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64 MS/s, 14-Bit Frequency-Domain Digitizer

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NI PXI-5620

- 1 analog input channel, 14-bit resolution
- 80 dB spurious-free dynamic range
- 1 kS/s to 64 MS/s sampling rate
- 10 kHz to 36 MHz (-3 dB bandwidth)
- AC coupled, 50 Ω input
- 16 or 32 million sample acquisition

Operating Systems

- Windows 2000/NT/XP

Recommended Software

- LabVIEW
- LabWindows/CVI
- Measurement Studio

Application Software (included)

- Spectral Measurements Toolkit

Driver Software (included)

- NI-SCOPE

Calibration Certificate Included

See page 21.



| Product | Bus | Analog Channels | Resolution | Sampling Rate | Spurious-Free Dynamic Range | Onboard Memory | Bandwidth |
|----------|-----|-----------------|------------|-------------------|-----------------------------|----------------|------------------|
| PXI-5620 | PXI | 1 | 14 Bits | 1 kS/s to 64 MS/s | 80 dB | 32 or 64 MB | 10 kHz to 36 MHz |

Table 1. PXI-5620 Channel, Speed, and Resolution Specifications

Overview

The National Instruments PXI-5620 is a single-channel PXI digitizer for a broad range of applications in research, product design and validation, and manufacturing test. Its dynamic range and resolution make it ideal for all types of frequency-domain analysis. It is well suited for applications ranging from ultrasound and high-resolution ATE to broadband communications test, such as cable, DSL, and wireless test.

Because the NI PXI-5620 is based on the PXI platform, it can be integrated with other PXI hardware from National Instruments and other PXI vendors. For example, it can be used with the NI PXI-5421 arbitrary waveform generator to create a stimulus/response test system for popular applications such as xDSL or baseband I/Q.

Hardware

Analog Input

The PXI-5620 provides outstanding dynamic range and resolution for measurements over a broad range of input levels. Its frequency range spans 10 kHz to 36 MHz, covering the intermediate frequency (IF) and high frequency (HF) bands for applications such as military and commercial radio, surveillance, and video. For superior distortion-free performance, you can use the dither capability of the PXI-5620 to achieve greater than 80 dB of spurious-free dynamic range in the 5 to 25 MHz band.

Acquisition Memory

The PXI-5620 is available with 32 or 64 MB of high-speed onboard memory, you can acquire up to 32 million real 16-bit samples, or 16 million complex 16-bit samples. The PXI-5620 uses the bus master capability of the NI MITE ASIC to move data to computer memory at much higher speeds – up to 10 times faster – than traditional instrument interfaces. This ASIC performs memory management functions usually handled by the system processor, so the host CPU resources can be devoted entirely to data processing and analysis, further improving measurement throughput.

Clock Generation

The sample clock of the PXI-5620 can synchronize to two sources – an external 10 MHz clock source or the PXI backplane – or it can run independently. Using the PXI backplane, the clocks of two or more PXI-5620 digitizers or other PXI modules can be synchronized without cables. This feature is useful for integrated test applications such as DSL parametric analysis, where signal generation and other test capabilities are required. Furthermore, the PXI-5620 has a front-panel connector that can synchronize to an external source.

Digital Downconversion and Decimation

With the digital downconversion (DDC) functionality of the PXI-5620, you can acquire narrowband signals at much less than the full digitization rate. By downconverting channels up to 1.25 MHz to baseband, the PXI-5620 dramatically reduces the

Modular Instrumentation

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Applications

General Purpose

- Spectral Analysis for R & D
- High-resolution ATE
- Ultrasound/radar/lidar
- Mass spectroscopy
- High-energy physics
- Military/aerospace
- Surveillance
- SigInt

Communications Signal Analysis

- Cable modem test
- xDSL test
- Wireless test

AM and HF Radio Signals

- Commercial military
- Marine
- Shortwave
- IF and baseband analysis

sampling rate necessary to acquire these signals, resulting in dramatic throughput improvements. For example, if you want to acquire a signal with a 200 kHz bandwidth centered at 25 MHz, the rate at which samples can be stored can be as low as 250 kS/s.

Triggering

The PXI-5620 can import and export triggers from the PXI trigger bus, the PXI star trigger line, or the front panel SMB connector. The PXI-5620 can also take

advantage of the PXI trigger bus to synchronize multiple devices for applications such as I/Q measurement in digital communications test.

Calibration

NI calibrates the amplitude accuracy of the PXI-5620 analog input channel. Temperature variations are calibrated and corrected during normal operation resulting in very high stability and repeatability. The PXI-5620 is shipped with NIST-traceable and ISO-9002-certified calibration certificate.

Measurements

- Zoom FFT
- Zoom power spectrum
- Averaged power spectrum
- Averaged cross spectrum
- Averaged frequency response
- Amplitude calibration
- Power spectral density
- Peak frequency
- Peak amplitude/power
- Spectrum peak search
- Power in band
- Adjacent channel power
- Occupied bandwidth
- Demodulate AM
- Demodulate FM
- Demodulate PM
- Downconvert passband

Software

The National Instruments Spectral Measurements Toolkit and NI-SCOPE software are included with the PXI-5620. The Spectral Measurements Toolkit plugs directly into LabVIEW and LabWindows/CVI to offer high-level measurement functionality. For a complete list of functions, refer to Table 3. NI-SCOPE provides a driver-level interface and integrates with NI LabVIEW, LabWindows/CVI, and Measurement Studio.

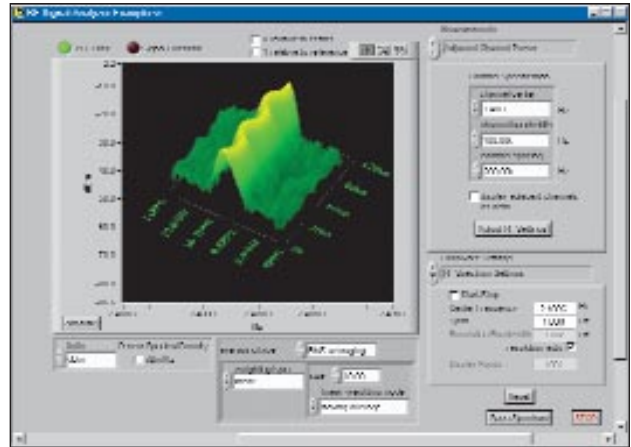


Figure 1. Spectral Measurements Toolset 3D Spectrum Screen

Ordering Information

NI PXI-5620
 32 MB778282-01
 64 MB778282-02

Includes PXI-5620 module, NI-SCOPE driver software, and Spectral Measurements Toolkit.

BUY ONLINE!

Visit ni.com/products and enter `pxi5620`.

Modular Instrumentation

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Specifications

Valid over specified operating environment (0 to 50 °C) unless otherwise stated.

General

| | |
|--------------------------|-------------------|
| Input channels | 1 |
| Resolution | 14 bits |
| Sampling rate range | 1 kS/s to 64 MS/s |
| Onboard memory | 16 or 32 MS |
| Using DDC (complex data) | 8 or 16 MS |

Input

| | |
|---|----------------------------|
| Signal level | |
| Nominal | 0 dBm ($\pm 0.316 V_p$) |
| Full scale | +10 dBm ($\pm 1 V_p$) |
| Maximum with dither enabled | +8 dBm |
| Maximum nonoperating input level | +20 dBm ($\pm 3.16 V_p$) |
| Maximum DC input voltage | $\pm 2 V$ |
| Impedance | 50 Ω nominal |
| VSWR | |
| 0.1 to 25 MHz | <1.5:1 |
| 25 to 32 MHz | <3:1 |
| Coupling | AC |
| Analog bandwidth (-3dB) | 10 kHz to 36 MHz |
| Frequency response (4-25 MHz) | |
| Relative (to response at 15 MHz) | $\leq \pm 0.25$ dB |
| Absolute | $\leq \pm 0.6$ dB |
| Absolute (using calibration table) | $\leq \pm 0.5$ dB |
| Dither frequency range | 150 Hz to 4 MHz |
| Average noise density (4 to 32 MHz) | <-133 dBm/Hz |
| Signal-to-noise ratio (9 dBm signal, full bandwidth) | |
| Excluding dither below 4 MHz | >67 dB |
| Harmonic distortion (single-tone, 0 dBm signal, includes aliased harmonic distortion) | |
| 4 to 25 MHz, dither enabled | <-80 dBm |
| 0.1 to 32 MHz, dither disabled | <-75 dBm |
| Intermodulation distortion (2-tone, -3 dBm signals) | |
| 4 to 25 MHz, dither enabled | <-85 dBm |
| 0.1 to 32 MHz, dither disabled | <-80 dBm |
| Residual responses (input terminated) | <-85 dBm (<-95 dBfs) |

Frequency

| | |
|-----------------------|----------------------------------|
| Internal sample clock | |
| Frequency | 64/n MHz, $1 \leq n \leq 2^{16}$ |
| Accuracy | $\leq \pm 25$ ppm |
| Phase noise | |
| Offset | Density |
| 100 Hz | <-100 dBc/Hz |
| 1 kHz | <-120 dBc/Hz |
| 10 kHz | <-130 dBc/Hz |
| 100 kHz | <-130 dBc/Hz |
| Residual FM | <2 Hz _{rms} in 10 ms |

Digital Downconversion

| | |
|-------------------|-------------|
| Decimation rate | 32 to 4,096 |
| Tuning resolution | 0.014901 Hz |

Triggering

| | |
|---------------------|------------------------------|
| Modes | Immediate, software, digital |
| Sources | PXI<7..0>, PXI STAR |
| Export | PFI 1, PXI<7..0> |
| Slope | Rising, falling |
| Pretrigger depth | Up to 16 ms |
| Posttrigger depth | Up to 16 ms |
| Minimum pulse width | 100 ns |

External Trigger (PFI 1)

| | |
|-----------------------|----------|
| Connector | SMB male |
| Level | TTL |
| Maximum input voltage | 5.5 V |

External Frequency Reference Input

| | |
|----------------------------------|---------------------|
| Connector | SMA female |
| Impedance | 50 Ω nominal |
| Input amplitude | -5 dBm to +15 dBm |
| Maximum nonoperating input level | +16 dBm |
| Maximum DC input voltage | ± 3.5 VDC |

| | |
|-----------------|---------------------|
| Frequency range | 10 MHz ± 40 ppm |
|-----------------|---------------------|

Power Requirements

| | |
|------------------------|---------|
| +3.3 VDC ($\pm 5\%$) | <600 mA |
| +5 VDC ($\pm 5\%$) | <1.5 A |
| +12 VDC ($\pm 5\%$) | <450 mA |
| -12 VDC ($\pm 5\%$) | <35 mA |

Physical

| | |
|------------|------------------------------|
| Dimensions | 10 by 16 cm (3.9 by 6.3 in.) |
| | 1 slot |

Environment

| | |
|-----------------------|--------------------------|
| Operating temperature | 0 to 50 °C |
| Storage temperature | -20 to 70 °C |
| Relative humidity | 10 to 90%, noncondensing |

Calibration

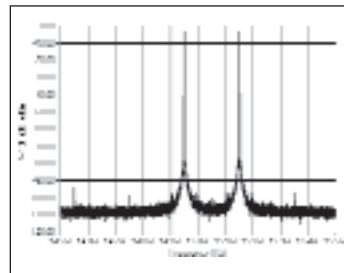
| | |
|--------------|------------|
| Interval | 1 year |
| Warm-up time | 10 minutes |

Certifications and Compliances

CE Mark Compliance **CE**

Typical Performance Charts

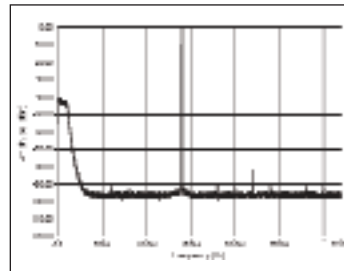
At operating environment of 22 °C



Intermodulation Distortion

Input: 14.95 MHz and 15.15 MHz at 3 dBm

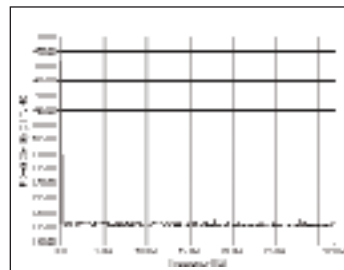
Intermodulation distortion refers to distortion that the PXI-5620 produces in response to two different input signals. This shows up in the frequency domain as spurious peaks at frequencies not harmonically related to the two input signals.



Harmonic Distortion

Input: 14 MHz at 0 dBm

Harmonic distortion refers to distortion produced by the PXI-5620 as a result of a single input frequency. It shows up at harmonics of the input signal frequency. In a sample system, some of those harmonics alias back to other frequencies within the Nyquist band.



Noise Density

Dither Disabled, Input Terminated

Noise density shows how much random noise the PXI-5620 produces with no input signal. It is termed "noise density" because it measures power per given frequency range (dBm/Hz). Over most of the band the noise density is -135 dBm/Hz, which means any 1 kHz band has a total noise power of -104 dBm.



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