# PCIe-1437 Getting Started

# Contents

# NI PCIe-1437 Getting Started

This document describes how to begin using the NI PCIe-1437.
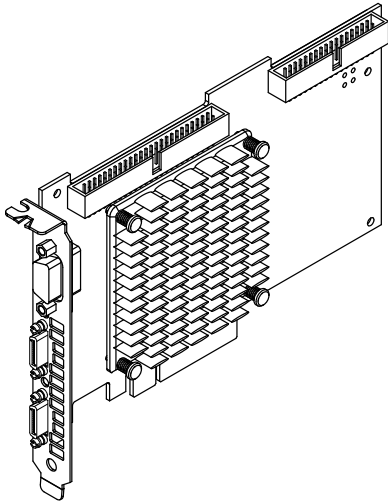


## Safety Guidelines

### General Guideline (ALL SERIS)

> ⚠ **Caution** Observe all instructions and cautions in the user documentation. Using the product in a manner not specified can damage the product and compromise the built-in safety protection.

> ⚠ **Attention** Suivez toutes les instructions et respectez toutes les mises en garde de la documentation d'utilisation. L'utilisation du produit de toute autre façon que celle spécifiée risque de l'endommager et de compromettre la protection de sécurité intégrée.

## Hot Surface Caution

**Caution** If the product has been in use, it may exceed safe handling temperatures and cause burns. Allow the product to cool before handling.

**Attention** Si le produit a été utilisé, il peut avoir atteint des températures trop élevées pour être manipulé en toute sécurité, ce qui peut provoquer des brûlures. Laissez le produit refroidir avant de le manipuler.

## mmWave Caution

**Caution** Product installation must adequately protect users' eyes from exposure to millimeter wave radiation output and input signals from the transmitter and receiver.

**Attention** L'installation du produit doit permettre d'assurer une protection adéquate des yeux des utilisateurs contre l'exposition aux rayonnements d'ondes millimétriques des signaux en entrée et en sortie provenant de l'émetteur et du récepteur.

## Board-Only/Components Caution

**Caution** The product will need to be mounted in suitable Fire and Mechanical end product enclosure; Exercise caution when placing the product inside an enclosure. Auxiliary cooling may be necessary to keep the product under the maximum ambient temperature rating for the product. Refer to the product specifications for more information about the maximum ambient temperature rating.

**Attention** Le produit devra être monté dans un boîtier du produit final répondant aux exigences de résistance mécanique et de protection incendie ; faites preuve de prudence lorsque vous placez le produit dans un boîtier. Un système de refroidissement auxiliaire peut être nécessaire pour maintenir le produit en dessous de sa température nominale maximale. Reportez-vous aux spécifications du produit pour obtenir plus d'informations sur la

température nominale maximale.

## NonHazardous Signals/Electric Shock Caution

⚠ **Caution** The product is designed for nonhazardous, live signals. You must ensure that all signals connected to the product are isolated from hazardous, live circuits and no unsafe voltages are present at the inputs. Voltages that exceed the specifications could result in damage to the product or electric shock.

⚠ **Attention** Le produit est conçu pour les signaux en direct non dangereux. Vous devez vous assurer que tous les signaux connectés au produit sont isolés des circuits dangereux sous tension et qu'aucune tension dangereuse n'est présente aux entrées. Des tensions supérieures à celles mentionnées dans les spécifications peuvent endommager le produit ou provoquer un choc électrique.

# 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.

> (!) **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 NI PCIe-1437 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 [ni.com/manuals](ni.com/manuals) 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[1][1] | 0 °C to 55 °C<br><br>(IEC 60068-2-1 and IEC 60068-2-2) |

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 [ni.com/info](ni.com/info) and enter the Info Code pcielocalambient.

| Operating humidity | 10% to 90% RH, noncondensing |
| | (IEC 60068-2-78) |
| System slot airflow | 0.4 m/s (80 LFM) |

## 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) |

## 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.

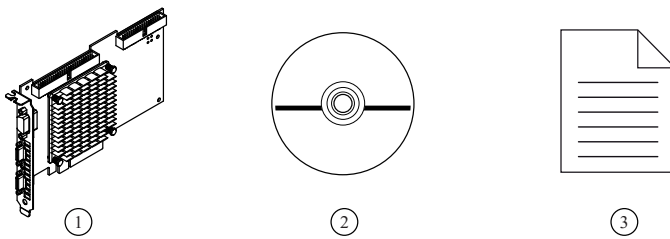3. Unpack any other items and documentation from the kit.

> ✎ **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 NI PCIe-1437 kit.

**Figure 1.** NI PCIe-1437 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. If applicable, install an application development environment (ADE), such as LabVIEW 2015 or later, LabVIEW NXG 2.1 or later, Microsoft Visual Studio®, or LabWindows™/CVI™.
2. Install the NI Vision Acquisition Software 18.0.

> ✎ **Note** NI-IMAQdx API is required when programming the NI PCIe-1437 in LabVIEW NXG.

## Installing the NI PCIe-1437

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-1437
- 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-1437
- Computer running Microsoft Windows 7 SP1 (32- or 64-bit) or later with at least one available x8 or larger PCIe slot
- 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-1437. 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-1437.

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-1437 is intended for a x8 PCIe slot. The NI PCIe-1437 will fit into, and can be used in, a x8 or x16 PCIe slot. Refer to the <u>Verifying the Installation</u> section to check the connected PCIe lane width and speed in Measurement & Automation Explorer (MAX) to ensure that the NI PCIe-1437 is plugged into a slot that is providing maximum performance. If the NI PCIe-1437 is plugged into a slot that cannot provide a x8 5.0 GT/s 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.

**Figure 2.** Installing a PCI Express Device
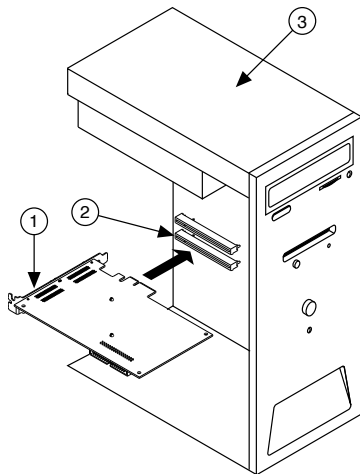


1.  PCI Express Device
2.  PCI Express System Slot
3.  PC with PCI Express Slot

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. Replace the computer cover.
9. 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.
10. 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-1437 and one cable connects the Med/Full/Ext connector of the camera to the Med/Full/Ext connector of the NI PCIe-1437. Crossing the cables will lead to the NI PCIe-1437 being unable to communicate with the camera.

11. Plug in and power on the computer.

The NI PCIe-1437 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 NI PCIe-1437 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 NI PCIe-1437 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.
4. Click on **NI PCIe-1437** and verify that the device is plugged into a slot that can provide the maximum performance with the following **Settings**:
   a. **Negotiated PCIe Lane Width** — X8

b. **Negotiated PCIe Link Speed** — 5.0 GT/s

## Configuring the NI PCIe-1437

Use Measurement & Automation Explorer (MAX), to configure the NI PCIe-1437 for acquisition. In NI Vision Acquisition Software 18.0, the NI PCIe-1437 will use the NI-IMAQdx MAX configuration panels if NI-IMAQdx is also installed. If NI-IMAQdx is not installed, it will use the NI-IMAQ panels to configure the device. Refer to the **_Measurement & Automation Explorer Help for NI-IMAQ_** for additional information about configuring the device.

> **Note** Before configuring the device in MAX, ensure that you installed the NI-IMAQdx and/or NI-IMAQ driver software, included with the NI Vision Acquisition Software.
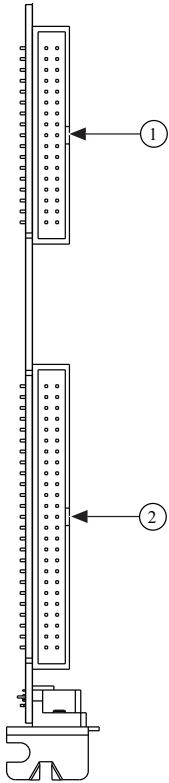
## Connectors and Interfaces

**Figure 3.** Front Panel Interface
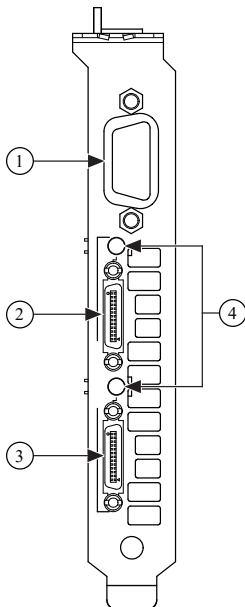


1. Digital I/O Connector
2. Base Camera Link SDR Connector
3. Medium/Full/Extended Camera Link SDR Connector

4.  Power over Camera Link LEDs

**Figure 4.** Top Connectors



1.  RTSI Connector
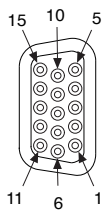2.  I/O Extension Connector

# Pinout

## Digital I/O Connector

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

| Pin | Signal Name | Description |
| --- | --- | --- |
| 1 | TTL I/O 0 | TTL-compatible Digital I/O or external trigger |
| 2 | Iso Input 0+ | 24 V-compatible isolated current sinking digital input |
| 3 | Phase A+ | Quadrature encoder phase A positive connection for single-ended or differential signal |
| 4 | Phase B- | Quadrature encoder Phase B negative connection for differential signal |
| 5 | TTL I/O 4 | TTL-compatible Digital I/O or external trigger |
| 6 | TTL I/O 1 | TTL-compatible Digital I/O |

| Pin | Signal Name | Description |
|-----|-------------|-------------|
|  |  | or external 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 | Phase B+ | Quadrature encoder Phase B positive connection for single-ended or differential signal |
| 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 | Iso Input 0- | Common Ground |

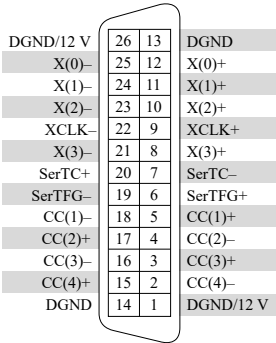| Pin | Signal Name | Description |
|-----|-------------|-------------|
|  | Iso Input 1- | reference for isolated digital inputs |
| 13 | Phase A- | Quadrature encoder Phase A negative connection for differential signal |
| 14 | Digital Ground | Digital Ground reference for quadrature encoder inputs 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 |

**Table 2.** Signal Descriptions

| Signal Name | Description |
|---|---|
| X<3..0>± | Base configuration data and enable signals from the camera to the NI PCIe-1437 |
| XCLK± | Transmission clock on the Base configuration chip for Camera Link communication between the NI PCIe-1437 and the camera |
| SerTC± | Serial transmission to the camera from the NI PCIe-1437 |
| SerTFG± | Serial transmission to the NI PCIe-1437 from the camera |
| CC<4..1>± | Four LVDS pairs, defined as camera inputs and NI PCIe-1437 outputs, reserved for camera control. On some cameras, the |

| Signal Name | Description |
|---|---|
| | camera controls allow the NI PCIe-1437 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<3..0>± | Medium configuration data and enable signals from the |

| Signal Name | Description |
|---|---|
| | camera to the NI PCIe-1437 |
| YCLK± | Transmission clock on the Medium configuration chip for Camera Link communication between the NI PCIe-1437 and the camera |
| Z<3..0>± | Full/Extended configuration data and enable signals from the camera to the NI PCIe-1437 |
| ZCLK± | Transmission clock on the Full/Extended configuration chip for Camera Link communication between the NI PCIe-1437 and the camera |
| DGND/12 V | Digital Ground when connected to non-PoCL cameras and 12 V power supply when connected to PoCL cameras |
| DGND | Digital Ground |

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

## NI Services

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

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

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

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