

## DEVICE SPECIFICATIONS

# NI PCI/PXI/PXIe-5105

## 60 MS/s, 12-Bit Oscilloscope

This document lists the specifications for the National Instruments PCI/PXI/PXIe-5105 (NI 5105).

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

- All filter settings
- All impedance selections
- Sample clock set to 60 MS/s

*Warranted* specifications describe warranted, traceable product performance over ambient temperature ranges of 0 °C to 55 °C for NI PXI/PXIe-5105 modules and 0 °C to 45 °C for NI PCI-5105 modules and include guardband for measurement uncertainty, unless otherwise noted. Specifications are warranted under the following conditions:

- The NI 5105 module is warmed up for 15 minutes at ambient temperature
- Self-calibration is completed after warm-up period
- Calibration cycle is maintained
- The PCI/PXI/PXI Express chassis fan speed is set to HIGH, the foam fan filters are removed if present, and the empty slots contain PXI chassis slot blockers and filler panels. For more information about cooling, refer to the *Maintain Forced-Air Cooling Note to Users* available at <http://www.ni.com/manuals>.
- External calibration is performed at 23 °C ± 3 °C

*Typical* values are representative of an average unit operating at room temperature.

All specifications are *typical* unless otherwise noted.

Specifications are subject to change without notice. For the most recent NI 5105 specifications, visit <http://www.ni.com/manuals>.

To access NI 5105 documentation, including the *NI PCI/PXI/PXIe-5105 Getting Started Guide*, go to **Start»All Programs»National Instruments»NI-SCOPE»Documentation**. In Windows 8, click **NI Launcher** and select **NI-SCOPE** in the window that appears.



**Caution** Refer to the *Read Me First: Safety and Electromagnetic Compatibility* document for important safety and electromagnetic compatibility information. To obtain a copy of this document online, visit [ni.com/manuals](http://ni.com/manuals) and search for the document title.



**Caution** To ensure the specified EMC performance, operate this product only with double-shielded cables (for example, RG-223/U) and accessories.



**Caution** You can impair the protection provided by the NI 5105 if you use it in a manner not described in this document.



**Hot Surface** If the NI 5105 has been in use, it may exceed safe handling temperatures and cause burns. Allow the NI 5105 to cool before removing it from the PXI/PXI Express chassis or PC. Refer to the *Environment* section for operating temperatures of this device.

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# Analog Input

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Number of channels.....Eight (simultaneously sampled)  
Input type.....Referenced single-ended  
Connectors.....SMB

## Impedance and Coupling

Input impedance  
50  $\Omega$ .....50  $\Omega \pm 2\%$   
1 M $\Omega$ .....1 M $\Omega \pm 1\%$  in parallel with a typical capacitance of 50 pF  
Input coupling.....AC<sup>1</sup>, DC

## Voltage Levels

**Table 1.** Full-Scale (FS) Input Range

50 $\Omega$ Input Range ( $V_{pk-pk}$ )	1 M $\Omega$ Input Range ( $V_{pk-pk}$ )
0.05 V	0.05 V
0.2 V	0.2 V
1 V	1 V
6 V	6 V
—	30 V

Maximum input overload  
50  $\Omega$ .....7  $V_{rms}$  with  $|Peaks| \leq 10$  V  
1 M $\Omega$ ..... $|Peaks| \leq 42$  V

## Accuracy

Resolution.....12 bits

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<sup>1</sup> AC coupling available on 1 M $\Omega$  input only.

**Table 2. NI PXI/PXIe-5105 DC Accuracy, Warranted<sup>2</sup>**

Input Impedance	Input Range (V <sub>pk-pk</sub> )	DC Accuracy
50 Ω	All	±(1% × Reading + 0.25% of FS + 600 μV)
1 MΩ	0.05 V	±(1% × Reading + 0.25% of FS + 600 μV)
	0.2 V, 1 V, and 6 V	±(0.65% × Reading + 0.25% of FS + 600 μV)
	30 V	±(0.75% × Reading + 0.25% of FS + 600 μV)

**Table 3. NI PCI-5105 DC Accuracy, Warranted<sup>2</sup>**

Input Impedance	Input Range (V <sub>pk-pk</sub> )	DC Accuracy
50 Ω	All	±(1% × Reading + 0.25% of FS + 1.4 mV)
1 MΩ	0.05 V	±(1% × Reading + 0.25% of FS + 1.4 mV)
	0.2 V, 1 V, and 6 V	±(0.65% × Reading + 0.25% of FS + 1.4 mV)
	30 V	±(0.75% × Reading + 0.25% of FS + 1.4 mV)

DC drift.....±(0.05% Reading + 0.02% of FS + 20 μV)  
per °C

**Table 4. AC Amplitude Accuracy<sup>2</sup>**

Input Impedance	Input Range (V <sub>pk-pk</sub> )	AC Amplitude Accuracy
50 Ω	All	±0.1 dB (±1.2%) at 50 kHz
1 MΩ, warranted	0.05 V	±0.2 dB (±2.3%) at 50 kHz
	0.2 V and 1 V	±0.13 dB (±1.5%) at 50 kHz
	6 V and 30 V	±0.4 dB (±4.7%) at 50 kHz

<sup>2</sup> Within ±5 °C of self-calibration temperature.

**Table 5. Crosstalk<sup>3</sup>**

Input Impedance	Input Range ( $V_{pk-pk}$ )	Crosstalk
50 $\Omega$	All	$\leq -80$ dB at 1 MHz
1 M $\Omega$	0.05 V	$\leq -75$ dB at 1 MHz
	0.2 V, 1 V, 6 V, and 30 V	$\leq -80$ dB at 1 MHz

## Bandwidth and Transient Response

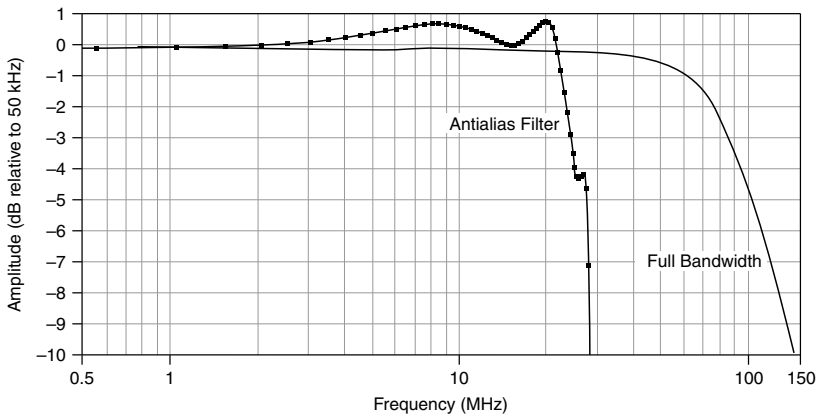
**Table 6. Bandwidth (-3 dB)**

Input Impedance	Input Range ( $V_{pk-pk}$ )	Bandwidth
50 $\Omega$	0.05 V	55 MHz
	0.2 V, 1 V, and 6 V	60 MHz
1 M $\Omega$	0.05 V	35 MHz
	0.2 V, 1 V, 6 V, and 30 V	60 MHz

Bandwidth-limiting filter.....24 MHz anti-alias filter

AC-coupling cutoff (-3 dB)<sup>4</sup>.....12 Hz

**Figure 1. Frequency Response, 50  $\Omega$ , 1  $V_{pk-pk}$  Input Range**



<sup>3</sup> Measured from one channel to another channel, with same range settings on both channels.

<sup>4</sup> AC coupling available on 1 M $\Omega$  input only.

# Spectral Characteristics

## 1 M $\Omega$ Spectral Characteristics

**Table 7.** Spurious-Free Dynamic Range (SFDR)<sup>5</sup>

Input Range (V <sub>pk-pk</sub> )	SFDR
0.2 V	70 dBc <sup>6</sup>
1 V and 6 V	65 dBc

**Table 8.** Total Harmonic Distortion (THD)<sup>5</sup>

Input Range (V <sub>pk-pk</sub> )	THD
0.05 V	-72 dBc
0.2 V	-75 dBc
1 V	-65 dBc
6 V	-68 dBc

**Table 9.** Signal to Noise and Distortion (SINAD)<sup>5</sup>

Input Range (V <sub>pk-pk</sub> )	SINAD
0.05 V	50 dB <sup>6</sup>
0.2 V	59 dB <sup>6</sup>
1 V	61 dB
6 V	59 dB

<sup>5</sup> -1 dBFS input signal. Includes the second through the fifth harmonics. 24 MHz bandwidth filter enabled.

<sup>6</sup> (NI PCI-5105 only) Due to high spectral noise content below 5 kHz caused by some computer chassis, spectral performance of the NI PCI-5105 is specified for 5 kHz and above on the indicated ranges. For more information on preventing ground loop noise, refer to the [PCI and PXI Ground Loop Noise](#) topic in the *NI High-Speed Digitizers Help*. For NI PXI-5105 modules, the specifications listed here apply for all frequencies.

## 1 M $\Omega$ Noise

**Table 10. 1 M $\Omega$  RMS Noise<sup>8</sup>**

Input Range (V <sub>pk-pk</sub> )	Full Bandwidth	24 MHz Filter Enabled
0.05 V	0.18% of FS (90 $\mu$ V) <sup>7</sup>	0.12% of FS (60 $\mu$ V) <sup>7</sup>
0.2 V	0.060% of FS (120 $\mu$ V) <sup>7</sup>	0.036% of FS (72 $\mu$ V) <sup>7</sup>
1 V	0.03% of FS (300 $\mu$ V)	0.03% of FS (300 $\mu$ V)
6 V	0.055% of FS (3.3 mV)	0.036% of FS (2.16 mV)
30 V	0.03% of FS (9 mV)	0.03% of FS (9 mV)

## 50 $\Omega$ Spectral Characteristics

**Table 11. Spurious-Free Dynamic Range (SFDR)<sup>9</sup>**

Input Range (V <sub>pk-pk</sub> )	SFDR
0.2 V	72 dBc <sup>10</sup>
1 V and 6 V	72 dBc

**Table 12. Total Harmonic Distortion (THD)<sup>9</sup>**

Input Range (V <sub>pk-pk</sub> )	THD
All	-75 dBc

<sup>7</sup> (NI PCI-5105 only) Due to high spectral noise content below 5 kHz caused by some computer chassis, spectral performance of the NI PCI-5105 is specified for 5 kHz and above on the indicated ranges. For more information on preventing ground loop noise, refer to the [PCI and PXI Ground Loop Noise](#) topic in the *NI High-Speed Digitizers Help*. For NI PXI-5105 modules, the specifications listed here apply for all frequencies.

<sup>8</sup> Verified using a 50  $\Omega$  terminator connected to input.

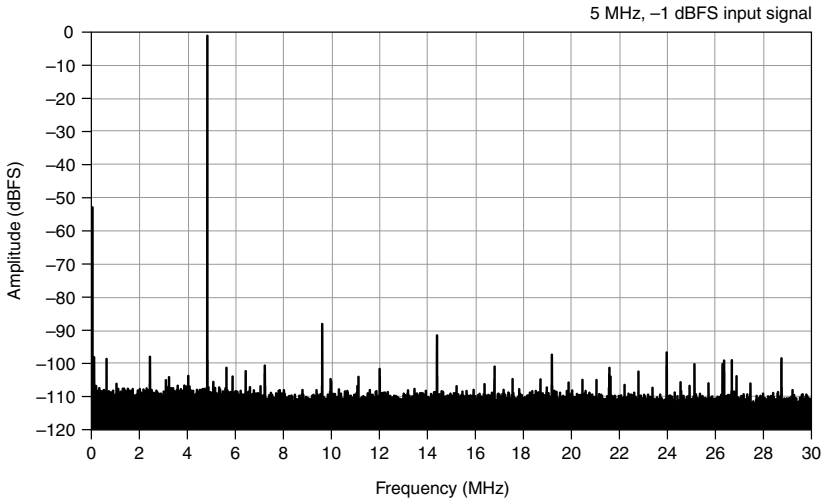
<sup>9</sup> -1 dBFS input signal. Includes the second through the fifth harmonics. 24 MHz bandwidth filter enabled.

<sup>10</sup> (NI PCI-5105 only) Due to high spectral noise content below 5 kHz caused by some computer chassis, spectral performance of the NI PCI-5105 is specified for 5 kHz and above on the indicated ranges. For more information on preventing ground loop noise, refer to the [PCI and PXI Ground Loop Noise](#) topic in the *NI High-Speed Digitizers Help*. For NI PXI-5105 modules, the specifications listed here apply for all frequencies.

**Table 13.** Signal to Noise and Distortion (SINAD)<sup>9</sup>

Input Range ( $V_{pk-pk}$ )	SINAD
0.05 V	59 dB <sup>10</sup>
0.2 V to 6 V	62 dB

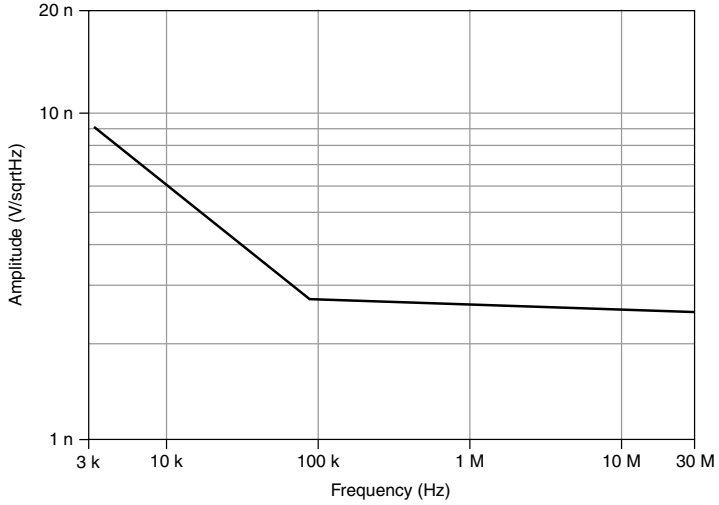
**Figure 2.** NI PCI/PXI/PXIe-5105 Dynamic Performance, 50  $\Omega$ , 1  $V_{pk-pk}$ , with 24 MHz Filter Enabled





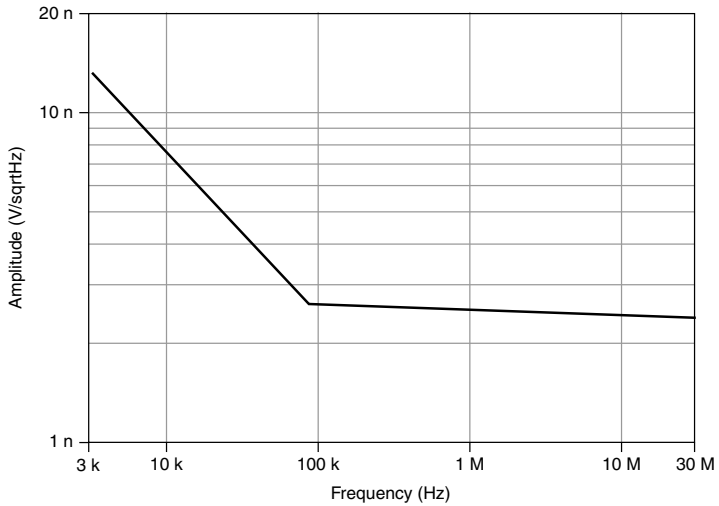
**Figure 3.** Representation of NI PXI/PXIe-5105 Spectral Noise Density, 50  $\Omega$ , 0.05  $V_{pk-pk}$ , with Anti-Alias Filter Enabled

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**Figure 4.** Representation of NI PCI-5105 Spectral Noise Density, 50  $\Omega$ , 0.05  $V_{pk-pk}$ , with Anti-alias Filter Enabled

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## 50 Ω Noise

**Table 14.** 50 Ω RMS Noise<sup>12</sup>

Input Range ( $V_{pk-pk}$ )	Full Bandwidth	24 MHz Filter Enabled
0.05 V	0.08% of FS (40 μV) <sup>10</sup>	0.038% of FS (19 μV) <sup>11</sup>
0.2 V	0.04% of FS (80 μV) <sup>11</sup>	0.028% of FS (56 μV) <sup>11</sup>
1 V	0.03% of FS (300 μV)	0.029% of FS (290 μV)
6 V	0.03% of FS (1.8 mV)	0.028% of FS (1.68 mV)

## Skew

Channel-to-channel skew<sup>13</sup>

24 MHz bandwidth filter.....	≤500 ps
disabled	
24 MHz bandwidth filter.....	≤600 ps
enabled	

## Horizontal

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## Sample Clock

Sources

NI PXI-5105

Internal.....Onboard clock (internal VCXO)<sup>14</sup>

External.....PFI 1, PXI Star

NI PXIe-5105

Internal.....Onboard clock (internal VCXO)<sup>14</sup>

External.....PFI 1, PXI Star

NI PCI-5105

Internal.....Onboard clock (internal VCXO)<sup>14</sup>

External.....PFI 1

<sup>11</sup> (NI PCI-5105 only) Due to high spectral noise content below 5 kHz caused by some computer chassis, spectral performance of the NI PCI-5105 is specified for 5 kHz and above on the indicated ranges. For more information on preventing ground loop noise, refer to the [PCI and PXI Ground Loop Noise](#) topic in the [NI High-Speed Digitizers Help](#). For NI PXI-5105 modules, the specifications listed here apply for all frequencies.

<sup>12</sup> Verified using a 50 Ω terminator connected to input.

<sup>13</sup> 10 MHz sine input signal.

<sup>14</sup> Internal Sample clock is locked to the Reference clock or derived from the onboard VCXO.

## Exporting<sup>15</sup>

Destination.....	PFI 1
Maximum frequency.....	65 MHz

## Onboard Clock (Internal VCXO)

Real-time sample rate range<sup>16</sup>.....915.5 S/s to 60 MS/s

Timebase frequency.....60 MHz

### Timebase accuracy

Not phase-locked to.....±25 ppm

Reference Clock

Phase-locked to.....Equal to the Reference Clock accuracy

Reference Clock

Sample Clock delay range.....±1 Sample Clock period

Sample Clock delay resolution.....<10 ps

## External Sample Clock

### Sources

NI PXI-5105.....PFI 1, PXI Star

NI PXIe-5105.....PFI 1, PXI Star

NI PCI-5105.....PFI 1

Frequency range<sup>17</sup>.....4 MHz to 65 MHz<sup>18</sup>

Duty cycle tolerance.....45% to 55%

## Phase-Locked Loop (PLL) Reference Clock

### Sources

NI PXI-5105.....PXI\_CLK10 (backplane connector) or PFI 1  
(front panel SMB connector)

NI PXIe-5105.....PXI\_CLK10 (backplane connector) or PFI 1  
(front panel SMB connector)

NI PCI-5105.....PFI 1 (front panel SMB connector) or RTSI 7

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<sup>15</sup> You cannot export a decimated Sample Clock signal.

<sup>16</sup> Divide by  $n$  decimation used for all rates less than 60 MS/s. For more information about the Sample Clock and decimation, refer to the [NI High-Speed Digitizers Help](#).

<sup>17</sup> Divide by  $n$  decimation available where  $1 \leq n \leq 65,535$ . For more information about the Sample Clock and decimation, refer to the [NI High-Speed Digitizers Help](#).

<sup>18</sup> NI PXI-5105 and NI PCI-5105 devices using NI-SCOPE 3.2 support a limited frequency range of 8 MHz to 65 MHz.

Frequency range <sup>19</sup> .....	1 MHz to 20 MHz in 1 MHz increments. Default of 10 MHz.
Duty cycle tolerance.....	45% to 55%
Exported Reference Clock.....	PFI 1 destinations

## Reference (Stop) Trigger

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Supported trigger.....	Reference (Stop) Trigger
Trigger types <sup>20</sup> .....	Edge, window, hysteresis, digital, immediate, and software
Trigger sources	
NI PXI-5105.....	CH 0 to CH 7, PFI 1, PXI_Trig <0..6>, PXI Star Trigger, and software
NI PXIe-5105.....	CH 0 to CH 7, PFI 1, PXI_Trig <0..6>, and software
NI PCI-5105.....	CH 0 to CH 7, PFI 1, RTSI <0..6>, and software
Time resolution.....	Sample Clock timebase period
Minimum rearm time <sup>21</sup>	
Internal Onboard Clock.....	2.4 $\mu$ s
External Sample Clock.....	144 $\times$ External Clock period
Holdoff.....	From rearm time up to $[(2^{32} - 1) \times$ Sample Clock timebase period]

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

Sources.....	CH 0 to CH 7 (front panel SMB connectors)
Trigger level range.....	100% FS
Edge trigger sensitivity.....	2% FS
Trigger jitter.....	Sample Clock timebase period

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<sup>19</sup> The PLL Reference Clock frequency must be accurate to  $\pm 50$  ppm.

<sup>20</sup> Refer to the following sections and the [NI High-Speed Digitizers Help](#) for more information about which sources are available for each trigger type.

<sup>21</sup> Holdoff set to 0. Onboard Sample Clock at maximum rate.

# Digital Trigger (Digital Trigger Type)

## Sources

NI PXI-5105.....	PFI 1 (front panel SMB connector), PXI_TRIG <0..6> (backplane connector), or PXI Star Trigger (backplane connector)
NI PXIe-5105.....	PFI 1 (front panel SMB connector) or PXI_TRIG <0..6> (backplane connector)
NI PCI-5105.....	PFI 1 (front panel SMB connector) or RTSI <0..6>

# Programmable Function Interface (PFI 1, Front Panel Connector)

Connector.....	SMB jack
Direction.....	Bidirectional
Coupling.....	AC, DC

## As a Sample Clock or Reference Clock

### Input voltage range

Sine wave.....	0.65 V <sub>pk-pk</sub> to 2.8 V <sub>pk-pk</sub> (0 dBm to 13 dBm)
Square wave.....	0.2 V <sub>pk-pk</sub> to 2.8 V <sub>pk-pk</sub>

Maximum input overload.....7 V<sub>rms</sub> with |Peaks| ≤ 10 V

Input impedance.....50 Ω

Coupling.....AC

## As an Input (Digital Trigger)

Destination.....Start Trigger (Acquisition Arm), Reference (Stop) Trigger, Arm Reference Trigger, Advance Trigger

Input impedance.....150 kΩ

V<sub>IH</sub>.....2.0 V

V<sub>IL</sub>.....0.8 V

Maximum input overload.....-0.5 V, 5.5 V

Maximum frequency.....65 MHz

## As an Output

Sources.....	Start Trigger (Acquisition Arm), Reference (Stop) Trigger, End of Record, Done (End of Acquisition), Sample Clock Timebase, Reference Clock
Output impedance.....	50 $\Omega$
Logic type.....	3.3 V CMOS
Maximum drive current.....	$\pm 24$ mA

## Waveform Specifications

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Onboard memory sizes <sup>22</sup> .....	16 MB, 128 MB, or 512 MB
Minimum record length.....	1 sample
Number of pretrigger samples <sup>23</sup> .....	Zero up to full record length
Number of posttrigger samples <sup>23</sup> .....	Zero up to full record length
Allocated onboard memory per record <sup>24</sup>	
NI PXI-5105.....	$[(\text{Record length} \times 2 \text{ bytes/sample} \times \text{number of enabled channels}) + 480]$ rounded up to the nearest 128 bytes
NI PXIe-5105.....	$[(\text{Record length} \times 2 \text{ bytes/sample} \times \text{number of enabled channels}) + 480]$ rounded up to the nearest 256 bytes

## Calibration

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### External Calibration

External calibration calibrates the onboard references used in self-calibration and the external trigger levels. All calibration constants are stored in nonvolatile memory.

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<sup>22</sup> Onboard memory is shared between all enabled channels.

<sup>23</sup> Single-record and multirecord acquisitions.

<sup>24</sup> The maximum number of records is 100,000.

# Self-Calibration

Self-calibration is done on software command. The calibration corrects for gain, offset, triggering, and timing errors for all input ranges.

# Calibration Specifications

Interval for external calibration.....	2 years
Warm-up time.....	15 minutes

# Power

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+3.3 VDC, typical	
NI PXI-5105.....	1.5 A
NI PXIe-5105.....	1.5 A
NI PCI-5105.....	1.7 A
+5 VDC, typical	
NI PXI-5105.....	1.7 A
NI PCI-5105.....	2 A
+12 VDC, typical	
NI PXI-5105.....	200 mA
NI PXIe-5105.....	1.5 A
NI PCI-5105.....	20 mA
-12 VDC, typical	
NI PXI-5105.....	25 mA
NI PCI-5105.....	0 A
Total power, typical	
NI PXI-5105.....	16.15 W
NI PXIe-5105.....	23 W
NI PCI-5105.....	15.85 W

# Software

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## Driver Software

The different form factors of the NI 5105 are supported in the following versions of NI-SCOPE:

- NI PCI-5105: NI-SCOPE 3.2 or later
- NI PXI-5105: NI-SCOPE 3.1 or later
- NI PXIe-5105: NI-SCOPE 14.1 or later

NI-SCOPE is an IVI-compliant driver that allows you to configure, control, and calibrate the NI 5105. NI-SCOPE provides application programming interfaces for many development environments.

## Application Software

NI-SCOPE provides programming interfaces, documentation, and examples for the following application development environments:

- LabVIEW
- LabWindows™/CVI™
- Measurement Studio
- Microsoft Visual C/C++
- Microsoft Visual Basic

## Interactive Soft Front Panel and Configuration

The NI-SCOPE Soft Front Panel version 14.1 or later supports interactive control of the NI 5105. The NI-SCOPE Soft Front Panel is included on the NI-SCOPE DVD.

National Instruments Measurement & Automation Explorer (MAX) also provides interactive configuration and test tools for the NI 5105. MAX is included on the NI-SCOPE DVD.

## TClk Specifications

You can use the National Instruments TClk synchronization method and the NI-TClk driver 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*. For other configurations, including multichassis systems, contact NI Technical Support at [ni.com/support](http://ni.com/support).



# Intermodule SMC Synchronization Using NI-TClk for Identical Modules

Specifications are valid for modules installed in one NI PXI-1042 chassis. These specifications do not apply to PCI modules. Specifications are valid under the following conditions:

- All parameters are set to identical values for each SMC-based module.
- Sample Clock set to 60 MS/s.
- All filters are disabled.



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

Skew<sup>25</sup> ..... 500 ps

Average skew after manual adjustment<sup>26</sup> ..... <10 ps

Sample Clock adjustment resolution ..... <10 ps

## Physical

### Front Panel Connectors

**Table 15. NI 5105 Front Panel Connectors**

Label	Function	Connector Type
CH 0—CH 7	Analog input connection; digitizes data and triggers acquisitions.	SMB jack
PFI 1	PFI line for trigger input/output, External Clock in, Reference Clock input/output, and timebase out.	SMB jack

### Dimensions and Weight

#### Dimensions

NI PXI-5105.....	3U, one slot, PXI/cPCI module, 21.6 × 2.0 × 13.0 cm (8.5 × 0.8 × 5.1 in)
NI PXIe-5105.....	21.4 × 2.0 × 13.0 cm (8.43 × 0.8 × 5.1 in)
NI PCI-5105.....	35.5 × 2.0 × 11.3 cm (14.0 × 0.8 × 4.4 in)

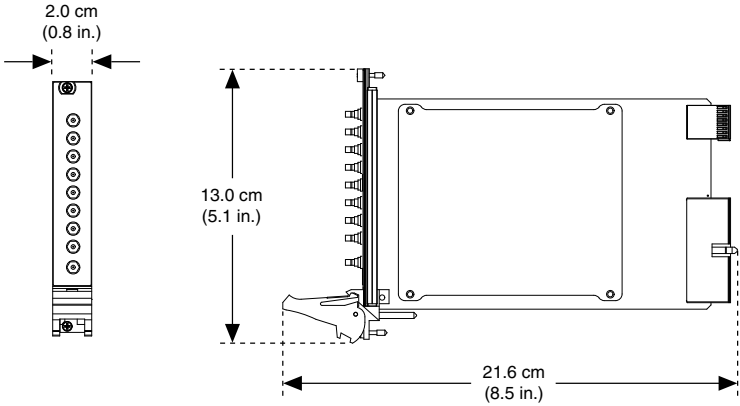
<sup>25</sup> Caused by clock and analog path delay differences. No manual adjustment performed.

<sup>26</sup> For more information about manual adjustment, refer to the *Synchronization Repeatability Optimization* topic in the *NI-TClk Synchronization Help*.

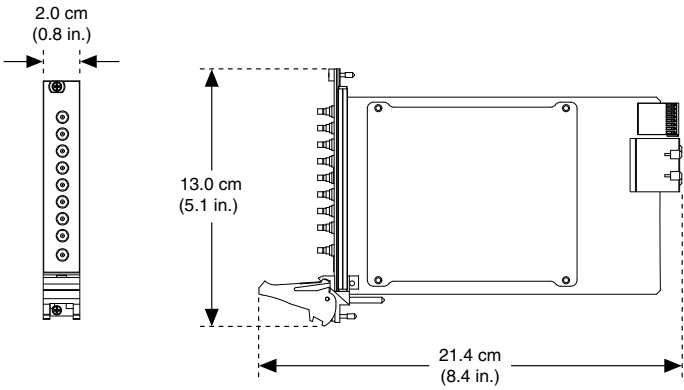
Weight

NI PXI-5105.....	474 g (16.7 oz)
NI PXIe-5105.....	520 g (18.3 oz)
NI PCI-5105.....	433 g (15.2 oz)

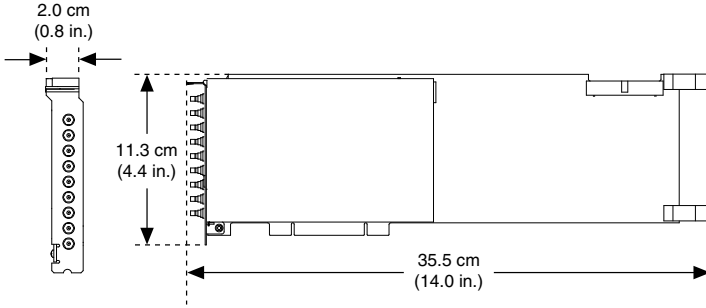
**Figure 5. NI PXI-5105**



**Figure 6. NI PXIe-5105**



**Figure 7. NI PCI-5105**



# Environment

## PCI Module

### Environment

Maximum altitude.....2,000 m (at 25 °C ambient temperature)

Pollution Degree.....2

Indoor use only.

### Operating Environment

Ambient temperature range.....0 °C to 45 °C (Tested in accordance with IEC-60068-2-1 and IEC-60068-2-2.)

Relative humidity range.....10% to 90%, noncondensing (Tested in accordance with IEC-60068-2-56.)

### Storage Environment

Ambient temperature range.....-40 °C to 71 °C (Tested in accordance with IEC-60068-2-1 and IEC-60068-2-2.)

Relative humidity range.....5% to 95%, noncondensing (Tested in accordance with IEC-60068-2-56.)

# PXI Module

## Environment

Maximum altitude.....2,000 m (at 25 °C ambient temperature)

Pollution Degree.....2

Indoor use only.

## Operating Environment

Ambient temperature range.....0 °C to 55 °C (Tested in accordance with IEC-60068-2-1 and IEC-60068-2-2.)

Relative humidity range.....10% to 90%, noncondensing (Tested in accordance with IEC-60068-2-56.)

## Storage Environment

Ambient temperature range.....-40 °C to 71 °C (Tested in accordance with IEC-60068-2-1 and IEC-60068-2-2.)

Relative humidity range.....5% to 95%, noncondensing (Tested in accordance with IEC-60068-2-56.)

## Shock and Vibration

Operational shock.....30 g peak, half-sine, 11 ms pulse (Tested in accordance with IEC-60068-2-27. Test profile developed in accordance with MIL-PRF-28800F.)

### Random vibration

Operating.....5 Hz to 500 Hz, 0.31 g<sub>rms</sub>

Nonoperating.....5 Hz to 500 Hz, 2.46 g<sub>rms</sub> (Tested in accordance with IEC-60068-2-64. Nonoperating test profile exceeds the requirements of MIL-PRF-28800F, Class 3.)

# PXI Express Module

## Environment

Maximum altitude.....	2,000 m (800 mbar) (at 25 °C ambient temperature)
Pollution Degree.....	2
Indoor use only.	

## Operating Environment

Ambient temperature range.....	0 °C to 55 °C (Tested in accordance with IEC-60068-2-1 and IEC-60068-2-2. Meets MIL-PRF-28800F Class 3 low temperature limit and MIL-PRF-28800F Class 2 high temperature limit.)
Relative humidity range.....	10% to 90%, noncondensing (Tested in accordance with IEC-60068-2-56.)

## Storage Environment

Ambient temperature range.....	-40 °C to 71 °C (Tested in accordance with IEC-60068-2-1 and IEC-60068-2-2. Meets MIL-PRF-28800F Class 3 limits.)
Relative humidity range.....	5% to 95%, noncondensing (Tested in accordance with IEC-60068-2-56.)

## Shock and Vibration

Operating shock.....	30 g peak, half-sine, 11 ms pulse (Tested in accordance with IEC-60068-2-27. Meets MIL-PRF-28800F Class 2 limits.)
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### Random vibration

Operating.....	5 Hz to 500 Hz, 0.3 g <sub>rms</sub>
Nonoperating.....	5 Hz to 500 Hz, 2.4 g <sub>rms</sub> (Tested in accordance with IEC-60068-2-64. Nonoperating test profile exceeds the requirements of MIL-PRF-28800F, Class 3.)

# Compliance and Certifications

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## Safety

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 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 61326-1 (IEC 61326-1): Class A emissions; Basic immunity
- EN 55011 (CISPR 11): Group 1, Class A emissions
- EN 55022 (CISPR 22): Class A emissions
- EN 55024 (CISPR 24): Immunity
- AS/NZS CISPR 11: Group 1, Class A emissions
- AS/NZS CISPR 22: Class A emissions
- FCC 47 CFR Part 15B: Class A emissions
- ICES-001: Class A emissions



**Note** In the United States (per FCC 47 CFR), Class A equipment is intended for use in commercial, light-industrial, and heavy-industrial locations. In Europe, Canada, Australia, and New Zealand (per CISPR 11), Class A equipment is intended for use only in heavy-industrial locations.



**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** For EMC declarations, certifications, and additional information, refer to the [Online Product Certification](#) section.

## CE Compliance

This product meets the essential requirements of applicable European Directives, 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](https://ni.com/certification), search by model number or product line, and click the appropriate link in the Certification column.

## 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 *Minimize Our Environmental Impact* web page at [ni.com/environment](https://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 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）



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