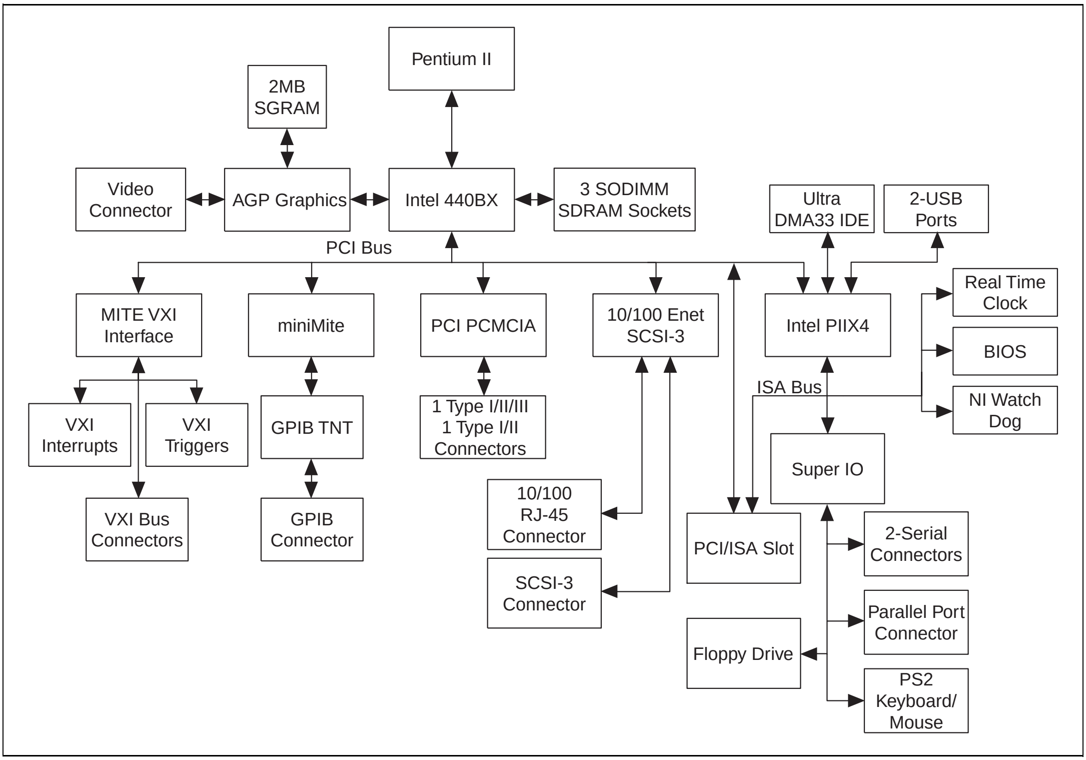


Figure 5-1. VXIpc 870 Series Block Diagram

Processor

The VXIpc-870 is based on the Intel Pentium II, Slot 1 architecture. The CPU connects to the motherboard through the 100 MHz GTL+ bus. Because of this modular design, you can easily upgrade your VXIpc 870 Series controller with a new CPU. As your application needs expand or change in the future, you can save money by changing the CPU as compared to purchasing a brand new controller. The VXIpc 870 Series controllers are based on Pentium II technology, and deliver 512 KB of level two cache.

Chip Set and SDRAM

The VXIpc 870 Series uses the latest in Intel Chip Set technology—the Intel 440BX Chip Set. The 440BX connects the Pentium II to the AGP port, PCI bus, and the SDRAM. The 440BX uses a 100 MHz bus for the CPU and SDRAM connections to give the highest performance possible. The VXIpc 870 Series has three SO-DIMM sockets that can support a maximum of 192 MB of main memory although as DRAM technology improves, the maximum amount of RAM supported may increase. The 440BX also connects to SVGA through the AGP port. The PCI bus is then responsible for connecting the rest of the system.

AGP Graphics

The VXIpc 870 Series uses a S3 VirgeMX AGP-based graphics controller to connect to SVGA. The AGP graphics controller is coupled to 2 MB of high-speed 64-bit SGRAM. Using the AGP port for graphics delivers a higher-speed connection between the CPU and graphics controller, off-loading traffic from the PCI bus. A few of the resolutions you can use include:

- 640 × 460 16M colors
- 800 × 600 16M colors
- 1024 × 768 64K colors
- 1280 × 1024 256 colors
- 1600 × 1200 256 colors

10/100 Ethernet and SCSI-3

The Ethernet and SCSI on the VXIpc 870 Series use a Symbios 53C885 dual-function PCI device to connect to 10/100Base Ethernet and Ultra Wide SCSI-3. The Ethernet function has auto negotiation to connect to 10BaseT and 100BaseTX automatically at 10 Mbits/s and 100 Mbits/s. The Ultra Wide SCSI-3 function is compatible with SCSI-1, SCSI-2, and SCSI-3. It supports 16-bit Ultra Wide SCSI transfers up to 40 Mbytes/s and 8-bit Ultra SCSI synchronous transfers at 20 Mbytes/s.

PC CARD Expansion

You can add third-party peripheral cards, such as additional serial ports, through one of the two PC CARD slots on the front panel. The VXIpc 870 Series can accommodate one Type I/II/III PC CARD and one Type I/II PC CARD simultaneously. The VXIpc 870 Series uses the Cirrus 6730 PCI-PC CARD bridge.

PCI or ISA Expansion

The VXIpc-872 motherboard can have an expansion slot for either one full-length PCI expansion card or one 16-bit XT-height ISA bus card. You can insert either one PCI or one ISA card, but not both at the same time. Refer to Appendix D, *Modifying and Installing I/O Expansion Boards*, for more information on using this expansion slot. The VXIpc-871 module does not have this expansion slot.

IEEE 488.2/HS488 Interface

The VXIpc 870 Series uses the miniMITE and TNT4882 ASIC (compatible with the National Instruments PCI-GPIB) to give full GPIB control of external instruments via a front-panel connector. GPIB control capability is fully IEEE 488.2 compatible. The GPIB interface on the VXIpc 870 Series is fully compatible with the National Instruments industry-standard NI-488.2 driver for a variety of operating systems. Any software using NI-488.2 will run on the VXIpc 870 Series. Using the high-speed HS488 protocol, the VXIpc 870 Series can transfer data at up to 8Mbytes/s.

PIIX4

The Intel PIIX4 is the bridge between the PCI bus and the ISA bus. It features the basic PC counter/timers, interrupt controller, and DMA controllers. It also connects to the USB port and to an Ultra DMA 33 IDE interface. The Ultra DMA 33 interface is the fastest means to connect an industry-standard IDE drive to the system.

Super IO

The Super IO block is the interface to standard PC functions, serial ports, parallel port, floppy drive, and PS2 keyboard and mouse. The serial ports can communicate at up to 460.8 kbits/s, and the parallel port supports all modes of EPP and ECP standards.

NI WatchDOG

The NI WatchDOG is a general-purpose counter/timer that you can use to monitor running applications and reset the embedded controller or assert a signal should the system lock up. On a WatchDOG timeout, the WatchDOG can assert any of the following:

- Reset
- VXI trigger line

- VXI interrupt
- For more advanced features, please contact National Instruments

The NI-VXI/VISA software makes it easy to use NI WatchDOG. The NI WatchDOG has a 32 kHz reference clock to clock an 8-bit prescaler that then clocks an 8-bit counter to accommodate timeouts up to 2 seconds.

Real-Time Clock

The VXIpc 870 Series uses a standard Y2K compliant real-time clock with a user-replaceable battery for backing up the CMOS setting.

BIOS

The VXIpc 870 Series uses a 2 Mb flash device for BIOS code. The BIOS code is based on the AWARD Modular BIOS. The BIOS code incorporates the VIDEO BIOS and SCSI BIOS in one device. The BIOS is user upgradable though a flash update utility.

Programmable Reset Circuitry

The programmable reset circuitry on the VXIpc 870 Series simplifies software development. You can program the circuitry to reset the PC based on VXI SYSRESET or reset the VXI bus only using NI-VXI.

VXI Voltage Monitor Circuitry

The VXIpc 870 Series has onboard logic to check all VXI backplane voltages. The **PWROK** status LED indicates when all voltages are present. This LED can give you a quick indication that something is wrong with the system. The voltage monitor can be configured to monitor all VXI power on just the voltages needed by the VXIpc-870.

Fused Power Protection

The VXIpc-870 uses resettable fuses on all voltages except +5V. The +5V power is a user-replaceable fuse accessible through the rear of the unit.

VXI Bus

VXI Addressing

The VXIpc 870 Series computers feature the MITE and MANTIS custom ASICs for accessing the VXI backplane resources. To access VXI memory or VXI devices, the VXIpc 870 Series uses the multiple-windowing scheme of the MITE, which makes it possible to access all of VXI address space. You can configure the VXI address windows to view specific areas of VXI memory, or you can use NI-VXI/VISA to do this automatically. The MITE exports a total of eight independent VXI address windows. The NI-VXI/VISA software driver uses three separate windows—one for VXI configuration space (A16), one for memory space (A24, A32), and one for internal use. The remaining five windows are completely user configurable. You can use one or all five windows; you can also configure the size and location of the windows. This multiple-windowing scheme alleviates the performance penalty related to the context switching of one window that you would constantly have to move between the different address spaces.

DMA Transfers to and from VXI

The VXIpc 870 Series can perform block-mode transfers using one of the two on-chip DMA controllers on the MITE. Controlling external VXI devices often consumes valuable CPU time because the microprocessor typically shoulders the burden of transferring data to and from devices. However, MITE-based VXI controllers, such as the VXIpc 870 Series, free up CPU processing time by moving the burden of block data transfers to one of the DMA controllers integrated in the MITE. Instead of the computer microprocessor transferring the data and/or commands, the NI-VXI/VISA software uses the MITE ASIC to execute the block data transfers. While the MITE transfers the data, the processor can perform application-specific tasks, such as data presentation and analysis.

VXI Slot 0 Functionality

The VXIpc 870 Series computers have full VXI Slot 0 capability, including a MODID register and a CLK10 source, as required by the VXIbus specification. You can also install the VXIpc 870 Series in another slot and use it in Non-Slot 0 mode. No matter what your configuration needs, the VXIpc 870 Series can automatically detect whether it is inserted into Slot 0 and automatically enable or disable the Slot 0 onboard circuitry without switches and jumpers.

External VXI CLK10 Synchronization

The VXIpc 870 Series computers have an SMB connector on the front panel for an external clock. Onboard programmable logic can configure the VXIpc 870 Series to drive its 10 MHz VXI CLK10 signal to this connector as an output or to use this connector as an input for the 10 MHz VXI CLK10 signal. In this fashion, you can configure multiple mainframes to operate off a single 10 MHz system clock. All CLK10 routing features are controllable through software.

VXI Trigger Lines

The VXIpc 870 Series gives programmers full hardware and software control over the VXI trigger lines. The VXIpc 870 Series has two SMB trigger I/O connectors on its front panel for routing any of the TTL trigger lines between the backplane and external devices. The VXI trigger interface is based on the advanced MANTIS ASIC developed by National Instruments. The MANTIS provides the complete VXIpc 870 Series VXI interface to the outer rows of the P2 backplane connector in a single chip. The VXIpc 870 Series can respond to all VXI-defined protocols on all P2 TTL and ECL trigger lines at the same time. The MANTIS features an internal cross-matrix switching system for routing between lines as well as to and from the front panel and onboard clocks. An internal counter gives sophisticated counting of events and interrupting on trigger edges and pulses, as well as generating pulse trains, variable length pulses, and pulse stretching.

VXI Interrupts

The VXIpc 870 Series can function as an interrupter and an interrupt handler for any or all of the VXIbus interrupt lines in a VXI mainframe. The VXIpc 870 Series works with both Release on Acknowledge (ROAK) and Release on Register Access (RORA) devices. All interrupts are routed to the microprocessor. The VXIpc 870 Series can also detect other VXIbus conditions, including assertion of ACFAIL, SYSFAIL, and BERR.

6

BIOS

This chapter contains information on the BIOS (Basic Input Output System), the low-level interface between the hardware and PC software that configures and tests your hardware at boot up. The BIOS features an easy-to-use graphical user interface you use to configure system aspects according to your needs.

Entering BIOS Setup

To enter the BIOS setup program, perform the following steps:

1. Turn on or reboot the system. A screen appears with a series of diagnostic checks.
2. When **`Hit <DEL> if you want to run SETUP`** appears, press the <DEL> key to enter the BIOS setup program.
3. Choose options with the keyboard. Modify the settings to reflect system options.

Default BIOS Setup Settings

To restore the default settings while inside the BIOS setup program, select either **FAILSAFE Defaults** or **OPTIMAL Defaults**.

Select the Optimal settings if you want to get maximum performance from the VXIpc 870 Series. Fail Safe settings are for debugging purposes.

A

Specifications

This appendix lists the specifications for the VXIpc 870 Series embedded computer.

Requirements

VXIbus Configuration Space .... 64 KB

A24 or A32 Space .... programmable
Minimum .... 16 KB

Environmental

Temperature
Operating .... 0 to 50 °C
Storage .... –20 to 70 °C

Relative Humidity
Operating .... 10% to 90% noncondensing
Storage .... 5% to 95% noncondensing

EMI .... FCC Class A verified, EC verified

Random vibration
Operational...................................... 5 to 500 Hz, 0.3 g_{RMS}, 3 axes
Non-operational .... 5 to 500 Hz, 2.4 g_{RMS}, 3 axes

Functional shock .... MIL-T-28800E Class 3 (per Section 4.5.5.4.1) Half-sine shock pulse (11 ms duration, 30 g peak, 3 shocks per face). Also meets IEC standard 60068-2-27.

Power Requirement

+5 V is fused with a user-replaceable glass fuse, type 3AG, 15A, Slowblow. All other voltages use a resettable-type circuit protector that requires no replacement by the user.

+5 V

Typical ....8 A
Maximum ....15 A

–5.2 V

Typical ....224.5 mA
Maximum ....2 A

–2 V

Typical ....67.2 mA
Maximum ....2 A

+12 V

Typical ....102.6 mA
Maximum ....2 A

–12 V

Typical ....2.43 mA
Maximum ....2 A

+24 V

Typical ....1 mA

-24 V

Typical ....1 mA

Physical

Dimensions

Fully enclosed, shielded VXI C-size module
233.35 by 340 mm (9.187 by 13.386 in.)

Weight

With 64 MB DRAM Installed ....2.5 Kg (5.51 lb.)

Slot Requirements...................................Two VXI C-size slots

Compatibility .... Fully compatible with VXI specification

VXI Keying Class .... Class 1 TTL

MTBF.. TBD

VMEbus Capability Codes

A32, A24, A16 (master)
VMEbus master A32, A24, and A16 addressing

A32, A24, A16 (slave)
VMEbus slave A32, A24, and A16 addressing

D64, D32, D16, D08(EO) (master)
VMEbus master D64, D32, D16, and D08 data sizes

D64, D32, D16, D08(EO) (slave)
VMEbus slave D64, D32, D16, and D08 data sizes

BLT, MBLT (master)
VMEbus master block and D64 transfers

BLT, MBLT (slave)
VMEbus slave block and D64 transfers

RMW (master)
VMEbus master read/modify/write transfers

RMW (slave)
VMEbus slave read/modify/write transfers

RETRY (master)
VMEbus master retry support

RETRY (slave)
VMEbus slave retry support

FSD
First slot detector

SCON
VMEbus System Controller (Automatic Detection)

PRI, RRS
Prioritized or Round Robin Select arbiter

ROR, RWD, FAIR
Release on Request, Release When Done, and FAIR bus requester

IH(7–1)
Interrupt handler for levels 7–1

I(7–1)
Interrupt requester for levels 7–1

D32, D16, D08(O) (Interrupt Handler)
VMEbus D32, D16, D08(O) interrupt handler

D32, D16, D08(O) (Interrupter)
VMEbus D32, D16, D08(O) interrupter

ROAK, RORA
Release on Acknowledge or Register Access interrupter

BTO(x)
VMEbus bus timer (programmable limit)

LOCK
Can lock the VMEbus for indivisible transfers

B

LED Indicators

This appendix describes how to read the LEDs on the front panel to interpret the status of the VXIpc 870 Series.

VXIbus Interface Status LEDs

The VXIbus interface status LEDs are located at the top of the module and include four LEDs: **FAIL**, **SYSF**, **ONLINE**, and **PWROK**. They indicate the various stages of initialization that occur as the VXIpc 870 Series boots. The following paragraphs describe each LED.

SYSF LED

The **SYSF** LED is lit when the VXIbus SYSFAIL signal is asserted. It does not necessarily indicate that the VXIpc 870 Series is asserting SYSFAIL, only that there is a device in the system asserting SYSFAIL.

FAIL LED

The **FAIL** LED is lit when the VXIpc 870 Series is driving the SYSFAIL signal. The VXIpc 870 Series asserts SYSFAIL when the PASSED bit in its VXIbus status register is clear. The PASSED bit is set by the power-on self configuration circuitry (POSC) when it has completed initializing the VXIbus interface.

ONLINE LED

The **ONLINE** LED is lit when the Resource Manager has successfully completed and the VXIbus interface is ready for application programs.

PWROK LED

The **PWROK** LED is lit when all the various voltages on the VXIbus backplane are present and within the tolerance range of the onboard detection circuitry. These voltages are monitored behind short circuit protection devices. If the **PWROK** LED is not lit, it could indicate either that a fuse is blown or one of the VXIbus power supplies is not working.

LEDs and System Startup Cycle

Table B-1 shows a system startup cycle and possible points of failure, up to and including the state in which the **ONLINE** LED is asserted.

Table B-1. LEDs and System Startup Status

Step	LEDs Lit	Status	Possible Problem if VXIpc 870 Fails
1	None	Machine just turned on.	The VXIpc 870 Series is not receiving power or a fuse is blown.
2	**PWROK**	Machine just turned on.	The VXIpc 870 Series is now starting to boot. All voltages are present.
3	**PWROK, FAIL, SYSF**	Now asserting **FAIL** because VXIbus interface has not been initialized yet.	Power-on self configuration (POSC) cannot execute because of problems with system reset or because the POSCEN switch is incorrectly configured.
4	**PWROK**	POSC cycles are complete. VXI port is ready to respond to Resource Manager inquiries.	POSC completed successfully; however, the Resource Manager either hung or was not executed.
5	**PWROK, Online**	Resource Manager has been executed, indicating that the VXI software can now communicate with the VXIbus circuitry.	Resource Manager interface initialized successfully.

If either the **SYSF** or **FAIL** LED remains lit, perform the following steps:

1. Power off the mainframe.
2. Remove all other modules from the mainframe.
3. Make sure that the VXIpc 870 Series switch and jumper settings are correct.
4. Make sure that the VXIpc 870 Series is seated properly in the mainframe.
5. Power on the mainframe and observe whether the **SYSF** and **FAIL** LEDs become unlit some time before the operating system boots.

Board Access LEDs

The board access LEDs—**ACC**, **DRV**, and **SCSI**—indicate when board resources have been accessed. The following paragraphs describe these LEDs.

ACC LED

When lit, the **ACC** LED indicates that the VXIpc 870 Series MODID line is asserted or that another VXIbus master is accessing VXIbus shared registers or shared memory.

DRV LED

The **DRV** LED light indicates that an access to the internal hard disk drive or the CD-ROM on the 871 is occurring.

SCSI LED

The **SCSI** LED light indicates that an access to an external hard disk drive is occurring.

Ethernet LEDs

The Ethernet LEDs (**RX/TX**, **LNK**, and **100B-T**) indicate the status of the Ethernet interface on the VXIpc 870 Series.

RX/TX LED

The **RX/TX** LED lights when the Ethernet interface is receiving or transmitting a packet.

LNK LED

The **LNK** LED indicates link status—in this case, that the controller is connected to a valid Ethernet port.

100B-T

The **100B-T** LED indicates that the current Ethernet connection is at 100 Mbits/s when lit.

C
Front Panel and Connectors

This appendix describes the front panel and connectors on the VXIpc 870 Series. This material contains the information relevant to VXI*plug&play* Specification VPP-8, *VXI Module/Mainframe to Receiver Interconnection*.

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

The VXIpc 870 Series has the following front panel connectors:

- Two RS-232 Serial
- Extended Capabilities Parallel (ECP)
- SVGA Controller
- IEEE 488.2
- 10/100 Ethernet
- UW-SCSI
- External Clock
- Trigger Output
- Trigger Input
- Audio Output
- PS/2-Style Keyboard
- PS/2-Style Mouse
- Two USB

This appendix also describes the VXIbus connector on the VXIpc 870 Series, which connects to the backplane of the VXIbus mainframe.

Front Panel

Figure C-1 shows the front panel layout of the VXIpc-871, and Figure C-2 shows the layout of the VXIpc-872 and Figure C-3 shows the layout of the VXIpc-873. The drawings show dimensions relevant to key elements on the front panel. Dimensions are shown in inches and millimeters, with millimeter dimensions in square brackets. The front panel thickness for all models in the VXIpc 870 Series is 2.49 mm (0.098 in.).

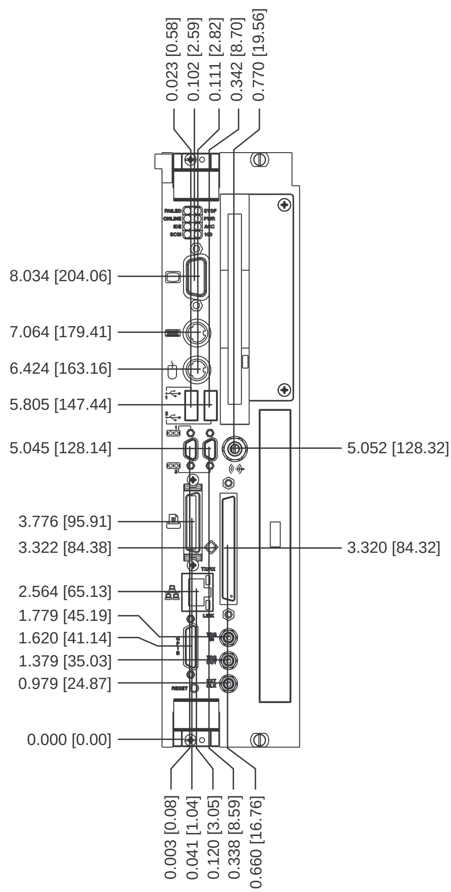


Figure C-1. VXIpc 871 Front Panel Layout and Dimensions

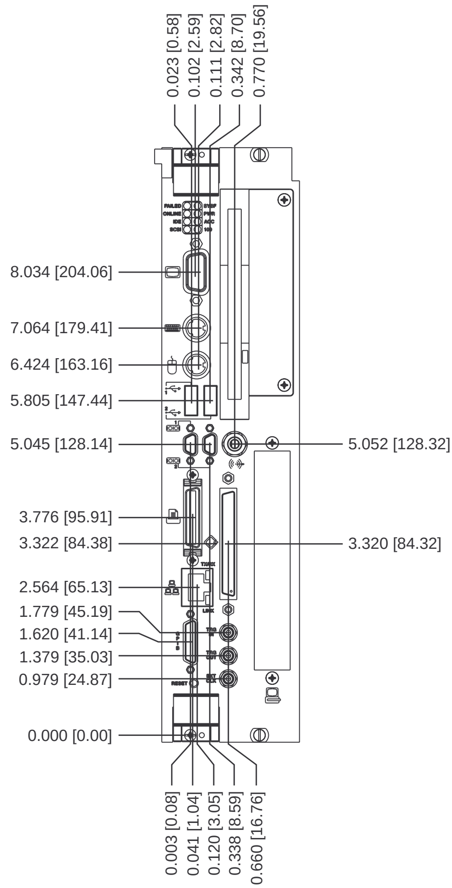


Figure C-2. VXIpc-872 Front Panel Layout and Dimensions

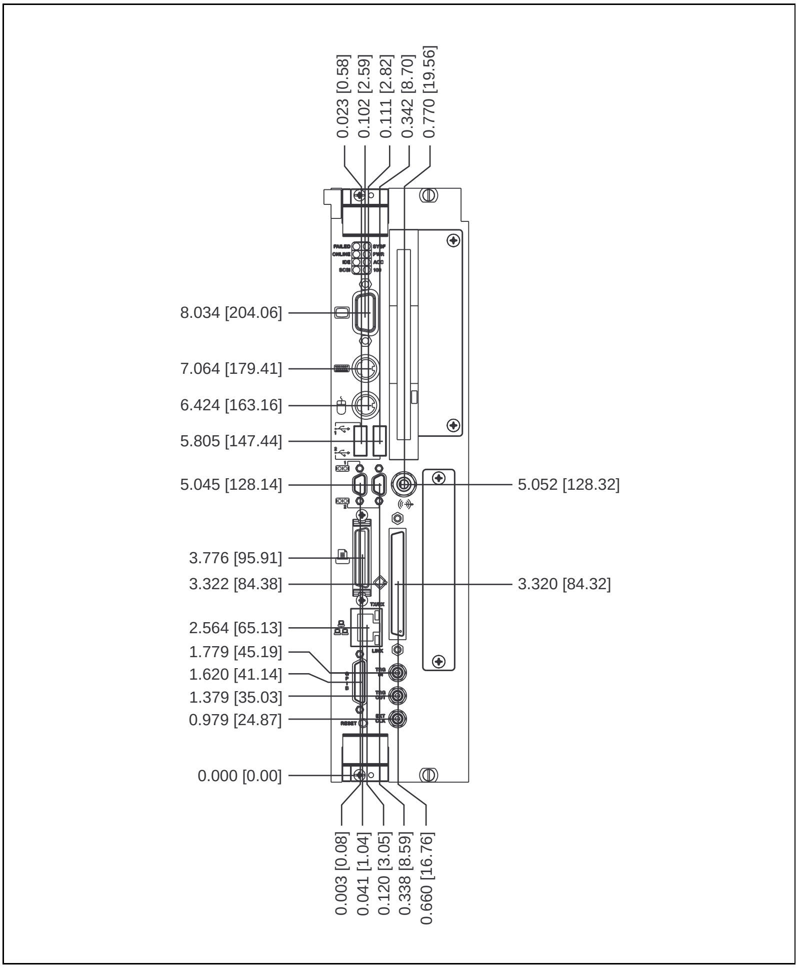


Figure C-3. VXIpc-873 Front Panel Layout and Dimensions

Keyboard and Mouse

Figure C-4 shows the location and pinouts for the keyboard and mouse connectors on the VXIpc 870 Series. Table C-1 gives the name and description for the keyboard and mouse connector signals.

Amp manufactures a mating connector with part numbers 212437-4 (housing), 212435-7 (ferrule), and 66735-4 (pin contact).

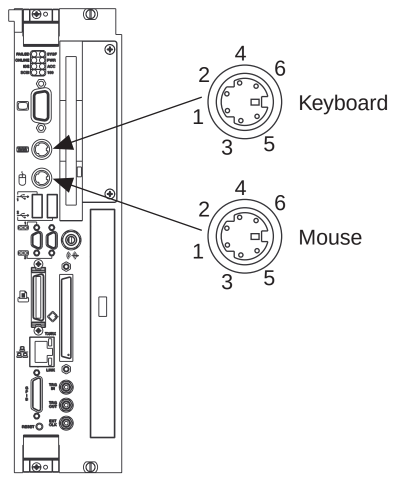


Figure C-4. Keyboard and Mouse Connectors Location and Pinout

Table C-1. Keyboard and Mouse Connector Signals

Pin	Signal Name	Signal Description
1	DATA	Data
2	NC	Not Connected
3	GND	Ground
4	+5V	+5 Volts
5	CLK	Clock
6	NC	Not Connected

SVGA

Figure C-5 shows the location and pinouts for the SVGA connector on the VXIpc 870 Series. Table C-2 gives the name and description for the SVGA connector signals.

Amp manufactures a mating connector with part numbers 748364-1 (housing) and 748333-2 (pin contact).

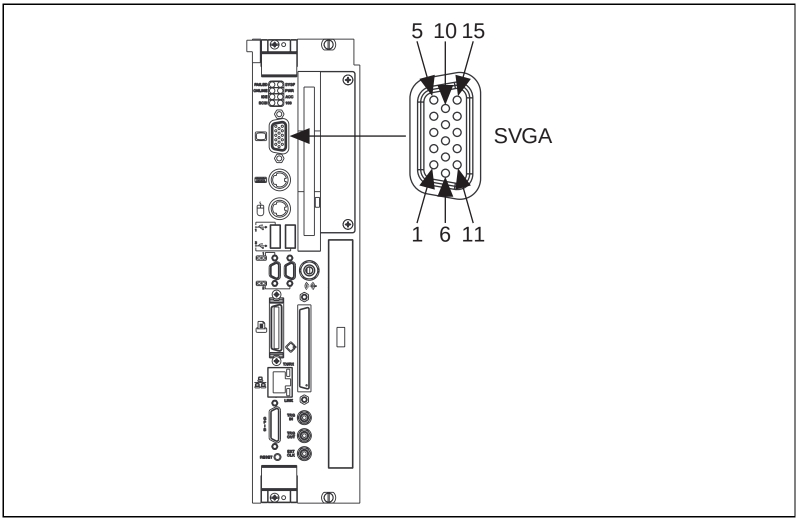


Figure C-5. SVGA Connector Location and Pinout

Table C-2. SVGA Connector Signals

Pin	Signal Name	Signal Description
1	R	Red
2	G	Green
3	B	Blue
4	NC	Not Connected
5	GND	Ground
6	GND	Ground
7	GND	Ground
8	GND	Ground

Table C-2. SVGA Connector Signals (Continued)

Pin	Signal Name	Signal Description
9	NC	Not Connected
10	GND	Ground
11	NC	Not Connected
12	SD	Serial Data
13	HSync	Horizontal Sync
14	VSync	Vertical Sync
15	SC	Serial Clock

Ethernet

Figure C-6 shows the location and pinouts for the Ethernet connector on the VXIpc 870 Series Table C-3 gives the name and description for the Ethernet connector signals.

Amp manufactures a mating connector, part number 554739-1.

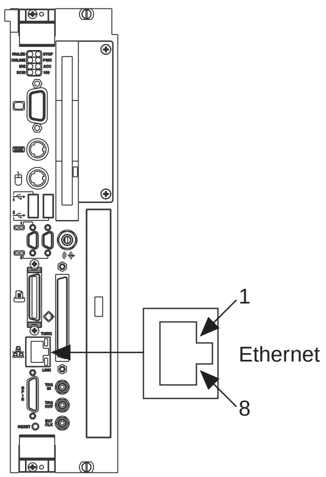


Figure C-6. Ethernet Connector Location and Pinout.

Table C-3. Ethernet Connector Signals

Pin	Signal Description
1	Differential Transmit +
2	Differential Transmit –
3	Differential Receive +
4	Not Connected
5	Not Connected
6	Differential Receive –
7	Not Connected
8	Not Connected

COM1 and COM2

Figure C-7 shows the location and pinouts for the COM1 and COM2 connectors on the VXIpc 870 Series. Table C-4 gives the name and description for the COM1 and COM2 connector signals.

ITT Cannon manufactures a serial port mating connector, part number MDSM-9SC-Z11, for the COM1 and COM2 connectors.

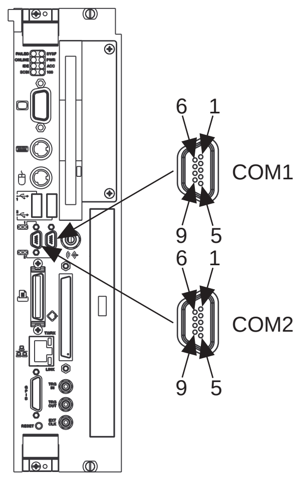


Figure C-7. COM1 and COM2 Connectors Location and Pinout.

Table C-4. COM1 and COM2 Connector Signals

Pin	Signal Name	Signal Description
1	DCD*	Data Carrier Detect
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	RI*	Ring Indicator

Parallel Port

Figure C-8 shows the location and pinouts for the IEEE-1284 connector on the VXIpc 870 Series. Table C-5 gives the name and description for the IEEE-1284 connector signals.Amp manufactures a parallel port compatible connector, part number 2-175677-5.

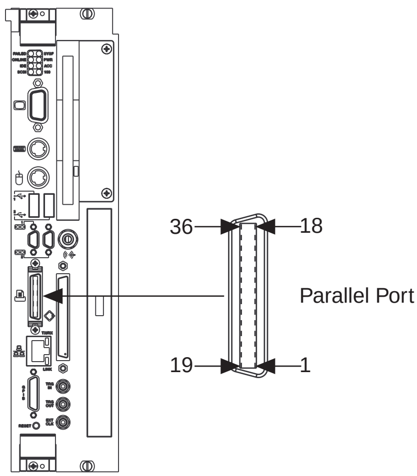


Figure C-8. Parallel Port Connector Location and Pinout

Table C-5. Parallel Port Connector Signals

Pin	Signal Name	Signal Description
1	BUSY*	Device Busy
2	SLCTIN*	Select Input
3	ACK*	Acknowledge
4	FAULT*	Fault
5	ERROR	Error
6	PD0	Data Bit 0
7	PD1	Data Bit 1
8	PD 2	Data Bit 2
9	PD3	Data Bit 3
10	PD4	Data Bit 4
11	PD5	Data Bit 5
12	PD6	Data Bit 6
13	PD7	Data Bit 7
14	INIT*	Initialize Printer
15	STROBE*	Strobe
16	SLCT	Select
17	AUTOFD	Auto Line Feed
18	+5V	+5 Volts
19–35	GND	Ground
36	NC	Not Connected

Universal Serial Bus

Figure C-9 shows the location and pinouts for the two Universal Serial Bus (USB) connectors on the VXIpc 870 Series. Table C-6 gives the name and description for the USB connector signals.

Amp manufactures a mating connector, part number 787633.

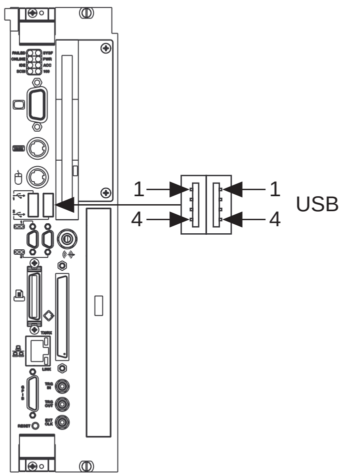


Figure C-9. USB Connectors Location and Pinout

Table C-6. USB Connector Signals

Pin	Signal Name	Signal Description
1	VCC	Cable Power (+5 V)
2	–Data	USB Data–
3	+Data	USB Data+
4	GND	Ground

SCSI

Figure C-10 shows the location and pinouts for the Ultra Wide SCSI connector on the VXIpc 870 Series. Table C-7 gives the name and description for the SCSI connector signals.

Amp manufactures a SCSI compatible connector, part number 749111-6, with shielded enclosure 750752-1.

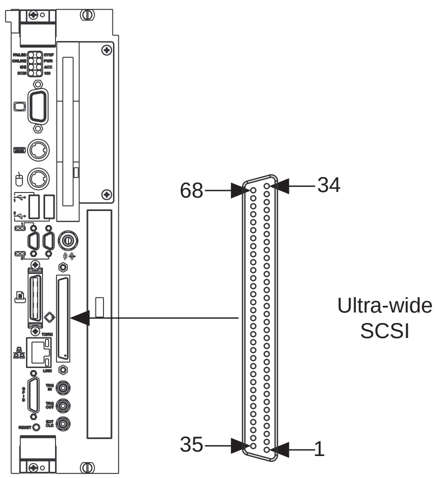


Figure C-10. SCSI Connector Location and Pinout

Table C-7. 16-Bit Wide SCSI-3 "P" (Primary) Connector Pinout (Single Ended)

SCSI Signal	High Density 68-Pin Connector	SCSI Signal	High Density 68-Pin Connector
GND	1	DB(12)*	35
GND	2	DB(13)*	36
GND	3	DB(14)*	37
GND	4	DB(15)*	38
GND	5	DP1	39
GND	6	DB(0)*	40

Table C-7. 16-Bit Wide SCSI-3 "P" (Primary) Connector Pinout (Single Ended) (Continued)

SCSI Signal	High Density 68-Pin Connector	SCSI Signal	High Density 68-Pin Connector
GND	7	DB(1)*	41
GND	8	DB(2)*	42
GND	9	DB(3)*	43
GND	10	DB(4)*	44
GND	11	DB(5)*	45
GND	12	DB(6)*	46
GND	13	DB(7)*	47
GND	14	DP0	48
GND	15	GND	49
GND	16	GND	50
TERMPWR	17	TERMPWR	51
TERMPWR	18	TERMPWR	52
RSRVD	19	RSRVD	53
GND	20	GND	54
GND	21	ATN*	55
GND	22	GND	56
GND	23	BSY*	57
GND	24	ACK*	58
GND	25	RST*	59
GND	26	MSG*	60
GND	27	SEL*	61
GND	28	C/D*	62
GND	29	REQ*	63
GND	30	I/O*	64

Table C-7. 16-Bit Wide SCSI-3 “P” (Primary) Connector Pinout (Single Ended) (Continued)

SCSI Signal	High Density 68-Pin Connector	SCSI Signal	High Density 68-Pin Connector
GND	31	DB(8)*	65
GND	32	DB(9)*	66
GND	33	DB(10)*	67
GND	34	DB(11)*	68

GPIB (IEEE-488.2)

Figure C-11 shows the location and pinouts for the GPIB connector on the VXIpc 870 Series. Table C-8 gives the name and description for the GPIB connector signals.

ITT Cannon manufactures a GPIB mating connector, part number MDSM-255C-Z11.

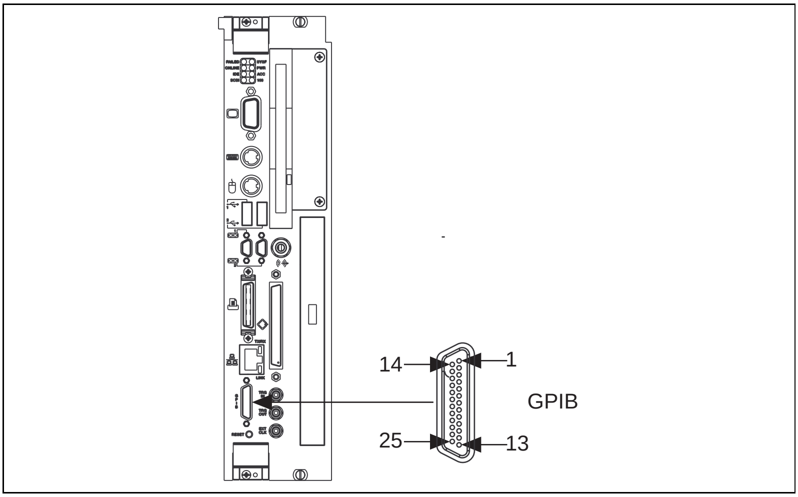


Figure C-11. GPIB Connector Location and Pinout

Table C-8. 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
18–25	GND	Logic Ground

External SMBs

Figure C-12 shows the location and pinouts for the SMB connectors on the VXIpc 870 Series. The SMB connectors are used for an external clock signal and TTL trigger input and output. Table C-9 gives the name and description for the SMB connector signals. Also see Table C-10 for a description of the signal characteristics for the SMB connections.

Amp manufactures an SMB mating connector, part number 1-413985-0.

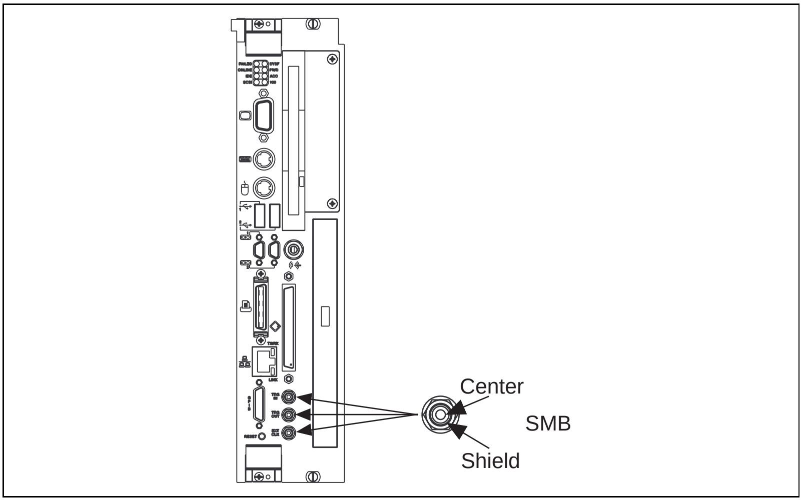


Figure C-12. SMB Connectors Location and Pinout

Table C-9. SMB Connector Signals

Pin	Signal Description
Center	TTL Trigger or Clock Signal
Shield	Ground

Speaker

Figure C-13 shows the location of the speaker connection on the VXIpc-870.

Switchcraft manufactures a mating speaker connector, part number 750.

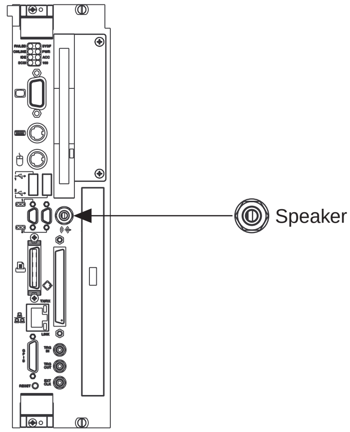


Figure C-13. Speaker Connection Location

Signal Characteristics

Refer to the relevant standard for the signal characteristics for VGA, SCSI, Ethernet, keyboard, mouse, parallel, serial, and GPIB.

Table C-10 shows the signal characteristics for the SMB and speaker connections.

Table C-10. Signal Characteristics for SMB and Speaker Connections

Signal	Voltage Range	Maximum Current	Frequency Range
SMB (TRIG out, CLK out)	0 to 3.4 V	200 mA	DC-10 MHz
SMB (TRIG in)	0 to 5 V	100 mA*	DC-10 MHz
Speaker	0 to 4.3 V	75 mA	DC-20 kHz
* With 50 Ω termination			

VXIbus P1 and P2

Figure C-14 shows the location and pinouts for the VXIbus connector on the VXIpc 870 Series. Table C-11 gives the name and description for the VXIbus P1 connector signals. Table C-12 gives the name and description for the VXIbus P2 connector signals.

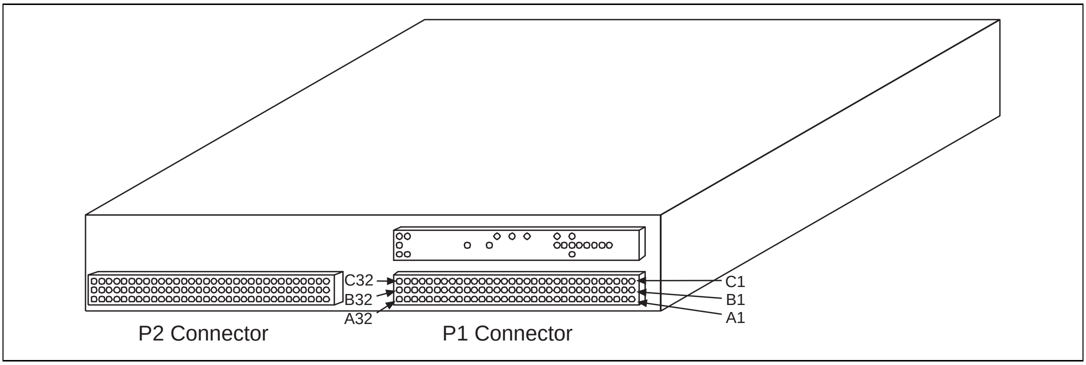


Figure C-14. VXIbus Connectors Location and Pinout

Table C-11. VXIbus P1 Connector Signals

Pin	Row C	Row B	Row A
1	D08	BBSY*	D00
2	D09	BCLR*	D01
3	D10	ACFAIL*	D02
4	D11	BG0IN*	D03
5	D12	BG0OUT*	D04
6	D13	BG1IN*	D05
7	D14	BG1OUT*	D06
8	D15	BG2IN*	D07
9	GND	BG2OUT*	GND
10	SYSFAIL*	BG3IN*	SYSCLK
11	BERR*	BG3OUT*	GND
12	SYSRESET*	BR0*	DS1*
13	LWORD*	BR1*	DS0*

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

Pin	Row C	Row B	Row A
14	AM5	BR2*	WRITE*
15	A23	BR3*	GND
16	A22	AM0	DTACK*
17	A21	AM1	GND
18	A20	AM2	AS*
19	A19	AM3	GND
20	A18	GND	IACK*
21	A17	Not Connected	IACKIN*
22	A16	Not Connected	IACKOUT*
23	A15	GND	AM4
24	A14	IRQ7*	A07
25	A13	IRQ6*	A06
26	A12	IRQ5	A05
27	A11	IRQ4	A04
28	A10	IRQ3	A03
29	A09	IRQ2	A02
30	A08	IRQ1	A01
31	+12 V	Not Connected	–12 V
32	+5 V	+5 V	+5 V

Table C-12. VXIbus P2 Connector Signals

Pin	Row C	Row B	Row A
1	CLK10+	+5 V	ECLTRG0
2	CLK10–	GND	–2 V
3	GND	Not Connected	ECLTRG1
4	–5.2 V	A24	GND
5	Not Connected	A25	MODID12

Table C-12. VXIbus P2 Connector Signals (Continued)

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

D

Modifying and Installing I/O Expansion Boards

This appendix explains how to modify and install an I/O board in the VXIpc-872. This information does not apply to the VXIpc-871.

Height of VXIpc-872 Plug-In Boards

In general, the VXIpc-872 can accommodate any standard-size PCI card and any XT-height ISA card. The height of an I/O card is measured from the bottom of the bus connector to the top of the board, as shown in Figure D-1.

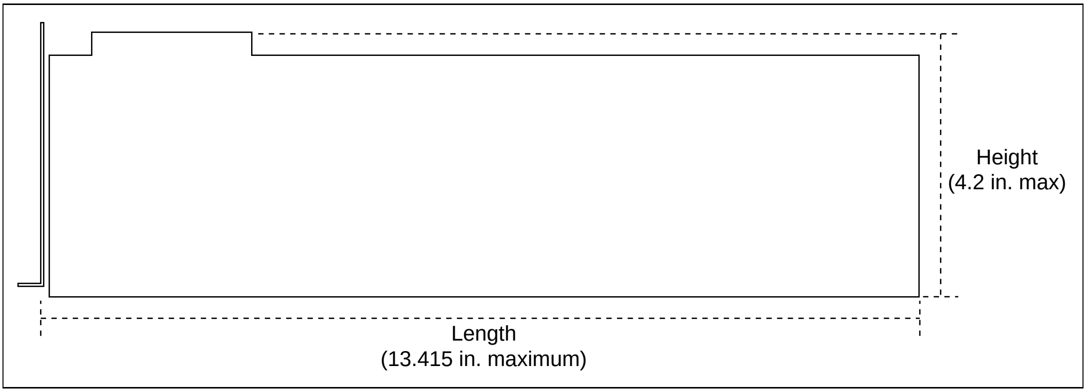


Figure D-1. I/O Board Dimensions for VXIpc-872 Expansion Slot

Both XT-height ISA cards and PCI cards are 4.2 in. high. The VXIpc-872 does not support AT-height ISA cards, which are 4.8 in. high.

Installing an I/O Board

This section leads you through the steps to install an expansion board in the VXIpc-872.

Materials Needed

You need the following items to install the expansion board:

- A user-defined panel is required on the expansion boards based on National Instruments blank PCI or ISA panels. The panel should be manufactured from 0.03 in. (0.76 mm) thick 1010 cold rolled steel. The finish should be 0.0003 in. (0.008 mm) nickel plate over 0.0001 in. (0.003 mm) copper flash. Contact National Instruments if you have any questions about specifications for user-defined panels.

  As an alternative, you can modify the blank panels provided with the VXIpc-872. Custom panel design services are available from National Instruments for a nominal fee.
- PEM nut or a 4-40 nut with lock washer (hole diameter should be 0.125 in. [3.18 mm]).
- 4-40 × 1/4 in. stainless steel panhead screw.

Installation Steps

Follow these steps to install the expansion board:

1. Notice that the VXIpc-872 includes one card guide that can be rotated to secure the top of either a PCI or an ISA plug-in board. You may use the card guide in either of two locations, depending on the length of your installed board. Loosen the screw holding the guide and rotate the guide to the uppermost position for PCI boards or the lowermost position for ISA boards. See Figure D-2.
2. Replace the manufacturer-supplied panel bracket with the custom bracket. The two holes in the bracket align with existing holes in the VXIpc-872 front panel.
3. Seat the board firmly in one of the expansion bus connectors.
4. Attach the board to the front panel with the two screws. You can use a PEM nut on the back (far) side of the bracket, or a 4-40 nut with a lock washer (hole diameter should be 0.125 in.). In either case, use a 4-40 × 1/4 in. stainless steel panhead screw to mount the board/bracket assembly to the front panel.

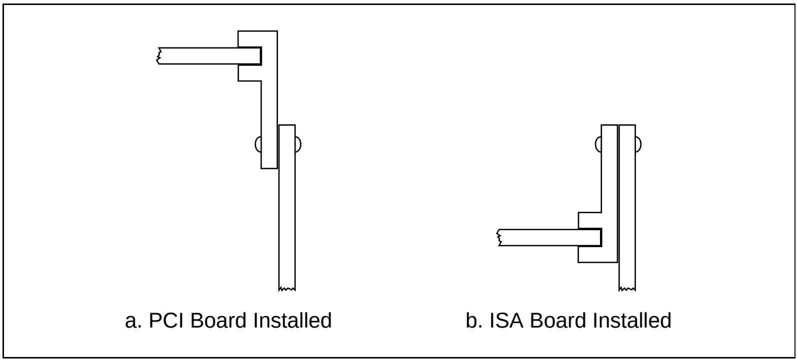


Figure D-2. PCI Board and ISA Board Installed in a VXIpc-872

Note In the following drawings, dimensions are given in inches and millimeters, with the millimeter dimensions in square brackets.

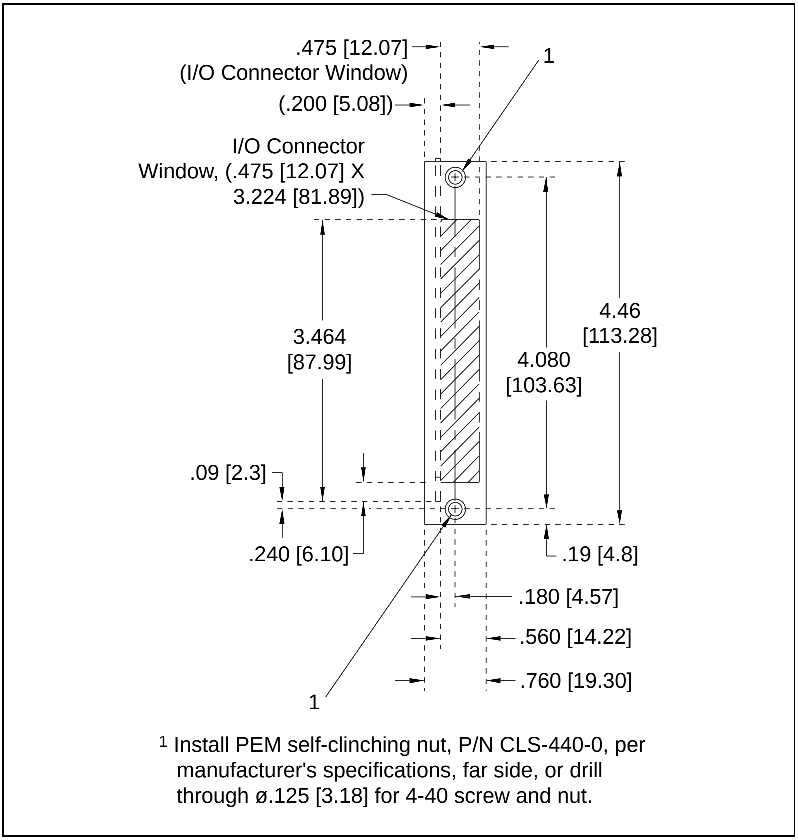


Figure D-3. Front View of PCI Board Expansion Bracket

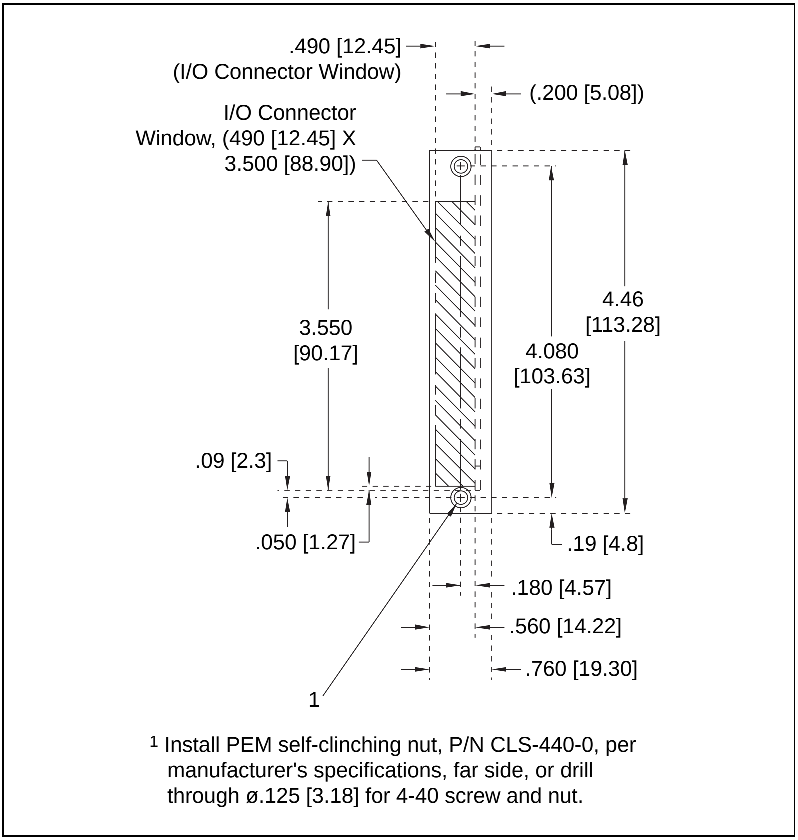


Figure D-4. Front View of ISA Board Expansion Bracket

E

Common Questions

This appendix answers common questions you may have when using the VXIpc 870 Series.

What do the LEDs on the front of the VXIpc 870 Series mean?

Refer to Appendix B, *LED Indicators*, for a description of the front panel LEDs.

Is something wrong if the red SYSF and FAIL LEDs stay lit after booting the VXIpc 870 Series?

If either the **SYSF** or **FAIL** LED remains lit, refer to Appendix B, *LED Indicators*, for troubleshooting steps.

Can I access 32-bit registers in my VXIbus system from the VXIpc 870 Series?

Yes. The VXIpc 870 Series uses the 32-bit PCI bus to interface to the VXIbus. In fact, its VXIbus circuitry also supports the VME64 standard for D64 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, because the oscillator and the EXTCLK input on the front panel use TTL levels, 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 870 Series is ±100 ppm (0.01%) as per the VXIbus specification. If you need a more accurate CLK10 signal, you can use the CLKI/O connector on the front panel.

What if my keyboard connector does not fit into the keyboard port?

You can plug keyboards that have a 6-pin PS/2 type connector directly into the VXIpc 870 Series. Your kit also includes a keyboard adapter cable that you can use to adapt the larger AT keyboard connector to the 6-pin PS/2 connector.

What do I need to do if I want to install the VXIpc 870 Series in a slot other than Slot 0?

The VXIpc 870 Series automatically detects whether it is in Slot 0 of a VXIbus mainframe. You do not need to change jumper settings to install the device in a slot other than Slot 0 unless you have defeated the first slot detector (FSD) circuitry by changing the J22 jumper setting.

Remember that devices in all other slots must not be manually configured as System Controller (Slot 0) devices. They must be configured either for automatic first slot detection or manual non-System Controller.

Refer to Chapter 2, *Configuration and Installation*, for information on enabling and defeating the FSD circuitry.

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

You can view these parameters in the BIOS setup. To enter the BIOS setup, reboot the VXIpc 870 Series and press the <DEL> key during the memory tests. Refer to Chapter 6, *BIOS*, for more information.

How can I boot from an external SCSI hard drive?

In the BIOS setup change the boot sequence to SCSI.

Can I boot off the CD-ROM of the VXIpc 870?

Yes, by changing the boot sequence to CD-ROM in the BIOS setup. Refer to Chapter 6, *BIOS*, for more information.

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

Yes, you can select which device to boot from in the BIOS setup. Refer to Chapter 6, *BIOS*, for information on entering BIOS.

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

1. Enter the BIOS setup program as described in Chapter 6, *BIOS*.
2. Select **Optimal Defaults**.
3. Select **Save and Exit**.

My operating system is damaged but my hard drive is OK. How can I re-install the operating system?

Do the following:

1. Make a bootable floppy disk. Make sure the disk contains `deltree`.
2. Boot the machine from the disk.
3. Run `deltree C:\*.*` and answer yes to all files and directories except `C:\Images`.
   - If using Windows NT:

     Go to `C:\Images\os\wint\I386` directory and run `Winnt /B`.
   - If using Windows 98:

     Go to `C:\Images\os\Win98` and run `Setup`.
4. Install all IO drivers from `C:\Images\VXI870\...`

What about running Resman?

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

When do you need to run Resman?

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

You can perform resource manager operations from within T&M Explorer. Additionally, you can tell T&M Explorer to run Resman when the computer first boots up. In this case you may never need to run Resman explicitly again. You can configure the computer to run Resman at startup, so when you power the chassis, Resman runs. If you power-cycle the chassis, the PC reboots, forcing Resman to run again.

How do I handle VME devices?

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

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

Following are several ways to find this information:

- From T&M Explorer, select **About...** from the **Help** menu. In the **About** dialog box, press the **Software Info** button. This displays version information on NI-VXI and NI-VISA files.
- Under Windows NT and Windows 98, you can find version information by right-clicking on any component and selecting the **Properties** option. This displays a property sheet with a version tab. This tab has version information about the product (NI-VXI) and the component (`NIVXINT.DLL`, for example).
- You can find version information about the NI-VXI driver by running the VIC utility program. Type `ver` at the prompt, and the utility displays the versions of VIC and NI-VXI, and the latest VXIpc hardware revision that this NI-VXI driver supports.
- You can find version information about the VISA driver through VISAIC by selecting **About...** from the **Help** menu.

How can I determine the serial number and hardware revision of the VXIpc embedded computers?

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

Which NI-VXI utility program must I use to configure the VXIpc 870 Series?

Use the T&M Explorer program to configure the VXIpc. T&M Explorer is located in the `NIVXI` program group folder.

Which NI-VXI utility program must I use to initialize the VXIpc 870 Series?

In Windows NT/98, the VXIpc embedded computer is automatically initialized at system startup.

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

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

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

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

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

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

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

F

Customer Communication

National Instruments offers technical support through electronic, fax, and telephone systems. The electronic services include our Web site, an FTP site, and a fax-on-demand system. If you have a hardware or software problem, please first try the electronic support systems. If the information available on these systems does not answer your questions, contact one of our technical support centers, which are staffed by applications engineers, for support by telephone and fax. To comment on the documentation supplied with our products, send e-mail to `techpubs@natinst.com`.

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E-Mail Support

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

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Belgium	02 757 00 20	02 757 03 11
Brazil	011 284 5011	011 288 8528
Canada (Ontario)	905 785 0085	905 785 0086
Canada (Québec)	514 694 8521	514 694 4399
Denmark	45 76 26 00	45 76 26 02
Finland	09 725 725 11	09 725 725 55
France	0 1 48 14 24 24	0 1 48 14 24 14
Germany	089 741 31 30	089 714 60 35
Hong Kong	2645 3186	2686 8505
India	91805275406	91805275410
Israel	03 6120092	03 6120095
Italy	02 413091	02 4139215
Japan	03 5472 2970	03 5472 2977
Korea	02 596 7456	02 596 7455
Mexico (D.F.)	5 280 7625	5 520 3282
Mexico (Monterrey)	8 357 7695	8 365 8543
Netherlands	0348 433466	0348 430673
Norway	32 84 84 00	32 84 86 00
Singapore	2265886	2265887
Spain (Madrid)	91 640 0085	91 640 0533
Spain (Barcelona)	93 582 0251	93 582 4370
Sweden	08 587 895 00	08 730 43 70
Switzerland	056 200 51 51	056 200 51 55
Taiwan	02 2377 1200	02 2737 4644
United Kingdom	01635 523545	01635 523154
United States	512 795 8248	512 794 5678

Technical Support Form

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

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

Name ____

Company ____

Address ____

____

Fax (___) ________________ Phone (___) __________________________________

Computer brand ____________ Model ___________________ Processor ___________________

Operating system (include version number) ____________________________________

Clock speed ______ MHz RAM _____ MB Display adapter __________________________

Mouse ___ yes ___ no Other adapters installed _______________________________

Hard disk capacity _____ MB Brand ____

Instruments used ____

____

National Instruments hardware product model _____________ Revision ____________________

Configuration ____

National Instruments software product ___________________ Version ____________________

Configuration ____

The problem is: ____

____

____

____

____

List any error messages: ____

____

____

The following steps reproduce the problem: ____

____

____

____

____

VXIpc 870 Series Hardware and Software Configuration Form

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

National Instruments Products

NI-VXI/VISA Software Version Number ______________________________

Using Both NI-VXI and NI-VISA? ______________________________

NI-488.2 Software Version Number (if applicable) ______________________________

LabVIEW Software Version Number (if applicable) ______________________________

LabWindows/CVI Software Version Number (if applicable) ______________________________

List Any Other National Instruments Software and Version Number ______________________________

____

VXIpc 870 Series Hardware Settings and System Configuration

VXIpc 870 Series Model Number ______________________________

Part Number ______________________________

Serial Number ______________________________

Hard Drive Size ______________ Video Memory ______________

Processor Speed ______________________________

Slot Location ______________________________

W1, W3, W5, W7: CPU Bus Factor ______________________________

W4: Bus Speed Setting ______________________________

W6: CMOS ______________________________

W8: Flash Protect ______________________________

W10: Ethernet Serial EEPROM Enable ______________________________

W11–W12: SCSI Termination Enable ______________________________

W15: Power Monitor ______________________________

J22: Automatic Slot 0 Detection ______________________________

S1: MITE User/Factory Configuration ______________________________

S2: MITE Configuration Enable ______________________________

Other Products

Mainframe make and model ____

Microprocessor ____

Clock frequency or speed ____

Total RAM size ____

Type of video board installed ____

Video memory ____

Operating system version or service pack ____

Operating system mode ____

Programming language and version ____

Monitor (manufacturer, model) ____

Mouse (manufacturer, model) ____

Keyboard (manufacturer, model) ____

List SCSI devices and SCSI IDs

Manufacturer, Description, Function, SCSI ID

List AT/PCI plug-in boards

Manufacturer, Description, Function

List Other Boards in VXI Mainframe

Slot	LA	DMA	IRQ	Manufacturer, Description, Function

Documentation Comment Form

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

Title: *VXIpc™ 870 Series User Manual*

Edition Date: March 1999

Part Number: 322116A-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.

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Glossary

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

Symbols

° degrees

Ω ohms

A

A amperes

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

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

address character code that identifies a specific location (or series of locations) in memory

address space	a set of 2^n memory locations differentiated from other such sets in VXI/VMEbus systems by six addressing lines known as address modifiers. *n* is the number of address lines required to uniquely specify a byte location in a given space. Valid numbers for *n* are 16, 24, and 32. In VME/VXI, because there are six address modifiers, there are 64 possible address spaces.
ANSI	American National Standards Institute
API	Application Programming Interface; the direct interface that an end user sees when creating an application
ASD	Acceleration Spectral Density; a calculation of random vibration intensity across a frequency bandwidth
ASIC	application-specific integrated circuit—a proprietary semiconductor component designed and manufactured to perform a set of specific functions for a specific customer

B

b	bit—one binary digit, either 0 or 1
B	byte—eight related bits of data, an 8-bit binary number. Also used to denote the amount of memory required to store one byte of data.
backplane	an assembly, typically a printed circuit board, with 96-pin connectors and signal paths that bus the connector pins. A C-size VXIbus system will have two sets of bused connectors called J1 and J2. A D-size VXIbus system will have three sets of bused connectors called J1, J2, and J3.
BERR*	bus error signal
BIOS	Basic Input/Output System. BIOS functions are the fundamental level of any PC or compatible computer. BIOS functions embody the basic operations needed for successful use of the computer's hardware resources.
bus	the group of conductors that interconnect individual circuitry in a computer. Typically, a bus is the expansion vehicle to which I/O or other devices are connected. Examples of buses include the ISA bus, PCI bus, VXI bus, and VME bus.

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

C

C — Celsius

CLK10 — a 10 MHz, ±100 ppm, individually buffered (to each module slot), differential ECL system clock that is sourced from Slot 0 of a VXIbus mainframe and distributed to Slots 1 through 12 on P2. It is distributed to each slot as a single-source, single-destination signal with a matched delay of under 8 ns.

CMOS — Complementary Metal Oxide Semiconductor; a process used in making chips

D

DIN — Deutsches Institut für Normung—German Standards Institute

DMA — Direct Memory Access; a method by which data is transferred between devices and internal memory without intervention of the central processing unit. DMA is the fastest method of transferring data to/from computer memory.

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

E

ECL — Emitter-Coupled Logic

EDO — Extended Data Out; a DRAM architecture that shortens overall access latency, improving performance

EEPROM — Electronically Erasable Programmable Read Only Memory—ROM that can be erased with an electrical signal and reprogrammed 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.

EMC — electromagnetic compliance

EMI — electromagnetic interference

external trigger — a voltage pulse from an external source that triggers an event

F

fair requester — a VXIbus device that will not arbitrate for the VXIbus after releasing it until it detects the bus request signal inactive. This ensures that all requesting devices will be granted use of the bus.

G

g — 1. grams
2. A measure of acceleration equal to 9.8 m/s^2

GPIB — General Purpose Interface Bus (IEEE 488)

g_{RMS} — A measure of random vibration. The root mean square of acceleration levels in a random vibration test profile.

H

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

Hz — hertz; cycles per second

I

IDE — Integrated Drive Electronics. Denotes the most common interface to the hard drive on PCs.

IEC — International Electrotechnical Commission. The IEC publishes internationally recognized standards. IEC 60068 contains information on environmental testing procedures and severities.

IEEE	Institute of Electrical and Electronics Engineers
in.	inches
I/O	input/output; the techniques, media, and devices used to achieve communication between machines and users
instrument driver	a set of routines designed to control a specific instrument or family of instruments, and any necessary related files for LabWindows/CVI or LabVIEW
interrupt	a means for a device to request service from another device; a computer signal indicating that the CPU should suspend its current task to service a designated activity
interrupt handler	a VMEbus functional module that detects interrupt requests generated by interrupters and responds to those requests by requesting status and identify information
interrupt level	the relative priority at which a device can interrupt
IRQ*	interrupt signal
ISA	Industry Standard Architecture; denotes a common expansion bus used in PCs

K

K	kilo—(1) the standard metric prefix for 1,000, or 10^3, used with units of measure such as volts, hertz, and meters; (2) the prefix for 1,024, or 2^{10}, used with B (byte) in quantifying data or computer memory

L

LED	light-emitting diode

M

m	meters
M	mega—(1) the standard metric prefix for 1 million or 10^6, when used with units of measure such as volts and hertz; (2) the prefix for 1,048,576, or 2^{20}, when used with B (byte) to quantify data or computer memory
MANTIS	a National Instruments custom ASIC that performs VXIbus arbitration and manages interrupts and triggers
master	a functional part of a VME/VXIbus device that initiates data transfers on the backplane. A transfer can be either a read or a write.
MBLT	eight-byte block transfers in which both the Address bus and the Data bus are used to transfer data
MITE	a National Instruments custom ASIC, a sophisticated dual-channel DMA controller that incorporates the Synchronous MXI and VME64 protocols to achieve high-performance block transfer rates
MODID	module ID lines. Used in VXI to geographically locate boards and to dynamically configure boards
MTBF	Mean Time Between Failure

N

NI-488.2 or NI-488.2M	the National Instruments industry-standard software for controlling GPIB instruments
NI-VISA	the National Instruments implementation of the VISA standard; an interface-independent software that provides a unified programming interface for VXI, GPIB, and serial instruments
NI-VXI	the National Instruments bus interface software for VME/VXIbus systems
Non-Slot 0 device	a device configured for installation in any slot in a VXIbus mainframe other than Slot 0. Installing such a device into Slot 0 can damage the device, the VXIbus backplane, or both.

P

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

PCMCIA — Personal Computer Memory Card International Association

POSC — Power-On Self Configuration. A process by which the MITE chip programs its own registers from EEPROMs at power up

R

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

RMS — Root mean squared. *See* g_{rms}.

S

s — seconds

SCSI — Small Computer System Interface (bus)

SIMM — Single In-line Memory Module

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

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

SMB — Sub Miniature Type B connector that features a snap coupling for fast connection

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

T

trigger	either TTL or ECL lines used for intermodule communication
TTL	Transistor-Transistor Logic

V

V	volts
VGA	Video Graphics Array; the minimum video display standard for all PCs
VISA	Virtual Instrument Software Architecture. This is the general name given to VISA and its associated architecture.
VME	Versa Module Eurocard or IEEE 1014
VXIbus	VMEbus Extensions for Instrumentation

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