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Find the *National Instruments PXIe-7972* at our website: *Click HERE*

GETTING STARTED GUIDE

NI PXIe-7972R

NI FlexRIO™ FPGA Module for PXI Express

This document explains how to install your NI FlexRIO system, comprised of the NI PXIe-7972R (NI 7972R) FlexRIO FPGA module and an NI FlexRIO adapter module.

For information about the device specifications, refer to the *NI PXIe-7972R Specifications*, available at **Start»All Programs»National Instruments»NI FlexRIO**, and at *ni.com/manuals*.

For detailed information about the features and configuration options specific to the NI FlexRIO FPGA module, refer to the *NI FlexRIO Help*, available at **Start»All Programs»National Instruments»NI FlexRIO**, and at *ni.com/manuals*.

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How to Use Your NI FlexRIO Documentation Set

Figure 1. How to Use Your NI FlexRIO Documentation Set

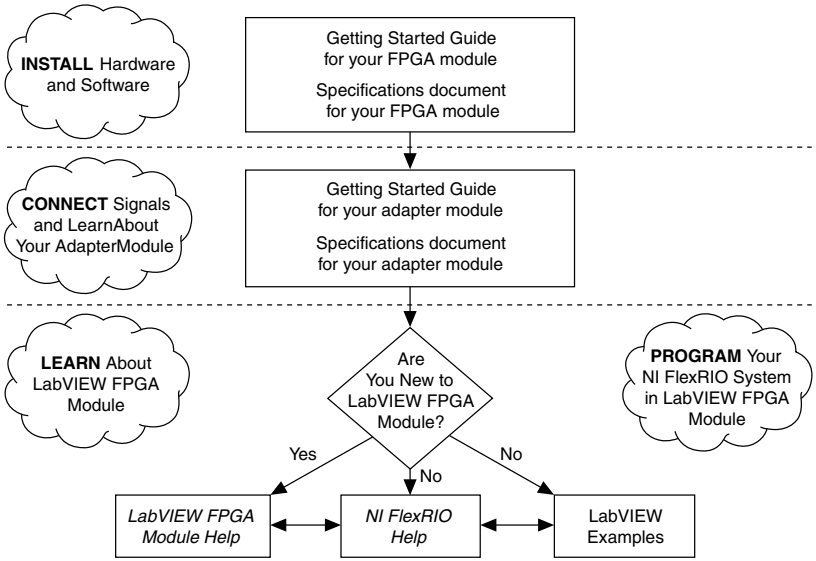


Table 1. NI FlexRIO Documentation Locations and Descriptions

Document	Location	Description
Getting started guide for your FPGA module	Available from the Start menu and at *ni.com/manuals*.	Contains installation instructions for your NI FlexRIO system.
Specifications document for your FPGA module	Available from the Start menu and at *ni.com/manuals*.	Contains specifications for your NI 7972R module.
Getting started guide for your adapter module	Available from the Start menu and at *ni.com/manuals*.	Contains signal information, examples, and CLIP details for your adapter module.
Specifications document for your adapter module	Available from the Start menu and at *ni.com/manuals*.	Contains specifications for your adapter module.
LabVIEW FPGA Module Help	Embedded in *LabVIEW Help* and at *ni.com/manuals*.	Contains information about the basic functionality of the LabVIEW FPGA Module.

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Table 1. NI FlexRIO Documentation Locations and Descriptions (Continued)

Document	Location	Description
NI FlexRIO Help	Available from the Start menu and at *ni.com/manuals*.	Contains information about the FPGA module, adapter module, and CLIP configuration information.
LabVIEW Examples	Available in NI Example Finder. In LabVIEW, click **Help»Find Examples» Hardware Input and Output»FlexRIO**.	Contains examples of how to run FPGA VIs and Host VIs on your device.
IPNet	*ni.com/ipnet*	Contains LabVIEW FPGA functions and intellectual property to share.
NI FlexRIO product page	*ni.com/flexrio*	Contains product information and data sheets for NI FlexRIO devices.

Required Components

The following items are necessary to set up and use your NI FlexRIO system:

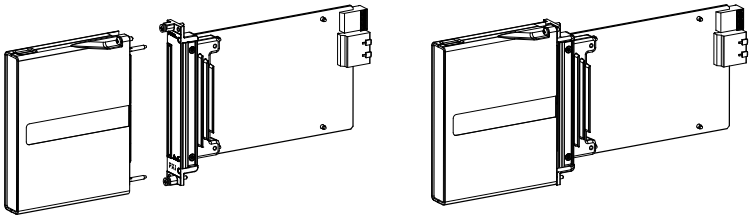
- The NI FlexRIO hardware device, comprised of the following items:
  - NI 7972R
  - NI FlexRIO adapter module

Note You can use the NI FlexRIO FPGA module without an adapter module for coprocessing or peer-to-peer streaming. The adapter module installation instructions in this document do not apply to these circumstances.

The following figure shows the combined module.

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Figure 2. Combining Your Adapter Module and FPGA Module



- The following software packages:
  - LabVIEW
  - LabVIEW FPGA Module
  - NI FlexRIO Support

    Note The most recent version of NI FlexRIO Support is available at *ni.com/downloads*. Search for `flexrio` to download the latest version of NI FlexRIO Support.
  - NI FlexRIO Adapter Module Support[1]

    Note The most recent version of NI FlexRIO Adapter Module Support is available at *ni.com/downloads*. Search for `flexrio adapter module support` to download the latest version of NI FlexRIO Adapter Module Support. You do not need this software if you are not using an adapter module.
  - (Optional) LabVIEW Real-Time Module.
- A PXI Express/CompactPCI Express chassis
- One of the following controllers:
  - PXI Express/CompactPCI Express embedded controller
  - MXI kit and a PC
- One of the following operating systems:
  - Windows 8
  - Windows 7

[1] The NI 1483 adapter module requires the NI-IMAQ instrument driver instead of NI FlexRIO Adapter Module Support.

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  - Windows Vista
  - Windows XP Pro x32 Service Pack 2 or Service Pack 3
- At least one cable for connecting signals to the NI FlexRIO device. Refer to your adapter module documentation for a list of applicable cables and accessories for your NI FlexRIO system.

Related Information

Installing the Application Software and Driver on page 5

Installing the Application Software and Driver

Before installing your hardware, you must install the application software and instrument driver. Visit *ni.com/info* and enter `rdsoftwareversion` as the Info Code to determine which minimum software versions you need for your device. Install the software in the following order:

1. Install LabVIEW.

   Refer to the *LabVIEW Installation Guide* for installation instructions for LabVIEW and system requirements for the LabVIEW software. Refer to the *LabVIEW Upgrade Notes* for additional information about upgrading to the most recent version of LabVIEW for Windows. Documentation for LabVIEW is available at *ni.com/manuals* and by selecting **Start»All Programs»National Instruments»LabVIEW»LabVIEW Manuals**.
2. Install the LabVIEW FPGA Module.

   Refer to the *LabVIEW FPGA Module Release and Upgrade Notes* for installation instructions and information about getting started with the LabVIEW FPGA Module. Documentation for the LabVIEW FPGA Module is available at *ni.com/manuals* and by selecting **Start»All Programs»National Instruments»LabVIEW»LabVIEW Manuals**.
3. (Optional) Install the LabVIEW Real-Time Module.

   Refer to the *LabVIEW Real-Time Module Release and Upgrade Notes* for system requirements, installation instructions, and additional information about using the LabVIEW Real-Time Module.
4. Install NI FlexRIO.

   Refer to the *NI FlexRIO Readme* on the NI FlexRIO installation media for system requirements and installation instructions for NI FlexRIO Support. Documentation for NI FlexRIO Support is available at *ni.com/manuals* and by selecting **Start»All Programs»National Instruments»NI FlexRIO**.

   Note If you are not using an adapter module, skip step 5.
5. Install NI FlexRIO Adapter Module Support.

   Refer to the *NI FlexRIO Adapter Module Support Readme* on the NI FlexRIO Adapter Module Support installation media for system requirements and installation instructions. Documentation for NI FlexRIO Adapter Module Support is available at *ni.com/manuals*

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and by selecting **Start»All Programs»National Instruments»NI FlexRIO»NI FlexRIO Adapter Module Documentation**.

Related Information

Required Components on page 3
NI FlexRIO FPGA Module Signals on page 10
Installing the NI FlexRIO FPGA Module on page 7

Installing the NI FlexRIO Devices

Note You must install the software before installing the hardware.

Unpacking

The NI 7972R modules ship in antistatic packages to prevent electrostatic discharge from damaging module components. To prevent such damage when handling the modules, ground yourself using a grounding strap or by holding a grounded object, such as your computer chassis, and complete the following steps:

1. Touch the antistatic package to a metal part of the computer chassis before removing the module from the package.

   Caution Never touch the exposed pins of connectors.

2. Remove each module from the package and inspect it for loose components or any other sign of damage.

Notify NI if the modules appear damaged in any way. Do not install a damaged module into the chassis.

Preparing the Environment

Ensure that the environment you are using the NI 7972R in meets the following specifications.

Operating temperature (IEC 60068-2-1, IEC60068-2-2).....0 °C to 55 °C

Operating humidity (IEC 60068-2-56).....10% to 90% RH, noncondensing

Pollution Degree.....2

Maximum altitude.....2,000 m at 25 °C ambient temperature

Indoor use only.

Note Refer to the *NI PXIe-7972R Specifications* at *ni.com/manuals* for complete specifications.

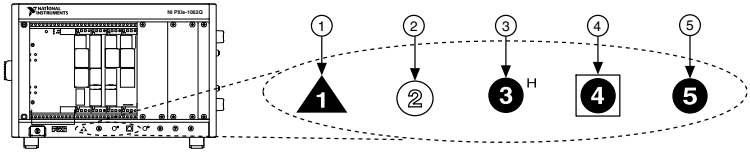
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Installing the NI FlexRIO FPGA Module

Note You must install the software before you install the hardware.

1. Power off and unplug the PXI Express chassis. Refer to your chassis manual to install or configure the chassis.
2. Identify a supported PXI Express slot in the chassis. The figure below shows the symbols that indicate the slot types in a PXI Express chassis.

Figure 3. Symbols for PXI Express/PXI Express HybridSlots

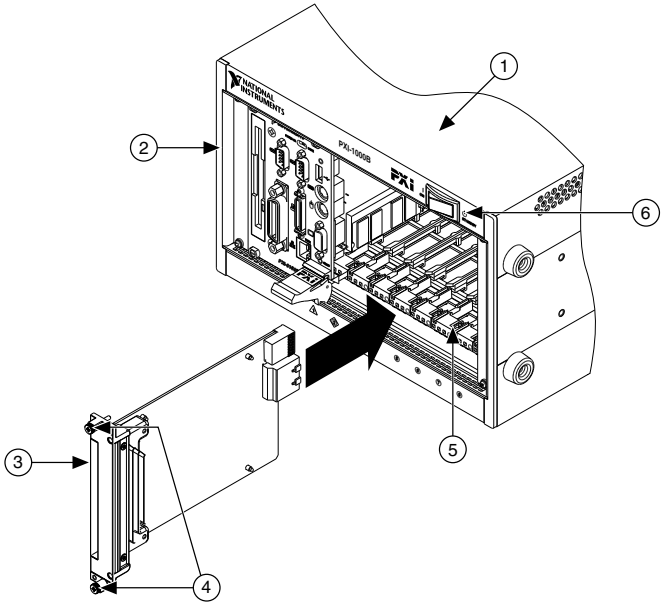


1. PXI Express System Controller Slot
2. PXI Peripheral Slot
3. PXI Express Hybrid Peripheral Slot
4. PXI Express System Timing Slot
5. PXI Express Peripheral Slot

   Refer to the chassis documentation for specifications.
3. Remove the filler panel of an unused PXI Express slot.
4. Touch any metal part of the chassis to discharge any static electricity. Place the PXI Express module edges into the module guides at the top and bottom of the chassis, and slide the module into the chassis until the module is fully inserted, as shown in the figure below.

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Figure 4. Installing an NI FlexRIO FPGA Module in the PXI Express Chassis



1. PXI Express Chassis
2. PXI Express System Controller
3. NI FlexRIO FPGA Module
4. Front-Panel Mounting Screws
5. Module Guides
6. Power Switch

5. Secure the device front panel to the chassis front panel mounting rail using the front panel mounting screws.
6. Plug in and power on the PXI Express chassis.

Related Information

Installing the Application Software and Driver on page 5

Confirming that Measurement & Automation Explorer (MAX) Recognizes the Device

Use Measurement & Automation Explorer (MAX) to configure your National Instruments hardware. MAX informs other programs about which devices reside in the system and how they are configured. MAX is automatically installed with NI FlexRIO Support.

1. Launch MAX by navigating to **Start»All Programs»National Instruments»NI MAX** or by clicking the NI MAX desktop icon.
2. In the Configuration pane, double-click **Devices and Interfaces** to see the list of installed devices. Installed devices appear under the name of their associated chassis.

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3. Expand your **Chassis** tree item. MAX lists all devices installed in the chassis. Your default device names may vary.

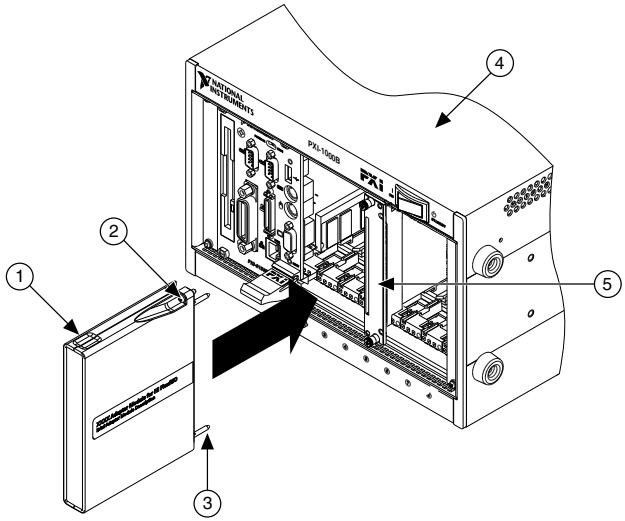
Note If you do not see your hardware listed, press <F5> to refresh the list of installed devices. If the device is still not listed, power off the system, ensure the device is correctly installed, and restart.

Installing the NI FlexRIO Adapter Module

Note Skip this step if you are not using an adapter module.

1. Gently insert the guide pins and the high-density card edge of the NI FlexRIO adapter module into the corresponding connectors of the NI FlexRIO FPGA module, as shown in the figure below.

Figure 5. Installing the NI FlexRIO Adapter Module



1. NI FlexRIO Adapter Module
2. Captive Screw
3. Guide Pin
4. PXI/PXI Express Chassis
5. NI FlexRIO FPGA Module

The connection may be tight, but do not force the adapter module into place.

2. Tighten the captive screws on the NI FlexRIO adapter module to secure it to the NI FlexRIO FPGA module. NI recommends using the laser-tipped screwdriver (part number 748677-01) included in the NI PXIe-7972R packaging.
3. Launch LabVIEW to begin configuring your NI FlexRIO system.

Note MAX only recognizes FPGA modules that are in the chassis. Your adapter module will not appear in MAX.

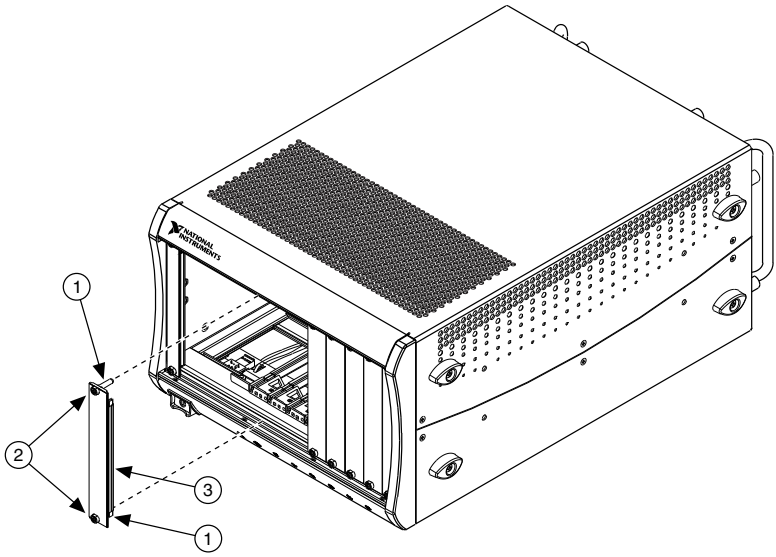
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Installing PXI EMC Filler Panels

To ensure specified EMC performance, PXI EMC filler panels must be properly installed in your NI FlexRIO system. The PXI EMC filler panels (National Instruments part number 778700-01) must be purchased separately.

1. Remove the captive screw covers.
2. Install the PXI EMC filler panels by securing the captive mounting screws to the chassis, as shown in the figure below. Make sure that the EMC gasket is on the right side of the PXI EMC filler panel.

Figure 6. PXI EMC Filler Panels and Chassis



1. Captive Screw Covers
2. Captive Mounting Screws
3. EMC Gasket

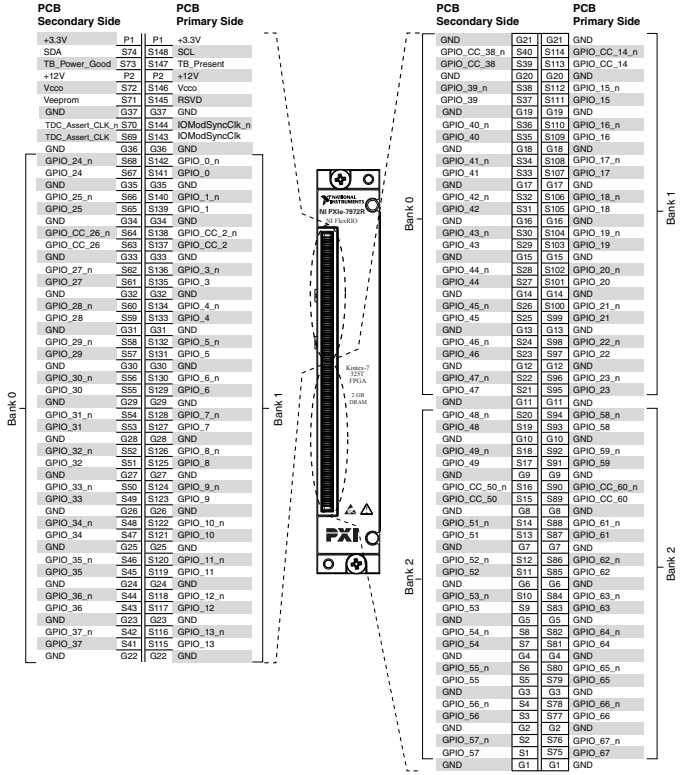
Note You must populate all slots with a module or a PXI EMC filler panel to ensure proper module cooling. Do not over tighten screws (2.5 lb · in. maximum). For additional information about the use of PXI EMC filler panels in your PXI system, visit `ni.com/info` and enter `emcpanels`.

NI FlexRIO FPGA Module Signals

The following figure shows the available signals on the NI FlexRIO FPGA module. Refer to your adapter module specifications for your adapter module pinout.

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Figure 7. NI FlexRIO FPGA Module Front Connector Pin Assignments and Locations



PCB Secondary Side			PCB Primary Side
+3.3V	P1	P1	+3.3V
SDA	S74	S148	SCL
TB_Power_Good	S73	S147	TB_Present
+12V	P2	P2	+12V
Vcco	S72	S146	Vcco
Veeprom	S71	S145	RSVD
GND	G37	G37	GND
TDC_Assert_CLK_n	S70	S144	IOModSyncClk_n
TDC_Assert_CLK	S69	S143	IOModSyncClk
GND	G36	G36	GND
GPIO_24_n	S68	S142	GPIO_0_n
GPIO_24	S67	S141	GPIO_0
GND	G35	G35	GND
GPIO_25_n	S66	S140	GPIO_1_n
GPIO_25	S65	S139	GPIO_1
GND	G34	G34	GND
GPIO_CC_26_n	S64	S138	GPIO_CC_2_n
GPIO_CC_26	S63	S137	GPIO_CC_2
GND	G33	G33	GND
GPIO_27_n	S62	S136	GPIO_3_n
GPIO_27	S61	S135	GPIO_3
GND	G32	G32	GND
GPIO_28_n	S60	S134	GPIO_4_n
GPIO_28	S59	S133	GPIO_4
GND	G31	G31	GND
GPIO_29_n	S58	S132	GPIO_5_n
GPIO_29	S57	S131	GPIO_5
GND	G30	G30	GND
GPIO_30_n	S56	S130	GPIO_6_n
GPIO_30	S55	S129	GPIO_6
GND	G29	G29	GND
GPIO_31_n	S54	S128	GPIO_7_n
GPIO_31	S53	S127	GPIO_7
GND	G28	G28	GND
GPIO_32_n	S52	S126	GPIO_8_n
GPIO_32	S51	S125	GPIO_8
GND	G27	G27	GND
GPIO_33_n	S50	S124	GPIO_9_n
GPIO_33	S49	S123	GPIO_9
GND	G26	G26	GND
GPIO_34_n	S48	S122	GPIO_10_n
GPIO_34	S47	S121	GPIO_10
GND	G25	G25	GND
GPIO_35_n	S46	S120	GPIO_11_n
GPIO_35	S45	S119	GPIO_11
GND	G24	G24	GND
GPIO_36_n	S44	S118	GPIO_12_n
GPIO_36	S43	S117	GPIO_12
GND	G23	G23	GND
GPIO_37_n	S42	S116	GPIO_13_n
GPIO_37	S41	S115	GPIO_13
GND	G22	G22	GND

PCB Secondary Side			PCB Primary Side
GND	G21	G21	GND
GPIO_CC_38_n	S40	S114	GPIO_CC_14_n
GPIO_CC_38	S39	S113	GPIO_CC_14
GND	G20	G20	GND
GPIO_39_n	S38	S112	GPIO_15_n
GPIO_39	S37	S111	GPIO_15
GND	G19	G19	GND
GPIO_40_n	S36	S110	GPIO_16_n
GPIO_40	S35	S109	GPIO_16
GND	G18	G18	GND
GPIO_41_n	S34	S108	GPIO_17_n
GPIO_41	S33	S107	GPIO_17
GND	G17	G17	GND
GPIO_42_n	S32	S106	GPIO_18_n
GPIO_42	S31	S105	GPIO_18
GND	G16	G16	GND
GPIO_43_n	S30	S104	GPIO_19_n
GPIO_43	S29	S103	GPIO_19
GND	G15	G15	GND
GPIO_44_n	S28	S102	GPIO_20_n
GPIO_44	S27	S101	GPIO_20
GND	G14	G14	GND
GPIO_45_n	S26	S100	GPIO_21_n
GPIO_45	S25	S99	GPIO_21
GND	G13	G13	GND
GPIO_46_n	S24	S98	GPIO_22_n
GPIO_46	S23	S97	GPIO_22
GND	G12	G12	GND
GPIO_47_n	S22	S96	GPIO_23_n
GPIO_47	S21	S95	GPIO_23
GND	G11	G11	GND
GPIO_48_n	S20	S94	GPIO_58_n
GPIO_48	S19	S93	GPIO_58
GND	G10	G10	GND
GPIO_49_n	S18	S92	GPIO_59_n
GPIO_49	S17	S91	GPIO_59
GND	G9	G9	GND
GPIO_CC_50_n	S16	S90	GPIO_CC_60_n
GPIO_CC_50	S15	S89	GPIO_CC_60
GND	G8	G8	GND
GPIO_51_n	S14	S88	GPIO_61_n
GPIO_51	S13	S87	GPIO_61
GND	G7	G7	GND
GPIO_52_n	S12	S86	GPIO_62_n
GPIO_52	S11	S85	GPIO_62
GND	G6	G6	GND
GPIO_53_n	S10	S84	GPIO_63_n
GPIO_53	S9	S83	GPIO_63
GND	G5	G5	GND
GPIO_54_n	S8	S82	GPIO_64_n
GPIO_54	S7	S81	GPIO_64
GND	G4	G4	GND
GPIO_55_n	S6	S80	GPIO_65_n
GPIO_55	S5	S79	GPIO_65
GND	G3	G3	GND
GPIO_56_n	S4	S78	GPIO_66_n
GPIO_56	S3	S77	GPIO_66
GND	G2	G2	GND
GPIO_57_n	S2	S76	GPIO_67_n
GPIO_57	S1	S75	GPIO_67
GND	G1	G1	GND

Note Pins S72 and S146 are shorted together on the NI 7972R.

Related Information

Installing the Application Software and Driver on page 5

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Compliance and Certifications

Safety

This product is designed to meet the requirements of the following electrical equipment safety standards for measurement, control, and laboratory use:

- IEC 61010-1, EN 61010-1
- UL 61010-1, CSA 61010-1

Note For UL and other safety certifications, refer to the product label or the *Online Product Certification* section.

Electromagnetic Compatibility

This product meets the requirements of the following EMC standards for electrical equipment for measurement, control, and laboratory use:

- EN 61326-1 (IEC 61326-1): Class A emissions; Basic immunity
- EN 55011 (CISPR 11): Group 1, Class A emissions
- EN 55022 (CISPR 22): Class A emissions
- EN 55024 (CISPR 24): Immunity
- AS/NZS CISPR 11: Group 1, Class A emissions
- AS/NZS CISPR 22: Class A emissions
- FCC 47 CFR Part 15B: Class A emissions
- ICES-001: Class A emissions

Note In the United States (per FCC 47 CFR), Class A equipment is intended for use in commercial, light-industrial, and heavy-industrial locations. In Europe, Canada, Australia, and New Zealand (per CISPR 11), Class A equipment is intended for use only in heavy-industrial locations.

Note Group 1 equipment (per CISPR 11) is any industrial, scientific, or medical equipment that does not intentionally generate radio frequency energy for the treatment of material or inspection/analysis purposes.

Note For EMC declarations, certifications, and additional information, refer to the *Online Product Certification* section.

CE Compliance CE

This product meets the essential requirements of applicable European Directives, as follows:

- 2006/95/EC; Low-Voltage Directive (safety)
- 2004/108/EC; Electromagnetic Compatibility Directive (EMC)

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Online Product Certification

To obtain product certifications and the DoC for this product, visit *ni.com/certification*, search by model number or product line, and click the appropriate link in the Certification column.

Environmental Management

NI is committed to designing and manufacturing products in an environmentally responsible manner. NI recognizes that eliminating certain hazardous substances from our products is beneficial to the environment and to NI customers.

For additional environmental information, refer to the *Minimize Our Environmental Impact* web page at *ni.com/environment*. This page contains the environmental regulations and directives with which NI complies, as well as other environmental information not included in this document.

Waste Electrical and Electronic Equipment (WEEE)

EU Customers At the end of the product life cycle, all products must be sent to a WEEE recycling center. For more information about WEEE recycling centers, National Instruments WEEE initiatives, and compliance with WEEE Directive 2002/96/EC on Waste Electrical and Electronic Equipment, visit *ni.com/environment/weee*.

电子信息产品污染控制管理办法（中国 RoHS）

中国客户 National Instruments 符合中国电子信息产品中限制使用某些有害物质指令(RoHS)。关于 National Instruments 中国 RoHS 合规性信息，请登录 `ni.com/environment/rohs_china`。(For information about China RoHS compliance, go to `ni.com/environment/rohs_china`.)

Electromagnetic Compatibility Guidelines

This product was tested and complies with the regulatory requirements and limits for electromagnetic compatibility (EMC) stated in the product specifications. These requirements and limits provide reasonable protection against harmful interference when the product is operated in the intended operational electromagnetic environment.

This product is intended for use in industrial locations. However, harmful interference may occur in some installations, when the product is connected to a peripheral device or test object, or if the product is used in residential or commercial areas. To minimize interference with radio and television reception and prevent unacceptable performance degradation, install and use this product in strict accordance with the instructions in the product documentation.

Furthermore, any changes or modifications to the product not expressly approved by National Instruments could void your authority to operate it under your local regulatory rules.

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Caution To ensure the specified EMC performance, operate this product only with shielded cables and accessories.

Caution Refer to the *Read Me First: Safety and Electromagnetic Compatibility* document for important safety and electromagnetic compatibility information. To obtain a copy of this document online, visit *ni.com/manuals*, and search for the document title.

Caution When exposed to transient electromagnetic phenomena such as electrostatic discharge (ESD) or power surges, this product may experience a temporary upset or other performance degradation that requires more than 10 seconds for self-recovery.

Caution The NI FlexRIO FPGA module front panel interface is sensitive to electrostatic discharge. Use caution when handling the NI FlexRIO FPGA module to prevent damage to the internal components exposed by this interface.

Caution Using the NI 7972R in a manner not described in this document may impair the protection the NI 7972R provides.

Worldwide Support and Services

The National Instruments website is your complete resource for technical support. At *ni.com/support*, you have access to everything from troubleshooting and application development self-help resources to email and phone assistance from NI Application Engineers.

Visit *ni.com/services* for NI Factory Installation Services, repairs, extended warranty, and other services.

Visit *ni.com/register* to register your National Instruments product. Product registration facilitates technical support and ensures that you receive important information updates from NI.

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