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CP400X

GETTING STARTED GUIDE

PXIe-5172

100 MHz, 250 MS/s, 14-Bit PXI Express Oscilloscope



Note Before you begin, complete the installation and configuration procedures in your chassis and controller documentation.

This document explains how to install and start using the PXIe-5172.

Safety Guidelines



Notice—Take precautions to avoid data loss, loss of signal integrity, degradation of performance, or damage to the model.



Caution—Take precautions to avoid injury. Consult the model documentation for cautionary statements when you see this icon printed on the model. Cautionary statements are localized into French for compliance with Canadian requirements.



Shock Warning—Take precautions to avoid electrical shock.



Hot Surface—Take precautions to avoid physical burns.



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 NI 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. The length of all I/O cables must be no longer than 3 m (10 ft).



Notice This product may become more sensitive to electromagnetic disturbances in the operational environment when test leads are attached or when connected to a test object.

Verifying the System Requirements

To use the PXIe-5172, your system must meet certain requirements.

For more information about minimum system requirements, recommended system requirements, and supported application development environments (ADEs), refer to the readme for your selected software support. Readmes are available on the driver software media or online at ni.com/manuals.

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.
4. Verify that you received the following contents.
 - PXIe-5172 Module
 - PXIe-5172 Getting Started Guide
 - Maintain Forced-Air Cooling Note to Users
 - NI-SCOPE Note to Users
 - Instrument Design Libraries for Reconfigurable Oscilloscopes Note to Users

Store the device in the antistatic package when the device is not in use.

Other Equipment

Your application may require additional items not included in your kit to interact with your device. The following accessories can connect to the PXIe-5172.

- PXI Chassis Slot Blocker kit (NI part number 199198-01)
- SMB (m)-to-SMB (m) cables
- AUX 0 cable (SHH19-MH19-AUX, NI part number 784091-01)
- AUX 0 accessory terminal block for connecting to external signals, including clocks or digital resources (SCB-19, NI part number 783959-01)

To use probes with the PXIe-5172, NI recommends using a cable adaptor (SMB (f)-to-BNC (f), NI part number 781449-01 for one adaptor, or NI part number 781449-10 for ten adaptors). With an adaptor, you can use the following probes:

- CP500X—500 MHz, 1.2 m, 10X Cable Divider Probe
- CP400X—400 MHz, 2 m, 10X Cable Divider Probe
- SP500X—500 MHz, 10x Passive Probe
- SP500C—500 MHz, 100x Passive Probe
- NI-5191—800 MHz, Differential Active Probe
- SA1000X—1 GHz Single-Ended Active Probe
- SA1500X—1.5 GHz Single-Ended Active Probe
- SA2500X—2.5 GHz Single-Ended Active Probe

Preparing the Environment

Ensure the environment in which you are using the PXIe-5172 meets the following specifications.

Operating environment

Ambient temperature range	0 °C to 45 °C (Tested in accordance with IEC-60068-2-1 and IEC-60068-2-2. Meets MIL-PRF-28800F Class 3 low temperature limit and MIL-PRF-28800F Class 4 high temperature limit.)
Relative humidity range	10% to 90%, noncondensing (Tested in accordance with IEC 60068-2-56.)
Maximum altitude	2,000 m (800 mbar) (at 25 °C ambient temperature)
Pollution Degree	2

Indoor use only.



Note For complete specifications, refer to the specifications document for your device at ni.com/manuals.

Software Options

NI provides multiple software options for interacting with the PXIe-5172: InstrumentStudio, the NI-SCOPE soft front panel (SFP), NI-SCOPE instrument driver software, and the instrument design libraries.

Table 1. PXIe-5172 Software Options

Use Case	Software Option
Acquire and analyze data without programming.	InstrumentStudio (first available in NI-SCOPE 18.1; 64-bit systems only)
	NI-SCOPE SFP (PXIe-5172 support first available in NI-SCOPE 17.1; 32-bit systems only beginning with NI-SCOPE 18.1)
Create custom measurements and automation applications.	NI-SCOPE instrument driver
Customize the behavior of the device FPGA to create application-specific instrument designs.	Instrument design libraries with the LabVIEW FPGA Module



Note You can use a combination of these software options for your application. However, when using the NI-SCOPE driver and the instrument design libraries in a single application, only one option can access the device at a time.

Installing the Software

1. Close all programs before installing the software.
2. Optional: To use instrument design libraries, complete the following steps.
 - a) Install NI LabVIEW.
 - b) Install NI LabVIEW FPGA Module.
 - c) Install the latest service pack for LabVIEW and any LabVIEW modules you are using.
3. Visit ni.com/downloads to download the NI-SCOPE driver software and, if desired, the LabVIEW Instrument Design Libraries for Reconfigurable Oscilloscopes driver software. Follow the instructions in the installation prompts to install the default installation.

Windows users may see access and security messages during installation. Accept the prompts to complete the installation.



Note For troubleshooting information, contact NI technical support or visit ni.com/support.

4. When the installer completes, restart your system.

Installing the PXIe-5172



Notice To prevent damage to the PXIe-5172 caused by ESD or contamination, handle the module using the edges or the metal bracket.

You must install the software before installing the hardware.

Before you install the hardware, refer to the guidelines in the *Maintain Forced-Air Cooling Note to Users* included in the PXIe-5172 kit to ensure that the PXIe-5172 can cool itself effectively. This document is also available at ni.com/manuals.

The PXIe-5172 is a single-slot module with one backplane connector. The module may be installed into any PXI Express-compatible slot.

1. Ensure the AC power source is connected to the chassis before installing the PXIe-5172. The AC power cord grounds the chassis and protects it from electrical damage while you install the PXIe-5172.
2. Power off the chassis.
3. Inspect the slot pins on the chassis backplane for any bends or damage prior to installation. Do not install a module if the backplane is damaged.
4. If the chassis has multiple fan speed settings, ensure the fans are set to the highest setting.



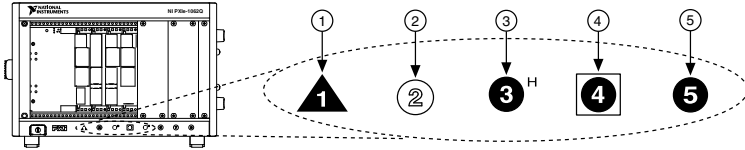
Notice Inadequate air circulation could cause the temperature inside the chassis to rise above the optimal operating temperature for the PXIe-5172, potentially causing thermal shutdown, shorter life spans, or improper performance.

5. Position the chassis so that inlet and outlet vents are not obstructed.

For more information about optimal chassis positioning, refer to the chassis documentation.

6. Remove the black plastic covers from all the captive screws on the module front panel.
7. Identify a supported slot in the chassis. The following figure shows the symbols that indicate the slot types.

Figure 1. Chassis Compatibility Symbols

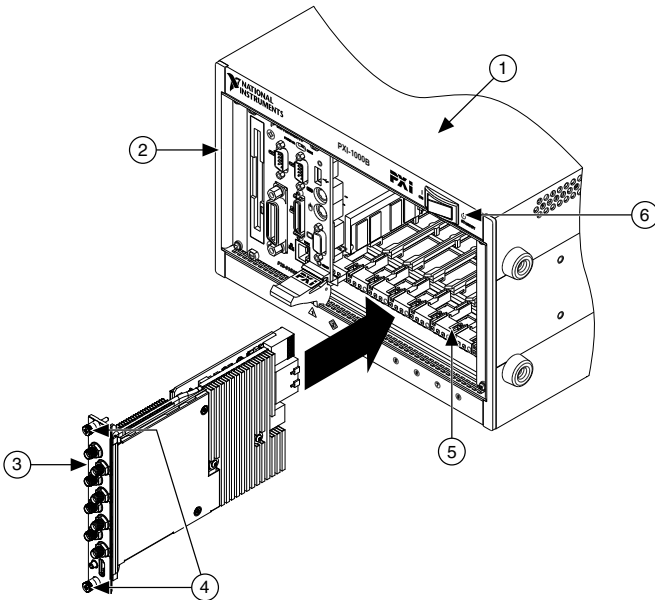


-
- | | |
|---------------------------------------|-----------------------------------|
| 1. PXI Express System Controller Slot | 4. PXI Express System Timing Slot |
| 2. PXI Peripheral Slot | 5. PXI Express Peripheral Slot |
| 3. PXI Express Hybrid Peripheral Slot | |
-

The PXIe-5172 can be placed in PXI Express Hybrid peripheral slots, PXI Express system timing slots, or PXI Express peripheral slots.

8. Touch any metal part of the chassis to discharge static electricity.
9. Place the module edges into the module guides at the top and bottom of the chassis. Slide the module into the slot until it is fully inserted.

Figure 2. PXIe-5172 Module Installation



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- | | |
|----------------------|--------------------------------|
| 1. Chassis | 4. Front-Panel Mounting Screws |
| 2. System Controller | 5. Module Guides |
| 3. Hardware Module | 6. Power Switch |
-

10. Secure the module front panel to the chassis using the front-panel mounting screws.



Note Tightening the top and bottom mounting screws increases mechanical stability and also electrically connects the front panel to the chassis, which can improve the signal quality and electromagnetic performance.

11. Cover all empty slots using EMC filler panels or fill using slot blockers to maximize cooling air flow, depending on your application.
12. Power on the chassis.

PXIe-5172 Front Panel and Pinout

Front Panel

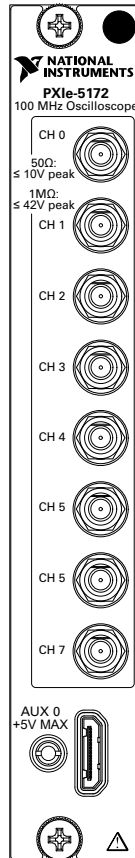
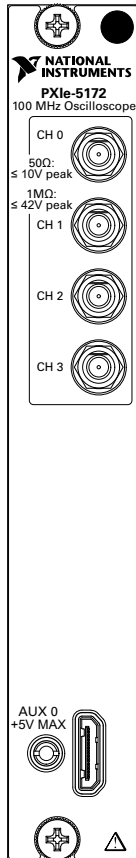
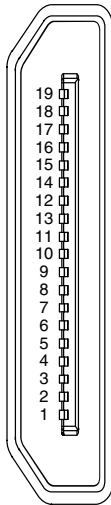


Table 2. Connectors

Signal	Connector Type	Description
CH 0 through CH 7	SMB	Analog input connection; digitizes data and triggers acquisitions.
AUX 0	MHDMR	Sample Clock or Reference Clock input, Reference Clock output, bidirectional digital PFI, and 3.3 V power output.

AUX 0 Connector Pinout**Table 3. AUX 0 Connector Pin Assignments**

Pin	Signal	Signal Description
1	GND	Ground reference for signals.
2	CLK IN	Used to import an external Reference Clock or Sample Clock.
3	GND	Ground reference for signals.
4	GND	Ground reference for signals.
5	CLK OUT	Used to export the Reference Clock.
6	GND	Ground reference for signals.

Table 3. AUX 0 Connector Pin Assignments (Continued)

Pin	Signal	Signal Description
7	GND	Ground reference for signals.
8	AUX 0/PFI 0	Bidirectional PFI line.
9	AUX 0/PFI 1	Bidirectional PFI line.
10	GND	Ground reference for signals.
11	AUX 0/PFI 2	Bidirectional PFI line.
12	AUX 0/PFI 3	Bidirectional PFI line.
13	GND	Ground reference for signals.
14	AUX 0/PFI 4	Bidirectional PFI line.
15	AUX 0/PFI 5	Bidirectional PFI line.
16	AUX 0/PFI 6	Bidirectional PFI line.
17	AUX 0/PFI 7	Bidirectional PFI line.
18	+3.3 V	+3.3 V power (200 mA maximum).
19	GND	Ground reference for signals.

PXIe-5172 SCB-19 Pinout

NI recommends using the SCB-19 connector block to connect digital signals to the AUX 0 connector on the PXIe-5172 front panel. Refer to the following figure and table for information about the SCB-19 signals when connected to the AUX 0 front panel connector.

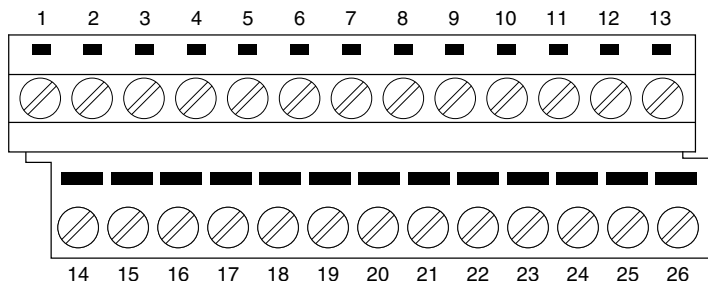


Table 4. SCB-19 Signal Descriptions

Pin	Signal	Signal Description
1	PFI 0	Bidirectional PFI line.
2	PFI 1	Bidirectional PFI line.
3	PFI 2	Bidirectional PFI line.
4	PFI 3	Bidirectional PFI line.
5	NC	No connection.
6	CLK IN	Used to import an external Reference Clock or Sample Clock.
7	NC	No connection.
8	CLK OUT	Used to export the Reference Clock.
9	PFI 4	Bidirectional PFI line.
10	PFI 5	Bidirectional PFI line.
11	PFI 6	Bidirectional PFI line.
12	PFI 7	Bidirectional PFI line.
13	+3.3 V	+3.3 V power (200 mA maximum)
14 to 26	GND	Ground reference for signals.

Configuring the Hardware in MAX

Use Measurement & Automation Explorer (MAX) to configure your National Instruments hardware. MAX informs other programs about which devices reside in the system and how they are configured. MAX is automatically installed with the instrument design libraries and NI-SCOPE.

1. Launch MAX by navigating to **Start»All Programs»National Instruments»NI MAX**.
2. In the Configuration pane, expand **Devices and Interfaces** to see the list of installed devices. Installed devices appear under the name of their associated chassis.
3. Expand your **Chassis** tree item.

MAX lists all devices installed in the chassis. PXIe-5172 devices appear as NI-RIO devices in the list. Your default device names may vary.



Note If you do not see your hardware listed, refer to the *Troubleshooting* section of this document.

- Record the device identifier MAX assigns to the hardware. Use this identifier when programming the PXIe-5172.



Note When you install, uninstall, or move an NI-RIO device in your system, resource identification of your NI-RIO devices may change. Whenever any of these changes occur, verify resource identification of all your NI-RIO devices in MAX, and, if necessary, make changes to your software and documentation.

Related Information

[What Should I Do if the PXIe-5172 Doesn't Appear in MAX?](#) on page 13

Self-Calibration

Self-calibration adjusts the PXIe-5172 for variations in the module environment. Perform a complete self-calibration after first installing your module and letting it warm up for 15 minutes.



Note Warm-up begins after the chassis is powered, the device is recognized by the host, and the device is configured using the instrument design libraries or NI-SCOPE. Running an included sample project or running self-calibration using NI MAX will configure the device and start warm-up.

The PXIe-5172 modules are externally calibrated at the factory; however, you should perform a self-calibration in any of the following situations:

- After first installing the PXIe-5172 into your chassis
- After any module in the chassis is installed, uninstalled, or moved
- When the system is in an environment where the ambient temperature varies or the module temperature has drifted more than ± 5 °C from the temperature at the last self-calibration
- To periodically adjust for small performance drifts that occur with product aging

To programmatically self-calibrate the PXIe-5172 when using instrument design libraries, use the Self Calibrate VI located on the **Functions»FPGA Interface»Software-Designed Instruments» Oscilloscopes»NI PXIe-5172»Calibration** palette.

To programmatically self-calibrate the PXIe-5172 when using NI-SCOPE, use the Self Calibrate VI located on the **Functions»Measurement I/O»NI-SCOPE»Calibration** palette.


You can also self-calibrate the PXIe-5172 by pressing the **Self Calibrate** button for the device in MAX.

Related Information

[What Should I Do if the PXIe-5172 Fails the Self-Test or Self-Calibration?](#) on page 14

Interacting with the Device in Software

Making a Measurement with InstrumentStudio

1. Connect CH 0 to an input signal.
2. Launch InstrumentStudio at **Start»National Instruments**.
3. In the instrument header menu in the upper-right corner of the panel () add the PXIe-5172 to the large panel with **Add/Remove Devices**.
4. Click **Auto** to automatically configure device settings for the detected signal.
5. If the soft front panel is not already running, click **Run/Stop**.
6. Add oscilloscope measurements to the channel by selecting **Add/Remove** in the measurement table of the oscilloscope.

For more information on the measurements available for oscilloscopes in InstrumentStudio, refer to the *InstrumentStudio Manual* at ni.com/manuals.

Making a Measurement with LabVIEW

1. Launch LabVIEW.
2. Select **Help»Find Examples**.
3. Open the example VI that you want to use by selecting **Hardware Input and Output»Modular Instruments»NI-SCOPE (High-Speed Digitizers)**.



Tip If you are not sure which example to run, use the Quick Start VI, which is found under **Hardware Input and Output»Modular Instruments»NI-SCOPE (High-Speed Digitizers)»Demos»niScope EX Quick Start.vi**.

4. Follow any setup instructions in the VI and specify any desired settings.
5. Click **Run** to run the example program.

Making a Measurement with .NET

1. Navigate to `<Public Documents>/National Instruments/NI-SCOPE/Examples/DotNET 4.X/VS20XX`.
2. Select the example you want to run and navigate to the `cs` folder.
3. Open the Visual Studio solution.
4. Click the **Start** button.
5. In the **Resource Name** drop-down menu, select the device name assigned to the device in MAX.
6. Specify the desired settings and click **Acquire**.

Making a Measurement with Instrument Design Libraries

You can verify proper installation and configuration of your device by making a measurement using a LabVIEW sample project.

This measurement requires installation of the instrument design libraries.

1. Launch LabVIEW.
2. Select **File»Create Project**.
3. On the left side of the **Create Project** window, select **Oscilloscopes**.
4. On the right side of the **Create Project** window, select the Stream to Host (PXIe-5172) sample project and click **Next**.
5. Specify a name, location, and device target for the project in the **Create Project** window and click **Finish**.
6. In the project tree, navigate to **My Computer»Project Documentation**, open the .html file, and navigate to the *Running this Sample Project* section of the documentation.
7. Follow the instructions in the project documentation for making the measurement.

Troubleshooting

If an issue persists after you complete a troubleshooting procedure, contact NI technical support or visit ni.com/support.

What Should I Do if the PXIe-5172 Doesn't Appear in MAX?

1. In the MAX configuration tree, expand **Devices and Interfaces**.
2. Expand the **Chassis** tree to see the list of installed hardware, and press <F5> to refresh the list.
3. If the module is still not listed, power off the system, ensure that all hardware is correctly installed, and restart the system.
4. Navigate to the Device Manager.

Option	Description
--------	-------------

Windows 10	Right-click the Start Menu icon and select Device Manager .
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Windows 8	Right-click the Start screen and select All apps»Control Panel»Hardware and Sound»Device Manager .
------------------	---

Windows 7	Select Start»Control Panel»Device Manager .
------------------	--

5. Verify the PXIe-5172 appears in the Device Manager.
 - a) Under an NI entry, confirm that a PXIe-5172 entry appears.



Note If you are using a PC with a device for PXI remote control system, under **System Devices**, also confirm that no error conditions appear for the **PCI-to-PCI Bridge**.

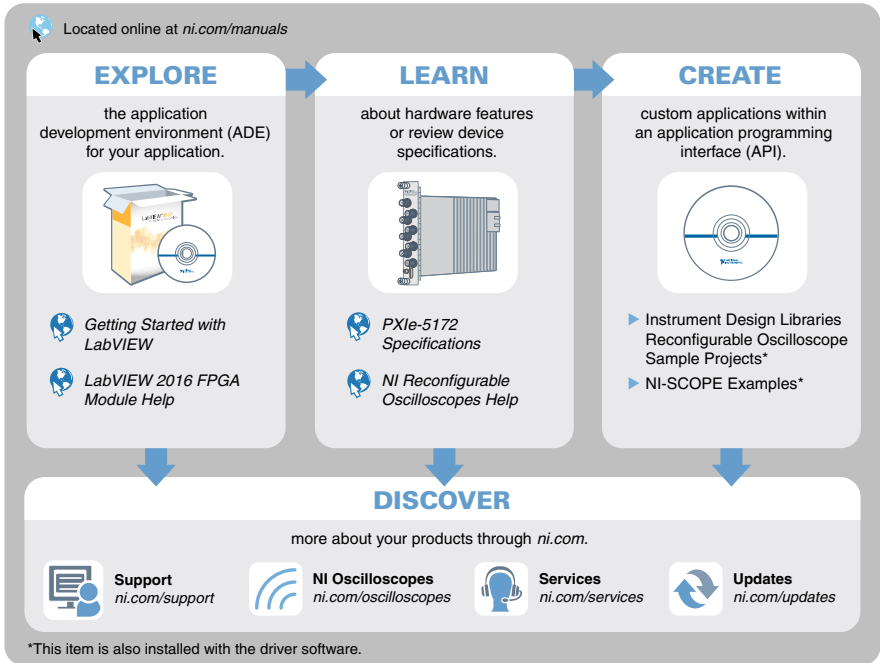
- b) If error conditions appear, reinstall NI LabVIEW Instrument Design Libraries for Reconfigurable Oscilloscopes and the PXIe-5172.

What Should I Do if the PXIe-5172 Fails the Self-Test or Self-Calibration?

1. Restart the system.
2. Launch MAX, and perform the self-test or self-calibration again.
3. Power off the chassis.
4. Reinstall the failed module in a different slot.
5. Power on the chassis.
6. Perform the self-test or self-calibration again.

Where To Go Next

Refer to the following resources and information that you may need as you create your own application.



Worldwide Support and Services

The NI 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 information about the services NI offers.

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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