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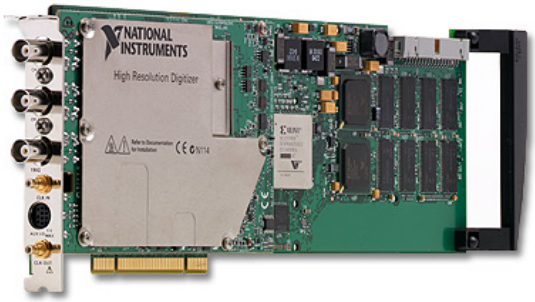


*Last Revised: 2012-12-11 16:18:45.0*

# 150 MHz, 200 MS/s, 12-Bit Digitizers

## NI PXI-5124, NI PCI-5124




- 2 channels simultaneously sampled with 12-bit resolution
- 200 MS/s real-time sample rate and 4.0 GS/s random interleaved sampling
- 150 MHz bandwidth
- 200 mVpp to 20 Vpp input ranges
- >75 dBc SFDR
- 8, 32, 256, or 512 MB of memory per channel
- Edge, window, hysteresis, video, and digital triggering with 50 ps timestamping

### Overview

NI 5124 high-resolution digitizers feature two 200 MS/s simultaneously sampled input channels with 12-bit resolution, 150 MHz bandwidth, and up to 512 MB of memory per channel in a 3U PXI or PCI device. NI 5124 devices use the high-speed PCI bus and the scatter-gather bus mastering of the NI MITE ASIC to move data to the computer at speeds up to 100 times faster than traditional instrument interfaces, thereby dramatically decreasing overall test time. With the NI Synchronization and Memory Core (SMC) architecture of an NI 5124, you can create mixed-signal systems using signal generators and digital waveform generators/analyzers or build a high-channel-count digitizer system with subnanosecond synchronization between channels.

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## Application and Technology

**Dual 200 MS/s, 12-Bit Input Channels for Time and Frequency Analysis**
• 150 MHz input bandwidth with antialias and noise filters
• >75 dBc spurious-free dynamic range (SFDR)
• 4.0 GS/s equivalent time sampling for repetitive signals
• Independent channel-selectable 200 mVpp to 20 Vpp input ranges
• Independent channel-selectable 50 Ω or 1 MΩ input impedance
• 2-year calibration cycle and 0 to 55 °C operating temperature

**Deep Onboard Memory**
• 8, 32, 256, or 512 MB of memory per channel
• Capture more than 1 million triggered waveforms with multiple-record hardware rearm
• Stream data continuously from onboard memory to host memory or disk

**Triggering, Clocking, and Synchronization**
• Edge, window, hysteresis, video, digital, triggering with 50 ps timestamping
• Pretrigger and posttrigger acquisition in single and multiple-record mode
• Internal 200 MHz clock or external clock from 50 to 210 MHz
• Phase lock to PXI 10 MHz reference or external reference from 1 to 20 MHz

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## Ordering Information

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

| Products | Part Number | Recommended Accessories | Part Number |
|---|---|---|---|
| **NI PXI-5124/32MB** | | | |
| **NI PXI-5124/32MB**<br>Requires: 1 Cables ; | 778757-02 | **Cables:** Unshielded - SMB112, Double Shielded SMB to BNC Male Coax Cable, 50 Ohm, 1m<br>***Also Available: [Shielded]* | 778827-01 |
| **NI PCI-5124_32** | | | |
| **NI PCI-5124 32MB/ch**<br>Requires: 1 Cables ; | 779171-02 | **Cables:** Unshielded - SMB112, Double Shielded SMB to BNC Male Coax Cable, 50 Ohm, 1m<br>***Also Available: [Shielded]* | 778827-01 |

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## 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.

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**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.

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## Detailed Specifications

**12-Bit 200 MS/s Digitizer**

This topic lists the specifications for the NI PXI/PCI-5124 (NI 5124) high-speed digitizer. Unless otherwise noted, these specifications are valid for the following conditions:

All filter settings
All impedance selections
Sample clock set to 200 MS/s using onboard clock

Typical values are representative of an average unit operating at room temperature. Specifications are subject to change without notice. For the most recent NI 5124 specifications, visit ni.com/manuals.

To access the NI 5124 documentation, including the *NI High-Speed Digitizers Getting Started Guide*, which contains functional descriptions of the NI 5124 signals, navigate to **Start»All Programs»National Instruments»NI-SCOPE»Documentation**.

**Hot Surface** If the NI 5124 has been in use, it may exceed safe handling temperatures and cause burns. Allow the NI 5124 to cool before removing it from the PXI chassis or PC. Refer to the Environment section for operating temperatures of this device.

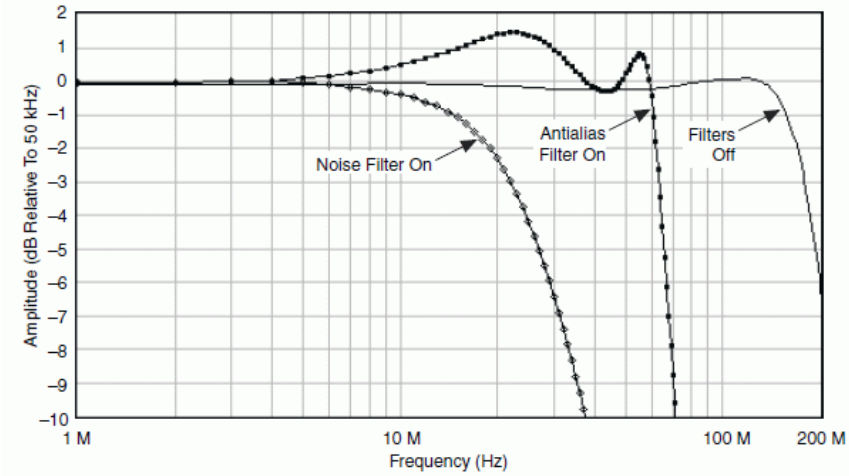
## Vertical

### Analog Input (Channel 0 and Channel 1)

| Specification | Value | | | | Comments |
|---|---|---|---|---|---|
| Number of Channels | Two (simultaneously sampled) | | | | — |
| Connector | BNC | | | | — |
| **Impedance and Coupling** | | | | | |
| 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 | 0 | 10 | ±5 | |
| | | | 20 | 0 | |
| Maximum Input Overload | 50 Ω | | 1 MΩ | | — |
| | 7 $V_{rms}$ with \|Peaks\| ≤10 V | | \|Peaks\| ≤42 V | | |
| **Accuracy** | | | | | |
| Resolution | 12 bits | | | | — |
| DC Accuracy (Programmable Vertical Offset = 0 V) | Range ($V_{pk-pk}$) | NI PXI-5124 | NI PCI-5124 | | Within ±5 °C of self-calibration temperature |
| | 0.2 and 0.4 | ±(0.65% of Input + 1.3 mV) | ±(0.65% of Input + 1.8 mV) | | |
| | 1 and 2 | ±(0.65% of Input + 1.5 mV) | ±(0.65% of Input + 2.1 mV) | | |
| | 4, 10, and 20 (1 MΩ only) | ±(0.65% of Input + 10.0 mV) | ±(0.65% of Input + 10.0 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 | | | — |
| | 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 | ≤–85 dB at 10 MHz | | | | CH 0 to/from CH 1, External Trigger to CH 0 or CH 1 |
| Sparkle Code Rate, Typical | <300 ppt* with onboard clock or 200 MHz external clock<br><3 ppt* with 150 MHz external clock<br>0 with 100 MHz external clock | | | | Results based on 2 × $10^{12}$ samples<br>* ppt = parts per trillion ($10^{12}$) |
| **Bandwidth and Transient Response** | | | | | |

| Specification | Value | | | Comments |
|---|---|---|---|---|
| Bandwidth (–3 dB) | Range ($V_{pk-pk}$) | 50 Ω | 1 MΩ | Filters off<br>† 135 MHz above 40 °C |
| | All ranges except 0.2 | 150 MHz | 145 MHz up to 40 °C† | |
| | 0.2 | 85 MHz | 75 MHz | |
| Rise/Fall Time, Typical | Range ($V_{pk-pk}$) | 50 Ω and 1 MΩ | | Filters off |
| | All ranges except 0.2 | 2.4 ns | | |
| | 0.2 | 3.3 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, typical 2-pole Bessel filter | | 60 MHz, typical 4-pole elliptical 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 | ±0.5 dB DC to 20 MHz<br>±1.0 dB 20 MHz to 50 MHz<br>±1.7 dB 50 MHz to 100 MHz | |
| | | 0.2 | ±0.6 dB DC to 20 MHz<br>±1.5 dB 20 MHz to 40 MHz | |
| | Antialias Filter On | All ranges | –1.0 dB to +2.0 dB DC to 55 MHz | |

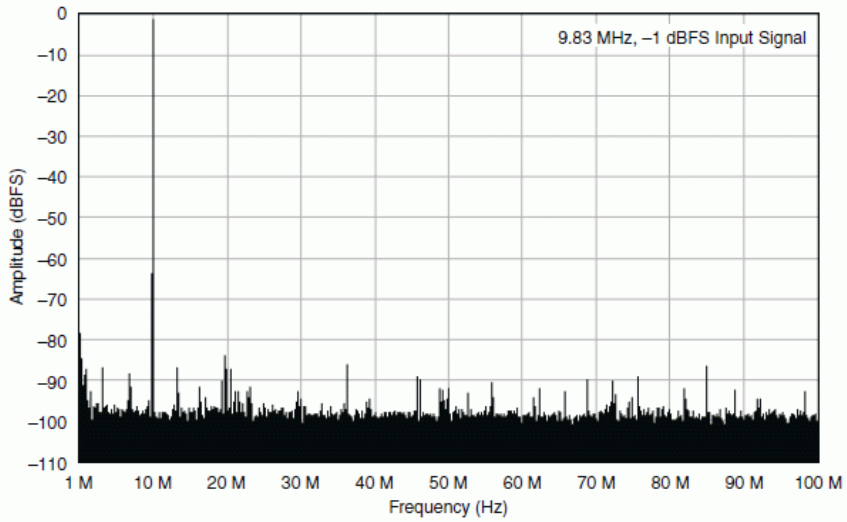
**NI 5124 Frequency Response (Typical)**




| Specification | Value | | | Comments |
|---|---|---|---|---|
| **Spectral Characteristics** | | | | |
| Spurious-Free Dynamic Range with Harmonics (SFDR), (Physical), Typical | Range ($V_{pk-pk}$) | 50 Ω | 1 MΩ | Filters off or antialias filter on<br>10 MHz, –1 dBFS input signal<br>Includes the 2nd through the 5th harmonics<br>Measured from DC to 100 MHz on NI PXI-5124<br>Measured from 5 kHz to 100 MHz on NI PCI-5124 |
| | 0.2 | 75 dBc | 70 dBc | |
| | 0.4 | 75 dBc | 70 dBc | |
| | 1 | 72 dBc | 70 dBc | |
| | 2 | 72 dBc | 70 dBc | |
| | 4 | 65 dBc | 67 dBc | |
| | 10 | 65 dBc | 60 dBc | |
| | 20 (1 MΩ only) | — | 60 dBc | |
| Total Harmonic Distortion (THD), Typical | Range ($V_{pk-pk}$) | 50 Ω | 1 MΩ | Filters off or antialias filter on<br>10 MHz, –1 dBFS input signal<br>Includes the 2nd through the 5th harmonics |
| | 0.2 | –74 dBc | –68 dBc | |
| | 0.4 | –74 dBc | –68 dBc | |
| | 1 | –72 dBc | –68 dBc | |
| | 2 | –72 dBc | –67 dBc | |

| Specification | Value | | | | Comments |
|---|---|---|---|---|---|
| | 4 | –63 dBc | | –66 dBc | |
| | 10 | –63 dBc | | –58 dBc | |
| | 20 (1 MΩ only) | — | | –58 dBc | |
| Intermodulation Distortion, Typical | 0.2 $V_{pk-pk}$ to 2.0 $V_{pk-pk}$ Ranges on 50 Ω Input | | | | Filters off or antialias filter on<br>Two tones at 10.2 MHz and 11.2 MHz<br>Each tone is –7 dBFS |
| | –75 dBc | | | | |
| Signal-to-Noise Ratio (SNR), Typical | Range ($V_{pk-pk}$) | 50 Ω | | 1 MΩ | Excludes harmonics<br>10 MHz, –1 dBFS input signal<br>Measured from DC to 100 MHz |
| | | Filters Off | Antialias Filter On | Filters Off | Antialias Filter On |
| | 0.2 | 57 dB | 56 dB | 53 dB | 55 dB |
| | 0.4 | 58 dB | 57 dB | 55 dB | 57 dB |
| | 1 | 58 dB | 58 dB | 57 dB | 57 dB |
| | 2 | 58 dB | 58 dB | 57 dB | 57 dB |
| | 4 | — | — | 56 dB | 58 dB |
| Signal to Noise and Distortion (SINAD), Typical | Range ($V_{pk-pk}$) | 50 Ω | | 1 MΩ | Includes harmonics<br>10 MHz, –1 dBFS input signal<br>Measured from DC to 100 MHz |
| | | Filters Off | Antialias Filter On | Filters Off | Antialias Filter On |
| | 0.2 | 57 dB | 56 dB | 53 dB | 55 dB |
| | 0.4 | 58 dB | 57 dB | 55 dB | 57 dB |
| | 1 | 58 dB | 58 dB | 57 dB | 57 dB |
| | 2 | 58 dB | 58 dB | 57 dB | 57 dB |
| | 4 | — | — | 56 dB | 57 dB |

**NI 5124 Dynamic Performance, 50 Ω, 1 $V_{pk-pk}$ Range, 262,144 Point FFT (Typical)**

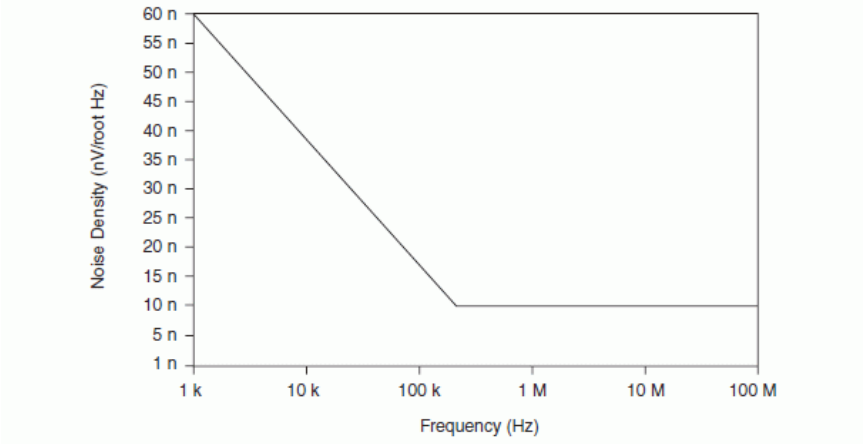



| Specification | Value | | | Comments |
|---|---|---|---|---|
| RMS Noise | Range ($V_{pk-pk}$) | 50 Ω | 1 MΩ | Noise filter on<br>50 Ω terminator connected to input |
| | 0.2 | NI PXI-5124: 94 $\mu V_{rms}$ (0.047% FS) | NI PXI-5124: 104 $\mu V_{rms}$ (0.052% FS) | |
| | | NI PCI-5124: 106 $\mu V_{rms}$ (0.053% FS) | NI PCI-5124: 116 $\mu V_{rms}$ (0.058% FS) | |
| | 0.4 | 188 $\mu V_{rms}$ (0.047% FS) | 192 $\mu V_{rms}$ (0.048% FS) | |
| | 1 | 470 $\mu V_{rms}$ (0.047% FS) | 480 $\mu V_{rms}$ (0.048% FS) | |
| | 2 | 940 $\mu V_{rms}$ (0.047% FS) | 960 $\mu V_{rms}$ (0.048% FS) | |
| | 4 | 1.88 $mV_{rms}$ (0.047% FS) | 1.92 $mV_{rms}$ (0.048% FS) | |
| | 10 | 4.7 $mV_{rms}$ (0.047% FS) | 4.8 $mV_{rms}$ (0.048% FS) | |

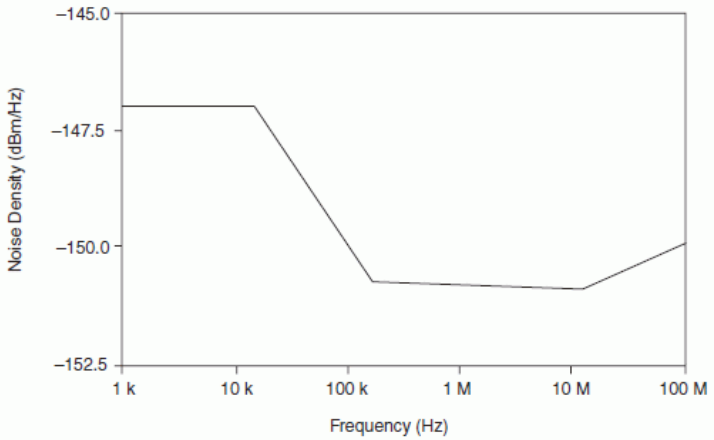
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| Specification | Value | | | Comments |
|---|---|---|---|---|
| | 20 (1 MΩ only) | — | 9.4 $mV_{rms}$ (0.047% FS) | |
| RMS Noise | Range ($V_{pk-pk}$) | 50 Ω | 1 MΩ | Antialias filter on<br>50 Ω terminator connected to input |
| | 0.2 | NI PXI-5124: 112 $\mu V_{rms}$ (0.056% FS)<br>NI PCI-5124: 126 $\mu V_{rms}$ (0.063% FS) | NI PXI-5124: 130 $\mu V_{rms}$ (0.065% FS)<br>NI PCI-5124: 146 $\mu V_{rms}$ (0.073% FS) | |
| | 0.4 | 200 $\mu V_{rms}$ (0.05% FS) | 216 $\mu V_{rms}$ (0.054% FS) | |
| | 1 | 500 $\mu V_{rms}$ (0.05% FS) | 510 $\mu V_{rms}$ (0.051% FS) | |
| | 2 | 1.0 $mV_{rms}$ (0.05% FS) | 1.02 $mV_{rms}$ (0.051% FS) | |
| | 4 | 2.04 $mV_{rms}$ (0.051% FS) | 2.16 $mV_{rms}$ (0.054% FS) | |
| | 10 | 5.1 $mV_{rms}$ (0.051% FS) | 5.2 $mV_{rms}$ (0.052% FS) | |
| | 20 (1 MΩ only) | N/A | 10.2 $mV_{rms}$ (0.051% FS) | |
| RMS Noise | Range ($V_{pk-pk}$) | 50 Ω | 1 MΩ | Filters off<br>50 Ω terminator connected to input |
| | 0.2 | NI PXI-5124: 114 $\mu V_{rms}$ (0.057% FS)<br>NI PCI-5124: 128 $\mu V_{rms}$ (0.064% FS) | NI PXI-5124: 164 $\mu V_{rms}$ (0.082% FS)<br>NI PCI-5124: 184 $\mu V_{rms}$ (0.092% FS) | |
| | 0.4 | 204 $\mu V_{rms}$ (0.051% FS) | 264 $\mu V_{rms}$ (0.066% FS) | |
| | 1 | 510 $\mu V_{rms}$ (0.051% FS) | 550 $\mu V_{rms}$ (0.055% FS) | |
| | 2 | 1.02 $mV_{rms}$ (0.051% FS) | 1.08 $mV_{rms}$ (0.054% FS) | |
| | 4 | 2.08 $mV_{rms}$ (0.052% FS) | 2.6 $mV_{rms}$ (0.065% FS) | |
| | 10 | 5.2 $mV_{rms}$ (0.052% FS) | 5.5 $mV_{rms}$ (0.055% FS) | |
| | 20 | — | 10.6 $mV_{rms}$ (0.053% FS) | |

**Representation of NI 5124 Spectral Noise Density on 0.2 V Range, Noise Filter Enabled, 1 MΩ Input Impedance**




**Representation of NI 5124 Spectral Noise Density on 0.2 V Range, Full Bandwidth, 50 Ω Input Impedance**




## Horizontal

### Sample Clock

| Specification | Value | | Comments |
|---|---|---|---|
| Sources | NI PXI-5124 | NI PCI-5124 | * Internal Sample Clock is locked to the Reference Clock or derived from the onboard VCXO |
| | Internal, Onboard Clock (internal VCXO)*<br>External, CLK IN (front panel SMB connector)<br>External, PXI Star Trigger (backplane connector) | Internal, Onboard Clock (internal VCXO)*<br>External, CLK IN (front panel SMB connector) | |
| **Onboard Clock (Internal VCXO)** | | | |
| Sample Rate Range | Real-Time Sampling (Single Shot) | Random Interleaved Sampling (RIS) | † Divide by *n* decimation used for all rates less than 200 MS/s<br>For more information about Sample Clock and decimation, refer to the *NI High-Speed Digitizers Help*. |
| | 3.052 kS/s to 200 MS/s† | 400 MS/s to 4 GS/s in multiples of 200 MS/s | |
| Phase Noise Density, Typical | <–100 dBc/Hz at 100 Hz<br><–120 dBc/Hz at 1 kHz<br><–130 dBc/Hz at 10 kHz | | 10 MHz input signal |
| Sample Clock Jitter, Typical | ≤1 ps rms (100 Hz to 100 kHz)<br>≤2 ps rms (100 Hz to 1 MHz) | | Includes the effects of the converter aperture uncertainty and the clock circuitry jitter<br>Excludes trigger jitter |
| Timebase Frequency | 200 MHz | | — |
| Timebase Accuracy | Not Phase-Locked to Reference Clock | Phase-Locked to Reference Clock | ppm = parts per million ($1 \times 10^{-6}$) |
| | ±25 ppm | Equal to the Reference Clock accuracy | |
| Sample Clock Delay Range | ±1 Sample Clock period | | — |
| Sample Clock Delay/Adjustment Resolution | ≤5 ps | | — |
| **External Sample Clock** | | | |
| Sources | NI PXI-5124 | NI PCI-5124 | — |
| | CLK IN (front panel SMB connector)<br>PXI Star Trigger (backplane connector) | CLK IN (front panel SMB connector) | |
| Frequency Range | 50 MHz to 210 MHz (CLK IN)<br>50 MHz to 80 MHz (PXI Star Trigger) | | Divide by *n* decimation available where $1 \le n \le 65{,}535$<br>For more information about Sample Clock and decimation, refer to the *NI High-Speed Digitizers Help*. |
| Duty Cycle Tolerance | 45% to 55% | | — |
| Exported Reference Clock Destinations | NI PXI-5124 | NI PCI-5124 | — |
| | CLK OUT (front panel SMB connector) | CLK OUT (front panel SMB connector) | |

| Specification | Value | | Comments |
|---|---|---|---|
| | PFI<0..1> (front panel 9-pin mini-circular DIN connector)<br>PXI_Trig<0..7> (backplane connector) | PFI<0..1> (front panel 9-pin mini-circular DIN connector)<br>RTSI<0..7> | |
| **Sample Clock Exporting** | | | |
| Exported Sample Clock Destinations | Destination | Maximum Frequency | * Decimated Sample Clock only |
| | CLK OUT (front panel SMB connector) | 210 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-5124 | NI PCI-5124 | — |
| | PXI_CLK10 (backplane connector)<br>CLK IN (front panel SMB connector) | RTSI 7<br>CLK IN (front panel SMB connector) | |
| Frequency Range | 1 MHz to 20 MHz in 1 MHz increments. Default of 10 MHz.<br>The PLL Reference Clock frequency must be accurate to ±50 ppm. | | — |
| Duty Cycle Tolerance | 45% to 55% | | — |
| Exported Reference Clock Destinations | NI PXI-5124 | NI PCI-5124 | — |
| | CLK OUT (front panel SMB connector)<br>PFI<0..1> (front panel 9-pin mini-circular DIN connector)<br>PXI_Trig<0..6> (backplane connector) | CLK OUT (front panel SMB connector)<br>PFI<0..1> (front panel 9-pin mini-circular DIN connector)<br>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)<br>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 and Sources | Types | | Sources | Refer to the following sections and the *NI High-Speed Digitizers Help* for more information about what sources are available for each trigger type. |
| | Edge, Window, Hysteresis, Video, Digital, Immediate, and Software | | CH 0, CH 1, TRIG, PXI_Trig<0..6>, PFI<0..1>, PXI Star Trigger, Software, and RTSI<0..6> | |
| Time Resolution | TDC | Onboard Clock | External Clock | TDC = Time to Digital Conversion Circuit |
| | On | 50 ps | N/A | |
| | Off | 5 ns | External Clock Period | |
| Minimum Rearm Time | TDC | | Rearm Time | Holdoff set to 0. Onboard sample clock at maximum rate. |
| | On | | 10 µs | |
| | Off | | 2 µs | |

| Specification | Value | | | Comments |
|---|---|---|---|---|
| Holdoff | TDC | Onboard Clock | External Clock | — |
| | On | 10 µs to 85.899 s | N/A | |
| | Off | 2 µs to 85.899 s | 200 × (External Clock Period) to ($2^{32}$ – 1) × (External Clock Period) | |
| **Analog Trigger (Edge, Window, and Hysteresis Trigger Types)** | | | | |
| Sources | CH 0 (front panel BNC connector)<br>CH 1 (front panel BNC connector)<br>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) | — |
| | 3.5% FS up to 50 MHz, increasing to 10% FS at 150 MHz | | 0.25 $V_{pk-pk}$ up to 100 MHz, increasing to 1 $V_{pk-pk}$ at 200 MHz | |
| Level Accuracy, Typical | CH 0, CH 1 | | TRIG (External Trigger) | — |
| | ±4.7% FS up to 10 MHz | | ±0.35 V up to 10 MHz | |
| Trigger 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)** | | | | |
| Sources | NI PXI-5124 | | NI PCI-5124 | — |
| | PXI_Trig<0..6> (backplane connector)<br>PFI<0..1> (front panel SMB connector)<br>PXI Star Trigger (backplane connector) | | RTSI<0..6><br>PFI<0..1> (front panel SMB connector) | |
| **Video Trigger (Video Trigger Type)** | | | | |
| Sources | CH 0 (front panel BNC connector)<br>CH 1 (front panel BNC connector)<br>TRIG (front panel BNC connector) | | | — |
| Types | Specific Line<br>Any Line<br>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 Connector)**

| Specification | Value | Comments |
|---|---|---|
| Connector | 9-pin mini-circular DIN | — |
| Direction | Bi-directional | — |
| **As an Input (Trigger)** | | |

| Specification | Value | Comments |
|---|---|---|
| Destinations | Start Trigger (Acquisition Arm)<br>Reference (Stop) Trigger<br>Arm Reference Trigger<br>Advance Trigger | — |
| Input Impedance | 150 kΩ | — |
| $V_{IH}$ | 2.0 V | — |
| $V_{IL}$ | 0.8 V | — |
| Maximum Input Overload | –0.5 V, 5.5 V | — |
| Maximum Frequency | 25 MHz | — |
| **As an Output (Event)** | | |
| Sources | Start Trigger (Acquisition Arm)<br>Reference (Stop) Trigger<br>End of Record<br>Done (End of Acquisition)<br>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 | ±24 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 modules installed in one NI PXI-1042 chassis.
All parameters set to identical values for each SMC-based module.
Sample Clock set to200 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<br>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 | ≤5 ps | — |

## Waveform Specifications

| Specification | Value | | Comments |
|---|---|---|---|
| Onboard Memory Size | 8 MB per channel standard (4 megasamples per channel) | | * NI PXI-5124 only |
| | 32 MB per channel option (16 megasamples per channel) | | |
| | 256 MB per channel option (128 megasamples per channel) | | |
| | 512 MB per channel option (256 megasamples per channel)* | | |
| 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 | * NI PXI-5124 only<br>† It is possible to exceed these numbers if you fetch records while acquiring data.<br>For more information, refer to the *NI High-Speed Digitizers Help*. |
| | 32 MB/channel | 87,381 | |
| | 256 MB/channel | 100,000† | |
| | 512 MB/channel* | 100,000† | |

| Specification | Value | Comments |
|---|---|---|
| Allocated Onboard Memory per Record | (*Record Length* × 2 bytes/S) + 200 bytes, rounded up to next multiple of 128 bytes<br>or<br>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

| Specification | Typical Value | | Comments |
|---|---|---|---|
| | NI PXI-5124 | NI PCI-5124 | — |
| +3.3 VDC | 1.3 A | 1.3 A | |
| +5 VDC | 1.7 A | 2.7 A | |
| +12 VDC | 130 mA | 130 mA | |
| –12 VDC | 270 mA | 0 A | |
| Total Power | 17.6 W | 19.4 W | |

## Software

| Specification | Value | Comments |
|---|---|---|
| Driver Software | NI-SCOPE 2.7 or later<br>NI-SCOPE is an IVI-compliant driver that allows you to configure, control, and calibrate the NI 5124. 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:<br>LabVIEW<br>LabWindows™/CVI™<br>Measurement Studio<br>Microsoft Visual C/C++<br>Microsoft Visual Basic | — |
| Interactive Soft Front Panel and Configuration | The Scope Soft Front Panel supports interactive control of the NI 5124. The Scope Soft Front Panel is included on the NI-SCOPE CD.<br>National Instruments Measurement & Automation Explorer (MAX) also provides interactive configuration and test tools for the NI 5124. MAX is included on the NI-SCOPE CD. | — |

## Environment

### NI PXI-5124

**Note** To ensure that the NI PXI-5124 cools effectively, follow the guidelines in the *Maintain Forced Air Cooling Note to Users* included in the NI PXI-5124 kit. The NI PXI-5124 is intended for indoor use only.

| Specification | Value | Comments |
|---|---|---|
| Operating Temperature | 0 ºC to +55 ºC in all NI PXI 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 | — |
| Storage Temperature | –40 ºC to +71 ºC Meets IEC-60068-2-1 and IEC-60068-2-2 | — |
| Operating Relative Humidity | 10% to 90%, noncondensing<br>Meets IEC-60068-2-56 | — |
| Storage Relative Humidity | 5% to 95%, noncondensing<br>Meets IEC-60068-2-56 | — |
| Operating Shock | 30 g, half-sine, 11 ms pulse | — |

| Specification | Value | Comments |
|---|---|---|
| | Meets IEC-60068-2-27<br>Test profile developed in accordance with MIL-PRF-28800F | |
| Storage Shock | 50 g, half-sine, 11 ms pulse<br>Meets IEC-60068-2-27<br>Test profile developed in accordance with MIL-PRF-28800F | — |
| Operating Vibration | 5 Hz to 500 Hz, 0.31 $g_{rms}$<br>Meets IEC-60068-2-64 | — |
| Storage Vibration | 5 Hz to 500 Hz, 2.46 $g_{rms}$<br>Meets IEC-60068-2-64<br>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-5124

**Note** To ensure that the NI PCI-5124 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-5124 kit for important cooling information. The NI PCI-5124 is intended for indoor use only.

| Specification | Value | Comments |
|---|---|---|
| Operating Temperature | 0 ºC to +45 ºC<br>Meets IEC-60068-2-1 and IEC-60068-2-2 | — |
| Storage Temperature | –40 ºC to +71 ºC<br>Meets IEC-60068-2-1 and IEC-60068-2-2 | — |
| Operating Relative Humidity | 10% to 90%, noncondensing<br>Meets IEC-60068-2-56 | — |
| Storage Relative Humidity | 5% to 95%, noncondensing<br>Meets IEC-60068-2-56 | — |
| Storage Shock | 50 g, half-sine, 11 ms pulse<br>Meets IEC-60068-2-27<br>Test profile developed in accordance with MIL-PRF-28800F | — |
| Storage Vibration | 5 Hz to 500 Hz, 2.46 $g_{rms}$<br>Meets IEC-60068-2-64<br>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）

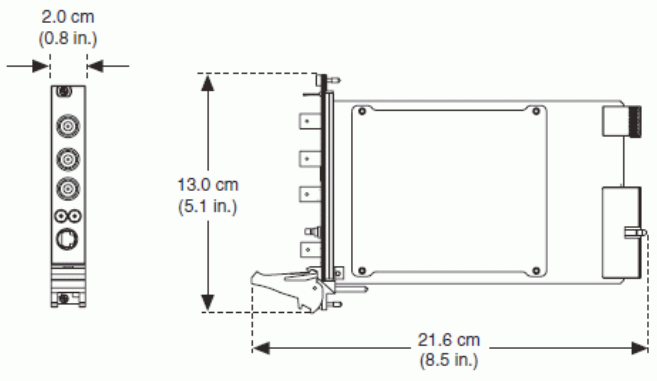
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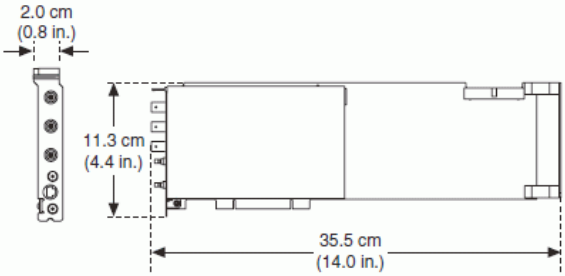
## Physical

**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-5124 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-5124 to the controller. | |
| ACTIVE | The ACTIVE LED indicates the status of the onboard acquisition hardware of the NI PXI-5124. | |

**Dimensions and Weight**

| **NI PXI-5124** | |
|---|---|
| Dimensions | 3U, One slot, PXI/cPCI Module<br>21.6 × 2.0 × 13.0 cm<br>(8.5 × 0.8 × 5.1 in.)<br> |
| Weight | 383 g (13.5 oz) |

| NI PCI-5124 | |
|---|---|
| Dimensions | 35.5 × 2.0 × 11.3 cm<br>(14.0 × 0.8 × 4.4 in.)<br><br> |
| Weight | 455 g (16 oz) |

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