

## GETTING STARTED GUIDE

# NI PXIe-5160/5162

## 10-Bit Oscilloscope



**Note** Before you begin, install and configure your chassis and controller.

This document explains how to install, configure, and test the NI PXIe-5160/5162 (NI 5160/5162). The NI 5160 is a 500 MHz 10-bit oscilloscope with a sample rate of up to 2.5 GS/s. The NI 5162 is a 1.5 GHz 10-bit oscilloscope with a sample rate of up to 5 GS/s.

To access NI 5160/5162 documentation, navigate to **Start»All Programs»National Instruments»NI-SCOPE»Documentation**.

## Contents

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Electromagnetic Compatibility Guidelines.....	1
Verifying the System Requirements.....	2
Unpacking the Kit.....	2
Kit Contents.....	3
Preparing the Environment.....	3
Installing the Software.....	4
Installing the NI 5160/5162.....	4
Configuring the NI 5160/5162 in MAX.....	6
Programming the NI 5160/5162.....	6
NI-SCOPE Examples.....	7
Making a Measurement.....	8
Making a Measurement with NI-SCOPE SFP.....	8
Making a Measurement with LabVIEW.....	8
Setting Up SMC-Based Devices for Synchronization.....	9
Troubleshooting.....	9
What Should I Do if the NI 5160/5162 Doesn't Appear in MAX?.....	9
What Should I Do if the Module Fails the Self-Test?.....	9
Thermal Shutdown Error.....	10
Where To Go Next.....	11
Worldwide Support and Services.....	11

## Electromagnetic Compatibility Guidelines

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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.



**Caution** To ensure the specified EMC performance, the length of all I/O cables must be no longer than 3 m (10 ft).



**Caution** To ensure the specified EMC performance, operate this product only with double-shielded cables (for example, RG-223/U or equivalent) and accessories.

## Verifying the System Requirements

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To use the NI 5160/5162, your system must meet certain requirements. For more information about minimum system requirements, recommended system, and supported application development environments (ADEs), refer to the readme, which is available on the software media or online at [ni.com/updates](https://ni.com/updates).

## Unpacking the Kit

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**Caution** 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.



**Caution** Never touch the exposed pins of connectors.



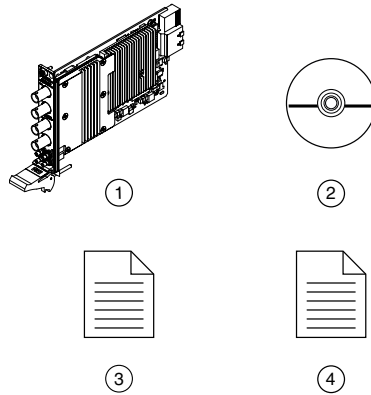
**Note** Do not install a device if it appears damaged in any way.

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

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

# Kit Contents

Figure 1. NI 5160/5162 Kit Contents



1. NI PXIe-5160/5162 Module
2. Driver Software DVD

3. NI PXIe-5160/5162 Getting Started Guide
4. Maintain Forced-Air Cooling Note to Users

## Preparing the Environment

Ensure the environment in which you are using the NI 5160/5162 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.



**Caution** You can impair the protection provided by the NI 5160/5162 if you use it in a manner not described in this document.



**Note** For complete specifications, refer to the specifications document for your device at [ni.com/manuals](http://ni.com/manuals).

## Installing the Software

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You must be an Administrator to install NI software on your computer.

1. Install an ADE, such as LabVIEW or LabWindows™/CVI™.
2. Insert the driver software media into your computer. The installer should open automatically.

If the installation window does not appear, navigate to the drive, double-click it, and double-click `autorun.exe`.

3. Follow the instructions in the installation prompts.



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

4. When the installer completes, select **Restart** in the dialog box that prompts you to restart, shut down, or restart later.

## Installing the NI 5160/5162

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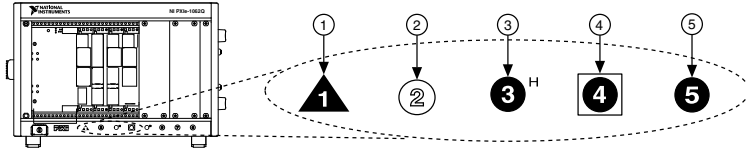
**Caution** To prevent damage to the device caused by ESD or contamination, handle the device using the edges or the metal bracket.

1. Ensure the AC power source is connected to the chassis before installing the modules.

The AC power cord grounds the chassis and protects it from electrical damage while you install the modules.

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

**Figure 2. Chassis Compatibility Symbols**

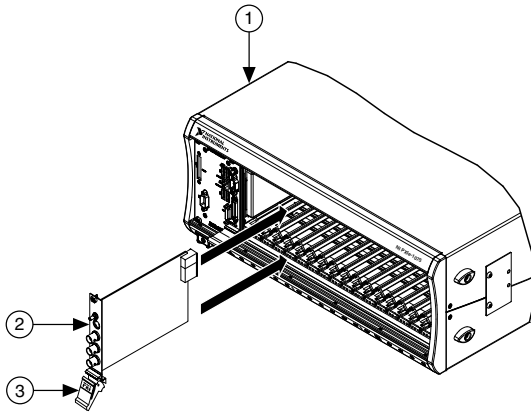


1. PXI Express System Controller Slot
2. PXI Peripheral Slot
3. PXI Express Hybrid Peripheral Slot
4. PXI Express System Timing Slot
5. PXI Express Peripheral Slot

NI 5160/5162 modules can be placed in PXI Express peripheral slots, PXI Express hybrid peripheral slots, or PXI Express system timing slots.

6. Touch any metal part of the chassis to discharge static electricity.
7. Ensure that the ejector handle is in the unlatched (downward) position.
8. Place the module edges into the module guides at the top and bottom of the chassis. Slide the device into the slot until it is fully inserted.

**Figure 3. Module Installation**



1. Chassis
2. Hardware Module
3. Ejector Handle in Down (Unlatched) Position

9. Latch the module in place by pulling up on the ejector handle.
10. Secure the device 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 filler panels or slot blockers to maximize cooling air flow.
12. Power on the chassis.

# Configuring the NI 5160/5162 in MAX

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

1. Launch MAX.
2. In the configuration tree, 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. Your default device names may vary.



**Note** If you do not see your device listed, press <F5> to refresh the list of installed devices. If the device is still not listed, power off the system, ensure the device is correctly installed, and restart.

4. Record the device identifier MAX assigns to the hardware. Use this identifier when programming the NI 5160/5162.
5. Self-test the device by selecting the device in the configuration tree and clicking **Self-Test** in the MAX toolbar.

The MAX self-test performs a basic verification of hardware resources.

6. Run the test panels on the device to verify the signal.
  - a) To access the test panels, right-click the device and select **Test Panels**. The NI-SCOPE Soft Front Panel (SFP) launches automatically.
  - b) Do one of the following to connect a signal to the device:
    - Connect an external signal by clicking **Auto** or by selecting the appropriate device parameters for the signal.
    - Connect a cable from PFI 1 to an input channel and select **Utility»Probe Compensation** from the SFP menu.



**Note** The NI 5160/5162 has self-calibration capabilities, which you can access programmatically with NI-SCOPE and your ADE, or interactively with NI-SCOPE SFP or MAX.

## Programming the NI 5160/5162

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You can acquire data interactively using the NI-SCOPE SFP, or you can use the NI-SCOPE instrument driver to program your device in the supported ADE of your choice.

**Table 1. NI 5160/5162 Programming Options**

Application Programming Interface (API)	Location	Description
NI-SCOPE SFP	Available from the start menu at <b>Start»All Programs»National Instruments»NI-SCOPE»NI-SCOPE Soft Front Panel</b> .	The NI-SCOPE SFP acquires, controls, analyzes, and presents data, similar to stand-alone oscilloscopes. The NI-SCOPE SFP operates on the PC, so you can view and control waveforms directly from your computer. You can also run multiple sessions of the NI-SCOPE SFP simultaneously.
NI-SCOPE Instrument Driver	LabVIEW—Available on the LabVIEW Functions palette at <b>Measurement I/O»NI-SCOPE</b> .	The NI-SCOPE API configures and operates the device hardware and provides customizable acquisition, control, analysis, and measurement options using LabVIEW VIs or LabWindows/CVI functions.
	C or LabWindows/CVI—Available at <b>Program Files»IVI Foundation»IVI»Drivers»niScope</b> .	
	Microsoft Visual C/C++—Use examples located in the <NIDocDir>\NI-SCOPE\examples directory, where <NIDocDir> is one of the following directories: <ul style="list-style-type: none"> <li>• Windows 8/7/Vista—Users\Public\Documents\National Instruments</li> <li>• Windows XP—Documents and Settings\All Users\Shared Documents\National Instruments</li> </ul>	You can modify an NI-SCOPE C example to create an application with Microsoft Visual C/C++. Copy an NI-SCOPE example to copy required project settings for include paths and library files. Alternatively, refer to the <i>Creating an Application with Microsoft Visual C and C++</i> topic of the <i>NI High-Speed Digitizers Help</i> to manually add all required include and library files to your project.

## NI-SCOPE Examples

Examples demonstrate the functionality of the device and serve as programming models and building blocks for your own applications.

The NI Example Finder is a utility available for some ADEs that organizes examples into categories and allows you to easily browse and search installed examples. You can see

descriptions and compatible hardware models for each example, or see all the examples compatible with one particular hardware model.

To locate examples, refer to the following table.

**Table 2.** Locating NI-SCOPE Examples

Application Development Environment (ADE)	Locating Examples
LabVIEW or LabWindows/CVI	Locate examples with the NI Example Finder. Within LabVIEW or LabWindows/CVI, select <b>Help»Find Examples</b> , and navigate to <b>Hardware Input and Output»Modular Instruments</b> .
ANSI C or Visual Basic	Locate examples in the <NIDocDir>\NI-SCOPE\examples directory, where <NIDocDir> is one of the following directories: <ul style="list-style-type: none"> <li>• Windows 8/7/Vista—Users\Public\Public Documents\National Instruments</li> <li>• Windows XP—Documents and Settings\All Users\Shared Documents\National Instruments</li> </ul>

## Making a Measurement

You can make a measurement interactively using the NI-SCOPE SFP or programmatically using LabVIEW.

### Making a Measurement with NI-SCOPE SFP

1. Connect CH 0 to input signal PFI 1 using an SMB cable.
2. Launch the NI-SCOPE SFP from the **Start** menu.
3. In the **Select Device** dialog box, select the device name assigned to the device in MAX.
4. To enable signal output on PFI 1, activate the probe compensation by selecting **Utility»Probe Compensation**.
5. Click **Auto** to display the data as a square wave.
6. If the SFP is not already running, click **Run**.

### 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.
5. In the **Resource Name** drop-down menu, select the device name assigned to the device in MAX.
6. Click **Run** to run the example program.

## Setting Up SMC-Based Devices for Synchronization

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Your device should automatically be configured for synchronization. If your device is not automatically configured, contact NI Technical Support at [ni.com/support](http://ni.com/support).

## Troubleshooting

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### What Should I Do if the NI 5160/5162 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 devices, 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.

Operating System	Description
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<b>Windows 8</b>	Right-click the Start screen, and select <b>All apps»Control Panel»Hardware and Sound»Device Manager</b> .
<b>Windows 7</b>	Select <b>Start»Control Panel»Device Manager</b> .
<b>Windows Vista</b>	Select <b>Start»Control Panel»System and Maintenance»Device Manager</b> .
<b>Windows XP</b>	Select <b>Start»Control Panel»System»Hardware»Device Manager</b> .

5. If you are using a PXI or PXI Express controller, verify that a **National Instruments** entry appears in the system device list. Reinstall NI-SCOPE and the device if error conditions appear in the list. If you are using an MXI controller, right-click **PCI-to-PCI Bridge**, and select **Properties** from the shortcut menu to verify that the bridge is enabled.

### What Should I Do if the Module Fails the Self-Test?

1. Restart the system.
2. Launch MAX, and perform the self-test 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 again.

## Thermal Shutdown Error

If you receive an over-temperature or thermal shutdown error and your device shuts down, complete the following steps to re-enable your device:

1. Power off the computer or chassis that contains the device.
2. Reinstall the device and make any necessary adjustments to make sure that the device is effectively cooled.
3. Power on the computer or chassis.

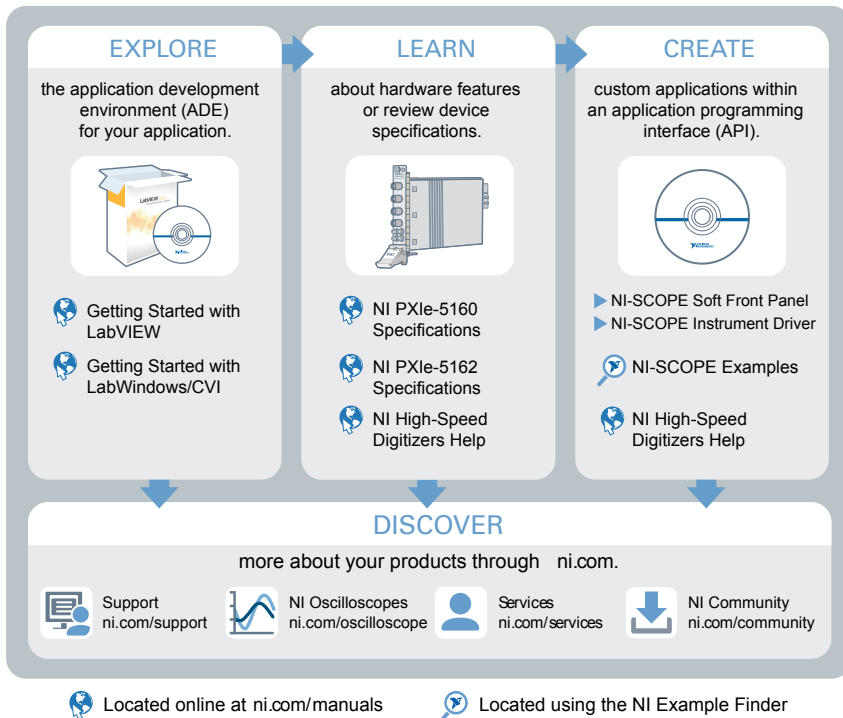


**Note** The thermal shutdown error is reported until the device has cooled to an acceptable operating temperature and has been successfully reset.

For more information about cooling the device, refer to the *Maintain Forced-Air Cooling Note to Users* included in your kit.

# Where To Go Next

Refer to the following figure for information about other product tasks and associated resources for those tasks.



## Worldwide Support and Services

The National Instruments website is your complete resource for technical support. At [ni.com/support](http://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](http://ni.com/services) for NI Factory Installation Services, repairs, extended warranty, and other services.

Visit [ni.com/register](http://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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