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GETTING STARTED GUIDE

PXIe-6570

32-Channel Digital Pattern Instrument

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

This document explains how to install, configure, and test the PXIe-6570. The PXIe-6570 is a 32-channel digital pattern instrument.

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Verifying the System Requirements

To use the NI-Digital Pattern Driver and Digital Pattern Editor, your system must meet certain requirements.

Refer to the product readme, which is available online at *ni.com/manuals* or on the NI-Digital Pattern Driver and Digital Pattern Editor Media (NI part number 785249-03), for more information about minimum system requirements, recommended system, and supported application development environments (ADEs).

NATIONAL INSTRUMENTS

Unpacking the Kit

Notice To prevent electrostatic discharge (ESD) from damaging the module, 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 module from the package and inspect it for loose components or other signs of damage.

   Notice Never touch the exposed pins of connectors.

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

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

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

Kit Contents

The kit contains the following items:

- PXIe-6570 Digital Pattern Instrument
- *PXIe-6570 Safety, Environmental, and Regulatory Information*
- *PXIe-6570 Getting Started Guide* (this document)

Note You can download the NI-Digital Pattern Driver and Digital Pattern Editor at *ni.com/downloads* or purchase the NI-Digital Pattern Driver and Digital Pattern Editor media (NI part number 785249-03) separately.

Installing the Software

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

1. Install an ADE, such as LabVIEW or Microsoft Visual Studio.
2. Insert the software media USB or download the NI-Digital Pattern Driver and Digital Pattern Editor at *ni.com/downloads*. The installer should open automatically after inserting the software media USB.

   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.
   a) Select **.NET Framework 4.0 Languages Support** or **.NET Framework 4.5 Languages Support** in the NI-Digital Pattern Driver installer to install .NET support for the NI-Digital Pattern Driver software.

   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.

Digital Pattern Editor

Use the Digital Pattern Editor to view, create, modify, and debug pin and channel maps, specifications, levels, timing, pattern, source waveform, and capture waveform files. You can also use the Digital Pattern Editor to configure the state of the digital pattern instrument.

The Digital Pattern Editor is installed when you install NI-Digital Pattern Driver. For more information, refer to the *Digital Pattern Help*.

Documentation for the Digital Pattern Instrument, NI-Digital Pattern Driver, and Digital Pattern Editor is available from the **Start** menu by navigating to **NI Digital Pattern Documentation** in the **National Instruments** folder. The primary help file is `digipat.chm`, and all other help files in the folder are embedded in `digipat.chm`.

Related Information

Digital Pattern Instrument Examples on page 11

Operating the Digital Pattern Instrument on page 10

You can operate the PXIe-6570 through use of the Digital Pattern Editor or the supported ADE of your choice.

Digital Pattern Help

NI-Digital Pattern Driver

NI-Digital Pattern Driver LabVIEW API

Use the NI-Digital VIs and properties in LabVIEW to configure and control the digital pattern instrument. The NI-Digital Pattern Driver LabVIEW API is installed by default when you run the installer. For more information, refer to the *Digital Pattern Help*.

NI-Digital Pattern Driver .NET API

You can optionally install and use the NI-Digital Pattern Driver .NET API to configure and control the digital pattern instrument. For more information, refer to the *Digital Pattern Help*.

Documentation for the Digital Pattern Instrument, NI-Digital Pattern Driver, and Digital Pattern Editor is available from the **Start** menu by navigating to **NI Digital Pattern Documentation** in the **National Instruments** folder. The primary help file is `digipat.chm`, and all other help files in the folder are embedded in `digipat.chm`.

NI-Digital Pattern Driver C API

You can use the NI-Digital Pattern Driver C API dynamically linked library to configure and control the digital pattern instrument. Add a reference to `C:\Program Files (x86)\IVI`

`Foundation\IVI\Bin\niDigital_32.dll` for 32-bit development or to `C:\Program Files\IVI Foundation\IVI\Bin\niDigital_64.dll` for 64-bit development.

Related Information

Digital Pattern Instrument Examples on page 11

Operating the Digital Pattern Instrument on page 10

You can operate the PXIe-6570 through use of the Digital Pattern Editor or the supported ADE of your choice.

Digital Pattern Help

Associated Drivers

NI-DCPower

The NI-DCPower driver is required to use NI-DCPower modules within the Digital Pattern Editor. For more information about using NI-DCPower modules within the Digital Pattern Editor, refer to the *Digital Pattern Help*. Visit *ni.com/downloads* to download NI-DCPower.

NI-Sync

The NI-Sync driver is required to support operations using the PXIe-6674T timing and synchronization module, such as combining comparison results across digital pattern instruments. For more information about using the PXIe-6674T with digital pattern instruments, refer to the *Digital Pattern Help*. Visit *ni.com/downloads* to download NI-Sync.

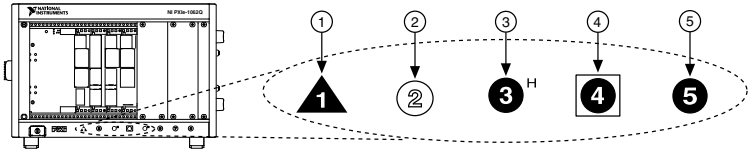
Installing the PXIe-6570

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 the slot you will use in the chassis.

   The PXIe-6570 is a two-slot module with two PXI Express backplane connectors. The module must be installed into two adjacent PXI Express-compatible slots. If you plan to use the optional PXIe-6674T Timing and Synchronization Module, reserve the PXI Express System Timing Slot for its placement in the chassis. The following figure shows the symbols that indicate the slot types.

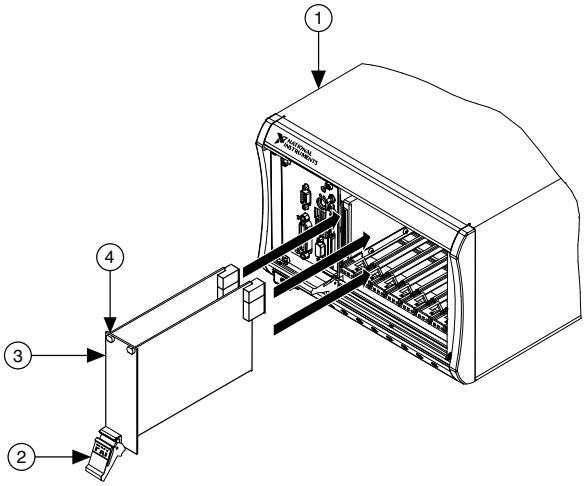
Figure 1. Chassis Compatibility Symbols



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

6. Touch any metal part of the chassis to discharge static electricity.
7. 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-6570 Installation



1. PXI Express Chassis
2. Ejector Handle in Downward (Unlatched) Position
3. PXI Express Two-Slot Module
4. Captive Screw

8. 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.

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

Connecting Signals

PXIe-6570 Front Panel

The PXIe-6570 front panel has a single 68-pin VHDCI Digital Data and Control (DDC) connector. The following figure shows the front panel and pinout of the PXIe-6570 digital pattern instrument.

Figure 3. PXIe-6570 Front Panel

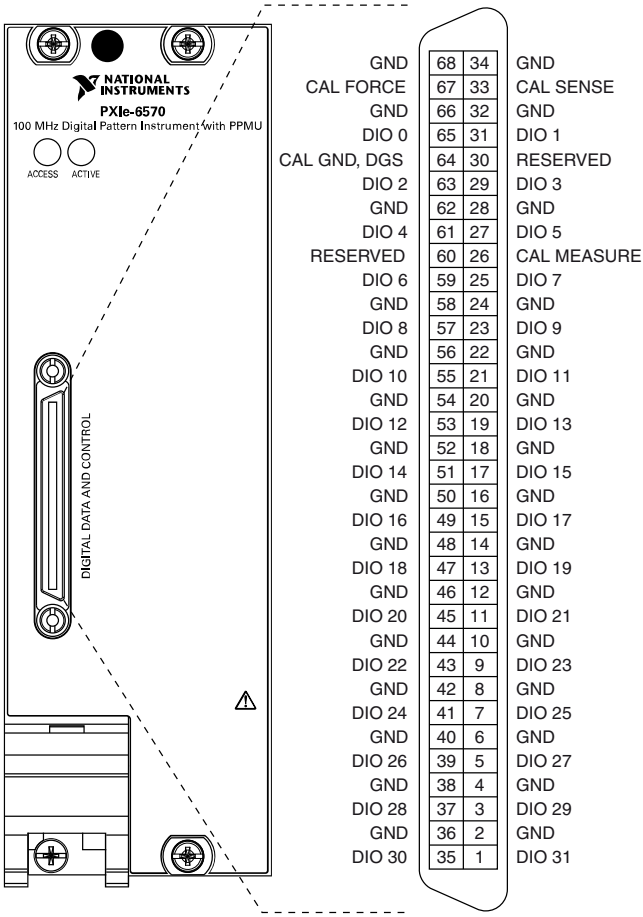


Table 1. PXIe-6570 Digital Data and Control Connector Pins

Pins	Signal Name	Signal Type	Signal Description
1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 35, 37, 39, 41, 43, 45, 47, 49, 51, 53, 55, 57, 59, 61, 63, 65	DIO <0..31>	Data	Bidirectional PPMU-capable digital I/O data channels 0 through 31.
2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 28, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50, 52, 54, 56, 58, 62, 66, 68	GND	Ground	Instrument ground. Also default ground reference if DUT Ground Sense (DGS) is not connected.
26	CAL MEASURE	Analog	Resource for external calibration.
33	CAL SENSE	Analog	Resource for external calibration.
64	DGS	Ground	Optional DGS for improved accuracy at higher currents in some configurations.
	CAL GND	Analog	Resource for external calibration.
67	CAL FORCE	Analog	Resource for external calibration.
30, 60	RESERVED	N/A	These terminals are reserved for future use. Do not connect to these pins.

Note The 32 digital I/O data channels on the digital pattern instrument are split into banks for PPMU operation efficiency: DIO<0..7>, DIO<8..15>, DIO<16..23>, DIO<24..31>. PPMU and frequency measurements run in parallel when you take measurements on channels in different banks.

LED Status Indicators

Status indicators on the front panel of the PXI-6570 provide feedback about instrument operation.

Use the following table to determine the PXIe-6570 state using the Access LED status indicator.

Table 2. Access LED Status Indicator

Color	Indications
Off	Instrument not yet functional.
Amber	Instrument being accessed by software.
Green	Instrument ready to be programmed.

Use the following table to determine the PXIe-6570 state using the Active LED status indicator.

Table 3. Active LED Status Indicator

Color	Indications
Off	Instrument is not waiting for a trigger, not bursting a pattern, and not experiencing an error. During PPMU operations, the Active LED remains off.
Amber	Instrument awaiting Start trigger.
Green	Instrument received Start trigger and is bursting a pattern.
Red	Instrument error condition. Possible error conditions: • The instrument has detected an unlocked condition on a PLL that might result in incorrect data. To clear this error condition, reset the instrument programmatically or through Measurement & Automation Explorer (MAX). • The instrument has been disabled because it exceeded its overall power limit. To re-enable the instrument, reset it programmatically or through MAX. • The instrument has been disabled because it exceeded its overall temperature limit. To re-enable the instrument, cool the instrument to an acceptable range and resolve the environmental condition that caused the shutdown. Reset the instrument programmatically or through MAX, or power cycle the instrument.

Note You will receive an error if self-test, self-calibration, or external calibration failed on the instrument, but the LED will remain green. The error will persist until self-test or calibration succeeds or the instrument is reset.

Connecting to a Device Under Test

To connect a device under test (DUT) to the PXIe-6570, you can create a custom device interface board to access the signals of the DUT. For more information, refer to the *Interfacing to the Digital Pattern Instrument or Digital Waveform Instrument using the VHDCI Connector*

application note. Go to *ni.com/info* and enter the info code `rdinwa` to locate the application note.

Note If you plan to use the PXIe-6570 as part of an integrated system, such as a Semiconductor Test System (STS), refer to the system documentation for guidance on device interface board design and connection guidelines. For system documentation, contact your NI sales engineer.

To connect a custom device interface board to the VHDCI Digital Data and Control connector on the PXIe-6570, use a mating connector for the VHDCI cable from NI.

PXIe-6570 Accessories

Description	NI Part Number
NI CB-2162 Connector Block and Prototyping Board	778592-01
SCB-68 HSDIO Shielded Connector Block for R Series and HSDIO Devices	782914-01
SMB-2163 SMB Breakout Box for High-Speed Digital Devices	778747-01
NI SHC68-C68-D4 Shielded Single-Ended Cable for High-Speed Digital Devices	781013-01 - 0.55 m 196275-01 - 1 m 152870-01 - 1 m Low Leakage 781293-01 - 2 m
SHC68-H1X38 High-Speed Digital Flying-Lead Cable, 1.5 m	192681-1R5
VHDCI connectors	780389-01 778914-01 780390-01
NI-Digital Pattern Driver and Digital Pattern Editor Media	785249-03

Note For more information on recommended accessories for use within a system such as STS, contact your NI Sales Engineer.

Configuring the PXIe-6570 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-Digital Pattern Driver.

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 PXIe-6570.
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 of the PXIe-6570 performs a basic verification of hardware resources and lasts several minutes.

Operating the Digital Pattern Instrument

You can operate the PXIe-6570 through use of the Digital Pattern Editor or the supported ADE of your choice.

Table 4. PXIe-6570 Interactive Use Options

Application Software	Location	Description
Digital Pattern Editor	In the **Start** menu, navigate to **NI Digital Pattern Editor** in the **National Instruments** folder to launch the Digital Pattern Editor.	Use the Digital Pattern Editor to view, create, modify, and debug pin and channel maps, specifications, levels, timing, pattern, source waveform, and capture waveform files. You can also use the Digital Pattern Editor to configure the state of the digital pattern instrument.

Table 5. PXIe-6570 Programming Options

Application Programming Interface (API)	Location	Description
NI-Digital Pattern Driver LabVIEW API	• LabVIEW 2015—**Functions»Instrument I/O»Instrument Drivers»NI-Digital palette** • LabVIEW 2016 and later—**Functions»Measurement I/O»NI-Digital palette or Functions»Instrument I/O»Instrument Drivers»NI-Digital palette**	Use the NI-Digital VIs and properties in LabVIEW to configure and control the digital pattern instrument. The NI-Digital Pattern Driver LabVIEW API is installed by default when you run the installer.
NI-Digital Pattern Driver .NET API	You can use the NI-Digital Pattern .NET class library by adding a reference to NationalInstruments.ModularInstruments.NIDigital.Fx40 or NationalInstruments.ModularInstruments.NIDigital.Fx45 and any dependent class libraries from within the Solution Explorer in Visual Studio.	You can optionally install and use the NI-Digital Pattern Driver .NET API to configure and control the digital pattern instrument.

Digital Pattern Instrument Examples

To locate programming and operating examples, refer to the following table.

Table 6. NI-Digital Pattern Driver Example Locations

Application Software or Application Development Environment (ADE)	Location
Getting Started	Use the getting started examples, located by default in the `<Public Documents>\National Instruments\NI-Digital \Examples\Getting Started` directory, to help you learn key concepts or to serve as a starting point for applications you create.
Digital Pattern Editor	In the **Start** menu, navigate to **NI Digital Pattern Editor** in the **National Instruments** folder to launch the Digital Pattern Editor. In the Welcome window, click **Examples** or click the Learning tab to launch the Learning window, which includes examples of common usages of digital patterns.

Table 6. NI-Digital Pattern Driver Example Locations (Continued)

Application Software or Application Development Environment (ADE)	Location
LabVIEW	Use the NI Example Finder to locate LabVIEW examples. In LabVIEW, select **Help»Find Examples** to launch the NI Example Finder. Find examples specific to NI-Digital by selecting **Hardware Input and Output»Modular Instruments»NI-Digital Pattern Driver**.
Microsoft Visual Studio	The Microsoft .NET examples are located in the `<Public Documents>\National Instruments\NI-Digital \Examples\DotNET 4.x` directory. In the **Start** menu, navigate to **NI Digital Pattern Examples** in the **National Instruments** folder.

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-6570 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	Right-click the Start button, and select **Device Manager**.
Windows 7	Select **Start»Control Panel»Device Manager**.

5. Verify the PXIe-6570 appears in the Device Manager.
   a) Under an NI entry, confirm that a PXIe-6570 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-Digital Pattern Driver and the PXIe-6570.

What Should I Do if the PXIe-6570 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.

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

The LEDs may not light until the module has been configured in MAX. Before proceeding, verify that the PXIe-6570 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.

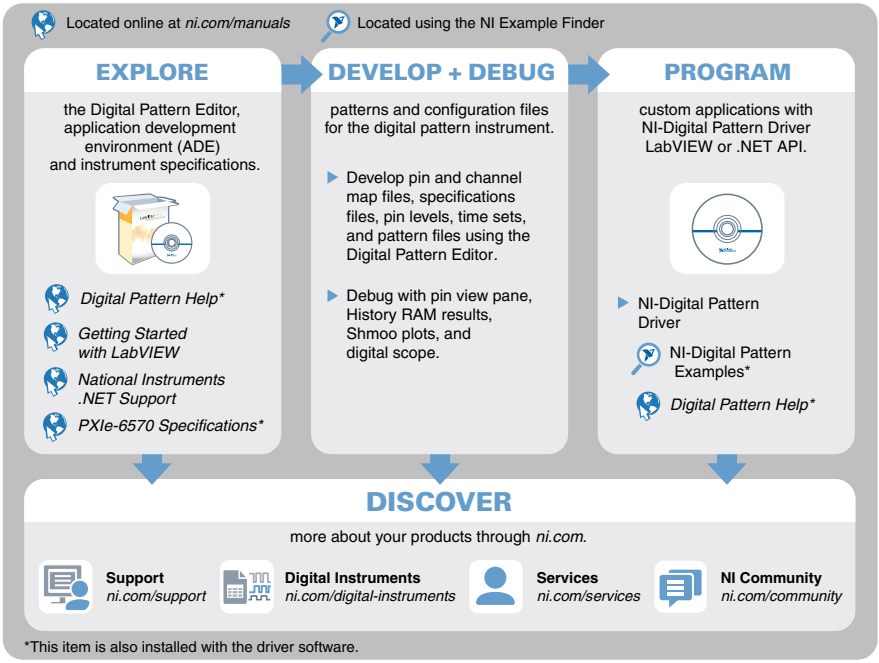
Notice Apply external signals only while the PXIe-6570 is powered on. Applying external signals while the module is powered off may cause damage.

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 PC with a device for PXI remote control system, 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.

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 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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