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PCIe-8255

Getting Started with the NI PCIe-8255R

The NI PCIe-8255R (NI 8255R) is an IEEE 1394a¹ and IEEE 1394b interface device with reconfigurable I/O (RIO) for PCI Express (PCIe). This document describes how to install and configure the necessary hardware and software components to begin using the NI 8255R.

What You Need to Get Started

You need the following items to set up and use the NI 8255R:

- ☐ NI 8255R interface device
- ☐ IEEE 1394 camera
- ☐ 9-pin IEEE 1394 cable for connecting to IEEE 1394b cameras
- ☐ 6-pin to 9-pin cable or 6-pin to 9-pin adapter for connecting to IEEE 1394a cameras
- ☐ Computer running Microsoft Windows Vista/XP/2000 with at least one available PCIe slot



Note Visit ni.com/info and enter `rdvisionvista` for more information about National Instruments interface device compatibility with Windows Vista.

- ☐ NI Vision Acquisition Software 8.2.1 or later, which includes the NI-IMAQdx and NI-IMAQ I/O driver software.
- ☐ Optional software for developing applications:
 - NI Vision Development Module
 - NI Vision Builder for Automated Inspection
 - LabVIEW
 - LabWindows™/CVI™
 - Microsoft Visual Basic

Optional Equipment

National Instruments offers a variety of products for use with the NI 8255R, including the following:

- Digital I/O cable and horizontal DIN rail terminal block (part number 778790-01)²
- Digital I/O cable and vertical DIN rail terminal block (part number 778791-01)²
- NI Vision I/O Terminal Block and Prototyping Accessory (part number 779166-01)²
- 24 V, 50 W power supply (part number 778794-01), for powering isolated outputs
- IEEE 1394 cameras
- LED ringlight and constant current source (part number 778787-01)
- 12 mm fixed focal length lens (part number 778789-01)

¹ To connect an IEEE 1394a camera to the NI 8255R, you will need a 6-pin to 9-pin cable or a 6-pin to 9-pin adapter.

² When using this accessory with the NI 8255R, three of the digital I/O signals on the device are not accessible. Refer to the *Connectors* section of the *NI PCIe-8255R User Manual* for more information.

Refer to the National Instruments catalog, visit ni.com, or call the National Instruments office nearest you for more specific information about these products.

Related Documentation

The following documents contain additional information that you may find helpful:

- *NI PCIe-8255R User Manual*—Contains information about programming options, hardware functionality, and signal connections.
- *NI Vision Acquisition Software Release Notes*—Contains information about new functionality, minimum system requirements, and installation instructions for the NI-IMAQ driver software.
- *Measurement & Automation Explorer Help for NI-IMAQdx*—Describes how to configure the NI-IMAQdx driver software, NI image acquisition devices, and cameras using Measurement & Automation Explorer (MAX).
- *NI-IMAQdx User Manual*—Contains fundamental programming concepts for the NI-IMAQdx driver software and terminology for using NI image acquisition devices.
- *LabVIEW Help*—This document contains reference information for the NI-IMAQ I/O shutdown states VIs, terminal references for the configurable I/O module on the NI-IMAQ I/O device, and parameter references for the parameters you can set for the NI-IMAQ I/O device in the Read/Write control. To locate the information, search for NI-IMAQ I/O in the *LabVIEW Help*.

Safety Information



Caution The following paragraphs contain important safety information you *must* follow when installing and operating the device.

Do *not* operate the device in a manner not specified in the documentation. Misuse of the device may result in a hazard and may compromise the safety protection built into the device. If the device is damaged, turn it off and do *not* use it until service-trained personnel can check its safety. If necessary, return the device to National Instruments for repair.

Keep away from live circuits. Do *not* remove equipment covers or shields unless you are trained to do so. If signal wires are connected to the device, hazardous voltages can exist even when the equipment is turned off. To avoid a shock hazard, do *not* perform procedures involving cover or shield removal unless you are qualified to do so. Disconnect all field power prior to removing covers or shields.

If the device is rated for use with hazardous voltages ($>30 V_{\text{rms}}$, $42.4 V_{\text{pk}}$, or $60 V_{\text{dc}}$), it may require a safety earth-ground connection wire. Refer to the device specifications for maximum voltage ratings.

Because of the danger of introducing additional hazards, do *not* install unauthorized parts or modify the device. Use the device only with the chassis, modules, accessories, and cables specified in the installation instructions. All covers and filler panels *must* be installed while operating the device.

Do *not* operate the device in an explosive atmosphere or where flammable gases or fumes may be present. Operate the device only at or below the pollution degree stated in the specifications. Pollution consists of any foreign matter—solid, liquid, or gas—that may reduce dielectric strength or surface resistivity. The following is a description of pollution degrees.

- Pollution Degree 1—No pollution or only dry, nonconductive pollution occurs. The pollution has no effect.
- Pollution Degree 2—Normally only nonconductive pollution occurs. Occasionally, nonconductive pollution becomes conductive because of condensation.

- Pollution Degree 3—Conductive pollution or dry, nonconductive pollution occurs. Nonconductive pollution becomes conductive because of condensation.

Clean the device and accessories by brushing off light dust with a soft, nonmetallic brush. Remove other contaminants with a stiff, nonmetallic brush. The unit *must* be completely dry and free from contaminants before returning it to service.

You *must* insulate signal connections for the maximum voltage for which the device is rated. Do *not* exceed the maximum ratings for the device. Remove power from signal lines before connection to or disconnection from the device.



Caution National Instruments measurement products may be classified as either Measurement Category I or II. Operate products at or below the Measurement Category level specified in the hardware specifications.

Measurement Category¹: Measurement circuits are subjected to working voltages² and transient stresses (overvoltage) from the circuit to which they are connected during measurement or test. Measurement Category establishes standardized impulse withstand voltage levels that commonly occur in electrical distribution systems. The following is a description of Measurement (Installation³) Categories:

- Measurement Category I is for measurements performed on circuits *not* directly connected to the electrical distribution system referred to as MAINS⁴ voltage. This category is for measurements of voltages from specially protected secondary circuits. Such voltage measurements include signal levels, special equipment, limited-energy parts of equipment, circuits powered by regulated low-voltage sources, and electronics.
- Measurement Category II is for measurements performed on circuits directly connected to the electrical distribution system. This category refers to local-level electrical distribution, such as that provided by a standard wall outlet (e.g., 115 V for U.S. or 230 V for Europe). Examples of Measurement Category II are measurements performed on household appliances, portable tools, and similar products.
- Measurement Category III is for measurements performed in the building installation at the distribution level. This category refers to measurements on hard-wired equipment such as equipment in fixed installations, distribution boards, and circuit breakers. Other examples are wiring, including cables, bus-bars, junction boxes, switches, socket-outlets in the fixed installation, and stationary motors with permanent connections to fixed installations.

¹ Measurement Categories as defined in electrical safety standard IEC 61010-1.

² Working voltage is the highest rms value of an AC or DC voltage that can occur across any particular insulation.

³ Measurement Category is also referred to as Installation Category.

⁴ MAINS is defined as the (hazardous live) electrical supply system to which equipment is designed to be connected for the purpose of powering the equipment. Suitably rated measuring circuits may be connected to the MAINS for measuring purposes.

Unpacking

The NI 8255R ships in an antistatic package to prevent electrostatic discharge from damaging device components. To avoid such damage in handling the device, take the following precautions:

1. Ground yourself using a grounding strap or by touching a grounded object, such as the computer chassis.
2. Touch the antistatic package to a metal part of the computer chassis before removing the device from the package.



Caution *Never* touch the exposed pins of connectors.

3. Remove the device from the package and inspect it for loose components or any other signs of damage. Notify National Instruments if the device appears damaged in any way. Do *not* install a damaged device in the computer.

Store the NI 8255R in the antistatic package when not in use.

Installation

The following instructions are for general installation. Refer to the documentation provided by your computer manufacturer for specific instructions and warnings. Refer to the [Specifications](#) section for a list of the typical power requirements for the NI 8255R.

1. Install NI Vision Acquisition Software before installing the NI 8255R. Refer to the *NI Vision Acquisition Software Release Notes* for specific installation instructions.
2. Power off and unplug the computer.



Caution To protect yourself and the computer from electrical hazards, the computer *must* remain unplugged until the installation is complete.

3. Remove the computer cover to expose the expansion slots.



Caution Installing a PCIe device into a PCI, PCI-X, AGP, or any non-PCIe slot can damage both the computer motherboard and the device. If you are unsure of the difference between connector types, do *not* install the device. Refer to the documentation provided by your computer manufacturer to determine the correct slot in which to install the NI 8255R.

4. Touch a metal part of the computer to discharge any static electricity that might be on your clothes or body. Static electricity can damage the device.
5. Choose an unused x1 or larger PCIe slot, and remove the corresponding expansion slot cover on the back panel of the computer. Figure 1 shows the different types of expansion slots available on most computers.



Note The NI 8255R is intended for a x1 PCIe slot. The NI 8255R will fit into, and can be used in a x4, x8, or x16 PCIe slot.

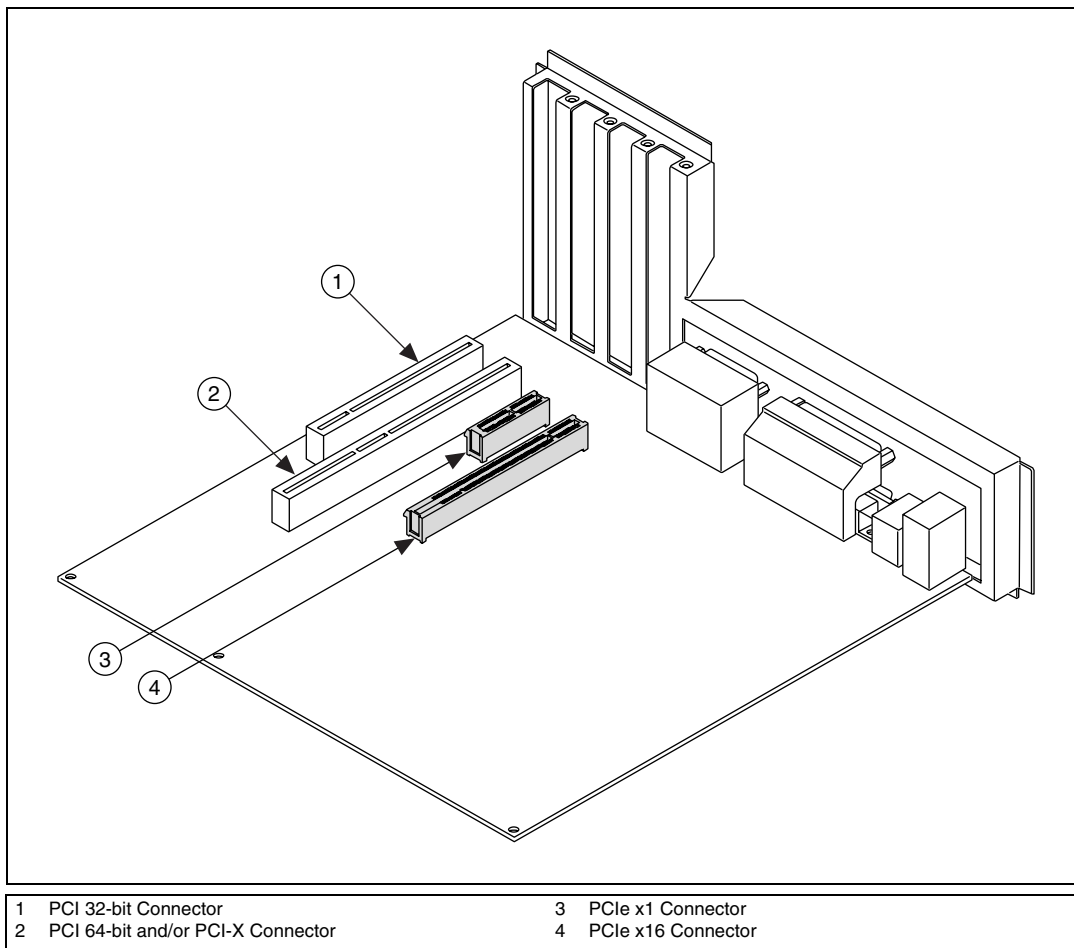


Figure 1. PC Expansion Slots

6. Remove your device from the antistatic package and gently rock the NI 8255R into the slot. The connection may be tight, but do *not* force the device into place.



Note Check that the bracket of your device aligns up with the hole in the back panel rail of the computer chassis.

7. Secure the device mounting bracket to the back panel rail of the computer.
8. To provide power to your camera, connect an unused power connector from the ATX power supply on your computer to the camera power ATX connector on your NI 8255R. Refer to Figure 2 for information about placement of the connectors on the NI 8255R.

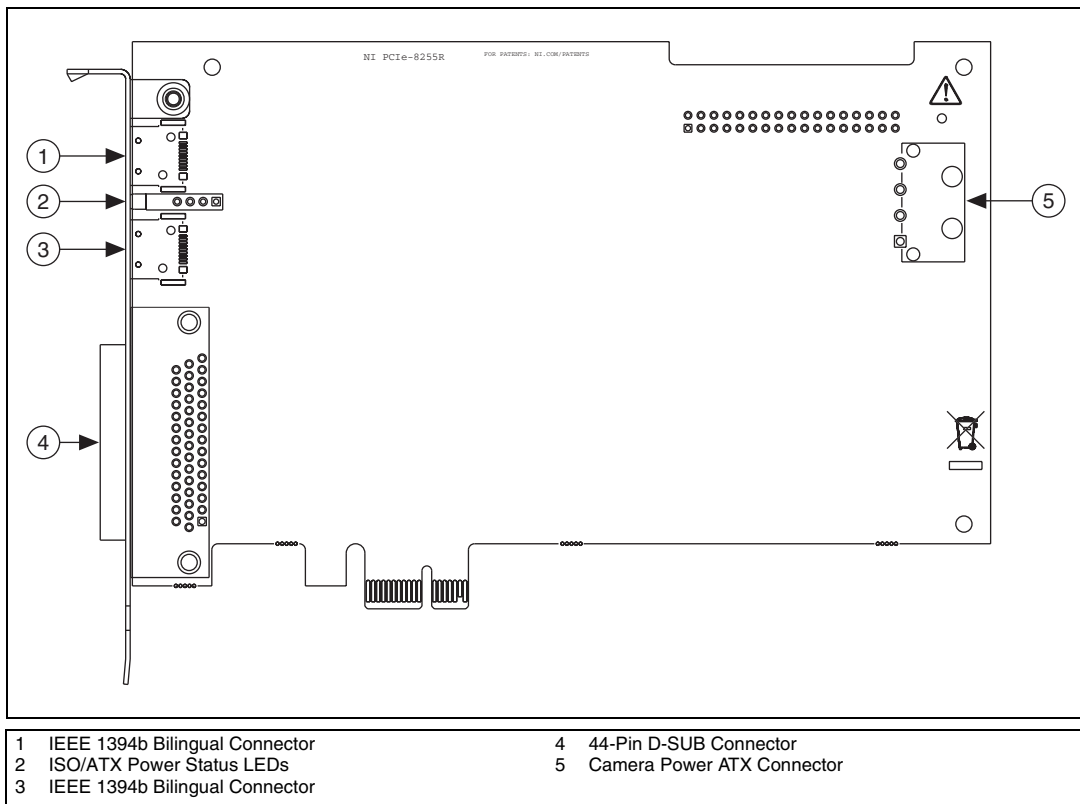


Figure 2. NI 8255R Connectors

9. Replace the computer cover.
10. Connect the IEEE 1394 cable to your camera. Refer to your camera manufacturer documentation for specific instructions about how to connect the cable to your camera.
11. Connect the IEEE 1394 cable to an IEEE 1394 connector on the NI 8255R front panel.
12. Plug in and power on the computer.

The NI 8255R is now installed and the camera is connected.

Wiring Isolated Output Power to the NI 8255R

Complete the following steps to connect power for the isolated outputs to the NI 8255R.



Caution Do *not* connect the NI 8255R isolated power to a source less than 5 VDC or greater than 30 VDC. Doing so could damage the device.

1. Complete this step if you are using the NI desktop power supply (part number 778794-01). If you are using a power supply other than the NI desktop power supply skip this step and proceed to step 2.
 - a. Disconnect the 4-position power connector from the power supply, as shown in Figure 3.

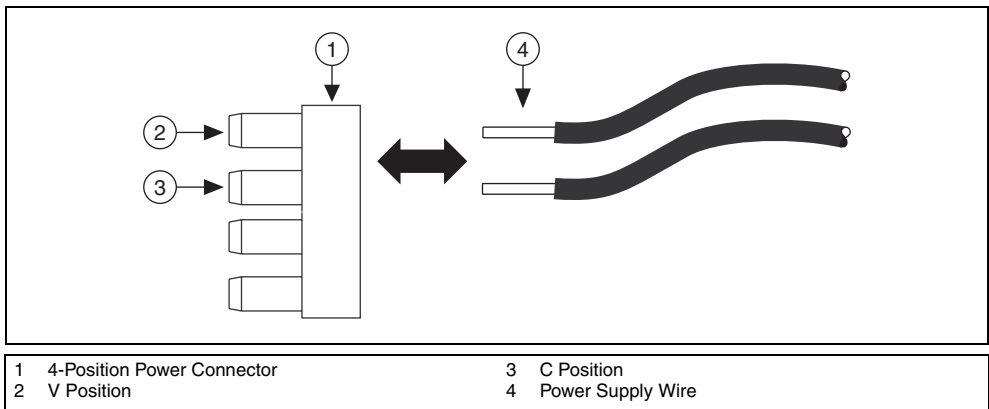


Figure 3. Removing the 4-Position Power Connector from the Power Supply

- b. Depending on your connection method, reconnect the V_{iso} and C_{iso} wires to one of the following options:
- V_{iso} and C_{iso} on the 44-pin D-SUB
 - V_{iso} and C_{iso} on the DIN rail terminal block
 - V_{iso} and C_{iso} on the NI Vision I/O Terminal Block and Prototyping Accessory

Refer to Table 1 for a summary of the isolated power supply connections.

Table 1. Isolated Power Supply Connection Options

Connection Method	V_{iso}	C_{iso}
Custom cable	10, 25	14, 26, 29, 33, 36, 39, 42
44-pin D-SUB to 37-pin terminal block	17, 33	12, 16, 18, 28, 32, 34
44-pin D-SUB to 37-pin NI Vision I/O Terminal Block	V_{iso} terminal	C_{iso} terminal

2. Complete this step if you are using a power supply other than the NI desktop power supply. If you are using the NI desktop power supply, skip this step and proceed to step 3.
- a. Wire the voltage output and the common-mode (ground) output of the isolated power supply to one of the following options:
- V_{iso} and C_{iso} on the 37-pin terminal block
 - V_{iso} and C_{iso} on the 44-pin D-SUB
 - V_{iso} and C_{iso} on the NI Vision I/O Terminal Block and Prototyping Accessory

Refer to Table 1 for a summary of the isolated power supply connections.

3. (Optional) To suppress electromagnetic interference, install a ferrite on the power supply cable as close to the connection to the NI 8255R as possible. Wrap the power supply cable around the ferrite two times, as shown in Figures 4 and 5.

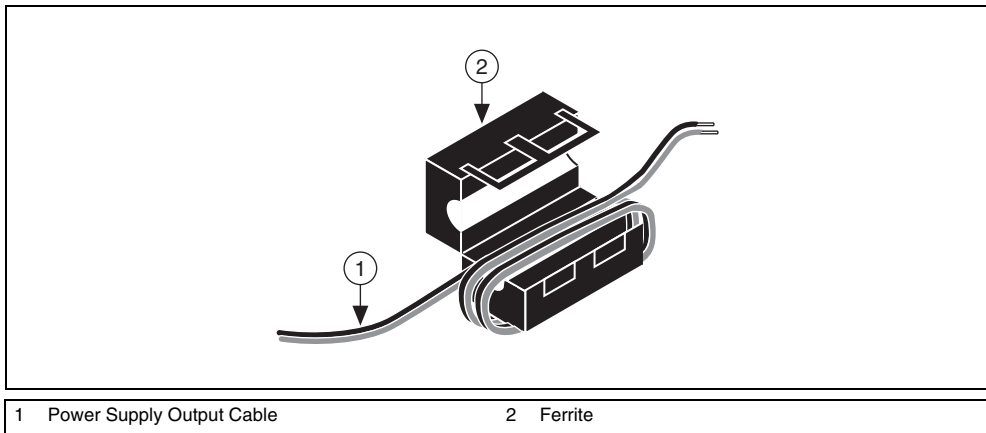


Figure 4. Installing a Ferrite Connector on the Power Supply Cable

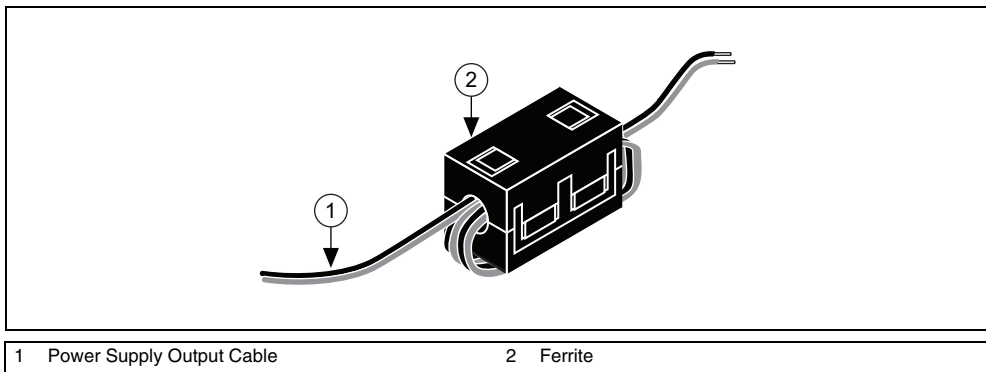


Figure 5. Closed Ferrite on the Power Supply Cable

4. Plug the power supply cord into an outlet. The orange LED on the NI 8255R front panel will illuminate when the computer is on and an isolated power supply is properly connected.

Configuring the NI 8255R

After you have installed the NI 8255R and powered on the computer, the computer will recognize the device and assign resources to it. Use Measurement & Automation Explorer (MAX), the National Instruments configuration utility, to configure the IEEE 1394 camera connected to the NI 8255R for acquisition. Refer to the *Measurement & Automation Explorer Help for NI-IMAQdx* for additional information about configuring the NI 8255R.



Note Before configuring the device in MAX, ensure that you installed the NI-IMAQdx driver software.

Specifications

The following specifications apply to the NI 8255R image acquisition device. These specifications are typical at 25 °C, unless otherwise stated.

TTL Inputs and Outputs

Digital logic levels

Level	Minimum	Maximum
Input low voltage (V_{IL})	0 V	0.5 V
Input high voltage (V_{IH})	2.2 V	5 V
Output low voltage (V_{OL}), at 5 mA	—	0.4 V
Output high voltage (V_{OH}), at 5 mA	2.4 V	—

TTL Inputs

Number of channels2

Maximum pulse rate2 MHz

Minimum pulse detected.....500 ns

Power-on state.....Input (high-impedance) 61.9 k Ω pull-up to 5 V

TTL Outputs

Number of channels10

Output voltage range.....0 V to 5 V

Maximum pulse rate2 MHz

Optically Isolated Inputs and Outputs

Isolated (Current Sinking) Inputs

Number of channels13

Input voltage range0 V to 30 V

Input ON voltage.....3.5 V to 30 V

Input OFF voltage0 V to 2 V

Turn-on current7.1 mA, typical
14 mA, maximum

Maximum pulse rate100 kHz

Minimum pulse detected.....10 μ s

Reverse polarity protectionYes, -30 V

Isolated (Current Sourcing) Outputs

Number of channels4

On-state voltage range5 V to 30 V, maximum

Maximum on-state voltage

drop from V1.2 V at 100 mA

Output current	
5 V isopower	50 mA, maximum
24 V isopower	100 mA, maximum
30 V isopower	100 mA, maximum
Maximum pulse rate	10 kHz (maximum load resistance 100 kΩ)
Minimum pulse generated	100 μs
Reverse polarity protection	Yes

IEEE 1394 Interface

Number of ports	2
Speed	100, 200, 400, or 800 Mbps

PCI Express Interface

PCI Express compliance	Version 1.0a
Native link width	x1
Up-plugging link width availability	x4, x8, x16

Power Requirements

IEEE 1394 bus power ¹	18 W, maximum (shared by both ports)
Isolated supply ²	5 VDC to 30 VDC
Camera interface ³	IEEE 1394b, compatible with IEEE 1394a cameras

Physical Characteristics

Dimensions	11.2 cm × 16.8 cm (4.4 in. × 6.6 in.)
Weight	130 g (4.5 oz)

Environment

The NI 8255R is intended for indoor use only.	
Operating temperature	0 °C to 55 °C
Storage temperature	–20 °C to 70 °C
Relative humidity	5% to 90%, noncondensing
Pollution Degree	2



Caution Do *not* use the NI 8255R for connection to signals within Measurement Categories II, III, or IV.

Measurement Category	I
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Approved at altitudes up to 2,000 m.

¹ The bus power specification assumes that power is provided to the NI 8255R device from the host computer power supply using the ATX power connector. If power is not supplied through the ATX power connector, camera power is supplied by the PCIe bus and should be limited to 3 W, shared by both ports.

² Do *not* draw more than 100 mA from 30 V isolated outputs. Do *not* draw more than 50 mA from 5 V isolated outputs.

³ To connect an IEEE 1394a camera to the NI 8255R, you will need a 6-pin to 9-pin cable or a 6-pin to 9-pin adapter.

Safety

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

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



Note For UL and other safety considerations, refer to the product label, or visit ni.com/certification, search by model number or product line, and click the appropriate link in the Certification column.

Electromagnetic Compatibility

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

- EN 61326 EMC requirements; Minimum Immunity
- EN 55011 Emissions; Group 1, Class A
- CE, C-Tick, ICES, and FCC Part 15 Emissions; Class A



Note For EMC compliance, operate this device according to product documentation.

CE Compliance

This product meets the essential requirements of applicable European Directives, as amended for CE marking, as follows:

- 73/23/EEC; Low-Voltage Directive (safety)
- 89/336/EEC; Electromagnetic Compatibility Directive (EMC)



Note Refer to the Declaration of Conformity (DoC) for this product for any additional regulatory compliance information. To obtain 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.

Waste Electrical and Electronic Equipment (WEEE)



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Where to Go for Support

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