



NATIONAL INSTRUMENTS PXIe-5673E PXI Vector Signal Generators Instruction Manual

[Home](#) » [NATIONAL INSTRUMENTS](#) » NATIONAL INSTRUMENTS PXIe-5673E PXI Vector Signal Generators Instruction Manual 



PRODUCT FLYER
PXI Vector Signal Generators

Contents

- [1 PXI Vector Signal Generators](#)
- [2 Detailed View of PXIe-5673E Vector Signal Generator](#)
- [3 Key Features](#)
- [4 NI-RFSG Soft Front Panel](#)
- [5 NI-RFSG Application Programming Interface \(API\)](#)
- [6 Platform-Based Approach to Test and Measurement](#)
- [7 PXI Instrumentation](#)
- [8 Hardware Services](#)
- [9 Documents / Resources](#)
 - [9.1 References](#)
- [10 Related Posts](#)

PXI Vector Signal Generators

PXI-5670, PXI-5671, PXIe-5672, and PXIe-5673E



- Software: Includes interactive soft front panel, API support for LabVIEW and text-based languages, shipping examples, and detailed help files
- Frequency measurement ranges from 250kHz to 20 GHz
- Up to 100 MHz instantaneous bandwidth
- Maximum output power of +10dBm
- Up to 2 GB onboard memory
- Up to 200 μ s sweep tuning speed or frequency resolution of < 1 Hz at \leq 1.3 GHz

Built for Automated Test and Measurement

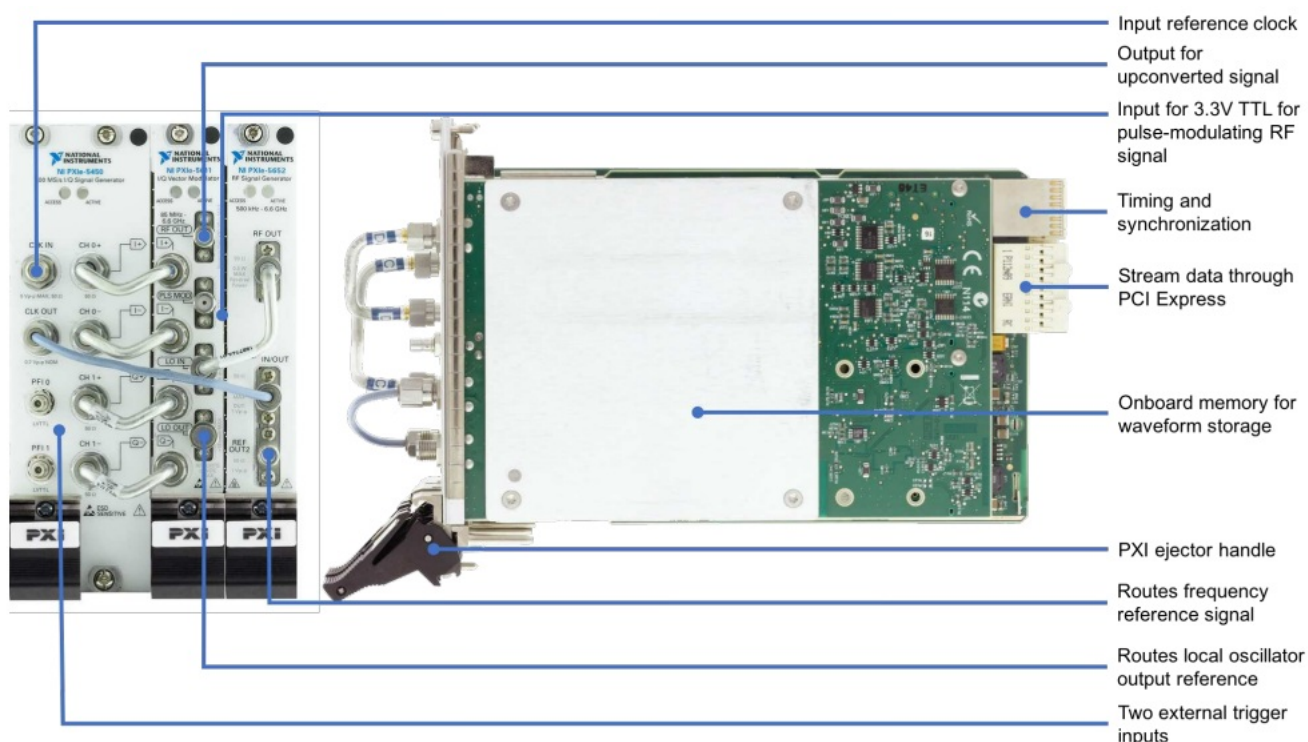
PXI Vector Signal Generators (VSGs) deliver the functionality of RF signal generators to the modular, compact PXI form factor. The PXI RF Analog Signal Generators support frequency ranges from 250 kHz to 20 GHz. PXI VSGs support quadrature digital upconversion, which reduces waveform download and signal generation time, as well as stream-to-disk capabilities. These modules offer custom and standard modulation, as well as the ability to generate communications standards formats such as GPS, WCDMA, DVB-H, and more. The power and flexibility of these modules make them ideal for use in scientific research, communications, consumer electronics, aerospace/defense, and semiconductor test applications as well as for areas such as software-defined radio, radio-frequency identification (RFID), and wireless sensor networks.

NI's RF signal generator portfolio is highlighted by the PXIe-5673E, which provides up to 6.6 GHz instantaneous bandwidth. With stream-from-disk capabilities, the PXIe-5673E can generate continuous waveforms that are up to several terabytes in length.

Table 1. NI offers RF Signal Generators ranging from low-cost RF Analog Signal Generator options to wide bandwidth RF Vector Signal Generators

	PXI-5670	PXI-5671	PXI-5671	PXIe-5673E
Description	Vector Signal Generator	Vector Signal Generator	Vector Signal Generator	Vector Signal Generator
Frequency Range	250 kHz to 2.7 GHz	250 kHz to 2.7 GHz	250 kHz to 2.7 GHz	50 MHz to 6.6 GHz
Instantaneous Bandwidth	20 MHz	20 MHz	20 MHz	100 MHz
Output Noise Floor at 0dB unless noted	-120 dBm/Hz	-120 dBm/Hz	-120 dBm/Hz	-141 dBm/Hz
Amplitude Accuracy	± 0.7 dB	± 0.7 dB	± 0.7 dB	± 0.75 dB
Maximum Output	+10 dBm	+10 dBm	+10 dBm	+10 dBm
Phase Noise	-95 dBc/Hz	-95 dBc/Hz	-95 dBc/Hz	-112 dBc/Hz
Tuning Speed	35 ms CW 4.2 s AWG	35 ms CW 4.2 s AWG	3 ms AWG	6.5 ms
Modulation Capabilities	Vector Modulation	Vector Modulation	Vector Modulation	Vector Modulation
RF List Mode	N/A	N/A	N/A	●
Number of PXI Slots	3	3	3	4

Detailed View of PXIe-5673E Vector Signal Generator



Key Features

Excellent RF Performance

Using a PXIe-5673/5673E, you can generate a variety of signals with significant accuracy. A combination of excellent dynamic range and low phase noise yields high-performance signal generation for higherorder modulation schemes such as 4096 QAM. In addition, the wide bandwidth of the PXIe-5673 combined with high-performance image rejection enables generation of modulated signals at high symbol rates. As shown in Figure

1, a loopback configuration with the PXIe-5673 and PXIe-5663 yields a typical EVM (RMS) measurement of 0.5 percent (1250 symbols, software equalization disabled).

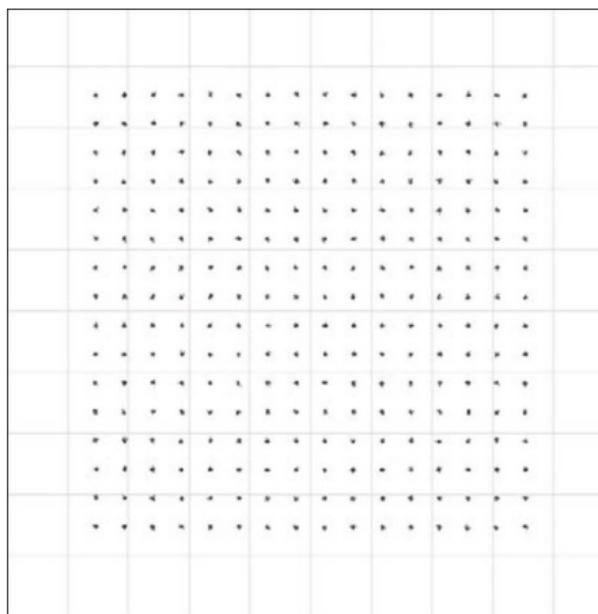


Figure 1. Constellation plot of 256 QAM

Multi-Channel Synchronization

The flexible architecture of a PXIe-5673E VSG enables multiple instruments to share a common start trigger, reference clock, and even an LO. As a result, you can synchronize up to four PXIe-5673/5673E VSGs in a single 18-slot PXI chassis for phase-coherent signal generation. A typical configuration of two synchronized generators is shown in Figure 2. With up to four channels of synchronized RF signal generation, you can easily address MIMO and beamforming applications.

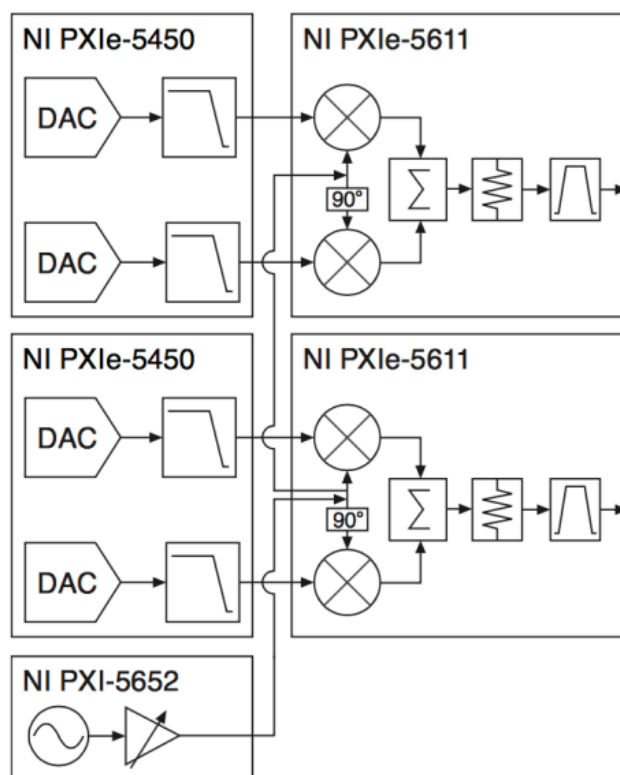
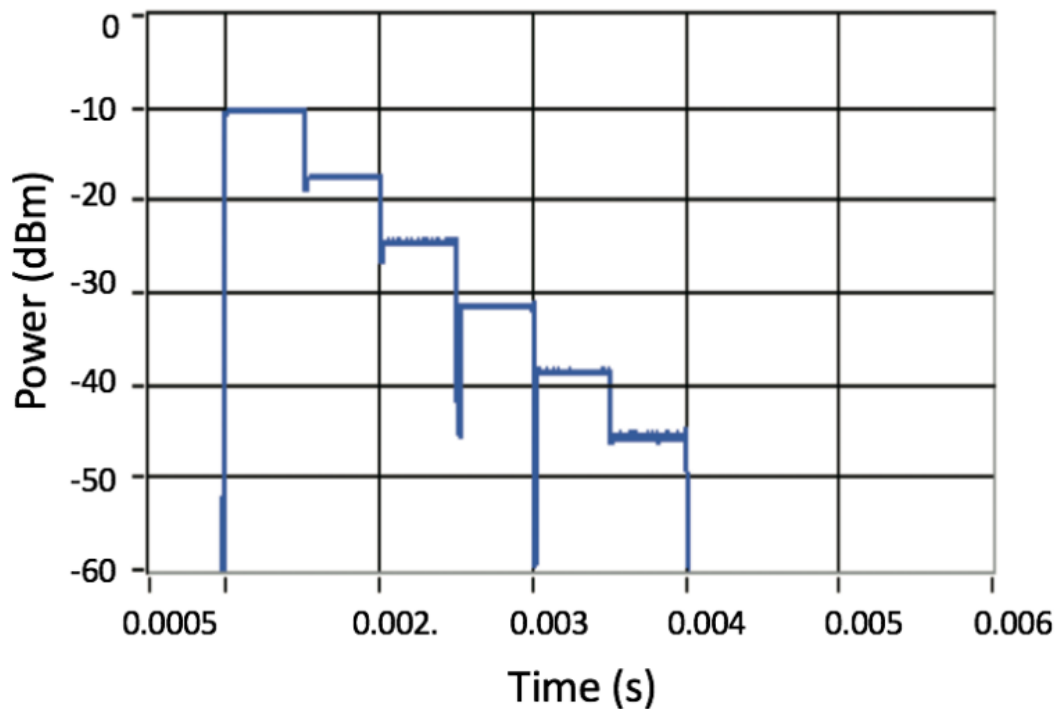


Figure 2. Simplified block diagram of synchronized PXI Vector Signal Generators

The NI VSG provides list mode support for fast and deterministic RF configuration changes. You supply a configuration list, and the RF modules proceed through the list without additional interaction with the host system and driver, making the configuration changes deterministic. Figure 3 illustrates this determinism with a single tone at 1 GHz stepping through six power levels in 7 dB steps, starting with -10 dBm and ending with -45 dBm and having a 500 μ s dwell time specified for each step. Analysis was performed using the PXIe-5663E vector signal analyzer (VSA).

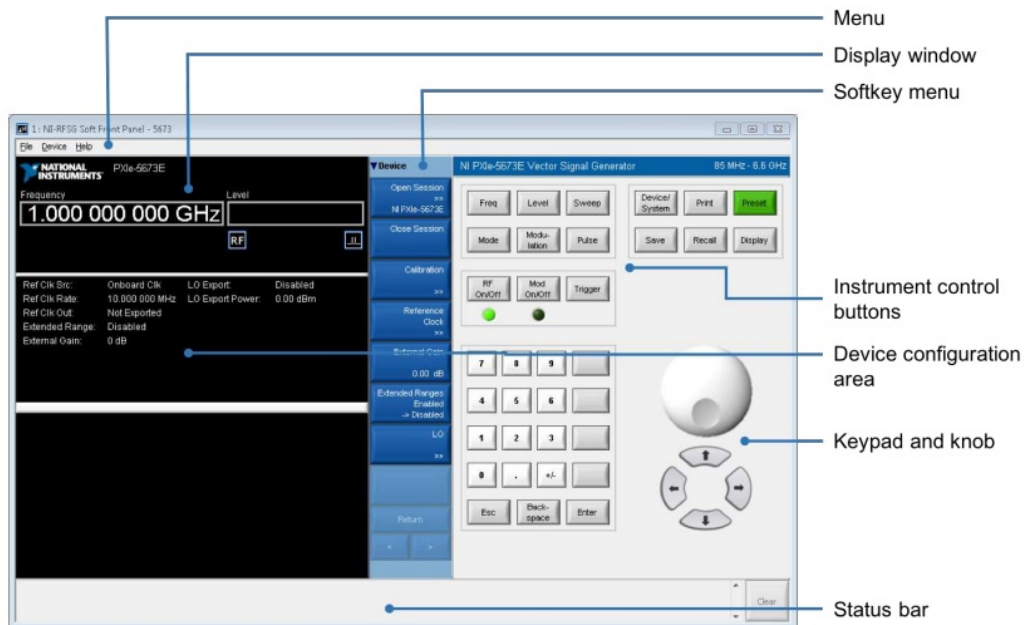


RF Record and Playback

You can combine a PXI VSG with a PXI VSA for record and playback applications. Using a 2 TB redundant array of inexpensive disks (RAID) volume, you can continuously generate up to 100 MHz (400 MB/s) for more than 1.5 hours. In this application, a PXIe- 5663/5663E VSA records up to two hours of continuous RF signal, and the data is stored as a binary file on a RAID volume. The PXIe-5673/5673E then streams recorded waveforms from disk. In addition to recorded waveforms, you can use streaming technology to generate large simulated waveforms.

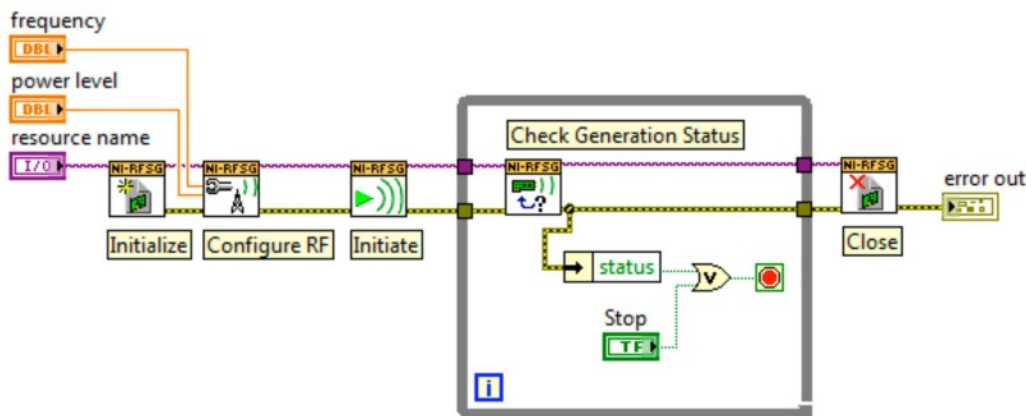
NI-RFSG Soft Front Panel

The [NI-RFSG driver](#) software includes an interactive soft front panel for full out-of-the-box functionality. This interactive soft front panel allows you to quickly generate RF continuous wave (CW) or modulated signals. You can open multiple instances for multiple instruments in a system. In addition, you can load I/Q waveforms, save and recall setups, preview data that is loaded onto the VSG, and sweep levels or frequencies using RF list mode. The soft front panel also features built-in modulation schemes such as AM, FM, and PM. In addition, you can reset, calibrate, and self-test the instrument during troubleshooting, and you can enable a Debug Driver Session to monitor and debug the instrument during automated measurements.



NI-RFSG Application Programming Interface (API)

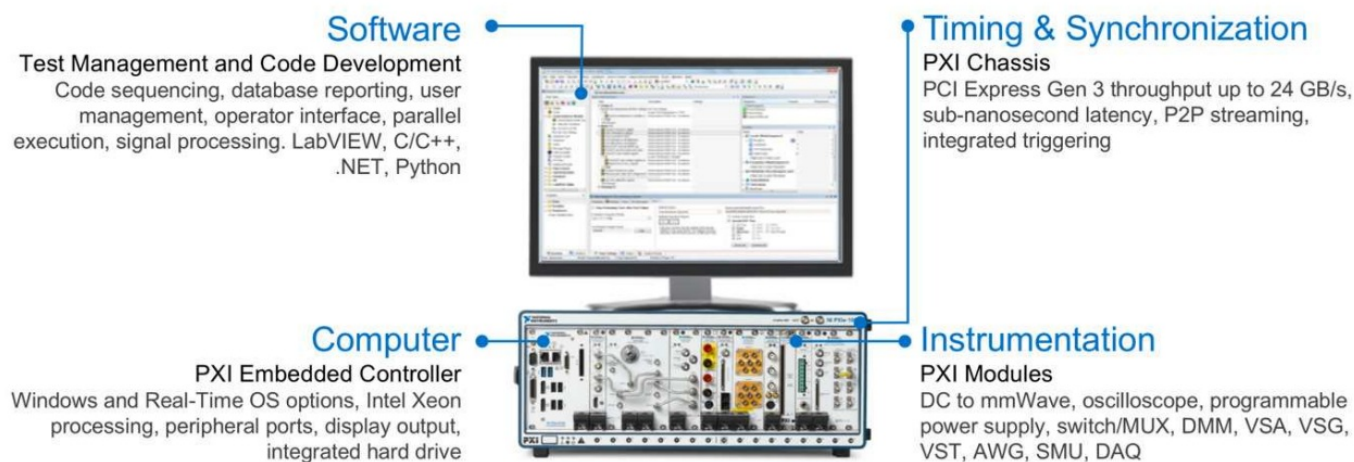
In addition to the soft front panel, the NI-RFSG driver includes a signal generation API that works with a variety of development options such as LabVIEW, C, C#, and others. The driver also provides access to help files, documentation, and dozens of ready-to-run shipping examples you can use as a starting point for your application.



Platform-Based Approach to Test and Measurement

What Is PXI?

Powered by software, PXI is a rugged PC-based platform for measurement and automation systems. PXI combines PCI electrical-bus features with the modular, Eurocard packaging of CompactPCI and then adds specialized synchronization buses and key software features. PXI is both a high-performance and low-cost deployment platform for applications such as manufacturing test, military and aerospace, machine monitoring, automotive, and industrial test. Developed in 1997 and launched in 1998, PXI is an open industry standard governed by the PXI Systems Alliance (PXISA), a group of more than 70 companies chartered to promote the PXI standard, ensure interoperability, and maintain the PXI specification.



Integrating the Latest Commercial Technology

By leveraging the latest commercial technology for our products, we can continually deliver highperformance and high-quality products to our users at a competitive price. The latest PCI Express Gen 3 switches deliver higher data throughput, the latest Intel multicore processors facilitate faster and more efficient parallel (multisite) testing, the latest FPGAs from Xilinx help to push signal processing algorithms to the edge to accelerate measurements, and the latest data converters from TI and ADI continually increase the measurement range and performance of our instrumentation.















PXI Instrumentation

NI offers more than 600 different PXI modules ranging from DC to mmWave. Because PXI is an open industry standard, nearly 1,500 products are available from more than 70 different instrument vendors.

With standard processing and control functions designated to a controller, PXI instruments need to contain only the actual instrumentation circuitry, which provides effective performance in a small footprint.

Combined with a chassis and controller, PXI systems feature high-throughput data movement using PCI Express bus interfaces and sub-nanosecond synchronization with integrated timing and triggering.

	<u>Oscilloscopes</u> Sample at speeds up to 12.5 GS/s with 5 GHz of analog bandwidth, featuring numerous triggering modes and deep onboard memory		<u>Digital Multimeters</u> Perform voltage (up to 1000 V), current (up to 3A), resistance, inductance, capacitance, and frequency/period measurements, as well as diode tests
	<u>Digital Instruments</u> Perform characterization and production test of semiconductor devices with timing sets and per-channel pin parametric measurement unit (PPMU)		<u>Waveform Generators</u> Generate standard functions including sine, square, triangle, and ramp as well as user-defined, arbitrary waveforms
	<u>Frequency Counters</u> Perform counter timer tasks such as event counting and encoder position, period, pulse, and frequency measurements		<u>Source Measure Units</u> Combine high-precision source and measure capability with high channel density, deterministic hardware sequencing, and SourceAdapt transient optimization
	<u>Power Supplies & Loads</u> Supply programmable DC power, with some modules including isolated channels, output disconnect functionality, and remote sense		<u>FlexRIO Custom Instruments & Processing</u> Provide high-performance I/O and powerful FPGAs for applications that require more than standard instruments can offer
	<u>Switches (Matrix & MUX)</u> Feature a variety of relay types and row/column configurations to simplify wiring in automated test systems		<u>Vector Signal Transceivers</u> Combine a vector signal generator and vector signal analyzer with FPGA-based, real-time signal processing and control
	<u>GPIB, Serial, & Ethernet</u> Integrate non-PXI instruments into a PXI system through various instrument control interfaces		<u>Data Acquisition Modules</u> Provide a mix of analog I/O, digital I/O, counter/timer, and trigger functionality for measuring electrical or physical phenomena

Hardware Services

All NI hardware includes a one-year warranty for basic repair coverage, and calibration in adherence to NI specifications prior to shipment. PXI systems also include basic assembly and a functional test. NI offers additional entitlements to improve uptime and lower maintenance costs with service programs for hardware. Learn more at ni.com/services/hardware.

	Standard	Premium	Description
Program Duration	3 or 5 years	3 or 5 years	Length of service program
Extended Repair Coverage	●	●	NI restores your device's functionality and includes firmware updates and factory calibration.
System Configuration, Assembly, and Test ¹	●	●	NI technicians assemble, install software in, and test your system per your custom configuration prior to shipment.
Advanced Replacement ²		●	NI stocks replacement hardware that can be shipped immediately if a repair is needed.
System Return Material Authorization (RMA) ³		●	NI accepts the delivery of fully assembled systems when performing repair services.
Calibration Plan (Optional)	Standard	Expedited	NI performs the requested level of calibration at the specified calibration interval for the duration of the service program.

¹This option is only available for PXI, CompactRIO, and CompactDAQ systems.

²This option is not available for all products in all countries. Contact your local NI sales engineer to confirm availability.

³Expedited calibration only includes traceable levels.

PremiumPlus Service Program

NI can customize the offerings listed above, or offer additional entitlements such as on-site calibration, custom sparing, and life-cycle services through a PremiumPlus Service Program. Contact your NI sales representative to learn more.

Technical Support

Every NI system includes a 30-day trial for phone and e-mail support from NI engineers, which can be extended through a [Software Service Program \(SSP\)](#) membership. NI has more than 400 support engineers available around the globe to provide local support in more than 30 languages. Additionally, take advantage of NI's award winning [online resources](#) and [communities](#).

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PXI Vector Signal Generators

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- [NI Product Documentation - NI](#)
- [NI Hardware Services - NI](#)
- [NI Driver Downloads - NI](#)
- [NI Engineer Ambitiously - NI](#)
- [NI Community - National Instruments](#)
- [What Are PXI Digital Pattern Instruments? - NI](#)
- [What Are PXI Digital Multimeters? - NI](#)
- [What Are PXI Oscilloscopes? - NI](#)
- [What are PXI Source Measure Units \(SMUs\)? - NI](#)
- [What Are PXI Switches? - NI](#)
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- [Power Supplies and Loads - NI](#)

-  [Waveform Generators - NI](#)
-  [What Is a PXI Vector Signal Transceiver? - NI](#)
-  [PXI-5670 - NI](#)
-  [PXI-5671 - NI](#)
-  [PXIe-5672 - NI](#)
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