

High-Performance Digital Products

CATALOG



Table of Contents

3

Introduction

5

Infiniium UXR-Series Oscilloscopes

8

Infiniium MXR-Series Oscilloscopes

11

Arbitrary Waveform Generators

13

Bit Error Ratio Testers

19

DCA Sampling Oscilloscopes

23

PCIe[®] 5.0 Protocol Test Solution

25

PathWave High-Speed Digital Design Software

27

KeysightCare Service and Support

Introduction



Physical-Layer Characterization, Validation, and Compliance Testing Systems

Today's enterprise and consumer products are driving the need for faster processing at lower power consumption and pushing your design margins to the extreme. Consumer technologies, communication infrastructure, data centers, pure science, electronic warfare, and quantum computing are driving measurement limits.

Today's laboratory requires best-in-class measurement and stimulus tools that can help validate test needs now and in the future. The Keysight Infiniium **UXR-Series** oscilloscope, Infiniium **MXR-Series** oscilloscope, **M8100 Series** arbitrary waveform generators (AWG), the J-BERT **M8020A**, **M8040A**, and **M8050A** high-performance bit error ratio testers (BERT), and Keysight **DCA sampling oscilloscopes** are invaluable tools for testing and validating complex signals.

From physical-layer characterization to validation and compliance testing solutions, Keysight's high-performance digital test tools enable you to design, verify, and characterize each step of your design workflow.

All high-performance digital products include 1 year of KeysightCare Assured. As a KeysightCare subscriber, you get unlimited and committed access to Keysight's technical experts with predictable response times on any instrument, application, and measurement question in addition to worry-free warranty coverage.

[Learn more](#)

* KeysightCare coverage may vary by country. For details, please view the [data sheet](#).





UXR1104B Infiniium UXR-B Series oscilloscope

Infiniium UXR-Series Oscilloscope

The Infiniium UXR is the first series of real-time oscilloscopes to offer ultra-high-performance acquisition with 10 bits of high-definition resolution. Designed with upgradability in mind, the UXR will support your current and future designs and test needs.

- Up to 110 GHz bandwidth
- 10-bit hardware analog-to-digital converter (ADC)
- Maximum bandwidth on all channels
- Industry's lowest noise and best interchannel jitter performance Up to 256 GSa/s sample rate
- Two or four phase-coherent channels per frame
- Up to 40 synchronized channels via Keysight's MultiScope support
- ENOB from 7.0 to 5.0 (10 GHz to 110 GHz)

| Specifications (at max bandwidth) | 3.5 mm Models | 1.85 mm Models | 1 mm Models |
|---|--|---|---|
| Bandwidth | 10 to 33 GHz | 40 to 70 GHz | 5, 25, 40, 59 to 110 GHz |
| Maximum sample rate | 128 GSa/s | 256 GSa/s | 256 GSa/s |
| Noise at highest sensitivity and bandwidth | < 0.3 mV (rms) | < 0.5 mV (rms) | < 0.9 mV (rms) |
| ENOB at ≥ 400 mVfs average value from DC to full licensed bandwidth of model | from 7.0 to 5.9 | from 5.8 to 5.4 | from 8.1 to 5.0 |
| Max multiframe channels | 40 channels maximum (10 oscilloscopes) | | |
| Detectable symbol rate at maximum bandwidth | 66 Gbaud | 140 Gbaud | 220 Gbaud |
| Vertical sensitivity (hardware) Vertical sensitivity (with zoom) | 40 mV to 8 V full scale 1 mV / div to 1 V / div | 60 mV to 4 V full scale 1 mV / div to 500 mV / div | 60 mV to 4 V full scale 1 mV / div to 500 mV / div |
| Hardware acquisition / acceleration system | <ul style="list-style-type: none"> • 10-bit ADC • Phase Noise Measurement | <ul style="list-style-type: none"> • 2.16 GHz digital downconversion (DDC analysis bandwidth) • 5 to 10 GHz mmWave frequency extensions | <ul style="list-style-type: none"> • Equalization and clock recovery • Real-time eye plotting and averaging |
| Upgradability | <ul style="list-style-type: none"> • Bandwidth (from 5, 10, 13, 16, 20, 25, 33, 40, 50, 59, 70, 80, 100 to 110 GHz) • Memory from 500 Mpts / CH to 1 Gpts or 2 Gpts <ul style="list-style-type: none"> • 1, 2, to 4 channels | | |
| | Get Quote > | Get Quote > | Get Quote > |

Infiniium UXR-Series mmWave Wideband Analysis Acceleration and Frequency Extension (N2163A)

The UXR-Series supports new mmWave measurement capabilities. In combination with its analysis, compliance, and protocol applications, the Infiniium UXR-Series oscilloscope offers up to four phase-coherent channels, each with up to 110 GHz of usable bandwidth. The UXR-B Series comes standard 160 MHz hardware-accelerated digital downconversion (DDC) and RTSA capabilities, so even the most demanding multiple input / multiple output (MIMO), mixed-signal, radar, Satcom, or high-frequency, high-bandwidth designs are no challenge.

Simultaneously capture on up to four channels

- ability to set different center frequencies on each channel
- MIMO 4x4 support (1 UXR) or MIMO 8x8 with MultiScope

<1s update rate with DDC

- captures >2s of 5G frames with max memory and DDC

Supports all 5G New Radio (NR) frequency bands

- FR1 (450 MHz – 6000 MHz)
- FR2 (24250 MHz – 5260 MHz)
- supports CC BW >400 MHz
- DDC support for multi-CC aggregation up to 2 GHz BW

Superior EVM performance

- equal to or better than a spectrum analyzer in FR2 bands
- 0.54766% error vector magnitude (EVM) at 28 GHz center frequency (CF)

5G NR FR2 28 GHz CF,
100 MHz BW CC, 256QAM fully filled





UXR Hardware Acceleration

- 1 mm input UXR-Series oscilloscope 5, 25, 40, 59, 70, 80, 100, 110 GHz AP models
- Dynamically allocate 5 GHz to 30 GHz wide bandwidth windows up to 110 GHz
- 2.16 GHz DDC for real-time IQ data demodulation compatible VSA for RF and vector analysis (IQ data processing)

UXR1004B real-time oscilloscope

Infiniium MXR-Series Oscilloscopes

See more. Do more. Save time.

You want your design to shine, and that means seeing more signals in new ways. Be ready with a Keysight Infiniium MXR-Series oscilloscope: it's your window into the intricate interactions of complex designs. Get from symptom to resolution fast by coupling an 8-in-1 bench solution's efficiency with unprecedented simultaneous eight-channel performance.

- Get faster test speeds than ever before with ASICs from Keysight's 110 GHz oscilloscopes.
- Make accurate measurements with effective number of bits (ENOB) up to 9.0 and noise as low as 43 μ V.
- Extend your oscilloscope's capabilities with 8-in-1 instrument integration.
- Protect your investment with complete upgradeability; add options, bandwidth, and more channels at any time.



Infiniium MXR-Series 8-channel oscilloscope

Infiniium MXR-Series Oscilloscopes

| Specifications | | MXR05xA | MXR10xA | MXR20xA | MXR25xA | MXR40xA | MXR60xA |
|--------------------------|--|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|
| Bandwidth (-3 dB) | 50 Ω | 500 MHz | 1 GHz | 2 GHz | 2.5 GHz | 4 GHz | 6 GHz |
| | 1 MΩ | 500 MHz | 500 MHz | 500 MHz | 500 MHz | 500 MHz | 500 MHz |
| Typical rise / fall time | 10 / 90% | 860 ps | 430 ps | 215 ps | 172 ps | 107.5 ps | 71.7 ps |
| | 20 / 80% | 620 ps | 310 ps | 155 ps | 124 ps | 77.5 ps | 51.7 ps |
| Channels | 4 or 8 channels analog, 16 channels digital (optional) | | | | | | |
| Sample rate | 16 GSa/s, all analog channels | | | | | | |
| Memory | Standard: 200 Mpts / channel (all channels) / Optional: 400 Mpts / channel (all channels) | | | | | | |
| Integrated instruments | Digital channels, protocol analysis, arbitrary waveform generator (50 MHz), frequency response analysis (50 MHz), 4-digit digital multimeter (10-digit counters), logic analysis (16 channels), real-time signal analyzer, and phase noise analysis | | | | | | |
| Noise floor | 100 μVrms noise floor at 1 mV / div (2.5 GHz), 43 μVrms noise floor at 1 mV / div (20 MHz) | | | | | | |
| Serial protocol options | I ² C, SPI, SR232 / UART, JTAG, CAN, CAN-FD, LIN, FlexRay, SVID, USB 2.0, USB-PD, MIPI RFFE, eSPI, I ² S, Ethernet 10 / 100BASE-T, SpaceWire, SPMI, 100BASE-T1, Manchester, ARINC429, MIL-STD1553, DDR2 / 3 / 4, LPDDR2 / 3 / 4, Ethernet 10GBASE-KR 64 / 66, Ethernet 100BASE KR / CR, MIPI (CSI-3, DigRF v4, D-PHY, LLI, RFFE, UniPro), PCIe [®] Gen 1 / 2 / 3, SATA / SAS, UFS, USB 2.0, USB 3.0, USB 3.0 SSIC, USB 3.1, C-PHY | | | | | | |
| Triggering | Edge, edge transition, edge then edge (time / event), pulse width, glitch, runt, timeout, pattern / state, setup / hold, window, protocol, generic protocol, burst, Nth edge, OR'd edges, Zone touch trigger, measurement limit, and non-monotonic edge | | | | | | |
| | | Get Quote > | Get Quote > | Get Quote > | Get Quote > | Get Quote > | Get Quote > |



M8199B 256 GSa/s arbitrary waveform generator

M8100 Series Arbitrary Waveform Generators

The Keysight family of AWGs offers stimulus sources that address a wide range of applications. The precision, high speeds, and flexibility of the **M8100 Series AWGs** help meet your most difficult challenges.

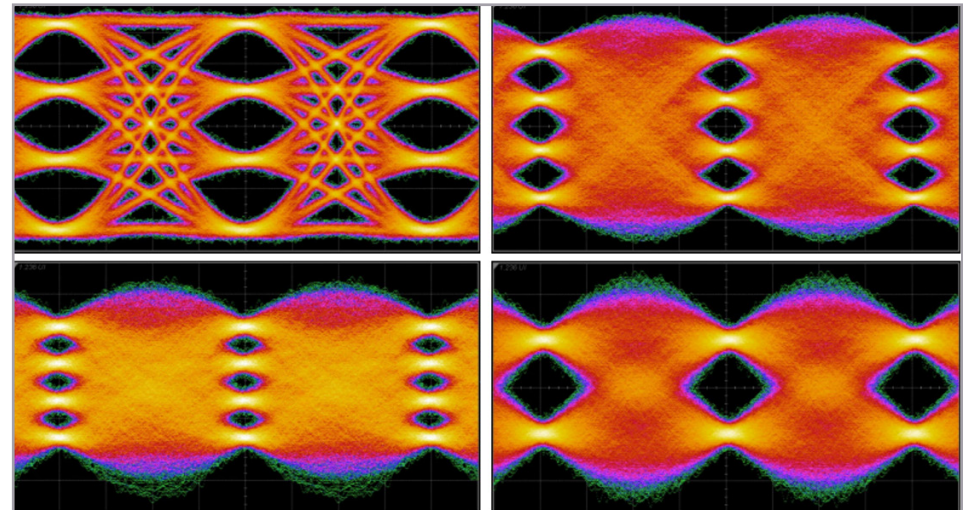
The M8190A, M8194A, M8195A, M8196A, M8199A, and M8199B high-performance AWGs support all of today's applications, from low-observable radar to multi-level QAM optical signals.

AWG applications include the following:

- Multilevel / multichannel digital signals up to 160 GBaud and above, enabling beyond 224Gb/s/lane transmissions
- Coherent optical applications up to 160 GBaud and beyond enabling multi-Tb/s transmissions
- 5G/6G, HDMI, MIPI
- Radar, electronic warfare, satellite, and general RF applications

Available in: **high speed and high fidelity**

- The **M8194A/95A/96A/99A/99B** AWGs are ideal for simulating multilane high-speed interfaces with high channel density, supporting up to 160 GBaud and beyond.
- The **M8190A** AWG provides superior signal fidelity with up to 14 bits of resolution and a spurious free dynamic range (SFDR) up to 90 dBc, ensuring your signals clearly stand out of noise.



PAM-4 at 112 GBaud (224 Gb/s) on the top-left, PAM-4 at 160 GBaud (320 Gb/s) on the top-right, PAM-4 at 200 GBaud (400 Gb/s) on the bottom-left, NRZ at 200 GBaud (200 Gb/s) on the bottom-right

| Key specifications | High-signal-fidelity AWG | | High-speed AWG | | | |
|----------------------------------|--|---|---|---|--|---|
| | M8190A | M8195A | M8196A | M8194A | M8199A | M8199B |
| Max. sample rate | 8 / 12 GSa/s | 65 GSa/s | 92 GSa/s | 120 GSa/s | 128 / 256 GSa/s | 256 GSa/s |
| Bandwidth (incl. sinc roll-off) | 3 / 5 GHz @-3dB (sinc roll-off compensated) | 23 GHz @-3dB | 26 GHz @-3dB | 45 GHz @-3dB | 50 / 55 GHz @-3dB | 75 GHz @-3dB 80 GHz @-6dB 90 GHz @-10dB |
| DAC resolution | 14 / 12 bits | 8 bits | 8 bits | 8 bits | 8 bits | 8 bits |
| Max. amplitude (differential) | 2 Vpp | 2 Vpp | 2 Vpp | 1.6 Vpp | 1.66 Vpp | 5.0 Vpp |
| Memory | 1536 / 2048 MSa per channel | 16 GSa per module | 256 kSa per channel | 512 kSa per channel | 512 / 1024 kSa per channel | 1024 kSa per channel |
| Random jitter (RMS) | 5 ps | 200 fs | 130 fs | 125 fs | 75 fs | 75 fs |
| Rise / fall time (20%/80%) | < 60 ps (typ) | 18 ps (typ) | 9 ps (typ) corrected | 6 ps (typ) corrected | 5 ps | 3 ps |
| Max. ENOB (charts in datasheets) | 11.7 / 10.8 bits | 6.4 bits | 6.3 bits | 5.8 bits | 6.0 bits | 6.1 bits |
| Max. SFDR | -90 dBc (DC to 2 GHz) | -80 dBc (DC to 1 GHz) | -57 dBc (DC to 4 GHz) | -35 dBc (DC to 10 GHz) | -48 dBc (DC to 20 GHz) | see datasheet |
| Channels per module | 1 or 2 | 1, 2, or 4 | 1, 2 or 4 | 1, 2 or 4 | 1, 2, or 4 / 1 or 2 | 1 or 2 |
| Synchronization | up to 12 channels using 6 M8190A modules and the M8192A sync module | up to 16 channels using 4 M8195A modules and the M8197A sync module | multi-module sync possible using a scope for time alignment | up to 16 channels using 4 M8194A modules and the sync cable kit | up to 16 / 8 channels using 4 M8199A modules and the M8008A clock module | up to 8 channels using 4 M8199B modules and the M8008A clock module |
| Sequencing | Yes | Yes | N/A | N/A | N/A | N/A |
| Channel output type | single-ended or differential | | | | | |
| Auxiliary outputs | sample marker (1 per channel), 2 sync markers, sample clock, sync clock, ref. clock | ref. clock | sync out | ref. clock | sample marker (differential), 2 sync markers, ref. clock (M8008A), ref. clock 16G (M8008A) | sample marker (differential), 2 sync markers, ref. clock (M8008A), ref. clock 16G (M8008A) |
| Form-factor | 2-slot AXIe | 1-slot AXIe | | | 2-slot AXIe | |
| Key applications | <ul style="list-style-type: none"> Radar, Satellite, Electronic Warfare, Multilevel Signals ADC testing (Analog Digital Converter testing), Jitter Margin Testing Digital Video, Noise Power Ratio Measurement, Wireless HD, HDMI, MHL IEEE 802.11ad, CaTV, OFDM, Software Defined Radio | <ul style="list-style-type: none"> Wireless 5G/6G Radar, Satellite, Electronic Warfare Coherent/IMDD optical (~30 GBaud) Quantum, physics, chemistry, and general-purpose electronics research <ul style="list-style-type: none"> HDMI, MIPI Random interference (RI) in BERT applications | <ul style="list-style-type: none"> Optical research (~80 GBaud), e.g. 400ZR and 100 Gb/s/lane IM/DD. Quantum, physics, chemistry, and general-purpose electronics research Random interference (RI) in BERT applications | <ul style="list-style-type: none"> Optical research (~100 GBaud), e.g. 400ZR and >100 Gb/s/lane IM/DD. Physics, chemistry, and general-purpose electronics research Wideband RF signal generation in wireless 5G/6G and aerospace / defense | <ul style="list-style-type: none"> Optical research (~128 GBaud), e.g. 800ZR/LR and 200 Gb/s/lane IM/DD. Physics, chemistry, and general-purpose electronics research Wideband RF signal generation in wireless 5G/6G and aerospace / defense | <ul style="list-style-type: none"> Optical research (~160/~200 GBaud), e.g. >1.6 Tb/s coherent and >200 Gb/s/lane IM/DD Physics, chemistry, and general-purpose electronics research Wideband RF signal generation in wireless 5G/6G and aerospace / defense |
| | Get Quote > | Get Quote > | Get Quote > | Get Quote > | Get Quote > | Get Quote > |

M8050A and M8040A High-Performance BERT, J-BERT M8020A, and M8070B Software

Whether you are working on data center or computing technologies, Keysight BERTs enable physical layer characterization, verification, and compliance testing for both NRZ (non-return-to-zero) and PAM4 (pulse amplitude modulation 4-level) coding schemes. Master your next design with flexible modules, intuitive software, advanced analysis applications, and expert-level support.

M8050A high-performance BERT

- Up to 120G Baud for NRZ and PAM4
- PAM6 and PAM8 encoding for 224 Gbps interfaces

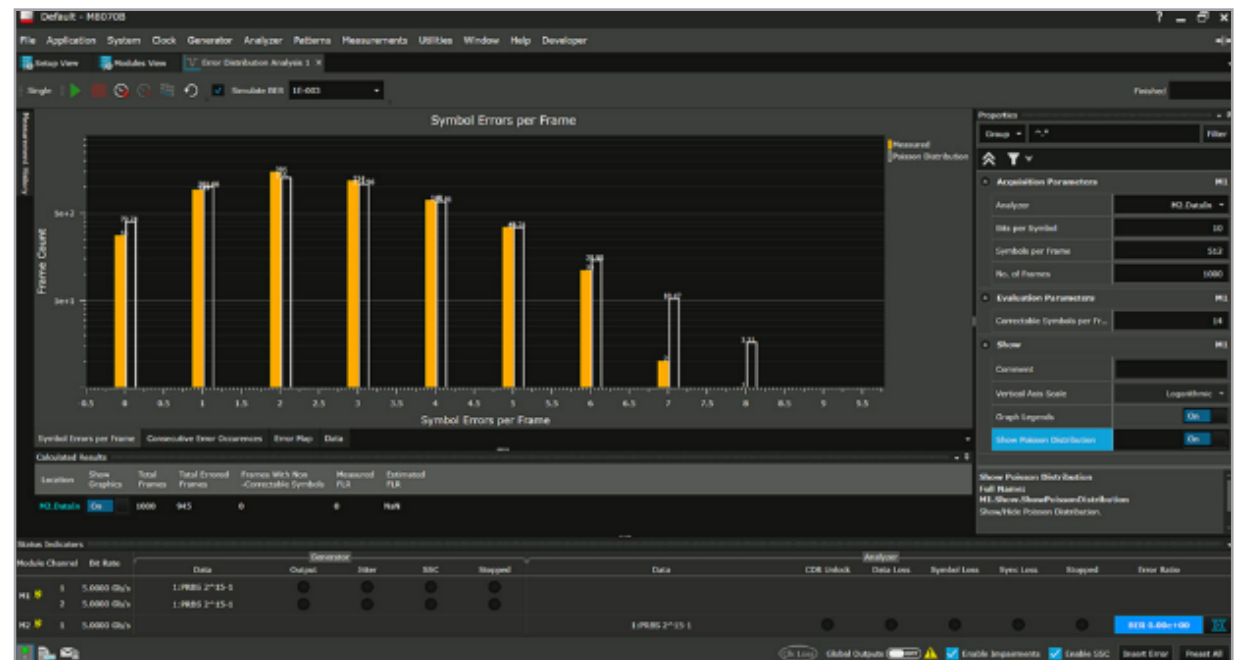
M8040A high-performance BERT

- Up to 64 Gbaud PAM4 and NRZ
- Serve both data center (PAM4) and computing (NRZ) with the same two hardware modules via software upgrades

J-BERT M8020A

- Up to 32 Gbit/s NRZ
- Only capable of NRZ generation and analysis

All modules for the M8040A and M8020A are controlled via the M8070B system software.





M8050A high-performance BERT



M8040A 64 Gbaud high-performance BERT

J-BERT M8020A high-performance BERT



| Key specifications | M8020A | M8040A | M8050A |
|---|--|---|--|
| Symbol rate | PG: 0.256 to 16 GBd ED: 2 to 16 GBd | PG: 2 to 64 GBd ED: 2 to 58 GBd | PG: 2 to 120 GBd, ED (UXR): 14 to 120 GBd |
| Channels per PG module | 1 or 2 (2-slot AXIe module incl. clock) | 1 or 2 (2-slot AXIe module incl. clock) | 1 or 2 (2 or 3 AXIe slots + 1 slot for clock module) |
| Line coding | NRZ | NRZ, PAM4, PAM3 | NRZ, PAM4, PAM6, PAM8 |
| 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 |
| De-emphasis | 8 taps | 5 taps, 1.6% resolution | 7 taps, 0.5% resolution |
| Intrinsic random jitter | 300 fs rms typical | < 10 mUI rms @ > 52 Gbd | < 300 fs rms |
| Transition time (20/80) | 12 ps typical | 9 ps @ > 32 GBd | 7 ps @ 64 Gbd 4 ps @ 120 Gbd |
| Jitter injection | SJ (LF, HF), RJ, BUJ, Clk/2 | SJ (LF, HF), RJ, BUJ, Clk/2 | SJ (LF, HF), RJ, BUJ, Clk/2 |
| Error analysis & interactive link training | Up to 16 G Interactive link training for PCIe, USB | Up to 58 GBd with M8046A Interactive link training for PCIe, USB | Up to 120 GBd with UXR Up to 58 GBd with M8046ASJ (LF, HF), RJ, BUJ, Clk/2 |
| Key applications | PCIe 4.0, USB, SATA 6G SAS 24G, DP, SD-UHS II, TBT MIPI, DDR5, PON, 64G FC 10/40/100 GbE, OIF-CEI-26G | PCIe 5.0, USB4, CCIX, SATA, SAS PON 64G/128G FC 100/200/400 GbE OIF-CEI-56G/112G | 800G and 1.6T, others: planned with future release |
| | Get Quote > | Get Quote > | Get Quote > |



Keysight DCA Sampling Oscilloscopes

DCA Sampling Oscilloscopes

DCA-X Series

The DCA-X wide-bandwidth sampling oscilloscopes are part of Keysight's digital communication analyzer (DCA) family. These modular platforms provide accurate and precise measurements of high-speed digital designs from 50 MBd to more than 112 GBd. DCA modules provide a wide range of configurations and performance options to interchange the bandwidth, channel count, and features.

- Achieve high bandwidths up to 120 GHz with jitter as low as 50 fs and noise as low as 275 V.
- Customize with plug-in modules for optical, electrical, and TDR / TDT / S-parameter analysis.
- Get high test throughput with a module bay that supports up to 16 channels.

DCA-M Series

Built on Keysight's DCA technology, the DCA-M family is the industry standard for verifying optical transmitter compliance to communications standards. With single to quad optical and electrical channels in a compact form factor, the DCA-M is ideal for both manufacturing and research and development (R&D) applications.

- Analyze a wide range of data rates, from 8.4 GBd through 64 Gbaud.
- Achieve characteristic intrinsic jitter as low as 160 fs RMS.
- Get support for both multimode and single mode for single-to quad-channel models.

| Key specifications | DCA-X Series | | | | | | | | | DCA-M Series | |
|---|--|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|---|--------------------------------|---|--------------------------------|
| | N1030A | N1030B | N1032A | N1032B | N1040A | N1045B | N1046A | N1055A | N1060A | N1092 A/B/C/D/E | N1094A/B |
| Bandwidth, -3 dB_o / -3 dB | 65 GHz optical / 95 GHz electrical | 65 GHz | 120 GHz | 120 GHz | 60 GHz | 60 GHz | > 100 GHz | 50 GHz | > 90 GHz | Up to 45 GHz optical / 50 GHz electrical | Up to 50 GHz electrical |
| Channel | 1 optical / 1 electrical (optional) | 2 optical | 1 optical | 2 optical | 2 electrical | 2/4 electrical remote head | 1/2/4 electrical remote head | 2/4 electrical remote head with TDR / TDT | 2 electrical with CRU & PTB | Up to quad channels with the combination of optical and electrical | 2/4 electrical |
| Jitter | ≤ 90 fs rms | | | | | | | | | < 200 fs rms | |
| RMS noise | 16 μW | 40 μW | 275 μV | | 310 μV | 440 μV | 600 μV | 700 μV | 3 μW | 275 μV | |
| Filter range | 15.6 to 80 GBd | 49.7 GBd to 112.5 GBd | | 10 GHz to 70 GHz | | 22.5 GHz to 130 GHz | N/A | 16.5 GHz to 100 GHz | 8.4 GBd to 64 GBd | N/A | |
| Wavelength | 1,250 nm to 1,600 nm | 1,250 nm to 1,625 nm | | N/A | | | | 830 nm to 1,600 nm | N/A | | |
| Supported modulation format | PAM4 / NRZ | | | | | | | | | | |
| Sample rate | Up to 250 kHz | | | | | | | | | | |
| Key features | <ul style="list-style-type: none"> flexible, modular platform precision measurements on high-speed signals up to 16 channels simultaneously powerful analysis features in optical, electrical, and TDR / TDT measurements | | | | | | | | | <ul style="list-style-type: none"> high-accuracy, cost-effective solution low-noise, high-sensitivity calibrated optical reference receivers small form factor for both manufacturing and R&D applications | |
| | Get Quote > | Get Quote > | Get Quote > | Get Quote > | Get Quote > | Get Quote > | Get Quote > | Get Quote > | Get Quote > | Get Quote > | Get Quote > |

DCA Sampling Oscilloscope Software

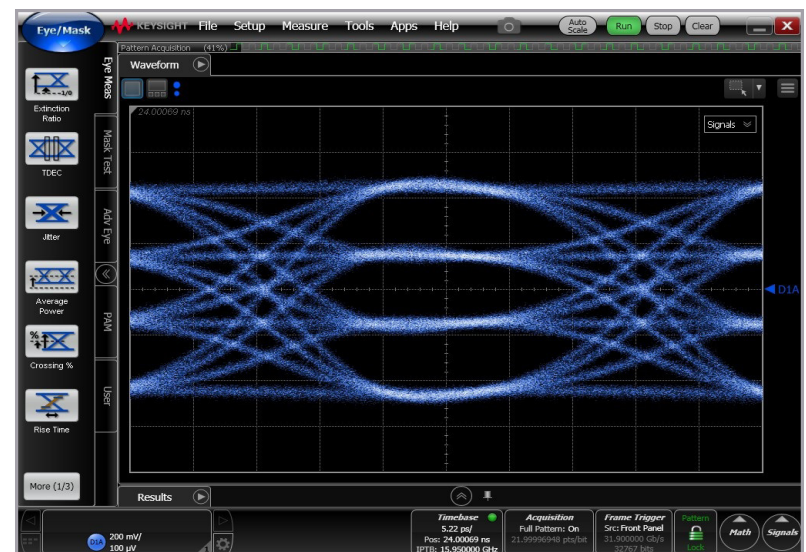
N1010A FlexDCA Software

Keysight's **N1010A FlexDCA** software runs our DCA family of sampling oscilloscopes (also known as equivalent-time oscilloscopes). A DCA is an instrument that helps visualize and analyze the analog properties of high-speed signals such as those used in wireline telecom and data center links.

While FlexDCA comes installed on DCA-X mainframes, you can also install it on a PC to control a DCA-M or remotely control a DCA-X.

In addition to the N1010A FlexDCA's data acquisition and basic measurement capabilities, Keysight offers a large selection of software tools with powerful capabilities:

- **N1010100A RND Package for FlexDCA Sampling Oscilloscope Software:** This package is intended for R&D engineers who want to characterize their designs and gain more insight into why a signal deviates from the expected performance. It includes Jitter and PAM4 test suites and FlexRT Advanced for optical measurements on UXR-Series Oscilloscopes.
- **N1010200A Manufacturing Package for FlexDCA Sampling Oscilloscope Software:** This package focuses on cost of test in optical transceiver manufacturing applications with capabilities such as FlexEye that enhance measurement flexibility. It includes measurements such as TDECQ and FlexRT Basic for optical measurements on UXR-Series Oscilloscopes.
- **N1010300A Signal Integrity Package for FlexDCA Sampling Oscilloscope Software:** This package adds powerful tools to measure impedances, transfer characteristics, S-parameter calculations to the basic TDR / TDT measurements, and FlexPLL for phase-locked loop measurements.

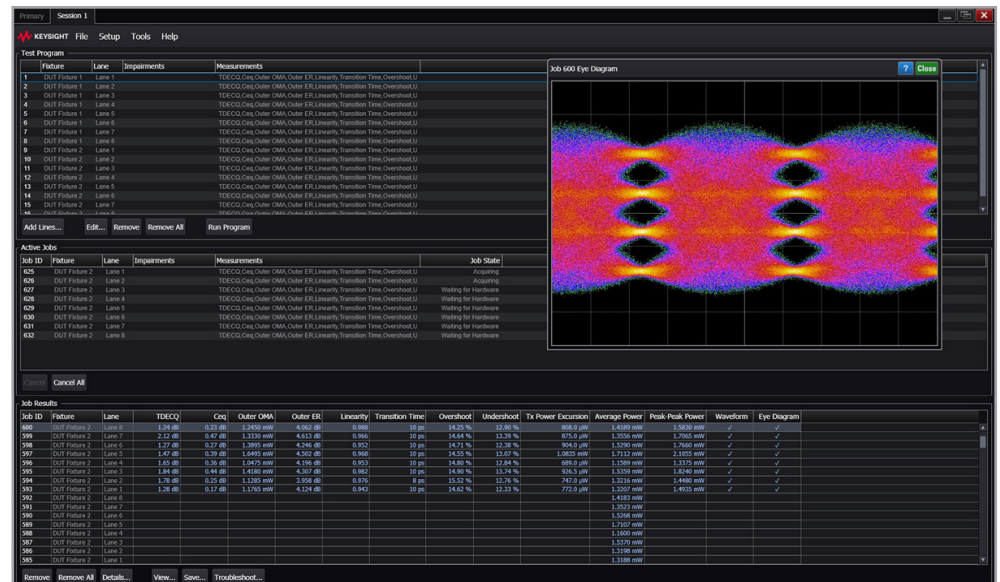
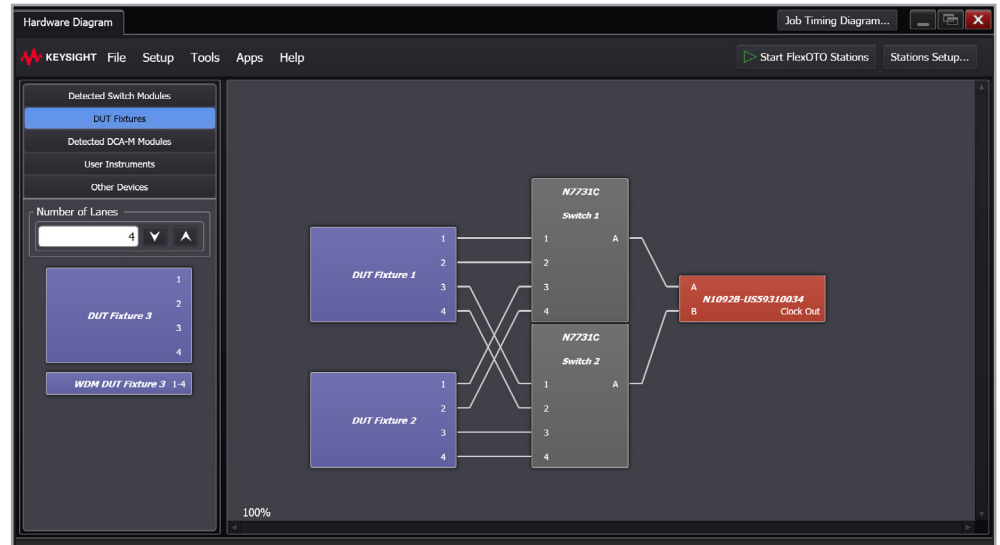


DCA Sampling Oscilloscope Software

N1002xxxA FlexOTO Application Software

Using instrumentation-grade optical switching, **FlexOTO application software** allows test system designers the ultimate flexibility in creating high port count, e.g. 800G/1.6T, CPO/NPO, and multi-channel applications, to improve test efficiency and increase utilization of DCA-M hardware without compromising measurement integrity:

- Create high channel count test systems with up to 128 ports using a variety of optical switch solutions.
- Easily tradeoff throughput and test system expense to achieve the lowest cost-of-test.
- Leverage existing DCA-M investments to meet your high channel count testing demands at a minimal cost.
- Easy setups for complex measurements ensure the highest measurement integrity.
- Simple SCPI interface for easy integration into overall manufacturing test flow.
- Maximize utilization of existing DCA assets beyond what can be achieved with common SCPI automation.
- **N1002L31A** and **N1002L33A** bundles provide a cost-saving solution for software and hardware



PCIe® 5.0 Protocol Test Solution

Combined Analyzer and Exerciser

Both the Keysight P5551A PCIe® 5.0 protocol exerciser and its companion tool, the P5552A PCIe 5.0 analyzer, can be driven by a single combined software interface, offering the user easy access to all the powerful capabilities of both tools.

Through a simple tab-based interface, the user can configure the exerciser and analyzer side by side with just a few clicks. The exerciser's graphical user interface (GUI) provides deep functionality for configuring traffic setup while also providing improved data exchange with the analyzer. The thoughtfully designed interface enables the user to configure all the most important characteristics of the PCIe link, such as lane width and link speed.

Hardware and Software Configuration Overview

P5552A: PCIe Slot Analyzer in single CEM card

- PCIe analysis: link training, equalization, and protocol compliance
- Trace analysis: capture, trigger, and filter
- Use case: decode between the root complex and endpoint
- Superior signal integrity has minimal channel impact

[Get Quote >](#)

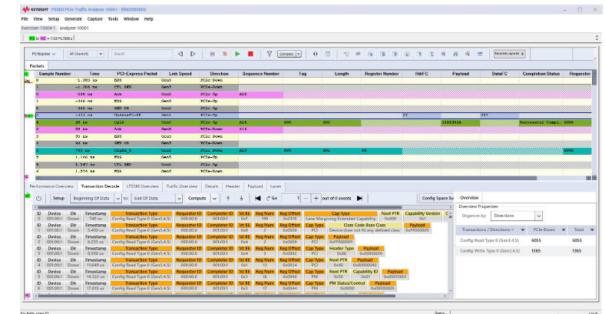
P5551A: PCIe Exerciser in single CEM card

- Protocol generation for PCIe 5.0, Link Training State Status Machine (LTSSM)
- Use case: root complex emulation, endpoint emulation, and error insertion
- Embedded PCIe analyzer function

[Get Quote >](#)

P5563A Test Backplane and P5500A Card Holder

- 5 PCIe 5.0 x16 slots
- Stabilizer bracket
- Exerciser / analyzer: software integrates into a single user interface
- Set up exerciser and analyzer quickly by loading pre-configured setting files



PCIe protocol analysis: TLP trace

PCI-SIG®, PCIe® and PCI Express® are US registered trademarks and/or service marks of PCI-SIG®.

PCIe 5.0 Protocol Test Solution

Analyzer and interposer come on one card

The analyzer comes on a single CEM interposer card to eliminate an oversized separate analyzer chassis. Similarly, the solution's exerciser is also on a single CEM card and eliminates the need for oversized separate connects to the PC via USB.

Superior Keysight signal integrity enables validation engineers to find protocol bugs rather than chase issues introduced by a lower-quality protocol analyzer. The solution equalizes and amplifies the PCIe data signals to compensate for the analyzer's own losses and provide additional compensation potential. The analyzer has minimal channel impact.

The PCIe 5.0 Protocol Test Solution also provides x4, x8, x16 lane widths supported with bifurcation support and real-time link equalization for all supported data rates.

The solution also includes the following features:

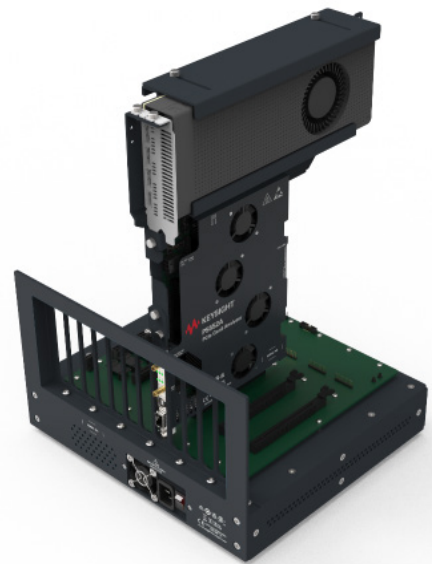
- Decodes and generates for physical layer (TS1 / TS2 / ordered sets), datalink layer (ACK / NAK, sequencer numbers, replay), transaction layer (memory, configuration, and I / O read / writes)
- Provides protocol error detection and insertion
- Emulates root complex or endpoint
- Replays and edits traffic captured from the analyzer to reproduce issues



P5551A PCIe Gen5 Exerciser



P5552A PCIe Gen5 Analyzer



P5563A PCIe Gen5 Test Backplane with an analyzer and DUT on it

PathWave High-Speed Digital (HSD) Design Software

Designing high-speed digital systems is more challenging than ever. With new technologies aiming for faster and smaller electronics, PCBs and packages are becoming denser with tighter routing constraints and lower noise margins. PathWave Advanced Design System (ADS) for signal integrity (SI) and power integrity (PI) is a powerful solution for designers to analyze complex high-speed digital systems. It enables them to try different situations, weigh alternatives, and characterize loss and coupling of signal nets before committing to a final design. Employing an intuitive workflow and fast simulation with uncompromised accuracy, PathWave ADS prevents mistakes and saves time, money, and resources. [Read more.](#)

Highlights:

- Provides a single platform with cohesive design flow: schematic, layout, circuit, electro-thermal, and electromagnetic simulations.
- Reduces the learning curve with built-in wizards for simulation setup, design guides, and standard-specific models.
- Enables easy sharing and collaborating with native data import, export (FlexDCA, Infinium Offline), and reporting (compliance) capabilities.
- Simulates faster by moving simulations to the cloud.

Channel Simulation in PathWave ADS:

- Provides complete chip-to-chip link analysis
- Includes Via Designer and Controlled Impedance Line Designer utilities
- Supports IBIS, IBIS-AMI, and retimer models
- Delivers patented high-accuracy channel characterization

Memory Designer in PathWave ADS:

- Provides industry-leading workflow for next-generation memory design
- Includes DDR bus simulator for characterizing signal integrity
- Unlocks multi-level modulations for pathfinding: NRZ, PAM3, PAM4, PAM6, PAM8, and PAM16
- Offers automated DDR5 / LP5 compliance test suite and report generation

SIPro in PathWave ADS:

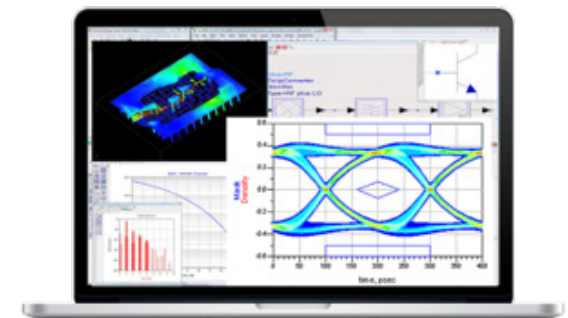
- Provides EM model extraction
- Offers fast and accurate simulation of large and complex PCB designs
- Delivers layout to results in less than 20 clicks
- Supplies auto-detect DDR signals for faster simulation setup
- Implements seamless workflow from EM to circuit simulation

PIPro in PathWave ADS:

- Provides EM model extraction
- Offers 3D visualization of the layout and simulation results (voltage, current, electric field)
- Delivers comprehensive analysis workflow (DC, electro-thermal, AC, and decap optimization)
- Supplies flexible results reporting (html and docx formats)

HSD Apps EP-Scan:

- Offers a lightweight app that produces signal integrity metrics from layout files post-simulation
- Provides trace Impedance and delay analysis
- Delivers channel S-parameter analysis
- Supplies Time Domain Reflectometry (TDR) impedance plot, standard specification checker, and simulation report generation



Channel Simulation in PathWave ADS

PathWave High-Speed Digital (HSD) Design Software

| Key specifications | Rapid Signal Integrity Analysis | SerDes simulation | SerDes & memory simulation | Power integrity | Post-layout EM verification for SerDes | Post-layout EM verification for SerDes & PI | Post-layout EM verification for SerDes, memory & PI | High accuracy EM simulation |
|-------------------------------------|---------------------------------|--------------------------------|--------------------------------|--------------------------------|--|---|---|--------------------------------|
| | W9001E | W3621B | W3622B | W3623B | W3624B | W3625B | W3626B | W3627B |
| ADS Core and 3D Drawing Environment | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| HSD Circuit Sim | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Memory Design | | | ✓ | | | | ✓ | |
| Layout | | | | ✓ | ✓ | ✓ | ✓ | ✓ |
| PIPro | | | | ✓ | | ✓ | ✓ | ✓ |
| SIPro | | | | | ✓ | ✓ | ✓ | ✓ |
| FEM | | | | | | | | ✓ |
| EP-Scan App | ✓ | | | | | | | |
| | Get Quote > | Get Quote > | Get Quote > | Get Quote > | Get Quote > | Get Quote > | Get Quote > | Get Quote > |

Remove the Barriers to Your Success with KeysightCare

Support portal

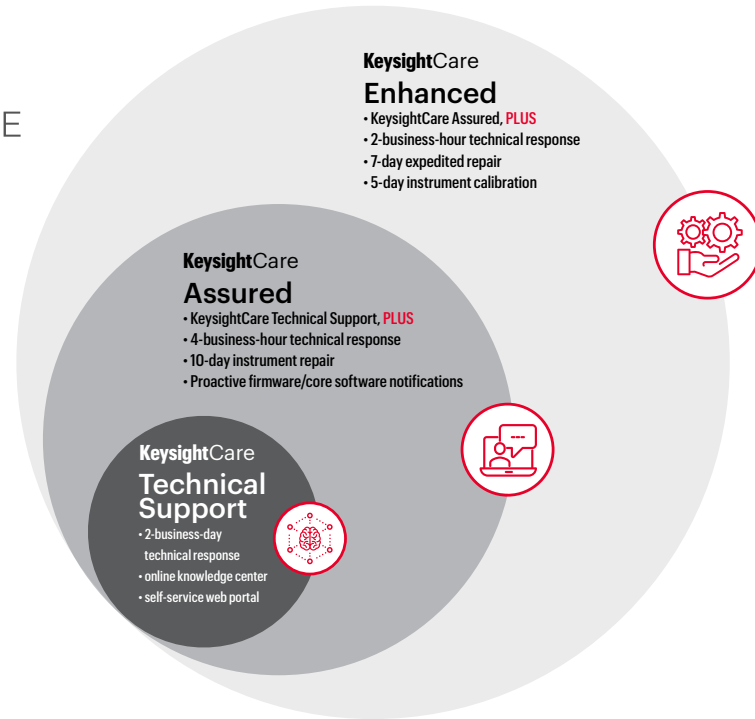
Receive personalized, proactive, and priority support. Find answers in the knowledge center, manage service requests, and interact with Keysight experts. **Start here.**

Access to experts

All high-performance digital products include 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.



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.



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.

This information is subject to change without notice.
© Keysight Technologies, 2018 – 2023, Published in USA, June 8, 2023, 7120-1099.EN