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Product Flyer

PXI Sound and Vibration Modules

ni.com

Contents

PXI Sound and Vibration Modules

Detailed View of PXI Express Sound and Vibration Module

Key Features

Software

Sound and Vibration Supporting Documentation

What Is PXI?

PXI Instrumentation

NI Hardware Services

PXI Sound and Vibration Modules

PXIe-4463, PXIe-4464, PXIe-4468, PXIe-4480



FIGURE 1

NI Sound and Vibration Family

- Dynamic sensor measurements at 51.2 kS/s, 102.4 kS/s, 204.8 kS/s, 1.25 MS/s, or 250 kS/s
- Built-in highpass filtering and parallel testing to increase throughput
- Per-channel software-selectable AC input coupling and input gain settings
- Select modules available with analog output channels for dynamic signal generation
- Included NI-DAQmx driver and configuration utility that simplifies configuration and measurements.
- Supported environments include LabVIEW, Python, ANSI C, C#.NET, and MathWorks® MATLAB® software

Reliably Characterize Dynamic Signals

PXI Sound and Vibration Modules are designed specifically for applications like audio test and measurement; noise and vibration diagnostics; machine condition monitoring; automotive test; noise, vibration, and harshness (NVH) analysis; and laboratory research. These dynamic signal acquisition (DSA) devices provide software-configurable AC/DC coupling, antialiasing filters, and Integrated Electronics Piezoelectric (IEPE) conditioning to ensure precision measurements with microphones, accelerometers, and other transducers with large dynamic ranges.

Table 1. Sound and Vibration Modules

Model	PXIe-4463	PXIe-4463	PXIe-4464	PXIe-4464	PXIe-4468[1]	PXIe-4480
Bus Connector	PXI Express	PXI Express	PXI Express	PXI Express	PXI Express	PXI Express
Maximum Number of Differential Analog Input Channels	0	0	4	4	2	6
Maximum Sample Rate	51.2 kS/s	51.2 kS/s	204.8 kS/s	204.8 kS/s	250 kS/s	1.25 MS/s
Analog Input Coupling	-	-	AC/DC	AC/DC	AC/DC	AC/DC
Analog Output Channels	2	2	0	0	2	0
Highpass Filter Cutoff Frequency	3.4 Hz	3.4 Hz	.72 Hz	.72 Hz	.8 Hz	.5 Hz
Number of Gain Settings	3	3	6	6	6	4
Front Connection Type	Mini-XLR, SMB	BNC, SMB	BNC, SMB	SMB, Mini-XLR	BNC, Mini-XLR	InfiniBand (IB)
DSA Dynamic Range	-	-	119 dB	119 dB	121 dB	115 dB

[1]Comes with Pure Tone Generator.

Detailed View of PXI Express Sound and Vibration Module

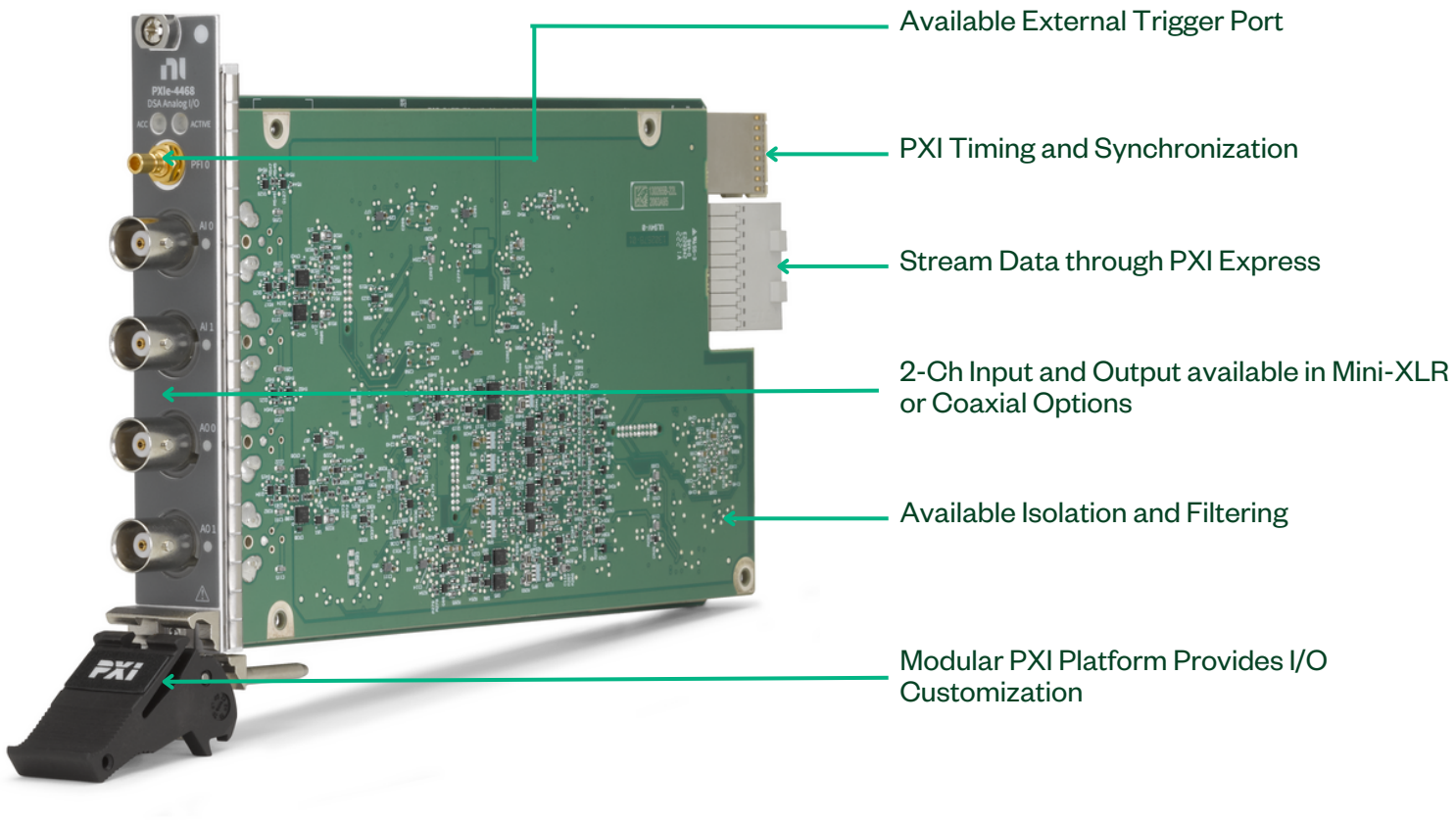


FIGURE 2

Detailed view of PXIe-4468

Key Features

Pure Tone Generator

NI Pure Tone generator capability is available with the PXIe-4468 module. This new mode produces sine waves with distortion, which was previously achievable only with larger, boxed instruments. You can use it to test demanding parameters like data converter linearity and amplifier distortion. The PXIe-4468 offers support for bench-quality signal-chain distortion analysis in a single-slot PXI Express form factor.

Many signal generators use widely available digital-to-analog converters (DACs) to create waveforms, but the noise and distortion performance of these types of generators is limited by the performance of commercially available parts. The NI Pure Tone sine wave generator uses novel digital signal processing (DSP) techniques to enable distortion performance far beyond the capabilities of conventional DACs to produce previously unachievable residual total harmonic distortion (THD) and total harmonic distortion plus noise (THD+N).

Figures 3 and 4 feature two representative fast Fourier transforms (FFTs) showing PXIe-4468 performance using a standard analog output sampling sine wave generation compared to PXIe-4468 performance using a sine wave generation with Pure Tone.

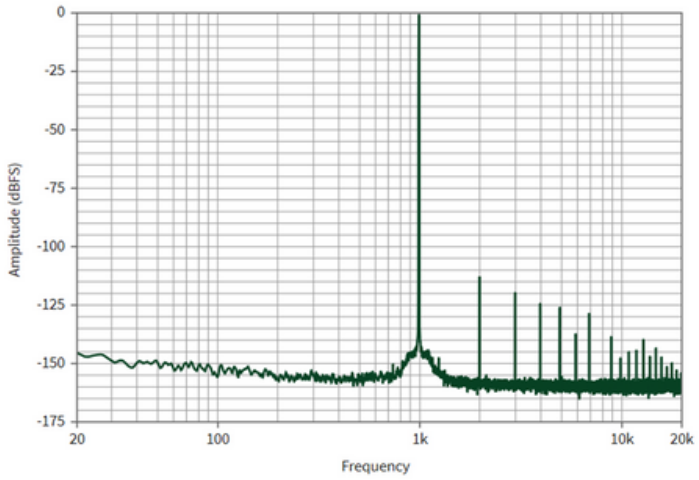


FIGURE 3

FFT of Standard Sine Wave Generation

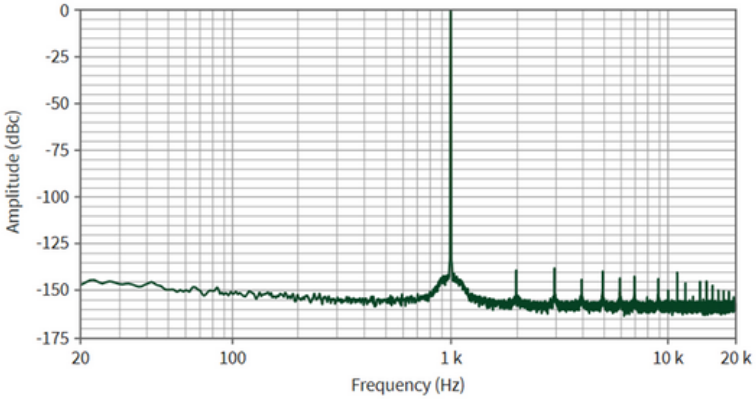


FIGURE 4

Fast Fourier Transformation of Sine Wave Generation with Pure Tone.

As can be seen from the two spectrums, the harmonics are reduced up to 25 dB with the Pure Tone generator. Additionally, the residual distortion of the Pure Tone signal is -129 dB, or 0.35 parts per million and total THD+N is -122 dB (10 Hz to 22.4 kHz bandwidth).

Sensor-Specific Signal Conditioning

You can use IEPE constant current conditioning with many modules on a per-channel basis. This conditioning replaces the need for external signal conditioning for measurements that have dynamic signal sensors like microphones and accelerometers. As a result, the measurement system is physically smaller as well as more accurate and precise.

High Spurious Free Dynamic Range

With these modules, you can simultaneously sample multiple channels at up to 113 dB of spurious-free dynamic range (SFDR) to ensure reliable characterization of frequencies. NI DSA devices are carefully designed to minimize spurious frequencies that can be caused by the electrical components of the device itself.

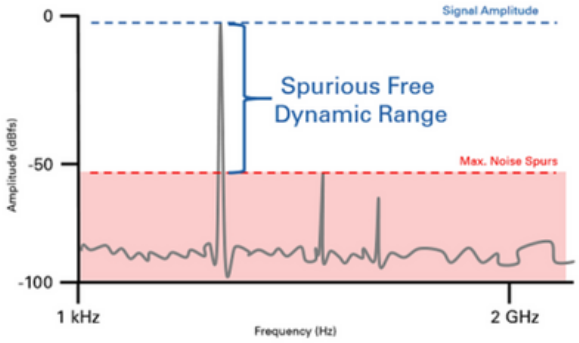


FIGURE 5

Graph Representation of SFDR

High Bandwidth and Exceptional Flatness

Modules are available for a variety of bandwidth requirements to provide reliable and consistent performance across the measurable spectrum. This helps ensure accurate representation of a signal's amplitude at all incoming frequencies, even at the upper end of the device's bandwidth as the signal approaches the -3 dB roll-off point.

Analog input flatness is a measure of how a device's measurement response varies across its bandwidth. A device with exceptional flatness shows little change in measured amplitude of the same voltage level at all frequencies it is specified to measure.

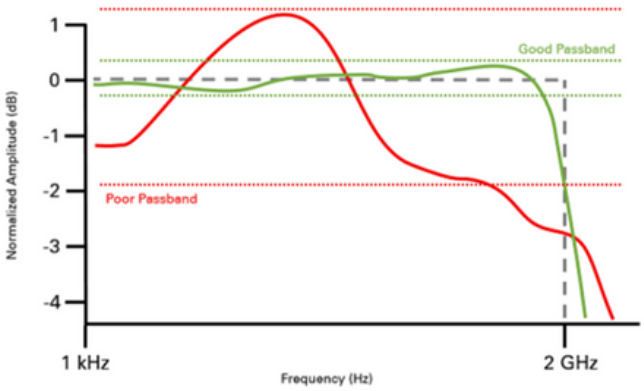


FIGURE 6

Passband Comparison (Green line represents the frequency response of a module with exceptional analog input flatness compared to modules without, which are represented in red.)

Low Noise

Built-in anti-aliasing filtering prevents high-frequency noise from aliasing into the measured signal, and selectable gain stages ensure maximum utilization of the available 24 bits of ADC resolution. This is especially important when measuring low-level signals or when searching for small variations in an otherwise electrically noisy environment.

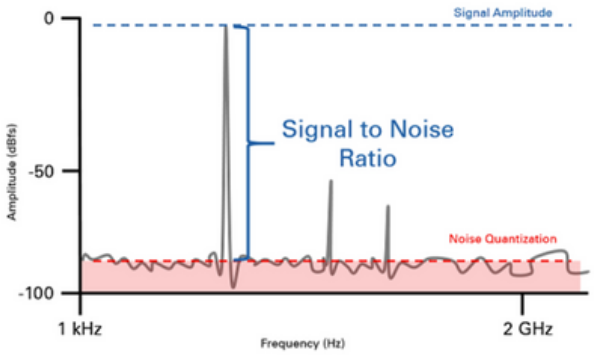


FIGURE 7

Signal-to-Noise Ratio

Synchronization and Integration

PXI Sound and Vibration Modules use the inherent timing and synchronization capabilities of the PXI platform to synchronize measurements between multiple modules, which is ideal for high-channel-count applications. A PXI Express chassis incorporates a dedicated 10 MHz system reference clock, 100 MHz differential system clock, PXI trigger bus, star trigger bus, slot-to-slot local bus, differential signaling, and differential star triggers to address the need for advanced timing and synchronization. You can also use NI-TClk technology for timing and synchronization for multiple instruments to simultaneously respond to triggers, to align sample clocks on multiple instruments, and/or to simultaneously start multiple instruments with subnanosecond levels of skew.

Self-Calibration and Two-Year Guaranteed Specifications

The warranted specifications of all NI data acquisition devices and modules are guaranteed to fall within the published limits for at least a year from factory calibration. Many devices and modules include a high-precision onboard reference and a self-calibration feature for intermittent calibrations during use. This technology helps correct for changes in the performance of the sound and vibration hardware over the normal range of operating conditions, like local changes in temperature. For guaranteed performance over time, external calibration services are provided to return a device to its "factory" performance state. This once again guarantees performance to the published specifications for an additional calibration interval of at least one year.



FIGURE 8

Calibration Intervals

Software

NI-DAQmx API

NI-DAQmx is the driver software you use to communicate with and control your NI data acquisition (DAQ) devices. It includes an extensive library of functions and VIs, help files, documentation, and dozens of ready-to run shipping examples you can use as a starting point for your application. You can build your applications with measurement-specific VIs, functions, data types, and analysis integrations and reliably make faster measurements with optimized DMA data transfer and single-point I/O.

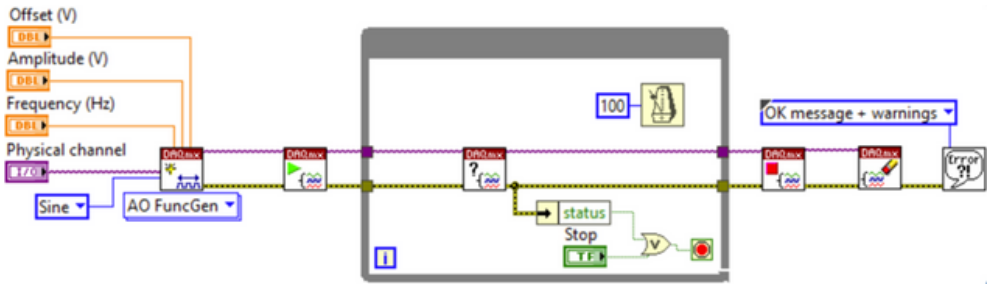


FIGURE 9

LabVIEW NI-DAQmx Example

LabVIEW Sound and Vibration Toolkit

The LabVIEW Sound and Vibration Toolkit is a software add-on that contains easy-to-use power spectrum, swept sine, and octave analysis VIs. It also handles audio and distortion measurements, frequency analysis, frequency response measurements, and transient analysis. The toolkit features updated analysis solutions to comply with evolving IEC standards. You can quickly begin applications with more than 50 ready-to-run LabVIEW examples provided in the LabVIEW Sound and Vibration Toolkit.

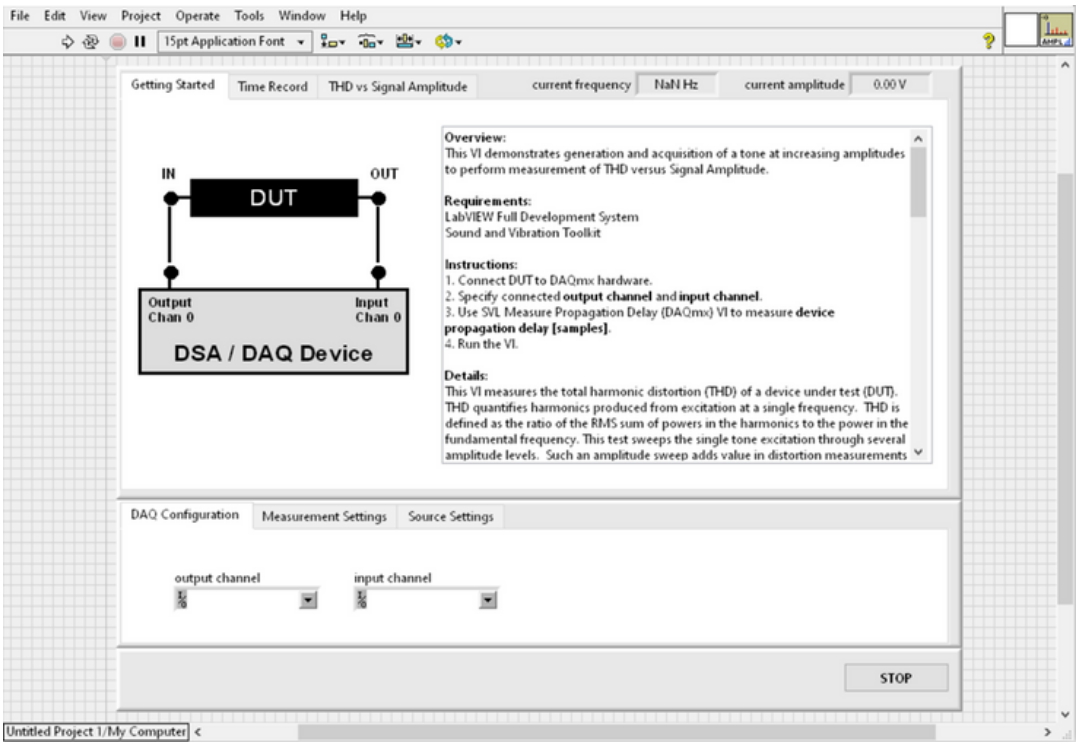


FIGURE 10

LabVIEW Sound and Vibration Example - Front Panel

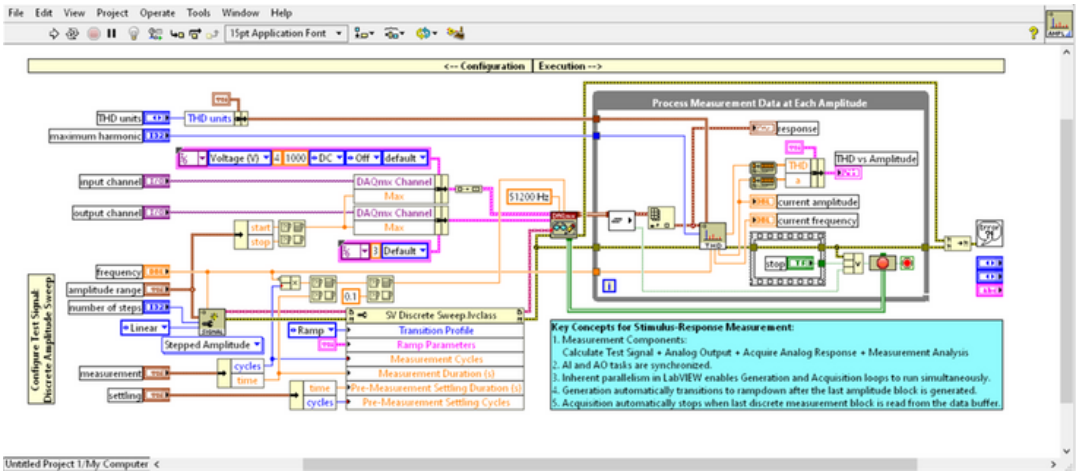


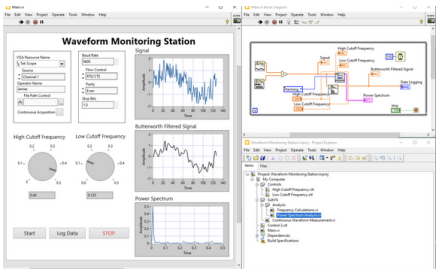
FIGURE 11

LabVIEW Sound and Vibration Example – Block Diagram

Additional NI Software-The Right Tool for the Job

NI has a variety of software for engineers working on research, validation, and production test applications. Learn about our software that helps engineers perform quick ad-hoc tests, build an automated test system, automate data analysis and reporting, develop test sequences, and more.

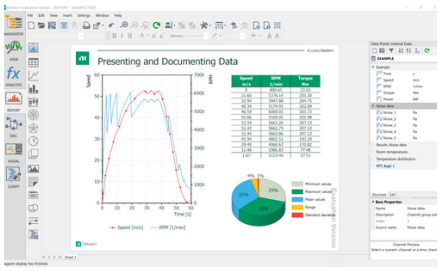
LabVIEW



Graphical programming environment that engineers use to develop automated research, validation, and production test systems.

- Acquire data from NI and third-party hardware and communicate using industry protocols
- Use configurable, interactive display elements
- Take advantage of available analysis functions

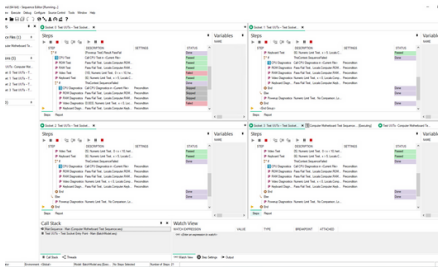
DIAdem



Data analytics software for measurement data search, inspection, analysis, and automated reporting.

- Display data in multiple 2D-axis systems
- Perform calculations with a simple point-and-click interface
- Automate your measurement data analysis workflow, from import to analysis

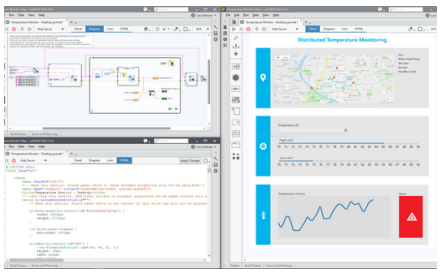
TestStand



Test executive software that accelerates system development for engineers in validation and production.

- Call and execute tests in LabVIEW, Python, C/C++, or .NET
- Conduct complex tasks, such as parallel testing
- Create customer operator interfaces and robust tools for deployment and debugging

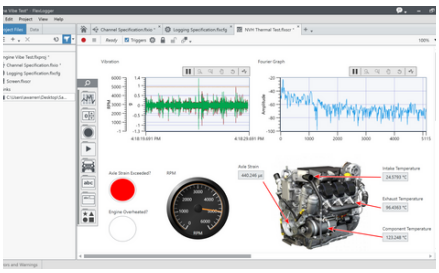
G Web



Development software that helps engineers create web-based user interfaces wihtout the need for traditional web development skills.

- Data transfer APIs for connecting to systems written in LabVIEW, Python, or C#
- Pre-built objects for data display and user input
- Included hosting on SystemLink™ Cloud

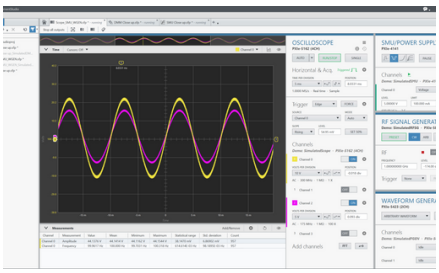
FlexLogger™



No-code data acquisition software engineers use to build validation and verification test applications.

- Interactive visualization tools for monitoring tests with drag-and-drop charts, graphs, and controls
- Ability to set alarms that monitor single channels or groups for unexpected behavior

InstrumentStudio™



Application software that simplifies setup and configuration of NI PXI hardware

- Customizable layouts for monitoring multiple instruments at once
- Interactively debug in tandem with code
- TDMS file export containing instrument settings, measurements, and raw data

Supporting Documentation

Table 2. Supporting Documentation

Document Type	Model
Getting Started Guide	PXIe-4463 PXIe-4464, PXIe-4468, PXIe-4480
Specifications	PXIe-4463 PXIe-4464, PXIe-4468, PXIe-4480
Additional Content	How To Generate Pure Tone Using PXIe-4468, PCI/PXI/PXIe/USB-443x/4461/4462/449x (Dynamic Signal Acquisition) Feature Usage Timing and Synchronization Features of NI-DAQmx

Configure a Custom NI System

NI's online system advisors help you create a custom system based on your specific requirements. Use the advisor to choose compatible hardware, software, accessories, and services and then save your selections as configurations for easy quoting and purchasing later. Visit ni.com/advisor to learn more.

What Is PXI?

A Platform Approach to Test and Measurement

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.

Software

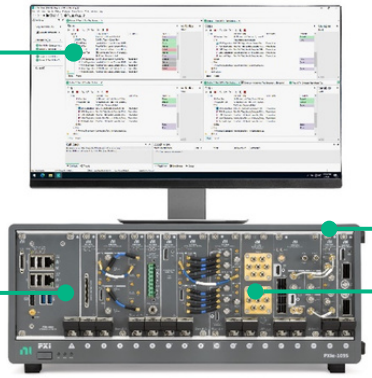
Test Management and Code Development

Code sequencing, database reporting, user management, operator interface, parallel execution, signal processing. LabVIEW, C/C++, .NET, Python

Computer

PXI Embedded Controller

Windows and Real-Time OS options, Intel Xeon processing, peripheral ports, display output, integrated hard drive



Timing and Synchronization

PXI Chassis

PCI Express Gen 3 throughput up to 24 GB/s sub-nanosecond latency, P2P streaming, integrated triggering

Instrumentation

PXI Modules

DC to mmWave, oscilloscope, programmable power supply, switch/MUX, DMM, VSA, VSG, VST, AWG, SMU, DAQ

Integrated with the Latest Commercial Technology

By leveraging the latest commercial technology for our products, we can continually deliver high performance 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.

HIGHER DATA THROUGHPUT



PCI Express Gen 3

PARALLEL TEST EXECUTION



Multicore Processors

MEASUREMENT ACCELERATION



FPGAs

INCREASED MEASUREMENT RANGE



Data Converters

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.



Oscilloscopes

Sample at speeds up to 12.5 GS/s with 5 GHz of analog bandwidth, featuring numerous triggering modes and deep onboard memory



Digital Instruments

Perform characterization and production test of semiconductor devices with timing sets and per channel pin parametric measurement unit (PPMU)



Frequency Counters

Perform counter timer tasks such as event counting and encoder position, period, pulse, and frequency measurements



Power Supplies & Loads

Supply programmable DC power, with some modules including isolated channels, output disconnect functionality, and remote sense



Switches (Matrix & MUX)

Feature a variety of relay types and row/column configurations to simplify wiring in automated test systems



GPIB, Serial, & Ethernet

Integrate non-PXI instruments into a PXI system through various instrument control interfaces



Digital Multimeters

Perform voltage (up to 1000 V), current (up to 3A), resistance, inductance, capacitance, and frequency/period measurements, as well as diode tests



Waveform Generators

Generate standard functions including sine, square, triangle, and ramp as well as user-defined, arbitrary waveforms



Source Measure Units

Combine high-precision source and measure capability with high channel density, deterministic hardware sequencing, and SourceAdapt transient optimization



FlexRIO Custom Instrumentation & Processing

Provide high-performance I/O and powerful FPGAs for applications that require more than standard instruments can offer



Vector Signal Transceivers

Combine a vector signal generator and vector signal analyzer with FPGA-based, real-time signal processing and control



Data Acquisition Modules

Provide a mix of analog I/O, digital I/O, counter/timer, and trigger functionality for measuring electrical or physical phenomena

NI 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.

	Hardware	Standard	Premium	Description
Duration at Point of Sale	1 year; included	3 years; optional	3 years; optional	NI enhances warranty coverage with additional service benefits provided with a hardware service program.
Maximum Duration with Renewal	≤3 years with service program	≤3 years	≤3 years	NI maintains the high performance and availability of your hardware for up to three years with a hardware service program.
Extended Repair Coverage	•	•	•	NI restores your device's functionality and includes firmware updates and factory calibration; <10 working days [4] + standard shipping.
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) [1]			•	NI accepts the delivery of fully assembled systems when performing repair services.
Technical Support	•	•	•	NI provides access to support resources for your hardware.
Calibration Plan (Optional)		Standard	Expedited [3]	NI performs the requested level of calibration at the specified calibration interval for the duration of the service program.

1 This option is only available for PXI, CompactRIO, and CompactDAQ systems.
2 This option is not available for all products in all countries. Contact your local NI sales engineer to confirm availability.
3 Expedited calibration is only available for the Traceable calibration level.
4 This applies to non-RF products only. Standard extended repair coverage for RF products is <15 working days + standard shipping.

PremiumPlus Service Program

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

Technical Support

NI hardware service programs and warranty include access to technical support provided by NI support agents during local business hours. Service requests can be managed online. Additionally, take advantage of NI's award-winning online resources and communities.

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