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PXIe-1491

GETTING STARTED GUIDE

NI PXIe-1491

This document explains how to install, configure, and test an NI PXIe-1491. You can use the NI PXIe-1491 with the following software:

- NI Picture Quality Analysis (NI PQA)
- NI Video Measurement Suite (NI VMS)
- NI AudioMASTER
- NI CEC Analyzer
- NI EDID Update Utility

Visit ni.com/updates for the latest versions of these software applications. Visit ni.com/manuals for the latest versions of product documentation.

Refer to the specifications document that ships with your device for detailed operational specifications. Refer to the [Programming the Device](#) section of this document for programming methods and examples for your device.

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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 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 HDMI cables marked as “High Speed HDMI Cable” or “High Speed HDMI Cable with Ethernet.”

Verifying System Requirements

To verify that you can use the device in your system, refer to the readme of the software with which you use the device with for minimum system requirements, recommended system requirements, and supported application development environments (ADEs).



Note If you have installed NI PQA, NI VMS, or NI AudioMASTER, their readmes are available at **Start»All Programs»National Instruments»<Software Application>»Documentation**, where **<Software Application>** represents the Start menu folder for NI PQA, NI VMS, or NI AudioMASTER.

Unpacking

The device ships in an antistatic package to prevent device damage due to electrostatic discharge (ESD).



Caution *Never* touch the exposed pins of connectors.

To unpack the device while avoiding ESD damage, complete the following steps:

1. Ground yourself with a grounding strap or by touching a grounded object.
2. Touch the antistatic package to a metal part of your computer chassis before removing the device from the package.
3. Remove the device from the package and inspect it for loose components or any other signs of damage.

Notify NI if the device appears damaged in any way. Do *not* install a damaged device in your chassis.

Store the device in the original antistatic package when not installed in a chassis to avoid damage.

Verifying the Kit Contents

Verify that the kit contains the following items:

- NI PXIe-1491 device
- Documents
 - *NI PXIe-1491 Specifications*—If you have installed NI PQA, NI VMS, or NI AudioMASTER, this document is available at **Start»All Programs»National Instruments»<Software Application>»Documentation»NI PXIe-1491 Specifications**, where <Software Application> represents the Start menu folder for NI PQA, NI VMS, or NI AudioMASTER.
 - *NI PXIe-1491 Getting Started Guide* (this document)—If you have installed NI PQA, NI VMS, or NI AudioMASTER, this document is available at **Start»All Programs»National Instruments»<Software Application>»Documentation»NI PXIe-1491 Getting Started Guide**, where <Software Application> represents the Start menu folder for NI PQA, NI VMS, or NI AudioMASTER.
 - *Read Me First: Safety and Electromagnetic Compatibility*—available at ni.com/manuals.
 - *Maintain Forced-Air Cooling Note to Users*—available at ni.com/manuals.

Required Items

In addition to the items in the kit, you need the following items:

- PXI Express chassis¹
- 1/8 in. flathead screwdriver
- PXI Express controller that meets minimum system requirements or MXI Express connection to a computer that meets minimum or recommended system requirements.²

Optional Items

Refer to [Appendix A: Device Front Panel](#) for information about cables you may need for the front panel connectors.

¹ Due to the high bandwidth considerations of high-definition video, you should use a PXI Express chassis that supports at least PCI Express x4 communications. Using multiple NI PXIe-1491 devices may require a configuration that supports higher bandwidth.

² For high-bandwidth video such as 1080p/60Hz, NI recommends using an MXI Express connection to an external high-performance computer that meets recommended system requirements. Furthermore, only controllers supporting at least one PCI Express x4 link are recommended. Refer to the readme of the software with which you use the device for more information.

Installing the Software

The NI PXIe-1491 is supported through application software. Complete the following steps to install software for the NI PXIe-1491:

1. (Optional) If you are developing a NI PXIe-1491 application or testing sequence, install an ADE, such as LabVIEW or TestStand.
2. Install one of the following software applications to automatically install software support for the NI PXIe-1491:
 - NI PQA 1.5 or later
 - NI VMS 3.2 or later
 - NI AudioMASTER 6.3 or later

For installation instructions for these software applications, refer to the following documents:

- *NI Picture Quality Analysis Getting Started Guide*
- *NI Video Measurement Suite Readme*
- *NI Video Measurement Suite Help*
- *NI AudioMASTER Readme*

To program your device using these software applications, refer to the [Programming the Device](#) section of this document. There is no stand-alone driver or hardware API for the NI PXIe-1491.

Installing the Device

You must install the software before installing the hardware.

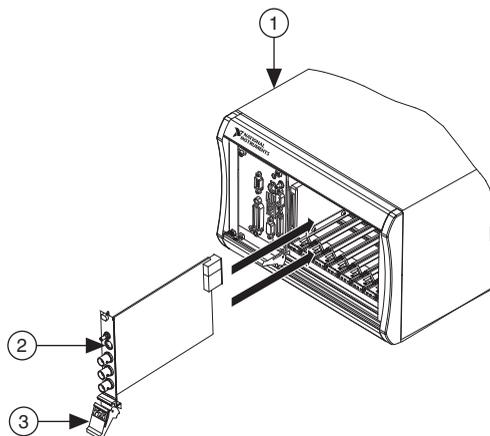


Caution Power off the chassis *before* installing the device. The device is not hot-swappable. Adding or removing the device while the chassis is powered on can result in blown chassis fuses or damage to the chassis and the device.

Follow proper ESD precautions to ensure you are grounded before installing the hardware. Refer to the specifications document for your device for important safety and compliance information.

Refer to Figure 1 and complete the following steps to install the device.

Figure 1. Installing a PXI Express Device



- | | |
|-----------------------|-----------------------------------|
| 1 PXI Express Chassis | 3 Ejector Handle in Down Position |
| 2 PXI Express Device | |

1. Power off and unplug the PXI Express chassis.
2. If the PXI Express chassis has multiple fan speed settings, ensure that the fans are set to high.
3. Position the PXI Express chassis so that inlet and outlet vents are not obstructed. Refer to the chassis documentation for more information.
4. Identify an unused PXI Express or PXI Express hybrid peripheral slot in the PXI Express chassis, and remove its filler panel. Refer to Table 1 to identify slots. Refer to the chassis documentation for details.

Table 1. Slot Identification Symbols in a PXI Express Chassis

| Slot Symbol | Slot Use |
|---------------------|------------------------------------|
| ▲ 1 | PXI Express System Controller Slot |
| ② | PXI Peripheral Slot |
| ● 3 | PXI Express Peripheral Slot |
| ● 4 ^H | PXI Express Hybrid Peripheral Slot |
| ■ 5 | PXI Express System Timing Slot |

5. Touch any metal part of the chassis to discharge static electricity.
6. Ensure that the ejector handle of the device is in the unlatched (down) position and swings freely.
7. Holding the device by the injector/ejector handle, slide it into the empty slot, ensuring that the card engages with the card guides in the chassis, as shown in Figure 1.
8. When you begin to feel resistance, pull up on the injector/ejector handle to latch the device.
9. Tighten the screws at the top and bottom of the device front panel.
10. Cover all empty slots using filler panels.
11. Plug in and power on the PXI Express chassis.
12. Proceed to the *Configuring and Testing the Device* section of this document.

Maintaining the Hardware

Refer to *Maintain Forced-Air Cooling Note to Users* for information about maintaining the chassis. For specific information about cleaning procedures and other recommended maintenance, refer to the chassis user documentation.

Uninstalling the Device

To remove the device from the chassis, complete the following steps:

1. Power off the chassis.
2. Ensure that you are grounded with a grounding strap or are touching a grounded metal surface. To avoid ESD, do not touch the exposed pins of the PXI Express connector or any exposed circuitry on the device.
3. Remove the device.

Store the device in the original antistatic package when not installed in a chassis to avoid damage.



Hot Surface During operation, the metal surfaces of the device may become hot. Be careful when removing the device from the chassis or when moving it to a different peripheral slot. When removing the device, hold it by *only* the ejector handle and front panel.

Configuring and Testing the Device

To configure the device, complete the following steps:

1. If you are using an embedded PXI Express controller, power on the chassis. If you are using an MXI controller, power on the chassis first, then power on the computer.
2. Launch Measurement & Automation Explorer (MAX) at **Start»All Programs»National Instruments»Measurement & Automation Explorer**.
3. Expand **Devices and Interfaces**.
4. Check that the PXI Express device appears under the appropriate chassis. If your chassis does not appear under **Devices and Interfaces**, refer to the chassis documentation to identify the chassis.



Note If the device does not appear under the appropriate chassis, verify that you installed one of the software applications that support the device. If the device still does not appear, press <F5> to refresh the view in MAX. If the device still does not appear, repeat the steps in the *Installing the Device* section. Refer to NI Technical Support at ni.com/support for troubleshooting information if the module does not appear as a device in MAX. For more information about using MAX, refer to the available help files within MAX.

Programming the Device

For instructions about how to operate the NI PXIe-1491 and program examples, refer to the following documents:

- *NI Picture Quality Analysis Help*—If you have installed NI PQA, this document is available at **Start»All Programs»National Instruments»NI Picture Quality Analysis»Documentation**.
- *NI Video Measurement Suite Help*—If you have installed NI VMS, this document is available at **Start»All Programs»National Instruments»NI Video Measurement Suite»Documentation**.
- *NI AudioMASTER Help*—If you have installed NI AudioMASTER, this document is available at **Start»All Programs»National Instruments»AudioMASTER»Documentation**.
- *NI EDID Help*—If you have installed NI PQA or NI VMS, then NI EDID is also installed and this document is available at **Start»All Programs»National Instruments»NI EDID Update Utility»Documentation**.
- *NI CEC Help*—If you have installed NI PQA or NI VMS, then NI CEC is also installed and this document is available at **Start»All Programs»National Instruments»NI CEC Analyzer»Documentation**.
- *NI Multimedia Test LabVIEW Reference Help*—If you have installed NI PQA or NI VMS, this document is available at **Start»All Programs»National Instruments»<Software Application>»Documentation»Multimedia Test LabVIEW VI Reference Help**, where <Software Application> represents the **Start** menu folder for NI PQA, NI VMS, or NI AudioMASTER.

You can find the latest versions of these documents at ni.com/manuals.

Refer to Table 2 for information about the environments in which you can program the NI PXIe-1491.

Table 2. NI PXIe-1491 Application Development Environments

| | Standalone Application | TestStand | LabVIEW VIs | C Functions |
|----------------|-------------------------------|------------------|--------------------|--------------------|
| NI PQA | yes | yes | yes | no |
| NI VMS | yes | yes | yes | yes |
| NI AudioMASTER | yes | yes | no | no |
| NI EDID | yes | no | yes | no |
| NI CEC | yes | no | yes | no |

Appendix A: Device Front Panel

The following sections describe the connectors and LED indicators on the device front panel, as shown in Figure 2 and described in Tables 3 and 4.

Figure 2. NI PXIe-1491 Front Panel

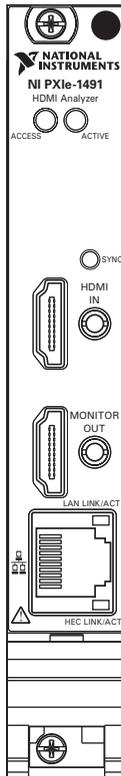


Table 3. NI PXIe-1491 Front Panel Connectors

| Connector | Function(s) | Connector Type |
|---|--|-----------------------|
| HDMI IN | HDMI-compliant input. Depending on software support, supports audio return channel (ARC) and Ethernet over HDMI (HEC).† | HDMI type A‡ |
| MONITOR OUT** | HDMI-compliant repeater output from HDMI IN. The HDMI output allows you to connect a monitor to see what the NI PXIe-1491 receives on its HDMI input (including 3D), but does not support HEC or ARC. | HDMI type A |
| HEC/LAN | Provides access to HEC from HDMI IN connector path. Does not serve as an end-point adapter. The connection supports bidirectional 100BASE-TX Ethernet data. | RJ-45 |
| <p>† To connect the NI PXIe-1491 to a digital visual interface (DVI) source that is digital only (DVI-D) or digital and analog (DVI-I), use a DVI to HDMI adapter or cable. Refer to the documentation of the software applications that support the NI PXIe-1491 for more information about support for ARC and HEC.</p> <p>‡ To connect the NI PXIe-1491 to an HDMI device that uses a type C or type D HDMI connector, use a type C to type A HDMI cable adapter or a type D to type A HDMI cable adapter. You must use a high-speed HDMI cable with Ethernet to reliably support all HDMI features of the NI PXIe-1491.</p> <p>** To connect the NI PXIe-1491 to a monitor, use an HDMI cable marked as “High Speed HDMI Cable” or “High Speed HDMI Cable with Ethernet.”</p> | | |

The following table includes LED and indication information for the NI PXIe-1491 front panel LEDs.

Table 4. NI PXIe-1491 Front Panel LEDs

| LED | Indication |
|--------------|---|
| ACCESS | <p>Indicates the following basic hardware states:</p> <ul style="list-style-type: none"> • OFF—The device is not yet initialized or has detected a problem with a power rail. • AMBER—The device is being accessed. <i>Accessed</i> means the device setup registers are being written to in order to control the device. • GREEN—The device is ready to be configured. • RED—The device has exceeded approved operating temperature and thermal shutdown has occurred. |
| ACTIVE | <p>Indicates the following active states:</p> <ul style="list-style-type: none"> • OFF—The device is not armed, triggered, or acquiring a waveform. • AMBER—The device is armed and waiting for a trigger. • GREEN—The device has received a Reference trigger. A green LED also indicates the device is acquiring a waveform. • RED—The device has detected an error. You must use the application software to access the device to determine the error cause. The LED remains red until the error condition is removed. |
| SYNC | <p>Indicates the following states for the selected input:</p> <ul style="list-style-type: none"> • OFF—No valid input signal from the source is detected, or the device is not yet in an operational state. • GREEN—The device has detected a valid input signal from the source. |
| LAN LINK/ACT | <p>Indicates the following states for the selected input:</p> <ul style="list-style-type: none"> • GREEN—There is a link over the Ethernet cable, but there is no active communication. • BLINKING GREEN—There is active communication over the Ethernet cable. |
| HEC LINK/ACT | <p>Indicates the following states for the selected input:</p> <ul style="list-style-type: none"> • YELLOW—The device is not yet functional, or there is a link over the HDMI cable, but there is no active communication. • BLINKING YELLOW—There is active communication over the HDMI cable. |

Appendix B: Worldwide Support and Services

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

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