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APEX WAVES NI PCIe-8255R 2-Port Reconfigurable Digital I-O Frame Grabber Device User Guide

Contents

APEX WAVES NI PCIe-8255R 2-Port Reconfigurable Digital I-O Frame Grabber Device

Product Information

The NI PCIe-8255R is an IEEE 1394a and IEEE 1394b interface device for PCI Express (PCIe) with reconfigurable I/O (RIO). It is designed for use with NI Vision Acquisition Software 8.2 or later and requires a computer running Windows 2000/XP with at least one PCIe slot. The device supports connection to IEEE 1394a and IEEE 1394b cameras and provides isolated outputs that may require an external power supply.

What You Need to Get Started

- NI Vision Acquisition Software 8.2 or later
- NI Vision Acquisition Software Release Notes
- Computer running Windows 2000/XP with at least one PCIe slot
- IEEE 1394 camera
- 9-pin IEEE 1394 cable for interfacing to IEEE 1394b cameras
- 6-pin to 9-pin cable or 6-pin to 9-pin adapter for interfacing to IEEE 1394a cameras
- External power supply to support powering isolated outputs
- Optional software packages and documentation

Optional Equipment
For specific information about optional equipment, refer to the National Instruments catalog, visit ni.com, or contact the National Instruments office nearest you.

Safety Information

Caution:
Follow the safety instructions provided below to ensure safe installation and operation of the device.

- Do not operate the device in a manner not specified in the documentation. Misuse of the device may result in hazards and compromise safety.
- 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 trained to do so. Hazardous voltages may exist even when the equipment is turned off.
- Disconnect all field power prior to removing covers or shields.
- Do not install unauthorized parts or modify the device. Use only specified chassis, modules, accessories, and cables.
- Do not operate the device in an explosive atmosphere or where flammable gases or fumes may be present. Operate the device within specified pollution degree.
- Clean the device and accessories before returning to service.

Refer to the NI PCIe-8255R User Manual for more detailed information.

Product Usage Instructions

To set up and use the NI PCIe-8255R, follow these steps:

1. Ensure you have the necessary items mentioned in the "What You Need to Get Started" section.
2. Install NI Vision Acquisition Software 8.2 or later on your computer.
3. Connect the NI PCIe-8255R to a PCIe slot in your computer.
4. Connect an IEEE 1394 camera to the NI PCIe-8255R using either a 9-pin IEEE 1394 cable for IEEE 1394b cameras or a 6-pin to 9-pin cable/adapter for IEEE 1394a cameras.
5. If using isolated outputs, connect an external power supply to support powering them.
6. Refer to the NI PCIe-8255R User Manual for detailed instructions on configuring the device.

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

What You Need to Get Started

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

- NI Vision Acquisition Software 8.2 or later
- NI Vision Acquisition Software Release Notes
- Computer running Windows 2000/XP with at least one PCIe slot
- IEEE 1394 camera
- 9-pin IEEE 1394 cable for interfacing to IEEE 1394b cameras
- 6-pin to 9-pin cable or 6-pin to 9-pin adapter for interfacing to IEEE 1394a cameras
- External power supply to support powering isolated outputs
- Optional software packages and documentation:
  - NI Vision Development Module
  - NI Vision Builder for Automated Inspection
  - LabVIEW
  - LabVIEW FPGA Module
  - LabWindows™/CVI™

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)1
- Digital I/O cable and vertical DIN rail terminal block (part number 778791-01) 1
- NI Vision I/O Terminal Block and Prototyping Accessory (part number 779166-01) 1
- 24 V, 50 W power supply (part number 778794-01) for powering isolated outputs
- Sony IEEE 1394a high-resolution monochrome camera (part number 778849-01)
- Basler IEEE 1394a standard resolution monochrome camera (part number 778785-01)
- LED ring light and constant current source (part number 778787-01)
- 12 mm fixed focal length lens (part number 778789-01)

For specific information about these products, refer to the National Instruments catalog, visit **ni.com**, or contact the National Instruments office nearest you.

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 Vrms, 42.4 Vpk, or 60 Vdc), 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 Category 1:
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 (Installation1) Categories:

- Measurement Category I is for measurements performed on circuits not directly connected to the electrical distribution system referred to as MAINS2 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.
- Measurement Category IV is for measurements performed at the primary electrical supply installation (<1,000 V). Examples include electricity meters and measurements on primary overcurrent protection devices and on ripple control units.

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:

- Ground yourself via a grounding strap or by holding a grounded object, such as the computer chassis.
- 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.

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 about installing hardware in the computer. 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 device. Refer to the NI Vision Acquisition Software Release Notes for installation and configuration 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. 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.
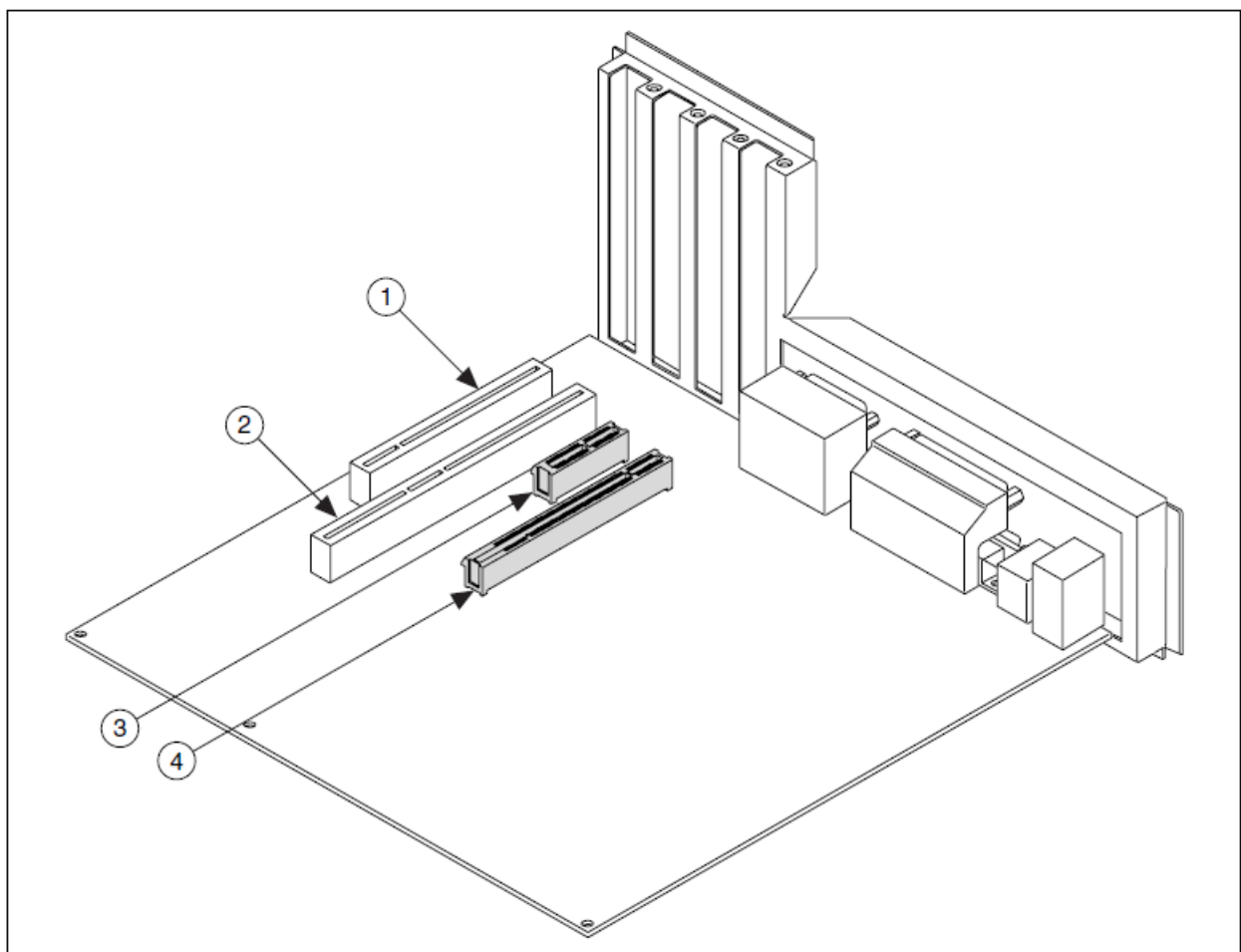
1. PCI 32-bit Connector
2. PCI 64-bit and/or PCI-X Connector
3. PCIe x1 Connector
4. PCIe x16 Connector

Figure 1. PC Expansion Slots

5. Touch a metal part on the computer case to discharge any static electricity on your clothes or body before

handling the NI 8255R. Static electricity can damage the device.

6. Remove the NI 8255R 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 the NI 8255R lines up with the hole in the back panel rail of the computer chassis.

7. Unless your computer secures expansion devices in a different manner, screw the mounting bracket of the device 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.

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 IEEE 1394 cable to your camera.

11. Connect the IEEE 1394 cable to an IEEE 1394 connector on the NI 8255R front panel. Refer to Figure 2 for the location of the IEEE 1394b bilingual connectors on the NI 8255R. If you are using an IEEE 1394a cable, an IEEE 1394a to IEEE 1394b adapter is required. Alternatively, you can use an IEEE 1394a to IEEE 1394b cable.

12. Plug in and power on the computer.

The NI 8255R is now installed and your camera is connected. Refer to Figure 2 for information about placement of the connectors on the NI 8255R.
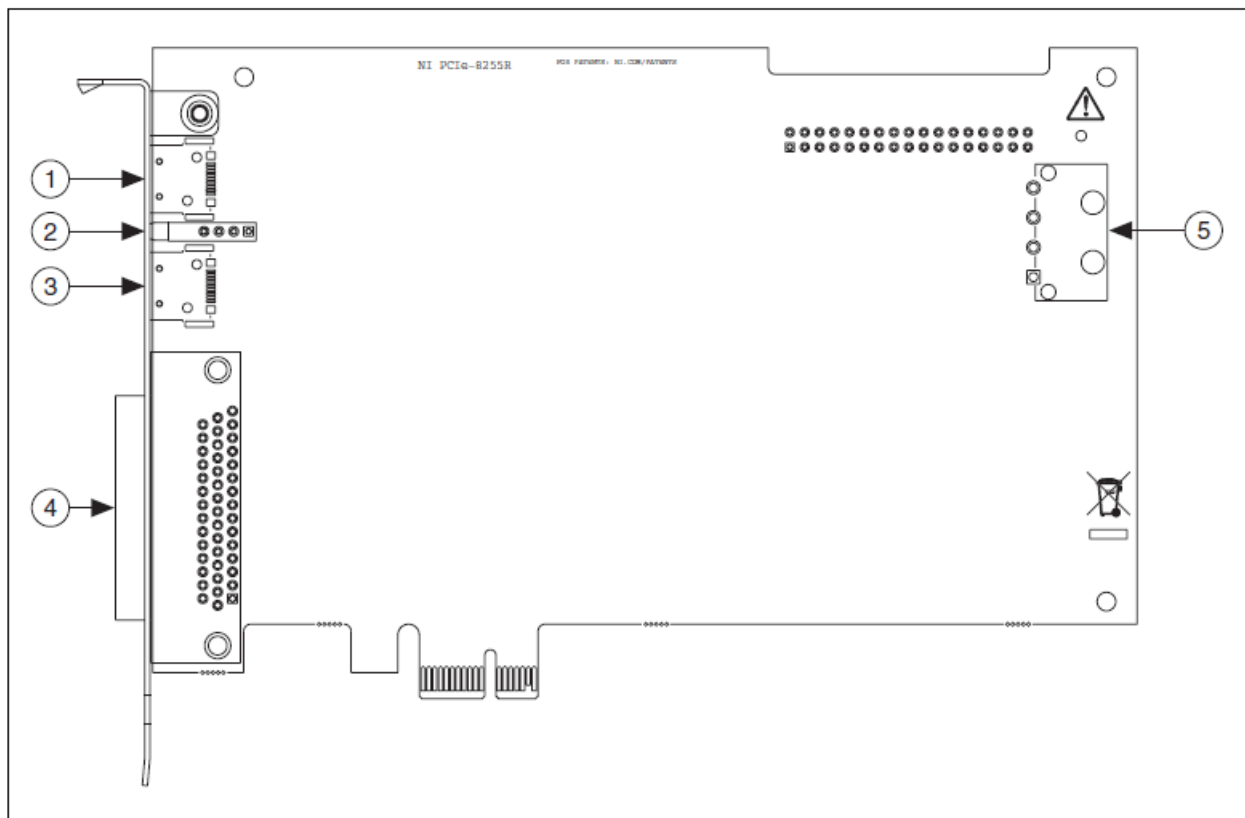

1. IEEE 1394b Bilingual Connector
2. ISO/ATX Power Status LEDs
3. IEEE 1394b Bilingual Connector
4. 44-Pin D-SUB Connector
5. Camera Power ATX Connector

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 NI 8255R 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.
   - Disconnect the 4-position power connector from the power supply, as shown in Figure 3.
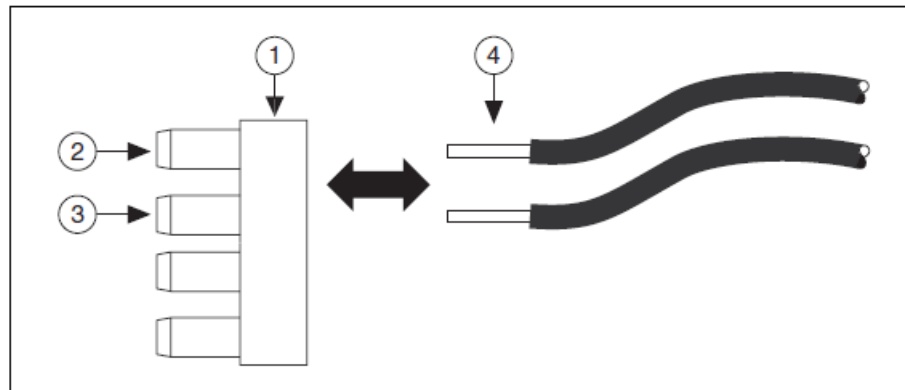
   1. 4-Position Power Connector
   2. V Position
   3. C Position
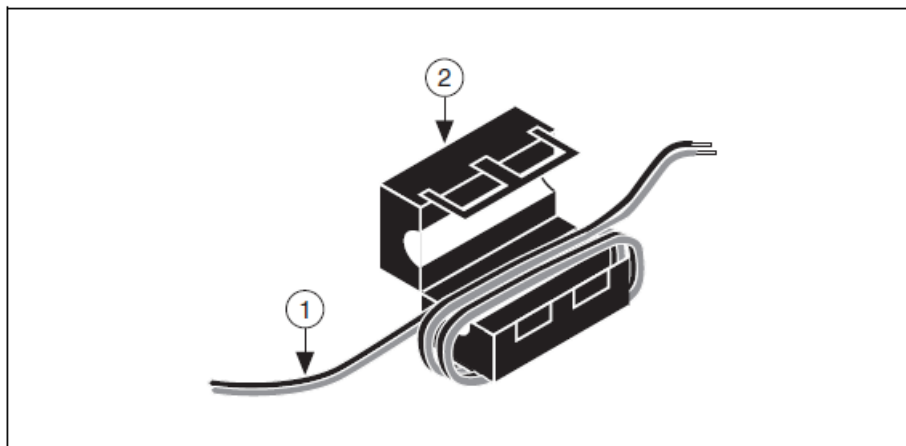   4. Power Supply Wire

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

   - Depending on your connection method, reconnect the Viso and Ciso wires to one of the following options:
     - isVo and Ciso on the 44-pin D-SUB
     - isVo and Ciso on the DIN rail terminal block
     - isVo and Ciso 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

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.
   - Wire the voltage output and the common-mode (ground) output of the isolated power supply to one of the following options:
     - isVo and Ciso on the 37-pin terminal block
     - isVo and Ciso on the 44-pin D-SUB
     - isVo and Ciso 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.

1. Power Supply Output Cable
2. Ferrite

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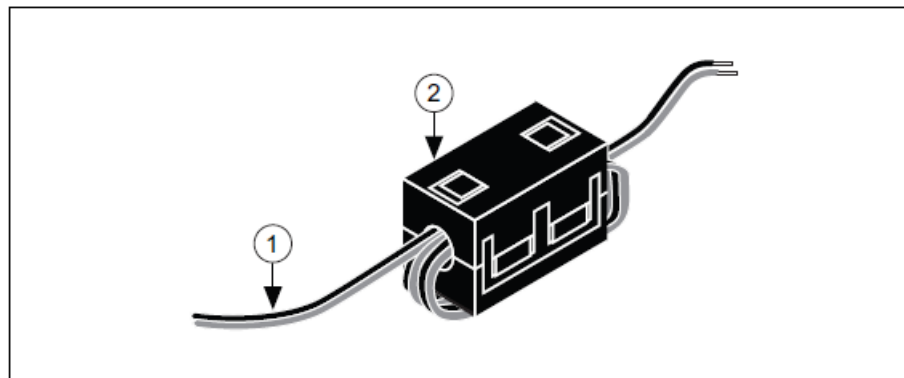
1. Power Supply Output Cable
2. Ferrite

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

Caution
Updating your computer to Microsoft Windows XP Service Pack 2 may decrease the performance of your IEEE 1394 devices. Refer to the NI KnowledgeBase article 3J0A446W or Microsoft Knowledge Base article 885222 for more information.

After you have installed the NI 8255R and powered on your computer, Windows 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.

Note
You must install NI Vision Acquisition Software 8.2 or later before configuring your camera in MAX. Refer to the NI Vision Acquisition Release Notes for information about configuring your camera.

Related Documentation
The following documents contain additional information about the NI 8255R:

- NI Vision Acquisition Software Release Notes—This document contains information about how to install the

driver software.

- 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 LabVIEW Help.

Specifications

These specifications are typical at 25 °C, unless otherwise stated.

Power Requirements

- IEEE 1394 bus power1 ……………………… 18 W, maximum (shared by both ports)
- Isolated supply2 ……………………………….. 5 VDC to 30 VDC
- Camera interface3 …………………………….. IEEE 1394b, compatible with IEEE 1394a cameras

TTL Inputs and Outputs

Digital logic levels

Level	Minimum	Maximum
Input low voltage (V_{IL})	0 V	0.5 V
Input high voltage (VIH)	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 channels …………………………. 2
- Maximum pulse rate…………………………. 2 MHz
- Minimum pulse detected …………………… 500 ns
- Power-on state………………………………… Input (high-impedance) 61.9 kΩ pull-up to 5V

TTL Outputs

- Number of channels…………………………..10
- Output voltage range …………………………0 V to 5 V
- Maximum pulse rate …………………………..2 MHz

Optically Isolated Inputs and Outputs

Isolated (Current Sinking) Inputs

- Number of channels…………………………..13
- Input voltage range …………………………0 V to 30 V
    - Input ON voltage ………………………..3.5 V to 30 V
    - Input OFF voltage……………………….0 V to 2 V
- Turn-on current……………………………….7.1 mA, typical 14 mA, maximum
- Maximum pulse rate ………………………..100 kHz
- Minimum pulse detected …………………….10 µs
- Reverse polarity protection…………………Yes, –30 V

Isolated (Current Sourcing) Outputs

- Number of channels………………………….4
- On-state voltage range ……………………….5 V to 30 V, maximum
    - Maximum on-state voltage
    - drop from V……………………………….1.2 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

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 device 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
- Approved at altitudes up to 2,000 m.

Safety

The NI 8255R is designed to meet the requirements of the following standards of safety for electrical equipment for measurement, control, and laboratory use:

- EN 61010-1, IEC 61010-1
- UL 61010-1, CAN/CSA-C22.2 No. 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

The NI 8255R 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 with shielded cabling.

CE Compliance
The NI 8255R 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

- **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.
- **Note** The NI 8255R may experience temporary data interruption if exposed to electrostatic discharge (ESD).

Waste Electrical and Electronic Equipment (WEEE)
EU Customers At the end of their life cycle, all products must be sent to a WEEE recycling center. For more information about WEEE recycling centers and National Instruments WEEE initiatives, visit

ni.com/environment/weee.htm.

Where to Go for Support

The National Instruments Web site 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.

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 electronic 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**.

National Instruments corporate headquarters is located at 11500 North Mopac Expressway, Austin, Texas, 78759-3504. National Instruments also has offices located around the world to help address your support needs. For telephone support in the United States, create your service request at ni.com/support and follow the calling instructions or dial 512 795 8248. For telephone support outside the United States, contact your local branch office:

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- Canada 800 433 3488, China 86 21 6555 7838,
- Czech Republic 420 224 235 774, Denmark 45 45 76 26 00,
- Finland 385 0 9 725 725 11, France 33 0 1 48 14 24 24,
- Germany 49 0 89 741 31 30, India 91 80 41190000,
- Israel 972 0 3 6393737, Italy 39 02 413091, Japan 81 3 5472 2970,
- Korea 82 02 3451 3400, Lebanon 961 0 1 33 28 28,
- Malaysia 1800 887710, Mexico 01 800 010 0793,
- Netherlands 31 0 348 433 466, New Zealand 0800 553 322,
- Norway 47 0 66 90 76 60, Poland 48 22 3390150,
- Portugal 351 210 311 210, Russia 7 095 783 68 51,
- Singapore 1800 226 5886, Slovenia 386 3 425 4200,
- South Africa 27 0 11 805 8197, Spain 34 91 640 0085,
- Sweden 46 0 8 587 895 00, Switzerland 41 56 200 51 51,
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Documents / Resources

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References

- **Engineer Ambitiously - NI**
- **Engineer Ambitiously - NI**
- **Calibration Services - NI**
- **Product Certifications - NI**
- **Product Take-Back Program and Recycling - NI**
- **Legal Information - NI**
- **National Instruments Patents - NI**
- **Support - NI**
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