PXIe-1090 User Manual

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PXIe-1090 User Manual

The PXIe-1090 User Manual provides detailed descriptions of the product functionality and the step by step processes for use.

Looking for Something Else?

For information not found in the User Manual for your product, such as specifications and API reference, browse *Related Information*.

Related information:

- PXIe-1090 Specifications
- Software and Driver Downloads
- PXIe-1090 Dimensional Drawings
- PXIe-1090 Product Certifications
- Letter of Volatility
- Discussion Forums
- NI Learning Center

PXIe-1090 Overview

The PXIe-1090 chassis combines a high-performance 2-slot PXI Express backplane with a power supply and a structural design that has been optimized for maximum usability in a wide range of applications. The PXIe-1090 chassis fully complies with the *PXI-5 PXI Express Hardware Specification*.

PXIe-1090 Key Features

The PXIe-1090 chassis includes the following key features.

High Performance for Instrumentation Requirements

- Up to 985 MB/s (single direction) per PXI Express slot dedicated bandwidth (x1 Gen-3 PCI Express)
- 58 W per slot cooling to meet increased PXI Express cooling requirements
- Low-jitter internal 10 MHz reference clock for PXI/PXI Express slots with ±25 ppm stability
- Low-jitter internal 100 MHz reference clock for PXI Express slots with ±25 ppm stability
- Quiet operation for 0 °C to 30 °C at 33.7 dBA
- Variable speed fan controller to optimize cooling emissions and acoustic emissions

High Reliability

- 0 °C to 50 °C temperature range
- Power supply, temperature, and fan monitoring

Part Numbers for Recommended Cables and Accessories

Use part numbers to purchase the cables and the accessories for optimizing the performance of the PXIe-1090.

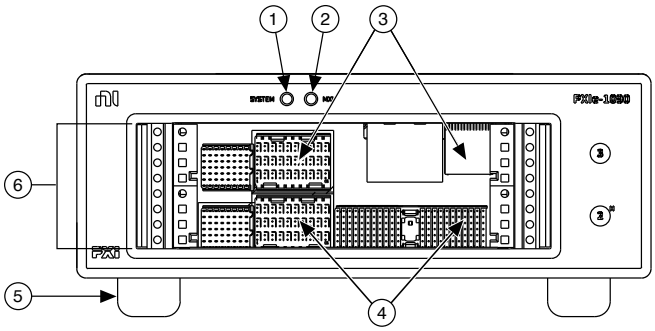
Table 1. Part Numbers for Recommended Cables and Accessories

Accessory or Cable	Description	Part number
Thunderbolt 3 Male-to-Male Cable	Thunderbolt 3 Type-C Cable, Active 40 Gb/S, 3 A, 2 m	785607-02
Thunderbolt 3 Male-to-Male Cable	Thunderbolt 3 Type-C Cable, Passive 20 Gb/S, 5 A, 2 m	785608-02
Thunderbolt 3 Male-to-Male Cable	Thunderbolt 3 Type-C Cable, Passive 40 Gb/S, 5 A, 0.8 m	787580-0R8
PXIe-1090 Rack Mount Kit	-	788347-01

PXIe-1090 Front Panel

The following figure shows the key features of the PXIe-1090 chassis front panel.

Figure 1. PXIe-1090 Front Panel

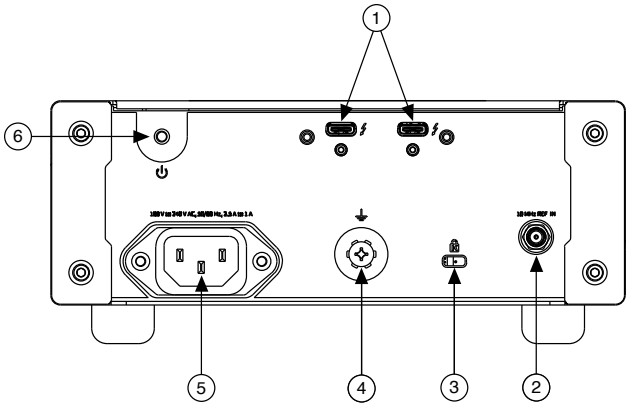


1. System LED
2. MXI LED
3. PXI Express Peripheral Slot
4. PXI Express Hybrid Peripheral Slot
5. Rubber Foot
6. Backplane Connectors

PXIe-1090 Back Panel

The following figure shows the key features of the PXIe-1090 chassis back panel.

Figure 2. PXIe-1090 Back Panel



1. Thunderbolt 3 MXI-Express Ports
2. 10 MHz REF IN SMA Connector
3. Kensington Slot
4. Chassis Grounding Terminal
5. Universal AC Input
6. Power Inhibit Switch

PXIe-1090 LED Indicators

The PXIe-1090 features an MXI LED and a System LED on the front panel.

Related reference:

- Powering On/Off the MXI-Express Thunderbolt System

MXI LED

The tri-color MXI LED on the PXIe-1090 front panel gives status information about the power supply and link state.

The following table lists the MXI LED states.

Table 2. MXI LED Status Indicators

Status Indicator	Description
Off	Power is off.
Blinking red	Power is out of specification.
Solid amber	Power is within specification, no link to chassis.
Solid green	Power is within specification, link established.

Related reference:

- Powering On/Off the MXI-Express Thunderbolt System

System LED

The System LED on the front panel of the PXIe-1090 indicates the system state.

The following figure shows the front panel System LED.

Figure 3. PXIe-1090 System LED



The following table describes the System LED states.

Table 3. Front Panel System LED States

Status Indicator	Description
Off	Chassis is powered off.
Steady green	Chassis is powered on and operates normally.
Steady red	Temperature is out of range or an internal chassis fault occurred.

Related reference:

- Powering On/Off the MXI-Express Thunderbolt System

PXIe-1090 Backplane Overview

This section describes the system integration and communication capabilities of the PXIe-1090 chassis.

Interoperability with CompactPCI

Use a PXIe-1090 chassis with PXI Express products, CompactPCI Express Type-2 peripherals, plus modified PXI or CompactPCI modules.

The PXIe-1090 design provides the flexibility to use the following devices in a single PXI Express chassis:

- PXI Express compatible products
- CompactPCI Express compatible Type-2 peripheral products
- PXI peripheral products modified to fit in a hybrid slot
- Standard CompactPCI peripheral products modified to fit in a hybrid slot

Thunderbolt 3 Interface

Built-in dual Thunderbolt 3 ports enable direct high-speed (up to 40 Gbps) connection and control from a compatible PC without additional drivers.

The PXIe-1090 chassis has a built-in Intel Thunderbolt 3 interface accessible through two Thunderbolt 3 ports on the back of the chassis. These ports let you control the PXIe-1090 from a host PC with a Thunderbolt 3 port. The PC must run a native (nonvirtualized) operating system that supports Thunderbolt connectivity.

Note The PXIe-1090 chassis does not include a slot 1. The Thunderbolt 3 ports replace this slot.

Thunderbolt technology is transparent to device drivers. You do not need additional software for CompactPCI Express-level support for PXI Express devices in connected chassis.

Note For full PXI/PXI Express functionality such as chassis and controller identification, trigger routing, and slot detection, install the latest version of PXI Platform Services. Your kit includes this software. You also can find PXI Platform Services at *ni.com/downloads*.

The link between the PC and the chassis is a Thunderbolt 3 link. The link can transmit at a rate of up to 40 Gbps in each direction simultaneously.

Related information:

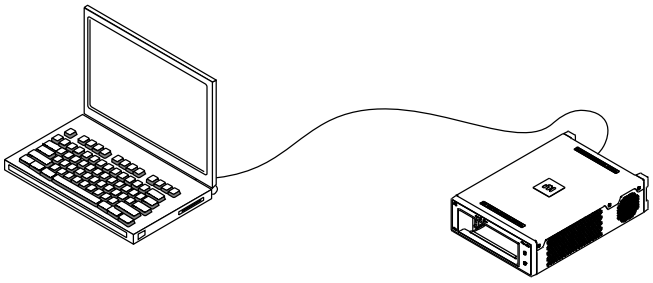
- Software and Driver Downloads

Basic MXI-Express Thunderbolt Systems

Overview of a basic MXI-Express Thunderbolt system linking a PC to a chassis through a Thunderbolt port.

The simplest MXI-Express Thunderbolt system consists of a PC connected to a PXIe-1090 via a Thunderbolt port on the chassis, as shown in the following figure.

Figure 4. Example of a Basic MXI-Express Thunderbolt Link Topology

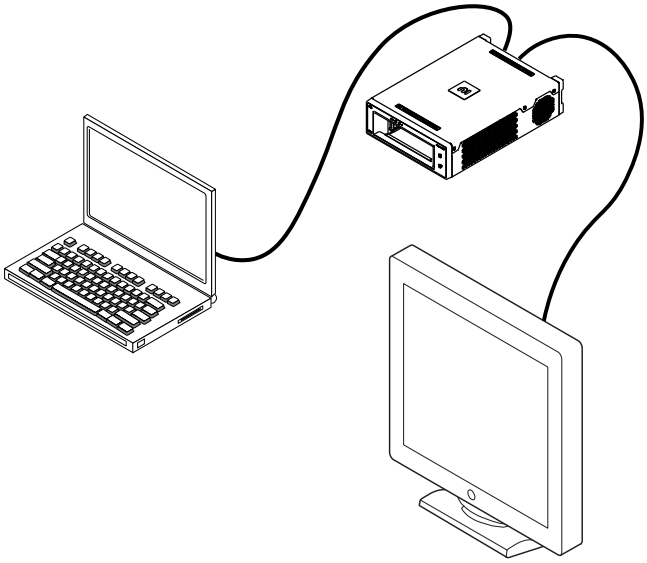


Thunderbolt Bus Extension

Overview of a daisy-chain Thunderbolt topology that extends a PC connection from a PXIe-1090 to additional devices.

The following figure shows how you can use a PXIe-1090 to connect multiple Thunderbolt 3 compatible devices to a PC in a daisy-chain topology.

Figure 5. Example of a Daisy-Chain Thunderbolt Link Topology



PXI Express Hybrid Peripheral Slot

The hybrid peripheral slot supports PXI Express, CompactPCI Express Type-2, hybrid-compatible PXI, and CompactPCI 32-bit peripheral modules.

Slot 2 of the PXIe-1090 is a hybrid peripheral slot. The hybrid peripheral slot can accept the following peripheral modules:

- A PXI Express peripheral with an x1 PCI Express link. If a PXI Express peripheral with an x4 link or an x8 link is installed, it operates at x1 link width.
- A CompactPCI Express Type-2 peripheral with an x1 PCI Express link. If a CompactPCI Express Type-2 peripheral with an x4 link or an x8 link is installed, it operates at x1 link width.
- A hybrid-compatible PXI peripheral module modified by replacing the J2 connector with an XJ4 connector installed in the upper eight rows of J2. Refer to the *PXI Express Specification* for details. The PXI peripheral communicates through the 32-bit PCI bus on the backplane.
- A CompactPCI 32-bit peripheral on the 32-bit PCI bus of the backplane.

A PXI Express or CompactPCI Express peripheral can link to Gen-3 8.0 GT/s x1 with the PCI Express interface. This link provides a maximum nominal single-direction bandwidth of 1 GB/s.

The hybrid peripheral slot provides full PXI Express functionality and 32-bit PXI

functionality except for PXI Local Bus. The hybrid peripheral slot connects only to PXI Local Bus 6 right.

Related reference:

- PXIe-1090 Front Panel

PXI Express Peripheral Slot

The PXI Express peripheral slot supports PXI Express and CompactPCI Express Type-2 peripheral modules with an x1 PCI Express connection.

Slot 3 of the PXIe-1090 is a PXI Express peripheral slot. PXI Express peripheral slots can accept the following modules:

- A PXI Express peripheral with an x1 PCI Express link. If a PXI Express peripheral with an x4 link or an x8 link is installed, it operates at x1 link width.
- A CompactPCI Express Type-2 peripheral with an x1 PCI Express link. If a CompactPCI Express Type-2 peripheral with an x4 link or an x8 link is installed, it operates at x1 link width.

A PXI Express or CompactPCI Express peripheral can link to Gen-3 8.0 GT/s x1 with the PCI Express interface. This link provides a maximum nominal single-direction bandwidth of 1 GB/s.

Related reference:

- PXIe-1090 Front Panel

PXI Local Bus

The PXI backplane local bus provides a daisy-chained connection between adjacent peripheral slots for local bus signals.

The backplane routes PXI Local Bus 6 between PXI slots. The left local bus 6 from slot 2 and right local bus 6 from slot 3 are not routed anywhere.

Local bus signals may range from high-speed TTL signals to analog signals as high as 42 V.

Initialization software uses the configuration information specific to each adjacent peripheral module to evaluate local bus compatibility.

PXI Trigger Bus

Eight shared PXI trigger lines provide timing synchronization across PXI slots for coordinated module responses to external events.

All slots share eight PXI trigger lines. You can use these trigger lines in a variety of ways. For example, you can use triggers to synchronize the operation of several different PXI peripheral modules. Modules can pass triggers to one another on the lines, allowing precisely timed responses to asynchronous external events the system is monitoring or controlling.

Dynamic routing of triggers (automatic line assignments) is supported through certain NI drivers like NI-DAQmx.

Note Although any trigger line may be routed in either direction, it cannot be routed in more than one direction at a time.

System Reference Clock

The PXIe-1090 chassis supplies PXI_CLK10, PXIe_CLK100, and PXIe_SYNC100 signals to every peripheral slot with an independent driver for each signal.

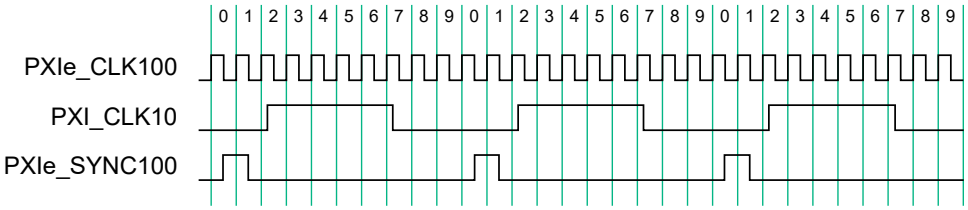
Table 4. Reference Clock and Synchronization Signals

Signal	Skew	Description
PXI_CLK10	< 250 ps between slots	The source impedance is matched to the backplane. You can use this common reference clock signal to synchronize multiple modules in a measurement or a control system.
PXIe_CLK100	< 100 ps	The differential pair must be terminated on

Signal	Skew	Description
		the peripheral with LVPECL termination for the buffer to drive the clock. If no peripheral or a peripheral that does not connect to PXIe_CLK100 is present, no clock is driven to that slot.
PXIe_SYNC100	Not specified	The differential pair must be terminated on the peripheral with LVPECL termination for the buffer to drive the signal. If no peripheral or a peripheral that does not connect to PXIe_SYNC100 is present, no SYNC100 signal is driven to that slot.

The following figure describes the default timing relationship of the PXI_CLK10, PXIe_CLK100, and PXIe_SYNC100 signals.

Figure 6. Default Behavior of the System Reference Clock



PXIe-1090 Kit Contents

Identify the contents of the PXIe-1090 kit.

The PXIe-1090 chassis kit contains the following items:

- PXIe-1090 chassis
- Filler panel
- Software with *PXI Platform Services 17.3* or newer
- Chassis number labels
- Documentation

You also need an AC power cable, sold separately. Refer to the following table for more information about AC power cables.

Table 5. AC Power Cables

Power Cable	**Reference Standards**
Standard 120 V (USA)	ANSI C73.11/NEMA 5-15-P
Switzerland 220 V	SEV 6534-2
Australia 240 V	AS C112
Universal Euro 230 V	CEE (7), II, IV, VII
United Kingdom 230 V	BS 1363
Japan 100 V	JIS 8303

If you miss any of the items or have the incorrect AC power cable, contact NI.

PXIe-1090 Safety Guidelines

Caution Before undertaking any troubleshooting, maintenance, or exploratory procedure, carefully read the following caution notices.

Caution Protection may be impaired if equipment is not used in the manner specified.

This equipment contains voltage hazardous to human life and safety, and is capable of inflicting personal injury.

- **Protective Earth**—The facility installation must provide a means for connection to protective earth.
- **Chassis Grounding**—The chassis requires a connection from the premise wire safety ground to the chassis ground. The earth safety ground must be connected during use of this equipment to minimize shock hazards. Refer to the *Connecting the Safety Ground* section for instructions on connecting safety ground.
- **Live Circuits**—Operating personnel and service personnel must not remove protective covers when operating or servicing the chassis. Adjustments and service to internal components must be undertaken by qualified service technicians. During service of this product, the mains connector to the premise wiring must be disconnected. Dangerous voltages may be present under certain conditions; use extreme caution.
- **Explosive Atmosphere**—Do *not* operate the chassis in conditions where flammable gases are present. Under such conditions, this equipment is unsafe and may ignite the gases or gas fumes.
- **Part Replacement**—Only service this equipment with parts that are exact replacements, both electrically and mechanically. Contact NI for replacement part information. Installation of parts with those that are not direct replacements may cause harm to personnel operating the chassis. Furthermore, damage or fire may occur if replacement parts are unsuitable.
- **Modification**—Do not modify any part of the chassis from its original condition. Unsuitable modifications may result in safety hazards.

Related information:

- Product Certifications

Setting up the PXIe-1090

Prepare and operate the PXIe-1090 chassis.

Unpacking the Kit

Take precautions to prevent electrostatic discharge when unpacking and inspecting your hardware.

> **Notice** To prevent electrostatic discharge (ESD) from damaging the device, ground yourself using a grounding strap or by holding a grounded object, such as your computer chassis.

1. Touch the antistatic package to a metal part of the computer chassis.
2. Remove the device from the package and inspect the device for loose components or any other sign of damage.

   > **Notice** Never touch the exposed pins of connectors.

   > **Note** Do not install a device if it appears damaged in any way.

3. Unpack any other items and documentation from the kit.

> **Note** Store the device in the antistatic package when the device is not in use.

Connecting the Safety Ground

Ensure chassis grounding with an earth safety ground using the IEC 60320 C14 inlet or the rear-panel grounding screw.

> **Caution** The PXIe-1090 chassis is designed with a three-position IEC 60320 C14 inlet for the U.S. that connects the ground line to the chassis ground. For

proper grounding, you must use a suitable cordset to connect this inlet to an appropriate earth safety ground.

If your power outlet does not have an appropriate ground connection, you must connect the premise safety ground to the chassis grounding screw located on the rear panel. To connect the safety ground, complete the following steps:

1. Connect a 16 AWG (1.3 mm) wire to the chassis grounding screw (M4 SEMS) using a grounding lug. The wire must have green insulation with a yellow stripe or must be noninsulated (bare).
2. Attach the opposite end of the wire to permanent earth ground using toothed washers or a toothed lug.

Connecting to a Power Source

Connect the chassis to an AC power source and verify power-on status using the Power Inhibit switch.

Caution Do not install modules prior to performing the following power-on test. To completely remove power, you must disconnect the AC power cable.

1. Attach the input power through the rear AC inlet using the appropriate AC power cable supplied.
2. Press down the Power Inhibit switch and hold it down for one second.

   The Power Inhibit switch allows you to power on the chassis or place it in Standby mode.

   Perform this test with an empty chassis in Default mode.

   All fans become operational, the System LED is green, and the MXI LED is solid amber (without a host PC).

3. Press and hold the Power Inhibit switch again for one second to return the chassis to standby.

Cabling

Provides NI MXI-Express Thunderbolt cable options with lengths and part numbers, plus connection guidance for the host PC and device.

The following table shows the various MXI-Express Thunderbolt cables available from NI.

Table 6. NI MXI-Express Thunderbolt Cables

Description	Cable Length (Meters)	Part Number
MXI-Express Thunderbolt active cable	2 m	785607-02
MXI-Express Thunderbolt passive cable	2 m	785608-02
MXI-Express Thunderbolt passive cable	0.8 m	787580-0R8

Connect the MXI-Express Thunderbolt cable to the host PC Thunderbolt port and the PXIe-1090. The cables have no polarity, so you can connect either end to either Thunderbolt port. The cable plugs are reversible, and there is no defined upstream or downstream port on the PXIe-1090.

Note Although Thunderbolt is a hotpluggable technology, avoid removing the cable after the system is powered on. Doing so can hang or cause errors in applications communicating with devices behind MXI-Express Thunderbolt. If a cable becomes unplugged, plug it back into the system.

Related reference:

- Part Numbers for Recommended Cables and Accessories

Installing Peripheral Modules

Install a peripheral module in a PXIe-1090 chassis.

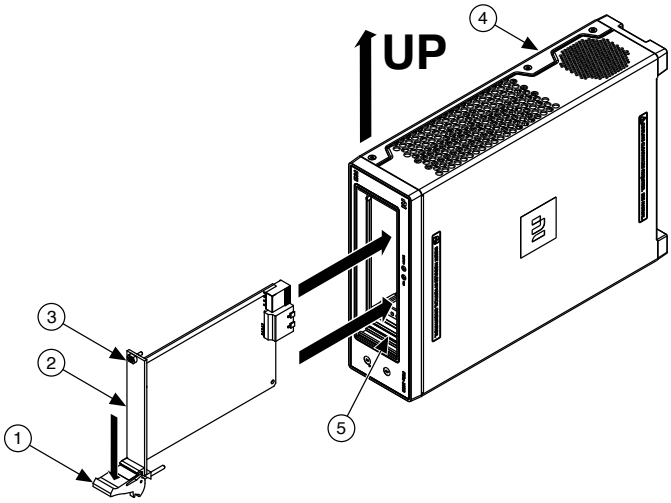
Refer to your peripheral module user manual for specific instructions and warnings.

Notice

- To avoid possible damage to a peripheral module when you install it in the PXIe-1090 chassis, the chassis must be in a vertical orientation, as shown in Figure 7. Installing PXI, PXI Express, or CompactPCI Peripheral Modules. Do not install a peripheral module with the chassis in a horizontal orientation.
- The PXIe-1090 chassis also must be in a vertical orientation when you remove a peripheral module from the chassis. Do not remove a peripheral module with the chassis in a horizontal orientation.

1. Connect the AC power source to the PXI Express chassis before installing the module.
   The AC power cord grounds the chassis and protects it from electrical damage while you install the module.
2. Ensure that the chassis is powered off.
3. Install a module into a chassis slot.
   a. Place the module card PCB into the front of the card guides (top and bottom), as shown in Figure 7. Installing PXI, PXI Express, or CompactPCI Peripheral Modules.
   b. Slide the module to the rear of the chassis. Ensure that the injector/ejector handle is pushed down, as shown in Figure 7. Installing PXI, PXI Express, or CompactPCI Peripheral Modules.
4. When you begin to feel resistance, push up on the injector/ejector handle to fully seat the module into the chassis frame.
5. Secure the module front panel to the chassis using the module front-panel mounting screws.

Figure 7. Installing PXI, PXI Express, or CompactPCI Peripheral Modules



1. Injector/Ejector Handle
2. PXI Express Peripheral Module
3. Peripheral Module Front Panel Mounting Screws (2x)
4. PXIe-1090 Chassis (in a Vertical Orientation)
5. Injector/Ejector Rail

Verifying the Installation Using Measurement & Automation Explorer (MAX)

Before using the PXIe-1090, verify that it is installed correctly through MAX.

1. Verifying the Installation in MAX
   To configure your NI hardware, use Measurement & Automation Explorer (MAX).

Verifying the Installation in MAX

To configure your NI hardware, use Measurement & Automation Explorer (MAX).

MAX informs other programs about the NI hardware products in the system and their hardware configuration. MAX is automatically installed with the driver.

Note MAX is not available on Linux.

1. Launch MAX.

2. In the configuration tree, expand **Devices and Interfaces** to see the list of installed NI hardware.
   Installed modules appear under the name of their associated chassis.
3. Expand your **Chassis** tree item.
   MAX lists all modules installed in the chassis. Your default names might vary.

> **Note** If you do not see your module in the list, press <F5> to refresh the list of installed modules. If the module is still not listed, power off the system, ensure that the module is correctly installed, and restart.

4. Record the name MAX assigns to the hardware. Use this identifier when programming the PXIe-1090.
5. Self-test the hardware by selecting the item in the configuration tree and clicking **Self-Test** in the MAX toolbar.
   The MAX self-test performs a basic verification of hardware resources.

What Should I Do If the PXIe-1090 Does Not Appear in MAX?

Check if you must refresh the connection between the hardware and the software in MAX.

1. In the MAX configuration tree, expand **Devices and Interfaces**.
2. To see the list of installed hardware, expand the **Chassis** tree and press **<F5>** to refresh the list.
3. If the PXIe-1090 is still not listed, complete the following steps.
   a. Power off the system.
   b. Ensure that all hardware is correctly installed.
   c. Restart the system.
4. Right-click the **Start** button and select **Device Manager**.
5. Depending on your controller type, verify the Device Manager settings.

Controller type	Description
PXI controller	a. Verify that a **National Instruments** entry appears in the system device list. b. If error conditions appear in the list, right-click the module you are using in the **Device Manager** and select **Update Driver**.

Controller type	Description
MXI controller	a. Right-click **PCI-to-PCI Bridge** and select **Properties**. b. Verify that you enabled the bridge. c. Verify that no error conditions appear.

If error conditions persist, reinstall the driver.

6. Restart your computer.

Mounting the PXIe-1090

The PXIe-1090 chassis is designed to operate on a bench or in an instrument rack.

Refer to the following sections for more information about mounting the PXIe-1090:

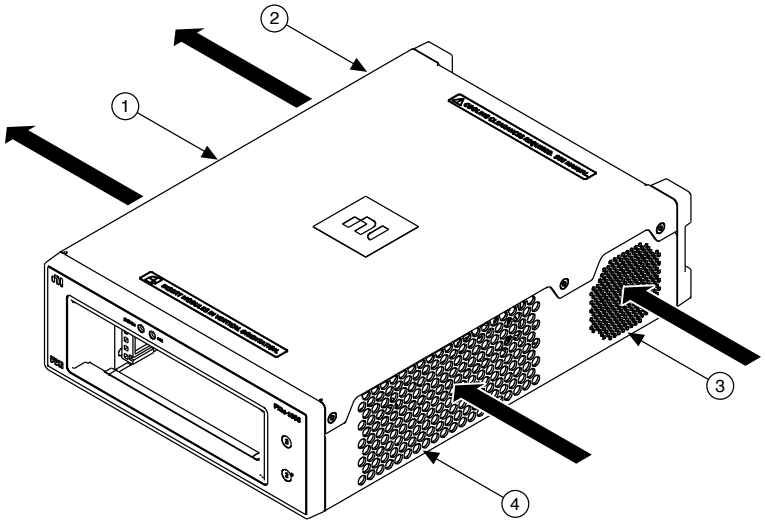
PXIe-1090 Mounting Requirements

Cooling clearance and ambient intake temperature requirements support proper chassis ventilation and prevent thermal-related issues in rack setups or benchtop setups.

Cooling Clearance

Figure 8. PXIe-1090 Cooling Air Flow shows the module and power supply intake and exhaust vents.

Figure 8. PXIe-1090 Cooling Air Flow



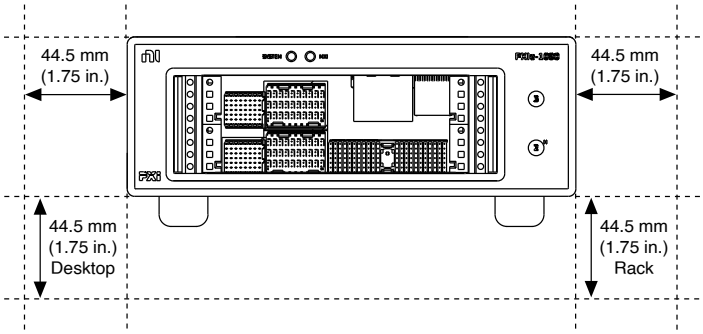
1. Module exhaust
2. Power supply exhaust
3. Power supply intake
4. Module intake

To ensure proper cooling, maintain adequate clearance between the chassis and the

surrounding equipment, heat-generating devices, and airflow blockages.

- For rack-mount applications, provide adequate forced-air ventilation
- For benchtop applications, provide additional cooling clearances for optimal airflow and reduced hot air recirculation to the air inlet fans

Figure 9. PXIe-1090 Cooling Clearances



Notice Failure to provide these clearances might result in thermal-related issues with the chassis or modules.

To aid in thermal health monitoring for either rack or benchtop use, you can monitor the chassis intake temperatures in Measurement & Automation Explorer (MAX). Ensure that the temperatures do not exceed the ratings in the *Operating Environment* section of the *PXIe-1090 Specifications*.

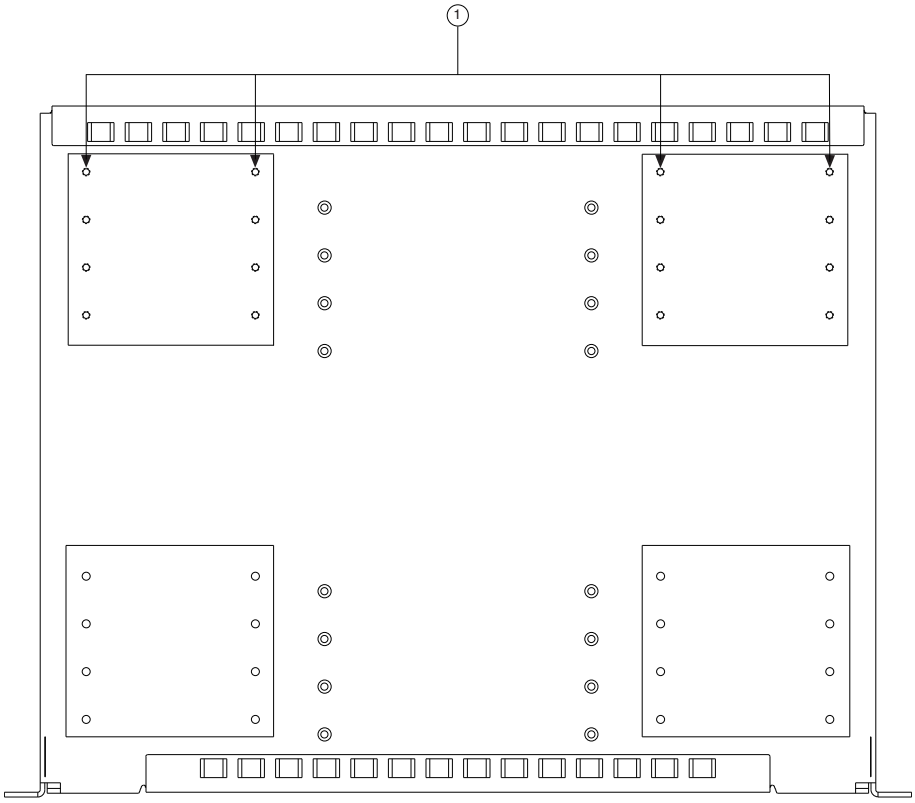
Many PXI modules provide temperature values you can monitor to ensure the chassis does not exceed critical temperatures. The following options improve the thermal performance of the chassis:

- Increase chassis clearances and ventilation
- Reduce external ambient temperatures
- Remove nearby heat sources

Airflow Considerations for Rack Installation

Consider the location of the PXIe-1090 inlets and exhausts inside the assembled system when determining where to install the rack mount kit. The rack mount shelf includes baffle holes for airflow baffles if needed due to system constraints, as shown in Figure 10. Baffle Hole Locations on the PXIe-1090 Rack Mount Shelf.

Figure 10. Baffle Hole Locations on the PXIe-1090 Rack Mount Shelf



1. Baffle holes

Ambient Temperature

The chassis fan control system uses ambient intake air temperatures to control fan speeds in Auto mode. These temperatures might be higher than the ambient room temperature depending on surrounding equipment or airflow blockages. Ensure ambient intake temperatures do not exceed the ratings in the *Operating Environment* section of the *PXIe-1090 Specifications*. You can monitor the chassis ambient intake temperatures in MAX.

Related reference:

- Fan Mode

Related information:

- PXIe-1090 Specifications

Mounting the PXIe-1090 in a Rack

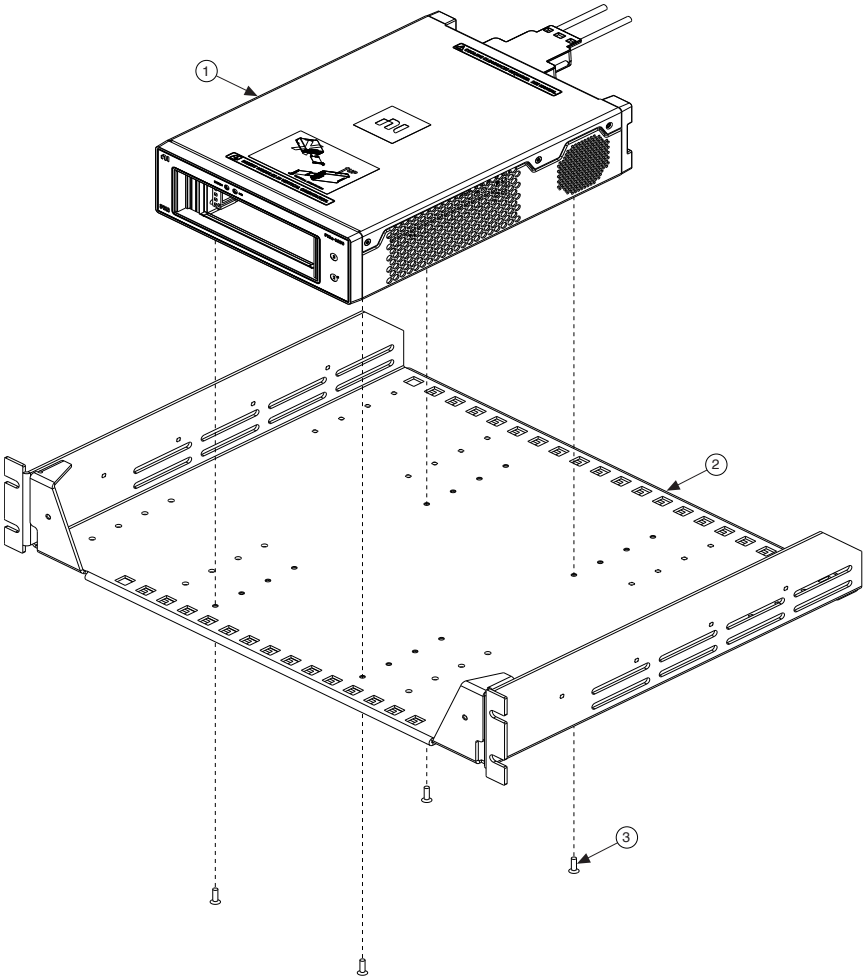
You can mount the PXIe-1090 in a rack with the PXIe-1090 Rack Mount Kit.

Collect the following items:

- PXIe-1090
- PXIe-1090 Rack Mount Kit (part number: 788347-01)
  - Rack mount shelf
  - #6-32 x 0.500 in flathead screws (x4)
  - M4 x 6 mm flathead screws
- Screwdriver

1. Remove the bottom feet from the chassis with a #2 Phillips screwdriver.
   Retain the feet and screws for future use if needed. The reinstallation torque is 0.76 N· m (6.7 lb · in).
2. Install the PXIe-1090 chassis on the shelf using four #6-32 x 0.500 in flathead screws as shown in Figure 11. Installing the PXIe-1090 Chassis on the Shelf. Tighten the screws to 0.76 N · m (6.7 lb · in) of torque.
   You can choose between four sets of chassis mounting holes, depending on the desired chassis recess. The front mounting holes place the chassis flush with the front panel. Each hole adds a 25.4 mm (1 in) chassis recess.

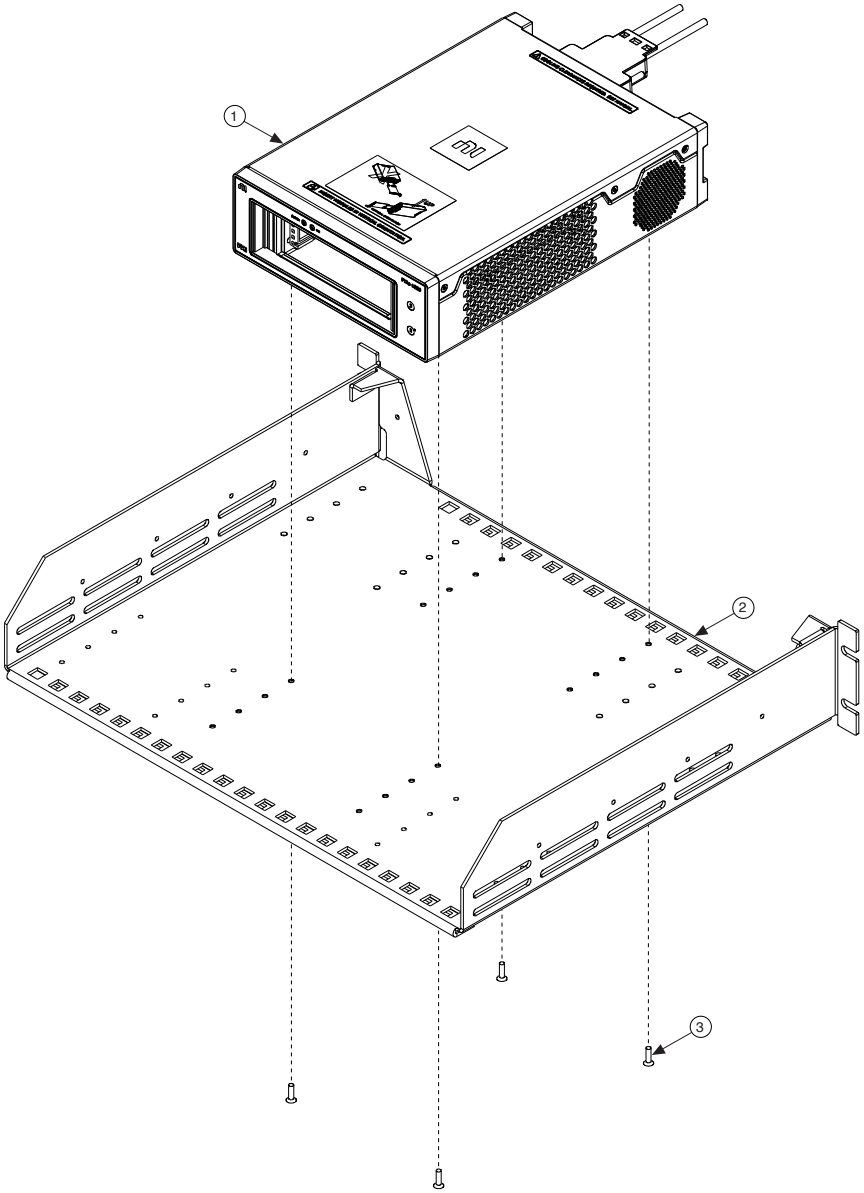
Figure 11. Installing the PXIe-1090 Chassis on the Shelf



1. PXIe-1090 Chassis
2. Rack mount shelf
3. #6-32 x 0.500 in flathead screws (x4)

You can rotate the PXIe-1090 180° and recess it based on airflow needs, as shown in Figure 12. PXIe-1090 Chassis Rotated on the Rack Mount Shelf.

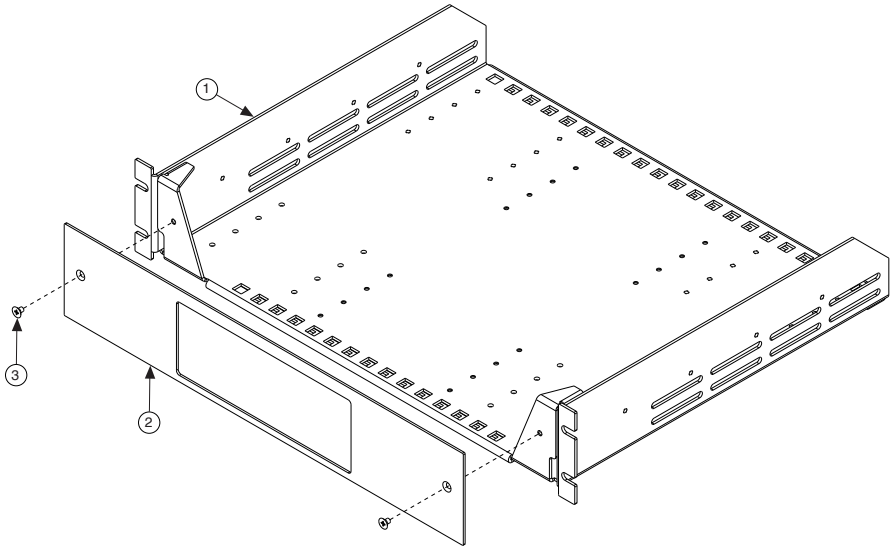
Figure 12. PXIe-1090 Chassis Rotated on the Rack Mount Shelf



1. PXIe-1090 Chassis
2. Rack mount shelf
3. #6-32 x 0.500 in flathead screws (x4)

3. **Optional:** Install the front panel on the shelf using two M4 x 6 mm flathead screws as shown in Figure 13. Installing the Front Panel on the Shelf. Tighten the screws to 1.3 N · m (11.5 lb · in) of torque.

Figure 13. Installing the Front Panel on the Shelf



1. Rack mount shelf
2. Front panel
3. M4 x 6 mm flathead screws (x2)

4. Install the shelf in the rack. Use rack screws and torque values that match the rack manufacturer recommendations.

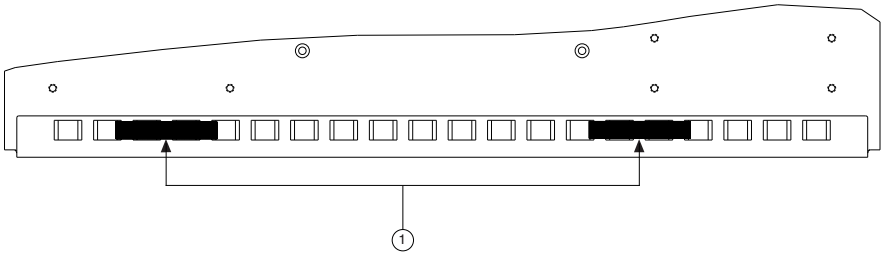
Cable Strain Relief and Accessory Mounting

The rack mount shelf supports cable strain relief using zip ties and offers side slots and M4 tapped holes for secure accessory mounting without occupying additional rack space.

Cable Strain Relief

The rack mount shelf includes slots at the front and rear for cable strain relief. You can use zip ties or other tie-down materials to secure the cables. You can use zip ties, as shown in Figure 14. PXIe-1090 Rack Mount Shelf with Zip Tie Locations, without encroaching on the U below the shelf. The maximum width of the zip tie is 9 mm (0.35 in.).

Figure 14. PXIe-1090 Rack Mount Shelf with Zip Tie Locations

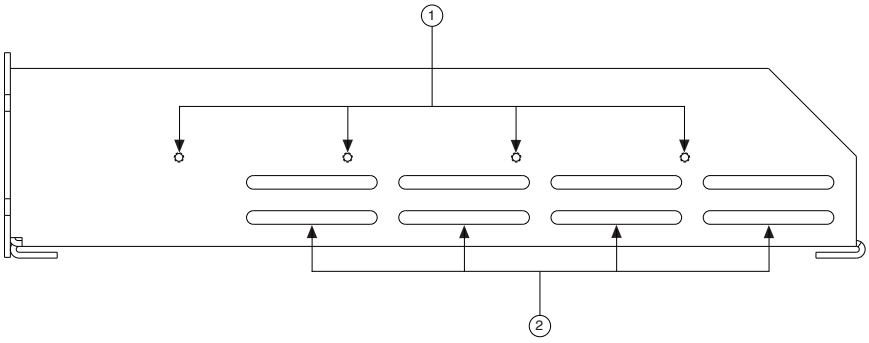


1. Zip ties

Additional Slots for Accessories

The rack mount shelf includes eight slots and four M4 x 7 tapped holes on each side for additional accessories, as shown in Figure 15. Side Holes and Slots on the PXIe-1090 Rack Mount Shelf .

Figure 15. Side Holes and Slots on the PXIe-1090 Rack Mount Shelf



1. M4 x 7 tapped holes for accessories
2. Slots for accessories

Powering On/Off the MXI-Express Thunderbolt System

This chassis includes a feature to follow host power based on the Thunderbolt connection. The following table defines how to power on or off the chassis based on the connection to the host.

Table 7. Chassis Inhibit Mode: Default

PXIe-1090 Power	Thunderbolt Connection to Host	Actions Required
To power the PXIe-1090 on	Not present	Press the power button.
	Present	Power on the host.
To power the PXIe-1090 off	Not present	Press the power button.
	Present	Power off the host. Press the power button > 4 s to initiate a forced shutdown.

Note Causing a forced shutdown of the chassis may result in crashes or hangs if a DMA transaction is active between the module installed in the PXIe-1090 and the host PC.

Note NI does not support hot-plugging/unplugging the Thunderbolt connection.

Table 8. Chassis Inhibit Mode: Manual

PXIe-1090 Power	Actions Required
To power the PXIe-1090 on	AC on
To power the PXIe-1090 off	AC off

Observe the PXIe-1090 LED status where applicable. A properly connected and powered up system should report a valid link and power status once the host PC is powered on. Refer to *LED Indicators* for more information.

Note Refer to *Inhibit Mode* for more Information about the Default and Manual chassis inhibit modes.

Related reference:

- Inhibit Mode
- PXIe-1090 LED Indicators
- MXI LED
- System LED

DIP Switches

Use the DIP switches to control the PXIe-1090 chassis.

Figure 16. PXIe-1090 Dip Switches Location

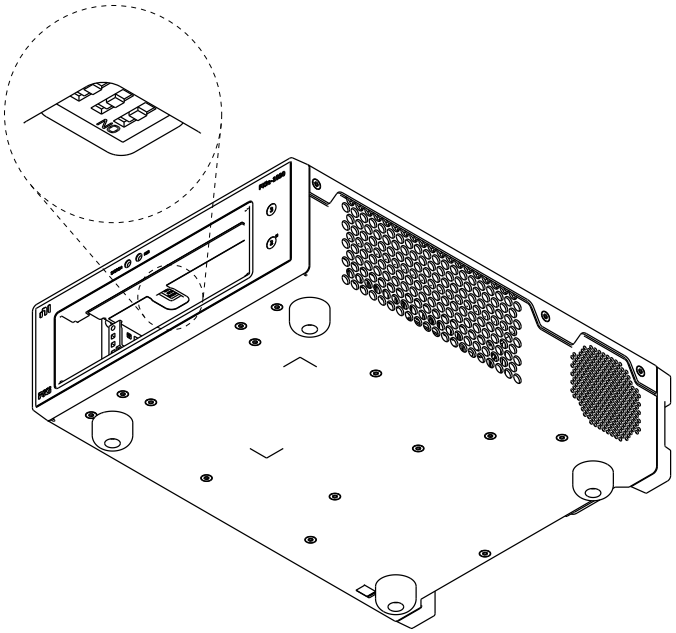


Figure 17. PXIe-1090 DIP Switches

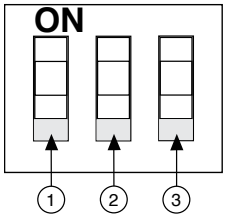


Table 9. DIP Switch States

Location	Switch	State	Description
1	Fan	Off (Down)	Set chassis fan mode to Auto. Refer to the *Fan Mode* section for information.
		On (Up)	Set chassis fan mode to High.
2	Inhibit	Off (Down)	Set chassis inhibit mode to Default. Refer to the *Inhibit Mode* section for information.
		On (Up)	Set chassis inhibit mode to

Location	Switch	State	Description
			Manual.
3	Host Power Up	Off (Down)	Set host power up mode to Default. Refer to the *Default Host Power Up Mode* section for information.
		On (Up)	Set host power up mode to Manual.

Related reference:

- Fan Mode
- Inhibit Mode
- Host Power Up Mode

Fan Mode

Fan mode settings control chassis fan speed based on intake air temperature or a fixed high speed. Use Auto mode for improved acoustic performance or High mode for maximum cooling.

The PXIe-1090 chassis operates in the following fan modes:

- **Auto**—

  In Auto mode, the chassis intake air temperature determines the chassis fans speed.

  Select Auto mode for improved acoustic performance.

- **High**—

  In High mode, the chassis fans speed is fixed at high speed regardless of the chassis intake air temperature.

  Select High mode for maximum cooling performance.

Related concepts:

- PXIe-1090 Mounting Requirements

Cooling Profiles

Cooling profiles define chassis fan modes for 38 W and 58 W power dissipation to support NI modules.

Both fan modes are available within the 38 W and 58 W cooling profiles.

- 38 W cooling profile supports NI modules up to 38 W max power dissipation.
- 58 W cooling profile supports NI modules up to 58 W max power dissipation.

Note For more information about chassis ambient temperature range and cooling capacity, refer to *Operating Environment* requirements in the *PXIe-1090 Specifications*.

Related information:

- PXIe-1090 Specifications

Fan Mode Selection

Chassis fan mode configuration options are available using Measurement and Automation Explorer (MAX) or a DIP switch.

Configure the chassies fan mode in the following ways:

- Select the PXIe-1090 chassis fan mode using MAX. For more information, refer to the *Fan Configuration in MAX* section.
- Select the PXIe-1090 chassis fan mode using a DIP switch. For more information. refer to the *DIP Switches* section.

Note The DIP switch must be in the Auto position for software configuration in MAX to work. If the DIP switch is in the High position, the chassis fan mode is High regardless of the software setting.

Related tasks:

- Fan Configuration in MAX

Related reference:

- DIP Switches

Inhibit Mode

Inhibit modes control chassis power behavior when a host is connected through the Thunderbolt port or when AC power changes.

The PXIe-1090 chassis supports operation in the following inhibit modes:

- **Default**—

  In Default mode, when no host is connected to the chassis Thunderbolt port, press the Power Inhibit button to power on the chassis.

  Use Default mode for normal power inhibit button functionality.

  When the host is connected to the chassis via a Thunderbolt cable, the chassis follows the host power states.

- **Manual**—In Manual mode, the chassis powers up when you apply AC power. The chassis shuts down when you remove AC power.

Related reference:

- Powering On/Off the MXI-Express Thunderbolt System

Inhibit Mode Selection

You can select the PXIe-1083 chassis Inhibit Mode using a DIP switch on the daughterboard. Refer to the *DIP Switches* section for the DIP switch location and more information about DIP switch settings.

Related reference:

- DIP Switches

Host Power Up Mode

Defines the Default and Manual host power up modes for the chassis, including Thunderbolt cable and Power Inhibit switch behavior.

The PXIe-1090 supports the following host power up modes:

- **Default**—The chassis turns on when the Thunderbolt cable is plugged into a PC or the Power Inhibit switch is pressed. You can turn off the chassis by unplugging the cable or pressing the Power Inhibit switch for 4 seconds.
- **Manual**—The chassis turns on and off only when the Power Inhibit switch is presses.

PXI Express System Configuration with MAX

Configure a PXI Express system in Measurement and Automation Explorer (MAX) using PXI Platform Services to generate `pxiesys.ini` and `pxisys.ini` system files. View chassis asset data, sensor readings, slot details, cooling settings, self-test results, and firmware updates.

The PXI Platform Services software included with your chassis automatically identifies your PXI Express system components to generate a `pxiesys.ini` file. You can configure your entire PXI system and identify PXI-1 chassis through Measurement & Automation Explorer (MAX), included with your system controller. PXI Platform Services creates the `pxiesys.ini` and the `pxisys.ini` files, which define your PXI system parameters.

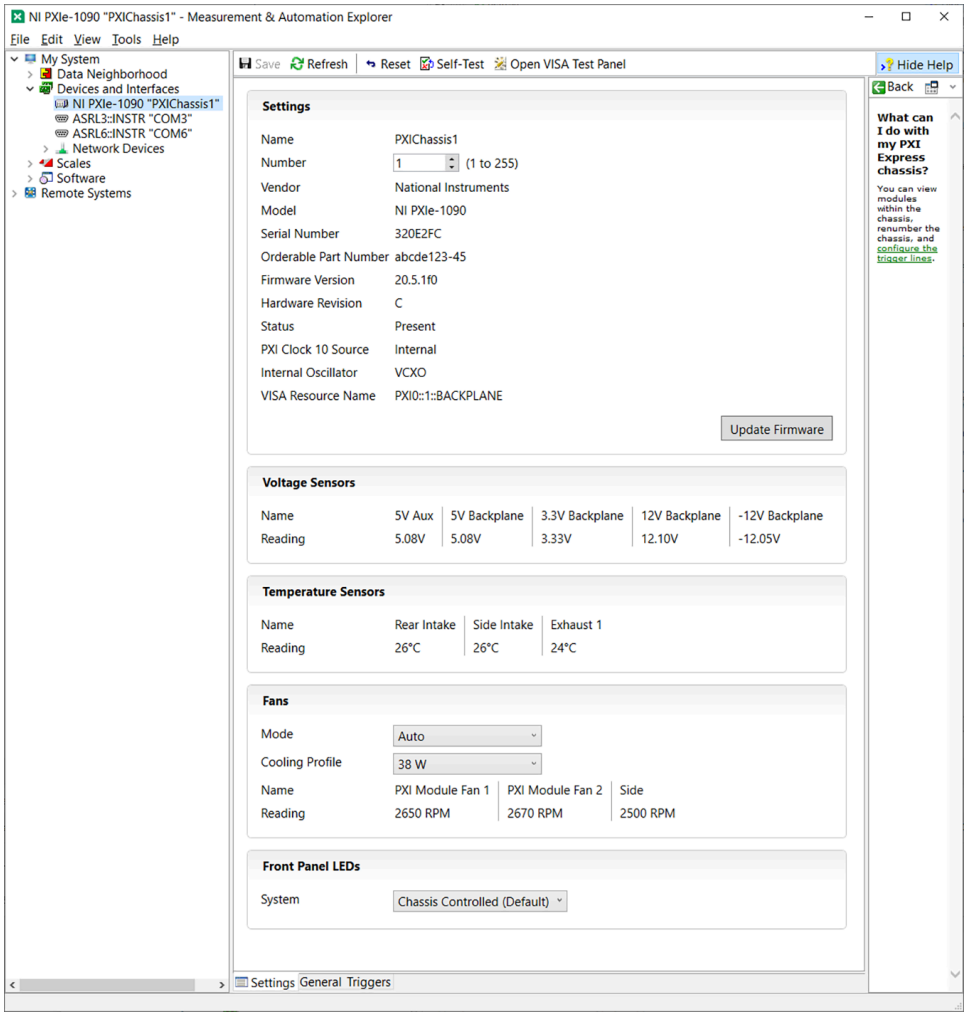


Note The configuration steps for single or multiple-chassis systems are the same.

MAX provides the following chassis information:

- Asset information, such as serial number or part number
- Chassis number
- Voltages, temperatures, and fan speed
- Fan and cooling settings
- Slot details
- Chassis self-test
- Firmware update

Figure 18. Chassis Settings in MAX



Note Information available through MAX might vary based on your chassis variant or the version of your firmware and PXI Platform Sevices software.

Trigger Configuration in MAX

Configure trigger routing and reservation for the PXI trigger bus in MAX to prevent double-driving trigger lines. Use static reservation only when dynamic reservation through NI DAQmx is unavailable.

PXI Platform Services provides an interface for routing and reserving triggers. This allows dynamic routing through drivers such as DAQmx, which helps prevent double-driving and potential damage to trigger lines.

The PXIe-1090 includes a trigger bus with eight lines, numbered 0 through 7. You can reserve and route these lines either statically or dynamically.

- Static reservation pre-allocates a trigger line so a user program cannot configure it.
- Dynamic reservation, routing, and deallocation occur on the fly within a user program by using NI APIs such as NI DAQmx.

NI recommends using dynamic reservation and routing whenever possible. If you must use static reservation, you can configure it in MAX on the **Triggers** tab.

Fan Configuration in MAX

You can configure fan behavior using software settings in MAX.

The PXIe-1090 supports both Auto and High fan modes for both the 38 W and 58 W cooling profiles. Refer to the *Fan Mode* section for more information about these modes.

You can also select a Manual fan mode. In this mode, you can manually set the fan speeds to achieve the desired performance.

Note You must not set the fan speeds or power settings lower than the minimum level required to maintain cooling levels.

Complete the following steps to change the fan settings in MAX .

1. In the **Configuration** tree, click on the PXI chassis you want to configure.
2. In the right-hand pane, click on the **Settings** tab.
3. In the **Fans** group, select the desired **Mode and Cooling Profile** using the drop-down menus.
4. Click **Save**.
   The fan speed changes.

Using System Configuration and Initialization Files

The capability documentation for the PXIe-1090 chassis is provided in the `chassis.ini` file on the software media included with the chassis. This information is combined with information about the system controller to create a single system initialization file called `pxisys.ini` (PXI System Initialization). NI system controllers provide the `pxisys.ini` file for the PXIe-1090 chassis, so you typically do not need to use the `chassis.ini` file. For more information about `pxisys.ini` and `chassis.ini` files, refer to the documentation provided with the system controller or visit *ni.com/support*.

Device drivers and other utility software read the `pxisys.ini` file to obtain system information. In most cases, device drivers do not need to read the `chassis.ini` file directly. For detailed information about initialization files, refer to the PXI Express specification at *www.pxisa.org*.

Related information:

- Support
- PXI Systems Alliance (PXISA)

Cleaning and Maintaining the PXIe-1090

This section describes basic maintenance procedures you can perform on the PXIe-1090 chassis.

Caution Disconnect the power cable prior to servicing your PXIe-1090 chassis.

Note Many components within the chassis are susceptible to static discharge damage. Service the chassis only in a static-free environment. Observe standard handling precautions for static-sensitive devices while servicing the chassis. Always wear a grounded wrist strap or equivalent while servicing the chassis.

Maintaining Forced-Air Cooling

Inadequate air circulation can cause the temperature within a PXI chassis to rise above the maximum recommended operating temperature for your PXI/PXI Express module. Overheating can cause a thermal shutdown or damage to the PXI/PXI Express module.

Ensure the ambient temperature of your PXI system is within the specifications for all of the system components. Ensure the ambient temperature provides adequate cooling clearances for your chassis to achieve the required airflow through the chassis.

Note The ambient temperature of a PXI system is defined as the temperature at the chassis fan inlet (air intake).

Follow these guidelines to maintain optimal forced-air cooling for PXI and PXI Express modules in the chassis:

- NI highly recommends installing slot blockers in unused slots to maximize airflow in the slots populated with instrumentation.
- Install filler panels over slot blockers and unused slots.
  Missing filler panels disrupt the necessary air circulation in the chassis.

- Install your chassis so cooling clearances meet the specifications stated in the specifications.
  Allow space around the chassis fan intake and exhaust vents; if you remove the chassis feet, allow for adequate clearance below the chassis. Blocked fan vents impede the airflow needed for cooling.
- For rackmount PXI deployments, follow these guidelines:
  - Place high-power units within the rack above the PXI system where possible.
  - Use racks with open sides and/or rear panels.
  - Use fan trays within the rack, and at the top and bottom of the rack, to increase overall airflow and reduce ambient temperatures within the rack.
  - Use other methods that reduce ambient temperature within the rack.
- If your chassis includes fan filters, clean them at least every six months.
  Depending on the amount of chassis use and the ambient dust levels, filters may require more frequent cleaning. If regular maintenance of dirty or clogged filters is not possible, you can remove foam filters to maintain adequate cooling.
- Set all chassis fans to high unless directed otherwise by the PXI or PXI Express module documentation; do not disable the fan(s).
- Ensure the ambient temperature does not exceed the rated ambient temperature specification.
  Refer to the chassis temperature LED, if available, or use a temperature probe to verify temperature.

Related concepts:

- Cleaning the PXIe-1090
- PXIe-1090 Mounting Requirements

Related tasks:

- Installing PXI Slot Blockers
- Installing PXI Filler Panels

Related reference:

- PXIe-1090 LED Indicators
- MXI LED
- System LED
- Interior Cleaning

- Exterior Cleaning
- Fan Mode

Installing PXI Slot Blockers

PXI slot blockers improve system cooling in PXI chassis by rerouting airflow from empty slots to slots containing PXI modules.

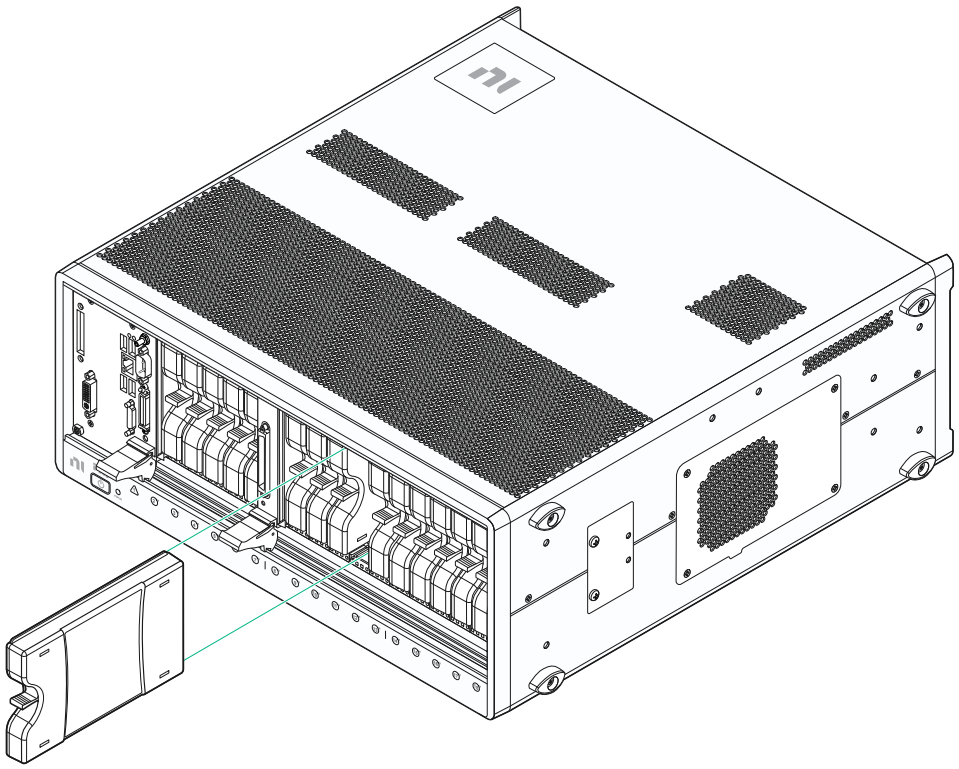
NI recommends using PXI slot blockers with standard or EMC filler panels to improve cooling performance for all PXI chassis.

Notice NI highly recommends installing PXI slot blockers if your PXI chassis features rear fans.

You can order PXI slot blockers (NI part number 199198-01) on `ni.com`.

To install PXI slot blockers in your PXI chassis, complete the following steps.

1. Install a PXI slot blocker in each empty slot of your PXI chassis.
   Figure 19. Slot Blocker Installation



2. Install PXI filler panels over each slot containing a PXI slot blocker.

Related tasks:

- Installing PXI Filler Panels

Installing PXI Filler Panels

To ensure proper cooling, install standard filler panels or EMC filler panels over each empty slot of a PXI chassis.

Filler panels improve the cooling performance of the system. EMC filler panels contain additional gaskets to control EMC emissions from the chassis. Some PXI/PXI Express modules require EMC filler panels to meet specification conditions.

Note To ensure adequate cooling of modules, you must install filler panels over all chassis slots. To ensure optimal cooling performance, NI recommends using slot blockers with filler panels.

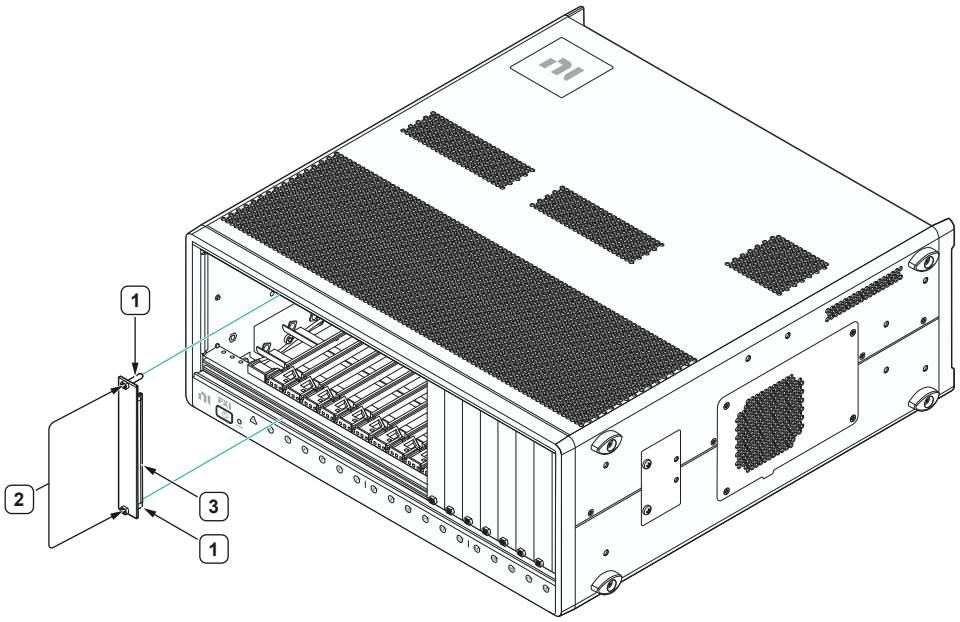
For more information about PXI filler panels, visit `ni.com/r/emcpanels`.

1. Remove the captive screw covers, if present, from the filler panel.
2. Secure the captive mounting screws to the chassis.

   Note Do not overtighten the screws (2.5 in. · lb maximum).

   When installing EMC filler panels, ensure that the EMC gasket is on the right side as shown in the following figure.

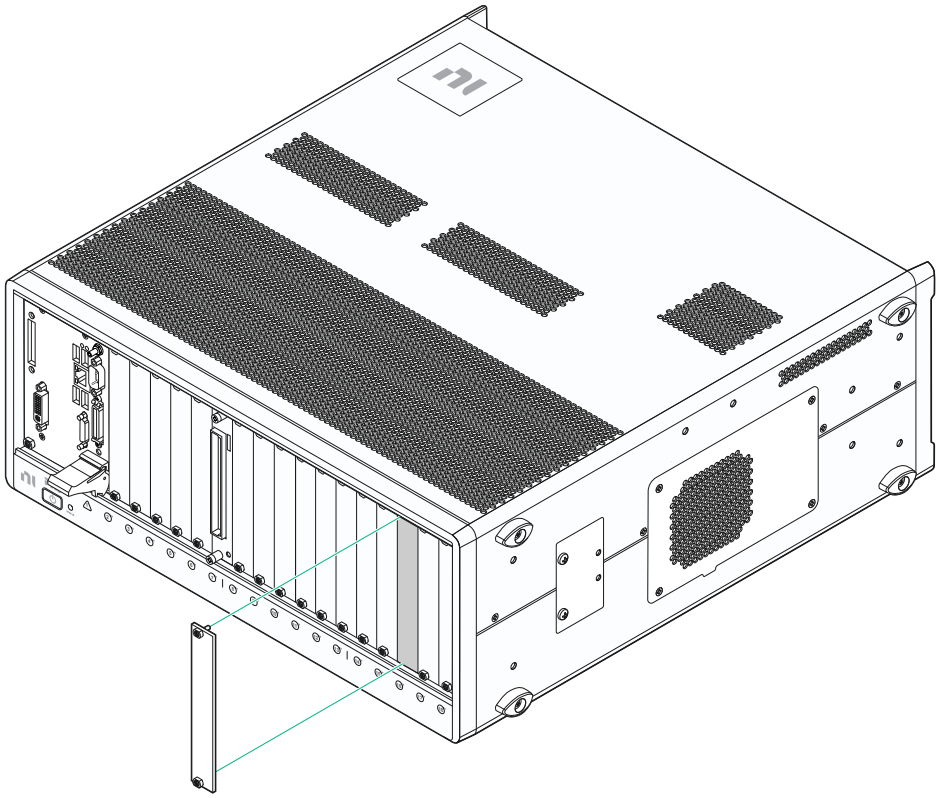
Figure 20. EMC Filler Panel Installation



1. Captive screw covers
2. Captive mounting screws
3. EMC gasket

When installing standard filler panels, install as shown in the following figure.

Figure 21. Standard Filler Panel Installation



Related tasks:

- Installing PXI Slot Blockers

Related information:

- Standard or EMC Filler Panels for My PXI Chassis

Cleaning the PXIe-1090

Cleaning procedures consist of exterior and interior cleaning of the chassis and cleaning the non-removeable mesh fan grates.

Clean dust from the chassis exterior (and interior) as needed, based on the operating environment. Periodic cleaning increases reliability.

Refer to your module user documentation for information about cleaning individual CompactPCI or PXI Express modules.

Caution Always disconnect the power cable prior to servicing the chassis.

Interior Cleaning

Use a dry, low-velocity stream of air to clean the interior of the chassis. Use a soft-bristle brush for cleaning around components.

Exterior Cleaning

Clean the exterior surfaces of the chassis with a dry, lint-free cloth or a soft-bristle brush. If any dirt remains, wipe with a cloth moistened in a mild soap solution. Remove any soap residue by wiping with a cloth moistened with clear water. Do not use abrasive compounds on any part of the chassis.

Caution Avoid getting moisture inside the chassis during exterior cleaning. Use just enough moisture to dampen the cloth.

Do not wash the front- or rear-panel connectors or switches. Cover these components while cleaning the chassis.

Do not use harsh chemical cleaning agents; they may damage the chassis. Avoid chemicals that contain benzene, toluene, xylene, acetone, or similar solvents.

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