

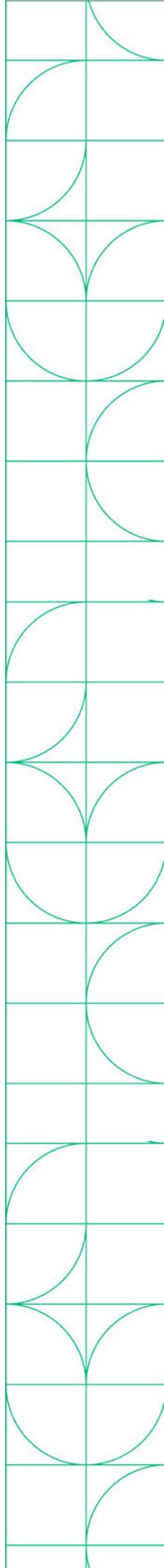


# PXIE-SCP5102 Bundle

Expandable PXI bundle based on PXIe-5111  
Oscilloscope, 350 MHz, 8 bits, 2 Channels, 512 MB

## Specifications

PXIE-1083 and PXIe-5111



# PXI Oscilloscope Bundle

## In the Box

### PXIe-SCP5102 Bundle Bundle P/N: 867012-01



**PXIe-5111**  
(Oscilloscope)



**PXIe-1083**  
(5-Slot PXIe Chassis)

#### Accessories:

- SP500X probe (x2)
- Thunderbolt cable
- Power cable, US

## Recommended Software

### Test Workflow P/N: 788509-35



Test Workflow is a bundle of select NI software featuring engineering-specific tools that help test professionals accomplish anything from their day-to-day work to overcoming their most challenging obstacles.

Test Workflow includes:

- **LabVIEW** - a graphical programming environment engineers use to develop automated research, validation, and production test systems.
- **InstrumentStudio** - an application software that provides an integrated approach to interactive PXI measurements.
- **TestStand** - a test executive software that accelerates system development and deployment for engineers in validation and production.
- And more NI Software!

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# PXle-1083

## Specifications

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# PXIe-1083 Specifications

This document contains specifications for the PXIe-1083 chassis.

## Electrical

The following section provides information about the PXIe-1083 AC input and DC output.

### AC Input

Input rating	100 VAC to 240 VAC, 50 Hz/60 Hz, 6 A to 3 A
Operating voltage range <sup>1</sup>	90 VAC to 264 VAC
Nominal input frequency	50 Hz/60 Hz
Operating frequency range <sup>1</sup>	47 Hz to 63 Hz
Efficiency	78% typical
Over-current protection	Internal fuse in line
Main power disconnect	The AC power cable provides main power disconnect. Do not position the equipment so that it is difficult to disconnect the power cord. The front-panel power switch causes the internal chassis power supply to provide DC power to the PXI Express backplane.



Caution Disconnect power cord to completely remove power.

## DC Output

DC output characteristics of the PXIe-1083.

Voltage Rail	Maximum Current	Load Regulation	Maximum Ripple and Noise (20 MHz BW)
+5V_AUX	1.0 A	±5%	50 mVpp
+12 V	30.1 A	±5%	120 mVpp
+5 V	25.1 A	±5%	50 mVpp
+3.3 V	30.7 A	±5%	50 mVpp
-12 V	0.75 A	±5%	120 mVpp

Maximum total available power for the PXIe-1083 is 293 W.

The maximum combined power available on +3.3 V and +5 V is 180 W.

The maximum power available for each Thunderbolt port is 15 W (5 V/3 A).

Table 1. Backplane Slot Current Capacity

Slot	+5 V	V (I/O)	+3.3 V	+12 V	-12 V	5 V <sub>AUX</sub>
Hybrid Peripheral Slot with PXI-5 Peripheral	-	-	3 A	6 A	-	1 A
Hybrid Peripheral Slot with PXI-1 Peripheral	6 A	5 A	6 A	1 A	1 A	-



**Note** PCI V(I/O) pins in Hybrid Peripheral Slots are connected to +5 V.



**Note** The maximum power dissipated in a peripheral slot should not exceed 58 W. Refer to the **Operating Environment** section for ambient temperature considerations at 58 W.

Over-current protection	All outputs are protected from short circuit and overload, they recover and return to regulation when the overload is removed and the power is cycled.
Over-voltage protection	+3.3 V clamped at 3.7 V to 4.3 V, +5 V clamped at 5.7 V to 6.5 V, +12 V clamped at 13.4 V to 15.6 V

## Chassis Cooling

Module cooling	Forced air circulation (positive pressurization) through one 150 CFM fan
Module slot airflow direction	Bottom of module to top of module
Module intake	Bottom of chassis
Module exhaust	Top, right side of chassis
Slot cooling capacity	58 W; slot 6 supports 58 W cooling with high fan mode
Power supply cooling	Forced air circulation through integrated fans
Power supply intake	Front and left side chassis
Power supply exhaust	Rear of chassis
<b>Minimum chassis cooling clearances</b>	
Above	44.45 mm (1.75 in.)
Rear	44.45 mm (1.75 in.)
Sides	44.45 mm (1.75 in.)
<b>Below</b>	
Rack	44.45 mm (1.75 in.)
Desktop	25.4 mm (1.00 in.)

## Environmental

Maximum altitude	2,000 m (6,560 ft.), 800 mbar (at 25 °C ambient, high fan mode)
Pollution Degree	2

Indoor use only.

## Operating Environment

<p><b>Ambient temperature range</b></p> <p>When all peripheral modules require <math>\leq 38</math> W cooling capacity per slot      0 °C to 50 °C (IEC 60068-2-1 and IEC 60068-2-2.)<sup>2</sup> Meets MIL-PRF-28800F Class 3 low temperature limit and high temperature limit.</p> <p>When any peripheral module requires <math>&gt; 38</math> W cooling capacity per slot      0 °C to 40 °C (IEC 60068-2-1 and IEC 60068-2-2.)<sup>2</sup> Meets MIL-PRF-28800F Class 3 low temperature limit and MIL-PRF-28800F Class 4 high temperature limit.</p>	
Relative humidity range	20% to 80%, noncondensing

## Storage Environment

Ambient temperature range	-40 °C to 71 °C (IEC-60068-2-1 and IEC-60068-2-2.) <sup>[3]</sup> Meets MIL-PRF-28800F Class 3 limits.
Relative humidity range	10% to 95%, noncondensing

## Shock and Vibration

Operational shock	30 g peak, half-sine, 11 ms pulse (IEC-60068-2-27.) <sup>3</sup> Meets MIL-PRF-28800F Class 2 limits.
Operational random vibration	5 to 500 Hz, 0.3 g <sub>rms</sub>
Non-operating vibration	5 to 500 Hz, 2.4 g <sub>rms</sub> (IEC 60068-2-64.) <sup>3</sup> Non-operating test profile exceeds the requirements of MIL-PRF-28800F, Class 3.

## Acoustic Emissions

### Sound Pressure Level (at Operator Position)

(Tested in accordance with ISO 7779. Meets MIL-PRF-28800F requirements.)

#### 38 W Profile

Auto fan (up to 30 °C ambient)	33.7 dBA
High fan	50.8 dBA

#### 58 W Profile

Auto fan (up to 30 °C ambient)	54.7 dBA
High fan	55.3 dBA

## Sound Power Level

#### 38 W Profile

Auto fan (up to 30 °C ambient)	44.9 dBA
High fan	60.3 dBA

**58 W Profile**

Auto fan (up to 30 °C ambient)	63.4 dBA
High fan	64.2 dBA



**Note** The protection provided by the PXIe-1083 can be impaired if it is used in a manner not described in this document.

## Safety Compliance Standards

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

- IEC 61010-1, EN 61010-1
- UL 61010-1, CSA C22.2 No. 61010-1



**Note** For safety certifications, refer to the product label or the [Product Certifications and Declarations](#) section.

## EMC Guidelines

This product was tested and complies with the regulatory requirements and limits for electromagnetic compatibility (EMC) stated in the product specifications. These requirements and limits provide reasonable protection against harmful interference when the product is operated in the intended operational electromagnetic environment.

This product is intended for use in industrial locations. However, harmful interference may occur in some installations, when the product is connected to a peripheral device or test object, or if the product is used in residential areas. To minimize interference with radio and television reception and prevent unacceptable performance degradation, install and use this product in strict accordance with the instructions in the product documentation.

Furthermore, any changes or modifications to the product not expressly approved by NI could void your authority to operate it under your local regulatory rules.

## EMC Notices

Refer to the following notices for cables, accessories, and prevention measures necessary to ensure the specified EMC performance.



### Notice

For EMC declarations and certifications, and additional information, refer to the [Product Certifications and Declarations](#) section.



**Notice** Changes or modifications to the product not expressly approved by NI could void your authority to operate the product under your local regulatory rules.



**Notice** Operate this product only with shielded cables and accessories.

## Electromagnetic Compatibility Standards

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

- EN 61326-1 (IEC 61326-1): Class A emissions; Basic immunity
- EN 55011 (CISPR 11): Group 1, Class A emissions

- AS/NZS CISPR 11: Group 1, Class A emissions



**Note** Group 1 equipment (per CISPR 11) is any industrial, scientific, or medical equipment that does not intentionally generate radio frequency energy for the treatment of material or inspection/analysis purposes.



**Note** In Europe, Canada, Australia, and New Zealand (per CISPR 11) Class A equipment is intended for use in nonresidential locations.

## CE Compliance

This product meets the essential requirements of applicable European Directives, as follows:

- 2014/35/EU; Low-Voltage Directive (safety)
- 2014/30/EU; Electromagnetic Compatibility Directive (EMC)
- 2011/65/EU; Restriction of Hazardous Substances (RoHS)

## Product Certifications and Declarations

Refer to the product Declaration of Conformity (DoC) for additional regulatory compliance information. To obtain product certifications and the DoC for NI products, visit [ni.com/product-certifications](http://ni.com/product-certifications), search by model number, and click the appropriate link.

## Environmental Management

NI is committed to designing and manufacturing products in an environmentally responsible manner. NI recognizes that eliminating certain hazardous substances from our products is beneficial to the environment and to NI customers.

For additional environmental information, refer to the **Engineering a Healthy Planet** web page at [ni.com/environment](http://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.

## EU and UK Customers

-  Waste Electrical and Electronic Equipment (WEEE)—At the end of the product life cycle, all NI products must be disposed of according to local laws and regulations. For more information about how to recycle NI products in your region, visit [ni.com/environment/weee](https://ni.com/environment/weee).

## 电子信息产品污染控制管理办法 ( 中国 RoHS )

-  中国 RoHS— NI 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 NI 中国 RoHS 合规性信息，请登录 [ni.com/environment/rohs\\_china](https://ni.com/environment/rohs_china)。(For information about China RoHS compliance, go to [ni.com/environment/rohs\\_china](https://ni.com/environment/rohs_china).)

## Backplane

Size	3U-sized; 5 peripheral slots. Compliant with IEEE 1101.10 mechanical packaging. PXI Express Specification compliant. Accepts both PXI Express and CompactPCI (PICMG 2.0 R 3.0) 3U modules.
Backplane bare-board material	UL 94 V-0 Recognized
Backplane connectors	Conforms to IEC 917 and IEC 1076-4-101, UL 94 V-0 rated

## System Synchronization Clocks

10 MHz System Reference Clock: PXI\_CLK10

Maximum slot-to-slot skew	250 ps
Accuracy	$\pm 25$ ppm max (guaranteed over the operating temperature range)
Maximum jitter	5 ps RMS phase-jitter (10 Hz–1 MHz range)
Duty-factor	45% to 55%
Unloaded signal swing	3.3 V $\pm$ 0.3 V



Note For other specifications, refer to the **PXI-1 Hardware Specification**.

### 100 MHz System Reference Clock: PXIe\_CLK100 and PXIe\_SYNC100

Maximum slot-to-slot skew	100 ps
Accuracy	$\pm 25$ ppm max (guaranteed over the operating temperature range)
Maximum jitter	3 ps RMS phase-jitter (10 Hz to 12 kHz range), 2 ps RMS phase-jitter (12 kHz to 20 MHz range)
Duty-factor for PXIe_CLK100	45% to 55%
Absolute differential voltage (When terminated with a 50 $\Omega$ load to 1.30 V or Thévenin equivalent)	400 mV to 1000 mV



Note For other specifications, refer to the **PXI-5 PXI Express Hardware Specification**.

## Mechanical

<b>Standard chassis dimensions</b>	
Height	177.1 mm (6.97 in.)
Width	257.1 mm (10.12 in.)
Depth	214.2 mm (8.43 in.)
Weight	6.7 kg (14.8 lb)
Chassis materials	Extruded Aluminum (6063-T5, 6060-T6), Cold Rolled Steel/Stainless Steel, Santoprene, Urethane Foam, PC-ABS, Nylon, Polyethylene
Finish	Conductive Clear Iridite on Aluminum, Electroplated Nickel on Cold Rolled Steel, Electroplated Zinc on Cold Rolled Steel

The following figures show the PXIe-1083 chassis dimensions. The holes shown are for installing the optional rack mount kits.

Figure 1. PXIe-1083 Chassis Dimensions (Front)

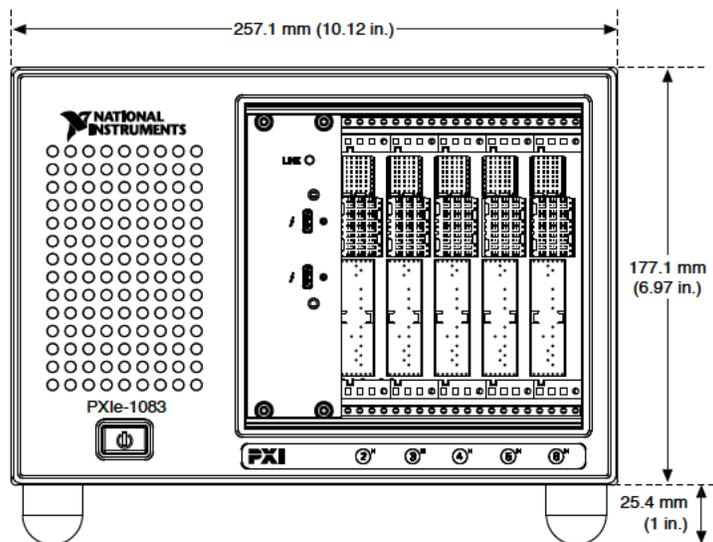


Figure 2. PXIe-1083 Chassis Dimensions (Side)

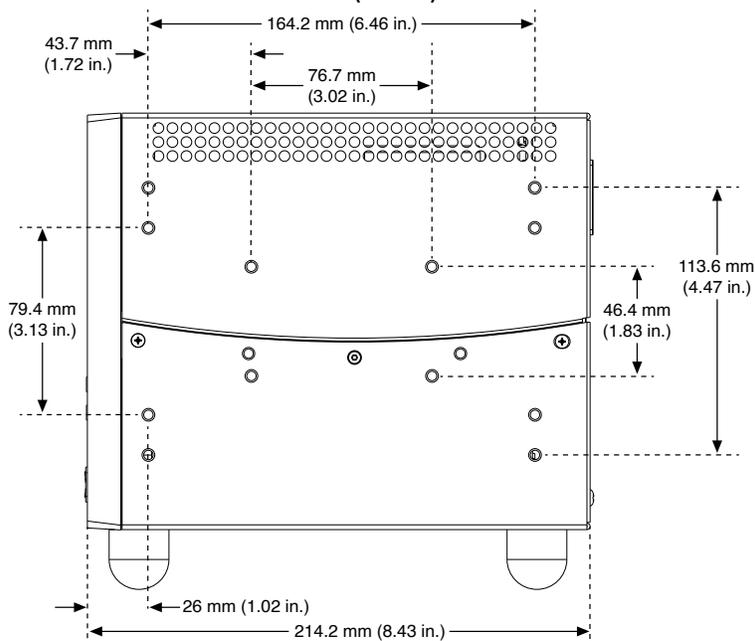
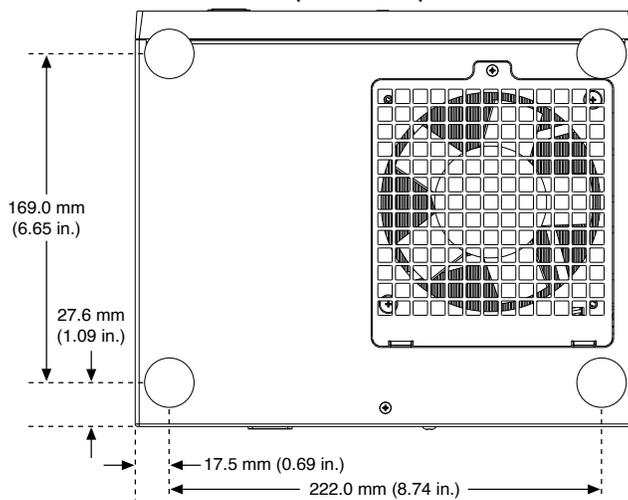


Figure 3. PXIe-1083 Chassis Dimensions (Bottom)



<sup>1</sup> The operating range is guaranteed by design.

<sup>2</sup> This product meets the requirements of the environmental standards for electrical equipment for measurement, control, and laboratory use.

<sup>3</sup> This product meets the requirements of the environmental standards for electrical equipment for measurement, control, and laboratory use.

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# PXle-5111

## Specifications

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# PXIe-5111 Specifications

These specifications apply to the PXIe-5111 with 64 MB and 512 MB of memory.

## Definitions

**Warranted** specifications describe the performance of a model under stated operating conditions and are covered by the model warranty. Warranted specifications account for measurement uncertainties, temperature drift, and aging. Warranted specifications are ensured by design or verified during production and calibration.

**Characteristics** describe values that are relevant to the use of the model under stated operating conditions but are not covered by the model warranty.

- **Typical** specifications describe the performance met by a majority of models.
- **Nominal** specifications describe an attribute that is based on design, conformance testing, or supplemental testing.
- **Measured** specifications describe the measured performance of a representative model.

Specifications are **Nominal** unless otherwise noted.

## Conditions

Specifications are valid under the following conditions unless otherwise noted.

- All vertical ranges, bandwidths, and bandwidth limiting filters
- Sample rate set to 1.5 GS/s or 3.0 GS/s
- Onboard sample clock locked to PXI\_Clk100 reference clock
- 15-minute warm-up time at ambient temperature
- Chassis configured:<sup>[1]</sup>

- PXI Express chassis fan speed set to HIGH
- Foam fan filters removed if present
- Empty slots contain PXI chassis slot blockers and filler panels

**Warranted** specifications are valid under the following conditions unless otherwise noted.

- Ambient temperature range of 0 °C to 55 °C
- Altitude  $\leq 2,000$  m
- Calibration cycle maintained
- Self-calibration run after:
  - Warm-up time has elapsed
  - Module has been power cycled
  - PC or controller has been restarted or wakes from sleep or hibernation modes
- External calibration performed at 23 °C  $\pm 3$  °C

**Typical** specifications are valid under the following conditions unless otherwise noted.

- Ambient temperature range of 0 °C to 55 °C
- Altitude  $\leq 2,000$  m

## Vertical

### Analog Input

Number of channels	Two (simultaneously sampled)
Input type	Referenced single-ended
Connectors	BNC, ground referenced

## Impedance and Coupling

Input impedance	50 $\Omega$ $\pm$ 1.5%, typical
	1 M $\Omega$ $\pm$ 1.0%, typical
Input capacitance (1 M $\Omega$ )	15.4 pF
Input coupling	AC
	DC

## Voltage Levels

Table 1. Full-Scale (FS) Input Range and Vertical Offset Range

Input Range ( $V_{pk-pk}$ )	Vertical Offset Range	
	50 $\Omega$	1 M $\Omega$
0.04 V	$\pm$ 5 V	
0.1 V	$\pm$ 5 V	
0.2 V	$\pm$ 5 V	
0.4 V	$\pm$ 5 V	
1 V	$\pm$ 5 V	$\pm$ 20 V
2 V	$\pm$ 5 V	$\pm$ 20 V
4 V	$\pm$ 5 V	$\pm$ 20 V
10 V	$\pm$ 2 V	$\pm$ 100 V
20 V	—	$\pm$ 100 V
40 V	—	$\pm$ 100 V

### Maximum input overload

50 $\Omega$	Peaks  $\leq$ 7 V
1 M $\Omega$ <sup>[2]</sup>	Peaks  $\leq$ 250 V DC



Notice Signals exceeding the maximum input overload may cause damage to the device.

## Accuracy

Resolution	8 bits
<b>DC accuracy<sup>[3]</sup></b>	
<b>50 Ω</b>	
Input range: 0.04 V	$\pm[(2\% \times  \mathbf{Reading} - \mathbf{Vertical\ Offset} ) + (0.4\% \times  \mathbf{Vertical\ Offset} ) + (1\% \text{ of FS}) + 0.2 \text{ mV}]$ , typical
Input range: 0.1 V to 4 V	$\pm[(2\% \times  \mathbf{Reading} - \mathbf{Vertical\ Offset} ) + (0.4\% \times  \mathbf{Vertical\ Offset} ) + (1\% \text{ of FS}) + 0.2 \text{ mV}]$ , warranted
Input range: 10 V	$\pm[(2\% \times  \mathbf{Reading} - \mathbf{Vertical\ Offset} ) + (1.1\% \times  \mathbf{Vertical\ Offset} ) + (1\% \text{ of FS}) + 0.2 \text{ mV}]$ , warranted
<b>1 MΩ</b>	
Input range: 0.04 V	$\pm[(2\% \times  \mathbf{Reading} - \mathbf{Vertical\ Offset} ) + (0.4\% \times  \mathbf{Vertical\ Offset} ) + (1\% \text{ of FS}) + 0.2 \text{ mV}]$ , typical
Input range: 0.1 V to 20 V	$\pm[(2\% \times  \mathbf{Reading} - \mathbf{Vertical\ Offset} ) + (0.4\% \times  \mathbf{Vertical\ Offset} ) + (1\% \text{ of FS}) + 0.2 \text{ mV}]$ , warranted
Input range: 40 V	$\pm[(2\% \times  \mathbf{Reading} - \mathbf{Vertical\ Offset} ) + (1.1\% \times  \mathbf{Vertical\ Offset} ) + (1\% \text{ of FS}) + 0.2 \text{ mV}]$ , warranted
DC drift <sup>[4]</sup>	$\pm[(0.2\% \times  \mathbf{Reading} - \mathbf{Vertical\ Offset} ) + (0.004\% \times  \mathbf{Vertical\ Offset} ) + (0.013\% \text{ of FS})]$ per °C

AC amplitude accuracy <sup>[3]</sup>	$\pm 0.25$ dB at 50 kHz
AC amplitude drift <sup>[4]</sup>	$\pm 0.0026$ dB per °C at 50 kHz

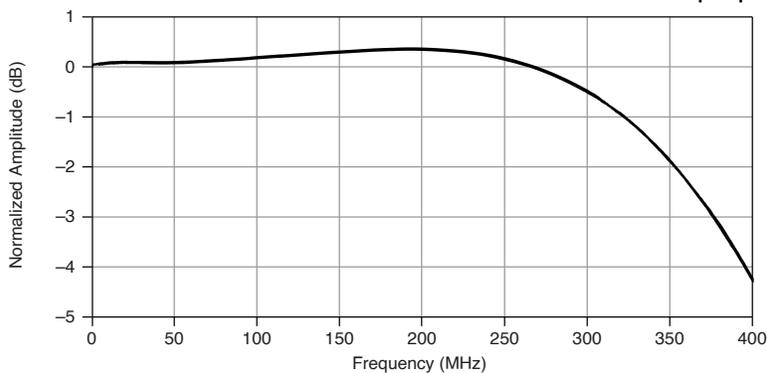
## Crosstalk

<b>Crosstalk<sup>[5]</sup></b>	
Input frequency: $\leq 200$ MHz	$< -60$ dB
Input frequency: 200 MHz to 350 MHz	$< -50$ dB

## Bandwidth and Transient Response

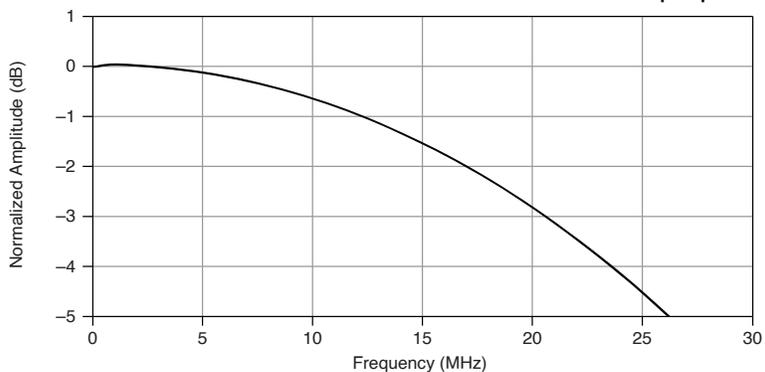
<b>Bandwidth (-3 dB)<sup>[6]</sup></b>	
50 $\Omega$ <sup>[7]</sup>	325 MHz, warranted
	350 MHz, typical
1 M $\Omega$ <sup>[8]</sup>	350 MHz, typical

Figure 1. 50  $\Omega$  Full Bandwidth Frequency Response, 3 GS/s, 1 V<sub>pk-pk</sub>, Measured<sup>[6]</sup>



Bandwidth-limiting filter	20 MHz noise filter
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Figure 2. 50 Ω 20 MHz Filter Frequency Response, 3 GS/s, 1 V<sub>pk-pk</sub>, Measured<sup>[6]</sup>



AC-coupling cutoff (-3 dB)	10 Hz
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Figure 3. Step Response, 50 Ω, 1 V<sub>pk-pk</sub>, 500 ps Rising Edge, Measured

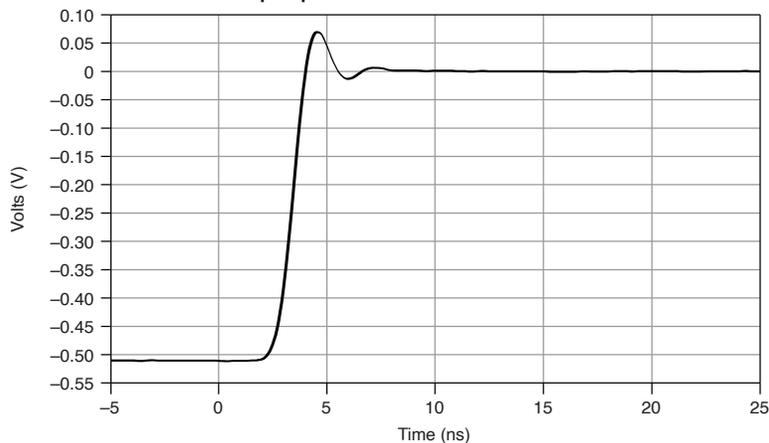
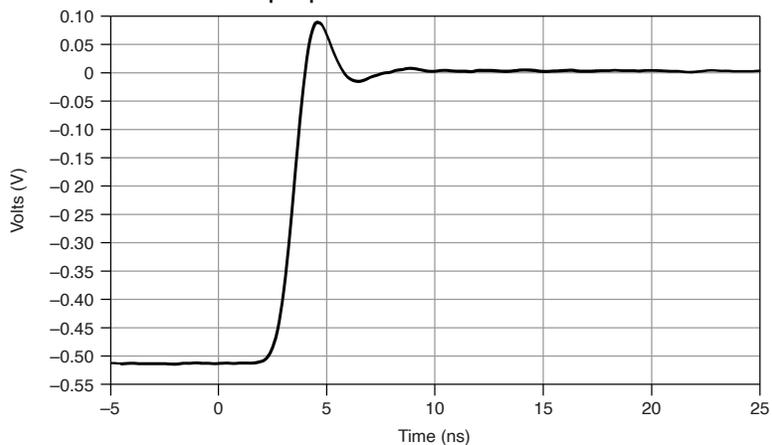


Figure 4. Step Response, 1 M $\Omega$ , 1 V<sub>pk-pk</sub>, 500 ps Rising Edge, Measured

## Spectral Characteristics<sup>[9]</sup>

Spurious-free dynamic range (SFDR) <sup>[10]</sup>	-45 dBc
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Table 2. Effective Number of Bits (ENOB)<sup>[11]</sup>

Input Range (V <sub>pk-pk</sub> )	Filters	
	20 MHz filter enabled	Full bandwidth (Input Frequency <100 MHz)
0.1 V to 4 V	7.3	6.7
0.04 V	6.7	6.1

Total harmonic distortion (THD) <sup>[10]</sup>	-45 dBc
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## Noise

RMS noise <sup>[12]</sup>	
0.04 V <sub>pk-pk</sub>	0.45% of FS
All other ranges	0.25% of FS

## Horizontal Sample Clock

Source	Onboard clock (internal oscillator)
Sample rate range, real time <sup>[13]</sup>	22.89 kS/s to 1.5 GS/s
Sample rate, time-interleaved sampling (TIS) mode <sup>[14]</sup>	3.0 GS/s
Timebase frequency	1.5 GHz
Timebase accuracy <sup>[15]</sup>	±50 ppm
Sample clock jitter <sup>[16]</sup>	1.1 ps RMS

## Phase-Locked Loop (PLL) Reference Clock

<b>Sources</b>	
Internal	Onboard clock (internal oscillator)
External	PXI_Clk100 (backplane connector)
Duty cycle tolerance	45% to 55%, typical

## Triggers

Supported triggers	Reference (Stop) Trigger  Reference (Arm) Trigger
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	Start Trigger (Acquisition Arm)	
	Advance Trigger	
Trigger types	Edge	
	Glitch	
	Hysteresis	
	Runt	
	Width	
	Window	
	Digital	
	Immediate	
	Software	
Trigger sources	CH 0	
	CH 1	
	PFI <0..3>	
	PXI_Trig <0..7>	
<b>Minimum dead time</b>		
Interpolator enabled		400 ns
Interpolator disabled		400 ns

Trigger delay	0 to $7.51 \times 10^{14}$ ns $[(2^{51} - 1) * \text{Sample Clock Period}]$
Holdoff	Dead time to $6.15 \times 10^{18}$ ns $[(2^{64} - 1) * \text{Sample Clock Period}]$

## Analog Trigger

Sources	CH 0 CH 1
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Table 3. Analog Trigger Time Resolution

Interpolator Status	Time Resolution	
	TIS Enabled	TIS Disabled
Enabled	0.326 ps	0.651 ps
Disabled	0.333 ns	0.667 ns

<b>Trigger filters</b>	
Low frequency (LF) reject	100 kHz
High frequency (HF) reject	100 kHz
Minimum threshold duration <sup>[17]</sup>	<b>Sample clock period</b>

## Digital Trigger

Sources	PFI <0..3> (front panel HD-BNC connectors) PXI_Trig <0..7> (backplane connector)
<b>Time resolution</b>	

PFI	1.333 ns
PXI_Trig	5.333 ns

## Programmable Function Interface (PFI)

Connectors	PFI <0..3> (front panel HD-BNC connectors)
Direction	Bidirectional per channel
<b>As an input (trigger)</b>	
Destinations	Start Trigger (Acquisition Arm) Reference (Stop) Trigger Reference (Arm) Trigger Advance Trigger
Input impedance	49.9 k $\Omega$
V <sub>IH</sub>	2 V, typical
V <sub>IL</sub>	0.8 V, typical
Recommended input range	0 V to 3.3 V
Maximum input overload	+5 V tolerant
Minimum pulse width	10 ns
<b>As an output (event)</b>	

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)
Output impedance	50 $\Omega$
Logic type	3.3 V CMOS
Maximum current drive	12 mA
Maximum frequency	50 MHz
Minimum pulse width	10 ns

## Probe Compensation

Connectors	Probe compensation terminal
	Ground terminal
Output voltage <sup>[18]</sup>	0 V to 5 V

Maximum overload voltage	25 V DC
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## CableSense

CableSense pulse voltage <sup>[19]</sup>	0.4 V
CableSense pulse rise time <sup>[20]</sup>	1.6 ns

Driver support for CableSense on the PXIe-5111 was first available in NI-SCOPE18.7.

### Related information

- [For more information about CableSense technology, refer to ni.com/cablesense.](http://ni.com/cablesense)

## Waveform Memory

Available onboard memory sizes <sup>[21]</sup>	512 MB
Minimum record length	1 sample
<b>Number of samples</b> Pretrigger                      0 up to ( <b>Record Length</b> - 1) Posttrigger                      0 up to <b>Record Length</b>	
Maximum number of records in onboard memory <sup>[22]</sup>	100,000

Table 4. Examples of Allocated Onboard Memory per Record, 512 MB Option

Channels	Bytes per Sample	Maximum Records per Channel	Record Length	Allocated Onboard Memory per Record
1	1	100,000	1	192
1	1	100,000	1,000	1,200
1	1	52,758	10,000	10,176
1	1	1	536,870,784	536,870,976
2	1	100,000	1	192
2	1	100,000	1,000	2,208
2	1	26,630	10,000	20,160
2	1	1	268,435,392	536,870,976

## Calibration

### External Calibration

External calibration corrects the onboard references for gain and offset errors used in self-calibration and adjusts the compensation attenuator. All calibration constants are stored in nonvolatile memory.

### Self-Calibration

Self-calibration is done on software command. The calibration corrects for gain, offset, interleaving spurs, and intermodule synchronization errors. Run self-calibration after the specified warm-up time has elapsed and any time the module is power cycled or the PC or controller is restarted or wakes from sleep or hibernation modes. Refer to the **NI High-Speed Digitizers Help** at [ni.com/manuals](http://ni.com/manuals) for more information on when to self-calibrate the device.

### Calibration Specifications

Interval for external calibration	2 years
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Warm-up time <sup>[23]</sup>	15 minutes
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## Software

### Driver Software

Driver support for this device was first available in NI-SCOPE18.6.

NI-SCOPE is an IVI-compliant driver that allows you to configure, control, and calibrate the PXIe-5111. 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++
- .NET (C# and VB.NET)

### Interactive Soft Front Panel and Configuration

When you install NI-SCOPE on a 64-bit system, you can use InstrumentStudio to monitor, control, and record measurements from the PXIe-5111.

InstrumentStudio is an application that allows you to perform interactive measurements on several different NI device types in a single application.

Interactive control of the PXIe-5111 was first available via InstrumentStudio in NI-SCOPE18.6. InstrumentStudio is included on the NI-SCOPE media.

NI Measurement & Automation Explorer (MAX) also provides interactive configuration and test tools for the PXIe-5111. MAX is included on the driver media.

## Synchronization

### Channel-to-channel skew, between the channels of a PXIe-5111

50 $\Omega$	<60 ps
1 M $\Omega$	<60 ps

### Synchronization with the NI-TClk API [\[24\]](#)

NI-TClk is an API that enables system synchronization of supported PXI modules in one or more PXI chassis, which you can use with the PXIe-5111 and NI-SCOPE.

NI-TClk uses a shared Reference Clock and triggers to align the Sample Clocks of PXI modules and synchronize the distribution and reception of triggers. These signals are routed through the PXI chassis backplane without external cable connections between PXI modules in the same chassis.

### Module-to-module skew, between PXIe-5111 modules using NI-TClk [\[25\]](#)

#### NI-TClk synchronization without manual adjustment [\[26\]](#)

Skew, peak-to-peak <a href="#">[27]</a>	200 ps
Jitter, peak-to-peak <a href="#">[28]</a>	120 ps

#### NI-TClk synchronization with manual adjustment [\[26\]](#)

Skew, average <a href="#">[27]</a>	10 ps
Jitter, peak-to-peak <a href="#">[28]</a>	8 ps

Sample Clock delay/adjustment resolution	<1 ps
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## Power

<b>Current draw</b>	
+3.3 V DC	1.82 A
+12 V DC	1.16 A
<b>Power draw</b>	
+3.3 V DC	6 W
+12 V DC	14 W
Total	20 W
Total maximum power allowed	30 W

## Physical

Dimensions	3U, one-slot, PXI Express/CompactPCI Express module  2.0 cm × 13.0 cm × 21.6 cm  (0.8 in × 5.1 in × 8.5 in)
Weight	380 g (13.4 oz)

## Bus Interface

Form factor	Gen 1 x4 module
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Slot compatibility	PXI Express or hybrid
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## Environmental Characteristics

<b>Temperature</b>	
Operating	0 °C to 55 °C
Storage	-40 °C to 71 °C
<b>Humidity</b>	
Operating	10% to 90%, noncondensing
Storage	5% to 95%, noncondensing
Pollution Degree	2
Maximum altitude	4,600 m (at 25 °C ambient temperature)
<b>Shock and Vibration</b>	
Operating vibration	5 Hz to 500 Hz, 0.3 g RMS
Non-operating vibration	5 Hz to 500 Hz, 2.4 g RMS
Operating shock	30 g, half-sine, 11 ms pulse

## Product Certifications and Declarations

Refer to the product Declaration of Conformity (DoC) for additional regulatory compliance information. To obtain product certifications and the DoC for NI

products, visit [ni.com/product-certifications](http://ni.com/product-certifications), search by model number, and click the appropriate link.

<sup>1</sup> For more information about cooling, refer to the **Maintain Forced-Air Cooling Note to Users** available at [ni.com/manuals](http://ni.com/manuals).

<sup>2</sup> Derate above 250 kHz at 20 dB/dec until 2.5 MHz, then derate at 5 dB/dec.

<sup>3</sup> Within  $\pm 5$  °C of self-calibration temperature.

<sup>4</sup> Used to calculate errors when the onboard temperature changes more than  $\pm 5$  °C from the self-calibration temperature.

<sup>5</sup> Measured on one channel with test signal applied to another channel and the same range setting on both channels. For 1 M $\Omega$  path, specifications are valid for input ranges  $\leq 10$  V ( $V_{pk-pk}$ ).

<sup>6</sup> Normalized to 50 kHz.

<sup>7</sup> For input ranges  $\leq 4$  V ( $V_{pk-pk}$ ) and temperature 0 °C to 30 °C.

<sup>8</sup> When used with the NI SP500X passive probe.

<sup>9</sup> Excludes ADC interleaving spurs.

<sup>10</sup> Input frequencies <100 MHz, input range  $\leq 4$  V $_{pk-pk}$ . -1 dBFS input signal. Includes second through fifth harmonics.

<sup>11</sup> Input frequencies <100 MHz. -1 dBFS input signal corrected to FS. 1 kHz resolution bandwidth.

<sup>12</sup> Applies to all filter settings and input modes. Verified using a 50  $\Omega$  terminator connected to input.

<sup>13</sup> Divide by **n** decimation from 1.5 GS/s. For more information on the sample clock and decimation, refer to the **NI High-Speed Digitizers Help**.

14 Single channel only.

15 Phase-locked to onboard clock. The default clock is PXI\_Clk100. Refer to your chassis specifications for the timebase accuracy of PXI\_Clk100.

16 Integrated from 100 Hz to 10 MHz. Includes the effects of converter aperture uncertainty and the clock circuitry jitter. Excludes trigger jitter.

17 Data must exceed each corresponding trigger threshold for at least this minimum duration to ensure analog triggering.

18 1 kHz, 50% duty cycle square wave.

19 When measured with a high-impedance device.

20 When sourcing into a 50  $\Omega$  cable or load.

21 Onboard memory is shared among all enabled channels.

22 For 512 MB option. You can exceed this value if you fetch records while acquiring data. For more information, refer to the Enable Records > Memory property in the **NI High-Speed Digitizers Help** at [ni.com/manuals](http://ni.com/manuals).

23 Warm-up time begins after the chassis and either the controller or PC is powered and NI-SCOPE is loaded.

24 NI-TClk installs with NI-SCOPE.

25 Although you can use NI-TClk to synchronize non-identical modules, these specifications apply only to synchronizing identical modules. Specifications are valid under the following conditions:

- All modules installed in the same PXI Express chassis
- NI-TClk used to align the sample clocks of each module
- All parameters set to identical values for each module
- Self-calibration completed
- Ambient temperature within  $\pm 1$  °C of self-calibration

For other configurations, including multi-chassis systems, contact NI Technical Support at [ni.com/support](https://ni.com/support).

<sup>26</sup> Manual adjustment is the process of minimizing synchronization jitter and skew by adjusting Trigger Clock (TClk) signals using the instrument driver.

<sup>27</sup> **Skew** is the misalignment between module timing across slots of a chassis and is caused by clock and analog path delay differences.

<sup>28</sup> **Jitter** is the variation in module alignment that can be expected with each call to NI-TClkSynchronize.