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Find the *National Instruments PXI-5401* at our website: *Click HERE*

16 MHz Function Generator

NI 5401

- 1 channel
- 16 MHz sine wave
- 1 MHz square, triangle, ramp waveforms
- 9.31 mHz frequency resolution
- 12-bit resolution
- 50 or 75 Ω output impedence, software selectable
- Linear and logarithmic sweeps
- Frequency hopping
- 4 triggering modes
- SYNC (TTL) output
- 16 KB memory for arbitrary waveform generation

Models
- NI PCI-5401
- NI PXI-5401

Operating Systems
- Windows 2000/NT/XP/Me/9x

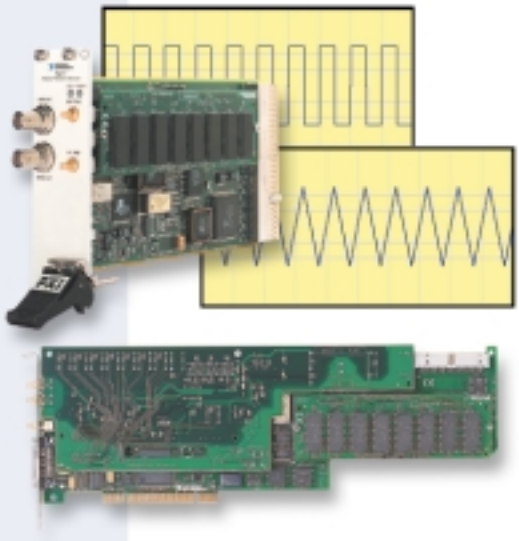
Recommended Software
- LabVIEW
- LabWindows/CVI
- Measurement Studio for Visual C++

Other Compatible Software
- Visual Basic
- C/C++

Driver Software (included)
- NI-FGEN

Calibration Certificate Included

See page 21.



Overview

NI 5401 devices are full-featured 40 MS/s function generators for use with PCI and PXI. Using an NI 5401, you combine the power and capability of a stand-alone function generator with the flexibility and benefits of your computer to create highly capable virtual instrument solutions.

Direct digital synthesis (DDS) is used to precisely generate standard waveforms that are repetitive in nature, including sine, TTL, square, and triangular waveforms. The number of waveform samples stored is 16,384, and the number of frequency steps that can be stored in the instruction FIFO memory is 512. The minimum frequency resolution is 9.31 mHz.

Analog voltages generated by the 12-bit DAC pass through a lowpass filter and amplification/attenuation scheme to maximize dynamic range.

SYNC Output

The SYNC output is a TTL version of the sine wave generated by the DAC and has a maximum frequency of 16 MHz. SYNC is useful as a high-frequency resolution and software-programmable clock source.

Triggering

Triggering controls the starting and stopping of waveform generation. Trigger sources are either external or software controlled. Like the NI 5411 AWGs, NI 5401 generators, include four triggering modes – single, continuous, stepped, and burst. See page 470 for a description of each mode.

INFO CODES

For more information, or to order products online visit *ni.com/info* and enter:

pxi5401
pci5401

BUY ONLINE!

Frequency Hopping and Frequency Sweeps

Frequency hopping and frequency sweeps are possible using the linking capabilities in DDS mode. All frequency changes are phase continuous, and a burst of several tones can be generated.

Phase-Locked Loops

The phase-locked loops (PLLs) of the instruments synchronize waveform generation to an external clock to within a tuning range of ±100 ppm. The reference clock source may come from the external connector, RTSI bus (for PCI), or PXI trigger bus (for PXI). The NI 5401 phase-locks to an external reference clock source of 1 MHz or 5 to 20 MHz in 1 MHz steps. The PLL can lock to a signal level from 1.0 V_{p-p} to 5.0 V_{p-p}.

Product	Bus	Operating Systems	Channels	Update Rate	Frequency Range (sine)	Resolution	Memory
NI 5401	PCI, PXI	Windows 2000/NT/XP/Me/9x	1	40 MS/s	16 MHz	12 bits	16 KB

Table 1. NI 5401 Channel, Speed, and Resolution Specifications

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16 MHz Function Generator

Calibration

Every NI 5401 is factory calibrated and is shipped with a calibration certificate verifying that it meets NIST-traceable standards. You can perform self-calibration (internal calibration) to ensure that your device is within specifications. If you want to externally calibrate your device return your NI 5401 to National Instruments or ship it to a qualified metrology lab for recalibration. External calibration is usually performed on an annual basis.

Please see page 21 or visit ni.com/calibration for more information about calibration services.

I/O Connector

The PCI-5401 has three SMB connectors for access to the analog output on ARB, to the sync pulse on SYNC, and to the PLL reference input on PLL Ref. The Dig Out connector is a 50-pin, very-high-density (VHD) SCSI connector for access to the external trigger input. The PXI-5401 has two BNC connectors for the analog output and SYNC pulse signals, and two SMB connectors for the PLL reference signal and external trigger input. The PXI-5401 does not have a VHD SCSI connector.



Figure 1. The Source Soft Front Panel provides interactive control of the NI 5401.

Software

To build an automated test application or integrate an NI 5401 in your test software, use the IVI-compliant NI-FGEN instrument driver with:

- LabVIEW
- LabWindows/CVI
- Measurement Studio for Visual C++
- Microsoft Visual Basic
- Microsoft C++

Interactive Control

NI 5401 generators come with the versatile Sources Soft Front Panel (SFP) with which you can interactively control the device. You can generate standard and arbitrary periodic waveforms with control of frequency, amplitude, and DC offset amplitude with the Sources SFP. You can generate linear and logarithmic frequency sweeps and phase-continuous frequency hopping of standard waveforms. Additionally, you can use the Sources SFP to set the sequential output with several triggering modes.

Ordering Information

NI PCI-5401 777949-01
NI PXI-5401 777950-01
Includes the NI 5401 hardware, cable, NI-FGEN, Sources Soft Front Panel, and calibration certificate.

For information on extended warranty and value added services, see page 20.
See page 480 for accessory and cable options.

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16 MHz Function Generator

Specifications

These specifications are typical at 25 °C unless otherwise stated.

Analog Output

Number of channels	1
Resolution	12 bits
Update rate	40 MS/s maximum; 610 S/s minimum
Type of DAC	Multiplying
DDS accumulator	32 bits
Frequency range	
Sine	16 MHz maximum
SYNC (TTL)	16 MHz maximum
Square	1 MHz
Ramp	1 MHz
Triangle	1 MHz
Frequency resolution (DDS mode)	9.31 mHz

Voltage Output

Ranges	±5 V into 50 Ω load ±10 V into high impedance load
Accuracy	±0.1 dB
Output attenuation	0 to 73 dB
Resolution	0.001 dB steps
Preattenuation offset	
Range	±2.5 V into 50 Ω (but with less than 10 dB of attenuation, single maximum and offset [before attenuation] must not exceed ±5 V [(into 50 Ω)]
Accuracy	±5 mV
Output coupling	DC
Output impedance	50 or 75 Ω, software selectable
Load impedance	50 Ω or greater
Output enable	Software switchable
Protection	Short circuit protected

Sine Spectral Purity

Harmonic and spurious	
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
Taps	67
Filter coefficients	Fixed 20-bit
Data interpolating frequency	80 MS/s
Pipeline signal delay	26 sampling periods

Analog

Type	7th-order, L-C lowpass filter
Passband ripple	±2 dB

Waveform Definition

Memory	16,384 samples exact, 16-bit
Frequency list length	512 steps

Timing I/O

Internal

Update clock	40 MHz maximum
Interval count	2 to 65,535
Internal clock	
Frequency	40 MHz
Initial accuracy	±5 ppm
Temperature stability (0 to 55° C)	±25 ppm
Aging (1 year)	±5 ppm

Phase Locking

External reference sources	Input connector, RTSI clock line or internal
Reference clock frequencies	1 MHz, 5 to 20 MHz in 1 MHz steps
Frequency locking range	±100 ppm

Digital Trigger

Compatibility	TTL
Response	Rising edge
Pulse width	20 ns minimum
Trigger to waveform output	
DDS mode	28 sample clocks + 150 ns, maximum

RTSI Bus, PXI Trigger Lines

Trigger lines	7
Clock lines	1
Bus Interface	Slave

SYNC out

Level	TTL
Duty cycle	20 to 80%, software controllable

External Clock Reference Input

Frequency	1 MHz or 5 to 20 MHz, in 1 MHz steps
Amplitude	1.0 to 5 Vpp

Power Requirements

+5 VDC	3.5 A maximum
+12 VDC	125 mA

Physical

Dimensions

PCI	33.8 by 9.9 cm (13.3 by 3.9 in.)
PXI	10 by 16 cm (3.9 by 6.3 in.)

I/O Connectors

Arb out, SYNC out (PCI)	SMB
Arb out, SYNC out (PXI)	BNC
PLL reference in (PCI, PXI)	SMB
External trigger (PCI)	50-pin, (VHD), SCSI connector
External trigger (PXI)	SMB

Environment

Operating temperature	0 to 55 °C
Storage temperature	-20 to 70 °C
Relative humidity	5 to 90%, noncondensing

Certifications and Compliances

CE Mark Compliance CE

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