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MXI™

MXI-Express (x1) for PXI Express Series User Manual

MXI-Express for PXI Express: Multisystem eXtension Interface for PCI Express, Compact PCI Express, and PXI Express Bus Systems

NI PCIe-8361/8362

NI PXIe-8360

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Depending on where it is operated, this Class A product could be subject to restrictions in the FCC rules. (In Canada, the Department of Communications (DOC), of Industry Canada, regulates wireless interference in much the same way.) Digital electronics emit weak signals during normal operation that can affect radio, television, or other wireless products.

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

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

FCC/DOC Warnings

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

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

Class A

Federal Communications Commission

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

Canadian Department of Communications

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

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

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

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

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About This Manual

This manual describes the features, functions, and operation of the MXI-Express for PXI Express series of products. The products in this series are the NI PCIe-8361/8362 and the NI PXIe-8360.

Conventions

The following conventions appear in this manual:

»	The » symbol leads you through nested menu items and dialog box options to a final action. The sequence **File»Page Setup»Options** directs you to pull down the **File** menu, select the **Page Setup** item, and select **Options** from the last dialog box.
	This icon denotes a note, which alerts you to important information.
	This icon denotes a caution, which advises you of precautions to take to avoid injury, data loss, or a system crash.
bold	Bold text denotes items that you must select or click in the software, such as menu items and dialog box options. Bold text also denotes parameter names.
CompactPCI Express/ CPCIe	The terms *CompactPCI Express* and *CPCIe* are interchangeable in this manual.
italic	Italic text denotes variables, emphasis, a cross-reference, or an introduction to a key concept. Italic text also denotes text that is a placeholder for a word or value that you must supply.
`monospace`	Text in this font denotes text or characters that you should enter from the keyboard, sections of code, programming examples, and syntax examples. This font is also used for the proper names of disk drives, paths, directories, programs, subprograms, subroutines, device names, functions, operations, variables, filenames, and extensions.
MXI-Express card	MXI-Express card refers to any of the following cards, unless otherwise noted: NI PCIe-8362/8361 and NI PXIe-8360.
NI PCIe-8360	The name *NI PCIe-8360* may be used in this manual when the material would refer to either the NI PCIe-8361 or NI PCIe-8362.

PCI Express/PCIe	The terms *PCI Express* and *PCIe* are interchangeable in this manual.
PXI Express chassis	In this manual, whenever a PXI Express chassis is referenced, a CompactPCI Express chassis could be used instead.
PXI Express/PXIe	The terms *PXI Express* and *PXIe* are interchangeable in this manual.

Related Documentation

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

- *Set Up Your MXI-Express System*
- Your computer or chassis documentation
- *PXI Express Hardware Specification*, Revision 1.0
- *PXI-2 PXI Software Specification*, Revision 2.1
- *PXI-6 PXI Express Software Specification*
- *PCI Specification*, Revision 2.3
- *PCI-PCI Bridge Architecture Specification*, Revision 1.1
- *PICMG CompactPCI Express EXP.0 R1.0 Specification*
- *PCI Express Specification*, Revision 1.0a

1

Introduction

This chapter describes the MXI-Express x1 series of products, lists what you need to get started, and explains how to unpack and set up your hardware.

The two products in this series are the NI PCIe-8361/8362 and the NI PXIe-8360. For the remainder of this manual the term *MXI-Express card* refers to any product in the MXI-Express x1 series.

MXI-Express cards must always be installed as a PCI Express card and a PXI Express card.

Note If you are using the NI ExpressCard MXI interface for PXI or PXI Express, refer to the *NI ExpressCard MXI Series User Manual* posted at `ni.com/manuals`.

About the MXI-Express Series

Description and Features

MXI-Express uses PCI Express signals over a cable of up to 7 m with a PCI Express-to-PCI Express switch. You can do the following with MXI-Express:

- Control a PXI Express or CompactPCI Express backplane with a PCI Express-based PC
- Physically separate the measurement or automation system from a host PC
- Combine PCI Express, CompactPCI, PXI, CPCIe, and PXIe devices in the same system

Basic MXI-Express System

The simplest MXI-Express system consists of an NI PCIe-8361/8362 in a PC connected to an NI PXIe-8360 in the controller slot of a PXI Express or CompactPCI Express chassis, as shown in Figure 1-1.

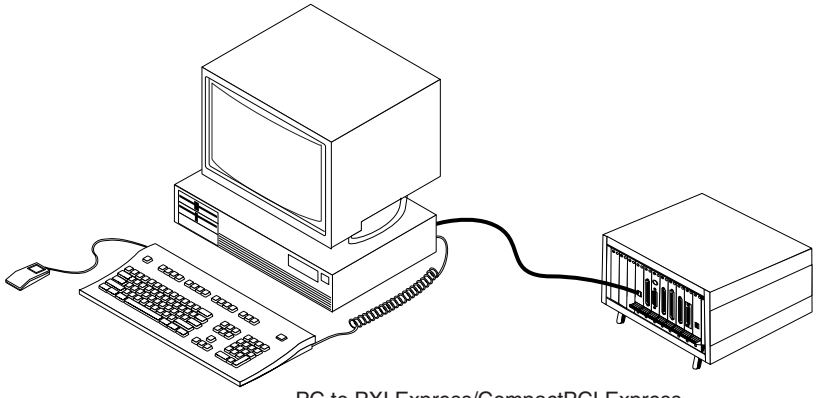


Figure 1-1. Basic MXI-Express Configuration

Larger MXI-Express Systems

The NI PCIe-8362 has two MXI-Express connectors, allowing one NI PCIe-8362 to host two different NI PXIe-8360 cards in separate PXI Express or CompactPCI Express chassis. If multiple PCI Express slots are available in the host PC, additional PXI Express chassis can be connected by installing an additional NI PCIe-8361/8362 in any available PCI Express slot.

Figure 1-2 shows how you can use MXI-Express cards to connect multiple CPCIe or PXIe expansion chassis to a PC in a star topology. The star topology is the only supported topology due to the point-to-point nature of PCI Express.

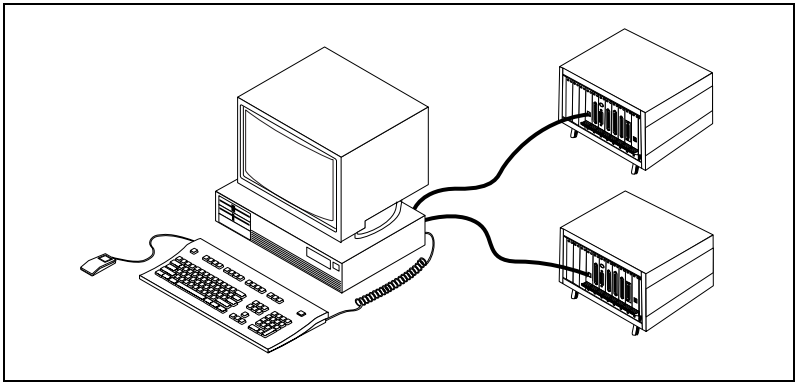


Figure 1-2. Star Topology MXI-Express Configuration

What You Need to Get Started

To set up and use your MXI-Express cards, you need the following:

- ❑ One NI PCIe-8361/8362 and one NI PXIe-8360
- ❑ A MXI-Express cable
- ❑ A host PC with an available x1 (or wider) PCI Express slot
- ❑ An expansion chassis—the PXI Express or CompactPCI Express chassis that you control with MXI-Express

Note Your PXI Express MXI-Express card will work in any standard CompactPCI Express chassis adhering to the *PICMG CompactPCI Express EXP.0 R1.0 Specification*, or in a PXI Express chassis compatible with the *PXI Express Hardware Specification*, Revision 1.0 or later. Your PCI Express MXI-Express card will work in systems compliant with the *PCI Express Specification*, Revision 1.0a or later.

Unpacking

Your MXI-Express cards are shipped in antistatic packages to prevent electrostatic damage (ESD) to the devices. ESD can damage several components on the device.

Caution *Never* touch the exposed pins of connectors. Doing so may damage the device.

To avoid such damage in handling the device, take the following precautions:

- Ground yourself using a grounding strap or by holding a grounded object.
- Touch the antistatic package to a metal part of the computer chassis before removing the device from the package.

Remove the device from the package and inspect the device for loose components or any sign of damage. Notify NI if the device appears damaged in any way. Do *not* install a damaged device into the computer or into a PXI Express or CompactPCI Express chassis.

Store the device in the antistatic envelope when not in use.

2

Hardware Installation

This chapter explains how to install the MXI-Express hardware.

Hardware Installation

The following are general instructions for installing the MXI-Express cards. Consult your computer user manual or technical reference manual for specific instructions and warnings.

Note The PXI Platform Services software on the *PXI Platform Services* CD or driver CD included with your PXI Express MXI-Express hardware is required to provide chassis and controller identification for PXI features such as trigger routing and slot detection. The PXI Platform Services software is also included with the NI-DAQmx and NI-VISA drivers. For more information, refer to KnowledgeBase 3TJDONDS at `ni.com`.

Installing an NI PCIe-8361/8362

1. Power off your computer, but leave it plugged in while installing the NI PCIe-8361/8362. The power cord grounds the computer and protects it from electrical damage while you install the card.

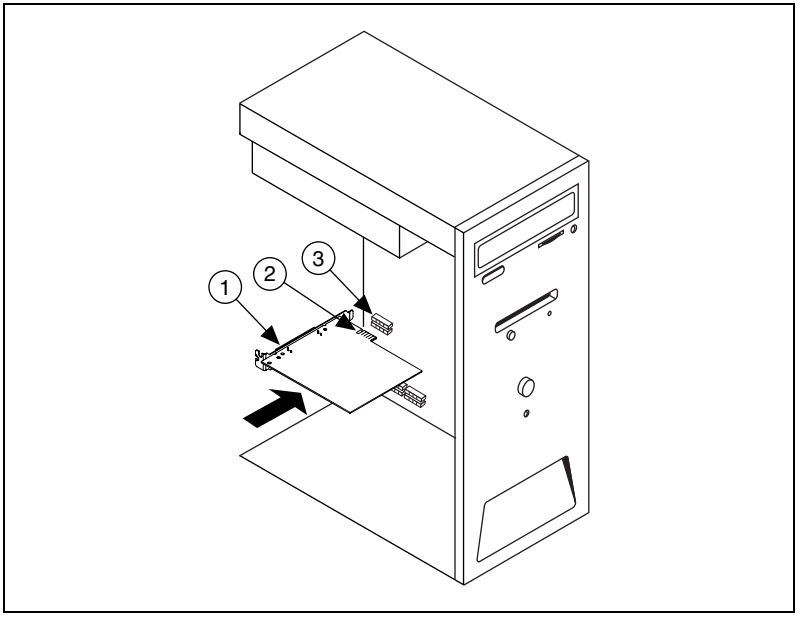
Caution To protect both yourself and the computer from electrical hazards, your computer should remain off until you finish installing the NI PCIe-8361/8362.

2. Remove the top cover or access port to the PCI Express bus.
3. Select any available PCI Express expansion slot (x1 or wider).

Note The BIOS or motherboard may not support the NI PCIe-8361/8362 in a slot intended for a graphics card.

4. Locate the metal bracket that covers the cut-out in the back panel of the computer for the slot you have selected. Remove and save the bracket-retaining screw and the bracket cover.
5. Touch the metal part of the power supply case inside the computer to discharge any static electricity that might be on your clothes or body.

6. Line up the NI PCIe-8361/8362 with the slot on the back panel. Slowly push down on the top of the NI PCIe-8361/8362 until its card-edge connector is resting on the expansion slot receptacle. Using slow, evenly distributed pressure, press the NI PCIe-8361/8362 straight down until it seats in the expansion slot.
7. Reinstall the bracket-retaining screw to secure the NI PCIe-8361/8362 to the back panel rail.
8. Replace the computer cover.



1	NI PCIe-8361/8362	3	PCI Express Slot
2	PCI Express x1 Card-Edge Connector		

Figure 2-1. Installing the NI PCIe-8361/8362

Installing an NI PXIe-8360

Complete the following steps to install the NI PXIe-8360 in your PXI Express or CompactPCI Express chassis.

1. Power off your PXI Express or CompactPCI Express chassis, but leave it plugged in while installing the NI PXIe-8360. The power cord grounds the chassis and protects it from electrical damage while you install the module.
2. Locate the System Controller slot of the chassis. The NI PXIe-8360 must be installed in the controller slot (slot 1 in a PXI Express chassis).

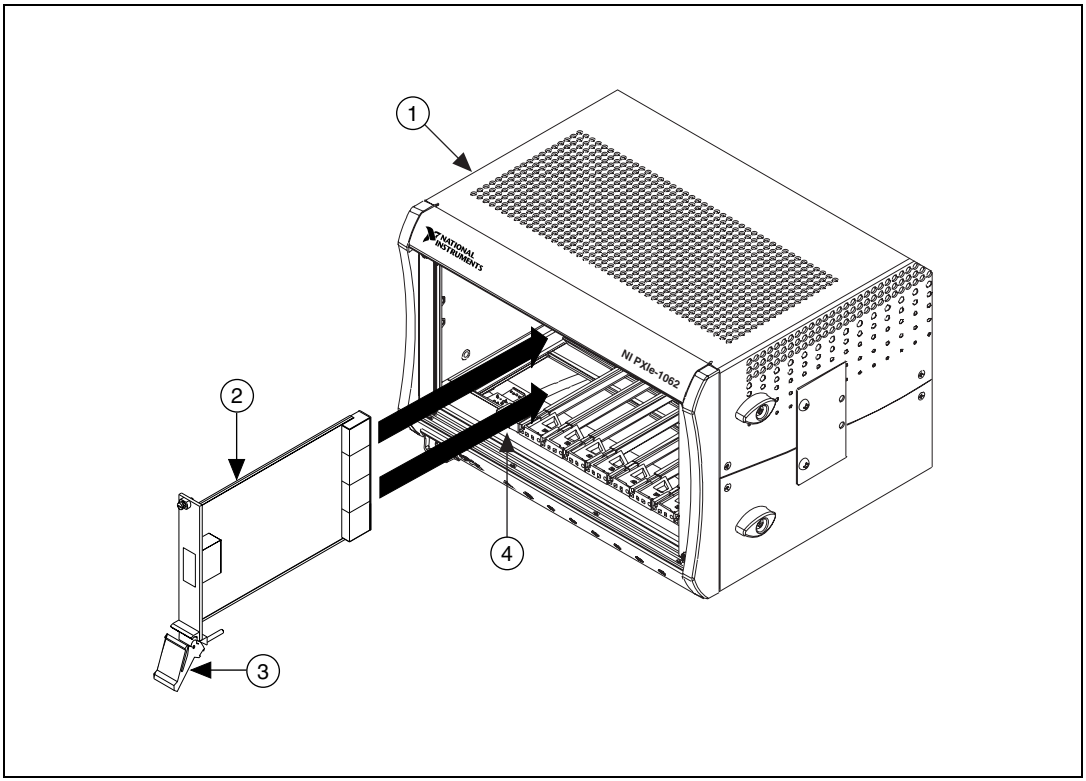
Caution To protect both yourself and the chassis from electrical hazards, leave the chassis off until you finish installing the NI PXIe-8360.

3. Remove or open any doors or covers blocking access to the slot in which you intend to install the NI PXIe-8360.
4. Touch the metal part of the case to discharge any static electricity that might be on your clothes or body.
5. Make sure the injector/ejector handle is in its downward position. Be sure to remove all connector packaging and protective caps from retaining screws on the module. Align the NI PXIe-8360 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-8360. It will not insert properly unless the handle is in its downward position so that it does not interfere with the injector/ejector rail on the chassis, as shown in Figure 2-2.

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-8360 should be even with the front panel of the chassis.
8. Tighten the bracket-retaining screws on the top and bottom of the front panel to secure the NI PXIe-8360 to the chassis.
9. Replace or close any doors or covers to the chassis.

Figure 2-2 shows an NI PXIe-8360 just before installation in the system controller slot of a National Instruments PXI Express chassis.



1	PXI Express/CompactPCI Express Chassis	3	Ejector Handle in Down Position
2	NI PXIe-8360	4	PXI Express/CompactPCI Express Slot 1

Figure 2-2. NI PXIe-8360 Card Before Installation

Cabling

Connect the MXI-Express cable to both MXI-Express cards. The cables have no polarity, so either end may be connected to either card.

Caution Do *not* remove the cable after the system is powered on. Doing so can hang or cause errors in applications communicating with devices behind MXI-Express. If a cable becomes unplugged, plug it back into the system.

Note For more information about cables, refer to the *MXI-Express Cable Options* section of Chapter 3, *Hardware Overview*.

Powering Up the MXI-Express System

1. Power-on all of the expansion chassis in any order you choose.
2. Power-on the host.

Typical PCI-PCI bridges and switches are used to add PCI devices to a PCI hierarchy in which all the bridges and devices are contained within a single chassis. Because of this, BIOSes and operating systems make the assumption that all PCI devices in the entire hierarchy will be available as soon as code execution begins at power-up. This assumption means that all of the expansion chassis must be turned on before the host PC for the BIOS and OS to correctly configure a MXI-Express system.

Note There are no requirements on how MXI-Express expansion chassis are powered up relative to each other, as long as they are all on before the computer is powered on.

Powering Down the MXI-Express System

Because operating systems and drivers commonly make the assumption that PCI devices will be present in the system from power-up to power-down, it is important to not power off the expansion chassis until after the host PC is powered off. Powering off the expansion chassis while the host is still on can cause crashes or hangs. The order in which expansion chassis are powered off, relative to each other, is not important.

3

Hardware Overview

This chapter presents an overview of MXI-Express hardware functionality and explains the operation of each functional unit.

Functional Overview

MXI-Express is based on PCI Express technology. A MXI-Express kit uses PCI Express switches to enable control of a PXI Express or CompactPCI Express chassis from a PC with an available PCI Express slot. The PCI Express switch architecture is transparent to device drivers, so no additional software is needed to support using PXI Express and CompactPCI Express devices in a chassis connected using MXI-Express.

Note The PXI Platform Services software on the *PXI Platform Services* CD or driver CD included with your PXI Express MXI-Express hardware is required to provide chassis and controller identification for PXI features such as trigger routing and slot detection. The PXI Platform Services software is also included with the NI-DAQmx and NI-VISA drivers. For more information, refer to KnowledgeBase 3TJDONDS at `ni.com`.

The link between the PC and the chassis is a x1 PCI Express link. This link is a dual-simplex communication channel comprised of a low-voltage, differentially driven signal pair. The link can transmit at a rate of 2.5 Gbps in each direction simultaneously. This connector is not compatible with the cabled PCI Express specification under development by the PCI-SIG.

Figure 3-1 shows the basic architecture of MXI-Express. The NI PCIe-8361/8362 consists of a PCI Express x1 card edge connector, a PCI Express switch, and one or two cabled MXI Express connectors. The NI PXIe-8360 consists of one cabled MXI Express connector, a PCI Express switch, and PXI Express connectors.

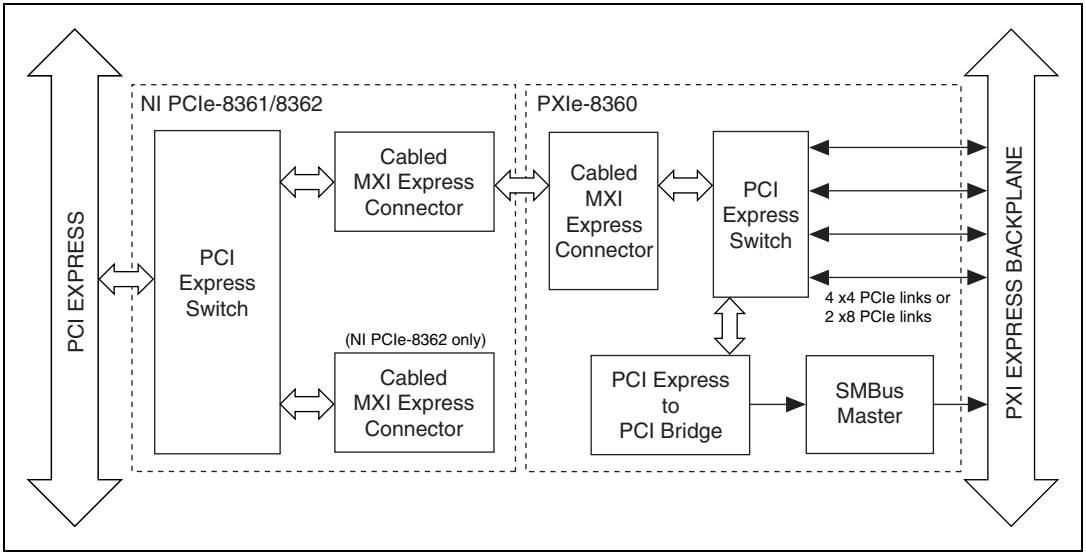


Figure 3-1. MXI-Express Block Diagram

Functional Unit Descriptions

PCI Express x1 Card Edge Connector

The card edge connector allows you to use the NI PCIe-8361/8362 in a x1 or wider PCI Express slot in a PC. The PCI Express Card Electromechanical Specification defines this connector.

PCI Express Switch

The PCI Express Base Specification defines a PCI Express switch as a logical collection of PCI Express-to-PCI Express bridge devices. On the NI PCIe-8361/8362, the upstream port of the switch is connected to the PCI Express x1 card edge connector, and the two downstream ports are connected to the two cabled MXI Express connectors.

On the NI PXIe-8360, the upstream part of the switch is connected to the cable. One downstream port is connected to the SMBus Master, and either 4 x4 ports or 2 x8 ports are connected to the backplane, depending on the chassis backplane configuration.

Cabled MXI Express Connector

The cabled MXI Express connector provides all necessary signals to connect an NI PCIe-8361/8362 and an NI PXIe-8360. These signals include the PCI Express transmit and receive pair, the system clock, presence detect signals, reset, and a wake-up signal. This connector is not compatible with the cabled PCI Express specification being defined by the PCI-SIG.

PCI Express-to-PCI Bridge

The PCI Express Base Specification defines a PCI Express-to-PCI bridge as a device that connects a PCI Express fabric and a PCI hierarchy. On the NI PXIe-8360, the PCI Express-to-PCI bridge connects the x1 PCI Express link and an SMBus Master on the card.

SMBus Master

The SMBus is a low-speed bus for reading and configuring devices outside the normal PCI Express mechanism. The PXI Express specification requires controllers to supply an SMBus for reading chassis configuration information from an EPROM. It may also be used for fan control, power monitors, or other system devices. In addition, devices on plug-in boards may connect to the SMBus for purposes specific to those devices.

LED Indicators

The LEDs on MXI-Express give status information about power supplies and link state. The NI PCIe-8362 has two tri-color LEDs, one for each port on the panel. The NI PXIe-8360 has two LEDs, one for power supply status and one for link state.

The LEDs on the NI PCIe-8362 indicate the following:

Table 3-1. NI PCIe-8362 Status LED Messages

Color	Meaning
Off	Power is off
Red	Power is out of spec
Amber	Power is within spec; no link to chassis
Green	Power is within spec; link established

The front-panel LEDs on the NI PXIe-8360 indicate the following:

Table 3-2. NI PXIe-8360 Status LED Messages

LED	Color	Meaning
PWR	Off	No power
	Red	Power is out of spec
	Green	Power is within spec
LINK	Off	Link not established
	Green	Link established

The NI PXIe-8360 has some additional LEDs on the back side of the board near the front-panel connector. These LEDs give additional information about the link status of the PCI Express lanes on the module to the backplane. For more information, refer to KnowledgeBase 3U7CDCD8 at `ni.com`.

MXI-Express Cable Options

MXI-Express is available with cables of various lengths. Table 3-3 shows the cables available from National Instruments.

Table 3-3. National Instruments MXI-Express Cables

Cable Length (Meters)	Description
3 m	MXI-Express copper cable (part number 779500-03)
7 m	MXI-Express copper cable (part number 779500-07)

A

Specifications

This appendix lists the system specifications for NI PCIe-8361/8362 and NI PXIe-8360 cards. These specifications are typical at 25 °C, unless otherwise stated.

Physical

Dimensions

NI PXIe-8360 ..... 10.0 × 16.0 cm (3.9 × 6.3 in.)

NI PCIe-8361/8362 ..... 10.7 × 17.5 cm (4.4 × 6.9 in.)

Maximum cable length ..... 7 m

Slot requirements

NI PXIe-8360 ..... One system slot (PXI Express or CompactPCI Express)

NI PCIe-8361/8362 ..... One slot (PCI Express)

Compatibility ..... Fully compatible with the *PXI Express Hardware Specification*, Revision 1.0 and the *PICMG CompactPCI Express EXP.0 R1.0 Specification*

Weight

NI PXIe-8360 ..... 0.17 Kg (0.37 lb) typical

NI PCIe-8361/8362 ..... 0.19 Kg (0.42 lb) typical

Power requirements

NI PXIe-8360

Power Rail	Typical Current	Maximum Current
+3.3 V	2.5 A	3 A
+5 V	0 mA	0 mA

Power Rail	Typical Current	Maximum Current
+12 V	0 mA	0 mA
+5 V_{aux}	0.3 A	0.4 A

NI PCIe-8361/8362

Power Rail	Typical Current	Maximum Current
+3.3 V	1.800 A	2.000 A
+3.3 V_{aux}	0 A	0 A
+12 V	0 A	0 A

Environment

NI PXIe-8360

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

Pollution Degree 2

Indoor use only.

Operating Environment

Ambient temperature range .....0 to 55 °C (Tested in accordance with IEC-60068-2-1 and IEC-60068-2-2)

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

Storage Environment

Ambient temperature range .....–40 to 70 °C (Tested in accordance with IEC-60068-2-1 and IEC-60068-2-2)

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

Shock and Vibration

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

Random Vibration

Operating..... 5 to 500 Hz, 0.3 g_{rms}

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.)

NI PCIe-8361/8362

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

Pollution Degree 2

Indoor use only

Operating Environment

Ambient temperature range..... 0 to 40 °C (Tested in accordance with IEC-60068-2-1 and IEC-60068-2-2)

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

Storage Environment

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

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

Caution Clean the NI PXIe-8360 and NI PCIe-8361/8362 with a soft nonmetallic brush. Make sure that the device is completely dry and free from contaminants before returning it to service.

Note For EMC compliance, operate this device with shielded cabling. In addition, all covers and filler panels must be installed. Refer to the Declaration of Conformity (DoC) for this product for any additional regulatory compliance information. To obtain the DoC for this product, visit `ni.com/certification`, search by model number or product line, and click the appropriate link in the Certification column.

Safety

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

- EN 61010-1, IEC 61010-1
- UL 61010-1, CAN/CSA-C22.2 No. 61010-1

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

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 EMC requirements; Minimum Immunity
- EN 55011 Emissions; Group 1, Class A
- CE, C-Tick, ICES, and FCC Part 15 Emissions; Class A

Note For EMC compliance, operate this device according to printed documentation.

CE Compliance

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

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



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

Waste Electrical and Electronic Equipment (WEEE)



Note At the end of their life cycle, all products *must* be sent to a WEEE recycling center. For more information about WEEE recycling centers and National Instruments WEEE initiatives, visit `ni.com/environment/weee.htm`.

B

Common Questions

This appendix lists common questions related to the use of the MXI-Express controllers.

General Hardware

What are the board names of the MXI-Express remote controllers?

- NI PCIe-8361/8362: PCI Express MXI-Express interface
- NI PXIe-8360: PXI Express MXI-Express interface

How many PXI bus segments can I connect together with MXI-Express?

The PCI specification allows up to 255 bus segments. MXI-Express does not limit this number, but the maximum number of bus segments allowed can be BIOS or operating system dependent. Also, a computer may already have several PCI bus segments internally, and the MXI-Express link also has multiple PCI buses internally. Every PCI Express device has at least 1 bus segment, though it will have more if it includes a bridge or switch.

What host PCs are compatible with MXI-Express for PXI Express?

Refer to KnowledgeBase 3U7CI4D8 at `ni.com`.

Note Due to the point-to-point nature of PCI Express, MXI-Express supports only the star configuration. You must use traditional MXI for the daisy chain configuration.

General Cabling

What is the maximum length of a MXI-Express copper cable?

The maximum length for a MXI-Express copper cable is 7 m. National Instruments offers 3 m and 7 m copper cables.

General Software

Under which operating systems will MXI-Express work?

MXI-Express will be recognized as a collection of PCI-to-PCI bridges to the majority of operating systems. It should automatically work with most systems like Windows, Macintosh OS X, Linux, and Solaris, but only Windows XP has been verified in the initial release of MXI-Express.

What software is required to use my MXI-Express kit?

For Windows and LabVIEW RT, the required software is included as part of the latest version of NI-VISA included with your kit. The software for your MXI-Express controller enhances the product, allowing you to view information about the organization of your PXI system and programmatically retrieve data about the chassis and modules you have installed.

If the MXI-Express software does not support your operating system, you can still use MXI-Express and the operating system will provide a mechanism for you to ignore the SMBus master that is built into the MXI-Express hardware.

MXI-3 required optimization software. Does MXI-Express require the same?

No. The necessary optimization is now done automatically by the MXI-Express hardware.

How does my MXI-Express board show up in the Windows Device Manager?

MXI-Express boards contain two types of PCI devices onboard and will have several listings in the Windows Device Manager (WDM). The first devices show up in the WDM listed under System devices as **PCI standard PCI-to-PCI bridges**. The second device type shows up in the WDM as an **NI PXIe-8360 SMBus Controller** when the correct MXI-Express driver is installed. This second device provides configuration information about the chassis. The NI PCIe-8361 includes two PCI standard PCI-to-PCI bridges. The NI PCIe-8362 includes three PCI standard PCI-to-PCI bridges. The

NI PXIe-8360 includes five to seven bridges and one NI PXIe-8360 SMBus Controller device.

If the MXI-Express software is not installed, the PCI-to-PCI function will still be detected and work correctly, but the SMBus master will be detected as an unknown device.

MXI-3 and MXI-4 to MXI-Express Upgrade Questions

What are some of the improvements from MXI-3 and MXI-4 to MXI-Express?

MXI-Express incorporates the latest technology to include:

- Support for PCI Express slots.
- Support for PXI Express and CompactPCI Express chassis.
- Improved error correction and handling for noisy or harsh environments.
- Improved mechanical connectivity.
- Improved performance.
- Support for two chassis from a single card in the host PC.

Can a MXI-3, MXI-4, and MXI-Express board be used together directly?

No. MXI-3, MXI-4, and MXI-Express boards use different cable connectors and cannot be connected together. Additionally, the board-to-board communication protocols differ.

Can I use a MXI-3, MXI-4, and MXI-Express kit in the same multichassis PXI system?

Yes. Different MXI kits can be intermixed to connect multiple PXI and PXI Express chassis together. As mentioned previously, an individual MXI-3 or MXI-4 board will not cable directly to a MXI-Express board.

MXI-3 and MXI-4 systems required the use of a specific boot ordering. Is this a requirement with MXI-Express?

Yes. The requirements of the PCI bus still mandate that you must power-on secondary PXI chassis before powering on the host PC when using MXI-Express.

With MXI-3 and several chassis connected in series (daisy chain configuration), you were required to power-on the chassis in order starting with the chassis at the end of the chain and move towards the host controller. Now with MXI-Express, multiple chassis are connected in parallel and can be powered on in any order, except that you need to ensure that the last component powered on is the host PC.

For more details, refer to the *Powering Up the MXI-Express System* section of Chapter 2, *Hardware Installation*.

C

Technical Support and Professional Services

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

- **Support**—Online technical support resources at ni.com/support include the following:
  - **Self-Help Resources**—For answers and solutions, visit the award-winning National Instruments Web site for software drivers and updates, a searchable KnowledgeBase, product manuals, step-by-step troubleshooting wizards, thousands of example programs, tutorials, application notes, instrument drivers, and so on.
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    For information about other technical support options in your area, visit ni.com/services or contact your local office at ni.com/contact.
- **Training and Certification**—Visit ni.com/training for self-paced training, eLearning virtual classrooms, interactive CDs, and Certification program information. You also can register for instructor-led, hands-on courses at locations around the world.
- **System Integration**—If you have time constraints, limited in-house technical resources, or other project challenges, National Instruments Alliance Partner members can help. To learn more, call your local NI office or visit ni.com/alliance.
- **Declaration of Conformity (DoC)**—A DoC is our claim of compliance with the Council of the European Communities using the manufacturer's declaration of conformity. This system affords the user protection for electronic compatibility (EMC) and product safety. You can obtain the DoC for your product by visiting ni.com/certification.

- **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.

Glossary

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

Symbols

°	Degrees
≥	Equal or greater than
≤	Equal or less than
%	Percent

B

bus	the group of conductors that interconnect individual circuitry in a computer. Typically, a bus is the expansion vehicle to which I/O or other devices are connected. Examples of PC buses are the PCI, PCI Express, AT bus, NuBus, Micro Channel, and EISA bus.
bus master	a type of a plug-in board or controller with the ability to read and write devices on the computer bus

C

C	Celsius
clock	hardware component that controls timing for reading from or writing to groups
counter/timer	a circuit that counts external pulses or clock pulses (timing)

D

device	a plug-in instrument card or pad that can contain multiple channels and conversion devices. Plug-in boards and PCMCIA cards are examples of devices.
digital trigger	a TTL level signal having two discrete levels—a high and a low level
DMA	Direct Memory Access—a method by which data can be transferred to/from computer memory from/to a device or memory on the bus while the processor does something else. DMA is the fastest method of transferring data to/from computer memory.

F

FPGA	Field Programmable Gate Array—a logic device that has its functionality defined after it is manufactured.

I

IEEE	Institute of Electrical and Electronics Engineers

P

PCI	Peripheral Component Interconnect—a high-performance expansion bus architecture originally developed by Intel to replace ISA and EISA. It is achieving widespread acceptance as a standard for PCs and workstations; it offers a theoretical maximum transfer rate of 132 Mbytes/s.
PCI Express	a scalable full-simplex serial bus standard that operates at 2.5 Gbps and offers both asynchronous and isochronous data transfers
PCI-PCI bridge	a device that transparently expands the PCI bus on a computer motherboard to another bus segment in the same machine. The bridge expands the number of PCI expansion slots, but remains transparent to the end user.
PXI	PCI eXtensions for Instrumentation. PXI is an open specification that builds off the CompactPCI specification by adding instrumentation-specific features.

X

x1	a link or port with one physical lane

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