# Set Up Your MXI™-Express x4 System

This document explains what you will need to set up various MXI-Express x4 hardware configurations.

The products covered by this guide are the NI PCIe-8371/8372 and NI PXIe-8370/8374. For the remainder of this manual the term *MXI-Express x4 product* refers to any of these products.

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

## Terminology

The following terms may be used throughout this document:

- **Host PC**—A host computer with at least one PCI Express x4 or wider slot available.

✐ **Note** Using a PCI Express slot wider than x4 may result in negotiation down to x1 width, and therefore limiting bandwidth. This is uncommon in newer PCs.

- **Expansion Chassis**—An expansion chassis of any of the following types:
  - CompactPCI Express chassis
  - PXI Express chassis
  - NI HDD RAID
- **MXI-Express x4 copper cable**—Standard PCI Express specification compliant cable with x4 PCIe connectors.

✐ **Note** Refer to the *Cabling* section for details. Most MXI-Express kits include the cable, but not all.

- **Host Board**—The MXI-Express x4 board of a cabled pair of boards that is closer to the CPU.

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- **Target Board**—The MXI-Express x4 board of a cabled pair of boards that is farther from the CPU.

- **Cabled Pair**—Two MXI-Express x4 boards that are connected with a single cable.

# Connecting a PC to an Expansion Chassis

## Using a MXI-Express x4 Copper Cable

Refer to the *Terminology* section for more detail on the items in this list.

### Equipment Needed

❑ Host PC

❑ Expansion chassis

❑ MXI-Express x4 copper cable

❑ A MXI-Express x4 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 x4 Connectivity Support from a Host PC Using a x4 Copper Cable

| From Host | Targets | | | | |
|---|---|---|---|---|---|
| | | **PXI Express Chassis** | **HDD RAID** | | |
| **Slot Type** | **Product** | **NI PXIe-8370** | **NI HDD-8263** | **NI HDD-8264** | **NI HDD-8265** |
| PCI Express x4 | NI PCIe-8371 | ✓ | ✓ | ✓ | ✓ |
| PCI Express x4 | NI PCIe-8372 | ✓ | ✓ | ✓ | ✓ |
| **Note**: For installation instructions and other information about the NI HDD series of products, refer to their respective user manuals. | | | | | |

✎ **Note** For full PXI or PXI Express functionality, refer to the *Software Installation and Configuration* section for more information.

# Connecting Additional Expansion Chassis to a System

## Using a MXI-Express x4 Copper Cable

Refer to the *Terminology* section for more detail on the items in this list.

### Equipment Needed

❑ Chassis to daisy-chain from

❑ Expansion chassis to daisy-chain to

❑ MXI-Express x4 copper cable

❑ A MXI-Express x4 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 x4 Connectivity Support from a Chassis Using a x4 Copper Cable

| From Chassis | | Targets | | | |
|---|---|---|---|---|---|
| | | PXI Express Chassis | HDD RAID | | |
| Slot Type | Product | NI PXIe-8370 | NI HDD-8263 | NI HDD-8264 | NI HDD-8265 |
| PXI Express x4 | NI PXIe-8374 | ✓ | ✓ | ✓ | ✓ |
| PXI Express x4 | NI 8262 | — | ✓ | ✓ | ✓ |
| **Note**: For installation instructions and other information about the NI HDD series of products, refer to their respective user manuals. | | | | | |

✏️ **Note** For full PXI or PXI Express functionality, refer to the *Software Installation and Configuration* section of for more information.

# Installation and Configuration

This section explains how to unpack, install, and configure the MXI-Express x4 hardware and software.

# Unpacking

Your MXI-Express x4 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.

# Hardware Installation

The following are general instructions for installing the MXI-Express x4 cards. Consult your computer user manual or technical reference manual for specific instructions and warnings.

## Installing an NI PCIe-8371/8372

Complete the following steps to install the NI PCIe-8371/8372 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 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 Express expansion slot (x4 or wider).

📝 **Note** Using a PCI Express slot wider than x4 may result in negotiation down to x1 width, which will reduce throughput performance. This is rare in modern systems.

📝 **Note** The BIOS or motherboard may not support the NI PCIe-8371/8372 in a slot intended for a graphics card.

📝 **Note** Not all PCI Express expansion slots that have x4 or wider physical connectors are electrically capable of x4 PCI Express operation. Check with the motherboard manufacturer to verify that the slot is capable of x4 PCI Express operation.

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 PCIe-8371/8372 with the slot on the back panel. Slowly lower the NI PCIe-8371/8372 until its card-edge connector is resting on the expansion slot receptacle. Using slow, evenly distributed pressure, press the NI PCIe-8371/8372 straight down until it seats in the expansion slot, as shown in Figure 1.

8. Secure the NI PCIe-8371/8372 to the back panel rail using a bracket retaining screw.

9. Replace the computer cover.
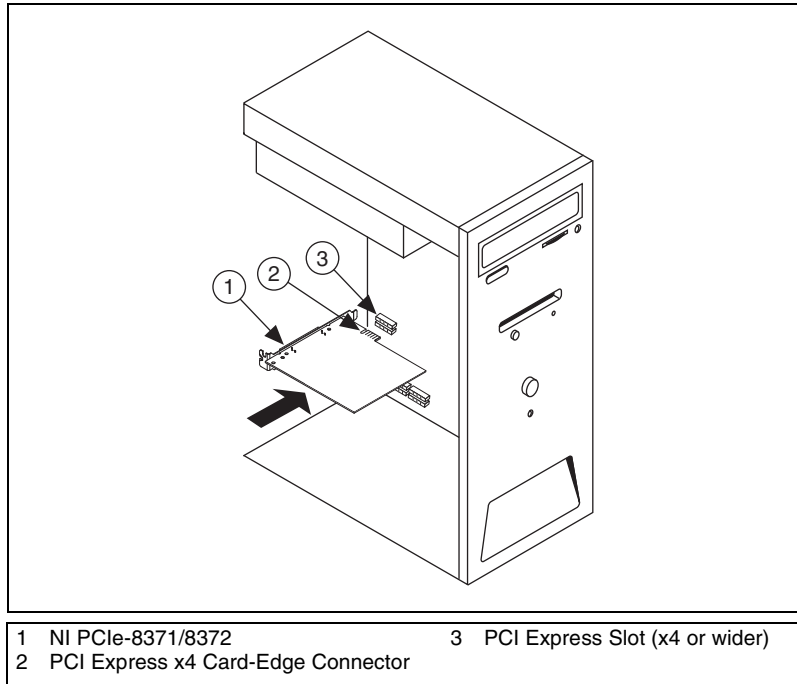
10. Plug the computer back in.



| 1 | NI PCIe-8371/8372 | 3 | PCI Express Slot (x4 or wider) |
|---|---|---|---|
| 2 | PCI Express x4 Card-Edge Connector | | |

**Figure 1.** Installing the NI PCIe-8371/8372

## Installing the Low-Profile Bracket on the NI PCIe-8371 (Optional)

To install the NI PCIe-8371 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.

1. Remove the standard height front bracket already installed on your NI PCIe-8371 card by removing the two 4-40 × 1/4 inch Phillips head screws that attach the bracket to the card. Note that the two mounting tabs for the standard height bracket rest against the *front* side of the card, which is the side upon which the cable receptacle connector housing rests. Set the two screws aside to re-use when installing the low-profile bracket.
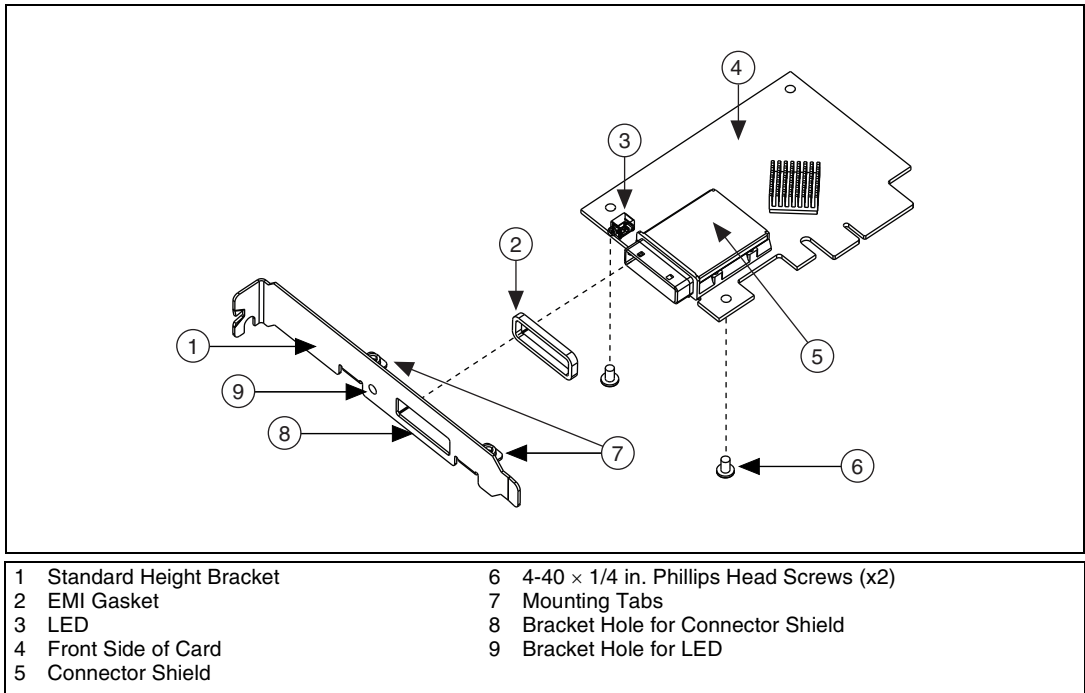
| | | | |
|---|---|---|---|
| 1 | Standard Height Bracket | 6 | 4-40 × 1/4 in. Phillips Head Screws (x2) |
| 2 | EMI Gasket | 7 | Mounting Tabs |
| 3 | LED | 8 | Bracket Hole for Connector Shield |
| 4 | Front Side of Card | 9 | Bracket Hole for LED |
| 5 | Connector Shield | | |

**Figure 2.** Removing the Standard Height Bracket from the NI PCIe-8371

⚠ **Caution** When removing the bracket, be careful not to remove or lose the EMI gasket on the cable receptacle connector housing.

2. Fit the low-profile bracket onto the NI PCIe-8371. Note that the two mounting tabs that the screws thread into rest against the *back* side of the card for the low-profile bracket. Ensure that the front bracket LED bulb is situated in the display hole correctly.

3. Align the mounting holes on the card with the threaded holes on the mounting tabs of the bracket, and insert the screws from the *front* side.

4. Tighten each screw to a maximum torque of 3.6 lb · in. (0.407 N · m).

# Installing an NI PXIe-8370 or NI PXIe-8374

Table 3 provides information on which PXI Express MXI-Express x4 boards are compatible with which chassis slot types.

**Table 3.** NI MXI-Express x4 PXI Express Board Slot Type Compatibility

| NI PXI Express Board | PXI Express Chassis | | |
|---|---|---|---|
| | **Controller** ▲ | **Peripheral** ● | **Hybrid** ●[H] |
| NI PXIe-8370 | ✓ | — | — |
| NI PXIe-8374 | — | ✓ | ✓ |

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

Complete the following steps to install the NI PXI Express board 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 PXI Express board. 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 off until you finish installing the NI PXI Express board.

2. Remove or open any doors or covers blocking access to the slot in which you intend to install the NI PXI Express 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 Express board 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 PXI Express 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 3.

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 Express board should be even with the front panel of the chassis.

**Note** LEDs on the back side of the NI PXIe-8370 will light, indicating the presence of 5 V auxiliary power. Refer to the *LED Indicators* section for details.

7. Tighten the bracket-retaining screws on the top and bottom of the front panel to secure the NI PXI Express board to the chassis.

8. Replace or close any doors or covers to the chassis.

Figure 3 shows an NI PXI Express board just before installation in the system controller slot of a National Instruments PXI Express chassis.
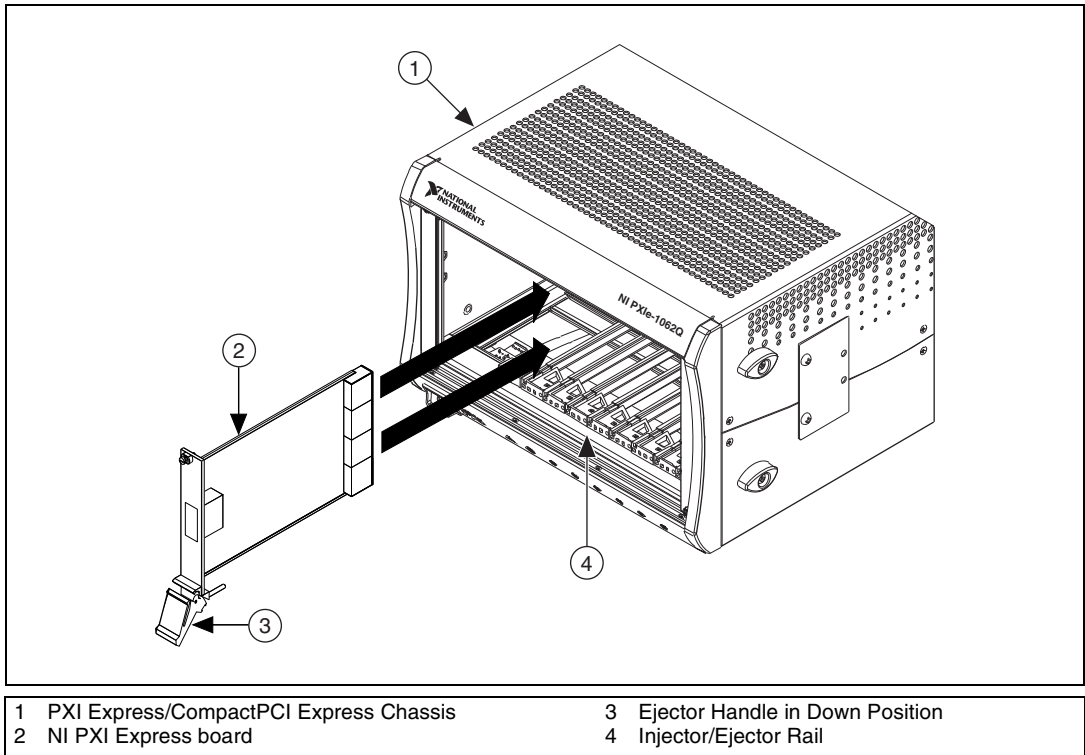


| 1 | PXI Express/CompactPCI Express Chassis | 3 | Ejector Handle in Down Position |
| 2 | NI PXI Express board | 4 | Injector/Ejector Rail |

**Figure 3.** Example NI PXI Express Board Installation Into a PXI Express Chassis

# Cabling

MXI-Express x4 is available with copper cables of various lengths. Table 4 shows the MXI-Express x4 copper cables[1] available from National Instruments.

**Table 4.** National Instruments MXI-Express x4 Copper Cables

| Cable Length (Meters) | Description | Part Number |
|---|---|---|
| 3 m | MXI-Express x4 copper cable | 779725-03 |
| 7 m | MXI-Express x4 copper cable | 779725-07 |

Connect the MXI-Express x4 cable to both MXI-Express x4 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 x4. If a cable becomes unplugged, plug it back into the system. (You may need to restart your computer.)

# Powering On the MXI-Express x4 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 how MXI-Express x4 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 PCIe-8371, NI PCIe-8372, NI PXIe-8370 and NI PXIe-8374 where applicable. A properly connected and powered up system should report 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 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 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 x4 system.

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[1] For more information, refer to the *Terminology* section.

## Powering Off the MXI-Express x4 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. However, once the host pc is powered off, the order that the expansion chassis are powered off is not important.

**Note** To power down the chassis while the host computer or host chassis is on, you may need to hold the power button for at least four seconds. However, this behavior cannot be guaranteed.

# LED Indicators

The LEDs on MXI-Express x4 cards give status information about power supplies and link state. The NI PCIe-8371 and NI PXIe-8374 have one tri-color LED on the panel, indicating power and link status. The NI PCIe-8372 has two tri-color LEDs on the panel, indicating power and link status for each port. The NI PXIe-8370 has two LEDs, one for power supply status and one for link state.

**Table 5.** LED Status Descriptions of MXI-Express x4 Products

| Board | LED | Color | Meaning |
|---|---|---|---|
| NI PCIe-8371 (199994x-01L) NI PXIe-8374 (193970x-02L) | 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 PCIe-8372 (194591x-01L) | PWR/LINK | Off | Power is off |
| | | Solid Red | Power is out of spec |
| | | Solid Amber | Power is within spec; no link to chassis |
| | | Solid Green | Power is within spec; link established |

Table 5. LED Status Descriptions of MXI-Express x4 Products (Continued)

| Board | LED | Color | Meaning |
|-------|-----|-------|---------|
| NI PXIe-8370 (194402x-02) | PWR | Off | No power |
| | | Blinking Red | Power is out of spec |
| | | Solid Green | Power is within spec |
| | LINK | Off | Link not established |
| | | Solid Green | Link established |

Refer to Figure 4 for onboard LED locations.
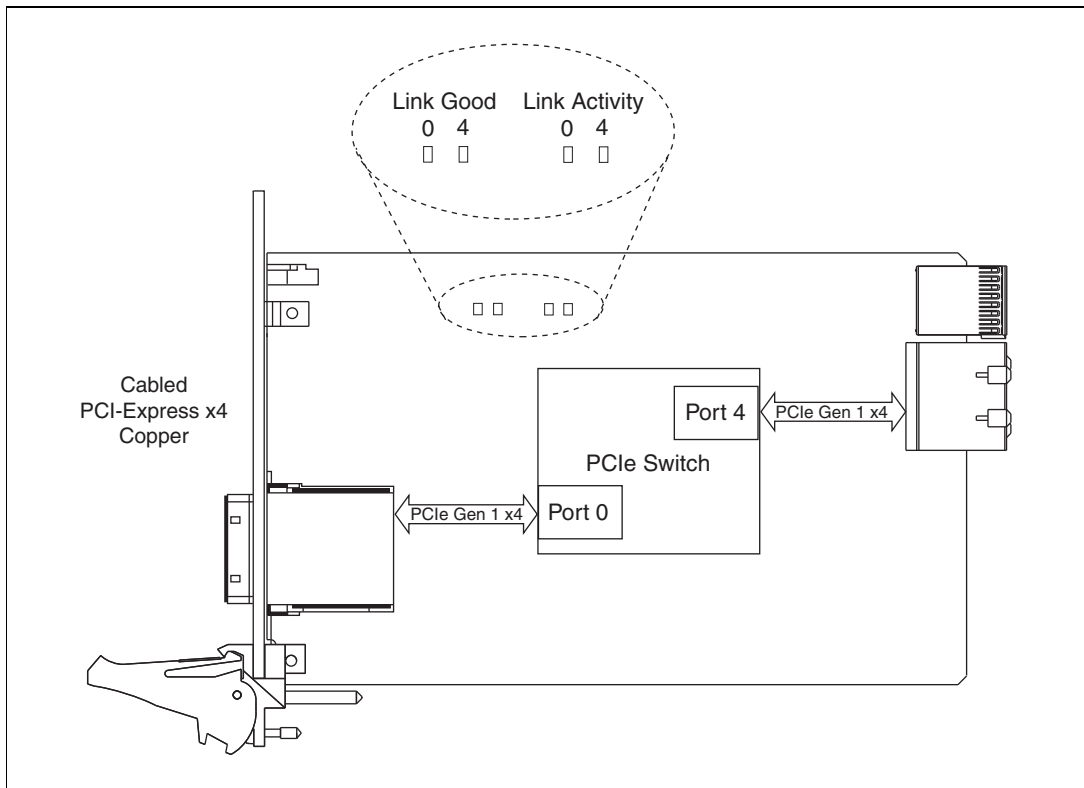


**Figure 4.** NI PXIe-8374 (193970x-02L) Onboard LED Locations

**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-8370 also has a vertical column of 16 LEDs on the back panel of the card near the front connector, as shown in Figure 5. 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.
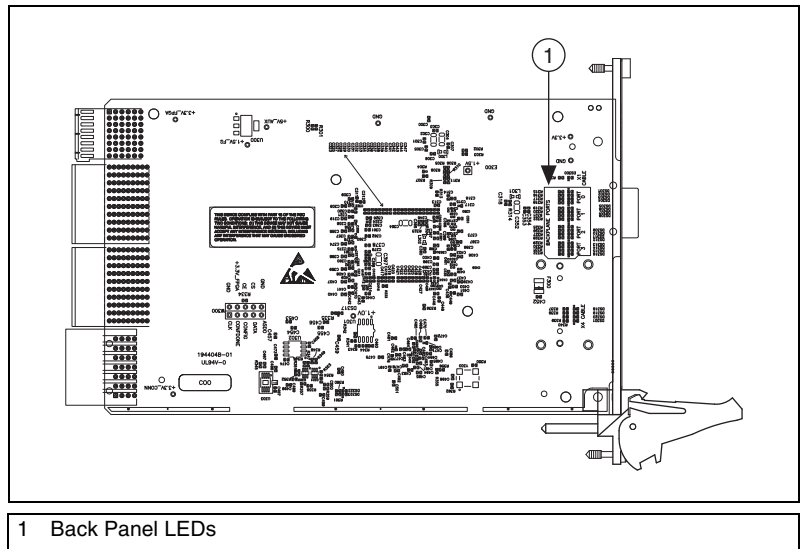


| 1 | Back Panel LEDs |

**Figure 5.** NI PXIe-8370 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

## Installation

MXI-Express x4 is based on PCI Express technology, using PCI Express switches and/or bridges to enable control of a PXI Express chassis from a PC or another PXI Express chassis with an available PCI Express or PXI Express slot. This technology will be recognized as a collection of PCI-to-PCI bridges to the operating system, and should automatically have CompactPCI Express level 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` 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`.

## 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**.