

Signal Sources

CATALOG



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Keysight Support Services

Keysight Signal Generators

One family. Three performance grades. 6 classes.

Vector Signal Generators



ESSENTIAL

XG1, XG2-class

- 6 GHz to 40 GHz
Maximum frequency
- 120 MHz to 160 MHz
Maximum modulation
bandwidth



EXPERT

XG4, XG5-class

- 8.5 GHz to 40 GHz
Maximum frequency
- 400 MHz to 1 GHz
Maximum modulation
bandwidth



PRO

XG7-class

- 54 GHz Maximum
frequency
- 2.5 GHz Maximum
modulation bandwidth

Analog Signal Generators



ESSENTIAL

XG1, XG2-class

- 6 GHz to 40 GHz
Maximum frequency
- 1 to 4 Number of outputs



EXPERT

XG5, XG6-class

- 8.5 GHz to 54 GHz
Maximum frequency
- 1 to 4 Number of outputs



PRO

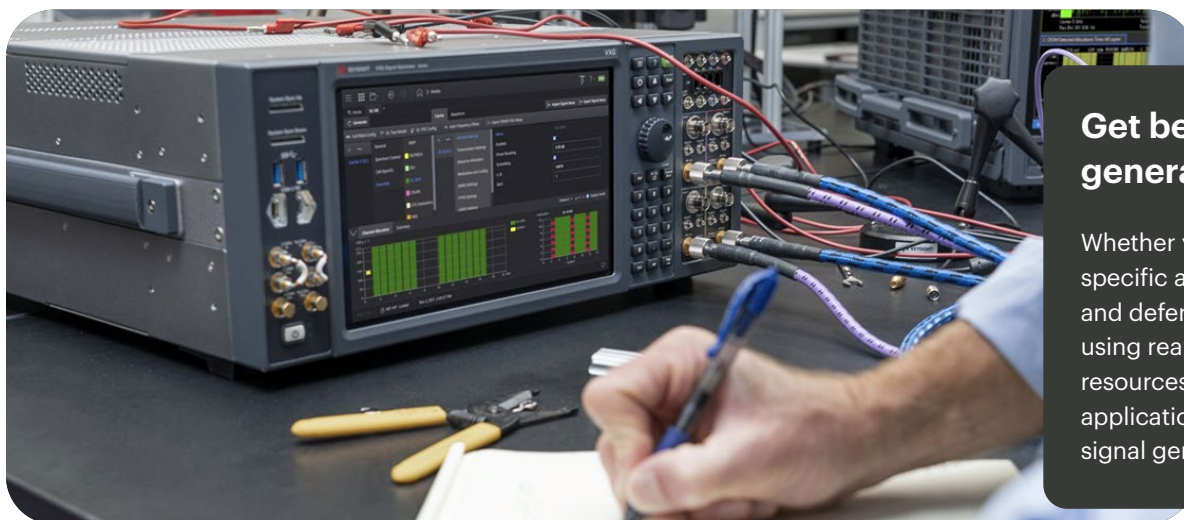
XG7-class

- 67 GHz Maximum frequency
- 1 Number of output

Introduction

Keysight Signal Generators — from research to manufacturing testing

Keysight signal generators are now offered in six capability classes across three performance grades: Essential, Expert, and Pro. Essential grade is our most affordable, entry-level vector signal generators, which include the XG1- and XG2-class. Expert includes the XG4- and XG5-class, taking modulation bandwidths to 1 GHz. Pro includes the XG7-class with maximum frequency up to 54 GHz. Essential grade analog signal generators, includes the XG1-and XG2-classes. Expert includes the XG5- and XG6-classes, increasing the maximum frequency and harmonics range. Pro includes XG7-class, taking maximum frequency to 67 GHz. A comprehensive library of [signal generator resources](#) are available to help you find the performance grade and class best suited to your lab.



Get better insights with realistic signal generation

Whether you are working on general-purpose or industry-specific applications such as 5G, automotive, or aerospace and defense, you need to stimulate your device under test using realistic signals with the highest signal integrity. Keysight resources cover everything from fundamentals to complex applications to help you develop a deeper understanding of signal generators.

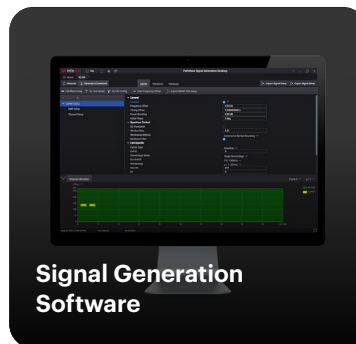
Here are a few examples of the resources you will find to help you select the signal generator that is right for you:



The Essential Signal Generator Guide



Selecting a Signal Generator



Signal Generation Software

Vector Signal Generators

Keysight vector signal generators enable you to stimulate your device or system under test using complex, digitally modulated, realistic signals with high signal integrity. When paired with our signal generation software, you can perform rapid, accurate tests with predefined, standards-based waveforms for cellular communications like 5G New Radio (NR), wireless connectivity like wireless local area network (WLAN) 802.11, and navigation solutions like global navigation satellite systems (GNSS). Select the signal generator performance you need based on maximum frequency, bandwidth, and channels, as well as phase noise. Explore our range of models from Essential to Pro performance grades to find the one that is right for your application.



Essential

XG1, XG2-class



Expert

XG4, XG5-class



Pro

XG7-class

Maximum frequency	6 GHz	8.5 GHz to 40 GHz	54 GHz
Maximum modulation bandwidth	120 MHz to 160 MHz	400 MHz to 1 GHz	2.5 GHz
Number of outputs	1	1 to 4	1 to 4
Phase noise @ 1 GHz (20 kHz offset)	-122 dBc/Hz to -119 dBc/Hz	-147 dBc/Hz to -145 dBc/Hz	-148 dBc/Hz
Output power @ 1 GHz	18 dBm to 21 dBm	18 dBm to 25 dBm	20 dBm
Harmonics @ 1 GHz	-35 dBc	-45 dBc to -35 dBc	-55 dBc
Frequency switching speed	800 μ s to 5000 μ s	2 μ s to 800 μ s	3 ms
Brands included	CXG and EXG Series	AP5041A-AP5042A and MXG Series	VXG and VXG-m Series

Explore

Explore

Explore

Essential Vector Signal Generators

Fundamental signal generation for general-purpose applications

Keysight Essential vector signal generators come in two classes. The XG1-class includes the CXG Series and the XG2-class includes the EXG Series. They are used in a variety of applications, including wireless communications for testing 5G devices (sub-6 GHz FR1), Wi-Fi®, and *Bluetooth*® systems. They are also critical in RF testing for evaluating radar systems, antenna performance, and signal integrity in general electronics. Far from basic, these entry-level vector signal generators also offer enhanced features such as additive white Gaussian noise (AWGN) to simulate real-world conditions and multitone generation capabilities to minimize distortion. Request a quote or order an Essential vector signal generator today.

[> Learn more about our Essential vector signal generators](#)

Preconfigured waveforms

Test your devices with multiple, verified, standards-compliant vector signals, including 5G NR FR1, WLAN 802.11, and ZigBee®, using high-fidelity signal generation.

Generate multitone signals

Generate interference in transmissions or neighboring channels. Characterize nonlinear devices like amplifiers and mixers by simulating the intermodulation distortion.

Simulate real-world conditions

Add AWGN to a carrier in real-time with an available calibrated noise generator to evaluate receiver sensitivity and simulate real-world conditions.

Self-maintenance capabilities

Quickly identify and address instrument issues, ensuring minimal disruption to testing. Internal self-diagnostics ensure your signal generator remains in optimal working condition.

Class	Included Brands	Range of Performance Specifications						
		Maximum Frequency	Maximum Modulation Bandwidth	Number of Outputs	Phase Noise @ 1 GHz (20 kHz offset)	Output Power @ 1 GHz	Harmonics @ 1 GHz	Frequency Switching Speed
XG1	CXG Series	6 GHz	120 MHz	1	-119 dBc/Hz	+18 dBm	-35 dBc	5 ms
XG2	EXG Series	6 GHz	160 MHz	1	-122 dBc/Hz	+21 dBm	-35 dBc	800 μs

Buy / Get quote

Expert Vector Signal Generators

High-performance bandwidth and precision

Keysight Expert vector signal generators come in two classes. The XG4-class includes the AP5041A-AP5042A and the XG5-class includes the N5186A MXG. Our Expert models build upon the capabilities of our Essential models with wider bandwidths and enhanced spectral purity, as well as cutting-edge capabilities like direct digital synthesis (DDS), an embedded reflectometer (XG5-class), and up to four phase-coherent outputs for complex testing like multiple-input / multiple-output (MIMO) and beamforming. DDS enables fast frequency switching and reduces phase noise and distortion. The embedded reflectometer characterizes the device under test (DUT) match with a single button to generate a match-corrected signal at the reference plane for reduced measurement uncertainty. Expert vector signal generators feature software to create complex modulations like 5G NR and multi-tone signals. Request a quote for an Expert vector signal generator today.

 [Learn more about our Expert vector signal generators](#)

Complex wideband signals

Generate complex wideband signals needed for carrier aggregation and digital pre-distortion (DPD) applications with up to 1 GHz bandwidth per channel.

Spectrally efficient signals

Ensure repeatable, high-quality measurements to speed up R&D testing or optimize production test margins with low adjacent channel power ratio (ACPR) and high output power.

Fast switching speeds

Accelerate testing or emulate fast moving signals like radar with rapid switching speeds and list mode preprogramming of frequency, amplitude, and other parameters.

Ultra-low phase noise

Critical for capturing precise measurements in highly sensitive applications like radar, satellite communications, and high-frequency oscillators.

Class	Included Brands	Range of Performance Specifications						
		Maximum Frequency	Maximum Modulation Bandwidth	Number of Outputs	Phase Noise @ 1GHz (20 kHz offset)	Output Power @ 1GHz	Harmonics @ 1GHz	Frequency Switching Speed
XG4	AP5041A, AP5042A	40 GHz	400 MHz	1 to 4	-145 dBc/Hz	+18 dBm	-45 dBc	2 μs
XG5	MXG Series	8.5 GHz	1 GHz	4	-147 dBc/Hz	+25 dBm	-35 dBc	800 μs

Get quote

Pro Vector Signal Generators

Generate the most complex wideband signals

Keysight XG7-class Pro vector signal generators include the VXG Series. Pro vector signal generators extend frequency support up to 54 GHz, or 110 GHz with a frequency extender, and bandwidth up to 2.5 GHz while supporting direct digital synthesis, embedded software, and other key features of our Expert models. Additional capabilities include channel bonding, providing up to 10 GHz bandwidth per instrument, real-time fading including custom fading models with signal generation software, and eight virtual signal generators per RF channel or 32 emulated transmitters in a single unit. Request a quote for a Pro vector signal generator today.

> [Learn more about our Pro vector signal generators](#)

Ultra-high frequency

Covers all 5G NR frequency bands and V- / W-bands up to 54 GHz, or 110 GHz with a frequency extender, with up to 2.5 GHz modulation bandwidth per channel.

Emulate up to 32 signals

Simplifies MIMO and beamforming tests with up to 4 synchronized and phase-coherent channels in one instrument, plus eight virtual emulators per channel with high dynamic range.

Real-time application support

Real-time signal creation for 5G and LTE uplink and GNSS, plus MIMO real-time fading for all 3GPP 5G NR base station conformance testing.

Lowest phase noise

Proprietary custom ASICs and DDS technology provide the lowest phase noise, down to -148 dBc/Hz, with extremely fine frequency tuning resolution.



Maximum frequency	54 GHz
Maximum modulation bandwidth	2.5 GHz
Number of outputs	1 to 4
Phase noise @ 1 GHz (20 kHz offset)	-148 dBc/Hz
Output power @ 1 GHz	+20 dBm
Harmonics @ 1 GHz	-55 dBc
Frequency switching speed	3 ms

Get quote

Analog Signal Generators

Keysight analog signal generators deliver low-phase-noise signals with precise frequency control, flexible configurations, and fast switching speeds. If you need more sophisticated modulation techniques, refer to our [vector signal generators](#). Select the analog signal generator performance level you need based on frequency, max channels, phase noise, and output power. Explore our wide range of models from Essential to Pro performance levels to find the one that is right for your application.



Essential

XG1, XG2-class



Expert

XG5, XG6-class



Pro

XG7-class

Maximum frequency	6 GHz to 40 GHz	8.5 GHz to 54 GHz	67 GHz
Number of outputs	1 to 4	1 to 4	1
Phase noise @ 1 GHz (20 kHz offset)	-122 dBc/Hz to -130 dBc/Hz	-150 dBc/Hz to -146 dBc/Hz	-143 dBc/Hz
Output power @ 1 GHz	+17 dBm to +25 dBm	+17 dBm to +25 dBm	+21 dBm
Harmonics @ 1 GHz	-33 dBc to -40 dBc	-33 dBc to -60 dBc	-55 dBc
Frequency switching speed	800 μ s to 20 μ s	800 μ s to 3 μ s	11 ms
Brands included	AP5001A-AP5012A N5171B N5173B	N5185A N5181B-N5183B AP5021A-AP5032A	E8257D E8663D R4453A

Explore

Explore

Explore

Essential Analog Signal Generators

General-purpose signal generation

Keysight Essential analog signal generators come in two classes. The XG1-class includes the AP5001A, AP5002A and the XG2-class includes the AP5011A, AP5012A N5171B, and N5173B. Essential analog signal generators feature low phase noise, a wide output power range, and fast switching speeds needed to test a variety of devices and communication systems. Additionally, our Essential models are available in four phase-coherent output configurations with a 40 GHz max frequency, ideal for evaluating the signal strength, frequency response, or noise performance in multiport receiver testing. Choose one of our popular configurations or configure one specific to your application.

[> Learn more about our Essential analog signal generators](#)

Low phase noise

Provides a clean, stable signal ideal for testing high-precision components like oscillators, mixers, and amplifiers in applications including 5G, Wi-Fi, and general wireless applications.

High output power

Compensate for system loss, enhance SNR, and test components from short-range wireless systems to long-distance communication links with greater than +17 dBm output power.

Fast switching speed

Simulate real-world signal transitions with rapid switching speeds, ideal for testing pulse and burst signals like radar or nonlinear devices like power amplifiers.

Modulation capabilities

Leverage modulation capabilities such as AM, FM, PM, and pulse modulation to generate complex analog waveforms for thorough testing of RF receivers, components, and systems.

Class	Included Brands	Range of Performance Specifications					
		Maximum Frequency	Number of Outputs	Phase Noise @1GHz (20 kHz offset)	Output Power @1GHz	Harmonics @1GHz	Frequency Switching Speed
XG1	AP5001A, AP5002A	6.1 GHz to 26 GHz	1	-130 dBc/Hz	+17 dBm to +23 dBm	-40 dBc	20 μs to 200 μs
XG2	AP5011A, AP5012A, N5171B, N5173B	6 GHz to 40 GHz	1 to 4	-130 dBc/Hz to -122 dBc/Hz	+21 dBm to +25 dBm	-40 dBc to -33 dBc	25 μs to 800 μs

[View popular configurations](#)

Expert Analog Signal Generators

Pure and precise signal generation

Keysight Expert analog signal generators come in two classes. The XG5-class includes the N5185A, N5181B, and N5183B MXG, and the AP5021A and AP5022A compact signal generators. The XG6-class includes the AP5031A and AP5032A compact signal generators. Expert analog signal generators build upon the capabilities of our Essential models to support a wider max frequency range and lower phase noise. Compact Expert models support a max frequency up to 54 GHz and ultra-fast switching speeds as low as 3 microseconds. Expert models are available in multichannel configurations and offer enhanced features like DDS to generate precise, low-distortion signals and an embedded reflectometer to automate DUT match correction. Choose one of our popular configurations or configure one specific to your application.

[Learn more about our Expert analog signal generators](#)

Ultra-low phase noise

Ensure the signal stability and purity required for demanding radar, analog-to-digital converter (ADC), and receiver-blocking tests with ultra-low phase noise.

Low harmonic distortion

Pure signal generation with low harmonic distortion reduces interference, improving signal integrity, and enabling more accurate RF measurements.

Ultra-fast switching speed

Achieve more accurate and dynamic signal simulation with switching speeds ranging from 800 μ s to 3 μ s, enabling precise replication of real-world RF environments.

Flexible configurations

Choose the right number of channels for your application, from a compact, single-channel model to a multichannel unit ideal for multiport receiver testing.

Class	Included Brands	Range of Performance Specifications					
		Maximum Frequency	Number of Outputs	Phase Noise @1GHz (20 kHz offset)	Output Power @1GHz	Harmonics @1GHz	Frequency Switching Speed
XG5	N5185A, N5183B, AP5021A, AP5022A	8.5 GHz to 54 GHz	1 to 4	-146 dBc/Hz to -145 dBc/Hz	+17 dBm to +25 dBm	-55 dBc to -33 dBc	15 μ s to 800 μ s
XG6	AP5031A, AP5032A	51 GHz	1 to 4	-150 dBc/Hz	+18 dBm	-60 dBc	3 μ s

[View popular configurations](#)

Pro Analog Signal Generators

Metrology-grade performance for demanding applications

Keysight XG7-class Pro analog signal generators include the E8257D and E8663D PSG signal generators. They offer metrology-grade accuracy and phase noise and frequency coverage up to 67 GHz (extendable to 1.1 THz) for testing critical applications in calibration labs, research environments, and production testing. You can rely on the highest-quality signals, from pure continuous wave (CW) tones to complex analog modulated signals with up to 1 W of power with a high-power extension. Request a quote or order a Pro analog signal generator today.

[Learn more about our Pro analog signal generators](#)

Spectral purity

Low phase noise, harmonics, and spurious signals ensure accurate testing of RF integrated circuits (RFICs), communication receivers, and other high-precision applications.

High max frequency

Offers max frequency of 67 GHz, and up to 1.1 THz with a frequency extender, enabling 6G research and development (R&D) and very high-frequency radar and satellite communication testing.

Metrology-grade signals

Traceable to national and international standards, ensuring accurate, repeatable results with minimal errors, ideal for precision signal generation in R&D, military testing, and satellite communications.

Ultra-high output power

Test high-power devices and overcome test system losses with optional high-power extension, which increases the maximum output power to +30 dBm (1 W), reducing the need for external amplification.



Maximum frequency	67 GHz
Number of outputs	1
Phase noise @ 1 GHz (20 kHz offset)	-143 dBc/Hz
Output power @ 1 GHz	+21 dBm
Harmonics @ 1 GHz	-55 dBc
Frequency switching speed	11 ms

Buy / Get quote

Agile Signal Generators

Accurately simulate complex signal scenarios

Keysight XG9-class agile signal generators include the UXG models. They simulate complex signal environments with an arbitrary waveform generator for testing specific protocols or unique communication formats for radar, electromagnetic spectrum operations (EMSO), and antenna testing. Its rapid frequency, amplitude, and phase-switching capabilities allow for accurate emulation of multi-threat scenarios. Choose one of our popular configurations or configure one specific to your application.

[Learn more about our agile signal generators](#)

Ultra-fast switching speed

Generate complex, dynamic signals in real-time with agile switching of frequency, phase, and amplitude with continuity and repeatability.

Pulse capabilities

Enhanced pulse modulation, including chirp, pulsed, and frequency modulated continuous wave (FMCW) radar signals, with varying pulse widths, frequency modulations, and timings.

Scalable, multi-emitter test

Emulate complex, crowded threat environments by scaling up the number of units to create thousands of radar threat-emitters and millions of pulses per second with unique antenna scans.

Baseband vector generator

Simulate complex electromagnetic environments across the full frequency range by adding an optional 1.6 GHz bandwidth baseband vector generator.

Class	Included Brands	Range of Performance Specifications						
		Maximum Frequency	Maximum Modulation Bandwidth	Number of Outputs	Phase Noise @ 1 GHz (20 kHz offset)	Output Power @ 1 GHz	Harmonics @ 1 GHz	Frequency Switching Speed
XG9	N5193A, N5194A	40 GHz	1.6 GHz	1	-144 dBc/Hz	3 dBm to 10 dBm	< -60 dBc to < -50 dBc	0.22 μs to 0.18 μs

[View popular configurations](#)

Frequency Synthesizers

Compact, pure frequency synthesizers for RF testing

Keysight FS Frequency Synthesizers are the FS1- and FS2-classes, which include the AP4001-AP4022A Frequency Synthesizers. They provide frequency synthesizers provide fast switching speeds, low phase noise, and high signal quality for a wide range of signals with precise frequency control. With single-channel and multichannel options and a variety of form factors available, our frequency synthesizers offer a scaled-down, affordable, compact option when the higher-level modulation capabilities of a signal generator are not required. Their compact size allows you to easily integrate them into your test system for various applications, including wireless communications, radar, electronic warfare, and quantum computing. Select the frequency synthesizer performance level you need based on max frequency, number of phase-coherent channels, phase noise, and switching frequency.

[Learn more about our frequency synthesizers](#)

Precision and accuracy

Deliver precise, stable signals quickly with ultra-fast switching and low-phase noise, ensuring high signal integrity in applications like wireless communication systems or high-frequency radar.

Enhanced synchronization

Ensure exceptional frequency accuracy and stability with the internal oven-controlled crystal oscillator (OXCO), ideal for high-precision applications.

Compact and easy to integrate

Support for various form factors, including compact and rack-mountable for space-constrained embedded systems, as well as portable benchtop models for R&D and field testing.

Flexible configurations

Choose the right number of channels for your application, from cost-effective single-channel models to multichannel units ideal for MIMO applications or testing multiple frequency bands at once.

Class	Included Brands	Range of Performance Specifications				
		Maximum Frequency	Number of Outputs	Phase Noise @ 1 GHz (20 kHz offset)	Frequency Switching Speed	Output Power @ 1 GHz
FS1	AP4011A-AP4022A	20 GHz to 40 GHz	1 to 4	-125 dBc/Hz to -147 dBc/Hz	20 μs to 5 μs	+18 dBm to +20 dBm
FS2	AP4003A-AP4007A	20 GHz to 22 GHz	1 to 4	-131 dBc/Hz to -147 dBc/Hz	15 μs to 5 μs	+15 dBm to +25 dBm

[View popular configurations](#)

Modular Signal Generators

Compact multichannel signal generation

Keysight modular analog and vector signal generators are built for applications that require multichannel measurement capabilities, measurement speed, and a small footprint. They provide you with the scalability and flexibility needed to create test systems with a shared processor, chassis, and other modular instruments.

With models ranging from 6 GHz to 44 GHz with varying performance levels, select the modular signal generator that is right for your application.

See catalog

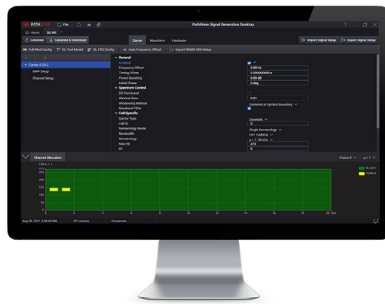
Maximum frequency	6 GHz to 44 GHz
Maximum modulation bandwidth	2 GHz
Phase noise @ 1 GHz (20 kHz offset)	-118 dBc/Hz to -137 dBc/Hz
Output power @ 1 GHz	+19 dBm to +20 dBm
Harmonics @ 1 GHz	-29 dBc to -46 dBc
Frequency switching speed	28 ms to 10 μ s



Software and Accessories

Find compatible software and accessories for your signal generator

Keysight's signal generation software streamlines the creation of complex test signals for various applications, including cellular communications, wireless connectivity, aerospace and defense, navigation, broadcasting, and general-purpose testing. Available in both desktop and embedded versions, it offers a consistent user experience across platforms. Our signal generation software supports multiple radio formats, provides enhanced signal creation capabilities such as the ability to create custom, standards-based common test signals, and includes add-on features like real-time fading, IQ impairments, and AWGN for comprehensive transmitter, receiver, and component testing.



Power your signal generator with a wide range of specialty software in the following categories:

- cellular and automotive communications standards like 5G NR / 5G-Advanced, LTE-V2X, and NR-V2X
- wireless connectivity and Internet of Things (IoT) standards like *Bluetooth*®, WLAN 802.11 / Wi-Fi, and HRP UWB
- satellite, video, audio, and radio tests like satellite communication (DVB-S / S2 / S2X), broadcast radio, digital video, and land mobile radio
- detection, positioning, tracking, and navigation tests like GNSS, pulse building, and multi-emitter scenario generation (MESG)
- general-purpose and waveform tools: custom IQ, custom OFDM, multitone, and advanced waveform utility (AWU)

[Explore software](#)



Get more functionality out of your signal generator by pairing it with the right accessories, including:

- frequency extenders
- power sensors
- power meters
- cabling
- power splitter or divider
- calibration kit
- cooling spacer kit

[Explore accessories](#)

Keysight Support Services

Explore the services that are right for you

Keysight Support Services can reduce your learning curve, enhance your uptime, guarantee the accuracy of your testing equipment, and provide the expertise you require, precisely when and where you need it.

Maximize your instrument uptime, quickly optimize your test measurements, and get the answers you need at our fastest available times. KeysightCare curated support plans bundle critical services with prioritized response and turnaround times. **High-performance instruments include one year of KeysightCare Assured.**

Explore support services



Calibration

Ensure your test system performs to specification and meets local and global standards.



Repair

Restore equipment to original functionality and specifications with trained technicians.



KeysightCare

Innovate at speed with curated support plans and prioritized response and turnaround times.



Education

Make measurements quickly with eLearning and in-house, instructor-led training.



Keysight Support

Get 24x7 access to service requests, case management help, and technical articles.



Keysight enables innovators to push the boundaries of engineering by quickly solving design, emulation, and test challenges to create the best product experiences. Start your innovation journey at www.keysight.com.

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