2.7 GHz RF Downconverter

NI PXI-5600

- 9 kHz to 2.7 GHz
- 20 MHz real-time bandwidth
- High-stability timebase (10 MHz OCXO)
  - ±20 ppb frequency stability
  - ±50 ppb frequency accuracy
- >80 dB spurious-free dynamic range
- <-135 dBm/Hz average noise density
- +30 dBm full-scale input range

Operating Systems
- Windows 2000/NT/XP

Recommended Software
- LabVIEW
- LabWindows/CVI

Driver Software (included)
- NI-TUNER

Calibration Certificate Included

See page 21.

Overview

The National Instruments PXI-5600 is a modular, broadband downconverter, capable of vector RF measurements in a compact 3U PXI module. The NI PXI-5600 features a wide real-time bandwidth, a highly stable time base, and excellent integration with PXI digitizers for RF analysis applications.

Hardware

Analog Input

The PXI-5600 can acquire a wide range of signals, from +30 dBm to less than -130 dBm, with 50 dB of input attenuation, scalable in 10 dB steps.

Frequency Characteristics

The PXI-5600 provides outstanding frequency characteristics over its operating range of 9 kHz to 2.7 GHz. It provides an typical noise density of <-140 dBm/Hz and over 80 dB of intermodulation spurious-free dynamic range. Typical phase noise is <-94 dBc/Hz at a 10 kHz offset.

Ultrahigh-Stability Timebase

The PXI-5600 offers an extremely high-stability timebase with frequency stability of ±20 ppb and frequency accuracy of ±50 ppb, making it useful for a range of automation applications, where outstanding frequency accuracy is required.

Accuracy

The noise and distortion characteristics of the PXI-5600 are stable and repeatable over a wide range of time and temperatures. For example, at a 1 MHz measurement bandwidth, a -30 dBm input signal typically has a single, unaveraged, measurement repeatability of less than 0.2 dB. The PXI-5600 employs a software compensation method that reduces amplitude error to less than 0.2 dB over a 20 °C change.

Applications
General Purpose Test
Spectral analysis
Ultrasound/radar/lidar
RF component characterization
Military/aerospace
SigInt
Commercial Electronics Test
Cable modem
Wireless LAN and bluetooth
Commercial radio and television
Satellite

Table 1. Applications for the PXI-5600

Clock Generation and Triggering

The 10 MHz reference clock on the PXI-5600 can synchronize to any one of three sources – the onboard high-precision OCXO reference clock, an external reference clock, or the PXI backplane. Using the PXI backplane, you can synchronize PXI-5600s and other PXI modules without using any cables. You can synchronize the PXI-5600 to an external source using front-panel connectors.

The NI PXI-5600 can import and export triggers from the PXI trigger bus, the PXI star trigger line, or the front panel SMA connector. The PXI trigger bus greatly simplifies synchronizing RF measurements with other PXI modules such as DMMs, audio analyzers, and machine vision modules.

Calibration

National Instruments calibrates the amplitude accuracy of the analog input. Temperature variations are calibrated and corrected during normal operation, resulting in very high stability and repeatability. The module is shipped with NIST-traceable and ISO-9002-certified calibration certificates.

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Software

National Instruments NI-TUNER software is included with the PXI-5600. NI-TUNER provides a driver-level interface that integrates with LabVIEW and LabWindows/CVI.

Ordering Information

NI PXI-5600 778283-01
Includes module, and NI-TUNER software.

BUY ONLINE!
Visit ni.com/products and enter pxi5600.

Specifications

Valid over specified Operating Environment (0 to 50 °C) unless otherwise stated.

Channels

RF input 1
IF output 1

Frequency

Frequency range ..... 9 kHz to 2.7 GHz
Real-time bandwidth ..... 20 MHz
Internal reference frequency ..... 10 MHz
Temperature stability ..... ±20 ppb maximum[1]
Initial achievable accuracy ..... ±50 ppb maximum
Aging ..... ±100 ppb per year
Locking range ..... >± 0.5 ppm
Lock time to ext. frequency reference ..... <10 s
Warm-up time (typical) ..... 15 minutes
Selectivity (60 dB : 3 dB) ..... < 2.5 (flat top)
< 4.1 (7 Term BH)

Tuning Resolution

RF downconverter (PXI-5600) ..... 1 MHz minimum
Tuning speed
(1% of step size) ..... 10 ms maximum
(0.01% of step size) ..... 20 ms maximum
(1 ppm of step size) ..... 30 ms maximum
Spectral purity (noise sidebands) at 100 MHz
1 kHz offset ..... <-80 dBc/Hz[2]
10 kHz offset ..... <-90 dBc/Hz
30 kHz offset ..... <-95 dBc/Hz
100 kHz offset... ... ... <-110 dBc/Hz
1 MHz offset ..... <-120 dBc/Hz
Sideband spurs
> 10 kHz offset ..... <-70 dBc
< 10 kHz offset ..... <-55 dBc
Residual FM ..... <10 Hz_{p-p} in 10 ms

Amplitude

Input signal range ..... <-130 to 30 dBm
Max safe input power (continuous) ..... +30 dBm (Atten 10dB)
+20 dBm (Atten: 0 dB)
RF input attenuator ..... 0 to 50 dB (10 dB steps)
Maximum DC input voltage ..... 0 VDC[3]
Relative accuracy (to 100 MHz, 15 to 35 °C)
<2 GHz, calibrated ..... ±0.75 dB, ±0.5 dB typical
>2 GHz, calibrated ..... ±1.25 dB, ±0.9 dB typical
Absolute accuracy (15 to 35 °C)
<2 GHz, calibrated ..... ±1 dB, ±0.6 dB typical
>2 GHz, calibrated ..... ±1.5 dB, ±1 dB typical
Group delay variation ..... ±15 ns max above 100 kHz
Mixer stage levels
(1 dB gain compression)
10 MHz to 1 GHz ..... >0 dBm
1 to 2.7 GHz ..... >2 dBm

[1]0 to 50 °C, referenced to 25 °C
[2]For spans 20 kHz, for spans > 20 kHz the value is <-78 dBc/Hz
[3]DC levels up to ± 25 V DC at input will not damage the instrument; however, high transient currents from low impedance DC step voltages at input can cause damage.

Spurious Responses

2nd-order harmonic distortion (single - 30 dBm tone)
100 kHz to 2.7 GHz ..... <-80 dBc (IIP2> +50 dBm)
3rd-order intermodulation distortion (Two -30 dBm tones, >200 kHz separation)
10 MHz to 1 GHz ..... <-80 dBc (IIP3> +10 dBm)
1 to 2.7 GHz ..... <-85 dBc (IIP3 > +12 dBm)
Input-related spurs
Signal Level = -30 dBm, 0 dB attenuation
>5 MHz ..... <-70 dBc
<5 MHz ..... <-60 dBc
Residual response-related spurs
Input terminated, 0 dB input attenuation
>5 MHz ..... <-100 dBm
<5 MHz ..... <-80 dBm
Noise density
9 kHz to 1 GHz ..... <-135 dBm/Hz (-140 dBm/Hz typical)
1 to 2 GHz ..... <-134 dBm/Hz
2 to 2.5 GHz ..... <-130 dBm/Hz (-133 dBm/Hz typical)
2.5 to 2.7 GHz ..... <-128 dBm/Hz (-130 dBm/Hz typical)

Inputs/Outputs

RF input ..... 50 , AC-coupled SMA female
VSWR (input atten = 10 dB)
9 kHz to 1 GHz ..... <1.3:1
1 to 2.7 GHz ..... <1.5:1
LO emission from RF input ..... <-87 dBm maximum
IF output ..... 50 SMA female
Frequency ..... 5 MHz to 25 MHz
Amplitude ..... 0 dBm full-scale
External frequency reference input ..... 50 , SMA female
Input amplitude ..... -5 dBm to +15 dBm
Maximum safe input level ..... +20 dBm
Maximum DC input voltage ..... ±10 V
Input frequency range ..... 10 MHz (±0.5 ppm)
10 MHz output (2 ports) ..... 50 , SMA female
Signal ..... Square wave
Amplitude ..... ±0.5 V (+7 dBm) into 50 (±1 V into open circuit)
Accuracy ..... See frequency reference
PXI 10 MHz input/output (50 , SMA female)
Input amplitude ..... -5 to +15 dBm
Output amplitude ..... 0.5V (+7 dBm) into 50

Power Requirements

Typical

+3.3 VDC (± 5 %)	+5 VDC (± 5 %)	+12 VDC (± 5 %)	-12 VDC (± 5 %)
920 mA	2.3 A	700 mA	115 mA

Physical

Dimensions ..... 10 by 16 cm (3.9 by 6.3 in.) 3 slots

Environment

Warm-up time ..... 20 minutes
Operating temperature ..... 0 to 50 °C
Storage temperature ..... -20 to +70 °C
Relative humidity ..... 10 to 90%, noncondensing

Calibration

Interval ..... 1 year

Certifications and Compliances

CE Mark Compliance CE