PXIe-5668 Getting Started

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Contents

Getting Started with the PXIe-5668

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

This document explains how to install, configure, and test the PXIe-5668. The PXIe-5668 is a 26.5 GHz or 14 GHz modular vector signal analyzer (VSA). The PXIe-5668 ships with the NI-RFSA instrument driver, which you use to program the device. You can also use NI-RFmx, available at ni.com/downloads, to program the device.

The PXIe-5668 comprises the following devices:

- PXIe-5606 RF Signal Downconverter (PXIe-5606) RF downconverter
- PXIe-5624 IF Digitizer (PXIe-5624) intermediate frequency (IF) digitizer
- PXIe-5653 RF Analog Signal Generator (PXIe-5653) synthesizer/local oscillator (LO) source module

Caution The protection provided by this product may be impaired if it is used in a manner not described in this document.

Hot Surface If the PXIe-5668 has been in use, it may exceed safe handling temperatures and cause burns. Allow the PXIe-5668 to cool before removing it from the chassis.

Note In this document, PXIe-5668 refers to both the PXIe-566826.5 GHz VSA and the PXIe-566814 GHz VSA unless otherwise specified.

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 NI 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, operate this product only with cables less than 3 meters in length.

Verifying the System Requirements

To use the PXIe-5668, 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 installed or available at ni.com/manuals.

Unpacking the Kit

Notice To prevent electrostatic discharge (ESD) from damaging the device, ground yourself using a grounding strap or by holding a grounded object, such as your computer chassis.

1. Touch the antistatic package to a metal part of the computer chassis.

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

> **Notice** Never touch the exposed pins of connectors.

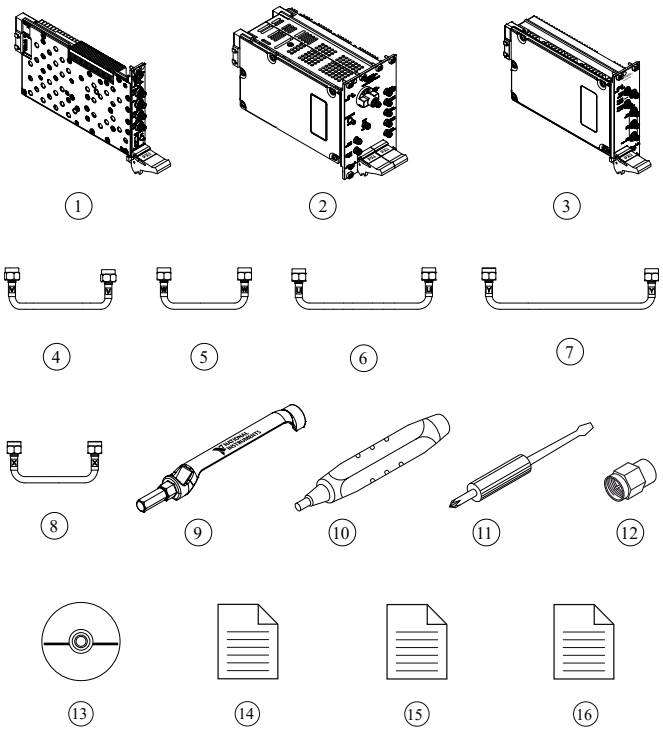
> **Note** Do not install a device if it appears damaged in any way.

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

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

Verifying the Kit Contents

Figure 4. PXIe-5668 Kit Contents and Replacement Part Numbers



1. PXIe-5624 IF Digitizer Module
2. PXIe-5606 RF Downconverter Module
3. PXIe-5653 Synthesizer/LO Source Module
4. SMA-to-SMA Cable, Labeled V, Part Number 152638A-01
5. SMA-to-SMA Cable, Labeled W, Part Number 152639A-01
6. SMA-to-SMA Cable, Labeled U, Part Number 152637A-01

7. SMA-to-SMA Cable, Labeled Y, Part Number 152641A-01
8. SMA-to-SMA Cable, Labeled X, Part Number 152640A-01
9. SMA Driver Bit, Part Number 190487B-01
10. RF Torque Screwdriver, Part Number 780487-01
11. Screwdriver, Part Number 772006-01
12. 50 Ω Loads (x3), Part Number 778353-01
13. Driver Software DVD
14. Read Me First: Safety and Electromagnetic Compatibility
15. Maintain Forced-Air Cooling Note to Users
16. PXIe-5668 Getting Started Guide (This Document)

Note The three 50 Ω loads are shipped installed on the downconverter front panels.

Other Equipment

There are several required items not included in your device kit that you need to operate the PXIe-5668. Your application may require additional items not included in your kit to install or operate your device.

- A PXI Express chassis and chassis documentation. The PXIe-1085 chassis is one available option for your device. For more information about compatible chassis options, refer to ni.com.
- An embedded controller or MXI controller system that meets the system requirements specified in this guide and chassis documentation.

Preparing the Environment

Ensure that the environment you are using the PXIe-5668 in meets the following specifications.

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

Operating relative humidity (IEC 60068-2-56)	10% to 90%, noncondensing
Maximum altitude	2,000 m (800 mbar) (at 25 °C ambient temperature)
Pollution Degree	2

Indoor use only.

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

Note Refer to the ***PXIe-5668 Specifications*** at ni.com/manuals for complete specifications.

Software Options

NI provides several software options for the PXIe-5668—NI-RFmx, the NI-RFSA instrument driver software, and the NI-RFSA Soft Front Panel (SFP).

Table 1. PXIe-5668 Software Options

Software Option	Description	Use Case
NI-RFmx	Provides a single-handle instrument driver with built-in measurements.	Use NI-RFmx SpecAn to perform spectral measurements. Use NI-RFmx Demod to perform modulation quality measurements, such as EVM. Use NI-RFmx cellular personalities to perform physical layer measurement analysis on supported cellular signals.

Software Option	Description	Use Case
NI-RFSA instrument driver	The NI-RFSA APIs each provide a fixed API for interacting with your PXIe-5668 device. NI-RFSA provides standard IVI-based functionality needed for most vector signal analyzer applications.	Use NI-RFSA to create custom measurements or applications that require I/Q data. Use NI-RFSA along with the NI Modulation Toolkit to analyze modulated signals to test receivers.
NI-RFSA SFP	Controls, analyzes, and presents data similar to stand-alone RF vector signal analyzers. The NI-RFSA SFP operates on the PC, so it provides processing, storage, and display capabilities.	Use the NI-RFSA SFP to interactively acquire data.

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. Download the driver software installer from ni.com/downloads.
   NI Package Manager downloads with the driver software to handle the installation. Refer to the NI Package Manager Manual for more information about installing, removing, and upgrading NI software using NI Package Manager.
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 PXIe-5668

Notice To prevent damage to the PXIe-5668 caused by ESD or contamination, handle the module using the edges or the metal bracket.

Note

You must install NI-RFSA before installing the hardware.

Before you install the hardware, refer to the guidelines in the ***Maintain Forced-Air Cooling Note to Users*** included with the module to ensure that the device can cool itself effectively.

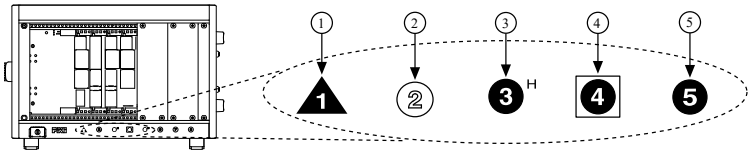
To use the included cables, you must install the PXIe-5624 IF digitizer immediately to the left of the PXIe-5606 RF downconverter module, and you must install the PXIe-5653 LO source module immediately to the right of the PXIe-5606 RF downconverter module.

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

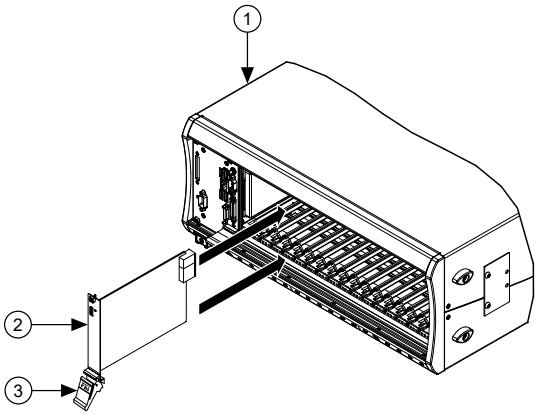


1. PXI Express System Controller Slot
2. PXI Peripheral Slot
3. PXI Express Hybrid Peripheral Slot
4. PXI Express System Timing Slot
5. PXI Express Peripheral Slot

PXIe-5668 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 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 1. 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 either filler panels (standard or EMC) or slot blockers with filler panels, depending on your application.

> **Note** For more information about installing slot blockers and filler panels, go to ni.com/r/pxiblocker.

12. Power on the chassis.

Related tasks:

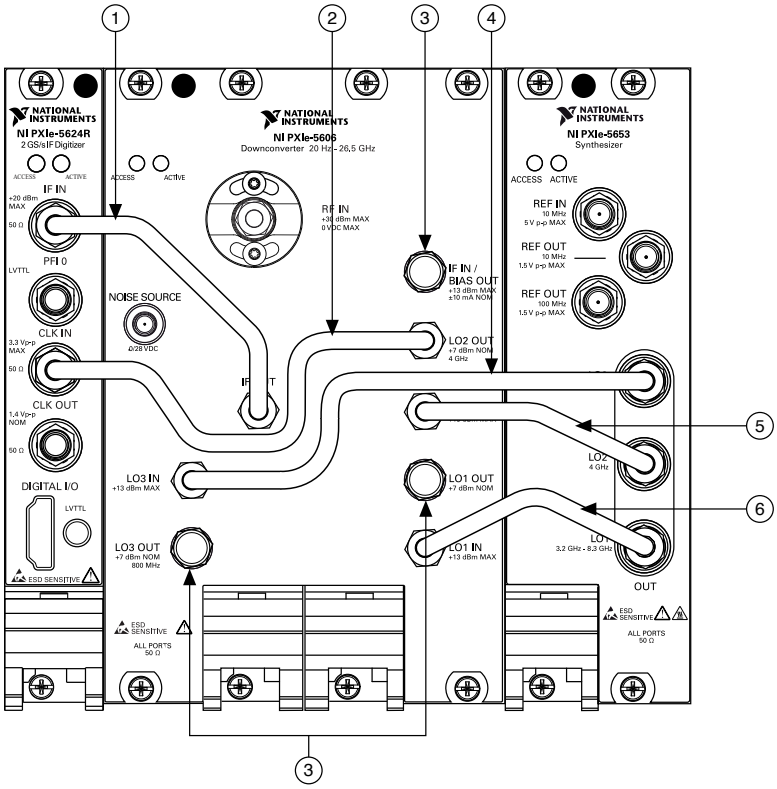
- Installing the Software

Interconnecting the PXIe-5668 Modules

Complete the following steps to interconnect the PXIe-5668 front panel connectors, as shown in the following figure.

> **Notice** The signal pins of this product's input/output ports can be damaged if subjected to ESD. To prevent damage, remove power from the product before connecting cables and employ industry-standard ESD prevention measures during installation, maintenance, and operation.

Figure 4. Installation of the PXIe-5668 Cables and 50 Ω Loads



1. SMA-to-SMA Cable, Labeled V
2. SMA-to-SMA Cable, Labeled U
3. 50 Ω Load
4. SMA-to-SMA Cable, Labeled Y
5. SMA-to-SMA Cable, Labeled X
6. SMA-to-SMA Cable, Labeled W

1. Using the three SMA-to-SMA coaxial cables labeled W, X, and Y, connect the LO1, LO2, and LO3 connectors on the NI 5653 front panel to the associated LO1 IN, LO2 IN, and LO3 IN connectors on the PXIe-5606 front panel.
2. Using the SMA-to-SMA cable labeled U, connect the LO2 OUT connector on the NI 5606 front panel to the CLK IN connector on the NI 5624R front panel.
3. Using the SMA-to-SMA cable labeled V, connect the IF OUT connector on the PXIe-5606 front panel to the IF IN connector on the NI 5624R front panel.
4. Install a 50 Ω load on each of the PXIe-5606 module LO1 OUT, LO3 OUT, and IF IN / BIAS OUT connectors.
5. Hand-tighten all SMA cable ends on the SMA connectors after the cable center pins are correctly aligned and connected. The cable connectors should tighten without much torque or effort.

Note If the SMA cable does not exactly align with the SMA connector, bend the cable slightly by hand to align the cable and the connector. The amount of bending should be minimal. The cables can be damaged by excessive bending.

6. Carefully complete tightening all SMA connectors to 1 N · m using an appropriate torque wrench (not included) or torque screwdriver and SMA driver bit. Tighten only until the wrench clicks.

Caution Incorrect torque at SMA connections can damage device connectors, degrade signal fidelity and phase locked loop performance, or cause insertion loss. Use an appropriate torque wrench or torque screwdriver and SMA driver bit to ensure all SMA connections are properly torqued. SMA connectors for connections to external equipment may require torque different from 1 N · m, depending on the connector type, material, and manufacturer.

7. Power on your PXI Express chassis and controller system. If you are using a MXI device and a remote controller, ensure that the chassis is powered on prior to triggering the remote controller. Using the controller system before the chassis is powered on may cause installed devices to not appear in MAX.
8. Verify that the ACCESS LED is on for all three modules.

Related concepts:

- Troubleshooting

Related information:

- Refer to the NI RF Vector Signal Analyzers Help for information about how to make connections using an external clock, or how to connect multiple NI 5668R modules.

Direct Connections to the PXIe-5606

The PXIe-5606 is a precision RF instrument that is sensitive to ESD and transients. Ensure you are making proper direct connections to the PXIe-5606 to avoid damaging

the device.

> **Notice** Apply external signals only while the PXIe-5606 is powered on. Applying external signals while the device is powered off may cause damage.

- Ensure you are properly grounded when manipulating cables or antennas connected to the PXIe-5606RF IN connector.
- If you are using noninsulated devices, such as an RF antenna, ensure the devices are maintained in a static-free environment.
- If you are using an active device, such as a preamplifier or switch routed to the PXIe-5606RF IN connector, ensure that the device cannot generate signal transients greater than the RF and DC specifications of the PXIe-5606RF IN connector.

PXIe-5606 RF Downconverter Module

The PXIe-5606 RF downconverter module front panel contains eight connectors and two LEDs.

Figure 1. PXIe-5606 Front Panel

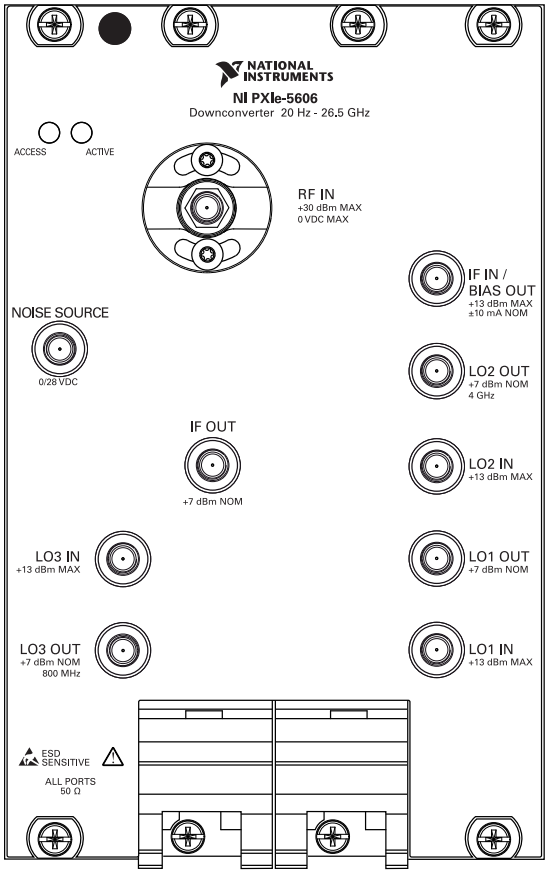


Table 2. Device Front Panel Icon Definitions

⚠	Refer to the user documentation for required maintenance measures to ensure user safety and/or preserve the specified EMC performance.
	The signal pins of this product's input/output ports can be damaged if subjected to ESD. To prevent damage, turn off power to the product before connecting cables and employ industry-standard ESD prevention measures during installation, maintenance, and operation.

Table 3. PXIe-5606 RF Downconverter Front Panel Connectors

Connector	Use
RF IN	Connects to the analog RF input signal to be measured by the vector signal analyzer. The maximum RF input is +30 dBm.

Connector	Use
	Note The PXIe-5606 downconverter module ships with a DC block attached to the RF IN connector. To make measurements below 16 kHz, you must remove the DC block. Refer to RF IN Connector DC Block for more information.
IF OUT	Connects to the IF IN connector on the PXIe-5624 module front panel. This connector is the output terminal for the frequency-translated IF signal.
LO1 IN	Connects to the LO1 OUT connector on the PXIe-5653 module front panel. This connector is the input terminal for the LO1 (3.2 GHz to 8.3 GHz) source. LO1 IN is an SMA connector with an impedance of 50 Ω (nominal).
LO2 IN	Connects to the LO2 OUT connector on the PXIe-5653 module front panel. This connector is the input terminal for the LO2 (4 GHz) source. LO2 IN is an SMA connector with an impedance of 50 Ω (nominal).
LO3 IN	Connects to the LO3 OUT connector on the PXIe-5653 module front panel. This connector is the input terminal for the LO3 (800 MHz) source. LO3 IN is an SMA connector with an impedance of 50 Ω (nominal).
LO1 OUT	Output terminal for the LO1 (3.2 GHz to 8.3 GHz) source. In multichannel systems, LO1 OUT exports the signal received at LO1 IN to other PXIe-5606 modules. LO1 OUT is disabled by default. LO1 OUT is an SMA connector with an impedance of 50 Ω (nominal).
LO2 OUT	Output terminal for the LO2 (4 GHz) source. In multichannel systems, LO2 OUT exports the signal received at LO2 IN to other PXIe-5606 modules. LO2 OUT is disabled by default. LO2 OUT is an SMA connector with an impedance of 50 Ω (nominal). **Note** When part of a PXIe-5668, LO2 OUT is disabled except when

Connector	Use
	connected to the PXIe-5624 CLK IN.
LO3 OUT	Output terminal for the LO3 (800 MHz) source. In multichannel systems, LO3 OUT exports the signal received at LO3 IN to other PXIe-5606 modules. LO3 OUT is disabled by default. LO3 OUT is an SMA connector with an impedance of 50 Ω (nominal).
IF IN / BIAS OUT	Connector for IF input and current source for biasing external mixers.
NOISE SOURCE	HD BNC connector for enabling noise source on/off.

Note LO1 OUT, LO2 OUT, and LO3 OUT enable phase-coherent operation of multiple devices by allowing you to use common LO signals when daisy-chaining the signals to other RF downconverter modules. When you are not using the LO1 OUT and LO3 OUT connectors, connect a 50 Ω load to each of these connectors.

Table 4. PXIe-5606 RF Downconverter Front Panel LEDs

LED	Indication
ACCESS	Indicates the basic hardware status of the module. OFF—The module is not yet functional, or the module has detected a problem with a power rail. AMBER—The module is being accessed. ***Accessed*** means that the device setup registers are being written to in order to control the device. GREEN—The module is ready to be programmed.
ACTIVE	Indicates the module state.

LED	Indication
	OFF—The module is in a quiescent state. AMBER—The module is waiting for the Advance Trigger from the configuration list. GREEN—The module is triggered and is running a step from the configuration list. RED—The module has detected an error state. An error state may indicate the module has exceeded approved operating temperature and thermal shutdown has occurred or that the module has detected a power supply failure. If the power supply fails, contact NI technical support.

PXIe-5606 RF IN Connector DC Block

The PXIe-5606 downconverter module has no internal DC block, so high-frequency components in the PXIe-5606 can be damaged when DC signals are applied directly to the RF IN connector. The PXIe-5606 ships with a 2.92 mm DC block attached to the RF IN connector to prevent damage to the device when a DC input signal is present.

To make measurements below 16 kHz, you must remove the DC block from the PXIe-5606 RF IN connector. If making measurements at frequencies greater than or equal to 16 kHz, NI recommends keeping the DC block attached to the RF IN connector. Refer to the table below for the maximum allowed voltage with the DC block attached or removed.

You can order the DC block separately as a spare or replacement part. The part number is 787672-01. Refer to the following sections for instructions on how to remove and reinstall the DC block.

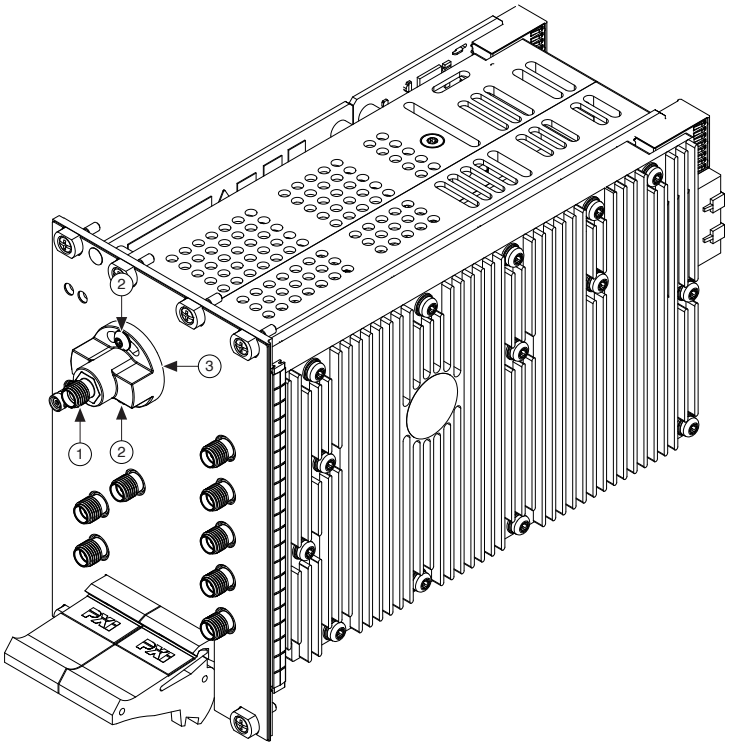
Table 5. DC Block Usage Guidelines

DC Block	Measurement Frequency	Maximum Allowed Voltage
Removed	≤16 kHz	0 V DC

DC Block	Measurement Frequency	Maximum Allowed Voltage
Attached	≥16 kHz	-2 V DC to +2 V DC

Removing the DC Block

Figure 6. Removing the DC Block from the PXIe-5606 RF IN Connector

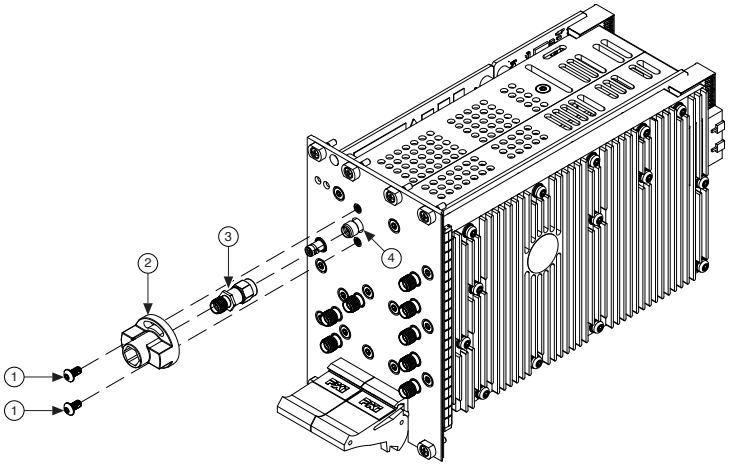


1. DC block
2. Screws
3. DC block support

1. Remove the two screws on the DC block support with a Torx screwdriver with a T8 bit.
2. Loosen the DC block support with a wrench and remove.
3. Loosen and remove the DC block from the RF IN connector with a torque wrench.

Reinstalling the DC Block

Figure 7. Installing the DC Block on the PXIe-5606 RF IN Connector



1. Screws
2. DC block support
3. DC block
4. PXIe-5606 RF IN Connector

1. Attach the DC block to the RF IN connector on the PXIe-5606 downconverter module with your hand.
2. Tighten the DC block with a torque wrench set to a maximum torque of 1 N · m (9 lb · in.).

> **Notice** Using more than the recommended amount of torque may damage the RF IN connector.

3. Place the DC block support around the DC block and align the mounting holes with the holes on the PXIe-5606 as shown in the figure above.
4. Insert two screws through the DC block support mounting holes into the holes on the PXIe-5606 as shown in the figure above.
5. Tighten the screws with a Torx screwdriver with a T8 bit to a torque of 1.65 N · m (5 lb · in.).

PXIe-5624 IF Digitizer Module

The PXIe-5624 IF digitizer module front panel contains four connectors and two LEDs.

Figure 8. PXIe-5624 IF Digitizer Module Front Panel

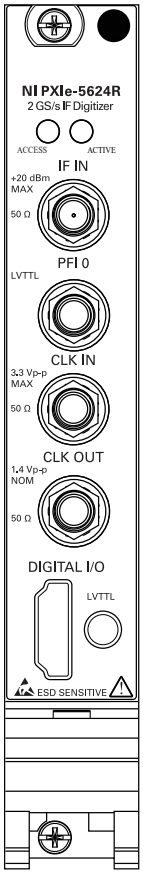


Table 6. Device Front Panel Icon Definitions

⚠	Refer to the user documentation for required maintenance measures to ensure user safety and/or preserve the specified EMC performance.
	The signal pins of this product's input/output ports can be damaged if subjected to ESD. To prevent damage, turn off power to the product before connecting cables and employ industry-standard ESD prevention measures during installation, maintenance, and operation.

Table 7. PXIe-5624 IF Digitizer Front Panel Connectors

Connector	Use
IF IN	Connects to the IF OUT connector on the PXIe-5606 front panel. This connector is the input terminal for a frequency-translated IF waveform from the RF downconverter, filtered

Connector	Use
	by the PXIe-5606, for digitization and measurement. IF IN is an SMA connector with a nominal input impedance of 50 Ω. When used in a PXIe-5668 the IF IN connector has a +6 dBm full-scale input level and a -6 dBm nominal input level. The IF IN connector damage level is +20 dBm.
CLK IN	Connects to the LO2 OUT connector on the PXIe-5606 module. The CLK IN connector is the input terminal for the Reference or Sample Clock (ADC Clock). CLK IN is an SMA connector with a nominal input impedance of 50 Ω.
CLK OUT	The CLK OUT connector is the output terminal for the PXIe-5624 PLL Reference or Sample Clock (ADC Clock). CLK OUT is an SMA connector with a nominal output impedance of 50 Ω. The output power delivered to a 50 Ω load is >10 dBm.
PFI 0	Receives a digital trigger from an external source. PFI 0 is an SMA connector and has LVTTL.
DIGITAL I/O	DIO terminal that contains general-purpose DIO signals. DIO lines are not accessible using NI-RFSA.

Caution The DIGITAL I/O connector accepts a standard, third-party HDMI™ cable, but the DIGITAL I/O port is not an HDMI interface. Do not connect the DIGITAL I/O port on the PXIe-5624 to the HDMI port of another device. NI is not liable for any damage resulting from such signal connections.

Table 8. PXIe-5624 IF Digitizer Front Panel LEDs

LED	Indication
ACCESS	Indicates the basic hardware status of the PXIe-5624 module. OFF—The module is not yet functional, or the

LED	Indication
	module has detected a problem with a PXI Express power rail. AMBER—The module is being accessed. ***Accessed*** means that the device setup registers are being written to in order to control the device. GREEN—The module is ready to be programmed by NI-RFSA. RED—The module has exceeded the approved operation temperature and thermal shutdown has occurred.
ACTIVE	Indicates the PXIe-5624 module state. OFF—The module is not armed, triggered, or acquiring a waveform. AMBER—The module is armed and waiting for a trigger. GREEN—The module has received a Reference Trigger. A green LED also indicates that the module is acquiring a waveform. RED—The module has detected an error. NI-RFSA must access the module to determine the cause of the error. The LED remains red until the error condition is removed.

PXIe-5653 Synthesizer/LO Source Module

The PXIe-5653 synthesizer/LO source module front panel contains six connectors and two LEDs.

Figure 9. PXIe-5653 Synthesizer/LO Source Module Front Panel

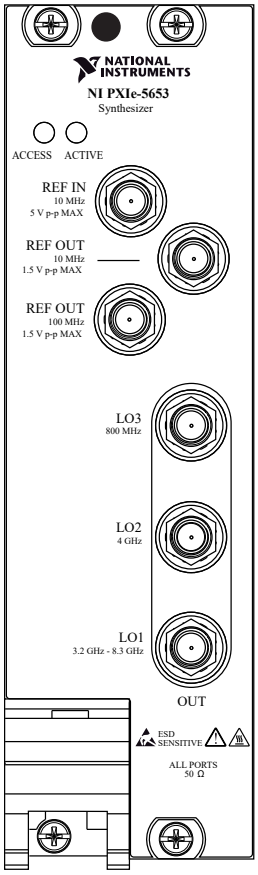


Table 9. Device Front Panel Icon Definitions

⚠	Refer to the user documentation for required maintenance measures to ensure user safety and/or preserve the specified EMC performance.
	The signal pins of this product's input/output ports can be damaged if subjected to ESD. To prevent damage, turn off power to the product before connecting cables and employ industry-standard ESD prevention measures during installation, maintenance, and operation.
	If this device has been in use, it may exceed safe handling temperatures and cause burns. Allow the device to cool before removing it from the chassis.

Table 10. PXIe-5653 Synthesizer/LO Source Front Panel Connectors

Connector	Use
REF IN	Routes a frequency reference signal to the RF synthesizer/LO source. This connector accepts a 10 MHz frequency signal with a maximum voltage of 2 V_{pk-pk}.
REF OUT (10 MHz)	Routes a frequency reference signal from the synthesizer/LO module onboard 10 MHz oven-controlled crystal oscillator (OCXO).
REF OUT (100 MHz)	Routes a frequency reference signal from the synthesizer onboard 100 MHz OCXO.
LO1 OUT	Connects to the LO1 IN connector on the PXIe-5606 module front panel. This connector is the output terminal for the LO1 (3.2 GHz to 8.3 GHz) source. LO1 OUT is an SMA connector with an impedance of 50 Ω (nominal).
LO2 OUT	Connects to the LO2 IN connector on the PXIe-5606 module front panel. This connector is the output terminal for the LO2 (4 GHz) source. LO2 OUT is an SMA connector with an impedance of 50 Ω (nominal).
LO3 OUT	Connects to the LO3 IN connector on the PXIe-5606 module front panel. This connector is the output terminal for the LO3 (800 MHz) source. LO3 OUT is an SMA connector with an impedance of 50 Ω (nominal).

Table 11. PXIe-5653 Synthesizer/LO Source Front Panel LEDs

LED	Indications
ACCESS	Indicates the basic hardware status of the module. OFF—The module is not yet functional, or the module has detected a problem with a power rail. AMBER—The module is being accessed. ***Accessed*** means that the device setup registers are being written to in order to control the device. GREEN—The module is ready to be programmed by NI-RFSA.
ACTIVE	Indicates the state of the module. OFF—The module is not generating a signal. AMBER—The module phased-locked loops (PLLs) are attempting to lock. GREEN—The module is generating a signal; applicable PLLs are locked. RED—The module has detected an error state. An error state may indicate the module detects a PLL lock failure, is exceeding approved operating temperature and is in a state of thermal shutdown, or the module detects a power supply failure. If the power supply fails, contact NI technical support.

Note The PXIe-5653 LO source has 10 MHz and 100 MHz reference outputs. For best performance, connect the 100 MHz REF OUT connector to the PXIe-5624 CLK IN connector.

Configuring the PXIe-5668 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-RFSA.

1. Launch MAX.
2. In the configuration tree, expand **Devices and Interfaces** to see the list of installed NI hardware. If you are using the PXIe-5668 with the LabVIEW Real-Time Module, expand **Remote Systems**. Find your target IP address or name, expand it, and then expand **Devices and Interfaces**.
   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-5668.
5. Associate the hardware modules that comprise your device.
   a. Select the PXIe-5606 that is identified as not configured in the configuration tree.
   b. In the Associated Devices section, select the appropriate module from each system component drop-down listbox.

      For the PXIe-5668, you must associate the PXIe-5624 IF digitizer module and the PXIe-5653 LO source module with the PXIe-5606 RF downconverter.

   c. Click **Save** in the MAX toolbar.

   Note Module associations may be lost when you move the modules to different chassis slots.

6. Self-test the device modules by selecting the modules in the configuration tree, and clicking **Self-Test** in the MAX toolbar. Repeat this step for all modules in your

PXIe-5668 system.
The MAX self-test performs a basic verification of hardware resources.

Related concepts:

- Troubleshooting

Related tasks:

- Interconnecting the PXIe-5668 Modules

Related information:

- Refer to the NI RF Vector Signal Analyzers Help for more information about renaming devices.

Self-Calibration

It is important to perform a self-calibration after first connecting your system because of cabling and mismatch effects and some degree of residual error, which result from module interconnections. You can determine and reduce these undesired effects through self-calibration, which adjusts the PXIe-5668 with respect to an onboard high-precision calibration tone. Additionally, you should periodically run a self-calibration to adjust for performance drifts that occur with product aging.

The PXIe-5668 modules are independently calibrated at the factory; however, you should perform a self-calibration in any of the following situations:

- After first installing and interconnecting your PXIe-5668 system
- When there is a physical change to any of the system components, such as replacement of modules
- When there is a change to the system cabling
- When the system is in an environment where external variables, such as temperature, can affect measurements

You should also perform a self-calibration if your device has exceeded any of the following temperature or time limits since the last device self-calibration:

- IF flatness: ±5 °C and/or 7 days
- Gain reference: ±5 °C and/or 7 days
- LO self-calibration: ±10 °C and/or 30 days
- Preselector alignment: ±5 °C and/or 7 days

Performing a Device Self-Calibration Using the NI-RFSA SFP

NI recommends you run the self-calibration from the NI-RFSA SFP. You can also run a self-calibration programmatically using the NI-RFSA API.

1. Launch the NI-RFSA SFP by navigating to **Start » All Programs » National Instruments » NI-RFSA » NI-RFSA Soft Front Panel**.
2. Click **Device/System » Calibration » Self Calibration**.
3. Select the self-calibration steps you want to perform from the Self-Calibration dialog box.
4. Click **Next** to run the self-calibration.

Software Locations

Table 12. Locations of NI-RFmx Software

ADE	Location
LabVIEW	Available on the LabVIEW Functions palette at **Measurement I/O » NI-RFmx**.
LabWindows/CVI	NI-RFmx functions are available from the LabWindows/CVI**Library** menu at **Library » RFmx SpecAn Library** and **Library » RFmx Demod Library**.
Microsoft Visual C/C++	Use the header files located in the `<NIDir>\Shared\ExternalCompilerSupport\C\include` directory and import library files

ADE	Location
	located in one of the following directories: • Windows 10 (32-bit)/8.1 (32-bit)/7 (32-bit)—`<NIDir>\Shared\ExternalCompilerSupport\C\include` • Windows 10 (64-bit)/8.1 (64-bit)/7 (64-bit): ◦ 32-bit installation—`<NIDir>\Shared\ExternalCompilerSupport\C\lib32\msvc` ◦ 64-bit installation—`<NIDir>\Shared\ExternalCompilerSupport\C\lib64\msvc` where <NIDir> is one of the following locations: • Windows 10 (32-bit)/8.1 (32-bit)/7 (32-bit)—`Program Files\National Instruments` • Windows 10 (64-bit)/8.1 (64-bit)/7 (64-bit)—`Program Files (x86)\National Instruments`
Microsoft .NET	For the location of .NET class libraries, refer to the installed NI-RFmx readme.

Table 13. Locations of NI-RFSA and NI-RFSA SFP Software

Software Option	ADE	Location
NI-RFSA	LabVIEW	Available on the LabVIEW Functions palette at **Measurement I/O » NI-RFSA**.

Software Option	ADE	Location
	LabWindows/CVI	Available in the `<IVIROOTDIR32>\Drivers\niRFSA` directory, where <IVIROOTDIR32> is one of the following locations: • Windows 10 (32-bit)/8.1 (32-bit)/7 (32-bit)—`Program Files\IVI Foundation\IVI` • Windows 10 (64-bit)/8.1 (64-bit)/7 (64-bit)—`Program Files (x86)\IVI Foundation\IVI`
	Microsoft Visual C/C++	Use the header files located in the `<IVIROOTDIR32>\Include` directory and import library files located in the `<IVIROOTDIR32>\Lib` directory, where <IVIROOTDIR32> is one of the following directories: • Windows 10 (32-bit)/8.1 (32-bit)/7 (32-bit)—`Program Files\IVI Foundation\IVI` • Windows 10 (64-bit)/8.1 (64-bit)/7 (64-bit)—`Program Files (x86)\IVI Foundation\IVI`

Software Option	ADE	Location
	Microsoft .NET	To use the .NET API, you must install the .NET class libraries. For download and installed file locations, visit ni.com/info and enter Info Code `NETAPIdriversupport`.
NI-RFSA SFP	LabVIEW	Available from the Start Menu at **Start » All Programs » National Instruments » NI-RFSA » NI-RFSA Soft Front Panel**.

Related information:

- Refer to the Getting Started with NI-RFSA section of the NI RF Vector Signal Analyzers Help for detailed instructions about how to acquire data in a specific ADE.
- Refer to the Creating an Application with Microsoft Visual C and C++ topic of the NI RF Vector Signal Analyzers Help if you prefer to manually add all required include and library files to the project.

Using the NI Example Finder

If you're using NI-RFmx or NI-RFSA with LabVIEW or LabWindows/CVI, use the NI Example Finder to locate programming examples.

1. Launch LabVIEW or LabWindows/CVI.
2. Select **Help » Find Examples** to open the NI Example Finder.
3. Navigate to **Hardware Input and Output » Modular Instruments**.
4. Open the example that best matches your application requirements.

Using Microsoft Visual C/C++

If you're using NI-RFmx or NI-RFSA with Microsoft Visual C/C++, locate examples in the following directories.

Table 14. Location of Microsoft Visual C/C++ Programming Examples

Software Option	Examples Location

NI-RFmx	`<NIDocDir>\RFmx\Demod\Examples`
	
	`<NIDocDir>\RFmx\SpecAn\Examples`
	
	where `<NIDocDir>` is the `Users\Public\Public Documents\National Instruments` directory.

NI-RFSA	`<NIDocDir>\NI-RFSA\examples` where `<NIDocDir>` is the `Users\Public\Public Documents\National Instruments` directory.

Note LabVIEW examples that demonstrate integration of the PXIe-5668 with NI RF vector signal generators and NI toolkit software, including the NI Modulation Toolkit, are also available online at ni.com/examples.

Troubleshooting

If an issue persists after you complete a troubleshooting procedure, search our KnowledgeBase for additional information our technical support engineers create as they answer common user questions and resolve unexpected issues.

Related tasks:

- Interconnecting the PXIe-5668 Modules

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 PXIe-5668 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-5668 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 device.
4. Reinstall the module in a different chassis slot.
5. Power on the chassis.
6. Verify that the device appears in MAX.
7. Reset the device in MAX and perform a self-test.

What Should I Do if the PXIe-5668 Does Not 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 by right-clicking the Start button, and selecting **Device Manager**.
5. Verify the PXIe-5668 appears in the Device Manager.
   a. Under an NI entry, confirm that a PXIe-5668 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 the NI-RFSA driver.

What Should I Do if the PXIe-5668 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.

What Should I Do if the Device Does Not Initialize?

Failure to initialize may indicate a problem with module interconnections or with MAX. If the niRFSA Initialize VI or the niRFSA_init function returns an error and the PXIe-5668 fails to initialize, complete the following steps:

1. Reconnect the PXIe-5668 hardware module front panel cables securely.
2. Power on your system and run the MAX configuration and self-test procedures.

Related tasks:

- Interconnecting the PXIe-5668 Modules
- Configuring the PXIe-5668 in MAX

What Should I Do if the PXIe-5624 IF Digitizer Module Does Not Phase-Lock to the PXIe-5653 LO Source Module?

If the IF digitizer module fails to phase-lock to the PXIe-56064 GHzLO2 OUT through the front panel, determine whether one of the following errors has occurred:

1. Verify that the cable is not faulty and that all cables are connected to the correct terminals.
2. Verify that there is a reference signal generated from the PXIe-5606 4 GHz LO2 OUT front panel connector.
   If there is a 4 GHz signal coming from the PXIe-5653LO2 OUT, the PXIe-5606LO2 OUT circuitry may be at fault. If there is a 4 GHz signal coming from the PXIe-5606LO2 OUT, the PXIe-5624 phase-lock circuitry may be at fault.
   If there is a signal coming from the PXIe-5653 and PXIe-5606 and failures continue, contact NI technical support or visit ni.com/support.

If failures continue and there is no signal from the NI 5653LO2 OUT connector, there may be a problem with the PXIe-5653 hardware. Contact NI technical support or visit

ni.com/support.

What Should I Do if the NI-RFSA Soft Front Panel Does Not Launch?

1. Verify the front panel interconnections for your RF vector signal analyzer.
2. Verify the MAX device association for your PXIe-5668.
3. If you have verified the interconnections and associations of your device and you are still unable to launch the NI-RFSA SFP, try uninstalling and then reinstalling NI-RFSA.

Related tasks:

- Interconnecting the PXIe-5668 Modules
- Configuring the PXIe-5668 in MAX

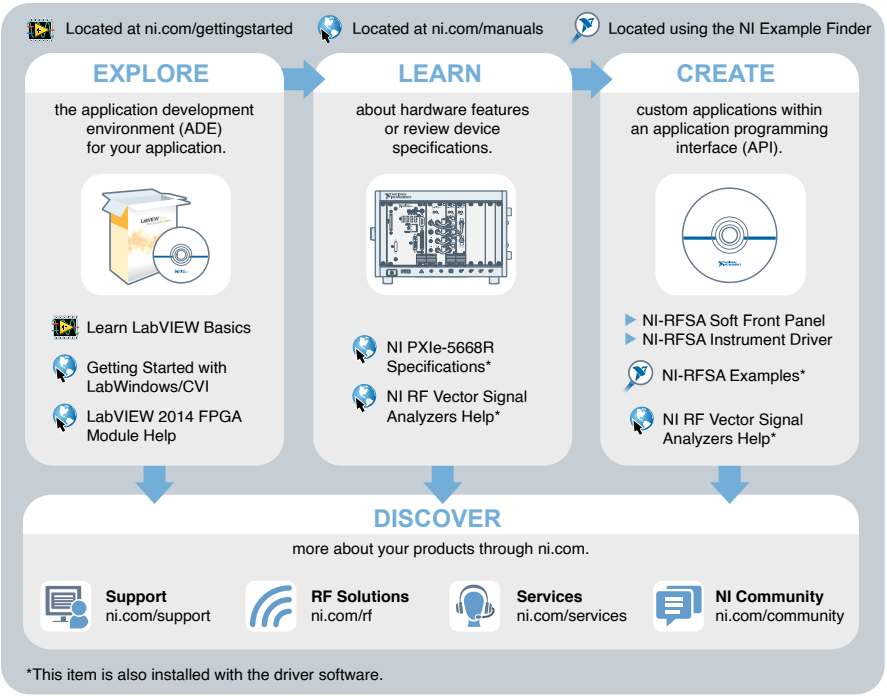
What Should I Do if the Device Amplitude Reading Does Not Match the Source?

1. Verify that the discrepancy between the PXIe-5668 and the source is within the error limits of the devices.
   a. Verify the absolute amplitude accuracy of the PXIe-5668 using the appropriate value.
   b. Verify the level accuracy of the input signal into the receiver.
2. Check for cable loss, which can be substantial. For example, an RG58 coaxial cable loses about 2.1 dB of signal amplitude per foot at 2 GHz. Unless you are using high-quality cables, expect losses when working with high-frequency signals.
3. Perform a self-calibration for the PXIe-5668.

If errors continue, contact NI technical support or visit ni.com/support.

Where to Go Next

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



Tip The ***NI RF Vector Signal Analyzers Help*** is an HTML version of a traditional user manual that includes detailed information about RF fundamentals, device features, and programming with NI-RFSA.

NI Services

Visit ni.com/support to find support resources including documentation, downloads, and troubleshooting and application development self-help such as tutorials and examples.

Visit ni.com/services to learn about NI service offerings such as calibration options, repair, and replacement.

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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