

Interconnect and Network Performance 800GE Test System

Challenge: 800GE from Silicon to AI and HPC Network Performance Test

The 800GE component and network infrastructure ecosystems, both traditional and AI networks, have greatly expanded over the last few years. Most major network equipment manufacturing companies have introduced high port density 51.2 Tbps bandwidth networking equipment for production network deployment. All this equipment has support for multi-rate Ethernet speeds from 50GE through 800GE with PAM4 encoded signaling and Forward Error Correction (FEC) support.

New applications in Artificial Intelligence (AI), Machine Learning (ML), and High Performance Computing (HPC) are driving rapid growth in the build-up and scale-out of new network infrastructures in large Data Centers. The result of this is a diversification of different types of optical transceivers, and active and passive interconnect devices. Each type with different wavelengths, media types, operating ranges, and nearly all with multi-rate Ethernet speed support. Most interconnects are managed with the Common Management Interface Specification (CMIS). CMIS facilitates the use of the extensive programming of the internal registers of the interconnect device to manage and configure the device. Many of the interconnect devices support several different data path configurations and multiple Ethernet speeds and signaling. This creates a vast array of complex, programmed, interconnect devices that are designed to support many different network topology applications. There is an ever-growing need to test the functionality and performance of all the different optical and copper interconnects for their individual performance. And, after they are connected to networking equipment for additional interoperability, link quality, performance, and reliability testing.

Once the network interconnect devices are proven, the test plan moves on to test the performance of switches and router networking protocol scale and to benchmark their performance at IP Layer 3. This includes requirements for benchmarking AI, ML, and HPC lossless fabric networks for Job Completion time, and AI network fabric performance for common types of collective communications, and much more...

Keysight has developed the Interconnect and Network Performance Tester that addresses Layer 1 through Layer 3 test plans.



Figure 1. Interconnect and network performance tester with 4-ports of OSFP800

The new 800GE benchtop chassis is designed to respond to this ever-growing and ever-changing set of network equipment and interconnect test requirements. It supports all the 800GE and 400GE PAM4 related Ethernet speeds, Layer 1 BERT PRBSQ pattern generation, BER and Frame Loss Ratio (FLR) measurements, CMIS management, auto-negotiation and link training for all speeds, and all the required data center network protocol emulation and benchmark performance testing that is also required.

Solution: 800GE Interconnect Test System

The Interconnect and Network Performance Tester benchtop 800GE system brings the award-winning Layer 1 through Layer 3 data and control plane test capabilities of the AresONE 800GE-M rackmount test systems to the new, portable, benchtop chassis.

Keysight's latest innovation in 800GE test provides a highly desirable, industry-leading, benchtop chassis that features:

- Multiple user support with up to 4-users on a 4-port chassis. And 2-users on the 2-port chassis.
- The 800GE benchtop chassis operates at an audio level that is classified as office quiet operation, less than 60dBA audio noise. It can be added onto the instrument bench without disturbing the existing noise level in your lab.
- It has a small footprint, 17.0" (L) x 10.86" (W) x 8.06" (H), or 431.8 mm (L) x 275.7 mm (W) x 204.8 mm (H). And the unit can be used in a horizontal or vertical chassis orientation to maximize lab bench space.
- It is lightweight at 22 pounds (9.9kg) and portable with a built-in handle. The chassis intended to be placed in the lab where you desire.
- Low power consumption is important to reducing carbon footprint in the lab. The benchtop chassis operates at a maximum of 15 amperes using 100-127VAC, 50/60 Hz. Only a single 15 or 20 ampere power source is required.

- Support for up to 30 watts per port for high power consumption coherent optical transceivers. The benchtop solves an on-going concern about test system support for these types of optical transceivers.
- The benchtop has an Ethernet management port for connection to a laptop or into a management network.
- A wireless connection to the benchtop using a Wi-Fi USB plug is available.

There are two hardware chassis models to fit your budget and lab application requirements.

- Interconnect and Network Performance Tester, 2-port benchtop chassis with native OSFP800 front panel ports, L1-3 support (941-0093)
- Interconnect and Network Performance Tester, 4-port, benchtop system with native OSFP800 front panel ports, L1-3 support (941-0094)

Both chassis models enable testing of multiple Ethernet speeds in the same chassis with each OSFP800 port capable of the following speeds:

- Built-in PAM4 signaling speeds based on 106.25 Gb/s host electrical lanes: 1x800GE, 2x400GE, 4x200GE, and 8x100GE per port
- (Planned) Built-in PAM4 signaling speeds based on 53.125 Gb/s host electrical lanes: 1x400GE, 2x200GE, 4x100GE and 8x50GE per port

Unsurpassed Test Coverage in a Benchtop

Many benchtop solutions have a narrow focus in what they can test. This is satisfactory for some applications. Keysight's Interconnect and Network Performance Tester benchtop 800GE brings the most functionality covering Layer 1 through Layer 3 available. The Interconnect and Network Performance Tester covers from the Layer 1 BERT test, Layer 2/3 switch and router performance benchmark test, to the most sophisticated networking, multi-protocol emulation performance and scale test, all the way to the latest testing of AI, ML and HPC applications on a benchtop test system-more than any other benchtop system available.

Productivity and high asset usage improve the ROI

The Interconnect and Network Performance Tester is a multiport, multi-user solution that allows more test personnel to access and utilize the system to increase the total test case throughput. The benchtop line offers a 2-port chassis for up to two concurrent users. Or a 4-port solution for up to four concurrent users. A multiport, multi-user solution is more productive over the 1-port or 2-port per chassis solutions from other test vendors. The more, local or remote, users per chassis, the more tests can be run in parallel that increases test case throughput.

- Provides a fully featured benchtop solution for customers testing: Silicon Chip (ASIC), optical transceivers plus active and passive fiber and copper cables (AOCs, AECs, ACCs, and DACs).
- Hardware development teams, optics and cable R&D, QA, regression, interoperability, and pre-deployment test teams now have a quiet and portable platform to place the test system wherever it is needed.

- The IxExplorer application is included with the purchase of the chassis and provides support for layer 1 BERT, Layer 1.5 PCS and FEC, FLR testing, Layer 2 and Layer 3 data plane Ethernet traffic generation, reception, error injection, and analysis with extensive statistics and counts.
- Run the IxExplorer functional test GUI application on the benchtop itself, just connect a monitor, keyboard and a mouse. It is your choice to connect a laptop computer or to use a client computer on a management network to operate the chassis. You can do both, since there is a multi-user capability.
- (Planned) The 800GE benchtop supports the optional IxNetwork software application:
 - Wire-rate traffic generation with service modeling that builds realistic, dynamically controllable data-plane traffic.
 - Mid-range L2/3 networking protocol emulation to validate performance and scalability of L2/3 routing/switching and data center test cases by using Keysight's IxNetwork protocol emulation application.
 - Support for RFC benchmarking of networking devices and equipment by using industry-standard RFC benchmark tests at line-rate from 50GE to 800GE PAM4 Ethernet speeds
 - IxNetwork support for the Keysight AI Fabric Test Solution to validate data center fabrics to lower AI training completion, time, and cost; this features RoCEv2 and RDMA protocol support to:
 - Model the AI training workload running on the tester's target topology.
 - Generates traffic that results from collective communications emanating from simulated end points which includes emulating Queue-Pair (QP) connections and flows, generating congestion notifications, performing DCQCN-based dynamic rate control, and providing flexibility to test throughput, buffer management and ECMP hashing enabling engineers to optimize the fabric's performance under the stress of the target AI workload and resulting collective communication
 - IxNetwork offers the industry's best test solution for functional and performance testing by using comprehensive emulation for routing, switching, MPLS, IP multicast, broadband, authentication, Carrier Ethernet, and data center Ethernet protocols.
 - IxNetwork includes test automation tools based on TCL, Python, and the Rest/RestPy.
 - IxNetwork protocol bundles that provide easy ordering and bundled packages specifically designed for the benchtop chassis systems.

Highlights

- Lightweight, office quiet, portable, benchtop chassis for the instrument bench with 4-port and 2-port OSFP800 models.
- Layer 1 BERT to Layer 3 IP testing from 50GE to 800GE PAM4 with 106.25 Gb/s and 53Gb/s host electrical lane signaling in a single test system.
- Complete Layer 2 and Layer 3 RFC benchmark, network, and internetworking protocol emulation scale and performance testing with the IxNetwork software application with Rest API and RestPy test automation support.
- AI, ML, and HPC network infrastructure test with RoCEv2 over RDMA and the Keysight AI Fabric Test Solution application support.
- Improve your interoperability, link stability, and robustness testing with Keysight-developed intellectual property for the critical test elements of 800GE and 400GE: MAC, PCS, FEC symbol error correction distribution, FEC error injection and statistics, and PAM4 Rx Eye Histogram analysis.
- Support for up to 30 watts per port for high power consumption coherent optical transceivers.
- Compatible with Ethernet Technology Consortium 800 Gigabit Ethernet (GbE) v1.1 and IEEE 802.3df 2024 specifications.

Key features

- Line-rate 50GE to 800GE packet generation per OSFP800 front panel port, for analysis and capture of received traffic to detect and debug data transmission errors for multiple Ethernet speeds when using PAM4 signaling over 106.25 Gb/s, and 53.125Gb/s electrical lanes.
- Built-in multi-rate fan-out speeds per port with PAM4 signaling and RS-FEC (544,514) support:
 - 800GE PAM4 speeds: 1x800, 2x400, 4x200, 8x100GE (default, built-in speeds)
 - (Planned) 400GE PAM4 speeds: 1x400, 2x200, 4x100 and 8x50GE (default, built-in speeds)
 - RS-FEC-Int for 100GBASE-R1 per IEEE802.3 Clause 161 is also supported on PAM4 signaling
- Line-rate, at all speeds with per-port and per-flow statistics
- Keysight instrumentation, including floating timestamp, sequence number, flow identification, and data integrity (for the entire packet)
- High-latency measurement resolution at 0.625 ns at 800GE and at 400GE speeds
- FEC error injection and analysis for all 800GE PAM4 speeds. Planned (FEC error injection and analysis for all 400GE PAM4 speeds)
 - FEC symbol error injection and FEC symbol error density distribution analysis; comprehensive set of FEC corrected and uncorrected counts, rates, and statistics; BER per lane and per port, and pre-FEC BER, frame loss ratio (FLR) analysis is provided

- 800GE PAM4 speeds and (planned) for 400GE PAM4 speeds, PCS lanes Transmit, and receive measurement:
 - Per-lane controls and status, FEC and error monitoring, lane mapping and skew insertion; see details in Specification Table in this datasheet, as capabilities may vary per Ethernet speed
- Inject packet errors: CRCs, runts, giants, checksum errors, and out of sequence
- Up to 30 watts of power and cooling support for OSFP800 MSA compatible optical transceivers, coherent optics, active optical cables, and other interconnect media.
- Support for passive copper direct attached cables (DAC) up to 2.0 meters in length
- Auto-negotiation (AN) and Link Training (LT) support for passive copper direct attached cables (DAC):
 - Up to 2.0 meters in length for: 1x800GE, 2x400GE, 4x200GE and 8x100GE PAM4 speeds over 106.25 Gb/s electrical lanes per port
 - (Planned) Up to 3.0 meters in length for: 1x400GE, 2x200GE, 4x100GE and 8x50GE PAM4 speeds over 53.125Gb/s electrical lanes per port
- Support for active electrical cables (AEC) and linear amplified copper cables (ACC). Please consult the factory for support of specific cable lengths as it may vary between different manufacturers.
- Overall optical and copper interconnect media support with CMIS 5.0 and C-CMIS 1.0 support with IxExplorer GUI and Tcl automation support.
 - Support for Application Selection Code (AppSel) feature of CMIS with auto-detection and configuration support
- Digital Optical Monitoring (DOM) that automatically provides information from the interconnect device plugged into the test port, along with the device status, electrical power, temperatures, power class, laser power and various LOL and LOS threshold and alarm monitoring information. The DOM also provides feedback when alarms and thresholds are exceeded. This capability is provided with the IxExplorer application.
- +/- 105 ppm line frequency adjustment that can be adjusted per front panel port for 800GE PAM4 speed mode. See Layer 1 BERT for ppm adjustment per electrical lane.
- Layer 1 BERT support
 - 106Gb/s lane patterns: Layer 1 BERT capability with per-lane and per-port BER statistics, ability to send PRBSQ patterns PRBS-7Q, PRBS-9Q, PRBS-11Q, PRBS-13Q, PRBS-15Q, PRBS-20Q, PRBS-23Q, and PRBS-31Q. Additional test pattern controls, per lane clock ppm adjustment, and pattern detection are included.
 - (Planned) 53Gb/s lane patterns: Layer 1 BERT with PRBS-7Q, PRBS-9Q, PRBS-11Q, PRBS-13Q, PRBS-15Q, PRBS-20Q, PRBS-23Q, and PRBS-31Q pattern support. Additional test pattern controls, per lane clock ppm adjustment, and pattern detection are included.
 - +/- 105 ppm line frequency adjustment per electrical lane in BERT mode. Each electrical lane can be adjusted to a different ppm value on 106Gb/s and 53Gb/s electrical lanes.
 - The BERT capability is provided only with the IxExplorer application
- Advanced Rx Eye Histogram Analysis provides in-depth, user-selected, per-lane PAM4 signal shape analysis, symbol error rate (SER) statistics, comparison of signal quality between lanes and an array of vertical eye measurements on 106Gb/s and 53Gb/s electrical lanes.
- (Planned) IxNetwork Application support (optional software packages)
 - Support for RFC benchmarking of networking devices and equipment by using industry-standard RFC benchmark tests at line-rate from 50GE to 800GE PAM4 speeds

- Mid-range L2/3 networking protocol emulation to validate performance and scalability of L2/3 routing/switching and data center test cases by using Keysight's IxNetwork protocol emulation applications and protocol bundles
- IxNetwork protocol bundles provides easy ordering and packages specifically designed for the Interconnect and Network Performance Tester 800GE benchtop chassis
- IxNetwork support for the Keysight AI Fabric Test Solution to validate data center fabrics to lower AI training completion, time, and cost:
 - Features an option for RoCEv2 and RDMA protocol support over Ethernet
 - Ability to model the AI training workload running on the tester's target topology.
 - Will generate traffic that results from collective communications emanating from simulated end points which includes emulating Queue-Pair (QP) connections and flows, generating congestion notifications, performing DCQCN-based dynamic rate control, and providing flexibility to test throughput, buffer management and ECMP hashing enabling engineers to optimize the fabric's performance under the stress of the target AI workload and resulting collective communication
- Native IxOS and IxExplorer application support with related Tcl automation is included with the purchase of the chassis.

Specifications

Product description	Interconnect and Network Performance Tester 800GE OSFP800 2-port and 4-port chassis models
Part numbers	941-0093 2-port OSFP800 benchtop chassis, 941-0094 4-port OSFP800 benchtop chassis
Hardware fixed chassis system specifications	
Number of ports	2-port OSFP800 benchtop chassis 4-port OSFP800 benchtop chassis
Physical interfaces	Native OSFP800 physical front panel pluggable ports
Supported per port speeds	Default speeds included with the chassis: • 1x800GE, 2x400GE, 4x200GE, and 8x100GE per port, PAM4 over 106Gb/s electrical lanes • (Planned) 1x400GE, 2x200GE, 4x100GE, and 8x50GE, PAM4 over 53Gb/s electrical lanes Optical transceiver and fiber cable interconnect support for all speeds Active and passive copper cable interconnect support for all speeds
CPU and memory	Multicore processor with CPU memory per OSFP800 port per Ethernet speed • 1x800GE 12GB • 2x400GE 6GB • 4x200GE 3GB • 8x100GE 3GB
Number of users	• 2 users on the 2-port chassis • 4 users on the 4-port chassis
Interface protocols specifications for 800GE/106Gb/s electrical lane support	IEEE 802.3ck Physical Layer Specifications and Management Parameters for 100 Gb/s, 200 Gb/s, and 400 Gb/s Electrical Interfaces Based on 100 Gb/s Signaling IEEE 802.3df-2024 Standard for Ethernet Amendment 9: Media Access Control Parameters for 800 Gb/s and Physical Layers and Management Parameters for 400 Gb/s and 800 Gb/s Operation Ethernet Technology Consortium 800 Gigabit Ethernet (GbE) v1.1 specification
(Planned) Interface protocols specifications for 400GE and 100GE for 53Gb/s electrical lane support	IEEE 802.3bs 200GE and 400GE IEEE 802.3cd 50 Gb/s, 100 Gb/s, and 200 Gb/s Ethernet

Product description	Interconnect and Network Performance Tester 800GE OSFP800 2-port and 4-port chassis models
Layer 1 support 800GE PAM4 speeds for 106Gb/s electrical lanes	PAM4, 800/400/200/100GE speeds: • KP4 (RS-544, 514) Ethernet Forward Error Correction, IEEE 802.3 Clause 119: • FEC Correctable and uncorrectable statistics per-port • FEC symbol error injection for all speeds • FEC Codeword symbol error correction distribution statistics • Interleave FEC (RS-FEC-Int) for PAM4 100GE(ck) 100BASE-CR1 applications over 106Gb/s electrical lanes • Pre-FEC BER and Frame Lose Ratio (FLR) measurements • All speeds support AN and LT • PCS lanes Tx lane map and skew insertion • PCS Rx per lane and port statistics • Layer 1 BERT with PRBS-7Q, PRBS-9Q, PRBS-11Q, PRBS-13Q, PRBS-15Q, PRBS-23Q, PRBS-31Q and SSPRQ (Tx only) pattern generation support and Rx-side statistics and analysis. Additional test, pattern controls, per lane clock ppm adjustment and pattern detection are included. • Layer 1 BERT with error injection • BERT inferred FEC: The ability to run a BERT pattern and to predict the FEC symbol error performance • +/- 105 ppm line frequency adjustment per electrical lane in BERT mode. Each electrical lane can be adjusted to a different ppm value on 106Gb/s electrical lanes. • Rx Eye Histogram analysis
(Planned) Layer 1 support 400GE PAM4 speeds for 53Gb/s electrical lanes	PAM4, 400/200/100/50GE speeds: • KP4 (RS-544,514) Ethernet Forward Error Correction, Clause 119 • FEC Correctable and uncorrectable statistics per-port • FEC symbol error injection for all speeds • FEC Codeword symbol error correction distribution statistics • Pre-FEC BER and Frame Loss Ratio (FLR) measurements • All speeds support AN and LT • PCS lanes Tx lane map and skew insertion • PCS Rx per lane and port statistics • Layer 1 BERT with PRBS-7Q, PRBS-9Q, PRBS-11Q, PRBS-13Q, PRBS-15Q, PRBS-20Q, PRBS-23Q, and PRBS-31Q pattern support • Layer 1 BERT with error injection • BERT inferred FEC: The ability to run a BERT pattern and to predict the FEC symbol error performance • +/- 105 ppm line frequency adjustment per electrical lane in BERT mode. Each electrical lane can be adjusted to a different ppm value on 53Gb/s electrical lanes. • Rx Eye Histogram analysis
OSFP800 optical transceiver support	Support for OSFP800 specification compliant optical transceivers up to 30 watts of consumption* (Power Class 8 and higher) such as: 800ZR, 800GBASE-DR8, 800GBASE-2xFR4, 800GBASE-SR8, 400GBASE-DR4, 400G-ZR and 400ZR+ coherent optics plus many other MSA compliant optical transceivers, AECs, ACCs, and AOCs. Please consult the factory for additional transceiver support information from various manufacturers See Optical Transceivers under the Ordering Information section of this data sheet for purchasable optical transceivers for this product
OSFP800 Active Electrical Cable support	Active Electrical Cable (AEC) and Active Copper Cable (ACC) support; please consult the factory for specific support information
OSFP800, passive copper cable support	OSFP800 passive copper cable support for up to 2.0 meters in length OSFP800-to-QSFP800 conversion cable support for up to 2.0 meters in length Auto-negotiation and Link Training support for passive copper direct attached cables (DAC) for all supported Ethernet speeds per port Consult the factory for support of passive copper cable lengths that are longer than those stated above
Common Management Interface Specification (CMIS)	Support for the CMIS 4.0 and 5.0 specifications including read/write access to all CMIS pages and registers Support for C-CMIS 1.0 (Coherent CMIS) Support for Application Selection Code (AppSel) feature of CMIS with auto-detection and transceiver configuration support

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	CMIS will operate with optical and copper interconnect media to the extent they are supported by the interconnect manufacturer CMIS is exposed through the IxExplorer application and Tcl test automation support
Digital Optical Monitoring (DOM)	Automatically provides information from the interconnect device plugged into the test port, along with the device status, electrical power, temperatures, power class, laser power and various LOL and LOS threshold and alarm monitoring information. The DOM also provides feedback when alarms and thresholds are exceeded. This capability is provided with the IxExplorer and IxNetwork applications.
800ZR, 400G-ZR/ZR+ Coherent Optics Transceiver support	CMIS 5.0 and C-CMIS 1.0 (Coherent CMIS) provide Read/Write access to all management pages and Versatile Diagnostics Monitoring (VDM) registers via IxExplorer GUI and Tcl test automation programming interface Support for Application Selection Code (AppSel) feature of CMIS with auto-detection and configuration support For optical transceivers that consume more than 20 watts of power, regardless of the form factor and technology type of the optical transceiver, the Interconnect and Network Performance Tester 800GE chassis has been operated with optical transceivers that consume up to 30 watts of power consumption. High power consumption transceivers such as 400ZR and 400ZR+ coherent optical transceivers have been fully qualified by Keysight in the Interconnect and Network Performance Tester 800GE chassis. 800ZR coherent optics that typically consume between 22 And 31 watts of power have been successfully operated in the Interconnect and Network Performance Tester 800GE chassis subject to the full power limits of the host connector and these operational conditions: • The case temperature of the installed module is maintained at <= 70 degrees centigrade. • There are no alarms triggered on module itself. • There are no over-temperature alarms triggered on the chassis itself. The IxExplorer application supports the Digital Optical Monitoring (DOM) feature that automatically monitors and reports the module case temperature, temperature warning limits, and the maximum temperature threshold limits. It is highly recommended that the DOM feature be active to monitor the temperature behavior of installed high power consumption optical transceivers before conducting long duration tests.
Fixed chassis system dimensions	17.0" (L) x 10.86" (W) x 8.06" (H) 431.8 mm (L) x 275.7 mm (W) x 204.8 mm (H)
Fixed chassis system weights	Hardware only: 22.0 lbs. (10.0 kg) Estimated Shipping: 44 lbs. (20.0 kg) ¹ ¹ Approximate (includes power cords, sync cables, and packaging)
Fixed chassis system electrical power	100-127VAC, 10A, 50/60 Hz 200-240 VAC, 4.5A, 50/60Hz One power cord is supplied with the unit. It is selected per the target country where the chassis is to be installed. Requires (1) power source when running 100-120VAC, 10 Amps for the chassis power supply. Requires (1) power source when running 200-240 VAC, 4.5 Amps for the chassis power supply. For 200-240 VAC power cords, order part number 942-0110 from the Ordering Section of this datasheet. The kit is provided at no charge with the purchase of the 2-port or the 4-port benchtop chassis when 200-240 VAC is required.
Temperature (ambient air)	Operating: 41°F to 104°F (5 °C to 40°C) Storage: -4°F to 122°F (-20 °C to 50°C)
Humidity (ambient air)	Operating: 5 % to 85 % RH, non-condensing Storage: 5 % to 85 % RH, non-condensing
Safety	IEC 62368-1 EN IEC 62368-1+A11 UL 62368-1 / CSA C22.2 No. 62368-1
Emissions and immunity	FCC Part 15B, Class A ICES-003(A)/NMB-003(A) EN 55032 Class A, EN 55035, EN 61000-3-2, EN 61000-3-3 AS/NZS CISPR 32, Class A KS C 9832 Class A, KS C 9835, KS C 9610-3-2, KS C 9610-3-3 VCCI – CISPR 32, Class A

Product description		Interconnect and Network Performance Tester 800GE OSFP800 2-port and 4-port chassis models
Regulatory approvals		UL (USA, Canada) CE (Europe) UKCA (United Kingdom) RCM (Australia) KCC (Korea) VCCI (Japan)
Environmental		RoHS Directive 2011/65/EU, Directive (EU) 2015/863 WEEE Directive 2012/19/EU China RoHS
Chassis synchronization extensibility		
Maximum number of chassis in single test topology		The Metronome Timing System (942-0090) is used for synchronizing a total of eight or more chassis at one time.
Transmit feature specifications		
Transmit engine		Wire-speed packet generation with timestamps, sequence numbers, data integrity, and packet group signatures
Max. streams per port and 800GE PAM4 speeds		1x800GE: 64 (per FPP) 2x400GE: 64 (per fan-out) 4x200GE: 64 (per fan-out) 8x100GE: 32 (per fan-out)
(Planned) Max. streams per port and 400GE PAM4 speeds		1x400GE: 256 (per FPP) 2x200GE: 256 (per fan-out) 4x100GE: 128 (per fan-out) 8x50GE: 64 (per fan-out)
Stream controls		Rate and frame size change on the fly Advanced stream scheduler Sequential stream scheduler
Minimum frame size		800GE, 400GE, 200GE and 100GE PAM4 speeds: 64 bytes at full line rate 61 bytes at less than full line rate (approximately 90% utilization) (Planned) 400GE, 200GE, 100GE and 50GE PAM4 speeds: 64 bytes at full line rate 60 bytes at less than full line rate
Maximum frame size for 800GE PAM4 speeds		16,000 bytes
(Planned) Maximum frame size for 400GE PAM4 speeds		16,000 bytes
Maximum frame size in data center Ethernet		9,216 bytes for all speeds
Priority flow control for 800GE PAM4 speeds (Planned) for 400GE PAM4 speeds		8 line-rate-capable queues, each supporting up to 9216-byte frame lengths
Frame length controls		Fixed, increment by user-defined step, weighted pairs (up to 16K in all speeds), uniform, repeatable random, IMIX, and Quad Gaussian
User-Defined Fields (UDF)		Fixed, increment or decrement by user-defined step, sequence, value list, and random configurations; up to 8, 2x16 bit-wide UDFs are available.
Value lists (max.) per port for 800GE PAM4 speeds		1x800GE: 64K / port /UDF 2x400GE: 64K / port /UDF 4x200GE: 32K /port /UDF 8x100GE: 64K / 4-ports /UDF
(Planned) Value lists (max.) per port for 400GE PAM4 speeds		1x400GE: 64K /port /UDF 2x200GE: 32K /port /UDF 4x100GE: 64K /4 ports /UDF 8x50GE: 32K /4 ports /UDF

Product description	Interconnect and Network Performance Tester 800GE OSFP800 2-port and 4-port chassis models
Sequence (max.) for 800GE PAM4 speeds	1x800GE: 32K / port /UDF 2x400GE: 32K /port /UDF 4x200GE: 32K /port /UDF 8x100GE: 8K / 4-ports /UDF
(Planned) Sequence (max.) for 400GE PAM4 speeds	1x400GE: 32K / port /UDF 2x200GE: 32K / port /UDF 4x100GE: 8K / port /UDF 8x50GE: 4K / port /UDF
Error generation (FEC and standard Keysight L2/3 Ethernet in 800GE PAM4 mode only)	- FEC symbol error-injection allows the user to inject FEC symbol errors using various weighted methods to achieve specific bit error rates (BER) - Generate good CRC or force bad CRC, undersize and oversize standard Ethernet frame lengths, and bad checksum
(Planned) Error generation (FEC and standard Keysight L2/3 Ethernet in 400GE PAM4 mode only)	- FEC symbol error-injection allows the user to inject FEC symbol errors using various weighted methods to achieve specific bit error rates (BER) - Generate good CRC or force bad CRC, undersize and oversize standard Ethernet frame lengths, and bad checksum
Physical coding sublayer for 800GE PAM4 speeds (Planned) 400GE PAM4 Ethernet speeds	PCS Transmit lane marker re-mapping PCS lane skew insertion
Hardware checksum generation	Checksum generation for IPv4, IP over IP, ICMP/GRE/TCP/UDP, L2TP, GTP, and multilayer checksum; support for protocol verification for control plane traffic
Link fault signaling for all speeds	- Reports, no fault, remote fault, and local fault port statistics - Generate local and remote faults with controls for the number of faults and order of faults - Option to have the transmit port ignore link faults from a remote link partner and send traffic anyway
Latency measurement resolution for 800GE PAM4 speeds (Planned) 400GE PAM4 Ethernet speeds	800GE and 400GE: 0.625 ns 200GE: 1.25 ns 100GE and 50GE: 2.5 ns
Intrinsic latency compensation	Removes inherent latency error from the port electronics for all speeds
Transmit line clock adjustment	- Ability to adjust the parts-per-million (ppm) line frequency: +/- 105 ppm on all the ports of the fixed chassis system for all speeds - Ability to adjust the clock ppm over a range of +/- 105 ppm in the BERT mode on a per lane basis
Transmit/receive loopback	- Internal loopback - Line loopback
Receive feature specifications	
Receive engine	Wire-speed packet filtering, capturing, real-time latency, and inter-arrival time for each packet group, with data integrity, and sequence checking capability
Trackable receive flows per port without Sequence checking and with Tx/Rx synch for 800GE PAM4 Ethernet speeds	800GE, 400GE, 200GE: 32K full statistics 100GE: 4K full statistics and 32K with minimum statistics
Trackable receive flows per port with and without Sequence checking and no Tx/RX synch for 800GE PAM4 Ethernet speeds	800GE, 400GE, 200GE: 32K full statistics 100GE: 8K full statistics and 32K with minimum statistics
(Planned) Trackable receive flows per port with and without Sequence Checking with Tx/Rx Synch for 400GE PAM4 Ethernet speeds	400GE and 200GE: 32K full statistics 100GE: 4K full statistics and 32K with minimum statistics
(Planned) Trackable receive flows per port with and without Sequence Checking and no Tx/RX Synch for 400GE PAM4 Ethernet speeds	400GE and 200GE: 32K full statistics 100GE: 4K full statistics and 32K with minimum statistics
Minimum frame size for all speeds	60 Bytes at full line rate (requires the IxExplorer application) 56 Bytes at less than line rate Bytes (requires the IxExplorer application)
Filters (user-defined statistics, UDS)	2 SA/DA pattern matchers, 2x16-byte user-definable patterns. 6 UDS counters are available with offsets for start of frame

Product description	Interconnect and Network Performance Tester 800GE OSFP800 2-port and 4-port chassis models
Hardware capture buffer	1 MB available per front panel OSFP800 port and for the fan-out modes on that port
Standard statistics and rates	Link state, line speed, frames sent, valid frames received, bytes sent/received, fragments, undersize, oversize, CRC errors, 6 user-defined stats, capture trigger (UDS 3), capture filter (UDS 4), data integrity frames, data integrity errors, sequence checking frames, sequence checking errors, ARP, and PING requests and replies
FEC statistics for 800GE PAM4 Ethernet speeds (Planned) for 400GE PAM4 Ethernet speeds	800GE PAM4 speeds: FEC port statistics: Total Bit Errors, Max Symbol Errors, Corrected Codewords, Total Codewords, Uncorrectable Codewords, Frame Loss Ratio, Pre-FEC Bit Error Rate, and Codeword error distribution analysis. FEC per lane Rx statistics: FEC Symbol Error Count, Corrected Bits Count, Symbol Error Rate, Corrected Bit Rate
Latency / jitter measurements	Cut-through, store and forward, forwarding delay, latency/jitter, MEF jitter, and inter-arrival time
Receive-side PCS lanes port statistics counters for all speeds	PCS: Sync Errors, Illegal Codes, Remote Faults, Local Faults, Illegal Ordered Set, Illegal Idle, and Illegal SOF
PCS receive-side statistics and indicators for 800GE PAM4 Ethernet speeds (Planned) 400GE PAM4 Ethernet speeds	Per-lane PCS receive capabilities include: Receive — per-lane PCS receive statistics, Physical Lane assignments, Lane Marker Lock, Lane Market Map, Relative Lane Skew, Lane Marker Error Count Receive — per-lane FEC receive statistics; FEC Symbol Error Count, FEC Corrected Bits Count, FEC Symbol Error Rate, FEC Corrected Bit Rate
Advanced Rx Eye Histogram Analysis	Advanced Rx Eye Histogram Analysis provides in-depth, user-selected, per lane PAM4 signal shape analysis, SER statistics, comparison of signal quality between lanes and an array of eye measurements.

Application Support

Interconnect and Network Performance Tester 800GE benchtop chassis models

IxExplorer: Layer 1-3 wire-speed traffic generation, capture, and analysis with Layer 1 BERT, Forward Error Correction analysis and error injection with statistics, PCS Lanes Tx/Rx with statistics and reporting capability. IxTcl API for custom user script development for Layer 1–3 testing using the IxExplorer features

(Planned) IxNetwork: Wire-rate traffic generation with service modeling that builds realistic, dynamically controllable data-plane traffic. IxNetwork offers the industry's best test solution for functional and performance testing by using comprehensive emulation for routing, switching, MPLS, IP multicast, broadband, authentication, Carrier Ethernet, and data center Ethernet protocols. Included with IxNetwork are test automation tools based on TCL, Python, and the Rest/RestPy.

Ordering Information

Part number	Description
Interconnect and Network Performance Tester 2-port hardware chassis and 4-port hardware chassis	
941-0093	Interconnect and Network Performance Tester, 2-port benchtop chassis with native OSFP800 front panel ports, L1-3 support, Includes all 1x800GE, 2x400GE, 4x200GE, and 8x100GE Ethernet speeds (941-0093).
941-0094	Interconnect and Network Performance Tester, 4-port benchtop chassis with native OSFP800 front panel ports, L1-3 support, Includes all 1x800GE, 2x400GE, 4x200GE, and 8x100GE Ethernet speeds (941-0094).
930-3300	RoCEv2 Lossless Ethernet Enablement for Interconnect and Network Performance Tester (930-3300); Perpetual node-locked license; Enable RoCEv2 capability for INPT-800-2P-OSFP-BT 2-port benchtop with OSFP800 ports (941-0093), INPT-800-4P-OSFP-BT 4-port benchtop with OSFP800 ports (941-0094), and INPT-1600-2P-BT 2-port benchtop chassis with OSFP1600 ports (941-0095), and INPT-1600-2P-RM 2-port half-rack chassis with OSFP1600 ports (941-0096); One option is required for each fixed chassis system

Part number	Description
OSFP800 800GE optical transceivers	
OSFP800-DR8-XCVR	Keysight, OSFP800-DR8-XCVR, 800GBASE-DR8, Single Mode Fiber, 500-meter reach with FEC, 1310nm center wavelength, 100G Lambda, optical transceiver (948-0071). CMIS 4.0 compliant. Compatible with Ixia cables: OSFP800-DR8-CBL MPO16 APC-APC, SMF, 3-meter and OSFP800-DR8-FO-CBL, fan-out, MPO16, APC-UPC, SMF, MPO16-to-8x100GE LC, 3-meter. This transceiver is compatible with all AresONE 800GE OSFP800-C and OSFP800-M fixed chassis models, and with the G800GE-02 800GE OSFP800 and OSFP800-COAX chassis models.
OSFP800-2XFR4-XCVR	Keysight, OSFP800-2XFR4-XCVR 2x400GE pluggable optical transceiver, SMF (single mode) 4 lambdas per port, Dual duplex LC connector, 2km reach (948-0091). This optical transceiver is compatible with AresONE 800GE-M OSFP800 and AresONE 800GE Dual Interface Model-M fixed chassis models. It supports 2x400GE PAM4 signaling output.
OSFP800 800GE fiber point-to-point cable	
OSFP800-DR8-CBL	Keysight, OSFP800-DR8-CBL, point-to-point, MPO16, APC-APC, Single Mode Fiber (SMF) cable, 2-meter length (942-0146) for OSFP-DR8 800GE optical transceiver, part number OSFP800-DR8-XCVR.
OSFP800 Optical transceiver fan-out cable	
OSFP800-DR8-FO-CBL	Keysight, OSFP800-DR8-FO-CBL, fan-out, MPO16, APC-UPC, Single Mode Fiber (SMF) cable, MPO16-to-8x100GE LC, 2-meter length (942-0147) for OSFP-DR8 800GE optical transceiver, part number OSFP800-DR8-XCVR.
OSFP800 Passive copper Direct Attached Cable (DAC)	
OSFP800-1M-CBL	Keysight, OSFP800 800GE 800GBASE-R passive copper, Direct Attach Cable, 28 AWG, 1-meter length (942-0158). This passive copper conversion DAC is a single point-to-point cable and is compatible with all AresONE 800GE OSFP800-C and OSFP800-M, fixed chassis models.
OSFP800-1.5M-CBL	Keysight, OSFP800 800GE 800GBASE-R passive copper, Direct Attach Cable, 28 AWG, 1.5-meter length (942-0159). This passive copper conversion DAC is a single point-to-point cable and is compatible with all AresONE 800GE OSFP800-C and OSFP800-M, fixed chassis models.
OSFP800-2M-CBL	Keysight, OSFP800-2M-CBL 800GE 800GBASE-R passive copper, Direct Attach Cable (DAC), 25 AWG, 2-meter length (942-0164). This passive copper conversion DAC is a single point-to-point cable and is compatible with all AresONE 800GE OSFP800-M, fixed chassis models.
Passive copper conversion Direct Attached Cables (DAC) – OSFP800-to-QSFP-DD800	
Q800G-O800G-1M-CBL	Keysight, QSPDD800-to-OSFP800-CBL 800GE 800GBASE-R passive copper, conversion Direct Attach Cable (DAC), 26 AWG, 1-meter length (942-0155). This copper conversion DAC is a single point-to-point cable and is compatible with all AresONE 800GE QSFP-DD800-C, AresONE 800GE QSFP-DD800-M, AresONE 800GE OSFP800-C, AresONE 800GE OSFP800-M fixed chassis models.
Q800G-O800G-1.5M-CBL	Keysight, QSPDD800-to-OSFP800-CBL 800GE 800GBASE-R passive copper, conversion Direct Attach Cable (DAC), 26 AWG, 1.5-meter length (942-0156). This copper conversion DAC is a single point-to-point cable and is compatible with all AresONE 800GE QSFP-DD800-C, AresONE 800GE QSFP-DD800-M, AresONE 800GE OSFP800-C, AresONE 800GE OSFP800-M fixed chassis models.
Q800G-O800G-2M-CBL	Keysight, QSPDD800-to-OSFP800-CBL 800GE 800GBASE-R passive copper, conversion Direct Attach Cable (DAC), 26 AWG, 2-meter length (942-0162). This copper conversion DAC is a single point-to-point cable and is compatible with all AresONE 800GE QSFP-DD800-M, and AresONE 800GE OSFP800-M fixed chassis models.
Part number	Description
Multiple Chassis synchronization	
942-0090	Metronome Timing System and Metronome Timing Software enabling advanced chassis timing. Includes Sync Cable 5m (942-0096). Compatible with the XGS-SD chassis, XGS-SDL chassis, XGS-HSL chassis, AresONE fixed chassis, Novus ONE PLUS fixed chassis and Interconnect and Network Performance Tester 800GE.

Part number	Description
IxNetwork Software options	
930-2250	IxNetwork Premium Package for Interconnect and Network Performance Tester; INCLUDES: IxNetwork Base, RFC2544/2889/3918 QuickTest, and Protocol emulation for Routing, Switching, MPLS/VPN, Carrier Ethernet and Timing, Data Center Ethernet, Broadband and Authentication, SDN, and 5G Transport
930-2251	IxNetwork Basic Package for Interconnect and Network Performance Tester; INCLUDES: IxNetwork Base, RFC2544/2889/3918 and ITU-T Y.1564 QuickTest, and IGMP/MLD emulation.
930-2252	IxNetwork Routing/Switching/MPLS/VPN Package for Interconnect and Network Performance Tester; INCLUDES: Protocol emulation for Routing, Switching, and MPLS/VPN; REQUIRES: 930-2251 Keysight IxNetwork Basic Package for Interconnect and Network Performance Tester.
930-2254	IxNetwork RoCEv2 Lossless Ethernet Package for Interconnect and Network Performance Tester (930-2254); Perpetual node-locked license; Enable RoCEv2 Lossless Ethernet validation with emulation of Queue Pairs, Congestion Notification and DCQCN; REQUIRES: 930-2251 IxNetwork Basic Package for for Interconnect and Network Performance Tester; and 930-3300 RoCEv2 Lossless Ethernet Enablement for Interconnect and Network Performance Tester
930-2255	IxNetwork Ultra Ethernet Transport Traffic Generation (930-2255); Perpetual node-locked license; Enable Ultra Ethernet Transport Compliant Traffic Generation; REQUIRES: IxNetwork Basic Package for Interconnect and Network Performance Tester (930-2251), OR IxNetwork Basic package for AresONE (930-2201)

More information

<https://www.keysight.com/us/en/products/network-test/network-test-hardware/interconnect-and-network-performance-tester-800ge.html>

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