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PXI

PXI-1011 Chassis User Manual

Combination Chassis for PXI, CompactPCI, and SCXI™ Modules

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 labeled 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.



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.

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Readers in the European Union (EU) 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.

To obtain the DoC for this product, click **Declaration of Conformity** at `ni.com/hardref.nsf/`. This Web site lists the DoCs by product family. Select the appropriate product family, followed by your product, and a link to the DoC appears in Adobe Acrobat format. Click the Acrobat icon to download or read the DoC.

* 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.

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About This Manual

The *PXI-1011 Chassis User Manual* describes the features of the PXI-1011 chassis and contains information about configuring the chassis, installing the data acquisition (DAQ) and SCXI modules, and operating the chassis.

Conventions

The following conventions appear in this manual:

<> — Angle brackets that contain numbers separated by an ellipsis represent a range of values associated with a bit or signal name—for example, DBIO<3..0>.

» — The » symbol leads you through nested menu items and dialog box options to a final action. The sequence **File»Page Setup»Options** directs you to pull down the **File** menu, select the **Page Setup** item, and select **Options** from the last dialog box.

 — This icon denotes a note, which alerts you to important information.

 — This icon denotes a caution, which advises you of precautions to take to avoid injury, data loss, or a system crash. When this symbol is marked on the product, see the *Safety Information* for precautions to take.

bold — Bold text denotes items that you must select or click on in the software, such as menu items and dialog box options. Bold text also denotes parameter names.

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.

`monospace bold` — Bold text in this font denotes the messages and responses that the computer automatically prints to the screen. This font also emphasizes lines of code that are different from the other examples.

NI-DAQ	NI-DAQ is used throughout this manual to refer to the NI-DAQ driver software.
SCXIbus	SCXIbus refers to the backplane in the SCXI chassis subsystem. A signal on the backplane is referred to as the SCXIbus <signal name> line (or signal). The SCXIbus descriptor may be omitted when the meaning is clear.
PXI chassis	PXI chassis refers to the PXI-1011.

National Instruments Documentation

The *PXI-1011 Chassis User Manual* is one piece of the documentation set for the PXI system. You could have any of several types of documents, depending on the hardware and software in your system. Use the documents you have as follows:

- *PXI-1011 Chassis User Manual*—Read this manual first for maintenance information on the chassis and installation instructions. This manual serves as the SCXI chassis manual.
- *Getting Started with SCXI*—Read this manual second. It gives an overview of the SCXI system and contains the most commonly needed information for modules, chassis, and software.
- The SCXI user manuals and installation guides—Read these documents next for information about signal connections and module configuration. They also explain in greater detail how the module works and contain application tips/strategies.
- The DAQ user manuals and installation guides—This documentation has detailed information about the DAQ hardware that plugs into or is connected to the chassis. Use these documents for hardware installation and configuration instructions, specification information about the DAQ hardware, and application hints.
- Software documentation—You might have several sets of software documentation. After you have set up the hardware system, use either the application software (LabVIEW or Measurement Studio) or the NI-DAQ documentation to help you write your application.
- Accessory installation guides or manuals—If you are using accessory products, these installation guides or user manuals explain how to physically attach accessories to the system. Also consult these guides when you make signal connections.

Related Documentation

If you are designing your own PXI module, the *PXI Specification*, Revision 2.0, which is available at `pxia.org`, describes the physical, electrical, and timing requirements for PXI.

1

Introduction

This chapter describes the PXI-1011, lists what you need to get started, describes the optional equipment, and explains how to unpack the PXI-1011 chassis.

About the PXI-1011 Chassis

The PXI-1011 chassis integrates a high-performance 4-slot PXI subsystem with an 8-slot SCXI subsystem to offer a complete solution for signal conditioning and switching applications. The PXI section of the chassis accepts an embedded controller or a MXI-3 interface, and a wide variety of modules—such as multifunction I/O (MIO), digital I/O (DIO), and computer-based instrument modules. The eight SCXI slots integrate signal conditioning modules into the PXI system. These modules provide analog and digital input conditioning, isolation, and other functions. You can daisy chain additional SCXI chassis to add more signal-conditioning channels. Refer to the *SCXI-1346 Shielded Multi-Chassis Cable Adapter Installation Guide* for more information on using the PXI-1011 in daisy-chained multi-chassis systems.

What You Need to Get Started

To install and use the PXI-1011 chassis, you need the following items:

- ❑ PXI-1011 chassis
- ❑ Power cable (see Table 1-1)
- ❑ *PXI-1011 Chassis User Manual*
- ❑ NI-DAQ for PC compatibles
- ❑ PXI chassis initialization file for PXI-1011, version 1.0 (floppy disk) with `chassis.ini`. See Chapter 2, *Installing and Configuring the PXI-1011*, for detailed information on initializing the PXI-1011 chassis.

- ❑ PXI system controller and system initialization file, `pxisys.ini`. You can obtain the `pxisys.ini` file by going to `ni.com/support` and searching for the `pxisys.ini` file.
- ❑ PXI DAQ/DMM module
- ❑ SCXI module
- ❑ Flat-blade screwdriver
- ❑ Needle-nose pliers

Table 1-1. Power Cables

Power Cable	Reference Standards
Standard 120 V (USA)	ANSI C73.11/NEMA 5-15-P/IEC83
Switzerland 220 V	SEV
Australia 240 V	AS C112
Universal Euro 240 V	CEE (7), II, IV, VII IEC83
North America 240 V	ANSI C73.20/NEMA 5-15-P/IEC83
United Kingdom 240 V	BS 1363/IEC83

If you are missing any of the above items or if you have the incorrect power cable, contact your National Instruments (NI) sales representative or contact NI through `ni.com/contact`.

Unpacking

While unpacking the PXI-1011, do the following:

- Carefully inspect the shipping container and the chassis for damage.
- Look for visible damage to the chassis enclosure.
- Make sure all handles, external hardware, and switches are undamaged.
- Inspect the chassis slots for any possible damage, debris, or detached components.
- If damage appears to have been caused during shipment, file a claim with the carrier.
- Retain the packing material for possible inspection and/or reshipment.

Optional Equipment

NI offers a variety of products to use with the PXI-1011 chassis, such as:

- Both shielded and ribbon cables and cable accessories
- Shielded and unshielded 68- and 100-pin screw-terminal connector blocks
- SCXI modules, switches, and accessories for isolating, amplifying, filtering, and multiplexing signals
- PXI modules and accessories for data acquisition and instrumentation
- Rack-mount kit

For more specific information about these products, refer to the NI catalog, `ni.com/catalog`, or contact the sales office nearest you.

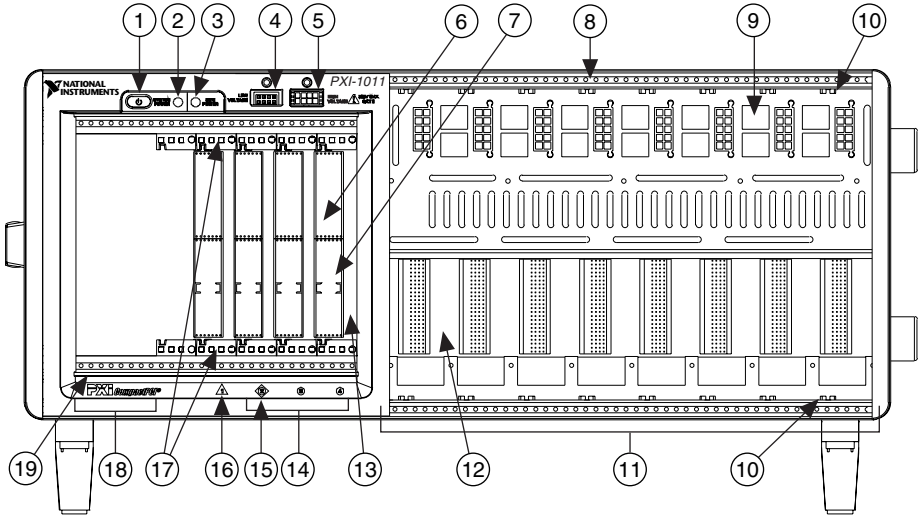
Key Features

The PXI-1011 combines a high-performance 4-slot PXI subsystem with an 8-slot SCXI subsystem. The PXI-1011 has a structural design that is optimized for use in a wide range of applications. The PXI-1011 fully complies with the *PXI Specification*, Revision 2.0, offering advanced timing and synchronization features.

The PXI-1011 has a built-in interconnection between the PXI and SCXI subsystems that allows a DAQ/DMM module in the fourth PXI slot to control the SCXI subsystem without additional cables. The SCXI subsystem provides a low-noise environment for signal conditioning. It supplies power and control circuitry for SCXI modules. You can use the PXI-1011 chassis with current and future SCXI modules.

Chassis Description

Figure 1-1 shows the front view of the PXI-1011. Table 1-2 describes the front view items.



1 System Power Switch
2 System Power Indicator LED
3 SCXI Subsystem Power Indicator LED
4 SCXI Low-Voltage Analog Bus Connector
5 SCXI High-Voltage Analog Bus Connector
6 P2 PXI Backplane Connectors
7 P1 PXI Backplane Connectors
8 SCXI Front-Threaded Strips
9 SCXI High-Voltage Backplane
10 SCXI Module Guides
11 SCXI Module Slots
12 SCXI Subsystem Backplane
13 PXI Subsystem Backplane
14 PXI Peripheral Slots
15 PXI Star Trigger Slot
16 PXI System Controller Slot
17 PXI Module Guides
18 PXI Controller Expansion Slots
19 Injector/Ejector Rail

Figure 1-1. Front View of the PXI-1011 Chassis

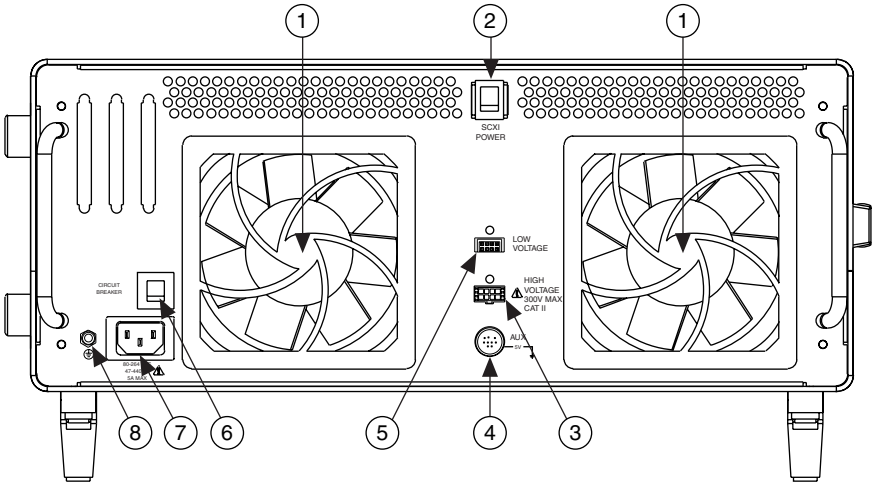
Table 1-2. PXI-1011 Chassis Front View Items

Item	Description
System Power Switch	Turns the chassis on and off.
System Power Indicator LED	When lit, indicates that the chassis is on. The PXI subsystem is always powered as long as the chassis is on.
SCXI Subsystem Power Indicator LED	When lit, indicates that the SCXI subsystem power is on. You can turn on/off the SCXI subsystem power using the SCXI subsystem power switch on the rear panel, while the system power switch is on.
SCXI Low-Voltage Analog Bus Connectors	Connect to the low-voltage analog bus (LVAB <0..3>) on the SCXI subsystem backplane.
SCXI High-Voltage Analog Bus Connectors	Connect to the high-voltage analog bus (HVAB <0..3>) on the SCXI high-voltage backplane.
PXI Backplane Connectors	Connect PXI modules to the PXIbus.
SCXI Front-Threaded Strips	Secure modules in the SCXI subsystem and attach SCXI terminal blocks.
SCXI High-Voltage Backplane	Brings high-voltage analog bus (HVAB <0..3>) connections to SCXI modules.
SCXI Module Guides	Guide modules to SCXIbus connectors.
SCXI Module Slots	Hold SCXI modules.
SCXI Subsystem Backplane	Brings power, control lines, and low-voltage analog bus connections to SCXI modules.
PXI Subsystem Backplane	Brings CompactPCI 64-bit bus, PXI trigger bus, PXI star trigger bus, and PXI local bus connections to PXI modules.
PXI Peripheral Slots	Hold PXI peripheral modules.
PXI Star Trigger Slot	Holds PXI star trigger controller or any PXI peripheral module.
PXI System Controller Slot	Holds PXI system controller.
PXI Module Guides	Guide PXI modules to PXIbus connectors.

Table 1-2. PXI-1011 Chassis Front View Items (Continued)

Item	Description
PXI Controller Expansion Slots	Provide space for large controllers.
Injector/Ejector Rails	Used to inject/eject the Injector/Ejector handle of a PXI module when the module is pushed in/out.

Figure 1-2 shows the chassis rear-view items that are described in Table 1-3.



1	Fans and Filters	5	SCXI Low-Voltage Analog Bus Connector
2	SCXI Subsystem Power Switch	6	Circuit Breaker
3	SCXI High-Voltage Analog Bus Connector	7	Power Entry Module
4	SCXI Auxiliary I/O Connector	8	Chassis Ground Screw

Figure 1-2. Rear View of the PXI-1011 Chassis

Table 1-3. PXI-1011 Chassis Rear View Items

Item	Description
Fans and Filters	Cool the chassis; prevent dirt from contaminating the chassis circuitry.
SCXI Subsystem Power Switch	Turns on/off SCXI subsystem power when the system power is on.
SCXI High-Voltage Analog Bus Connector	Connects to the high-voltage analog bus on the SCXI high-voltage backplane.
SCXI Auxiliary I/O Connector	Connects to the control lines on the SCXI subsystem backplane.
SCXI Low-Voltage Analog Bus Connector	Connects to the low-voltage analog bus on the SCXI subsystem backplane.
Circuit Breaker	Protects you and the chassis from electrical injury/damage in case of an overcurrent fault.
Power Entry Module	IEC receptacle for power input.
Chassis Ground Screw	Provides a place to make a connection to the safety earth ground.

SCXI Subsystem Overview

You can install several modules in the SCXI subsystem and use a DAQ/DMM module in slot 4 of the PXI subsystem to control and/or acquire data from all the SCXI modules.

Note The chassis address of the SCXI subsystem is hard-wired as 0 when configuring the SCXI subsystem.

PXI Subsystem Overview

The following sections describe the PXI subsystem.

Interoperability with CompactPCI

The PXI subsystem is interoperable with PXI-compatible products and standard CompactPCI products. This feature is important because many PXI-compatible systems 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 PXI-1011 backplane P1 connector meet the requirements of the CompactPCI specification for both the peripheral and system modules. The PXI-specific signals are located on the P2 connector and are found only on the lines that are reserved or not used in the CompactPCI 64-bit specification. Therefore, all modules that meet the CompactPCI 64-bit specification requirements function in the PXI-1011.

System Controller Slot

Slot 1 is the System Controller slot of the chassis as defined by the PXI specification. It has three controller expansion slots, which are used for system controller modules wider than one slot. As defined in the PXI specification, these slots allow the controller to expand to the left, so it does not fill all the peripheral slots.

Peripheral Slots

Slots 2 through 4 are the three PXI-1011 peripheral slots. You can use PXI modules in peripheral slots to add functionality to the PXI subsystem not already provided by the system controller. Examples of PXI peripheral modules are MIO, DIO, and instrument modules. Some peripheral slots also have special capabilities, such as the Star Trigger (slot 2) and the SCXI Control (slot 4).

Star Trigger Slot

Slot 2 is the Star Trigger slot. This slot has a dedicated equal-length trigger line connected to each peripheral slot (see Figure 1-3) and is intended for modules with Star Trigger functionality to provide individual triggers to all other peripheral modules. However, if you do not require advanced trigger functionality, you can install any standard peripheral module into this slot.

Local Bus

The PXI backplane local bus is a daisy-chained bus that connects each PXI peripheral slot with its adjacent left and right peripheral slots, as shown in Figure 1-3.

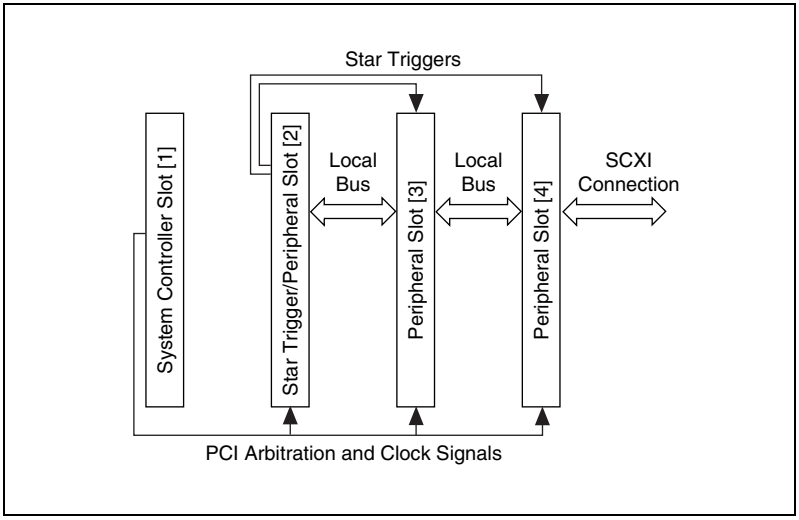


Figure 1-3. PXI Star Trigger and Local Bus Routing

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

Local bus signals can range from high-speed TTL signals to analog signals as high as 42 V. Keying of adjacent modules is implemented by initialization software that prohibits the use of incompatible modules. The `pxisys.ini` initialization file describes the PXI system configuration and the `chassis.ini` initialization file describes the functionality of the chassis. The `.ini` files use the configuration information specific to each peripheral module to evaluate compatibility before enabling local bus circuitry. This method provides a flexible means for defining local bus functionality that is not limited by hardware keying. The PXI-SCXI interface described in the *SCXI Control Slot* section is a typical application.

SCXI Control Slot

Slot 4 of the PXI backplane has connections for a PXI peripheral module to control the SCXI subsystem. These connections use the available local bus right pins (PXI_LBR0:12). The SCXI connection passes communication, timing, and low-voltage analog bus signals between the SCXI subsystem and the PXI module in slot 4.

Note For more information about the local bus right pins, see the *PXI Specification,* Revision 2.0.

Trigger Bus

The eight PXI trigger lines are routed 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 the asynchronous external events the system monitors or controls.

System-Reference Clock

The PXI-1011 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.

Caution 400 Hz power applications—The PXI-1011 can operate on 400 Hz power systems, but it is not qualified for use in aircraft. A navigation hazard can exist if the PXI-1011 is operated in flight with common avionics in use.

2

Installing and Configuring the PXI-1011

This chapter provides safety information and describes how to install and configure the PXI-1011 chassis.

Safety Information

The following section contains important safety information that you *must* follow when installing and using the product.

Do *not* operate the product in a manner not specified in this document. Misuse of the product can result in a hazard. You can compromise the safety protection built into the product if the product is damaged in any way. If the product is damaged, return it to NI for repair.

Do *not* substitute parts or modify the product except as described in this document. Use the product only with the chassis, modules, accessories, and cables specified in the installation instructions. You *must* have all covers and filler panels installed during operation of the product.

Do *not* operate the product in an explosive atmosphere or where there may be flammable gases or fumes. Operate the product only at or below the pollution degree stated in Appendix A, *Specifications*. Pollution is foreign matter in a solid, liquid, or gaseous state that can reduce dielectric strength or surface resistivity. The following is a description of pollution degrees:

- Pollution degree 1 means no pollution or only dry, nonconductive pollution occurs. The pollution has no influence.
- Pollution degree 2 means that only nonconductive pollution occurs in most cases. Occasionally, however, a temporary conductivity caused by condensation must be expected.
- Pollution degree 3 means that conductive pollution occurs, or dry, nonconductive pollution occurs that becomes conductive due to condensation.

Clean the product with a soft nonmetallic brush. Make sure that the product is completely dry and free from contaminants before returning it to service.

You *must* insulate signal connections for the maximum voltage for which the product or any installed module is rated. Do *not* exceed the maximum ratings for the product. Remove power from signal lines before connecting them to or disconnecting them from the product.

Operate this product only at or below the installation category stated in the Appendix A, *Specifications*.

The following is a description of installation categories:

- Installation category I is for measurements performed on circuits not directly connected to MAINS.[1] This category is a signal level such as voltages on a printed wire board (PWB) on the secondary of an isolation transformer.

  Examples of installation category I are measurements on circuits not derived from MAINS and specially protected (internal) MAINS-derived circuits.

- Installation category II is for measurements performed on circuits directly connected to the low-voltage installation. This category refers to local-level distribution such as that provided by a standard wall outlet.

  Examples of installation category II are measurements on household appliances, portable tools, and similar equipment.

- Installation category III is for measurements performed in the building installation. This category is a distribution level referring to hard-wired equipment that does not rely on standard building insulation.

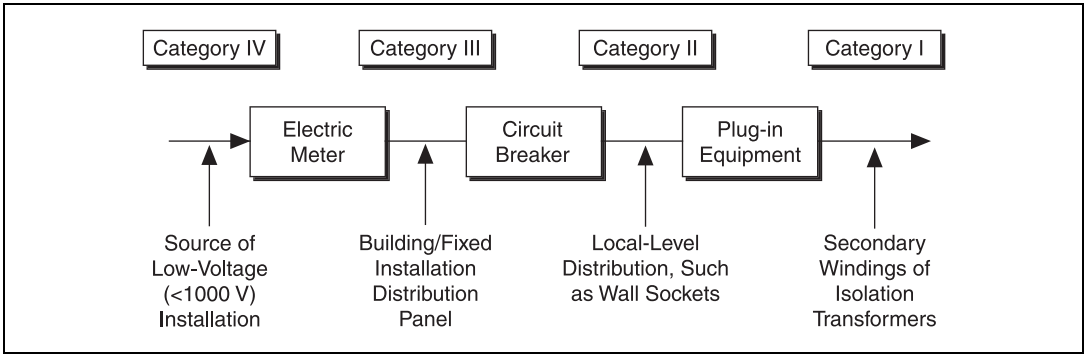
  Examples of installation category III include measurements on distribution circuits and circuit breakers. Other examples of installation category III are wiring including cables, bus-bars, junction boxes, switches, socket outlets in the building/fixed installation, and equipment for industrial use, such as stationary motors with a permanent connection to the building/fixed installation.

- Installation category IV is for measurements performed at the source of the low-voltage (<1,000 V) installation.

[1] MAINS is defined as the electricity supply system to which the equipment concerned is designed to be connected either for powering the equipment or for measurement purposes.

Examples of category IV are electric meters, and measurements on primary overcurrent protection devices and ripple-control units.

Below is a diagram of a sample installation.



Mounting Information

The PXI-1011 is designed to operate on a bench or in an instrument rack. Determine where you will use the PXI-1011 and follow the appropriate installation instructions.

Apertures in the rear and along both sides of the chassis facilitate power supply and module cooling. Air enters through filters and fan inlets located in the lower rear of the chassis and exits through the upper sections in the rear and along the sides. Place the PXI-1011 on a bench or in an instrument rack so that the fans (air inlets) and the air outlet apertures along both sides of the chassis have adequate ventilation. Keep other equipment a minimum of 10 cm (4 in.) away from the air inlets and outlets.

Install the chassis with easy access to the rear panel to simplify air filter maintenance and provide easy access to the SCXI subsystem power switch.

Rack-mount installations require the optional rack-mount kit available from NI. Refer to the *PXI-1011 Chassis Rack-Mount Kit Installation Guide* to install the PXI-1011 in an instrument rack.

PXI-1011 Chassis Installation

Caution Equipment described in this document *must* be used in an installation category II environment in accordance with IEC 60664. This category requires local-level supply MAINS-connected installation.

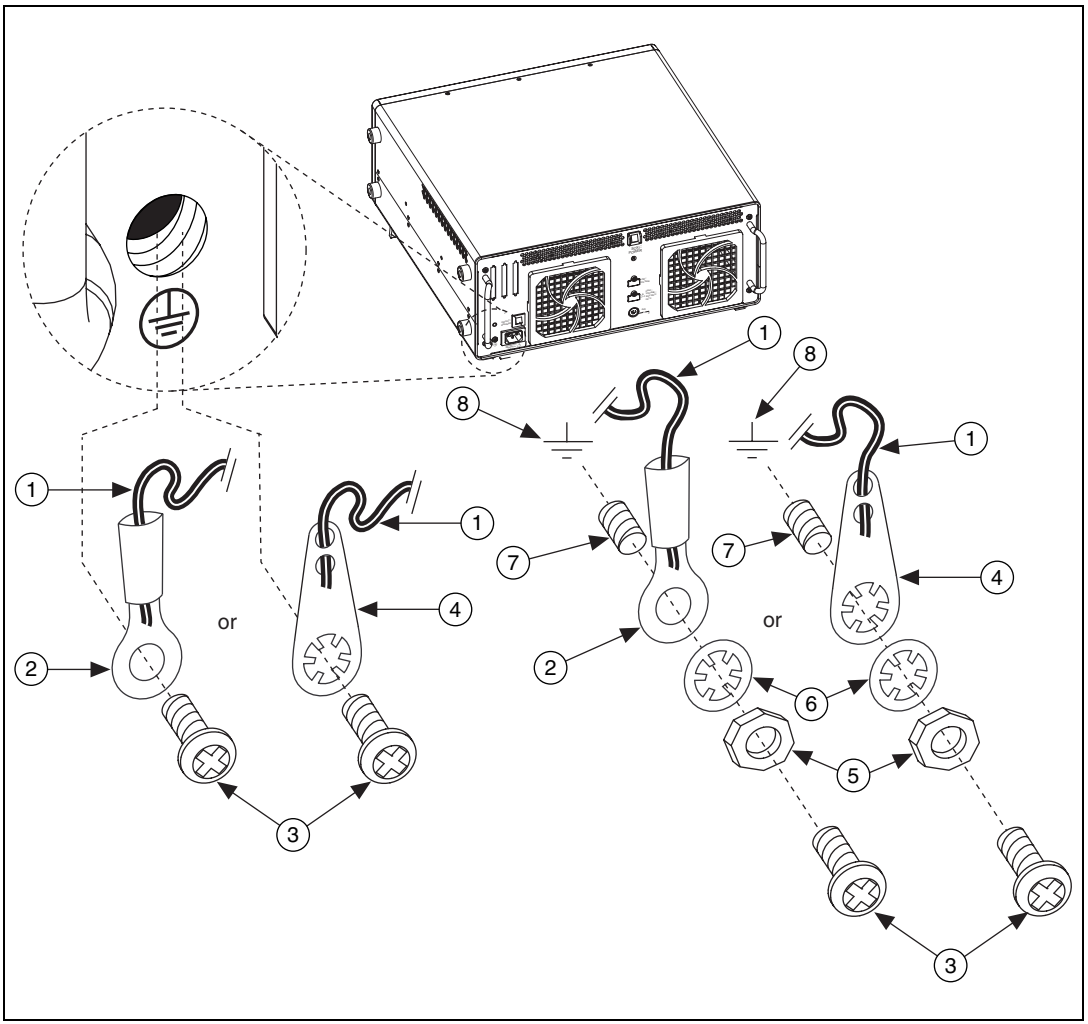
Connecting Safety Ground

Caution The PXI-1011 chassis is designed with a three-wire style cord that connects the ground (protective earth) line to the chassis ground. To minimize shock hazard, the electrical power outlet *must* have an appropriate earth safety ground that is connected whenever you use the chassis.

If the power outlet does not have an appropriate ground connection or the power frequency is above 63 Hz, you must connect the premise safety ground to the chassis grounding screw located on the rear panel. Refer to Figure 2-1 to connect the safety ground, while completing the following steps:

1. Connect a 16 AWG (1.3 mm diameter) or larger wire to the chassis grounding screw using the supplied 10-32 screw and a toothed lug. The copper wire must have green insulation with a yellow stripe or must be non-insulated (bare).
2. Attach the other end of the wire to permanent earth ground using toothed washers or a toothed lug.

Caution The electrical wiring codes in your area may not consider soldered connections as reliable. A crimp style connector is recommended with two crimps applied to improve reliability.



1	Ground Wire (can be either bare solid copper or green insulated with a yellow stripe)	5	Hex Nut
2	Crimp Type Ring Lug	6	Star Washer
3	Grounding Screw	7	Grounding Stud
4	Solder Type Star Ring Lug	8	Earth Ground

Note: You can use grounding screws to attach to earth ground, or if using a grounding stud, use the star washers with hex nuts.

Figure 2-1. Grounding the PXI-1011 Chassis

Installing the PXI-1011

Follow these steps to install the PXI-1011 chassis:

1. Place the PXI chassis on a sturdy, level surface. Leave at least 10 cm (4 in.) of space behind the chassis for adequate air circulation.
2. Turn off the system using the power switch shown in Figure 1-1, *Front View of the PXI-1011 Chassis*. When the pushbutton is in the *out* position, the system power is off.
3. Insert the female end of the power cable into the power-entry module.
4. Insert the male end of the power cable into the wall outlet.
5. Install the SCXI and PXI modules into the chassis as described in the *Installing an SCXI Module* and *Installing a PXI Module* sections.
6. Install front filler panels if needed (see the *Installing PXI Filler Panels* and the *Installing SCXI-1360 Filler Panels* sections for installation details).
7. Turn on the system using the power switch.

   The system power indicator LED should be lit now, which indicates that system power is available to both the PXI and SCXI subsystems. The PXI subsystem remains powered as long as the system power is on. However, you can control the SCXI subsystem using the power switch on the rear panel.
8. If the SCXI subsystem power indicator LED is lit, then the SCXI subsystem power is on. If not, turn on the SCXI subsystem using the power switch on the rear panel. You can use the SCXI subsystem power switch to power the SCXI subsystem on/off only when the system power is on.

Installing a PXI Module

Caution Before installing CompactPCI or PXI modules, *turn off* the system using the power switch shown in Figure 1-1, *Front View of the PXI-1011 Chassis*.

Note Remove any rubber thread protectors from the PXI module mounting screws before you install the module.

Follow these steps to install a PXI module into the PXI subsystem:

1. Place the module edges into the PXI chassis module guides (top and bottom), as shown in Figure 1-1, *Front View of the PXI-1011 Chassis*.
2. Slide the module to the rear of the chassis, making sure that the injector/ejector handle is pushed down, as shown in Figure 2-2.

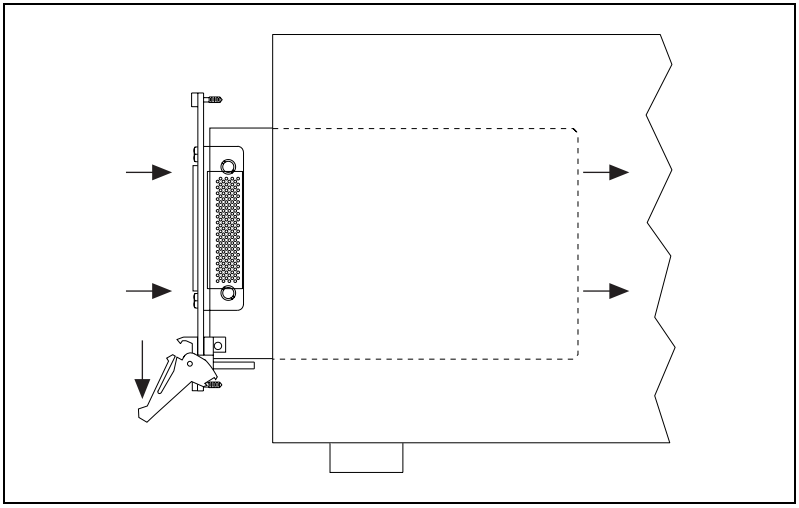


Figure 2-2. Injector/Ejector Handle Position during Module Insertion

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

Installing PXI Filler Panels

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

Installing an SCXI Module

Note Remove any rubber thread protectors from the SCXI module mounting screws before you install the module.

Follow these steps to install an SCXI module:

1. Turn off the SCXI subsystem using the switch shown in Figure 1-2, *Rear View of the PXI-1011 Chassis*, or turn off the system power.
2. Remove the front filler panel of an unused SCXI slot.
3. Insert the module into the module guide rails and slide the module to the back of the chassis. Do *not* force the module into place.
4. Fasten the front panel of the module to the top and bottom threaded strips of the SCXI subsystem using the thumbscrews on the module front panel.
5. Refer to the module user manual and install any necessary cables, cable accessories, or terminal blocks.

Refer to the SCXI module and terminal block documentation for specific instructions related to configuration and signal connections.

Installing SCXI-1360 Filler Panels

The SCXI-1360 filler panels protect the inside of the SCXI subsystem by preventing unwanted material from entering the PXI-1011 chassis and damaging modules or forming conductive paths that can degrade performance. Install all SCXI modules first, then, in any unused SCXI slots, install filler panels.

Filler panels are the full height of a slot. Follow these steps to install SCXI-1360 filler panels:

1. Place the filler panel with the captive screws in front of an unused SCXI slot. Line up the screws with the threaded strip holes.
2. Using a flat-blade screwdriver, screw the two captive screws into the threaded strip holes.

System Configuration and Initialization Files

The PXI specification allows many combinations of PXI chassis and system modules. To assist system integrators, the manufacturers of PXI chassis and system modules must 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` files, and configuration utilities and device drivers can also use them.

The documentation for the PXI-1011 chassis is contained in the `chassis.ini` file on the diskette that comes with the chassis. The information in this file is combined with information about the system controller into a single system initialization file called `pxisys.ini` (PXI System Initialization). The system controller manufacturer either provides a `pxisys.ini` file for the particular chassis model that contains the system controller or provides a utility that can read an arbitrary `chassis.ini` file and generate the corresponding `pxisys.ini` file. System controllers from NI provide the `pxisys.ini` file for the PXI-1011 chassis, so you should not need to use the `chassis.ini` file. Refer to the documentation provided by the system controller for more information on `pxisys.ini` and `chassis.ini` files.

Device drivers and other utility software read the `pxisys.ini` file to determine information about the system. The device drivers should have no need to directly read the `chassis.ini` file. For detailed information regarding initialization files, please refer to the PXI specification at `pxisa.org`.

3

Maintaining the PXI-1011

This chapter describes basic maintenance procedures for the PXI-1011 chassis.

Maintenance Procedures

Service Interval

Clean the chassis fan filters every six months. Depending on chassis use and ambient dust levels in the operating environment, the filters 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 *Safety Information* section in Chapter 2, *Installing and Configuring the PXI-1011*, 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 cleaning the exterior and interior of the chassis and the fan filters. Refer to the PXI module documentation for information on cleaning the individual CompactPCI or PXI modules.

Caution *Always* turn off the chassis and disconnect the power cable before cleaning or servicing the chassis.

Cleaning the Interior

Use a dry, low-velocity stream of air to clean the chassis interior. 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.

Cleaning the Exterior

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.

Cautions 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 chemical cleaning agents—they can damage the chassis. Avoid chemicals that contain benzene, toluene, xylene, acetone, or similar solvents.

Cleaning the Fan Filter

To easily remove the chassis cooling filters from the rear of the chassis, turn off the chassis and remove the plastic housing attached to each fan, as shown in Figure 1-2, *Rear View of the PXI-1011 Chassis*.

To clean the fan filters, wash them in a mild soap solution, and then vacuum them or blow air through them. Rinse the filters with water and allow them to dry before reinstalling them onto the chassis.

Resetting the AC Main Circuit Breaker

If the PXI chassis encounters an overcurrent condition, the circuit breaker located on the rear panel trips to prevent chassis damage. Refer to Figure 1-1, *Front View of the PXI-1011 Chassis*, and Figure 1-2, *Rear View of the PXI-1011 Chassis*, and complete the following steps to reset the circuit breaker:

1. Turn off the system using the power switch.
2. Depress the circuit breaker to reset it.
3. Turn on the system using the power switch.

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

1. Turn off the system using the power switch.
2. Remove all the PXI and SCXI modules from the chassis.
3. Depress the circuit breaker to reset it.
4. Turn on the system using the power switch and verify that the circuit breaker does not trip.
5. Verify that the PXI-1011 can meet the power requirements of the CompactPCI and PXI modules. Overloading the chassis can trip the breaker. Refer to Appendix A, *Specifications*, for power requirements.
6. The overcurrent condition that caused the circuit breaker to trip can be due to a faulty CompactPCI or PXI module. Refer to the module documentation to troubleshoot faulty modules.

Troubleshooting the PXI-1011

Refer to Table 3-1 to troubleshoot power failure problems for the PXI-1011 chassis. The table lists possible causes for power failure and recommends ways to correct the problem.

Table 3-1. Troubleshooting Power Failure

Possible Cause	What to Do
PXI-1011 chassis is not connected to power source.	Make sure that the PXI-1011 is connected to a live electrical outlet. Try operating another piece of equipment from this outlet.
System power switch is not turned on.	Set the system power switch to the *ON* (pushed in) position.
SCXI power switch is not turned on.	Set the SCXI power switch to the *ON* position.
Short-circuit condition exists.	Remove all modules from the chassis. Carefully inspect each module and remove the short-circuit condition.
Circuit breaker is tripped.	Reset the circuit breaker. Refer to the *Resetting the AC Main Circuit Breaker* section in this chapter.
Power supply has failed.	Contact NI through your sales representative or `ni.com/support`.

A

Specifications

This appendix contains complete specifications for the PXI-1011 chassis.

Note The acquisition rate is dependent upon the chassis configuration. Chassis configuration consists of quantity and type of PXI/SCXI modules in use.

Embedded SCXI

Max sampling rate
(12-bit accuracy) ..... 333 kS/s

System Electrical Characteristics

AC Input

Input voltage range..... 100 to 240 VAC

Input frequency range ..... 47 to 440 Hz

Note Additional earth safety ground is required when the frequency is greater than 63 Hz. See the *PXI-1011 Chassis Installation* section in Chapter 2, *Installing and Configuring the PXI-1011*, for more information on grounding the chassis.

Overcurrent protection ..... 5 A circuit breaker

Operating current ..... 4.2 A at 85 VAC

AC to DC power
conversion efficiency ..... 70% typ

DC Output

PXI max usable power.....140 W

PXI subsystem DC current capacity

Table A-1. Maximum Currents Available to PXI Subsystem

Voltage	I_{MAX} (Steady-state current)
+3.3 V	15.0 A
+5 V	12.0 A
+12 V	2.0 A
–12 V	0.5 A

SCXI subsystem DC current capacity

Table A-2. Maximum Currents Available to SCXI Subsystem

Voltage	I_{MAX}	
	Steady-State Current	Current per SCXI Slot
+5 V	400 mA	50 mA
V+ (+20 V nominal)	1.36 A	170 mA
V– (+20 V nominal)	1.36 A	170 mA

Regulation.....±5%, all outputs

Max peak-to-peak ripple and noise.....1% from 0 to 20 MHz bandwidth

Overcurrent protection.....Constant current limiting at 140 to 150% of rated output

Overvoltage protection .....110% +0.5 V for each output

PXI Subsystem Cooling

Per slot cooling capacity	Slot cooling capacity in worst-case slot is 20 W
Module cooling system	Forced air circulation (positive pressurization) using two fans
Slot airflow direction	P1 to P2, bottom of module to top of module
Module cooling intake	Bottom rear of chassis
Module cooling exhaust	Top sides and rear of chassis
Power supply cooling system	Forced air circulation using integrated fan
Power supply cooling intake	Rear of chassis
Power supply cooling exhaust	Sides and rear of chassis

PXI Backplane

Size	3U-sized PXI subsystem; one system slot (with three system expansion slots) and three peripheral slots.[1]
Backplane bare-board material	UL 94 V-0 rated
Backplane connectors	Conform to IEC 917 and IEC 1076-4-101, and are UL 94 V-0 rated

[1] Complies with IEEE 1101.10 mechanical packaging.
Complies with PXI Specifications, Revision 2.0.
Accepts both PXI and CompactPCI (PICMG 2.0 R2.1) 3U modules.

Mechanical

Usable PXI peripheral slots 3

Usable SCXI slots.....8

Overall dimensions .....44.7 by 43.9 by 17.7 cm (17.6 by 17.3 by 7 in.)

Weight .....9 kg (20 lb)

Environmental

Functional shock (operational) .....MIL-T-28800E CLASS 3, Half-Sine Shock Pulse, 11 ms duration, 30 g peak

Random vibration (operational).....5 to 500 Hz, 0.31 g_{rms}

Random vibration (non-operational)[1].....10 to 500 Hz, 2.46 g_{rms}

Operating temperature .....0 to 50 °C

Storage temperature.....–20 to 70 °C

Humidity .....10 to 90% RH, noncondensing

Maximum altitude.....2000 meters

Pollution degree (indoor use only) 2

Safety

The PXI-1011 chassis meets the requirements of the following standards for safety and electrical equipment for measurement, control, and laboratory use:

- EN 61010-1:1993/A2:1995, IEC 61010-1:1990/A2:1995
- UL 3111-1:1994
- CAN/CSA c22.2 no. 1010.1:1992/A2:1997

[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.

Electromagnetic Compatibility

CE, C-Tick, and FCC Part 15 (Class A) compliant

Electrical emissions..... EN 55011 Class A at 10 m
FCC Part 15A above 1 GHz

Electrical immunity..... Evaluated to EN 61326:1997/
A1:1998, Table 1

Note For full EMC compliance, you must operate this device with shielded cabling. In addition, all covers and filler panels must be installed. Refer to the Declaration of Conformity (DoC) for this product for any additional regulatory compliance information. To obtain the DoC for this product, click **Declaration of Conformity** at `ni.com/hardref.nsf/`. This Web site lists the DoCs by product family. Select the appropriate product family, followed by the product, and a link to the DoC appears in Adobe Acrobat format. Click the Acrobat icon to download or read the DoC.

B

P1 (J1) and P2 (J2) Connector Pin Assignments

This appendix describes the P1 (J1) and P2 (J2) connector pin assignments for the PXI subsystem backplane in Tables B-1 through B-6.

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

Table B-1. P1 (J1) Connector Pin Assignments 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 Pin Assignments 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 Pin Assignments 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 Pin Assignments 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 Pin Assignments 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 Pin Assignments 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

Common Questions

This appendix lists common questions related to the use of the PXI-1011 chassis.

How do I obtain the most current version of NI-DAQ?

You can obtain the most current version of NI-DAQ at `ni.com/downloads`.

Where can I obtain the correct `pxisys.ini` file to use with my PXI-1011 chassis and system controller?

You can obtain the `pxisys.ini` file by going to `ni.com/support/pxi` and searching for the `pxisys.ini` file you need.

How do I use MAX to configure the SCXI subsystem in a PXI-1011 chassis?

1. Launch Measurement & Automation Explorer.
2. Locate **Devices and Interfaces** in the left-hand pane of the MAX window. Right-click the entry and choose **Create New...** from the pop-up menu.
3. In the **Create New** window select the PXI-1011 chassis and click **Finish**.
4. If the monitor displays an error message stating that the `pxisys.ini` file was not located, make sure that you have the current version of NI-DAQ and the appropriate `pxisys.ini` file for the controller and chassis. You must also verify that the `pxisys.ini` file is in the correct directory as shown in Table C-1.

Table C-1. Locations of `pxisys.ini` File for Various Operating Systems

Operating System	Location of `pxisys.ini` File
Windows 2000	`C:\WinNT`
Windows NT	`C:\WinNT`
Windows Me	`C:\Windows`
Windows 98/95	`C:\Windows`

5. If the **Control SCXI with Internal Bus** option is grayed out, check the following:
   a. Make sure you have the current version of NI-DAQ.
   b. Make sure the PXI DAQ or DMM module is in the PXI slot closest to the SCXI subsystem.
   c. Make sure the SCXI subsystem is turned on.
   d. Verify that you have the correct `pxisys.ini` file.

Note You cannot control the SCXI subsystem using the internal bus until you can select this option. If the **Control SCXI with Internal Bus** option is grayed out, you cannot work around this limitation by manually adding the SCXI modules using MAX.

6. Click **OK,** and you are prompted to auto-detect any SCXI modules that have been installed. Make sure that the SCXI subsystem is turned on. Click **Yes** to auto-detect the modules.

The chassis should now appear in the **Devices and Interfaces** section of MAX.

After installation, you can manually configure additional modules by right-clicking on the SCXI slots available in the PXI chassis sub-menu (under **Devices and Interfaces**) and choosing **Insert...** from the pop-up menu.

How do I configure the SCXI subsystem in an RT-series PXI-1011 chassis?

1. Launch Measurement & Automation Explorer.
2. To launch Remote DAQ Configuration, select **Tools»NI-DAQ Configuration»Remote DAQ Configuration**. Type the RT engine IP address, and password if necessary. Click **OK**.

3. Highlight SCXI chassis in the **Remote DAQ Configuration** window, and click **Add**. Select the SCXI chassis and click **Next**. Select `PXI-1011` from the list and click **Next**. Verify the chassis ID and click **Finish**.
4. Expand the `PXI-1011` entry to configure the SCXI modules in the chassis. Click the SCXI slots available in the PXI chassis sub-menu and click **Add**. Choose **SCXI Module** and click **Next**. Select the correct slot and module from the list and follow the instructions to complete the configuration.
5. Make sure that you have the current version of NI-DAQ and the correct version of `pxisys.ini`. Verify that the `pxisys.ini` file is in the correct directory. You can download the appropriate `pxisys.ini` file from `ni.com/support`. When using any PXI RT system, the `pxisys.ini` file resides in the following two locations:
   - The host Windows machine has a copy that is downloaded to any target on which you are updating software. This location is in the `RT Images` folder, which is located at `~\National Instruments\RT Images`.
   - The RT Series PXI controller has a copy in the `c:\ni-rt\system\` folder. This is the actual file the RT system uses to configure its PXI backplane.
6. If the **Control SCXI with Internal Bus** option is grayed out, check the following:
   a. Make sure you have the current version of NI-DAQ. You can download the most current version of NI-DAQ at `ni.com/downloads`.
   b. Make sure the PXI DAQ or DMM module is in the PXI slot closest to the SCXI subsystem.
   c. Make sure the SCXI subsystem is turned on.
   d. Make sure that you have the correct `pxisys.ini` file for the PXI controller.

Note You cannot control the SCXI subsystem using the internal bus until you are allowed to select this option. If the **Control SCXI with Internal Bus** is grayed out, you can still have trouble communicating with the SCXI module, even if you add them manually.

PXI-8155/56, PXI-8155B/56B, and PXI-817*X* controllers ship with a floppy disk that contains a different `pxisys.ini` file for each chassis. Where should I put the `pxisys.ini` file on my computer?

Search for and remove any older versions of `pxisys.ini` file on the system. Put the new `pxisys.ini` file in the directory according to your operating system as shown in Table C-1.

Which address should I use for the SCXI subsystem in my PXI-1011 chassis?

The PXI-1011 chassis has no chassis-address switches and is internally hard-wired to an address of zero.

I use the *SCXI POWER* switch on the rear of the PXI-1011 chassis to toggle the SCXI subsystem power from *ON* to *OFF* while the PXI subsystem power remains *ON*. This permits me to safely remove/insert modules from/into the SCXI subsystem without shutting down the PXI controller and operating system. When I switch the SCXI subsystem power *ON* again, MAX sometimes reports erroneous information about which SCXI modules are currently in the SCXI subsystem. How do I correct this information?

NI recommends that you have the *SCXI POWER* switch, located on the rear of the PXI-1011 chassis, in the *ON* position when you turn on the power using the *SYSTEM POWER* switch, located on the front of the PXI-1011 chassis.

If at any point MAX cannot detect and verify the SCXI subsystem correctly, do the following:

1. Leave the *SCXI POWER* switch *ON*.
2. Shut down the operating system.
3. Turn the *SYSTEM POWER* switch *OFF*.
4. Turn the *SYSTEM POWER* switch *ON*.
5. Wait for the operating system to restart, and launch MAX again.

How do I get the modules in the SCXI subsystem of a PXI-1011 chassis to appear in a MXI-3 system?

First, make sure you have the latest version of NI-DAQ and the MXI-3 optimization software installed on the chassis. You must have a version 1.1 or later of the MXI-3 Optimization software. You can find this software at `ni.com/downloads`.

A typical PXI system, with an embedded computer, has a `pxisys.ini` file in the `Windows` or `WinNT` directory. Configuration software, such as that included with NI-DAQ, uses this file to determine the characteristics of the controller and the chassis that make up the PXI system. Part of the `pxisys.ini` file describes any external buses, such as the SCXIbus, that are coupled to one of the PXI slots. In the case of the PXI-1011 chassis, the contents of this file tell the controller that slot 4 of the PXI-1011 is connected to the SCXIbus.

A MXI-3 system controller is a PCI bus to PXI bus connection. It initially does not contain a `pxisys.ini` file. Since this file does not exist, initially there is no information about the SCXI modules in the PXI-1011 chassis.

You can correct the problem by copying the missing `pxisys.ini` file into the `Windows` or `WinNT` directory of the host computer. You can obtain the `pxisys.ini` file for the PXI-1011 by going to `ni.com/support/pxi` and searching for the `pxisys.ini` file you need. You must then modify this file to reflect the PCI bus characteristics that describe slot 4 of the PXI-1011 chassis. These characteristics include the PCI bus number (PCIBusNumber) and PCI device number (PCIDeviceNumber), and with MXI-3 these can vary from system to system due to the variety of PCI implementations on PC motherboards. The following information helps you modify the `pxisys.ini` file. To modify the `pxisys.ini` file, open the file in a text editor and locate the following section:

```
[Slot4]

IDSEL = 29

SecondaryBusNumber = 0

ExternalBackplaneInterface = SCXI

PCIBusNumber = 2

PCIDeviceNumber = 13
```

In a MXI-3 system, the PCIBusNumber can change depending on the layout of the host PCI motherboard and the PCI slot in which the primary MXI-3 board resides.

The way that you determine the PCI Bus Number depends on your operating system:

- Win32 operating systems with a Device Manager utility such as Windows 2000/98/95.

  After you have installed the PXI DAQ or DMM module in the rightmost slot in the PXI-1011 chassis, open your **Device Manager Utility**, which you can usually find in **System Properties**. You should see an entry for **Data Acquisition Devices**. Expand this entry and you should find the PXI DAQ module which you installed in slot 4. Right-click this device and select **Properties**. Go to the tab labeled **NI-DAQ Information**. Here you find the appropriate PCI Bus Number to enter into your `pxisys.ini` file.

- Operating systems without a Device Manager utility such as Windows NT.

  After you have installed the PXI DAQ or DMM module in the rightmost slot in the PXI-1011chassis, you can determine the proper PCI Bus Number from a log file generated by your MXI-3 optimization software. Search your system for a file called `mxi3.log`. After running the MXI-3 optimization software, this text file contains both the PCI bus number and the PCI device number for the DAQ card in the last slot of the PXI-1011 chassis. These numbers should be entered into the `pxisys.ini` file under the information for slot 4.

  You can confirm that your `pxisys.ini` file is correct by adding the PXI-1011 chassis in MAX. With the PXI DAQ or DMM module in the rightmost slot, right-click **Devices and Interfaces** in MAX and select **Create New**. Select the PXI-1011 chassis from the list. The next screen prompt presents you with a check-box asking you to control SCXI with **Internal Bus**. If this checkbox is grayed out, you have not properly edited your `pxisys.ini` file.

How can I get my PXI-1011 chassis to connect through the SCXI backplane to my RT Series DAQ device over MXI-3?

When you configure the PXI-1011 in MAX, the option to **`Control SCXI with internal BUS`** is disabled even if the RT Series DAQ device, such as the 7030/6*xxx*, is located in slots 3 and 4.

To enable this option, you need to modify the `pxisys.ini` file. You must add the modified file to the `Windows` folder of the host computer.

To allow the computer to recognize the RT Series DAQ device as the SCXI backplane controller, you must exit the `pxisys.ini` file to specify where

the device is located. The `pxisys.ini` file has an entry for each slot of the PXI chassis, as follows:

```
[Slot2]
IDSEL = 31
SecondaryBusNumber = 0
ExternalBackplaneInterface = None
PCIBusNumber = 0
PCIDeviceNumber = 15
```

You must modify entries in slots 3 and 4. The architecture of the RT Series DAQ device is such that the motherboard is in slot 3 and on the PXI bus. The daughterboard in slot 4 connects to the SCXI backplane, but the daughterboard is not on the PXI bus. Therefore, you must change the following entries:

```
[Slot3]
IDSEL = 30
SecondaryBusNumber = 0
ExternalBackplaneInterface = None
PCIBusNumber = 0
PCIDeviceNumber = 14
[Slot4]
IDSEL = 29
SecondaryBusNumber = 0
ExternalBackplaneInterface = None
PCIBusNumber = 0
PCIDeviceNumber = 13
```

These changes reflect the RT Series DAQ motherboard (70*xx*) on the PXI bus and the daughterboard connection to the SCXI backplane. In order to find the PCIBusNumber for slot 3 when using Windows complete the following steps.



Note You do not need to modify the PCIDevice Number.

1. Open **Device Manager**.
2. Select the PCI-70*xx* under **DAQ Devices**. The bus number is listed under the **NI Device Information** tab.

3. Modify the PCIBusNumber for slot 3 to match what the **Device Manager** lists.
4. Slot 4 must connect to the SCXI backplane. Change the ExternalBackplaneInterface to `SCXI`.

If you use Windows NT, go to `ni.com/support` to obtain the MXI-3 Optimization Software utility, which returns the PCI bus number.

How do I use multiple SCXI chassis with a PXI-1011 chassis and E Series DAQ device?

The SCXI subsystem that is integrated into the PXI-1011 chassis communicates with a PXI DAQ or DMM module through an internal backplane. The SCXI subsystem uses a channel on the PXI DAQ module that is dedicated to the internal backplane, which frees analog channel 0 on the PXI DAQ module for other uses.

Keep the following in mind when adding one or more SCXI chassis to a PXI-1011 chassis:

- The integrated SCXI subsystem communicates through the internal backplane and additional external SCXI chassis are connected to the front of the PXI DAQ module that controls the integrated SCXI chassis.
- The integrated SCXI chassis is hard-wired for chassis address 0. You can arbitrarily assign the chassis ID.
- Give additional external SCXI chassis a chassis address and chassis ID that do not conflict with the values in MAX for the integrated SCXI chassis.

Example:

I have a PXI-1011 chassis with a PXI-6040E PXI DAQ module to control the integrated SCXI chassis. I want to add two SCXI-1001 chassis to this system.

Cable connections:

1. Connect one of the SCXI-1001 chassis to the front of the PXI-6040E PXI DAQ module using an SH6868 cable and an SCXI-1346 cable adapter.
2. Daisy chain (connect in series) the second SCXI-1001 chassis to the first one using an SCXI-1349 cable adapter.

Configuration:

Use MAX to add the integrated SCXI subsystem and the two external SCXI-1001 chassis to the list of installed devices and interfaces. Use MAX and the front-panel switches on the external chassis to assign a unique chassis address and ID to each chassis, as shown in Table C-2.

Table C-2. Chassis Address and ID

Chassis	Chassis Address	Chassis ID
PXI-1011 Integrated Chassis	Defaults to 0	Use MAX to assign a value of 1
First External SCXI-1001 Chassis	Set chassis front-panel switches and MAX for a value of 1	Use MAX to assign a value of 2
Second External SCXI-1001 Chassis	Set chassis front-panel switches and MAX for a value of 2	Use MAX to assign a value of 3

Channel addressing in LabVIEW:

- Integrated SCXI subsystem:

  `ob0 ! sc1 ! mdZ ! channel#`

- SCXI-1001 chassis cabled to PXI DAQ module:

  `ob0 ! sc2 ! mdZ ! channel#`

- Last SCXI-1001 chassis in the chain:

  `ob1 ! sc3 ! mdZ ! channel#`

D

Technical Support Resources

Web Support

National Instruments Web support is your first stop for help in solving installation, configuration, and application problems and questions. Online problem-solving and diagnostic resources include frequently asked questions, knowledge bases, product-specific troubleshooting wizards, manuals, drivers, software updates, and more. Web support is available through the Technical Support section of `ni.com`.

NI Developer Zone

The NI Developer Zone at `ni.com/zone` is the essential resource for building measurement and automation systems. At the NI Developer Zone, you can easily access the latest example programs, system configurators, tutorials, technical news, as well as a community of developers ready to share their own techniques.

Customer Education

National Instruments provides a number of alternatives to satisfy your training needs, from self-paced tutorials, videos, and interactive CDs to instructor-led hands-on courses at locations around the world. Visit the Customer Education section of `ni.com` for online course schedules, syllabi, training centers, and class registration.

System Integration

If you have time constraints, limited in-house technical resources, or other dilemmas, you may prefer to employ consulting or system integration services. You can rely on the expertise available through our worldwide network of Alliance Program members. To find out more about our Alliance system integration solutions, visit the System Integration section of `ni.com`.

Worldwide Support

National Instruments has offices located around the world to help address your support needs. You can access our branch office Web sites from the Worldwide Offices section of `ni.com`. Branch office Web sites provide up-to-date contact information, support phone numbers, e-mail addresses, and current events.

If you have searched the technical support resources on our Web site and still cannot find the answers you need, contact your local office or National Instruments corporate. Phone numbers for our worldwide offices are listed at the front of this manual.

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
ANSI	American National Standards Institute
asynchronous timing	1. hardware—a property of an event that is not synchronized to a reference clock 2. software—a property of a function that begins an operation and returns before the operation is complete
AWG	American Wire Gauge

B

backplane	an assembly, typically a printed circuit board, with connectors and signal paths that route the connector pin signals
bandwidth	the range of frequencies present in a signal, or the range of frequencies to which a measuring device can respond
bus	the group of conductors that interconnect individual circuitry in a computer. Typically, a bus is the expansion interface to which I/O or other devices are connected. Examples of PC buses are the ISA bus and PCI bus.

C

C	Celsius
cfm	cubic feet per minute
CFR	Code of Federal Regulations
combination chassis	a chassis that integrates the PXI and SCXI systems
CompactPCI	an adaptation of the Peripheral Component Interconnect (PCI) Specification 2.1 or later for industrial and/or embedded applications requiring a more robust mechanical form factor than desktop PCI. It uses industry standard mechanical components and high-performance connector technologies to provide an optimized system intended for rugged applications. It is electrically compatible with the PCI Specification, which enables low-cost PCI components to be utilized in a mechanical form factor suited for rugged environments.
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
DAQ	data acquisition—(1) collecting and measuring electrical signals from sensors, transducers, and test probes or fixtures and processing the measurement data using a computer; (2) collecting and measuring the same kinds of electrical signals with A/D and/or DIO devices plugged into a computer, and possibly generating control signals with D/A and/or DIO devices in the same computer
DC	direct current
DoC	Declaration of Conformity
DOC	Department of Communications (of Industry Canada)

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
GND	ground signal
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

h	hour
Hz	hertz– cycles per second of a periodic signal

I

I/O	input/output—the transfer of data to/from a computer system involving communications channels, operator interface devices, and/or data acquisition and control interfaces
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.	inch or inches

L

LED	light-emitting diode
lb	pounds
local bus	a group of signals that connect two peripheral slots

M

m	meters
max	maximum
MAX	Measurement & Automation Explorer
min	1. minutes 2. minimum
MTBF	mean time between failure

MTTR	mean time to repair
MXI	Multisystem eXtension Interface

N

NEMA	National Electrical Manufacturers Association

O

OEM	original equipment manufacturer
overcurrent	a condition in which the current drawn by the load on a power supply exceeds the rating of the power supply

P

PC	personal computer
PCI	peripheral component interconnect—a high-performance expansion bus architecture originally developed by Intel to replace ISA and EISA. It has widespread acceptance as a standard for PCs and work-stations; it offers a theoretical maximum transfer rate of 132 Mbytes/s.
PXI	PCI eXtensions for Instrumentation—an open specification that builds on the CompactPCI specification by adding instrumentation-specific features
PXI 10 MHz system clock signal	a 10 MHz clock reference provided by the PXI backplane to all peripheral modules
PXI_CLK10	the pin that provides the PXI 10 MHz system clock signal to a peripheral slot
PXI_CLK10_IN	the pin that a star trigger module uses to supply the PXI 10 MHz system clock signal
PXI backplane	the board section in the PXI subsystem that connects the PXI modules
PXI module	a PXI module that plugs into a PXI slot
PXI peripheral module	a PXI module that plugs into a PXI peripheral slot

PXI peripheral slot	a PXI slot that holds a PXI peripheral module
PXI subsystem	the PXI-1011 chassis section that uses PXI modules

R

RH	relative humidity
rms	root mean square—the square root of the average value of the square of the instantaneous signal amplitude; a measure of signal amplitude
RT	real-time

S

s	seconds
SCXI	Signal Conditioning eXtensions for Instrumentation—an NI product line designed to perform front-end signal conditioning for NI plug-in DAQ devices
SCXI subsystem	the PXI-1011 chassis section that uses SCXI modules
slot	the guide in the chassis where a module is inserted
ST	star trigger
Star Trigger slot	slot 2 of the PXI-1011, which has a dedicated trigger line connected to each peripheral slot. Use this slot for a module with ST functionality that can provide individual triggers to all other peripherals.
synchronous timing	1. hardware—a property of an event that is synchronized to a reference clock 2. software—a property of a function that begins an operation and returns only when the operation is complete

system controller	a module configured for installation in slot 0 of a PXIbus mainframe. This device is unique in the PXIbus system in that it performs the VMEbus 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 PXIbus backplane, or both.
system integrator	the party who connects pieces of hardware and software to create a complete system for the end user

T

trigger	any event that causes or starts some form of data capture
TTL	transistor-transistor logic
typ	typical

U

UL	Underwriters Laboratories

V

V	volts
VAC	volts alternating current
V_{PP}	peak to peak voltage

W

W	watts

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