200 MS/s, 16-Bit Arbitrary Waveform Generator

NI PXI-5422

- 16-bit resolution, 200 MS/s sampling rate
- 8, 32, 256, or 512 MB of onboard memory
- 80 MHz analog bandwidth
- Multimodule synchronization with <20 ps rms skew
- Time and frequency-domain waveform creation software
- Function generator emulation mode for easy standard waveform generation
- External clock and reference inputs
- 16-bit LVDS digital pattern output (32, 256, and 512 MB models)

Operating Systems
- Windows 2000/NT/XP

Recommended Software
- NI Modulation Toolkit
- LabVIEW
- LabWindows/CVI
- Measurement Studio

Driver Software (included)
- NI-FGEN
- LabVIEW Express VIs
- FGEN Soft Front Panel
- NI Analog Waveform Editor (with 32, 265 and 512 MB models)

Calibration
- Gain, offset and timing self-calibration
- 2 year external calibration cycle

Description
The National Instruments PXI-5422 is a 200 MS/s arbitrary waveform generator featuring 16-bit resolution and up to 512 MB of onboard memory in a compact, 1 slot 3U PXI module. Because the NI PXI-5422 uses the PCI-based PXI platform, waveforms can be downloaded at up to 84 MB/s, far faster than traditional GPIB-based instruments. Using the Synchronization and Memory Core (SMC) architecture of the PXI-5422, you can create mixed signal test systems by synchronizing the generator with digitizers and digital waveform generator/analyzers or synchronize multiple arbitrary waveform generators to form a phase-coherent multichannel generator.

Exceptional Time and Frequency-Domain Performance
- 1.8 ns rise time, 6% pulse aberration
- -60 dBC (0.1%) total harmonic distortion (THD) at 10 MHz
- -139 dBM/Hz average noise density
- -81 dBC intermodulation distortion (IMD) with intermediate frequency (IF) optimized direct path
- < 1.3 ps rms jitter -138 dBC/Hz phase noise (10 MHz carrier, 10 kHz offset)

Triggering and Sequencing
- Four triggering modes – single, continuous, stepped, and burst
- Up to 2 million waveform segments
- Up to 3 million sequence instructions (links and loops)
- Segment looping up to 16,777,216 times or infinitely

Timing and Synchronization
- Multi-instrument synchronization with <20 ps rms of skew
- 3 sample clock sources – Divide-by-N, High-Resolution, and External.
- 1.06 µHz sample rate resolution with high-resolution clock
- Phase lock to external reference or the PXI 10 MHz reference clock

Software
- NI Analog Waveform Editor for creating frequency and time-domain signals
- NI-FGEN instrument driver with LabVIEW Express VIs for function and arbitrary waveform generation
- FGEN Soft Front Panel for interactive control

Applications

<table>
<thead>
<tr>
<th>Communications</th>
<th>Digitally modulated I/Q signals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct to IF modulated signals</td>
<td></td>
</tr>
<tr>
<td>Semiconductor</td>
<td>Imaging sensors (CCD, CMOS)</td>
</tr>
<tr>
<td>Display devices (LCD)</td>
<td></td>
</tr>
<tr>
<td>Biomedical devices</td>
<td></td>
</tr>
<tr>
<td>Mixed signal devices</td>
<td></td>
</tr>
<tr>
<td>Automotive</td>
<td>Telematics systems</td>
</tr>
<tr>
<td>Antilock brake systems</td>
<td></td>
</tr>
<tr>
<td>Aerospace/Defense</td>
<td>Aircraft</td>
</tr>
<tr>
<td>Rail</td>
<td></td>
</tr>
<tr>
<td>Scientific Research</td>
<td>Analytical instruments</td>
</tr>
</tbody>
</table>

Ordering Information
NI PXI-5422 ..............................................................779087-0M
Includes SMB112 cable, NI-FGEN, and FGEN Soft Front Panel.
32, 256, and 512 MB models include NI Analog Waveform Editor.
1 M (onboard memory): 1 (8 MB), 2 (32 MB), 3 (256 MB), 4 (512 MB)

Recommended PXI Switch
NI PXI-2593 ..............................................................778793-01

BUY NOW!
For complete product specifications, pricing, and accessory information, call (866) 265-9891 (U.S. only) or go to ni.com and search on a four-digit model number listed above.
### Specifications

#### General
- Number of channels: 1
- DAC resolution: 16 bits
- Maximum sampling rate: 200 MS/s
- Output paths: 1. Main Output Path setting with driver selected Low Gain Amplifier or High Gain Amplifier, 2. Direct Path optimized for IF applications

#### Recommended Maximum Output Frequencies
- Direct Path: 80 MHz
- Low Gain Path: 80 MHz
- High Gain Path: 40 MHz up to 12 \( V_{pp} \) (80 MHz up to 8 \( V_{pp} \))

#### Analog Output
- Amplitude range (full scale)
  - Main output path: \( 12 \ V_{pp} \) to 5.64 m\( V_{pp} \) (60 \( \Omega \) load)
  - Direct path: \( 1 \ V_{pp} \) to 0.707 \( V_{pp} \) (50 \( \Omega \) load)
- Offset range: \( \pm 50\% \) of Amplitude Range (Signal plus offset not to exceed amplitude range)
- Output impedance: \( 50 \pm 7\% \) T\&A, software selectable
- DC accuracy: \( \pm 0.4\% \) of Amplitude \( \pm 0.05\% \) of offset \( \pm 1 \ mV \)
- AC amplitude accuracy: \( \pm 1.0\% \) of Amplitude \( \pm 1 \ mV \) at 50 kHz
- Output filter: Software enabled seven-pole elliptical analog filter available on Main Output Path

#### Sources
- Internal Divide-by-N, Internal High-Resolution, External CLK IN
- Sources
- Internal Divide-by-N, Internal High-Resolution, External CLK IN, External DDC Clk In, PXI star Trigger, PXI TRIG <0:7>

#### Spectral Characteristics

<table>
<thead>
<tr>
<th>Frequency (MHz)</th>
<th>Direct Path</th>
<th>Low Gain Path</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 kHz</td>
<td>( \pm 85 \ dBc ) (0.005%)</td>
<td>( \pm 81 \ dBc ) (0.009%)</td>
<td>Total Harmonic Distortion (THD)</td>
</tr>
<tr>
<td>1 MHz</td>
<td>( \pm 87 \ dBc )</td>
<td>( \pm 63 \ dBc )</td>
<td>2nd through 6th harmonics</td>
</tr>
<tr>
<td>10 MHz</td>
<td>( \pm 67 \ dBc )</td>
<td>( \pm 60 \ dBc )</td>
<td>Each time is ( \pm 7 \ dBc ) 200 kHz spacing</td>
</tr>
</tbody>
</table>

#### Average Noise Density

<table>
<thead>
<tr>
<th>Path</th>
<th>( V_{pp} )</th>
<th>Average Noise Density</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct Path</td>
<td>4</td>
<td>25</td>
</tr>
<tr>
<td>Low Gain</td>
<td>10</td>
<td>14</td>
</tr>
<tr>
<td>High gain</td>
<td>282</td>
<td>( -118 )</td>
</tr>
</tbody>
</table>

#### Sample Clock
- Sources: Internal Divide-by-N, Internal High-Resolution, External CLK IN, External DDC Clk In, PXI star Trigger, PXI TRIG <0:7>
- Frequency resolution: \( 200 \ MS/s \) / \( N \ where \ 1 \leq N \leq 40 \)
- High Resolution: \( 1.08 \ pm\)Hz

#### Limitations

<table>
<thead>
<tr>
<th>Path</th>
<th>( V_{pp} )</th>
<th>( \pm 12 \ dBc )</th>
<th>( \pm 2 )</th>
<th>( \pm 1 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct Path</td>
<td>4</td>
<td>25</td>
<td>( -139 )</td>
<td>( -143.0 )</td>
</tr>
<tr>
<td>Low Gain</td>
<td>10</td>
<td>14</td>
<td>( -144 )</td>
<td>( -128.0 )</td>
</tr>
<tr>
<td>High gain</td>
<td>282</td>
<td>( -118 )</td>
<td>( -143.6 )</td>
<td></td>
</tr>
</tbody>
</table>

#### Onboard Clock (Internal VCXO)
- Frequency accuracy: \( \pm 25 \ ppm \)
- PLL reference clock sources: PXI_CLK10, CLK IN

#### Digital Data and Control, DDC (optional front panel connector)
- Data output signals: 16 LVDS data lines (ANSI/TIA/EIA-644 compliant)

#### Start Trigger
- Sources: PRI, PRI-TRIG, PRI, HD-TRIG, PRI TRIG, Software, Immediate
- Modes: Single, Continuous, Stepped, Burst

#### Markers
- Destinations: PRI, PRI-TRIG, PRI TRIG, PRI TRIG
- Quantity: 1 Marker per Segment

### Waveform and Instruction Memory Utilization

<table>
<thead>
<tr>
<th>Mode</th>
<th>Maximum Samples</th>
<th>Samples</th>
<th>Samples</th>
<th>Samples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arbitrary Sequence</td>
<td>6,348,040</td>
<td>16,777,088</td>
<td>134,217,520</td>
<td>268,435,260</td>
</tr>
<tr>
<td>Arbitrary Waveform</td>
<td>6,348,040</td>
<td>16,777,088</td>
<td>134,217,520</td>
<td>268,435,260</td>
</tr>
<tr>
<td>Arbitrary Sequence</td>
<td>104,000</td>
<td>418,000</td>
<td>3,354,000</td>
<td>6,708,000</td>
</tr>
</tbody>
</table>

Refer to detailed specifications for all trigger modes.

1Condition: One or two segments in a sequence
2Condition: Waveform memory is <4,000 samples.

#### Power
- \( +3.3 \ V_{DC}, +5 \ V_{DC}, +12 \ V_{DC}, -12 \ V_{DC} \)
- Total Power: \( 22.2 \ W \)
- Typical operating conditions: \( +5 \ V_{DC} \)
- Maximum overload: \( +15 \ V_{DC} \)

#### Physical
- Dimensions: Single 3U PXI slot
- Front panel connectors:
  - CH0: SMB (Jack)
  - CLK IN: SMB (Jack)
  - PRI 0: SMB (Jack)
  - PRI 1: SMB (Jack)
  - Digital data control: 68-pin HVC Female Receptacle

#### Environment
- Operating temperature: 0 to \( +55 \)^\( \circ \)C (Meets IEC-60068-2-1 and IEC-60068-2-2)
- Storage temperature: -25 to \( +65 \)^\( \circ \)C (Meets IEC-60068-2-1 and IEC-60068-2-2)
- Relative humidity: 10 to \( 90\% \), noncondensing (Meets IEC-60068-2-56)

#### Calibration
- Self-calibration: DC gain and offset
- External calibration interval: 2 years

#### Certifications and Compliances
- CE Mark Compliance

#### Note
- Unless otherwise noted, the following conditions were used for each specification:
  A. Analog filter enabled
  B. Signals terminated with 50 \( \Omega \)
  C. Direct path set to 1 \( V_{pp} \) pk-pk, Low Gain Amplifier Path set to 2 \( V_{pp} \) pk-pk, and High Gain Amplifier Path set to 12 \( V_{pp} \)
  D. Sample clock set to 200 MS/s

Specifications subject to change without notice. Please see detailed specifications for more information.