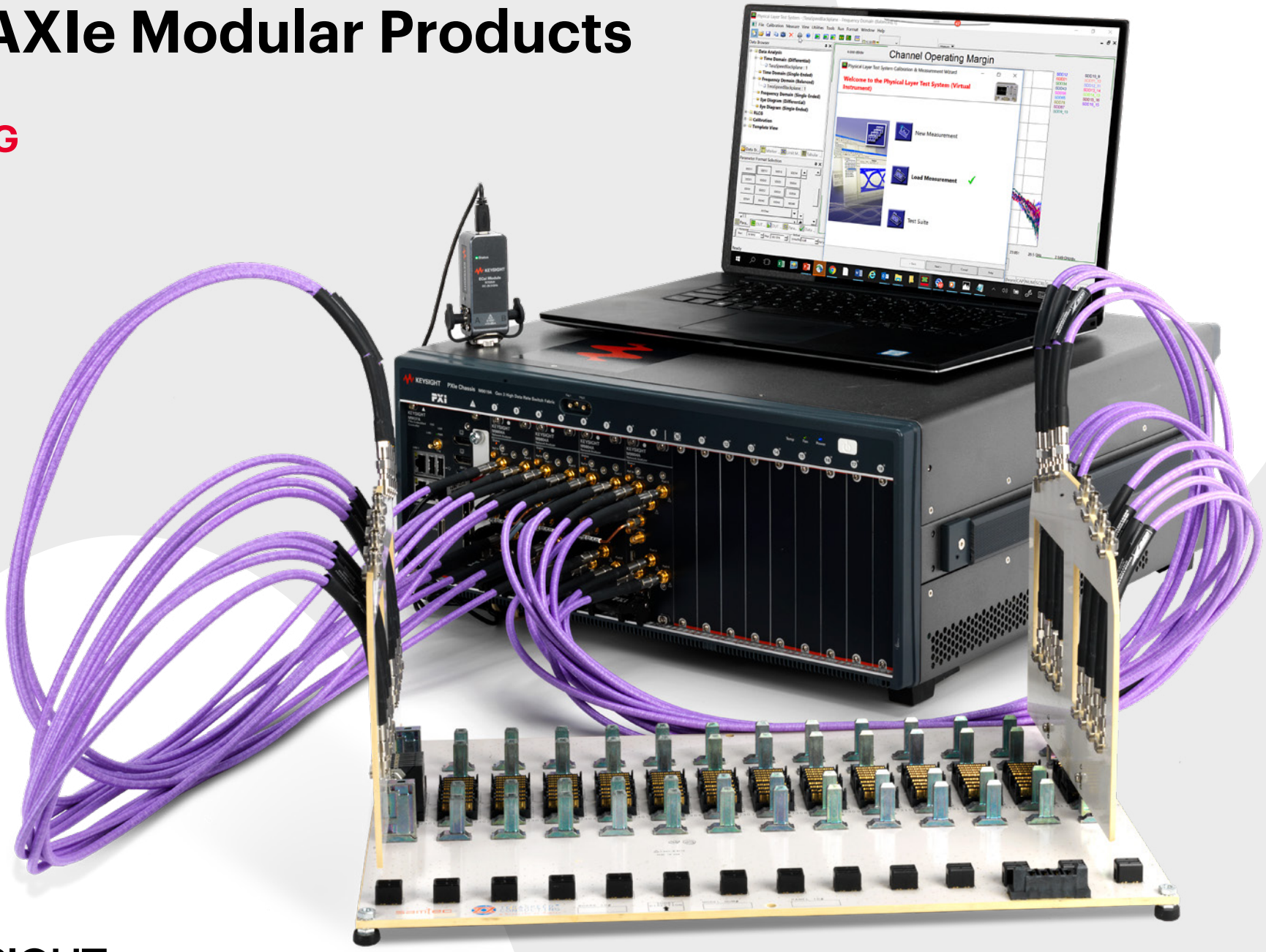
# PXI / AXIe Modular Products

## CATALOG




KEYSIGHT

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# Design and Test Complex Devices with Confidence

As commercial and military communications systems increase in complexity, R&D engineers optimize space by replacing multiple discrete subsystems with a single compact chip or module. These highly integrated devices must be high-performance, power-efficient, and reasonably cost-effective to produce and test.

Keysight helps you test highly integrated multichannel or multiport devices with speed and accuracy using our line of Keysight PXI and AXIe instruments. Here are a couple of examples of how these solutions can help you:

- Keysight PXI vector network analyzer (VNA) demonstrates a significant reduction in manufacturing test time at many customer sites. It provides true multiport capability — simultaneously testing up to 50 ports in one chassis without switches.
- Keysight M8199B AXIe arbitrary waveform generator (AWG) addresses coherent optical and multilevel / multichannel signal requirements. This solution delivers the highest bandwidth (exceeding 80 GHz) and highest speed at 256 GSa/s, enabling signal generation 160 GBaud and beyond.

There are time-saving starting points for test system creation — documented solutions that address specific measurement applications such as 5G infrastructure testing and quantum computing. The Keysight PathWave test software, usable with benchtop and modular instruments, helps development teams transition designs from the lab to high-volume production. Modular instruments offer the added benefit of efficient, high-speed test.

Keysight helps you tackle your toughest RF, microwave, and digital test challenges. Our foundation is the industry's most accurate measurement science, giving you maximum confidence to achieve your first, best measurement and insight into what's next.

Most PXI / AXIe modular purchases include KeysightCare. As a KeysightCare subscriber, you get unlimited access to Keysight technical experts with predictable response times on any instrument or measurement questions for these application areas.

KEYSIGHTCARE

# PXI modular instruments — interoperability, size, speed, and scalability

PXI, an open, multivendor standard governed by the PXI Systems Alliance, ensures interoperability of modules and chassis from different vendors. The PXIe backplane bus leverages PCI Express® technology, which significantly improves test speed and reduces latency, especially for data- and transaction-intensive test applications. The bus also enables the scalability of the system as your test needs change. Integrate PXI instruments into an existing test system of benchtop, PXIe, or AXIe instruments.


M9804A and N1930B physical layer test system (PLTS) software

# AXIe modular instruments — truly advanced, cutting-edge technology

AXIe is a next-generation open standard based on Advanced Telecommunications Computing Architecture (AdvancedTCA). Increasing the power and headroom available to each slot allowed the development of higher-performance modules with faster switching speeds, larger power draws, and more complex measurement architectures. AXIe instruments provide timing, triggering, and module-to-module data movement features for high-performance test and measurement systems used in aerospace / defense, high-energy physics, semiconductor test, and other industries. The chassis and modules complement benchtop and PXI products, including PCIe® and LAN interfaces that allow them to act like virtual PXI or benchtop instruments.


M8199A 8 channel,
128 GSa/s arbitrary waveform generator

# High-Speed Chassis, Controllers, and I/O Components

Build a modular system by choosing the compatible chassis and controllers that meet your needs. Keysight offers a variety of modular chassis and system modules with different sizes and performance characteristics.

## PXIe chassis

Choose PCIe Gen 3 chassis, controllers and system modules for superior performance or Gen 2 for more power.

| Technical overview | M9010A | M9019A | M9046A |
|---|---|---|---|
| Module compatibility | PXIe, PXI-hybrid, PXI-1 (J1 only), cPCI (J1 only) | | |
| Number of slots | 10 | 18 | 18 |
| Backplane fabric | Gen 3 (PCIe 3.0) | Gen 3 (PCIe 3.0) | Gen 3 (PCIe 3.0) |
| Maximum data bandwidth | 24 GB/s (system slot)<br>8 GB/s (slot to slot) | 24 GB/s (system slot)<br>8 GB/s (slot to slot) | 24 GB/s (system slot)<br>8 GB/s (slot to slot) |
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M9046A PXIe chassis high-power, 18-slot, 24 GB/s

# AXIe chassis

When you need truly cutting-edge instruments that provide timing, triggering, and module-to-module data movement features.

| Technical overview | M9502A | M9505A | M9506A |
|---|---|---|---|
| Module compatibility | AXIe 1 Revision 2.0 | | AXIe 1 Revision 2.0<br>AXIe 1 Revision 3.0 |
| Number of slots | 2 | 5 | 5 |
| Backplane fabric | PCIe 2.0 | PCIe 2.0 | PCIe 3.0 |
| Maximum data bandwidth | 2 GB/s (system slot)<br>4 GB/s (slot to slot) | 2 GB/s (system slot)<br>4 GB/s (slot to slot) | 16 GB/s (system slot)<br>16 GB/s (slot to slot) |
| | Get Quote > | Get Quote > | Get Quote > |

# PXIe and AXIe controllers

| Technical overview | M9035A | M9038A | M9537A |
|---|---|---|---|
| Instrumentation | PXIe | PXIe | AXIe |
| CPU | Intel Quad-Core i3-8100H 3.0 GHz | Intel CoffeeLake 6-Core i7-9850HE | Intel i7 6820EQ 2.8 GHz quad-core |
| Memory and storage | 16 GB std, 32 GB max, 256 GB SSD | 32 GB std, 64 GB max, 512 GB SSD | 8 GB std, 16 GB maximum, optional<br>400 GB NVMe disk cache, 240 GB SSD |
| Maximum data bandwidth | 16 GB/s | 16 GB/s | 16 GB/s (CPU to backplane) |
| | Get Quote > | Get Quote > | Get Quote > |

M9506A AXIe 5-slot chassis

# PXIe and AXIe interface modules and adapters

Achieve a high-performance and reliable connection from a remote or embedded controller to one or multiple chassis with the Keysight PCIe and PXIe interface modules. The Keysight high-performance Gen 3 interface modules enable connections from your PC, remote or embedded PC, to a PXIe or AXIe test system or to multiple PXIe or AXIe chassis.

**Learn more**

Interface modules and adapters PXIe and AXIe systems


**Diagnose and Resolve PXIe and AXIe Chassis Communication Issues**

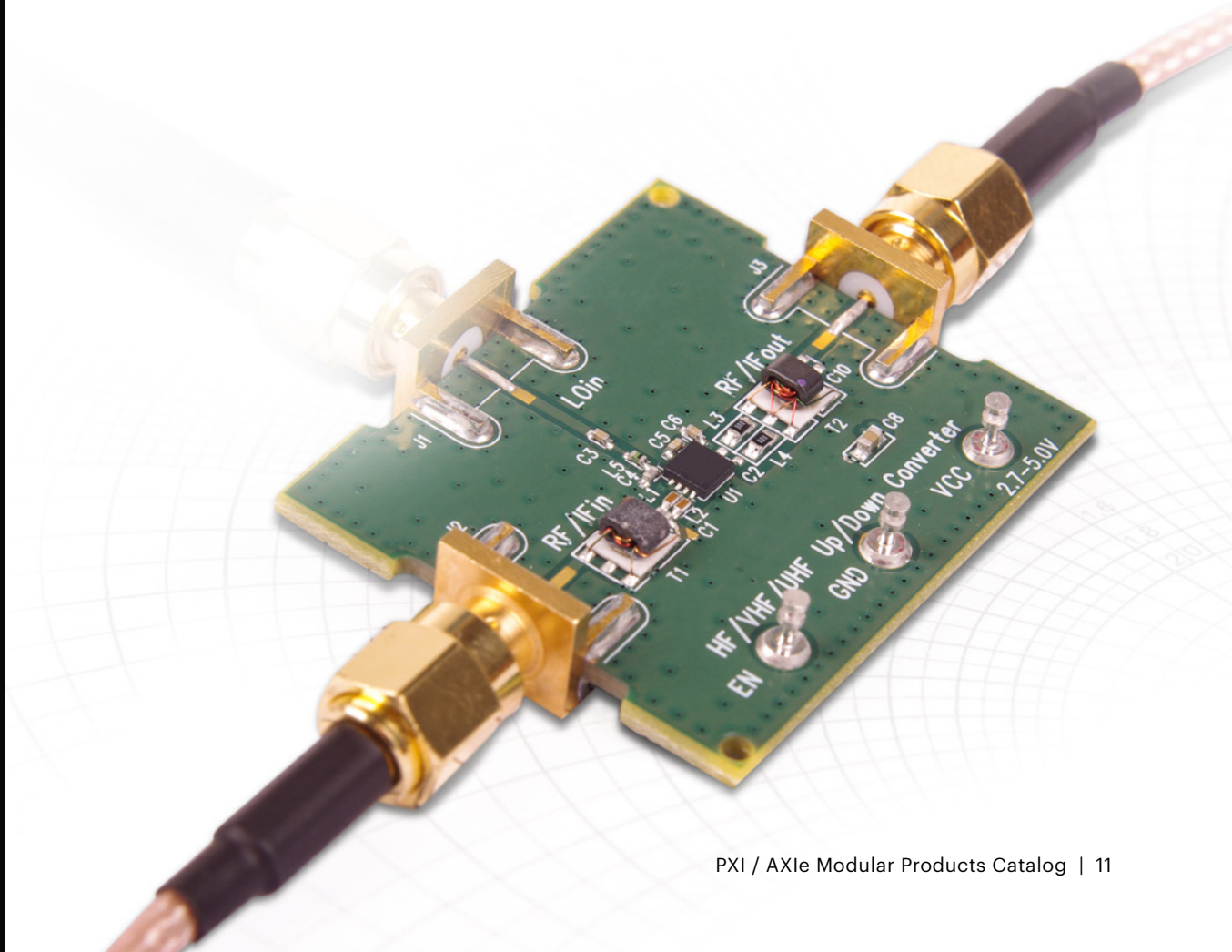
Get up to speed on the hardware connections, firmware, and software components of your PXI or AXIe system. This guide can also help you diagnose and resolve chassis communication problems.

**Download reference guide**

# PXIe RF Instruments for Fast, Direct Test of Multichannel Devices

Modern multiport or multichannel devices demand faster and more accurate measurements than a standard measurement system can provide. External switches are often used to multiplex or add ports available to measure on standard measurement equipment. External switches, even when calibrated, fundamentally affect measurement performance. In addition, switches require significant operator intervention for setup, calibration, and adjusting configurations, decreasing test throughput.

Keysight PXIe RF modules help you overcome these challenges. They allow you to create scalable solutions without the need for external components, thus providing consistent, accurate results with proven Keysight measurement science.



# PXI signal generators

Built for applications that require multichannel measurement capabilities and test speed, PXIe signal generators also offer scalability and a small footprint:

- Configure solutions with a shared processor, chassis, and other modular instruments.
- Use the same software as benchtop signal generators for measurement consistency throughout the product development cycle.


M9383B microwave signal generator, 1 MHz to 44 GHz

## Simplify signal creation with PathWave signal generation software

The PathWave signal generation software is a flexible suite of signal-creation tools that can reduce the time you spend on signal simulation. Its performance-optimized reference signals — validated by Keysight — enhance the characterization and verification of your devices.

Learn more

| Technical overview | M9380A CW source | M9381A vector signal generator | M9383A microwave signal generator | M9383B VXG-m microwave signal generator [1] |
|---|---|---|---|---|
| Number of slots | 3 | 5 | 4-12 | 9 |
| Frequency range | 1 MHz to 3 or 6 GHz | 1 MHz to 3 or 6 GHz | 1 MHz to 14, 20, 31.8, or 44 GHz | 1 MHz to 44 GHz |
| RF bandwidth | NA | 40, 100, or 160 MHz | 40, 160, 500, or 1,000 MHz | 2 GHz |
| Amplitude accuracy | ±0.4 dB | ±0.4 dB | ±1.0 dB | ±1.5 dB |
| Phase noise (1 GHz) | -122 dBc/Hz at 20 kHz offset | -122 dBc/Hz at 20 kHz offset | -118 dBc/Hz at 10 kHz offset | -137 dBc/Hz at 10 kHz offset |
| | Get Quote > | Get Quote > | Get Quote > | Get Quote > |

[1] Must use in conjunction with the M9043A chassis and the M9035A controller. For details, please refer to the configuration guide.

# PXI signal analyzers

Ideal for design validation and manufacturing applications that require fast, high-quality measurements, PXIe signal analyzers provide essential quality controls, product conformance, and test optimization:

- Achieve scalability and the flexibility to configure a solution with a shared processor, frame / chassis, display, and interface.
- Build single or multichannel test solutions with PXIe vector signal analyzer building blocks.
- Using Keysight PathWave X-Series measurement applications and the PathWave vector signal analysis (VSA) software, you can count on consistent, repeatable measurement results across form factors and the product development life cycle.

## Transform your PXI signal analyzer with PathWave X-Series measurement applications

The PathWave X-Series measurement applications provide proven, ready-to-use measurements for signal analysis. Capturing measurement expertise and delivering repeatable results, the applications let you see and understand the performance of your devices and designs.

Learn more

## See through the complexity with PathWave VSA software

The PathWave 89600 VSA software is a comprehensive set of tools for demodulation and vector signal analysis. These tools enable you to explore virtually every facet of a signal and optimize your most advanced designs.

Learn more

| Technical overview | M9290A CXA-m signal analyze | M9391A vector signal analyzer | M9393A vector signal analyzer |
|---|---|---|---|
| Number of slots | 4 | 4 | 5 |
| Frequency range | 10 Hz to 3, 7.5, 13.6, or 26.5 GHz | 1 MHz to 3 or 6 GHz | 9 kHz to 8.4, 14, 18, or 27 GHz<br>Extended: 3.6 to 50 GHz |
| Analysis bandwidth | 10 or 25 MHz | 40, 100, or 160 MHz | 40, 100, or 160 MHz |
| Amplitude accuracy | ±0.6 dB | ±0.45 dB | ±0.13 dB |
| Display average noise level | -160 dBm/Hz at 1 GHz | -157 dBm/Hz at 1 GHz | -168 dBm/Hz at 1 GHz |
| | Get Quote > | Get Quote > | Get Quote > |

# PXI vector transceivers

Get signal generation and analysis in one PXIe module with real-time field-programmable gate array (FPGA)-accelerated measurements for faster throughput. The Keysight PXIe vector transceiver is perfect for manufacturing test of wireless devices, RF power amplifiers, and front-end modules:

- Reduce development time with open source test libraries, and reference solutions.
- Ensure wireless standards conformance with PathWave X-series measurement applications and signal generation software.

| Technical overview | M9421A | M9410A / M9411A | M9415A / M9416A | M9471A |
|---|---|---|---|---|
| Number of slots | 4 | 2 / 3 | 3 / 4 | 3 |
| Frequency range | 60 MHz to 3.8 or 6 GHz | M9410A: 380 MHz to 6 GHz<br>M9411A: 1 MHz to 6 GHz | 380 MHz to 6, 8 or 12 GHz | 1 MHz to 26.5 GHz, with M9410A/11A/15A/16A |
| Analysis bandwidth | 40, 80, or 160 MHz | 300, 600, or 1,200 MHz | 400, 800, or 1,200 MHz | 300, 600, or 1,200 MHz |
| Maximum output power | + 20 dBm | + 20 dBm | + 20 dBm | + 20 dBm |
| Display average noise level (1 GHz) | -160 dBm/Hz at 1 GHz (SA) | -163 dBm/Hz at 1 GHz (SA) | -167 dBm/Hz at 1 GHz (SA) | -165 dBm/Hz at 1 GHz (SA) |
| Phase noise (1 GHz, 10 kHz offset) | -112 dBc/Hz (SG)<br>-111 dBc/Hz (SA) | -130 dBc/Hz (SG)<br>-129 dBc/Hz (SA) | -133 dBc/Hz (SG)<br>-130 dBc/Hz (SA) | -130 dBc/Hz (SG)<br>-129 dBc/Hz (SA) |
| IQ streaming (in/out) | N/A | Available on M9411A | Available on M9416A | N/A |
| | Get Quote > | Get Quote > | Get Quote > | Get Quote > |


VXT PXI vector transceiver

# Powerful troubleshooting tools and consistent measurement science

Keysight VXT PXIe vector transceivers support a wide range of applications using the same measurement application software as benchtop instruments. These trusted measurement applications offer users powerful troubleshooting tools and consistent measurement science to easily and quickly transition from R&D to production.

- PathWave X-Series measurement applications
- PathWave vector signal analysis (89600 VSA)
- PathWave signal generation software

**Accelerate 5G Testing:**
**5G Manufacturing Test Considerations**

5G leverages new and existing technologies to achieve higher data throughput, bringing faster and more reliable communications. Learn about the evolution of the 3rd Generation Partnership Project (3GPP) on test and design solutions available to help you scale to production quickly.

**Download white paper**

# PXI vector network analyzers

Take on the most demanding multiport challenges with industry-leading, true multiport architecture that offers exceptional performance no matter how many ports you use. Significantly increase test speed and efficiency, reducing your cost of test.

PXI VNAs provide these benefits:

- Get industry-leading speed, dynamic range, trace noise, and stability. Improve accuracy, yield, and margins.
- Characterize up to 50 ports with the M980xA series in a single PXI chassis. All test ports are fully synchronous, so that you can measure multiple ports simultaneously with multiport error correction applied.
- Receive the same quality results since PXIe VNAs are compatible with the same software applications as benchtop VNAs.


M9804A PXI vector network analyzers

| Product number | M937xA VNA | M9804A VNA | M9808A VNA |
|---|---|---|---|
| Number of slots | 1 | 1 (2 ports), 2 (4 and 6 ports) | 1 (2 ports) |
| Frequency range | 300 kHz to 26.5 GHz | 9 kHz to 20 GHz | 100 kHz to 53 GHz |
| Dynamic range at 4 GHz | 115 dB (at 10 Hz IFBW) | 140 dB (at 10 Hz IFBW) | 140 dB (at 10 Hz IFBW) |
| Trace noise at 4 GHz | 0.002 dB RMS (1 kHz IFBW) | 0.0015 dB RMS (10 kHz IFBW) | 0.0015 dB RMS (10 kHz IFBW) |
| Maximum number of ports | 2 ports per module, up to 32 in one PXI chassis | 2, 4, or 6 ports per module, up to 50 ports in one PXI chassis | 2 ports per module, up to 34 ports in one PXI chassis |
| | Get Quote > | Get Quote > | Get Quote > |

# M983xA PXIe vector network analyzer multiport, multi-measurement, single connection

The Keysight M983xA PXIe VNA consolidates your modulated signal measurements in a simple setup, enabling multi-site, multi-DUT, and multiport system characterization with greater flexibility and faster speed.

The PXI's form factor scalability, built-in noise receivers, and configurable test set combined with modulated signal measurements enable you to characterize highly integrated components with a single connection. Easily perform RF measurements with software wizards to guide you through advanced wideband measurements such as EVM and ACP.

- Get PXI VNA speed and form factor scalability in a configurable test set with built-in noise receivers on each port and modulated signal measurement capabilities.
- Build your multiport setup out of full two-port PXI modules.
- Scale your test with full multiport capability, cascading multiple modules for true multiport applications.

| Product number | M9834A VNA | M9837A VNA |
|---|---|---|
| Number of slots | 2 (base option)<br>3 (with upconverter option) | 3 |
| Frequency range | 10 MHz to 20 GHz | 10 MHz to 44 GHz |
| Dynamic range at 4 GHz | 143 dB (at 10 Hz IFBW) | 143 dB (at 10 Hz IFBW) |
| Trace noise at 4 GHz | 0.0015 dB RMS (1 kHz IFBW) | 0.0015 dB RMS (1 kHz IFBW) |
| Receiver noise figure at 4 GHz | 12 dB | 12 dB |
| | Get Quote > | Get Quote > |


M983xA PXIe vector network analyzer

# Software and accessories for PXI vector network analyzers

## Enhance your network analyzer with application software

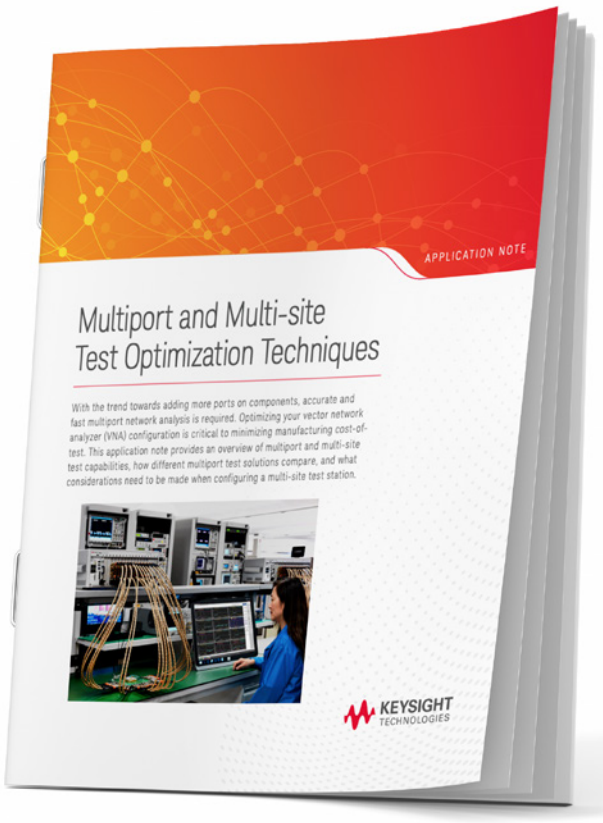
Network analyzer software tools enable you to investigate, characterize, and troubleshoot your designs in a variety of measurement applications, including mixer / converter, automated measurement, automatic fixture removal, multiport calibration, time-domain analysis, pulse-RF, noise figure, embedded local oscillator (LO), gain-compression, and spectrum analysis.

Learn more

## PXI digital and analog I/O for VNAs

The Keysight M9341B PXIe digital and analog input / output (I/O) comes with a 24-bit digital I/O connector and an 8-bit digital interface to allow users to control the device under test (DUT) directly with serial or parallel digital signals. This allows you to use a PXI VNA, such as the Keysight M937xA, M980xA, and M983xA in an automated test environment.

Learn more




**Multiport and Multi-site Test Optimization Techniques**

If you're designing or manufacturing devices with multiple ports, you may want to know about the advantages of a true multiport VNA. This application note explains the difference between a switch-based system and a PXI multiport VNA that does not require an external switch matrix.

Download application note


PXI 2X8 switch matrix,
300 KHz to 18 GHz

# Expand your test capability with PXI RF and microwave test accessories

RF and microwave modules benefit from additional or expanded capability when combined with switch, signal attenuation, and signal conditioning modules as they are integrated into test system solutions. These modules provide the capabilities required by higher-frequency applications.

## PXI RF and microwave switches

The PXI RF and microwave switches deliver high-performance, high-density switching up to 40 GHz. They are available in multiple switch configurations to integrate into various test environments.

| Technical overview | M9128A | M9164A/B/C<br>M9165A/B/C | M9146–49A | M9155–57C<br>M9155-57CH40 | M9161D |
|---|---|---|---|---|---|
| Type | Matrix | Full-cross bar matrix | Multiplexer | Coaxial / transfer | Solid state |
| Maximum frequency | 300 MHz | 18 GHz | 3 GHz | 40 GHz | 20 GHz |
| Configuration | 8x12 | 2x8, 2x16 | 1x4, 1x8, 1x16 | Dual SPDT, dual transfer, single SP6T | Dual SP4T |
| | Get Quote > | Get Quote > | Get Quote > | Get Quote > | Get Quote > |


## PXI attenuators

Keysight offers step attenuator modules that operate across a broad frequency range of DC to 50 GHz.

Learn more

## PXI frequency reference

The Keysight M9300A PXIe frequency reference is a modular instrument that provides 10 MHz or 100 MHz frequency reference in various solutions.

Learn more

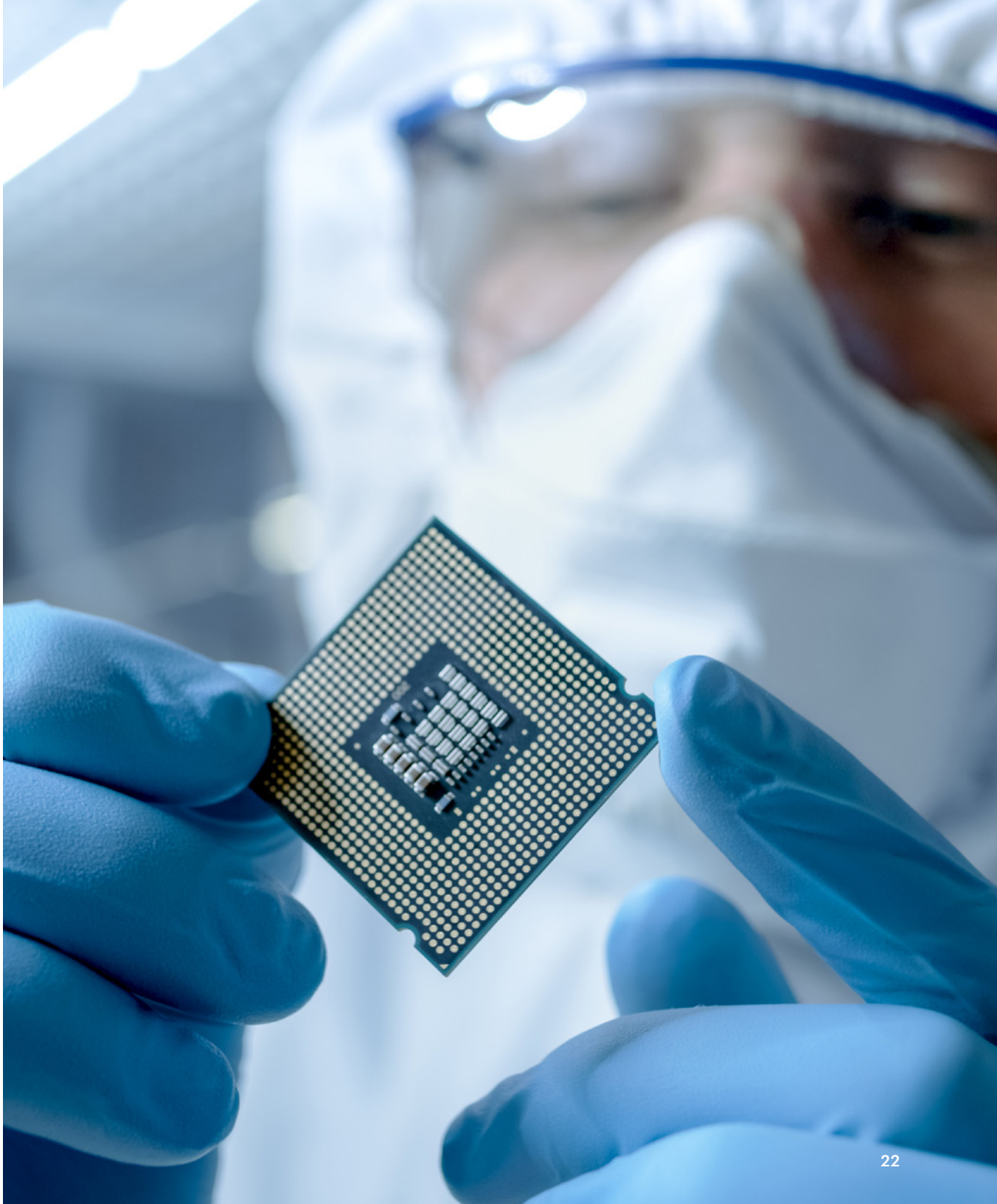
## PXI signal conditioning

For RF and microwave measurements, Keysight PXI signal conditioning modules modify an analog signal to meet the requirements of the next signal processing stage.

Learn more

# AXIe Instruments for Cutting-Edge Digital Test

High-performance AXIe products provide timing, triggering, and module-to-module data movement features. Those features are important for implementing high-performance test and measurement systems used in aerospace / defense, high-speed digital, high-energy physics, 400GE, semiconductor test, and other industries.



# High-speed, high-fidelity AXIe arbitrary waveform generators address your toughest measurement challenges

The Keysight M8100A Series AWGs offer stimulus sources that address a wide range of applications. The precision, high speeds, and flexibility of the AWGs help meet your most complex challenges.

M8190A 12 GSa/s arbitrary waveform generators

| Technical overview | M8190A | M8194A | M8195A | M8196A | M8199A | M8199B |
|---|---|---|---|---|---|---|
| Size (slot) | 2 | 1 | 1 | 1 | 2 | 2 |
| Maximum sample rate | 12 GSa/s | 120 GSa/s | 65 GSa/s | 92 GSa/s | 256 GSa/s | 256 GSa/s |
| Maximum baud rate | ~10 GBd | ~100 GBd | ~50 GBd | ~64 GBd | ~128 GBd | ~160 GBd |
| Maximum bandwidth | 5 GHz | 45 GHz | 25 GHz | 32 GHz | 70 GHz | 80 GHz |
| Resolution (bit) | 12 / 14 | 8 | 8 | 8 | 8 | 8 |
| Maximum SFDR | -90 dBc | -35 dBc | -80 dBc | -73 dBc | -48 dBc | -55 dBc |
| Channel | 1 / 2 (differential) | 1 / 2 / 4 (differential) | 1 / 2 / 4 (differential) | 1 / 2 / 4 (differential) | 2 or 4 (differential) | 1 / 2 (differential) |
| | Get Quote > | Get Quote > | Get Quote > | Get Quote > | Get Quote > | Get Quote > |

# Multichannel synchronization module gives you precise alignment for repeatable measurements

Complex testing sometimes requires playing multiple waveforms in parallel. The M8192A and M8197A synchronization modules fit in a standard AXIe frame and allow engineers to synchronize multiple AXIe AWGs.

| Technical overview | M8192A | M8197A |
|---|---|---|
| Maximum channels | 12 (up to 6 M8190A)<br>10 (up to 4 M8051A and 1 M8041A) | 16 (up to 4 M8195A) |
| Skew repeatability | 2 ps | 2 ps |
| Skew resolution | 50 fs | 50 fs |
| | Get Quote > | Get Quote > |

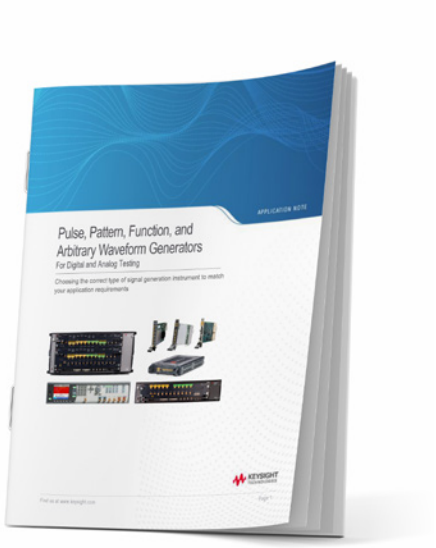
# Clock generator module

The Keysight M8008A is designed as a sample clock source for the M8199A 128/256 GSa/s arbitrary waveform generator and the M8199B 224/256 GSa/s arbitrary waveform generator. You can also use it as a standalone low-jitter clock source for other applications. It comes as a one-slot AXIe module, which lets you plug in an M8008A and up to two M8199A/B AWG modules into a single five-slot AXIe chassis.

## Key benefits

- 32 to 64 GHz continuous frequency range
- Output amplitude up to +10 dBm
- Very low intrinsic jitter and wideband phase noise
- 4 clock outputs can drive up to four M8199A/B AWG modules

Learn more




**Pulse, Pattern, Function, and Arbitrary Waveform Generators For Digital and Analog Testing**

Choosing the correct type of signal generation instrument to match your application requirements.

Download AWG application note

# Industry-leading AXIe bit error ratio test (BERT) solutions

Keysight bit error ratio test (BERT) solutions enable physical-layer characterization, verification, and compliance testing for both NRZ (non-return-to-zero) and PAM4 (pulse-amplitude modulation 4-level) coding schemes. Hone your next design with flexible modules, intuitive software, advanced analysis applications, and expert-level support.

## Extend the capabilities of your BERT with software applications

Customize your BERT with additional features and functions. Our selection of software, accessories, and services ensures you get the most out of your instrument. These are available for purchase with the equipment or any time afterward.

Learn more

64 Gbaud
high-performance BERT

| BERT family | M8020A | M8040A | M8050A |
|---|---|---|---|
| Key applications | Computer buses up to 32 GBd | Data center and computer buses up to 64 GBd | Data center and computer buses up to 120 GBd |
| Standards | PCIe 4.0, MIPI, DDR5,USB3, DP NRZ | 400/800G, PCIe 5.0/6.0, CCIX, SATA, USB4, NRZ, PAM3, PAM4 | 800G/1.6T, USB 4, NRZ, PAM3, PAM4, PAM6, PAM8 |
| Symbol rate - pattern generator[1] | 0.256 to 16 GBd | 2 to 64 GBd | 2 to 120 GBd |
| Symbol rate - error detector[1] | 2 to 16 GBd | 2 to 58 GBd | 2 to 64.4 GBd |
| Output amplitude | 100 mV to 2.4 Vpp, diff | 0.16 to 1.8 Vpp, diff @ 58 GBd | 0.1 to 1.6 Vpp, diff @ 120 GBd |
| | Get Quote > | Get Quote > | Get Quote > |

1. Extended range available

# General-Purpose Oscilloscopes, Digitizers and More

## PXIe oscilloscopes – Keysight oscilloscope technology in a compact form factor

Keysight InfiniiVision PXIe oscilloscopes are the first full-featured oscilloscopes in PXI to offer up to 1 GHz bandwidth for quick analysis and troubleshooting of wideband signals. With an update rate of 1 million waveforms per second and advanced probing technology, the oscilloscope enables troubleshooting random and intermittent signals not easily seen with digitizer technology.


PXIe 1 GHz oscilloscope and auto probe power module

# PXIe Oscilloscopes

| Technical overview | M9241A | M9242A | M9243A |
|---|---|---|---|
| Maximum bandwidth | 200 MHz | 500 MHz | 1 GHz |
| Size / channel | 1 slot / 2 channels | 1 slot / 2 channels | 1 slot / 2 channels |
| Update rate | 1,000,000 wfms/s | 1,000,000 wfms/s | 1,000,000 wfms/s |
| | Get Quote > | Get Quote > | Get Quote > |

## Probing solutions for PXI modular

Keysight M924XA Series oscilloscopes require the M9240A PXIe AutoProbe power module to use Keysight active probes. The M9240A provides power and the communication circuit required for proper operation of the active probes.

Learn more

## Expand your oscilloscope's capabilities with powerful applications

The InfiniiVision PXIe oscilloscope software package for the M924xA PXIe modular oscilloscopes provides comprehensive serial bus protocol trigger and decode capabilities, along with the advanced measurement capabilities, of the individual licensed industry / application software packages. They include automotive, aerospace and defense, NFC automated test, and embedded analysis.

Learn more

# PXIe / AXIe digitizers

The Keysight PXIe / AXIe digitizer's portfolio combines high channel density, measurement fidelity, and high throughput to build scalable acquisition systems with high channel count and fast, accurate measurements in a compact form factor.

## Insert your logic into Keysight PXI / AXIe digitizers — PathWave FPGA programming environment

Keysight opened its PXI and AXI instruments, allowing you to insert custom user data or processes into the instrument field programmable gate array (FPGA). The Keysight PathWave FPGA enables engineers of all skill levels to add logic, control, and combinatorial routines to a wide range of Keysight instruments. PathWave FPGA ships with a rich set of built-in library elements that you can drop into your schematic.

Learn more

PXIe digitizer 100 MSa/s, 14 bit, 100 MHz

AXIe high-speed digitizer/DAQ, 8-bit, 1 GS/s, 32-ch

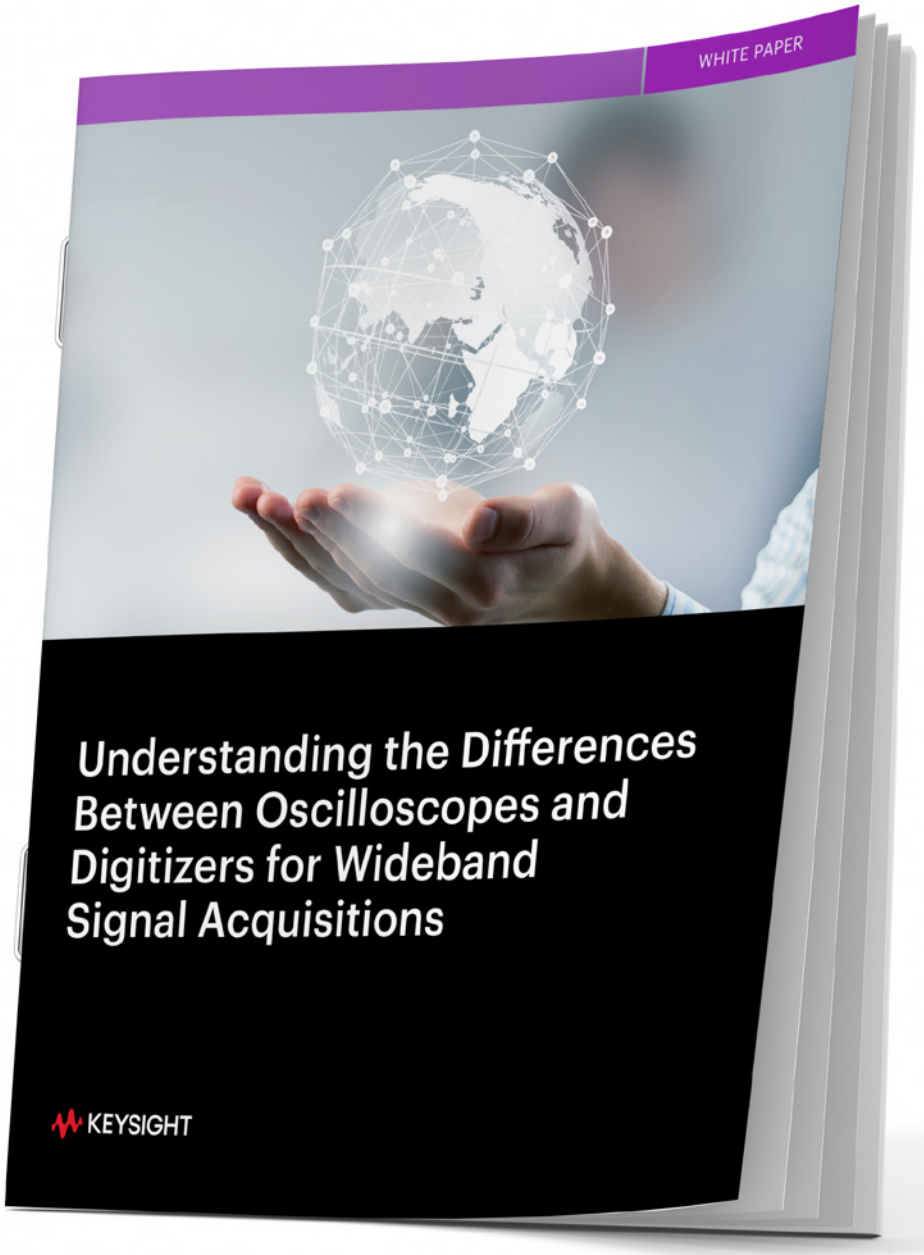
| Technical overview | M3100A | M3102A | M5200A | M8131A |
|---|---|---|---|---|
| | PXIe | | | AXIe |
| Size (slot) | 1 | 1 | 1 | 2 |
| Maximum bandwidth | 100 MHz | 100 MHz | 2 GHz | 12.5 GHz |
| Resolution / ENOB | 14 / 10.8 bits | 12 / 10.6 bits | 12 / 8 bits | 10 bits |
| SFDR | 79 dBc | 71 dBc | 65 dBc | 67 dBc |
| Channel | 4 / 8 | 2 / 4 | 4 | 1 / 2 / 4 |
| | Get Quote > | Get Quote > | Get Quote > | Get Quote > |

[1] AWG and digitizer combination

**Understanding the Differences Between Oscilloscopes and Digitizers for Wideband Signal Acquisitions**

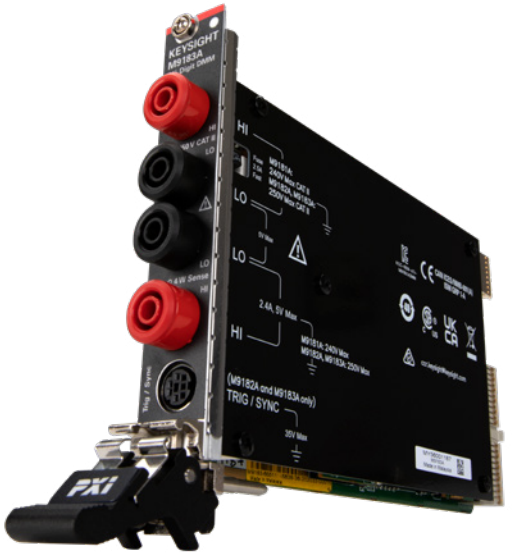
Both oscilloscopes and wideband digitizers use analog-to-digital converter (ADC) technology for waveform acquisitions. While oscilloscopes and wideband digitizers share similarities, their distinct targeted applications and optimized architectures and features set them apart.

**Download white paper**



## High throughput PXI digital multimeters

Keysight M9181A PXI digital multimeter (DMM) provides the most popular measurement functions, including DCV, ACV, DCI, ACI, and two- and four-wire resistance, at an affordable price. The Keysight M9182A and M9183A 6½-digit high-performance PXI DMMs offer fast throughput, flexible measurements, and reliable results.




| Technical overview | M9181A | M9182A | M9183A |
|---|---|---|---|
| Resolution | 6½ digits | 6½ digits | 6½ digits |
| Maximum reading speed | 150 readings / s | 4,500 readings / s | 15,000 readings / s |
| DCV, ACV | 200 mV to 200 V | 200 mV to 250 V | 200 mV to 250 V |
| DCI; ACI | 2 mA to 2 A | 2 mA to 2 A | 200 nA to 2 A; 2 mA to 2 A |
| 2- & 4-wire resistance | 200 Ω to 20 MΩ | 200 Ω to 20 MΩ | 20 Ω to 200 MΩ |
| | Get Quote > | Get Quote > | Get Quote > |

## PXIe audio analyzer — fast, accurate audio test

The Keysight M9260A distinguishes itself from other PXI digitizer modules for accurate audio measurements. The solution features a one million-sample arbitrary waveform buffer and a one million-sample limitless input buffer, ensuring fast test speed and high performance. Furthermore, it has super-linear / low-noise amplifiers and digital-to-analog converters, resulting in ultra-low residual distortion and high amplitude accuracy.

Learn more

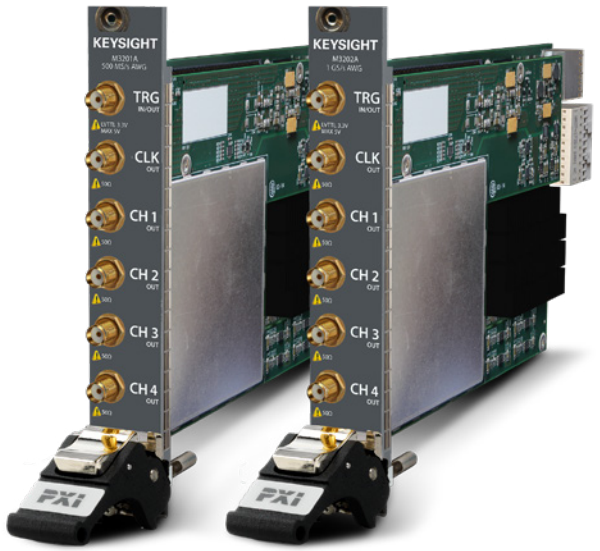
# PXIe arbitrary waveform generators

The Keysight PXI arbitrary waveform generators (AWGs) deliver unprecedented performance for creating complex wideband waveforms. High sampling rate and high bit resolution provided in a single instrument enable designers to create ideal waveforms for accurate testing of radar, satellite, and frequency agile systems.

| Technical overview | M3201A | M3202A | M5301A | M9336A |
|---|---|---|---|---|
| Size (slot) | 1 | 1 | 1 | PXIe |
| Maximum bandwidth | 200 MHz | 400 MHz | 400 MHz | 540 MHz |
| Resolution (bit) | 16 | 14 | 14 | 16 |
| SFDR | 64 dBc at 80 MHz | 54 dBc at 160 MHz | 50 dBc (0-120 MHz) [1] | 67 dBc (DC to 135 MHz) |
| Channel | 2 / 4 | 2 / 4 | 4 | 3 (differential) |
| | Get Quote > | Get Quote > | Get Quote > | Get Quote > |

1. Check data sheet for full range

PXIe arbitrary waveform generators




## Insert your logic into Keysight PXI AWGs — PathWave FPGA programming environment

Keysight opened its PXI and AXI instruments, enabling you to insert custom user data or processes into the instrument field-programmable gate array (FPGA). The Keysight PathWave FPGA enables engineers of all FPGA skill levels to add logic, control, and combinatorial routines to a wide range of Keysight instruments. PathWave FPGA ships with a rich set of built-in library elements that you can drop into your schematic.

Learn more

# PXIe source / measure units (SMU)

Keysight PXIe source measure units (SMUs) provide high accuracy, resolution, density, speed, and measurement flexibility for various applications, including integrated circuit testing and semiconductor parametric/reliability tests. The SMUs also serve as bias sources for optical devices, RF power amplifiers, and quantum computing systems.

| Technical overview | M9111A | M9601A | M9602A | M9603A | M9614A | M9615A |
|---|---|---|---|---|---|---|
| Channel | 1 | 1 | 1 | 1 | 5 | 5 |
| Maximum output | 13 V / 1A or 6V / 3A | 210 V / 315 mA | 60 V / 3.5 A (10.5 A pulsed) | 60 V / 3.5 A (10.5 A pulsed) | 30 V / 500 mA | 30 V / 500 mA |
| Minimum resolution | 120 µV / 1.4 nA | 500 nV / 10 fA | 6 µV / 1 pA | 6 µV / 100 fA | 6 µV / 100 pA | 6 µV / 10 pA |
| Minimum pulse width | N/A | 20 µs | 10 µs | 10 µs | 100 µs | 100 µs |
| Sampling rate | 200 kSa/s | 1.25 MSa/s | 15 MSa/s | 15 MSa/s | 500 kSa/s | 500 kSa/s |
| | Get Quote > | Get Quote > | Get Quote > | Get Quote > | Get Quote > | Get Quote > |


PXIe 5-channel source/ measure units

# PXI multiplexer and matrix switches

The Keysight PXI high-density multiplexer switches deliver high-speed signal routing of numerous channels to a single point. They are ideal for routing multiple analog signals to a measurement device in automated test environments or data acquisition systems. The PXI matrix switch modules deliver medium- to high-density switching of multiple channels in a single instance. You can connect any row to any column, which is ideal for routing multiple signals between the DUT and instruments.

| Technical overview | M9101A | M9102A | M9103A | M9120A | M9121A | M9122A |
|---|---|---|---|---|---|---|
| Switch type | Multiplexer | | | Matrix | | |
| Channel | 64 | 128 | 99 | 4x32 | 4x64 | 8x32 |
| Connection | 2-wire, reed | 1-wire, reed | 2-wire, armature | 2-wire, armature | 2-wire, reed | 1-wire, armature |
| Maximum volt | 100 Vrms | 100 Vrms | 100 Vrms | 100 Vrms | 100 Vrms | 100 Vrms |
| Maximum switch / carry rating | 0.5 A / 1.0 A | 0.5 A / 1.0 A | 1.0 A / 1.0 A | 2.0 A / 2.0 A | 0.5 A / 0.5 A | 2.0 A / 2.0 A |
| Bandwidth | 5 MHz | 5 MHz | 1 MHz | 7.5 MHz | 10 MHz | 5 MHz |
| | Get Quote > | Get Quote > | Get Quote > | Get Quote > | Get Quote > | Get Quote > |

# PXI general-purpose switches

The Keysight PXI general-purpose switch modules deliver fast, reliable switching in a variety of configurations. Cycle power to products under test, control indicator and status lights, or actuate external power relays and solenoids with independent, single-pole, double-throw (Form C) or single-pole, single-throw (Form A) switches in a single PXI module.

| Technical overview | M9130A | M9131A | M9132A | M9133A | M9135A |
|---|---|---|---|---|---|
| Channel | 26 | 64 | 50 | 100 | 20 |
| Connection | SPDT, armature | SPDT, reed | SPST, reed | SPST, reed | SPST, reed |
| Maximum volt | 250 Vrms | 100 Vrms | 100 Vrms | 100 Vrms | 250 Vrms |
| Maximum switch / carry rating | 2 A / 2A | 0.25 A / 1 A | 1 A / 1 A | 1 A / 1 A | 5 A / 5 A |
| | Get Quote > | Get Quote > | Get Quote > | Get Quote > | Get Quote > |

# PXI digital input / output

The Keysight PXI digital I/O modules cover a wide range of applications, from system monitoring and relay control to integrated circuit design validation and automated test in manufacturing.

## PXI digital I/O

The Keysight M5302A digital I/O control module has 28 programmable LVDS channels and 8 single-ended channels. The low-voltage differential signaling (LVDS) channels can be used to communicate to the device under test or can be used to control other devices by emulating protocols such as Camera Link. The single-ended channels are suitable for event triggers or other general-purpose IO applications.

Learn more

## PXIe digital stimulus / response with PPMU

The Keysight M9195B digital stimulus / response (DSR) provides speed, configuration flexibility, and multisite capability for RF chipset emulation and device characterization. The DSR synchronizes up to 12 modules or 192 channels.

Learn more

PXIe digital I/O

# Gain Faster Insights with Proven PXI and AXIe Test Solutions

Try out our proven test solutions optimized for specific applications. Our application engineers built these reference test systems that come with programming examples using Keysight PXI and AXIe instruments and software to help you get measurement insights faster.

## 6G sub-terahertz R&D testbed for prototyping and testing

The Keysight 6G sub-terahertz R&D testbed is flexible and scalable to address a multitude of frequency bands, frequency bandwidths, and waveform types. This flexibility allows you to tackle emerging 6G R&D testing challenges with up to 10 GHz of bandwidth at D-band (110–170 GHz) and G-band (140–220 GHz).

Learn more

## Automate, accelerate, and scale across your test workflow — PathWave test automation

Keysight PathWave test automation software delivers significant cost- and time-saving benefits over traditional test automation and analysis tools. With PathWave test automation, your team has all the tools they need to meet even the most aggressive product release schedules.

Learn more

# 5G multiband vector transceiver for high-volume test

The Keysight 5G multi-band vector transceiver test solutions enable automated testing of 5G new radio (NR), non-terrestrial networks (NTN), and radio components. These compact, non-signaling measurement systems address applications in frequency range (FR) 1 (sub-6 GHz), FR 2 (up to 49.2 GHz), and NTN (10 GHz to 32 GHz).

- Validate 5G RF radio performance in high-volume 4G and 5G millimeter-wave
- Get the precision required for 5G NR and NTN in-band design validation

The modular architecture, easy-to-use application programming interface, and Keysight PathWave solution software reduce your test cost and accelerate your time to volume, especially for millimeter-wave applications.

Learn more

| | S9110E | S9110A | S9115A |
|---|---|---|---|
| Frequency range | 1 MHz to 26.5 or 49.2 GHz | 380 MHz to 6 GHz, and 10 to 32 GHz, or 22.7 to 43.5 GHz, or 22.7 to 49.2 GHz | 380 MHz to 13 GHz, and 22.7 to 43.5 GHz, or 22.7 to 49.2 GHz |
| Maximum signal generation and analysis bandwidth | 1.2 GHz | 1.2 GHz | 1.2 GHz |
| MIMO | 2 x 2 | 2 x 2 | 2 x 2 |
| Vector transceiver included | M9410A and M9471A | M9410A | M9415A |
| Remote radio head included | M1749B | M1742A or M1749B | M1749B |
| | Get Quote > | Get Quote > | Get Quote > |


S9110A 5G multi-band vector transceiver

## Phase noise test system measures at the limits of physics

The Keysight N5511A phase noise test system (PNTS) replaces the gold-standard Keysight E5500 phase noise measurement system. The N5511A PNTS is the foundation of test systems that measure phase noise down to kT (-177 dBm / Hz at room temperature). This thermal phase noise floor is the theoretical limit for any measurement — the PNTS can measure at the limits of physics.

Learn more

N5511A phase noise test system, 50 kHz to 40 GHz


## Modulation distortion analysis solution to characterize nonlinear DUT behavior

The modulation distortion solution enables fast and accurate active-device modulation distortion characterization under modulated stimulus conditions up to 44 GHz. The wide dynamic range and vector error correction of the M983xA PXIe VNA results in an extremely low residual EVM of the test setup to give you a complete picture of your device's performance without test system interference. The solution measures error vector magnitude (EVM), noise power ratio (NPR), and Adjacent Channel Power Ratio (ACPR). It can also decompose nonlinear signals and linear signals with the spectral correlation between the input and output spectrum without performing demodulation.

Learn more


S95070B modulation distortion

## Military and public safety radio test set

Keysight M8920A Radio Test Set supports many formats by combining PXI hardware with application-specific software in a single flexible and scalable chassis, providing broad multiformat coverage for next-generation radio testing. It has a scalable modular architecture for efficient and complete test development and execution needed for the manufacturing and radio maintenance environment.

Learn more

M8920A radio test set

## Digital interconnect test system

When you need to measure advanced S-parameters with a fast, low-cost, and easy-to-use test solution, the Digital Interconnect Test System gives you a significant edge. It provides a full 32-port 53 GHz VNA configured in a single PXI chassis — ideal for high-speed cable testing. And it lets you test any linear passive interconnect — including backplanes, connectors, and PCBs — faster and easier. Sharpen your edge with Keysight Digital Interconnect Test System, which enables signal integrity characterization of multiport interconnect products.

Learn more


N1930B physical layer test system

# Expand Your Instrument's Capability with KeysightCare

## Support portal

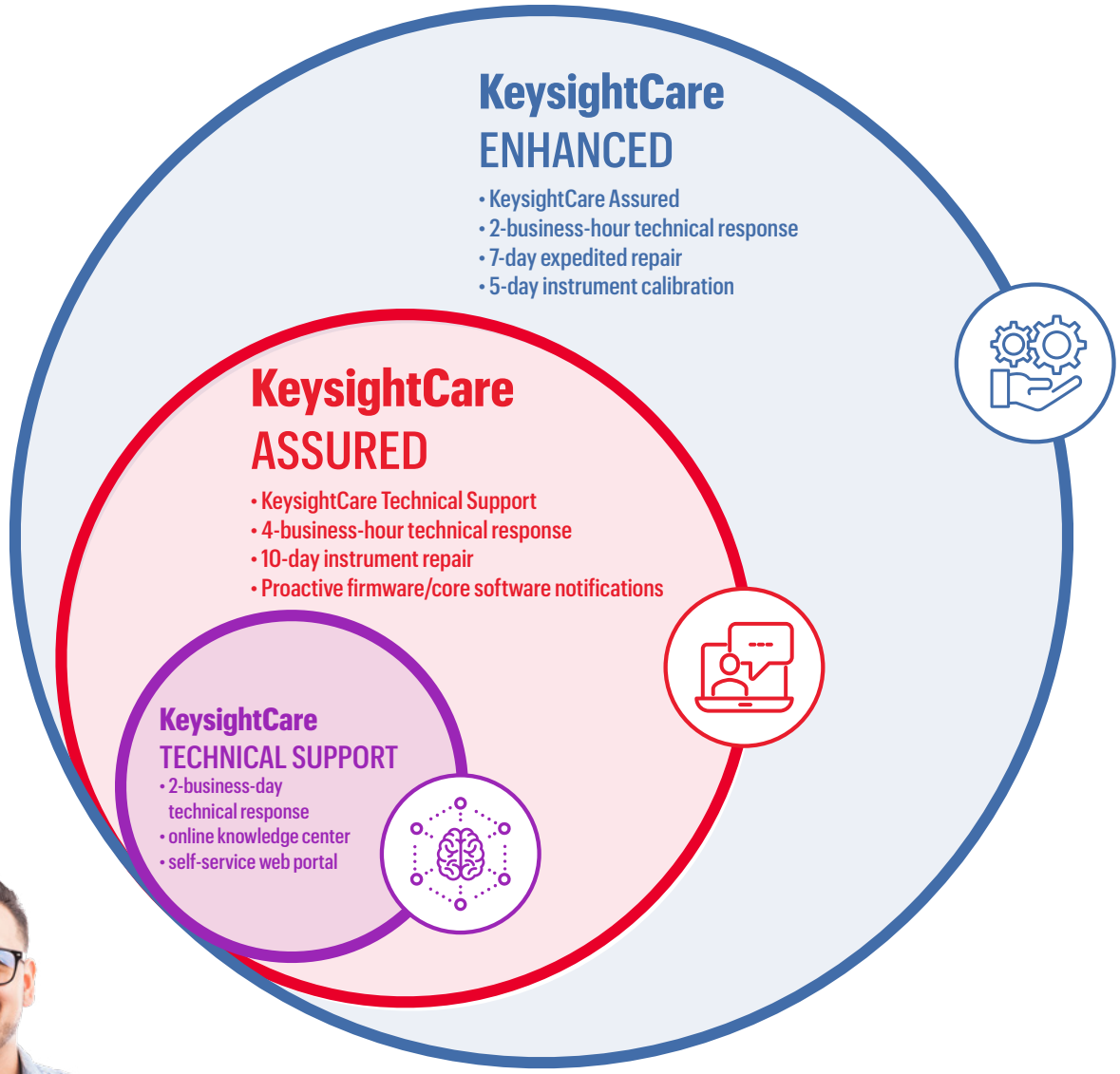
Receive personalized, proactive, and priority support. Find answers in the knowledge center, manage service requests, and interact with Keysight experts. Start **here**.

## Access to experts

Every PXI / AXIe modular instrument purchase includes 1 year of **KeysightCare Assured**. Get unlimited access to Keysight's technical experts on any instrument, application, or measurement question in addition to a worry-free warranty.

## Lock in price & peak performance

Extend your peace of mind and eliminate budgetary surprises for up to 5 years with **KeysightCare Enhanced**. Trust your test results with calibrated in tolerance instruments and accurate measurements.




**Learn more**

# Accelerate the win with help from Keysight Services

Prevent delays caused by technical questions or system downtimes due to instrument maintenance and repairs. The Keysight Services team is here to support you with expert technical support, instrument repair and calibration, software support, training, and more.

Maximize your test system up-time by securing technical support, repair and calibration services with committed response and turnaround times. **High-performance instruments include 1-year KeysightCare Assured.**

**KeysightCare Enhanced * (includes tech support, warranty and calibration)**

| | |
|---|---|
| **R-55B-001-1** | KeysightCare Enhanced - Upgrade 1 year |
| **R-55B-001-2** | KeysightCare Enhanced - Extend to 2 years |
| **R-55B-001-3** | KeysightCare Enhanced - Extend to 3 years |
| **R-55B-001-5** | KeysightCare Enhanced - Extend to 5 years |

*Available in select countries. For details, please view the data sheet. R-55B-001-2/3/5 must be ordered with R-55B-001-1.

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