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PXI Express

NI PXIe-8103 User Manual

February 2006
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All Class A products display a simple warning statement of one paragraph in length regarding interference and undesired operation. The FCC rules have restrictions regarding the locations where FCC Class A products can be operated.

Consult the FCC Web site at `www.fcc.gov` for more information.

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This equipment generates and uses radio frequency energy and, if not installed and used in strict accordance with the instructions in this manual and the CE marking Declaration of Conformity*, may cause interference to radio and television reception. Classification requirements are the same for the Federal Communications Commission (FCC) and the Canadian Department of Communications (DOC).

Changes or modifications not expressly approved by NI could void the user's authority to operate the equipment under the FCC Rules.

Class A

Federal Communications Commission

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

Canadian Department of Communications

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

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

Compliance with EU Directives

Users in the European Union (EU) should refer to the Declaration of Conformity (DoC) for information* pertaining to the CE marking. Refer to the Declaration of Conformity (DoC) for this product for any additional regulatory compliance information. To obtain the DoC for this product, visit `ni.com/certification`, search by model number or product line, and click the appropriate link in the Certification column.

* The CE marking Declaration of Conformity contains important supplementary information and instructions for the user or installer.

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About This Manual

This manual contains detailed instructions for installing and configuring the National Instruments PXIe-8103 embedded computer kit.

How to Use the Documentation Set

Begin by reading the *NI PXIe-8103 Installation Guide*, a brief quick-start guide that describes how to install and get started with your controller.

This manual, the *NI PXIe-8103 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.

`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.

Related Documentation

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

- *PICMG EXP.0 R1.0 CompactPCI Express Specification*, PCI Industrial Computers Manufacturers Group
- IEEE Standard P1284.1-1997 *(C/MM) Standard for Information Technology for Transport Independent Printer/System Interface*
- *PCI Express Base Specification*, Revision 1.1, PCI Special Interest Group
- *PXI-5 PXI Express Hardware Specification*, Revision 1.0, PXI Systems Alliance
- *PXI-6 PXI Express Software Specification*, Revision 1.0, PXI Systems Alliance
- *Serialized IRQ Support for PCI Systems Specification*, Revision 6.0, Compaq Computer et al.
- *ExpressCard* Standard, Release 1.0, PCMCIA

1

Introduction

This chapter provides overview information for PXI Express and the NI PXIe-8103 embedded controller.

Benefits of PXI Express

The PXI (PCI eXtensions for Instrumentation) industry standard, an open specification governed by the PXI Systems Alliance (PXISA), has quickly gained adoption and grown in prevalence in test, measurement, and control systems since its release in 1998. One of the key elements driving the rapid adoption of PXI is its use of PCI in the communication backplane. As the commercial PC industry has improved the available bus bandwidth by evolving PCI to PCI Express, PXI is now able to meet even more application needs by integrating PCI Express into the PXI standard. By taking advantage of PCI Express technology in the backplane, PXI Express increases the available PXI bandwidth from up to 132 MB/s to up to 6 GB/s for a more than 45x improvement in bandwidth.

PXI Express maximizes both hardware and software compatibility with PXI modules. PXI Express hybrid slots deliver both PCI and PCI Express signaling to accept devices that use PXI communication and triggering or the newer PXI Express standard. Software compatibility is maintained because PCI Express uses the same OS and driver model as PCI, resulting in complete software compatibility among PCI-based systems, for example PXI, and PCI Express-based systems such as PXI Express.

PXI Express, like PXI, leverages from the CompactPCI specification to define a rugged, modular form factor that offers superior mechanical integrity and easy installation and removal of hardware components. PXI Express products offer higher and more carefully defined levels of environmental performance required by the shock, vibration, temperature, and humidity extremes of industrial environments. Mandatory environmental testing and active cooling is added to the CompactPCI mechanical specification to ease system integration and ensure multivendor interoperability.

The demanding timing and synchronization requirements of instrumentation systems are met by the integrated features of PXI Express.

Not only are the trigger bus, 10 MHz system reference clock, and star trigger bus available in PXI retained by PXI Express, but new timing and synchronization features that include a 100 MHz differential system reference clock for the synchronization of multiple modules and three differential star trigger buses for the distribution of precise clock and trigger signals have been added. Differential timing and synchronization signals provide PXI Express systems with increased noise immunity and the ability to transmit clock signals at higher frequencies.

NI PXIe-8103

Description

The NI PXIe-8103 PXI Express/CompactPCI Express embedded computer is a high-performance PXI Express/CompactPCI Express-compatible system controller. The NI PXIe-8103 controller integrates standard I/O features in a single unit by using state-of-the-art packaging. Combining an NI PXIe-8103 embedded controller with a PXI Express-compatible chassis, such as the PXIe-1062, results in a fully PC-compatible computer in a compact, rugged package.

The standard I/O on each module includes video, one RS-232 serial port, a parallel port, four high-speed USB 2.0 ports, Gigabit Ethernet, a reset button, and a PXI trigger.

The NI PXIe-8103 has an Intel Pentium M Processor 760 (2.0 GHz/533 MHz FSB, all the standard I/O, and a 40 GB (or larger) hard drive. It also has a PCI-based GPIB controller and an ExpressCard/34 expansion slot.

Functional Overview

This section contains functional descriptions of each major logic block on the NI PXIe-8103 embedded computer.

NI PXIe-8103 Functional Description

The NI PXIe-8103 is a modular PC in a PXI Express 3U-size form factor. Figure 1-1 is a functional block diagram of the NI PXIe-8103. Following the diagram is a description of each logic block shown.

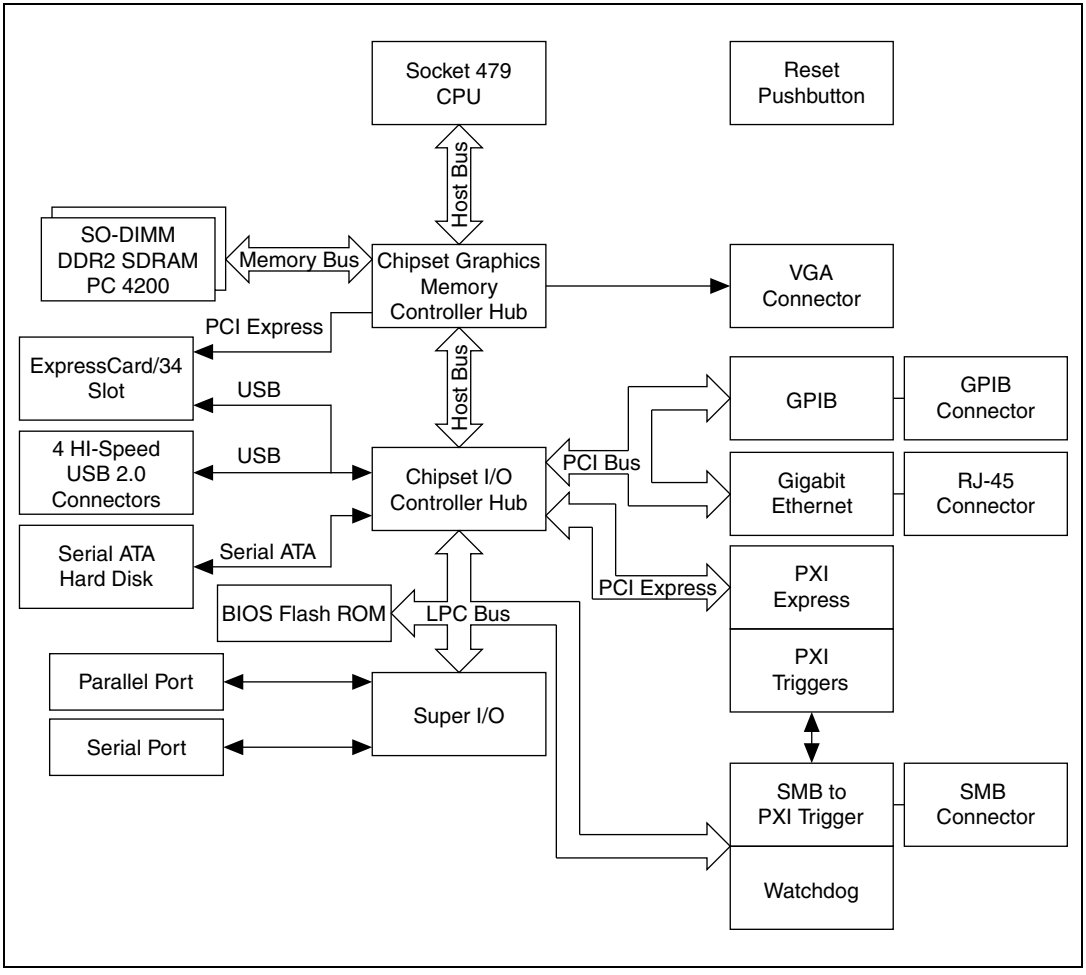


Figure 1-1. NI PXIe-8103 Block Diagram

The NI PXIe-8103 consists of the following logic blocks on the CPU module and the I/O (daughter card) module. The CPU module has the following logic blocks:

- *Socket 479 CPU* is the socket definition for the Intel Pentium M processor families.
- The *SO-DIMM* block consists of two 64-bit DDR2 SDRAM sockets that can hold up to 1 GB each.
- The *Chipset GMCH* connects to the CPU, DDR2 SDRAM, video, and ExpressCard.

- The *SMB to PXI Trigger* provides a routable connection of the PXI Express triggers to/from the SMB on the front panel.
- The *Watchdog Timer* block consists of a watchdog timer that can reset the controller or generate a trigger.
- The *Chipset ICH6M* connects to the PCI, USB, Serial ATA, and LPC buses.
- The *USB Connectors* connect the chipset to the Hi-Speed USB 2.0 interface.
- The *Serial ATA Hard Disk* is a 40 GB or larger notebook hard disk. The Serial ATA interface enables transfer rates up to 1.5 Gb/s. The hard disk also supports Native Command Queuing.
- The *PXI Express Connector* connects the NI PXIe-8103 to the PXI Express/CompactPCI Express backplane.
- The *Super I/O* block represents the other peripherals supplied by the NI PXIe-8103. The NI PXIe-8103 has one serial port, and an ECP/EPP parallel port.
- The *Gigabit Enet* connects to either 10 Mbit, 100 Mbit, or 1,000 Mbit Ethernet interfaces.
- The *GPIB* block contains the GPIB interface.
- The *ExpressCard/34* slot accommodates an ExpressCard/34 module.

National Instruments Software

National Instruments has developed several software tools you can use with the NI PXIe-8103.

National Instruments' hardware and software work together to help you make the most of your PXI Express system. The LabVIEW, Measurement Studio, and LabWindows™/CVI™ application development environments combine with leading hardware drivers such as NI-DAQmx to provide exceptional control of NI hardware. Instrument drivers are available at `ni.com/idnet` to simplify communication with instruments over a variety of busses.

LabVIEW is a powerful and easy-to-use graphical programming environment you can use to acquire data from thousands of different instruments including USB, IEEE 488.2, VXI, serial, PLCs, and plug-in boards. LabVIEW helps you convert acquired data into meaningful results using powerful data analysis routines. Add-on tools provide additional

specialized functionality. For more information visit ni.com/labview and ni.com/toolkits.

If you prefer to use Microsoft's Visual Basic, Visual C++, and Visual Studio .NET for the core of your application, Measurement Studio adds tools for Measurement and Automation to each language. For more information visit ni.com/mstudio.

LabWindows/CVI is an interactive ANSI C programming environment designed for building virtual instrument applications. LabWindows/CVI delivers a drag-and-drop editor for building user interfaces, a complete ANSI C environment for building your test program logic, and a collection of automated code generation tools, as well as utilities for building automated test systems, monitoring applications, or laboratory experiments. For more information visit ni.com/lwcvi.

NI-DAQmx provides an extensive library of functions that you can call from your application development environment or interactive environment such as NI Signal Express. These functions provide an intuitive API for National Instruments' multifunction DAQ products. Features available include analog input (A/D conversion), buffered data acquisition (high-speed A/D conversion), analog output (D/A conversion), waveform generation, digital I/O, counter/timer operations, SCXI signal conditioning, RTSI or PXI synchronization, self-calibration, messaging, and acquiring data to extended memory. For more information visit ni.com/daq.

National Instruments' Modular Instruments use specialized drivers suited to each product's specialization. Express VIs provide customized, interactive programming of instruments in a single interface and soft front panels provide an interface for testing the functionality of each instrument with no programming required. NI Switches, DMMs, High-Speed DIO, High-Speed Digitizers, and Sources each have customized drivers for high-end modular instrumentation systems. RF applications leverage two drivers, NI-RFSG and NI-RFSA and Dynamic Signal Acquisition is available through NI-DAQmx. For more information visit ni.com/modularinstruments.

You can expand the timing and triggering functionality of your PXI system with PXI Timing and Synchronization products. These products provide precision clock sources, custom routing of triggers for multi-chassis synchronization, clock sharing, and more and are programmed with NI-Sync. For more information visit ni.com/pxi.

NI-VISA is the National Instruments implementation of the VISA specification. VISA is a uniform API for communicating and controlling

USB, Serial, GPIB, PXI, VXI, and various other types of instruments. This API aids in the creation of portable applications and instrument drivers. For information on writing your own PXI instrument driver with NI-VISA, refer to the *NI-VISA Getting Started Manual* and the `readme.txt` file in the NI-VISA directory. For more information visit `ni.com/visa`.

With LabVIEW for Linux and support for over two hundred devices on Linux with the NI-DAQmx driver, you can now create Virtual Instruments based on the Linux OS. Instrument control in Linux has been improved by the NI-VISA driver for Linux and NI Modular Instruments are partially supported. For more information visit `ni.com/linux`.

2

Installation and Configuration

This chapter contains information about installing and configuring your NI PXIe-8103 controller.

Installing the NI PXIe-8103

This section contains general installation instructions for the NI PXIe-8103. Consult your PXI Express chassis user manual for specific instructions and warnings.

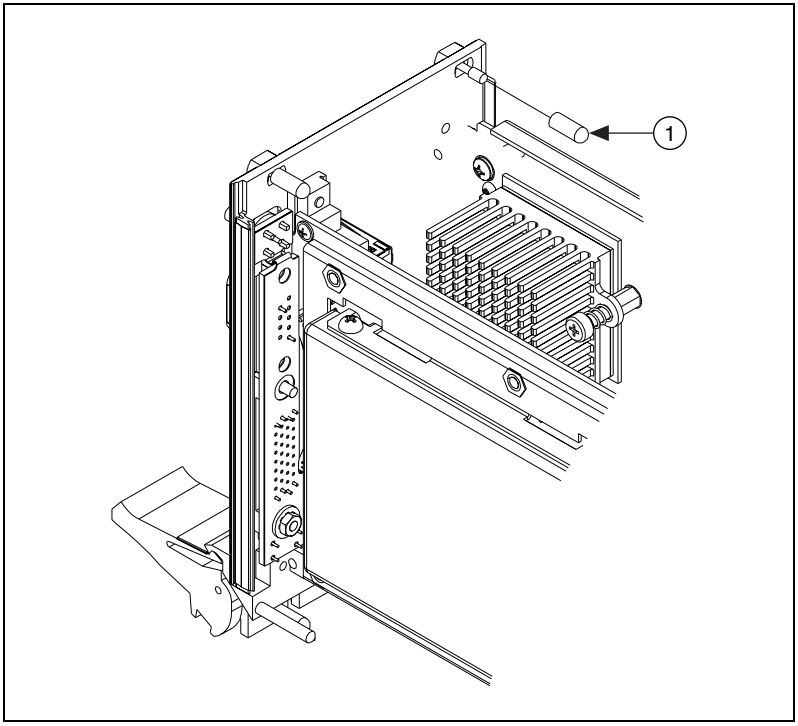
1. Plug in your chassis before installing the NI PXIe-8103. The power cord grounds the chassis and protects it from electrical damage while you install the module.

Cautions To protect both yourself and the chassis from electrical hazards, leave the chassis powered off until you finish installing the NI PXIe-8103 module.

ESD: An electrostatic discharge event to the ExpressCard slot may cause the controller to restart.

This is an Electromagnetic Compatibility (EMC) performance criteria C (noncontinuous operation) for Electrostatic Discharge.

2. Remove any filler panels blocking access to the system controller slot (Slot 1) in the chassis.
3. Touch the metal part of the case to discharge any static electricity that might be on your clothes or body.
4. Remove the protective plastic covers from the four bracket-retaining screws as shown in Figure 2-1.



1 Protective Screw Cap (4X)

Figure 2-1. Removing Protective Screw Caps

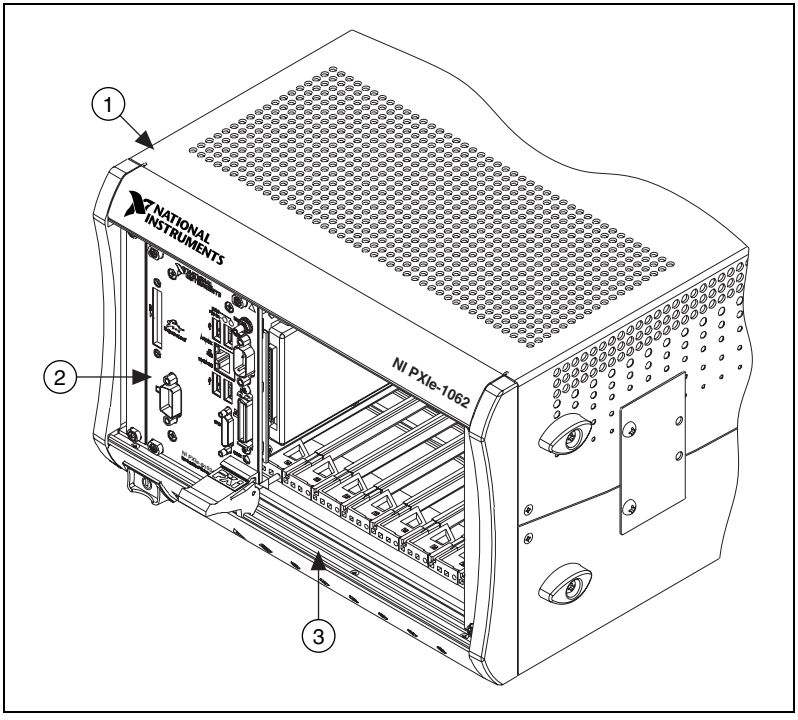
5. Make sure the injector/ejector handle is in its downward position. Align the NI PXIe-8103 with the card guides on the top and bottom of the system controller slot.

Caution Do *not* raise the injector/ejector handle as you insert the NI PXIe-8103. The module will not insert properly unless the handle is in its downward position so that it does not interfere with the injector rail on the chassis.

6. Hold the handle as you slowly slide the module into the chassis until the handle catches on the injector/ejector rail.
7. Raise the injector/ejector handle until the module firmly seats into the backplane receptacle connectors. The front panel of the NI PXIe-8103 should be even with the front panel of the chassis.
8. Tighten the four bracket-retaining screws on the top and bottom of the front panel to secure the NI PXIe-8103 to the chassis.
9. Check the installation.

10. Connect the keyboard and mouse to the appropriate connectors. If you are using a PS/2 keyboard and a PS/2 mouse, a Y-splitter adapter is available to connect both to a single USB connector. Refer to Figure 4-1, *Y-Splitter Cable*.
11. Connect the VGA monitor video cable to the VGA connector.
12. Connect devices to ports as required by your system configuration.
13. Power on the chassis.
14. Verify that the controller boots. If the controller does not boot, refer to the *What if the NI PXIe-8103 does not boot?* section of Chapter 5, *Troubleshooting*.

Figure 2-2 shows an NI PXIe-8103 installed in the system controller slot of a National Instruments PXIe-1062 chassis.



1 PXIe-1062 Chassis 2 NI PXIe-8103 Controller 3 Injector/Ejector Rail

Figure 2-2. NI PXIe-8103 Controller Installed in a PXI Express Chassis

How to Remove the Controller from the PXI Express Chassis

The NI PXIe-8103 controller is designed for easy handling. To remove the unit from the PXI Express chassis, complete the following steps.

1. Power off the chassis.
2. Unscrew the bracket-retaining screws in the front panel.
3. Press the injector/ejector handle down.
4. Slide the unit out of the chassis.

BIOS Setup

You can change the NI PXIe-8103 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 PXIe-8103 controller features.

Most users do not need to use the BIOS setup program, as the NI PXIe-8103 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 PXIe-8103 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.
- **<+> 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.
- **DMI Event Logging**—This setting brings up the **DMI Event Logging** submenu. (Refer to the *DMI Event Logging Submenu* section.)
- **Require Keyboard to Boot**—When **Yes**, a missing or malfunctioning keyboard causes the BIOS to halt with an error. When **No**, 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 **No**. The default value is **Yes**.

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**—This item displays the Serial ATA device detected in the system. Normally, you do not need to modify this item. However, if a Serial 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 PXIe-8103 controller.

DMI Event Logging Submenu

Major errors that occur during the BIOS booting process are stored in battery-backed memory on the controller, and remain there until you view and clear them using this submenu. This logging capability allows a system administrator to detect the historical occurrence of faults on a controller. This submenu includes the following items.

- **View DMI Event Log**—This setting displays a window containing all logged system errors and the time at which they occurred.
- **Mark DMI Events as Read**—This setting prevents any current logged entries from being displayed again. However, all entries remain in battery-backed memory, and you can retrieve them using other DMI software that is beyond the scope of this document.
- **Clear All DMI Event Logs**—When set to **Yes**, this setting clears all entries from the DMI event log on reboot.
- **Event Logging**—This setting controls whether events are logged. Disabling logging has no impact on system performance. The default is **Enabled**.

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.

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 for more information.

- **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**.
- **After Power Failure**—This setting controls how the PXI Express controller should behave after an AC power loss event occurs. The controller can be configured to **Stay Off** when power is restored or **Turn On** when power is restored. The default is **Stay Off**.

Note Removing the PXIe-8103 controller from a chassis will trigger a "Power Failure" event. When set to **Turn On** the controller will attempt to power on the chassis during re-insertion.

- **Power Button Instant-Off**—This setting selects the OS environments where the PXI Express chassis power button should instantly power off the system. The controller can be configured to power off instantly in a **Non-ACPI OS** environment only (for instance, LabVIEW RT and DOS, but not Windows), power off instantly in **Any OS** environment (including Windows), or to not power off instantly in any OS environment. The default is **Non-ACPI OS Only**.

Caution Be careful when choosing the **Any OS** option for this setting, as instantly removing power from an OS such as Windows can lead to data corruption.

Integrated Peripherals Submenu

Use this submenu to apply nondefault configurations to the front panel peripherals of an NI PXIe-8103 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.

- **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. Certain real-time applications may require you to disable this setting to reduce loop time jitter. The default is **Enabled**.
- **AHCI Configuration**—This setting determines whether AHCI mode is Enabled or Disabled for the SATA port. Some operating systems, such as Windows 2000, 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**.

PXI Setup Menu

Use this menu to control and route certain signals on the PXI Express backplane. Normally, you do not need to modify these settings. However, other sections of this manual may indicate that modifications are necessary and may lead to unpredictable behavior.

- **APIC Routing**—This setting controls whether the APIC subsystem is enabled or disabled. Select **Enabled** to initialize the IOAPIC and local APIC in uniprocessor mode. Select **Disabled** to use the legacy PIC for interrupt routing. This item is valid only for modern operating systems such as Windows XP or 2000. The default setting is **Enabled**.

Note Refer to KnowledgeBase 3SIC67D8 at `ni.com/support` for detailed information about switching between APIC and legacy PIC mode for Windows operating systems.

- **PIRQx Routing**—This setting selects the routing option for PXI Express/PCI Express devices connected to PIRQx. This settings affects OSes that do not use APIC routing. The default setting for all PIRQx options is **IRQ10**.

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.

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 a bootable device, the message **`Operating System Not Found`** is displayed, and the system halts.

- **IDE SATA**—The internal Serial ATA hard drive, connected to the Serial ATA port.
- **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 SCSI**—A SCSI drive (hard disk drive or CD-ROM) connected through a SCSI controller in the PXI Express chassis.
- **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.
- **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.

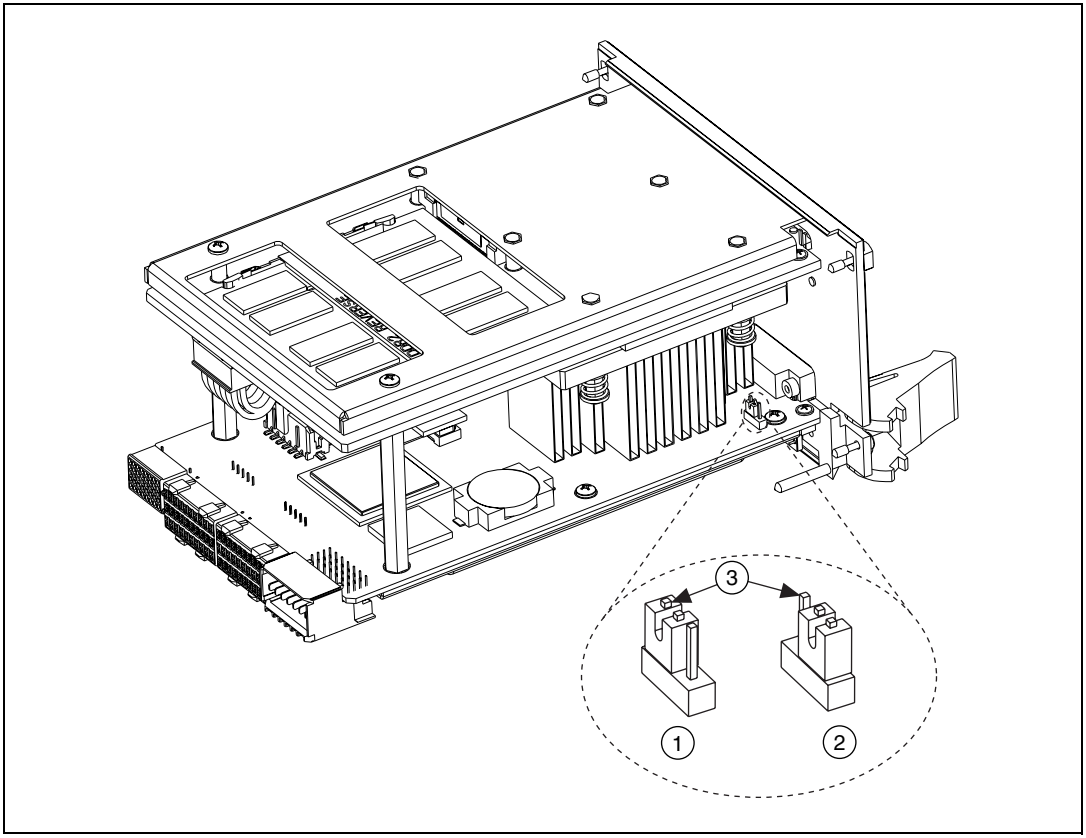
System CMOS

The NI PXIe-8103 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 W5 from pins 1–2 to pins 2–3, as shown in Figure 2-3.
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 and prevents the controller from booting.



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

Figure 2-3. Clearing the CMOS Contents

Drivers and Software

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

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

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. You will see several files, one corresponding to each peripheral.

The os directory contains a subdirectory corresponding to the operating system installed on your computer.

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.

PXI Express Features

PXI Express Trigger Connectivity

The SMB connector on the NI PXIe-8103 front panel can connect to or from any PXI Express backplane trigger line. A trigger allocation process is needed to prevent two resources from connecting to the same trigger line, resulting in the trigger being double-driven and possibly damaging the hardware. At the time of this manual's publication, this software is not yet available for Windows. Contact National Instruments for more information.

PXI Chassis Configuration

The PXI Platform Services software included with your controller automatically identifies your PXI Express system components to generate a pxiesys.ini file. You can configure your entire PXI system and identify PXI-1 chassis through Measurement & Automation Explorer (MAX), included with your controller. MAX creates the pxiesys.ini and pxisys.ini file, which define your PXI system parameters. MAX also provides an interface to route and reserve triggers so dynamic routing, through drivers such as DAQmx, avoids double-driving and potentially damaging trigger lines. For more information about routing and reserving PXI triggers, refer to KnowledgeBase 3TJDOND8 at ni.com/support.

The configuration steps for single or multiple-chassis systems are the same.

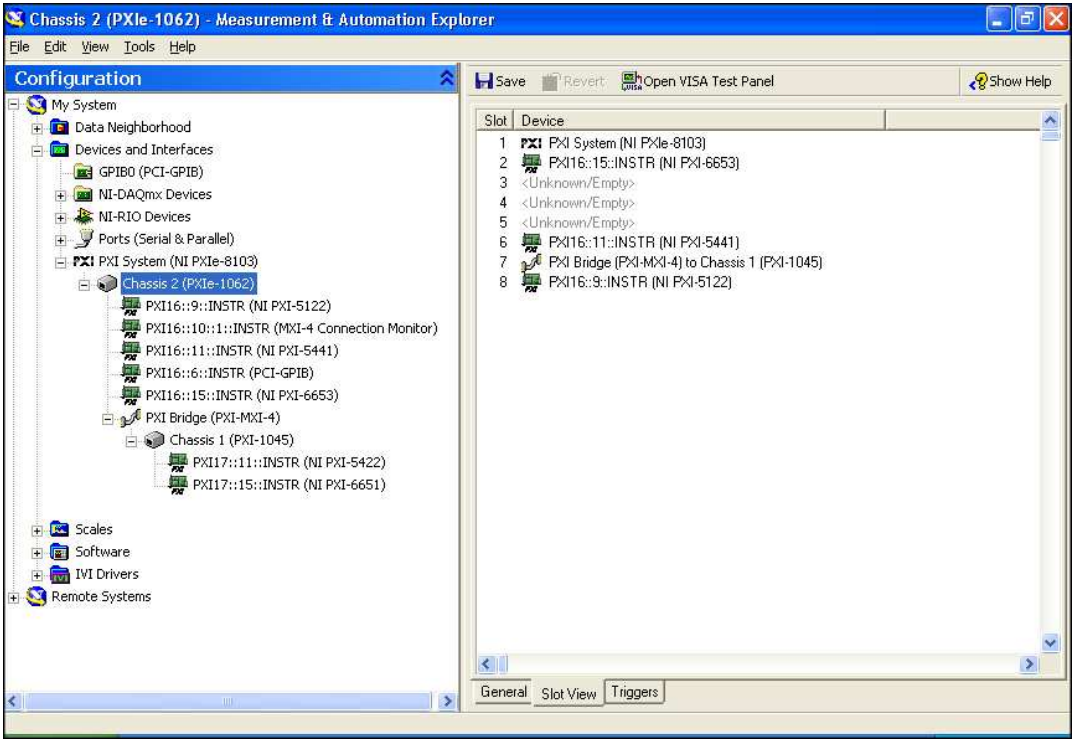


Figure 2-4. Multichassis Configuration in MAX

PXI-1 System Configuration

1. Launch MAX.
2. In the **Configuration** tree, click the **Devices and Interfaces** branch to expand it.
3. If the PXI system controller has not yet been configured, it is labeled **PXI System (Unidentified)**. Right-click this entry to display the pop-up menu, then select the appropriate controller model from the **Identify As** submenu.
4. Click the **PXI System** controller. The chassis (or multiple chassis, in a multichassis configuration) is listed below it. Identify each chassis by right-clicking its entry, then selecting the appropriate chassis model through the **Identify As** submenu. Further expanding the **PXI System** branch shows all devices in the system that can be recognized by NI-VISA. When your controller and all your chassis are identified, the required `pxisys.ini` file is complete.

The PXI specification allows for many combinations of PXI chassis and system modules. To assist system integrators, the manufacturers of PXI chassis and system modules must document the capabilities of their products. PXI Express devices must provide a driver and `.ini` file for identification. These files are provided as part of the PXI Platform Services software included with your controller. The minimum documentation requirements for PXI-1 are contained in `.ini` files, which consist of ASCII text. System integrators, configuration utilities, and device drivers can use these `.ini` files.

The capability documentation for a PXI-1 chassis is contained in a `chassis.ini` file provided by the chassis manufacturer. The information in this file is combined with information about the system controller to create a single PXI-1 system initialization file called `pxisys.ini` (PXI System Initialization). The NI PXIe-8103 uses MAX to generate the `pxisys.ini` file from the `chassis.ini` file.

Device drivers and other utility software read the `pxiesys.ini` and `pxisys.ini` file to obtain system information. For detailed information about initialization files, refer to the PXI specification at `www.pxisa.org`.

Upgrading RAM

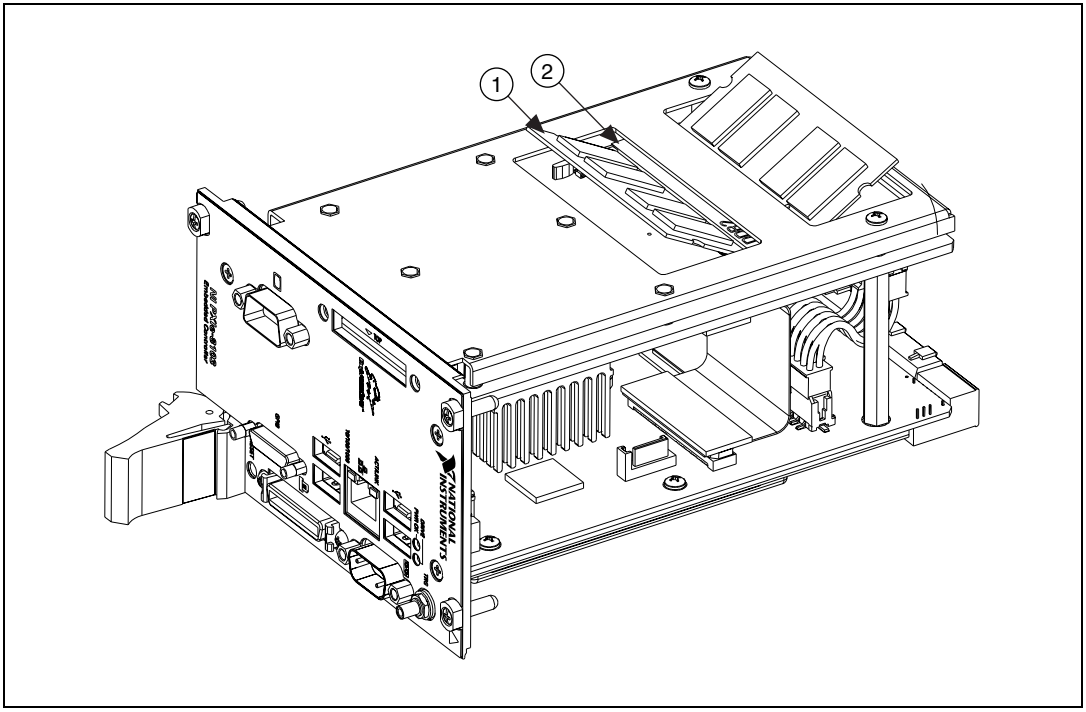
You can change the amount of installed RAM on the NI PXIe-8103 by upgrading the SO-DIMMs.

To upgrade the RAM, remove the NI PXIe-8103 from the PXI Express chassis. 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.

National Instruments offers the following types of SO-DIMMs for use with the NI PXIe-8103 controller.

- PC2-4200 256 MB, 32 MB × 64, CL 4, 1.18 in. max
- PC2-4200 512 MB, 64 MB × 64, CL 4, 1.18 in. max
- PC2-4200 1 GB, 128 MB × 64, CL 4, 1.18 in. max

Note National Instruments has tested and verified that the DDR2 SO-DIMMs we sell work with the NI PXIe-8103. 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.



1 DDR2 SO-DIMM Module	2 DDR2 SO-DIMM Socket

Figure 2-5. Installing a DDR2 SO-DIMM in an NI PXIe-8103 Controller

Hard Drive Recovery

NI PXIe-8103 controllers include 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 PXIe-8103 controller also ships with an OS Recovery CD that allows you to reinstall your operating system onto your hard drive through an external 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 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 CD, you can use the included OS re-installation CD with an external CD-ROM drive such as a USB CD-ROM drive. Boot the PXI Express 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.

Installing an OS

NI PXIe-8103 controllers include a preinstalled OS. In some cases, you may want to install a different OS. When doing so, consider the following guidelines.

Installing from a CD-ROM

The NI PXIe-8103 supports the installation of Windows XP from a USB CD-ROM. However, many other operating systems do not support installation from a USB CD-ROM. For example, Windows 2000 aborts during the install process because it does not have drivers for the CD-ROM device.

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

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

Note For additional assistance with installing or changing an operating system, refer to KnowledgeBase 2ZKC02OK at `ni.com/support`.

ExpressCard

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

Installing an ExpressCard

You can install an ExpressCard module while the NI PXIe-8103 is running. The NI PXIe-8103 will automatically detect the card. ExpressCards 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, 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 PXIe-8103 will automatically recognize the ExpressCard and load the appropriate driver(s). Third-party cards may require that you install additional drivers. Contact your ExpressCard vendor for more information.

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

Removing an ExpressCard

To remove the ExpressCard 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 device before removing it from the PXIe-8103. In Windows, use the Safely Remove Hardware tool to safely stop the ExpressCard.

3

I/O Information

Front Panel Connectors

Table 3-1 lists various peripherals and their corresponding NI PXIe-8103 external connectors, bus interfaces, and functions.

Table 3-1. NI PXIe-8103 Peripherals Overview

Peripheral	External Connector	Description
Video	VGA (15-pin DSUB)	Intel Extreme Graphics controller
Serial	COM1 (9-pin DSUB)	16550 RS-232 serial port
Ethernet	LAN (RJ45)	10/100/1000 Ethernet connection
Parallel	Parallel Port (36-pin champ)	IEEE 1284
USB	USB 4-pin Series A stacked receptacle (4 ports)	USB 2.0 capable
PXI trigger	Trigger (SMB)	Routing PXI triggers to or from the backplane trigger bus
GPIB device	GPIB (25-pin Micro D)	General-Purpose Interface Bus, IEEE 488.2
ExpressCard/34 module	ExpressCard/34 slot	ExpressCard/34 Expansion

Front Panel

Figure 3-1 shows the front panel layout and dimensions of the NI PXIe-8103. Dimensions are in inches [millimeters].

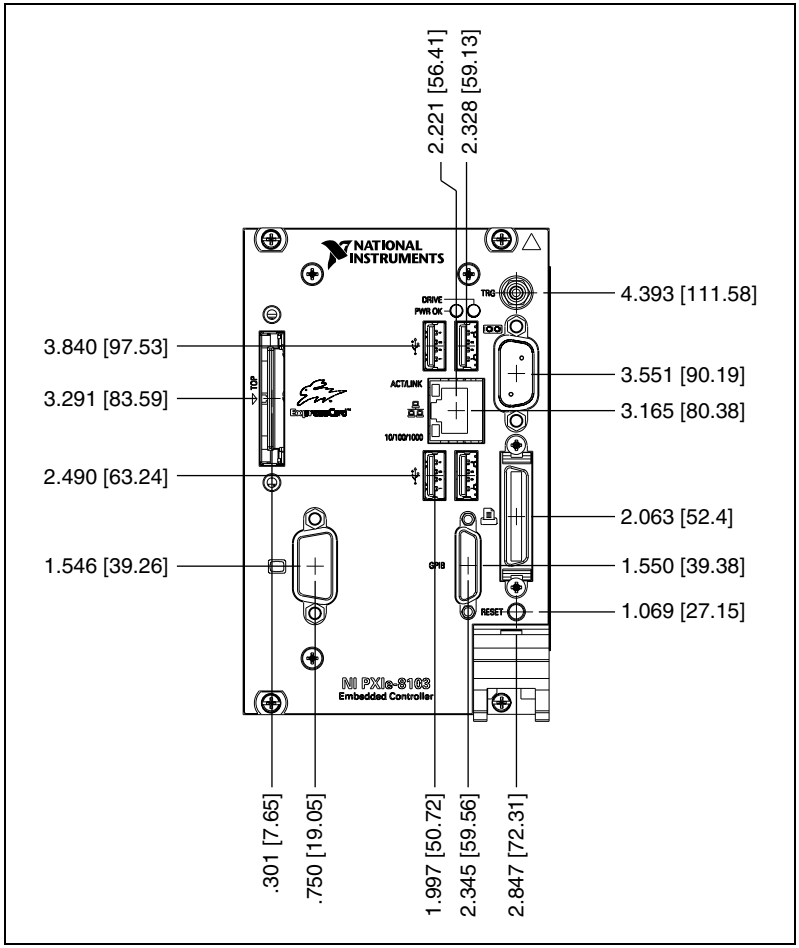


Figure 3-1. NI PXIe-8103 Front Panel Layout and Dimensions

VGA

Figure 3-2 shows the location and pinouts for the VGA connector on the NI PXIe-8103. Table 3-2 lists and describes the VGA connector signals.

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

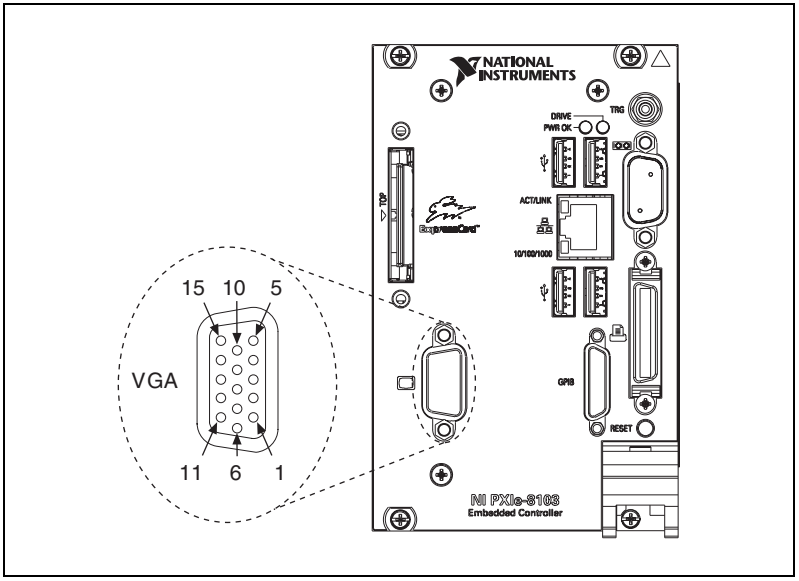


Figure 3-2. VGA Connector Location and Pinout

Table 3-2. VGA Connector Signals

Pin	Signal Name	Signal Description
1	R	Red
2	G	Green
3	B	Blue
4	NC	Not Connected
5	GND	Ground
6	GND	Ground
7	GND	Ground
8	GND	Ground
9	+5V	5 V
10	GND	Ground
11	NC	Not Connected
12	SD	Serial Data
13	HSync	Horizontal Sync

Table 3-2. VGA Connector Signals (Continued)

Pin	Signal Name	Signal Description
14	VSync	Vertical Sync
15	SC	Serial Clock

COM1

Figure 3-3 shows the location and pinouts for the COM1 connector on the NI PXIe-8103. Table 3-3 lists and describes the COM1 connector signal.

AMP manufactures a serial port mating connector, part number 745491-5.

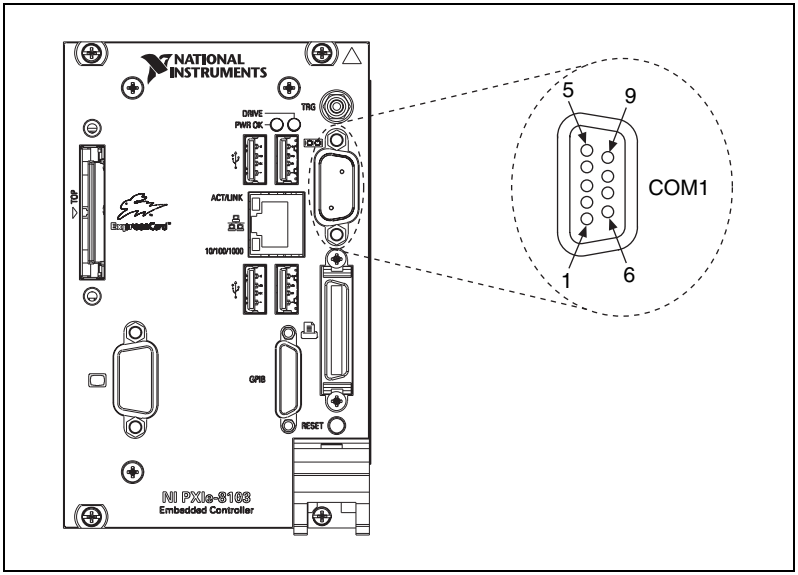


Figure 3-3. COM1 Connector Location and Pinout

Table 3-3. 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

Table 3-3. COM1 Connector Signals (Continued)

Pin	Signal Name	Signal Description
6	DSR#	Data Set Ready
7	RTS#	Ready to Send
8	CTS#	Clear to Send
9	RI#	Ring Indicator

Ethernet

Figure 3-4 shows the location and pinouts for the Ethernet connector on the NI PXIe-8103. Table 3-4 lists and describes the Ethernet connector signals.

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

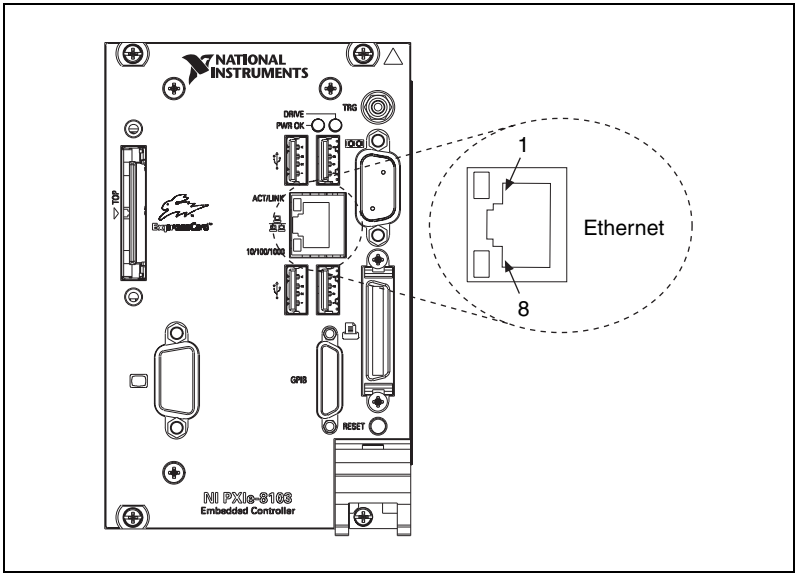


Figure 3-4. Ethernet Connector Location and Pinout

Table 3-4. Ethernet Connector Signals

Pin	Fast Ethernet	Gigabit Ethernet
1	TX+	TX_A+
2	TX–	TX_A–
3	RX+	RX_B+

Table 3-4. Ethernet Connector Signals (Continued)

Pin	Fast Ethernet	Gigabit Ethernet
4	NC	TX_C+
5	NC	TX_C–
6	RX–	RX_B–
7	NC	RX_D+
8	NC	RX_D–

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

Table 3-5. 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 (brighter and pulsing)	The controller is communicating with another computer on the LAN.
Bottom	(None)	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.

Parallel Port

Figure 3-5 shows the location and pinouts for the IEEE 1284 (parallel) connector on the NI PXIe-8103. Table 3-6 lists and describes the IEEE 1284 connector signals.

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

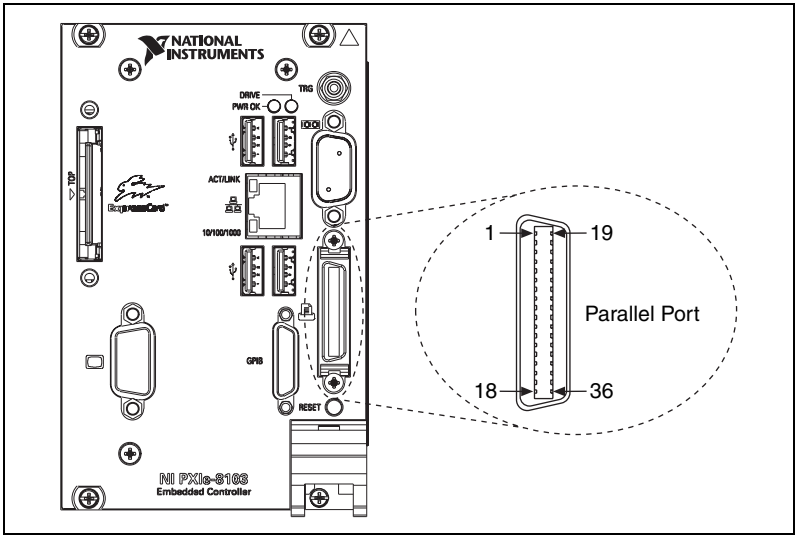


Figure 3-5. Parallel Port Connector Location and Pinout

Table 3-6. 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

Table 3-6. Parallel Port Connector Signals (Continued)

Pin	Default Configuration (LPT)	
	Signal Name	Signal Description
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

Universal Serial Bus

Figure 3-6 shows the location and pinouts for the Universal Serial Bus (USB) connector on the NI PXIe-8103. Each controller has 4 USB ports on the front panel. Table 3-7 lists and describes the USB connector signals.

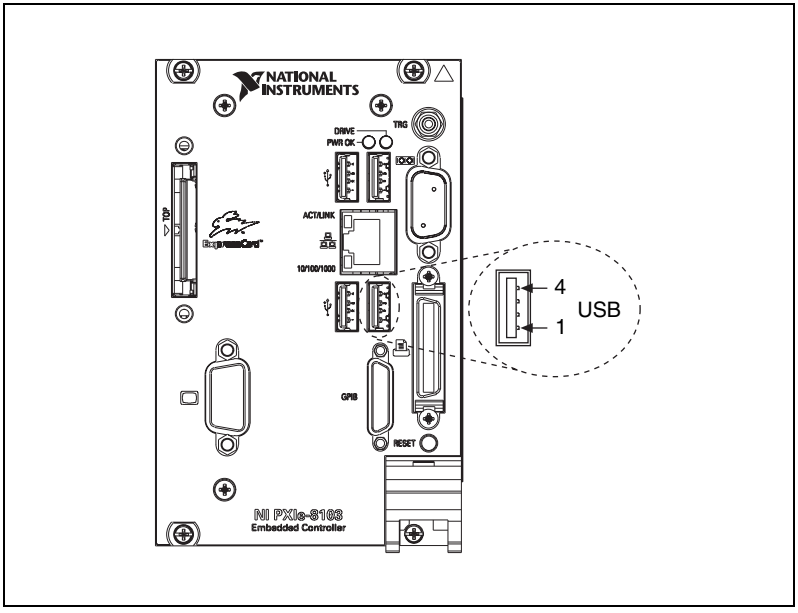


Figure 3-6. USB Connector Location and Pinout

Table 3-7. USB Connector Signals

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

Trigger

The TRG connector is the software-controlled trigger connection for routing PXI triggers to or from the backplane trigger bus.

Figure 3-7 shows the TRG connector location on the NI PXIe-8103. Table 3-8 lists and describes the trigger connector signals.

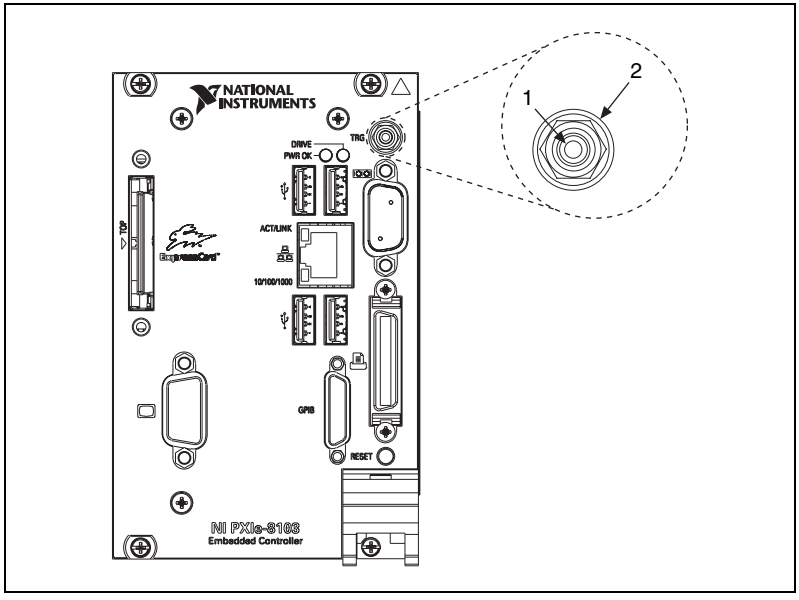


Figure 3-7. TRG Connector Location and Pinout

Table 3-8. TRG Connector Signals

Pin	Signal Name	Signal Description
1	TRIG	Trigger
2 (Shield)	GND	Ground

GPIB (IEEE 488.2)

Figure 3-8 shows the location and pinouts for the GPIB connector on the NI PXIe-8103. Table 3-9 lists and describes the GPIB connector signals.

ITT Canon manufactures a GPIB mating connector, part number MDSM-25SC-Z11-V51.

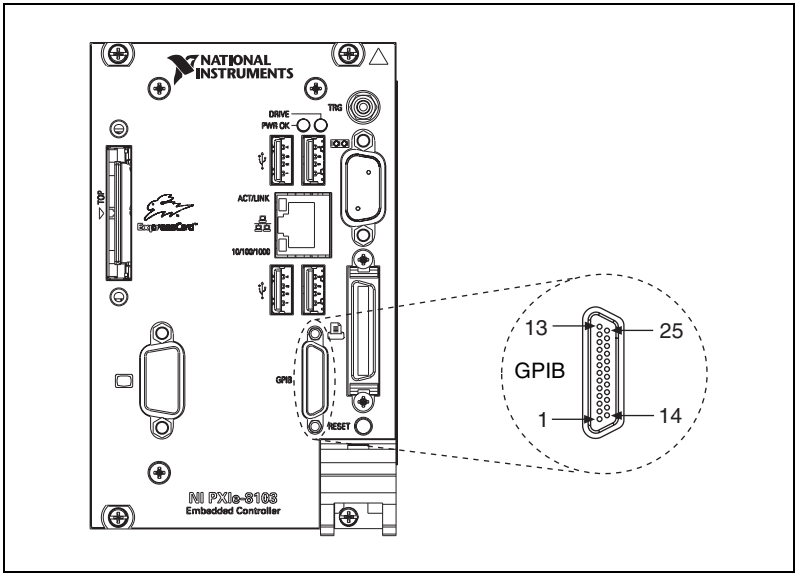


Figure 3-8. GPIB Connector Location and Pinout

Table 3-9. 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

Table 3-9. GPIB Connector Signals (Continued)

Pin	Signal Name	Signal Description
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

ExpressCard/34 Slot

The NI PXIe-8103 controller is equipped with an ExpressCard/34 slot on the front panel, which provides I/O expansion and options for removable storage.

Figure 3-9 shows the location and pinouts for the ExpressCard/34 slot on the NI PXIe-8103. Table 3-10 lists and describes the ExpressCard connector signals.

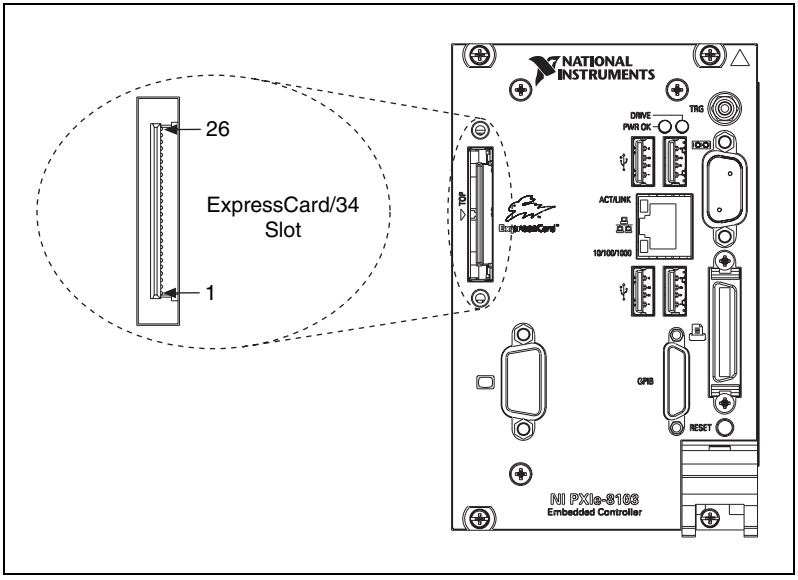


Figure 3-9. ExpressCard/34 Slot Location and Pinout

Table 3-10. ExpressCard 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

Table 3-10. ExpressCard Connector Signals (Continued)

Pin	Signal Name	Signal Description
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	PERn0	PE Data Receive –
22	PERp0	PE Data Receive +
23	GND	Ground
24	PETn0	PE Data Transmit –
25	PETp0	PE Data Transmit +
26	GND	Ground

Front Panel Features

The NI PXIe-8103 has the following front-panel features:

- A system reset pushbutton (press the button to generate a reset to the controller)
- Two front panel LEDs that show PC status
  - The **POWER OK** LED indicates the power status of the controller. The LED will indicate one of the following states:
    - ON steady—PXI and onboard power is on and within regulation limits
    - BLINKING—One of the onboard power supplies is operating outside of the normal limits
    - OFF—The controller is powered off
  - The **DRIVE** LED indicates when an access to the internal hard disk is occurring.

Data Storage

The NI PXIe-8103 has the following data storage features:

- Internal Serial ATA hard drive
  - 2.5 in. notebook hard drive
  - Supports Native Command Queuing
  - Supports transfer rates up to 1.5 Gb/s
- USB storage support—USB CD-ROM, mass storage device, or floppy drive

4

Common Configuration Questions

This chapter answers common configuration questions you may have when using a NI PXIe-8103 embedded controller.

General Questions

What do the LEDs on the NI PXIe-8103 front panel mean?

Refer to the LED status descriptions in the *Front Panel Features* section of Chapter 3, *I/O Information*.

After shutting down my NI PXIe-8103 controller, the Ethernet LEDs continue to blink. Is it safe to remove my controller or disconnect power?

The NI PXIe-8103 controller Ethernet device remains powered even after shutdown. It is safe to remove your controller or disconnect power.

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 PXIe-8103 and press <Delete> during the memory tests. Refer to the *Entering BIOS Setup* section of Chapter 2, *Installation and Configuration*, for more information.

Can I use the internal Serial ATA drive and an external hard drive at the same time?

Yes.

Boot Options

What devices can I boot from?

The NI PXIe-8103 can boot from the following devices:

- The internal Serial ATA hard drive
- An external SCSI hard drive or CD-ROM if an SCSI adapter, such as the PXI-8214, is used
- A network PXE server on the same subnet
- An external USB mass storage device such as a USB hard drive or CD-ROM
- An external USB floppy drive
- Most PCI or PCIe-based devices that provide their own Option ROM

Note There are some limitations when booting from a USB device. Windows XP can be installed from a USB CD-ROM, but earlier versions of Windows cannot. The NI PXIe-8103 BIOS configures the USB devices so that they will work in a DOS environment.

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 <Esc> 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.

Cables and Connections

How do I plug both a PS/2 mouse and PS/2 keyboard into the controller?

The NI PXIe-8103 has no PS/2 connector, and you need to use a USB Y-splitter cable as shown in Figure 4-1, or a similar device, to connect both a PS/2 mouse and PS/2 keyboard. National Instruments Part Number 778713-02 is such a cable and is available through the online catalog at `ni.com/products`.

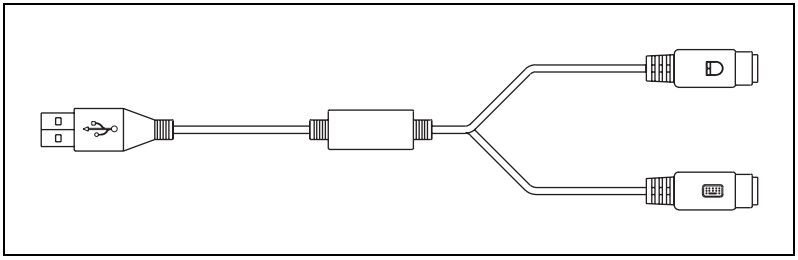


Figure 4-1. Y-Splitter Cable

What if I don't have a Y-splitter cable? Can I still use a mouse and keyboard?

If you do not have a Y-splitter cable, plug a USB keyboard into any USB connector. You can also plug a USB mouse into any USB connector.

How do I connect a standard 25-pin LPT cable to the NI PXIe-8103?

The NI PXIe-8103 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. Parallel port adapter cables, part number 777169-01, are available through the online catalog at `ni.com/products`.

Software Driver Installation

How do I install or reinstall the video driver?

Refer to KnowledgeBase 3H3COSD8 at `ni.com/support`.

How do I install or reinstall the Ethernet driver?

Refer to KnowledgeBase 3H3COSD8 at `ni.com/support`.

How do I install or reinstall the GPIB driver?

The NI-488.2 driver for your GPIB port is installed by default when your controller is first shipped from the factory. To change the default installed driver, complete the following steps:

1. Download the latest GPIB driver from `ni.com/downloads`.
2. Install the driver and verify that the driver has properly detected the GPIB driver in the Device Manager. If you need more assistance, refer to `ni.com/support/install`.

Note Click the **Scan for Hardware Changes in the Device Manager** button to force re-detection of the GPIB hardware after installing the driver.

How do I install software from a CD?

The compact size of the NI PXIe-8103 does not allow for an integrated CD-ROM drive. If you are using Windows XP, you have the following options:

- **USB CD-ROM**—Windows XP supports installing from a USB CD-ROM using a bootable installation CD.
- **SCSI CD-ROM**—Windows XP supports installing from a SCSI CD-ROM using a bootable installation CD.
- **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 PXIe-8103.

Upgrade Information

How do I upgrade system memory?

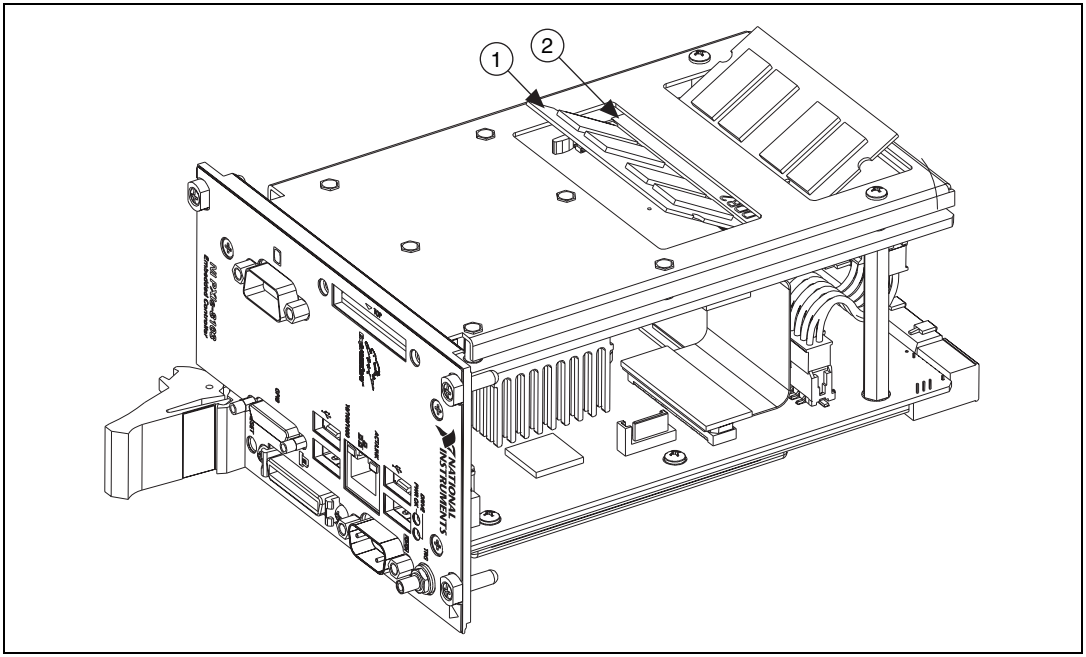
You can change the amount of installed RAM on the NI PXIe-8103 by upgrading the DDR2 SO-DIMMs.

To upgrade the RAM, remove the NI PXIe-8103 from the PXI chassis. 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.

National Instruments offers the following types of SO-DIMMs for use with the NI PXIe-8103 controller.

- PC2-4200 256 MB, 32 MB × 64, CL 4, 1.18 in. max
- PC2-4200 512 MB, 64 MB × 64, CL 4, 1.18 in. max
- PC2-4200 1 GB, 128 MB × 64, CL 4, 1.18 in. max

Note National Instruments has tested and verified that the DDR2 SO-DIMMs we sell work with the NI PXIe-8103. 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.



1 DDR2 SO-DIMM Module	2 DDR2 SO-DIMM Socket

Figure 4-2. Installing a DDR2 SO-DIMM in an NI PXIe-8103 Controller

How do I flash a new BIOS?

You can download the new BIOS from `ftp.ni.com/support/pxi/`. For more information, refer to KnowledgeBase 3H3COSD8.

Where do I get the latest software drivers?

The latest National Instruments software is available from `ni.com/downloads/`. For peripheral drivers, refer to KnowledgeBase 3H3COSD8 at `ni.com`.

My NI PXIe-8103 does not have an internal floppy drive. Is there a way to use an external drive?

Yes. The NI PXIe-8103 controller supports and can boot from USB floppy drives. A USB floppy drive will not work with Windows NT4, but will work with Windows 2000 or Windows XP. Refer to the *Boot Options* section for more information.

A USB floppy drive is available from National Instruments, part number 778492-02.

PXI Express Configuration

How do I use the SMB trigger on the front panel?

For details, refer to the *PXI Express Features* section of Chapter 2, *Installation and Configuration*.

Why doesn't the NI PXIe-8103 work with the PXI-8220 or PXI-8221?

The serialized IRQ line is not routed to the backplane on the PXIe-8103. This prevents PC cards using ISA interrupts from working with the PXIe-8103.

5

Troubleshooting

This chapter answers common troubleshooting questions you may have when using the NI PXIe-8103 embedded computer.

What if the NI PXIe-8103 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 **Power 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?
- Refer to your chassis user manual for additional troubleshooting steps.

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.
- Clear the CMOS. (Refer to the *System CMOS* section of Chapter 2, *Installation and Configuration*.)
- Recover the hard drive on the controller. (Refer to the *Hard Drive Recovery* section of Chapter 2, *Installation and Configuration*.)

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 synch 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. Once 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.

If the system has been booted to Windows without a monitor attached, the driver may have defaulted to the CRT connector being disabled. Press <Ctrl-Alt-F1> to re-enable the CRT in Windows. For additional information, refer to KnowledgeBase 3OHCFRD8 at `ni.com/support`.

My system boots fine as long as a particular module is not in my chassis.

The most common cause of this is a damaged module. Try the module in a different chassis or with a different controller. Also, remove any external cables or terminal blocks connected to the system. If the module does not work in these cases, it is likely damaged. Contact the module manufacturer for further troubleshooting.

Refer to the KnowledgeBase or product manuals section at `ni.com` for more information specific to the chassis and controller with which you are having difficulties.

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

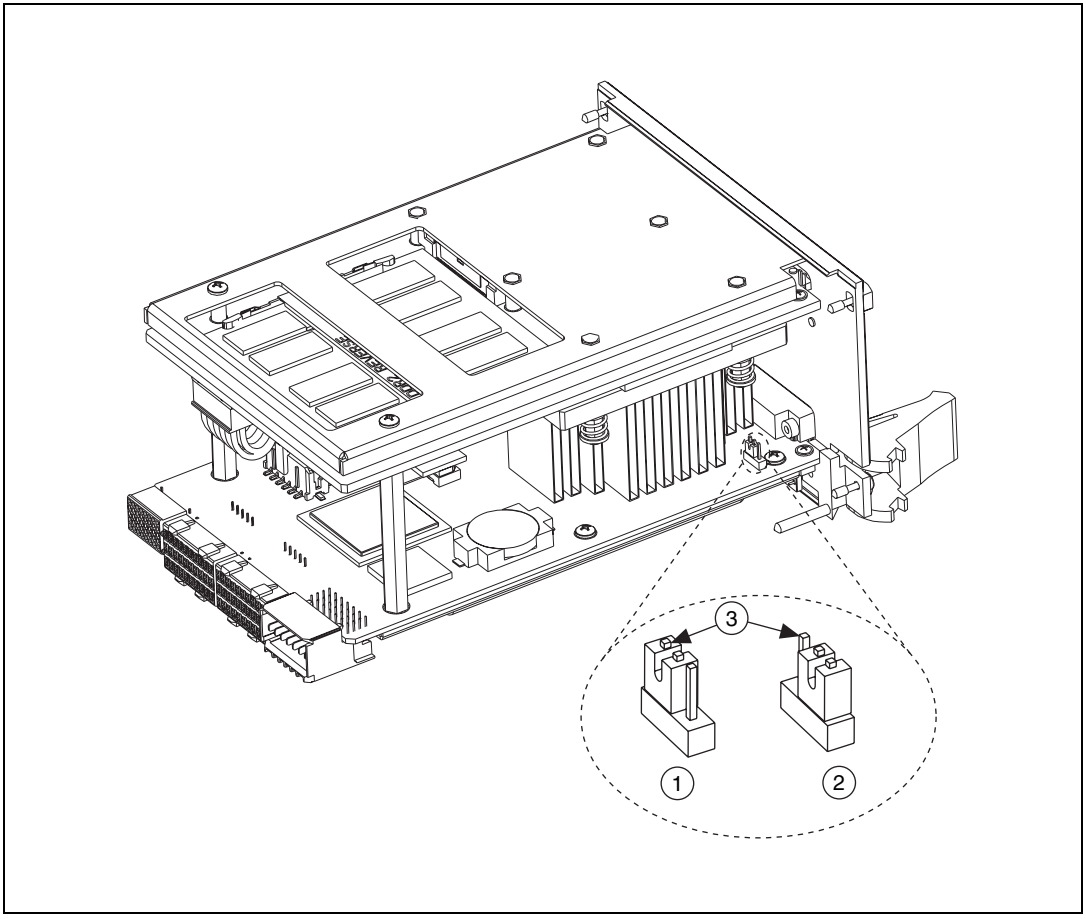
1. Enter the BIOS setup program as described in the *Entering BIOS Setup* section of Chapter 2, *Installation and Configuration*.
2. Press <F9> to load BIOS default**s**.
3. Answer **Y** (Yes) to the verification prompt.
4. Select **Save and Exit Setup**.

As an alternative method, complete the following steps:

1. Power off the chassis.
2. Remove the controller from the chassis.

3. Move the jumper on W5 from pins 1–2 to pins 2–3 as shown in Figure 5-1.
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. Also, the controller will not boot.



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

Figure 5-1. Clearing the CMOS Contents

A

Specifications

This appendix lists the electrical, mechanical, and environmental specifications of the NI PXIe-8103 embedded computer.

Features

	NI PXIe-8103
CPU	Intel Pentium M 760 (2.0 GHz)
On-die L2 cache	2048 kB
Dual-Channel DDR2 RAM	512 MB Standard 2 GB Maximum
Hard Drive	40 GB Serial ATA, minimum
Ethernet	10/100/1000 BaseTX
PXI Express 4 Link Configuration	Supports 4 x1 links
PXI Express 2 Link Configuration	Supports 2 x1 links
GPIB (IEEE 488.2 Interface)	Yes
Serial Ports (RS-232)	Yes (1)
Parallel Port	Yes (1)
USB 2.0 Hi-Speed Ports	Yes (4)
ExpressCard/34 Slot	Yes
PS/2 Keyboard/Mouse Connector	No
PXI Trigger Bus Input/Output	Yes
Operating System	Windows XP Professional

Electrical

Voltage (V)	Current (A)	
	Typical	Maximum
+3.3	2.8 A	4.7 A
+5	5 A	7.6 A
+5_STBY (Off)	0.230 A	0.300 A
+5_STBY (On)	0.580 A	1 A
+12	0 A	0 A
–12	0 A	0 A

Physical

Board dimensions .....Four-wide 3U PXI Express module

Slot requirements .....One system slot plus three controller expansion slots

Compatibility .....Fully compatible with *PXI Express Specification* 1.0

Weight .....0.7 Kg (1.7 lb) typical

Environment

Maximum altitude.....2,000 m (at 25 °C ambient temperature)

Pollution Degree 2

Indoor use only.

Caution Clean the NI PXIe-8103 with a soft nonmetallic brush. Make sure that the device is completely dry and free from contaminants before returning it to service.

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.)

Caution The operating temperature must not be exceeded, even when used in a chassis with a higher temperature range.

Storage Environment

Ambient temperature range ..... –40 to 65 °C (Tested in accordance with IEC-60068-2-1 and IEC-60068-2-2. Low temperature meets MIL-PRF-28800F, Class 3 limits.)

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

Shock and Vibration

Operational shock ..... 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 ..... 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 3.)

Safety

This product is designed to meet 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
- CAN/CSA-C22.2 No. 61010-1

Note For UL and other safety certifications, refer to the product label or to `ni.com/certification`, search by model number or product line, and click the appropriate link in the Certification column.

Electromagnetic Compatibility

Emissions	EN 55011 Class A at 10 m FCC Part 15A above 1 GHz
Immunity	EN 61326:1997 + A2:2001, Table 1
EMC	CE, C-Tick, and FCC Part 15 (Class A) compliant

Note For full EMC compliance, operate this device with shielded cabling.

CE Compliance

This product meets the essential requirements of applicable European Directives, as amended for CE marking, as follows:

Low-Voltage Directive (safety)	73/23/EEC
Electromagnetic Compatibility Directive (EMC)	89/336/EEC

Note Refer to the Declaration of Conformity (DoC) for this product for any additional regulatory compliance information. To obtain the DoC for this product, visit `ni.com/certification`, search by model number or product line, and click the appropriate link in the Certification column.

B

Technical Support and Professional Services

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

- **Support**—Online technical support resources at ni.com/support include the following:
  - **Self-Help Resources**—For answers and solutions, visit the award-winning National Instruments Web site 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.
  - **Free Technical Support**—All registered users receive free Basic Service, which includes access to hundreds of Application Engineers worldwide in the NI Developer Exchange at ni.com/exchange. National Instruments Application Engineers make sure every question receives an answer.

    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.
- **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 electronic compatibility (EMC) and product safety. You can obtain the DoC for your product by visiting ni.com/certification.

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.

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.

B

B	Bytes.
backplane	An assembly, typically a printed circuit board, with connectors and signal paths that bus the connector pins.
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 Express	An adaptation of the PCI specification for industrial and/or embedded applications that require a more robust mechanical form factor than desktop PCI. CompactPCI Express 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.
DDR	Double Data Rate.
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.

E

ECP	Extended Capabilities Parallel.
EEPROM	Electronically Erasable Programmable Read Only Memory.
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.
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.

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.

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

R

RAM	Random Access Memory—the computer's primary workspace.
resource	Hardware settings used by devices in a computer system, including ISA interrupt level, DMA channel, and I/O address.
RMS	Root mean squared. *See also* g_{rms}.
RTC	Real Time Clock—An electronic circuit that maintains the time of day and also can 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.

U

USB	Universal Serial Bus.

V

V	Volts.
VGA	Video Graphics Array—The minimum video display standard for all PCs.

W

W	Watts.

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