

NI 5102 Specifications

15 MHz, 20 MS/s Digitizer

This document lists the specifications of NI PXI/PCI/USB/PCMCIA-5102 high-speed digitizers. These specifications are typical at 25 °C unless otherwise stated. The operating range is 0 °C to 50 °C. All specifications are subject to change without notice.



Note Visit ni.com/manuals for the most current specifications and product documentation.

Input Characteristics

Number of input channels	2 single-ended, simultaneously sampled
◆ NI PXI/PCI/USB-5102	
Input impedance	1 M Ω \pm 1% in parallel with 25 pF \pm 10 pF (Impedance increases with attenuating probes) CH 0, CH 1, TRIG
◆ NI PCMCIA-5102	
Input impedance	1 M Ω \pm 1% in parallel with 40 pF \pm 10 pF (Impedance increases with attenuating probes) CH 0, CH 1, TRIG
ADC resolution	8 bits
Maximum sample rate	
Internal	20 MS/s each channel in real-time sample mode
External sample clock	20 MS/s
Minimum high or low time	24 ns
Random interleaved sampling (RIS) sample mode	1 GS/s

Minimum sample rate	1 kS/s (internal/external)
Maximum input range	± 50 V, DC + peak AC < 15 MHz (with X10 probe) ± 5 V, DC + peak AC < 15 MHz (with X1 probe)
Input signal ranges (CH 0, CH 1) (without probe attenuation)	± 5 V at gain of 1 ± 1 V at gain of 5 ± 0.25 V at gain of 20 ± 50 mV at gain of 100
Input coupling	AC or DC, software-selectable
Overvoltage protection	± 42 V (DC + peak AC < 10 kHz without external attenuation) CH 0, CH 1, TRIG only
Onboard FIFO memory depth	663,000 samples per channel
Max waveform buffer	Up to 16 million samples per channel on NI PXI/PCI-5102 with bus mastering, depends on available host memory 663,000 samples per channel on NI PCMCIA/USB-5102
Data transfers	Programmed I/O supported on all boards; direct-to-memory burst transfers with PCI bus mastering on NI PXI/PCI-5102 only

Timebase System

Timebase	20 MHz
Clock accuracy	100 ppm
Interpolator resolution	1 ns
External clock	RTSI<0..6> or PFI<1..2>; Frequency ≤ 20 MHz with a 50% duty cycle

Transfer Characteristics

Relative accuracy	± 1 LSB typical, ± 1.8 LSB max
Differential nonlinearity	± 0.3 LSB typical, ± 0.5 LSB max
No missing codes	8 bits guaranteed
Offset error after external calibration.....	$\pm 1.0\%$ of full scale ¹
Gain error after external calibration.....	$\pm 1.5\%$ of input signal ¹
DC accuracy	$\pm(1.5\%$ of input signal + 1.0% of full scale) ¹

Dynamic Characteristics

Bandwidth		
Small signal (-3 dB)	15 MHz typical	
Large signal (2% THD)	10 MHz typical	
AC coupling low frequency cut-off..... 11 Hz (1.1 Hz with X10 probe)		
Settling for full-scale step to $\pm 1\%$ full-scale range		50 ns typical
System noise	0.5 LSB rms typical	
Crosstalk.....	-60 dB	
Interchannel skew	1 ns	
Aperture jitter	1 ns rms	

Stability

Recommended warm-up time	15 minutes
Offset temperature coefficient	$(1 \text{ mV/gain} + 200 \text{ } \mu\text{V})/ \text{ } ^\circ\text{C}$
Gain temperature coefficient.....	50 ppm/ $^\circ\text{C}$
Timebase accuracy	100 ppm over operating temperature range

¹ Within ± 1 $^\circ\text{C}$ of external calibration temperature

Triggering System

Analog

Source	CH 0, CH 1, TRIG
Level	256 levels between \pm full scale for CH 0 and CH 1; ± 5 V for TRIG; software-selectable
Slope	Positive or negative, software-selectable
Resolution	8 bits
Hysteresis.....	Software-programmable, up to full scale
Bandwidth.....	15 MHz
Trigger holdoff	800 ns to 6.71 seconds

Digital

Sources.....	PFI<1..2>, RTSI<0..6>
Compatibility	CMOS/TTL
Response	Rising or falling edge; software-selectable
Pulse width	10 ns min

DC characteristics over operating range

Symbol	Parameter	Conditions	Min	Max
V_{IH}	Input HIGH voltage	—	2.0 V	$V_{CC} + 0.5$ V
V_{IL}	Input LOW voltage	—	-0.5	0.8 V
V_{OH}	Output HIGH voltage	$I_{OH} = -4$ mA $I_{OH} = -16$ mA $I_{OH} = -10$ μ A	3.7 V 2.4 V $V_{CC} - 0.1$ V	—
V_{OL}	Output LOW voltage	$I_{OL} = 16$ mA $I_{OL} = 10$ μ A	—	0.45 V 0.1 V

Symbol	Parameter	Conditions	Min	Max
C_{in}	Input capacitance (nominal)	—	—	10 pF
I_{OS}	Output short circuit current*	$V_O = GND$ $V_O = V_{CC}$	-15 mA 40 mA	-120 mA 210 mA

* Only one output at a time; duration should not exceed 30 s.

Power Requirements

NI PCI-5102—5 V DC ($\pm 5\%$)	500 mA typical
NI PXI-5102—5 V DC ($\pm 5\%$)	550 mA typical
NI PCMCIA-5102—5 V DC ($\pm 5\%$)	260 mA typical, active 60 mA standby
NI USB-5102	
External power supply	4 W max

Physical Characteristics

PCMCIA card type.....	Type II
Dimensions	
NI PCI-5102	10.67 cm \times 17.45 cm (4.2 \times 6.87 in.)
NI PXI-5102	3U, One Slot, PXI/cPCI Module 2.0 \times 13.0 \times 21.6 cm (0.8 \times 5.1 \times 8.5 in.)
NI USB-5102	14.6 cm \times 21.3 cm \times 3.8 cm (5.8 \times 8.4 \times 1.5 in.)

Maximum Working Voltage

(Signal voltage plus common-mode voltage)	
Channel to earth	5 V, Measurement Category I
Channel to channel.....	5 V, Measurement Category I



Caution Do not use this module for connection to signals or for measurements within Categories II, III, or IV. Refer to the *Read Me First: Safety and Radio-Frequency Interference* document for more information on categories.

Environmental Characteristics

Operating temperature	0 °C to 55 °C
Storage temperature	-20 °C to 70 °C
Relative humidity	10% to 90% noncondensing
Maximum altitude.....	2,000 m
Pollution Degree	2
Indoor use only	

Calibration

Internal.....	Upon software command; adjusts timing for RIS acquisitions only
Interval.....	1 week, or any time the operating environment changes
External.....	Internal reference recalibrated
Interval.....	1 year
Warm-up time.....	15 minutes

Safety

This product is designed to meet 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, CSA 61010-1



Note 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.

Electromagnetic Compatibility

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

- EN 61326 EMC requirements; Minimum Immunity
- EN 55011 Emissions; Group 1, Class A
- CE, C-Tick, ICES, and FCC Part 15 Emissions; Class A



Note For EMC compliance, operate this device with RG223/U or equivalent shielded cable. Operate according to product documentation

CE Compliance

This product meets the essential requirements of applicable European Directives, as amended for CE marking, as follows:

- 73/23/EEC; Low-Voltage Directive (safety)
- 89/336/EEC; Electromagnetic Compatibility Directive (EMC)



Note 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)



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