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VXI

NI VXIpc™-882 User Manual

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NATIONAL INSTRUMENTS™

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About This Manual

This manual contains detailed instructions for installing and configuring your National Instruments VXIpc-882 embedded computer kit.

How to Use the Documentation Set

Begin by reading *NI VXIpc-882 Installation Guide*, a brief quick-start guide that describes how to install and get started with your controller.

This manual, the *NI VXIpc-882 User Manual*, contains more details about changing the installation or configuration from the defaults and using the hardware.

Conventions

The following conventions appear in this manual:

» The » symbol leads you through nested menu items and dialog box options to a final action. The sequence **File»Page Setup»Options** directs you to pull down the **File** menu, select the **Page Setup** item, and select **Options** from the last dialog box.

 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.

bold Bold text denotes items that you must select or click in the software, such as menu items and dialog box options. Bold text also denotes parameter names.

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

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`monospace`	Text in this font denotes text or characters that you should enter from the keyboard, sections of code, programming examples, and syntax examples. This font is also used for the proper names of disk drives, paths, directories, programs, subprograms, subroutines, device names, functions, operations, variables, filenames, and extensions.
`monospace bold`	Bold text in this font denotes the messages and responses that the computer automatically prints to the screen. This font also emphasizes lines of code that are different from the other examples.
`monospace italic`	Italic text in this font denotes text that is a placeholder for a word or value that you must supply.

Related Documentation

The following documents contain information 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
- VXI-8, *Cooling Characterization Methodology Specification*, Rev. 2.0, VXIbus Consortium
- *NI-VISA Help*

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1 Introduction

NI VXIpc-882 Overview

Description

The NI VXIpc-882 embedded computer is a C-size VXIbus system controller. The controller uses off-the-shelf Intel PC technology to bring you powerful VXI system control in a familiar PC environment. Using state-of-the-art packaging, the NI VXIpc-882 provides powerful control in a two-slot configuration.

Install a NI VXIpc-882 controller in your VXI mainframe, and you can take full advantage of the high-performance VXI backplane and have direct control of VXI registers, memory, interrupts, and triggers.

The NI VXIpc-882 computers are fully VXI*plug&play* compliant and compatible with PC-compatible software tools, the National Instruments LabVIEW and LabWindows™/CVI™ application software, and the NI-VISA, NI-VXI, and NI-488.2 bus interface software.

Modules

The NI VXIpc-882 controller has a standard I/O set that includes integrated DVI-I video, four Hi-Speed USB ports, one RS-232 serial port, one parallel port, a 10/100/1000 Ethernet port, GPIB, an ExpressCard/34 slot, SMB connectors for trigger and clock I/O, and a system reset button. The NI VXIpc-882 features an Intel® Core™ 2 Duo processor T7400 (2.16 GHz dual core processor) and an 80 GB (or larger) hard drive.

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NI VXIpc-882 Functional Block Diagram

Figure 1-1 is a functional block diagram of the NI VXIpc-882 controller.

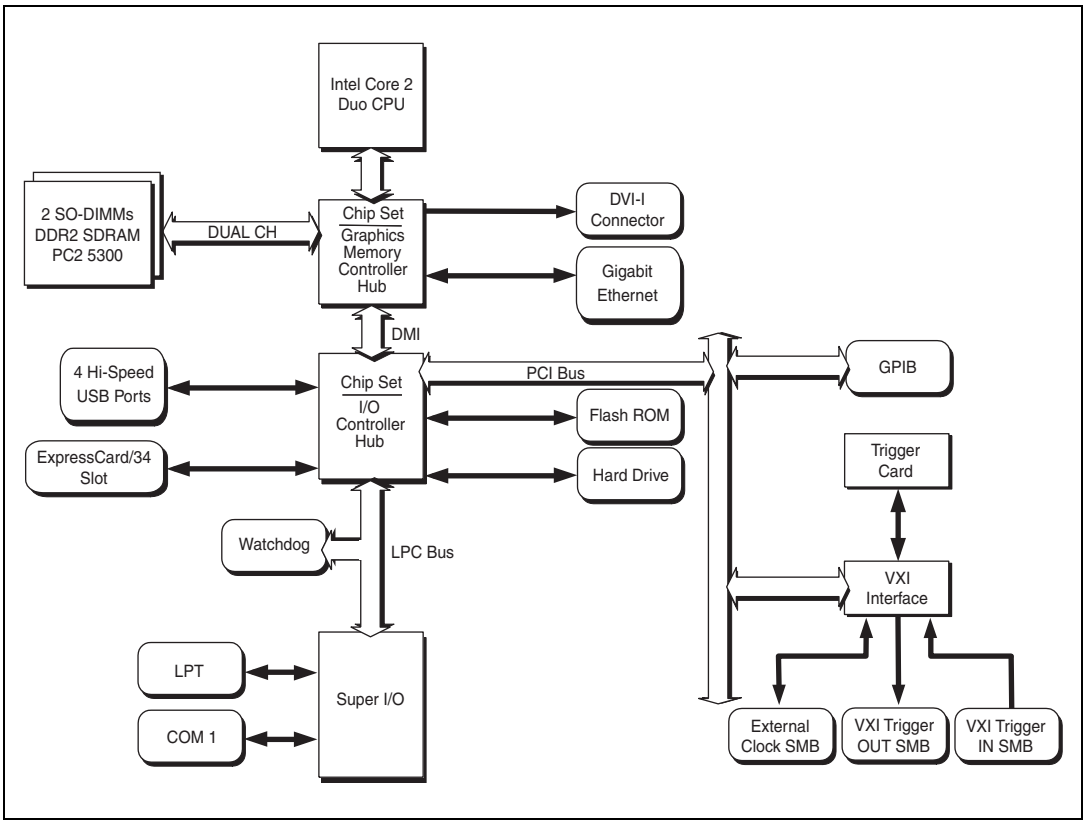


Figure 1-1. NI VXIpc-882 Block Diagram

NI VXIpc-882 Functional Description

This section contains brief functional descriptions of the major NI VXIpc-882 logic blocks shown in Figure 1-1.

- The *SO-DIMM* block consists of two DDR2 SDRAM sockets that can hold up to 2 GB each.
- The *Gigabit Ethernet* connects to either 10 Mbit, 100 Mbit, or 1,000 Mbit Ethernet interfaces.
- The *Watchdog Timer* block consists of a watchdog timer that can reset the controller.

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- The *Super I/O* block represents the other peripherals included with the NI VXIpc-882 controller, including:
  - One serial port
  - One parallel port
- The *GPIB* block contains the GPIB interface.
- The *ExpressCard/34* slot accommodates an ExpressCard/34 module.
- The *VXI Interface* connects the NI VXIpc-882 controller to the VXI backplane through the National Instruments MITE ASIC.
- The *External Clock SMB* provides an input for an external source to generate CLK10 to the VXI backplane or allow you to output CLK10 to an external device.
- The *VXI Trigger In/Out SMBs* provide a routable connection of the VXI triggers to and from the VXI backplane.

National Instruments Software

National Instruments has developed several software kits you can use with the NI VXIpc-882. NI-VISA and NI-VXI are already installed on your hard drive; LabVIEW is optional.

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.

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.

The NI-VISA/NI-VXI 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-VISA and NI-VXI, 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.

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You can also use the National Instruments LabVIEW application program and instrument drivers to ease your programming task. This standardized program matches the modular virtual instrument capability of VXI and can reduce your VXI software development time. This program features extensive libraries of GPIB, Serial, and VXI instrument drivers written to take full advantage of direct VXI control. LabVIEW includes all the tools needed for instrument control, data acquisition, analysis, and presentation.

LabVIEW is an easy-to-use, graphical programming environment you can use to acquire data from thousands of different instruments, including IEEE 488.2 devices, VXI devices, serial devices, PLCs, and plug-in data acquisition boards. After you have acquired raw data, you can convert it into meaningful results using the powerful data analysis routines in LabVIEW. LabVIEW also comes with hundreds of instrument drivers, which dramatically reduce software development time, because you do not need to spend time programming the low-level control of each instrument.

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2

Installation

This chapter contains information about installing your NI VXIpc-882 controller and components.

Caution Electrostatic discharge can damage your controller. To avoid such damage, handle the controller only in a proper ESD-controlled environment.

Installing the NI VXIpc-882

This section contains general installation instructions for the NI VXIpc-882 controller. Consult your VXIbus chassis user manual or technical reference manual for specific instructions and warnings.

1. Plug in your chassis before installing the controller. The power cord grounds the chassis and protects it from electrical damage while you are installing the controller.

Caution To protect both yourself and the chassis from electrical hazards, the chassis should remain off until you finish installing the controller.

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

Caution If the controller is not configured for automatic System Controller detection, be certain that the slot you select in your VXIbus chassis matches the controller configuration as either a System Controller device or a Non-System Controller device. Installing the controller into a slot that does not correspond with the jumper setting can damage the controller, the VXIbus backplane, or both. Refer to the *Slot 0 Detection* section of Chapter 3, *Configuration and Default Settings*, for jumper configuration information.

3. Insert the controller in the desired slot by aligning the top and bottom of the controller with the card-edge guides inside the chassis. Slowly push the controller 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 controller should be even with the front panel of the chassis.

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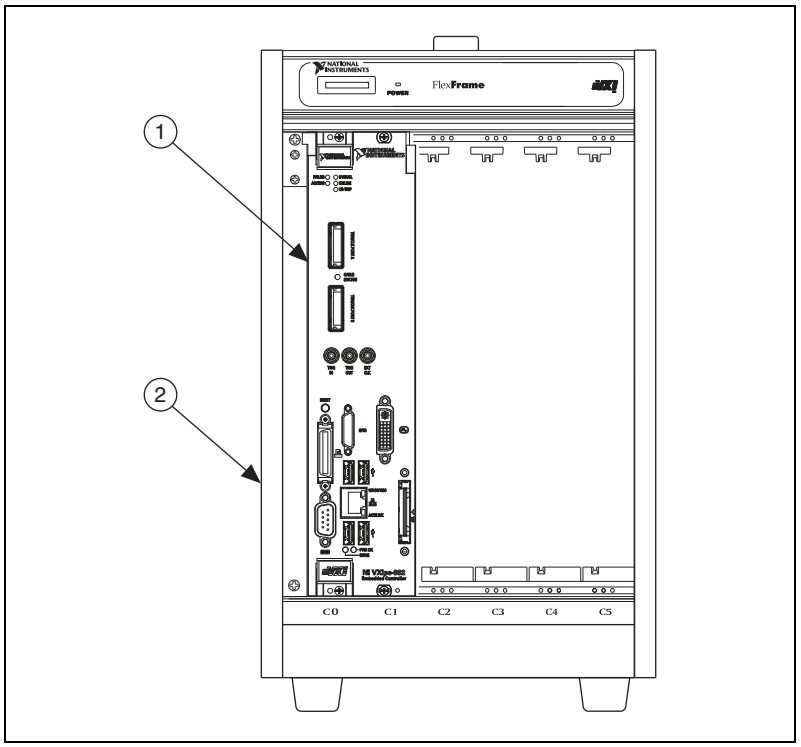
4. Tighten the retaining screws on the top and bottom edges of the front panel.
5. Check the installation.
6. Connect the keyboard and mouse to the USB connectors.

Note Install a noise-suppression ferrite (included in your shipping kit) onto the external USB cable when using a USB mouse or keyboard to ensure that your device meets all EMC standards applicable to your country. For more information on installing the ferrite, refer to KnowledgeBase 4Q0899P6 at `ni.com`.

7. Connect the DVI-I monitor video cable to the DVI-I connector.
8. Connect devices to ports as required by your system configuration.
9. Replace or close any doors or covers on the chassis.
10. Power on the chassis.
11. The controller should now boot. If the controller does not boot, refer to the *What if the NI VXIpc-882 does not boot?* section of Chapter 6, *Common Questions and Troubleshooting*.
12. On the first boot of the controller, a setup program automatically runs.
13. Follow the prompts in the setup program to fully configure your controller.
14. When prompted for the Windows serial number, enter the serial number of the operating system from the included certificate.
15. Your controller is now ready for development.

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Figure 2-1 shows an NI VXIpc-882 installed in the system controller slot of a National Instruments VXI chassis. You can place VXI devices in any other slot.



1	NI VXIpc-882 Controller	2	VXI Chassis

Figure 2-1. NI VXIpc-882 Controller Installed in a VXI Chassis

How to Remove the Controller from the VXI Chassis

The NI VXIpc-882 controller is designed for easy handling. To remove the controller from the VXI chassis, complete the following steps:

1. Shut down all applications and the operating system.
2. Turn off power.
3. Disconnect devices from the front panel ports as your system configuration requires.
4. Remove the retaining screws in the controller front panel.

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5. Push the upper ejector handle up and the lower ejector handle down until the controller pops out of the backplane connectors.
6. Slide the controller out of the chassis.

Removing the NI VXIpc-882 Component Side Cover

The NI VXIpc-882 is housed in a metal enclosure comprised of a component-side (top), solder-side (bottom), and rear cover to improve EMC performance and provide easy handling. Remove the component side cover to access the jumper settings.

Complete the following steps to remove the top and rear covers from the controller.

1. Remove the 3 Phillips-head screws attaching the rear cover to the component-side cover.
2. Remove the 8 screws holding the component-side cover to the solder side cover, and the 2 screws holding the component-side cover to the module standoffs.
3. Lift the component-side and rear covers away from the module.

Installing and Upgrading RAM

The NI VXIpc-882 uses PC2 5300 DDR2 SDRAM and supports up to 2 GB in each of the two RAM sockets.

National Instruments recommends the following size SO-DIMMs for use with the NI VXIpc-882 controller (SDRAM):

- PC2-5300 1 GB, 128 MB × 64, CL 5, 1.18 in. max (NI part number 779302-1024)
- PC2-5300 2 GB, 256 MB × 64, CL 5, 1.18 in. max (NI part number 780031-2048)

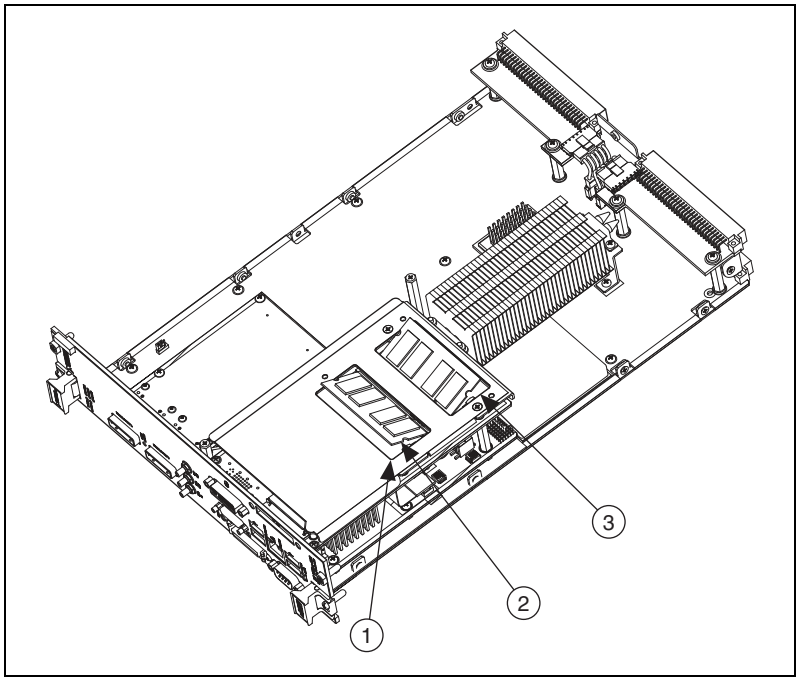
Note National Instruments has tested and verified that the DDR2 SO-DIMMs we sell work with the NI VXIpc-882. We recommend you purchase your DDR2 SO-DIMM modules from National Instruments. Other off-the-shelf DDR2 SO-DIMM modules are not guaranteed to work properly.

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To add or replace RAM for the NI VXIpc-882, complete the following steps:

1. Remove the NI VXIpc-882 from the chassis. Refer to the removal instructions in the *How to Remove the Controller from the VXI Chassis* section.
2. Remove the component side cover. Refer to the removal instructions in the *Removing the NI VXIpc-882 Component Side Cover* section.
3. Add the SO-DIMM modules to the empty SO-DIMM sockets. Refer to Figure 2-2.

Note To optimize both memory capacity and system performance, use the same size and speed memory module in each of the two module slots. The use of different size modules in each slot is supported, but system performance will be slower than using two matched modules. However, two mismatched modules will result in better performance than using a single module.



1 SO-DIMM Socket XA1 2 SO-DIMM Module 3 SO-DIMM Socket XA2

Figure 2-2. Installing a SO-DIMM in an NI VXIpc-882 Controller

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Installing and Removing the Internal Hard Drive

Complete the following steps to remove the internal hard drive from your NI VXIpc-882 controller:

1. Remove the controller from the chassis. Refer to the removal instructions in the *How to Remove the Controller from the VXI Chassis* section.
2. Remove the component side cover. Refer to the removal instructions in the *Removing the NI VXIpc-882 Component Side Cover* section.
3. Remove the four screws under the solder side cover that hold the hard drive in place. You will need a 2mm hex driver to remove the M3 button head screws.

Caution Be careful when sliding the hard drive toward the bottom of the controller. The hard drive could contact components on the motherboard, causing severe damage to both the components and motherboard.

4. Carefully and slowly slide the hard drive toward the bottom of the controller to free the pins from the SATA docking connector.
5. When the pins are free of the connector, lift the hard drive off of the motherboard.

Note Always handle the hard drive in accordance with the handling instructions outlined by the hard drive manufacturer.

Complete the following steps to install the internal hard drive in your NI VXIpc-882 controller:

1. Be sure the insulating pad is properly placed on the motherboard over the hard drive ground plane.

Caution Use care when installing the hard drive. The hard drive could contact components on the motherboard, causing severe damage to both the components and motherboard.

2. Set the hard drive on the motherboard and carefully slide the drive forward until it seats firmly in the SATA docking connector. The insulating pad should be between the hard drive and the motherboard.
3. Reinstall the four screws that hold the hard drive in place.
4. Reinstall the component side cover.

The controller is now ready to be reinstalled in the VXI mainframe.

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ExpressCard/34

This section provides information on the installation and removal of ExpressCard/34 modules.

Installing an ExpressCard/34

You can install an ExpressCard/34 module while the NI VXIpc-882 is running. The NI VXIpc-882 will automatically detect the card. ExpressCard/34s are generally marked with a symbol or a label to indicate which end to insert into the slot. The cards are keyed to prevent incorrect insertion.

To install an ExpressCard/34, complete the following steps.

1. Hold the card so the top side is facing left.
2. Insert the card until it is completely seated in its connector. The connector has an automatic eject mechanism. If you insert the card and it is ejected, simply re-insert the card until it is seated.

If you encounter too much resistance, do not force the card. Check the card orientation and try again.

The NI VXIpc-882 will automatically recognize the ExpressCard/34 and load the appropriate driver(s). Third-party cards may require that you install additional drivers. Contact your ExpressCard/34 vendor for more information.



Caution The ExpressCard/34 interface is ESD sensitive. An electrostatic shock on the ExpressCard/34 module while it is inserted may cause the controller to lock-up or reboot.

Removing an ExpressCard/34

To remove the ExpressCard/34 module push in the module and then release to eject the card. Slide the card out of the slot.



Caution To avoid data loss and other potential issues, stop communication with your ExpressCard/34 device before removing it from the NI VXIpc-882. In Windows, use the Safely Remove Hardware tool to safely stop the ExpressCard/34.

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3

Configuration and Default Settings

Hardware Default Settings

This chapter summarizes the hardware default settings for the NI VXIpc-882 for easy reference. The module is set at the factory for the most commonly used configuration.

Figure 3-1 and Table 3-1 show the factory-default settings of the user-configurable jumpers on the NI VXIpc-882 controller. Tables 3-2, 3-3, 3-4, 3-5, and 3-6 show user-configurable settings in Measurement & Automation Explorer (MAX).

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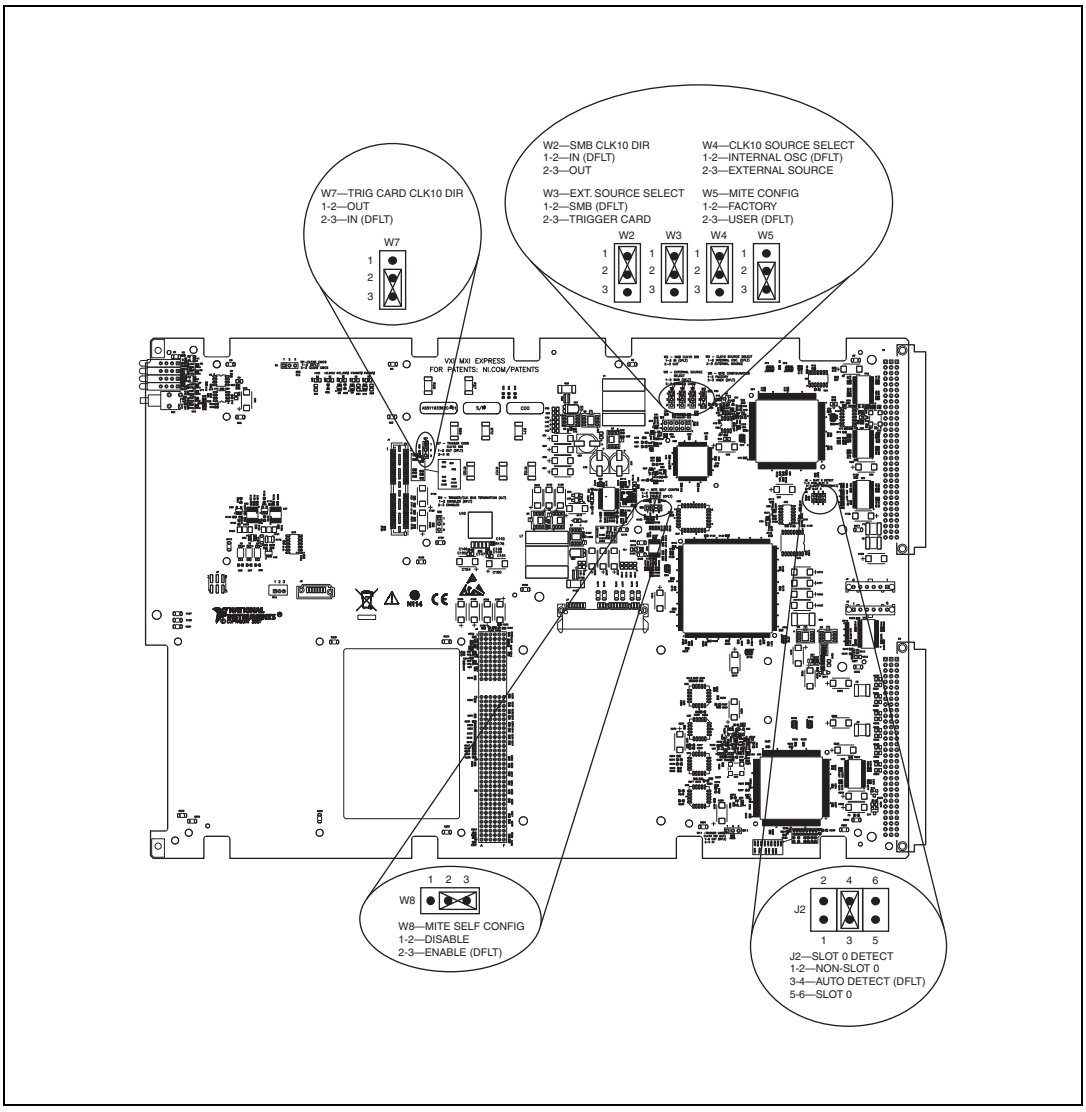


Figure 3-1. NI VXIpc-882 Shipping Configuration Settings

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Table 3-1. NI VXIpc-882 Controller Hardware Default Settings

Jumper	Description	Setting
W2	SMB CLK10 DIR	1–2 In (Default) 2–3 Out
W3	External CLK10 Source Select	1–2 SMB (Default) 2–3 Trigger Card
W4	CLK10 Source Select	1–2 Internal Osc. (Default) 2–3 External Source
W5	MITE Configuration	1–2 Factory 2–3 User (Default)
W7	Trigger Card CLK10 Direction	1–2 Out 2–3 IN (Default)
W8	MITE Self Configuration	1–2 Disable 2–3 Enable (Default)
J2	Slot 0 Detect	1–2 Non-Slot 0 3–4 Auto Detect (Default) 5–6 Slot 0

Note 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.

Default Software Settings

The following hardware configurations are available through Measurement & Automation Explorer (MAX).

Table 3-2. MAX Device Tab Default Settings

Editor Field	Default Setting
Device class	Message-based
Number of handlers	1

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Table 3-3. MAX Shared Memory Tab Default Settings

Editor Field	Default Setting
Don't share memory	—
A24/A32 write posting	Enabled

Table 3-4. MAX VXI Bus Tab Default Settings

Editor Field	Default Setting
Bus timeout value	500 µs
VXI retry generation	Enabled
Automatic retries	Enabled
VXI transfer limit	256
A24/A32 write posting	Enabled
Requester mode	Release on Request
Request level	3
Operate as fair requester	Enabled
Bus arbitration mode	Prioritized
Arbiter timeout	Disabled

Table 3-5. MAX PCI Tab Default Settings

Editor Field	Default Setting
Low-level register access API support	Enabled
User window size	2 MB
DMA setting	Enable DMA on this controller

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Table 3-6. MAX SMB Tab Default Settings

Editor Field	Default Setting
CLK10 50 Ω termination	Disabled
Invert CLK10 polarity	Enabled
TRIG IN 50 Ω termination	Disabled

The following hardware configuration settings are user configurable.

- Slot 0 detection
- VXIbus CLK10 routing
- SMB Trigger I/O
- Backplane trigger I/O

For the configuration switch locations and default settings, see Figure 3-1.

Note Do *not* attempt an alternate setting unless you are familiar with its purpose. In addition, do not reconfigure any switches or jumpers not described in this manual unless directed by National Instruments support.

Slot 0 Detection

The NI VXIpc-882 controller is configured at the factory to automatically detect if it is installed in Slot 0 of a VXI mainframe. With automatic System Controller slot detection the NI VXIpc-882 controller can be installed in any VXIbus slot.

The NI VXIpc-882 controller can be manually configured for either System Controller or Non-System Controller operation by defeating the automatic detection circuitry. Use the three position jumper J2 as shown in Figure 3-2 to select between automatic detection, System Controller, or Non-System Controller.

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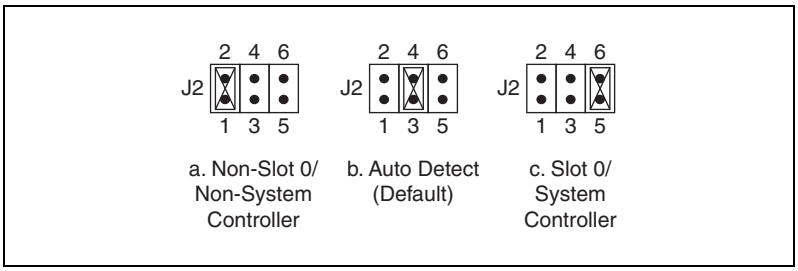


Figure 3-2. Slot 0 Detection through the J2 Jumper

Caution Do *not* install a device configured as the System Controller in any slot other than Slot 0. When installing into a slot other than Slot 0, first reconfigure it as either a Non-System Controller or for automatic detection. Failing to do so may result in damage to the NI VXIpc-882 controller and/or the backplane.

When the NI VXIpc-882 controller is installed in Slot 0 of a VXI system it becomes the VXIbus System Controller. As the System Controller, the NI VXIpc-882 controller has VXIbus Data Transfer 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 the VXIbus System Controller, the NI VXIpc-882 controller also drives the 16 MHz VXIbus system clock via an onboard 16 MHz oscillator. As required by the specification, when installed in Slot 0, the NI VXIpc-882 controller drives CLK10, a differential ECL output, to the VXIbus backplane. When the system is not installed in Slot 0 it will only receive the CLK10 signal.

MITE EEPROM

User/Factory Configuration

The EEPROM is divided into two halves—one half is factory configured and one half is user configurable. Use jumper W5 to control whether the NI VXIpc-882 controller boots off the factory-configured EEPROM settings or the user-modified settings. In its default setting, the NI VXIpc-882 controller boots off the user-configurable half.

This jumper is useful in the event that the user-configured half of the EEPROM becomes corrupted in such a way that the NI VXIpc-882 controller boots to an unusable state. By changing this jumper setting, you can boot to the factory configuration and get up and running again. Use the procedure as described in the *How to Fix an Invalid EEPROM Configuration* section of this manual.

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

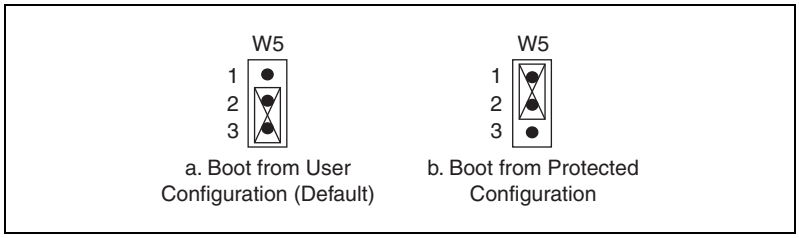


Figure 3-3. EEPROM Configuration

Power-On Self Configuration

The NI VXIpc-882 controller has an onboard EEPROM, which stores default register values for the VXI circuitry. These values are loaded when you power up the computer. The 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 seconds of SYSRST# deasserting.

You can disable this power-on self-configuration (POSC) circuit by changing switch W8. 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 W8 in its factory-default setting. Figure 3-4 shows the possible configurations for W8.

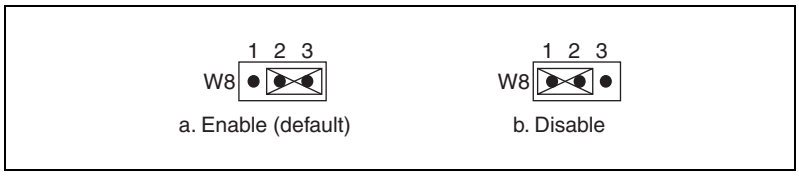


Figure 3-4. Power-on Self Configuration Status

How to Fix an Invalid EEPROM Configuration

Use MAX under Windows to edit the NI VXIpc-882 controller configuration. Some of these settings are stored in files that the NI-VXI software reads, while other settings are stored directly in the NI VXIpc-882 controller EEPROM.

Certain EEPROM configurations, including invalid configurations, can lock up your computer while it is booting. Generally, only the size and

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location of the memory windows can cause the NI VXIpc-882 controller 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 NI VXIpc-882 controller user memory window. The EEPROM can become corrupted if the NI VXIpc-882 controller is shut down while it is updating the EEPROM.

If one of these situations occurs after you change the configuration, complete the following steps to reconfigure the NI VXIpc-882 controller.

1. Power off your computer.

Caution To protect both yourself and the mainframe from electrical hazards, the mainframe should remain off until you finish changing the settings on the NI VXIpc-882 controller.

2. Change jumper W5 to the position shown in Figure 3-3b to restore the factory configuration.
3. Power on the computer. The computer should boot this time because the factory-default configuration is being used to initialize the NI VXIpc-882 controller.
4. Run your software configuration utility to re-adjust the NI VXIpc-882 controller configuration.
5. After saving the configuration, exit Windows and power off the computer.
6. Change jumper W5 to the default position, as shown in Figure 3-3a.
7. Power on the computer. If the computer does not boot with this configuration, you will need to repeat these steps, modifying your configuration until a final configuration is reached.

VXIbus CLK10 Routing

When the NI VXIpc-882 controller is installed in Slot 0 of your mainframe, it supplies the VXIbus CLK10 signal. Three different sources for CLK10 are available with the NI VXIpc-882:

- The internal 10 MHz ±50 ppm CLK10 oscillator. This is the default CLK10 source.
- The front panel CLK10 SMB. When configured as an input the front panel SMB allows an external source to be used as the source for the VXIbus CLK10 signal.

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- The front panel TRIG/CLK PORT A(B). CLK10 can be routed into the NI VXIpc-882 from another NI VXIpc-882 through the TRIG/CLK PORT A(B) on the front panel. Onboard jumpers are used to set this configuration.

Front Panel SMB Direction Control

W2—SMB CLK10 Direction

This jumper allows you to configure the front panel SMB connector on the NI VXIpc-882 controller.

The default jumper position, shown in Figure 3-5a, **IN**, shuts off CLK10 to the front panel SMB connector. Use jumpers W4 and W3 to configure the front panel SMB as an input for CLK10. In non-Slot 0 operation the SMB cannot be configured as an input as only the Slot 0 controller is allowed to supply CLK10 to the VXI backplane.

Setting the W2 jumper to **OUT**, as shown in Figure 3-5b, routes the VXIbus CLK10 to the front panel SMB connector. In non-Slot 0 operation this jumper will also route the VXIbus CLK10 out of the front panel SMB connector.

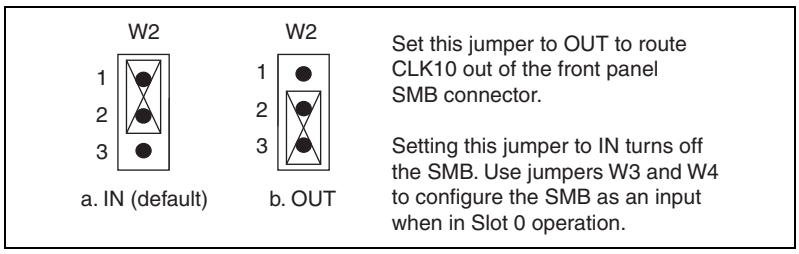


Figure 3-5. Setting the Front Panel CLK10 SMB Direction with Jumper W2

Selecting the CLK10 Source

W3—External CLK10 Source Select

When W4—CLK10 Source Select is set to select an external CLK10 source, W3 is used to select between two external CLK10 sources.

- The default setting, shown in Figure 3-6a, **SMB**, selects the front panel SMB connector as the external CLK10 source. There is no need to set the direction of the SMB with jumper W2 as the controller will set the SMB as an input for you.

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- Set the W3 jumper to **Trigger Card**, shown in Figure 3-6b, to select the CLK10 source as the TRIG/CLK PORT A(B) on the NI VXIpc-882 front panel. When selecting the trigger card as the CLK10 input source be sure to set jumper W7 to set the direction of CLK10 through the TRIG/CLK PORT A(B).

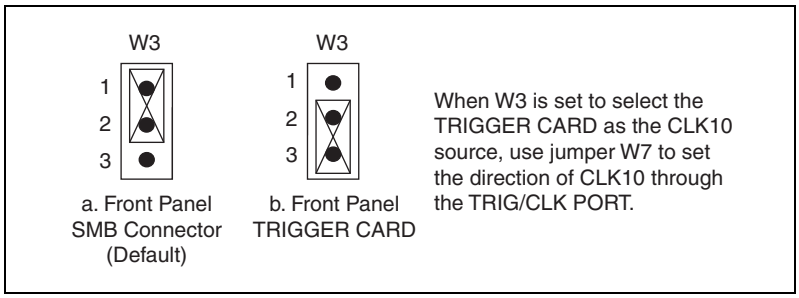


Figure 3-6. Selecting the External CLK10 Source with the W3 Jumper

W4—CLK10 Source Select

In Slot 0 operation the CLK10 Source Select jumper allows you to select the source for the VXIbus CLK10 that is routed to the backplane.

The default setting, **Internal Oscillator**, shown in Figure 3-7a, uses the internal 10 MHz ±50 ppm oscillator as the VXIbus CLK10 source.

Set the W4 jumper to **External Source**, shown in Figure 3-7b, to use the front panel SMB or the Trigger Card as the CLK10 source. Jumper W3 External CLK10 Source Select is used in conjunction with W4 when W4 is set to select an external oscillator as the VXIbus CLK10 source.

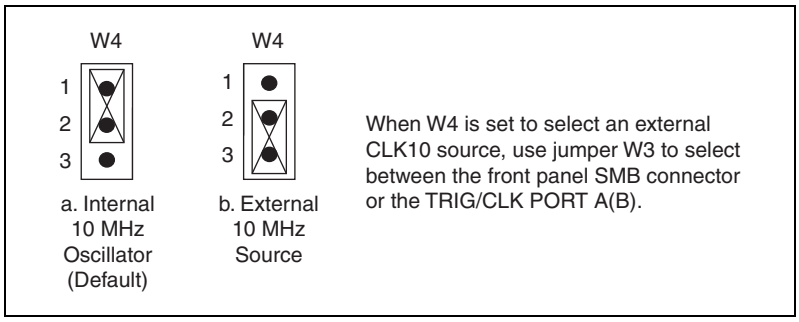


Figure 3-7. Selecting the CLK10 Source with the W4 Jumper

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TRIG/CLK PORT A(B) Direction

W7—Trigger Card CLK10 Dir

This jumper allows you to configure the direction of CLK10 through the TRIG/CLK PORT A(B).

- In Slot 0 operation with jumpers W4 set for an external source and W3 set for the front panel TRIG/CLK PORT A(B) set this jumper to **IN**, as shown in Figure 3-8a, to route CLK10 in from another NI VXIpc-882 to the VXI backplane. In non-slot 0 operation the **IN** setting has no effect.
- In Slot 0 and non-Slot 0 operation setting this jumper to **OUT**, as shown in Figure 3-8b, routes the VXIbus CLK10 out of the TRIG/CLK PORT A(B).

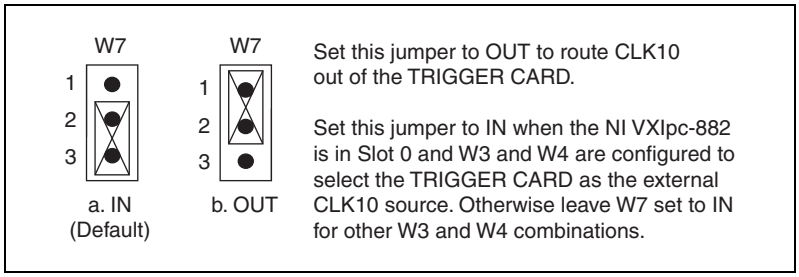


Figure 3-8. Setting the TRIG/CLK PORT A(B) Direction with Jumper W7

Optional CLK10 Settings

Inverting CLK10

If the front panel SMB connector EXT CLK is configured as an output this software setting provides the capability to invert the clock output. This setting can be found in the hardware configuration panels in MAX as shown in Figure 3-9.

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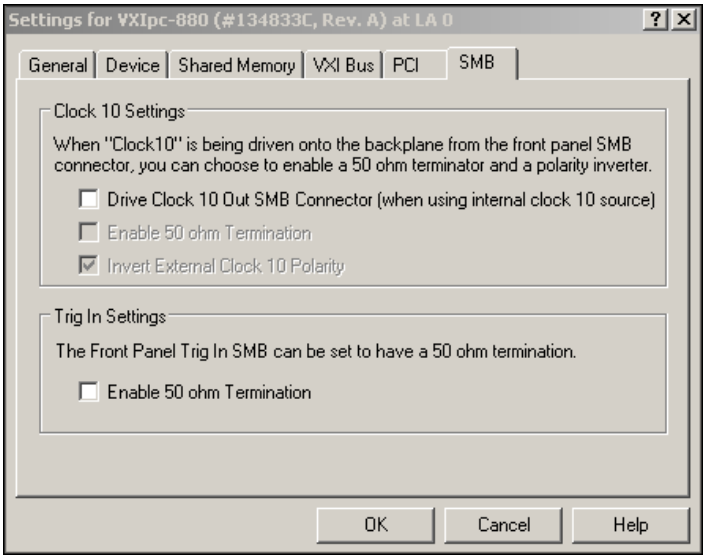


Figure 3-9. Inverting the CLK10 Signal through MAX

CLK10 Termination

If the front panel SMB connector EXT CLK is configured as an input this software setting can enable 50 Ω parallel termination. This setting can be found in the hardware configuration panels in MAX, as shown in Figure 3-9.

Trigger Input Termination

Optional software enabled 50 Ω parallel termination is available for the front panel trigger input. This setting can be found in the hardware configuration panels in MAX, as shown in Figure 3-9.

Note Parallel termination is not necessary when the signal is driven by a 50 Ω source, such as an NI VXIpc-882 controller.

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BIOS Configuration

You can change the NI VXIpc-882 configuration settings in the BIOS setup. The BIOS is the low-level interface between the hardware and PC software that configures and tests your hardware when you boot the system. The BIOS setup program includes menus for configuring settings and enabling NI VXIpc-882 controller features.

Most users do not need to use the BIOS setup program, as the NI VXIpc-882 controller ships with default settings that work well for most configurations.

Caution Changing BIOS settings may lead to incorrect controller behavior and possibly an unbootable controller. If this happens, follow the instructions for restoring default settings in the *System CMOS* section. In general, do *not* change a setting unless you are absolutely certain what it does.

Entering BIOS Setup

To start the BIOS setup utility, complete the following steps:

1. Power on or reboot your NI VXIpc-882 controller.
2. When the message **`Press <DEL> to enter SETUP`** appears, press the Delete key on the keyboard. The message **`Entering Setup`** appears, and the setup program is loaded after a short delay.
3. When you first enter the BIOS setup program, it displays the **Main** menu.

Use the following keys to navigate through the BIOS setup:

- **Left Arrow, Right Arrow**—Use these keys to move between the different setup menus. If you are in a submenu, these keys have no effect, and you need to press <Esc> to leave the submenu first. (To use the arrows on the numeric keypad, you must turn off Num Lock.)
- **Up Arrow, Down Arrow**—Use these keys to move between the options within a setup menu. (To use the arrows on the numeric keypad, you must turn off Num Lock.)
- **<Enter>**—Use this key either to enter a submenu or display all available settings for a highlighted configuration option.
- **<Esc>**—Use this key to return the parent menu of a submenu. At the top-level menus, this key serves as a shortcut to the **Exit** menu.

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- **<+> and <–>**—Use these keys to cycle between all available settings for a selected configuration option.
- **<Tab>**—Use this key to select time and date fields.

Main Setup Menu

The most commonly accessed and modified BIOS settings are in the **Main** setup menu. The **Main** setup menu includes the following settings:

- **System Time & Date**—This setting controls the time of day, which is stored in a battery-backed real-time clock. Most operating systems also include a way to change this setting. Use <+> and <–> in conjunction with <Enter> and <Tab> to change these values.
- **Require Keyboard to Boot**—When **Enabled**, a missing or malfunctioning keyboard causes the BIOS to halt with an error. When **Disabled**, the BIOS allows booting without a keyboard. If you are using a USB keyboard, you may attach it at any time during the powered up state. To use this controller in a "headless" mode, you must set this option to **Disabled**. The default value is **Enabled**.

Note Attaching a USB-to-PS/2 keyboard adapter may allow the system to boot even if no PS/2 keyboard is attached.

- **Num Lock**—This setting indicates whether you turn on Num Lock at boot time. The default value is **On**.
- **SATA Port 0/1**—This item displays the SATA devices detected in the system. Normally, you do not need to modify this item. However, if a SATA device is not autodetected properly, you can specify it manually by pressing <Enter> on the item.
- **IDE Channel 0 Master/Slave**—These items display the IDE/ATA devices detected in the system. Normally, you do not need to modify these items. However, if an IDE/ATA device is not autodetected properly, you can specify it manually by pressing <Enter> on an item.
- **System Information**—This setting displays a screen containing important system information about the NI VXIpc-882 controller.

Advanced Setup Menu

This menu contains BIOS settings that normally do not require modification. If you have specific problems such as unbootable disks or resource conflicts, you may need to examine these settings.

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Caution Changing settings in this menu may result in an unstable or unbootable controller. If this happens, follow the procedures outlined in the *System CMOS* section to restore BIOS settings to their factory defaults.

The **Advanced** setup menu includes the following settings:

- **Reset Configuration Data**—A portion of the EEPROM on the controller is designated as the Extended System Configuration Data region (ESCD). The BIOS and Plug-and-Play operating systems use this table to store the *Last Known Good* configuration of system peripherals. If you experience resource conflicts or peripheral malfunction, set this setting to **Yes** to force the BIOS to recreate the ESCD on the next reboot. This is rarely necessary.
- **Integrated Peripherals**—Use this setting to bring up the **Integrated Peripherals** submenu. (Refer to the *Integrated Peripherals Submenu* section.)
- **Quick Boot Mode**—When you enable this option, certain lengthy BIOS tests that rarely fail are skipped to shorten controller boot time. The default is **Enabled**.
- **Summary Screen**—This setting controls the display of the summary screen shown after BIOS completes its initialization, but before booting takes place. You can disable this screen in the interest of shortening controller boot time. The default is **Disabled**.
- **PXE Network Boot**—This setting enables the option for booting from a network PXE server on the subnet. The default is **Disabled**.

Integrated Peripherals Submenu

Use this submenu to apply nondefault configurations to the front panel peripherals of an NI VXIpc-882 controller. Normally, you do not need to modify these settings, as the factory default settings provide the most compatible and optimal configuration possible.

- **Serial Port A**—This setting enables or disables COM1. You also can change this setting to **Enabled** and modify the base address and Interrupt Request Level (IRQ) of a port. The default is **Auto**, which places COM1 at 0x3F8 IRQ 4.
- **Parallel Port**—Use this setting to enable or disable LPT1. You also can change this setting to **Enabled** and modify the base address, IRQ level, and ISA Direct Memory Access (DMA) channel of the port. The default is **Auto**, which places LPT1 at 0x378, IRQ 7, using ISA DMA Channel 3 if necessary.

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- **Parallel Port Mode**—The PC industry has created several different modes of operation for this port over the years. Usually, the default setting works for all applications. However, if a parallel port device specifically requires a nondefault setting, you can change it here. The default is **Bidirectional**, for full IEEE 1284 capabilities.
- **Legacy USB Support**—Use this setting to use a USB keyboard and mouse as if they were standard PS/2-style peripherals. You *must* enable this setting to use these devices in operating systems with no USB support and to boot from a USB floppy or CD-ROM. The BIOS setup screen always works with USB keyboards regardless of this setting. The default is **Enabled**.
- **SATA Mode**—This setting determines whether the SATA controller operates in **Enhanced** or **Compatible** mode. **Enhanced** mode provides the advanced features of a SATA controller, while **Compatible** mode provides legacy backwards compatibility with standard ATA for operating systems that do not natively support SATA. The default setting is **Enhanced**.
- **AHCI Configuration**—This setting determines whether AHCI mode is **Enabled** or **Disabled** for the SATA port. Because some operating systems do not support AHCI mode, you can use this setting to disable AHCI mode so that non-compatible OSes function correctly. The default setting is **Enabled**.
- **Multi-Core Processing**—This setting determines whether or not the second core processor on the Intel® Core™ 2 Duo T7400 is enabled. The default setting is **Enabled**.
- **Monitor DDC**—This setting determines how the monitor DDC is routed. Use this setting to select whether or not the DDC is routed for an Analog monitor or a DVI monitor. In order to use a DVI monitor, this setting must be set to **DVI**. An analog monitor, however, will function with this option set to either **Analog** or **DVI**. The DDC communication path is only enabled when set to **Analog** for an analog monitor, so certain advanced features of your analog monitor may only be enabled when routing DDC to **Analog**. The default setting is **DVI**.
- **Force IGD Primary**—This setting determines how the BIOS prioritizes video controllers when external video cards are present in the system. During POST, only one device can act as the video display device. When set to **Enabled**, the BIOS allows the integrated graphics device to remain the video display device. When set to **Disabled**, the BIOS allows an external graphics card, if present, to act as the default video display device. Note that even when set to **Disabled**, the integrated graphics device still acts as the video display device if it is the only one available in the system. The default setting is **Disabled**.

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- **ExpressCard Hot-Plug Resources**—This setting determines whether or not resource pre-allocation is **Enabled** or **Disabled** for the ExpressCard/34 port. When this setting is **Enabled**, the BIOS will pre-allocate memory space, I/O space, and PCI bus numbers for the ExpressCard/34 port, allowing non-PCI Express-aware operating systems to support hot-plugging ExpressCard/34 devices. When this setting is **Disabled**, no resources will be pre-allocated, and you may need to restart the OS when hot-plugging an ExpressCard/34 device. The default setting is **Enabled**.
- **Hot-Plug Bus Gap**—This setting determines the number of PCI buses that will be reserved by the BIOS for ExpressCard/34 PCI-PCI bridges that may be hot-plugged in the ExpressCard/34 slot. This setting is only applicable if **ExpressCard Hot-Plug Resources** is set to **Enabled**. The default value for this setting is **8** PCI buses.
- **I/O**—This setting determines the amount of I/O space, in bytes, that will be reserved by the BIOS for PCI-PCI bridges that may be hot-plugged in the ExpressCard/34 slot. This setting is only applicable if **ExpressCard Hot-Plug Resources** is set to **Enabled**. The default value for this setting is **4096** bytes of I/O space.
- **Memory**—This setting determines the amount of memory space, in bytes, that will be reserved by the BIOS for PCI-PCI bridges that may be hot-plugged in the ExpressCard/34 slot. This setting is only applicable if **ExpressCard Hot-Plug Resources** is set to **Enabled**. The default value for this setting is **32** megabytes of memory.
- **Pre-fetchable Memory**—This setting determines the amount of pre-fetchable memory space, in bytes, that will be reserved by the BIOS for PCI-PCI bridges that may be hot-plugged in the ExpressCard/34 slot. This setting is only applicable if **ExpressCard Hot-Plug Resources** is set to **Enabled**. The default value for this setting is **32** megabytes of pre-fetchable memory.

Security Menu

Use this menu to enable BIOS security options.

- **Set User Password**—This setting allows you to specify a password that must be entered to boot the system. To activate this feature, you must first specify a Supervisor password and enable the **Password on boot** feature. By default, no password is specified.
- **Set Supervisor Password**—This setting allows you to specify a password that must be entered to access the BIOS setup options. By default, no password is specified.

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- **Password on Boot**—This setting controls whether or not a password is required to boot the system. If enabled, the user must enter the User Password to boot the system. The default setting is **Disabled**.
- **Write Protect Boot Sector**—When set to **Yes**, this setting prevents modification of a hard disk boot sector via INT 13h services, which may help prevent certain computer viruses from infecting the controller. This setting does not prevent boot sector modification by 32-bit operating system drivers that access the hard disk directly. The default is **No**.

Boot Setup Menu

This screen displays the boot order of devices associated with the controller. The BIOS proceeds down the **Boot priority order list** in search of a bootable device. Devices under the **Excluded from boot order** list will not be used for booting. If the BIOS fails to find any bootable device, the message **`Operating System Not Found`** is displayed, and the system halts.

- **PCI SCSI**—A SCSI drive (hard disk drive or CD-ROM).
- **IDE HDD**—The internal hard drive.
- **USB HDD**—A USB based flash drive or hard disk drive.
- **USB CDROM**—A USB based CD-ROM drive.
- **USB FDC**—A USB based floppy disk drive.
- **PCI LAN**—A PXE Network boot device, if **PXE Network Boot** is enabled on the **Advanced** menu.

Exiting BIOS Setup

The **Exit** setup menu includes all available options for exiting, saving, and loading the BIOS default configuration. As an alternative to this screen, press <F9> to load BIOS default settings and <F10> to save changes and exit setup.

The **Exit** setup menu includes the following settings:

- **Exit Saving Changes**—Any changes made to BIOS settings are stored in the battery-backed System CMOS. The setup program then exits and reboots the controller.
- **Exit Discarding Changes**—Any changes made to BIOS settings during this session of the BIOS setup program are discarded. The setup program then exits and boots the controller without rebooting first.

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- **Load Setup Defaults**—This setting restores all BIOS settings to the factory default. This is useful if the controller exhibits unpredictable behavior due to an incorrect or inappropriate BIOS setting. Notice that any nondefault settings such as boot order, passwords, and keyboardless operation are restored to their factory defaults. This may produce undesirable behavior, and in heavily customized cases, may cause the controller to malfunction or fail to boot.
- **Discard Changes**—Any changes made to BIOS settings during this session of the BIOS setup program are discarded. Unlike **Exit Discarding Changes**, however, the BIOS setup continues to be active.
- **Save Changes**—Changes made to BIOS settings during this session are committed to battery-backed System CMOS. The setup program remains active, allowing further changes.

System CMOS

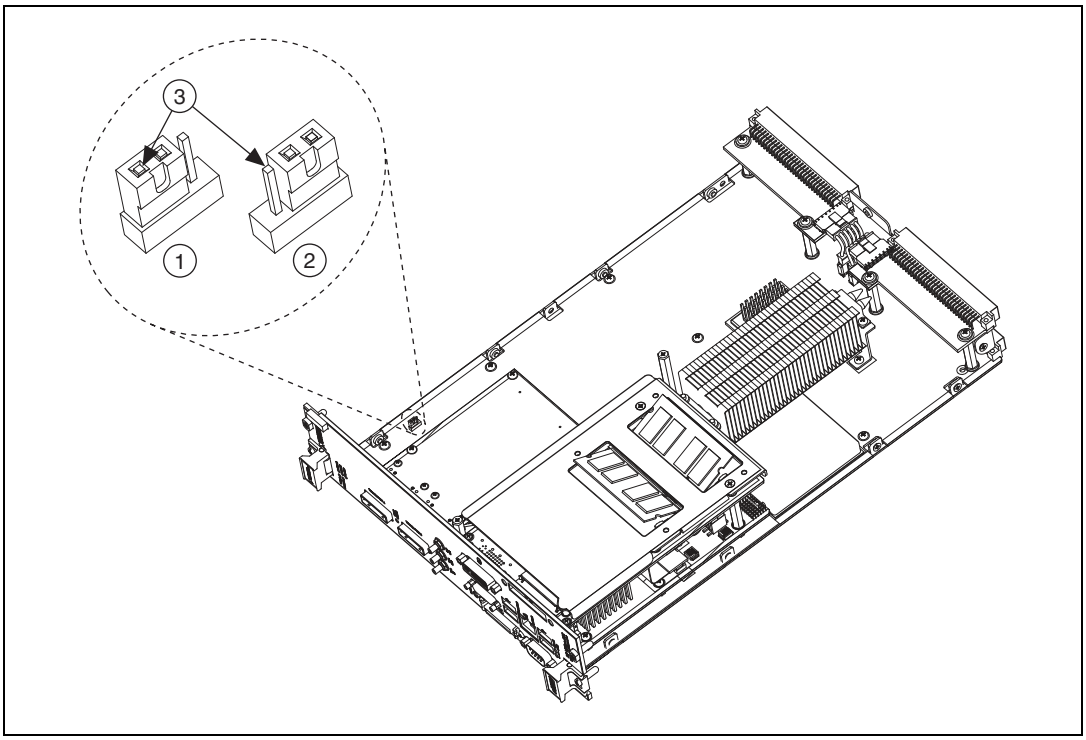
The NI VXIpc-882 contains a backed-up memory used to store BIOS configuration information.

Complete the following steps to clear the CMOS contents:

1. Power off the chassis.
2. Remove the controller from the chassis.
3. Move the jumper on W1 from pins 1–2 to pins 2–3, as shown in Figure 3-10.
4. Wait one second. Move the jumper back to pins 1–2.
5. Reinstall the controller in the chassis.

Caution Do *not* leave the jumper on pins 2–3. Doing so decreases battery life. In addition, leaving the jumper on the pins prevents the controller from booting.

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1	Normal Operation (Default)	2	Clear CMOS Contents	3	Pin 1

Figure 3-10. Clearing the CMOS Contents

Software Configuration

Measurement and Automation Explorer (MAX)

Measurement and Automation Explorer (MAX) is the utility for configuring most National Instruments hardware and software. You can use this utility to configure your NI VXIpc-882 controller's various software and hardware features.

The following sections describe hardware configuration settings available with NI-VXI 3.6. If you are using a later version of NI-VXI, you may find some differences between your settings and those described in this section.

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Default MAX Settings

The **General** tab for the VXIpc MAX hardware configuration contains two options for quickly configuring your VXIpc controller. You can use the **Quick Configuration** table to select from a few commonly used configurations. The default setting lists **Current Board Configuration**, which means the current hardware configuration is set according to the last user modifications made. Table 3-7 lists the configurations you can select.

Table 3-7. VXIpc MAX General Tab Settings

Menu Selection	Explanation
Current Board Configuration	(Default) Last configuration loaded
LA 5 Message Based	Sets controller to message-based device at logical address 5
LA 5 Register Based, Shared RAM	Sets controller to register-based device at logical address 5, sharing RAM
Share 128 KB of Memory	Shares 128 KB of RAM

Note Whenever you open the hardware configuration, MAX reports that the VXIpc is in **Current Board Configuration**. This means that if you select one of the common configurations such as **LA 5 Message Based** and save the configuration, the next time you open MAX, it will not report that the **Current Board Configuration** is **LA 5 Message Based** as you might expect. If you have used a common configuration setting, closed and reopened MAX, and want to verify the current VXIpc configuration, you must check each tab for the current controller configuration.

In MAX, you can load a VXIpc configuration from a file or save the current configuration for future use. You may execute this option by selecting one of the options in the **General** tab in the MAX hardware configuration.

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You can use the **Device** tab to set some basic VXI properties of your device. Table 3-8 lists the default settings for this tab on your VXIpc controller.

Table 3-8. VXIpc MAX Device Tab Default Settings

Setting	Default Value
Logical Address	0
Device Class	Message Based
Interrupt Configuration: Number of Handlers	1

You can use the **Shared Memory** tab to configure the amount of memory you make available to the VXI bus. Table 3-9 lists the default settings for this tab on your VXIpc controller. The default setting on the controller is to share no system RAM. After you select one of the shared RAM options, you can select the amount of RAM you want to share.

Table 3-9. VXIpc MAX Shared Memory Tab Default Settings

Setting	Default Value
Shared Memory	Do Not Share Memory

You can use the **VXI bus** tab to set various configurations related to VXI bus control. Table 3-10 lists the default settings for this tab on your VXIpc controller.

Table 3-10. VXIpc MAX VXI Bus Tab Default Settings

Setting	Default Value
Bus Settings: Bus Timeout	500 µs
Bus Requester: Release on Request	Checked
Bus Requester: Request Level	3
Bus Requester: Operate as Fair Requester	Checked
Bus Arbitration: Prioritized	Checked

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You can use the **PCI tab** to set various configurations associated with the PCI resources your VXI interface uses. Table 3-11 lists the default settings for this tab on your VXIpc controller.

Table 3-11. VXIpc MAX PCI Tab Default Settings

Setting	Default Value
User Window: Enable Low-Level Register Access API Support	Checked
User Window Size	2 MB
DMA Setting: Enable DMA on this Controller	Enabled

You can use the SMB tab to configure the options associated with the SMB connectors on the front panel of your VXIpc controller. Table 3-12 lists the default settings for this tab on your VXIpc controller.

Table 3-12. VXIpc MAX SMB Tab Default Settings

Setting	Default Value
Clock 10 Settings: Enable 50 Ohm Termination	Not Checked

VXI-MXI-2 Default Settings

This section summarizes the software default settings for the VXI-MXI-2. This information is included for your convenience in case you have any of these modules in your system.

Table 3-13. VXI-MXI-2 General Tab Default Settings

Setting	Default Value
Common Board Configurations	Current Board Configuration

Table 3-14. VXI-MXI-2 Device Tab Default Settings

Setting	Default Value
Logical Address Selection	Use DIP Switch to Set the Logical Address
Shared Memory: Address Space	A24

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Table 3-14. VXI-MXI-2 Device Tab Default Settings (Continued)

Setting	Default Value
Shared Memory: Requested Memory	16 KB
Operate in Interlocked Mode	Checked

Table 3-15. VXI-MXI-2 MXI-2 Bus Tab Default Settings

Setting	Default Value
Bus Settings: Bus Timeout	1 ms
System Controller	Auto Detect
Advanced: Bus Protocols: MXI Transfer Limit	Unlimited
Advanced: Bus Protocols: Perform Parity Checking	Checked
Advanced: MXI-2 CLK 10 Signal	Receive

Table 3-16. VXI-MXI-2 VXI Bus Tab Default Settings

Setting	Default Value
Bus Settings: Bus Timeout	125 µs
Bus Requester: Release on Request	Checked
Slot 0 Configuration: Auto-Detect (Recommended)	Checked
Advanced: Bus Protocols: Transfer Limit	256
Advanced: Bus Arbitration: Arbiter Type: Priority	Checked
Advanced: Bus Arbitration: Operate as Fair Requester	Checked

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Table 3-16. VXI-MXI-2 VXI Bus Tab Default Settings (Continued)

Setting	Default Value
Advanced: Bus Arbitration: Enable Arbiter Timeout	Checked
Advanced: Bus Arbitration: Request Level	3

PCI-MXI-2 Default Settings

This section summarizes the software default settings for the PCI-MXI-2. This information is included for your convenience in case you have any of these modules in your system.

Table 3-17. PCI-MXI-2 General Tab Default Settings

Setting	Default Value
Common Board Configurations	Current Board Configuration

Table 3-18. PCI-MXI-2 Device Tab Default Settings

Setting	Default Value
Logical Address	0
Device Class	Message Based
Interrupt Configuration: Number of Handlers	1

Table 3-19. PCI-MXI-2 Shared Memory Tab Default Settings

Setting	Default Value
Share Memory in A32 Space	Selected
Shared Memory: Shared RAM Size	2 GB
Shared Memory: Reserve Physical Memory (KB)	0

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Table 3-19. PCI-MXI-2 Shared Memory Tab Default Settings (Continued)

Setting	Default Value
Advanced: Lower Half Window: Map Lower Half To	System Memory
Advance: Upper Half Window: Map Upper Half To	System Memory

Table 3-20. PCI-MXI-2 MXI-2 Bus Tab Default Settings

Setting	Default Value
Bus Settings: Bus Timeout	1 ms
System Controller	Auto Detect
Advanced: Bus Protocols: Enable MXI-2 Auto Retry	Checked
Advanced: Bus Protocols: Enabled A24/A32 Write Posting	Checked
Advanced: Bus Protocols: MXI Transfer Limit	256
Advanced: MXI-2 CLK 10 Signal	Receive

Table 3-21. PCI-MXI-2 PCI Tab Default Settings

Setting	Default Value
User Window: Enable Low-Level Register Access API Support	Checked
User Window: User Window Size	64 KB
Enable PCI Expansion ROM	Checked
DMA Setting	Enable DMA on this Controller

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Front Panel SMB ExtClk Setup

The NI VXIpc-882 computers have an SMB connector on the front panel for an external clock. Onboard programmable logic can configure the NI VXIpc-882 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. Refer to the *VXIbus CLK10 Routing* section for information on properly configuring the hardware to use the CLK10 routing feature of the NI VXIpc-882.

Front Panel SMB TRIGIN/TRIGOUT

The NI VXIpc-882 gives programmers full hardware and software control over the VXI trigger lines. The NI VXIpc-882 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 NI VXIpc-882 VXI interface to the outer rows of the P2 backplane connector in a single chip. The NI VXIpc-882 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.

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

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4

Developing Your Application

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

After installing the NI-VXI software, you can begin developing your VXI/VME application. Be sure to check the release notes for the latest application development notes and changes.

NI-VXI, NI-VISA, and Related Terms

Before you develop your application, it is important to understand the difference between *NI-VXI*, *NI-VISA*, and similar terms:

- *NI-VXI* is the software package that ships with National Instruments VXI and VME controllers. NI-VXI includes Measurement & Automation Explorer (MAX), NI-VISA, NI Spy, Resource Manager (Resman), VXI device drivers, and other utilities for configuring and controlling your VXI or VME system.
- *NI-VISA* is the native API for communicating with VXI/VME devices. NI-VISA is the National Instruments implementation of the VISA I/O standard, which is a common interface to many types of instruments (such as VXI, GPIB, PXI, Serial, TCP/IP, and so on). NI-VXI is optimized for use through NI-VISA, and we recommend using NI-VISA to develop all new VXI/VME applications.
- The *NI-VXI API* is an optional development environment that is not part of the default NI-VXI installation. The NI-VXI API was developed before NI-VISA; while NI-VXI still supports the NI-VXI API, we recommend using NI-VISA for all new VXI/VME applications. If you must develop an application using the older NI-VXI API, run the NI-VXI installer and select the appropriate option in the custom installation screen. Be sure to review the *NI-VXI API Notes* section later in this chapter.
- The *NI-VXI compatibility layer* allows older programs that use the NI-VXI API to communicate with VXI devices through VISA. Using this compatibility layer, older programs can run in NI-VXI 3.0 or later without being rewritten to use the VISA interface. This layer installs with NI-VXI by default. It should be completely transparent and

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provide a high level of performance; however, there may be some slight changes in behavior for certain applications.

Your software features several system development utilities including MAX, Resman, NI Spy, VISA Interactive Control (VISAIC), and VXI Interactive Control (VIC, optional). You can also access help and a variety of examples to learn how to use NI-VXI for certain tasks.

Each component assists you with one of four development steps: configuration, device interaction, programming, and debugging.

You can access the utilities, help files, and release notes through the Windows **Start** menu by opening the **National Instruments»VXI** or **National Instruments»VISA** program groups.

Configuration

The configuration utilities in your software kit are Resman and MAX.

Resman performs VXI Resource Manager functions as described in the VXIbus specification. Resman configures all devices on the VXI backplane for operation and allocates memory for devices that request it. Resman does not require you to specify any settings; it automatically performs the VXI resource management whenever you run it.

Note Power cycling resets all devices, so you must run Resman to reconfigure your system every time you cycle the power on the chassis.

MAX presents a graphical display of your entire test and measurement system to help you configure various components. When you launch MAX, you see all your devices (including VXI) on the screen. You can view the properties (such as logical address, address space, and so on) of each device by clicking the device in the configuration tree. To see additional configuration options for a given device, right-click the device in the configuration tree. When you access the properties of most National Instruments devices by right-clicking, you can configure the hardware settings by selecting **Hardware Configuration**.

MAX and Resman are designed to work together. You can run Resman through MAX by either clicking the **Run VXI Resource Manager** button in the toolbar or right-clicking a specific VXI system on which to run Resman (refer to Figure 4-1). You can also select **Tools»NI-VXI»VXI Resource Manager** to run Resman on all VXI systems. From the **VXI Options** dialog in the **Tools»NI-VXI** menu, you can also use MAX to

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configure Resman to run on all VXI systems automatically when the computer boots. Resman reports to MAX all errors it finds in your system; when you view your VXI system in MAX, you can easily spot any errors that Resman found while configuring the system.

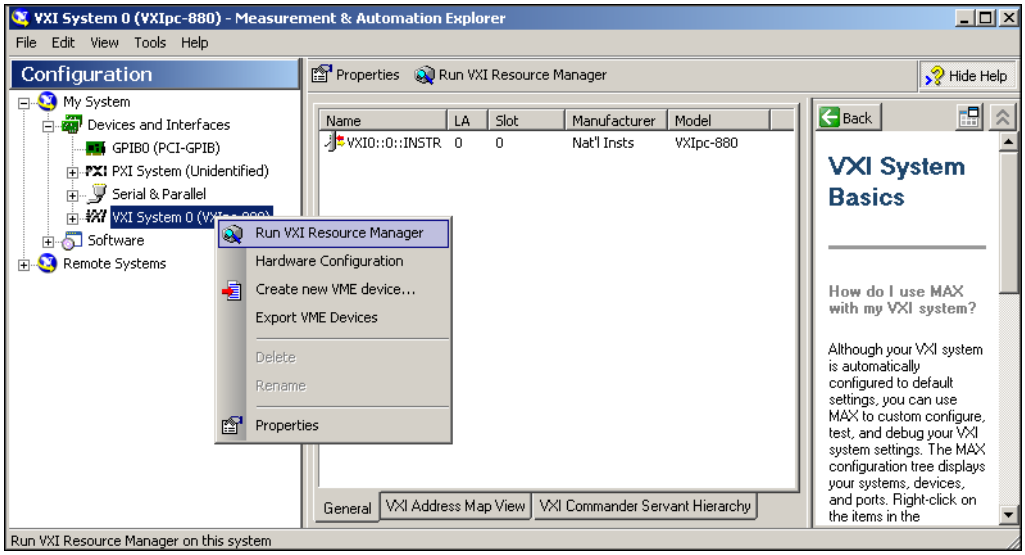


Figure 4-1. Right-Click a VXI System in MAX to Run Resman on that System

After Resman detects and configures all your VXI/VME devices, you can use MAX to view specific information about each device in your system. The default MAX view of a VXI system shows the **General** tab window, which contains a summary of key information about each device, including its device name, logical address, model name, and other data.

For more information about MAX, refer to its help by selecting the **Help**» **Help Topics** menu.

Device Interaction

You can interact with your VXI/VME devices using the VISA Interactive Control (VISAIC) utility. VISAIC allows you to control your VXI/VME devices without using a conventional programming language, LabVIEW, or Measurement Studio. You can also control your devices in MAX by right-clicking a device name and selecting **Open VISA Session**.

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Note You can also use VXI Interactive Control Program (VIC) to control your VXI/VME devices and develop and debug VXI application programs. VIC is not included in the default NI-VXI installation; to install it, select **NI-VXI API Development** from the custom installation screen in the installer.

You can launch VISAIC (or VIC) from the **Tools** menu in MAX or from the **VISA** or **VXI** subgroups in **Start»Programs»National Instruments**.

Try the following in VISAIC: In the tree view, navigate using your mouse to the VISA resource for your controller—probably **VXI1::0::INSTR**, representing the VXI system 1, logical address 0 instrument resource (refer to Figure 4-2).

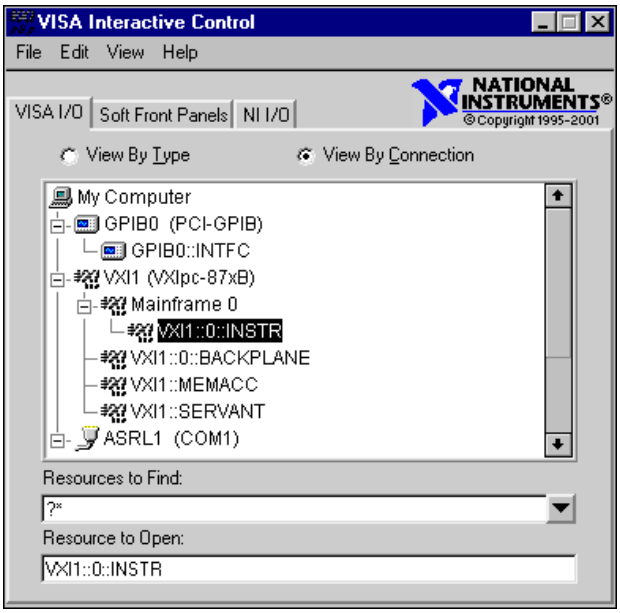


Figure 4-2. Select Your Controller in VISAIC

Open the selected resource and navigate to the **Register I/O** tab. In this tab, you can read registers on your device, such as the VXI device configuration registers. Execute the **viIn** operation (called **In** in LabVIEW compatibility mode) with the default parameters. The **Data Value** field shows the I/O operation result, such as `0x9ff6`. The **Return Value** field shows the function status, such as `0` for `VI_SUCCESS` (see Figure 4-3).

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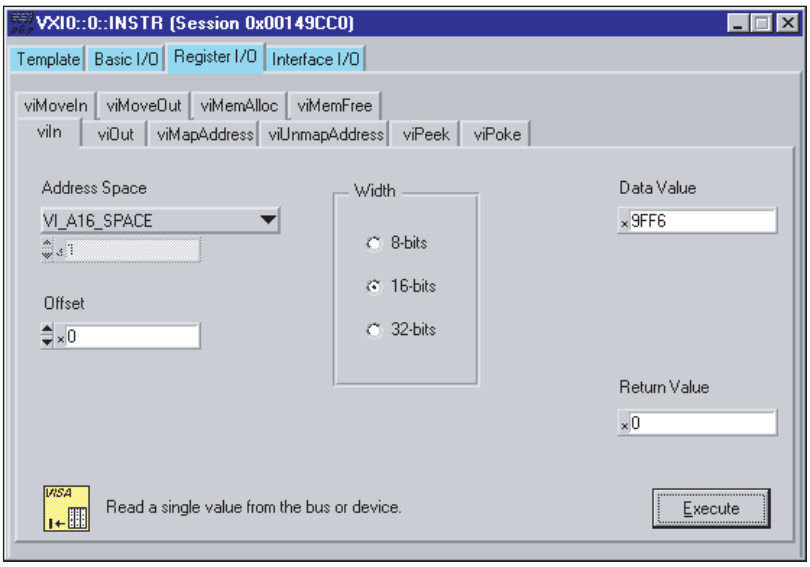


Figure 4-3. Successful viIn Access in the VISAIC Register I/O Tab
(This Dialog Box May Look Slightly Different for LabVIEW Users)

If the data value ends in `ff6`, you have successfully read the National Instruments manufacturer ID from your VXI/VME controller's ID register.

You may now want to read the configuration registers from other VXI devices in your system by opening the devices in VISAIC. Try reading a register from each device listed in the MAX view of your VXI system. This way, you can verify that your VXI controller can access each device in your VXI system successfully.

You can also access VXI and VME devices configured in A16, A24, or A32 space by opening the VXI MEMACC resource, which is VISA's representation of VXI memory. For more information about VISAIC operations and commands, refer to the help in the **Help** menu and the context-sensitive help (such as **What's This?**) available by right-clicking in any panel.

Programming for VXI

NI-VISA and the NI-VXI API are the two National Instruments programming interfaces for accessing your VXI/VME instruments. With NI-VXI 3.0 or later, NI-VISA is the native API for communicating with a VXI or VME system, and we recommend using it for all new applications.

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Older programs that use the NI-VXI API now use the NI-VXI-to-NI-VISA compatibility layer to communicate with the VXI devices. Using this layer, older programs can run in NI-VXI 3.0 or later without being rewritten to use the VISA interface. For more information about programming with NI-VISA, refer to the *NI-VISA Help*, which you can find at `ni.com/support`.

Note The NI-VXI API development environment is not installed by default as part of the NI-VXI installation. If you must develop an application using the older NI-VXI API, run the NI-VXI installer and select the appropriate option in the custom installation screen. Be sure to review the *NI-VXI API Notes* section later in this chapter.

NI-VISA is the National Instruments implementation of the VISA API as the VXI*plug&play* standard defines. It provides a common interface to many types of instruments (such as VXI, GPIB, PXI, Serial, TCP/IP, and so on) and therefore is especially useful in situations where you are using multiple types of instruments.

Both NI-VISA and the NI-VXI API include functions for register-level access to VXI instruments and messaging capability to message-based devices. You can also use either interface to service asynchronous events such as triggers, signals, and interrupts, and also assert them. Compatibility with the NI-VXI API is included for legacy applications only—we recommend that you write all new VXI/VME applications in VISA.

The best way to learn NI-VISA programming is by reviewing the example programs your software includes. The examples directory contains working VISA programs that illustrate many different types of applications. You can find these examples in the `VXIpnp\WinNT\NIvisa\Examples` directory.

If you are just getting started, you should learn how to access registers with high-level calls and send messages with word-serial functions. The NI-VISA examples for these tasks are `HighReg.c` and `RdWrt.c`. Refer to the other examples as you try more advanced techniques. Consult the *NI-VISA Help* for additional information on these topics.

Table 4-1 summarizes the topics the example programs address. All files are in the `<root directory>\Program Files\National Instruments\VXI\NIVXI API` directory, in the subdirectories listed in Table 4-1.

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Table 4-1. NI-VISA/NI-VXI Examples

Coverage	NI-VISA Example	NI-VXI Example (Optional)
Message-Based Access	`RdWrt.c`	`VXIws.c`
High-Level Register Access	`HighReg.c`	`VXIhigh.c`
Low-Level Register Access	`LowReg.c`	`VXIlow.c`
Sharing Memory	`ShareSys.c`	`VXImem.c`
Interrupt Handling	`AsyncIntr.c` and `WaitIntr.c`	`VXIint.c`
Trigger Handling	`WaitTrig.c`	`VXItrig.c`

Note MAX includes configuration options that affect low-level functions and shared memory, as well as trigger mappings and other attributes of your VXI system. Refer to the *MAX Help* for information regarding these options.

Optimizing Large VXIbus Transfers

For best performance, keep the following in mind when using `viMove()` or `VXImove()`:

- Make sure your buffers are 32-bit aligned.
- Transfer 32-bit data whenever possible.
- Use VXI block access privileges to significantly improve performance to devices that are capable of accepting block transfers.
- To optimize move performance on virtual memory systems, lock the user buffer in memory yourself so the move operation does not need to lock the buffer.
- To optimize move performance on paged memory systems, use a contiguous buffer so the move operation does not need to build a scatter-gather list for the user buffer.

Note `viMemAlloc()` or `VXImemAlloc()` returns 32-bit aligned, page-locked, contiguous buffers which work efficiently with the move operations.

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Shared Memory

In the **Hardware Configuration** settings for your controller in MAX, you can share memory from your embedded controller on the VXI/VME bus. Right-click any setting or consult the MAX help for more information. You can access shared memory on your computer using `viMemAlloc()` in VISA (or `VXImemAlloc()` in the NI-VXI API).

NI-VXI API Notes

The following notes apply only if you are using the NI-VXI API. We recommend that all new VXI/VME applications use the NI-VISA API, but you can still develop with the older NI-VXI API for compatibility with legacy code.

Compiler Symbols

You may need to define certain compiler symbols so that the NI-VXI library can work properly with your program. The required symbol indicates your operating system platform; for example, `VXINT` designates the application as a Windows 7/Vista/XP/2000/Me/9x/NT application.

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

The additional symbol `BINARY_COMPATIBLE` is optional. It ensures that the resulting application is binary compatible with other National Instruments VXI controllers using the same operating system. This symbol may cause a slight performance degradation when you use low-level VXIbus access functions.

You can define these symbols using `#define` statements in your source code or using the appropriate option in your compiler (typically either `-D` or `/D`). If you use `#define` statements, they must appear in your code before the line that includes the NI-VXI API header `nivxi.h`.

Compatibility Layer Options

Although NI-VXI supports multiple VXI controllers through NI-VISA, the NI-VXI API supports only a single controller. To specify which controller the emulation layer should use, run MAX. Select **Tools»NI-VXI»VXI Options**. Select the VXI system that will support the emulation layer.

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In NI-VXI 3.0 or later, when you enable for triggers or interrupts, only the local controller is enabled. In the NI-VXI API functions for enabling triggers and interrupts, the controller parameter is ignored. If you need to enable a remote controller for triggers, use the MAX frame resource to map the trigger back to the local controller.

The interrupt and trigger routing in the NI-VXI 3.0 or later low-level drivers is somewhat different from the default routing in previous versions of NI-VXI. Therefore, the compatibility layer may behave differently than the original NI-VXI API with regard to these settings. In particular, if you are receiving triggers on an external controller, you may need to modify the trigger configuration on your extender module using MAX. In general, interrupts are routed automatically based on the interrupt configuration the resource manager detects. Whether the changed routing behavior affects your program is application dependent.

Because VISA is an instrument-centric API, certain functions from the more controller-centric NI-VXI API do not match perfectly with a VISA counterpart. When an application enables an event with the NI-VXI API compatibility layer, each logical address is enabled for that event separately. For example, if the application enables an interrupt level, VISA will enable the interrupt on each logical address, one at a time, until all the devices are enabled. This means that some interrupts could be lost from devices with higher numbered logical addresses. MAX provides an option for users to pick which logical address is enabled first. Select **Tools»NI-VXI»VXI Options**. Set **Prioritized Signal LA** to the logical address of the device that generates the events. This prevents possible loss of events from that device.

Debugging

NI Spy and VISAIC are useful utilities for identifying the causes of problems in your application.

NI Spy tracks the calls your application makes to National Instruments programming interfaces, including NI-VISA, NI-VXI, and NI-488. NI Spy highlights functions that return errors, so during development you can quickly spot which functions failed during a program's execution. NI Spy can log the calls your program makes to these drivers so you can check them for errors at your convenience, or use the NI Spy log as a reference when discussing the problem with National Instruments technical support. Figure 4-4 shows an example of a normal error returned from a call to `viMemAlloc` when no memory has been shared.

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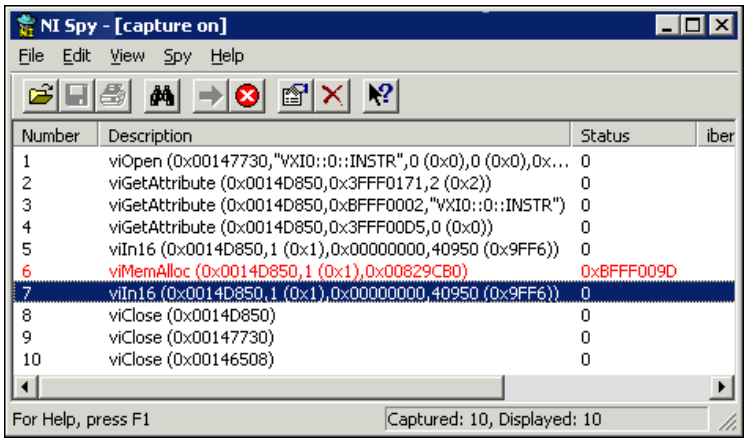


Figure 4-4. NI-Spy

VISAIC, discussed in the *Device Interaction* section of this chapter, is an excellent platform for quickly testing instruments and learning how to communicate with them. Refer to the *NI-VISA Help* for more information about using VISAIC.

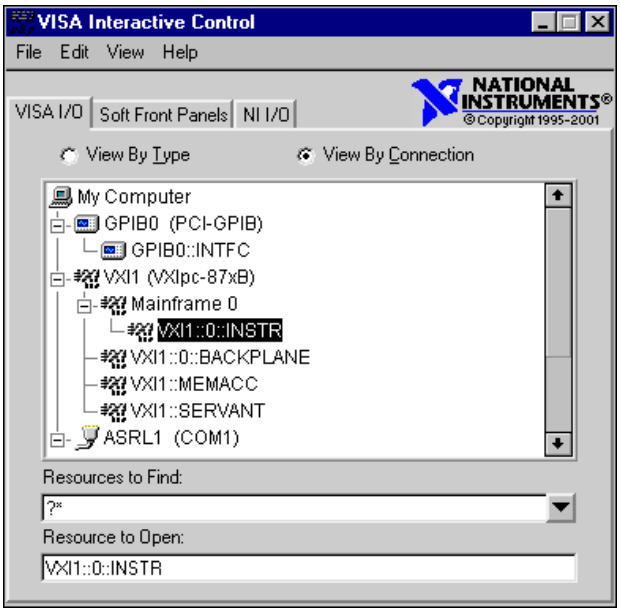


Figure 4-5. VISAIC

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5

I/O Information

Front Panel Connectors

Table 5-1 lists various peripherals and their corresponding NI VXIpc-882 external connectors, bus interfaces, and functions.

Table 5-1. NI VXIpc-882 Peripherals Overview

Peripheral	External Connector	Function
Video	24-pin D-SUB (standard DVI-I)	Integrated with Dynamic Video Memory
Serial	COM1 RS-232 serial port (9-pin D-SUB)	16550 serial port
Gigabit Ethernet	Ethernet, RJ45	Ethernet network connection
Parallel	Parallel Port IEEE 1284 Type C miniature	Extended capabilities
USB	4-pin High Speed receptacle (four ports)	Universal Serial Bus
Keyboard	USB	USB-style keyboard
Mouse	USB	USB-style mouse
VXI	TRIG IN, TRIG OUT, EXT CLK (three SMB connectors)	Routing VXI triggers to or from the backplane trigger bus; routing CLK10 to or from the VXI backplane
GPIB device	GPIB (IEEE 488.2) micro D25	General-Purpose Interface Bus
ExpressCard/34 device	One ExpressCard/34 slot	Interface for ExpressCard/34 devices

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DVI-I

Figure 5-1 shows the location and pinouts for the DVI-I connector on the NI VXIpc-882. Table 5-2 lists and describes the DVI-I connector signals.

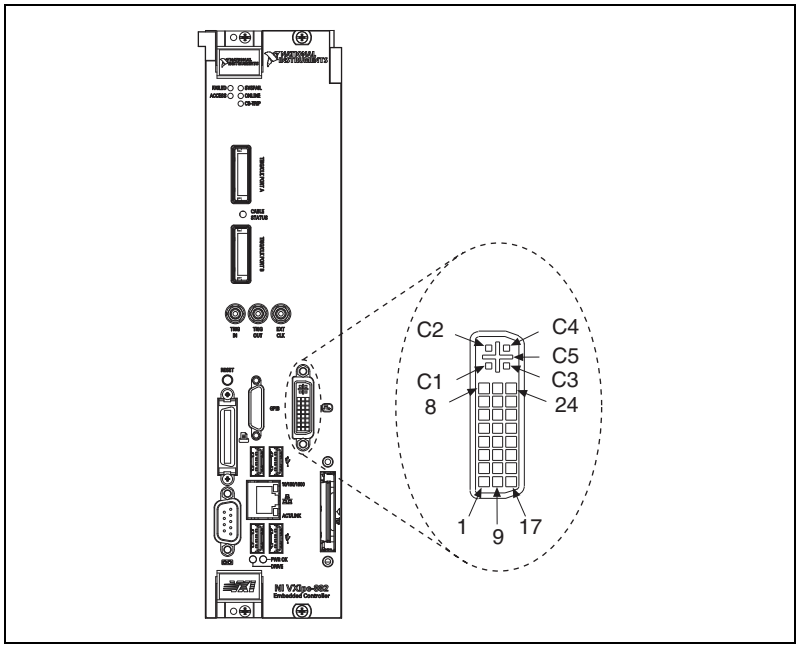


Figure 5-1. DVI-I Connector Location and Pinout

Table 5-2. DVI-I Connector Signals

Pin	Signal Name
1	TMDS Data2–
2	TMDS Data2+
3	TMDS Data2/4 Shield
4	Reserved
5	Reserved
6	DDC Clock [SCL]
7	DDC Data [SDA]
8	Analog vertical sync
9	TMDS Data1–

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Table 5-2. DVI-I Connector Signals (Continued)

Pin	Signal Name
10	TMDS Data1+
11	TMDS Data1/3 Shield
12	Reserved
13	Reserved
14	+5 V Power
15	Ground (for +5 V)
16	Hot Plug Detect
17	TMDS Data0–
18	TMDSData0+
19	TMDS Data0/5 Shield
20	Reserved
21	Reserved
22	TMDS Clock Shield
23	TMDS Clock+
24	TMDS Clock–
C1	Analog Red
C2	Analog Green
C3	Analog Blue
C4	Analog Horizontal Sync
C5	Analog GND Return: (analog R, G, B)

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COM1

Figure 5-2 shows the location and pinouts for the COM1 connector on the NI VXIpc-882. Table 5-3 lists and describes the COM1 connector signal.

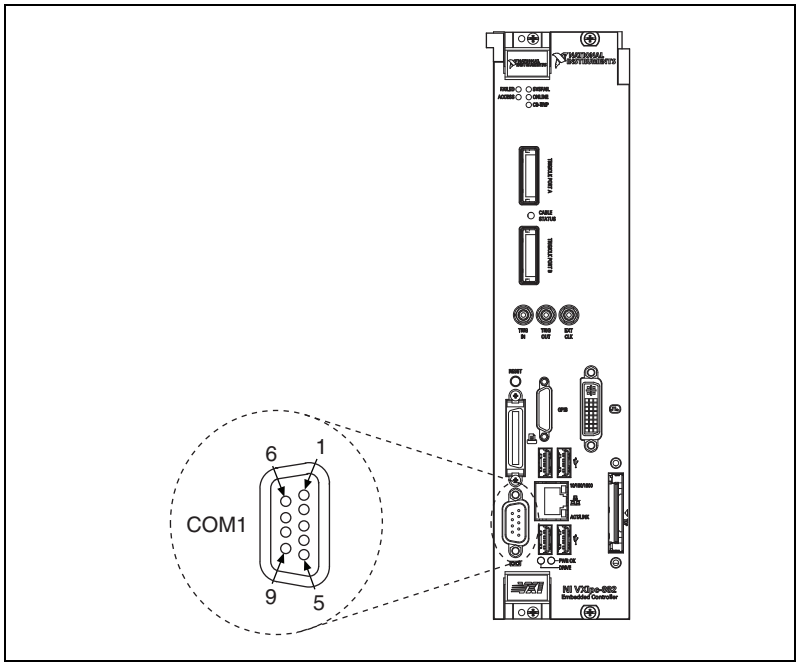


Figure 5-2. COM1 Connector Location and Pinout

Table 5-3. COM1 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

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Ethernet

Figure 5-3 shows the location and pinouts for the Ethernet connector on the NI VXIpc-882. Table 5-4 lists and describes the Ethernet connector signals.

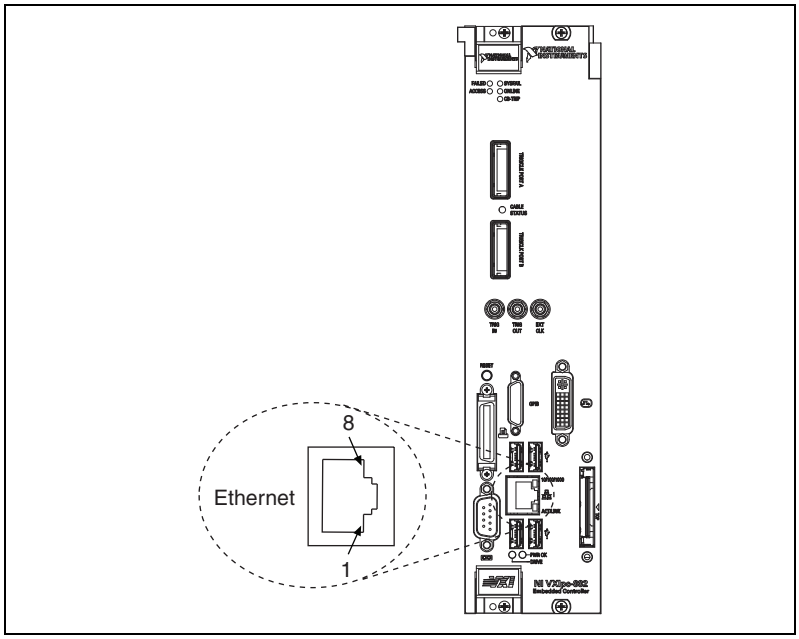


Figure 5-3. Ethernet Connector Location and Pinout

Table 5-4. Ethernet Connector Signals

Pin	Fast Ethernet	Gigabit Ethernet
1	TX+	TX_A+
2	TX–	TX_A–
3	RX+	RX_B+
4	NC	TX_C+
5	NC	TX_C–
6	RX–	RX_B–
7	NC	RX_D+
8	NC	RX_D–

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Note The Ethernet controller can perform automatic crossover, thus eliminating the need for crossover cables.

Table 5-5. 10/100/1000 LAN Connector LED States

LED	Color	LED State	Condition
Top	Green	Off	LAN link is not established.
		On (steady state)	LAN link is established.
		On (pulsing)	The controller is communicating with another computer on the LAN.
Bottom	Unlit	Off	10 Mbit/sec data rate is selected.
	Green	On	100 Mbit/sec data rate is selected.
	Orange	On	1000 Mbit/sec data rate is selected.

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Parallel Port

Figure 5-4 shows the location and pinouts for the IEEE 1284 (parallel) connector on the NI VXIpc-882. Table 5-6 lists and describes the IEEE 1284 connector signals.

Parallel port adapter cables are available from National Instruments, part number 777169-01.

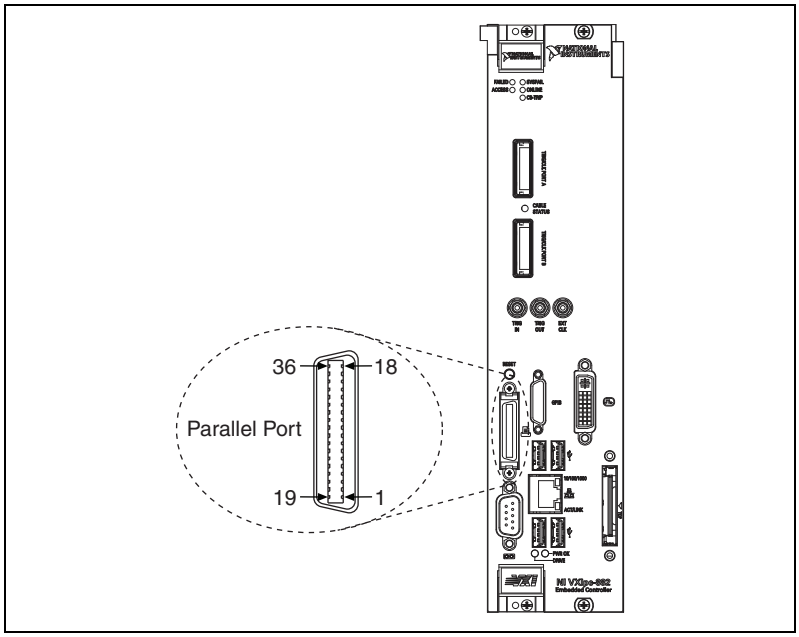


Figure 5-4. Parallel Port Connector Location and Pinout

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Table 5-6. Parallel Port Connector Signals

Pin	Default Configuration (LPT)	
	Signal Name	**Signal Description**
1	BUSY	Device Busy
2	SLCT	Select
3	ACK#	Acknowledge
4	FAULT#(ERROR#)	Fault
5	PAPEREND	Paper End
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	SLCTIN#	Select Input
17	AUTOFD#	Auto Line Feed
18	+5V	+5 V
19–35	GND	Ground
36	NC	Not Connected

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Universal Serial Bus

Figure 5-5 shows the location and pinouts for the Universal Serial Bus (USB) connectors on the NI VXIpc-882. Table 5-7 lists and describes the USB connector signals.

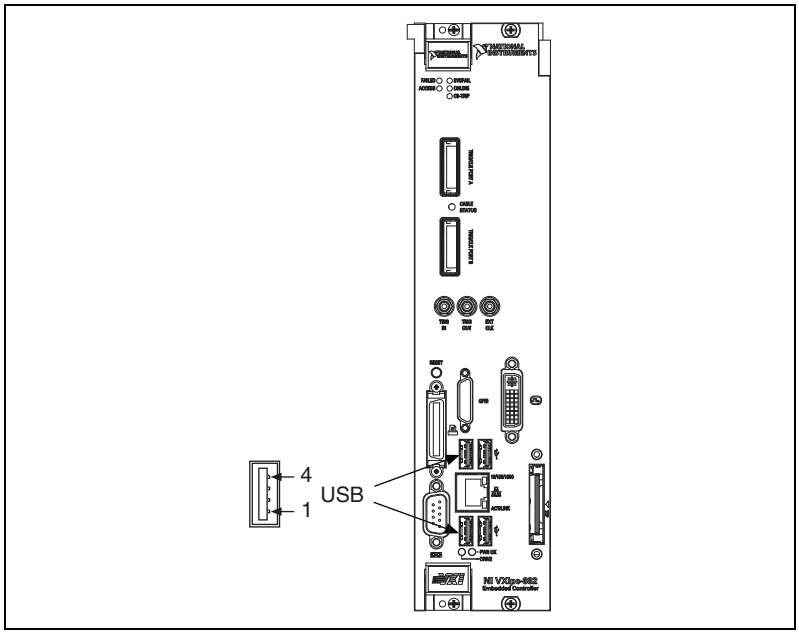


Figure 5-5. USB Connector Location and Pinout

Table 5-7. USB Connector Signals

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

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SMB TRIGIN/OUT and EXTCLK

The TRIG connectors are the software-controlled trigger connections for routing VXI triggers to or from the VXI backplane. For more information, refer to the *Front Panel SMB TRIGIN/TRIGOUT* section of Chapter 3, *Configuration and Default Settings*.

Figure 5-6 shows the TRIG connector locations on the NI VXIpc-882. Table 5-8 lists and describes the trigger connector signals.

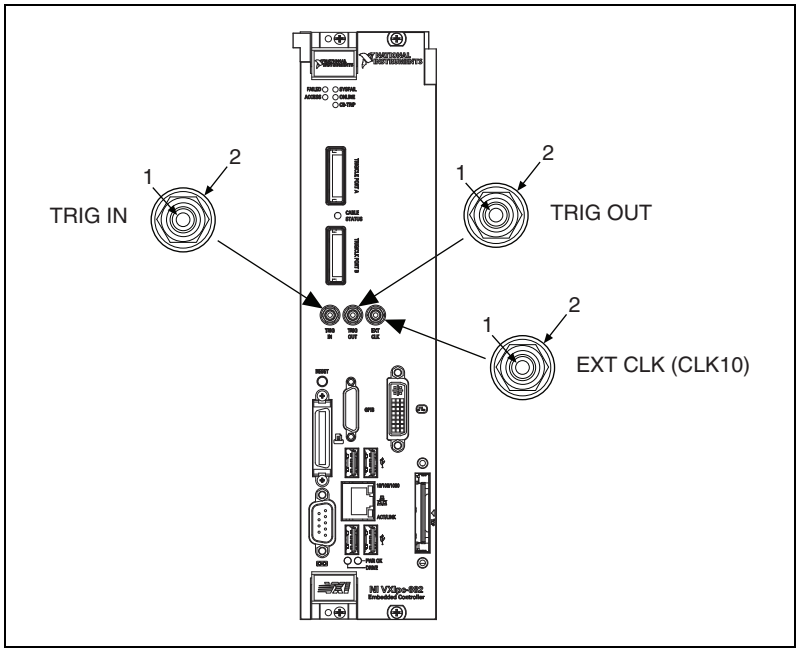


Figure 5-6. SMB Connector Location and Pinout

Table 5-8. TRIG/CLK Connector Signals

Pin	Signal Name	Signal Description
1	SIGNALCONDUCTOR	Trigger/CLK
2 (Shield)	GND	Ground

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GPIB (IEEE 488.2)

Figure 5-7 shows the location and pinouts for the GPIB connector on the NI VXIpc-882. Table 5-9 lists and describes the GPIB connector signals.

National Instruments provides a GPIB mating connector, part number 183285-0R2.

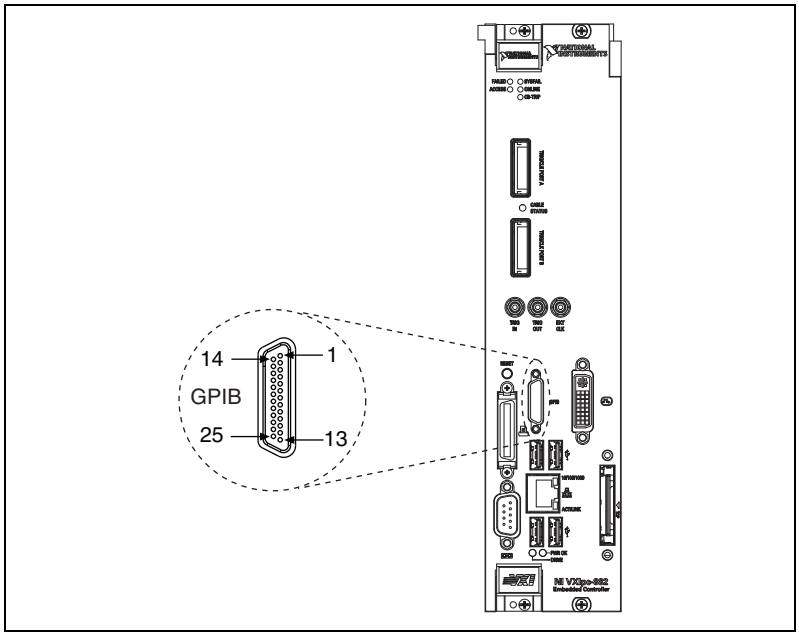


Figure 5-7. GPIB Connector Location and Pinout

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Table 5-9. 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

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ExpressCard/34 Slot

The NI VXIpc-882 controller is equipped with an ExpressCard/34 slot on the front panel, which provides I/O expansion and options for removable storage, Ethernet, and a variety of other I/O.

Figure 5-8 shows the location and pinouts for the ExpressCard/34 slot on the NI VXIpc-882. Table 5-10 lists and describes the ExpressCard/34 connector signals.

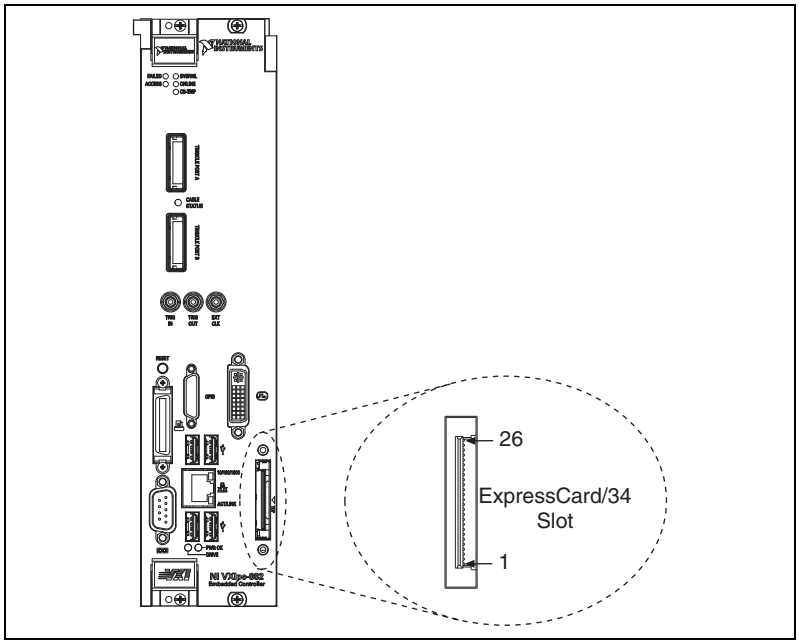


Figure 5-8. ExpressCard/34 Slot Location and Pinout

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Table 5-10. ExpressCard/34 Connector Signals

Pin	Signal Name	Signal Description
1	GND	Ground
2	USBD–	USB Data –
3	USBD+	USB Data +
4	CPUSB#	USB Presence
5	RESERVED	Reserved by spec for future use
6	RESERVED	Reserved by spec for future use
7	SMBCLK	SMBus Clock
8	SMBDATA	SMBus Data
9	+1.5V	Power
10	+1.5V	Power
11	WAKE#	PE Wake
12	+3.3VAUX	Power
13	PERST#	PE Reset
14	+3.3V	Power
15	+3.3V	Power
16	CLKREQ#	Clock Request
17	CPPE#	PE Presence
18	REFCLK–	Reference Clock –
19	REFCLK+	Reference Clock +
20	GND	Ground
21	PERn	PE Data Receive –
22	PERp	PE Data Receive +
23	GND	Ground
24	PETn	PE Data Transmit –
25	PETp	PE Data Transmit +
26	GND	Ground

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Front Panel Features

The NI VXIpc-882 has the following front-panel features:

- A system reset pushbutton (hold the button for at least 2 seconds to generate a reset to the controller)
- Eight front-panel LEDs that show PC status:
  - **FAILED**—Indicates the NI VXIpc-882 controller failed power on diagnostics.
  - **SYSFAIL**—Indicates the VMEbus SYSFAIL line has been asserted on the backplane.
  - **ONLINE** —Indicates the board is detected and ready for use.
  - **ACCESS** indicates the VXI bus master is active.
  - **CB**—Indicates the circuit breaker has tripped from an over current condition on the +5.0 V_{DC} rail of the NI VXIpc-882 controller.
  - **PWR OK**—Indicates the on board power supplies are in regulation.
  - **DRIVE**—Indicates the hard drive is being accessed.

Data Storage

The NI VXIpc-882 has a SATA hard drive (at least 80 GB).

You can add additional data storage capacity with a USB DVD/CD-ROM drive or USB floppy drive. Contact National Instruments to purchase these devices.

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6

Common Questions and Troubleshooting

This chapter addresses many common questions about the NI VXIpc-882 controller and includes information for troubleshooting common problems you may encounter. If you cannot find the answer to the specific question or problem you have, visit the VXI support page at `ni.com/support`.

General Questions

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

You can view these parameters in the BIOS setup. To enter the BIOS setup, reboot the NI VXIpc-882 and press <Delete> during the memory tests. Refer to the *BIOS Configuration* section of Chapter 3, *Configuration and Default Settings*, for more information.

Operating System, Drivers, and Software

What important files and directories are preinstalled on my hard drive?

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

In the `images` directory itself, you will find a `manuals` directory, an `os` directory, and directories for each computer peripheral or installed driver.

The `manuals` directory contains quick reference guides, technical reference manuals, and National Instruments software manuals, all in Adobe Acrobat format. To access any manual, change your directory to `c:\images\manuals` and list the contents of that directory. For copies of other National Instruments product manuals, visit `ni.com/manuals`.

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The rest of the directories correspond to each peripheral in your system. Within each of these directories are the drivers for the peripherals. These files and directories are copied exactly from the manufacturer distribution disks, so the naming conventions vary from peripheral to peripheral. You can find copies of these peripheral drivers on the VXI support page at `ni.com`.

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

How do I install or reinstall the video driver?

Refer to the `Drivers.txt` file on the hard drive or recovery CD-ROM.

How do I install or reinstall the Ethernet driver?

Refer to the `Drivers.txt` file on the hard drive or recovery CD-ROM.

How do I install or reinstall the GPIB driver?

1. The best way to set up GPIB is to set up networking on your controller so you can access `ni.com` to download the latest drivers. You can access both drivers by going to the current **Drivers and Updates** page.
2. After these drivers are installed, go into the **Device Manager** in the **System Properties** window, delete the **PCI Bridge** and **PCI Communication Device** entries under **Other Devices**, and reboot the controller.
3. When the controller reboots, it correctly finds and installs the proper drivers for the GPIB adapter.

How do I install or reinstall the VXI and VISA drivers?

The best way to install NI-VXI and NI-VISA is to set up networking on your controller so you can access `ni.com` to download the latest drivers that support your controller. If you cannot access the network, copies of these drivers should be available in the `Images` directory on your hard drive.

After you obtain these drivers, uninstall any old versions of NI-VXI or NI-VISA and follow the installation instructions downloaded or included with the driver you want to install.

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How do I install software from a DVD/CD?

You have the following options:

- **USB DVD/CD-ROM**—Windows 7, Vista, and XP support USB mass storage devices. With most USB DVD/CD-ROM drives, once you plug the drive into the USB port, you should be able to access the drive through a drive letter.
- **Mapped network drive**—You can use the Ethernet to connect to another computer. If you share the CD-ROM drive on the other computer, you can map the shared CD-ROM drive to a drive letter on the NI VXIpc-882.

How do I flash a new BIOS?

Follow the instructions for upgrading your BIOS by executing a search for **VXI BIOS** at `ni.com/support`.

Where do I get the latest software and peripheral drivers?

You can download the latest drivers from `ni.com/support/vxisupp.htm`. For instructions on installing the latest peripheral drivers, execute a search for **VXI Peripherals** at `ni.com/support`.

Boot Options

What devices can I boot from?

The NI VXIpc-882 can boot from the following devices:

- The internal SATA hard drive.
- An external USB mass storage device such as a USB hard drive or CD-ROM.
- An external USB floppy drive.
- A network PXE server on the same subnet.

Note There are some limitations when booting from a USB device. Windows does *not* support booting from USB devices. Windows 7, Vista, and XP can be installed from a USB DVD/CD-ROM, but earlier versions of Windows cannot. The NI VXIpc-882 BIOS configures the USB devices so they will work in a DOS environment.

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How do I configure the controller to boot from these devices?

There are two methods:

- Enter Setup and select the **Boot** menu. You will see a list of all bootable devices, ordered by device type. You can set the boot order using <+> and <–>. Set the order by device type and set the order for the devices listed within the device type.
- To boot from a different device without permanently changing the boot order, press <F10> during POST. After the BIOS completes the POST and just before the controller boots the OS, the **Boot** menu is displayed. You can select the device type you want to boot from.

Hard Drive Recovery

The NI VXIpc-882 controller includes two methods of restoring the original factory condition of your hard drive. Hard drive-based recovery stores a factory backup on a separate portion of your hard drive allowing you to restore your controller without additional media. The NI VXIpc-882 controller also ships with an OS Recovery CD that allows you to reinstall your operating system onto your hard drive through an external DVD/CD-ROM. For more information on these tools, refer to the documentation on your hard drive in the `c:\Images\Recovery` directory or KnowledgeBase 2ZKC02OK: *Hard Drive Recovery and OS Installation for PXI and VXI Controllers* at `ni.com/support`.

Note Your system hot key is <F4>. To access the hard drive-based recovery tool, press and hold <F4> when video first appears during the boot process.

If you need to recover your factory-installed operating system from a DVD/CD, you can use the included OS re-installation CD with an external DVD/CD-ROM drive such as a USB DVD/CD-ROM drive. Boot the controller using the OS re-installation CD to recover the OS. You also may need to reinstall other software after using the CD to recover the OS.

Note Recovering the OS erases the contents of your hard disk. Back up any files you want to keep.

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Installing an OS

The NI VXIpc-882 controller includes a pre-installed OS. In some cases, you may want to install a different OS. When doing so, consider the following guidelines.

Installing from a DVD/CD-ROM

The NI VXIpc-882 controller supports the installation of Windows 7, Vista, and XP from a USB DVD/CD-ROM. However, many other operating systems do not support installation from a USB DVD/CD-ROM. For example, Windows 2000 aborts during the install process because it does not have drivers for the DVD/CD-ROM device.

With DOS drivers, you can install Windows 9*x* operating systems. However, only a few USB DVD/CD-ROM drives have DOS drivers.

As an alternative to a USB DVD/CD-ROM drive, you can use an external SCSI DVD/CD-ROM with a VXI-SCSI adapter.

Note For additional assistance with installing or changing an operating system, refer to KnowledgeBase 2ZKC02OK: *Hard Drive Recovery and OS Installation for PXI and VXI Controllers* at `ni.com/support`.

ExpressCard/34

This section provides information on the installation and removal of ExpressCard/34 modules.

Installing an ExpressCard/34

You can install an ExpressCard/34 module while the NI VXIpc-882 is running. The NI VXIpc-882 will automatically detect the card. ExpressCard/34s are generally marked with a symbol or a label to indicate which end to insert into the slot. The cards are keyed to prevent incorrect insertion.

To install an ExpressCard/34, complete the following steps.

1. Hold the card so the top side is facing left.
2. Insert the card until it is completely seated in its connector. The connector has an automatic eject mechanism. If you insert the card and it is ejected, simply re-insert the card until it is seated.

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If you encounter too much resistance, do not force the card. Check the card orientation and try again.

The NI VXIpc-882 will automatically recognize the ExpressCard/34 and load the appropriate driver(s). Third-party cards may require that you install additional drivers. Contact your ExpressCard/34 vendor for more information.

Caution The ExpressCard/34 interface is ESD sensitive. An electrostatic shock on the ExpressCard/34 module while it is inserted may cause the controller to lock-up or reboot.

Removing an ExpressCard/34

To remove the ExpressCard/34 module push in the module and then release to eject the card. Slide the card out of the slot.

Caution To avoid data loss and other potential issues, stop communication with your ExpressCard/34 device before removing it from the NI VXIpc-882. In Windows, use the Safely Remove Hardware tool to safely stop the ExpressCard/34.

Cables, Optional Hardware, and Main Power Fuse

How do I connect a standard 25-pin LPT cable to the NI VXIpc-882?

The NI VXIpc-882 uses a type C LPT connector. Most parallel port devices use a type A connector. To use a device with a standard type A LPT connector, you need to use a type C-to-type A LPT adapter. To order the adapter, refer to the online catalog at `ni.com`.

My NI VXIpc-882 does not have an internal floppy drive. Is there a way to use an external drive?

Yes. The NI VXIpc-882 controller supports and can boot from USB floppy drives.

The LPT port on the NI VXIpc-882 can also be configured through the BIOS setup for floppy signals instead of LPT signals. Refer to Chapter 5, *I/O Information*, for the floppy drive pinout.

I did not purchase a bootable USB DVD/CD-ROM or USB floppy with my NI VXIpc-882 controller. How can I obtain one?

Contact National Instruments to purchase these devices.

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How do I upgrade system memory?

You can change the amount of installed RAM on the NI VXIpc-882 by upgrading the SO-DIMM. Refer to the *Installing and Upgrading RAM* section of Chapter 2, *Installation*, or `ni.com/support` for more information about supported SO-DIMMs and installation instructions.

How do I change the main power fuse?

The NI VXIpc-882 is not equipped with a user-replaceable fuse. If the internal fuse blows, contact National Instruments for assistance.

Troubleshooting

What if the NI VXIpc-882 does not boot?

Several problems can cause a controller not to boot. Here are some things to look for and possible solutions.

Things to Notice

- Which LEDs come on? The **PWR OK** LED should stay lit. The **DRIVE** LED should blink during boot as the disk is accessed.
- What appears on the display? Does it hang at some particular point (BIOS, Operating System, and so on)? If nothing appears on the screen, try a different monitor. Does your monitor work with a different PC? If it hangs, note the last screen output that you saw for reference when consulting National Instruments technical support.
- What has changed about the system? Did you recently move the system? Was there electrical storm activity? Did you recently add a new module, memory chip, or piece of software?

Things to Try

- Make sure the chassis is plugged in to a working power source.
- Check any fuses or circuit breakers in the chassis or other power supply (possibly a UPS).
- Make sure the controller module is firmly seated in the chassis.
- Remove all other modules from the chassis.
- Remove any nonessential cables or devices.
- Try the controller in a different chassis.
- Try a similar controller in this same chassis.

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- Recover the hard drive on the controller. (Refer to the *Hard Drive Recovery* section.)
- Clear the CMOS. (Refer to the *Default Software Settings* section of Chapter 3, *Configuration and Default Settings*.)

My controller boots fine until I get to Windows, at which point I cannot read the screen. This may include garbled output, white screen, black screen, or an out of sync message from the monitor.

This problem usually results from having the video card output set past the limits of the monitor. You will need to boot Windows in Safe Mode. To do this, reboot the controller. As Windows begins to boot, hold down <F8>. You should now be able to reset the video driver to lower settings. Try setting the resolution to 640 × 480 and the refresh rate to 60 Hz. After you reboot, you can raise these values again, using the test option in Windows. These settings are accessible through the **Advanced** tab of the **Display** item in the **Control Panel**. Alternately, you can try a different monitor, preferably a newer and larger one.

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

1. Enter the BIOS setup program as described in the *BIOS Configuration* section of Chapter 3, *Configuration and Default Settings*.
2. Press <F9> to load BIOS defaults.
3. Answer **Y** (Yes) to the verification prompt.
4. Select **Save and Exit Setup**.

I can't change the display on the controller from 640 × 480 to 800 × 600. What's wrong?

Be sure the video driver is installed. If it is not, refer to the `Drivers.txt` file on the hard drive or recovery CD-ROM.

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A

Specifications

This appendix lists the electrical, mechanical, and environmental specifications of the NI VXIpc-882 embedded computers.

Electrical

Voltage (V)	Current (A)	
	Peak	Dynamic
+24	3.1 A	±1.26 A
+12	0.225 A	±0 A
+5	10.6 A	±1.21 A
–2	0.251 A	±0.04 A
–5.2	0.318 A	±0.06 A
–12	0.265 A	±0 A

Note Power usage depends on peripherals connected to the controller. For example, connecting four high power USB devices will draw more current from the +5 V rail than just connecting a USB keyboard and mouse.

Physical

Board dimensions..... Two-slot VXI C-size module
233.35 × 340 × 60.96 mm
(9.187 × 13.386 × 2.4 in.)

Slot requirements ..... Two system slots

Compatibility ..... Fully compatible with VXI-6, *VXIbus Mainframe Extender Specification*, Rev. 2.0

MTBF..... Contact NI for MTBF

Weight..... 2.58 kg (5.69 lb)

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Operating Environment

Ambient temperature range .....5 to 50 °C
(Tested in accordance with IEC-60068-2-1 and IEC-60068-2-2.)

Relative humidity range.....10 to 90%, noncondensing
(Tested in accordance with IEC-60068-2-56.)

Altitude .....2,000 m

Pollution Degree 2

For indoor or enclosed area use only.

Module cooling requirements.....For 18 °C temperature rise, 2.6 liters/sec airflow, 0.03 mm H_2O pressure across module, per *VXI-8, Cooling Characterization Methodology Specification*

Caution Clean the NI VXIpc-882 with a soft nonmetallic brush. Make sure that the device is completely dry and free from contaminants before returning it to service.

Storage Environment

Ambient temperature range .....–20 to 70 °C
(Tested in accordance with IEC-60068-2-1 and IEC-60068-2-2.)

Relative humidity range.....5 to 95%, noncondensing
(Tested in accordance with IEC-60068-2-56.)

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Shock and Vibration

Operational shock[1] ..... 30 g peak, half-sine, 11 ms pulse (Tested in accordance with IEC-60068-2-27. Test profile developed in accordance with MIL-PRF-28800F.)

Random vibration

Operating[1] ..... 5 to 500 Hz, 0.3 g_{rms} (with solid-state hard drive)

Nonoperating ..... 5 to 500 Hz, 2.4 g_{rms}

(Tested in accordance with IEC-60068-2-64. Nonoperating test profile exceeds the requirements of MIL-PRF-28800F, Class B.)

Note Specifications are subject to change without notice.

Safety

This product meets the requirements of the following standards of safety for electrical equipment for measurement, control, and laboratory use:

- IEC 61010-1, EN 61010-1
- UL 61010-1, CSA 61010-1

Note For UL and other safety certifications, refer to the product label or the *Online Product Certification* section.

Electromagnetic Compatibility

This product meets the requirements of the following EMC standards for electrical equipment for measurement, control, and laboratory use:

- EN 61326-1 (IEC 61326-1): Class A emissions; Basic immunity
- EN 55011 (CISPR 11): Group 1, Class A emissions
- AS/NZS CISPR 11: Group 1, Class A emissions
- FCC 47 CFR Part 15B: Class A emissions
- ICES-001: Class A emissions

Caution For EMC compliance, operate this device with shielded cables and accessories.

[1] Only valid with an NI VXIpc-882 using a solid-state drive, not with the shipping configuration, which contains a hard drive.

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Note For EMC declarations and certifications, refer to the *Online Product Certification* section.

CE Compliance CE

This product meets the essential requirements of applicable European Directives as follows:

- 2006/95/EC; Low-Voltage Directive (safety)
- 2004/108/EC; Electromagnetic Compatibility Directive (EMC)

Online Product Certification

To obtain product certifications and the Declaration of Conformity (DoC) for this product, `visit ni.com/certification`, search by model number or product line, and click the appropriate link in the Certification column.

Environmental Management

NI is committed to designing and manufacturing products in an environmentally responsible manner. NI recognizes that eliminating certain hazardous substances from our products is beneficial to the environment and to NI customers.

For additional environmental information, refer to the *NI and the Environment* Web page at `ni.com/environment`. This page contains the environmental regulations and directives with which NI complies, as well as other environmental information not included in this document.

Waste Electrical and Electronic Equipment (WEEE)

EU Customers At the end of the product life cycle, all products *must* be sent to a WEEE recycling center. For more information about WEEE recycling centers, National Instruments WEEE initiatives, and compliance with WEEE Directive 2002/96/EC on Waste and Electronic Equipment, visit `ni.com/environment/weee`.

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Battery Replacement and Disposal

Battery Directive This device contains a long-life coin cell battery. If you need to replace it, use the Return Material Authorization (RMA) process or contact an authorized National Instruments service representative. For more information about compliance with the EU Battery Directive 2006/66/EC about Batteries and Accumulators and Waste Batteries and Accumulators, visit `ni.com/environment/batterydirective`.

电子信息产品污染控制管理办法 （中国 RoHS）

中国客户 National Instruments 符合中国电子信息产品中限制使用某些有害物质指令 (RoHS)。
关于 National Instruments 中国 RoHS 合规性信息，请登录 `ni.com/environment/rohs_china`。
(For information about China RoHS compliance, go to `ni.com/environment/rohs_china`.)

Front Panel Layout and Dimensions

Figure A-1 shows the front panel layout and dimensions for the NI VXIpc-882. Dimensions are in inches (millimeters).

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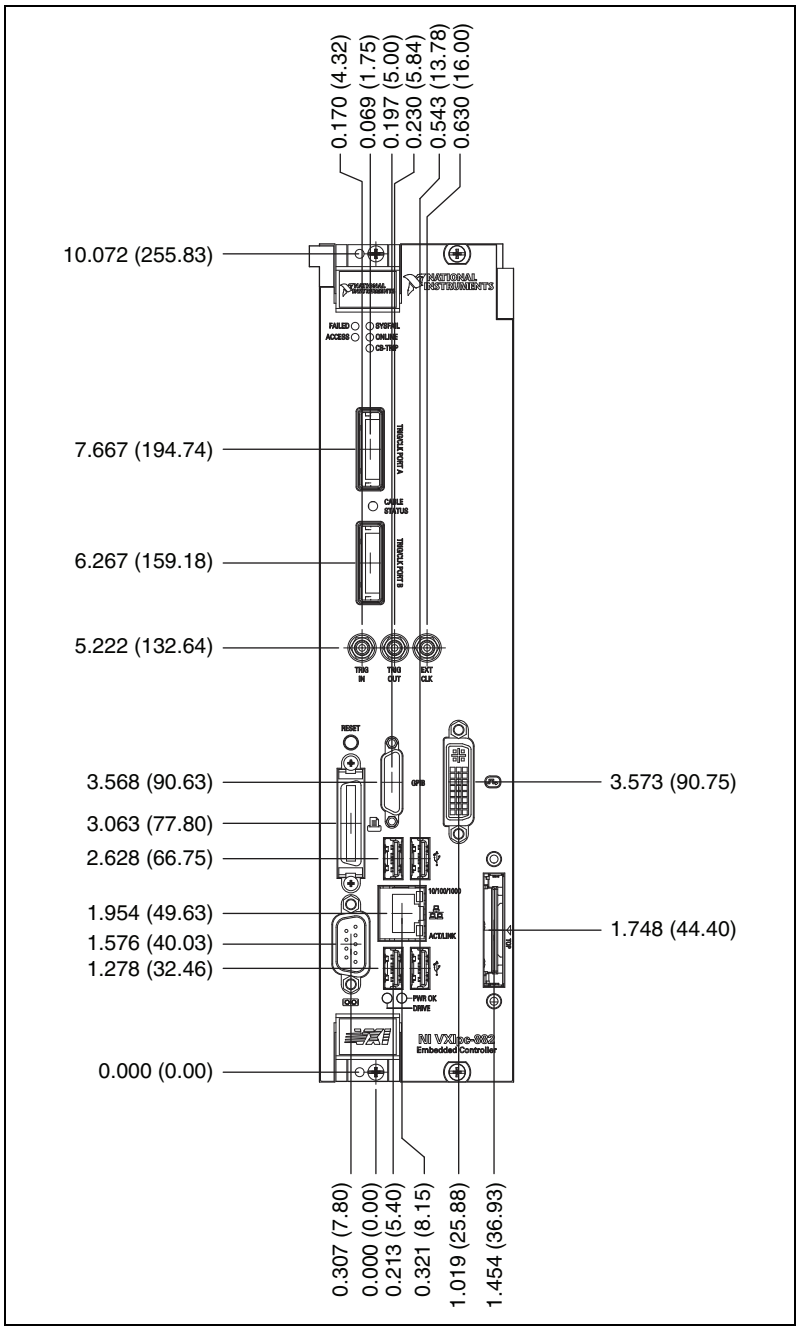


Figure A-1. NI VXIpc-882 Front Panel Layout and Dimensions

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B

Using The Trigger Ports On The NI VXIpc-882

The NI VXIpc-882 allows you to extend the 8 TTL backplane triggers and CLK10 between chassis through convenient front panel connectors. Each trigger and the CLK are independently configurable as either inputs or outputs of the frame. The trigger bus is connected in a daisy chain topology and can support up to six (6) devices with a total of 19 m of cables.

Cautions The trigger bus uses the MXI-Express x4 cables, however these are not MXI-Express x4 ports. Do *not* connect the trigger ports to a MXI-Express x4 or PCI Express x4 device.

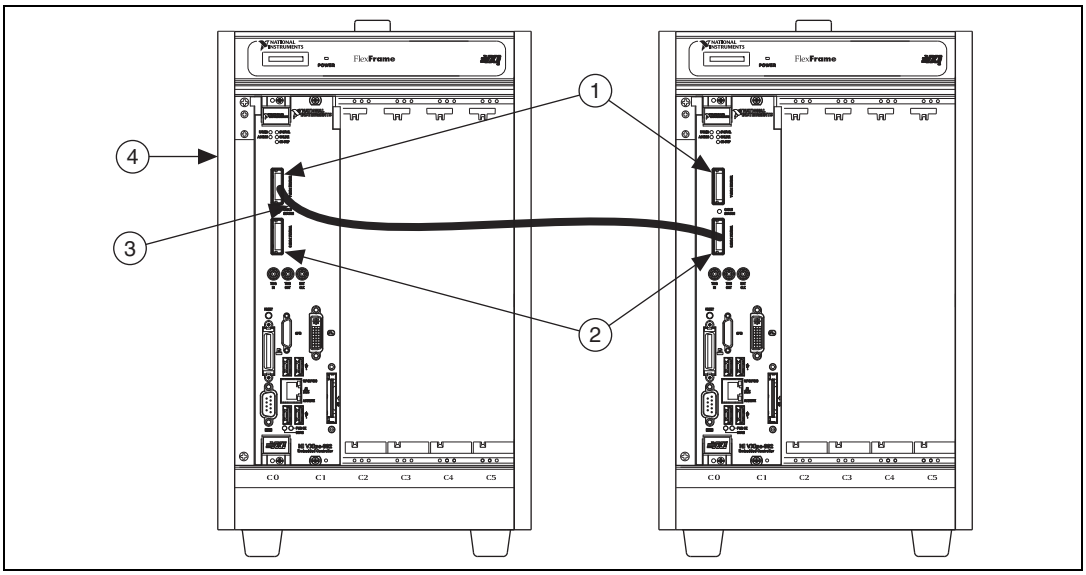
The trigger bus may be able to support more devices and/or greater cable lengths, but these configurations have not been validated by National Instruments and are not currently supported.

Connecting the Trigger Port Cables

When connecting the cables between two devices on the trigger bus, always ensure you connect TRIG/CLK PORT A of one device to TRIG/CLK PORT B of the second device, or TRIG/CLK PORT B of one device to TRIG/CLK PORT A of the second device, as shown in Figure B-1. The front panel LED will blink red if the cables are not connected correctly. The LED will be lit steady state green if they are connected properly.

Note Trigger bus cables may be removed and inserted while power is on.

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1	TRIG/CLK PORT A	3	Trigger Cable
2	TRIG/CLK PORT B	4	NI VXIpc-882 Controller in Slot 0e

Figure B-1. NI VXIpc-882 Controller Trigger Cabling

Software Configuration

Triggers are mapped into and out of your NI VXIpc-882 though software using the following steps.

1. Open MAX.
2. Find your device under **Devices and Interfaces**.
3. Right click on your device and select **Properties**.
4. Click on the **Signal Mappings Tab**.
5. From each TTL Trigger select **Into the Frame**, **Out of the Frame**, or **None**.
6. Click **OK** and re-run the VXI Resource Manager (Resman) for the changes to take effect.

Note Do not map the same trigger out of the frame on more than one device on the trigger bus. This will cause the bus to be driven by more than one device. Protection circuitry prevents this from causing physical damage, however your setup will not function properly.

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C

VMEbus Capability Codes

This appendix summarizes the VMEbus capability codes for the VXIpc-882 hardware.

VMEbus Capability Codes

Capability Code	Description
A32, A24, A16 (master)	VMEbus master A32, A24, and A16 addressing
A32, A24, A16 (slave)	VMEbus slave A32, A24, and A16 addressing
D32, D16, D08(EO) (master)	VMEbus master D32, D16, and D08 data sizes
D32, D16, D08(EO) (slave)	VMEbus slave 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
PRI, RRS	Prioritized or Round Robin Select arbiter
ROR, FAIR	Release on Request 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

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Capability Code	Description
ROAK, RORA	Release on Acknowledge or Register Access interrupter
BTO(x)	VMEbus bus timer (programmable limit)

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D

Technical Support and Professional Services

Visit the following sections of the award-winning National Instruments Web site at `ni.com` for technical support and professional services:

- **Support**—Technical support at `ni.com/support` includes the following resources:
  - **Self-Help Technical Resources**—For answers and solutions, visit `ni.com/support` for software drivers and updates, a searchable KnowledgeBase, product manuals, step-by-step troubleshooting wizards, thousands of example programs, tutorials, application notes, instrument drivers, and so on. Registered users also receive access to the NI Discussion Forums at `ni.com/forums`. NI Applications Engineers make sure every question submitted online receives an answer.
  - **Standard Service Program Membership**—This program entitles members to direct access to NI Applications Engineers via phone and email for one-to-one technical support as well as exclusive access to on demand training modules via the Services Resource Center. NI offers complementary membership for a full year after purchase, after which you may renew to continue your benefits.

    For information about other technical support options in your area, visit `ni.com/services`, or contact your local office at `ni.com/contact`.
- **Training and Certification**—Visit `ni.com/training` for self-paced training, eLearning virtual classrooms, interactive CDs, and Certification program information. You also can register for instructor-led, hands-on courses at locations around the world.
- **System Integration**—If you have time constraints, limited in-house technical resources, or other project challenges, National Instruments Alliance Partner members can help. To learn more, call your local NI office or visit `ni.com/alliance`.

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- **Declaration of Conformity (DoC)**—A DoC is our claim of compliance with the Council of the European Communities using the manufacturer's declaration of conformity. This system affords the user protection for electromagnetic compatibility (EMC) and product safety. You can obtain the DoC for your product by visiting `ni.com/certification`.
- **Calibration Certificate**—If your product supports calibration, you can obtain the calibration certificate for your product at `ni.com/calibration`.

If you searched `ni.com` and could not find the answers you need, contact your local office or NI corporate headquarters. Phone numbers for our worldwide offices are listed at the front of this manual. You also can visit the Worldwide Offices section of `ni.com/niglobal` to access the branch office Web sites, which provide up-to-date contact information, support phone numbers, email addresses, and current events.

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Glossary

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

Symbols

°	degrees
Ω	ohms
%	percent

A

A	amperes
AC	Alternating Current
ASIC	application-specific integrated circuit

B

B	bytes
backplane	An assembly, typically a printed circuit board, with connectors and signal paths that bus the connector pins.

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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.

C

C	Celsius
cache	Small portion of high-speed memory used for temporary storage of frequently used data
CMOS	Complementary Metal Oxide Semiconductor; a process used in making chips
CompactPCI	An adaptation of the PCI specification for industrial and/or embedded applications that require a more robust mechanical form factor than desktop PCI. CompactPCI provides a standard form factor for those applications requiring the high performance of PCI as well as the small size and ruggedness of a rack-mount system.

D

DC	Direct Current
DIMM	Dual In-line Memory Module
DMA	Direct Memory Access; a method by which data is transferred between devices and internal memory without intervention of the central processing unit
DRAM	Dynamic RAM (Random Access Memory); storage that the computer must refresh at frequent intervals
DVI-I	Video Graphics Array; the minimum video display standard for all PCs

E

ECP	Extended Capabilities Parallel
EDO	Extended Data Out
EEPROM	Electronically Erasable Programmable Read Only Memory

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embedded controller	An intelligent CPU (controller) interface plugged directly into the PXI backplane, giving it direct access to the PXI bus. It must have all of its required PXI interface capabilities built in.
EMC	Electromagnetic Compatibility
EMI	electromagnetic interference
EPP	Enhanced Parallel Port
expansion ROM	An onboard EEPROM that may contain device-specific initialization and system boot functionality

F

FCC	Federal Communications Commission

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

Hz	hertz; cycles per second

I

I/O	input/output; the techniques, media, and devices used to achieve communication between machines and users
IDE	Integrated Drive Electronics; hard disk and built-in controller
IEEE	Institute of Electrical and Electronics Engineers
in.	inches

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instrument driver	A set of routines designed to control a specific instrument or family of instruments, and any necessary related files for LabWindows/CVI or LabVIEW
interrupt	A means for a device to request service from another device
interrupt level	The relative priority at which a device can interrupt
IRQ*	Interrupt signal
ISA	Industry Standard Architecture; the original PC bus architecture, specifically the 16-bit AT bus

K

KB	kilobytes of memory

L

LAN	Local Area Network; communications network that serves users within a confined geographical area. It is made up of servers, workstations, a network operating system, and a communications link.
LED	light-emitting diode

M

m	meters
master	A functional part of a PXI device that initiates data transfers on the PXI backplane. A transfer can be either a read or a write.
MB	megabytes of memory
MTBF	Mean time between failure
MTTR	Mean time to repair

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N

NI-488 or NI-488.2	The National Instruments software for GPIB systems
NI-DAQ	The National Instruments software for data acquisition instruments
NI-VISA	The National Instruments implementation of the VISA standard; an interface-independent software that provides a unified programming interface for VXI, GPIB, and serial instruments
NMI	Non-maskable interrupt; high-priority interrupt that cannot be disabled by another interrupt. It is used to report malfunctions such as parity, bus and math coprocessor errors.

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
peripheral	any hardware device connected to a computer, such as a monitor, keyboard, printer, plotter, disk or tape drive, graphics tablet, scanner, mouse, and so on
POSC	Power On Self Configuration
PXI	PCI eXtensions for Instrumentation; an open implementation of CompactPCI that adds electrical features that meet the high-performance requirements of instrumentation applications by providing triggering, local buses, and system clock capabilities. PXI also offers two-way interoperability with CompactPCI products.

R

RAM	Random Access Memory; the computer's primary workspace
RAMDAC	Random Access Memory Digital to Analog Converter; the DVI-I controller chip that maintains the color palette and converts data from memory into analog signals for the monitor
resource	hardware settings used by devices in a computer system, including ISA interrupt level, DMA channel, and I/O address

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RMS	Root mean squared. *See also* g_{rms}.
RTC	Real Time Clock; an electronic circuit that maintains the time of day, and can also provide timing signals for timesharing operations

S

s	seconds
slave	A functional part of a PXI device that detects data transfer cycles initiated by a PXI bus master and responds to the transfers when the address specifies one of the device's registers
SO-DIMM	Small Outline Dual In-line Memory Module
SRAM	Static RAM; a memory chip that requires power to hold its content. It does not require refresh circuitry as a dynamic RAM chip, but it does take up more space and uses more power
ST	Start Trigger
Star Trigger Slot	This slot is located at Slot 2 in a PXI mainframe and has a dedicated trigger line between each peripheral slot. This slot would be used for a module with ST functionality that can provide individual triggers to all other peripherals.

U

USB	Universal Serial Bus

V

V	Volts

W

W	Watts

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