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Product Brochure

PXI Oscilloscopes

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PXI Oscilloscope Portfolio Overview

NI offers a wide range of oscilloscope options with variable bandwidths, sample rates, analog-to-digital (ADC) resolutions, voltage ranges, and channel densities. Since all NI PXI Oscilloscopes use the same software driver, you can mix and match models to optimize performance and cost for your various application needs.

8-Bit Oscilloscopes: Optimized for Cost

PXIe-5110
100 MHz
1 GS/s
2 channels

PXIe-5111
350 MHz
3 GS/s
2 channels

PXIe-5113
500 MHz
3 GS/s
2 channels

10-Bit Oscilloscopes: Optimized for Speed

PXIe-5160
500 MHz
2.5 GS/s
2/4 channels

PXIe-5162
1.5 GHz
5 GS/s
2/4 channels

12-Bit and 14-Bit Oscilloscopes: Optimized for Resolution and Density

PXI-5105
60 MHz
60 MS/s
2 channels
12-bits

PXIe-5122
100 MHz
100 MS/s
2 channels
14-bits

PXIe-5163
200 MHz
1 GS/s
2 channels
14-bits

PXIe-5164*
400 MHz
1 GS/s
2 channels
14-bits

PXIe-5170*
100 MHz
250 MS/s
4/8 channels
14-bits

PXIe-5171*
250 MHz
250 MS/s
8 channels
14-bits

PXIe-5172*
100 MHz
250 MS/s
4/8 channels
14-bits

24-Bit Oscilloscope: Optimized for Flexible Resolution

PXI-5922
6 MHz
500 kS/s
2 channels

*Programmable FPGA

Oscilloscope Probes

An oscilloscope probe is a fundamental part of an analog measurement system. Without an appropriate probe, the best oscilloscope is useless, so you need to choose the right probe to connect the circuit under test to your oscilloscope. The most popular probes are passive probes, which contain only passive circuit elements. Active probes are ideal when you require extremely low capacitance for high-frequency measurements or you need isolation from a given ground reference. Current probes are ideal for applications that require evaluating a current signal in relation to a voltage line. For more information on oscilloscope probe fundamentals, read this white paper.

Single-Ended Passive Probes	SP500X	SP500C	CP500X	CP400X
Bandwidth (Hz)	500 MHz	500 MHz	500 MHz	400 MHz
Attenuation Ratio	10:1	100:1	10:1	10:1
Maximum Input Voltage (V)	±300 V	±300 V	±60 V	±60 V
Input Resistance	10 MΩ	100 MΩ	10 MΩ	10 MΩ
Input Capacitance	11 pF	4.6 pF	10 pF	13 pF
Capacitance Compensation Range	10-25 pF	10-25 pF	7-25 pF	10-40 pF
Rise Time	0.9 ns	0.9 ns	0.7 ns	0.9 ns
Oscilloscope Input Impedance	1 MΩ	1 MΩ	1 MΩ	1 MΩ
Connectors	BNC to Probe Tip	BNC to Probe Tip	BNC to BNC	BNC to BNC

Table 1. NI offers several 400 and 500 MHz passive probes.



Single-Ended and Differential Active Probes	SA1000X	SA1500X	SA2500X
Bandwidth (Hz)	1000 MHz	1500 MHz	2500 MHz
Terminal Configuration	Single-Ended	Single-Ended	Single-Ended
Attenuation Ratio	10:1	10:1	10:1
Maximum Input Voltage	20 V	20 V	20 V
Common-Mode Input Voltage	±8 V	±8 V	±8 V
Differential Input Voltage	-	-	-
Input Resistance	1 MΩ	1 MΩ	1 MΩ
Input Capacitance	0.9 pF	0.9 pF	0.9 pF
Oscilloscope Input Impedance	50 Ω	50 Ω	50 Ω
Connectors	BNC	BNC	BNC or SMA

Table 2. NI active probes range from 800 MHz to 2.5 GHz bandwidth.

Current Probes[1]	CC0550X	CC05120X	CC3050X	CC30100X	CC15010X	CC5002X
Maximum Continuous Current	5 A_{rms}	5 A_{rms}	5 A_{rms}	5 A_{rms}	5 A_{rms}	5 A_{rms}
Output Voltage Rate (Volts per Amp)	1 V/A	1 V/A	0.1 V/A	0.1 V/A	0.01 V/A	0.01 V/A
Bandwidth (Hz)	50 MHz	120 MHz	50 MHz	100 MHz	10 MHz	2 MHz
Rise Time	7 ns	2.9 ns	7 ns	3.5 ns	35 ns	175 ns
Oscilloscope Input Impedance	1 MΩ	1 MΩ	1 MΩ	1 MΩ	1 MΩ	1 MΩ
Connector	BNC	BNC	BNC	BNC	BNC	BNC

Table 3. NI offers Hioki current probes that range from 5 A_{rms} to 500 A measurements.
[1]Requires the use of the 2-channel PS-OP01 power supply or 4-channel PS-OP02 power supply.

FIGURE 1

Hioki current probes require power supplies and may need short cable adapters if you are using them with SMA/SMB scopes or BNC scopes with closely adjacent channels.

PXI Oscilloscope & Probe Compatibility

Not all PXI Oscilloscopes can be used with all probes. For example, a passive probe's 1 MΩ input capacitance range may not accommodate the 1 MΩ input capacitance of a certain oscilloscope, and current probes can be used only with oscilloscopes that have a 1 MΩ input. All of NI's oscilloscope probes have BNC connections, so PXI Oscilloscopes with SMA or SMB front panel connectors require adapters, as noted in Table 4.

NI Oscilloscope	5105	5110	5111	5113	5122	5160	5162	5163	5164	5170	5171	5172	5922
Oscilloscope Connector	SMB	BNC	BNC	BNC	BNC	BNC	BNC	BNC	BNC	SMA	SMA	SMB	BNC
Single-Ended Passive Probes													
SP500X	-	Y	Y	Y	-	Y	Y	Y	Y	-	-	Y[1]	-
SP500C	-	Y	Y	Y	-	Y	Y	Y	Y	-	-	Y[1]	-
CP500X	-	Y	Y	Y	-	Y	Y	Y	Y	-	-	Y[1]	-
CP400X	-	Y	Y	Y	Y	Y	Y	Y	Y	-	-	Y[1]	-
Single-Ended and Differential Active Probes													
SA1000X[3]	Y[1]	Y	Y	Y	Y	Y	Y	Y	Y	Y[2]	Y[2]	Y[1]	Y
SA1500X[3]	Y[1]	Y	Y	Y	Y	Y	Y	Y	Y	Y[2]	Y[2]	Y[1]	Y
SA2500X[3]	Y[1]	Y	Y	Y	Y	Y	Y	Y	Y	Y[2]	Y[2]	Y[1]	Y
Current Probe[3]													
CC0550X	Y[1]	Y	Y	Y	Y	Y	Y	Y	Y	-	-	Y[1]	Y
CC05120X	Y[1]	Y	Y	Y	Y	Y	Y	Y	Y	-	-	Y[1]	Y
CC3050X	Y[1]	Y	Y	Y	Y	Y	Y	Y	Y	-	-	Y[1]	Y
CC30100X	Y[1]	Y	Y	Y	Y	Y	Y	Y	Y	-	-	Y[1]	Y
CC15010X	Y[1]	Y	Y	Y	Y	Y	Y	Y	Y	-	-	Y[1]	Y
CC5002X	Y[1]	Y	Y	Y	Y	Y	Y	Y	Y	-	-	Y[1]	Y

Table 4. PXI Oscilloscopes differ in their compatibility with passive, active, and current probes.

[1] Requires SMB to BNC adapter.

[2] Requires SMA to BNC adapter.

[3] The use of some active or current probes on adjacent BNC oscilloscope channels may require the use of short BNC to BNC adapters due to proximity.

8-Bit Oscilloscopes

PXIe-5110, PXIe-5111, PXIe-5113

- Software: Includes InstrumentStudio™ support for interactive measurements, API support for LabVIEW and text-based languages, shipping examples, and detailed help files
- Two analog channels
- 100 MHz to 500 MHz of analog bandwidth
- Edge, digital, immediate, and software standard triggers
- Additional window, hysteresis, glitch, runt, and width triggers on PXIe-5110, 5111, and 5113

Optimized for Cost

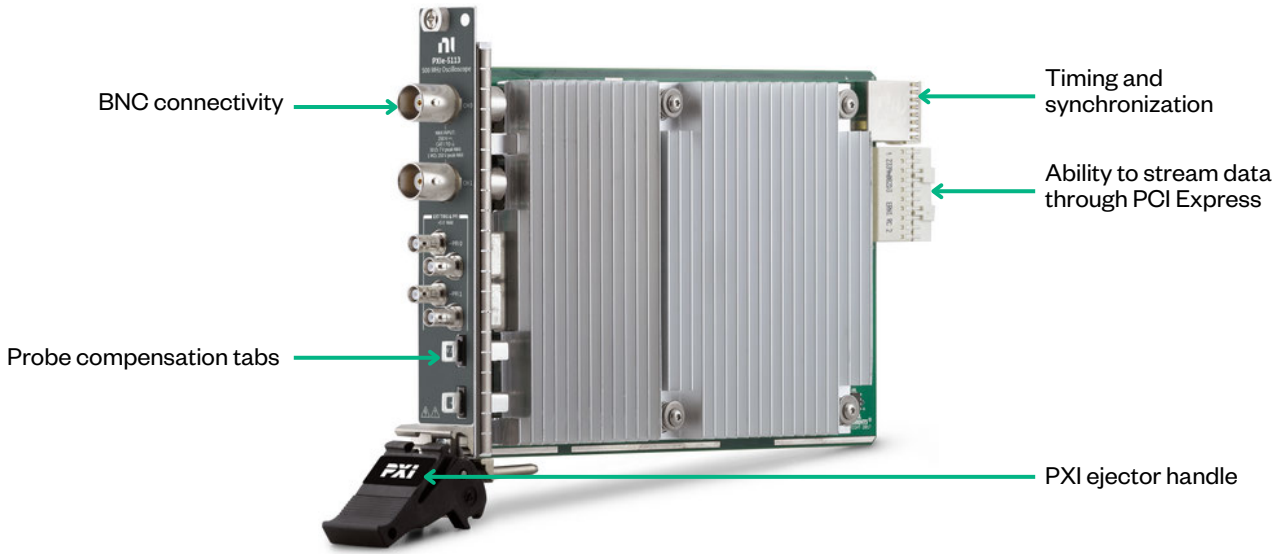
NI's 8-bit PXI Oscilloscopes range from the lowest cost 100 MHz PXIe-5110 model to the 500 MHz PXIe-5113 model. They provide the measurement performance of traditional box oscilloscopes in a form factor better suited for automated test and high-channel-count applications. Programmable settings for coupling, input impedance, voltage range, and filtering offer flexibility for automated and partially automated applications. Combined with the high throughput and low latency of the PCI Express bus, they are better equipped than LAN and GPIB alternatives to sequence measurements quickly and minimize test time. In addition, you can use the PXI backplane to easily synchronize PXI Oscilloscopes with either each other or additional instrument types for mixed-signal tests.

8-Bit PXI Oscilloscopes

	PXIe-5110	PXIe-5111	PXIe-5113
50 Ω Bandwidth	100 MHz	350 MHz	500 MHz
1 MΩ Bandwidth	100 MHz	350 MHz	500 MHz
ADC Resolution	8-bit	8-bit	8-bit
Channels	2	2	2
Maximum Sample Rate	1 GS/s Divide by number of channels used	3 GS/s Divide by number of channels used	3 GS/s Divide by number of channels used
50 Ω Full Scale Input Voltage Range	0.04 to 10 V_{pk-pk}	0.04 to 10 V_{pk-pk}	0.04 to 10 V_{pk-pk}
50 Ω Maximum Voltage Offset (Depends on Input Range)	±5 V	±5 V	±5 V
1 MΩ Full Scale Input Voltage Range	0.04 to 40 V_{pk-pk}	0.04 to 40 V_{pk-pk}	0.04 to 40 V_{pk-pk}
1 MΩ Maximum Voltage Offset (Depends on Input Range)	±100 V	±100 V	±100 V
Input Channel Connector	BNC	BNC	BNC
Input Capacitance (Characteristic)	16 pF	15.4 pF	15.4 pF
User-Programmable FPGA	N/A	N/A	N/A
Maximum External Calibration Cycle	2 Years	2 Years	2 Years

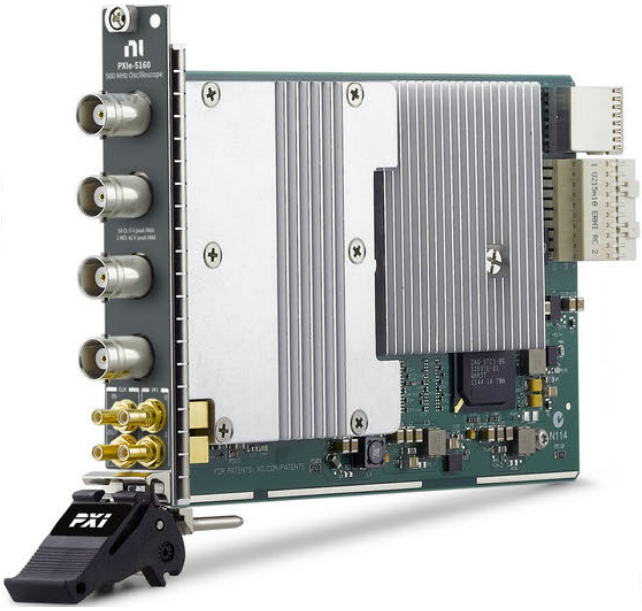
Table 5: NI's 8-bit oscilloscopes range from 100 MHz to 500 MHz options.

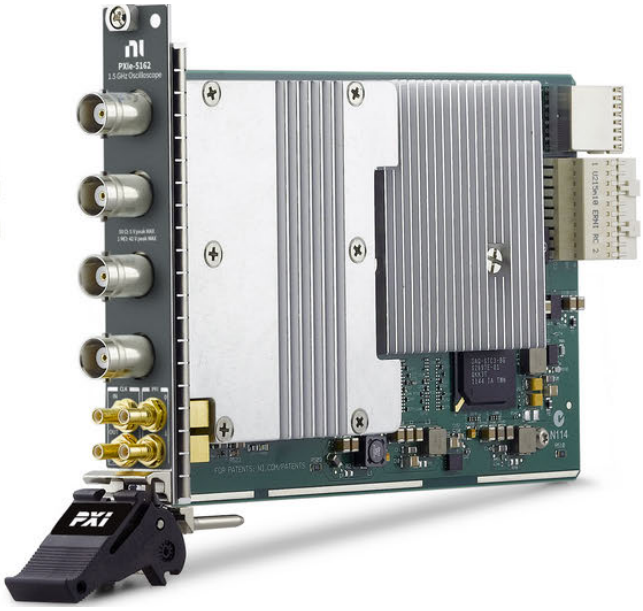
Detailed View of PXIe-5113 Oscilloscope



10-Bit Oscilloscopes

PXIe-5160, PXIe-5162





- Software: Includes InstrumentStudio™ support for interactive measurements, API support for LabVIEW and text-based languages, shipping examples, and detailed help files
- Two and four analog channels
- 500 MHz to 1.5 GHz of analog bandwidth
- Edge, digital, immediate, and software standard triggers

Optimized for Speed

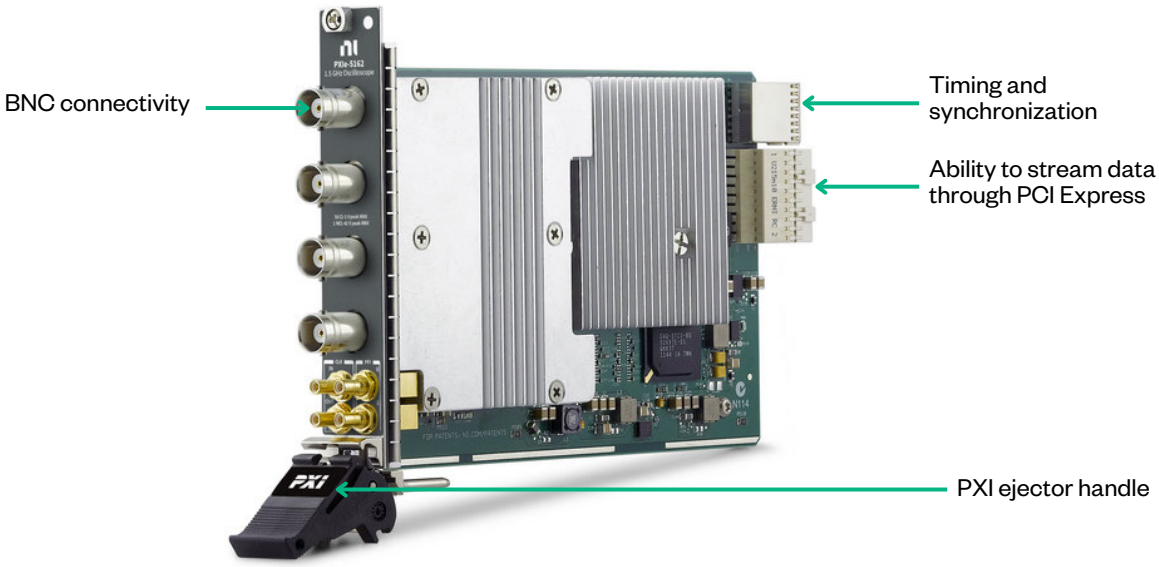
NI's 10-bit PXI Oscilloscopes optimize the opposing specifications of sample rate, ADC resolution, and channel density into high-performing, general-purpose products. They provide the measurement performance of traditional box oscilloscopes in a form factor better suited for automated test and high-channel-count applications. Programmable settings for coupling, input impedance, voltage range, and filtering offer flexibility for automated and partially automated applications. Combined with the high throughput and low latency of the PCI Express bus, they are better equipped than LAN and GPIB alternatives to sequence measurements quickly and minimize test time. In addition, you can use the PXI backplane to easily synchronize PXI Oscilloscopes with either each other or additional instrument types for mixed-signal tests.

10-Bit PXI Oscilloscopes

	PXIe-5160	PXIe-5162
50 Ω Bandwidth	500 MHz	1.5 GHz
1 MΩ Bandwidth	300 MHz	300 MHz
ADC Resolution	10-bit	10-bit
Channels	2 or 4	2 or 4
Maximum Sample Rate	2.5 GS/s (1 ch or 2 ch) 1.25 GS/s (4 ch)	5 GS/s Divide by number of channels used
50 Ω Full Scale Input Voltage Range	0.05 to 5 V_{pk-pk}	0.05 to 5 V_{pk-pk}
50 Ω Maximum Voltage Offset (Depends on Input Range)	±1.5 V	±1.5 V
1 MΩ Full Scale Input Voltage Range	0.05 to 50 V_{pk-pk}	0.05 to 5 V_{pk-pk}
1 MΩ Maximum Voltage Offset (Depends on Input Range)	±30 V	±30 V
Input Channel Connector	BNC	BNC
Input Capacitance (Characteristic)	15 pF	15 pF
User-Programmable FPGA	N/A	N/A
Maximum External Calibration Cycle	2 Years	2 Years

Table 6: NI's 10-bit oscilloscopes range from 500 MHz to 1.5 GHz options.

Detailed View of PXIe-5162 Oscilloscope



12-Bit and 14-Bit Oscilloscopes

PXIe-5105, PXIe-5122, PXIe-5163, PXIe-5164, PXIe-5170, PXIe-5171, PXIe-5172

- Software: Includes InstrumentStudio™ support for interactive measurements, API support for LabVIEW and text-based languages, shipping examples, and detailed help files
- Two, four, and eight analog channel options
- 60 MHz to 400 MHz of analog bandwidth
- Edge, window, hysteresis, digital, immediate, and software standard triggers
- Additional video trigger on PXIe-5122
- User-programmable Xilinx Kintex-7 FPGA on PXIe-5164, 5170, 5171, and 5172

Optimized for Resolution and Density

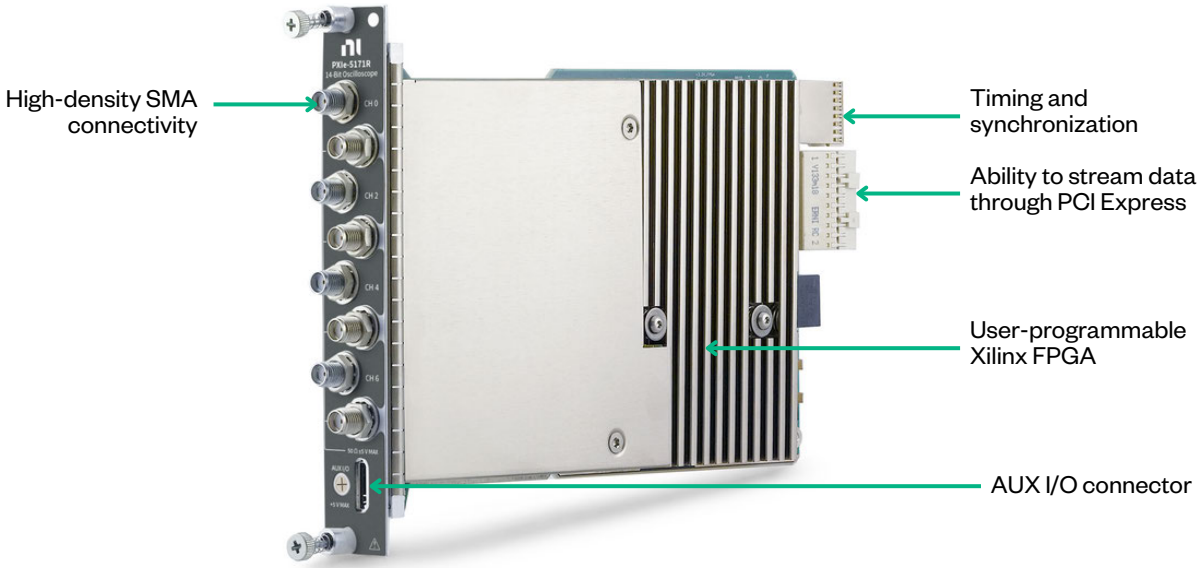
NI's 12-bit and 14-bit PXI Oscilloscopes are optimized for high ADC resolution and often high-channel density as well. They provide the measurement performance of traditional box oscilloscopes in a form factor better suited for automated test and high-channel-count applications. Programmable settings for coupling, input impedance, voltage range, and filtering offer flexibility for automated and partially automated applications. Combined with the high throughput and low latency of the PCI Express bus, they are better equipped than LAN and GPIB alternatives to sequence measurements quickly and minimize test time. In addition, you can use the PXI backplane to easily synchronize PXI Oscilloscopes with either each other or additional instrument types for mixed-signal tests. Several 14-bit PXI Oscilloscopes also have a user-programmable Xilinx Kintex-7 FPGA for implementing custom triggers or intensive inline processing.

12-Bit and 14-Bit PXI Oscilloscopes

	PXIe-5105	PXIe-5122	PXIe-5163	PXIe-5164	PXIe-5170	PXIe-5171	PXIe-5172
50 Ω Bandwidth	60 MHz	100 MHz	200 MHz	400 MHz	100 MHz	250 MHz	100 MHz
1 MΩ Bandwidth	60 MHz	100 MHz	200 MHz	300 MHz	N/A	N/A	100 MHz
ADC Resolution	12-bit	14-bit	14-bit	14-bit	14-bit	14-bit	14-bit
Channels	8	2	2	2	4 or 8	8	8
Maximum Sample Rate	60 MS/s Independent sampling channels	100 MS/s Independent sampling channels	1 GS/s Independent sampling channels	1 GS/s Independent sampling channels	250 MS/s Independent sampling channels	250 MS/s Independent sampling channels	250 MS/s Independent sampling channels
50 Ω Full Scale Input Voltage Range	0.05 to 6 V_{pk-pk}	0.2 to 10 V_{pk-pk}	0.25 to 5 V_{pk-pk}	0.25 to 5 V_{pk-pk}	0.2 to 5 V_{pk-pk}	0.2 to 5 V_{pk-pk}	0.2 to 10 V_{pk-pk}
50 Ω Maximum Voltage Offset (Depends on Input Range)	N/A	±2 V	N/A	N/A	N/A	N/A	±2.5 V
1 MΩ Full Scale Input Voltage Range	0.05 to 30 V_{pk-pk}	0.2 to 20 V_{pk-pk}	0.25 to 100 V_{pk-pk}	0.25 to 100 V_{pk-pk}	N/A	N/A	0.2 to 80 V_{pk-pk}
1 MΩ Maximum Voltage Offset (Depends on Input Range)	N/A	±5 V	±248.75 V	±248.75 V	N/A	N/A	±20 V
Input Channel Connector	SMB	BNC	BNC	BNC	SMA	SMA	SMB
Input Capacitance (Characteristic)	29 pF	29 pF	20.2 pF	20.2 pF	N/A	N/A	16 pF
User-Programmable FPGA	N/A	N/A	N/A	Xilinx Kintex-7 410T	Xilinx Kintex-7 325T	Xilinx Kintex-7 410T	Xilinx Kintex-7 325T or 410T
Maximum External Calibration Cycle	2 Years	2 Years	2 Years	2 Years	2 Years	2 Years	2 Years

Table 7: NI's 12-bit and 14-bit oscilloscopes range from 60 MHz to 400 MHz options.

Detailed View of PXIe-5171 Oscilloscope



PXIe-517x Series Highlight: Key Features

High-Density, High-Performance, Simultaneously Sampled Channels

To enable their compact, flexible, and powerful design, PXIe-517x oscilloscopes take advantage of multiple technological advances, including low-power, high-resolution ADCs that use the JESD204B high-speed serial interface for data transfer and high-performance, low-power Xilinx Kintex-7 FPGAs.

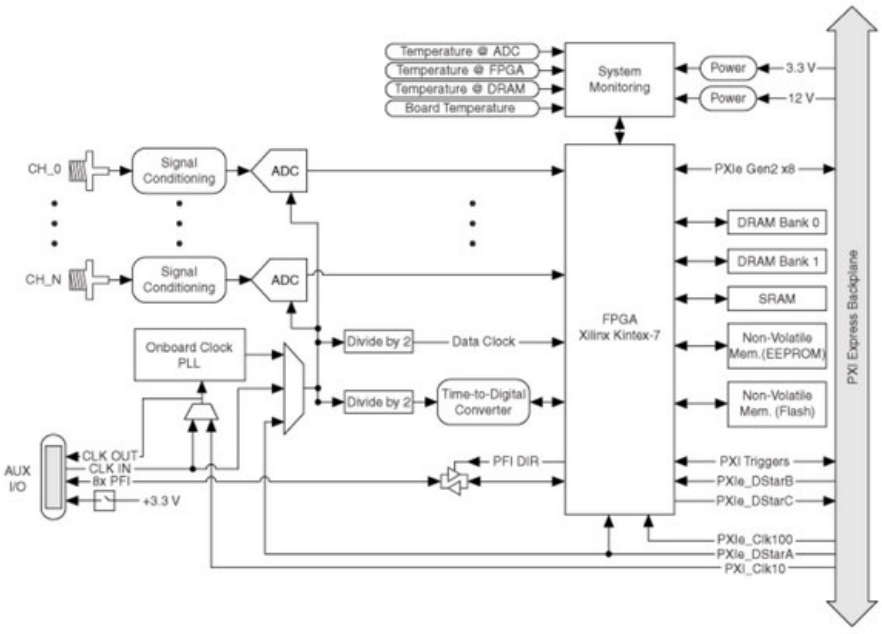


FIGURE 2

PXIe-517x oscilloscopes are built around a 14-bit Analog Devices ADC and a Xilinx Kintex-7 FPGA.

The First Oscilloscopes with LabVIEW-Programmable FPGAs

The PXIe-517x oscilloscopes are the first to include FPGAs that you can target and reprogram with the LabVIEW FPGA Module. With this leap forward in instrumentation technology, you can define the operation of your oscilloscopes to meet your needs now and in the future as your devices and experiments change. PXIe-517x oscilloscopes give you excellent channel density, accuracy, and measurement flexibility along with a user-programmable FPGA for implementing custom triggers or inline processing. Future-proof your test equipment and improve your test yield with PXIe-517x reconfigurable oscilloscopes.

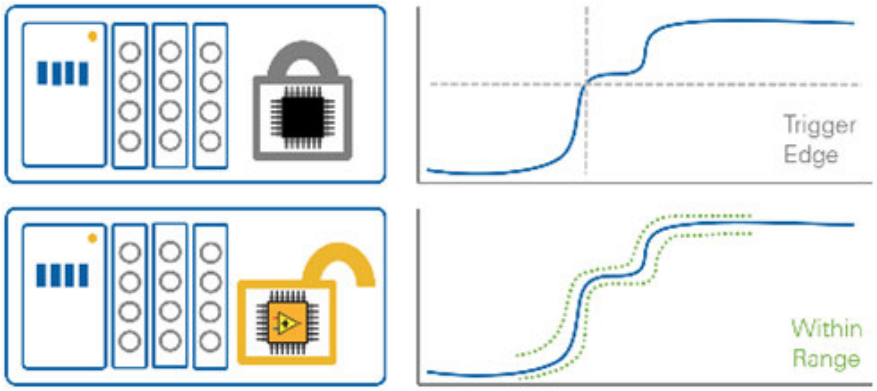


FIGURE 3

With the user-programmable FPGA in PXIe-517x oscilloscopes, you can customize the firmware of those oscilloscopes to achieve your required results.

PXIe-5164 Highlight

Wide Dynamic Range ADC and Front End

The PXIe-5164 departs from the usual oscilloscope circuit arrangement to achieve a low noise floor and high measurement accuracy. Figure 4 shows the difference in the block diagrams of typical oscilloscopes, in which the 50 Ω mode is accomplished by simply connecting a 50 Ω resistor in parallel with the front panel input, and the approach taken in the PXIe-5164 oscilloscope, in which a dedicated 50 Ω path bypasses the 1 MΩ section and connects directly to the low-impedance amplifier section. Using one amplifier rather than several eliminates the noise and distortion generated during the multiple stages.

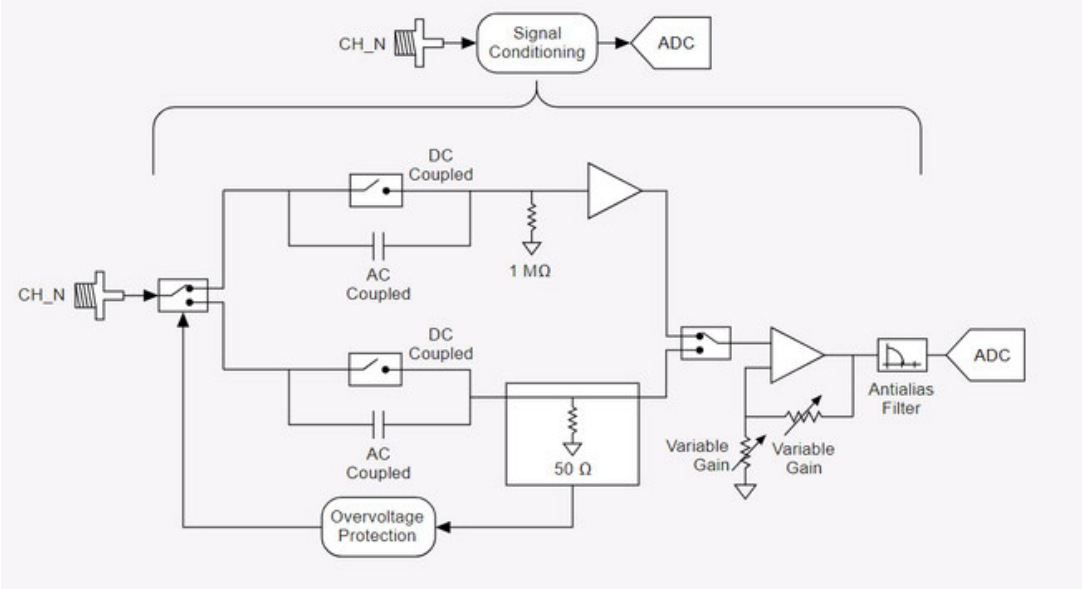


FIGURE 4

The PXIe-5164 oscilloscope has a signal path optimized for measurement accuracy by bypassing the 1 MΩ buffer on the 50 Ω path and having only a single gain stage. A typical oscilloscope signal path is optimized for high impedance and voltage.

A time domain plot of a one-time-event communications signal riding on a digital pulse taken with a box scope and a PXIe-5164 oscilloscope clearly illustrates the superior dynamic range of the PXIe-5164 over a popular 8-bit box oscilloscope. The communications signal is nearly indiscernible in the data captured with the 8-bit box scope but easily recognizable and decodable in the data captured by the PXIe-5164 oscilloscope.

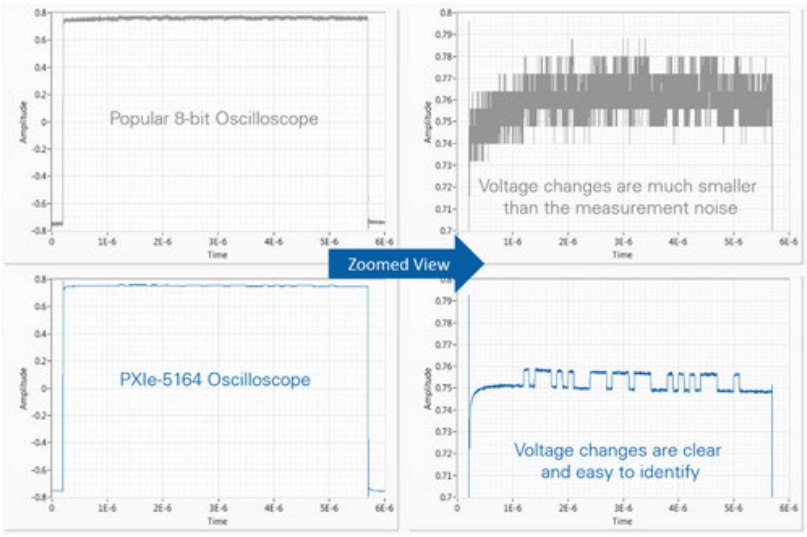


FIGURE 5

Compare the time domain plots of a popular 8-bit box oscilloscope with the PXIe-5164 oscilloscope that are both sampling an identical one-time-event communications signal riding on a digital pulse. The communications signal is nearly indiscernible on the 8-bit box scope but easily recognizable and decodable on the PXIe-5164.

The superior dynamic range of the PXIe-5164 is even more pronounced in the frequency domain. The noise floor of the PXIe-5164 is a significant 22 dB lower than that of the popular 8-bit oscilloscope. The PXIe-5164 also has the better harmonic distortion performance.

Digital Signal Processing Stabilizes and Equalizes the Magnitude and Phase Responses

Digital filtering can offer a considerable improvement in range-to-range, channel-to-channel, and even unit-to-unit variability in the frequency and step response of an oscilloscope's analog front end. The PXIe-5164 oscilloscope has a 16-tap finite impulse response (FIR) filter in the FPGA and in line with the ADC data stream to realize a very flat frequency response of ±0.35 dB up to 330 MH. Figure 6 shows a typical PXIe-5164 oscilloscope response in which the deviation from 0 dB is less than 0.022 dB for all ranges and channels and a measured step response in which the symmetry in the waveform indicates the desired linear phase characteristic.

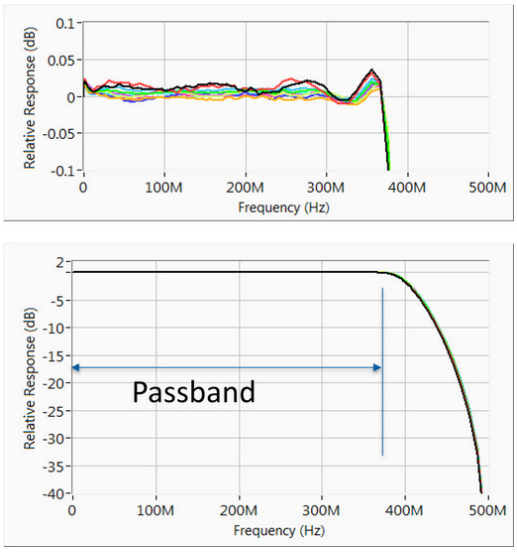


FIGURE 6

This graph shows the frequency and step response of a typical PXIe-5164 oscilloscope on the 50 Ω path up to the full bandwidth. The responses of all ranges and channels of one module are superimposed, and the maximum deviation in the passband is 0.022.

24-Bit Oscilloscope

PXI-5922

- Software: Includes InstrumentStudio™ support for interactive measurements, API support for LabVIEW and text-based languages, shipping examples, and detailed help files
- Up to -114 dBc spurious-free dynamic range (SFDR) and noise floor of -120 dBFS
- Two simultaneously sampled channels with 24-bit resolution up to 500 kS/s and 16-bit resolution up to 15 MS/s
- Integrated anti-alias protection for all sampling rates
- Edge, window, hysteresis, digital, immediate, and software standard triggers

Optimized for Flexible Resolution

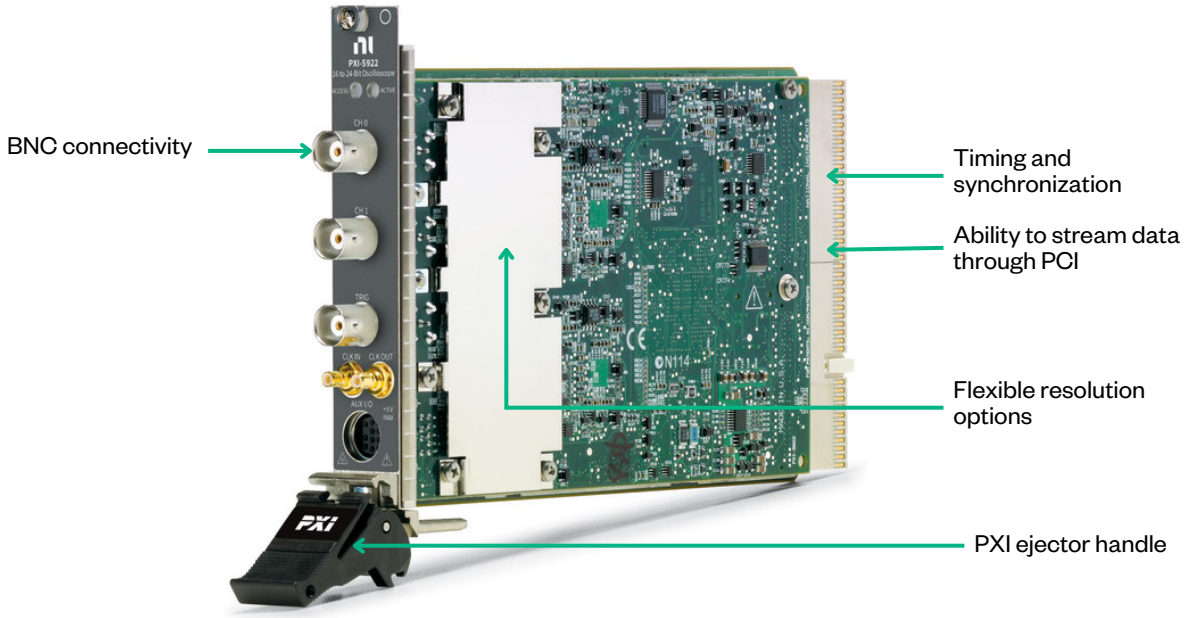
The PXI-5922 is one of the most sensitive analog signal measurement instruments on the market, with 24 bits of effective measurement resolution, up to -114 dBc SFDR, and a noise floor as low as -120 dBFS. In general, PXI Oscilloscopes provide the measurement performance of traditional box oscilloscopes in a form factor better suited for automated test and high-channel-count applications. Programmable settings for coupling, input impedance, voltage range, and filtering offer flexibility for automated and partially automated applications. Combined with the high throughput and low latency of the PCI Express bus, they are better equipped than LAN and GPIB alternatives to sequence measurements quickly and minimize test time. In addition, you can use the PXI backplane to easily synchronize PXI Oscilloscopes with either each other or additional instrument types for mixed-signal tests.

24-Bit PXI Oscilloscope

	PXI-5922
50 Ω Bandwidth	6 MHz
1 MΩ Bandwidth	6 MHz
Resolution (Bits) by Sample Rate	24-bit at 50 kS/s 24-bit at 500 kS/s 22-bit at 1 MS/s 20-bit at 5 MS/s 18-bit at 10 MS/s 16-bit at 15 MS/s
Channels	8
Maximum Sample Rate (Independent Sampling Channels)	15 MS/s
50 Ω Full Scale Input Voltage Range	2 to 10 V_{pk-pk}
50 Ω Maximum Voltage Offset (Depends on Input Range)	N/A
1 MΩ Full Scale Input Voltage Range	2 to 10 V_{pk-pk}
1 MΩ Maximum Voltage Offset (Depends on Input Range)	N/A
Input Channel Connector	BNC
Input Capacitance (Characteristic)	60 pF
User-Programmable FPGA	N/A
Maximum External Calibration Cycle	2 Years

Table 8: The PXI-5922 establishes a trade-off between effective measurement resolution and available sample rates.

Detailed View of PXI-5922 Oscilloscope



Flex II ADC: Flexible Resolution Technology Highlight

The PXI-5922 is a flexible resolution oscilloscope that you can use to acquire data at different sampling rates to achieve variable resolutions depending on your application needs. For example, at sampling rates up to 500 kS/s, the PXI-5922 delivers 24-bit resolution. This same module, without any changes, can trade resolution for sampling speed and sample at 15 MS/s with 16-bit resolution.

With its flexible resolution and high dynamic range, the PXI-5922 is the first universal instrument for dynamic measurements. Just as the digital multimeter (DMM) is used as a universal measurement device for DC measurements like voltage, current, and resistance, the PXI-5922 revolutionizes AC measurements, combining the measurement capabilities of many instruments into one. With unmatched performance over a range of sampling rates up to 15 MS/s, this oscilloscope combined with powerful LabVIEW software can be used to replace the measurement capabilities of many traditional instruments such as audio analyzers, spectrum analyzers, IF oscilloscopes, DC and rms voltmeters, and frequency counters.

Several applications including audio, communications, and ultrasound demand extremely high dynamic performance. Though traditional instrumentation performance has improved incrementally, it has not kept pace with resolution and dynamic range requirements. The PXI-5922 introduces an unprecedented expansion in dynamic range and resolution.

Key Features

In general, PXI Oscilloscopes provide the measurement performance of traditional box oscilloscopes in a form factor better suited for automated test and high-channel-count applications. Various advantages include integration with other instrument types, synchronization for high-channel-count systems, superior data throughput and lower bus latency, deep onboard memory, and debug monitoring and control support in InstrumentStudio software.

Synchronization and Integration

NI oscilloscopes use the inherent timing and synchronization capabilities of the PXI platform to communicate with switches and other instruments within the PXI chassis. Using the timing features of the PXI chassis and additional timing software, you can achieve synchronization of <10 ps between channels of multiple oscilloscopes. NI oscilloscopes can also “handshake” with NI waveform generators by sending and receiving hardware-timed triggers over the PXI backplane, scanning through a list of frequencies in a scan list stored in memory onboard the waveform generator. This method of scanning removes the software overhead associated with traditional scan lists and helps you create a deterministic scan list for faster test execution with more repeatable timing.

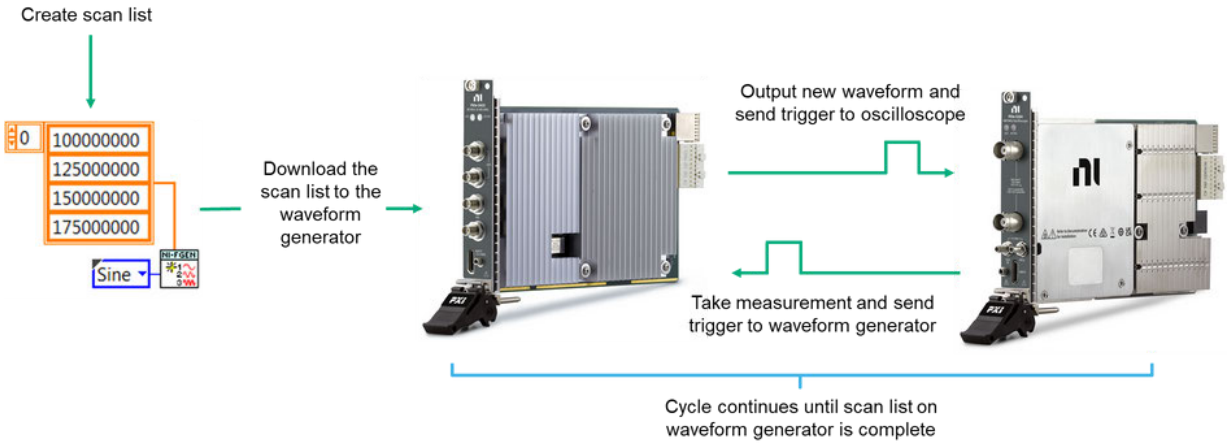


FIGURE 7

Timing and Synchronization

You also can implement the timing and synchronization of multiple instruments through NI-TClk. It aligns the sample clocks of multiple instruments in a single chassis or across multiple chassis using a timing and control module to distribute the 10 MHz reference clock and triggers from a master chassis to all worker chassis. Learn more about NI-TClk timing and synchronization.

Avoid Test System Downtime with CableSense™

NI's PXIe-511x series as well as the PXIe-5160 and PXIe-5162 models work with CableSense technology by incorporating a pulse generator behind the oscilloscope channel's 50 Ω path. Like a traditional time-domain reflectometer (TDR), the PXI oscilloscope sends a pulse along the entirety of the electrical path, allowing for the characterization of the impedance or reflection coefficient over time. This enables the early detection of common automated test equipment (ATE) connection issues without disrupting the ongoing test. By creating limit masks from a known, golden setup, you can programmatically verify the system's physical setup against these known masks. This automates the detection of both major and minor failures, which ensures repeatability and the prevention of false failures. Learn more about avoiding test system downtime using NI's CableSense technology.

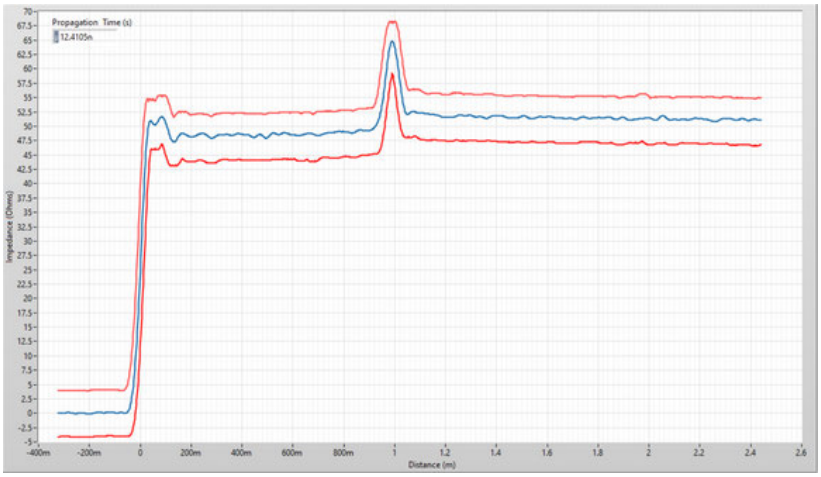


FIGURE 8

The CableSense pulse passes the mask check, meaning that the setup has not varied from its known, golden setup.

Self-Calibration and Two-Year Guaranteed Specifications

NI oscilloscopes offer self-calibration, which is a unique feature that corrects for all DC gain and offset drifts within the instrument using a precision, high-stability internal voltage. Using the self-calibration feature makes NI oscilloscopes highly accurate and stable at any operating temperature—well outside the traditional 18 °C to 28 °C range.

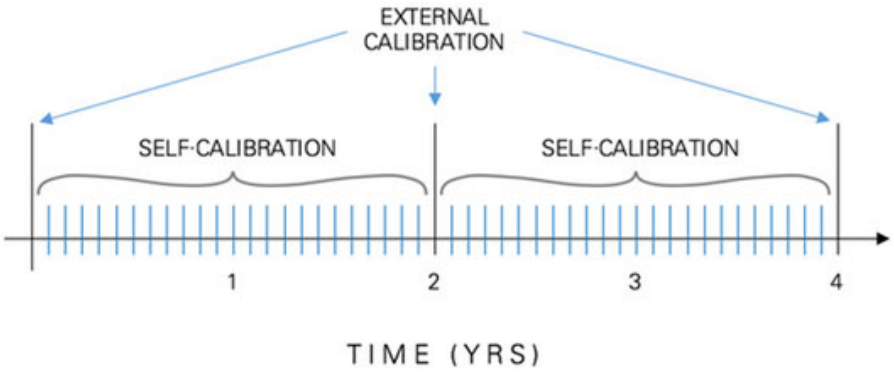


FIGURE 9

NI Self-Calibration

Performing self-calibration takes only a few minutes and requires no external calibrator, which minimizes the maintenance burden of deployed systems. Most NI oscilloscopes have up to a two-year external calibration cycle thanks to the self-calibration precision circuitry. Visit ni.com to learn more about NI's calibration services.

Software Overview

NI-SCOPE Driver and Application Programming Interface (API)

In addition to the InstrumentStudio soft front panel, the NI-SCOPE driver includes a best-in-class API that works with a variety of development options such as LabVIEW, C, C#, Python, and others. To ensure long-term interoperability of oscilloscopes, the NI-SCOPE driver API is the same API used for all past and current NI oscilloscopes. The driver also provides access to help files, documentation, and dozens of ready-to-run shipping examples you can use as a starting point for your application.

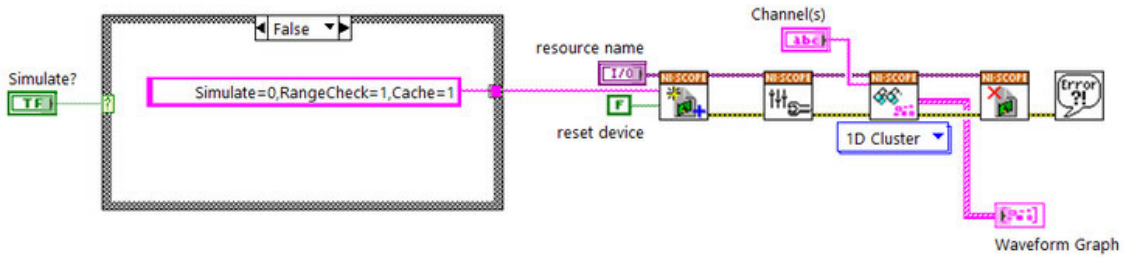


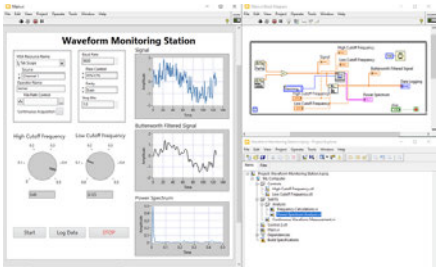
FIGURE 10

Simple LabVIEW code helps you get started taking measurements using NI-SCOPE.

NI Software-The Right Tool for the Job

NI has a variety of software for engineers working on research, validation, and production test applications. Learn about our software that helps engineers perform quick ad-hoc tests, build an automated test system, automate data analysis and reporting, develop test sequences, and more.

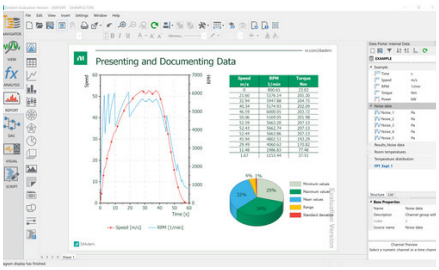
LabVIEW



Graphical programming environment that engineers use to develop automated research, validation, and production test systems.

- Acquire data from NI and third-party hardware and communicate using industry protocols
- Use configurable, interactive display elements
- Take advantage of available analysis functions

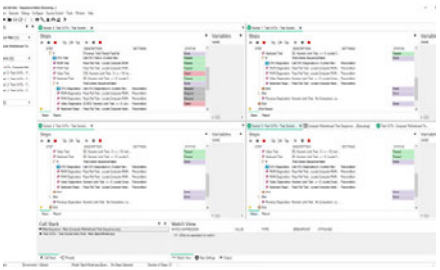
DIAdem



Data analytics software for measurement data search, inspection, analysis, and automated reporting.

- Display data in multiple 2D-axis systems
- Perform calculations with a simple point-and-click interface
- Automate your measurement data analysis workflow, from import to analysis

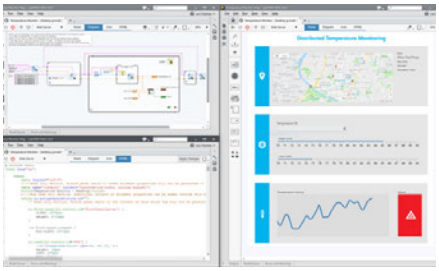
TestStand



Test executive software that accelerates system development for engineers in validation and production.

- Call and execute tests in LabVIEW, Python, C/C++, or .NET
- Conduct complex tasks, such as parallel testing
- Create customer operator interfaces and robust tools for deployment and debugging

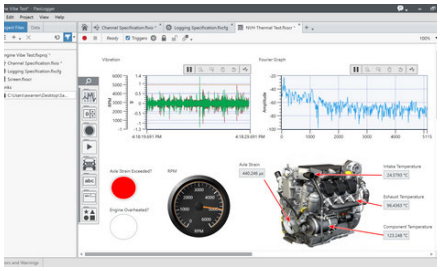
G Web



Development software that helps engineers create web-based user interfaces wihtout the need for traditional web development skills.

- Data transfer APIs for connecting to systems written in LabVIEW, Python, or C#
- Pre-built objects for data display and user input
- Included hosting on SystemLink™ Cloud

FlexLogger™



No-code data acquisition software engineers use to build validation and verification test applications.

- Interactive visualization tools for monitoring tests with drag-and-drop charts, graphs, and controls
- Ability to set alarms that monitor single channels or groups for unexpected behavior

InstrumentStudio™

Application software that simplifies setup and configuration of NI PXI hardware

- Customizable layouts for monitoring multiple instruments at once
- Interactively debug in tandem with code
- TDMS file export containing instrument settings, measurements, and raw data

What is PXI?

Powered by software, PXI is a rugged PC-based platform for measurement and automation systems. PXI combines PCI electrical-bus features with the modular, Eurocard packaging of CompactPCI and then adds specialized synchronization buses and key software features. PXI is both a high-performance and low-cost deployment platform for applications such as manufacturing test, military and aerospace, machine monitoring, automotive, and industrial test. Developed in 1997 and launched in 1998, PXI is an open industry standard governed by the PXI Systems Alliance (PXISA), a group of more than 70 companies chartered to promote the PXI standard, ensure interoperability, and maintain the PXI specification.

Software

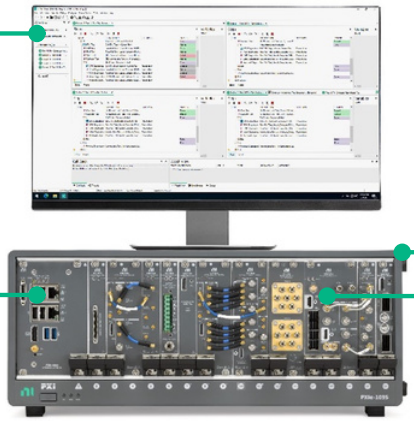
Test Management and Code Development

Code sequencing, database reporting, user management, operator interface, parallel execution, signal processing using LabVIEW, C/C++, .NET, Python

Computer

PXI Embedded Controller

Windows and Real-Time OS options, Intel Xeon processing, peripheral ports, display output, integrated hard drive



Timing and Synchronization

PXI Chassis

PXI Express Gen 3 throughput up to 24 GB/s, sub-nanosecond latency, P2P streaming, integrated triggering

Instrumentation

PXI Modules

DC to mmWave, oscilloscope, programmable power supply, switch/MUX, DMM, VSA, VST, AWG, SMU, DAQ

Integrating the Latest Commercial Technology

By leveraging the latest commercial technology, we can continually deliver high-performance and high-quality products to our users at a competitive price. The latest PCI Express Gen 3 switches deliver higher data throughput, the latest Intel multicore processors facilitate faster and more efficient parallel (multisite) testing, the latest FPGAs from Xilinx help to push signal processing algorithms to the edge to accelerate measurements, and the latest data converters from TI and ADI continually increase the measurement range and performance of our instrumentation.

HIGHER DATA THROUGHPUT

PCI Express Gen 3

PARALLEL TEST EXECUTION

Multicore Processors

MEASUREMENT ACCELERATION

FPGAs

INCREASED MEASUREMENT RANGE

Data Converters

PXI Instrumentation

NI offers more than 600 different PXI modules ranging from DC to mmWave. Because PXI is an open industry standard, nearly 1,500 products are available from more than 70 different instrument vendors. With standard processing and control functions designated to a controller, PXI instruments need to contain only the actual instrumentation circuitry, which provides effective performance in a small footprint. Combined with a chassis and controller, PXI systems feature high-throughput data movement using PCI Express bus interfaces and sub-nanosecond synchronization with integrated timing and triggering.

Oscilloscopes

Sample at speeds up to 12.5 GS/s with 5 GHz of analog bandwidth, featuring numerous triggering modes and deep onboard memory

Digital Instruments

Perform characterization and production test of semiconductor devices with timing sets and per channel pin parametric measurement unit (PPMU)

Frequency Counters

Perform counter timer tasks such as event counting and encoder position, period, pulse, and frequency measurements

Power Supplies & Loads

Supply programmable DC power, with some modules including isolated channels, output disconnect functionality, and remote sense

Switches (Matrix & MUX)

Feature a variety of relay types and row/column configurations to simplify wiring in automated test systems

GPIB, Serial, & Ethernet

Integrate non-PXI instruments into a PXI system through various instrument control interfaces

Digital Multimeters

Perform voltage (up to 1000 V), current (up to 3A), resistance, inductance, capacitance, and frequency/period measurements, as well as diode tests

Waveform Generators

Generate standard functions including sine, square, triangle, and ramp as well as user-defined, arbitrary waveforms

Source Measure Units

Combine high-precision source and measure capability with high channel density, deterministic hardware sequencing, and SourceAdapt transient optimization

FlexRIO Custom Instruments & Processing

Provide high-performance I/O and powerful FPGAs for applications that require more than standard instruments can offer

Vector Signal Transceivers

Combine a vector signal generator and vector signal analyzer with FPGA-based, real-time signal processing and control

Data Acquisition Modules

Provide a mix of analog I/O, digital I/O, counter/timer, and trigger functionality for measuring electrical or physical phenomena

Supporting Documentation

Table 9. PXI Oscilloscope Supporting Documentation

Document Type	8-Bit Oscilloscopes	10-Bit Oscilloscopes	12-Bit and 14-Bit Oscilloscopes	24-Bit Oscilloscopes
Getting Started Guide	PXIe-5110/5111/5113	PXIe-5160/5162	PXIe-5105, PXIe-5122, PXIe-5163, PXIe-5164, PXIe-5170/5171, PXIe-5172	PXIe-5922
Specifications	PXIe-5110, PXIe-5111, PXIe-5113	PXIe-5160, PXIe-5162	PXIe-5105, PXIe-5122, PXIe-5163, PXIe-5164, PXIe-5170, PXIe-5171, PXIe-5172	PXIe-5922

Configure a Custom NI System

NI's online system advisors help you create a custom system based on your requirements. Use the advisor to choose compatible hardware, software, accessories, and services, and then save your selections as configurations for easy quoting and purchasing later. Visit ni.com/Advisor to learn more.

NI Hardware Services

All NI hardware includes a one-year warranty for basic repair coverage and calibration in adherence to NI specifications prior to shipment. PXI systems also include basic assembly and a functional test. NI offers additional entitlements to improve uptime and lower maintenance costs with service programs for hardware. Learn more at ni.com/services/hardware.

	Hardware	Standard	Premium	Description
Duration at Point of Sale	1 year; included	3 years; optional	3 years; optional	NI enhances warranty coverage with additional service benefits provided with a hardware service program.
Maximum Duration with Renewal	≤3 Years w/ Service Program	≤3 Years	≤3 Years	NI maintains the high performance and availability of your hardware for up to three years with a hardware service program.
Extended Repair Coverage	•	•	•	NI restores your device's functionality and includes firmware updates and factory calibration within < 10 working days [4] plus standard shipping time.
System Configuration, Assembly, and Test [1]		•	•	NI technicians assemble, install software in, and test your system per your custom configuration prior to shipment.
Advanced Replacement [2]			•	NI stocks replacement hardware that can be shipped immediately if a repair is needed.
System Return Material Authorization (RMA) [1]			•	NI accepts the delivery of fully assembled systems when performing repair services.
Technical Support	•	•	•	NI provides access to support resources for your hardware.
Calibration Plan (Optional)		Standard	Expedited [3]	NI performs the requested level of calibration at the specified calibration interval for the duration of the service program.

1 This option is only available for PXI, CompactRIO, and CompactDAQ systems.
2 This option is not available for all products in all countries. Contact your local NI sales engineer to confirm availability.
3 Expedited calibration is only available for the Traceable calibration level.
4 This applies to non-RF products only. Standard extended repair coverage for RF products is <15 working days plus standard shipping time.

PremiumPlus Service Program

NI can customize the offerings listed above or offer additional entitlements such as on-site calibration, custom sparing, and life-cycle services through a PremiumPlus Service Program. Contact your NI sales representative to learn more.

Technical Support

NI hardware service programs and warranty include access to technical support provided by NI Support Agents during local business hours. Service requests can be managed online. Additionally, take advantage of NI's award winning online resources and communities.