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SMA-2164

GETTING STARTED GUIDE

NI 6587

NI FlexRIO High-Speed Digital I/O Adapter Module

The NI 6587 is a 1 Gbps per channel high-speed, low-voltage differential signaling (LVDS) adapter module designed to work in conjunction with your NI FlexRIO™ FPGA module. The NI 6587 features 20 LVDS channels (16 data and 4 PFI).
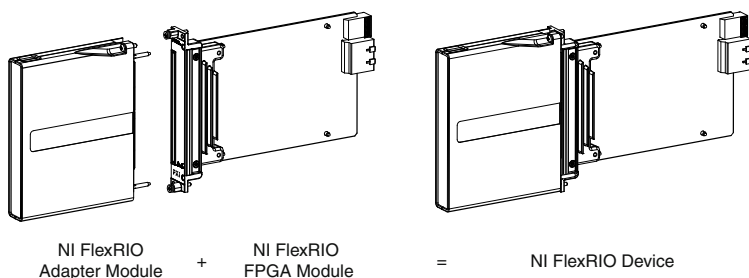
This document contains installation instructions and signal information for the NI 6587R, which is composed of an NI FlexRIO FPGA module and the NI 6587.

📝 **Note** Before configuring your NI 6587, you must install the appropriate software and hardware. Refer to the getting started guide for your NI FlexRIO FPGA module for installation instructions.

The following figure shows an example of a properly connected NI FlexRIO device.

Figure 1. NI FlexRIO Device

NI FlexRIO Adapter Module + NI FlexRIO FPGA Module = NI FlexRIO Device

Contents

![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 are designed to 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 shielded cables and accessories.

⚠ **Caution** To ensure the specified EMC performance, you must attach EMI gaskets (NI part number 746228-01) to both sides of your NI 6587 before using.

⚠ **Caution** To ensure the specified EMC performance, you must install PXI EMC Filler Panels (NI part number 778700-01) in all open chassis slots.

How to Use Your NI FlexRIO Documentation Set

Refer to the following flowchart for information about how to use FlexRIO documentation.

Figure 2. How to Use Your NI FlexRIO Documentation Set.
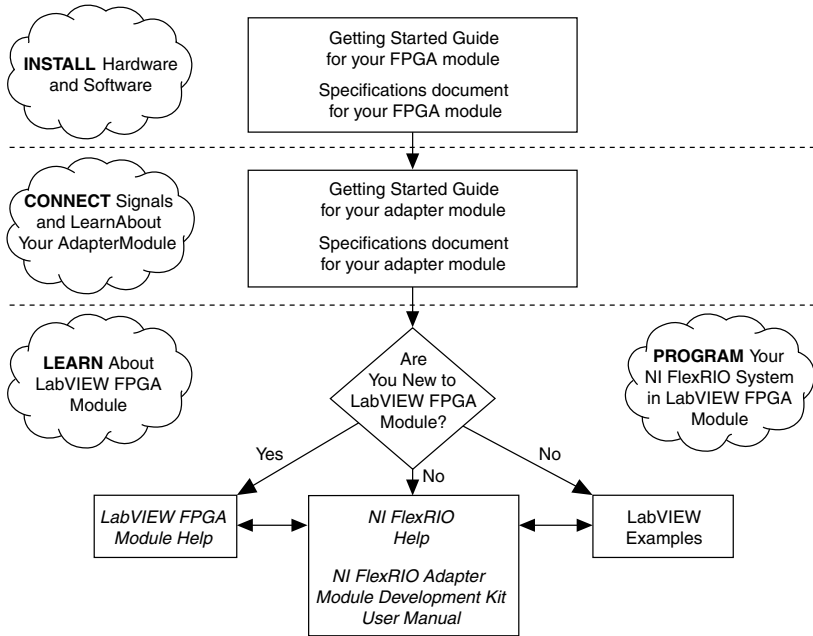
Table 1. NI FlexRIO Documentation Locations and Descriptions

Document	Location	Description
Getting started guide for your FPGA module	Available from the Start menu and at *ni.com/manuals*.	Contains installation instructions for your NI FlexRIO system.
Specifications document for your FPGA module	Available from the Start menu and at *ni.com/manuals*.	Contains specifications for your FPGA module.
Getting started guide for your adapter module	Available from the Start menu and at *ni.com/manuals*.	Contains signal information, examples, and CLIP details for your adapter module.
Specifications document for your adapter module	Available from the Start menu and at *ni.com/manuals*.	Contains specifications for your adapter module.

Table 1. NI FlexRIO Documentation Locations and Descriptions (Continued)

Document	Location	Description
LabVIEW FPGA Module Help	Embedded in *LabVIEW Help* and at *ni.com/manuals*.	Contains information about the basic functionality of the LabVIEW FPGA Module.
NI FlexRIO Help	Available from the Start menu and at *ni.com/manuals*.	Contains information about the FPGA module, adapter module, and CLIP configuration information.
NI FlexRIO Adapter Module Development Kit User Manual	Available from the Start menu at **Start»All Programs»National Instruments»NI FlexRIO»NI FlexRIO Adapter Module Development Kit» Documentation**.	Contains information about how to create custom adapter modules for use with NI FlexRIO FPGA modules.
LabVIEW Examples	Available in NI Example Finder. In LabVIEW, click **Help»Find Examples»Hardware Input and Output»FlexRIO**.	Contains examples of how to run FPGA VIs and Host VIs on your device.
IPNet	*ni.com/ipnet*	Contains LabVIEW FPGA functions and intellectual property to share.
NI FlexRIO product page	*ni.com/flexrio*	Contains product information and data sheets for NI FlexRIO devices.

Verifying the System Requirements

To use the NI FlexRIO Adapter Module Support instrument driver, your system must meet certain requirements. For more information about minimum system requirements, recommended system, and supported application development environments (ADEs), refer to the *NI FlexRIO Adapter Module Support Readme*, which is available on the NI FlexRIO Adapter Module Support software DVD or online at *ni.com/updates*.

Front Panel and Connector Pinouts

The NI 6587 provides one PFI signal and one clock signal through the two SMA connectors on the device front panel. The NI 6587 also provides the following signals on the Digital Data & Control (DDC) connector:

• Sixteen LVDS signals

• Four LVDS PFI signals

• Three single-ended PFI signals

• One LVDS clock out signal

The following figure shows the front panel connector and signal descriptions for the NI 6587.

Figure 3. NI 6587 Front Panel and Connector Pinout
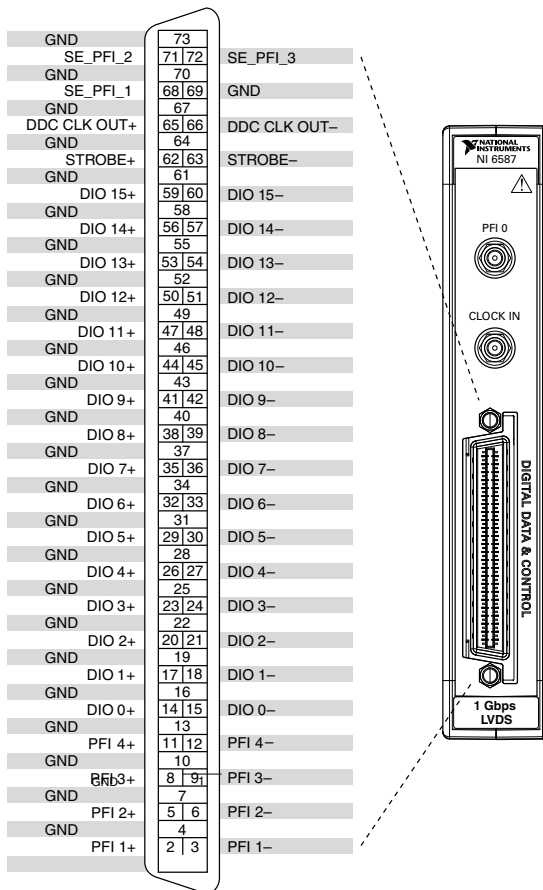
Caution To avoid permanent damage to the NI 6587, disconnect all signals connected to the NI 6587 before powering down the module, and connect signals only after the adapter module has been powered on by the NI FlexRIO FPGA module.

Caution Connections that exceed any of the maximum ratings of any connector on the NI 6587 can damage the device and the chassis. NI is not liable for any damage resulting from such connections.

Note If you design a custom cabling solution with the InfiniBand connector (779157-01) and the SHB12X-B12X LVDS shielded cable (192344-01), the NI 6587 pinout is reversed at the end connector. For example, the signal shown on pin 1 maps to pin 73 in the pinout at the end connector.

The following table contains pin location information and signal information for the SMA connectors on the NI 6587.

Table 2. SMA Connector Names and Descriptions

Signal Name	Connector	Signal Type	Signal Description
PFI 0	PFI 0	Control	Bidirectional single-ended terminal for channel PFI 0.
CLOCK IN	CLOCK IN	Clock	External single-ended clock input terminal.

The following table contains pin location information and signal information for the DDC connectors on the NI 6587.

Table 3. NI 6587 DDC Connector Names and Descriptions

Signal Name	Pin(s)	Signal Type	Signal Description
DDC CLK OUT+	65	Control	Positive terminal for the LVDS exported Sample Clock.
DDC CLK OUT-	66	Control	Negative terminal for the LVDS exported Sample Clock.
STROBE+	62	Control	Positive differential terminal for the external Sample Clock source that can be used for synchronous dynamic acquisition.
STROBE-	63	Control	Negative differential terminal for the external Sample Clock source that can be used for synchronous dynamic acquisition.

Table 3. NI 6587 DDC Connector Names and Descriptions (Continued)

Signal Name	Pin(s)	Signal Type	Signal Description
DIO<0..15>+	14, 17, 20, 23, 26, 29, 32, 35, 38, 41, 44, 47, 50, 53, 56, 59	Data	Positive differential terminal for the bidirectional digitial I/O data channels 0 through 15.
DIO<0..15>-	15, 18, 21, 24, 27, 30, 33, 36, 39, 42, 45, 48, 51, 54, 57, 60	Data	Negative differential terminal for the bidirectional digital I/O data channels 0 through 15.
PFI <1..4>+	2, 5, 8, 11	Control	Positive differential terminals for bidirectional PFI channels 1 through 4.
PFI <1..4>-	3, 6, 9, 12	Control	Negative differential terminals for bidirectional PFI channels 1 through 4.
SE_PFI<1..3>	68, 71, 72	Control	Single-ended terminals for bidirectional PFI channels 1 through 3.
GND	1, 4, 7, 10, 13, 16, 19, 22, 25, 28, 31, 34, 37, 40, 42, 46, 49, 52, 55, 58, 69	Ground	Ground reference for signals.

For more detailed information about the NI 6587 front panel connectors, refer to the *NI 6587 Specifications*.

Block Diagrams

Figures 4 through 8 show the data flow through the NI 6587. Single-ended data lines use standard clock levels to interpret data as either a binary zero or a one in high-speed digital data transfers. Differential data lines provide a low-noise, low-power, low-amplitude differential method for high-speed digital data transfer.
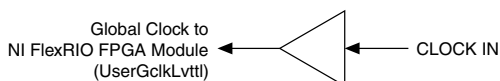
Figure 4. Clock Input Signal
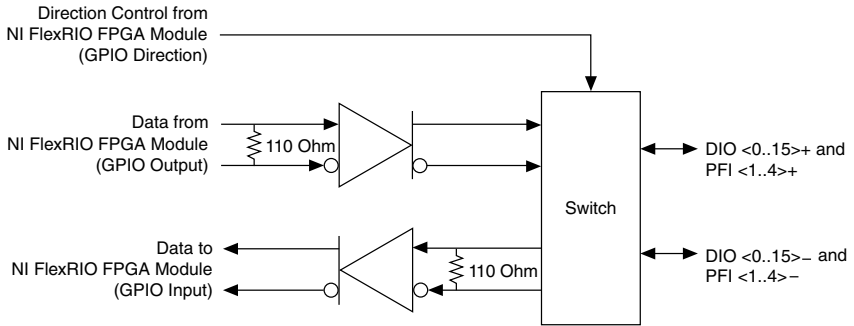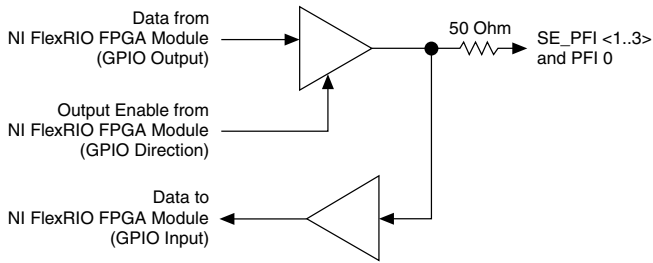
Figure 5. LVDS Data and PFI Lines

Direction Control from
NI FlexRIO FPGA Module
(GPIO Direction)

Data from
NI FlexRIO FPGA Module
(GPIO Output)

110 Ohm

Switch

DIO <0..15>+ and
PFI <1..4>+

Data to
NI FlexRIO FPGA Module
(GPIO Input)

110 Ohm

DIO <0..15>− and
PFI <1..4>−

Figure 6. Single-Ended PFI Lines

Data from
NI FlexRIO FPGA Module
(GPIO Output)

50 Ohm

SE_PFI <1..3>
and PFI 0

Output Enable from
NI FlexRIO FPGA Module
(GPIO Direction)

Data to
NI FlexRIO FPGA Module
(GPIO Input)

Figure 7. Clock Output Signals

Output Enable from
NI FlexRIO FPGA Module
(GPIO Direction)

Clock from
NI FlexRIO FPGA Module
(GPIO Output)

110 Ohm

LVDS

LVDS

Switch

DDC CLK OUT+

DDC CLK OUT −

10 kOhm

10 kOhm
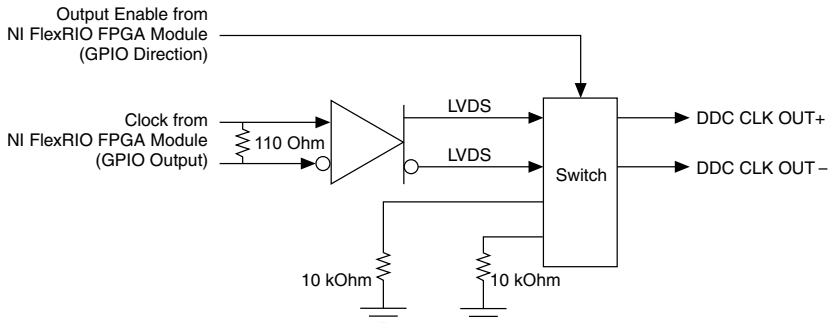
Figure 8. Crosspoint Switch

4×4 Crosspoint Switch
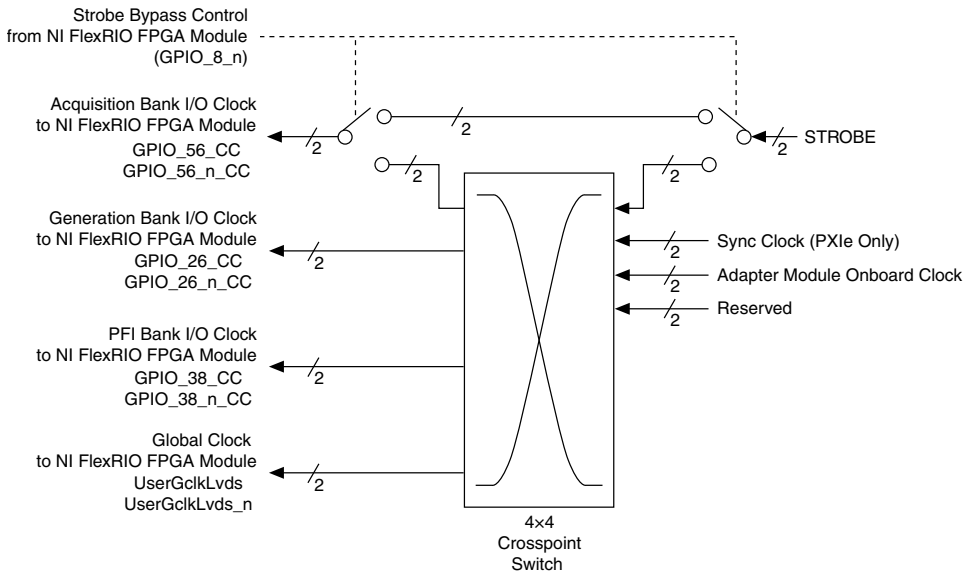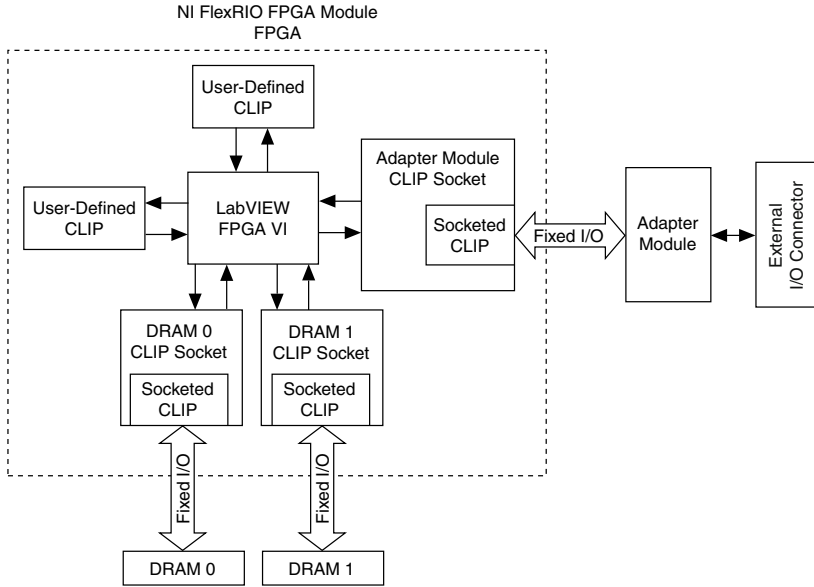
Related Information

NI 6587 Component-Level Intellectual Property (CLIP)

The LabVIEW FPGA Module includes component-level intellectual property (CLIP) for HDL IP integration. NI FlexRIO devices support two types of CLIP: user-defined and socketed.

- *User-defined CLIP* allows you to insert HDL IP into an FPGA target, enabling VHDL code to communicate directly with an FPGA VI.
- *Socketed CLIP* provides the same IP integration of the user-defined CLIP, but also allows the CLIP to communicate directly with circuitry external to the FPGA. Adapter module socketed CLIP allows your IP to communicate directly with both the FPGA VI and the external adapter module connector interface.

The following figure shows the relationship between an FPGA VI and the CLIP.

Figure 9. CLIP and FPGA VI Relationship

The NI 6587 ships with socketed CLIP items that add module I/O to the LabVIEW project.

Related Information

Block Diagrams on page 7

NI 6587 CLIP

Refer to the following table for the available NI 6587 CLIP items, and each CLIP item's function and available signals.

> **Note** All NI 6587 CLIP items allow individual clock output inversion.

Table 4. NI 6587 CLIP Items

CLIP Name	Signals	Description
NI 6587 Basic Connector CLIP[1]	• Sixteen bidirectional data LVDS lines • Four LVDS PFI lines • One LVDS STROBE line • One LVDS clock output signal • Four single-ended PFI lines • One single-ended clock input signal	Provides read/write access to all low-voltage differential signal (LVDS) and single-ended channels, where the channels are grouped by connector. You can access the LVDS data and direction lines using a U16 data type in which each bit position corresponds to an individual channel. You can access the LVDS PFI lines and the single-ended PFI lines using a Boolean control.
NI 6587 Serdes Channel CLIP[2]	• Sixteen bidirectional data LVDS lines • Four LVDS PFI lines • One LVDS STROBE line • One LVDS clock output signal • Four single-ended PFI lines • One single-ended clock input signal	Provides read/write access to all LVDS and single-ended channels using a channel-based interface. You can access the LVDS data and PFI channels using a U16 data type in which the top six bits are unused. Each LVDS line, PFI line, and clock output is connected to an OSERDES or ISERDES block that serializes or deserializes, respectively, the signal by a factor of 10 by default. During acquisition, the NI 6587 reads or writes ten bits of data per channel to or from the ISERDES or OSERDES blocks. All OSERDES and ISERDES blocks are set to double data rate (DDR) mode.

---

[1] This CLIP is compatible only with LabVIEW 2009 and later.
[2] This CLIP is compatible only with LabVIEW 2010 and later.

Table 4. NI 6587 CLIP Items (Continued)

CLIP Name	Signals	Description
NI 6587 Serdes Connector CLIP[3]	• Sixteen bidirectional data LVDS lines • Four LVDS PFI lines • One LVDS STROBE line • One LVDS clock output signal • Four single-ended PFI lines • One single-ended clock input signal	Provides read/write access to all LVDS and single-ended channels, where the channels are grouped by connector. This CLIP conveys parallel data at high speeds. You can access the LVDS data and direction lines using a U16 data type, you can access the LVDS PFI lines using a U8 data type, and you can access the single-ended PFI lines using a Boolean control. In the U8 data type, the top four bits are unused. Each LVDS line, PFI line, and clock output is connected to an OSERDES or ISERDES block that serializes or deserializes, respectively, the signal by a factor of six by default. Therefore, with every regional clock cycle, the NI 6587 reads or writes six samples to or from the ISERDES or OSERDES blocks. All OSERDES and ISERDES blocks are set to double data rate (DDR) mode.

The following table lists the NI 6587 SMA connector signals and corresponding NI FlexRIO FPGA module signals necessary for designing custom component-level IP (CLIP).

Table 5. NI 6587 SMA Signals and NI FlexRIO FPGA Module Signals

NI 6587	NI FlexRIO FPGA Module		
Signal Name	GPIO Input	GPIO Output	GPIO Direction
PFI 0	GPIO_2_n	GPIO_5_n	GPIO_6_n (as enable)
CLOCK IN	GClk_SE	—	—

The following table lists the NI 6587 DDC connector signals and corresponding NI FlexRIO FPGA module signals necessary for designing custom component-level IP (CLIP). The _CC suffix on signals identifies channels that can receive a regional clock.

---

[3] This CLIP is compatible only with LabVIEW 2010 and later.

Table 6. NI 6587 DDC Signals and NI FlexRIO FPGA Module Signals

NI 6587	NI FlexRIO FPGA Module		
Signal Name	GPIO Input	GPIO Output	GPIO Direction
PFI 1+	GPIO_39_CC	GPIO_36	GPIO_14
PFI 1-	GPIO_39_n_CC	GPIO_36_n	
PFI 2+	GPIO_40_CC	GPIO_41	GPIO_14_n
PFI 2-	GPIO_40_n_CC	GPIO_41_n	
PFI 3+	GPIO_45	GPIO_46	GPIO_15
PFI 3-	GPIO_45 _n	GPIO_46_n	
PFI 4+	GPIO_47	GPIO_48	GPIO_15_n
PFI 4-	GPIO_47_n	GPIO_48_n	
DIO 0+	GPIO_62	GPIO_32	GPIO_4_n
DIO 0-	GPIO_62_n	GPIO_32_n	
DIO 1+	GPIO_63	GPIO_28	GPIO_11
DIO 1-	GPIO_63_n	GPIO_28_n	
DIO 2+	GPIO_64	GPIO_23	GPIO_9_n
DIO 2-	GPIO_64_n	GPIO_23_n	
DIO 3+	GPIO_65	GPIO_19	GPIO_3
DIO 3-	GPIO_65_n	GPIO_19_n	
DIO 4+	GPIO_60	GPIO_31	GPIO_4
DIO 4-	GPIO_60_n	GPIO_31_n	
DIO 5+	GPIO_61	GPIO_27	GPIO_5
DIO 5-	GPIO_61_n	GPIO_27_n	
DIO 6+	GPIO_55	GPIO_22	GPIO_6
DIO 6-	GPIO_55_n	GPIO_22_n	
DIO 7+	GPIO_54	GPIO_18	GPIO_7
DIO 7-	GPIO_54_n	GPIO_18_n	

NI 6587	NI FlexRIO FPGA Module		
Signal Name	GPIO Input	GPIO Output	GPIO Direction
DIO 8+	GPIO_53	GPIO_30	GPIO_8
DIO 8-	GPIO_53_n	GPIO_30_n	
DIO 9+	GPIO_52	GPIO_25	GPIO_9
DIO 9-	GPIO_52_n	GPIO_25_n	
DIO 10+	GPIO_51	GPIO_21	GPIO_10
DIO 10-	GPIO_51_n	GPIO_21_n	
DIO 11+	GPIO_50	GPIO_17	GPIO_2
DIO 11-	GPIO_50_n	GPIO_17_n	
DIO 12+	GPIO_49_CC	GPIO_29	GPIO_12
DIO 12-	GPIO_49_n_CC	GPIO_29_n	
DIO 13+	GPIO_57_CC	GPIO_24	GPIO_13
DIO 13-	GPIO_57_n_CC	GPIO_24_n	
DIO 14+	GPIO_58_CC	GPIO_20	GPIO_3_n
DIO 14-	GPIO_58_n_CC	GPIO_20_n	
DIO 15+	GPIO_59_CC	GPIO_16	GPIO_1_n
DIO 15-	GPIO_59_n_CC	GPIO_16_n	

Table 6. NI 6587 DDC Signals and NI FlexRIO FPGA Module Signals (Continued)

NI 6587	NI FlexRIO FPGA Module		
Signal Name	GPIO Input	GPIO Output	GPIO Direction
STROBE+[4]	GPIO_56_CC	—	GPIO_8_n
	GPIO_26_CC		
	GPIO_38_CC		
	GPIO_LVDS		
STROBE-[5]	GPIO_56_n_CC		
	GPIO_26_n_CC		
	GPIO_38_CC		
	GPIO_LVDS_n		
DDC CLOCK OUT LVDS+	—	GPIO_43	GPIO_7_n (as enable)
DDC CLOCK OUT LVDS-		GPIO_43_n	
SE_PFI_1	GPIO_44_n	GPIO_37_n	GPIO_44 (as enable)
SE_PFI_2	GPIO_42_n	GPIO_34_n	GPIO_42 (as enable)
SE_PFI_3	GPIO_35	GPIO_33_n	GPIO_35_n (as enable)

Refer to the *NI FlexRIO Help* for more information about NI FlexRIO CLIP items, configuring the NI 6587 with a socketed CLIP, and a list of available socketed CLIP signals.

Cables

⚠ **Caution** You must operate the NI 6587 with shielded cables and shielded accessories to ensure compliance with the EMC requirements defined in the *NI 6587 Specifications*. Do not use unshielded cables or accessories unless they are installed in a shielded enclosure with properly designed and shielded input/output ports and are connected to the NI 6587 using a shielded cable. If unshielded cables or accessories are not properly installed and shielded, the EMC specifications for the NI 6587 are no longer guaranteed.

---

[4] Refer to Figure 8 for more information about configuring LVDS STROBE through the crosspoint switch.
[5] Refer to Figure 8 for more information about configuring LVDS STROBE through the crosspoint switch.

Use a shielded 50 Ω coaxial cable with an SMA plug end to connect to the PFI 0 and CLOCK IN connectors on the NI 6587 front panel. Use the NI SHB12X-B12X shielded cable (NI part number 192344-01) or the NI SHB12X-H3X24 differential flying-lead cable (NI part number 196236-1R5) to connect to the DDC connector. You can also connect the NI SMA-2164 accessory to the NI 6587 through the SHB12X-B12X shielded cable for testing and debugging.

> **Note** If you design a custom cabling solution with the DDC connector (779157-01) and SHB12X-B12X shielded cable (192344-01), the NI 6587 pinout is reversed at the end connector. For example, the signal shown on pin 1 maps to pin 73 at the end connector.

The following NI cables and accessories are not properly shielded for EMC-compliant use with the NI 6587:

- NI SMA-2164 accessory
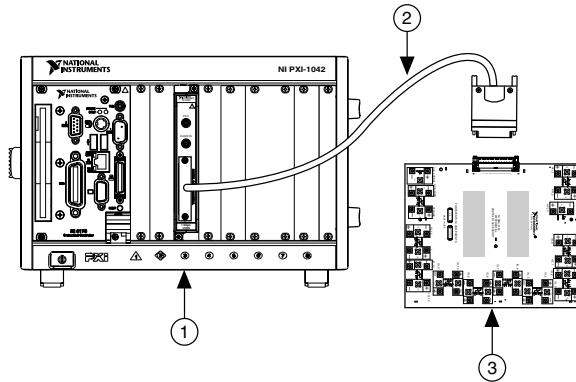- NI SHB12X-H3X24 differential flying-lead cable

> **Note** Whether you use NI cables and accessories or design your own, terminate cables properly to avoid improper measurements caused by signal reflections, overshoot, and undershoot.

Accessories

The NI SMA-2164 test fixture is a breakout box for differential signals. This fixture provides an easy way to connect to other devices for testing and debugging.

The following figure shows how to connect the differential DDC connector to the NI SMA-2164, using the NI SHB12X-B12X cable. For more information about using the NI SMA-2164, refer to the *NI SMA-2164/2165 Test Fixture User Guide*.

Figure 10. Connecting the NI SMA-2164 Accessory

1. PXI/PXIe Chassis with an NI 6587R
2. NI SHB12-B12X Cable
3. NI SMA-2164

A flying lead cable, the NI SHB12X-H3X24, is also available for differential signals. This cable offers connectivity similar to that found on a typical logic analyzer, so you can use it in logic analyzer-type applications. This cable is shown in the following figure.

Figure 11. NI SHB12X-H3X24 Flying Lead Cable
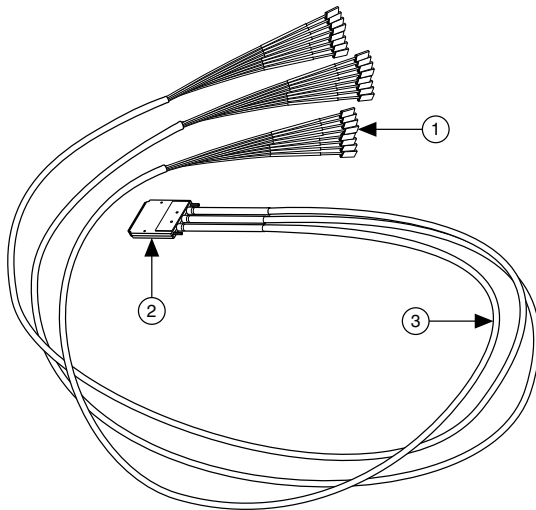
1. Leads (1 × 3 Header Receptacle)
2. DDC Connector
3. Removeable Sleeving

Custom Accessories

If you are creating a custom accessory to use with a DUT with a VHDCI DDC connector, you can purchase the mating connector for the VHDCI cable from NI. For more information about creating these custom accessories, refer to the *Interfacing to the NI Digital Waveform Generator/Analyzer using the VHDCI Connector* application note.

Visit *ni.com/info* and enter the info code rdinwa to download this note.

If you are designing a custom accessory to use with a device that uses an InfiniBand connector, you can also purchase this connector from NI.

Note If you design a custom cabling solution with the DDC connector (779157-01) and SHB12X-B12X shielded cable (192344-01), the NI 6587 pinout is reversed at the end connector. For example, the signal shown on pin 1 maps to pin 73 at the end connector.

For more information about connecting I/O signals on your device, refer to the *NI 6587 Specifications*.

Related Information
*http://www.ni.com/info*

Clocking

The clocks on the NI 6587 control the sample rate and other timing functions on your NI FlexRIO system. The following figure shows the NI 6587 clock sources routed through the crosspoint switch. The Generation Bank I/O clock, PFI Bank I/O clock, and Global clock are all sourced by the crosspoint switch. The Acquisition Bank I/O clock can be sourced from the crosspoint switch or accessed directly through the Strobe Bypass path.

Note Only the Acq_IO_Clock_Source signal can use the STROBE Bypass path. If Acq_IO_Clock_Source is set to Strobe Bypass, then Gen_IO_Clock_Source, PFI_IO_Clock_Source, and IO_Module_Clock_1_Source cannot be set to Strobe From Crosspoint Switch.

Figure 12. Crosspoint Switch
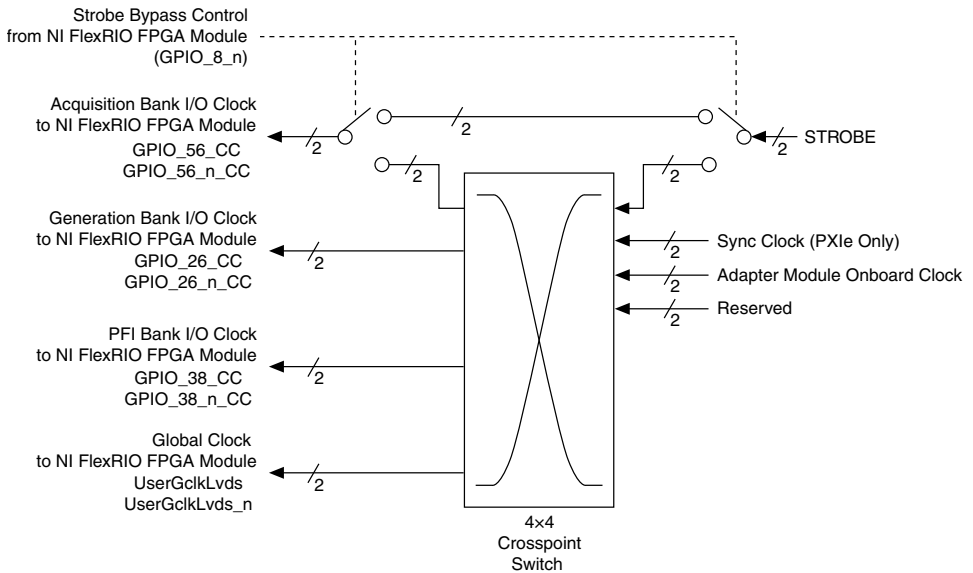
In software, each clock output terminal is accessed with a U8 data type. The following table shows the values of the crosspoint switch clock options.

Table 7. Clock Values

Value	Clock Option
0	**Tristate**—Output disabled (high impedance).
2	**Sync Clock (PXI Express Only)**—Clock from PXI Express backplane. You can select **PXI_CLK10** or **DStarA** in the **Details** category of the **IO Module Properties** dialog box.
3	**Adapter Module Onboard Clock**—Clock generated from the Si570 clock chip.
4	**Strobe From Crosspoint Switch**—LVDS STROBE signal from crosspoint switch. Use this setting to route the LVDS STROBE signal to multiple I/O clocks.
5	**Strobe Bypass**—LVDS STROBE bypasses the crosspoint switch. The propagation delay of the **Strobe Bypass** exactly matches the propagation delay of the data channels. This setting is ideal for source- synchronous applications.

Installing the Application Software and Driver

Before installing your hardware, you must install the application software and instrument driver. Visit *ni.com/info* and enter `rdsoftwareversion` as the Info Code to determine which minimum software versions you need for your device. Install the software in the following order:

1. Install LabVIEW.

    Refer to the *LabVIEW Installation Guide* for installation instructions for LabVIEW and system requirements for the LabVIEW software. Refer to the *LabVIEW Upgrade Notes* for additional information about upgrading to the most recent version of LabVIEW for Windows. Documentation for LabVIEW is available at *ni.com/manuals* and by selecting **Start»All Programs»National Instruments»LabVIEW»LabVIEW Manuals**.

2. Install the LabVIEW FPGA Module.

    Refer to the *LabVIEW FPGA Module Release and Upgrade Notes* for installation instructions and information about getting started with the LabVIEW FPGA Module. Documentation for the LabVIEW FPGA Module is available at *ni.com/manuals* and by selecting **Start»All Programs»National Instruments»LabVIEW»LabVIEW Manuals**.

3. (Optional) Install the LabVIEW Real-Time Module.

    Refer to the *LabVIEW Real-Time Module Release and Upgrade Notes* for system requirements, installation instructions, and additional information about using the LabVIEW Real-Time Module.

4. Install NI FlexRIO.

    Refer to the *NI FlexRIO Readme* on the NI FlexRIO installation media for system requirements and installation instructions for NI FlexRIO Support. Documentation for NI FlexRIO Support is available at *ni.com/manuals* and by selecting **Start»All Programs»National Instruments»NI FlexRIO**.

    > **Note** If you are not using an adapter module, skip step 5.

5. Install NI FlexRIO Adapter Module Support.

    Refer to the *NI FlexRIO Adapter Module Support Readme* on the NI FlexRIO Adapter Module Support installation media for system requirements and installation instructions. Documentation for NI FlexRIO Adapter Module Support is available at *ni.com/manuals* and by selecting **Start»All Programs»National Instruments»NI FlexRIO»NI FlexRIO Adapter Module Documentation**.

Installing the NI FlexRIO Devices

> **Note** You must install the software before installing the hardware.

Unpacking

The NI 6587 modules ship in antistatic packages to prevent electrostatic discharge from damaging module components. To prevent such damage when handling the modules, ground yourself using a grounding strap or by holding a grounded object, such as your computer chassis, and complete the following steps:

1. Touch the antistatic package to a metal part of the computer chassis before removing the module from the package.

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

2. Remove each module from the package and inspect it for loose components or any other sign of damage.

Notify NI if the modules appear damaged in any way. Do not install a damaged module into the chassis.

Preparing the Environment

Ensure that the environment you are using the NI 6587 in meets the following specifications.

Operating temperature.......................................0 °C to 55 °C
(IEC 60068-2-1, IEC 60068-2-2)

Operating humidity...10% to 90% RH, noncondensing
(IEC 60068-2-56)

Pollution Degree...2

Maximum altitude..2,000 m at 25 °C ambient temperature

Indoor use only.

📝 **Note** Refer to the *NI 6587 Specifications* at *ni.com/manuals* for complete specifications.

Installing the NI FlexRIO FPGA Module

📝 **Note** You must install the software before you install the hardware.

1. Power off and unplug the PXI Express chassis. Refer to your chassis manual to install or configure the chassis.
2. Identify a supported PXI Express slot in the chassis. The figure below shows the symbols that indicate the slot types in a PXI Express chassis.

**Figure 13.** Symbols for PXI Express/PXI Express HybridSlots
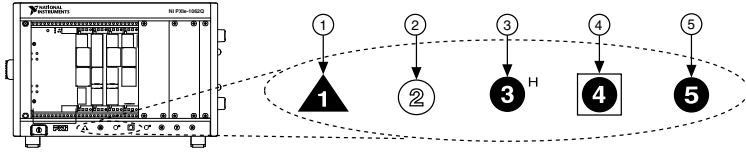
1. PXI Express System Controller Slot
2. PXI Peripheral Slot
3. PXI Express Hybrid Peripheral Slot
4. PXI Express System Timing Slot
5. PXI Express Peripheral Slot

Refer to the chassis documentation for specifications.

3. Remove the filler panel of an unused PXI Express slot.

4. Touch any metal part of the chassis to discharge any static electricity. Place the PXI Express module edges into the module guides at the top and bottom of the chassis, and slide the module into the chassis until the module is fully inserted, as shown in the figure below.

Figure 14. Installing an NI FlexRIO FPGA Module in the PXI Express Chassis
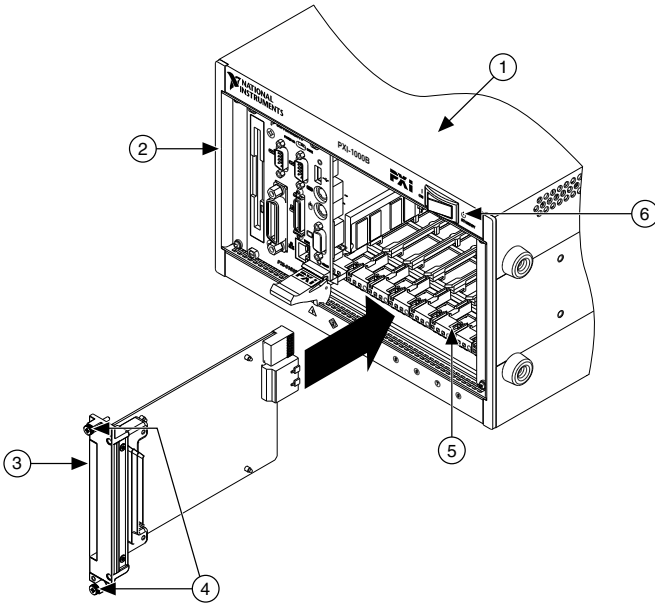
1. PXI Express Chassis
2. PXI Express System Controller
3. NI FlexRIO FPGA Module
4. Front-Panel Mounting Screws
5. Module Guides
6. Power Switch

5. Secure the device front panel to the chassis front panel mounting rail using the front panel mounting screws.

6. Plug in and power on the PXI Express chassis.

Confirming that Measurement & Automation Explorer (MAX) Recognizes the Device

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 NI FlexRIO Support.

1. Launch MAX by navigating to **Start**»**All Programs**»**National Instruments**»**NI MAX** or by clicking the NI MAX desktop icon.

2. In the Configuration pane, double-click **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 hardware 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.
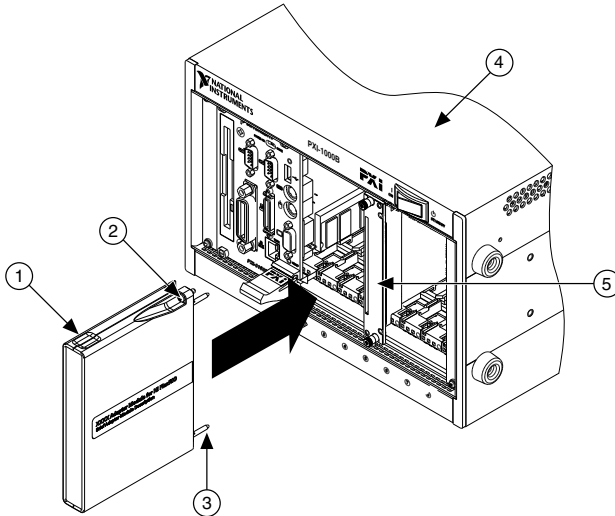
Installing the NI FlexRIO Adapter Module

> **Note** Skip this step if you are not using an adapter module.

1. Gently insert the guide pins and the high-density card edge of the NI FlexRIO adapter module into the corresponding connectors of the NI FlexRIO FPGA module, as shown in the figure below.

Figure 15. Installing the NI FlexRIO Adapter Module

1.	NI FlexRIO Adapter Module	4.	PXI/PXI Express Chassis
2.	Captive Screw	5.	NI FlexRIO FPGA Module
3.	Guide Pin		

The connection may be tight, but do not force the adapter module into place.

2. Tighten the captive screws on the NI FlexRIO adapter module to secure it to the NI FlexRIO FPGA module. NI recommends using the laser-tipped screwdriver (part number 748677-01) included in the NI 6587 packaging.

3. Launch LabVIEW to begin configuring your NI FlexRIO system.

Installing PXI EMC Filler Panels

To ensure specified EMC performance, PXI EMC filler panels must be properly installed in your NI FlexRIO system. The PXI EMC filler panels (National Instruments part number 778700-01) must be purchased separately.

1. Remove the captive screw covers.

2. Install the PXI EMC filler panels by securing the captive mounting screws to the chassis, as shown in the figure below. Make sure that the EMC gasket is on the right side of the PXI EMC filler panel.

Figure 16. PXI EMC Filler Panels and Chassis
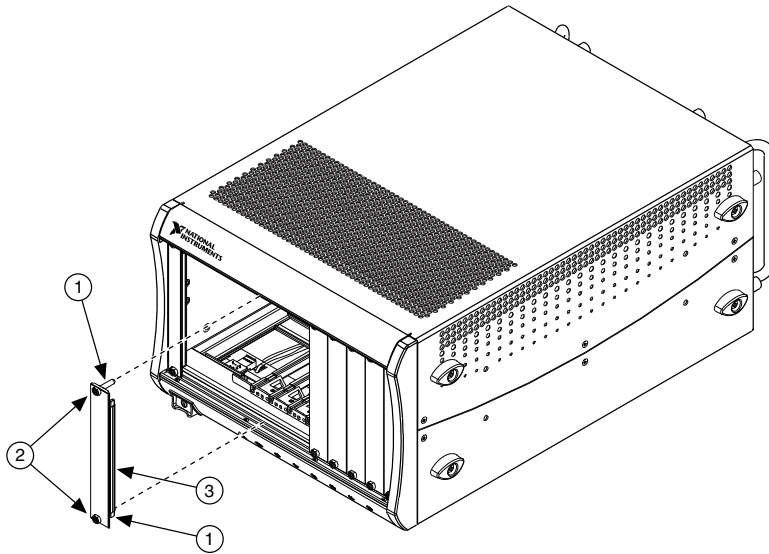
1. Captive Screw Covers
2. Captive Mounting Screws
3. EMC Gasket

Note You must populate all slots with a module or a PXI EMC filler panel to ensure proper module cooling. Do not over tighten screws (2.5 lb · in. maximum). For additional information about the use of PXI EMC filler panels in your PXI system, visit ni.com/info and enter emcpanels.

Uninstalling the Hardware

Hot Surface If the module has been in use, it may exceed safe handling temperatures and cause burns. Allow the module to cool before removing it from the chassis.

1. **Caution** Disconnect or disable any external RF, clock, or digital connections to the NI 6587 front panel. Applying external signals while the device is powered off may cause damage.

   Disconnect any cables from the module front panel connectors.
2. Power off the chassis.
3. Ground yourself with a grounding strap or touch a grounded metal surface.
4. Unlatch the module by pushing down on the ejector handle.
5. Hold the module by the ejector handle and remove it from the slot.

Store the module in the original antistatic packaging when not in use to avoid damage.

Environment

Maximum altitude..2,000 m (800 mbar) (at 25 °C ambient temperature)

Pollution Degree..2

Indoor use only.

Operating Environment

Ambient temperature range...............................0 °C to 55 °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 2 high temperature limit.)

Relative humidity range....................................10% to 90%, noncondensing (Tested in accordance with IEC-60068-2-56.)

Storage Environment

Ambient temperature range...............................-20 °C to 70 °C (Tested in accordance with IEC-60068-2-1 and IEC-60068-2-2. Meets MIL-PRF-28800F Class 3 limits.)

Relative humidity range....................................5% to 95%, noncondensing (Tested in accordance with IEC-60068-2-56.)

Shock and Vibration

Operating shock...30 g peak, half-sine, 11 ms pulse (Tested in accordance with IEC-60068-2-27. Meets MIL-PRF-28800F Class 2 limits.)

Random vibration
    Operating...5 Hz to 500 Hz, 0.3 g_{rms}
    Nonoperating...5 Hz to 500 Hz, 2.4 g_{rms} (Tested in accordance with IEC-60068-2-64. Nonoperating test profile exceeds the requirements of MIL-PRF-28800F, Class 3.)

Compliance and Certifications

Safety

This product is designed to meet the requirements of the following electrical equipment safety standards for measurement, control, and laboratory use:

- IEC 61010-1, EN 61010-1
- UL 61010-1, CSA 61010-1

Note For UL and other safety certifications, refer to the product label or the *Online Product Certification* section.

Electromagnetic Compatibility

This product meets the requirements of the following EMC standards for electrical equipment for measurement, control, and laboratory use:

- EN 61326-1 (IEC 61326-1): Class A emissions; Basic immunity
- EN 55011 (CISPR 11): Group 1, Class A emissions
- AS/NZS CISPR 11: Group 1, Class A emissions
- FCC 47 CFR Part 15B: Class A emissions
- ICES-001: Class A emissions

Note In the United States (per FCC 47 CFR), Class A equipment is intended for use in commercial, light-industrial, and heavy-industrial locations. In Europe, Canada, Australia, and New Zealand (per CISPR 11), Class A equipment is intended for use only in heavy-industrial locations.

Note Group 1 equipment (per CISPR 11) is any industrial, scientific, or medical equipment that does not intentionally generate radio frequency energy for the treatment of material or inspection/analysis purposes.

Note For EMC declarations, certifications, and additional information, refer to the *Online Product Certification* section.

CE Compliance $C \mathbb{E}$

This product meets the essential requirements of applicable European Directives, as follows:

- 2006/95/EC; Low-Voltage Directive (safety)
- 2004/108/EC; Electromagnetic Compatibility Directive (EMC)

Online Product Certification

Refer to the product Declaration of Conformity (DoC) for additional regulatory compliance information. To obtain product certifications and the DoC for this product, visit *ni.com/certification*, search by model number or product line, and click the appropriate link in the Certification column.

Environmental Management

NI is committed to designing and manufacturing products in an environmentally responsible manner. NI recognizes that eliminating certain hazardous substances from our products is beneficial to the environment and to NI customers.

For additional environmental information, refer to the *Minimize Our Environmental Impact* web page at *ni.com/environment*. This page contains the environmental regulations and directives with which NI complies, as well as other environmental information not included in this document.

Waste Electrical and Electronic Equipment (WEEE)

EU Customers At the end of the product life cycle, all NI products must be disposed of according to local laws and regulations. For more information about how to recycle NI products in your region, visit *ni.com/environment/weee*.

电子信息产品污染控制管理办法（中国 RoHS）

中国客户 National Instruments 符合中国电子信息产品中限制使用某些有害物质指令（RoHS）。关于 National Instruments 中国 RoHS 合规性信息，请登录 ni.com/environment/rohs_china。（For information about China RoHS compliance, go to ni.com/environment/rohs_china.）

Where to Go Next

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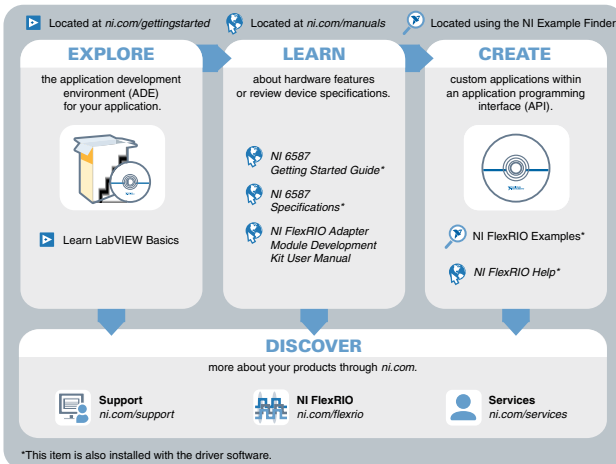
Worldwide Support and Services

The National Instruments website is your complete resource for technical support. At *ni.com/support*, 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.

A Declaration of Conformity (DoC) is our claim of compliance with the Council of the European Communities using the manufacturer's declaration of conformity. This system affords the user protection for electromagnetic compatibility (EMC) and product safety. You can obtain the DoC for your product by visiting *ni.com/certification*. If your product supports calibration, you can obtain the calibration certificate for your product at *ni.com/calibration*.

National Instruments corporate headquarters is located at 11500 North Mopac Expressway, Austin, Texas, 78759-3504. National Instruments also has offices located around the world. For telephone support in the United States, create your service request at *ni.com/support* or dial 1 866 ASK MYNI (275 6964). For telephone support outside the United States, visit the *Worldwide Offices* section of *ni.com/niglobal* to access the branch office websites, which provide up-to-date contact information, support phone numbers, email addresses, and current events.