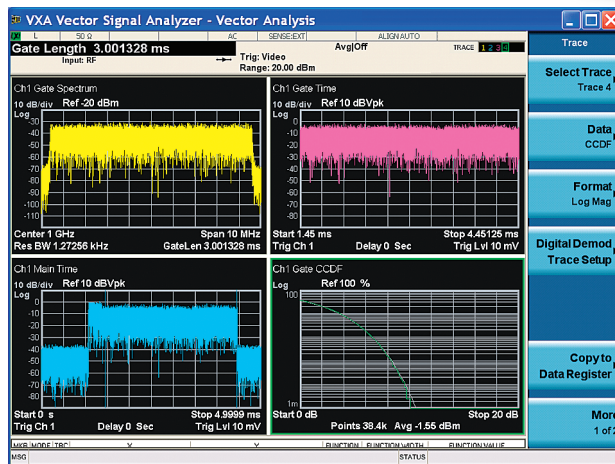
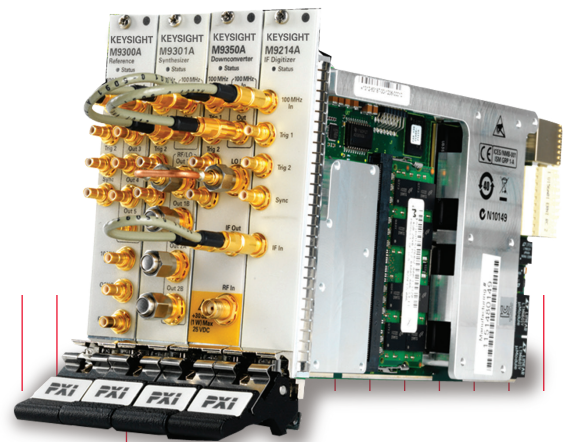


Keysight Technologies

M9064A VXA Vector Signal Analysis X-Series Measurement Application for PXIe Vector Signal Analyzers

Technical Overview



- FFT-based spectrum analysis
- Time-domain analysis tools for burst analysis
- Flexible modulation analysis
- PC-based SCPI remote interface and manual user interface
- Built-in, context-sensitive help with SCPI command reference
- Transportable license supports up to four PXI VSA channels in one mainframe

VXA vector signal analysis measurement application

Expand the capabilities of your M9391A and M9393A PXIe vector signal analyzers (PXI VSAs) with Keysight Technologies', Inc. library of measurement applications - the same applications used to increase the capability and functionality of its X-Series signal analyzers. Eleven of the most popular applications are now available for use with Keysight's new M9393A PXIe performance VSA and the M9391A PXI VSA. When you combine the raw hardware speeds of the PXI VSAs and the X-Series measurement applications for modular instruments, you can test more products in less time, while ensuring measurement continuity from design to manufacturing.

The M9064A VXA vector signal analysis measurement application provides the PXI VSAs with a wide range of measurements, demodulation types, and filters to perform comprehensive signal analysis, helping you thoroughly test your designs, ensure product quality, and optimize without compromise.

Proven algorithms and a common user interface across the X-Series analyzers and modular PXI VSAs create a consistent measurement framework for signal analysis that ensures repeatable results and measurement integrity so you can leverage your test system software through all phases of product development. The VXA vector signal analysis measurement application is just one in a common library of several measurement applications. You can further extend your test assets by utilizing up to four PXI VSAs with one software license.

Keysight's X-Series applications for modular instruments also include a unique "Resource Manager" that provides direct access to PXI VSA hardware drivers for the fastest power and spectrum-based measurements, while simultaneously using the X-Series applications for fast modulation quality measurements and the 89600 VSA software for fast spectrum measurements.

More about signal analysis

The VXA measurement application is a general-purpose FFT-based spectrum analysis application, with a wide selection of demodulation types and filters to perform flexible digital modulation analysis.

- Bring comprehensive vector signal analysis to the test rack
- Troubleshoot signals with powerful time domain capability
- Use analog demodulation to identify unintentional modulations
- Test when no commercial test standard is available
- Utilize flexible digital modulation analysis capability

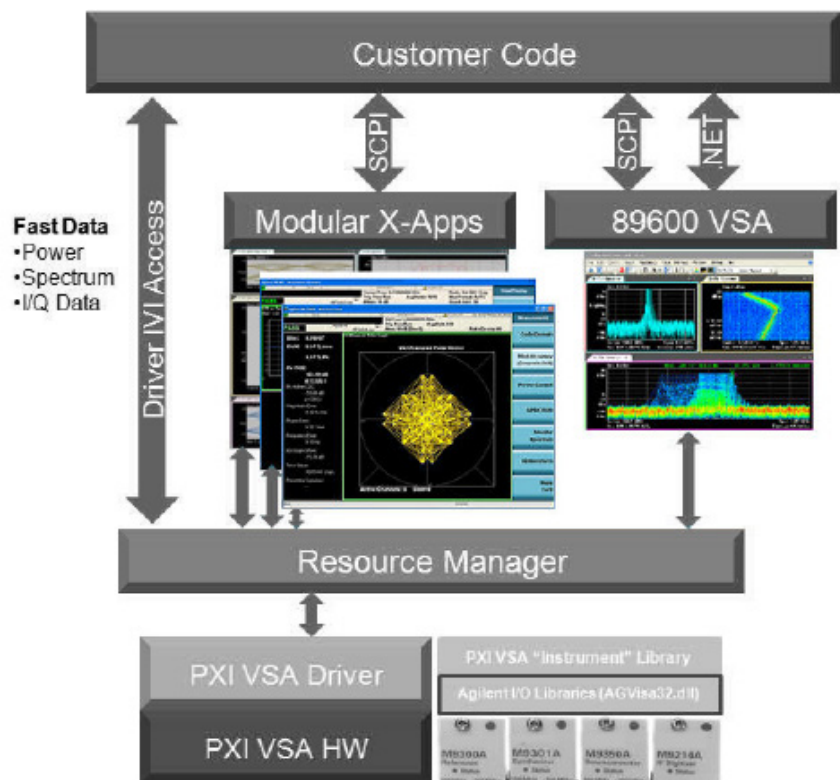


Figure 2. Resource Manager is included with all X-Series measurement applications for modular instruments.

Vector signal analysis measurement details

Bringing comprehensive vector signal analysis to the test rack

The vector signal analysis (Option 1FP) is the foundation of all measurement options in the VXA measurement application and is a required option. Each measurement is available simultaneously, in either one, two, three or four user-selected separate trace displays. You have full control of trace data format and scaling.

- Spectrum, instantaneous spectrum
- Time, instantaneous time, raw time
- Time gating
- Time averaging, including continuous peak hold, exponential, RMS (video), RMS (video) exponential, time, time exponential
- Band power
- Power spectral density (PSD)
- Power statistics (including gated):
 - Complementary cumulative distribution function (CCDF)
 - Cumulative distribution function (CDF)
 - Probability distribution function (PDF)
- Auto correlation
- Occupied bandwidth (OBW)
- Adjacent channel power (ACP)
- Analog demodulation: AM/FM/PM (includes spectrum, time, gated time, PSD, power statistics)
- Frequency counter
- Signal tracking
- Marker coupling
- Ability to save traces

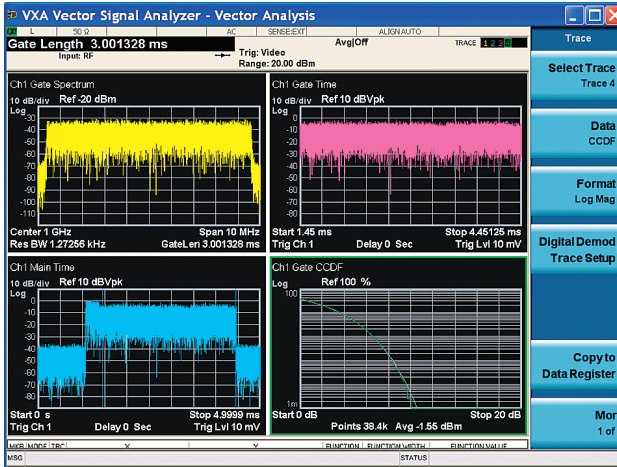


Figure 1. Basic vector signal analysis: The spectrum, time, and CCDF of the gated signal are shown, as well as the full time domain signal (Trace 2, lower left).

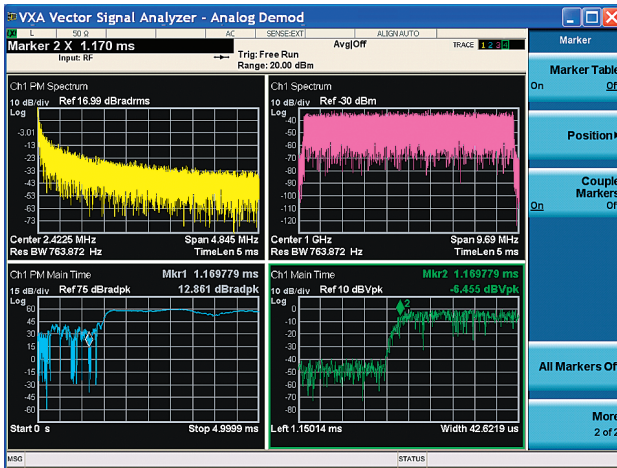


Figure 2. Analog demodulation: PM demodulation showing phase stability of the burst at turn-on; by coupling markers to an expanded time domain trace, we can see that data is sent prior to the phase settling out to a stable value after the burst turn-on occurs.

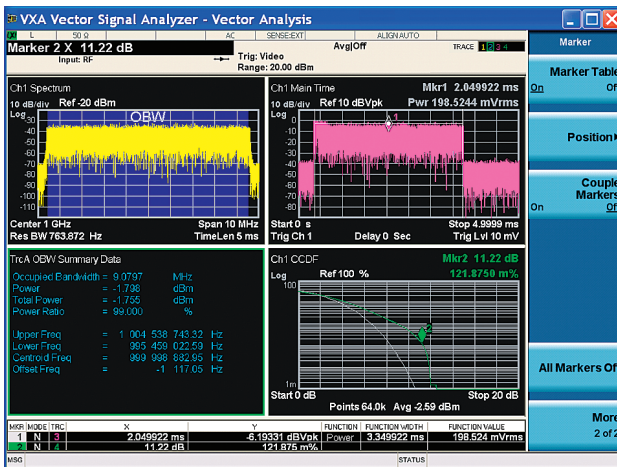


Figure 3. 2x2 grid display showing multiple measurements, markers, and marker table for at-a-glance signal analysis.

View detailed frequency behavior

The VXA measurement application gives you a complete set of tools to maximize the resolution of your spectrum display and the accuracy of the data displayed:

- Up to 409601 frequency points across whatever frequency span you select provides unprecedented frequency resolution to locate the most difficult problem; RBWs of less than 1 millihertz are available
- Automatic selection of highest frequency resolution for a given measurement
- Four different FFT window functions to choose from to meet specific measurement needs—Gaussian filter for high dynamic range measurements, or flat top filter for highest amplitude accuracy measurements
- Use the X-axis scaling feature for a better view of the area of interest on the signal; save this display or paste the measurement result into a report to the design team



Figure 5. The FFT window filter is applied to each frequency bin, similar to the filter that a spectrum analyzer uses as it sweeps across the frequency span of the measurement; however, with VXA, the filters are applied simultaneously to all frequencies and can be changed.

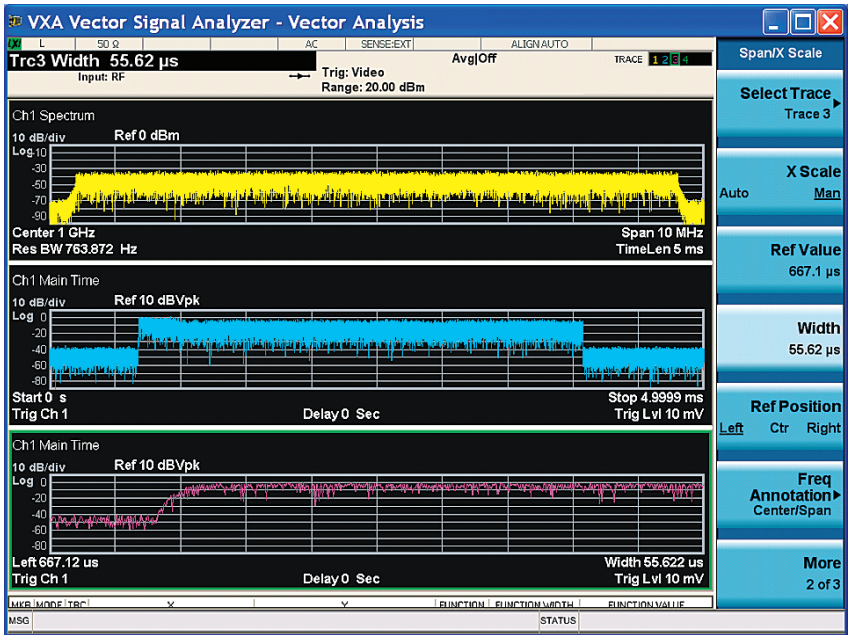


Figure 4. High-resolution frequency and time domain traces; Trace 3 shows the same time with the x-axis expanded to improve resolution of burst turn-on.

Choosing between X-Series applications and 89600 VSA software

X-Series measurement applications provide format-specific, one-button measurements for X-Series analyzers and modular PXI VSAs. With fast measurement speed, SCPI programmability, pass/fail testing and simplicity of operation, these applications are ideally suited for design verification and manufacturing. The 89600 VSA is the industry-leading measurement software for evaluating and troubleshooting signals for R&D and design validation. Supporting numerous measurement platforms and multiple measurement channels, the 89600 VSA provides flexibility and sophisticated measurements tools essential to find and fix signal problems. Recent enhancements for the modular PXI VSA platforms (89601B-SSA) provide fast spectrum measurements with benchtop analyzer SCPI programming compatibility.

Flexible digital modulation analysis

Add powerful analysis options

The flexible digital modulation analysis option, Option 2FP, adds the capability to visualize system performance rapidly and intuitively. Teamed with a PXI VSA, you can increase the speed of your measurement tasks with the flexibility this option offers:

- Customize modulation analysis formats including PSK, QAM (16 to 1024QAM), MSK, EDGE, FSK, VSB, DVBQAM, APSK, SOQPSK
- A complete set of more than 30 modulation quality

measurements, including overall EVM, peak EVM, EVM vs. symbol time, EVM spectrum, time, spectrum, constellation diagram, vector diagram, IQ parameters, frequency and clock error, and channel/impulse response with EQ filter, zero crossing error, symbol clock error

- Convenient measurement presets to cover popular communication formats, such as CDMA, GSM/EDGE, Bluetooth®, Zigbee, TETRA, APCO25, Wi-SUN (MR-FSK PHY)

Testing when no commercial test standard is available

Testing proprietary and custom signals is a challenge. Turnkey test software for those signals is seldom available off-the-shelf, so you have to design and implement the tests yourself. The flexible digital modulation analysis option will help you with that task. It covers the various demands of “do it yourself” testing for single carrier, single modulation signals with a deep set of flexible modulation analysis tools that you can tweak to meet your needs. In addition, these flexible tools are SCPI programmable.

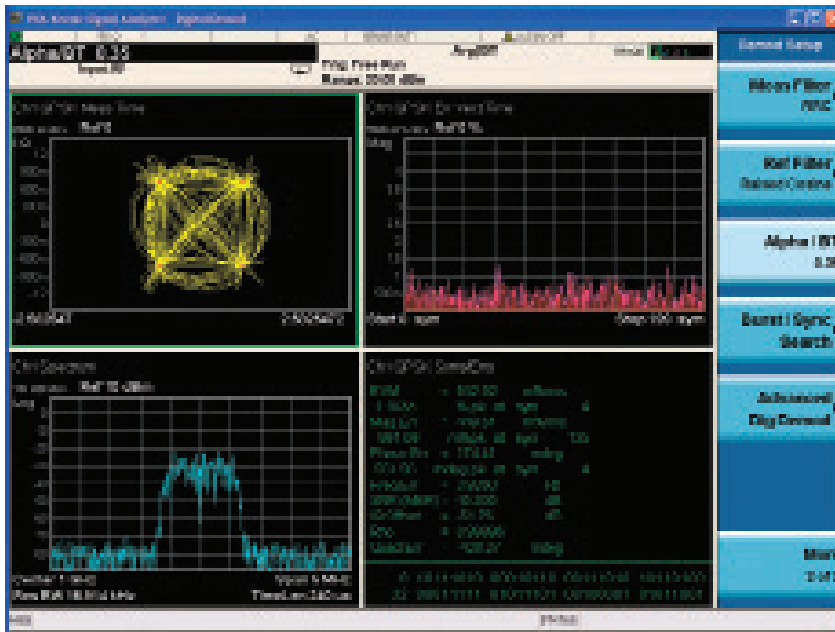


Figure 6. QPSK modulation analysis in default quad view: Trace 1 (upper left), IQ constellation; Trace 2 (lower left), spectrum; Trace 3 (upper right), error vector magnitude versus time (symbol) trace; Trace 4 (lower right), Symbols/Error table.

Key features of digital modulation analysis

Standard presets (for single carrier)	
Cellular	CDMA (base, mobile), CDPD, EDGE, GSM, NADC, PDC, PHS (PHP), W-CDMA
Wireless networking	Bluetooth (Basic Rate), HIPERLAN/1 (HBR, LBR), WLAN (802.11b), ZigBee (802.15.4, 868/915/2450 MHz), Wi-SUN (802.15.4g, MR-FSK-PHY)
Digital video	DTV (8, 16), DVB (16, 32, 64, 128, 256), DVB (16APSK, 32APSK)
Other	APCO 25, APCO 25 P2 (HCPM), APCO 25 P2 (HDQPSK), DECT, TETRA, VDL Mode 3, MIL-STD 188-181C, SOQPSK-TG
Modulation formats	
FSK:	2, 4, 8, 16 level (including GFSK)
	MSK (including GMSK)
	BPSK, QPSK, OQPSK, DQPSK, D8PSK, $\pi/4$ DQPSK, 8PSK, $3\pi/8$ 8PSK (EDGE), $\pi/8$ D8PSK, SOQPSK
QAM (absolute encoding):	16, 32, 64, 128, 256, 512, 1024
QAM (differential encoding per DVB standard):	16, 32, 64, 128, 256
APSK:	16, 16 w/DVB, 32, 32 w/DVB
VSB:	8, 16
Filter types:	Raised cosine, square-root raised cosine, IS-95 compatible, Gaussian, EDGE, 1REC, 3RC, SOQPSK-TG, low pass, rectangular, half-sine, none
Alpha/BT:	Continuously adjustable from 0.05 to 10 user-defined filters
Adaptive equalizer:	Decision directed, LMS, feed-forward, equalization with adjustable convergence rate; removes the effects of linear distortion (i.e. non-flat frequency response, multipath, etc.) from modulation quality measurements
Symbol rate	Rate = Frequency span / (1+ α); maximum symbol rate limited only by the measurement span
Advanced analysis setup	Burst search Pulse search Sync search (with user-selected synchronization word) Adjustable search length and offset timing
Measurements/displays	Eye diagram Trellis diagram Polar diagram Constellation and vector (shows trajectory between symbol times) diagram I and Q versus time Error vector magnitude EVM versus symbol time EVM versus frequency Magnitude and phase error Frequency error (carrier offset frequency) IQ origin offset Quadrature error Gain imbalance Amplitude droop (PSK and MSK formats) SNR (8/16VSB and QAM formats) Symbols table (demodulated bits) Error table with tabular EVM and IQ errors Equalizer channel frequency response Equalizer impulse response Symbol clock error Zero crossing error

Ordering information

Software licensing and configuration

- Transportable, perpetual license: This allows you to run the application using an embedded PXI PC controller or external PC, plus it may be transferred from one controller or PC to another. One software license supports up to four modular PXI VSA channels in one PXI mainframe.

Try before you buy!

Free 30-day trials of X-Series measurement applications provide unrestricted use of each application's features and functionality on your modular PXI VSA. See www.keysight.com/find/M90XA for more information.

You can upgrade!

Options can be added after your initial purchase. All of our X-Series application options are license-key upgradeable.

The table below contains information on our transportable, perpetual licenses. For more information, please visit the product web pages.

M9064A VXA vector signal analysis measurement application

Description	Model-Option	Notes
Vector signal analysis	M9064A-1TP	
Flexible digital modulation	M9064A-2TP	Requires 1TP

Measurement consistency you can trust

Did you know that X-Series measurement applications for modular instruments use the same measurement algorithms and programming commands as the bench top applications? This means you will get consistent measurement results if you use Keysight bench top and modular equipment across the product development cycle. Learn how this consistency and programming compatibility will increase the efficiency of your product development cycle.

www.keysight.com/find/measurementconsistency

Recommended hardware configuration

M9391A PXIe vector signal analyzer configuration

Model-Option	Description	Notes
M9391A-F03, -F06	3 GHz or 6 GHz frequency range	One required
M9391A-B04, -B10, or -B16	40 MHz, 100 MHz or 160 MHz analysis bandwidth	One required. -B16 recommended for fastest spectrum measurements with 89600 VSA software Option SSA.
M9391A-300	PXIe frequency reference	Recommended.
M9391A-UNZ	Fast tuning	Recommended. Highly recommended for fastest spectrum measurements with 89600 VSA software Option SSA.
M9391A-M01, -M05, or -M10	Memory options (512 MB, 2 GB, or 4 GB)	Recommend 1 Gsa/4 GB memory

M9393A PXIe performance vector signal analyzer configuration

Model-Option	Description	Notes
M9393A-F08, -F14, -F18, or -F27	8 GHz, 14 GHz, 18 GHz, or 27 GHz frequency range	One required
M9393A-B04, -B10, or -B16	40 MHz, 100 MHz or 160 MHz analysis bandwidth	One required. -B16 recommended for fastest spectrum measurements with 89600 VSA software Option SSA.
M9393A-300	PXIe frequency reference	Recommended
M9393A-UNZ	Fast tuning	Recommended. Highly recommended for fastest spectrum measurements with 89600 VSA software Option SSA.
M9393A-M01, -M05, or -M10	Memory options (512 MB, 2 GB, or 4 GB)	Recommend 1 Gsa/4 GB memory

Related literature

- *N9064A & W9064A Vector Signal Analysis, Self-Guided Demonstration*, literature number 5990-6159EN
- *N9064A & W9064A Vector Signal Analysis, Measurement Guide*, part number N9064-90002
- User's and Programmer's Reference guide is available in the library section of the N9064A and W9064A product pages
- *M9391A PXIe Vector Signal Analyzer Datasheet*, literature number 5991-2603EN
- *M9391A & M9381A PXIe Vector Signal Analyzer & Generator Configuration Guide*, literature number 5991-0897EN
- *X-Series Measurement Applications for Modular Instruments Brochure*, literature number 5991-2604EN

Web

- Product page:
www.keysight.com/find/M9064A
- X-Series measurement applications:
www.keysight.com/find/M90XA
- X-Series signal analyzers:
www.keysight.com/find/X-Series
- M9391A PXIe vector signal analyzer
www.keysight.com/find/M9391A
- M9393A PXIe performance vector signal analyzer
www.keysight.com/find/M9393A

Evolving Since 1939

Our unique combination of hardware, software, services, and people can help you reach your next breakthrough. We are unlocking the future of technology.

From Hewlett-Packard to Agilent to Keysight.



For more information on Keysight Technologies' products, applications or services, please contact your local Keysight office. The complete list is available at:

www.keysight.com/find/contactus

Americas

Canada	(877) 894 4414
Brazil	55 11 3351 7010
Mexico	001 800 254 2440
United States	(800) 829 4444

Asia Pacific

Australia	1 800 629 485
China	800 810 0189
Hong Kong	800 938 693
India	1 800 11 2626
Japan	0120 (421) 345
Korea	080 769 0800
Malaysia	1 800 888 848
Singapore	1 800 375 8100
Taiwan	0800 047 866
Other AP Countries	(65) 6375 8100

Europe & Middle East

Austria	0800 001122
Belgium	0800 58580
Finland	0800 523252
France	0805 980333
Germany	0800 6270999
Ireland	1800 832700
Israel	1 809 343051
Italy	800 599100
Luxembourg	+32 800 58580
Netherlands	0800 0233200
Russia	8800 5009286
Spain	800 000154
Sweden	0200 882255
Switzerland	0800 805353
	Opt. 1 (DE)
	Opt. 2 (FR)
	Opt. 3 (IT)
United Kingdom	0800 0260637

For other unlisted countries:

www.keysight.com/find/contactus
(BP-9-7-17)

DEKRA Certified
ISO 9001 Quality Management System

www.keysight.com/go/quality

Keysight Technologies, Inc.
DEKRA Certified ISO 9001:2015
Quality Management System

myKeysight

myKeysight

www.keysight.com/find/mykeysight

A personalized view into the information most relevant to you.

www.keysight.com/find/emt_product_registration

Register your products to get up-to-date product information and find warranty information.

KEYSIGHT SERVICES

Accelerate Technology Adoption.
Lower costs.

Keysight Services

www.keysight.com/find/service

Keysight Services can help from acquisition to renewal across your instrument's lifecycle. Our comprehensive service offerings—one-stop calibration, repair, asset management, technology refresh, consulting, training and more—helps you improve product quality and lower costs.



Keysight Assurance Plans

www.keysight.com/find/AssurancePlans

Up to ten years of protection and no budgetary surprises to ensure your instruments are operating to specification, so you can rely on accurate measurements.

Keysight Channel Partners

www.keysight.com/find/channelpartners

Get the best of both worlds: Keysight's measurement expertise and product breadth, combined with channel partner convenience.

Bluetooth® and the Bluetooth logos are trademarks owned by Bluetooth SIG, Inc, U.S.A. and licensed to Keysight Technologies, Inc.

www.keysight.com/find/modular
www.keysight.com/find/m9064a



This information is subject to change without notice.

© Keysight Technologies 2017
Published in USA, December 1, 2017
5991-4313EN
www.keysight.com