USRP-2944 Specifications

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Contents

USRP-2944 Specifications 3

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Definitions

Warranted specifications describe the performance of a model under stated operating conditions and are covered by the model warranty.

Characteristics describe values that are relevant to the use of the model under stated operating conditions but are not covered by the model warranty.

- *Typical* specifications describe the performance met by a majority of models.
- *Nominal* specifications describe an attribute that is based on design, conformance testing, or supplemental testing.

Specifications are *Characteristics* unless otherwise noted.

Conditions

Specifications are valid at 25 °C unless otherwise noted.

USRP-2944 Pinout

Use the pinout to connect to terminals on the USRP-2944.

Figure 1. Front Panel

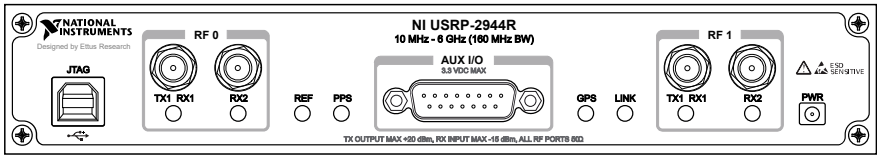

Table 1. Front Panel Connector Descriptions

Connector	Use
JTAG	A USB port that connects the host computer to the device FPGA for recovery purposes. This port can be used with the Xilinx

Connector		Use
		iMPACT configuration tool to temporarily load a new bitfile.
RF 0	TX1 RX1	Input and output terminal for the RF signal. TX1 RX1 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.
AUX I/O		General-purpose I/O (GPIO) port. AUX I/O is controlled by the FPGA.
RF 1	TX1 RX1	Input and output terminal for the RF signal. TX1 RX1 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.

Table 2. LED Indicators

LED		Description	Color	State	Indication
RF 0	TX1 RX1	Indicates the transmit status of the device.	OFF	—	The device is not active.
			Red	Solid	The device is

LED		Description	Color	State	Indication
					transmitting data.
			Green	Solid	The device is receiving data.
	RX2	Indicates the receive status of the device.	OFF	—	The device is not receiving data.
			Green	Solid	The device is receiving data.
REF		Indicates the status of the reference signal.	OFF	—	There is no reference signal, or the device is not locked to the reference signal.
			Green	Blinking	The device is not locked to the reference signal.
				Solid	The device is locked to the reference signal.
PPS		Indicates the pulse per second (PPS).	OFF	—	There is no PPS timing reference signal, or the device is not locked to the reference signal.
			Green	Blinking	The device is locked to the PPS timing reference signal.

LED		Description	Color	State	Indication
GPS		Indicates whether the GPSDO is locked.	OFF	—	There is no GPSDO or the GPSDO is not locked.
			Green	Solid	The GPSDO is locked.
LINK		Indicates the status of the link to a host computer.	OFF	—	There is no link to a host computer.
			Green, yellow, or red	Solid	The host is actively communicating with the device.
RF 1	TX1 RX1	Indicates the transmit status of the device.	OFF	—	The device is not active.
			Red	Solid	The device is transmitting data.
			Green	Solid	The device is receiving data.
	RX2	Indicates the receive status of the device.	OFF	—	The device is not receiving data.
			Green	Solid	The device is receiving data.

Figure 2. Back Panel

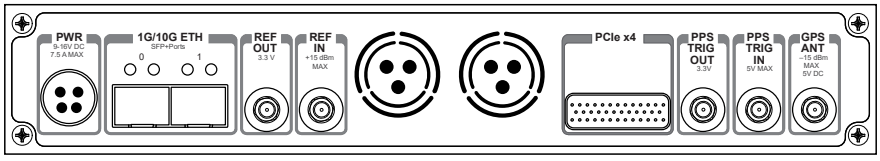

Table 3. Back Panel Connector Descriptions

Connector	Use
PWR	Input that accepts a 9 V to 16 V, 6 A external DC power connector.

Connector	Use
1G/10G ETH	Two SFP+ input terminals used for 1G ETH or 10G ETH connectivity with the host driver. Not currently supported in LabVIEW FPGA.
REF OUT	Output terminal for an external reference signal for the LO on the device. REF OUT is a female SMA connector with an impedance of 50 Ω, and it is a single-ended reference output. The output signal at this connector is 10 MHz at 3.3 V.
REF IN	Input terminal for an external reference signal for the LO on the device. REF IN is a female SMA connector with an impedance of 50 Ω, and it is a single-ended reference input. REF IN accepts a 10 MHz signal with a minimum input power of 0 dBm (0.632 Vpk-pk) and a maximum input power of 15 dBm (3.56 Vpk-pk) for a square wave or sine wave.
PCIe x4	Port for a PCI Express Generation 1, x4 bus connection through an MXI Express four-lane cable.
PPS TRIG OUT	Output terminal for the pulse per second (PPS) timing reference. PPS TRIG OUT is a female SMA connector with an impedance of 50 Ω, and it is a single-ended input. The output signal is 0 V to 3.3 V TTL. You can also use this port as triggered output (TRIG OUT) that you program with the PPS Trig Out I/O signal.
PPS TRIG IN	Input terminal for pulse per second (PPS) timing reference. PPS TRIG IN is a female SMA connector with an impedance of 50 Ω, and it is a single-ended input channel. PPS TRIG IN accepts 0 V to 3.3 V TTL and 0 V to 5 V TTL signals. You can also use this port as a triggered input (TRIG IN) that you control using NI-USRP software.
GPS ANT	Input terminal for the GPS antenna signal. GPS ANT is a female SMA connector with a maximum input power of -15 dBm and an output of DC 5 V to power an active antenna.

Connector	Use
	Notice Do not terminate the GPS ANT port if you do not use it.

Transmitter

Number of channels	2
Frequency range	10 MHz to 6 GHz
Frequency step	<1 kHz
Maximum output power (P_{out})	
10 MHz to 4 GHz	50 mW to 100 mW (17 dBm to 20 dBm)
4 GHz to 6 GHz	5 mW to 50 mW (7 dBm to 17 dBm)
Gain range[1]	0 dB to 31.5 dB
Gain step	0.5 dB
Frequency accuracy[2]	2.5 ppm

1. The output power resulting from the gain setting varies over the frequency band and among devices.
2. *Frequency accuracy* is based on temperature-compensated crystal oscillator (TCXO) vendor specifications and is not measured. Alternatively, you can incorporate an external reference source to provide a more precise frequency Reference Clock and to achieve better frequency accuracy.

Maximum instantaneous real-time bandwidth[3]	160 MHz
Maximum I/Q sample rate	200 MS/s
Digital-to-analog converter (DAC) resolution	16 bit

Receiver

Number of channels	2
Frequency range	10 MHz to 6 GHz
Frequency step	<1 kHz
Gain range[4]	0 dB to 37.5 dB
Gain step	0.5 dB
Maximum input power (P_{in})	-15 dBm
Noise figure	5 dB to 7 dB

3. The NI 2944 transmitter path has 160 MHz of bandwidth throughout the full frequency range of the device.
4. The received signal amplitude resulting from the gain setting varies over the frequency band and among devices.

Frequency accuracy[5]	2.5 ppm
Maximum instantaneous real-time bandwidth[6]	160 MHz
Maximum I/Q sample rate	200 MS/s
Analog-to-digital converter (ADC) resolution	14 bit

Power Requirements

Input voltage	9 V to 16 V, DC
Input current	7.5 A, maximum
Typical power consumption	38 W to 44 W, varies by application

Caution You must use an LPS or Class 2 power supply with the device. The power supply must also meet any safety and compliance requirements for the country of use.

Attention Vous devez utiliser avec l'appareil une alimentation LPS ou de classe 2. L'alimentation doit également satisfaire aux exigences de sécurité et de conformité en vigueur dans le pays d'utilisation.

5. *Frequency accuracy* is based on temperature-compensated crystal oscillator (TCXO) vendor specifications and is not measured. Alternatively, you can incorporate an external reference source to provide a more precise frequency Reference Clock and to achieve better frequency accuracy.
6. The NI 2944 receiver path has 84 MHz of bandwidth for center frequencies from 10 MHz to 500 MHz.

Onboard DRAM

Memory size	1,024 MB

Physical Characteristics

Physical dimensions	
(L × W × H)	26.67 cm × 4.06 cm × 21.84 cm (10.5 in. × 1.6 in. × 8.6 in.)
Weight	1.588 kg (3.50 lb)

Environment

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

Indoor use only.

Operating Environment

Operating temperature	23 °C ± 5 °C
Relative humidity range	10% to 90%, noncondensing (tested in accordance with IEC 60068-2-56)

Compliance and Certifications

Safety Compliance Standards

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

- IEC 61010-1, EN 61010-1
- UL 61010-1, CSA C22.2 No. 61010-1

Note For safety certifications, refer to the product label or the Product Certifications and Declarations section.

Electromagnetic Compatibility

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

- EN 61326-1 (IEC 61326-1): Class A emissions; Basic immunity
- EN 55011 (CISPR 11): Group 1, Class A emissions
- EN 55022 (CISPR 22): Class A emissions
- EN 55024 (CISPR 24): Immunity
- AS/NZS CISPR 11: Group 1, Class A emissions
- AS/NZS CISPR 22: Class A emissions
- FCC 47 CFR Part 15B: Class A emissions
- ICES-001: Class A emissions

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

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

Note For EMC declarations, certifications, and additional information, refer to the Product Certifications and Declarations section.

CE Compliance CE

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

- 2014/35/EU; Low-Voltage Directive (safety)
- 2014/30/EU; Electromagnetic Compatibility Directive (EMC)

Product Certifications and Declarations

Refer to the product Declaration of Conformity (DoC) for additional regulatory compliance information. To obtain product certifications and the DoC for NI products, visit ni.com/product-certifications, search by model number, and click the appropriate link.

Environmental Management

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

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

EU and UK Customers

- **Waste Electrical and Electronic Equipment (WEEE)**—At the end of the product life cycle, all NI products must be disposed of according to local laws and regulations. For more information about how to recycle NI products in your region, visit ni.com/environment/weee.

电子信息产品污染控制管理办法（中国RoHS）

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

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