GETTING STARTED GUIDE

NI PXIe-5694

IF Conditioning Module

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

This document explains how to install, configure, and test the NI PXIe-5694 (NI 5694). The NI 5694 is an IF conditioning module. The NI 5694 ships with the NI-RFSA instrument driver, which you use to program the device.

To access NI 5694 documentation, navigate to **Start»All Programs»National Instruments» NI-RFSA»Documentation**.

⚠ **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 NI 5694 has been in use, it may exceed safe handling temperatures and cause burns. Allow the NI 5694 to cool before removing it from the chassis.

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, the length of all I/O cables must be no longer than 3 m (10 ft).

Verifying the System Requirements

To use the NI-RFSA 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 product readme, which is available on the driver software media or online at *ni.com/updates*.

Unpacking the Kit

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

1. Touch the antistatic package to a metal part of the computer chassis.
2. Remove the device from the package and inspect the device for loose components or any other sign of damage.
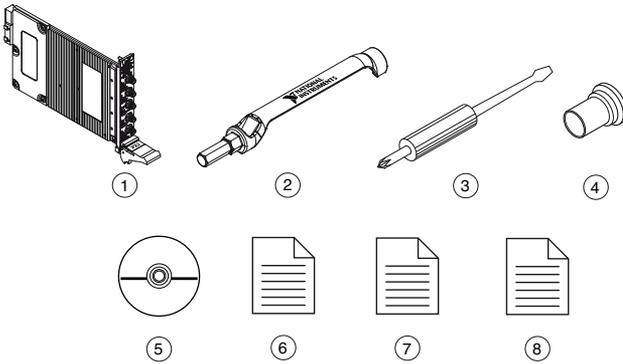
⚠ **Caution** Never touch the exposed pins of connectors.

Notify NI if the device appears damaged in any way. Do not install a damaged device.

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

1. NI 5694 IF Conditioning Module
2. SMA Driver Bit, Part Number 190487A-01
3. Screwdriver, Part Number 772006-01
4. Plastic Cap (x3), Part Number 775067-01
5. Driver Software DVD
6. NI 5694 IF Conditioning Module Getting Started Guide (This Document)
7. Read Me First: Safety and Electromagnetic Compatibility
8. Maintain Forced-Air Cooling Note to Users

Preparing the Environment

Ensure that the environment you are using the NI 5694 in meets the following specifications.

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

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

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

Pollution Degree..2

Indoor use only.

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

📝 **Note** Refer to the *NI PXIe-5694 Specifications* at *ni.com/manuals* for complete specifications.

Installing the Software

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

1. Install an ADE, such as LabVIEW or LabWindows™/CVI™.

2. Insert the driver software media into your computer. The installer should open automatically.

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

3. Follow the instructions in the installation prompts.

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

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

Installing the NI 5694

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

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

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

2. Power off the chassis.

3. Inspect the slot pins on the chassis backplane for any bends or damage prior to installation. Do not install a module if the backplane is damaged.

4. Remove the black plastic connectors from all the captive screws on the module front panel.

5. Identify a supported slot in the chassis. The following figure shows the symbols that indicate the slot types.

Figure 1. Chassis Compatibility Symbols
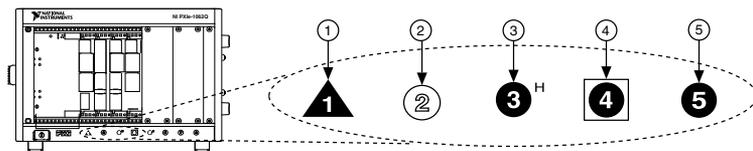
1. PXI Express System Controller Slot
2. PXI Peripheral Slot
3. PXI Express Hybrid Peripheral Slot
4. PXI Express System Timing Slot
5. PXI Express Peripheral Slot

The NI 5694 module can be placed in PXI Express peripheral slots or PXI Express Hybrid peripheral slots.

6. Touch any metal part of the chassis to discharge static electricity.

7. Ensure that the ejector handle is in the unlatched (downward) position.

8. Place the module edges into the module guides at the top and bottom of the chassis. Slide the device into the slot until it is fully inserted.

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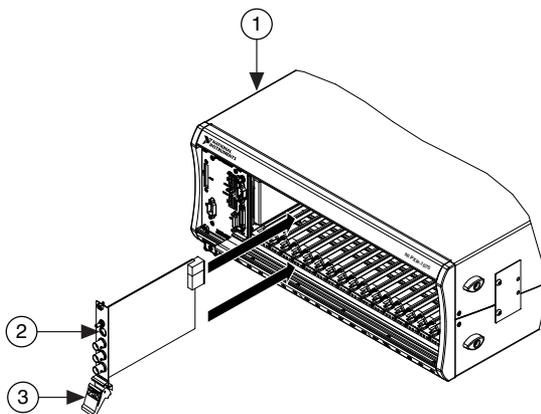
1. Chassis
2. Hardware Module
3. Ejector Handle in Down (Unlatched) Position

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

10. Secure the device front panel to the chassis using the front-panel mounting screws.

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

11. Cover all empty slots using filler panels or slot blockers to maximize cooling air flow.

12. Power on the chassis.

Related Information

Installing the Software on page 4

Direct Connections to the NI 5694

The NI 5694 is a precision RF instrument that is sensitive to ESD and transients. Ensure you take the following precautions when making direct connections to the NI 5694 to avoid damaging the device.

⚠ **Caution** Apply external signals only while the NI 5694 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 NI 5694 IF IN connector.
- If you are using noninsulated devices, such as a noninsulated 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 NI 5694 IF IN connector, ensure that there are no signal transients greater than the RF and DC specifications for the device that are being generated and sourced to the NI 5694 IF IN connector.

NI 5694 Front Panel

The NI 5694 IF conditioning module front panel contains five connectors and two LEDs.

Figure 3. NI 5694 IF Conditioning Module Front Panel

Table 1. 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 2. NI 5694 IF Conditioning Module Front Panel Connectors

Connector	Use
IF OUT	Provides the conditioned intermediate frequency (IF) signal to the input connector on a digitizer, for example, the IF IN connector on the NI PXIe-5622.
IF IN	Receives a signal from the IF OUT connector of an RF downconverter, for example, the IF OUT connector of the NI PXIe-5603 or NI PXIe-5605.
REF/LO IN	Connects to a 10 MHz clock signal or a 215 MHz LO signal. If your application uses the NI 5694 in downconversion mode in a phase-coherent system, connect the REF/LO IN connector on a slave NI 5694 to a 215 MHz LO signal.
REF OUT	Output terminal for a 10 MHz signal received at the REF/LO IN connector.
LO OUT	Output terminal for either a 215 MHz LO signal received at the REF/LO IN connector or an internally generated 215 MHz LO signal.

Table 3. NI 5694 IF Conditioning Module 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 module state.
	OFF—The module is in a quiescent state.
	AMBER—The module is waiting for a Reconfiguration 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.

Configuring the NI 5694 in MAX

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-RFSA.

1. Launch MAX.

2. In the configuration tree, double-click **Devices and Interfaces** to see the list of installed devices.

> **Note** If you are using the NI 5694 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 devices appear under the name of their associated chassis.

3. Expand your **Chassis** tree item.

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

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

4. Record the device identifier MAX assigns to the hardware. Use this identifier when programming the NI 5694.

5. To use the NI 5694 with the NI 5667 spectrum monitoring receiver, you must associate the NI 5694 with the RF downconverter in MAX.

> **Note** This step is not required if you are using the NI 5694 as a stand-alone device.

   a) Select the system device with the appropriate downconverter in the configuration tree.

   b) In the Associated Devices section, use the **IF Conditioning** drop-down listbox to select the NI 5694.

   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 by selecting the device in the configuration tree and clicking **Self-Test** in the MAX toolbar.

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

Related Information

Troubleshooting on page 9

If an issue persists after you complete a troubleshooting procedure, contact NI technical support or visit *ni.com/support*.

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

Troubleshooting

If an issue persists after you complete a troubleshooting procedure, contact NI technical support or visit *ni.com/support*.

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 NI 5694 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.

⚠️ **Caution** Apply external signals only while the NI 5694 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 NI 5694 Doesn't Appear in MAX?

1. In the MAX configuration tree, click **Devices and Interfaces**.
2. Expand the **Chassis** tree to see the list of installed devices, and press <F5> to refresh the list.
3. If the module is still not listed, power off the system, ensure that all hardware is correctly installed, and restart the system.
4. Navigate to the Device Manager.

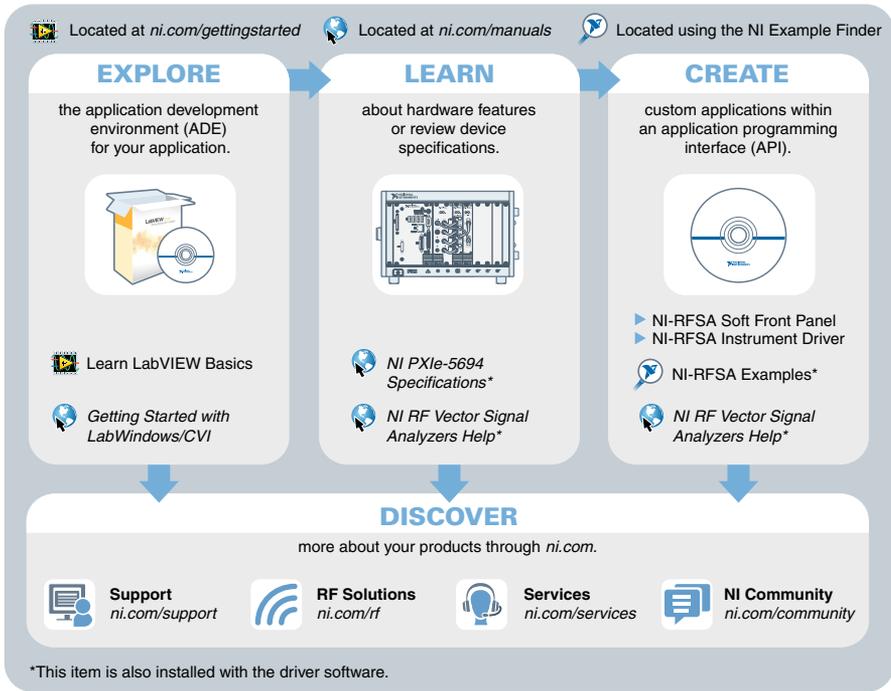| Operating System	Description
Windows 8	Right-click the Start screen, and select **All apps**»**Control Panel**»**Hardware and Sound**»**Device Manager**.
Windows 7	Select **Start**»**Control Panel**»**Device Manager**.
Windows Vista	Select **Start**»**Control Panel**»**System and Maintenance**»**Device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

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

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

1. Restart the system.
2. Launch MAX, and perform the self-test again.
3. Power off the chassis.
4. Reinstall the failed module in a different slot.
5. Power on the chassis.
6. Perform the self-test again.

Where to Go Next

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

Located at *ni.com/gettingstarted* Located at *ni.com/manuals* Located using the NI Example Finder

EXPLORE the application development environment (ADE) for your application.

LEARN about hardware features or review device specifications.

CREATE custom applications within an application programming interface (API).

▶ NI-RFSA Soft Front Panel
▶ NI-RFSA Instrument Driver

Learn LabVIEW Basics

Getting Started with LabWindows/CVI

NI PXIe-5694 Specifications*

NI RF Vector Signal Analyzers Help*

NI-RFSA Examples*

NI RF Vector Signal Analyzers Help*

DISCOVER more about your products through *ni.com*.

Support *ni.com/support*

RF Solutions *ni.com/rf*

Services *ni.com/services*

NI Community *ni.com/community*

*This item is also installed with the driver software.

> 💡 **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.

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*.

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