

# NI PCI-5911 Specifications

## High-Speed Digitizer with Flex ADC™

This document lists the specifications of the NI PCI-5911. These specifications are typical at 25 °C unless otherwise stated. All specifications are subject to change without notice.



**Note** Visit [ni.com/manuals](http://ni.com/manuals) for the most current specifications and product documentation.

## Acquisition System

Max bandwidth .....	100 MHz (Refer to <b>NI High-Speed Digitizers Help» Devices»NI 5911»Flexible Resolution Mode</b> for a table of available sampling rates, resolution, and corresponding bandwidths.)
Number of channels .....	1
Number of flexible-resolution A/D converters .....	1
Max real-time sample rate.....	100 MS/s
Max random interleaved sampling (RIS) sample rate .....	1 GS/s

## Resolution

Sample Rate	Mode	Effective Resolution
100/n* MS/s	Conventional	8 bits
12.5 MS/s	Flexible resolution	11 bits
5 MS/s	Flexible resolution	14 bits
2.5 MS/s	Flexible resolution	15.5 bits
1 MS/s	Flexible resolution	17.5 bits
500 kS/s	Flexible resolution	18 bits
200 kS/s	Flexible resolution	18.5 bits
100 kS/s	Flexible resolution	19 bits
50 kS/s	Flexible resolution	19.5 bits
20 kS/s	Flexible resolution	20.5 bits
10 kS/s	Flexible resolution	21 bits

\*  $1 \leq n \leq 2^{24}$  in conventional mode

Sample onboard memory .....4 MB or 16 MB

## Memory Sample Depth

Sampling Frequency	Mode	Sample Depth (4 MB)	Sample Depth (16 MB)
100/n* MS/s	Conventional	4 MS	16 MS
12.5 MS/s	Flexible resolution	1 MS	4 MS
5 MS/s	Flexible resolution	1 MS	4 MS
2.5 MS/s	Flexible resolution	1 MS	4 MS
1 MS/s	Flexible resolution	1 MS	4 MS
500 kS/s	Flexible resolution	1 MS	4 MS
200 kS/s	Flexible resolution	1 MS	4 MS

Sampling Frequency	Mode	Sample Depth (4 MB)	Sample Depth (16 MB)
100 kS/s	Flexible resolution	1 MS	4 MS
50 kS/s	Flexible resolution	1 MS	4 MS
20 kS/s	Flexible resolution	1 MS	4 MS
10 kS/s	Flexible resolution	1 MS	4 MS
* $1 \leq n \leq 2^{24}$ in conventional mode			

### Vertical Sensitivity (Input Ranges)

Input Range	Noise Referred to Input
$\pm 10$ V	$-174$ dBfs / $\sqrt{\text{Hz}}$
$\pm 5$ V	$-168$ dBfs / $\sqrt{\text{Hz}}$
$\pm 2$ V	$-160$ dBfs / $\sqrt{\text{Hz}}$
$\pm 1$ V	$-154$ dBfs / $\sqrt{\text{Hz}}$
$\pm 0.5$ V	$-148$ dBfs / $\sqrt{\text{Hz}}$
$\pm 0.2$ V	$-140$ dBfs / $\sqrt{\text{Hz}}$
$\pm 0.1$ V	$-128$ dBfs / $\sqrt{\text{Hz}}$

## Acquisition Characteristics

### Accuracy

DC gain accuracy .....  $\pm 0.05\%$  signal  $\pm 0.0001\%$  full scale (fs) for all input ranges at 1 MS/s in flexible resolution mode

DC offset accuracy .....  $\pm 0.1$  mV  $\pm 0.01\%$  fs for all input ranges at 1 MS/s in flexible resolution mode

Input coupling ..... DC and AC, software-selectable

AC coupling cut-off frequency  
( $-3$  dB) ..... 2.5 Hz  $\pm 0.5$  Hz

Input impedance .....1 M $\Omega$   $\pm$ 2%

Max measurable input voltage..... $\pm$ 10 V (DC + peak AC)

Input protection..... $\pm$ 42 VDC (DC + peak AC)

Input bias current ..... $\pm$ 1 nA, typical at 25 °C

## Common-Mode Characteristics

Impedance to chassis ground .....10 k $\Omega$

Common-mode rejection ratio .....CMRR > -70 dB, ( $F_{in}$  < 1 kHz)

## Filtering

Sampling Frequency	Filter Mode	Bandwidth	Ripple	Alias Attenuation
100/ $n^*$ MS/s	Conventional	100 MHz	$\pm$ 3 dB	N/A
12.5 MS/s	Flexible Resolution	3.75 MHz	$\pm$ 0.2 dB	-60 dB
5 MS/s	Flexible Resolution	2 MHz	$\pm$ 0.1 dB	-70 dB
2.5 MS/s	Flexible Resolution	1 MHz	$\pm$ 0.05 dB	-80 dB
1 MS/s	Flexible Resolution	400 kHz	$\pm$ 0.005 dB	-80 dB
500 kS/s	Flexible Resolution	200 kHz	$\pm$ 0.005 dB	-80 dB
200 kS/s	Flexible Resolution	80 kHz	$\pm$ 0.005 dB	-80 dB
100 kS/s	Flexible Resolution	40 kHz	$\pm$ 0.005 dB	-80 dB
50 kS/s	Flexible Resolution	20 kHz	$\pm$ 0.005 dB	-80 dB
20 kS/s	Flexible Resolution	8 kHz	$\pm$ 0.005 dB	-80 dB
10 kS/s	Flexible Resolution	4 kHz	$\pm$ 0.005 dB	-80 dB

\*  $1 \leq n \leq 2^{24}$  in conventional mode

## Dynamic Range

Noise (excluding input-referred noise)

Sampling Frequency	Bandwidth	Noise Density	Total Noise
100/n* MS/s	100 MHz	-120 dBfs / $\sqrt{Hz}$	-43 dBfs
12.5 MS/s	3.75 MHz	-135 dBfs / $\sqrt{Hz}$	-64 dBfs
5 MS/s	2 MHz	-143 dBfs / $\sqrt{Hz}$	-83 dBfs
2.5 MS/s	1 MHz	-152 dBfs / $\sqrt{Hz}$	-91 dBfs
1 MS/s	400 kHz	-160 dBfs / $\sqrt{Hz}$	-104 dBfs
500 kS/s	200 kHz	-160 dBfs / $\sqrt{Hz}$	-107 dBfs
200 kS/s	80 kHz	-160 dBfs / $\sqrt{Hz}$	-111 dBfs
100 kS/s	40 kHz	-160 dBfs / $\sqrt{Hz}$	-114 dBfs
50 kS/s	20 kHz	-160 dBfs / $\sqrt{Hz}$	-117 dBfs
20 kS/s	8 kHz	-160 dBfs / $\sqrt{Hz}$	-121 dBfs
10 kS/s	4 kHz	-160 dBfs / $\sqrt{Hz}$	-124 dBfs

\*  $1 \leq n \leq 2^{24}$  in conventional mode

## Distortion

Sampling Frequency	SFDR for Input 0 dBfs	SFDR for Input -20 dBfs	SFDR for Input -60 dBfs (typical)
100 MS/s	50 dBfs	50 dBfs	N/A
12.5 MS/s	65 dBfs	85 dBfs	125 dBfs
5 MS/s	70 dBfs	90 dBfs	130 dBfs
2.5 MS/s	75 dBfs	95 dBfs	135 dBfs
1 MS/s	85 dBfs	105 dBfs	145 dBfs
500 kS/s	90 dBfs	110 dBfs	150 dBfs
200 kS/s	100 dBfs	110 dBfs	160 dBfs
100 kS/s	100 dBfs	110 dBfs	160 dBfs
50 kS/s	100 dBfs	110 dBfs	160 dBfs
20 kS/s	100 dBfs	110 dBfs	160 dBfs
10 kS/s	100 dBfs	110 dBfs	160 dBfs

## Timebase System

Reference clock .....	10 MHz
Clock accuracy (as master).....	10 MHz $\pm$ 50 ppm
Clock input tolerance (as slave).....	10 MHz $\pm$ 100 ppm
Clock jitter .....	<75 ps <sub>rms</sub> , independent of reference clock source
Clock compatibility .....	TTL for both input and output
Sample clock frequencies	
Conventional mode.....	100/ <i>n</i> MHz, where $1 \leq n \leq 2^{24}$
Flexible resolution mode .....	12.5 MHz, 5 MHz, 2.5 MHz, 1 MHz, 500 kHz, 200 kHz, 100 kHz, 50 kHz, 20 kHz, 10 kHz
Reference clock sources .....	PFI lines, RTSI clock, or onboard

## Triggering Systems

Modes .....	Edge, hysteresis, window, digital
Source .....	CH 0, RTSI<0..6>, PFI 1, 2 (TTL)
Slope .....	Rising/falling
Hysteresis.....	Full-scale voltage/ <i>n</i> , where <i>n</i> is between 1 and 170
Coupling .....	AC/DC
Pretrigger depth .....	Up to 4 MS or 16 MS, depending on memory option purchased and sampling mode
Posttrigger depth.....	Up to 4 MS or 16 MS, depending on memory option purchased and sampling mode
Holdoff time .....	5 $\mu$ s to 171.79 s in 40 ns increments
Trigger resolution .....	170 steps in full-scale voltage range

## Sampling Methods

RIS .....	1 GS/s down to 200 MS/s effective sample rate, repetitive signals only
Real-time sampling .....	Up to 100 MS/s sample rate for transient and repetitive signals

## Power Requirements

+5 VDC .....	4 A
+12 VDC .....	100 mA
-12 VDC .....	100 mA

## Physical

Dimensions.....	33.8 cm by 9.9 cm (13.3 in. by 3.9 in.)
I/O connectors	
Analog input CH 0.....	BNC female
Digital triggers .....	SMB jack, 9-pin mini DIN

## Environmental Characteristics



**Note** Multiple NI 5911 devices in the same computer may raise operating temperatures beyond specification and produce imprecise data. NI strongly recommends leaving an empty PCI slot between multiple NI 5911 devices or adding a fan.

Ambient temperature.....	5 °C to 40 °C
Relative humidity .....	10% to 90%, noncondensing

## Storage Environment

Ambient temperature.....	-20 °C to 65 °C
--------------------------	-----------------

# Calibration

Self-calibration (internal calibration) .....	Self-calibration is done using a software command. The calibration involves gain, offset and linearity correction for all input ranges and input modes.
Interval.....	1 week, or any time temperature changes beyond $\pm 5$ °C. Hardware detects temperature variations beyond calibration limits, which also can be queried by software.
External calibration.....	Internal reference requires recalibration
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 3111-1, UL 61010B-1
- CAN/CSA C22.2 No. 1010.1



**Note** For UL and other safety certifications, refer to the product label, or visit [ni.com/hardref.nsf](http://ni.com/hardref.nsf), search by model number or product line, and click the appropriate link in the Certification column.

# Electromagnetic Compatibility

Emissions .....	EN 55011 Class A at 10 m FCC Part 15A above 1 GHz
Immunity .....	EN 61326:1997 + A2:2001, Table 1
CE, C-Tick, and FCC Part 15 (Class A) compliant	



**Note** For full EMC compliance, you *must* operate this device with shielded cabling. In addition, all covers and filler panels must be installed. 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/hardref.nsf](http://ni.com/hardref.nsf), search by model number or product line, and click the appropriate link in the Certification column.

## CE Compliance

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



**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/hardref.nsf](http://ni.com/hardref.nsf), search by model number or product line, and click the appropriate link in the Certification column.

Flex ADC™, National Instruments™, NI™, ni.com™, and RTSI™ are trademarks of National Instruments Corporation. Product and company names mentioned herein are trademarks or trade names of their respective companies. For patents covering National Instruments products, refer to the appropriate location: **Help»Patents** in your software, the `patents.txt` file on your CD, or [ni.com/patents](http://ni.com/patents).

© 2003 National Instruments Corp. All rights reserved.



323496B-01

Dec03