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PXI™

PXI-8140RT Series 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 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.

Compliance to EU Directives

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

This manual contains detailed instructions for installing and configuring your National Instruments PXI-8140RT Series embedded PXI computer. The PXI-8140RT Series includes all models of the PXI-8145RT and PXI-8146RT embedded PXI computers.

How to Use This Documentation Set

This manual, the *PXI-8140RT Series User Manual*, describes how to change the installation or configuration from the defaults and use the hardware.

If you ordered either LabVIEW or LabWindows/CVI, you received full documentation along with a configuration disk to unlock and access these application programming environments, which are already installed on your hard drive.

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.

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.

PXI-8140RT Series — The terms *PXI-8140RT Series* and *PXI-8140RT* refer to a series of 3U PXI controllers. Currently, this series consists of the PXI-8145RT and PXI-8146RT.

Related Documentation

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

- *PICMG 2.0 R2.1 CompactPCI Specification*, PCI Industrial Computers Manufacturers Group
- IEEE Standard P1284.1-1997 *(C/MM) Standard for Information Technology for Transport Independent Printer/System Interface*
- *PCI Local Bus Specification*, Revision 2.1, PCI Special Interest Group
- *PXI Specification*, Revision 2.0, National Instruments Corporation
- *Serialized IRQ Support for PCI Systems Specification*, Revision 6.0, Compaq Computer et al.

1 Introduction

This chapter describes the PXI-8140RT Series of embedded PXI computers and lists optional equipment and software.

Overview

The PXI-8140RT Series consists of the PXI-8145RT and the PXI-8146RT PXI system controllers, as shown in the following illustrations. Refer to Appendix C, *Front Panel and Connectors*, to determine the purpose for each connector on the module. Figure 1-1 shows a PXI-8145RT model.

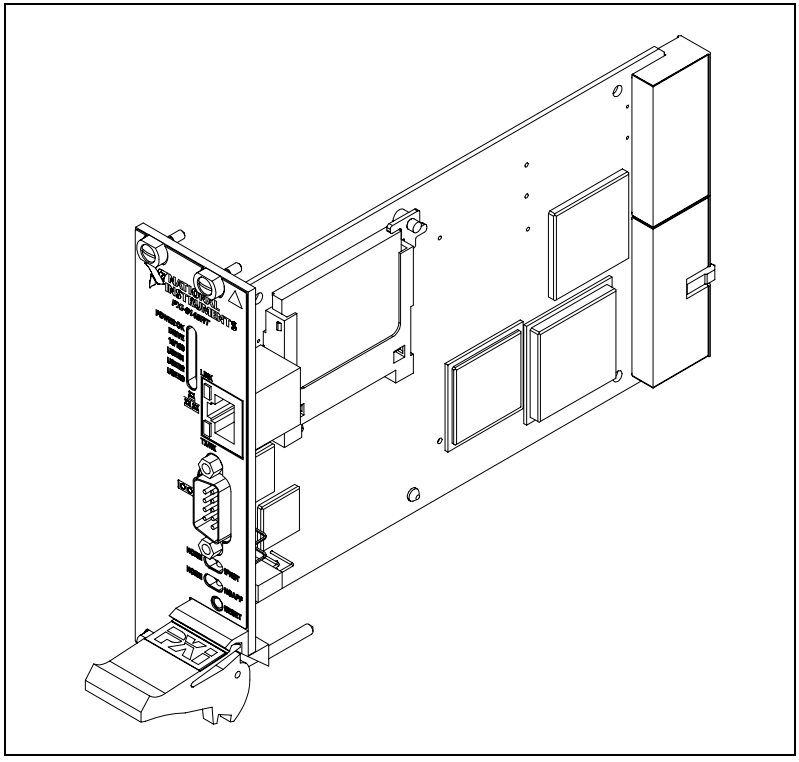


Figure 1-1. PXI-8145RT Embedded Computer

Figure 1-2 shows a PXI-8146RT model.

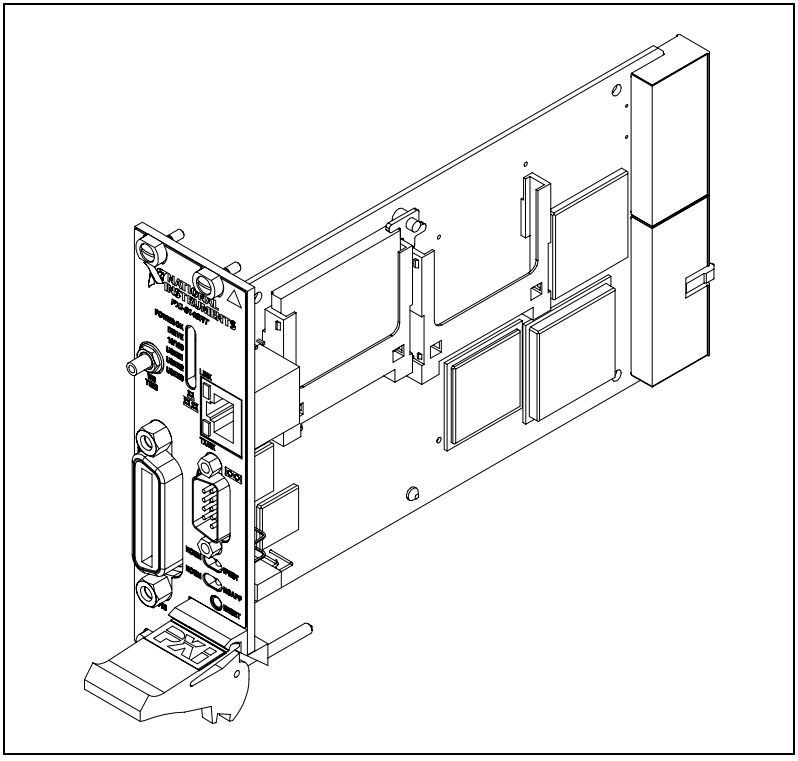


Figure 1-2. PXI-8146RT Embedded Computer

The PXI-8140RT Series controllers are 3U PXI/CompactPCI embedded computers based on the Peripheral Component Interface (PCI) bus and Industry Standard Architecture (ISA). These computers are high-performance, easy-to-use platforms for controlling PCI systems, featuring complete PXI (PCI eXtensions for Instrumentation) functionality through interactive utilities. In addition, the PXI-8146RT has an IEEE 488.2 interface that is compatible with the NI-488.2 architecture.

The PXI-8140RT Series are custom computers that you install directly in the system controller slot of your PXI mainframe. An embedded computer can take full advantage of the PXI high-performance backplane capabilities.

Hardware Description

PXI-8140RT Series Design

The PXI-8140RT Series PXI embedded computers are high-performance PXI system controllers. The PXI-8140RT Series supports masters in all available PXI slots.

The PXI-8140RT Series design includes many standard PC peripherals, which means you can install your custom-designed peripheral devices in all PXI slots. It also has one user-accessible SO-DIMM socket so it is easy to upgrade memory. The PXI-8140RT plugs directly into the system controller slot and expands to the left, thus preserving all usable PXI slots for user-defined peripheral devices.

PXI-8140RT Series Models

Currently, the PXI-8140RT Series consists of two models—the PXI-8145RT and the PXI-8146RT.

The models differ in the front-panel I/O. The PXI-8145RT comes complete with a serial port, a 10/100BaseT Ethernet port, and software installed. The PXI-8146RT adds an IEEE 488.2 (GPIB) interface compatible with the National Instruments AT-GPIB/TNT and an SMB connector for the watchdog trigger.

Memory

The PXI-8140RT and its memory socket is easily accessible so you can install additional DRAM in the field. You can install up to 256 MB of 10 ns SDRAM, using 144-pin SO-DIMMS.

For information on adding RAM by installing SO-DIMMs, refer to Appendix A, *Specifications*.

Watchdog Timer

The PXI-8140RT Series controller features a user-programmable counter/timer, known as a watchdog, that counts down from a user-specified value. You can frequently reset the counter/timer in software, by a backplane trigger line, or by the SMB connector (PXI-8146RT only). In the event that the watchdog counter reaches zero, as in a software failure, it is programmed to reset the controller, set an occurrence, assert a backplane trigger line, or assert a signal on the SMB connector (PXI-8146RT only).

System Slot Functionality

You can use the PXI-8140RT Series computers to achieve full PXI system slot control of your PXI system. In the system slot, the PXI-8140RT Series provides master/slave capabilities to all slots in the PXI system.

Custom Application-Specific Interface Chips

The PXI-8146RT has the TNT4882C custom ASIC to give full GPIB control of external instruments via a front-panel connector. GPIB capability is fully compatible with IEEE 488.2 and the industry-standard NI-488.2M driver for a variety of operating systems.

Front Panel Features

The PXI-8140RT Series has the following front-panel features:

- System reset push-button
- Front-panel connectors:
  - RS-232 Serial
  - GPIB (PXI-8146RT only)
  - Watchdog trigger SMB (PXI-8146RT only)
  - 10/100BaseT Ethernet
- Six front-panel LEDs that show PC status
  - **POWER OK** LED indicates that the power is on and reset is no longer asserted.
  - **DRIVE** LED indicates when an access to the internal flash disk is occurring.
  - 10/100 indicates 100BaseT status
  - USER1 indicates system status
  - USER2 is programmable
  - USER3 is programmable
- Two front-panel LEDs that show Ethernet port status
  - **TX/RX** LED indicates that the PXI-8140RT Series is receiving or transmitting a packet of data through its Ethernet port.
  - **LINK** LED indicates periodic link test passed.

Optional Equipment

Contact National Instruments to order the following optional equipment:

- Single-shielded 2 m GPIB cable

National Instruments Software

National Instruments has developed several software kits that you can use with the PXI-8140RT Series. The software is already installed on your flash drive.

The NI-488.2M software kit gives you access to the industry-standard NI-488.2M software for controlling external GPIB instruments through the GPIB port on the front panel of the PXI-8146RT. The GPIB interface is fully compatible with the NI-488.2M driver for a variety of operating systems. Any GPIB application using NI-488.2M or NI-VISA will run on the PXI-8146RT.

NI-DAQ has an extensive library of functions that you can call from your application programming environment. These functions include routines for analog input (A/D conversion), buffered data acquisition (high-speed A/D conversion), analog output (D/A conversion), waveform generation, digital I/O, counter/timer operations, SCXI, RTSI, self-calibration, messaging, and acquiring data to extended memory.

NI-VISA is the National Instruments implementation of the VISA specification. VISA is a uniform API for communicating and controlling Serial, GPIB, PXI, VXI, and various other types of instruments. This API aids in the creation of more portable applications and instrument drivers. For information on writing your own PXI instrument driver with NI-VISA, see the NI-VISA *Getting Started* manual.

The PXI-8140RT Series controllers are specifically designed to use LabVIEW RT. For more information, refer to your LabVIEW RT manual.

2

PXI-8140RT Series Configuration and Installation

This chapter contains instructions for configuring and installing the PXI-8140RT Series embedded computer. Unless otherwise noted, these instructions apply to all models in the PXI-8140RT Series, which currently consists of the PXI-8145RT and the PXI-8146RT.

Caution Electrostatic discharge can damage several components on your PXI-8140RT module. To avoid such damage in handling the module, touch the antistatic plastic package to a metal part of your PXI mainframe before removing the module from the package.

Default Settings

This section summarizes the hardware default settings for the PXI-8140RT Series for easy reference. The module is set at the factory for the most commonly used configuration.

Table 2-1 lists the factory-default settings and options for the onboard jumpers and switches.

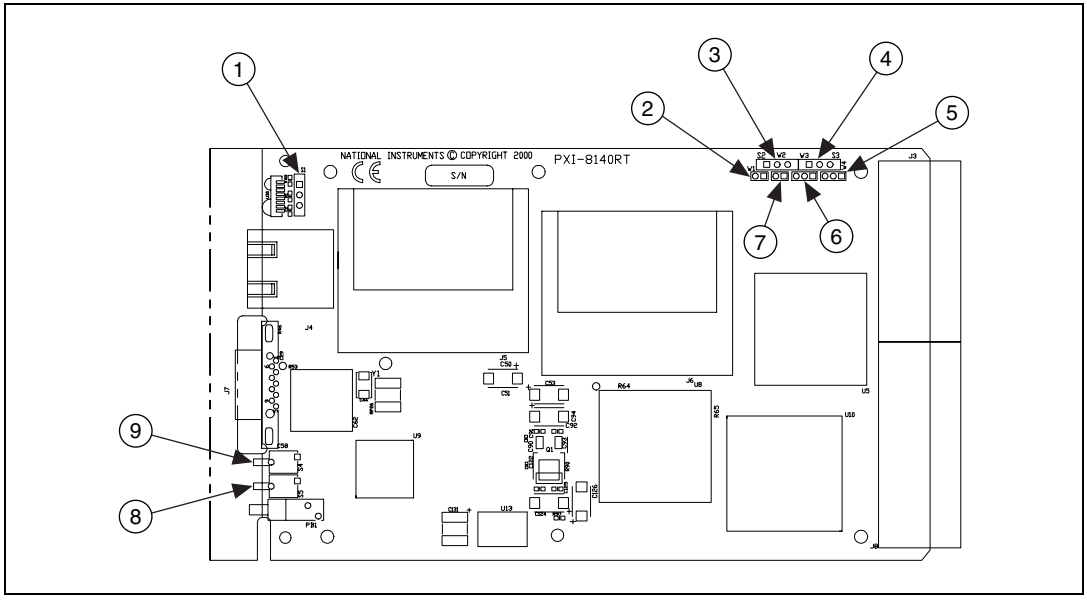
Table 2-1. PXI-8140RT Series Hardware Default Settings

Jumper/Switch	Default Setting	Optional Setting
W1 (CPU Board) CMOS Clear	Disabled (Normal CMOS operation)	Clear CMOS
W2 (BIOS Protect)	Disabled (Normal BIOS operation)	Overwrite BIOS
W3 (CPU Board) INTS Connection	Serial IRQ Connected to INTS	a. No Connection b. IRQ15
W4 (CPU Board) INTP Connection	Watchdog NMI	a. IRQ14 b. No Connection
S1 GPIB Interrupt Select	IRQ 11	IRQ 5

Table 2-1. PXI-8140RT Series Hardware Default Settings (Continued)

Jumper/Switch	Default Setting	Optional Setting
S2 Safe Mode Select	Normal Mode	Software Safe Mode
S3 Serial Redirect	Normal Operation	Serial Redirection
IPRST/NRML	Normal Operation	Reset IP Address
NOAPP/NRML	Normal Operation	Halt Application Execution

Figure 2-1 shows the location and factory-default settings of the configuration switches and jumpers on the PXI-8140RT Series.

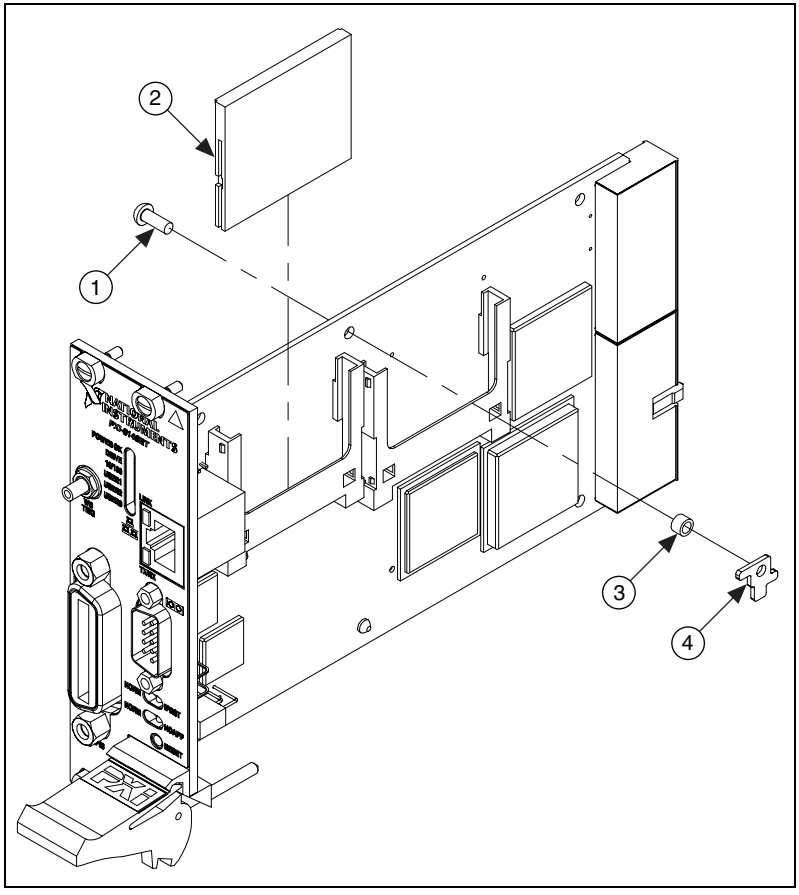


1 S1	4 W4	7 W2
2 S2	5 S3	8 NOAPP/NRML
3 W1	6 W3	9 IPRST/NRML

Figure 2-1. PXI-8140RT Series I/O Board Parts Locator Diagram

Installing CompactFlash Memory

This section describes how to install and remove CompactFlash memory.



1	Retainer Screw	3	Spacer
2	CompactFlash Memory Card	4	Retainer Bracket

Figure 2-2. Installing CompactFlash Memory

To install the CompactFlash memory, refer to Figure 2-2 and follow these steps:

1. Insert the CompactFlash memory card in either slot on the I/O board.
2. Insert the retainer screw through the rear of the I/O board.
3. Assemble the spacer and retainer bracket as shown and tighten screw.

To remove the CompactFlash memory, reverse these steps.

Configuring the PXI-8140RT Series

This section describes how to configure the following options.

- System RAM
- System CMOS
- Serial IRQ, INTP and INTS connection
- Ethernet power-on defaults

Installed System RAM

You can change the amount of installed RAM on the PXI-8140RT Series by installing DRAM SO-DIMMs. Refer to Appendix A, *Specifications*, for more information on SO-DIMMs.

System CMOS

The PXI-8140RT contains a backed-up memory used to store BIOS defaults and configuration information.

To clear the CMOS contents, short the pins of W1 as shown in Figure 2-3b. Plug the unit back into the mainframe and apply power momentarily. Turn the power back off and remove the unit. Place the jumper back in the default state.

Caution Do *not* keep these two pins short-circuited. The computer cannot sustain the CMOS memory when the power is turned off if you leave these two pins shorted.

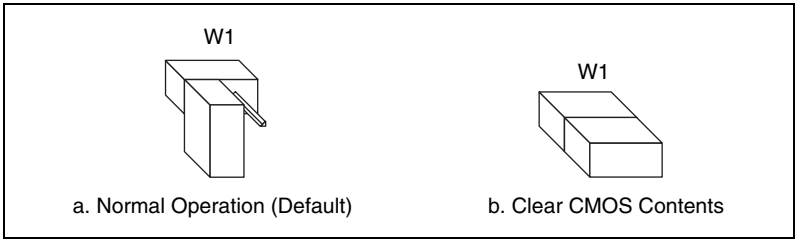


Figure 2-3. System CMOS

Figure 2-4 shows the BIOS protect configuration options. To overwrite the BIOS, short the pins of W2 as shown in Figure 2-4b.

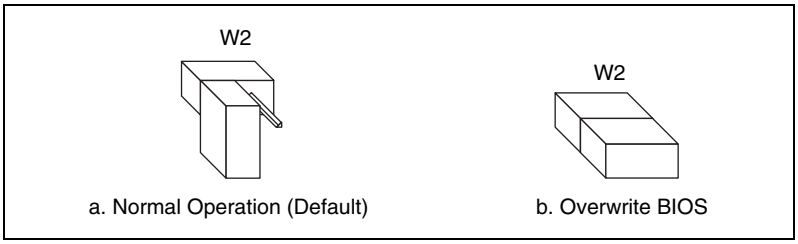


Figure 2-4. BIOS Protect Configuration

Serial IRQ, INTP, and INTS

You can use jumper settings on the PXI-8140RT Series to connect INTP on the PXI backplane to IRQ14 as well as INTS to either IRQ15 or to serial IRQ. Refer to the documentation that comes with your PXI peripheral device to see if you need to make any changes from the default settings. For more information on Serial IRQ, refer to the *Serialized IRQ Support for PCI Systems Specification*.

Figure 2-5 shows the INTP configuration options, and Figure 2-6 shows the INTS configuration options.

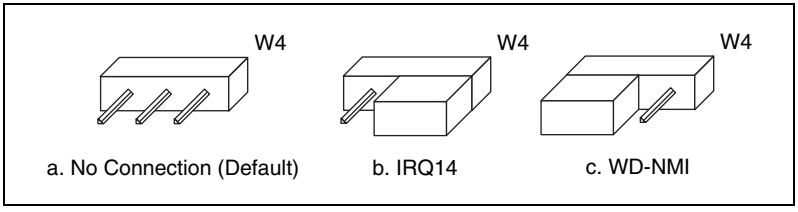


Figure 2-5. INTP Configuration

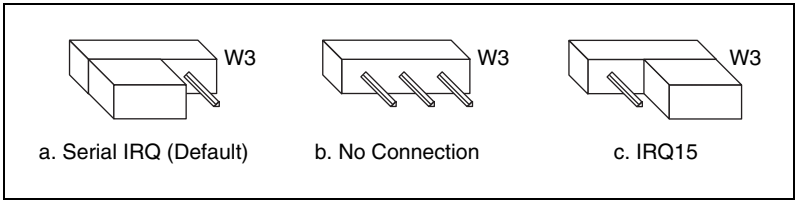


Figure 2-6. INTS Configuration

Figure 2-7 shows the GPIB interrupt configuration options. The default is IRQ 11.

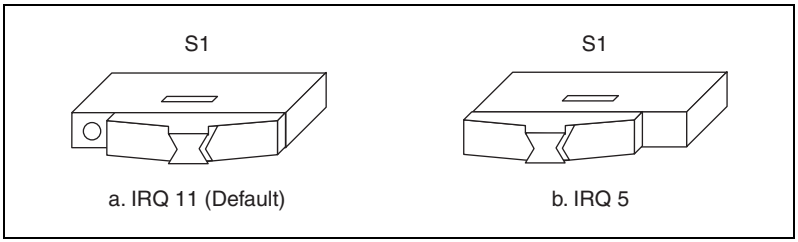


Figure 2-7. GPIB Interrupt Configuration

Figure 2-8 shows the safe mode configuration options. The default is normal operation.

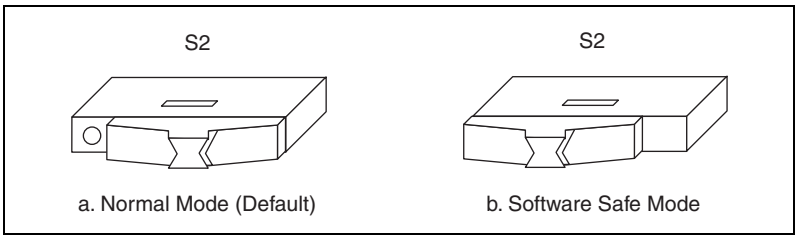


Figure 2-8. Safe Mode Configuration

Figure 2-9 shows the serial redirection configuration options. The default is normal operation.

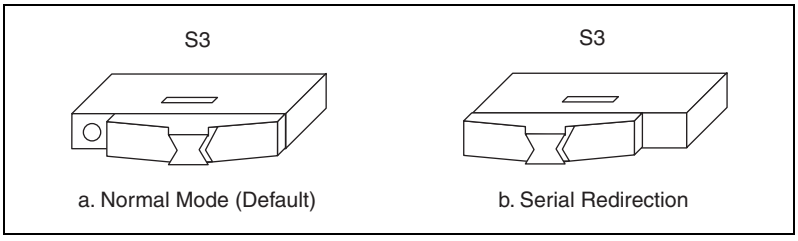


Figure 2-9. Serial Redirect Configuration

Figure 2-10 shows the IP address reset configuration options. In the IPRST position, the IPRST/NRML toggle switch resets the system IP address to 0.0.0.0 at boot time.

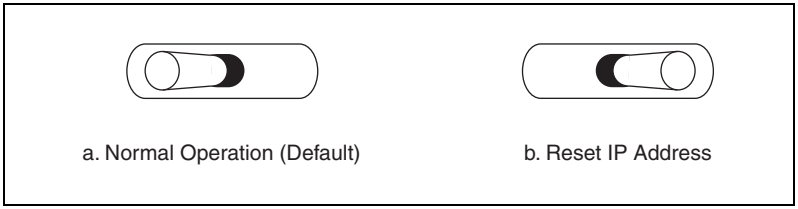


Figure 2-10. IP Address Reset Configuration

Figure 2-11 shows the application execution configuration options. When set to NOAPP at boot time, the NOAPP/NRML switch prevents the LabVIEW application loaded in the system from executing.

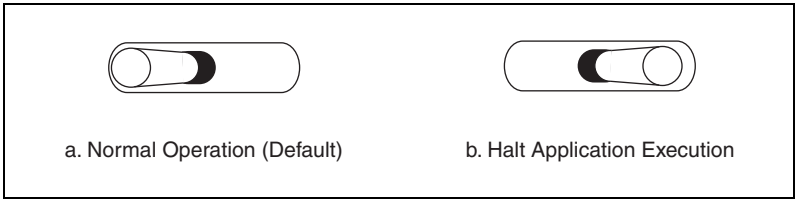


Figure 2-11. Application Execution Configuration

Installing the PXI-8140RT Series

This section contains general installation instructions for the PXI-8140RT. Consult your PXI mainframe user manual for specific instructions and warnings.

1. Plug in your mainframe before installing the PXI-8140RT. The power cord grounds the mainframe and protects it from electrical damage while you install the module.

Warning To protect both yourself and the mainframe from electrical hazards, leave the mainframe off until you finish installing the PXI-8140RT module.

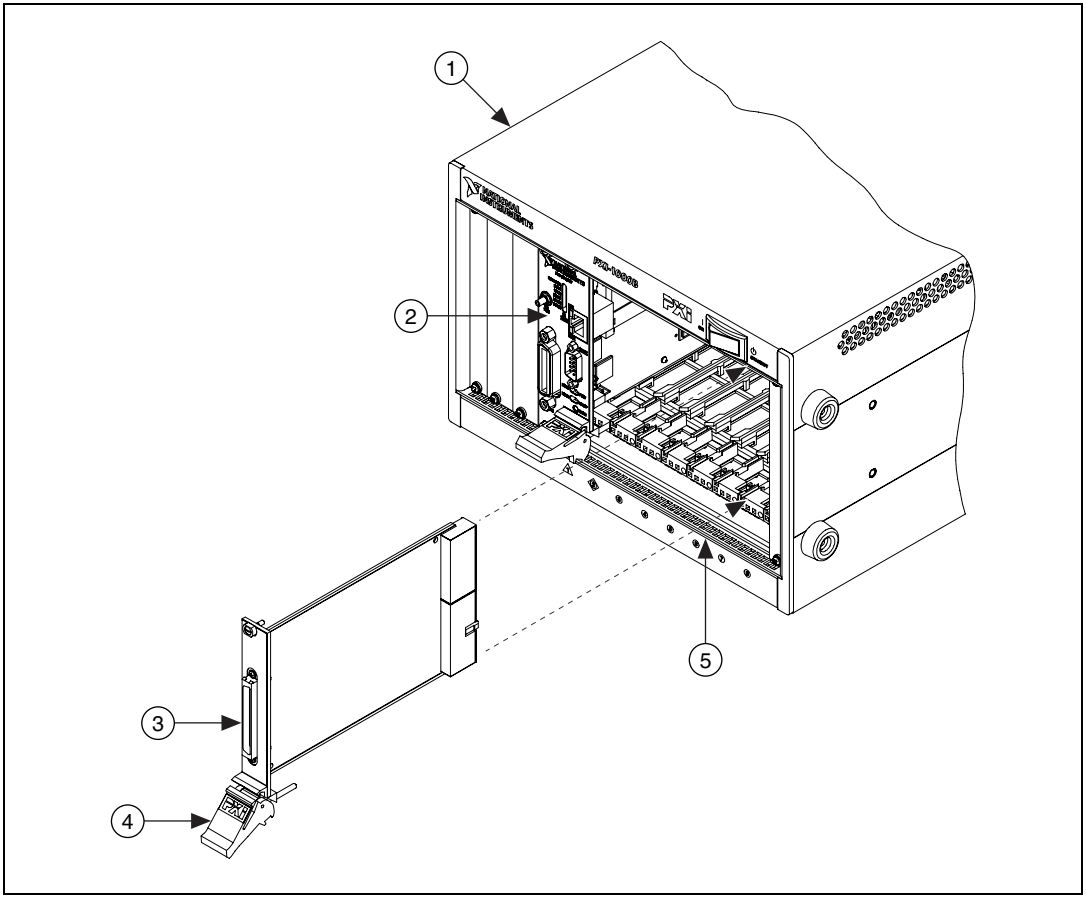
2. Remove or open any doors or covers blocking access to the system controller slot (Slot 1) in the mainframe.
3. Touch the metal part of the case to discharge any static electricity that might be on your clothes or body.

4. Make sure the injector/ejector handle is in its downward position. Align the PXI-8140RT with the card guides on the top and bottom of the system controller slot.

Caution Do *not* raise the injector/ejector handle as you insert the PXI-8140RT. The module will not insert properly unless the handle is in its downward position so that it does not interfere with the injector rail on the mainframe.

5. Hold the handle as you slowly slide the module into the mainframe until the handle catches on the injector/ejector rail.
6. Raise the injector/ejector handle until the module firmly seats into the backplane receptacle connectors. The front panel of the PXI-8140RT should be even with the front panel of the mainframe.
7. Tighten the four bracket-retaining screws on the top and bottom of the front panel to secure the PXI-8140RT to the mainframe.
8. Check the installation.
9. Replace or close any doors or covers to the mainframe.

Figure 2-12 shows a PXI-8146RT installed in the system controller slot of a National Instruments PXI-1000 mainframe. You can place PXI devices in any other slot.



1	PXI-1000 Chassis	3	PXI Board	5	Injector/Ejector Rail
2	PXI-8146RT System Controller	4	Injector/Ejector Handle		

Figure 2-12. PXI-8146RT Installed in a PXI Mainframe

How to Remove the Unit from the PXI Mainframe

The PXI-8140RT Series is designed for easy handling. If you later decide to change any of the jumper settings or the amount of DRAM installed on the module, remove the unit from the PXI mainframe as follows:

1. Remove the bracket-retaining screws in the front panel.
2. Press the injector/ejector handle down.
3. Slide the unit out of the mainframe.

A

Specifications

This appendix lists the electrical, mechanical, and environmental specifications of the PXI-8140RT Series embedded computer, and describes how to add RAM.

Electrical

PXI-8145RT 266 MHz MMX Processor

+3.3 V ..... 2.8 A typical
5.0 A maximum

+5 V ..... 230 mA typical
500 mA maximum

+12 V ..... 10 mA typical
100 mA maximum

–12 V..... 5 mA typical
100 mA maximum

PXI-8146RT 266 MHz MMX Processor

+3.3 V ..... 3.0 A typical
5.0 A maximum

+5 V ..... 230 mA typical
500 mA maximum

+12 V ..... 10 mA typical
100 mA maximum

–12 V..... 5 mA typical
100 mA maximum

Physical

Board dimensions..... PXI 3U-size module
8.1 by 13 by 21.6 cm
(3.2 by 5.1 by 8.5 in.)

Slot requirements ..... One system slot plus one
controller expansion slot

Compatibility .....Fully compatible with PXI specification

MTBF

PXI-8145RT .....281,262 h

PXI-8146RT .....257,363 h

Weight.....340 g (0.75 lb) typical

Environmental

Temperature

Operating .....0 to 50 °C

Storage.....–20 to 70 °C

Relative humidity

Operating .....10 to 90% noncondensing

Storage.....5 to 95% noncondensing

EMI .....FCC Class A verified, EC verified

Random vibration

Operational .....5 to 500 Hz, 0.31 g_{RMS}, 3 axes

Non-operational.....10 to 500 Hz, 2.46 g_{RMS}, 3 axes

Functional shock.....MIL-T-28800E Class 3 (per Section 4.5.5.4.1) Half-sine shock pulse (11 ms duration, 30 g peak, 3 shocks per face). Also meets IEC standard 60068-2-27.

Note Random vibration profiles were developed in accordance with MIL-T-28800E 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). Test report available upon request.

Adding RAM

To add RAM to the PXI-8140RT Series, remove the unit from the PXI mainframe and add an SO-DIMM module to the empty SO-DIMM socket. National Instruments recommends the following types of SO-DIMMs for use with the PXI-8140RT Series controller (SDRAM):

- 32 MB 4 MB × 64 SO-DIMMs—10 ns, 1.05 in. max.
- 64 MB 8 MB × 64 SO-DIMMs—10 ns, 1.05 in. max.
- 128 MB 16 MB × 64 SO-DIMMs—10 ns, 1.05 in. max.



Note National Instruments has tested and verified that the SO-DIMMs we sell work with the PXI-8140RT Series. We recommend you purchase your SO-DIMM modules from National Instruments. Other off-the-shelf SO-DIMM modules are not guaranteed to work properly.

B

LED Indicators and Switch Options

This appendix describes how to interpret the status of the PXI-8140RT Series computer by reading the LEDs on the front panel.

Interface Status and Access LEDs

POWER OK

When lit, the **POWER OK** LED indicates that the power is on and the PXI-8140RT is out of reset.

DRIVE LED

The **DRIVE** LED indicates when an access to the internal flash disk drive is occurring.

10/100

The **10/100** LED indicates 100BaseT status.

USER1

The **USER1** LED indicates LabVIEW RT status:

- If this LED blinks *one* time every 2–3 seconds, the IP address is 0.0.0.0 (the device is unconfigured).
- If this LED blinks *two* times every 2–3 seconds, the software on the PXI-8140RT is corrupt or missing, and the box is in safe mode. (Reinstall the software from MAX.)
- If this LED blinks *three* times every 2–3 seconds, you have flipped the safe mode switch, causing the box to go into safe mode regardless of whether it could otherwise boot.

USER2

The **USER2** LED is user programmable via LabVIEW. See the LabVIEW documentation for more information.

USER3

The **USER3** LED is user programmable via LabVIEW. See the LabVIEW documentation for more information.

Ethernet LEDs

The Ethernet LEDs (**TX/RX** and **LINK**) indicate the status of the Ethernet interface on the PXI-8140RT.

TX/RX LED

The **TX/RX** LED indicates when the Ethernet interface is receiving or transmitting a packet.

LINK LED

The **LINK** LED indicates the periodic link test passed.

Switches

S1 GPIB Interrupt Select

Switch S1 selects the GPIB interrupt select. The default setting is IRQ 11. The optional setting is IRQ 5.

S2 Safe Mode Select

Switch S2 selects safe mode. The default setting is for normal operation. When set before turning power on, this switch sets LabVIEW RT in safe mode.

S3 Serial Redirection

Switch S3 selects the serial redirection mode. When selected, BIOS boot sequence text and other diagnostic output will be redirected to the RS-232 serial port on the front panel. To view this output, connect with a null modem serial cable to a terminal with ANSI emulation at 9600 bits per second, 8 data bits, no parity, 1 stop bit, and hardware flow control. While the PXI-8140RT Series controller is in this mode, the system will boot at a slower speed than when operating in normal mode.

IPRST/NRML

In the IPRST position, this switch resets the system IP address to 0.0.0.0 at boot time.

NOAPP/NRML

When set to NOAPP at boot time, this switch prevents the LabVIEW application loaded in the system from executing.

C

Front Panel and Connectors

This appendix describes the front panel and connectors on the PXI-8140RT Series embedded computer.

Note The illustrations in this appendix show the mating face of the connectors. An asterisk suffix (*) on a signal name indicates that the signal is active low.

The PXI-8145RT Series has the following front panel connectors:

- RS-232 Serial
- 10/100BaseT

The PXI-8146RT Series has the following additional front panel connectors:

- IEEE 488.2
- Watchdog SMB

Front Panel

Figure C-1 shows the front panel layout of the PXI-8145RT, and Figure C-2 shows the front panel layout of the PXI-8146RT. The drawings show dimensions relevant to key elements on the front panel. Dimensions are shown in inches and millimeters, with millimeter dimensions in square brackets. The front panel thickness for all models in the PXI-8140RT Series is 2.49 mm (0.098 in.).

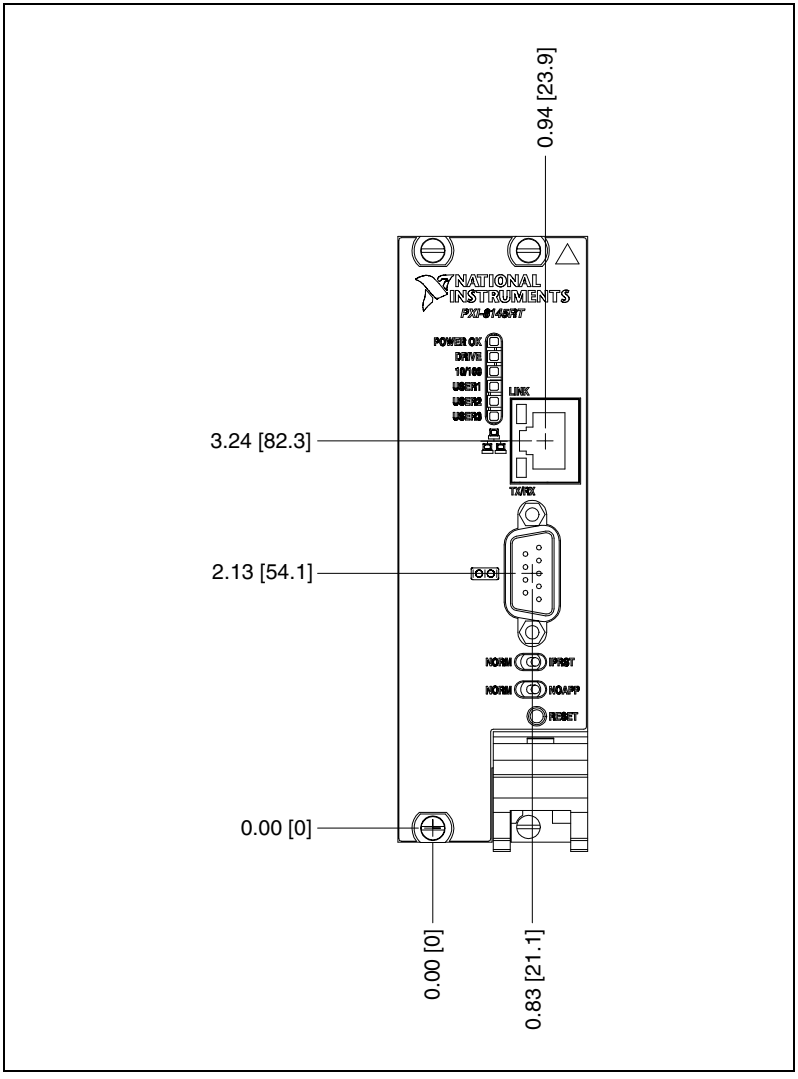


Figure C-1. PXI-8145RT Front Panel Layout and Dimensions

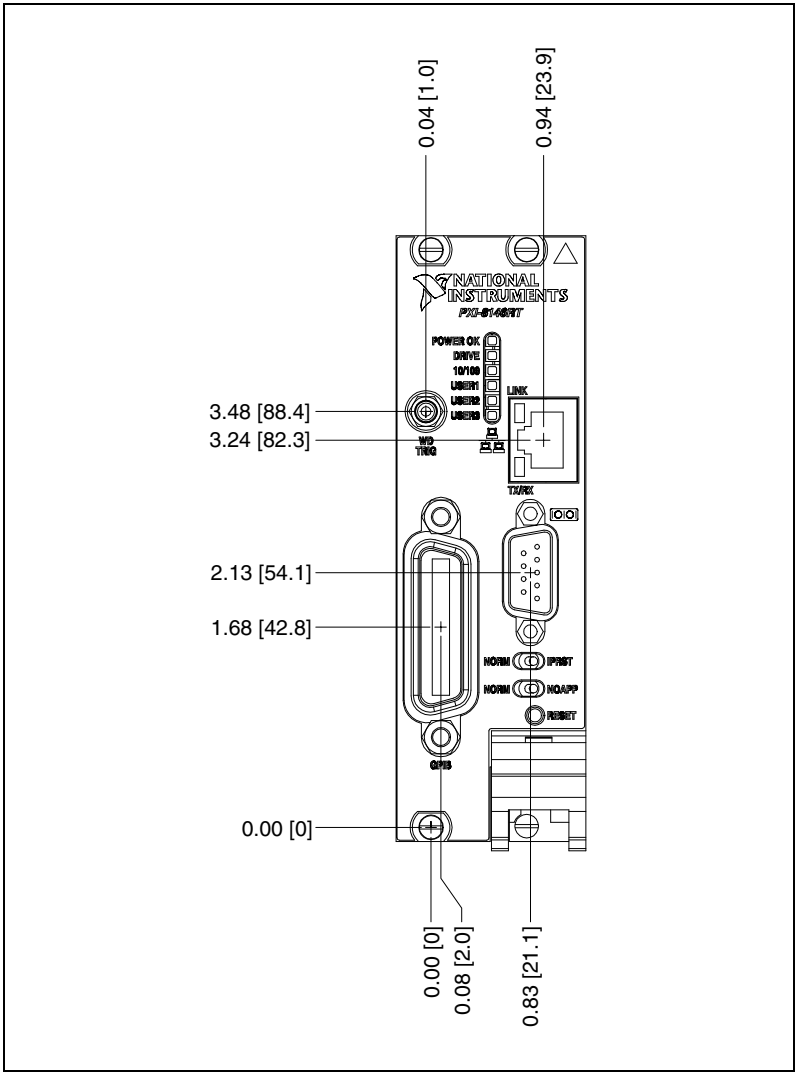


Figure C-2. PXI-8146RT Front Panel Layout and Dimensions

Ethernet

Figure C-3 shows the location and pinouts for the Ethernet connector on the PXI-8146RT. Table C-1 lists and describes the Ethernet connector signals.

AMP manufactures a mating connector, part number 554739-1.

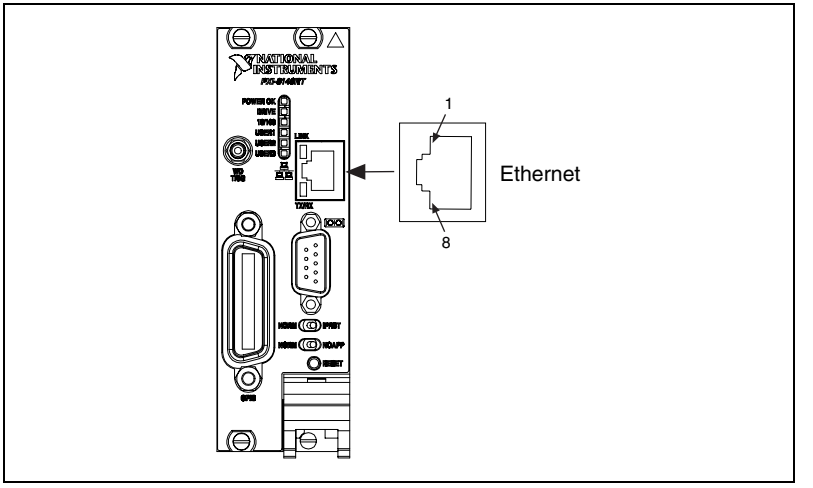


Figure C-3. Ethernet Connector Location and Pinout

Table C-1. Ethernet Connector Signals

Pin	Signal Description
1	Differential Transmit
2	Differential Transmit
3	Differential Receive
4	NC
5	NC
6	Differential Receive
7	NC
8	NC

COM1 and COM2

Figure C-4 shows the location and pinouts for the COM1 connector on all models in the PXI-8140RT Series. Table C-2 lists and describes the COM1 connector signals.

AMP manufactures a serial port mating connector, part number 745491-5, for the COM1 connector on the PXI-8146RT.

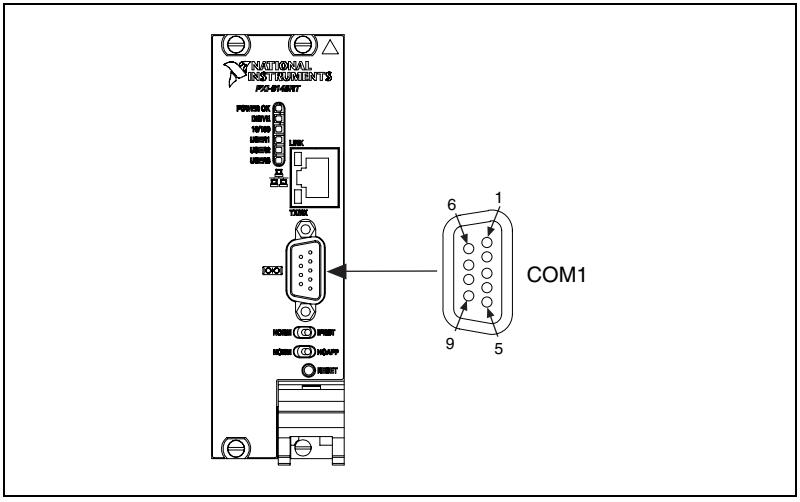


Figure C-4. COM1 and COM2 Connectors Location and Pinout

Table C-2. COM1 and COM2 Connector Signals

Pin	Signal Name	Signal Description
1	DCD*	Data Carrier Detect
2	RXD*	Receive Data
3	TXD*	Transmit Data
4	DTR*	Data Terminal Ready
5	GND	Ground
6	DSR*	Data Set Ready
7	RTS*	Ready to Send
8	CTS*	Clear to Send
9	RI*	Ring Indicator

GPIB (IEEE 488.2)

Figure C-5 shows the location and pinouts for the GPIB connector on the PXI-8146RT. Table C-3 lists and describes the GPIB connector signals.

AMP manufactures a GPIB mating connector, part number 554349-01.

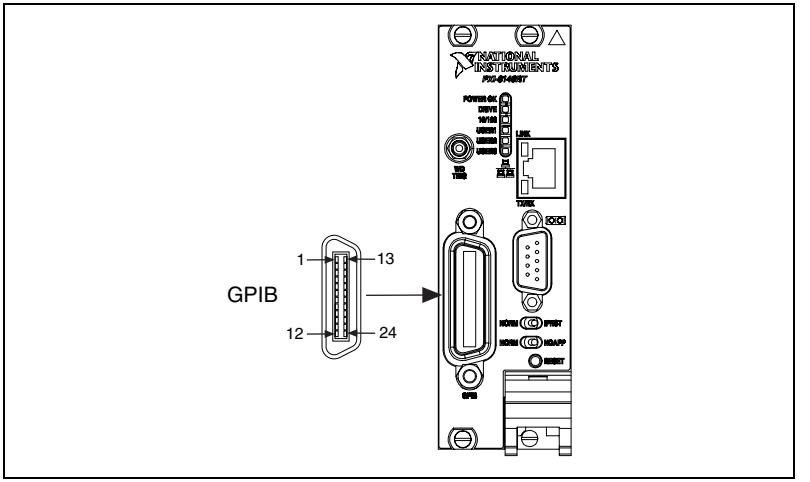


Figure C-5. GPIB Connector Location and Pinout

Table C-3. GPIB Connector Signals

Pin	Signal Name	Signal Description
1	DIO1*	Data Bit 1
2	DIO2*	Data Bit 2
3	DIO3*	Data Bit 3
4	DIO4*	Data Bit 4
5	EOI*	End or Identify
6	DAV*	Data Valid
7	NRFD*	Not Ready for Data
8	NDAC*	Not Data Accepted
9	IFC*	Interface Clear

Table C-3. GPIB Connector Signals (Continued)

Pin	Signal Name	Signal Description
10	SRQ*	Service Request
11	ATN*	Attention
12	SHIELD	Chassis ground
13	DIO5*	Data Bit 5
14	DIO6*	Data Bit 6
15	DIO7*	Data Bit 7
16	DIO8*	Data Bit 8
17	REN*	Remote Enable
18–25	GND	Logic Ground

PXI Connectors

Figure C-6 shows the location and pinouts for the PXI connector on the PXI-8140RT Series. Table C-4 shows the P2 connector pinouts for the PXI connector as it applies to the system controller slot (Slot 1). Table C-5 shows the P1 connector pinouts.

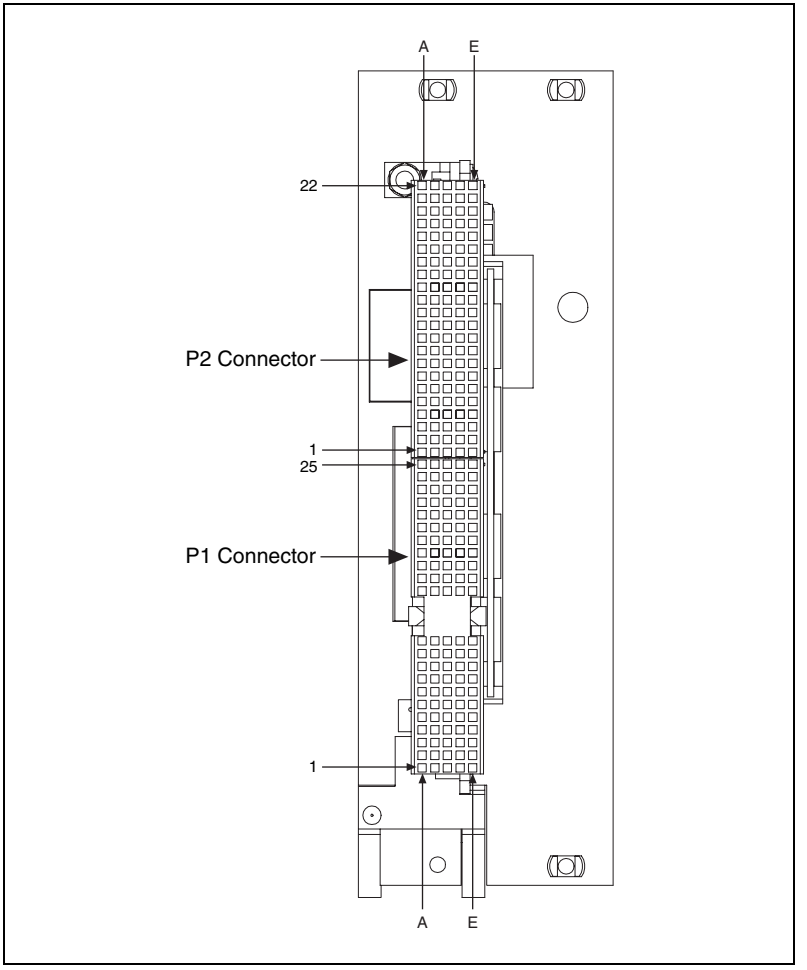


Figure C-6. PXI Connector Locations and Pinouts

Table C-4. P2 Connector Pinouts 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	CLK6	GND	RSV	RSV	RSV	GND
20	GND	CLK5	GND	RSV	GND	RSV	GND
19	GND	GND	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

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

Table C-5. P1 Connector Pinouts 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]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

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}
k-	kilo-	10^{3}
M-	mega-	10^{6}
G-	giga-	10^{9}

Symbols

°	degrees
Ω	ohms
%	percent

A

A	amperes
AC	Alternating Current
ASIC	application-specific integrated circuit

B

B	bytes
backplane	An assembly, typically a printed circuit board, with connectors and signal paths that bus the connector pins.

BIOS	Basic Input/Output System. BIOS functions are the fundamental level of any PC or compatible computer. BIOS functions embody the basic operations needed for successful use of the computer's hardware resources.

C

C	Celsius
cache	Small portion of high-speed memory used for temporary storage of frequently used data
CMOS	Complementary Metal Oxide Semiconductor; a process used in making chips
CompactPCI	An adaptation of the PCI specification for industrial and/or embedded applications that require a more robust mechanical form factor than desktop PCI. CompactPCI provides a standard form factor for those applications requiring the high performance of PCI as well as the small size and ruggedness of a rack-mount system.

D

DC	Direct Current
DIMM	Dual In-line Memory Module
DMA	Direct Memory Access; a method by which data is transferred between devices and internal memory without intervention of the central processing unit
DRAM	Dynamic RAM (Random Access Memory); storage that the computer must refresh at frequent intervals

E

ECP	Extended Capabilities Parallel
EDO	Extended Data Out
EEPROM	Electronically Erasable Programmable Read Only Memory

embedded controller	An intelligent CPU (controller) interface plugged directly into the PXI backplane, giving it direct access to the PXI bus. It must have all of its required PXI interface capabilities built in.
EMC	Electromagnetic Compatibility
EMI	electromagnetic interference
EPP	Enhanced Parallel Port
expansion ROM	An onboard EEPROM that may contain device-specific initialization and system boot functionality

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

IDE	Integrated Drive Electronics; hard disk and built-in controller
IEEE	Institute of Electrical and Electronics Engineers
in.	inches

instrument driver	A set of routines designed to control a specific instrument or family of instruments, and any necessary related files for LabWindows/CVI or LabVIEW
interrupt	A means for a device to request service from another device
interrupt level	The relative priority at which a device can interrupt
I/O	input/output; the techniques, media, and devices used to achieve communication between machines and users
IRQ*	Interrupt signal
ISA	Industry Standard Architecture; the original PC bus architecture, specifically the 16-bit AT bus

K

KB	kilobytes of memory

L

LAN	Local Area Network; communications network that serves users within a confined geographical area. It is made up of servers, workstations, a network operating system, and a communications link.
LED	light-emitting diode

M

m	meters
master	A functional part of a PXI device that initiates data transfers on the PXI backplane. A transfer can be either a read or a write.
MB	megabytes of memory
MTBF	Mean time between failure
MTTR	Mean time to repair

N

NI-488 or NI-488.2	The National Instruments software for GPIB systems
NI-DAQ	The National Instruments software for data acquisition instruments
NI-VISA	The National Instruments implementation of the VISA standard; an interface-independent software that provides a unified programming interface for VXI, GPIB, and serial instruments
NMI	Non-maskable interrupt; high-priority interrupt that cannot be disabled by another interrupt. It is used to report malfunctions such as parity, bus and math coprocessor errors.

P

PCI	Peripheral Component Interconnect. The PCI bus is a high-performance 32-bit or 64-bit bus with multiplexed address and data lines.
PCMCIA	Personal Computer Memory Card International Association
peripheral	any hardware device connected to a computer, such as a monitor, keyboard, printer, plotter, disk or tape drive, graphics tablet, scanner, mouse, and so on
POSC	Power On Self Configuration
PXI	PCI eXtensions for Instrumentation; an open implementation of CompactPCI that adds electrical features that meet the high-performance requirements of instrumentation applications by providing triggering, local buses, and system clock capabilities. PXI also offers two-way interoperability with CompactPCI products.

R

RAM	Random Access Memory; the computer's primary workspace
RAMDAC	Random Access Memory Digital to Analog Converter; the VGA controller chip that maintains the color palette and converts data from memory into analog signals for the monitor
resource	hardware settings used by devices in a computer system, including ISA interrupt level, DMA channel, and I/O address

RMS	Root mean squared. *See* gRMS.
RTC	Real Time Clock; an electronic circuit that maintains the time of day, and can also provide timing signals for timesharing operations

S

s	seconds
slave	A functional part of a PXI device that detects data transfer cycles initiated by a PXI bus master and responds to the transfers when the address specifies one of the device's registers
SO-DIMM	Small Outline Dual In-line Memory Module
SRAM	Static RAM; a memory chip that requires power to hold its content. It does not require refresh circuitry as a dynamic RAM chip, but it does take up more space and uses more power.
ST	Start Trigger
Star Trigger Slot	This slot is located at Slot 2 in a PXI mainframe and has a dedicated trigger line between each peripheral slot. This slot would be used for a module with ST functionality that can provide individual triggers to all other peripherals.

U

USB	Universal Serial Bus

V

V	Volts
VGA	Video Graphics Array; the minimum video display standard for all PCs

W

W	Watts

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