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PXI™

# PXI-1020
# User Manual

NATIONAL INSTRUMENTS™

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## FCC/Canada Radio Frequency Interference Compliance*

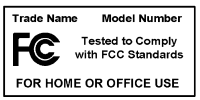
### Determining FCC Class

The Federal Communications Commission (FCC) has rules to protect wireless communications from interference. The FCC places digital electronics into two classes. These classes are known as Class A (for use in industrial-commercial locations only) or Class B (for use in residential or commercial locations). Depending on where it is operated, this 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. By examining the product you purchased, you can determine the FCC Class and therefore which of the two FCC/DOC Warnings apply in the following sections. (Some products may not be labelled at all for FCC, if so the reader should then assume these are Class A devices.)

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

FCC Class B products display either a FCC ID code, starting with the letters **EXN**, or the FCC Class B compliance mark that appears as shown here on the right.




The curious reader can consult the FCC web site `http://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 Mark 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 National Instruments 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 will be required to correct the interference at his 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.

### Class B

#### Federal Communications Commission

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful

interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

### Canadian Department of Communications

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

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

## European Union - Compliance to EEC Directives

Readers in the EU/EEC/EEA must refer to the Manufacturer's Declaration of Conformity (DoC) for information** pertaining to the CE Mark compliance scheme. The Manufacturer includes a DoC for most every hardware product except for those bought for OEMs, if also available from an original manufacturer that also markets in the EU, or where compliance is not required as for electrically benign apparatus or cables.

* Certain exemptions may apply in the USA, see FCC Rules §15.103 **Exempted devices**, and §15.105(c). Also available in sections of CFR 47.

** The CE Mark Declaration of Conformity will contain important supplementary information and instructions for the user or installer.

# For Your Safety



**Caution** Before undertaking any troubleshooting, maintenance, or exploratory procedure, read carefully the following WARNING and CAUTION notices.

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

- **Chassis Grounding**—The PXI-1020 chassis requires a connection from the premise wire safety ground to the PXI-1020 chassis ground. The earth safety ground must be connected during use of this equipment to minimize shock hazards. Refer to the *Connecting Safety Ground* section of Chapter 2, *Installation, Configuration, and Operation*, for instructions on connecting safety ground.
- **Live Circuits**—Operating personnel and service personnel must *not* remove protective covers when operating the PXI-1020. 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**—Service this equipment only with parts that are exact replacements, both electrically and mechanically. Contact National Instruments 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.

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# About This Manual

The *PXI-1020 User Manual* describes the features of the PXI-1020 chassis and contains information about configuration, installing the modules, and operating the PXI-1020.

## Conventions

The following conventions appear in this manual:



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.



This icon denotes a warning, which advises you of precautions to take to avoid being electrically shocked.

*italic* — Italic text denotes variables, emphasis, a cross reference, or an introduction to a key concept. This font 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, and code excerpts.

## Related Documentation

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

- *CompactPCI Specification PICMG 2.0 R2.1*
- *PXI Specification Revision 1.0*
- IEEE 1101.1-1991, *IEEE Standard for Mechanical Core Specifications for Microcomputers Using IEC 603-2 Connectors*
- IEEE 1101.10 and P1101.11, *IEEE Standard for Additional Mechanical Specifications for Microcomputers Using IEEE 1101.1 Equipment Practice*

# 1

# Getting Started

This chapter describes the key features of the PXI-1020 chassis, lists the contents of your kit, and lists optional equipment you can order from National Instruments.

## Unpacking

Carefully inspect the shipping container and the chassis for damage. Check for visible damage to the metal work. Check to make sure all handles, hardware, and switches are undamaged. Inspect the inner chassis for any possible damage, debris, or detached components. If damage appears to have been caused in shipment, file a claim with the carrier. Retain the packing material for possible inspection and/or reshipment.

## What You Need to Get Started

The PXI-1020 kit contains the following items:

- ❑ PXI-1020 chassis
- ❑ Filler panels
- ❑ *PXI-1020 User Manual*
- ❑ Floppy disk with Chassis Initialization file, `chassis.ini`

Other required equipment includes:

- ❑ AC power cord (contact National Instruments to order your power cord)

**Note** AC mains power supply cords used with the PXI-1020 must meet the requirements of ANSI/UL817 for use in the United States, CSA C22.2 21 and 49 for use in Canada, and IEC 227 or 245 for use in the European Union. AC mains power supply cords used with the PXI-1020 in other countries must be approved by the authority having jurisdiction in that country.

# Optional Equipment

Contact National Instruments to order the following options for your PXI-1020 chassis.

## Battery Pack and Cable for DC-Capable PXI-1020

A DC input capable power supply is optionally installed in your PXI-1020 chassis at the factory. The DC-capable supply can be powered with AC input or 10 to 32 VDC input and has 150 W of output.

If you have purchased a PXI-1020 with the DC-capable power supply, you can install an optional 1.7 Ah NiCd battery pack. The chassis can draw power from this battery pack and operate when no AC or DC input are present or if the DC input drops below 10 V. The battery can power the PXI-1020 for up to 12 minutes under full load.

A DC input cable is available for the PXI-1020 with the DC-capable power supply. This cable contains an inline fuse and has unterminated ends allowing the user to install connectors for their specific DC source.

## Rack-Mount Kit

An optional rack-mount kit is available from National Instruments. This kit allows you to install the PXI-1020 chassis into a standard 19 in. (48 cm) wide instrument cabinet.

# Key Features

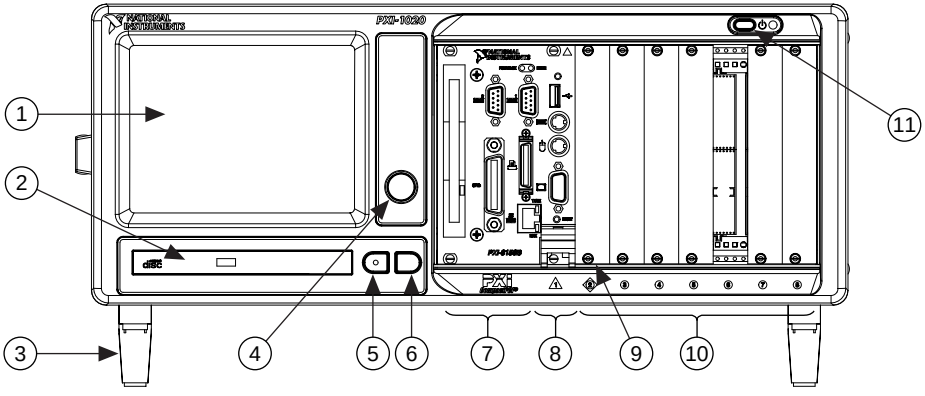
The PXI -1020 is a flexible instrument platform that features an integrated LCD display, pointing device, and CD-ROM drive that are used through built-in interconnections on a PXI controller (PXI-8150B Series or later) as well as eight PXI slots. An external mouse and Super VGA display can also be connected on the controller front panel. Also, any standard keyboard can be used with the PXI-1020 system. The PXI backplane in the PXI-1020 fully implements all timing and triggering extensions defined in the PXI specification for high-performance instrumentation applications.

The key features of the PXI-1020 include:

- PXI and CompactPCI (PICMG 2.0 R 2.1) module compatibility
- Compact, 8-slot chassis for portable applications
- 300 W of usable power; 150 W for DC-capable supply

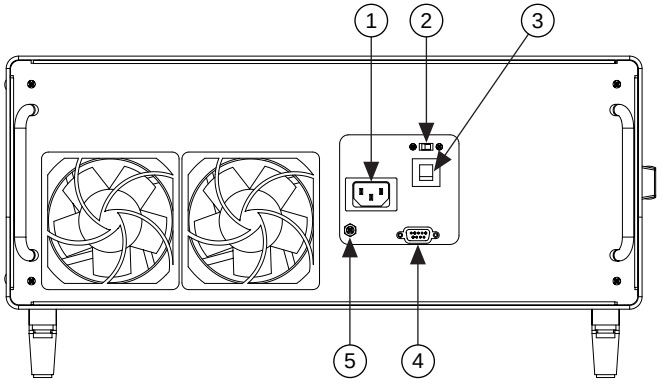
- Universal AC input: auto-voltage and auto-frequency ranging
- Carrying handle
- Tilt feet
- Rear handles double as a cable wrap
- Built-in CD ROM drive
- 6.4 in. 640 × 480 VGA LCD color display
- Pointing device and mouse buttons
- Temperature sensing module controls fan speed to maintain proper cooling

Figures 1-1, 1-2, and 1-3 show some of the key features and components of the PXI-1020 chassis. Figure 1-1 shows the front view of the PXI-1020. Figure 1-2 shows the rear view of the AC-only chassis, and Figure 1-3 shows the rear view of the DC-capable chassis.



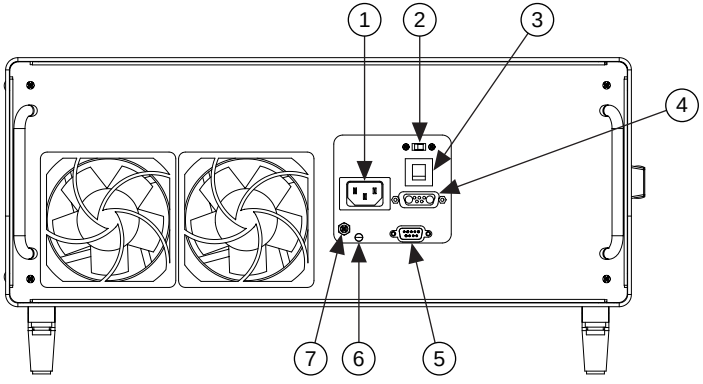

| | | | | | |
|---|---|---|---|---|---|
| 1 | Video Display | 4 | Pointing Device | 8 | System Controller Slot |
| 2 | CD-ROM | 5 | Left Mouse Button | 9 | Star Trigger/Peripheral Slot |
| 3 | Removable Feet (Front Feet Swivel) | 6 | Right Mouse Button | 10 | Peripheral Slots |
| | | 7 | Controller Expansion Slots | 11 | Power Switch |

**Figure 1-1.** Front View of the PXI-1020 Chassis




| | | | | | |
|---|---|---|---|---|---|
| 1 | Universal AC Input | 3 | Circuit Breaker | 5 | Chassis Ground Screw |
| 2 | Fan Speed Selector | 4 | Remote Inhibit and Power Status Connector | | |

**Figure 1-2.** Rear View of the AC-Only PXI-1020 Chassis




| | | | | | |
|---|---|---|---|---|---|
| 1 | Universal AC Input | 4 | DC Input Connector | 6 | Power Supply Status LED |
| 2 | Fan Speed Selector | 5 | Remote Inhibit and Power Status Connector | 7 | Chassis Ground Screw |
| 3 | Circuit Breaker | | | | |

**Figure 1-3.** Rear View of the DC-Capable PXI-1020 Chassis

# PXI-1020 Backplane Overview

## Interoperability with CompactPCI

The PXI-1020 backplane is interoperable with PXI-compatible products and standard CompactPCI products. This is an important feature, as many PXI-compatible systems may not require components that do not implement PXI-specific features. For example, you may want to use a standard CompactPCI network interface card in a PXI chassis.

The signals on the P1 connector of the backplane meet the requirements of the CompactPCI specification for both the peripheral and system modules.

The PXI-specific signals are located on P2 and are found only on the signals that are reserved or not used in the CompactPCI 64-bit specification. Therefore, all modules that meet the requirements of the CompactPCI 64-bit specification will function in the PXI-1020.

## System Controller Slot

The System Controller slot is located in Slot 1 of the chassis as defined by the PXI specification. It has three controller expansion slots, which are used for system controller modules that are wider than one slot. As defined in the PXI specification, these slots allow the controller to expand to the left to prevent the controller from using up peripheral slots.

## Star Trigger Slot

The Star Trigger (ST) slot is located at Slot 2. This slot has a dedicated trigger line between each peripheral slot (see Figure 1-4). This slot is intended for modules with ST functionality that can provide individual triggers to all other peripherals. Additionally, you can use the ST slot as a high-precision 10 MHz clock source. However, if you do not require advanced trigger functionality, you can install any standard peripheral module into this slot.

## Peripheral Slots

There are seven peripheral slots including the ST slot.

# Local Bus

The PXI backplane's local bus is a daisy-chained bus that connects each peripheral slot with its adjacent peripheral slots to the left and right, as shown in Figure 1-4.

For example, a given peripheral slot's right local bus connects to the adjacent slot's left local bus, and so on. Each local bus is 13 lines wide and can pass analog signals between cards or provide a high-speed side-band communication path that does not affect the PCI bandwidth.

Local bus signals may range from high-speed TTL signals to analog signals as high as 42 V. Initialization software keys adjacent boards to prohibit the use of incompatible boards. This software uses the configuration information specific to each peripheral board to evaluate compatibility. This method is a flexible way to define local bus functionality that is not limited by hardware keying.

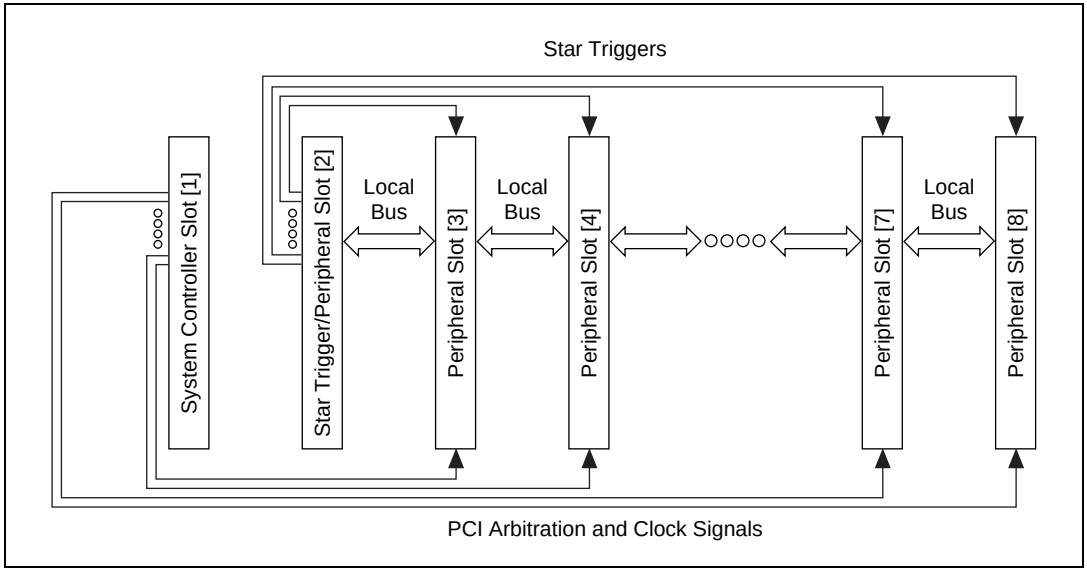



**Figure 1-4.** PXI Local Bus and Star Trigger Routing

## Trigger Bus

The eight PXI trigger lines are bused to each slot. You can use the trigger lines in a variety of ways. For example, you can use triggers to synchronize the operation of several different PXI peripheral modules. In other applications, one module can control carefully timed sequences of operations performed on other modules in the system. Modules can pass triggers to one another, allowing precisely timed responses to asynchronous external events the system is monitoring or controlling.

## System Reference Clock

The PXI-1020 supplies the PXI 10 MHz system clock signal (PXI_CLK10) independently to each peripheral slot. An independent buffer (having a source impedance matched to the backplane and a skew of less than 1 ns between slots) drives the clock signal to each peripheral slot. You can use this common reference clock signal to synchronize multiple modules in a measurement or control system. You can drive PXI_CLK10 from an external source through the PXI_CLK10_IN pin on the P2 connector of the Star Trigger Slot. (See Table B-4, *P2 (J2) Connector Pinout for the Star Trigger Slot*, in Appendix B, *Pinouts*.) Sourcing an external clock on this pin automatically disables the backplane's 10 MHz source.

# 2

# Installation, Configuration, and Operation

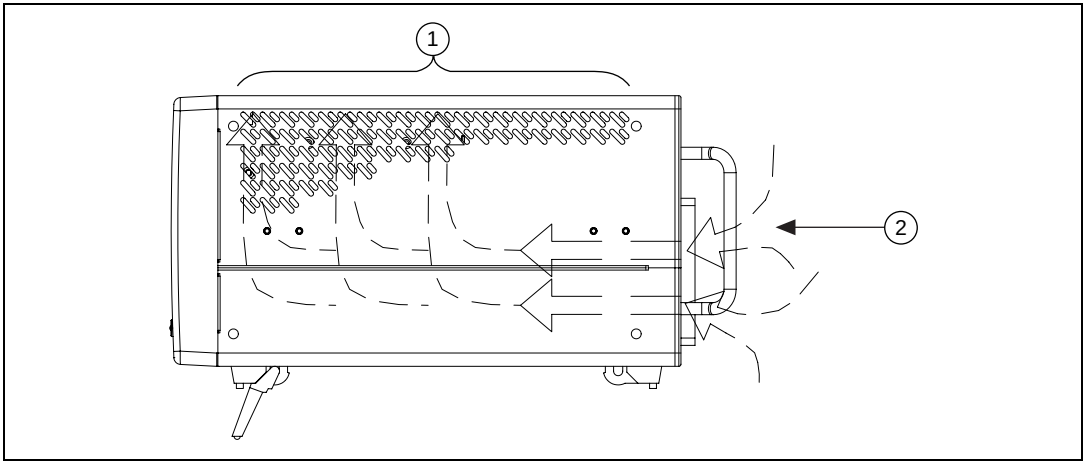
This chapter describes how to prepare and operate your PXI-1020 chassis.

Before connecting the chassis to a power source, read this chapter and the *For Your Safety* section located at the beginning of this manual.

## Site Considerations

The PXI-1020 is designed to operate on a bench or in an instrument rack. Determine how you want to use your PXI-1020 and follow the appropriate installation instructions.

To facilitate power supply and module cooling, air enters through filters and fan inlets located in the rear of the chassis and exits through the upper section on the left and right sides of the chassis, as shown in Figure 2-1. Place your PXI-1020 on a bench top or in an instrument rack so that the fans (air inlets) and the air outlet apertures along the left and right sides of the chassis have adequate ventilation. Keep other equipment a minimum of 3.0 in. (76.2 mm) away from the air inlets and outlets.




| | |
|---|---|
| 1 Module Cooling Air Outlets | 2 Module Cooling Air Intake |

**Figure 2-1.** PXI-1020 Chassis Airflow Side View

# Rack Mounting

Rack-mount applications require the optional rack-mount kit available from National Instruments. Refer to the instructions supplied with the rack-mount kit to install your PXI-1020 in an instrument rack.

# Setting Fan Speed

The fan speed selector switch is on the rear panel of the PXI-1020. Refer to Figure 1-2, *Rear View of the AC-Only PXI-1020 Chassis*, or Figure 1-3, *Rear View of the DC-Capable PXI-1020 Chassis*, for the location of the fan speed selector switch. Select HIGH for maximum cooling or AUTO to employ the temperature sensing module that controls the fan speed.

# Connecting Safety Ground

**Warning** The PXI-1020 chassis is designed with a three-position NEMA 15-5 style plug that connects the ground line to the chassis ground. To minimize shock hazard, make sure your electrical power outlet has an appropriate earth safety ground that is connected whenever you power up the chassis.

If your power outlet does not have an appropriate ground connection, you must connect the premise wire safety ground to the chassis grounding screw located on the rear panel. Refer to Figure 1-2, *Rear View of the AC-Only PXI-1020 Chassis*, or Figure 1-3, *Rear View of the DC-Capable PXI-1020 Chassis*, for the location of the chassis grounding screw. To connect the safety ground, complete the following steps:

1. Connect a 16 AWG (1.3 mm) wire to the chassis grounding screw using a toothed 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 Power Source

**Caution** Do *not* install modules prior to performing the first power-on test.

If your PXI-1020 has an AC-only input power supply, attach input power through the rear AC inlet using the appropriate line cord supplied. Refer to Figure 1-2, *Rear View of the AC-Only PXI-1020 Chassis*, for a diagram of the IEC 320 inlet.

If your PXI-1020 has a DC-capable power supply, you can attach an AC line cord or a DC cord if a DC power source is available.

The power switch allows you to turn on the chassis or place it in standby mode. Push the power switch to the On position (if not already on). Observe that all fans become operational.

# DC Input Connector (DC-Capable Chassis Only)

Figure 2-2 shows the DC input connector (P1) on the rear panel of the DC-capable PXI-1020.

If you want to build a custom DC cable, be sure to note the positive (+) and negative (–) terminals shown in Figure 2-2. Use the following components or their equivalents to mate to the P1 port:

- Positronic connector, part number CBD7W2F20000
- Norcomp hood, part number 972-015-010-011
- Two Positronic contacts, part number FS4008D

Install a 20 A inline fuse on the positive (+) wire of the custom cable.

**Note** You can purchase an optional DC cable from National Instruments that incorporates an inline fuse and the mating connector for the P1 port.

Figure 2-2 details the P1 connector on the chassis, *not* the cable.

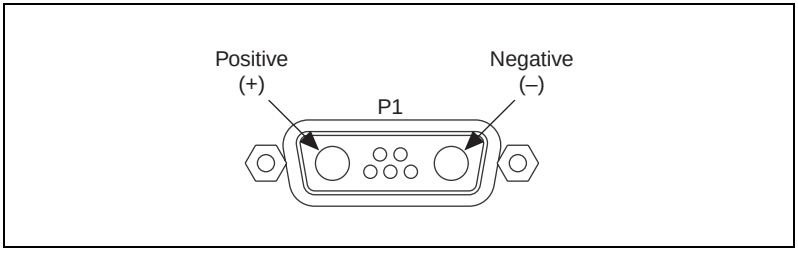



**Figure 2-2.** DC Connector on Rear of DC-Capable PXI-1020 Chassis

# Installing the Battery Pack (DC-Capable Power Supply Only)

If you purchased a DC-capable PXI-1020 and an optional 1.7 Ah NiCd battery pack, install it according to the following steps. (Refer to Figures 2-3, 2-4, and 2-5.)

1. Make sure the power switch is in the Off/Standby position.
2. Disconnect AC power cord (and DC power cable, if attached).
3. Remove the four screws on the rear of the chassis.
4. Pull the rear panel away from the chassis.

5. Disconnect the fan connector.

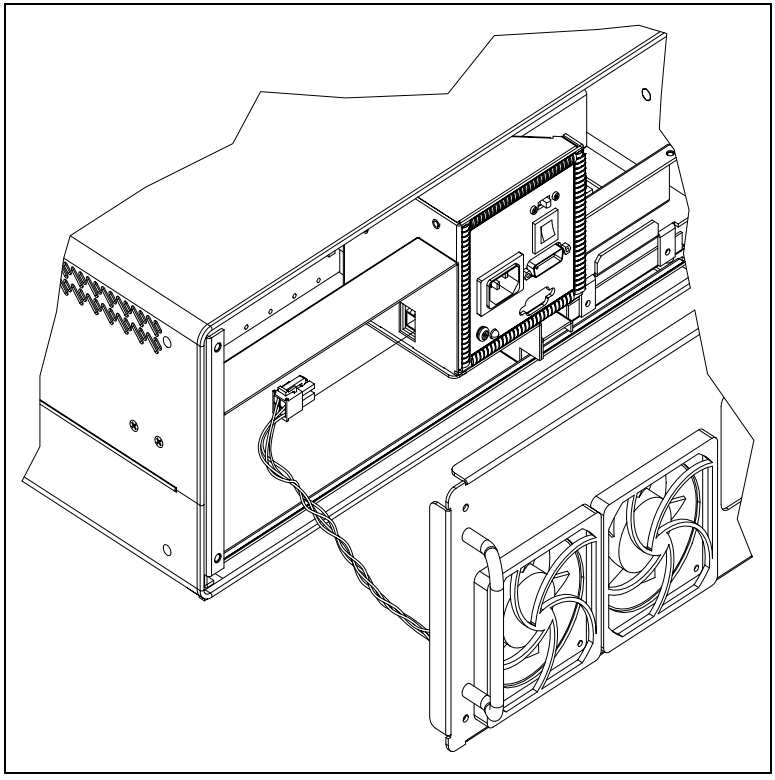


**Figure 2-3.** Fan Connector

6. Remove the power supply by removing the two screws and sliding out the power supply tray.

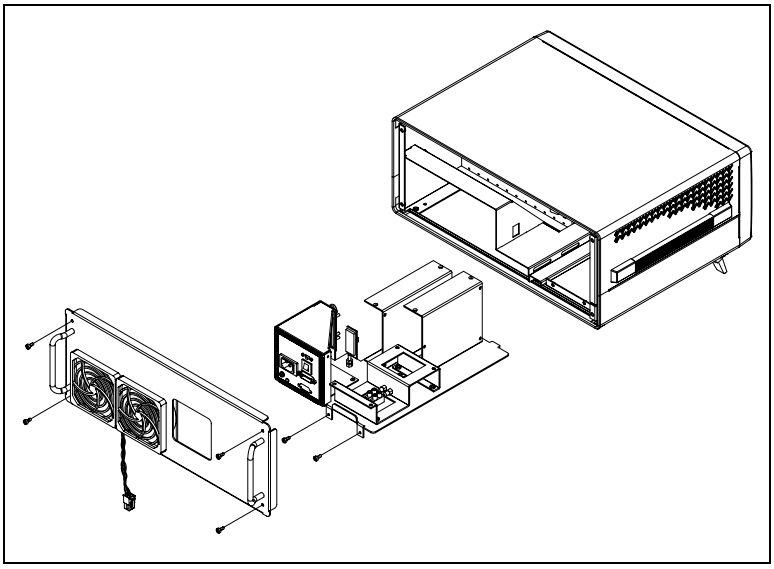
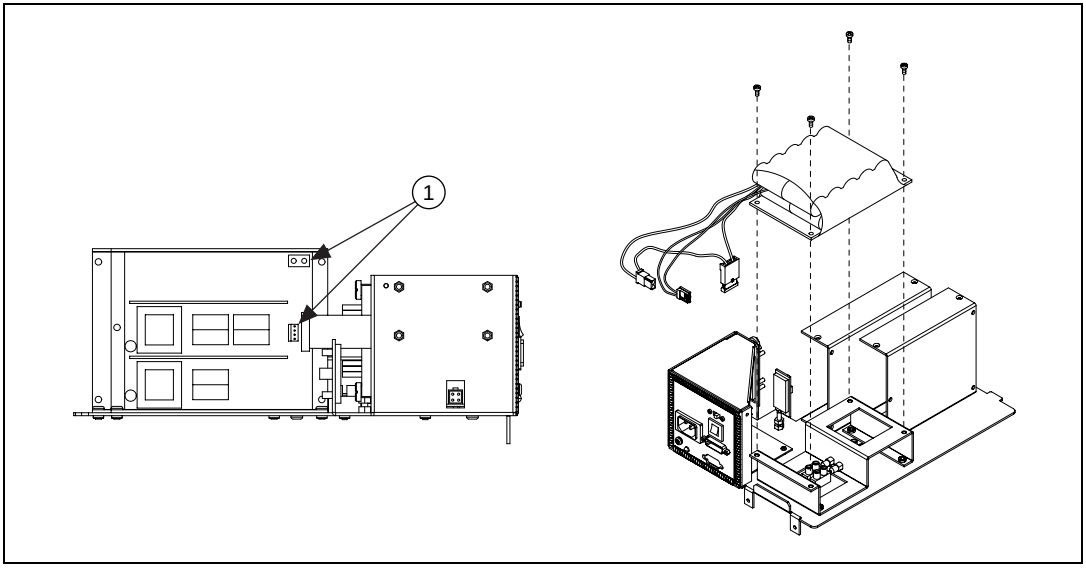


**Figure 2-4.** Rear of Chassis with Rear Panel and Power Supply Removed

7. Secure the battery pack inside the chassis using the four screws supplied with the battery pack.




1 Battery Pack Connector Mates

**Figure 2-5.** Positioning, Securing, and Connecting the Battery Pack

8. Connect the two plugs from the battery pack to the mating connectors on the power supply, as shown in Figure 2-5.
9. Reinstall the power supply tray and replace the two screws.
10. Reconnect the fan connector and rear panel.
11. Replace the four screws.
12. Reconnect the AC power cord (and DC power cable, if previously attached).

# Charging the Battery Pack (DC-Capable Power Supply Only)

The optional battery pack is charged when either the AC power or the external DC power is connected, regardless of the power switch position. The power supply has circuitry to prevent the battery pack from overcharging.

# Power Supply Status Indication (DC-Capable Power Supply Only)

If your PXI-1020 has a DC-capable power supply, refer to the following table for power supply indications provided by the Power Supply Status LED. Refer to Figure 1-3, *Rear View of the DC-Capable PXI-1020 Chassis*, for the location of the Power Supply Status LED.

**Table 2-1.** Power Supply Status Indication, DC Only

| Power Source | Power Switch Mode | Status LED |
|---|---|---|
| AC or External DC Input | Standby | Green |
| AC or External DC Input | On | Bright Green |
| Optional Battery Pack | On | Yellow |
| Optional Battery Pack (Discharged) | On | Red |

# Input Voltage Priority (DC-Capable Power Supply Only)

If more than one power source is connected at the same time, the priority of the power sources is as follows.

1. AC Input
2. DC Input
3. Internal Battery Pack

# Testing Power Up

**Caution** When connecting digital voltmeter probes to the rear D-sub connector, be careful not to short the probe leads together. Doing so could damage the power supply.

You can use a digital voltmeter to ensure all voltage levels in your PXI-1020 are within the allowable limits. Referring to Table 2-2, connect one lead of the voltmeter to a supply pin on the remote power monitoring connector (9-pin D-sub) located on the rear panel. Refer to Table 2-3 for a pinout diagram of the remote power monitoring connector. Connect the reference lead of the voltmeter to one of the ground pins. Compare each voltage reading to the values listed in Table 2-2.

**Note** Use the rear-panel D-sub connector to check voltages only. Do *not* use the connector to supply power to external devices.

**Table 2-2.** Power Supply Voltages at Power Monitoring Connector (DB-9)

| Pin | Supply | Acceptable Voltage Range |
|---|---|---|
| 2 | +5 V | 4.75 to 5.25 V |
| 4 | +3.3 V | 3.135 to 3.465 V |
| 6 | +12 V | 11.4 to 12.6 V |
| 8 | –12 V | –12.6 to –11.4 V |
| 1, 9 | Logic Ground | N/A |

If the voltages fall within the specified ranges, the mainframe complies with the CompactPCI voltage limit specifications. Notice that the rear-panel D-sub connector is to be used to check voltages only. Do *not* use these voltages to supply power to external devices.

**Note** If the fans or power unit fail to function properly, refer to Chapter 4, *Troubleshooting*.

# Remote Power Monitoring and Inhibiting Interface

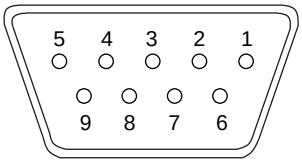
The PXI-1020 mainframe supports remote power monitoring and inhibiting via a 9-pin D-sub connector located on the rear panel. Table 2-3 shows the pinout of the DB-9 connector.

**Table 2-3.** DB-9 Connector Pinout

| DB-9 Pin | Signal |
|---|---|
| 1 | Logic Ground |
| 2 | +5 V |
| 3 | Inhibit Return (DC-capable supply only) |
| 4 | +3.3 V |
| 5 | Inhibit* |
| 6 | +12 V |

**Table 2-3.** DB-9 Connector Pinout (Continued)

| DB-9 Pin | Signal |
|---|---|
| 7 | Reserved |
| 8 | –12 V |
| 9 | Logic Ground |



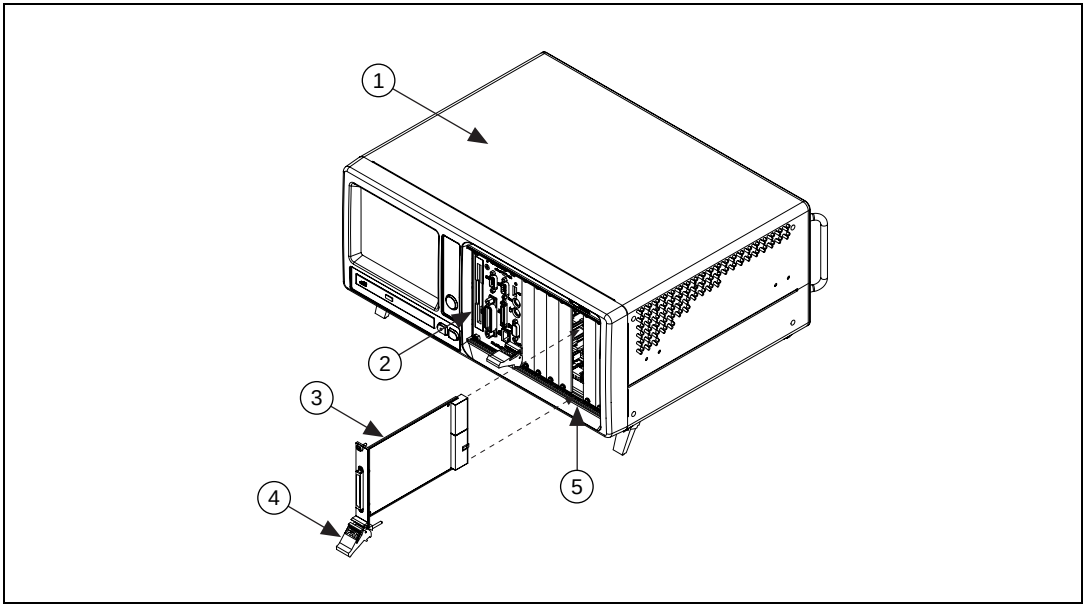

You can use the Inhibit signal (active low) to turn off the power supply outputs. To use this feature, connect the Inhibit pin (pin 5) to a Logic Ground pin (pin 1 or 9) on the AC-only input power supply or Inhibit Return (pin 3) for the DC-capable power supply. Make sure the front (standby) switch is in the ON position. As long as the connection is made, the power supply inhibits its DC outputs. DC output resumes when Inhibit is no longer connected. For remote reset, connect a momentary switch between pin 5 and pin 1 (or pin 9) on the AC-only input power supply or between pin 5 and pin 3 for the DC-capable power supply.

# Installing PXI Modules

**Caution** Turn off the chassis power before installing CompactPCI or PXI modules.

Install a module into a chassis slot by first placing the module's card edges into the front module guides (top and bottom), as shown in Figure 2-6. Slide the module to the rear of the chassis, making sure that the injector/ejector handle is pushed down as shown in Figure 2-7.

When you begin to feel resistance, push up on the injector/ejector handle to inject the card into the frame. Secure the module's front panel to the chassis using the module's front-panel mounting screws.




| | | | | | |
|---|---|---|---|---|---|
| 1 | PXI-1020 Chassis | 3 | PXI Board | 5 | Injector/Ejector Rail |
| 2 | PXI-8156B System Controller | 4 | Injector/Ejector Handle | | |

**Figure 2-6.** Installing PXI or CompactPCI Modules

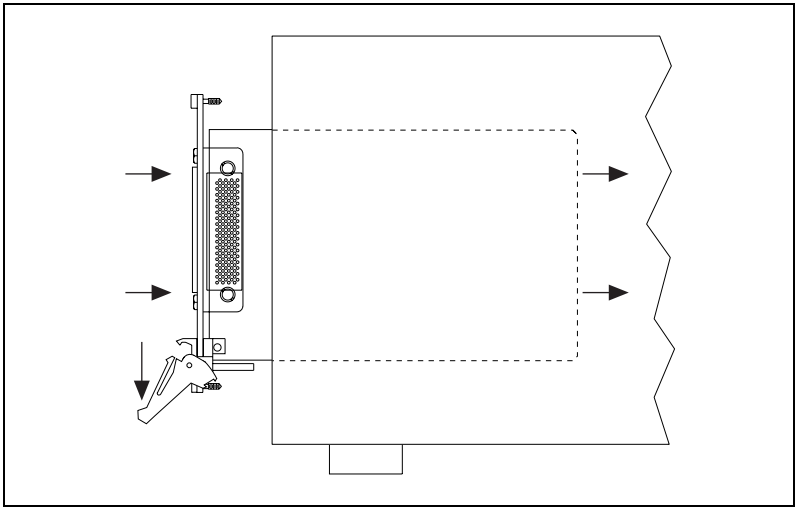


**Figure 2-7.** Injector/Ejector Handle Position During Module Insertion

# Installing Filler Panels

To optimize module cooling performance, install filler panels into unused or empty slots. Secure with the captive mounting screws.

# Using the Chassis Initialization File

To assist system integrators, the PXI specification requires manufacturers of PXI chassis and system modules to document the capabilities of their products. The minimum documentation requirements are contained in `.ini` files, which consist of ASCII text. The system integrator can read the `.ini` file, and configuration utilities and device drivers can also use this file. The PXI-1020 chassis initialization file, `chassis.ini`, is included on the diskette for your PXI-1020.

# 3

# Maintenance

This chapter describes basic maintenance procedures you can perform on the PXI-1020 chassis.

## Service Interval

Clean the chassis fan filter at a maximum interval of six months. Depending on the amount of use and ambient dust levels in the operating environment, the filter may require more frequent cleaning.

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

## Preparation

The information in this section is designed for use by qualified service personnel. Read the *For Your Safety* section at the beginning of this manual before attempting any procedures in this chapter.

**Caution** 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.

## Cleaning

Cleaning procedures consist of exterior and interior cleaning of the chassis and cleaning the fan filter. Refer to your module user documentation for information on cleaning the individual CompactPCI or PXI modules.

**Caution** Always power-off the chassis and disconnect the power cord before cleaning or 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. If you must use a liquid for minor interior cleaning, use a 75% isopropyl alcohol solution and rinse with deionized water.

## 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 connectors or switches. Cover these components while cleaning the chassis.

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

# Cleaning the Fan Filters

You can easily remove the fan filters from the rear of the chassis by removing the plastic housing attached to each fan. You can then remove the filters.

Clean the filters by washing them in a mild soap solution and then vacuuming or blowing air through them. Rinse the filters with water and allow them to dry before reinstalling.

# 4

# Troubleshooting

This chapter describes basic troubleshooting procedures for the PXI-1020 chassis.

Refer to Table 4-1 to troubleshoot the PXI-1020 chassis. The table lists possible causes for power failure and recommends ways to correct the problem.

**Table 4-1.** Troubleshooting

| Possible Cause | What to Do |
|---|---|
| PXI-1020 chassis is not connected to power source. | Make sure that the PXI-1020 is connected to a live electrical outlet. Try operating another piece of equipment from this outlet. |
| Power switch is not switched on. | Set the power switch to the On position. The green LED should be lit. |
| Remote inhibiting input on the rear panel of the mainframe is active. | Deactivate your system's remote inhibiting control. |
| Circuit breaker is tripped. | Reset the circuit breaker. Refer to the *Resetting the AC Mains Circuit Breaker* section of this chapter. |
| If DC-capable PXI-1020 is powered by an external DC source, inline fuse on DC-power cord may be blown. | Check fuse and replace, if necessary, with same type. |
| If DC-capable PXI-1020 is powered by optional battery pack, inline fuse to the battery pack may be blown. | Check fuse and replace. See the section *Replacing the Fuse for Optional Battery Pack (DC-Capable Chassis Only)* in this chapter. |
| If DC-capable PXI-1020 is powered by an optional battery pack only, battery pack may be discharged. | Connect PXI-1020 to AC or DC power source to charge battery. (Note: The battery is charged whether the power switch is in the On or Standby position.) |
| Power supply has failed. | Contact National Instruments. |

# Resetting the AC Mains Circuit Breaker

If your PXI-1020 is connected to an AC source and encounters an over-current condition, the circuit breaker on the rear panel will trip to prevent damage to the mainframe. Complete the following steps to reset the circuit breaker:

1. Make sure the power switch is in the Off/Standby position.
2. Disconnect the AC line cord.
3. Depress the circuit breaker to reset it.
4. Reconnect the AC line cord.
5. Turn the power switch to the On position.

If the circuit breaker trips again, complete the following steps:

1. Turn the power switch to the Off/Standby position.
2. Disconnect the mainframe from the AC mains power source.
3. Remove all modules from the mainframe.
4. Complete the test procedure described in the *Connecting to Power Source* section in Chapter 2, *Installation, Configuration, and Operation*.
5. If any voltages are outside the acceptable limits, contact National Instruments.
6. If all voltages are within the acceptable limits, verify that your PXI-1020 can meet the power requirements of your CompactPCI or PXI modules. Overloading the chassis can cause the breaker to trip. Refer to Appendix A, *Specifications*.
7. The over-current condition that caused the circuit breaker to trip may be due to a faulty CompactPCI or PXI module. Refer to the documentation supplied with the modules for troubleshooting your modules.

# Replacing the Fuse for Optional Battery Pack (DC-Capable Chassis Only)

The optional battery pack for the DC-capable PXI-1020 has a 10 A inline automotive-type fuse. Complete the following steps to replace the fuse shown in Figure 4-3.

1. Make sure the power switch is in the Off/Standby position.
2. Disconnect AC power cord (and DC power cable, if attached).
3. Remove the four screws on the rear of the chassis.
4. Pull the rear panel away from the chassis.
5. Disconnect the fan connector.

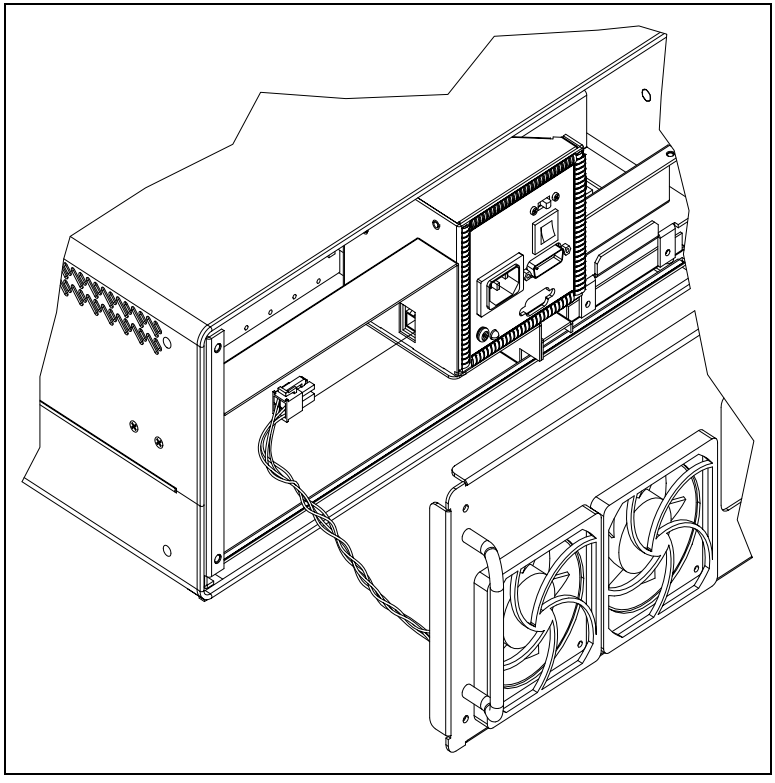


**Figure 4-1.** Fan Connector

6. Remove the power supply by removing the two screws and sliding out the power supply tray.

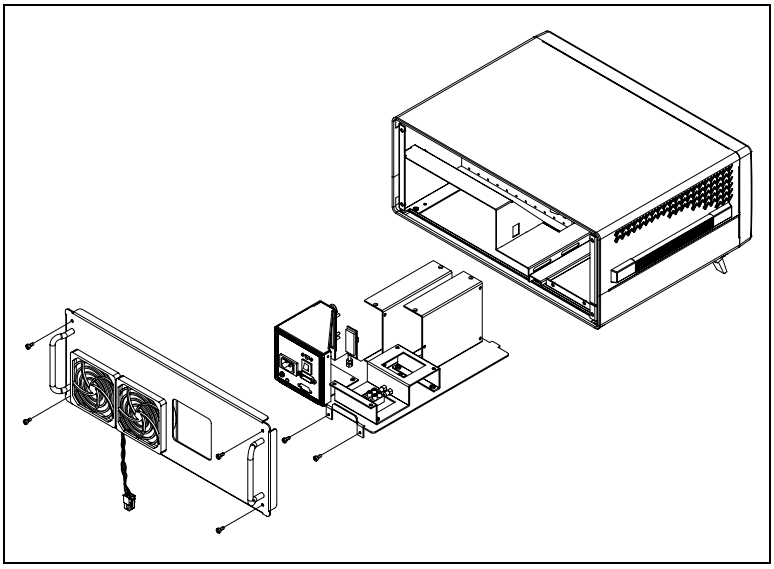


**Figure 4-2.** Rear of Chassis with Rear Panel and Power Supply Removed

7. Replace the battery pack fuse.

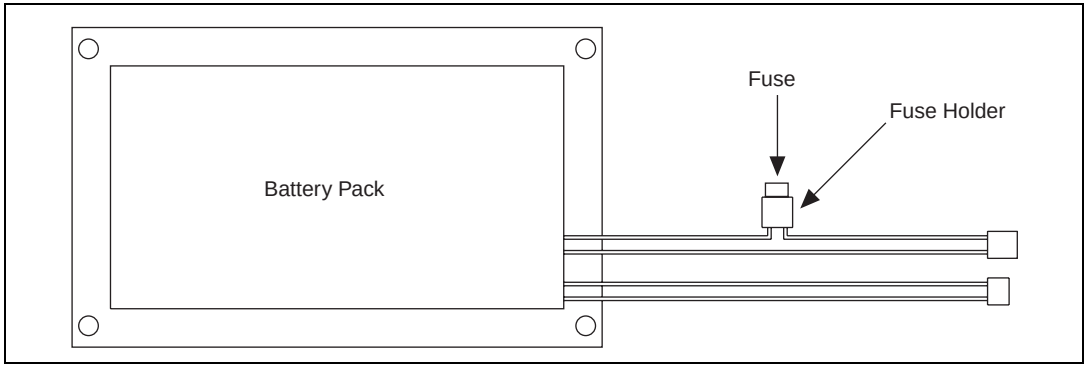



**Figure 4-3.** Optional Battery Pack

8. Reinstall the power supply tray and replace the two screws.
9. Reconnect the fan connector and rear panel.
10. Replace the four screws.
11. Reconnect the AC power cord (and DC power cable, if previously attached).

# A

# Specifications

This appendix contains specifications for the PXI-1020 chassis.

## Electrical

### AC Input Specifications for AC-Only Power Supply

Input voltage range ..... 90–264 VAC

Input frequency range ..... 47 to 63 Hz

Over-current protection ..... 10 A circuit breaker

Power disconnect ..... The power switch causes the power module to supply DC power to the CompactPCI/PXI backplane. The power cord provides main power disconnect.

Maximum steady state operating operating current ..... 8 A

Line regulation ..... ±0.2% over operating line range

Efficiency ..... 70% typical

### DC Output Specifications for AC-Only Power Supply

Maximum usable power ..... 300 W

Maximum ripple and noise ..... 1% ripple, 1% noise, 20 MHz bandwidth

DC Current Capacity ($I_{MP}$)

| Voltage | $I_{MP}$ (Steady-State Current) | Regulation |
|---|---|---|
| +3.3 V | 35 A | < 1.5% |
| +5 V | 25 A | < 1% |
| +12 V | 4 A | < 5% |
| –12 V | 1 A | < 5% |

Power supply MTTR .....Replacement in under 5 minutes

## AC Input Specifications for DC-Capable Power Supply

Input voltage range .....85–265 VAC

Input frequency range .....45 to 65 Hz

Over-current protection.....5 A circuit breaker

Operating current (RMS steady state) ....3.0 A

Line regulation.....±0.2% over operating line range

Efficiency.....85% typical

Power disconnect .....The power switch causes the power module to supply DC power to the CompactPCI/PXI backplane. The power cord provides main power disconnect.

## DC Input Specifications for DC-Capable Power Supply

Input voltage range .....10–32 V

DC to DC isolation .....500 Vrms

Over-current protection.....Inline fuse must be installed into DC input cable

Efficiency.....82% typical

Power disconnect ..... The power switch causes the power module to supply DC power to the CompactPCI/PXI backplane. The power cord provides main power disconnect.

## DC Output Specifications for DC-Capable Power Supply

Maximum usable power..... 150 W

Ripple and noise..... 1% ripple, 1% noise, 20 MHz bandwidth

DC Current Capacity ($I_{MP}$)

| Voltage | $I_{MP}$ (Steady-State Current) | Regulation |
|---|---|---|
| +3.3 V | 10 A | < 2% |
| +5 V | 20 A (3.3 V power) | < 2% |
| +12 V | 4 A | < 2% |
| –12 V | 0.4 A | < 5% |

Power supply MTTR..... Replacement in under 5 minutes

# Cooling

Per slot cooling capacity ..... Slot cooling capacity in worst-case slot is 20 W with fan speed set to HIGH

Module cooling system ..... Forced air circulation (positive pressurization) via two 60 cfm fans with AUTO/HIGH speed selector

Slot airflow direction..... P1 to P2, bottom of module to top of module

Module cooling

- Intake ..... Rear of chassis
- Exhaust..... Upper left and right sides

## Safety

UL 3111-1, IEC 1010-1, CSA 22.2 No. 1010.1
Installation Category II
Pollution Degree 2
Safety Class 1

## Environmental

Operating temperature .....0 to 50 °C

Storage temperature .....–20 to 70 °C

Operating relative humidity .....10 to 90%, noncondensing

Functional shock (operating) .....MIL-T-28800E CLASS 3, 30 g half-sine shock pulse (also meets IEC 60068-2-27)

Operating location .....Indoor use

Random vibration

Operational .....5 to 500 Hz, 0.3 $g_{RMS}$

Non-operational[1] .....10 to 500 Hz, 2.4 $g_{RMS}$

EMC emissions .....FCC Class A compliant and EN 55011 Group 1 Class A compliant

EMC immunity .....Refer to DOC supplied with chassis for compliance to relevant directives.

[1] Random vibration profiles were developed in accordance with MIL-T-28800E CLASS 3 and MIL-STD-810E Method 514 Test levels exceed those recommended in MIL-STD-810E for Category 1 (Basic Transportation), Figures 514.4-1 through 514.4-3.

## Backplane

| | |
|---|---|
| Size | 3U-sized; one system slot (with three system expansion slots) and seven peripheral slots. Compliant with IEEE 1101.10 mechanical packaging. PXI Specification Revision 1.0 compliant. Accepts both PXI and CompactPCI (PICMG 2.0 R2.1) 3U modules. |
| Backplane bare-board material | UL 94 V-0 recognized (File No. E 116551) |
| Backplane connectors | Conform to IEC 917 and IEC 1076-4-101, and are UL 94 V-0 rated |

## Mechanical

| | |
|---|---|
| Overall dimensions standard chassis | 17.71 by 44.51 by 36.95 cm (6.97 by 17.52 by 14.55 in.) |
| Weight | 9.75 kg (21.5 lb.) |
| Maximum module weight | 1.82 kg (4 lb.) |

Figures A-1, A-2, and A-3 show the PXI-1020 dimensions.

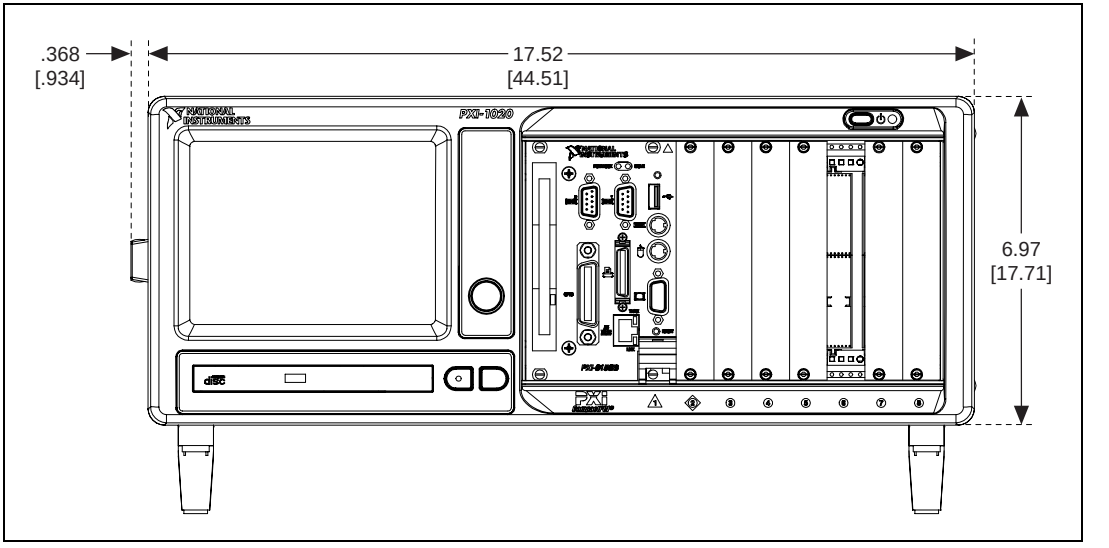



**Figure A-1.** PXI-1020 Front Dimensions

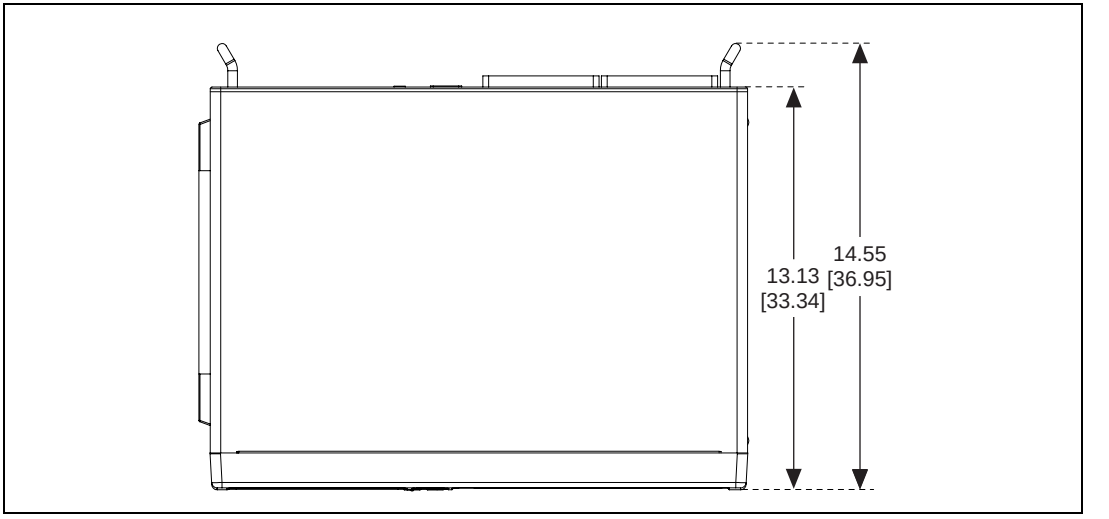



**Figure A-2.** PXI-1020 Top Dimensions

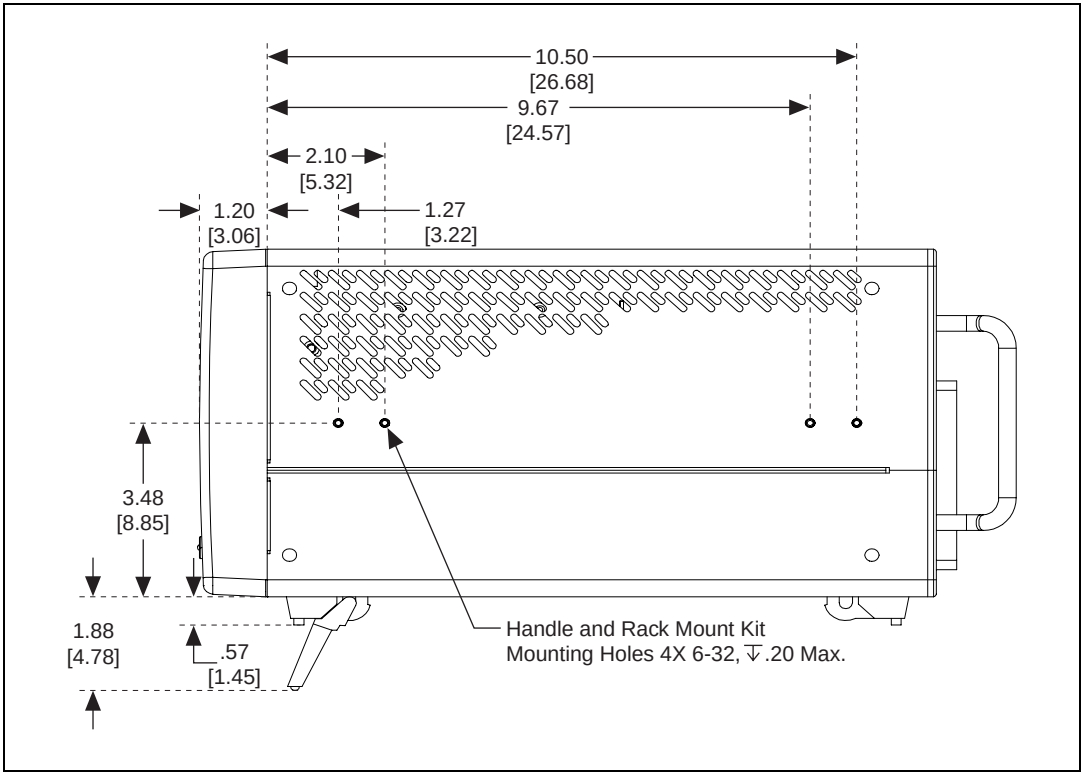



**Figure A-3.** PXI-1020 Side Dimensions

# B

# Pinouts

This appendix describes the P1 and P2 connector pinouts for the PXI-1020 backplane.

Table B-1 shows the P1 (J1) connector pinout for the System Controller slot.

Table B-2 shows the P2 (J2) connector pinout for the System Controller slot.

Table B-3 shows the P1 (J1) connector pinout for the Star Trigger slot.

Table B-4 shows the P2 (J2) connector pinout for the Star Trigger slot.

Table B-5 shows the P1 (J1) connector pinout for the peripheral slots.

Table B-6 shows the P2 (J2) connector pinout for the peripheral slots.

**Note** PXI signals are shown in **bold**.

**Table B-1.** P1 (J1) Connector Pinout for the System Controller Slot

| Pin | Z | A | B | C | D | E | F |
|---|---|---|---|---|---|---|---|
| 25 | GND | 5V | REQ64# | ENUM# | 3.3V | 5V | GND |
| 24 | GND | AD[1] | 5V | V(I/O) | AD[0] | ACK64# | GND |
| 23 | GND | 3.3V | AD[4] | AD[3] | 5V | AD[2] | GND |
| 22 | GND | AD[7] | GND | 3.3V | AD[6] | AD[5] | GND |
| 21 | GND | 3.3V | AD[9] | AD[8] | M66EN | C/BE[0]# | GND |
| 20 | GND | AD[12] | GND | V(I/O) | AD[11] | AD[10] | GND |
| 19 | GND | 3.3V | AD[15] | AD[14] | GND | AD[13] | GND |
| 18 | GND | SERR# | GND | 3.3V | PAR | C/BE[1]# | GND |
| 17 | GND | 3.3V | SDONE | SBO# | GND | PERR# | GND |
| 16 | GND | DEVSEL# | GND | V(I/O) | STOP# | LOCK# | GND |
| 15 | GND | 3.3V | FRAME# | IRDY# | GND | TRDY# | GND |
| 12–14 | Key Area | | | | | | |
| 11 | GND | AD[18] | AD[17] | AD[16] | GND | C/BE[2]# | GND |
| 10 | GND | AD[21] | GND | 3.3V | AD[20] | AD[19] | GND |
| 9 | GND | C/BE[3]# | IDSEL | AD[23] | GND | AD[22] | GND |
| 8 | GND | AD[26] | GND | V(I/O) | AD[25] | AD[24] | GND |
| 7 | GND | AD[30] | AD[29] | AD[28] | GND | AD[27] | GND |
| 6 | GND | REQ# | GND | 3.3V | CLK | AD[31] | GND |
| 5 | GND | BRSVP1A5 | BRSVP1B5 | RST# | GND | GNT# | GND |
| 4 | GND | BRSVP1A4 | GND | V(I/O) | INTP | INTS | GND |
| 3 | GND | INTA# | INTB# | INTC# | 5V | INTD# | GND |
| 2 | GND | TCK | 5V | TMS | TDO | TDI | GND |
| 1 | GND | 5V | –12V | TRST# | +12V | 5V | GND |

**Table B-2.** P2 (J2) Connector Pinout for the System Controller Slot

| Pin | Z | A | B | C | D | E | F |
|---|---|---|---|---|---|---|---|
| 22 | GND | **PXI_RSVA22** | **PXI_RSVB22** | **PXI_RSVC22** | **PXI_RSVD22** | **PXI_RSVE22** | GND |
| 21 | GND | RSV | GND | RSV | RSV | RSV | GND |
| 20 | GND | RSV | RSV | RSV | GND | RSV | GND |
| 19 | GND | RSV | GND | RSV | RSV | RSV | GND |
| 18 | GND | **PXI_TRIG3** | **PXI_TRIG4** | **PXI_TRIG5** | GND | **PXI_TRIG6** | GND |
| 17 | GND | **PXI_TRIG2** | GND | PRST# | REQ6# | GNT6# | GND |
| 16 | GND | **PXI_TRIG1** | **PXI_TRIG0** | DEG# | GND | **PXI_TRIG7** | GND |
| 15 | GND | **PXI_BRSVA15** | GND | FAL# | REQ5# | GNT5# | GND |
| 14 | GND | AD[35] | AD[34] | AD[33] | GND | AD[32] | GND |
| 13 | GND | AD[38] | GND | V(I/O) | AD[37] | AD[36] | GND |
| 12 | GND | AD[42] | AD[41] | AD[40] | GND | AD[39] | GND |
| 11 | GND | AD[45] | GND | V(I/O) | AD[44] | AD[43] | GND |
| 10 | GND | AD[49] | AD[48] | AD[47] | GND | AD[46] | GND |
| 9 | GND | AD[52] | GND | V(I/O) | AD[51] | AD[50] | GND |
| 8 | GND | AD[56] | AD[55] | AD[54] | GND | AD[53] | GND |
| 7 | GND | AD[59] | GND | V(I/O) | AD[58] | AD[57] | GND |
| 6 | GND | AD[63] | AD[62] | AD[61] | GND | AD[60] | GND |
| 5 | GND | C/BE[5]# | GND | V(I/O) | C/BE[4]# | PAR64 | GND |
| 4 | GND | V(I/O) | **PXI_BRSVB4** | C/BE[7]# | GND | C/BE[6]# | GND |
| 3 | GND | CLK4 | GND | GNT3# | REQ4# | GNT4# | GND |
| 2 | GND | CLK2 | CLK3 | SYSEN# | GNT2# | REQ3# | GND |
| 1 | GND | CLK1 | GND | REQ1# | GNT1# | REQ2# | GND |

**Table B-3.** P1 (J1) Connector Pinout for the Star Trigger Slot

| Pin | Z | A | B | C | D | E | F |
|---|---|---|---|---|---|---|---|
| 25 | GND | 5V | REQ64# | ENUM# | 3.3V | 5V | GND |
| 24 | GND | AD[1] | 5V | V(I/O) | AD[0] | ACK64# | GND |
| 23 | GND | 3.3V | AD[4] | AD[3] | 5V | AD[2] | GND |
| 22 | GND | AD[7] | GND | 3.3V | AD[6] | AD[5] | GND |
| 21 | GND | 3.3V | AD[9] | AD[8] | M66EN | C/BE[0]# | GND |
| 20 | GND | AD[12] | GND | V(I/O) | AD[11] | AD[10] | GND |
| 19 | GND | 3.3V | AD[15] | AD[14] | GND | AD[13] | GND |
| 18 | GND | SERR# | GND | 3.3V | PAR | C/BE[1]# | GND |
| 17 | GND | 3.3V | SDONE | SBO# | GND | PERR# | GND |
| 16 | GND | DEVSEL# | GND | V(I/O) | STOP# | LOCK# | GND |
| 15 | GND | 3.3V | FRAME# | IRDY# | GND | TRDY# | GND |
| 12–14 | Key Area | | | | | | |
| 11 | GND | AD[18] | AD[17] | AD[16] | GND | C/BE[2]# | GND |
| 10 | GND | AD[21] | GND | 3.3V | AD[20] | AD[19] | GND |
| 9 | GND | C/BE[3]# | IDSEL | AD[23] | GND | AD[22] | GND |
| 8 | GND | AD[26] | GND | V(I/O) | AD[25] | AD[24] | GND |
| 7 | GND | AD[30] | AD[29] | AD[28] | GND | AD[27] | GND |
| 6 | GND | REQ# | GND | 3.3V | CLK | AD[31] | GND |
| 5 | GND | BRSVP1A5 | BRSVP1B5 | RST# | GND | GNT# | GND |
| 4 | GND | BRSVP1A4 | GND | V(I/O) | INTP | INTS | GND |
| 3 | GND | INTA# | INTB# | INTC# | 5V | INTD# | GND |
| 2 | GND | TCK | 5V | TMS | TDO | TDI | GND |
| 1 | GND | 5V | –12V | TRST# | +12V | 5V | GND |

**Table B-4.** P2 (J2) Connector Pinout for the Star Trigger Slot

| Pin | Z | A | B | C | D | E | F |
|---|---|---|---|---|---|---|---|
| 22 | GND | **PXI_RSVA22** | **PXI_RSVB22** | **PXI_RSVC22** | **PXI_RSVD22** | **PXI_RSVE22** | GND |
| 21 | GND | **PXI_LBR0** | GND | **PXI_LBR1** | **PXI_LBR2** | **PXI_LBR3** | GND |
| 20 | GND | **PXI_LBR4** | **PXI_LBR5** | **PXI_STAR0** | GND | **PXI_STAR1** | GND |
| 19 | GND | **PXI_STAR2** | GND | **PXI_STAR3** | **PXI_STAR4** | **PXI_STAR5** | GND |
| 18 | GND | **PXI_TRIG3** | **PXI_TRIG4** | **PXI_TRIG5** | GND | **PXI_TRIG6** | GND |
| 17 | GND | **PXI_TRIG2** | GND | PRST# | **PXI_CLK10_IN** | **PXI_CLK10** | GND |
| 16 | GND | **PXI_TRIG1** | **PXI_TRIG0** | DEG# | GND | **PXI_TRIG7** | GND |
| 15 | GND | **PXI_BRSVA15** | GND | FAL# | **PXI_STAR6** | **PXI_LBR6** | GND |
| 14 | GND | AD[35] | AD[34] | AD[33] | GND | AD[32] | GND |
| 13 | GND | AD[38] | GND | V(I/O) | AD[37] | AD[36] | GND |
| 12 | GND | AD[42] | AD[41] | AD[40] | GND | AD[39] | GND |
| 11 | GND | AD[45] | GND | V(I/O) | AD[44] | AD[43] | GND |
| 10 | GND | AD[49] | AD[48] | AD[47] | GND | AD[46] | GND |
| 9 | GND | AD[52] | GND | V(I/O) | AD[51] | AD[50] | GND |
| 8 | GND | AD[56] | AD[55] | AD[54] | GND | AD[53] | GND |
| 7 | GND | AD[59] | GND | V(I/O) | AD[58] | AD[57] | GND |
| 6 | GND | AD[63] | AD[62] | AD[61] | GND | AD[60] | GND |
| 5 | GND | C/BE[5]# | GND | V(I/O) | C/BE[4]# | PAR64 | GND |
| 4 | GND | V(I/O) | **PXI_BRSVB4** | C/BE[7]# | GND | C/BE[6]# | GND |
| 3 | GND | **PXI_LBR7** | GND | **PXI_LBR8** | **PXI_LBR9** | **PXI_LBR10** | GND |
| 2 | GND | **PXI_LBR11** | **PXI_LBR12** | SYSEN# | **PXI_STAR7** | **PXI_STAR8** | GND |
| 1 | GND | **PXI_STAR9** | GND | **PXI_STAR10** | **PXI_STAR11** | **PXI_STAR12** | GND |

**Table B-5.** P1 (J1) Connector Pinout for the Peripheral Slot

| Pin | Z | A | B | C | D | E | F |
|---|---|---|---|---|---|---|---|
| 25 | GND | 5V | REQ64# | ENUM# | 3.3V | 5V | GND |
| 24 | GND | AD[1] | 5V | V(I/O) | AD[0] | ACK64# | GND |
| 23 | GND | 3.3V | AD[4] | AD[3] | 5V | AD[2] | GND |
| 22 | GND | AD[7] | GND | 3.3V | AD[6] | AD[5] | GND |
| 21 | GND | 3.3V | AD[9] | AD[8] | M66EN | C/BE[0]# | GND |
| 20 | GND | AD[12] | GND | V(I/O) | AD[11] | AD[10] | GND |
| 19 | GND | 3.3V | AD[15] | AD[14] | GND | AD[13] | GND |
| 18 | GND | SERR# | GND | 3.3V | PAR | C/BE[1]# | GND |
| 17 | GND | 3.3V | SDONE | SBO# | GND | PERR# | GND |
| 16 | GND | DEVSEL# | GND | V(I/O) | STOP# | LOCK# | GND |
| 15 | GND | 3.3V | FRAME# | IRDY# | GND | TRDY# | GND |
| 12–14 | Key Area | | | | | | |
| 11 | GND | AD[18] | AD[17] | AD[16] | GND | C/BE[2]# | GND |
| 10 | GND | AD[21] | GND | 3.3V | AD[20] | AD[19] | GND |
| 9 | GND | C/BE[3]# | IDSEL | AD[23] | GND | AD[22] | GND |
| 8 | GND | AD[26] | GND | V(I/O) | AD[25] | AD[24] | GND |
| 7 | GND | AD[30] | AD[29] | AD[28] | GND | AD[27] | GND |
| 6 | GND | REQ# | GND | 3.3V | CLK | AD[31] | GND |
| 5 | GND | BRSVP1A5 | BRSVP1B5 | RST# | GND | GNT# | GND |
| 4 | GND | BRSVP1A4 | GND | V(I/O) | INTP | INTS | GND |
| 3 | GND | INTA# | INTB# | INTC# | 5V | INTD# | GND |
| 2 | GND | TCK | 5V | TMS | TDO | TDI | GND |
| 1 | GND | 5V | –12V | TRST# | +12V | 5V | GND |

**Table B-6.** P2 (J2) Connector Pinout for the Peripheral Slot

| Pin | Z | A | B | C | D | E | F |
|---|---|---|---|---|---|---|---|
| 22 | GND | **PXI_RSVA22** | **PXI_RSVB22** | **PXI_RSVC22** | **PXI_RSVD22** | **PXI_RSVE22** | GND |
| 21 | GND | **PXI_LBR0** | GND | **PXI_LBR1** | **PXI_LBR2** | **PXI_LBR3** | GND |
| 20 | GND | **PXI_LBR4** | **PXI_LBR5** | **PXI_LBL0** | GND | **PXI_LBL1** | GND |
| 19 | GND | **PXI_LBL2** | GND | **PXI_LBL3** | **PXI_LBL4** | **PXI_LBL5** | GND |
| 18 | GND | **PXI_TRIG3** | **PXI_TRIG4** | **PXI_TRIG5** | GND | **PXI_TRIG6** | GND |
| 17 | GND | **PXI_TRIG2** | GND | PRST# | **PXI_STAR** | **PXI_CLK10** | GND |
| 16 | GND | **PXI_TRIG1** | **PXI_TRIG0** | DEG# | GND | **PXI_TRIG7** | GND |
| 15 | GND | **PXI_BRSVA15** | GND | FAL# | **PXI_LBL6** | **PXI_LBR6** | GND |
| 14 | GND | AD[35] | AD[34] | AD[33] | GND | AD[32] | GND |
| 13 | GND | AD[38] | GND | V(I/O) | AD[37] | AD[36] | GND |
| 12 | GND | AD[42] | AD[41] | AD[40] | GND | AD[39] | GND |
| 11 | GND | AD[45] | GND | V(I/O) | AD[44] | AD[43] | GND |
| 10 | GND | AD[49] | AD[48] | AD[47] | GND | AD[46] | GND |
| 9 | GND | AD[52] | GND | V(I/O) | AD[51] | AD[50] | GND |
| 8 | GND | AD[56] | AD[55] | AD[54] | GND | AD[53] | GND |
| 7 | GND | AD[59] | GND | V(I/O) | AD[58] | AD[57] | GND |
| 6 | GND | AD[63] | AD[62] | AD[61] | GND | AD[60] | GND |
| 5 | GND | C/BE[5]# | GND | V(I/O) | C/BE[4]# | PAR64 | GND |
| 4 | GND | V(I/O) | **PXI_BRSVB4** | C/BE[7]# | GND | C/BE[6]# | GND |
| 3 | GND | **PXI_LBR7** | GND | **PXI_LBR8** | **PXI_LBR9** | **PXI_LBR10** | GND |
| 2 | GND | **PXI_LBR11** | **PXI_LBR12** | SYSEN# | **PXI_LBL7** | **PXI_LBL8** | GND |
| 1 | GND | **PXI_LBL9** | GND | **PXI_LBL10** | **PXI_LBL11** | **PXI_LBL12** | GND |

# C

# Technical Support Resources

This appendix describes the comprehensive resources available to you in the Technical Support section of the National Instruments Web site and provides technical support telephone numbers for you to use if you have trouble connecting to our Web site or if you do not have internet access.

## NI Web Support

To provide you with immediate answers and solutions 24 hours a day, 365 days a year, National Instruments maintains extensive online technical support resources. They are available to you at no cost, are updated daily, and can be found in the Technical Support section of our Web site at `www.ni.com/support`

### Online Problem-Solving and Diagnostic Resources

- **KnowledgeBase**—A searchable database containing thousands of frequently asked questions (FAQs) and their corresponding answers or solutions, including special sections devoted to our newest products. The database is updated daily in response to new customer experiences and feedback.
- **Troubleshooting Wizards**—Step-by-step guides lead you through common problems and answer questions about our entire product line. Wizards include screen shots that illustrate the steps being described and provide detailed information ranging from simple getting started instructions to advanced topics.
- **Product Manuals**—A comprehensive, searchable library of the latest editions of National Instruments hardware and software product manuals.
- **Hardware Reference Database**—A searchable database containing brief hardware descriptions, mechanical drawings, and helpful images of jumper settings and connector pinouts.
- **Application Notes**—A library with more than 100 short papers addressing specific topics such as creating and calling DLLs, developing your own instrument driver software, and porting applications between platforms and operating systems.

## Software-Related Resources

- **Instrument Driver Network**—A library with hundreds of instrument drivers for control of standalone instruments via GPIB, VXI, or serial interfaces. You also can submit a request for a particular instrument driver if it does not already appear in the library.
- **Example Programs Database**—A database with numerous, non-shipping example programs for National Instruments programming environments. You can use them to complement the example programs that are already included with National Instruments products.
- **Software Library**—A library with updates and patches to application software, links to the latest versions of driver software for National Instruments hardware products, and utility routines.

# Worldwide Support

National Instruments has offices located around the globe. Many branch offices maintain a Web site to provide information on local services. You can access these Web sites from `www.ni.com/worldwide`

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France 01 48 14 24 24, Germany 089 741 31 30, Greece 30 1 42 96 427,
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Italy 02 413091, Japan 03 5472 2970, Korea 02 596 7456,
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Netherlands 0348 433466, Norway 32 27 73 00, Poland 48 22 528 94 06,
Portugal 351 1 726 9011, Singapore 2265886, Spain 91 640 0085,
Sweden 08 587 895 00, Switzerland 056 200 51 51,
Taiwan 02 2377 1200, United Kingdom 01635 523545

# Glossary

| Prefix | Meaning | Value |
|---|---|---|
| n- | nano- | $10^{-9}$ |
| µ- | micro- | $10^{-6}$ |
| m- | milli- | $10^{-3}$ |
| c- | centi- | $10^{-2}$ |
| k- | kilo- | $10^{3}$ |
| M- | mega- | $10^{6}$ |

## Symbols

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

## A

| | |
|---|---|
| A | Amperes |
| AC | Alternating current |
| Ah | Ampere hours |
| ANSI | American National Standards Institute |
| AWG | American Wire Gauge |

## B

| | |
|---|---|
| backplane | An assembly, typically a printed circuit board, with connectors and signal paths that bus the connector pins |

## C

| | |
|---|---|
| C | Celsius |
| cfm | Cubic feet per minute |
| CFR | Cooperative Fuel Research |
| CSA | Canadian Standards Association |

## D

| | |
|---|---|
| daisy-chain | A method of propagating signals along a bus, in which the devices are prioritized on the basis of their position on the bus |
| DC | Direct current |

## E

| | |
|---|---|
| ECL | Emitter-coupled logic |
| EIA | Electronic Industries Association |
| EMC | Electromagnetic Compatibility |

## F

| | |
|---|---|
| FCC | Federal Communications Commission |

## G

| | |
|---|---|
| g | 1) grams 2) A measure of acceleration equal to 9.8 $m/s^2$ |
| GPIB | General Purpose Interface Bus (IEEE 488) |

| | |
|---|---|
| $g_{RMS}$ | A measure of random vibration. The root mean square of acceleration levels in a random vibration test profile. |

## H

| | |
|---|---|
| Hz | Hertz; cycles per second |

## I

| | |
|---|---|
| IEC | International Electrotechnical Commission; an organization that sets international electrical and electronics standards |
| IEEE | Institute of Electrical and Electronics Engineers |
| $I_{MP}$ | Mainframe peak current |
| in. | Inches |

## L

| | |
|---|---|
| lb | Pounds |

## M

| | |
|---|---|
| m | Meters |
| MTBF | Mean time between failure |
| MTTR | Mean time to repair |

## N

| | |
|---|---|
| NEMA | National Electrical Manufacturers Association |

## P

| | |
|---|---|
| PXI | PCI eXtensions for Instrumentation |

## R

| | |
|---|---|
| RH | Relative humidity |
| RMS | Root mean square. A method used to measure electrical output in volts and watts |

## S

| | |
|---|---|
| s | Seconds |
| ST | Star Trigger |
| Star Trigger slot | This slot is located at slot 2 and has a dedicated trigger line between each peripheral slot. Use this slot for a module with ST functionality that can provide individual triggers to all other peripherals. |
| System controller | A module configured for installation in Slot 1 of a PXI chassis. This device is unique in the PXI system in that it performs the PCI system controller functions, including clock sourcing and arbitration for data transfers across the backplane. Installing such a device into any other slot can damage the device, the PXI backplane, or both. |

## U

| | |
|---|---|
| UL | Underwriter's Laboratories |

## V

| | |
|---|---|
| V | Volts |
| VAC | Volts alternating current |
| $V_{PP}$ | Peak to peak voltage |

## W

| | |
|---|---|
| W | Watts |

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