Ordering Information | Detailed Specifications

For user manuals and dimensional drawings, visit the product page resources tab on ni.com.

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100 MHz, 100 MS/s, 14-Bit Digitizer

NI PCI-5122, NI PXI-5122

- 2 channels simultaneously sampled at 14-bit resolution
- 100 MS/s real-time and 2.0 GS/s random interleaved sampling
- 100 MHz bandwidth
- 50 Ω or 1 MΩ input impedance

- 200 mV to 20 V input range
- 75 dBc SFDR and 62 dB SINAD
- Memory options from 8 to 512 MB per channel
- Edge, window, hysteresis, video, and digital triggering with 100 ps timestamping

Overview

NI 5122 high-speed digitizers feature two 100 MS/s simultaneously sampled input channels with 14-bit resolution, 100 MHz bandwidth, and up to 512 MB of memory per channel in a compact, 3U PXI Express, PXI, or PCI device. With its high sampling rate and low-distortion front end, an NI 5122 is ideal for a wide range of applications in automotive, communications, scientific research, military/aerospace, and consumer electronics. Using the National Instruments Synchronization and Memory Core (SMC) architecture, you can easily synchronize to other analog and digital instruments to develop high-channel-count or mixed-signal test systems.

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Application and Technology

Analog Input Performance

NI 5122 digitizers use 14-bit analog-to-digital converters (ADCs), low-noise variable-gain amplifiers, and a low-jitter 100 MHz timebase to deliver a 75 dBc spurious-free dynamic range and a 62 dB signal-to-noise ratio. The 14-bit data converters have 64 times the resolution
of traditional 8-bit instruments, providing more accurate time- and frequency-domain measurements.

Software-selectable 50 Ω or 1 MΩ input impedance, input ranges from 200 mVpp to 20 Vpp, seven trigger modes, and antialias and noise filters make NI 5122 digitizers versatile enough to meet the most demanding application requirements. The programmable DC offset feature maximizes the use of the entire 14 bits of vertical range. Onboard self-calibration also ensures measurement stability over the entire operating temperature range of 0 to 55 °C.
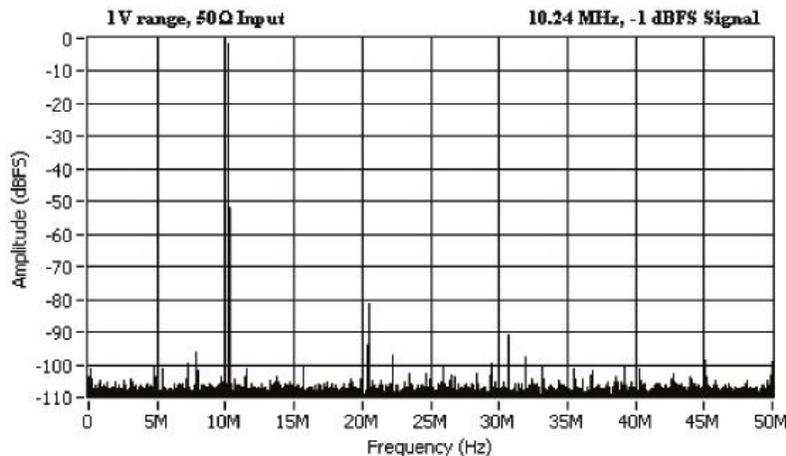

Figure 1. Graph of NI 5122 Dynamic Performance (FFT)

Deep Onboard Acquisition Memory

NI 5122 devices, based on the NI Synchronization and Memory Core (SMC) architecture, come with high-speed memory options from 8 to 512 MB per channel (4 to 256 million 14-bit samples per channel). An NI 5122 can acquire more than 1 million triggered waveforms without software intervention in multiple-record acquisition mode for applications such as RADAR, ultrasound, and event detection, which require short trigger rearm times. In addition, you can timestamp each triggered event with 100 ps resolution in both single-shot and multiple-record acquisition modes. An NI 5122 also can stream data continuously from onboard memory to host memory for longer acquisitions and streaming to disk.
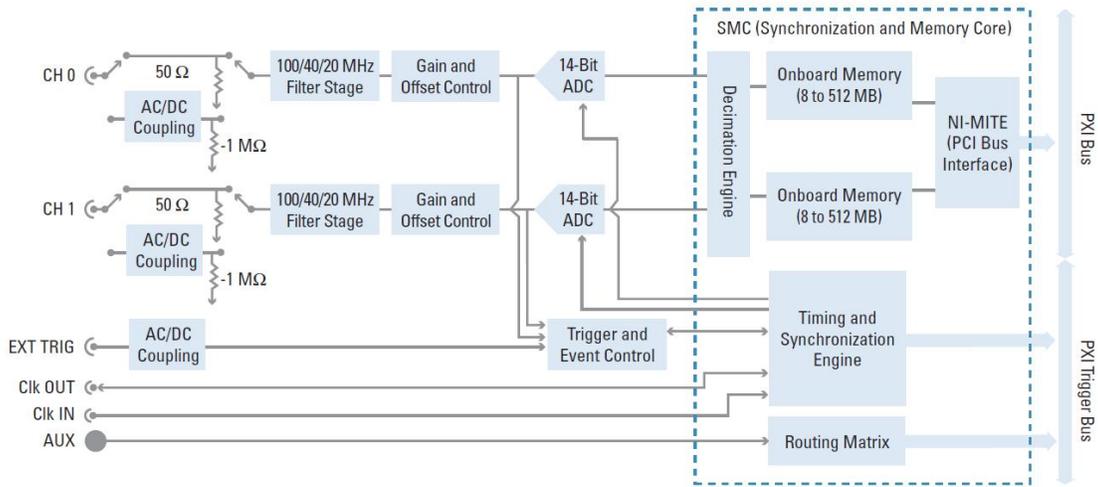
Figure 2. Hardware Block Diagram

Data Streaming Up to 400 MB/s

Because of the PCI and PCI Express buses used in PXI, an NI 5122 can continuously stream data to the host computer at rates up to 110 MB/s using PCI/PXI or 400 MB/s using PXI Express. At 400 MB/s, an NI 5122 is streaming data on both channels at its maximum data rate. The dedicated per-slot bandwidth available in PXI Express enables multimodule systems to achieve higher aggregate data rates. High-speed data record and playback applications are possible using the host computer's memory or high-end storage solutions such as RAID. Using an

8 x 500 GB drive RAID system with a capacity of 4 TB, you can capture data at 400 MB/s for more than 2.5 hours. Areas that benefit from this capability include RF/IF data streaming in signal intelligence, data record and playback, and scientific applications.

Triggering

NI 5122 digitizers have three trigger sources – analog, digital, and software control. Compare the input signal on either channel or the external trigger channel to one or two thresholds for edge, hysteresis, or window trigger detection. You can also use line-selectable video triggering for NTSC, PAL, or SECAM broadcast standards. Drive and receive digital triggers to and from the PXI trigger bus or the external 9-pin AUX connector. You can specify the number of samples to acquire before and after a trigger event occurs. These pretrigger and posttrigger settings also apply when the module is used in multiple-record mode.

Timing and Synchronization

An advanced 100 MHz clock generator produces the low-jitter, low-phase-skew clock for the precise clocking and stable synchronization necessary for high-speed, high-resolution digitizers. You can also use an external clock source, such as the NI PXI-5404 100 MHz frequency generator, for applications that require very specific sample frequencies, or you can clock directly from the device under test. Synchronize multiple instruments using the PXI backplane 10 MHz reference clock or an external reference ranging from 1 to 20 MHz in 1 MHz increments. Because NI 5122 digitizers are built on the SMC architecture, you can synchronize two or more digitizers for high-channel-count applications and build mixed-signal test systems using NI PXI-5421 arbitrary waveform generators and NI PXI-655x digital waveform generator/analyzers.

Software

Every National Instruments high-speed digitizer comes with the IVI-compliant NI-SCOPE driver, which is fully compatible with NI LabVIEW, LabWindows™/CVI, and Measurement Studio for Visual Studio 6.0 and .NET. NI-SCOPE includes more than 50 built-in measurement and analysis functions and the interactive NI-SCOPE Soft Front Panel. The NI Spectral Measurements Toolkit gives you sophisticated frequency-domain measurements, such as power in-band, multiple peak search, and 3D spectrogram, for applications in communications, signal intelligence, and avionics.
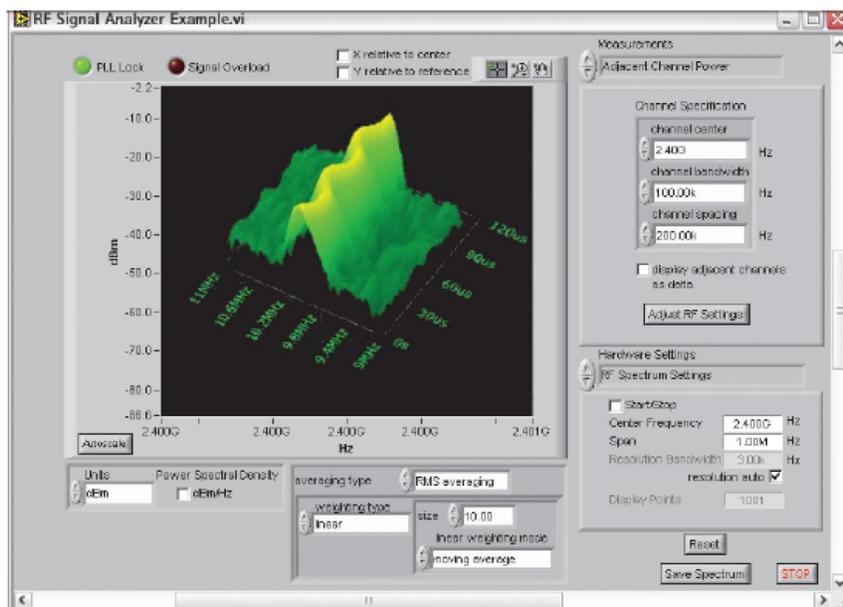

Figure 3. Spectral Measurements Toolkit 3D Spectrogram

Ordering Information

For a complete list of accessories, visit the product page on ni.com.

Products	Part Number	Recommended Accessories		Part Number
NI PXI-5122/32MB				
NI PXI-5122/32MB Requires: 1 Cables ;	778756-02	**Cables:** Unshielded - SMB112, Double Shielded SMB to BNC Male Coax Cable, 50 Ohm, 1m ***Also Available: [Shielded]**		778827-01
NI PCI-5122_32				
NI PCI-5122 32MB/ch Requires: 1 Cables ;	778758-02	**Cables:** Unshielded - SMB112, Double Shielded SMB to BNC Male Coax Cable, 50 Ohm, 1m ***Also Available: [Shielded]**		778827-01

Support and Services

System Assurance Programs

NI system assurance programs are designed to make it even easier for you to own an NI system. These programs include configuration and deployment services for your NI PXI, CompactRIO, or Compact FieldPoint system. The NI Basic System Assurance Program provides a simple integration test and ensures that your system is delivered completely assembled in one box. When you configure your system with the NI Standard System Assurance Program, you can select from available NI system driver sets and application development environments to create customized, reorderable software configurations. Your system arrives fully assembled and tested in one box with your software preinstalled. When you order your system with the standard program, you also receive system-specific documentation including a bill of materials, an integration test report, a recommended maintenance plan, and frequently asked question documents. Finally, the standard program reduces the total cost of owning an NI system by providing three years of warranty coverage and calibration service. Use the online product advisors at ni.com/advisor to find a system assurance program to meet your needs.

Calibration

NI measurement hardware is calibrated to ensure measurement accuracy and verify that the device meets its published specifications. To ensure the ongoing accuracy of your measurement hardware, NI offers basic or detailed recalibration service that provides ongoing ISO 9001 audit compliance and confidence in your measurements. To learn more about NI calibration services or to locate a qualified service center near you, contact your local sales office or visit ni.com/calibration.

Technical Support

Get answers to your technical questions using the following National Instruments resources.

- **Support** - Visit ni.com/support to access the NI KnowledgeBase, example programs, and tutorials or to contact our applications engineers who are located in NI sales offices around the world and speak the local language.
- **Discussion Forums** - Visit forums.ni.com for a diverse set of discussion boards on topics you care about.
- **Online Community** - Visit community.ni.com to find, contribute, or collaborate on customer-contributed technical content with users like you.

Repair

While you may never need your hardware repaired, NI understands that unexpected events may lead to necessary repairs. NI offers repair services performed by highly trained technicians who quickly return your device with the guarantee that it will perform to factory specifications. For more information, visit ni.com/repair.

Training and Certifications

The NI training and certification program delivers the fastest, most certain route to increased proficiency and productivity using NI software and hardware. Training builds the skills to more efficiently develop robust, maintainable applications, while certification validates your knowledge and ability.

- **Classroom training in cities worldwide** - the most comprehensive hands-on training taught by engineers.
- **On-site training at your facility** - an excellent option to train multiple employees at the same time.
- **Online instructor-led training** - lower-cost, remote training if classroom or on-site courses are not possible.
- **Course kits** - lowest-cost, self-paced training that you can use as reference guides.
- **Training memberships** and training credits - to buy now and schedule training later.

Visit ni.com/training for more information.

Extended Warranty

NI offers options for extending the standard product warranty to meet the life-cycle requirements of your project. In addition, because NI understands that your requirements may change, the extended warranty is flexible in length and easily renewed. For more information, visit ni.com/warranty.

OEM

NI offers design-in consulting and product integration assistance if you need NI products for OEM applications. For information about special pricing and services for OEM customers, visit ni.com/oem.

Alliance

Our Professional Services Team is comprised of NI applications engineers, NI Consulting Services, and a worldwide National Instruments Alliance Partner program of more than 700 independent consultants and integrators. Services range from start-up assistance to turnkey system integration. Visit ni.com/alliance.

Detailed Specifications

14-Bit 100 MS/s Digitizer

Unless otherwise noted, the following conditions were used for each specification:

- All filter settings
- All impedance selections
- Sample clock set to 100 MS/s

Typical values are representative of an average unit operating at room temperature. Specifications are subject to change without notice. For the most recent NI 5122 specifications, visit ni.com/manuals.

To access the NI 5122 documentation, including the *NI High-Speed Digitizers Getting Started Guide*, which contains functional descriptions of the NI 5122 signals, navigate to **Start»All Programs»National Instruments»NI-SCOPE»Documentation**.

⚠️ **Hot Surface** If the NI 5122 has been in use, it may exceed safe handling temperatures and cause burns. Allow the NI 5122 to cool before removing it from the PXI/PXIe chassis or PC. Refer to the *Environment* section for operating temperatures of this device.
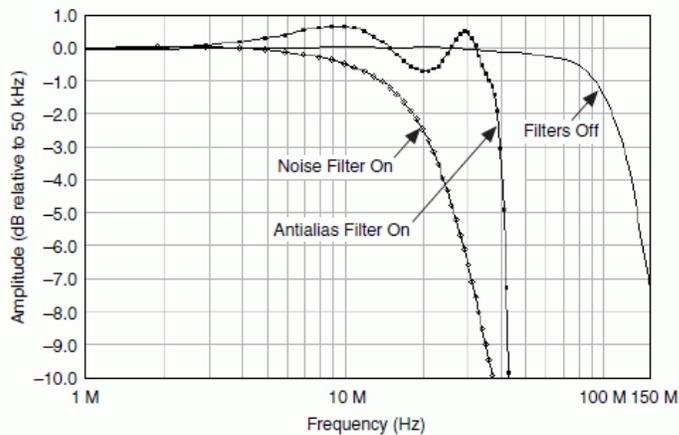
Vertical

Analog Input (Channel 0 and Channel 1)

Specification	Value				Comments
Number of Channels	Two (simultaneously sampled)				—
Connector	BNC				—

Impedance and Coupling

Specification	Value		Comments
Input Impedance	50 Ω ±2.0%	1 MΩ ±0.75% in parallel with a typical capacitance of 29 pF	Software selectable.
Input Coupling	AC, DC, GND		AC coupling available on 1 MΩ only.

Voltage Levels

Full Scale (FS) Input Range and Programmable Vertical Offset	50 Ω		1 MΩ		—
	Range (V_{pk-pk})	Vertical Offset Range (V)	Range (V_{pk-pk})	Vertical Offset Range (V)	
	0.2	±0.1	0.2	±0.1	
	0.4	±0.2	0.4	±0.2	
	1	±0.5	1	±0.5	
	2	±1	2	±1	
	4	±2	4	±2	
	10	—	10	±5	
			20	—	
Maximum Input Overload	50 Ω		1 MΩ		—
	7 V_{rms} with |Peaks| ≤ 10 V		|Peaks| ≤ 42 V		

Accuracy

Resolution	14 bits		Within ±5 °C of self-calibration temperature.
DC Accuracy (Programmable Vertical Offset = 0 V)	Range (V_{pk-pk})	50 Ω and 1 MΩ	Within ±5 °C of self-calibration temperature.
	0.2, 0.4	NI PXI/PXIe-5122: ±(0.65% of Input + 1.0 mV) NI PCI-5122: ±(0.65% of Input + 2.0 mV)	
	1	NI PXI/PXIe-5122: ±(0.65% of Input + 1.2 mV) NI PCI-5122: ±(0.65% of Input + 2.0 mV)	
	2	NI PXI/PXIe-5122: ±(0.65% of Input + 1.6 mV) NI PCI-5122: ±(0.65% of Input + 2.0 mV)	
	4, 10	NI PXI/PXIe/PCI-5122: ±(0.65% of Input + 8.0 mV)	
	20 (1 MΩ only)	NI PXI/PXIe/PCI-5122: ±(0.65% of Input + 13.0 mV)	
Programmable Vertical Offset Accuracy	±0.4% of offset setting		Within ±5 °C of self-calibration temperature.
DC Drift	Range (V_{pk-pk})	50 Ω and 1 MΩ	—

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Specification	Value			Comments
	0.2, 0.4, 1, and 2	±(0.057% of Input + 0.006% of FS + 100 µV) per °C		
	4, 10, and 20 (1 MΩ only)	±(0.057% of Input + 0.006% of FS + 900 µV) per °C		
AC Amplitude Accuracy	50 Ω		1 MΩ	Within ±5 °C of self-calibration temperature.
	±0.06 dB (±0.7%) at 50 kHz		±0.09 dB (±1.0%) at 50 kHz	
Crosstalk, Typical	≤−100 dB at 10 MHz			CH 0 to/from CH 1, External Trigger to CH 0 or CH 1.
Bandwidth and Transient Response				
Bandwidth (–3 dB)	Range (V$_{pk-pk}$)	50 Ω and 1 MΩ		Filters off.
	All ranges except 0.2	100 MHz		[*] 78 MHz above 40 ºC.
	0.2	80 MHz up to 40 ºC[*]		
Rise/Fall Time, Typical	Range (V$_{pk-pk}$)	50 Ω and 1 MΩ		—
	All ranges except 0.2	3.5 ns		
	0.2	4.2 ns		
Bandwidth Limit Filters	Noise Filter		Antialias Filter	Only one filter can be enabled at any given time. The antialias filter is enabled by default.
	20 MHz 2-pole Bessel filter		40 MHz (–6 dB, typical) 35 MHz (–3 dB) 6-pole Chebyshev filter	
AC-Coupling Cutoff (–3 dB)	12 Hz			AC coupling available on 1 MΩ only.
Passband Flatness	Filter Settings	Range (V$_{pk-pk}$)	50 Ω and 1 MΩ	Referenced to 50 kHz.
	Filters Off	All ranges except 0.2	±0.4 dB DC to 20 MHz ±1 dB 20 MHz to 50 MHz	
		0.2	±0.4 dB DC to 20 MHz ±1 dB 20 MHz to 40 MHz	
	Antialias Filter On	All ranges	±1.2 dB DC to 16 MHz ±1.6 dB 16 MHz to 32 MHz	

NI 5122 Frequency Response (Typical)

Specification	Value			Comments
Spectral Characteristics				
Spurious Free Dynamic Range with Harmonics (SFDR), Typical	Range (V$_{pk-pk}$)	50 Ω	1 MΩ	10 MHz, –1 dBFS input signal.
	0.2	75 dBc	70 dBc	Includes the 2nd through the 5th harmonics.
	0.4	75 dBc	70 dBc	Measured from DC to 50 MHz on NI PXI/PXIe-5122.
	1	75 dBc	70 dBc	Measured from 5 kHz to 50 MHz on NI PCI-5122.
	2	75 dBc	70 dBc	
	4	65 dBc	70 dBc	

Specification	Value			Comments
	10	65 dBc	60 dBc	
	20 (1 MΩ only)	N/A	60 dBc	
Total Harmonic Distortion (THD), Typical	Range (V pk-pk)	50 Ω	1 MΩ	10 MHz, −1 dBFS input signal. Includes the 2nd through the 5th harmonics.
	0.2	−75 dBc	−68 dBc	
	0.4	−75 dBc	−68 dBc	
	1	−75 dBc	−68 dBc	
	2	−73 dBc	−68 dBc	
	4	−63 dBc	−68 dBc	
	10	−63 dBc	−58 dBc	
	20 (1 MΩ only)	N/A	−58 dBc	
Intermodulation Distortion, Typical	0.2 Vpk-pk to 2.0 Vpk-pk Ranges on 50 Ω Input			Two tones at 10.2 MHz and 11.2 MHz. Each tone is −7 dBFS.
	−75 dBc			

Specification	Value					Comments
Signal-to-Noise Ratio (SNR), Typical	Range (V pk-pk)	50 Ω		1 MΩ		10 MHz, −1 dBFS input signal. Excludes harmonics. Measured from DC to 50 MHz.
		Filters Off	Antialias Filter On	Filters Off	Antialias Filter On	
	0.2	60 dB	60 dB	56 dB	60 dB	
	0.4	62 dB	62 dB	61 dB	62 dB	
	1	62 dB	62 dB	62 dB	62 dB	
	2	62 dB	62 dB	62 dB	62 dB	
	4	—	—	61 dB	62 dB	
Signal to Noise and Distortion (SINAD), Typical	Range (V pk-pk)	50 Ω		1 MΩ		10 MHz, −1 dBFS input signal. Includes harmonics. Measured from DC to 50 MHz.
		Filters Off	Antialias Filter On	Filters Off	Antialias Filter On	
	0.2	60 dB	60 dB	56 dB	59 dB	
	0.4	62 dB	62 dB	60 dB	61 dB	
	1	62 dB	62 dB	61 dB	61 dB	
	2	62 dB	62 dB	61 dB	61 dB	
	4	—	—	60 dB	61 dB	

NI 5122 Dynamic Performance, 50 Ω, 1 Vpk-pk Range (Typical)
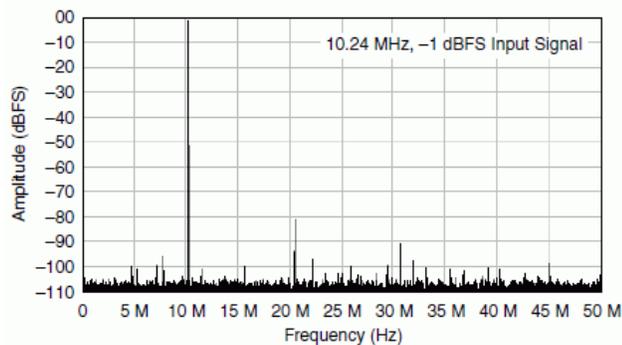
Specification	Value			Comments
RMS Noise (Noise Filter On)	Range (Vpk-pk)	50 Ω	1 MΩ	50 Ω terminator connected to input.
	0.2	NI PXI/PXIe-5122: 46 µVrms (0.023% FS) NI PCI-5122: 56 µVrms (0.028% FS)	NI PXI/PXIe-5122: 60 µVrms (0.030% FS) NI PCI-5122: 72 µVrms (0.036% FS)	
	0.4	92 µVrms (0.023% FS)	92 µVrms (0.023% FS)	
	1	230 µVrms (0.023% FS)	230 µVrms (0.023% FS)	
	2	460 µVrms (0.023% FS)	460 µVrms (0.023% FS)	
	4	920 µVrms (0.023% FS)	920 µVrms (0.023% FS)	

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10	2.3 mV$_{rms}$ (0.023% FS)	2.3 mV$_{rms}$ (0.023% FS)	
20 (1 MΩ only)	N/A	4.6 mV$_{rms}$ (0.023% FS)	

Specification	Value		Comments
RMS Noise (Antialias Filter On)	Range (V$_{pk-pk}$) | 50 Ω	1 MΩ	50 Ω terminator connected to input.
	0.2 | NI PXI/PXIe-5122: 66 µV$_{rms}$ (0.033% FS) NI PCI-5122: 82 µV$_{rms}$ (0.041% FS)	NI PXI/PXIe-5122: 80 µV$_{rms}$ (0.040% FS) NI PCI-5122: 96 µV$_{rms}$ (0.048% FS)	
	0.4 | 100 µV$_{rms}$ (0.025% FS)	120 µV$_{rms}$ (0.030% FS)	
	1 | 250 µV$_{rms}$ (0.025% FS)	300 µV$_{rms}$ (0.030% FS)	
	2 | 500 µV$_{rms}$ (0.025% FS)	600 µV$_{rms}$ (0.030% FS)	
	4 | 1 mV$_{rms}$ (0.025% FS)	1.2 mV$_{rms}$ (0.030% FS)	
	10 | 2.5 mV$_{rms}$ (0.025% FS)	3 mV$_{rms}$ (0.030% FS)	
	20 (1 MΩ only) | N/A	6 mV$_{rms}$ (0.030% FS)	

Specification	Value		Comments
RMS Noise (Filters Off)	Range (V$_{pk-pk}$) | 50 Ω	1 MΩ	50 Ω terminator connected to input.
	0.2 | NI PXI/PXIe-5122: 66 µV$_{rms}$ (0.033% FS) NI PCI-5122: 90 µV$_{rms}$ (0.045% FS)	110 µV$_{rms}$ (0.055% FS)	
	0.4 | 100 µV$_{rms}$ (0.025% FS)	160 µV$_{rms}$ (0.040% FS)	
	1 | 250 µV$_{rms}$ (0.025% FS)	300 µV$_{rms}$ (0.030% FS)	
	2 | 500 µV$_{rms}$ (0.025% FS)	600 µV$_{rms}$ (0.030% FS)	
	4 | 1 mV$_{rms}$ (0.025% FS)	1.6 mV$_{rms}$ (0.040% FS)	
	10 | 2.5 mV$_{rms}$ (0.025% FS)	3 mV$_{rms}$ (0.030% FS)	
	20 (1 MΩ only) | N/A	6 mV$_{rms}$ (0.030% FS)	

Representation of NI 5122 Spectral Noise Density on 0.2 V Range, Noise Filter Enabled, 1 MΩ Input Impedance
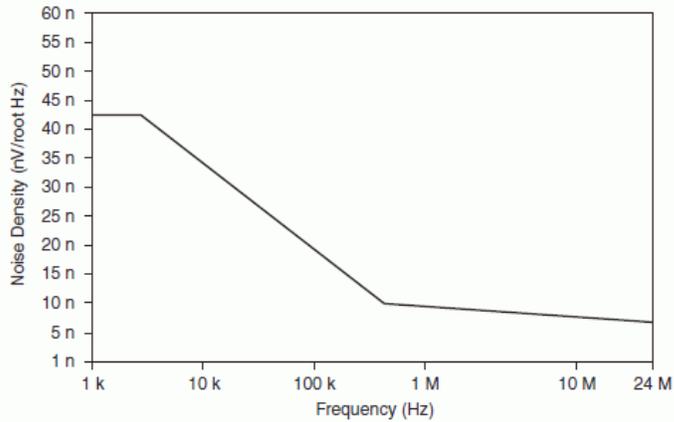
Representation of NI 5122 Spectral Noise Density on 0.2 V Range, Full Bandwidth, 50 Ω Input Impedance

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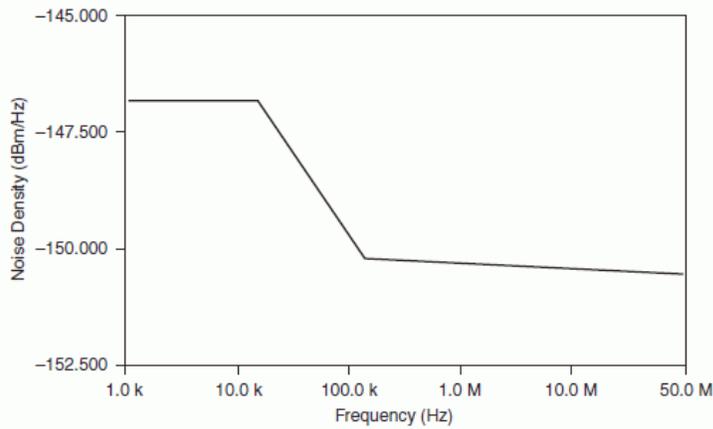
Horizontal

Sample Clock

Specification	Value		Comments
Sources	NI PXI/PXIe-5122	NI PCI-5122	[*] Internal Sample Clock is locked to the Reference Clock or derived from the onboard VCXO.
	Internal, Onboard Clock (internal VCXO)[*]	Internal, Onboard Clock (internal VCXO)[*]	
	External, CLK IN (front panel SMB connector)	External, CLK IN (front panel SMB connector)	
	External, PXI Star Trigger (backplane connector)		

Onboard Clock (Internal VCXO)

Specification	Value		Comments
Sample Rate Range	Real-Time Sampling (Single Shot)	Random Interleaved Sampling (RIS)	[*] Divide by n decimation used for all rates less than 100 MS/s. For more information about Sample Clock and decimation, refer to the *NI High-Speed Digitizers Help*.
	1.526 kS/s to 100 MS/s[*]	200 MS/s to 2 GS/s in multiples of 100 MS/s	
Phase Noise Density, Typical	<–100 dBc/Hz at 100 Hz		10 MHz input signal.
	<–120 dBc/Hz at 1 kHz		
	<–130 dBc/Hz at 10 kHz		
Sample Clock Jitter, Typical	≤1 ps rms (100 Hz to 100 kHz)		Includes the effects of the converter aperture uncertainty and the clock circuitry jitter. Excludes trigger jitter.
	≤2 ps rms (100 Hz to 1 MHz)		
Timebase Frequency	100 MHz		—
Timebase Accuracy	Not Phase-Locked to Reference Clock	Phase-Locked to Reference Clock	ppm = parts per million (1×10^{-6})
	±25 ppm	Equal to the Reference Clock accuracy	
Sample Clock Delay Range	±1 Sample Clock period		—
Sample Clock Delay/Adjustment Resolution	≤10 ps		—

External Sample Clock

Specification	Value		Comments
Sources	NI PXI/PXIe-5122	NI PCI-5122	—
	CLK IN (front panel SMB connector)	CLK IN (front panel SMB connector)	
	PXI Star Trigger (backplane connector)		
Frequency Range	30 MHz to 105 MHz (CLK IN)		Divide by n decimation available where $1 \le n \le 65,535$. For more information about Sample Clock and decimation, refer to the *NI High-Speed Digitizers Help*.
	30 MHz to 80 MHz (PXI Star Trigger, PXI/PXIe devices only)		
Duty Cycle Tolerance	45% to 55%		—

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Specification	Value		Comments
Sample Clock Exporting			
Exported Sample Clock Destinations	Destination	Maximum Frequency	* Decimated Sample Clock only.
	CLK OUT (front panel SMB connector)	105 MHz	
	PXI_Trig <0..6> (backplane connector)*	20 MHz	
	PFI <0..1> (front panel 9-pin mini-circular DIN connector)*	25 MHz	
	RTSI <0..6>*	20 MHz	

Phase-Locked Loop (PLL) Reference Clock

Specification	Value		Comments
Sources	NI PXI/PXIe-5122	NI PCI-5122	—
	PXI_CLK10 (backplane connector) CLK IN (front panel SMB connector)	RTSI 7 CLK IN (front panel SMB connector)	
Frequency Range	1 MHz to 20 MHz in 1 MHz increments. Default of 10 MHz. The PLL Reference Clock frequency has to be accurate to ±50 ppm.		—
Duty Cycle Tolerance	45% to 55%		—
Exported Reference Clock Destinations	NI PXI/PXIe-5122	NI PCI-5122	—
	CLK OUT (front panel SMB connector) PFI <0..1> (front panel 9-pin mini-circular DIN connector) PXI_Trig <0..7> (backplane connector)	CLK OUT (front panel SMB connector) PFI <0..1> (front panel 9-pin mini-circular DIN connector) RTSI <0..7>	

CLK IN (Sample Clock and Reference Clock Input, Front Panel Connector)

Specification	Value	Comments
Input Voltage Range	Sine wave: 0.65 V_{pk-pk} to 2.8 V_{pk-pk} (0 dBm to 13 dBm) Square wave: 0.2 V_{pk-pk} to 2.8 V_{pk-pk}	—
Maximum Input Overload	7 V_{rms} with |Peaks| ≤ 10 V	—
Impedance	50 Ω	—
Coupling	AC	—

CLK OUT (Sample Clock and Reference Clock Output, Front Panel Connector)

Specification	Value	Comments
Output Impedance	50 Ω	—
Logic Type	3.3 V CMOS	—
Maximum Drive Current	±48 mA	—

Trigger

Reference (Stop) Trigger

Specification	Value			Comments
Trigger Types	Edge, Window, Hysteresis, Video, Digital, Immediate, and Software			Refer to the following sections and to the *NI High-Speed Digitizers Help* for more information about what sources are available for each trigger type.
Trigger Sources	NI PXI-5122	NI PXIe-5122	NI PCI-5122	
	CH 0, CH 1, TRIG, PXI_Trig <0..6>, PFI <0..1>, PXI Star Trigger, and Software	CH 0, CH 1, TRIG, PXI_Trig <0..6>, PFI <0..1>, and Software	CH 0, CH 1, TRIG, RTSI <0..6>, and Software	
Time Resolution	TDC	Onboard Clock	External Clock	TDC = Time to Digital Conversion Circuit.
	On	100 ps	N/A	
	Off	10 ns	External Clock Period	
Minimum Rearm Time	TDC		Rearm Time	Holdoff set to 0. Onboard sample clock at maximum rate.

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Specification	Value			Comments
	On	12 µs		
	Off	3 µs		
Holdoff	Onboard Clock	External Clock		TDC is off when using External Sample Clock.
	Rearm Time to 171.79 s	(Rearm Time/10 ns) × External Clock Period to $(2^{34} - 1)$ × External Clock Period		

Analog Trigger (Edge, Window, and Hysteresis Trigger Types)

Specification	Value			Comments
Sources	CH 0 (front panel BNC connector) CH 1 (front panel BNC connector) TRIG (front panel BNC connector)			—
Trigger Level Range	CH 0, CH 1	TRIG (External Trigger)		—
	100% FS	±5 V		
Trigger Level Resolution	10 bits (1 in 1,024)			—
Edge Trigger Sensitivity	CH 0, CH 1	TRIG (External Trigger)		—
	2.5% FS up to 50 MHz, increasing to 5% FS at 100 MHz	$0.25\ V_{pk\text{-}pk}$ up to 100 MHz, increasing to $1\ V_{pk\text{-}pk}$ at 200 MHz		
Level Accuracy, Typical	CH 0, CH 1	TRIG (External Trigger)		—
	±3.5% FS up to 10 MHz	±0.35 V (±3.5% FS) up to 10 MHz		
Jitter	≤80 ps rms			Within ±5 °C of self-calibration temperature.
Trigger Filters	Low-Frequency (LF) Reject	High-Frequency (HF) Reject		—
	50 kHz	50 kHz		

Digital Trigger (Digital Trigger Type)

Specification	Value			Comments
Sources	NI PXI-5122	NI PXIe-5122	NI PCI-5122	—
	PXI_Trig <0..6> (backplane connector) PFI <0..1> (front panel SMB connector) PXI Star Trigger (backplane connector)	PXI_Trig <0..6> (backplane connector) PFI <0..1> (front panel SMB connector)	RTSI <0..6> PFI <0..1> (front panel SMB connector)	

Video Trigger (Video Trigger Type)

Specification	Value			Comments
Sources	CH 0 (front panel BNC connector) CH 1 (front panel BNC connector) TRIG (front panel BNC connector)			—
Types	Specific Line Any Line Specific Field			—
Standard	Negative sync of NTSC, PAL, or SECAM signal			—

TRIG (External Trigger, Front Panel Connector)

Specification	Value	Comments
Connector	BNC	—
Impedance	1 MΩ in parallel with 22 pF	—
Coupling	AC, DC	—
AC-Coupling Cutoff (–3 dB)	12 Hz	—
Input Voltage Range	±5 V	—
Maximum Input Overload	|Peaks| ≤ 42 V	—

PFI 0 and PFI 1 (Programmable Function Interface, AUX Front Panel Connectors)

Specification	Value	Comments
Connector	9-pin mini-circular DIN	—

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Specification	Value		Comments
Direction	Bi-directional		—
As an Input (Trigger)			
Destinations	Start Trigger (Acquisition Arm) Reference (Stop) Trigger Arm Reference Trigger Advance Trigger		—
Input Impedance	150 kΩ		—
V_{IH}	2.0 V		—
V_{IL}	0.8 V		—
Maximum Input Overload	–0.5 V to 5.5 V		—
Maximum Frequency	25 MHz		—
As an Output (Event)			
Sources	Ready for Start Start Trigger (Acquisition Arm) Ready for Reference Reference (Stop) Trigger End of Record Ready for Advance Advance Trigger Done (End of Acquisition) Probe Compensation (1 kHz, 50% duty cycle square wave, PFI 1 only)		—
Output Impedance	50 Ω		—
Logic Type	3.3 V CMOS		—
Maximum Drive Current	NI PXI/PCI-5122	NI PXIe-5122	—
	±24 mA	±12 mA	
Maximum Frequency	25 MHz		—

TClk Specifications

National Instruments TClk synchronization method and the NI-TClk driver are used to align the sample clocks on any number of SMC-based modules in a chassis. For more information about TClk synchronization, refer to the *NI-TClk Synchronization Help*, which is located within the *NI High-Speed Digitizers Help*.

- Specifications are valid for any number of PXI modules installed in one NI PXI-1042 chassis or any number of PXIe modules installed in a PXI Express chassis.
- All parameters set to identical values for each SMC-based module.
- Sample Clock set to 100 MS/s and all filters are disabled.
- For other configurations, including multichassis systems, contact NI Technical Support at ni.com/support.

Note Although you can use NI-TClk to synchronize nonidentical modules, these specifications apply only to synchronizing identical modules.

Specification	Value	Comments
Intermodule SMC Synchronization Using NI-TClk for Identical Modules (Typical)		
Skew	500 ps	Caused by clock and analog path delay differences. No manual adjustment performed.
Average Skew After Manual Adjustment	<10 ps	For information about manual adjustment, refer to the *Synchronization Repeatability Optimization* topic in the *NI-TClk Synchronization Help*. For additional help with the adjustment process, contact NI Technical Support at ni.com/support.
Sample Clock Delay/Adjustment Resolution	≤10 ps	—

Waveform Specifications

Specification	Value				Comments
Onboard Memory Size		PXI	PXIe	PCI	—
	8 MB per chan standard (4 megasamples per chan)				
	32 MB per chan option (16 megasamples per chan)		—		

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Specification	Value			Comments
	64 MB per chan option (32 megasamples per chan)	—		—
	256 MB per chan option (128 megasamples per chan)			
	512 MB per chan option (256 megasamples per chan)		—	—
Minimum Record Length	1 Sample			—
Number of Pretrigger Samples	Zero up to full Record Length			Single-record mode and multiple-record mode.
Number of Posttrigger Samples	Zero up to full Record Length			Single-record mode and multiple-record mode.
Maximum Number of Records in Onboard Memory	8 MB/channel	21,845		[*] It is possible to exceed these numbers if you fetch records while acquiring data. For more information, refer to the *NI High-Speed Digitizers Help*.
	32 MB/channel	87,381		
	64 MB/channel	100,000[*]		
	256 MB/channel	100,000[*]		
	512 MB/channel	100,000[*]		
Allocated Onboard Memory per Record	(*Record Length* × 2 bytes/S) + 200 bytes, rounded up to next multiple of 128 bytes or 384 bytes, whichever is greater			—

Calibration

Specification	Value	Comments
Self-Calibration	Self-calibration is done on software command. The calibration corrects for gain, offset, frequency response, triggering, and timing adjustment errors for all input ranges.	—
External Calibration (Factory Calibration)	The external calibration calibrates the VCXO and the voltage reference. Appropriate constants are stored in nonvolatile memory.	—
Interval for External Calibration	2 years	—
Warm-Up Time	15 minutes	—

Power

NI PXI/PCI-5122		
Specification	Typical Value	
+3.3 VDC	NI PXI-5122	NI PCI-5122
	1.4 A	1.4 A
+5 VDC	1.5 A	2.4 A
+12 VDC	110 mA	110 mA
−12 VDC	270 mA	0 A
Total Power	16.7 W	17.9 W

NI PXIe-5122		
Specification	Typical Value	Maximum Value
+3.3 VDC	1.6 A	1.6 A
+12 VDC	2.0 A	2.32 A
Total Power	29.28 W	33.12 W

Software

Specification	Value	Comments
Driver Software	NI-SCOPE 2.6 or later (PXI and PCI) NI-SCOPE 3.3.1 or later (PXIe)	—

Specification	Value	Comments
	NI-SCOPE is an IVI-compliant driver that allows you to configure, control, and calibrate the NI 5122. NI-SCOPE provides application programming interfaces for many development environments.	
Application Software	NI-SCOPE provides programming interfaces, documentation, and examples for the following application development environments: - LabVIEW - LabWindows™/CVI™ - Measurement Studio - Microsoft Visual C/C++ - Microsoft Visual Basic	—
Interactive Soft Front Panel and Configuration	The Scope Soft Front Panel supports interactive control of the NI 5122. and is included on the NI-SCOPE CD. The required versions are as follows: NI PXI/PCI-5122: version 2.0.1 or later NI PXIe-5122: version 2.7 or later National Instruments Measurement & Automation Explorer (MAX) also provides interactive configuration and test tools for the NI 5122. MAX is included on the NI-SCOPE CD.	—

Environment

NI PXI/PXIe-5122

Note To ensure that the NI PXI/PXIe-5122 cools effectively, follow the guidelines in the *Maintain Forced-Air Cooling Note to Users* included in the NI PXI/PXIe-5122 kit. The NI PXI/PXIe-5122 is intended for indoor use only.

Specification	Value	Comments
Operating Temperature	0 ºC to +55 ºC in all NI PXI and PXIe chassis except the following: 0 ºC to +45 ºC when installed in an NI PXI-1000/B or PXI-101*x* chassis. Meets IEC-60068-2-1 and IEC-60068-2-2. **Note**: (NI PXIe-5122 only) Refer to KnowledgeBase 4AEB2ML1 at ni.com for more information about maximizing PXIe data transfer rates when operating at ambient temperatures below 10 ºC.	—
Storage Temperature	–40 ºC to +71 ºC. Meets IEC-60068-2-1 and IEC-60068-2-2.	—
Operating Relative Humidity	10% to 90%, noncondensing. Meets IEC-60068-2-56.	—
Storage Relative Humidity	5% to 95%, noncondensing. Meets IEC-60068-2-56.	—
Operating Shock	30 g, half-sine, 11 ms pulse. Meets IEC-60068-2-27. Test profile developed in accordance with MIL-PRF-28800F.	—
Storage Shock	50 g, half-sine, 11 ms pulse. Meets IEC-60068-2-27. Test profile developed in accordance with MIL-PRF-28800F.	—
Operating Vibration	5 Hz to 500 Hz, 0.31 g_{rms}. Meets IEC-60068-2-64.	—
Storage Vibration	5 Hz to 500 Hz, 2.46 g_{rms}. Meets IEC-60068-2-64. Test profile exceeds requirements of MIL-PRF-28800F, Class 3.	—
Altitude	2,000 m maximum (at 25 °C ambient temperature)	—
Pollution Degree	2	—

NI PCI-5122

Note To ensure that the NI PCI-5122 cools effectively, make sure that the chassis in which it is used has active cooling that provides at least some airflow across the PCI card cage. To maximize airflow and extend the life of the device, leave any adjacent PCI slots empty. Refer to the *Maintain Forced-Air Cooling Note to Users* included in the NI PCI-5122 kit for important cooling information. The NI PCI-5122 is intended for indoor use only.

Specification	Value	Comments
Operating Temperature	0 ºC to +45 ºC. Meets IEC-60068-2-1 and IEC-60068-2-2.	—
Storage Temperature	–40 ºC to +70 ºC. Meets IEC-60068-2-1 and IEC-60068-2-2.	—
Operating Relative Humidity	10% to 90%, noncondensing. Meets IEC-60068-2-56.	—
Storage Relative Humidity	5% to 95%, noncondensing. Meets IEC-60068-2-56.	—
Storage Shock	50 g, half-sine, 11 ms pulse. Meets IEC-60068-2-27. Test profile developed in accordance with MIL-PRF-28800F.	—
Storage Vibration	5 Hz to 500 Hz, 2.46 g_{rms}. Meets IEC-60068-2-64. Test profile exceeds requirements of MIL-PRF-28800F, Class 3.	—
Altitude	2,000 m maximum (at 25 °C ambient temperature)	—
Pollution Degree	2	—

Safety, Electromagnetic Compatibility, and CE Compliance

Safety Standards

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

- IEC 61010-1, EN 61010-1
- UL 61010-1, CSA 61010-1

Note For UL and other safety certifications, refer to the product label or the *Online Product Certification* section.

Electromagnetic Compatibility

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

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

Note For the standards applied to assess the EMC of this product, refer to the *Online Product Certification* section.

Note For EMC compliance, operate this device with RG223/U or equivalent shielded cable. Operate according to product documentation.

CE Compliance ![CE]

This product meets the essential requirements of applicable European Directives, as amended for CE marking, as follows:

- 2006/95/EC; Low-Voltage Directive (safety)
- 2004/108/EC; Electromagnetic Compatibility Directive (EMC)

Online Product Certification

Refer to the product Declaration of Conformity (DoC) for additional regulatory compliance information. To obtain product certifications and the DoC for this product, visit ni.com/certification, search by module number or product line, and click the appropriate link in the Certification column.

Environmental Management

National Instruments is committed to designing and manufacturing products in an environmentally responsible manner. NI recognizes that eliminating certain hazardous substances from our products is beneficial not only to the environment but also to NI customers.

For additional environmental information, refer to the *NI and the Environment* 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.

Waste Electrical and Electronic Equipment (WEEE)

EU Customers At the end of the product life cycle, all products *must* be sent to a WEEE recycling center. For more information about WEEE recycling centers, National Instruments WEEE initiatives, and compliance with WEEE Directive 2002/96/EC on Waste Electrical and Electronic Equipment, visit ni.com/environment/weee.htm.

电子信息产品污染控制管理办法 （中国 **RoHS**）

中国客户 National Instruments 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 National Instruments 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.)

Physical

NI PXI-5122	
Dimensions	3U, One slot, PXI/cPCI Module 21.6 × 2.0 × 13.0 cm (8.5 × 0.8 × 5.1 in.)
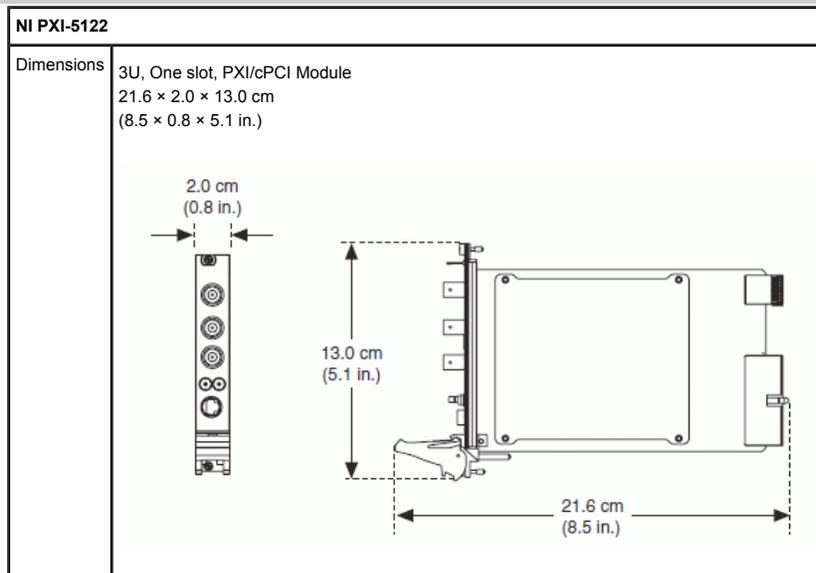
Weight	383 g (13.5 oz)

NI PXIe-5122	
Dimensions	3U, One slot, PXI Express Module 21.3 × 2.0 × 13.0 cm (8.4 × 0.8 × 5.1 in.)
Weight	453 g (16.0 oz)

NI PCI-5122	
Dimensions	35.5 × 2.0 × 11.3 cm (14.0 × 0.8 × 4.4 in.)
Weight	455 g (16.0 oz)

Front Panel Connectors

Label	Function	Connector Type
CH 0	Analog Input	BNC female
CH 1	Analog Input	BNC female
TRIG	External Trigger	BNC female
CLK IN	Sample Clock Input and Reference Clock Input	SMB jack
CLK OUT	Sample Clock Output and Reference Clock Output	SMB jack
AUX I/O	PFI 0, PFI 1	9-pin mini-circular DIN

NI PXI/PXIe-5122 Front Panel Indicators

Label	Function	
		For more information, refer to the *NI High-Speed Digitizers Help*.
ACCESS	The ACCESS LED indicates the status of the PCI bus and the interface from the NI PXI/PXIe-5122 to the controller.	
ACTIVE	The ACTIVE LED indicates the status of the onboard acquisition hardware of the NI PXI/PXIe-5122.	

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