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USB-5684

GETTING STARTED GUIDE

NI USB-5684

10 MHz to 18 GHz RF Power Meter

This document explains how to install, configure, and set up the NI USB-5684 radio frequency (RF) power meter. NI RF power meters make true RMS power measurements. The NI RF power meters ship with the NI-568x instrument driver, which you can use to program the device.

For more information about the NI 5684, refer to the *NI RF Power Meters Help*, at **Start»All Programs»National Instruments»NI-568x»Documentation**.

The most recent versions of product documentation are available at ni.com/manuals. Visit ni.com/updates for the latest version of NI-568x driver software.



Caution You can impair the protection provided by the NI 5684 if you use it in a manner not described in this document.

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Electromagnetic Compatibility Guidelines

This product was tested and complies with the regulatory requirements and limits for electromagnetic compatibility (EMC) stated in the product specifications. These requirements and limits provide reasonable protection against harmful interference when the product is operated in the intended operational electromagnetic environment.

This product is intended for use in industrial locations. However, harmful interference may occur in some installations, when the product is connected to a peripheral device or test object, or if the product is used in residential or commercial areas. To minimize interference with radio and television reception and prevent unacceptable performance degradation, install and use this product in strict accordance with the instructions in the product documentation.

Furthermore, any changes or modifications to the product not expressly approved by National Instruments could void your authority to operate it under your local regulatory rules.



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 cables connected to the RF and Trigger ports must be no longer than 3 m (10 ft).



Caution To ensure the specified EMC performance, the length of the USB cable must be no longer than 30 m (100 ft).

Verifying the System Requirements

To use the NI 5684, your system must meet certain requirements. For more information about minimum system requirements, recommended system, and supported application development environments (ADEs), refer to the readme, which is available on the software media or online at ni.com/updates.

Unpacking the Kit



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

1. Touch the antistatic package to a metal part of the computer chassis.
2. Remove the device from the package and inspect the device for loose components or any other sign of damage.



Caution Never touch the exposed pins of connectors.

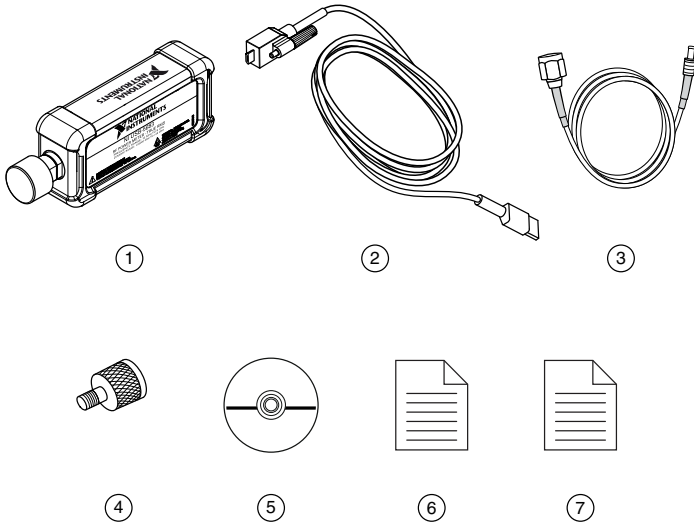


Note Do not install a device if it appears damaged in any way.

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

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

Verifying the Kit Contents



-
- | | |
|------------------------------------|--|
| 1. NI RF Power Meter with Dust Cap | 5. NI-568x Instrument Driver Software DVD |
| 2. USB 2.0 A to Mini-B Cable | 6. Certificate of Calibration |
| 3. BNC(m) to MCX(m) Cable | 7. NI 5684 Getting Started Guide (This Document) |
| 4. Precision Type-N-to-SMA Adapter | |
-

Other Required Items

In addition to the kit contents, you need the following items:

- 1 N · m torque wrench
- Desktop computer, laptop, or chassis with one available USB 2.0- or USB 1.1-compliant slot

Preparing the Environment

Ensure that the environment you are using the NI 5684 in meets the following specifications.

Operating environment

Ambient temperature range	0 °C to 50 °C (Tested in accordance with IEC 60068-2-1 and IEC 60068-2-2.)
Relative humidity range	45% to 95%, noncondensing (Tested in accordance with IEC 60068-2-56).

Storage ambient temperature range	-40 °C to +71 °C (Tested in accordance with MIL-PRF-28800F (Class 3).)
Maximum altitude	4,600 m operational
Pollution Degree	2

Indoor use only.



Note For detailed specifications, refer to the NI 5684 specifications document at ni.com/manuals.

Installing the Software

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

1. Install an ADE, such as LabVIEW or LabWindows™/CVI™.
2. Insert the driver software media into your computer. The installer should open automatically.

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

3. Follow the instructions in the installation prompts.



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

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

Installing the Hardware

Install the NI-568x software before installing the hardware.

1. Ensure that the NI-568x software is installed.



Note If you connect the NI 5684 to a PC or chassis before installing the software, the PC or chassis does not recognize the NI 5684.

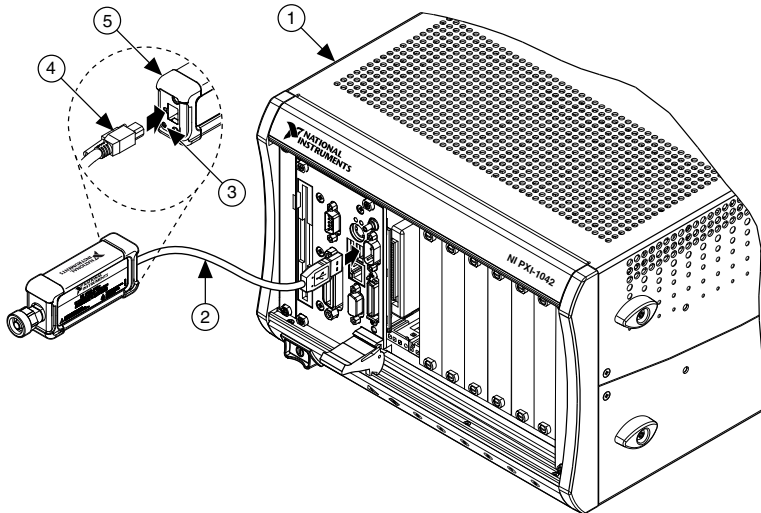
2. Connect the A-Type USB connector to the PC or chassis and secure the Mini-B USB connector to the power meter using the anchor screw.



Note The NI 5684 has a power requirement of approximately 450 mA. If you plan to use the device through a USB hub, NI recommends using an external power source.

Refer to the following figure for an example of a completed installation.

Figure 1. Installing the NI 5684



- | | |
|--------------------|---------------------------------|
| 1. PXI Chassis | 4. Mini-B USB connector |
| 2. USB Cable | 5. NI RF Power Meter Back Panel |
| 3. Mini-B USB Port | |

Connecting the Device Under Test

NI recommends that you zero the NI RF power meter after connecting to a USB port and before taking power measurements. If you make frequent low-power measurements, zero the power meter often.

1. Connect the NI RF power meter to a computer or chassis.
2. Zero the NI RF power meter.
3. Connect the Type-N front panel connector to the RF source connection.



Note You may need to use the included Type-N-to-SMA adapter, depending on the RF source connection.



Caution Always refer to the specifications document before connecting signals. Failure to observe the specified maximum signal ratings can cause shock, a fire hazard, or damage to the devices connected to the NI RF power meter. NI is not liable for any damage or injuries resulting from incorrect signal connections.



Caution Do not turn the sensor body when mating the connectors. Always use the specified torque wrench. Do not over-torque the connectors.

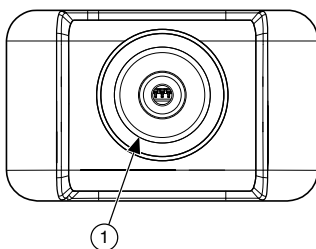
4. The back panel LED indicates the status of the NI RF power meter. To confirm that the device is properly connected, refer to the following table for LED information.

Table 1. LED Status Indication

LED Color	Status
Green	The NI RF power meter is connected to a computer or a chassis and is functioning properly.
Yellow	An error has occurred or the firmware is being updated.
Off	The NI RF power meter is not initialized.

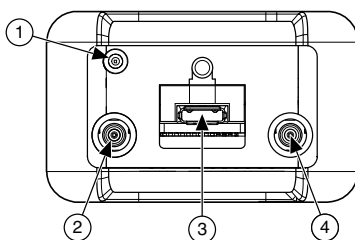
Front and Back Panel

Figure 2. NI 5684 Front Panel



1. Type-N Connector

Figure 3. NI 5684 Back Panel



1. Status LED
2. External Trigger In Terminal
3. USB 2.0 A to Mini-B Port
4. External Trigger Out Terminal



Note External Trigger Out capability is currently unsupported.

Connector Care and Handling

The NI 5684 is a high-quality precision laboratory device and should be carefully handled. Follow the precautions listed in this section when handling or connecting devices. Complying with these precautions guarantees longer component life and lower equipment downtime because of connector or device failure.

Avoid Touching Connectors with Bare Hands

Avoid touching connector mating planes with bare hands. Natural skin oils and microscopic dirt particles are difficult to remove.

Observe Pin Depth of Mating Connectors

Make sure to use the proper connectors to mate with the NI 5684.

NI recommends that you use precision or industrial grade Type-N connectors or that you use SMA connectors when using the Type N-to-SMA adapter. Always check the pin depth of a connector before use to determine if they are out of the specified range.

Avoid Lateral Pressure

Never put lateral pressure on the center pin of the connector.

Avoid Overtorquing Connectors

Do not overtorque connectors; doing so may damage the connector center pin. Always use a $1\text{ N} \cdot \text{m}$ torque wrench when tightening connectors. Never use pliers. Never tighten the connectors, adapters, or cables such that the center pin rotates.

Avoid Applying Excessive Power

The NI 5684 is rated for a specific maximum continuous input power. Exceeding the maximum input power level permanently damages the internal components. Before making connections, verify the maximum input levels labeled below the ports on the module front panel.

Avoid Mechanical Shock

Precision connectors are designed to withstand years of normal bench handling. Handle the connectors carefully and avoid dropping them. Mechanical shock significantly reduces their service life.

Clean Connectors Carefully

Dirt and other contamination on the connector interfaces can affect the performance of the RF components. To clean the connector interfaces, use only pure isopropyl alcohol as a cleaning solvent. Do not use excessive amounts of alcohol, as this prolongs drying time. Apply the alcohol with a foam-tipped swab instead of cotton swabs, because the cotton can become lodged in the connector.

Use low-pressure compressed air to remove foreign particles and to dry the connector. After cleaning, verify that the center pin has not been bent or damaged.

Store Connectors Properly

When not in use, keep the connectors covered with the dust cap included in the NI 5684.

Related Information

Refer to the [RF Connector Care white paper](#) for more information about proper connector care.

Configuring the NI 5684 in MAX

Use Measurement & Automation Explorer (MAX) to configure your NI hardware. MAX informs other programs about which devices reside in the system and how they are configured. MAX is automatically installed with NI-568x.

1. Launch MAX.
2. In the configuration tree, expand **Devices and Interfaces** to see the list of installed devices.



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.

3. Record the device identifier MAX assigns to the hardware. Use this identifier when programming the NI 5684.
4. 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.

NI RF Power Meter Programming Options

You can acquire data with the NI 5684 by using the NI-568x soft front panel (SFP), or you can control the NI RF power meter programmatically using the NI-568x instrument driver.

Table 2. NI 5684 Programming Options

Application Programming Interface (API)	Location	Description
NI-568x Soft Front Panel (SFP)	Available from the Start menu at Start»All Programs»National Instruments»NI-568x»NI-568x Soft Front Panel .	The SFP is a software representation of a traditional benchtop power meter. Launch the NI-568x SFP to use the NI RF power meter interactively.
NI-568x Instrument Driver	LabVIEW—Available on the LabVIEW Functions palette at Instrument I/O»Instrument Drivers»NI-568x .	NI-568x features a set of operations and attributes that exercise all the functionality of the NI 5684 including configuration, control, and other device-specific functions.
	C or LabWindows/CVI—Available at Program Files\IVI Foundation\IVI\Drivers\ni568x and Program Files (x86)\IVI Foundation\IVI\Drivers\ni568x. Header Files—Available at Program Files\IVI Foundation\IVI\Include and Program Files (x86)\IVI Foundation\IVI\Include.	



Tip You can modify an NI-568x C example to create an application with Microsoft Visual C/C++, and all required include and library files are automatically added to the project.

Related Information

Refer to the [Creating an Application with Microsoft Visual C and C++ topic of the NI RF Power Meters Help](#) if you prefer to manually add all required include files and library files to the project.

NI-568x Examples

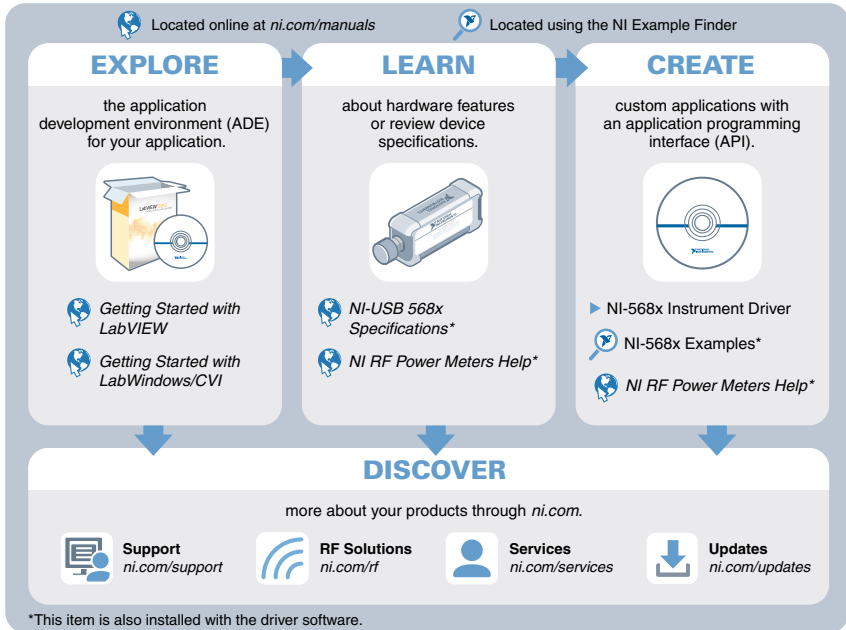
The instrument driver examples are instructional tools that demonstrate some of the functionality of the NI RF power meter. You can use these examples separately or integrate

them into your systems. NI-568x includes examples for getting started and other power meter functionality.

The examples are available from the Start menu at **Start»All Programs»National Instruments»NI-568x»Examples**.

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 Power Meters Help* is an HTML version of a traditional user manual that includes detailed information about RF fundamentals, device features, and programming the NI 5684.

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.

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