# PCle-1477 Getting Started





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# PCIe-1477 Getting Started

This document describes how to begin using the PCIe-1477.



## Safety Guidelines

**Caution** Observe all instructions and cautions in the user documentation. Using the model in a manner not specified can damage the model and compromise the built-in safety protection. Return damaged models to NI for repair.

**Attention** Suivez toutes les instructions et respectez toutes les mises en garde de la documentation utilisateur. L'utilisation d'un modèle de toute autre façon que celle spécifiée risque de l'endommager et de compromettre la protection de sécurité intégrée. Renvoyez les modèles endommagés à NI pour réparation.

## **EMC 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.

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

# Preparing the Environment

Ensure that the environment in which you are using the PCIe-1477 meets the following specifications.

Maximum altitude	2,000 m (800 mbar) (at 25 °C ambient temperature)
Pollution degree	2

Indoor use only.

**Note** Refer to the device specifications on <u>ni.com/manuals</u> for complete specifications.

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

## **Operating Environment**

Operating temperature, local <sup>1</sup>	0 °C to 55 °C (IEC 60068-2-1 and IEC 60068-2-2)
Operating humidity	10% to 90% RH, noncondensing (IEC 60068-2-78)

## Storage Environment

Ambient temperature range	-20 °C to 70 °C (IEC 60068-2-1 and IEC 60068-2-2)
Relative humidity range	5% to 95% RH, noncondensing (IEC 60068-2-78)

1. For PCI Express adapter cards with integrated air movers, NI defines the local operational ambient environment to be at the fan inlet. For cards without integrated air movers, NI defines the local operational ambient environment to be 25 mm (1 in.) upstream of the leading edge of the card. For more information about the local operational ambient environment definition for PCI Express adapter cards, visit <u>ni.com/info</u> and enter the Info Code pcielocalambient.

# Unpacking the Kit

**Notice** 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.



**Notice** 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.

**Note** 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-1477 kit.

#### Figure 1. PCIe-1477 Kit Contents



- 1. Hardware
- 2. NI Vision Acquisition Software
- 3. Getting Started Guide

# Installing the Software

Close any applications before upgrading your software. You must be an Administrator to install NI software on your computer.

- 1. Install LabVIEW 2017 or later and LabVIEW FPGA 2017 or later.
- 2. Install the NI Vision Acquisition Software 18.5.

## Installing the NI PCIe-1477

The following instructions are for general installation. Refer to the documentation provided by your computer manufacturer for specific instructions and warnings.

### What to Use

- NI PCIe-1477
- Camera Link-compatible camera
- One (base) or two (medium/full/extended) Camera Link cables with a 26-pin SDR connector on the end for the NI PCIe-1477
- Computer running Microsoft Windows 7 SP1 (32- or 64-bit) or later with at least one available x8 or larger PCIe slot and a 6-pin (2 x 3) PCIe auxiliary power connector if using PoCL
- Tools for PCIe card installation (refer to the documentation provided by your computer manufacturer)
- NI Vision Acquisition Software

## What to Do

- 1. Install NI Vision Acquisition Software before installing the NI PCIe-1477. 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.

**Attention** Pour vous protéger et protéger l'ordinateur des risques électriques, l'ordinateur doit rester débranché jusqu'à ce que l'installation soit terminée.

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

**Notice** Installing a PCIe device into any non-PCIe slot can damage both the computer motherboard and the device. Refer to the documentation provided by your computer manufacturer to determine the correct slot in which to install the NI PCIe-1477.

- 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 x8 or larger PCIe slot, and remove the corresponding expansion slot cover on the back panel of the computer.

**Note** The NI PCIe-1477 is intended for a x8 PCIe slot. The NI PCIe-1477 will fit into, and can be used in, a x8 or x16 PCIe slot. If the NI PCIe-1477 is plugged into a slot that cannot provide a x8 5.0 GT/s<sup>2</sup> connection, you will not be able to achieve full bandwidth and you may experience timeouts and/or FIFO overflows.

6. Insert the device into the applicable PCIe slot and gently rock the device 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.

2. Most motherboards label the slots capable of this speed as PCIe 2.0 or PCIe 3.0.

Figure 2. Installing a PCI Express Device



- 1. PCI Express Device
- 2. PCI Express System Slot
- 3. PC with PCI Express Slot
- 7. Secure the device mounting bracket to the back panel rail of the computer.

Note If you will be using the NI Camera Link I/O Extension Board (PCIe), refer to the NI Camera Link I/O Extension Board (PCIe) User Guide for installation instructions.

8. Connect the 6-pin PCIe auxiliary power connector if using PoCL.



**Note** This connection is not necessary if PoCL will not be used.

- 9. Replace the computer cover.
- 10. Connect the Camera Link cable(s) to a Camera Link-compatible camera. Refer to the camera manufacturer documentation for specific instructions about how to connect the cable to your camera.
- 11. Connect the other end of the Camera Link cable(s) to the 26-pin SDR Camera Link connector(s) on the front panel. Tighten the retention screws to secure the cable(s) to the connector(s).



**Note** If connecting two cables, ensure that one cable connects the Base connector of the camera to the Base connector of the NI PCIe-1477 and one cable connects the Med/Full/Ext connector of the camera to the Med/Full/Ext connector of the NI PCIe-1477. Crossing the cables will lead to the NI PCIe-1477 being unable to communicate with the camera.

12. Plug in and power on the computer.

The NI PCIe-1477 is now installed and the camera is connected.

## Verifying the Installation

After you have installed the device and powered on your computer, Windows will recognize the device and assign resources to it. You can verify that the system recognizes the PCIe-1477 by using Measurement & Automation Explorer (MAX).

- 1. Launch MAX by navigating to Start <u>» All Programs <u>»</u> National Instruments <u>»</u> MAX or by clicking the MAX desktop icon.</u>
- 2. Expand Devices and Interfaces.
- Verify that the PCIe-1477 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 <u>ni.com/support</u> for troubleshooting information.

## **Connectors and Interfaces**

Figure 3. Front Panel Interface



1. Digital I/O Connector

- 2. Base Camera Link SDR Connector
- 3. Medium/Full/Extended Camera Link SDR Connector
- 4. Power over Camera Link LEDs

#### Figure 4. Top Connectors



- 1. RTSI Connector
- 2. I/O Extension Connector

#### Figure 5. Rear Connector



1. 6-pin PCIe Auxiliary Power Connector

## Pinout

### Digital I/O Connector



#### Table 1. Pin Assignments and Signal Descriptions

	0	0	•	
Pin			Signal Name	Description
1			TTL I/O 0	TTL- compatible Digital I/O or external trigger
2			lso Input 0+	24 V- compatible

Pin	Signal Name	Description
		isolated current sinking digital input
3	Diff 0+	Bidirectional RS-422 I/O positive connection, or quadrature encoder phase A+. Can also be used as active-high single- ended input
4	Diff 0-	Bidirectional RS-422 I/O positive connection, or quadrature encoder phase A Can also be used as active-low single- ended input
5	TTL I/O 4	TTL- compatible Digital I/O or external trigger
6	TTL I/O 1	TTL- compatible Digital I/O or external

Pin	Signal Name	Description
		trigger
7	TTL I/O 2	TTL- compatible Digital I/O or external trigger
8	Iso Input 1+	24 V- compatible isolated current sinking digital input
9	Diff 1+	Bidirectional RS-422 I/O positive connection, or quadrature encoder phase B+. Can also be used as active-high single- ended input
10	TTL I/O 3	TTL- compatible Digital I/O or external trigger
11	Digital Ground	Digital Ground reference for quadrature encoder inputs and TTL I/O
12	lso Input 0-	Common

Pin	Signal Name	Description
	lso Input 1-	Ground reference for isolated digital inputs
13	Diff 1-	Bidirectional RS-422 I/O positive connection, or quadrature encoder phase B Can also be used as active-low single- ended input
14	Digital Ground	Digital Ground reference for quadrature encoder inputs and TTL I/O
15	TTL I/O 5	TTL- compatible Digital I/O or external trigger

#### Base Camera Link SDR Connector

	/		)
DGND/12 V	26	13	DGND
X(0)-	25	12	X(0)+
X(1)-	24	11	X(1)+
X(2)-	23	10	X(2)+
XCLK-	22	9	XCLK+
X(3)-	21	8	X(3)+
SerTC+	20	7	SerTC-
SerTFG-	19	6	SerTFG+
CC(1)-	18	5	CC(1)+
CC(2)+	17	4	CC(2)-
CC(3)-	16	3	CC(3)+
CC(4)+	15	2	CC(4)-
DGND	14	1	DGND/12 V
(		_	J

#### Table 2. Signal Descriptions

Signal Name	Description
X<30>±	Base configuration data and enable signals from the camera to the PCIe-1477
XCLK±	Transmission clock on the Base configuration chip for Camera Link communication between the PCIe-1477 and the camera
SerTC± SerTFG±	Serial transmission to the camera from the PCIe-1477
	Serial transmission to the PCIe-1477 from the camera
CC<41>±	Four LVDS

Signal Name	Description
	pairs, defined as camera inputs and PCIe-1477 outputs, reserved for camera control. On some cameras, the camera controls allow the PCIe-1477 to control exposure time and frame rate
DGND/12 V	Digital Ground when connected to non-PoCL cameras and 12 V power supply when connected to PoCL cameras
DGND	Digital Ground

#### Medium/Full/Extended Camera Link SDR Connector



#### Table 3. Signal Descriptions

Signal Name	Description
Y<30>±	Medium configuration data and enable signals from the camera to the PCIe-1477
YCLK±	Transmission clock on the Medium configuration chip for Camera Link communication between the PCIe-1477 and the camera
Z<30>±	Full/Extended configuration data and enable signals from the camera to the PCIe-1477
ZCLK±	Transmission clock on the Full/Extended configuration chip for Camera Link communication between the PCIe-1477 and the camera
DGND/12 V	Digital Ground when connected to non-PoCL

Signal Name	Description
	cameras and 12 V power supply when connected to PoCL cameras
DGND	Digital Ground

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

## **NI Services**

Visit <u>ni.com/support</u> to find support resources including documentation, downloads, and troubleshooting and application development self-help such as tutorials and examples.

Visit <u>ni.com/services</u> to learn about NI service offerings such as calibration options, repair, and replacement.

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

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