

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

## NI PXI-5124

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

### Operating Systems

- Windows 2000/NT/XP

### Recommended Software

- LabVIEW
- LabWindows/CVI
- Measurement Studio

### Driver Software (included)

- NI-SCOPE driver
- LabVIEW Express VIs
- SCOPE Soft Front Panel
- NI Spectral Measurements Toolkit (with 32, 256 and 512 MB models)

### Calibration

- Gain, offset, frequency response and timing self-calibration
- 2 year external calibration cycle



## Overview

The National Instruments PXI-5124 high-resolution digitizer features two 200 MS/s simultaneously sampled inputs channels with 12-bit resolution, 150 MHz bandwidth, and up to 512 MB of memory per channel in a compact 3U PXI module. The NI PXI-5124 uses 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 Synchronization and Memory Core (SMC) architecture of the PXI-5124, you can create mixed-signal systems using signal generators and digital waveform generator/analyzers or build a high-channel-count digitizer with subnanosecond synchronization between channels.

### Dual 200 MS/s, 12-Bit Input Channels for Time and Frequency Analysis

- 150 MHz input bandwidth with anti-alias and noise filters
- >75 dBc spurious free dynamic range (SFDR)
- 4.0 GS/s equivalent time sampling for repetitive signals
- Independent channel selectable 200 mV<sub>pp</sub> to 20 V<sub>pp</sub> 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
- Pre 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

### Software

- IVI-compliant NI-SCOPE driver for LabVIEW, LabWindows/CVI, and Microsoft C++ and Visual Basic with more than 50 built-in measurements
- SCOPE Soft Front Panel for interactive control
- Spectral Measurements Toolkit for sophisticated frequency-domain measurements in communications, signal intelligence, and avionics applications

### Applications

<b>Communications</b>
xDSL
Wireless communications
Baseband I & Q
<b>Consumer Electronics</b>
DVD, DVD-R, and PVR
Set top box
Gaming console
<b>Biomedical and Scientific Research</b>
Ultrasonic medical imaging
Mass spectrometry
Particle physics
<b>Aerospace/Defense</b>
Emulation of IC communications
<b>Consumer Electronics</b>
RADAR, SONAR, and LIDAR
Satellite
Signal intelligence

## Ordering Information

NI PXI-5124 .....778757-0M<sup>1</sup>  
 Includes NI-SCOPE driver and SCOPE Soft Front Panel. 32, 256, and 512 MB models include NI Spectral Measurements Toolkit.  
<sup>1</sup>M (memory per channel): 1 (8 MB), 2 (32 MB), (256 MB), 4 (512 MB)

Recommended PXI Switch  
 NI PXI-2593 .....778793-01



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

## Specifications

These specifications are valid for 0 to 55 °C, unless otherwise stated.

### Acquisition System

Number of channels..... 2 simultaneously sampled  
 Resolution..... 12 bits  
 Bandwidth (-3 dB)

Full Scale Input Range	50 Ω	1 MΩ
400 mV, 1 V, 2 V, 5 V, 10 V, 20 V	150 MHz	145 MHz <sup>1</sup>
200 mV	85 MHz	75 MHz

### Bandwidth limit filters

(software selectable) ..... 20 MHz noise (2-pole Bessel)  
 60 MHz antialias (4-pole elliptical)  
 Maximum sampling rate..... 200 MS/s real-time, 4 GS/s random interleave sampling  
 Onboard sample memory..... 8, 32, 256, or 512 MB per channel  
 (4, 16, 128, 256 million samples)  
 Pre and posttrigger data points?..... 0 to 100% of full record length

	Memory per channel (MB)	Maximum number of records
<b>Multiple records acquisition (0 to 100% pre and posttrigger data)</b>	8	32,768
	32	131,072
	256	1,048,576
	512	2,097,152

Input impedance..... 50 Ω and 1 M Ω || 25 pF, software selectable  
 Full-scale input range..... 50 Ω: 200 mV, 400 mV, 1 V, 2 V, 4 V, 10 V  
 1 MΩ: 200 mV, 400 mV, 1 V, 2 V, 4 V, 10 V, 20 V  
 Vertical offset ranges..... ±50% of full scale input range  
 Maximum input overload..... 50 Ω: 7 V<sub>rms</sub> with peaks ≤ 10 V  
 1 MΩ: peaks ≤ 42 V  
 Input coupling..... AC, DC, GND (AC coupling on 1 M Ω only)  
 AC coupling cutoff frequency (-3 dB)..... 12 Hz

### Accuracy

DC accuracy (0 V offset setting)

Full Scale Input Range	50 Ω and 1 MΩ
200 mV, 400 mV	±0.65% of Input ±1.3 mV
1 V, 2 V	±0.65% of Input ±1.5 mV
4 V, 10 V, 20 V	±0.65% of Input ±10.0 mV

Passband flatness (referenced at 50 kHz)

	Full-scale input range	50 Ω and 1 MΩ
<b>Filters Off</b>	400 mV, 1 V, 2 V, 5 V, 10 V, 20 V	±0.5 dB, DC to 20 MHz ±1 dB, 20 MHz to 50 MHz ±1.7 dB, 50 MHz to 100 MHz
	200 mV	±0.6 dB, DC to 20 MHz ±1.5 dB, 20 MHz to 40 MHz
<b>Antialias Filter On</b>	All ranges	-1 dB to +2 dB, DC to 55 MHz

AC amplitude accuracy (50 kHz) ..... 50 Ω: ±0.06 dB  
 1 MΩ: ±0.09 dB  
 Channel-to-channel crosstalk ..... ≤-85 dB at 10 MHz

### Spectral Characteristics (typical)

#### Dynamic Performance (50 Ω input impedance with 10 MHz, -1 dBFS input signal)

Full Scale Input Range	SFDR	THD	SNR	SINAD
200 mV	75 dB	-74 dBc	57 dB	57 dB
400 mV	75 dB	-74 dBc	58 dB	58 dB
1 V	72 dB	-72 dBc	58 dB	58 dB
2 V	72 dB	-72 dBc	58 dB	58 dB
4 V	65 dB	-63 dBc	—	—
10 V	65 dB	-63 dBc	—	—

#### Dynamic Performance (1 MΩ input impedance with 10 MHz, -1 dBFS input signal)

Full Scale Input Range	SFDR	THD	SNR	SINAD
200 mV	70 dB	-68 dBc	53 dB	53 dB
400 mV	70 dB	-68 dBc	55 dB	55 dB
1 V	70 dB	-68 dBc	57 dB	57 dB
2 V	70 dB	-67 dBc	57 dB	57 dB
4 V	67 dB	-66 dBc	56 dB	56 dB
10 V	60 dB	-58 dBc	—	—
20 V	60 dB	-58 dBc	—	—

SFDR = Spurious-free dynamic range

THD = Total harmonic distortion

SNR = Signal-to-noise ratio, excluding distortion (antialias filter enabled)

SINAD = Signal-to-noise and distortion (antialias filter enabled)

### RMS Noise (20 MHz filter enabled)

Full Scale Input Range	50 Ω	1 MΩ
200 mV	94 μV <sub>rms</sub>	104 μV <sub>rms</sub>
400 mV	188 μV <sub>rms</sub>	192 μV <sub>rms</sub>
1 V	470 μV <sub>rms</sub>	480 μV <sub>rms</sub>
2 V	940 μV <sub>rms</sub>	960 μV <sub>rms</sub>
4 V	1.88 mV <sub>rms</sub>	1.92 mV <sub>rms</sub>
10 V	4.7 mV <sub>rms</sub>	4.8 mV <sub>rms</sub>
20 V (1 MΩ only)	—	9.4 mV <sub>rms</sub>

Intermodulation distortion<sup>3</sup> (IMD)..... -75 dBc  
 Phase noise density (10 MHz input)..... <-100 dBc/Hz at 100 Hz  
 <-120 dBc/Hz at 1 kHz  
 <-130 dBc/Hz at 10 kHz

### Acquisition Modes

Real-time sampling rate..... 200 MS/s to 3.052 kS/s sample rate  
 Random interleave sampling (RIS)..... 4 GS/s to 400 MS/s sample rate (repetitive signals only)

### Timebase System

Total sample clock jitter<sup>4</sup> ..... ≤1 ps<sub>rms</sub>

### Internal

Internal sample clock frequency..... 200 MS/s sampling rate with decimation by n where 1 ≤ n ≤ 65,535  
 Timebase accuracy ..... ±25 ppm (±0.0025%)

### External

External clock sources..... CLK IN (SMB connector), PXI star  
 External clock range..... 50 MHz to 210 MHz, variable with decimation by n where 1 ≤ n ≤ 65,535  
 External reference sources ..... CLK IN (SMB connector), PXI backplane 10 MHz  
 External reference range..... 1 to 20 MHz in 1 MHz increments  
 External clock/reference amplitude..... Sine wave: 0.65 to 2.8 Vpp (0 to 13 dBm)  
 Square wave: 0.2 to 2.8 Vpp  
 External clock/reference impedance ..... 50 Ω, AC coupled

### Trigger System

Modes..... Edge, Hysteresis, Window, Video, Digital, Immediate, Software  
 Source..... CH 0, CH 1, TRIG, PXI\_Trig <0.6>, PFI <0.1>, PXI Star, Software  
 Slope..... Rising or falling  
 Hysteresis..... Fully programmable  
 Video trigger..... Negative sync of NTSC, PAL, and SECAM standards  
 Video trigger types..... Any line, specific line, specific field  
 High frequency reject filter..... 50 kHz software selectable  
 Low frequency reject filter..... 50 kHz software selectable  
 Sensitivity..... CH0 and CH1: 2.5% FS up to 50 MHz  
 decreasing to 10% FS at 150 MHz  
 TRIG: 2.5% up to 100 MHz decreasing to 10% at 200 MHz

Level accuracy..... CH0, CH1: ±4.7% FS up to 10 MHz  
 TRIG: ±3.5% FS up to 10 MHz  
 Time resolution..... 50 ps with time-to-digital converter enabled  
 Holdoff<sup>5</sup> ..... 2 μs to 171.79 s, software selectable

### External Trigger Channel (TRIG)

Impedance ..... 1 MΩ || 22 pF  
 Vertical Range..... ±5 V  
 Coupling..... AC, DC

### Power Requirements (typical)

+3.3 VDC	+5 VDC	+12 VDC	-12 VDC	Total Power
1.3 A	1.7 A	130 mA	270 mA	17.6 W

### Environment

Operating temperature<sup>6</sup>..... 0 to 55 °C (Meets IEC-60068-2-1 and IEC-60068-2-2)  
 Storage temperature..... -40 to 71 °C (meets IEC-60068-2-1 and 60068-2-2)  
 Relative humidity..... 10 to 90 %, noncondensing (meets 60068-2-56)

### Calibration

Self-calibration..... Gain, offset, frequency response, triggering, and timing for all input ranges  
 External calibration interval..... 2 years

### Certification and Compliances

CE Mark compliance

For detailed specifications on power, environmental, safety, and physical dimensions see PXI-5124 detailed specifications.

1. Bandwidth on the 1 MΩ input is 145 MHz for 0 to 40 °C and 135 MHz for 40 to 55 °C

2. NI PXI-5124 is also capable of continuous acquisition

3. Measured on ranges up to 2 V on 50 Ω input with two tones at 10.2 MHz and 11.2 MHz, each at -7 dBFS

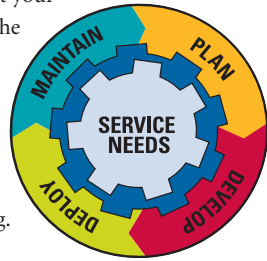
4. Includes effects of converter aperture and clock circuitry jitter from 100 Hz to 100 kHz

5. Time-digital converter disabled

6. 0 to 45 °C in PXI-101x and 1000/B chassis

# NI Services and Support

NI has the services and support to meet your needs around the globe and through the application life cycle – from planning and development through deployment and ongoing maintenance. We offer services and service levels to meet customer requirements in research, design, validation, and manufacturing. Visit [ni.com/services](http://ni.com/services).



## Training and Certification

NI training is the fastest, most certain route to productivity with our products. NI training can shorten your learning curve, save development time, and reduce maintenance costs over the application life cycle. We schedule instructor-led courses in cities worldwide, or we can hold a course at your facility. We also offer a professional certification program that identifies individuals who have high levels of skill and knowledge on using NI products. Visit [ni.com/training](http://ni.com/training).

## Professional Services

Our Professional Services Team is comprised of NI applications engineers, NI Consulting Services, and a worldwide NI Alliance Partner Program of more than 600 independent consultants and integrators. Services range from start-up assistance to turnkey system integration. Visit [ni.com/alliance](http://ni.com/alliance).



## OEM Support

We offer design-in consulting and product integration assistance if you want to use our products for OEM applications. For information about special pricing and services for OEM customers, visit [ni.com/oem](http://ni.com/oem).

## Local Sales and Technical Support

In offices worldwide, our staff is local to the country, giving you access to engineers who speak your language. NI delivers industry-leading technical support through online knowledge bases, our applications engineers, and access to 14,000 measurement and automation professionals within NI Developer Exchange forums. Find immediate answers to your questions at [ni.com/support](http://ni.com/support).

We also offer service programs that provide automatic upgrades to your application development environment and higher levels of technical support. Visit [ni.com/ssp](http://ni.com/ssp).

## Hardware Services

### NI Factory Installation Services

NI Factory Installation Services (FIS) is the fastest and easiest way to use your PXI or PXI/SCXI™ combination systems right out of the box. Trained NI technicians install the software and hardware and configure the system to your specifications. NI extends the standard warranty by one year on hardware components (controllers, chassis, modules) purchased with FIS. To use FIS, simply configure your system online with [ni.com/pxiadvisor](http://ni.com/pxiadvisor).

## Calibration Services

NI recognizes the need to maintain properly calibrated devices for high-accuracy measurements. We provide manual calibration procedures, services to recalibrate your products, and automated calibration software specifically designed for use by metrology laboratories. Visit [ni.com/calibration](http://ni.com/calibration).

## Repair and Extended Warranty

NI provides complete repair services for our products. Express repair and advance replacement services are also available. We offer extended warranties to help you meet project life-cycle requirements. Visit [ni.com/services](http://ni.com/services).



[ni.com](http://ni.com) • (800) 433-3488

National Instruments • Tel: (512) 683-0100 • Fax: (512) 683-9300 • [info@ni.com](mailto:info@ni.com)

© 2004 National Instruments Corporation. All rights reserved. LabVIEW, LabWindows/CVI, Measurement Studio and ni.com are trademarks of National Instruments. Other product and company names listed are trademarks or trade names of their respective companies.