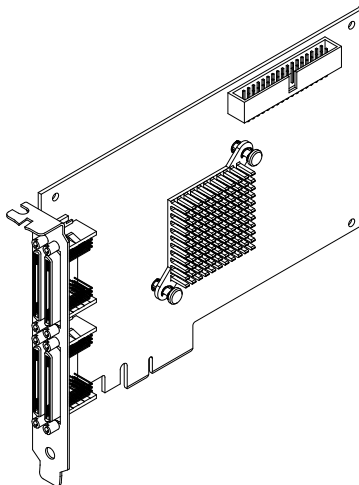


GETTING STARTED GUIDE

NI PCIe-7821R

R Series Digital I/O Module for PCI Express, 128 DIO, 512 MB DRAM, Kintex-7 160T FPGA

This document describes how to begin using the PCIe-7821R.



Safety Guidelines



Caution Do not operate the PCIe-7821R in a manner not specified in this document. Product misuse 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.

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.



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



Caution To ensure the specified EMC performance, the length of all I/O cables must be no longer than 3 m (10 ft).

Preparing the Environment

Ensure that the environment in which you are using the PCIe-7821R meets the following specifications.

Operating temperature (IEC 60068-2-1, IEC 60068-2-2)	0 °C to 40 °C
Operating humidity (IEC 60068-2-56)	10% RH to 90% RH, noncondensing
Pollution degree	2
Maximum altitude	2,000 m

Indoor use only.



Note Refer to the device specifications on ni.com/manuals for complete specifications.

Unpacking the Kit



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

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



Caution Never touch the exposed pins of connectors.



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

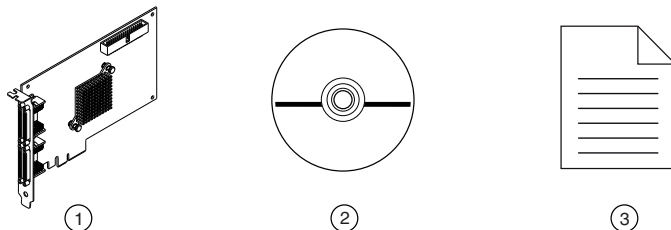
3. Unpack any other items and documentation from the kit.

Store the device in the antistatic package when the device is not in use.

Verifying the Kit Contents

Verify that the following items are included in the PCIe-7821R kit.

Figure 1. PCIe-7821R Kit Contents



1. Hardware
 2. NI-RIO Media
 3. Getting Started Guide
-

Installing Software on the Host Computer

Before using the PCIe-7821R, you must install the following application software and device drivers on the host computer.

1. LabVIEW 2017 or later
2. LabVIEW FPGA Module 2017 or later
3. NI R Series Multifunction RIO Device Drivers May 2017 or later

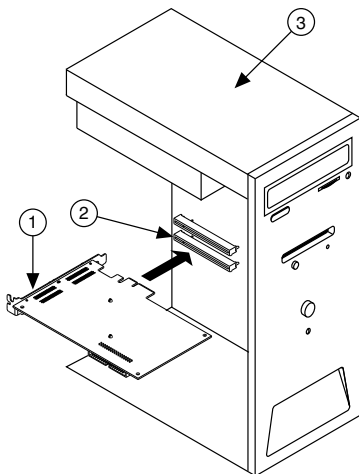
Visit ni.com/info and enter the Info Code `softwareversion` for minimum software support information.

Installing the PCIe-7821R

1. Power off and unplug the computer.
2. Access the computer system expansion slots. This step might require you to remove one or more access panels on the computer case.
3. Locate a compatible slot and remove the corresponding slot cover on the computer back panel.
4. Touch any metal part of the computer to discharge any static electricity.
5. Insert the PCIe-7821R into the applicable PCI Express system slot. Gently rock the PCIe-7821R into place. Do not force the device into place.

You cannot install PCI Express devices in PCI slots. PCI Express devices support up-plugging into a PCI Express slot of higher lane width. For more information, refer to ni.com/pciexpress.

Figure 2. Installing a PCI Express Device



1. PCI Express Device
 2. PCI Express System Slot
 3. PC with PCI Express Slot
-
6. Secure the module mounting bracket to the computer back panel rail.
 7. Replace any access panels on the computer case.
 8. Plug in and power on your computer.
 9. If applicable, install accessories and/or terminal blocks as described in the installation guides.
 10. Attach sensors and signal lines to the device, terminal block, or accessory terminals.

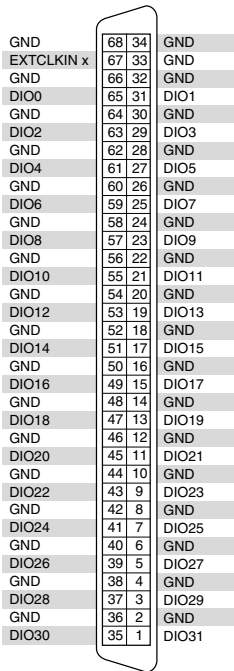
Verifying Hardware Installation

You can verify that the system recognizes the PCIe-7821R by using Measurement & Automation Explorer (MAX).

1. Launch MAX by navigating to **Start»All Programs»National Instruments»MAX** or by clicking the MAX desktop icon.
2. Expand **Devices and Interfaces**.
3. Verify that the device appears under **Devices and Interfaces**.

If the device does not appear, press <F5> to refresh the view in MAX. If the device does not appear after refreshing the view, visit ni.com/support for troubleshooting information.

Pinout



*x is the connector number.
EXTCLKIN x is an input only.

Table 1. PCIe-7821R Signal Descriptions

Signal	Description
DIO	Digital input/output signal connection
EXTCLKIN	External clock input source that can be used for source synchronous acquisitions. The provided clock source must be stable and glitch-free.
GND	Ground connection

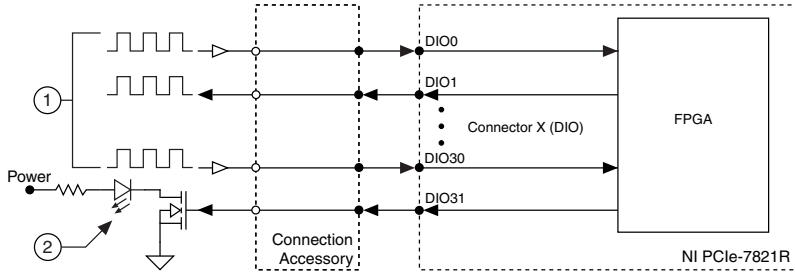
The PCIe-7821R is protected from overvoltage and overcurrent conditions.



Note Refer to the device specifications, available at ni.com/manuals for more information.

Digital I/O Connections

Figure 3. Connecting to the DIO Channels



1. High-speed signal frequencies up to 80 MHz with logic levels configured as 1.2 V, 1.5 V, 1.8 V, 2.5 V, or 3.3 V
2. LED

The DIO channels connect to the FPGA through protection circuitry, which has overvoltage and undervoltage protection as well as overcurrent protection.



Note Refer to the device specifications, available at ni.com/manuals for more information.

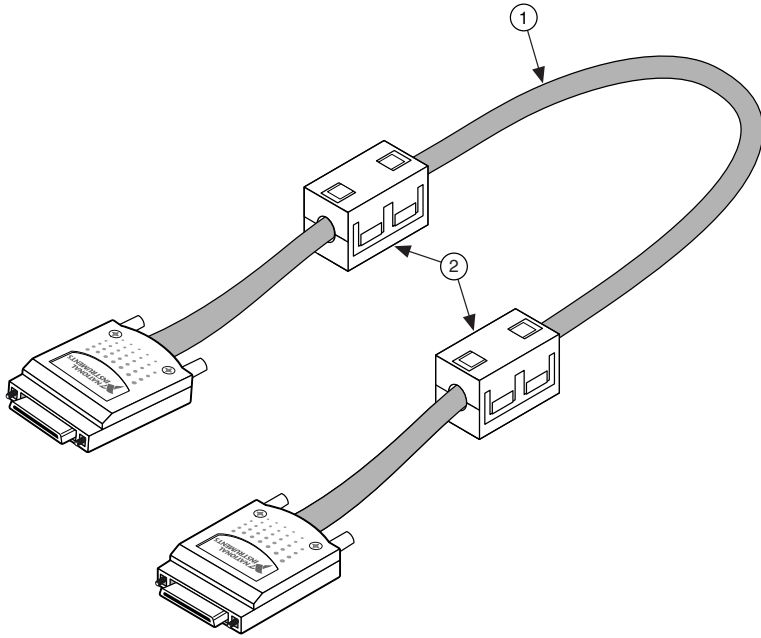
When the system powers on, the DIO channels are set as input low with pull-down resistors. To set another power-on state, you can configure the PCIe-7821R to load a VI when the system powers on. The VI can then set the DIO lines to any power-on state. Visit ni.com/info and enter `RSeries_PowerUpStates` to learn more about configuring the power-up states for the PCIe-7821R.

All the DIO channels on Connectors 0 through 3 are routed with a 50 Ω characteristic trace impedance. Route all external circuitry with a similar impedance to ensure best signal quality. NI recommends performing signal integrity measurements to test the affect of signal routing with the cable and connection accessory for your application.

Installing Noise Suppression Ferrites

For each connected I/O cable, install two (2) snap-on, ferrite beads (777297-01), one on each end of the cable, as close to the connector as practical.

Figure 4. Ferrite Installation



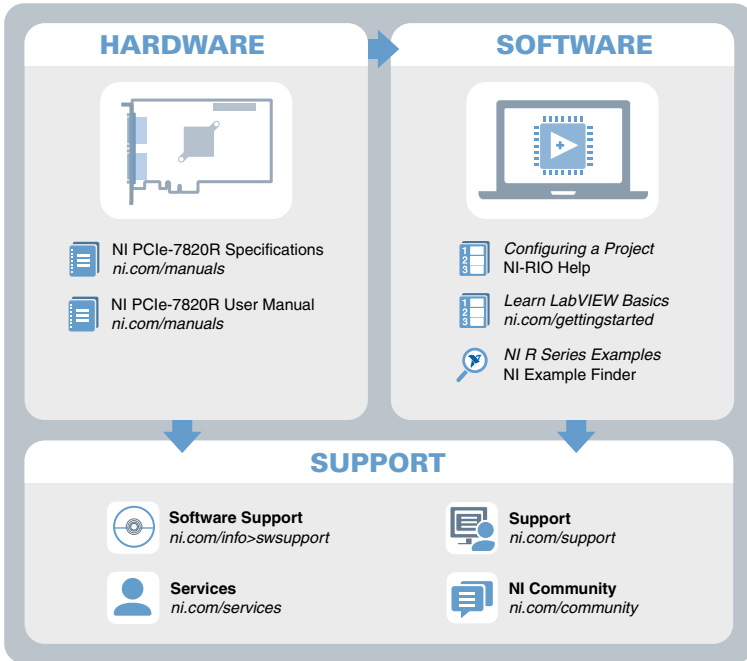
1. I/O cable
2. Ferrites

Two (2) snap-on, ferrite beads (777297-01) are included in each of the following recommended cable kits:

- Shielded R Series High Speed Digital Cable, 1m (156166-01)
- Shielded R Series High Speed Digital Cable, 2m (156166-02)

For user-supplied cables, visit ni.com/info and enter RDIO2FERRITE for ferrite beads that can be ordered directly from NI.

Where to Go Next



Worldwide Support and Services

The NI 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 NI product. Product registration facilitates technical support and ensures that you receive important information updates from NI.

A Declaration of Conformity (DoC) is our claim of compliance with the Council of the European Communities using the manufacturer's declaration of conformity. This system affords the user protection for electromagnetic compatibility (EMC) and product safety. You can obtain the DoC for your product by visiting ni.com/certification. If your product supports calibration, you can obtain the calibration certificate for your product at ni.com/calibration.

NI corporate headquarters is located at 11500 North Mopac Expressway, Austin, Texas, 78759-3504. NI also has offices located around the world. For telephone support in the United States, create your service request at ni.com/support or dial 1 866 ASK MYNI (275 6964). For telephone support outside the United States, visit the *Worldwide Offices* section of ni.com/niglobal to access the branch office websites, which provide up-to-date contact information, support phone numbers, email addresses, and current events.

Information is subject to change without notice. Refer to the *NI Trademarks and Logo Guidelines* at ni.com/trademarks for information on NI trademarks. Other product and company names mentioned herein are trademarks or trade names of their respective companies. For patents covering NI products/technology, refer to the appropriate location: **Help»Patents** in your software, the `patents.txt` file on your media, or the *National Instruments Patent Notice* at ni.com/patents. You can find information about end-user license agreements (EULAs) and third-party legal notices in the `readme` file for your NI product. Refer to the *Export Compliance Information* at ni.com/legal/export-compliance for the NI global trade compliance policy and how to obtain relevant HTS codes, ECCNs, and other import/export data. NI MAKES NO EXPRESS OR IMPLIED WARRANTIES AS TO THE ACCURACY OF THE INFORMATION CONTAINED HEREIN AND SHALL NOT BE LIABLE FOR ANY ERRORS. U.S. Government Customers: The data contained in this manual was developed at private expense and is subject to the applicable limited rights and restricted data rights as set forth in FAR 52.227-14, DFAR 252.227-7014, and DFAR 252.227-7015.

© 2017 National Instruments. All rights reserved.

376830A-01 Apr17