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Find the *National Instruments PCI-5124* at our website: *Click HERE*

GETTING STARTED GUIDE

NI PXI/PCI-5124

200 MS/s, 12-Bit Oscilloscope

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

This document explains how to install, configure, and test the PXI/PCI-5124. The PXI/PCI-5124 high-speed oscilloscope features 150 MHz analog bandwidth and up to 200 MS/s real-time sample rate (4 GS/s equivalent-time sample rate for repetitive signals).

To access PXI/PCI-5124 documentation, navigate to **Start»All Programs»National Instruments»NI-SCOPE»NI-SCOPE Documentation**.

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NATIONAL INSTRUMENTS

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.

Verifying the System Requirements

To use the PXI/PCI-5124, 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*.

Unpacking the Kit

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.

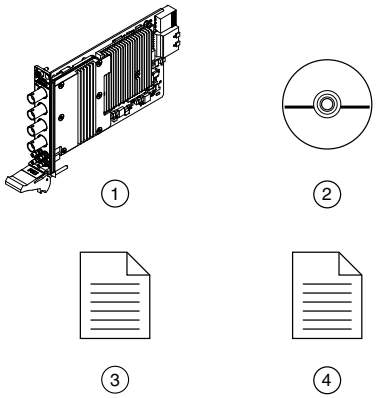
   Note Do not install a device if it appears damaged in any way.

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. PXI/PCI-5124 Kit Contents



1. Hardware Module
2. Driver Software DVD
3. Getting Started Guide (this document)
4. Maintain Forced-Air Cooling Note to Users

Preparing the Environment

Ensure that the environment in which you are using the PXI/PCI-5124 meets the following specifications.

PXI Modules

Operating Environment	
Ambient temperature range	0 °C to 55 °C (Tested in accordance with IEC 60068-2-1 and IEC 60068-2-2.)
Relative humidity range	10% to 90%, noncondensing (Tested in accordance with IEC 60068-2-56.)
Maximum altitude	2,000 m (at 25 °C ambient temperature)
Pollution Degree	2

Indoor use only.

PCI Modules

Operating Environment	
Ambient temperature range	0 °C to 45 °C (Tested in accordance with IEC 60068-2-1 and IEC 60068-2-2.)
Relative humidity range	10% to 90%, noncondensing (Tested in accordance with IEC 60068-2-56.)
Maximum altitude	2,000 m (at 25 °C ambient temperature)
Pollution Degree	2

Indoor use only.

Caution Clean the hardware with a soft, nonmetallic brush. Make sure that the hardware is completely dry and free from contaminants before returning it to service.

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

Installing the Software

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 PXI-5124

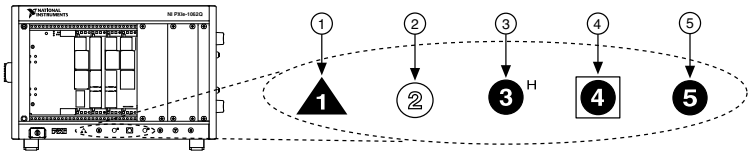
Caution To prevent damage to the PXI-5124 caused by ESD or contamination, handle the module using the edges or the metal bracket.

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

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

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 covers 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

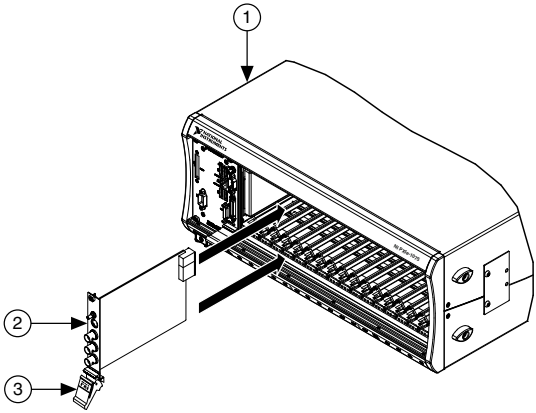


1. PXI Express System Controller Slot
2. PXI Peripheral Slot
3. PXI Express Hybrid Peripheral Slot
4. PXI Express System Timing Slot
5. PXI Express Peripheral Slot

PXI-5124 modules can be placed in PXI peripheral slots or PXI Express Hybrid peripheral slots.

6. Touch any metal part of the chassis to discharge static electricity.
7. Ensure that the ejector handle is in the downward (unlatched) position.
8. 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 3. Module Installation



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

9. Latch the module in place by pulling up on the ejector handle.

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.

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

Related Information

Why Is the ACCESS LED Off When the Chassis Is On? on page 13

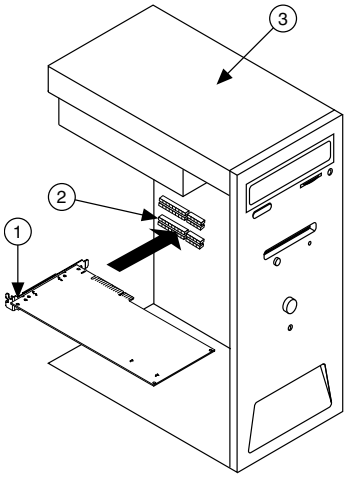
Installing the PCI-5124

1. Power off and unplug the computer.
2. Access the computer system expansion slots. This step might require you to remove one or more access panels on the computer case.
3. Locate a compatible slot and remove the corresponding slot cover on the computer back panel. PCI-5124 modules can only be inserted into PCI slots.

Tip To maximize airflow and extend the life of the PCI device, leave any adjacent PCI slots empty.

4. Touch any metal part of the computer to discharge any static electricity.
5. Insert the module into the slot you selected. Gently rock the module in to place without forcing it.

Figure 4. Module Installation



1. Module
2. System Expansion Slot
3. PC

6. Secure the module mounting bracket to the computer back panel rail.

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

7. Some computer manufacturers use a securing lever made of plastic to secure PCI devices; such a lever is unacceptable and must be removed. Use the screw provided in the kit to screw down the device. Otherwise, you must use a different computer chassis.
8. Replace any access panels on the computer case.
9. Power on your computer.
10. Verify that spread-spectrum clocking is enabled in the PC BIOS. For information about how to verify this setting, refer to the PC user documentation

Note For SMC-based devices, spread-spectrum clocking varies the clock signal to spread the timing clock signal over a small frequency range. Disabling spread-spectrum clocking may affect the accuracy of device specifications.

Front Panel Connectors and Indicators

Figure 5. PXI/PCI-5124 Front Panels

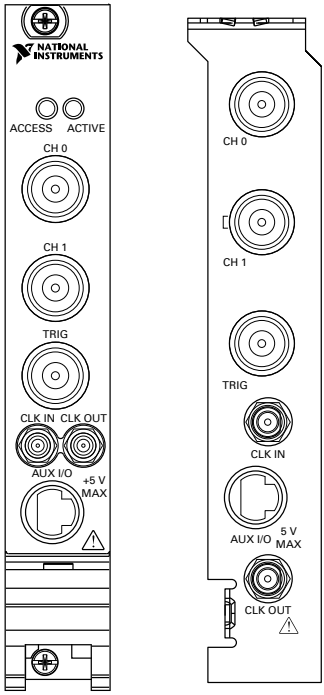


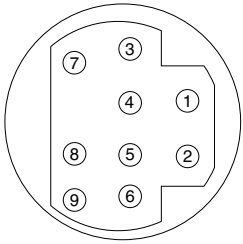
Table 1. PXI/PCI-5124 Front Panel Connectors

Label	Function	Connector Type
CH 0	Analog input	BNC female
CH 1	Analog input	BNC female
TRIG	External analog trigger	BNC female
CLK IN	Sample clock input and Reference clock input	SMB jack
CLK OUT	Sample clock output and Reference clock output	SMB jack
AUX I/O	PFI 0 and PFI 1 lines for digital trigger input/output and probe compensation (PFI 1 only).	9-pin mini-circular DIN

Table 2. PXI/PCI-5124 Front Panel Indicators

Label	Function
ACCESS	Indicates the status of the PCI bus and the interface from the PXI-5124 to the controller.
ACTIVE	Indicates the status of the onboard acquisition hardware of the PXI-5124

Figure 6. PXI/PCI-5124 9-Pin DIN Connector Pin Assignments



1. +5 V (Fused)
2. GND
3. Reserved
4. Reserved
5. Reserved
6. PFI 1
7. Reserved
8. Reserved
9. PFI 0

Configuring the PXI/PCI-5124 in MAX

Use Measurement & Automation Explorer (MAX) to configure your NI hardware. MAX informs other programs about which NI hardware products are 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 NI hardware.

   Installed modules appear under the name of their associated chassis.
3. Expand your **Chassis** tree item.

   MAX lists all modules installed in the chassis. Your default names may vary.

   Note If you do not see your module listed, press <F5> to refresh the list of installed modules. If the module is still not listed, power off the system, ensure the module is correctly installed, and restart.
4. Record the identifier MAX assigns to the hardware. Use this identifier when programming the PXI/PCI-5124.
5. Self-test the hardware by selecting the item 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, or
      - Connect a cable from PFI 1 to an input channel and select **Utility»Probe Compensation** from the SFP menu. Click **Auto** to display a 1 kHz square wave.



Note The PXI/PCI-5124 has self-calibration capabilities, which you can access programmatically with NI-SCOPE and your ADE, or interactively with NI-SCOPE SFP or MAX.

Related Information

Making a Measurement on page 12
What Should I Do if the Module Fails the Self-Test? on page 14
What Should I Do if the PXI/PCI-5124 Doesn't Appear in MAX? on page 14

Programming the PXI/PCI-5124

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 3. PXI/PCI-5124 Programming Options

Application Programming Interface (API)	Location	Description
NI-SCOPE SFP	Available from the start menu at **Start»All Programs»National Instruments»NI-SCOPE» NI-SCOPE Soft Front Panel**.	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 **Measurement I/O»NI-SCOPE**.	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 **Program Files»IVI Foundation» IVI»Drivers»niScope**.	
	Microsoft Visual C/C++—Use examples located in the file directory `Users\Public\Documents\National Instruments\NI-SCOPE\examples`.	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 *Creating an Application with Microsoft Visual C and C++* topic of the *NI High-Speed Digitizers Help* 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 4. 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 **Help»Find Examples**, and navigate to **Hardware Input and Output»Modular Instruments**.
ANSI C or Visual Basic	Locate examples in the `<NIDocDir>\NI-SCOPE\examples` directory, where `<NIDocDir>` is one of the following directories: • Windows 8/7/Vista—`Users\Public\Public Documents\National Instruments` • Windows XP—`Documents and Settings\All Users\Shared Documents\National Instruments`

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 an input signal.
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. Click **Auto** to adjust the acquisition display.
5. 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 PXI/PCI-5124 for Synchronization

The PXI/PCI-5124 is built on NI Synchronization and Memory Core (SMC) technology and therefore supports TClk synchronization. To synchronize SMC-based devices and share triggers or clocks, you must configure components in MAX.

PXI Modules

You must identify the PXI system controller by completing the following steps:

1. Launch MAX.
2. In the MAX configuration pane, expand the chassis tree.
3. Right-click the name of the chassis you are using, and select **Identify As**.
4. Select your controller from the list. For example, select **External PC** if you are using an MXI controller in an external PC.

PCI Modules

You must configure the RTSI cable by completing the following steps:

1. Connect an RTSI cable between the PCI devices to physically share triggers and/or clocks.
2. Launch MAX.
3. In the MAX configuration pane, right-click **Devices and Interfaces**, and select **Create New**.
4. In the dialog box that opens, select **NI-RTSI Cable**.
5. Click **Finish**.
6. In the MAX configuration pane, right-click the NI-RTSI cable, select **Add Device to NI-RTSI Cable**, and select the device you want to add.

For more information about connecting PCI devices, refer to **NI High-Speed Digitizers Help**»**Programming**»**Reference**»**NI-TClk Synchronization Help**.

Troubleshooting

Why Is the ACCESS LED Off When the Chassis Is On?

The LEDs may not light until the device has been configured in MAX. Before proceeding, verify that the PXI-5124 appears in MAX.

If the ACCESS LED fails to light after you power on the chassis, a problem may exist with the chassis power rails, a hardware module, or the LED.

Note Apply external signals only while the PXI-5124 is powered on. Applying external signals while the device is powered off may cause damage.

1. Disconnect any signals from the module front panels.
2. Power off the chassis.
3. Remove the module from the chassis and inspect it for damage. Do not reinstall a damaged module.
4. Install the module in a different chassis slot from which you removed it.
5. Power on the chassis.

   Note If you are using a MXI controller, power on the chassis before powering on the computer.

6. Verify that the module appears in MAX.
7. Reset the module in MAX and perform a self-test.

If the ACCESS LED still fails to light and failures continue, contact NI technical support or visit *ni.com/support*.

Related Information

Installing the PXI-5124 on page 4
Installing the PCI-5124 on page 6

What Should I Do if the PXI/PCI-5124 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.

Operating System	Description
Windows 10/8.1	Right-click the Start button, and select **Device Manager**.
Windows 7	Select **Start»Control Panel»Device Manager**.

5. If you are using a PXI or PXI Express controller, verify that a **National Instruments** entry appears in the **System Devices** list. Reinstall NI-SCOPE and the module 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.

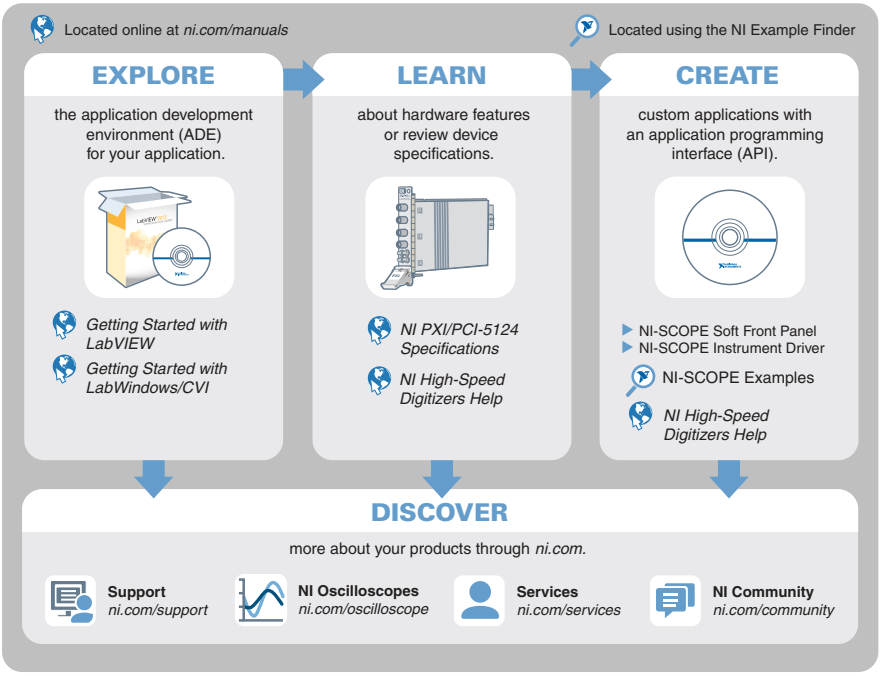
Note The thermal shutdown error is reported until the device has cooled to an acceptable operating temperature and has been successfully reset.

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

Related Information

Installing the PXI-5124 on page 4
Installing the PCI-5124 on page 6

Where to Go Next



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 NI Factory Installation Services, repairs, extended warranty, and other services.

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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