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**PCI-8361**

# Set Up Your MXI™-Express x1 System

This document explains what is needed to set up various MXI-Express x1 hardware configurations.

The products covered by this guide are the NI PCI-8361, NI PCIe-8361/8362, NI PXI-8360/8364, NI PXIe-8360/8364, and NI ExpressCard-8360. For the remainder of this manual the term *MXI-Express x1 product* refers to any of these products.

Additional compatible products are included in subsequent tables, but are not covered in this manual.

## Terminology

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The following terms may be used throughout this document:

- **Host PC**—A host computer with at least one of the following slot types available:
  - PCI Express x1 or wider
  - PCI
- **Laptop**—A portable laptop with the following slot types available:
  - ExpressCard/34 or ExpressCard/54 slot with PCI Express support<sup>1</sup>
- **Expansion Chassis**—An expansion chassis of any of the following types:
  - CompactPCI chassis
  - PXI chassis
  - CompactPCI Express chassis
  - PXI Express chassis
  - VXI mainframe
  - NI CompactRIO backplane

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<sup>1</sup> Some ExpressCard adapters support USB only.

- **MXI-Express x1 copper cable**—Standard PCI Express specification compliant cable with 18-pin Molex TDP™ connectors.



**Note** Refer to the [Cabling](#) section for details and ordering information. Most MXI-Express kits include the cable, but not all.

- **Host Board**—The MXI-Express x1 board of a cabled pair of boards that is closer to the CPU.
- **Target Board**—The MXI-Express x1 board of a cabled pair of boards that is farther from the CPU.
- **Cabled Pair**—Two MXI-Express x1 boards that are connected with a single cable.



**Note** Some NI MXI-Express x1 link capable products have integrated ports and do not require a separate host or target board.

## Connecting a PC or Laptop to an Expansion Chassis

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### Using a MXI-Express x1 Copper Cable

Refer to the [Terminology](#) section for more detail on the items in this list.

#### Equipment Needed

- Host PC or laptop
- Expansion chassis
- MXI-Express x1 copper cable
- A MXI-Express x1 host board and target board that is appropriate for the host system slot and target chassis. Refer to Table 1 for more information.

**Table 1.** MXI-Express x1 Connectivity Support From a Host PC Using a Copper Cable

From Host		Targets						
Slot Type	Product	PXI Chassis		VXI Chassis	PXI Express Chassis		MXI-Express RIO	
		NI PXI-8360	NI PXI-1033*	NI VXI-8360T	NI PXIe-8360	NI PXIe-1073*	NI 9157*	NI 9159*
PCI	NI PCI-8361	✓	— <sup>†</sup>	— <sup>†</sup>	— <sup>†</sup>	— <sup>†</sup>	—	—
PCI Express x1	NI PCIe-8361	✓	✓	✓	✓	✓	✓	✓
PCI Express x1	NI PCIe-8362	✓	✓	✓	✓	✓	✓	✓
ExpressCard	NI ExpressCard-8360	✓	✓	✓	✓	✓	✓	✓
Industrial Controller	NI 3100/3110*	✓	✓	✓	✓	✓	✓	✓

\* Product has an integrated MXI-Express x1 port.

<sup>†</sup> These configurations are not supported, even though the front panel MXI connectors are mechanically compatible. For these configurations the boards will likely report a valid cable link via the front panels LEDs. Since these link scenarios expose a possible data integrity issue that may not be obvious to the user, National Instruments strongly recommends against using these configurations.

**Note:** For installation instructions and other information concerning the NI PXI-1033, NI PXIe-1073, NI VXI-8360T, NI 9157, NI 9159, and the NI 3100/3110, refer to their respective user manuals.

**Note:** For full PXI or PXI Express functionality, refer to the [Software Installation and Configuration](#) section.

**Note:** PCI Express host slots will give better throughput and latency performance than PCI slots.

# Connecting Additional Expansion Chassis to a System

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## Using a MXI-Express x1 Copper Cable

Refer to the [Terminology](#) section for more detail on the items in this list.

### Equipment Needed

- Chassis (or embedded controller with ExpressCard slot) to daisy-chain from
- Expansion chassis to daisy-chain to
- MXI-Express x1 copper cable
- A MXI-Express x1 host board and target board that is appropriate for the host system slot and target chassis. Refer to Table 2 for more information.

**Table 2.** MXI-Express x1 Daisy-Chain Connectivity Support From a Chassis Using a Copper Cable

From Chassis		Targets						
Slot Type	Product	PXI Chassis		VXI Chassis	PXI Express Chassis		MXI-Express RIO	
		NI PXI-8360	NI PXI-1033 <sup>†</sup>	NI VXI-8360T	NI PXIe-8360	NI PXIe-1073 <sup>*</sup>	NI 9157 <sup>*</sup>	NI 9159 <sup>*</sup>
PXI or PXIe Hybrid	NI PXI-8364	✓	— <sup>†</sup>	— <sup>†</sup>	— <sup>†</sup>	— <sup>†</sup>	✓ <sup>‡</sup>	✓ <sup>‡</sup>
PXI Express or PXIe Hybrid	NI PXIe-8364	✓	✓	✓	✓	✓	✓	✓
ExpressCard <sup>**</sup>	NI ExpressCard-8360	✓	✓	✓	✓	✓	✓	✓

<sup>\*</sup> Product has an integrated MXI-Express x1 port.  
<sup>†</sup> These configurations are not supported, even though the front panel MXI connectors are mechanically compatible. For these configurations the boards will likely report a valid cable link via the front panels LEDs. Since these link scenarios expose a possible data integrity issue that may not be obvious to the user, National Instruments strongly recommends against using these configurations.  
<sup>‡</sup> Daisy-chaining from PXI Express or ExpressCard slots will give better throughput and latency performance than PXI or PXI Express hybrid slots.  
<sup>\*\*</sup> ExpressCard slot of an embedded controller that is installed in the chassis to be daisy-chained from.

**Note:** For installation instructions and other information concerning the NI PXI-1033, NI PXIe-1073, NI VXI-8360T, NI 9157, and NI 9159 refer to their respective user manuals.  
**Note:** For full PXI or PXI Express functionality, refer to the [Software Installation and Configuration](#) section.

# Installation and Configuration

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This section explains how to unpack, install, and configure the MXI-Express x1 hardware and software.

## Unpacking

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Your MXI-Express x1 boards 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 a computer, laptop, PXI/CompactPCI, PXI Express/CompactPCI Express, CompactRIO, or VXI chassis.

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

# Hardware Installation

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The following are general instructions for installing the MXI-Express x1 cards. Consult your computer user manual or technical reference manual for specific instructions and warnings.

## Installing an NI PCI-8361 or NI PCIe-8361/8362 Host Card

Complete the following steps to install the NI PCI-8361 or NI PCIe-8361/8362 in your computer.

1. Power off your computer.



**Caution** To protect both yourself and the computer from electrical hazards, your computer should remain off until you finish installing all hardware as instructed.

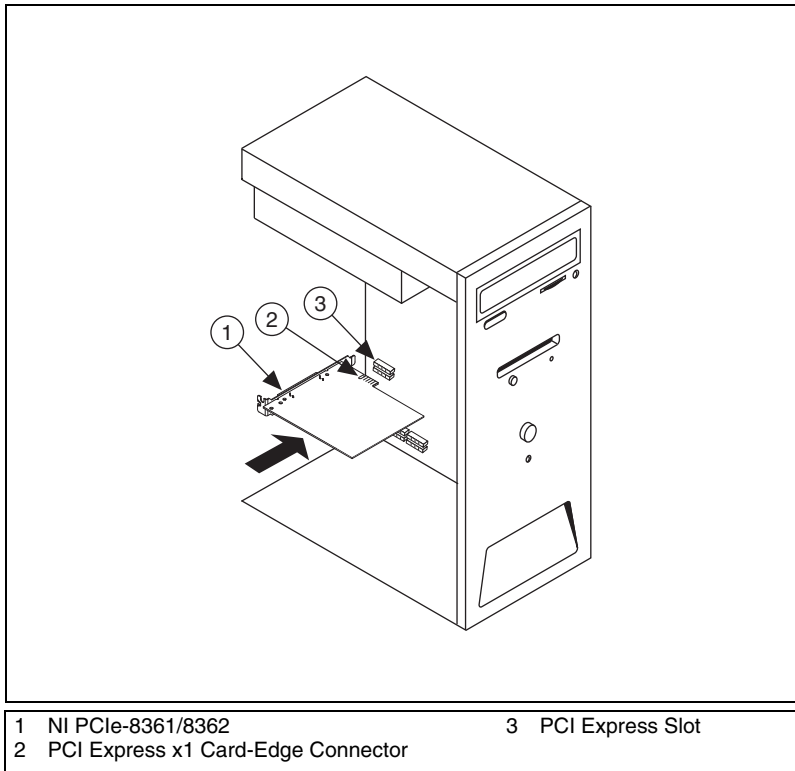
2. Remove the top cover or access port to the PCI or PCI Express expansion slots.
3. Touch the metal part of the power supply case inside the computer to discharge any static electricity that might be on your clothes or body.
4. Unplug the computer and wait 30 seconds to allow the energy stored in the computer's power supply to fully dissipate.
5. Select any available PCI slot for the NI PCI-8361 or PCI Express (x1 or wider) expansion slot for the NI PCIe-8361/8362.



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

6. 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.
7. Line up the NI PCI-8361 or NI PCIe-8361/8362 with the slot on the back panel, as shown in Figure 1. Slowly push down on the top of the NI PCI-8361 or NI PCIe-8361/8362 until its card-edge connector is resting on the expansion slot receptacle. Using slow, evenly distributed pressure, press the NI PCI-8361 or NI PCIe-8361/8362 straight down until it seats in the expansion slot.
8. Reinstall the bracket-retaining screw to secure the NI PCI-8361 or NI PCIe-8361/8362 to the back panel rail.
9. Replace the computer cover.
10. Plug the computer back in.





**Figure 1.** NI PCIe-8361/8362 Card Installation Example



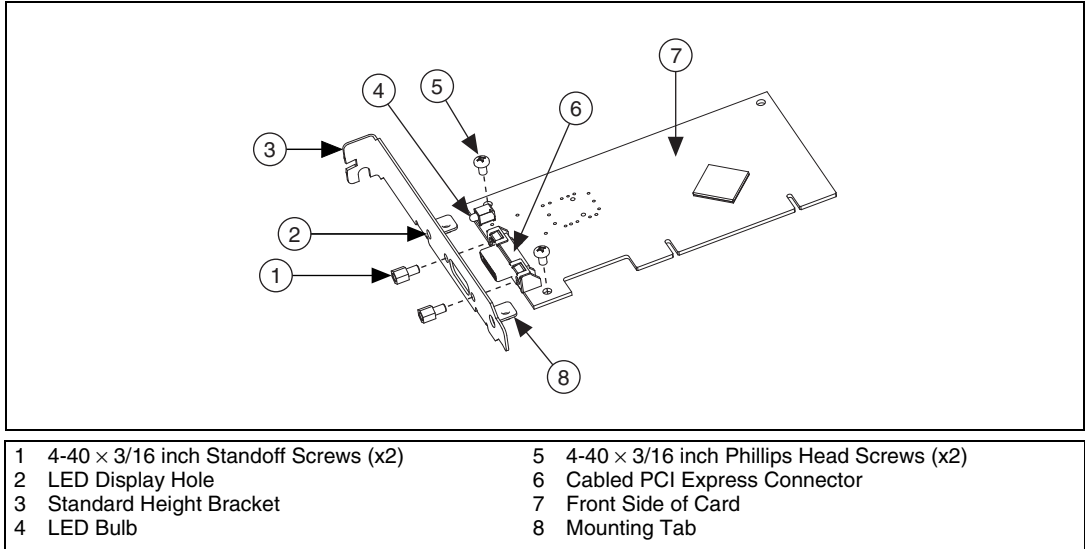
**Note** Figure 1 shows a PCI Express based card installation. The same procedure applies for a PCI card and slot.

## Installing the Low-Profile Bracket (Optional)

To install the NI PCI-8361 or NI PCIe-8361 in a host computer that requires a low-profile height card, the front bracket must be replaced with the low-profile bracket included with your kit. Complete the following steps to replace the bracket.

## NI PCI-8361 or NI PCIe-8361

1. Remove the standard height front bracket already installed on your NI PCI-8361 or NI PCIe-8361 card by removing the two 4-40 × 3/16 inch Phillips head screws and the two 4-40 × 3/16 inch standoff screws that attach the bracket to the card, as shown in Figure 2. Set the screws aside to re-use when installing the low-profile bracket.



**Figure 2.** Removing the Standard Height Bracket from an NI PCI-8361



**Note** The NI PCI-8361 standard height bracket mounting tabs rest against the back side of the card. The NI PCIe-8361 standard height bracket mounting tabs rest against the front side of the card, which is the side upon which the cabled PCI Express connector rests.

2. Fit the low-profile bracket onto the NI PCI-8361 or NI PCIe-8361. Ensure the two mounting tabs on the low-profile bracket rest against the back side of the card and that the LED bulb is situated in the bracket's LED display hole correctly, where applicable.
3. Align the mounting holes on the card with the threaded holes on the mounting tabs of the bracket. Insert the two 4-40 × 3/16 inch Phillips head screws from the front side of the card to attach the bracket.
4. Install the two 4-40 × 3/16 inch standoff screws to the front connector holes.
5. Tighten all screws to a maximum torque of 3.6 lb · in. (0.407 N · m).

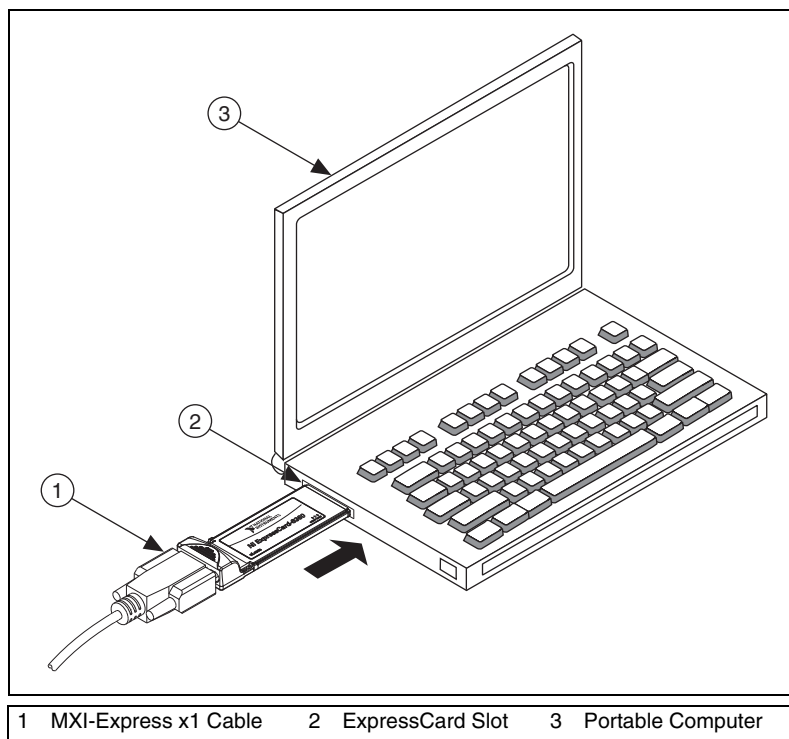
## Installing an NI ExpressCard-8360 Host Card

Because a laptop is not grounded, follow this procedure to safely connect it to your PXI system:

1. Install the NI PXI-8360, NI PXI-8361, or NI PXIe-8360 as directed in the [Installing an NI PXI-8360/8364 or NI PXIe-8360/8364 Board](#) section where applicable.
2. Touch the NI ExpressCard-8360 and a metal part of the PXI chassis simultaneously. Do *not* install it into the laptop or embedded controller yet.
3. Connect the cable to the NI ExpressCard-8360 and target chassis.
4. Plug the NI ExpressCard-8360 into an available ExpressCard slot.

If your computer is already running (or hibernating, etc.) when you install NI ExpressCard-8360, you must reboot to detect the PXI system. Otherwise, the PXI system is detected when you start your computer.

Figure 3 shows how to insert the NI ExpressCard-8360 into a laptop and connect the cable.



**Figure 3.** Installing the NI ExpressCard-8360 Into a Laptop

## Installing an NI PXI-8360/8364 or NI PXIe-8360/8364 Board

Table 3 provides information on which PXI or PXI Express MXI-Express x1 boards are compatible with which chassis slot types.

**Table 3.** NI MXI-Express x1 PXI/PXI Express Board Slot Type Compatibility

NI PXI Board	PXI Chassis		PXI Express Chassis		
	Controller △	Peripheral ○	Controller ▲	Peripheral ●	Hybrid ● <sup>H</sup>
NI PXI-8360	✓	—	—	—	—
NI PXI-8364	—	✓	—	—	✓
NI PXIe-8360	—	—	✓	—	—
NI PXIe-8364	—	—	—	✓	✓



**Note** For this section, all of the above products will be referred to as an “NI PXI board.”

Complete the following steps to install the NI PXI board into your PXI or PXI Express chassis.

1. Power off your PXI or PXI Express chassis, and leave it plugged in. The power cord grounds the chassis and protects it from ESD.

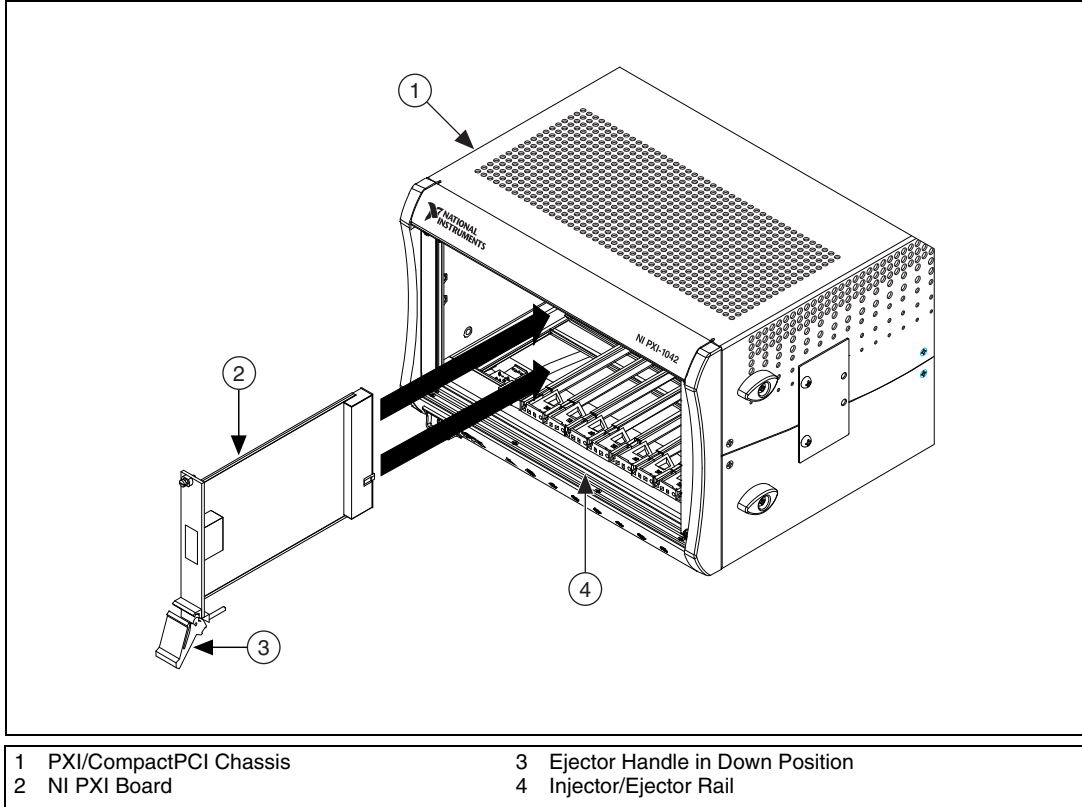


**Caution** To protect both yourself and the chassis from electrical hazards, leave the chassis off until you finish installing the NI PXI board.

2. Remove or open any doors or covers blocking access to the slot in which you intend to install the NI PXI board.
3. Touch a metal part of the chassis to discharge any static electricity that might be on your clothes or body.
4. 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 PXI board with the card guides on the top and bottom of the chassis slot.



**Caution** Do *not* raise the injector/ejector handle as you insert the NI PXI board. 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 4.



**Figure 4.** Example NI PXI Board Installation into a PXI Chassis

5. Hold the handle as you slowly slide the module into the chassis until the handle catches on the injector/ejector rail.
6. Raise the injector/ejector handle until the module firmly seats into the backplane receptacle connectors. The front panel of the NI PXI board should be even with the front panel of the chassis.
7. Tighten the bracket-retaining screws on the top and bottom of the front panel to secure the NI PXI board to the chassis.
8. Replace or close any doors or covers to the chassis.



**Note** Figure 4 shows an NI PXI board and chassis installation. The same procedure applies for a PXI Express board and chassis.

# Cabling

MXI-Express x1 products support two types of cable of various lengths. Table 4 shows the MXI-Express x1 copper cables<sup>1</sup> available from National Instruments.

**Table 4.** National Instruments MXI-Express x1 Copper Cables

Cable Length (Meters)	Description	Part Number
1 m	MXI-Express x1 copper cable	779500-01
3 m	MXI-Express x1 copper cable	779500-03
7 m	MXI-Express x1 copper cable	779500-07

## Powering On the MXI-Express x1 System

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



**Note** There are no requirements on the order that connected expansion chassis are powered up relative to each other, as long as they are all on before the computer is powered on.

3. Observe the LED status on the NI PCI-8361, NI PCIe-8361/8362, NI PXI-8360/8364, and NI PXIe-8360/8364 where applicable. A properly connected and powered up system should display a valid link and power status on *all* of these boards once the host PC is powered on. Refer to the [LED Indicators](#) section for more information.

Typical PCI-PCI bridges 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 time. 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** In some cases where there is an invalid MXI-Express x1 connection, some boards may report a valid link while others do not. It is important to observe a valid link status across *all* connected MXI-Express x1 boards when the host is powered on to ensure a valid configuration.

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<sup>1</sup> For more information, refer to the [Terminology](#) section.

## Powering Off the MXI-Express x1 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 not to 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. However, once the host PC is powered off, the order that the expansion chassis are powered off is not important.

## LED Indicators

The LEDs on MXI-Express x1 cards provide status information about power supplies and link state. The NI PCI-8361, NI PXI-8364, and NI PXIe-8364 all have one tri-color LED on the panel, indicating power and link status. The NI PCIe-8362 has two tri-color LEDs on the panel, indicating power and link status for each port. The NI PXI-8360 and NI PXIe-8360 have two LEDs, one for power supply status and one for link state.

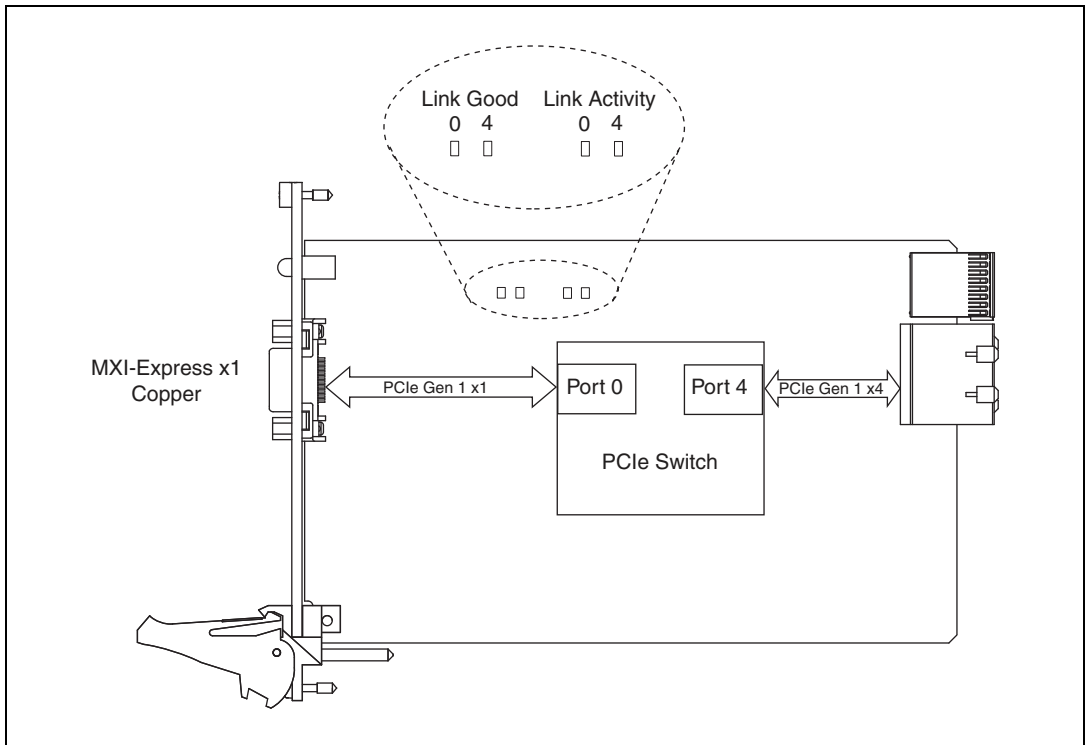


**Note** In some cases where there is an invalid MXI-Express x1 connection, some boards may report a valid link while others do not. It is important to observe a valid link status across all connected MXI-Express x1 boards when the host is powered on to ensure a valid configuration.

**Table 5.** LED Status Descriptions of MXI-Express x1 Products

Board	LED	Color	Meaning
NI PCI-8361 (199392x-01L) NI PCIe-8362 (190735x-01L) NI PXI-8364 (199991x-02L) NI PXIe-8364 (193970x-01L)	PWR/LINK	Off	Power is off
		Blinking Red	Power is out of spec
		Solid Amber	Power is within spec; no link to chassis
		Solid Green	Power is within spec; link established
NI PXI-8360 (191373x-01) NI PXIe-8360 (194402x-01L)	PWR	Off	No power
		Solid Red	Power is out of spec
		Solid Green	Power is within spec
	LINK	Off	Link not established
		Solid Green	Link established

Refer to Figure 5 for onboard LED locations.



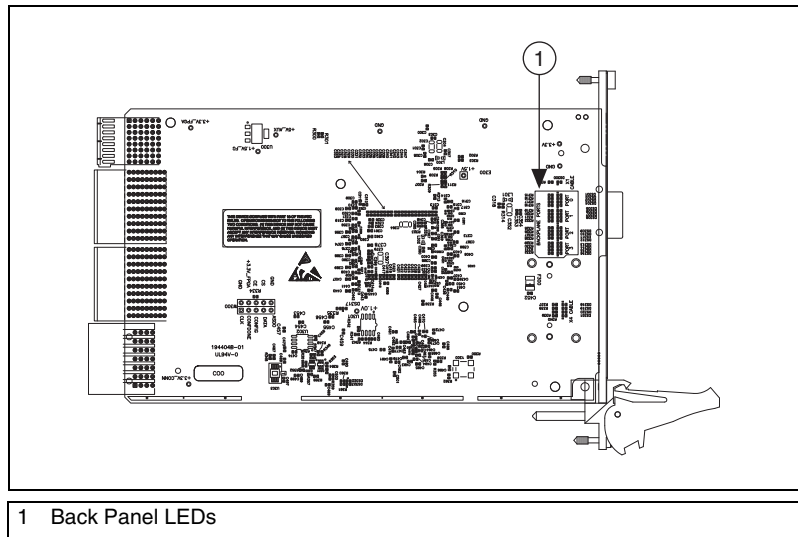
**Figure 5.** NI PXIe-8364 (193970x-01L) Onboard LED Locations

**Link Good LEDs**—LEDs that indicate a successful cable link (LED 0) and backplane link (LED 4).

**Link Activity LEDs**—LEDs that indicate link activity on the cable link (LED 0) and the backplane link (LED 4).



The NI PXIe-8360 also has a vertical column of 16 LEDs on the back side of the card near the front connector, as shown in Figure 6. These LEDs provide additional information about the link status of the PCI Express lanes on the module to the backplane. Each group of four LEDs corresponds to one of the four PCI Express links to the backplane.



**Figure 6.** NI PXIe-8360 Back Side LED Locations



**Notes** If you are using a chassis (such as the NI PXIe-1062) that directly links the PXI Express board, the LEDs to that slot will not illuminate until you have a PXI Express board installed and linked.

If you are using the NI PXIe-1062 chassis, you will notice that the last group of LEDs has an LED (PORT 3) illuminated even if no boards are populated in the slots. Since the NI PXIe-1062 uses the last link for a PCI Express to PCI bridge for PXI communication, this link should always be active. Different chassis topologies will give different default behaviors. Contact your chassis' manufacturer for more information on your chassis' topology.

# Software Installation and Configuration

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## Installation

MXI-Express x1 is based on PCI Express technology, using PCI Express switches and/or bridges to enable control of a PXI or PXI Express chassis from a PC or laptop with an available PCI, PCI Express, or ExpressCard slot. This technology will be recognized as a collection of PCI-to-PCI bridges to the operating system, and should automatically have CompactPCI support without any additional software.



**Note** For full PXI/PXI Express functionality such as chassis and controller identification, trigger routing, and slot detection, install the PXI Platform Services software included with your kit. This software also can be found at [ni.com/updates](http://ni.com/updates) by searching for **PXI Platform Services**.

For operating system support, refer to the KnowledgeBase **53399AQ7**, *PXI Platform Services Operating System Support*, at [ni.com/kb](http://ni.com/kb).

## Configuring Your System



**Note** The following requires the PXI Platform Services software and Measurement & Automation Explorer (MAX), included on your *PXI Platform Services* CD or your driver CD.

For information on configuring your system in MAX, open MAX and navigate to **Help»Help Topics»PXI**.

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