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Find the *National Instruments PXI-5105* at our website: *Click HERE*

NI PXI-5105 Specifications

12-Bit 60 MS/s Digitizer

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

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

Typical values are representative of an average unit operating at room temperature. Specifications are subject to change without notice. For the most recent NI 5105 specifications, visit `ni.com/manuals`.

To access the NI 5105 documentation, including the *NI High-Speed Digitizers Getting Started Guide*, go to **Start»Programs»National Instruments»NI-SCOPE»Documentation**.



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 chassis or PC.

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Vertical

Analog Input (Channels 0–7)

Specification	Value		Comments
Number of Channels	Eight (simultaneously sampled)		—
Connectors	SMB		—
Impedance and Coupling			
Input Impedance	50 Ω ±2% 1 MΩ ±1% in parallel with a typical capacitance of 50 pF		Software selectable.
Input Coupling	AC, DC		AC coupling available on 1 MΩ only.
Voltage Levels			
Full Scale (FS) Input Range	50 Ω Range (V_{pk-pk})	1 MΩ Range (V_{pk-pk})	—
	0.05	0.05	—
	0.2	0.2	—
	1	1	—
	6	6	—
	—	30	—
Maximum Input Overload	50 Ω	1 MΩ	—
	7 V_{rms} with |Peaks| ≤ 10 V	|Peaks| ≤ 42 V	

<table>
<tr><th>Specification</th><th colspan="4">Value</th><th>Comments</th></tr>
<tr><td colspan="6">Accuracy</td></tr>
<tr><td>Resolution</td><td colspan="4">12 bits</td><td>—</td></tr>
<tr><td rowspan="4">DC Accuracy</td><td colspan="2">50 Ω</td><td colspan="2">1 MΩ</td><td rowspan="4">Within ±5 °C of self-calibration temperature.</td></tr>
<tr><td colspan="2">All ranges:
±(1% of Input + 0.25% of FS + 600 µV)</td><td colspan="2">50 mV range:
±(1% of Input + 0.25% of FS + 600 µV)</td></tr>
<tr><td colspan="2"></td><td colspan="2">200 mV, 1 V, and 6 V ranges:
±(0.65% of Input + 0.25% of FS + 600 µV)</td></tr>
<tr><td colspan="2"></td><td colspan="2">30 V range:
±(0.75% of Input + 0.25% of FS + 600 µV)</td></tr>
<tr><td>DC Drift</td><td colspan="4">±(0.05% of Input + 0.02% of FS + 20 µV) per °C</td><td>—</td></tr>
<tr><td rowspan="7">AC Amplitude Accuracy</td><td colspan="2">50 Ω</td><td colspan="2">1 MΩ</td><td rowspan="7">Within ±5 °C of self-calibration temperature.</td></tr>
<tr><td>Range V_{pk-pk}</td><td>At 50 kHz, typical</td><td>Range V_{pk-pk}</td><td>At 50 kHz, guaranteed</td></tr>
<tr><td>0.05</td><td>± 0.1 dB (± 1.2%)</td><td>0.05</td><td>± 0.2 dB (± 2.3%)</td></tr>
<tr><td>0.2</td><td>± 0.1 dB (± 1.2%)</td><td>0.2</td><td>± 0.13 dB (± 1.5%)</td></tr>
<tr><td>1</td><td>± 0.1 dB (± 1.2%)</td><td>1</td><td>± 0.13 dB (± 1.5%)</td></tr>
<tr><td>6</td><td>± 0.1 dB (± 1.2%)</td><td>6</td><td>± 0.4 dB (± 4.7%)</td></tr>
<tr><td colspan="2">—</td><td>30</td><td>± 0.4 dB (± 4.7%)</td></tr>
<tr><td rowspan="2">Crosstalk, Typical</td><td colspan="2">50 Ω</td><td colspan="2">1 MΩ</td><td rowspan="2">Channel to nearest channel.
Channels in same configuration.</td></tr>
<tr><td colspan="2">All ranges:
≤ –80 dB at 1 MHz</td><td colspan="2">50 mV range:
≤ –75 dB at 1 MHz
All other ranges:
≤ –80 dB at 1 MHz</td></tr>
</table>

Specification	Value			Comments
Bandwidth and Transient Response				
Bandwidth (–3 dB), Typical	Range (V_{pk-pk})	50 Ω	1 MΩ	—
	0.05	55 MHz	35 MHz	
	All other ranges	60 MHz	60 MHz	
Bandwidth Limit Filter	24 MHz Antialias Filter			—
AC Coupling* Cutoff (–3 dB), Typical	12 Hz			* AC coupling available on 1 MΩ only
Passband Flatness	Refer to Figure 1			—

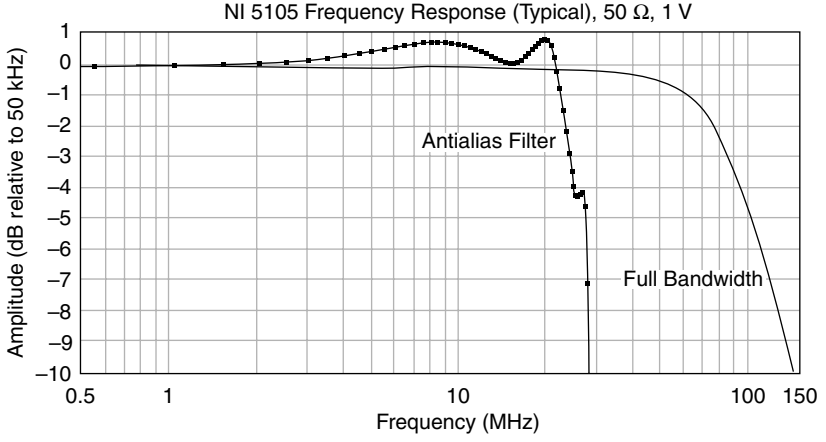


Figure 1. NI 5105 Frequency Response (Typical)

Specification	Value			Comments
Spectral Characteristics				
Spurious Free Dynamic Range with Harmonics (SFDR), Typical	Range V_{pk-pk}	50 Ω	1 MΩ	5 MHz, –1 dBFS input signal. Includes the 2nd through the 4th harmonics. 24 MHz filter on.
	0.2	72 dBc	70 dBc	
	1	72 dBc	65 dBc	
	6	72 dBc	65 dBc	
Total Harmonic Distortion (THD), Typical	Range V_{pk-pk}	50 Ω	1 MΩ	5 MHz, –1 dBFS input signal. Includes the 2nd through the 4th harmonics. 24 MHz filter on.
	0.05	–75 dBc	–72 dBc	
	0.2	–75 dBc	–75 dBc	
	1	–75 dBc	–65 dBc	
	6	–75 dBc	–68 dBc	
Signal to Noise and Distortion (SINAD), Typical	Range (V_{pk-pk})	50 Ω	1 MΩ	5 MHz, –1 dBFS input signal. Includes the 2nd through the 4th harmonics. 24 MHz filter on.
	0.05	59 dB	50 dB	
	0.2	62 dB	59 dB	
	1	62 dB	61 dB	
	6	62 dB	59 dB	

Specification	Value					Comments
RMS Noise	Range (V_{pk-pk})	50 Ω		1 MΩ		50 Ω terminator connected to input.
		Full BW	24 MHz Filter On	Full BW	24 MHz Filter On	
	0.05	0.06% FS (30 µV)	0.038% FS (19 µV)	0.16% FS (80 µV)	0.12% FS (60 µV)	
	0.2	0.035% FS (70 µV)	0.028% FS (56 µV)	0.055% FS (110 µV)	0.036% FS (72 µV)	
	1	0.03% FS (300 µV)	0.029% FS (290 µV)	0.03% FS (300 µV)	0.03% FS (300 µV)	
	6	0.03% FS (1.8 mV)	0.028% FS (1.68 mV)	0.055% FS (3.3 mV)	0.036% FS (2.16 mV)	
	30	—	—	0.03% FS (9 mV)	0.03% FS (9 mV)	
Skew						
Channel to Channel Skew, Typical	24 MHz Filter On		24 MHz Filter Off			10 MHz sine input signal.
	≤ 600 ps		≤ 500 ps			

Horizontal

Sample Clock

Specification	Value		Comments
Sources	Internal: Onboard Clock (internal VCXO)* External: PFI 1, PXI Star		* Internal Sample Clock is locked to the Reference Clock or derived from the onboard VCXO.
Onboard Clock (Internal VCXO)			
Sample Rate Range	Real-Time Sampling (Single Shot)		* Divide by *n* decimation used for all rates less than 60 MS/s. For more information about Sample Clock and decimation, refer to the *NI High-Speed Digitizers Help*.
	60 MS/s*		
Timebase Frequency	60 MHz		—
Timebase Accuracy	Not Phase-Locked to Reference Clock	Phase-Locked to Reference Clock	—
	±25 ppm	Equal to the Reference Clock accuracy	
Sample Clock Delay Range	±1 Sample Clock period		—
Sample Clock Delay Resolution	< 10 ps		—

Specification	Value		Comments
External Sample Clock			
Sources	PFI 1, PXI Star		—
Frequency Range	8 MHz to 65 MHz		Divide by *n* decimation available where $1 \le n \le 65{,}535$. For more information about Sample Clock and decimation, refer to the *NI High-Speed Digitizers Help*.
Duty Cycle Tolerance	45% to 55%		—
Sample Clock Exporting			
Exported Sample Clock Destinations	Destination	Maximum Frequency	Cannot export decimated Sample Clock.
	PFI 1	65 MHz	

Phase-Locked Loop (PLL) Reference Clock

Specification	Value	Comments
Sources	PXI_CLK10 (PXI backplane connector) PFI 1	—
Frequency Range	1 MHz to 20 MHz in 1 MHz increments. Default of 10 MHz. The PLL Reference Clock frequency must be accurate to ±50 ppm.	—
Duty Cycle Tolerance	45% to 55%	—
Exported Reference Clock Destinations	PFI 1	—

Trigger

Reference (Stop) Trigger

Specification	Value		Comments
Trigger Types and Sources	Types	Sources	Refer to the following sections and *NI High-Speed Digitizers Help* for more information about what sources are available for each trigger type.
	Edge, Window, Hysteresis, Digital, Immediate, and Software	CH 0–CH 7, PFI 1 PXI_Trig <0..6>, PXI Star Trigger, and Software	
Time Resolution	Sample Clock Timebase Period		—
Rearm Time	144 × Sample 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–CH 7 (front panel SMB connectors)		—
Trigger Level Range	100% FS		—
Edge Trigger Sensitivity	2% FS		—
Trigger Jitter	Sample Clock Timebase Period		—
Digital Trigger (Digital Trigger Type)			
Sources	PXI_Trig <0..6> (backplane connector) PFI 1 (front panel SMB connector) PXI Star Trigger (backplane connector)		—

PFI 1 (Programmable Function Interface, Front Panel Connector)

Specification	Value	Comments
Connector	SMB	—
Direction	Bidirectional	—
Coupling	AC, DC	—
As Sample Clock, Reference Clock		
Input Voltage Range	Sine Wave: 0.65 V_{pk-pk} to 2.8 V_{pk-pk} (0 dBm to 13 dBm) Square Wave: 0.2 V_{pk-pk} to 2.8 V_{pk-pk}	—
Maximum Input Overload	7 V_{rms} with |Peaks| ≤ 10 V	—
Input Impedance	50 Ω	—
Coupling	AC	—
As an Input (Digital Trigger)		
Destinations	Start Trigger (Acquisition Arm) Reference (Stop) Trigger Arm Reference Advance Trigger	—
Input Impedance	150 kΩ	—
V_{IH}	2.0 V	—
V_{IL}	0.8 V	—
Maximum Input Overload	–0.5 V to 5.5 V	—
Maximum Frequency	65 MHz	—

Specification	Value	Comments
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 Ω	—
Logic Type	3.3 V CMOS	—
Maximum Drive Current	±24 mA	—

TClk Specifications

National Instruments TClk synchronization method and the NI-TClk driver are used to align the sample clocks on any number of SMC-based modules in a chassis. For more information about TClk synchronization, refer to the *NI-TClk Synchronization Help*, which is located within the *NI High-Speed Digitizers Help*.

- Specifications are valid for any number of modules installed in one NI PXI-1042 chassis.
- All parameters set to identical values for each SMC-based module.
- Sample Clock set to 60 MS/s and all filters are disabled.
- For other configurations, including multichassis systems, contact NI Technical Support at `ni.com/support`.

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

Specification	Value	Comments
Intermodule SMC Synchronization Using NI-TClk for Identical Modules (Typical)		
Skew	500 ps	Caused by clock and analog path delay differences. No manual adjustment performed.
Skew After Manual Adjustment	< 10 ps	For information about manual adjustment, refer to the *Synchronization Repeatability Optimization* topic in the *NI-TClk Synchronization Help*. For additional help with the adjustment process, contact NI Technical Support at `ni.com/support`.
Sample Clock Adjustment Resolution	< 10 ps	—

Waveform Specifications

Specification	Value	Comments
Onboard Memory Size	16 MB Standard	—
	128 MB Option	
	512 MB Option	
Minimum Record Length	1 Sample	—
Number of Pretrigger Samples	Zero up to full record length	Single-record mode and multiple-record mode.
Number of Posttrigger Samples	Zero up to full record length	Single-record mode and multiple-record mode.
Allocated Onboard Memory per Record	[(Record length* $\times$ 2† $\times$ number of enabled channels) + 480‡] rounded up to nearest 128 bytes **Note**: The maximum number of records is 100,000.	* samples † bytes/sample ‡ bytes

Calibration

Specification	Value	Comments
Self-Calibration	Self-calibration is done on software command. The calibration corrects for gain, offset, triggering, and timing adjustment errors for all input ranges.	—
External Calibration (Factory Calibration)	The external calibration calibrates the VCXO and the voltage reference. Appropriate constants are stored in nonvolatile memory.	—
Interval for External Calibration	2 years	—
Warm-Up Time	15 minutes	—

Power

Specification	Typical Value	Comments
+3.3 VDC	1.5 A	—
+5 VDC	1.7 A	
+12 VDC	.20 A	
–12 VDC	.025 A	
Total Power	16.15 W	

Software

Specification	Value	Comments
Driver Software	NI-SCOPE 3.1 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 Scope Soft Front Panel 2.5 or later supports interactive control of the NI 5105. The Scope Soft Front Panel is included on the NI-SCOPE CD. National Instruments Measurement & Automation Explorer (MAX) also provides interactive configuration and test tools for the NI 5105. MAX is included on the NI-SCOPE CD.	—

Environment

Note To ensure that the NI PXI-5105 cools effectively, follow the guidelines in the *Maintain Forced Air Cooling Note to Users* included in the NI PXI-5105 kit. The NI PXI-5105 is intended for indoor use only.

Specification	Value	Comments
Operating Temperature	0 ºC to +55 ºC in all NI PXI chassis except the following: 0 ºC to +45 ºC when installed in an NI PXI-1000/B or PXI-101*x* chassis. Meets IEC-60068-2-1 and IEC-60068-2-2.	—
Storage Temperature	–40 ºC to +71 ºC. Meets IEC-60068-2-1 and IEC-60068-2-2.	—
Operating Relative Humidity	10% to 90%, noncondensing. Meets IEC-60068-2-56.	—
Storage Relative Humidity	5% to 95%, noncondensing. Meets IEC-60068-2-56.	—
Operating Shock	30 g, half-sine, 11 ms pulse. Meets IEC-60068-2-27. Test profile developed in accordance with MIL-PRF-28800F.	—
Storage Shock	50 g, half-sine, 11 ms pulse. Meets IEC-60068-2-27. Test profile developed in accordance with MIL-PRF-28800F.	—
Operating Vibration	5 Hz to 500 Hz, 0.31 g_{rms}. Meets IEC-60068-2-64.	—
Storage Vibration	5 Hz to 500 Hz, 2.46 g_{rms}. Meets IEC-60068-2-64. Test profile exceeds requirements of MIL-PRF-28800F, Class B.	—
Altitude	2,000 m maximum (at 25 °C ambient temperature)	—
Pollution Degree	2	—

Safety, Electromagnetic Compatibility, and CE Compliance

Specification	Value	Comments
Safety	The NI 5105 meets the requirements of the following standards of safety for electrical equipment for measurement, control, and laboratory use: • IEC 61010-1, EN 61010-1 • UL 61010-1, CAN/CSA-C22.2 No. 61010-1	—
For UL and other safety certifications, refer to the product label or visit `ni.com/certification`, search by model number or product line, and click the appropriate link in the Certification column.		
Emissions	EN 55011 Class A at 10 m FCC Part 15A above 1 GHz	—
Immunity	EN 61326 EMC requirements; Minimum Immunity	—
EMC/EMI	CE, C-Tick, and FCC Part 15 (Class A) Compliant **Note**: For EMC compliance, operate this device with shielded cabling.	—
This product meets the essential requirements of applicable European Directives, as amended for CE marking, as follows:		
Low-Voltage Directive (safety)	73/23/EEC	—
Electromagnetic Compatibility Directive (EMC)	89/336/EEC	—
For EMC compliance, operate this device with shielded cabling. Refer to the Declaration of Conformity (DoC) for this product for any additional regulatory compliance information. To obtain the DoC for this product, visit `ni.com/certification`, search by model number or product line, and click the appropriate link in the Certification column.		
Waste Electrical and Electronic Equipment (WEEE)	**EU Customers**: At the end of their life cycle, all products *must* be sent to a WEEE recycling center. For more information about WEEE recycling centers and National Instruments WEEE initiatives, visit `ni.com/environment/weee.htm`.	

Physical

Specification	Value	Comments
Dimensions	3U, One slot, PXI/cPCI Module 21.6 × 2.0 × 13.0 cm (8.5 × 0.8 × 5.1 in.)	—
Weight	474 g (16.7 oz)	—

Front Panel Connectors		
Label	Function	Connector Type
CH 0–CH 7	Analog input	SMB jack
PFI 1	Trigger input/output, external clock in, reference clock input/output, and timebase out	SMB jack

Where to Go for Support

The National Instruments Web site is your complete resource for technical support. At ni.com/support you have access to everything from troubleshooting and application development self-help resources to email and phone assistance from NI Application Engineers.

A Declaration of Conformity (DoC) is our claim of compliance with the Council of the European Communities using the manufacturer's declaration of conformity. This system affords the user protection for electronic compatibility (EMC) and product safety. You can obtain the DoC for your product by visiting ni.com/certification. If your product supports calibration, you can obtain the calibration certificate for your product at ni.com/calibration.

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