GETTING STARTED GUIDE

USRP-2930/2932

USRP Software Defined Radio Device

This document explains how to install, configure, and test the following USRP devices:

- USRP-2930 Software Defined Radio Device
- USRP-2932 Software Defined Radio Device

The USRP-2930/2932 can send and receive signals for use in various communications applications. This device ships with the NI-USRP instrument driver, which you can use to program the device.

Contents

NATIONAL INSTRUMENTS™

Verifying the System Requirements

To use the NI-USRP instrument driver, your system must meet certain requirements.

Refer to the product readme, which is available on the driver software media or online at *ni.com/manuals*, for more information about minimum system requirements, recommended system, and supported application development environments (ADEs).

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
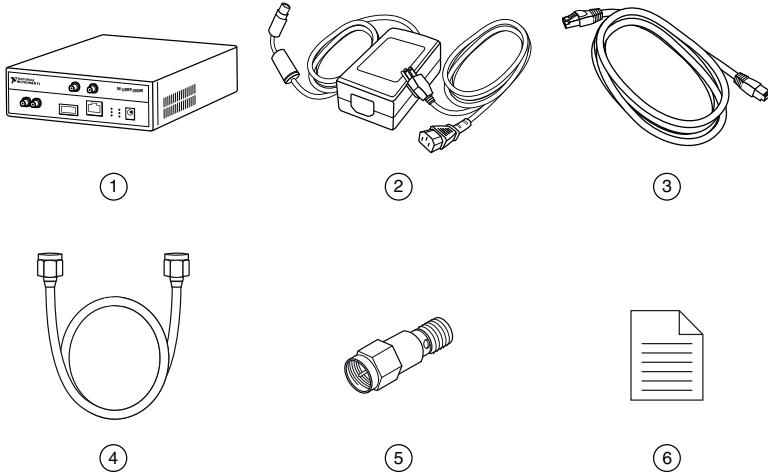
1. USRP Device
2. AC/DC Power Supply and Power Cable
3. Shielded Ethernet Cable
4. SMA (m)-to-SMA (m) Cable
5. 30 dB SMA Attenuator
6. Getting Started Guide (This Document) and Safety, Environmental, and Regulatory Information Document

> **Notice** If you directly connect or cable a signal generator to your device, or if you connect multiple USRP devices together, you must connect a 30 dB attenuator to the RF input (RX1 or RX2) of each receiving USRP device.

Other Required Item(s)

In addition to the kit contents, you must provide a computer with available gigabit Ethernet interface.

Optional Items

- LabVIEW Modulation Toolkit (MT), available for download at *ni.com/downloads* and included in LabVIEW Communications System Design Suite, which includes MT VIs and functions, examples, and documentation

  > **Note** You must install the LabVIEW Modulation Toolkit for proper operation of the NI-USRP Modulation Toolkit example VIs.

- LabVIEW Digital Filter Design Toolkit, available for download at *ni.com/downloads* and included in LabVIEW Communications System Design Suite
- LabVIEW MathScript RT Module, available for download at *ni.com/downloads*
- USRP MIMO sync and data cable, available at ni.com, to synchronize clock sources

- Additional SMA (m)-to-SMA (m) cables to connect both channels with external devices or to use the REF IN and PPS IN signals
- GPS antenna for devices with GPS disciplined oscillator (GPSDO) support

Environmental Guidelines

⚠ **Notice** This model is intended for use in indoor applications only.

Environmental Characteristics

Temperature and Humidity

Operating Temperature	0 °C to 45 °C
Operating Humidity	10% to 90% relative humidity, noncondensing
Pollution Degree	2
Maximum altitude	2,000 m (800 mbar) (at 25 °C ambient temperature)

Shock and Vibration

Operating shock	30 g peak, half-sine, 11 ms pulse
Random Vibration	
Operating	5 Hz to 500 Hz, 0.3 g_{rms}
Nonoperating	5 Hz to 500 Hz, 2.4 g_{rms}

Installing the Software

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

1. Install an application development environment (ADE), such as LabVIEW or LabVIEW Communications System Design Suite.
2. Follow the instructions below that correspond with the ADE that you installed.

Installing the Software Using NI Package Manager

Ensure that you have installed the latest version of NI Package Manager. To access the download page for NI Package Manager, go to *ni.com/info* and enter info code NIPMDownload.

📝 **Note** NI-USRP versions 18.1 to current are available to download using NI Package Manager. To download another version of NI-USRP, refer to *Installing the Software Using the Driver Download Page*.

1. To install the latest NI-USRP instrument driver, open NI Package Manager.
2. On the **BROWSE PRODUCTS** tab, click **Drivers** to display all available drivers.

3. Select **NI-USRP** and click **INSTALL**.

4. 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.

Related Information

Refer to the NI Package Manager Manual for instructions on installing drivers using NI Package Manager.

Installing the Software Using the Driver Download Page

> **Note** NI recommends using NI Package Manager to download NI-USRP driver software.

1. Visit *ni.com/info* and enter the Info Code usrpdriver to access the driver download page for all versions of NI-USRP software.

2. Download a version of NI-USRP driver software.

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 **Shut Down** in the dialog box that prompts you to restart, shut down, or restart later.

Installing the Device

Install all the software you plan to use before you install the hardware.

> **Note** The USRP device connects to a host computer using a standard gigabit Ethernet interface. Refer to the documentation for your gigabit Ethernet interface for installation and configuration instructions.

1. Power on the computer.

2. Attach the antenna or cable to the front panel terminals of the USRP device as desired.

3. Use the Ethernet cable to connect the USRP device to the computer. For maximum throughput over Ethernet, NI recommends that you connect each USRP device to its own dedicated gigabit Ethernet interface on the host computer.

4. Connect the AC/DC power supply to the USRP device.

5. Plug the power supply into a wall outlet. Windows automatically recognizes the USRP device.

Synchronizing Multiple Devices (Optional)

You can connect two USRP devices so that they share clocks and the Ethernet connection to the host.

1. Connect the MIMO cable to the MIMO EXPANSION port of each device.
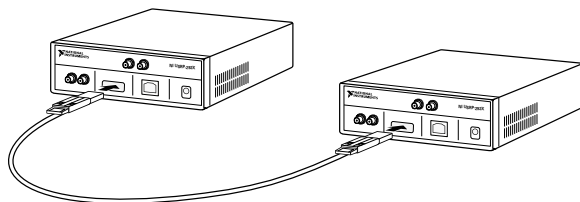
2. If you have not already done so, attach antennas to the USRP devices.

   If you want to use one USRP device as a receiver and the other as a transmitter, attach one antenna to the RX 1 TX 1 port of the transmitter, and attach another antenna to the RX 2 port of the receiver.

The NI-USRP driver ships with some examples that you can use to explore the MIMO connection, including USRP EX Rx Multiple Synchronized Inputs (MIMO Expansion) and USRP EX Tx Multiple Synchronized Outputs (MIMO Expansion).

Configuring the Device

Setting Up the Network (Ethernet Only)

The device communicates with a host computer over gigabit Ethernet. Set up the network to enable communication with the device.

📝 **Note** The IP addresses for the host computer and each connected USRP device must be unique.

Configuring the Host Ethernet Interface with a Static IP Address

The default IP address for the USRP device is 192.168.10.2.

1. Ensure the host computer uses a static IP address.

   You may need to modify the network settings for the local area connection using the Control Panel on the host computer. Specify the static IP address in the **Properties** page for Internet Protocol Version 4 (TCP/IPv4).

2. Configure the host Ethernet interface with a static IP address on the same subnet as the connected device to enable communication, as shown in the following table.

Table 1. Static IP Addresses

Component	Address
Host Ethernet interface static IP address	`192.168.10.1`
Host Ethernet interface subnet mask	`255.255.255.0`
Default USRP device IP address	`192.168.10.2`

Note NI-USRP uses user datagram protocol (UDP) broadcast packets to locate the device. On some systems, the firewall blocks UDP broadcast packets. NI recommends that you change or disable the firewall settings to allow communication with the device.

Changing the IP Address

To change the USRP device IP address, you must know the current address of the device, and you must configure the network.

1. Verify that your device is powered on and connected to your computer using the gigabit Ethernet interface.

2. Select **Start**»**All Programs**»**National Instruments**»**NI-USRP**»**NI-USRP Configuration Utility** to open the NI-USRP Configuration Utility, as shown in the following figure.
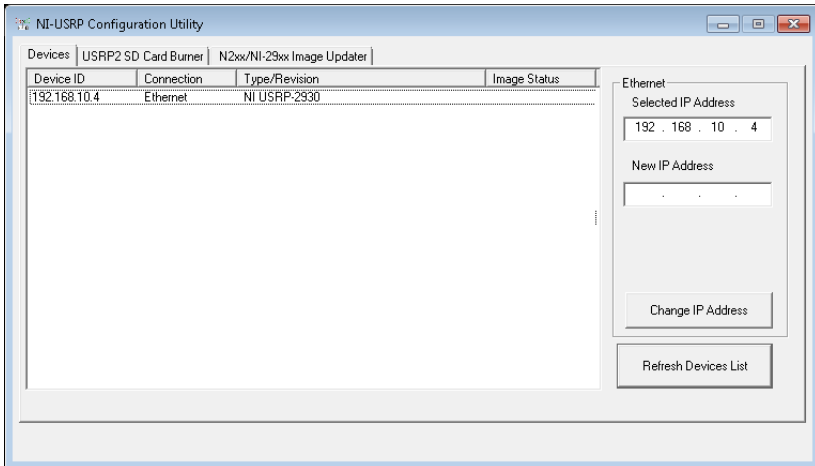
Your device should appear in the list on the left side of the tab.

3. Select the **Devices** tab of the utility.

4. In the list, select the device for which you want to change the IP address.

   If you have multiple devices, verify that you selected the correct device.

   The IP address of the selected device displays in the **Selected IP Address** textbox.

5. Enter the new IP address for the device in the **New IP Address** textbox.

6. Click the **Change IP Address** button or press <Enter> to change the IP address.

   The IP address of the selected device displays in the **Selected IP Address** textbox.

7. The utility prompts you to confirm your selection. Click **OK** if your selection is correct; otherwise, click **Cancel**.

8. The utility displays a confirmation to indicate the process is complete. Click **OK**.

9. Power cycle the device to apply the changes.

10. After you change the IP address, you must power cycle the device and click **Refresh Devices List** in the utility to update the list of devices.

Confirming Network Connection

1. Select **Start»All Programs»National Instruments»NI-USRP»NI-USRP Configuration Utility** to open the NI-USRP Configuration Utility.

2. Select the **Devices** tab of the utility.

   Your device should appear in the **Device ID** column.

   📝 **Note** If your device is not listed, verify that your device is powered on and correctly connected, then click the **Refresh Devices List** button to scan for USRP devices.

Configuring Multiple Devices with Ethernet

You can connect multiple devices in the following ways:

- Multiple Ethernet interfaces—One device for each interface
- Single Ethernet interface—One device connected to the interface, with additional devices connected using an optional MIMO cable
- Single Ethernet interface—Multiple devices connected to an unmanaged switch

   💡 **Tip** Sharing a single gigabit Ethernet interface among devices may reduce overall signal throughput. For maximum signal throughput, NI recommends that you connect no more than one device per Ethernet interface.

Multiple Ethernet Interfaces

To configure multiple devices connected to separate gigabit Ethernet interfaces, assign each Ethernet interface a separate subnet, and assign the corresponding device an address in that subnet, as shown in the following table.

Table 2. Multiple Host Ethernet Interface Configuration

Device	Host IP Address	Host Subnet Mask	Device IP Address
USRP Device 0	192.168.10.1	255.255.255.0	192.168.10.2
USRP Device 1	192.168.11.1	255.255.255.0	192.168.11.2

Single Ethernet Interface—One Device

You can configure multiple devices using a single host Ethernet interface when the devices are connected to each other using a MIMO cable.

1. Assign each device a separate IP address in the subnet of the host Ethernet interface, as shown in the following table.

Table 3. Single Host Ethernet Interface—MIMO Configuration

Device	Host IP Address	Host Subnet Mask	Device IP Address
USRP Device 0	192.168.10.1	255.255.255.0	192.168.10.2
USRP Device 1	192.168.10.1	255.255.255.0	192.168.10.3

2. Connect Device 0 to the Ethernet interface and connect Device 1 to Device 0 using a MIMO cable.

Single Ethernet Interface—Multiple Devices Connected to an Unmanaged Switch

You can connect multiple USRP devices to a host computer through an unmanaged gigabit Ethernet switch that allows a single gigabit Ethernet adapter on the computer to interface with multiple USRP devices connected to the switch.

Assign the host Ethernet interface a subnet, and assign each device an address in that subnet, as shown in the following table.

Table 4. Single Host Ethernet Interface—Unmanaged Switch Configuration

Device	Host IP Address	Host Subnet Mask	Device IP Address
USRP Device 0	192.168.10.1	255.255.255.0	192.168.10.2
USRP Device 1	192.168.10.1	255.255.255.0	192.168.10.3

Programming the Device

You can use the NI-USRP instrument driver to create communications applications for the USRP device.

NI-USRP Instrument Driver

The NI-USRP instrument driver features a set of functions and properties that exercise the capabilities of the USRP device, including configuration, control, and other device-specific functions.

Related Information

Refer to the NI-USRP Manual for information about using the instrument driver in your applications.

NI-USRP Examples and Lessons

NI-USRP includes several examples and lessons for LabVIEW, LabVIEW NXG, and LabVIEW Communications System Design Suite. They can be used individually or as components of other applications.

NI-USRP examples and lessons are available in the following locations.

Content Type	Description	LabVIEW	LabVIEW NXG 2.1 to Current or LabVIEW Communications System Design Suite 2.1 to Current
Examples	NI-USRP includes several example applications that serve as interactive tools, programming models, and building blocks in your own applications. NI-USRP includes examples for getting started and other software-defined radio (SDR) functionality. **Note** You can access additional examples from the Code Sharing Community at `ni.com/usrp`.	• From the Start menu at **Start**»**All Programs**»**National Instruments**»**NI-USRP**»**Examples**. • From the LabVIEW **Functions** palette at **Instrument I/O**»**Instrument Drivers**»**NI-USRP**»**Examples**.	• From the **Learning** tab, select **Examples**»**Hardware Input and Output**»**NI-USRP**. • From the **Learning** tab, select **Examples**»**Hardware Input and Output**»**NI USRP RIO**.
Lessons	NI-USRP includes lessons that guide you through the process of identifying and demodulating an FM signal with your device.	-	From the **Learning** tab, select **Lessons**»**Getting Started**»**Demodulating FM Signals with the NI...** and choose a task to accomplish.

Note The NI Example Finder does not include NI-USRP examples.

Verifying the Device Connection (Optional)

Verifying the Device Connection Using LabVIEW NXG or LabVIEW Communications System Design Suite 2.1 to Current

Use USRP Rx Continuous Async to confirm that the device receives signals and is connected correctly to the host computer.

1. Navigate to **Learning**»**Examples** »**Hardware Input and Output**»**NI-USRP**»**NI-USRP**.

2. Select **Rx Continuous Async**. Click **Create**.

3. Run USRP Rx Continuous Async.

    If the device is receiving signals you will see data on the front panel graphs.

4. Click **STOP** to conclude the test.

Verifying the Device Connection Using LabVIEW

Perform a loopback test to confirm that the device transmits and receives signals and is connected correctly to the host computer.

1. Attach the included 30 dB attenuator to one end of the SMA (m)-to-SMA (m) cable.

2. Connect the 30 dB attenuator to the RX 2 TX 2 connector on the front panel of the USRP device and connect the other end of the SMA (m)-to-SMA (m) cable to the RX 1 TX 1 port.

3. On the host computer, navigate to **<NIDIR>**»**National Instruments**»**LabVIEW <Year>**»**examples**»**instr**»**niUSRP**.

4. Open the niUSRP EX Tx Continuous Async example VI and run it.

    If the device is transmitting signals, the I/Q graph displays I and Q waveforms.

5. Open the niUSRP EX Rx Continuous Async example VI and run it.

    If the device is transmitting signals, the I/Q graph displays I and Q waveforms.

Troubleshooting

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

Device Troubleshooting

Why Doesn't the Device Power On?

Check the power supply by substituting a different adapter.

Why Does USRP2 Appear Instead of the USRP Device in the NI-USRP Configuration Utility?

- An incorrect IP address on the computer may cause this error. Check the IP address and run the NI-USRP Configuration Utility again.
- An old FPGA or firmware image on the device may also cause this error. Upgrade the FPGA and firmware using the NI-USRP Configuration Utility.

Should I Update Device Firmware and FPGA Images?

USRP devices ship with firmware and FPGA images compatible with NI-USRP driver software. You may need to update the device for compatibility with the latest version of the software.

When you use the NI-USRP API, a default FPGA loads from persistent storage on the device.

The driver software media also includes the NI-USRP Configuration Utility, which you can use to update the devices.

Updating Device Firmware and FPGA Images (Optional)

The firmware and FPGA images for USRP devices are stored in the device internal memory. You can reload the FPGA image or firmware image using the NI-USRP Configuration Utility and an Ethernet connection, but you cannot create custom FPGA images using the Ethernet connection.

1. If you have not already done so, connect the host computer to the device using the Ethernet port.
2. Select **Start»All Programs»National Instruments»NI-USRP»NI-USRP Configuration Utility** to open the NI-USRP Configuration Utility.
3. Select the **N2xx/NI-29xx Image Updater** tab. The utility automatically populates the **Firmware Image** and **FPGA Image** fields with the paths to the default firmware and FPGA image files. If you want to use different files, click the **Browse** button next to the file you want to change, and navigate to the file you want to use.
4. Verify that the firmware and FPGA image paths are entered correctly.
5. Click the **Refresh Device List** button to scan for USRP devices and update the device list.

    If your device does not appear in the list, verify that the device is on and is correctly connected to the computer.

If your device still does not appear in the list, you can manually add the device to the list. Click the **Manually Add Device** button, enter the IP address of the device in the dialog box that displays, and click **OK**.

6. Select the device to update from the device list and verify that you selected the correct device.

7. Verify that the version of the FPGA image file matches the board revision for the device you are updating.

8. To update the device, click the **WRITE IMAGES** button.

9. A confirmation dialog box displays. Confirm your selections and click **OK** to continue.

   A progress bar indicates the status of the update.

10. When the update completes, a dialog box prompts you to reset the device. A device reset applies the new images to the device. Click **OK** to reset the device.

   > **Note** The utility is unresponsive while it verifies that the device reset correctly.

11. Close the utility.

Related Information

Refer to the Load the Images onto the On-board Flash (USRP-N Series Only) section of the UHD - USRP2 and N Series Application Notes

Why Doesn't the USRP Device Appear in MAX?

MAX does not support the USRP device. Use the NI-USRP Configuration Utility instead. Open the NI-USRP Configuration Utility from the Start menu at **Start**»**All Programs**» **National Instruments**»**NI-USRP**»**NI-USRP Configuration Utility**.

Why Doesn't the USRP Device Appear in the NI-USRP Configuration Utility?

1. Check the connection between the USRP device and the computer.

2. Ensure that the USRP device is connected to a computer with a gigabit-compatible Ethernet adapter.

3. Ensure that a static IP address of 192.168.10.1 is assigned to the adapter in your computer.

4. Allow up to 15 seconds for the device to completely start up.

Why Don't NI-USRP Examples Appear in the NI Example Finder in LabVIEW?

NI-USRP does not install examples into the NI Example Finder.

Network Troubleshooting

Why Doesn't the Device Respond to a Ping (ICMP Echo Request)?

The device should reply to an internet control message protocol (ICMP) echo request. To ping the device, open a Windows command prompt and enter `ping` *192.168.10.2*, where *192.168.10.2* is the IP address for your USRP device. If you do not receive a response, verify that the host network interface card is set to a static IP address corresponding to the same subnet as the IP address of the corresponding device. Also verify that the device IP address is set properly.

Related Information

Why Doesn't the NI-USRP Configuration Utility Return a Listing for My Device?

If the NI-USRP Configuration Utility does not return a listing for your device, search for a specific IP address.

1. Navigate to `<Program Files>\National Instruments\NI-USRP\`.
2. <Shift>-right-click the `utilities` folder, and select **Open command window here** from the shortcut menu to open a Windows command prompt.
3. Enter `uhd_find_devices --args=addr=`*192.168.10.2* in the command prompt, where *192.168.10.2* is the IP address for your USRP device.
4. Press <Enter>.

   If the `uhd_find_devices` command does not return the listing for your device, the firewall may be blocking replies to UDP broadcast packets. Windows installs and enables a firewall by default. To allow UDP communication with a device, disable any firewall software associated with the network interface for the device.

Why Doesn't the Device IP Address Reset to the Default?

If you cannot reset the default device IP address, your device may be on a different subnet than the host network adapter. You can power cycle the device in a safe (read-only) image, which sets the device to the default IP address of `192.168.10.2`.

1. Open the device enclosure, making sure to take appropriate static precautions.
2. Locate the safe-mode button, a push-button switch (S2), inside the enclosure.
3. Press and hold the safe-mode button while you power cycle the device.
4. Continue to press the safe-mode button until the front panel LEDs blink and remain solid.
5. While in safe-mode, run the NI-USRP Configuration Utility to change the IP address from the default, `192.168.10.2`, to a new value.

6. Power cycle the device without holding the safe-mode button to return the normal mode.

> **Note** NI recommends that you use a dedicated network with no other USRP devices connected to the host computer to avoid the possibility of an IP address conflict. Also, verify that the static IP address of the host network adapter on the computer that runs the NI-USRP Configuration Utility is different from the device default IP address of `192.168.10.2` and different from the new IP address to which you want to set the device.

> **Note** If the device IP address is on a different subnet from the host network adapter, the host system and configuration utility cannot communicate with and configure the device. For example, the utility recognizes, but cannot configure a device with an IP address of `192.168.11.2` connected to a host network adapter with a static IP address of `192.168.10.1` and a subnet mask of `255.255.255.0`. To communicate with and configure the device, change the host network adapter to a static IP address on the same subnet as the device, such as `192.168.11.1`, or change the subnet mask of the host network adapter to recognize a wider range of IP addresses, such as `255.255.0.0`.

Related Information

Changing the IP Address on page 7

Why Does the Device Not Connect to the Host Interface?

The host Ethernet interface must be a gigabit Ethernet interface to connect to the USRP device.

Ensure the connection between the host network interface card and the device cable connection is valid and both the device and computer are powered on.

A lit green LED in the upper left corner of the gigabit Ethernet connection port on the device front panel indicates a gigabit Ethernet connection.

Front Panels, Back Panels, and Connectors

Direct Connections to the Device

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

> **Notice** Apply external signals only while the USRP device 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 USRP device TX 1 RX 1 or RX 2 connector.
- If you are using nonisolated devices, such as a nonisolated 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 USRP device TX 1 RX 1 or RX 2 connector, ensure that the device cannot generate signal

transients greater than the RF and DC specifications of the USRP device TX 1 RX 1 or RX 2 connector.

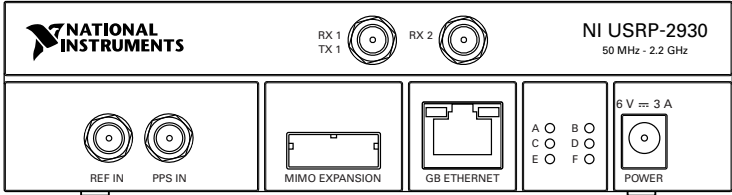# USRP-2930 Front Panel, Back Panel, and LEDs

Front Panel

Table 5. Connector Descriptions

Connector	Use
RX1 TX1	Input and output terminal for the RF signal. RX1 TX1 is an SMA (f) connector with an impedance of 50 Ω and is a single-ended input or output channel.
RX2	Input terminal for the RF signal. RX2 is an SMA (f) connector with an impedance of 50 Ω and is a single-ended input channel.
REF IN	This terminal is not used for this device.
PPS IN	Input terminal for the PPS timing reference. PPS IN is an SMA (f) connector with an impedance of 50 Ω and is a single-ended input channel. PPS IN accepts 0 V to 3.3 V TTL and 0 V to 5 V TTL signals.
MIMO EXPANSION	The MIMO EXPANSION interface port connects two USRP devices using a compatible MIMO cable.
GB ETHERNET	The gigabit Ethernet port accepts an RJ-45 connector and gigabit Ethernet compatible cable (Category 5, Category 5e, or Category 6).
POWER	The power input accepts a 6 V, 3 A external DC power connector.

Table 6. LED Indicators

LED	Description	Color	Indication
A	Indicates the transmit status of the device.	Off	The device is not transmitting data.
		Green	The device is transmitting data.

Table 6. LED Indicators (Continued)

LED	Description	Color	Indication
B	Indicates the status of the physical MIMO cable link.	Off	The devices are not connected using the MIMO cable.
		Green	The devices are connected using the MIMO cable.
C	Indicates the receive status of the device.	Off	The device is not receiving data.
		Green	The device is receiving data.
D	Indicates the firmware status of the device.	Off	The firmware is not loaded.
		Green	The firmware is loaded.
E	Indicates the reference lock status of the LO on the device.	Off	There is no reference signal, or the LO is not locked to a reference signal.
		Blinking	The LO is not locked to a reference signal.
		Green	The LO is locked to a reference signal.
F	Indicates the powers status of the device.	Off	The device is powered off.
		Green	The device is powered on.

Back Panel

GPS ANT is the input terminal for the GPS antenna signal. GPS ANT is an SMA (f) connector with an impedance of 50 Ω.

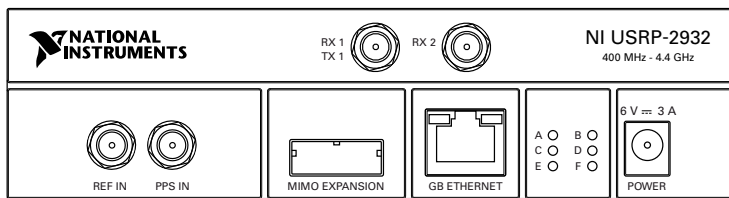# USRP-2932 Front Panel, Back Panel, and LEDs

Front Panel

Table 7. Connector Descriptions

Connector	Use
RX1 TX1	Input and output terminal for the RF signal. RX1 TX1 is an SMA (f) connector with an impedance of 50 Ω and is a single-ended input or output channel.
RX2	Input terminal for the RF signal. RX2 is an SMA (f) connector with an impedance of 50 Ω and is a single-ended input channel.
REF IN	This terminal is not used for this device.
PPS IN	Input terminal for the PPS timing reference. PPS IN is an SMA (f) connector with an impedance of 50 Ω and is a single-ended input channel. PPS IN accepts 0 V to 3.3 V TTL and 0 V to 5 V TTL signals.
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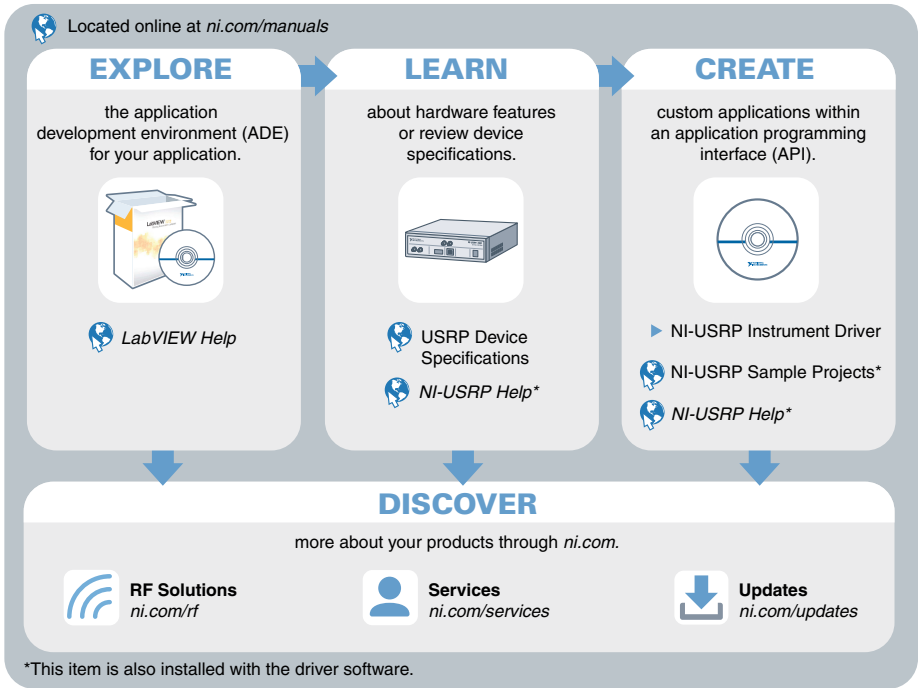| LED	Description	Color	Indication
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Back Panel

GPS ANT is the input terminal for the GPS antenna signal. GPS ANT is an SMA (f) connector with an impedance of 50 Ω.

Where to Go Next

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

Located online at *ni.com/manuals*

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

LabVIEW Help

LEARN
about hardware features or review device specifications.

USRP Device Specifications

NI-USRP Help*

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

▶ NI-USRP Instrument Driver

NI-USRP Sample Projects*

NI-USRP Help*

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

RF Solutions
ni.com/rf

Services
ni.com/services

Updates
ni.com/updates

*This item is also installed with the driver software.

Worldwide Support and Services

The NI website is your complete resource for technical support. At *ni.com/support*, you have access to everything from troubleshooting and application development self-help resources to email and phone assistance from NI Application Engineers.

Visit *ni.com/services* for information about the services NI offers.

Visit *ni.com/register* to register your NI product. Product registration facilitates technical support and ensures that you receive important information updates from NI.

NI corporate headquarters is located at 11500 North Mopac Expressway, Austin, Texas, 78759-3504. NI also has offices located around the world. For support in the United States, create your service request at *ni.com/support* or dial 1 866 ASK MYNI (275 6964). For 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.