NI PXI/PCI-5411/5431 Specifications

NI PXI/PCI-5411 High-Speed Arbitrary Waveform Generator
NI PXI/PCI-5431 Video Waveform Generator

This document lists the specifications for the NI PXI/PCI-5411 and the NI PXI/PCI-5431. These specifications are typical at 25 °C unless otherwise stated. The operating temperature range is 0–50 °C.

Analog Output

Number of channels 1

Resolution ..... 12 bits

Maximum update rate ..... 40 MHz

DDS accumulator ..... 32 bits

Frequency range

Waveform Type	NI PXI-5411	NI PXI-5431
Arb	40 MS/s	40 MS/s
PAL-B, STANDARD PAL, N-PAL, Combination N-PAL, SECAM	—	40 MS/s
NTSC/PAL-M	—	40.02797 MS/s
SYNC (TTL)	16 MHz, max	8 MHz, max
Square	1 MHz, max	1 MHz, max
Ramp	1 MHz, max	1 MHz, max
Triangle	1 MHz, max	1 MHz, max

Frequency resolution (DDS mode) ..... 9.31 mHz

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Voltage Output

Ranges .....±5 V into a 50 Ω load;
±10 V into a high-impedance load

Accuracy .....±0.1 dB

Output attenuation .....0 to 73 dB

Resolution.....0.001 dB steps

Pre-attenuation offset

Range.....±2.5 V into 50 Ω[1]

Accuracy.....±5 mV

Output coupling .....DC

Output impedance.....50 Ω or 75 Ω, software selectable

Load impedance.....50 Ω or greater

Output enable.....Software switchable

Protection.....Short-circuit protected

Typical rise/fall time.....8 ns (10–90% 0–5 V square wave into 50 W load, filters off)

Sine Spectral Purity

Harmonic products and spurs

Up to 1 MHz.....–60 dBc

Up to 16 MHz.....–35 dBc

Phase noise .....–105 dBc/Hz at 10 kHz from carrier

Filter Characteristics

Digital

Type.....Half-band interpolating

Selection .....Software switchable (enable or disable)

Taps 67

Filter coefficients.....Fixed 20-bit

[1] With less than 10 dB of attenuation, signal maximum plus offset (before attenuation) must not exceed ±5 V (into 50 Ω).

Data interpolating frequency ..... 2x interpolation (up to 80 MS/s)

Pipeline signal delay ..... 26 sampling periods

Analog

Type ..... 7th-order L-C lowpass filter

Passband ripple ..... ±2 dB

Waveform Specifications

Memory

Arb mode

NI 5411 ..... 2,000,000 16-bit samples

NI 5431 ..... 8,000,000 16-bit samples

DDS mode..... 16,384 16-bit samples

Segment length

Arb mode ..... 256 samples, minimum, multiples of 8 samples

DDS mode..... 16,384 samples, exact

Max segments in waveform memory..... 5,000 (Arb mode only)

Segment linking (instruction FIFO)

Arb mode

NI 5411 ..... 292 links

NI 5431 ..... 1,168 links

DDS mode..... 512 links

Segment looping (Arb mode only)

Count..... 65,536 loops

Timing I/O

Update clock ..... Internal, 40 MHz, max

Interval count 2–65,535

Phase locking

External reference sources

NI PCI-5411/5431 ..... Front panel PLL IN SMB connector, internal, or RTSI clock line

NI PXI-5411/5431 ..... Front panel PLL Ref SMB connector, internal, or PXI_CLK10

Reference clock frequencies ..... 1 MHz, 5–20 MHz in 1 MHz steps

Frequency locking range

NI 5411 ..... ±100 ppm

NI 5431 ..... ±500 ppm

Triggers

Digital Trigger

Compatibility ..... TTL

Response ..... Rising edge

Pulse width (T_{d1}) ..... 20 ns, minimum

Trigger to waveform output (Arb mode) delay (T_{d2}) ..... 76 sample clocks plus 38 ns, max

Trigger to waveform output (DDS mode) delay (T_{d2}) ..... 28 sample clocks plus 150 ns, max

RTSI

Trigger lines

NI PCI-5411/5431 7

NI PXI-5411/5431 7

Clock lines

NI PCI-5411/5431 1

NI PXI-5411/5431 ..... Not applicable

Bus Interface

Type ..... Slave

Operational Modes

Type ..... Single, continuous, burst, stepped

Other Outputs

SYNC Out

Level..... TTL

Duty cycle ..... 20–80%, software controllable

Marker Output

Types..... TTL

Location ..... User defined, one per stage

Pulse width (T_{d4})..... 8 sample clock periods

Arb output delay from marker (T_{d3})..... 50 ns, max

Digital Pattern Output

Sample rate..... 40 MHz, max

Resolution ..... 16 bits

Sample clock logic ..... TTL

Clock pulse HIGH time..... 25 ns, fixed
(for clock interval counts >1)

PCLK to pattern data
output time (T_{co})..... 1 ns, max

Digital pattern logic ..... TTL

Logic level output ratings for SYNC, marker, digital pattern, and sample clock outputs

Type	Min	Max
V_{OH}	3.0 V	—
V_{OL}	—	0.7 V
I_{OH}	—	1.0 mA
I_{OL}	—	1.0 mA

V_{OH} = voltage output for logic level 1
V_{OL} = voltage output for logic level 0
I_{OH} = current output for logic level 1
I_{OL} = current output for logic level 0

External PLL Reference Input

Frequency .....1 MHz or 5–20 MHz in 1 MHz steps

Amplitude .....1 V_{pk-pk} ≤ level ≤ 5 V_{pk-pk}

Internal Clock

Frequency .....40 MHz

Initial accuracy .....±5 ppm

Temperature stability (0 to 50 °C).....±25 ppm

Aging (1 year).....±5 ppm

External Clock Reference Input

Frequency .....40 MHz, max

Amplitude .....TTL

Mechanical

Connectors

- ARB/Video (output) .....SMB/BNC
- SYNC (output).....SMB/BNC
- PLL reference (input) .....SMB
- Digital I/O (digital pattern out, marker out, external trigger in).....50-pin digital, SMB (for PXI)

Size .....1 slot

Power requirements .....5 V, 3.5 A, max; 12 V, 125 mA

Safety

This product meets the requirements of the following standards for 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

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

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

Note For EMC compliance, you *must* operate this device with shielded cabling.

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/certification`, search by model number or product line, and click the appropriate link in the Certification column.

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