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# 40 and 20 MHz Arbitrary Function Generators

## NI 5406, NI 5402

- Phase-continuous frequency hopping and frequency sweeps
- 400 MS/s effective sample rate with interpolation
- .355  $\mu$ Hz frequency resolution
- $<\pm 0.4$  dB passband flatness across bandwidth for sine waveforms
- NI-TClk technology for timing and synchronization
- Built-in sine, square, triangle, noise ramp up, ramp down, and DC offset functions
- 32 kB memory for arbitrary waveform generation
- 10  $V_{pp}$  into 50  $\Omega$
- Low-jitter square wave and SYNC (TTL) output

### NI 5406

- 40 MHz sine and square wave generation
- 5 MHz ramp and triangle wave generation
- 16-bit resolution

### NI 5402

- 20 MHz sine and square wave generation
- 1 MHz ramp and triangle wave generation
- 14-bit resolution

### Operating Systems

- Windows XP/2000
- LabVIEW Real-Time

### Recommended Software

- LabVIEW
- LabWindows™/CVI
- Measurement Studio
- LabVIEW SignalExpress

### Other Compatible Software

- Visual Basic
- ANSI C/C++

### Driver Software (included)

- NI-FGEN
- FGEN Soft Front Panel

**Calibration Certificate Available**



## Overview

NI 5406 and NI 5402 devices are 100 MS/s, 40 and 20 MHz arbitrary function generators (AFGs) that feature up to 16 bits of resolution and 32 kB of onboard memory for arbitrary function generation in a compact, 1-slot 3U PXI module or PCI board. Using these devices, you can combine the power of a stand-alone function generator with the flexibility and benefits of your computer to create highly capable virtual instrumentation solutions. Direct digital synthesis (DDS) is used to precisely generate waveforms that are repetitive in nature, including sine, square, triangle, ramp, noise, and DC waveforms.

## Analog Output Performance

These devices feature unparalleled analog output performance in PXI and PCI. The analog output path features a 7-pole elliptical analog filter to suppress high-frequency signal images. Depending on your signal and application needs, you can select up to a 4X digital interpolation for an effective sampling rate up to 400 MS/s. Additionally, the analog output has a passband flatness of  $\pm 0.4$  dB across the bandwidth for sine generation.

## Frequency Hops and Sweeps

The function generator uses DDS, which is a technique for deriving, under digital control, an analog frequency source from a single reference clock frequency. This technique is used to achieve high-frequency accuracy and resolution; temperature stability; and rapid, phase-continuous frequency switching. All frequency sweeping and hopping is phase-continuous, and you can generate a burst of several tones. Frequency sweeping and hopping is implemented through a frequency list of steps, each of which defines frequency and duration. Complex frequency lists can be instructed with 32 MS/s of available instruction memory.

## Timing and Synchronization

Using NI-TClk synchronization technology, you can synchronize multiple NI signal generators for applications requiring a greater number of channels. Because it is built into the Synchronization and Memory Core (SMC), NI-TClk can synchronize NI signal generators with SMC-based high-speed digitizers and digital waveform generator/analyzers for tight correlation of analog and digital stimulus and response. Using onboard calibration measurements and compensation, NI-TClk can



## 40 and 20 MHz Arbitrary Function Generators

automatically synchronize any combination of SMC-based modules with less than 500 ps<sub>rms</sub> module-to-module skew. Greatly improved from traditional synchronization methods, the skew between modules does not increase as the number of modules increases. To achieve even better performance, you can use a high-bandwidth oscilloscope to precisely measure the module-to-module skew. Using the oscilloscope measurement for calibration information, NI-TCIk can achieve <-20 ps<sub>rms</sub> module-to-module skew.

### Calibration

Every NI 5406 and NI 5402 device is factory calibrated using NIST-traceable standards. NI 5406 and NI 5402 devices have onboard calibration references that correct for environmental effects on DC gain, offset, and timing errors. If you want to calibrate your device externally, return your NI 5406 or NI 5402 devices to National Instruments or ship them to a qualified metrology lab for recalibration.

### Software

Every National Instruments signal generator comes with the IIVI-compliant NI-FGEN driver, which is fully compatible with NI LabVIEW, LabWindows/CVI, LabVIEW SignalExpress, and Measurement Studio, as well as Microsoft Visual C++ and Visual Basic. NI-FGEN also includes the interactive FGEN Soft Front Panel, with which you can quickly generate standard signals such as sine, square, and ramp, as well as user-defined waveforms. You can generate waveforms with control of frequency, amplitude, and DC offset as well as phase-continuous frequency hopping and sweeping. Simulation mode is available in both the FGEN Soft Front Panel and the NI-FGEN instrument driver, so you can develop your application without having the hardware in your system. In this mode, several developers can write applications for the same hardware and share resources.

### Ordering Information

|                  |           |
|------------------|-----------|
| NI PCI-5406..... | 779658-01 |
| NI PCI-5402..... | 779656-01 |
| NI PXI-5406..... | 779657-01 |
| NI PXI-5402..... | 779655-01 |

Includes the NI 540x hardware, NI-FGEN, and FGEN Soft Front Panel. Calibration certificate available.

### Recommended PXI Switch

|                  |           |
|------------------|-----------|
| NI PXI-2593..... | 778793-01 |
|------------------|-----------|

### BUY NOW!

For complete product specifications, pricing, and accessory information, call 800 813 3693 (U.S.) or go to [ni.com/modularinstruments](http://ni.com/modularinstruments).

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range from start-up assistance to turnkey system integration. Visit [ni.com/alliance](http://ni.com/alliance).

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We also offer service programs that provide automatic upgrades to your application development environment and higher levels of technical support. Visit [ni.com/ssp](http://ni.com/ssp).

## Hardware Services

### System Assurance Programs

NI system assurance programs are designed to make it even easier for you to own an NI system. These programs include configuration and deployment services for your NI PXI, CompactRIO, or Compact FieldPoint system. The NI Basic System Assurance Program provides a simple integration test and ensures that your system is delivered completely assembled in one box. When you configure your system with the NI Standard System Assurance Program, you can select from available NI system driver sets and application development environments to create customized, reorderable software configurations. Your system arrives fully assembled and tested in one box with your software preinstalled. When you order your system with the standard program, you also receive system-specific documentation including a bill of materials, an integration test report, a recommended maintenance plan, and frequently asked question documents. Finally, the standard program reduces the total cost of owning an NI system by providing three years of warranty coverage and calibration service. Use the online product advisors at [ni.com/advisor](http://ni.com/advisor) to find a system assurance program to meet your needs.

### Calibration Services

NI recognizes the need to maintain properly calibrated devices for high-accuracy measurements. We provide manual calibration procedures, services to recalibrate your products, and automated calibration software specifically designed for use by metrology laboratories. Visit [ni.com/calibration](http://ni.com/calibration).

### Repair and Extended Warranty

NI provides complete repair services for our products. Express repair and advance replacement services are also available. We offer extended warranties to help you meet project life-cycle requirements. Visit [ni.com/services](http://ni.com/services).



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