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PXI Express

NI PXIe-8130 User Manual

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Compliance

Electromagnetic Compatibility Information

This hardware has been tested and found to comply with the applicable regulatory requirements and limits for electromagnetic compatibility (EMC) as indicated in the hardware's Declaration of Conformity (DoC)[1]. These requirements and limits are designed to provide reasonable protection against harmful interference when the hardware is operated in the intended electromagnetic environment. In special cases, for example when either highly sensitive or noisy hardware is being used in close proximity, additional mitigation measures may have to be employed to minimize the potential for electromagnetic interference.

While this hardware is compliant with the applicable regulatory EMC requirements, there is no guarantee that interference will not occur in a particular installation. To minimize the potential for the hardware to cause interference to radio and television reception or to experience unacceptable performance degradation, install and use this hardware in strict accordance with the instructions in the hardware documentation and the DoC[1].

If this hardware does cause interference with licensed radio communications services or other nearby electronics, which can be determined by turning the hardware off and on, you are encouraged to try to correct the interference by one or more of the following measures:

- Reorient the antenna of the receiver (the device suffering interference).
- Relocate the transmitter (the device generating interference) with respect to the receiver.
- Plug the transmitter into a different outlet so that the transmitter and the receiver are on different branch circuits.

Some hardware may require the use of a metal, shielded enclosure (windowless version) to meet the EMC requirements for special EMC environments such as, for marine use or in heavy industrial areas. Refer to the hardware's user documentation and the DoC[1] for product installation requirements.

When the hardware is connected to a test object or to test leads, the system may become more sensitive to disturbances or may cause interference in the local electromagnetic environment.

Operation of this hardware in a residential area is likely to cause harmful interference. Users are required to correct the interference at their own expense or cease operation of the hardware.

Changes or modifications not expressly approved by National Instruments could void the user's right to operate the hardware under the local regulatory rules.

[1] The Declaration of Conformity (DoC) contains important EMC compliance information and instructions for the user or installer. 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.

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About This Manual

This manual contains detailed instructions for installing and configuring the National Instruments PXIe-8130 embedded computer kit.

How to Use the Documentation Set

Begin by reading the *NI PXIe-8130 Installation Guide*, a brief quick-start guide that describes how to install and get started with your controller.

This manual, the *NI PXIe-8130 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 tip, which alerts you to advisory information.



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.

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

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1 Introduction

This chapter provides overview information for PXI Express and the NI PXIe-8130 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.

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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-8130

Description

The NI PXIe-8130 PXI Express/CompactPCI Express embedded computer is a high bandwidth PXI Express/CompactPCI Express-compatible system controller. The NI PXIe-8130 controller integrates standard I/O features in a single unit by using state-of-the-art packaging. Combining an NI PXIe-8130 embedded controller with a PXI Express-compatible chassis, such as the PXIe-1062Q, results in a fully PC-compatible computer in a compact, rugged package.

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

The NI PXIe-8130 has an AMD 2.3 GHz Turion 64 X2, 800 MHz HyperTransport Link, Dual Channel DDR2, 667 MHz memory controller, all the standard I/O, and a 40 GB (or larger) hard drive. It also has an ExpressCard/34 expansion slot.



Note The NI PXIe-8130 Real-Time controllers ship with 40 GB (or larger) Extended Temperature hard drives. These controllers can be ordered from National Instruments with the part number 780032-33.

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Functional Overview

This section contains functional descriptions of each major logic block on the NI PXIe-8130 embedded computer.

NI PXIe-8130 Functional Description

The NI PXIe-8130 is a modular PC in a PXI Express 3U-size form factor. Figure 1-1 is a functional block diagram of the NI PXIe-8130. Following the diagram is a description of each logic block shown.

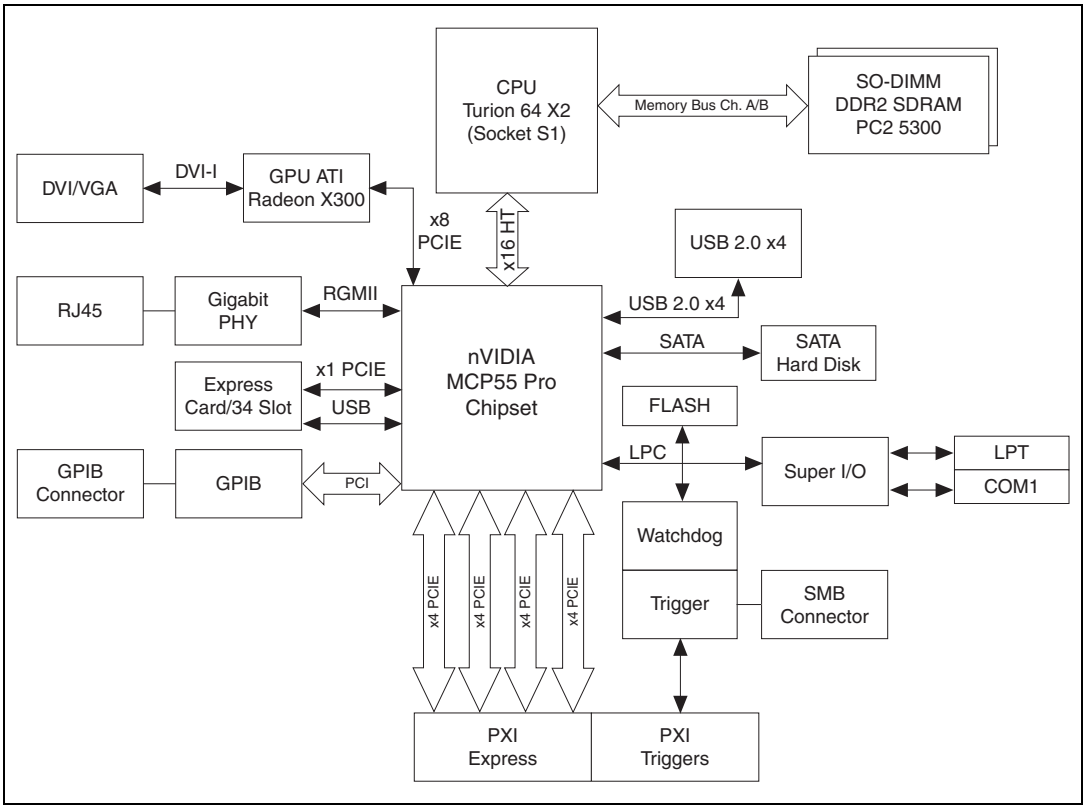


Figure 1-1. NI PXIe-8130 Block Diagram

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The NI PXIe-8130 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 S1 CPU* is the socket definition for the AMD 2.3 GHz Turion 64 X2 processor.
- The *SO-DIMM* block consists of two 64-bit DDR2 SDRAM sockets that can hold up to 2 GB each.
- The *CPU* connects to the DDR2 SDRAM, and nVIDIA MCP55 Pro.
- The *SMB to PXI Trigger* provides a routable connection of the PXI Express triggers to/from the SMB on the front panel.
- The *ATI Radeon X300 Embedded GPU* drives the graphics.
- The *Watchdog Timer* block consists of a watchdog timer that can reset the controller or generate a trigger.
- The *nVIDIA MCP55 Pro* chipset connects to the PCI, USB, Serial ATA, ExpressCard, PXI Express, and LPC buses.
- The *USB Connectors* connect the nVIDIA MCP55 Pro to the Hi-Speed USB 2.0 interface.
- The *Serial ATA Hard Disk* is a 60 GB or larger notebook hard disk.[1] The Serial ATA interface enables transfer rates up to 150 MB/s. The hard disk also supports Native Command Queuing.
- The *PXI Express Connector* connects the NI PXIe-8130 to the PXI Express/CompactPCI Express backplane.
- The *Super I/O* block represents the other peripherals supplied by the NI PXIe-8130. The NI PXIe-8130 has one serial port, and an ECP/EPP parallel port.
- The *Gigabit Enet PHY* 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.

[1] The extended-temperature, 24/7 option controller provides a 40 GB PATA hard drive.

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Figure 1-2 illustrates the architecture of the CPU board and the I/O board.

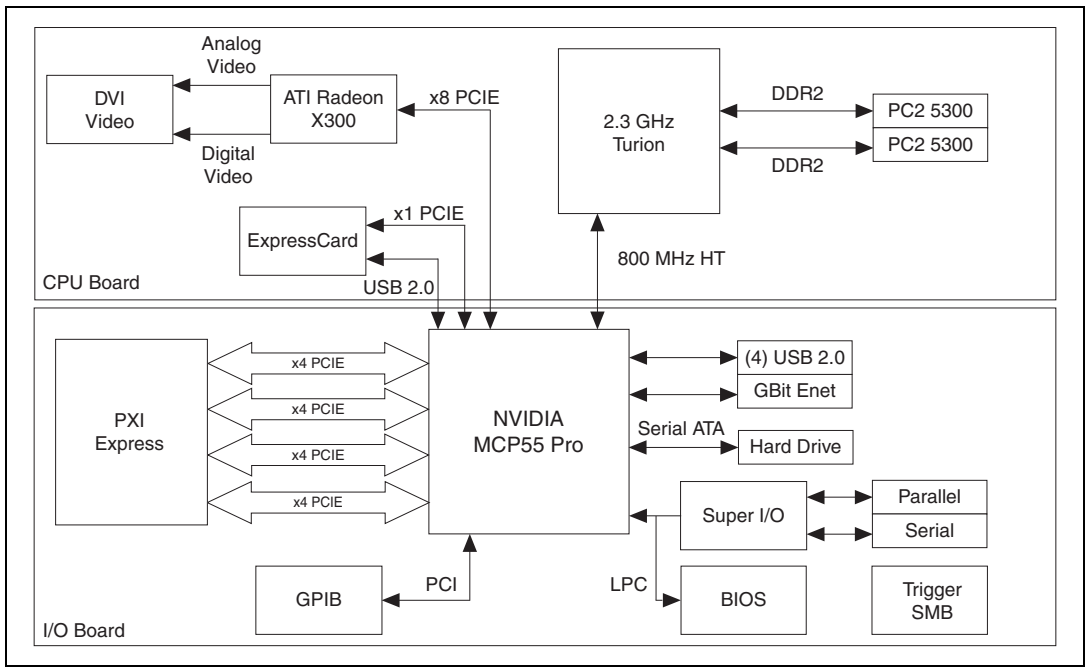


Figure 1-2. NI PXIe-8130 CPU Board and I/O Board

National Instruments Software

National Instruments has developed several software tools you can use with the NI PXIe-8130.

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 buses.

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

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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.

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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`.

Cleaning

Use a dry, low-velocity stream of air to clean the NI PXIe-8130 controller. If needed, use a soft-bristle brush for cleaning around components.

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2

Installation and Configuration

This chapter contains information about installing and configuring your NI PXIe-8130 controller.

Installing the NI PXIe-8130

This section contains general installation instructions for the NI PXIe-8130. Consult your PXI Express chassis user manual for specific instructions and warnings.

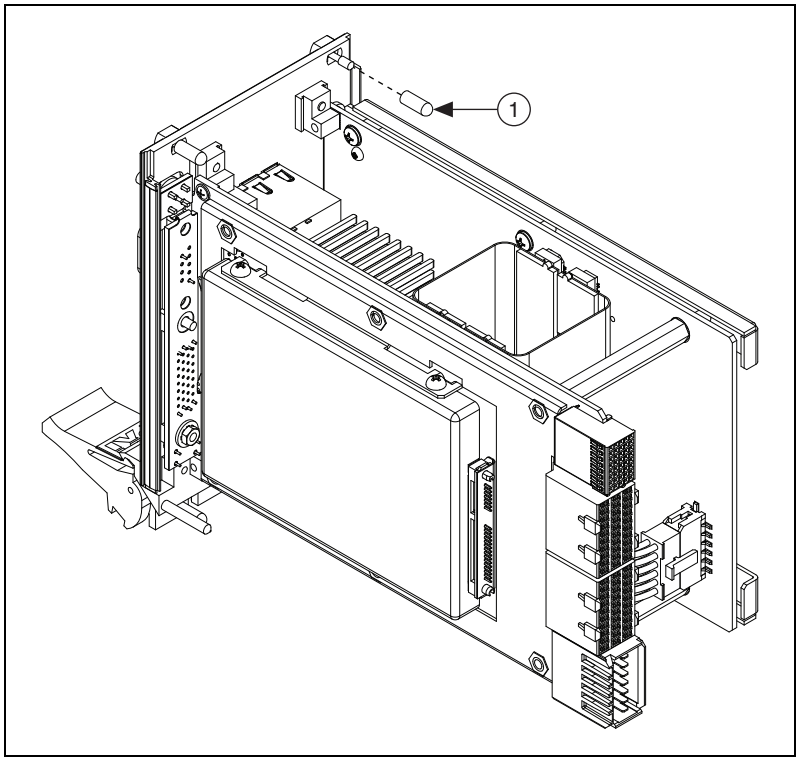
1. Plug in your chassis before installing the NI PXIe-8130. The power cord grounds the chassis and protects it from electrical damage while you install the module.

Caution To protect both yourself and the chassis from electrical hazards, leave the chassis powered off until you finish installing the NI PXIe-8130 module.

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.

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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-8130 with the card guides on the top and bottom of the system controller slot.

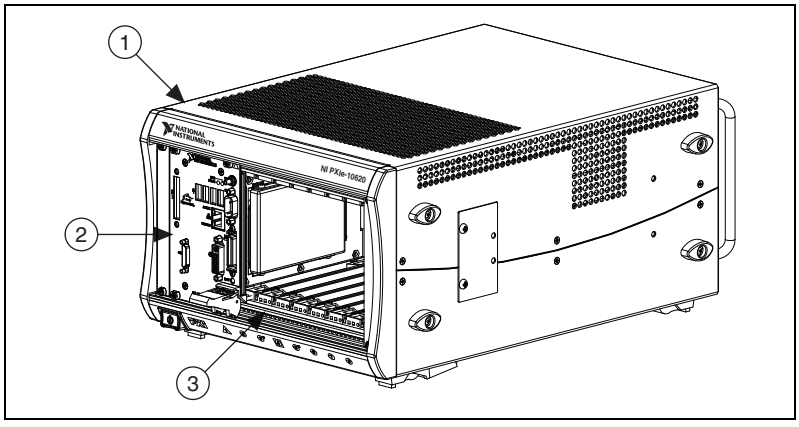
Caution Do *not* raise the injector/ejector handle as you insert the NI PXIe-8130. The module will not insert properly unless the handle is in its downward position so that it does not interfere with the injector rail on the chassis.

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-8130 should be even with the front panel of the chassis.

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8. Tighten the four bracket-retaining screws on the top and bottom of the front panel to secure the NI PXIe-8130 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 DVI monitor video cable to the DVI connector, or use the DVI-to-VGA adapter included with your controller to connect a VGA monitor to the DVI 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-8130 does not boot?* section of Chapter 5, *Troubleshooting*.

Figure 2-2 shows an NI PXIe-8130 installed in the system controller slot of a National Instruments NI PXIe-1062Q chassis.



1	NI PXIe-1062Q Chassis	3	Injector/Ejector Rail
2	NI PXIe-8130 Controller		

Figure 2-2. NI PXIe-8130 Controller Installed in a PXI Express Chassis

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How to Remove the Controller from the PXI Express Chassis

The NI PXIe-8130 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 4 bracket-retaining screws in the front panel.
3. Press the injector/ejector handle down.
4. Slide the unit out of the chassis.

Note If the PXIe chassis Inhibit Mode Selector Switch is not in the Default position, any attempt to shut down the NI PXIe-8130 through the push button reset or using Windows will result in the controller Power OK LED blinking. The user will be required to use the Remote Inhibit pin on the Remote Inhibit and Voltage Monitoring Connector to turn off the chassis. Refer to the PXIe chassis user manual for details on the functionality of the Remote Inhibit and Voltage Monitoring controls.

BIOS Setup Utility

You can change the NI PXIe-8130 configuration settings in the BIOS setup program. The BIOS is the low-level interface between the hardware and operating system 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-8130 controller features.

Most users do not need to use the BIOS setup program, as the NI PXIe-8130 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.

Accessing the BIOS Setup Utility

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

1. Power on or reboot your NI PXIe-8130 controller.
2. When the message **`Press DEL to run SETUP`** appears, press <Delete>. 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.

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Use the following keys to navigate through the BIOS setup program:

- **Left Arrow, Right Arrow**—Use these keys to move between 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 to enter a submenu or to display all available settings for a highlighted configuration option.
- **<Esc>**—Use this key to return to the parent menu of a submenu. At the top-level menus, this key serves as a shortcut to discard the configuration changes and exit the setup program.
- **<+>** 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.
- **<F9>**—Use this key to load the optimal default values for BIOS configuration settings. The optimal default values are the same as the shipping configuration default values.

Main Setup Menu

The most commonly accessed and modified BIOS settings are in the Main setup menu. The Main setup menu reports the following configuration information:

- **BIOS Version** and **Build Date**—These values indicate the version of the PXIe-8130 controller BIOS and the date that the BIOS was built on.
- **Processor Type**, **Speed**, and **Number of Cores**—These values indicate the type of processor used in the PXIe-8130 controller, the speed of the processor, and the number of processor cores.
- **System Memory**—This value indicates the size of system RAM detected by the BIOS.

The Main setup menu also includes the following settings:

- **System Time**—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.
- **System Date**—This setting controls the date, 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.

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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 and submenus:

- **IDE Configuration**—Use this setting to access the IDE Configuration submenu. Refer to the *IDE Configuration Submenu* section for more information.
- **Serial/Parallel Port Configuration**—Use this setting to access the Serial/Parallel Port Configuration submenu. Refer to the *Serial/Parallel Port Configuration Submenu* section for more information.
- **USB Configuration**—Use this setting to access the USB Configuration submenu. Refer to the *USB Configuration Submenu* section for more information.
- **Event Log Configuration**—Use this setting to access the Event Log submenu. Refer to the *Event Log Configuration Submenu* section for more information.
- **Video Configuration**—Use this setting to access the Video Configuration submenu. Refer to the *Video Configuration Submenu* section for more information.
- **Power/Reset Configuration**—Use this setting to access the Power/Reset Configuration submenu. Refer to the *Power/Reset Configuration Submenu* section for more information.
- **Trigger Router Configuration**—Use this setting to access the Trigger Router Configuration submenu. Refer to the *Trigger Router Configuration Submenu* section for more information.

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IDE Configuration Submenu

Use this submenu to apply alternate settings to the hard disk drive (HDD) interfaces. Normally, you do not need to modify these settings, as the factory default settings provide the most compatible and optimal configuration.

- **Onboard IDE Controller**—This setting specifies whether or not the onboard IDE controller is enabled or disabled. The default value is **Enabled**.
- **Serial-ATA Devices**—This setting specifies whether Serial-ATA device interfaces are enabled or disabled. For the PXIe-8130, the only available Serial-ATA device interface is **Device 0**. Selecting **Device 0** enables the Serial-ATA device interface. Selecting **Disabled** will disable all Serial-ATA device interfaces. The default value is **Device 0**. If a hard disk drive is detected on the interface, the setting will indicate **Hard Disk**.
- **Primary IDE Master**—Use this setting to access the Primary IDE Master submenu. Refer to the *Primary IDE Master/Slave Submenus* section for more information. If no IDE device is detected on the primary IDE master interface, this setting will indicate **Not Detected**. If a hard disk drive is detected on the interface, the setting will indicate **Hard Disk**.
- **Primary IDE Slave**—Use this setting to access the Primary IDE Slave submenu. Refer to the *Primary IDE Master/Slave Submenus* section for more information. If no IDE device is detected on the primary IDE slave interface, this setting will indicate **Not Detected**. If a hard disk drive is detected on the interface, the setting will indicate **Hard Disk**.
- **Serial-ATA 0 Primary Channel**—Use this setting to access the Serial-ATA 0 Primary Channel submenu. Refer to the *Serial-ATA 0 Primary/Secondary Channel Submenus* section for more information. If no Serial-ATA device is detected on the SATA0 primary channel, this setting will indicate **Not Detected**. If a hard disk drive is detected on the interface, the setting will indicate **Hard Disk**.
- **Serial-ATA 0 Secondary Channel**—Use this setting to access the Serial-ATA 0 Secondary Channel submenu. Refer to the *Serial-ATA 0 Primary/Secondary Channel Submenus* section for more information. If no Serial-ATA device is detected on the SATA0 secondary channel, this setting will indicate **Not Detected**. If a hard disk drive is detected on the interface, the setting will indicate **Hard Disk**.

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Primary IDE Master/Slave Submenus

Use these submenus to apply alternate settings to the primary IDE master and slave interfaces. Normally, you do not need to modify these settings, as the factory default settings provide the most compatible and optimal configuration.

- **Type**—This setting specifies type of device that the BIOS attempts to boot from. The default is **Auto**, which allows the BIOS to auto-detect the type of device connected to the IDE interface.
- **LBA/Large Mode**—This setting specifies whether or not the BIOS will use LBA mode on the IDE interface. LBA (Logical Block Addressing) is a method of addressing data on a disk drive. In LBA mode, the maximum drive capacity is 137 GB. The default is **Auto**, which allows the BIOS to automatically detect whether or not to use LBA mode.
- **Block (Multi-sector transfer)**—This setting specifies whether or not block (multi-sector transfer) mode should be enabled. The default is **Auto**, which allows the BIOS to automatically detect whether or not the device on the IDE interface supports block mode.
- **PIO Mode**—This setting specifies the Programmed I/O mode that should be used on this IDE interface. As PIO mode increases, the cycle time decreases. The default is **Auto**, which allows the BIOS to automatically detect the PIO mode of the device attached to this IDE interface.
- **DMA Mode**—This setting specifies the DMA mode that should be used on this IDE interface. The default is **Auto**, which allows the BIOS to automatically detect the DMA mode of the device attached to this IDE interface.
- **S.M.A.R.T.**—This setting specifies whether or not the Self-Monitoring Analysis and Reporting Technology feature is enabled or disabled. This feature can be used to predict drive failures. The default is **Auto**, which allows the BIOS to automatically determine if the attached hard drive is SMART capable, and if so, to enable the feature.
- **32Bit Data Transfer**—This setting specifies whether or not 32-bit data transfers are enabled on supported hard disks. The default is **Enabled**.

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Serial-ATA 0 Primary/Secondary Channel Submenus

Use these submenus to apply alternate settings to the Serial-ATA device 0 primary and secondary interfaces. Normally, you do not need to modify these settings, as the factory default settings provide the most compatible and optimal configuration.

- **LBA/Large Mode**—This setting specifies whether or not the BIOS will use LBA mode on the IDE interface. LBA (Logical Block Addressing) is a method of addressing data on a disk drive. In LBA mode, the maximum drive capacity is 137 GB. The default is **Auto**, which allows the BIOS to automatically detect whether or not to use LBA mode.
- **Block (Multi-sector transfer)**—This setting specifies whether or not block (multi-sector transfer) mode should be enabled. The default is **Auto**, which allows the BIOS to automatically detect whether or not the device on the IDE interface supports block mode.
- **PIO Mode**—This setting specifies the Programmed I/O mode that should be used on this IDE interface. As PIO mode increases, the cycle time decreases. The default is **Auto**, which allows the BIOS to automatically detect the PIO mode of the device attached to this IDE interface.
- **DMA Mode**—This setting specifies the DMA mode that should be used on this IDE interface. The default is **Auto**, which allows the BIOS to automatically detect the DMA mode of the device attached to this IDE interface.
- **S.M.A.R.T.**—This setting specifies whether or not the Self-Monitoring Analysis and Reporting Technology feature is enabled or disabled. This feature can be used to predict drive failures. The default is **Auto**, which allows the BIOS to automatically determine if the attached hard drive is SMART capable, and if so, to enable the feature.
- **32Bit Data Transfer**—This setting specifies whether or not 32-bit data transfers are enabled on supported hard disks. The default is **Enabled**.

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Serial/Parallel Port Configuration Submenu

Use this submenu to apply alternate configurations to the serial and parallel ports. Normally, you do not need to modify these settings, as the factory default settings provide the most compatible and optimal configuration possible.

- **Serial Port1 Address**—This setting specifies base address and interrupt request level (IRQ) information for COM1. The setting can also be used to disable COM1. The default value is **3F8/IRQ4**, which places COM1 at 0x3F8 IRQ 4.
- **Parallel Port Address**—This setting specifies the base address for LPT1, the parallel port. The setting can also be used to disable LPT1. The default is value is **378**, which places LPT1 at 0x378.
- **Parallel Port Mode**—This setting specifies the operating mode for LPT1. Usually, the default setting works for all applications. However, if a parallel port device requires a nondefault setting, select it here. The default is value is **Normal** (full IEEE 1284 capabilities).
- **Parallel Port IRQ**—This setting specifies the interrupt request level (IRQ) for LPT1, the parallel port. The default value is **IRQ7**.

USB Configuration Submenu

Use this submenu to apply alternate configurations to the USB ports. Normally, you do not need to modify these settings, as the factory default settings provide the most compatible and optimal configuration.

- **Legacy USB Support**—This setting specifies whether or not legacy USB support is enabled. Legacy USB support refers to the ability to use a USB keyboard and mouse during system boot or in a legacy operating system such as DOS. The default is **Enabled**.



Note Certain real-time applications may require you to disable this setting to reduce loop time jitter. When the controller is configured to boot LabVIEW RT, legacy USB support is automatically disabled.

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In addition, if a USB mass storage device is present, the following option is available:

- **USB Mass Storage Device Configuration**—Use this setting to access the USB Mass Storage Device Configuration submenu. Refer to the next section, *USB Mass Storage Device Configuration Submenu*, for more information. If no USB Mass Storage Device is detected, then this setting will not be present.
  - **USB Mass Storage Device Configuration Submenu**—Use this submenu to apply alternate settings to USB mass storage devices. Normally, you do not need to modify these settings, as the factory default settings provide the most compatible and optimal configuration.
    - **USB Mass Storage Reset Delay**—This setting specifies the number of seconds the Power-On Self Test will wait for a USB mass storage device to start. The default is **20 seconds**.
    - **Emulation Type**—This setting specifies how the BIOS will present the USB mass storage device to the system. This option can be used to present a USB mass storage device as a floppy, Zip, hard disk, or CD-ROM drive. The default is **Auto**, which allows the BIOS to treat USB devices under 530 MB as floppy drives and all other devices as hard disk drives.

Event Log Configuration Submenu

Use this submenu to access the system event log. The event log can be used to detect errors that occur during the Power-On Self Test.

- **View Event Log**—Use this option to view all unread events in the system event log.
- **Mark All Events as Read**—Use this option to mark all events in the system event log as read.
- **Clear Event Log**—Use this option to discard all events in the system event log.

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Video Configuration Submenu

Use this submenu to apply alternate settings to the video configuration. Normally, you do not need to modify these settings, as the factory default settings provide the most compatible and optimal configuration.

- **Onboard Video Adapter**—This setting specifies whether or not the onboard video adapter is enabled. The default is **Enabled**.
- **Primary Graphics Adapter**—This setting specifies which video adapter the BIOS should use as the primary adapter if more than one is present. To use an external video adapter as the primary graphics adapter, choose **Add-in PCI Video**. The default is **Onboard Video**.

Power/Reset Configuration Submenu

Use this submenu to apply alternate configurations to the power and reset configuration. Normally, you do not need to modify these settings, as the factory default settings provide the most compatible and optimal configuration.

- **Power Button Instant-Off**—This setting specifies the operating system 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-power managed OS environment only (corresponding to the **Non-PM OS Only** setting), such as LabVIEW RT or DOS. Alternatively, the controller can be configured to power off instantly in any OS, including Windows. The default is **Non-PM OS Only**.
- **Restore on AC Power Loss**—This setting specifies how the controller should behave after an AC power loss event occurs. The controller can be configured to **Power Off**, **Power On**, or return to the **Last State** that it was operating in before power was lost. The default is **Power Off**.

Trigger Router Configuration Submenu

Use this submenu to program the front panel trigger router configuration.

- **Route Front Panel Trigger**—This setting specifies how the front panel SMB trigger should be routed. The front panel trigger can be routed to **System Reset**, allowing an external trigger to reset the system. The default is **Disabled**.

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Boot Setup Menu

Use this menu to configure settings related to the boot process and boot device priority.

- **Boot Settings Configuration**—Use this setting to access the Boot Settings Configuration submenu. Refer to the *Boot Settings Configuration Submenu* section for more information.
- **1st Boot Device**, **2nd Boot Device**, **3rd Boot Device**—These settings specify the order in which the BIOS checks for bootable devices, including the local hard disk drive, removable devices such as USB flash disk drives or USB CD-ROM drives, or the PXE network boot agent. The BIOS will first attempt to boot from the device associated with **1st Boot Device**, followed by **2nd Boot Device** and **3rd Boot Device**. If multiple boot devices are not present, the BIOS setup utility will not display all of these configuration options. To select a boot device, press <Enter> on the desired configuration option and select a boot device from the resulting menu. You can also disable certain boot devices by selecting **Disabled**.
- **PXE Network Boot**—This setting specifies whether or not the PXE network boot agent is enabled. When enabled, this setting will you to select the **nVidia Boot Agent** as a **1st Boot Device**, **2nd Boot Device**, or **3rd Boot Device**, allowing you to boot from a PXE server on the local subnet. The system must be restarted for this setting to take effect. The default is **Disabled**.

Boot Settings Configuration Submenu

Use this submenu to apply alternate configurations to boot settings. Normally, you do not need to modify these settings, as the factory default settings provide the most compatible and optimal configuration.

- **Quick Boot**—This setting specifies whether or not the BIOS should perform all system tests during the Power-On Self Test. When **Enabled**, the BIOS will skip some tests during POST to allow the system to boot faster. The default is **Enabled**.
- **Bootup Num-Lock**—This setting specifies the power-on state of the keyboard Num-Lock setting. The default is **On**.
- **Wait for 'F1' If Error**—This setting specifies how the system should behave if an error is encountered during the Power-On Self Test. If this setting is **Enabled**, the BIOS will prompt the user to press <F1> to enter setup when an error is encountered during the boot process. If this setting is **Disabled**, the BIOS will not pause to allow the user to acknowledge an error during the boot process. The default is **Enabled**.

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PXI Express Setup Menu

Use this menu to display configuration information for features of the PXI Express embedded controller and backplane.

- **Chassis Link Configuration**—This setting displays the PXI Express link configuration, either **2-Link** or **4-Link**. If **2-Link** is displayed, the PXIe-8130 detected a 2-link PXI Express backplane and is operating with two x8 PCI Express links. If **4-link** is displayed, the PXIe-8130 detected a 4-link PXI Express backplane and is operating with four x4 PCI Express links.

LabVIEW RT Options Setup Menu

Use this menu to configure boot options for LabVIEW RT if it is installed on the controller. If you are not using LabVIEW RT, you should leave these settings at default.

Note The settings below override the behavior of the switches on S1. Refer to LabVIEW RT Configuration Switches section for more information. To use the settings from the switches, select Use Switch Setting for each option.

- **Boot Configuration**—This setting selects whether the controller should boot LabVIEW RT, LabVIEW RT Safe Mode, or an installed OS such as Windows XP. The default is **Use Switch Setting**.

Note Booting LabVIEW RT requires that your NI PXIe-8130 controller has an IDE (PATA) hard drive. Such a controller may be ordered from National Instruments with the part number 780032-33.

- **Reset IP Address**—If the controller is deployed to a different subnet from which it was originally configured, or if the current IP address is invalid, use this switch to reset the IP address and other TCP/IP settings to their factory defaults during LabVIEW RT startup. The default is **Use Switch Setting**.
- **Disable Startup VI**—If the controller becomes inaccessible because of a startup VI, this switch can prevent VIs from automatically running at startup. The default is **Use Switch Setting**.

Note By default, the target will automatically attempt to connect to the network using DHCP. If the target is unable to initiate a DHCP connection, the target connects to the network with a link-local IP address or `169.254.x.x`.

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Security Setup Menu

Use this menu to enable BIOS security options.

- **Change Supervisor Password**—This setting specifies a password that must be entered to access the BIOS Setup Utility. By default, no password is specified.
- **User Access Level**—This setting specifies the allowed access level corresponding to the **User Password**. If **Full Access** is specified, then the User Password will permit changing configuration options in the BIOS Setup Utility. If **Limited** is specified, then the User Password will permit access to some configuration options in the BIOS Setup Utility but not others. If **View Only** is specified, then the User Password will permit access to view but not change the configuration options in the BIOS Setup Utility. This setting will only display if a Supervisor Password is specified. The default is **Full Access**.
- **Change User Password**—This setting specifies a password that must be entered to access the BIOS Setup Utility or to boot the system. If a **User Password** is specified, its access level is restricted according to the **User Access Level** configuration option. This setting will only display if a Supervisor Password is specified. By default, no password is specified.
- **Password Check**—This setting specifies when the BIOS should prompt for a password. If **Setup** is specified, the BIOS will only prompt for a password when trying to access the BIOS Setup Utility. When **Always** is specified, the BIOS will prompt for a password when booting the system in addition to accessing the BIOS Setup Utility. This setting will only display if a Supervisor Password is specified. The default is **Setup**.
- **Boot Sector Virus Protection**—This setting specifies whether or not the hard disk drive boot sector is write protected. When set to **Enabled**, 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 **Disabled**.

Exiting the BIOS Setup Utility

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 optimal BIOS default settings and <F10> to save changes and exit setup.

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The Exit setup menu includes the following options:

- **Save Changes and Exit**—Any changes made to BIOS settings are stored in the battery-backed system CMOS. The setup program then exits and reboots the controller. The <F10> key can also be used to select this option.
- **Discard Changes and Exit**—Select this option to discard any changes made to BIOS settings during this session of the BIOS setup program. The setup program then exits and continues booting the controller without restarting first. The <Esc> key can also be used to select this option.
- **Discard Changes**—Select this option to discard any changes made to BIOS settings during this session of the BIOS setup program without also exiting the setup program. The <F7> key can also be used to select this option.
- **Load Defaults**—Select this option to restore all BIOS settings to the factory defaults. This option is useful if the controller exhibits unpredictable behavior due to an incorrect or inappropriate BIOS setting. Note that any nondefault settings such as boot order, passwords, and so on, are restored to their factory defaults. The <F9> key can also be used to select this option.

System CMOS

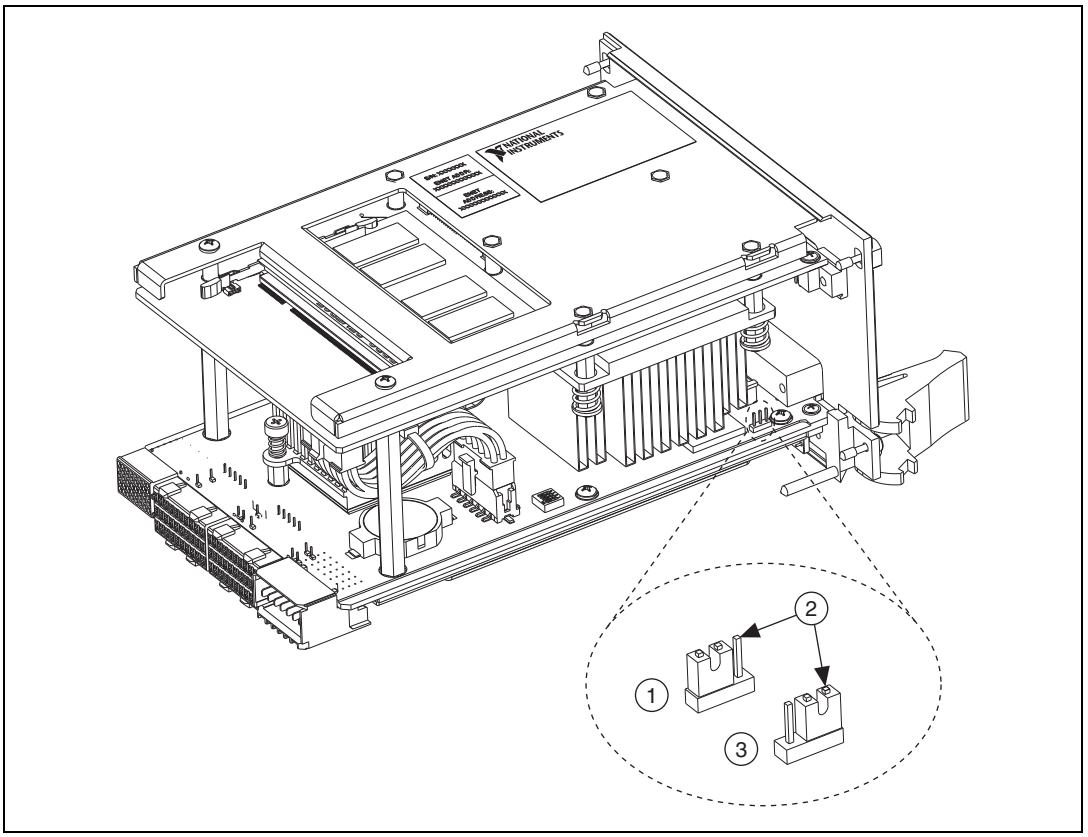
The NI PXIe-8130 contains memory backed up by a battery to store BIOS configuration information.

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 W2 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.

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

Figure 2-3. Clearing the CMOS Contents

LabVIEW RT Installation

This section explains software installation and switch configuration for LabVIEW RT on your PXI controller.

LabVIEW RT Software Installation

The following section describes the necessary steps to get your PXI embedded controller setup to run LabVIEW Real-Time. In this section you will configure the boot mode of the controller, verify or change IP settings, and install LabVIEW Real-Time software.

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Complete the following steps to install the LabVIEW RT software.

1. Boot the NI PXI embedded controller into the real-time operating system. Refer to the *LabVIEW RT Configuration Switches* section or the *LabVIEW RT Options Setup Menu* section in this manual to configure the controller for booting into LabVIEW RT.

   The PXI controller will automatically boot into LabVIEW RT Safe Mode when no software is installed. LabVIEW RT Safe Mode loads with the basic real-time operating system and will automatically attempt to connect to the network using DHCP. If DHCP is not available, it will then connect to the network with a link-local IP address.

Tip You can connect a monitor to the desktop PC to display startup messages such as the IP address and MAC address.

2. Open Measurement & Automation Explorer (MAX) on another computer in the same subnet and expand the **Remote Systems** branch. MAX lists the PXI controller as the model name of the controller followed by the MAC address (for example, NI-PXIe-8130 00802f108562).

Tip Record the PXI controller MAC address, located on the side of the controller, for use in identifying the controller. The label also can be removed and placed on the front of the controller for easier access.

3. Click on the appropriate PXI controller entry to access the **Network Settings** tab in the right pane view.
4. (Optional) Enter a name for the RT target in the **Name** text box.
5. Set the network configuration options of the RT target in the **IP Settings** section and click the **Apply** button.

   For information about configuring network settings, refer to the *Configuring Network Settings* book, accessible by browsing to **MAX Remote Systems Help»LabVIEW Real-Time Target Configuration»Configuring Network Settings** from the **Contents** tab of *MAX Help*.

Note When any IP or identification settings are changed, you will be prompted to reboot the controller for the changes to take effect. Click **Yes** to automatically reboot the RT target. You may also reboot the controller by right-clicking on the target name under **Remote Systems** and selecting **Reboot**.

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After rebooting the PXI controller it will appear in the **Remote Systems** category with the assigned name.

Figure 2-4 shows the RT Series PXI target, **PXI-8106**, configured to automatically obtain an IP address from a DHCP server, as indicated in the **IP Settings** section of the figure.

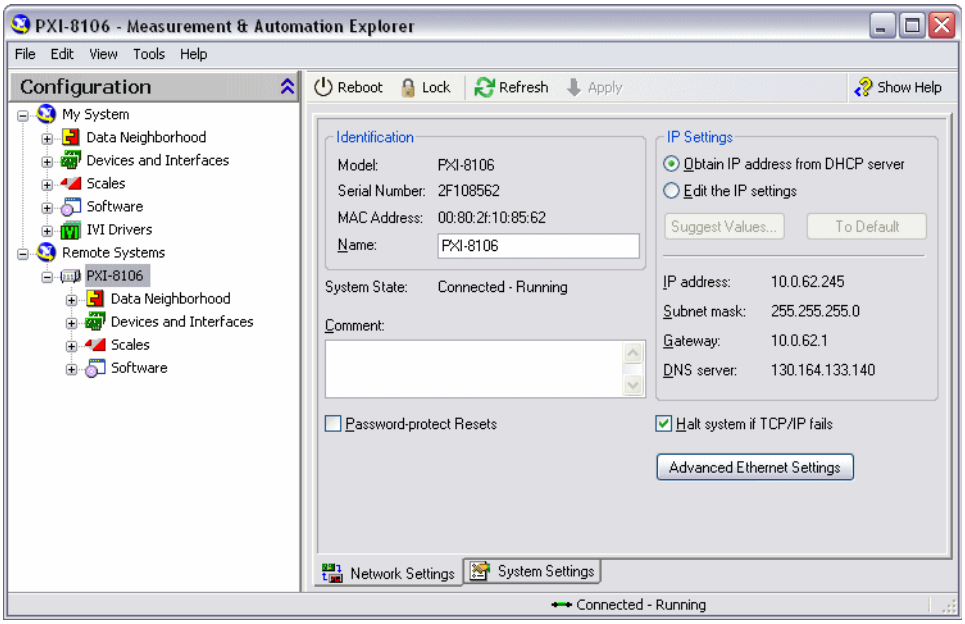


Figure 2-4. Configuring RT Target Network Settings

6. Expand the PXI controller view in the **Remote Systems** branch and select **Software**.
7. Click the **Add/Remove Software** button in the toolbar to launch the LabVIEW Real-Time Software Wizard.
8. Install the LabVIEW Real-Time software and device drivers that you require on the RT target. Refer to the NI Web site at `ni.com/info` and enter the info code `etspc` for the latest information about supported software.

After installation of the software the controller will automatically reboot and you will now be able to program it using LabVIEW Real-Time.

Note Refer to the *RT Getting Started Guide* available on your host computer for more information about setting up your RT target.

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LabVIEW RT Configuration Switches

Use the LabVIEW RT configuration switches to configure LabVIEW RT if it is installed on the controller. If you are not using LabVIEW RT, these switches should remain in the OFF position. The controller reads these switches only after a system reset.

Note You must reboot the controller for any changes to take place.

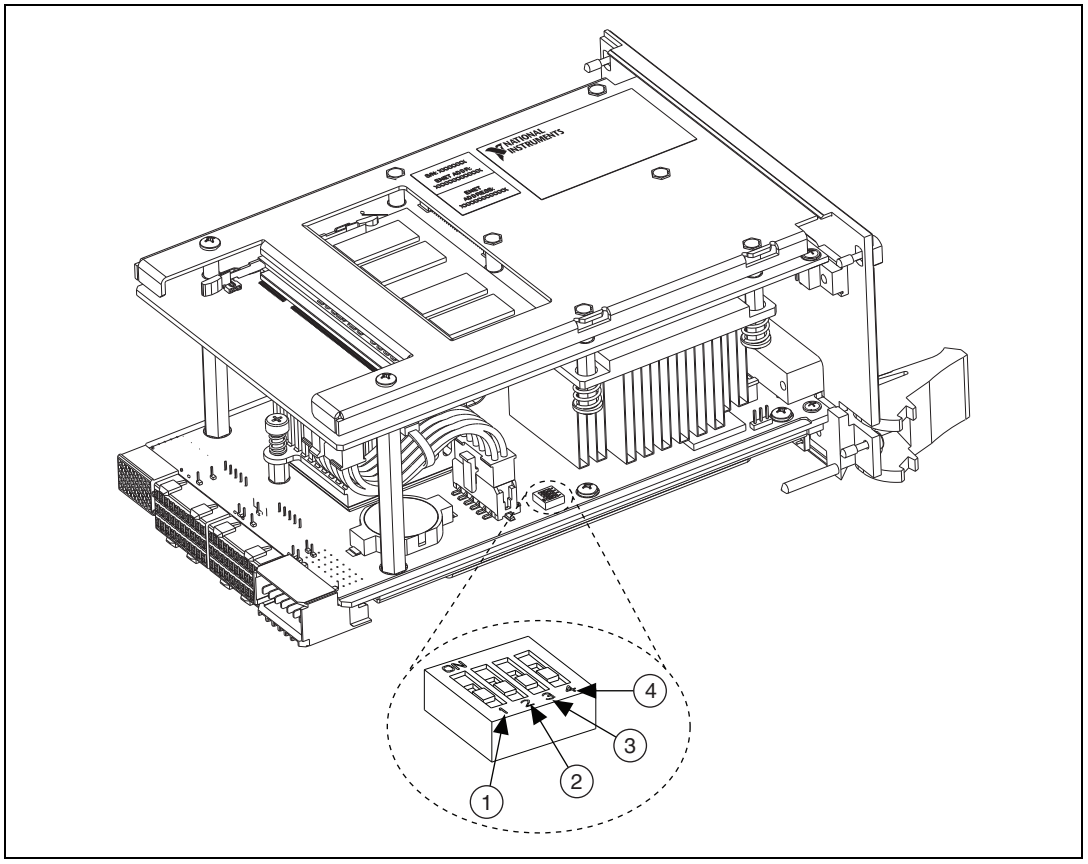
The NI PXIe-8130 controller includes the following LabVIEW RT configuration switches:

- Switch 1—**Boot LabVIEW RT**: Set this switch to ON to boot LabVIEW RT.
- Switch 2—**Boot Safe Mode**: Set this switch to ON to boot LabVIEW RT into safe mode to reconfigure TCP/IP settings and to download or update software from a host computer. This switch overrides the behavior of Switch 1. Booting the controller into safe mode does not start the embedded LabVIEW RT engine. After changing the settings or software, reboot the controller with this switch OFF to resume normal operation.
- Switch 3—**Disable Startup VI**: Set this switch to ON to prevent VIs from automatically running at startup if the controller becomes inaccessible because of a startup VI.
- Switch 4—**Reset IP Address**: Set this switch to ON to reset the IP address and other TCP/IP settings to their factory defaults. Use this switch if moving the controller to a different subnet or if the current TCP/IP settings are valid.

Note By default, the target will automatically attempt to connect to the network using DHCP. If the target is unable to initiate a DHCP connection, the target connects to the network with a link-local IP address or `169.254.x.x`.

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Figure 2-5 shows the location of the LabVIEW RT configuration switches. The switches are shown in the OFF position.



1	Switch 1—Boot LabVIEW RT	3	Switch 3—Disable Startup VI
2	Switch 2—Boot Safe Mode	4	Switch 4—Reset IP Address

Figure 2-5. LabVIEW RT Configuration Switches

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 a `drivers` directory.

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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.

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

The `drivers` directory contains driver installers for the system 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-8130 front panel can connect to or from any PXI 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 installed on your controller and available on the *National Instruments Driver CD* included with your kit automatically identifies your PXI Express system components to generate a `pxiesys.ini` and `pxisys.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, *Using PXI Timing and Triggering Functionality*, at `ni.com/support`.

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

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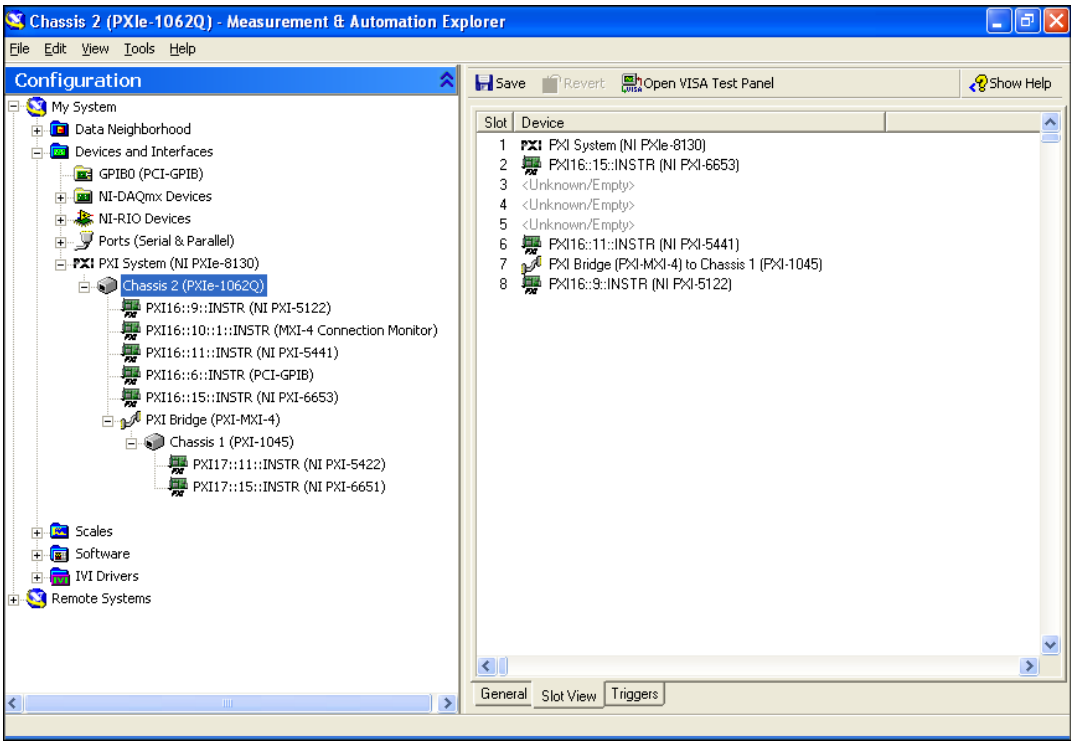


Figure 2-6. Multichassis Configuration in MAX

PXI System Configuration

1. Launch Measurement & Automation Explorer (MAX).
2. In the **Configuration** tree, expand **Devices and Interfaces**.
3. In the **Devices and Interfaces** tree, expand **PXI System**. Your PXI Express chassis is already identified and appears in the **PXI System** tree.
4. For each unidentified PXI chassis in the **PXI System** tree, right-click on the chassis and select the appropriate chassis model through the **Identify As** submenu. Further expanding the **PXI System** branch shows all devices in the system that NI-VISA can recognize.

The PXI specification allows for many combinations of PXI chassis and system modules. To assist system integrators, PXI chassis and system module manufacturers must document their products' capabilities. PXI Express devices must provide a driver and/or `.ini` file for identification. For NI PXI Express chassis and controllers, these files are

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provided as part of the NI PXI Platform Services software included with your controller. System integrators, configuration utilities, and device drivers can use these `.ini` files.

The NI PXI Platform Services software uses the system module driver, chassis driver, and `chassis.ini` files to generate the PXI system description files (`pxisys.ini` and `pxiesys.ini`). Device drivers and other utility software read the `pxiesys.ini` and `pxisys.ini` files 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-8130 by upgrading the SO-DIMMs.

To upgrade the RAM, remove the NI PXIe-8130 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 could result in better performance than using a single module.

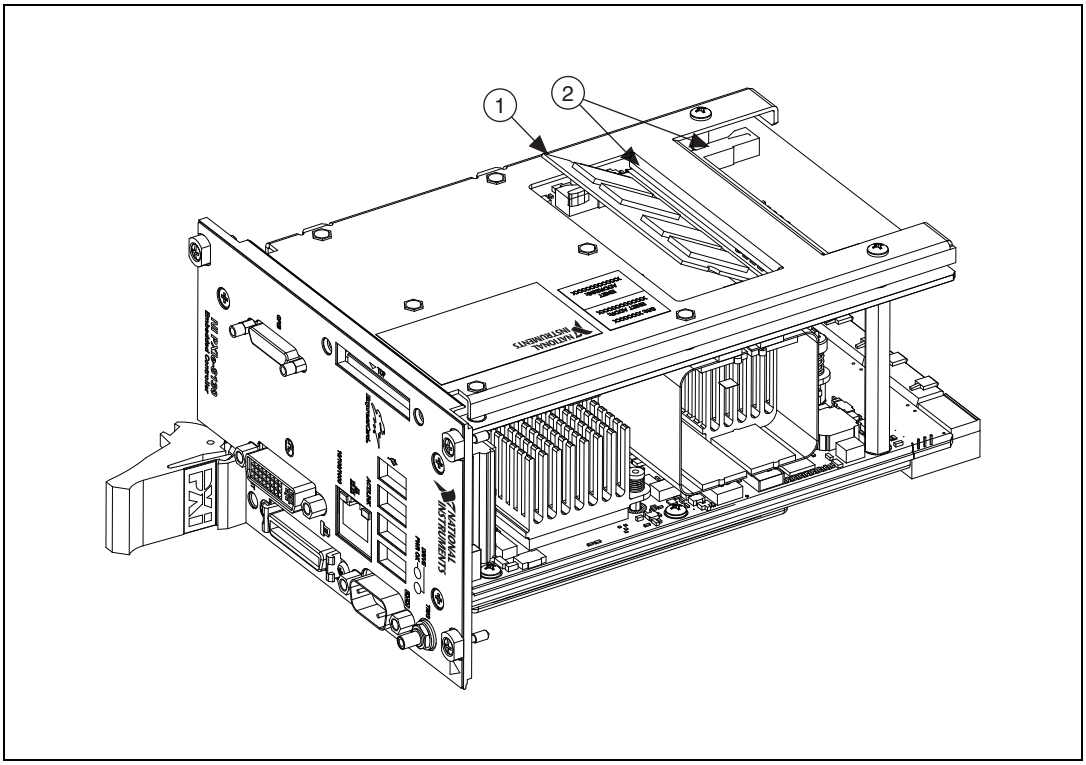
National Instruments offers the following SO-DIMM for use with the NI PXIe-8130 controller.

- PC2-5300 (DDR2 667) 1 GB, 128 MB × 64, CL 5, 1.18 in. max (NI part number 780031-1024)



Note National Instruments has tested and verified that the DDR2 SO-DIMMs we sell work with the NI PXIe-8130. 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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1	DDR2 SO-DIMM Module	2	DDR2 SO-DIMM Socket

Figure 2-7. Installing a DDR2 SO-DIMM in an NI PXIe-8130 Controller

Hard Drive Recovery

NI PXIe-8130 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-8130 controller also ships with an *OS Recovery* CD that allows you to reinstall your operating system onto your hard drive through an external USB CD/DVD-ROM. For more information on these tools, refer to 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.

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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 USB CD/DVD-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-8130 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 USB CD/DVD-ROM

The NI PXIe-8130 supports the installation of Windows 7, XP, or Vista from a USB CD-ROM. However, many other operating systems do not support installation from a USB CD/DVD-ROM. For example, Windows 2000 aborts during the install process because it does not have drivers for the USB CD/DVD-ROM device.

As an alternative to a USB CD/DVD-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, *Hard Drive Recovery and OS Installation for PXI and VXI Controllers*, at `ni.com/support`.

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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-8130 is running. The NI PXIe-8130 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 NI PXIe-8130 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.

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 NI PXIe-8130. In Windows, use the Safely Remove Hardware tool to safely stop the ExpressCard.

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3

I/O Information

Front Panel Connectors

Table 3-1 lists various peripherals and their corresponding NI PXIe-8130 external connectors, bus interfaces, and functions.

Table 3-1. NI PXIe-8130 Peripherals Overview

Peripheral	External Connector	Description
Video	DVI-I (24-pin DSUB)	ATI Radeon X300 Embedded GPU
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

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Front Panel

Figure 3-1 shows the front panel layout and dimensions of the NI PXIe-8130. Dimensions are in inches [millimeters].

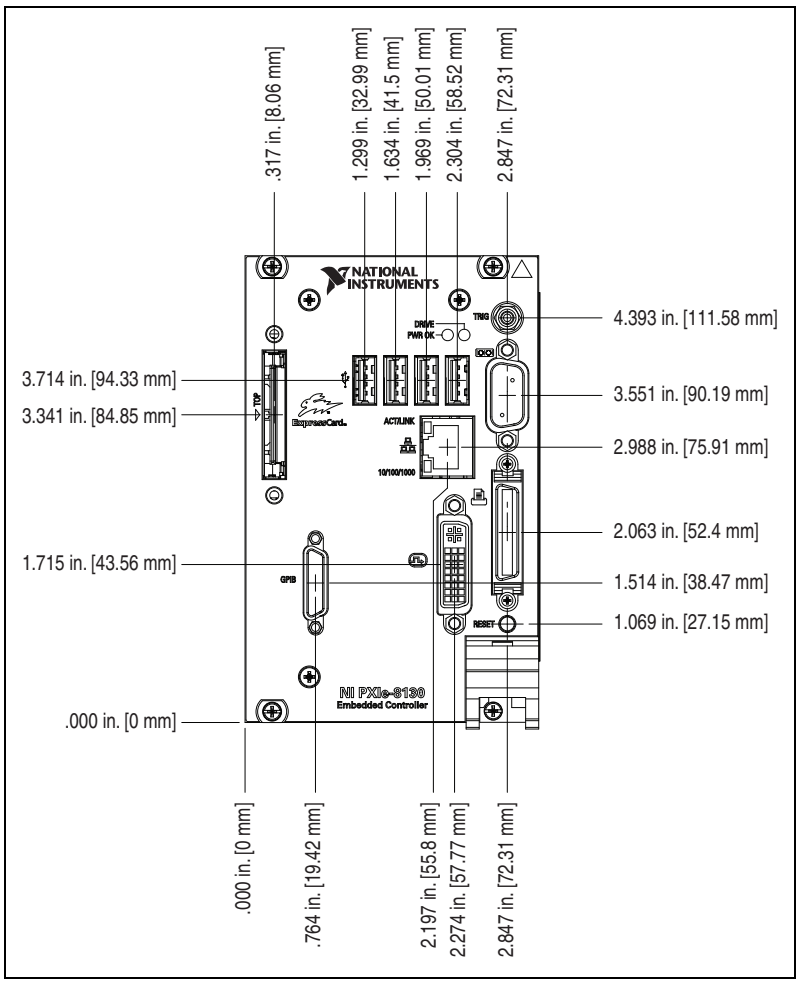


Figure 3-1. NI PXIe-8130 Front Panel Layout and Dimensions

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DVI-I

Figure 3-2 shows the location and pinouts for the DVI connector on the NI PXIe-8130. Table 3-2 lists and describes the DVI connector signals.

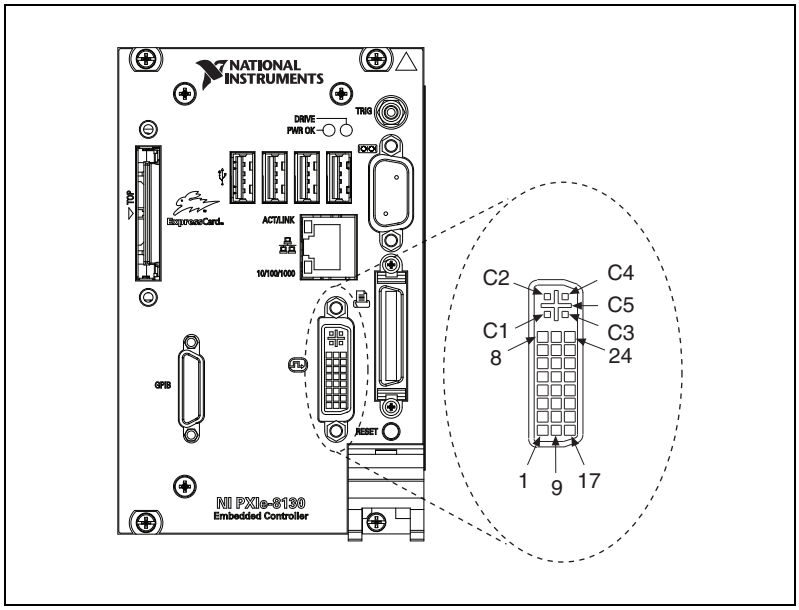


Figure 3-2. DVI Connector Location and Pinout

Table 3-2. 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 3-2. 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 3-3 shows the location and pinouts for the COM1 connector on the NI PXIe-8130. Table 3-3 lists and describes the COM1 connector signal.

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

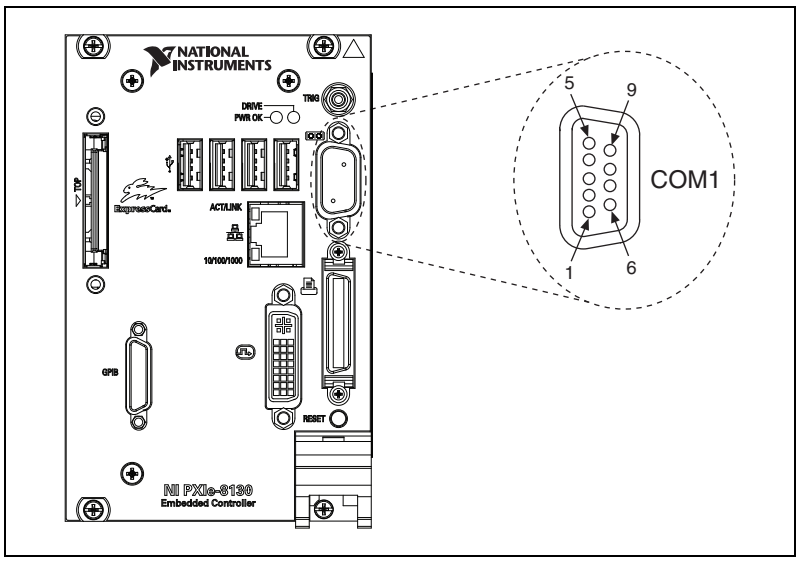


Figure 3-3. COM1 Connector Location and Pinout

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
6	DSR#	Data Set Ready
7	RTS#	Ready to Send
8	CTS#	Clear to Send
9	RI#	Ring Indicator
Note: The pound symbol (#) indicates an active low signal.		

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Ethernet

Figure 3-4 shows the location and pinouts for the Ethernet connector on the NI PXIe-8130. Table 3-4 lists and describes the Ethernet connector signals.

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

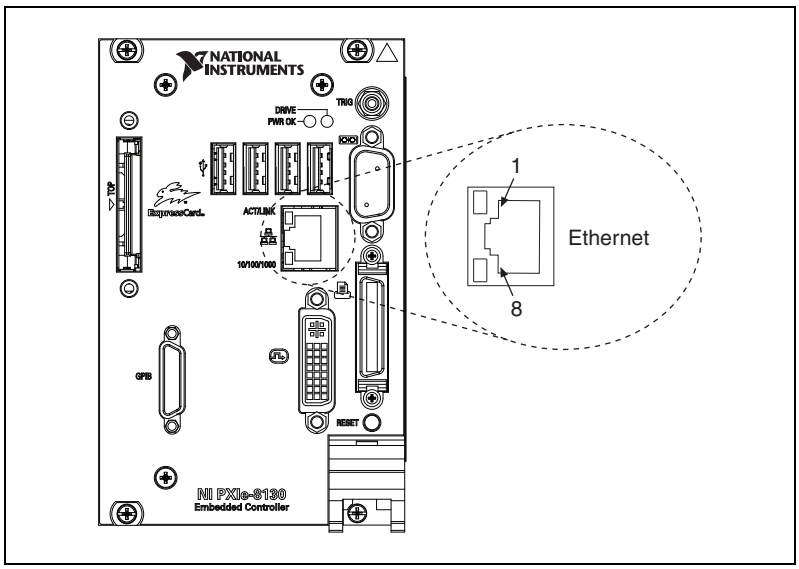


Figure 3-4. Ethernet Connector Location and Pinout

Table 3-4. Ethernet Connector Signals

Pin	Fast Ethernet	Gigabit Ethernet
1	TX+	TX_A+
2	TX–	TX_A–
3	RX+	RX_B+
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 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.
	Amber	On	1000 Mbit/sec data rate is selected.

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Parallel Port

Figure 3-5 shows the location and pinouts for the IEEE 1284 (parallel) connector on the NI PXIe-8130. Table 3-6 lists and describes the IEEE 1284 connector signals.

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

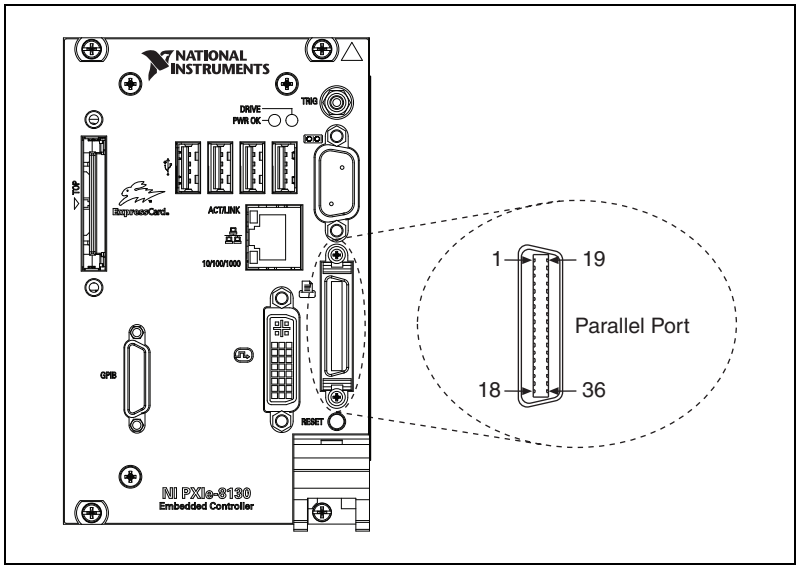


Figure 3-5. Parallel Port Connector Location and Pinout

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

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

Pin	Default Configuration (LPT)	
	Signal Name	**Signal Description**
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

Note: The pound symbol (#) indicates an active low signal.

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Universal Serial Bus

Figure 3-6 shows the location and pinouts for the Universal Serial Bus (USB) connector on the NI PXIe-8130. Each controller has 4 USB ports on the front panel. Table 3-7 lists and describes the USB connector signals.

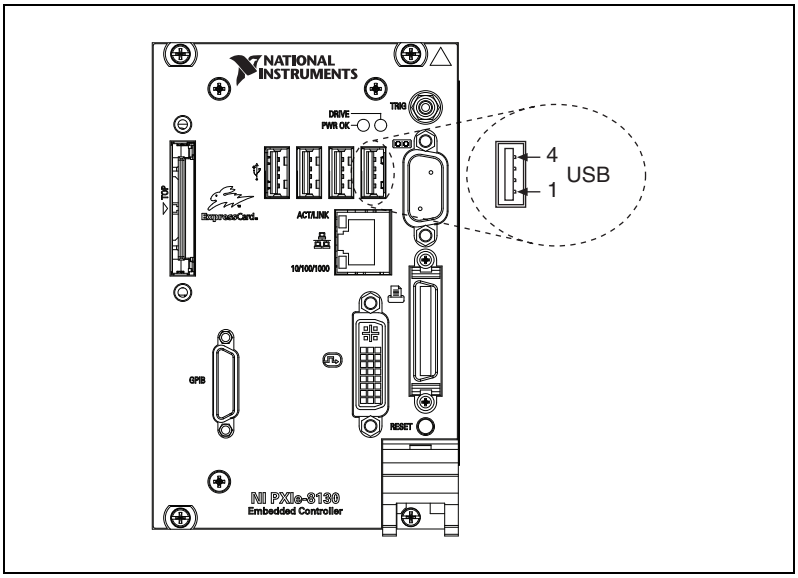


Figure 3-6. USB Connector Location and Pinout

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

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Trigger

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

Figure 3-7 shows the TRIG connector location on the NI PXIe-8130. Table 3-8 lists and describes the trigger connector signals.

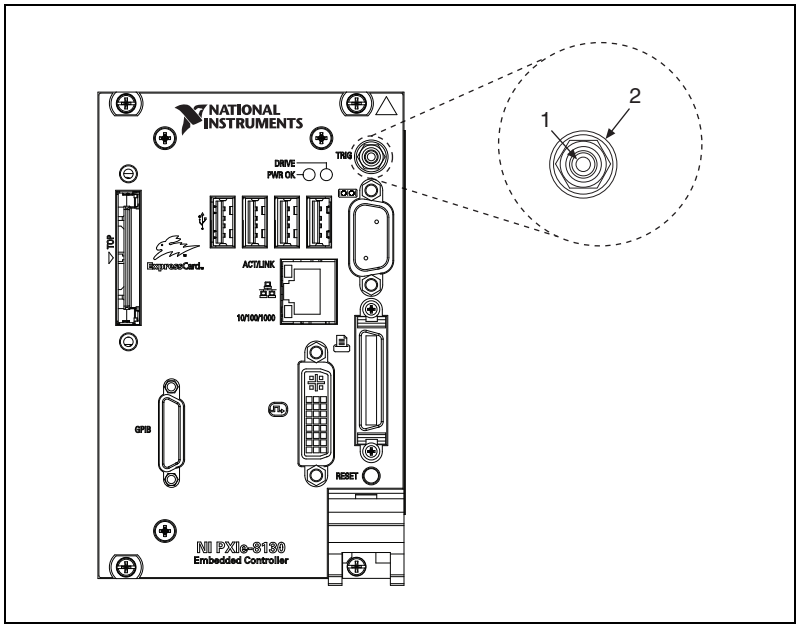


Figure 3-7. TRIG Connector Location and Pinout

Table 3-8. TRIG Connector Signals

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

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GPIB (IEEE 488.2)

Figure 3-8 shows the location and pinouts for the GPIB connector on the NI PXIe-8130. Table 3-9 lists and describes the GPIB connector signals.

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

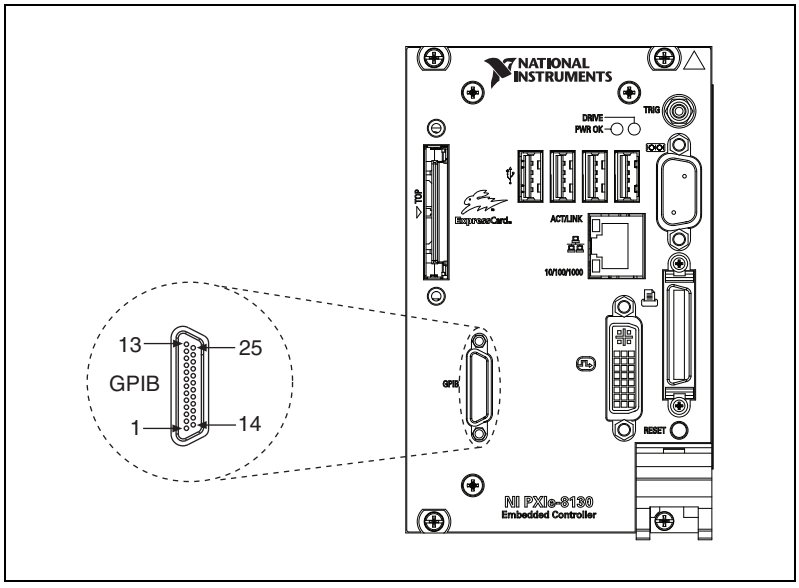


Figure 3-8. GPIB Connector Location and Pinout

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

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Table 3-9. GPIB Connector Signals (Continued)

Pin	Signal Name	Signal Description
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
Note: The pound symbol (#) indicates an active low signal.		

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ExpressCard/34 Slot

The NI PXIe-8130 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-8130. Table 3-10 lists and describes the ExpressCard connector signals.

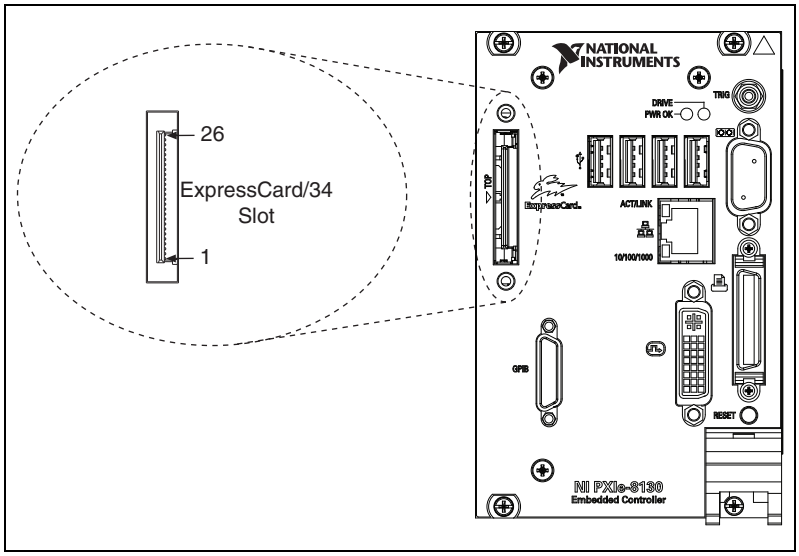


Figure 3-9. ExpressCard/34 Slot Location and Pinout

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

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Table 3-10. ExpressCard Connector Signals (Continued)

Pin	Signal Name	Signal Description
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	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

Note: The pound symbol (#) indicates an active low signal.

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Front Panel Features

The NI PXIe-8130 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 or the system power supply is out of regulation.
    - 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-8130 has the following data storage features:

- Internal Serial ATA hard drive
  - 60 GB minimum 2.5 in. notebook hard drive (40 GB minimum PATA drive on extended-temperature, 24/7 option controller)
  - Supports Native Command Queuing
  - Supports transfer rates up to 150 MB/s
- USB storage support—USB CD/DVD-ROM, mass storage device, or floppy drive

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4

Common Configuration Questions

This chapter answers common configuration questions you may have when using a NI PXIe-8130 embedded controller.

General Questions

What do the LEDs on the NI PXIe-8130 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-8130 controller, the Ethernet LEDs continue to blink. Is it safe to remove my controller or disconnect power?

The NI PXIe-8130 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-8130 and press <Delete> during the memory tests. Refer to the *Accessing the BIOS Setup Utility* 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. Refer to the *BIOS Setup Utility* section of Chapter 2, *Installation and Configuration*, for more information.

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Boot Options

What devices can I boot from?

The NI PXIe-8130 can boot from the following devices:

- The internal Serial ATA hard drive (or PATA hard drive for the NI PXIe-8130 Extended Temperature option)
- An external SCSI hard drive or USB CD/DVD-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, USB CD/DVD-ROM, or USB key
- An external USB floppy drive
- Most PCI or PCIe-based devices that provide an Option ROM

Note There are some limitations when booting from a USB device. Windows XP can be installed from a USB CD/DVD-ROM, but earlier versions of Windows cannot. The NI PXIe-8130 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 the BIOS setup by rebooting the controller and pressing <Delete> during the memory tests. Select the **Boot** menu. You will see a list of all bootable devices, ordered by device type. You can set the boot order by altering the **1st Boot Device**, **2nd Boot Device**, and **3rd Boot Device** settings.
- 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.

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Cables and Connections

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

The NI PXIe-8130 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 778713-01 is such a cable and is available through the online catalog at `ni.com/products`.

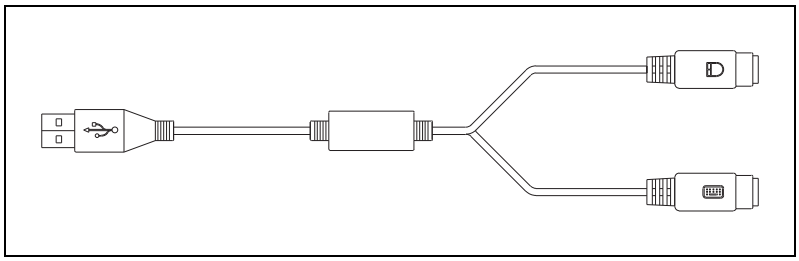


Figure 4-1. Y-Splitter Cable

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-8130?

The NI PXIe-8130 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, *What Peripheral Drivers Should I Use with My PXI or VXI Controller?*, at `ni.com/support`.

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How do I install or reinstall the Ethernet driver?

Refer to KnowledgeBase 3H3COSD8, *What Peripheral Drivers Should I Use with My PXI or VXI Controller?*, 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`.

How do I install software from a CD?

The compact size of the NI PXIe-8130 does not allow for an integrated USB CD/DVD-ROM drive. If you are using Windows XP, you have the following options:

- **USB CD/DVD-ROM**—Windows XP supports installing from a USB CD/DVD-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 USB CD/DVD-ROM drive on the other computer, you can map the shared USB CD/DVD-ROM drive to a drive letter on the NI PXIe-8130.

A USB CD/DVD-ROM drive is available from National Instruments, part number 778492-01.

Upgrade Information

How do I upgrade system memory?

You can change the amount of installed RAM on the NI PXIe-8130 by upgrading the DDR2 SO-DIMMs.

To upgrade the RAM, remove the NI PXIe-8130 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

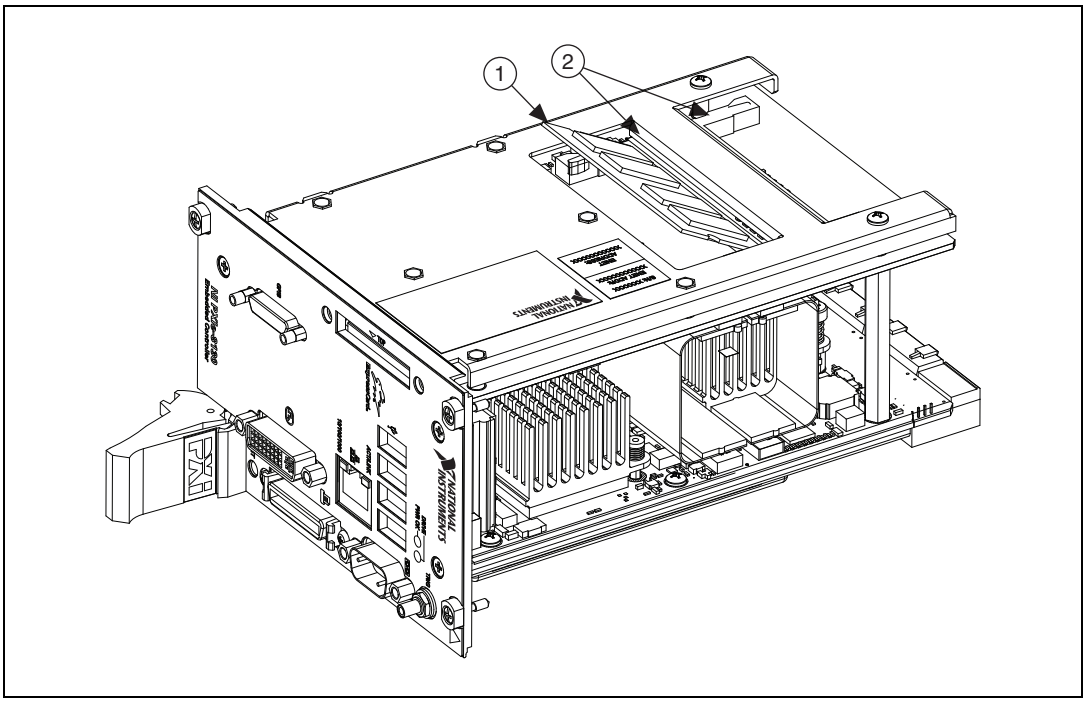
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will be slower than using two matched modules. However, two mismatched modules will result in better performance than using a single module.

National Instruments offers the following types of SO-DIMMs for use with the NI PXIe-8130 controller.

- PC2-5300 (DDR2 667) 1 GB, 128 MB × 64, CL 5, 1.18 in. max (NI part number 780031-1024)

Note National Instruments has tested and verified that the DDR2 SO-DIMMs we sell work with the NI PXIe-8130. 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-8130 Controller

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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 2GIGKD0Z, *Determining and Upgrading PXI and VXI Embedded Controller BIOS Versions*.

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, *What Peripheral Drivers Should I Use with My PXI or VXI Controller?*, at `ni.com`.

My NI PXIe-8130 does not have an internal floppy drive. Is there a way to use an external drive?

Yes. The NI PXIe-8130 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-8130 work with the PXI-8220 or PXI-8221?

The serialized IRQ line is not routed to the nVIDIA MCP55 Pro on the PXIe-8130. This prevents PC cards using ISA interrupts from working with the PXIe-8130.

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5

Troubleshooting

This chapter answers common troubleshooting questions you may have when using the NI PXIe-8130 embedded computer.

What if the NI PXIe-8130 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*.)

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- Recover the hard drive on the controller. (Refer to the *Hard Drive Recovery* section of Chapter 2, *Installation and Configuration*.)
- Make sure the RAM is properly seated.

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.

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 *Accessing the BIOS Setup Utility* section of Chapter 2, *Installation and Configuration*.
2. Press <F9> to load BIOS defaults.
3. Answer **Y** (Yes) to the verification prompt.
4. Select **Save and Exit Setup**.

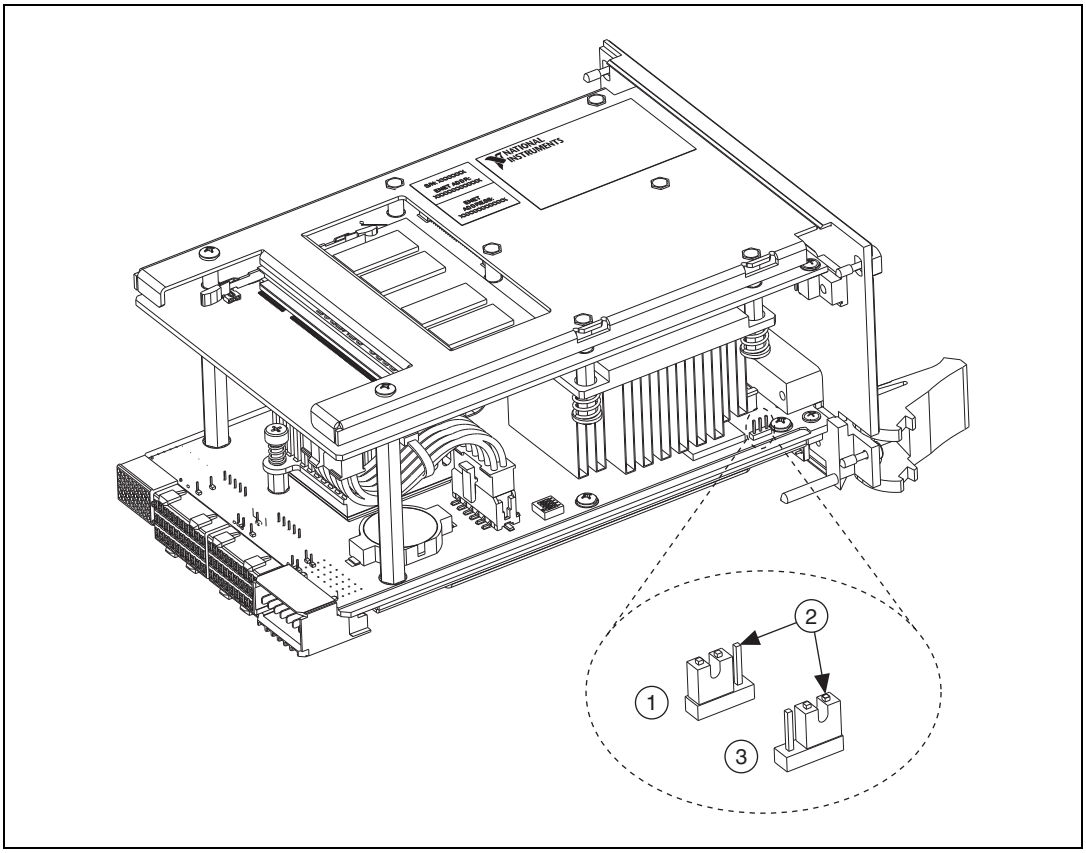
As an alternative method, complete the following steps:

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

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3. Move the jumper on W2 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 Clear CMOS Contents	2 Pin 1	3 Normal Operation (Default)

Figure 5-1. Clearing the CMOS Contents

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A

Specifications

This appendix lists the electrical, mechanical, and environmental specifications of the NI PXIe-8130 embedded controller.

Features

NI PXIe-8130	
CPU	AMD 2.3 GHz Turion 64 X2, (800 MHz HyperTransport Link)
On-die L2 cache	512 KB x2 (512 KB per core)
Dual-Channel DDR2 RAM, PC2 5300	1 GB Standard 4 GB Maximum
Hard Drive	60 GB Serial ATA, minimum*, †
Ethernet	10/100/1000 BaseTX
PXI Express 4 Link Configuration	x4, x4, x4, x4
PXI Express 2 Link Configuration	x8, x8
GPIB (IEEE 488 Controller)	Yes
Serial Ports (RS-232)	Yes (1)
Parallel Port	Yes (1)
Hi-Speed USB (2.0) Ports	Yes (4)
ExpressCard/34 Slot	Yes
PS/2 Keyboard/Mouse Connector	No
PXI Trigger Bus Input/Output	Yes
Installed Operating System	Windows 7 Professional, Windows Vista Business, Windows Vista Business downgraded to Windows XP Professional

* Extended-temperature 24/7 option provides 40 GB minimum PATA hard drive.
† Controllers configured for LabVIEW RT provide a 40 GB (minimum) PATA hard drive.

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Electrical

Voltage (V)	Current (Amps)	
	Typical	Maximum
+3.3 V	1.80	3.90
+5 V	3.50	4.70
+12 V	2.75	4.00
–12 V	0.00	0.00
+5 V Aux	0.35	0.70

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 .....0.98 kg (2.15 lb) typical

Environment

Maximum altitude.....2,000 m (800 mbar) (at 25 °C ambient temperature)

Pollution Degree 2

Indoor use only.

Caution Clean the NI PXIe-8130 with a soft nonmetallic brush. Make sure that the device is completely dry and free from contaminants before returning it to service.

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Operating Environment

NI PXIe-8130

Ambient temperature range ..... 5 to 50 °C
(Tested in accordance with IEC-60068-2-1 and IEC-60068-2-2. Meets MIL-PRF-28800F Class 3 high temperature limit.)

NI PXIe-8130
Extended Temperature Option

Ambient temperature range ..... 0 to 55 °C
(Tested in accordance with IEC-60068-2-1 and IEC-60068-2-2. Meets MIL-PRF-28800F Class 3 low temperature limit and MIL-PRF-28800F Class 2 high temperature limit.)

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

NI PXIe-8130

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

NI PXIe-8130
Extended Temperature Option

Ambient temperature range ..... –40 to 70 °C
(Tested in accordance with IEC-60068-2-1 and IEC-60068-2-2. Meets MIL-PRF-28800F Class 3 limits.)

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

Shock and Vibration

Operating Shock .....30 g peak, half-sine, 11 ms pulse
(Tested in accordance with IEC-60068-2-27. Meets MIL-PRF-28800F Class 2 limits.)

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.)

Note Specifications are subject to change without notice.

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, CSA 61010-1

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

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Electromagnetic Compatibility

This product is designed to meet the requirements of the following standards of EMC for electrical equipment for measurement, control, and laboratory use:

- EN 61326 (IEC 61326): 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

Note For the standards applied to assess the EMC of this product, refer to the *Online Product Certification* section.

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

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

Refer to the product Declaration of Conformity (DoC) for additional regulatory compliance information. To obtain product certifications and 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.

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Environmental Management

National Instruments is committed to designing and manufacturing products in an environmentally responsible manner. NI recognizes that eliminating certain hazardous substances from our products is beneficial not only to the environment but also 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`.

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`.)

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B

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.

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.

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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.
DMA	Direct Memory Access—A method by which data is transferred between devices and internal memory without intervention of the central processing unit.
DVI	Digital Visual Interface—A video connector designed to maximize the visual quality of digital display devices such as flat panel LCD computer displays and digital projectors. It was developed by an industry consortium, the Digital Display Working Group (DDWG).

E

ECP	Extended Capabilities Parallel.
EEPROM	Electronically Erasable Programmable Read Only Memory.
EMC	Electromagnetic Compatibility.
EMI	Electromagnetic interference.

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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.

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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.

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.

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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}.

S

s	Seconds.
SDRAM	Synchronous Dynamic RAM (Random Access Memory)—Storage that the computer must refresh at frequent intervals.
SO-DIMM	Small Outline Dual In-line Memory Module.
SPI Bus	Serial Peripheral Interface—A standard for controlling most any digital electronics that accept a clocked serial stream of bits.

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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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