

AresONE-400GE QSFP-DD High Density 8-Port Test System

Challenge: Capturing the Promises of Native 400GE Products

Using 100 Gigabit Ethernet (GE) technologies to get 400GE speeds is a costly and complex method to get higher bandwidth in the datacenter. The native 400GE hardware brings better economies of scale, higher bandwidth configurations, and more attractive price-per-port.

For large-scale data center networks, 400GE promises four times the bandwidth of 100GE in equivalent or less rack space. These critical factors save costs in operations. When it comes to testing new 400GE equipment, the same is true by using the Keysight AresOne-400GE test products.

Solution: Density with Performance — Not One or the Other

Keysight's AresONE-400GE product family is the most compact high-port-density 400GE test solution for accelerating performance and benchmark testing of your high density 25.6 Tbps networking devices. AresONE offers a factory and a field-upgrade that provides 2x200GE, 4x100GE, and 8x50GE speed test capabilities. This provides your development teams the speeds and test options they need to create the networking technologies of the future. AresONE fixed chassis are available in two models:

- Full-feature performance and scale
- Reduced-feature performance and scale

Both models enable full line-rate traffic generation functionality for transmit, receive, and capture. This facilitates RFC benchmark testing, stress testing, and hardware/ASIC bring-up in high-port-count test beds. It can be used for optics and cable qualification, interoperability, and functional test. Plus, with IxNetwork, Keysight offers the broadest and highest performance Layer 2/3 routing protocol emulation coverage and performance available in the industry.

AresONE, T400GD-8P-QDD and T400GD-4P-QDD: Full performance, 400GE 8-port and 4-port models in a 2RU fixed chassis system designed for high density full-scale and performance enterprise and data center switch and router testing.

AresONE, T400GDR-8P-QDD and T400GDR-4P-QDD: Reduced performance 400GE 8-port and 4-port models in a 2RU fixed chassis system designed for high-density hardware, ASIC, cable/optics qualification, RFC benchmark, and interoperability testing for high-port-count testing. The QSFP-DD-R400GE scales down the L2/3 feature set and L2/3 networking protocol scaling, without compromising routing protocol coverage, while increasing affordability.

Pay as you Grow — Full and Reduced, 4-Port and 8-Port Variants, All Field Upgradeable

The ability to upgrade AresONE fixed chassis to have AresONE grow with your needs is un-paralleled. Any AresONE 8-port or 4-port reduced model can be upgraded in the field to a full performance, higher-capacity, L2/3 feature set and L2/3 networking protocol scaling performance model. Any 4-port model can be upgraded to an 8-port model. Mix and match whatever upgrade or upgrades that you require. No longer are you stuck with a dedicated piece of hardware with no hope of extending its capabilities. Let AresONE assist you in the critical ROI analysis. AresONE upgrades extend the reuse of the fixed chassis system and improves your ROI. This is a unique capability that AresONE offers.

Highlights

- Save power, cooling, and rack space with Keysight's compact, 8-port 400GE QSFP-DD L1-3 test solution
- Validate high port count devices for performance, scalability, and interoperability with AresONE multi-speed 400, 200, 100, 50GE test capabilities and Keysight's IxNetwork Layer 2/3 test application
- Get faster test results because of Keysight-developed intellectual property for the critical test elements of 400GE: MAC, PCS, FEC symbol error distribution, FEC error injection and statistics, and PAM4 Rx Eye Histogram analysis
- Speed hardware development and interoperability testing with Layer 1 BERT, PCS, and FEC Tx/Rx test capability with IxSuiteStore
- Rely on a proven test solution for validating mission-critical network infrastructure—AresONE extends Keysight's proven K400 400GE QSFP-DD test solution



Figure 1. AresONE QSFP-DD-400GE, 8-port, fixed chassis system

Table of Contents

Key Features 4

IxSuiteStore—Fast and Efficient Standards-Based Test Methodology for 400GE PAM4 5

Specifications 6

Application Support 12

Ordering Information 13

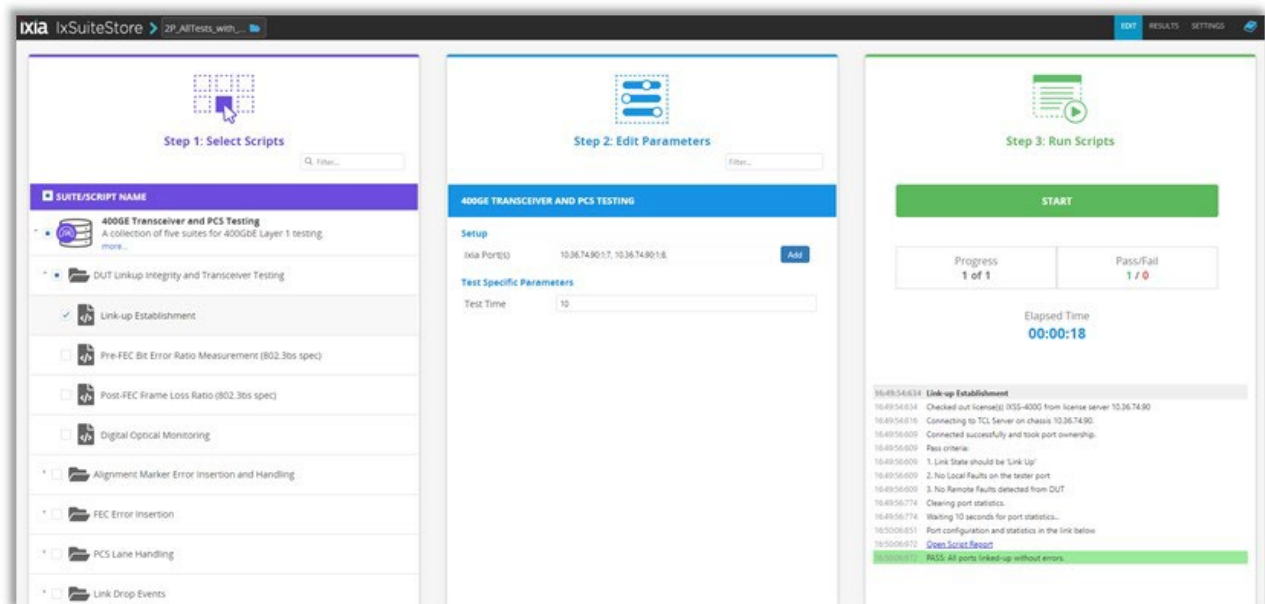
Key Features

- Line-rate 400 Gbps packet generation, capture, and analysis of received traffic to detect and debug data transmission errors for multiple speeds, including 2x200GE, 4x100GE and 8x50GE
- Multi-rate speed option that includes 2x200GE, 4x100GE, and 8x50GE speed modes and fan-out support; these speed modes are compliant with the IEEE 802.3cd specification
- New IxNetwork protocol bundles that provide easy and flexible pricing designed for fixed chassis systems
- IxSuiteStore, the industry's first fully automated IEEE 802.3bs-based test suite that enables automated validation of 400GE implementations, includes testing of physical coding sublayer (PCS) lanes, bit error rate (BER), KP4 FEC bit-error distribution with error insertion and link stability
- All reduced and 4-port models may be upgraded via one or more options to an 8-port full-performance mode
- Line-rate, at all speeds with per-port and per-flow statistics
- High-latency measurement resolution at 0.625 ns at the 400GE speed and 1.25 ns at 200GE
- RS-544 (KP4) Forward Error Correction (FEC) support for all speeds (400/200/100/50GE)
- An excellent test platform for full line-rate 400/200/100/50 Gb/s to evaluate 400GE ASIC designs, FPGAs, and hardware switch fabrics that use the new 8x56Gb/s electrical interface with PAM4 encoding that is IEEE 802.3bs and IEEE 802.3cd compliant
- 400GE and 2x200GE FEC symbol error injection and FEC symbol error density distribution; 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 to name a few
- Keysight instrumentation, including floating timestamp, sequence number, flow identification, and data integrity
- 400G PCS lanes Transmit, error injection testing and receive measurement:
 - Per-lane controls and status, FEC and error monitoring, error insertion, lane mapping and skew insertion; see details in Specification Table in this datasheet, as capabilities may vary per Ethernet speed
- Layer 1 BERT capability with per-lane and per-port BER statistics, ability to send PRBS patterns and inject bit errors per lane under user control
- Advanced Rx Eye Histogram Analysis Option that 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 eye measurements
- +/- 100 PPM line frequency adjustment
- Overall optical and copper QSFP-DD MSA compatible interconnect media support with CMIS 5.0 and C-CMIS 1.0 support with IxExplorer GUI and Tcl automation
- Auto-Negotiation (AN) and Link Training (LT) support for passive copper cables up to 3-meters in length. See the Specifications table for additional information.
- Coherent optical transceiver support, 400G-ZR with CMIS 5.0 and C-CMIS 1.0 management. 400G-ZR optics with up to 20 watts of power consumption are support in all ports of the AresONE-S QSFP-DD chassis front panel. See the Specifications table for additional information.
- 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

- Inject packet errors: CRCs, runts, giants, checksum errors, and out of sequence
- Mid-to-high-range L2/3 networking protocol emulation to validate performance and scalability of L2/3 routing/switching and data center test cases using Keysight's IxNetwork protocol emulation application
- Supports RFC benchmarking of networking devices and equipment using industry-standard RFC benchmark tests at line-rate 400/200/100/50GE speeds
- Supported with the Native IxOS software
- Application support: backwards compatible with existing chassis and software with IxExplorer and IxNetwork
- IxExplorer, IxNetwork, and related Tcl and automation APIs

IxSuiteStore — Fast and Efficient Standards-Based Test Methodology for 400GE PAM4

The automated 400GE Transceiver and PCS Testing suite enables developers of 400GE equipment to accelerate testing and gain significant time to market advantage. Quality assurance teams can benefit from front-loading testing, flagging implementation issues more quickly, and reducing manual test time. Consumers of 400GE equipment like data center and service provider equipment validation teams can use the test suite to automate 400GE equipment and optical transceiver and copper cable validation during initial stages of qualification, to ensure quality of upgrades and avoid future interoperability issues.



The 400GE test suite is available using Keysight's IxSuiteStore framework. The test suite validates key aspects of a 400GBASE-R PCS and supported physical media dependents (PMDs) per IEEE 802.3bs. Following are more details on this test suite:

- A set of Keysight-provided scripts exercising most of the Layer 1 test capabilities of Keysight AresONE hardware
- It is also compatible with Keysight's K400 QSFP-DD 400GE load modules
- Enables quick start testing with basic steps and progressively guides to more advanced cases
- Customers can configure these tests to support regression testbeds
- Currently 25 tests are available, covering key validations required in a 400GE implementation
- Requires IxOS version 9.00 or later

Specifications

Product Description	T400GD-8P-QDD T400GD-4P-QDD Full Feature 8-Port / 4-Port	T400GDR-8P-QDD T400GDR-4P-QDD Reduced Feature 8-Port / 4-Port
Part numbers	944-1170 / 944-1172	944-1171 / 944-1173
Hardware Fixed Chassis System Specifications		
RU / Number of ports	2 RU 8-port and 4-port fixed chassis systems	
Physical interfaces	Native QSFP-DD physical port	
Supported port speeds	400GE/port: 400GE-capable fiber and passive copper cable media 2x200, 4x100, 8x50GE, and 4x50GE per port with the purchase of a factory or a field upgrade speed option. See the Ordering Section of this datasheet.	
CPU and memory	Multicore processor with 2 GB of CPU memory per port	
IEEE interface protocols for 400GE	IEEE P802.3bs 200GE and 400GE, 400GBASE-R IEEE 802.3cd 50 Gb/s, 100 Gb/s, and 200 Gb/s Ethernet	
Layer 1 support	400GE native ports and 200/100/50GE speed option: • KP4 (RS-544) Ethernet Forward Error Correction, Clause 119 • Auto-negotiation and link training support ◦ All speeds support AN and LT for 1x400GE, 2x200GE, 4x100GE, and 4x50GE speed modes ◦ 8x50GE speed mode does not support AN and LT • Correctable and uncorrectable FEC statistics per-port • FEC symbol error injection (400GE and 200GE speeds only) • PCS lanes Tx and Rx test and statistics • Layer 1 classical BERT	
QSFP-DD optical transceiver support	Support for QSFP-DD MSA compliant optical transceivers up to Power Class 8 with up to 20 watts of power consumption such as: 400GBASE-DR4, 400GBASE-FR4, 400GBASE-LR4, 400GBASE-SR8 and 400G-ZR coherent optics along with other optical transceiver types (for example, QSFP56), AEC's and AOCs. Please consult the factory for specific transceiver support information. See Optical Transceivers under the Ordering Information section of this data sheet for the current offerings of optical transceivers for this product. Please download the 400GE Optics and Cables Guide from http://www.keysight.com under Products+Services, Network Test Hardware.	

Product Description	T400GD-8P-QDD T400GD-4P-QDD Full Feature 8-Port / 4-Port	T400GDR-8P-QDD T400GDR-4P-QDD Reduced Feature 8-Port / 4-Port
400G-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 - Coherent optics up to 20 watts of power consumption are supported on the manufacturers that have been qualified by Keysight. Please consult your Keysight Sales Representative for additional information.	
Passive copper cable media	400GBASE-CR8, passive, copper Direct Attached Cable (DAC) up to 3 meters in length. Please consult the factory for longer lengths and information on Active Electrical Cable information. See Cables and Transceivers under the Ordering Information section of this datasheet.	
Active Electrical Copper (AEC) cable media	This cable is designed for 400GE-to-4x100GE fan-out application. The 400GE AEC 3-meter cable breaks out one 400GE (8x50G-PAM4) QSFP-DD into four 100GE (4x25G-NRZ) QSFP28 ends with built-in gearbox feature. See Cables and Transceivers under the Ordering Information section of this datasheet.	
Common Management Interface Specification (CMIS) support	- CMIS 4.0 and 5.0 - C-CMIS 1.0 (Coherent CMIS) - Automatic version detection on the device in the port - Read/Write access to all management pages and registers via IxExplorer GUI and Tcl test automation programming interface - CMIS will operate with optical and copper interconnect media to the extent they are supported by the interconnect manufacturer	
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 GUI application.	
Fixed chassis system dimensions	30.3" (L) x 17.3" (W) x 3.46" (H) 770 mm (L) x 438.2 mm (W) x 88 mm (H)	
Fixed chassis system weights	- Hardware only: 74.6 lbs. (33.84 kg) - Shipping: 94.5 lbs. (42.86 kg)	
Fixed chassis system electrical power ²	- Operates on 100-240 VAC, 50/60 Hz 200-240 VAC is single phase - Requires (3) power sources when running 100-120VAC, 9 Amps for each power supply. AresONE fixed chassis is shipped with (3 each) 100-125 VAC power cords. - Requires (2) power sources when running 200-240 VAC, 7 Amps for each 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 an AresONE fixed chassis when 200-240 VAC is required.	
Temperature (ambient air)	- Operating: 41 °F to 95 °F (5 °C to 35 °C) - Storage: 41 °F to 122 °F (5 °C to 50 °C)	
Humidity (ambient air)	- Operating: 0 % to 85 %, non-condensing - Storage: 0 % to 85 %, non-condensing	

Product Description	T400GD-8P-QDD T400GD-4P-QDD Full Feature 8-Port / 4-Port	T400GDR-8P-QDD T400GDR-4P-QDD Reduced Feature 8-Port / 4-Port
Regulatory compliance specifications	IEC 60950-1, UL 60950-1, CSA C22.2 No.60950-1, CE (LVD, EMC, RoHS), EN/IEC 55032, EN/IEC 55024, CFR 47, FCC Part 15B, ICES-003, AS/NZ CISPR 32/24, KN32/35	
Chassis Capacity: Maximum Number of Chassis and Ports per Model		
T400GD-8P-QDD (944-1170) T400GDR-8P-QDD (944-1171)	8-port fixed chassis systems: 8-port, 2RU fixed chassis with built-in star topology synchronization ports to connect up to 5 additional fixed chassis systems - Total single synchronized system capacity is 48-ports of 400GE in a single configuration - Consult factory for port count requirements beyond 48-ports in a single configuration	
T400GD-4P-QDD (944-1172) T400GDR-4P-QDD (944-1173)	4-port fixed chassis systems: 4-port, 2RU fixed chassis with built-in star topology synchronization ports to connect up to 5 additional fixed chassis systems - Total single system capacity is 24-ports of 400GE in a single configuration - Consult factory for port count requirements beyond 48-ports in a single configuration	
Transmit Feature Specifications		
Transmit engine	Wire-speed packet generation with timestamps, sequence numbers, data integrity, and packet group signatures	
Max. Streams per port and speed (including in data center Ethernet)	400GE: 128 2x200GE: 128 4x100GE: 32 8x50GE: 16	400GE: 32 2x200GE: 32 4x100GE: 16 8x50GE: 8
Stream controls	- Rate and frame size change on the fly - Advanced stream scheduler support	
Minimum frame size	400GE and 200GE: 60 bytes at full line rate 56 bytes at less than full line rate 100GE and 50GE: 64 bytes at full line rate 56 bytes at less than full line rate	
Maximum frame size	16,000 bytes	
Maximum frame size in data center Ethernet	9,216 bytes	
Priority flow control	4 line-rate-capable queues, each supporting up to 9,216-byte frame lengths for 400G / 200G speed modes 4 line-rate-capable queues, each supporting up to 2,500-byte frame lengths for all other speeds	

Product Description	T400GD-8P-QDD T400GD-4P-QDD Full Feature 8-Port / 4-Port	T400GDR-8P-QDD T400GDR-4P-QDD Reduced Feature 8-Port / 4-Port
Frame length controls	Fixed, increment by user-defined step, weighted pairs (up to 14K in 400/200/100GE, uniform, repeatable random*, IMIX, and Quad Gaussian	
	*Note: The repeatable random frame length feature utilizes a PRBS31 bit pattern to fill the data payload section of the frame. The data payload content is made different for each frame via a random seed mechanism so that the payload content is different from frame to frame.	
User-Defined Fields (UDF)	Fixed, increment or decrement by user-defined step, sequence, value list, and random configurations; up to 10, 32-bit-wide UDFs are available	
Value lists (max.) per port	• 400GE: 1M / UDF • 2x200GE: 1M / UDF • 4x100GE: 1M / UDF • 8x50GE: 512K / UDF	
Sequence (max.)	• 400GE: 32K / UDF • 2x200GE: 16K / UDF • 4x100GE: 8K / UDF • 8x50GE: 4K / UDF	
Error generation (FEC and standard Keysight L2/3 Ethernet)	400GE and 2x200GE FEC • FEC symbol error-injection allows the user to inject FEC symbol errors using various weighted methods to achieve specific bit error rates (BER) for 400/200GE No FEC error insertion and related statistics for 4x100GE, 8x50GE, 4x50GE	
	400GE, 2x200GE, 4x100GE, 8x50GE, and 4x50GE L2/3 Ethernet: • Generate good CRC or force bad CRC, undersize and oversize standard Ethernet frame lengths, and bad checksum	
Physical coding sublayer	• PCS lane marker error injection • PCS lane re-mapping • PCS lane marker error injection PCS bit error generation	
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	• 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	• 400GE: 0.625 ns • 2x200GE: 1.25 ns • 4x100GE: 2.5 ns • 8x50GE: 2.5 ns	

Product Description	T400GD-8P-QDD T400GD-4P-QDD Full Feature 8-Port / 4-Port	T400GDR-8P-QDD T400GDR-4P-QDD Reduced Feature 8-Port / 4-Port
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 over a range of +/- 100 ppm on all the ports of a 400GE fixed chassis system	

Product Description	T400GD-8P-QDD T400GD-4P-QDD Full Feature 8-Port / 4-Port	T400GDR-8P-QDD T400GDR-4P-QDD Reduced Feature 8-Port / 4-Port
Transmit/receive Loopback	Internal loopback support	
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	• 400GE: 32K full statistics • 2x200GE: 32K full statistics • 4x100GE: 4K full statistics and 32K with minimum statistics • 8x50GE: 4K full statistics and 16K with minimum statistics • 4x50GE: 4K full statistics and 16K with minimum statistics	
Trackable receive flows per port with and without sequence checking and no Tx/RX synch	• 400GE: 32K full statistics • 2x200GE: 32K full statistics • 4x100GE: 8K full statistics and 32K with minimum statistics • 8x50GE: 8K full statistics and 16K with minimum statistics • 4x50GE: 8K full statistics and 16K with minimum statistics	
Minimum frame size	• 400GE and 2x200GE: 60 bytes • 4x100GE, 8x50GE, 4x50GE: 64 bytes	
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	
Hardware capture buffer	• 400GE: 1 MB • 2x200GE, 4x100GE, 8x50GE, and 4x50GE: 1 MBⁱ	
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	400GE and 2x200GE: • 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	

Product Description	T400GD-8P-QDD T400GD-4P-QDD Full Feature 8-Port / 4-Port	T400GDR-8P-QDD T400GDR-4P-QDD Reduced Feature 8-Port / 4-Port
	4x100GE, 8x50GE, and 4x50GE: ⁱⁱ Corrected and uncorrectable codewords	
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	PCS: Sync Errors, Illegal Codes, Remote Faults, Local Faults, Illegal Ordered Set, Illegal Idle, and Illegal SOF	
400GE PCS receive-side statistics and indicators	Per-lane PCS receive capabilities include the following: - 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	
Basic Rx Eye Histogram Analysis	Basic Rx Eye Histogram Analysis is provided for basic PAM4 signal quality analysis per lane that includes SER statistics	
Advanced Rx Eye Histogram Analysis	Advanced Rx Eye Histogram Analysis option 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	
Layer 2-3 Protocol Support		
Layer 2-3 protocol support	IxNetwork Base, RFC2544/2889/3918 QuickTest	
Routing, switching, and carrier Ethernet	BGP4/BGP4+, OSPFv2/v3, ISISv4/v6, RIP/RIPng, EIGRP, BFD, Seamless BFD, IGMP/MLD, PIM-SM/SSM, STP/RSTP/MSTP/PVST, LACP/Protocol over LACP, GRE and Protocol over GRE, LISP, CFM/Y.1731, Link-OAM, PBB-TE, ELMI, 1588v2/SyncE ESMC, Y.1564QT, TWAMP, NTP; REQUIRES: 930-2201 IxNetwork Basic package for AresONE	Complete protocol coverage as shown on the left side of this row only with reduced session scale: 100 routing and switching sessions 2,000 host/access sessions
Software defined network	BGP4/BGP4+, OSPFv2/v3, ISISv4/v6, RIP/RIPng, BFD; EVPN, VXLAN, GENEVE, Segment Routing (MPLS and IPv6), BGP-LS, PCEP, BGP SR-TE Policy, BGP FlowSpec, OVSDb, Netconf, BIER, OpenFlow; GRE and Protocol over GRE, LACP/Protocol over LACP, eCPRI; REQUIRES: 930-2201 IxNetwork Basic package for AresONE	Complete protocol coverage as shown on the left side of this row only with reduced session scale: 100 routing and switching sessions 2,000 host/access sessions
MPLS and VPN	BGP4/BGP4+, OSPFv2/v3, ISISv4/v6, RIP/RIPng, EIGRP, BFD, RSVP-TE P2P/P2MP, LDP/LDPv6/mLDP, LDP L2VPN (PWE/VPLS), BGP VPLS/VPWS, L3VPN/6VPE, BGP RFC3107, PIM-SM/SSM, Multicast VPN, MPLS-TP, MPLS OAM, EVPN/PBB-EVPN; REQUIRES: 930-2201 IxNetwork Basic package for AresONE	Complete protocol coverage as shown on the left side of this row only with reduced session scale: 100 routing and switching sessions 2,000 host/access sessions
Broadband access and authentication	PPPoX/L2TPv2, DHCPv4/DHCPv6, ANCP, IGMP/MLD, IPv6 Autoconfiguration (SLAAC), 802.1x, Bonded GRE HG, GRE/Protocol over	Complete protocol coverage as shown on the left side of this row only with reduced session scale:

Product Description	T400GD-8P-QDD T400GD-4P-QDD Full Feature 8-Port / 4-Port	T400GDR-8P-QDD T400GDR-4P-QDD Reduced Feature 8-Port / 4-Port
	GRE, LACP/Protocol over LACP, Session Aware Traffic, Service over MPLS, Broadband Control Plane QT, Asymmetric Data Performance QT; REQUIRES: 930-2201 IxNetwork Basic package for AresONE	• 100 routing and switching sessions • 2,000 host/access sessions
Data center Ethernet	BGP4/BGP4+, OSPFv2/v3, ISISv4/v6, RIP/RIPng, BFD; EVPN, VXLAN, GENEVE, OVSDb, DCBX, FCoE, Fabric Path, SPBM, VEPA, TRILL, FCoE QT, IxCloudPerf QT, RFC7747 BGP Convergence QT, LACP/Protocol over LACP; REQUIRES: 930-2201 IxNetwork Basic package for AresONE	Complete protocol coverage as shown on the left side of this row only with reduced session scale: • 100 routing and switching sessions • 2,000 host/access sessions

Application Support

QSFP-DD-400GE / QSFP-DD-R400GE

IxExplorer: Layer 1-3 wire-speed traffic generation, capture, and analysis with Forward Error Correction and error injection with statistics, PCS Lanes Tx/Rx with statistics, and reporting capability.

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.

IxSuiteStore: Test suite for functional validation of PCS lanes BER, KP4 FEC bit-error distribution with error insertion and link stability based on IEEE 802.3bs specification (at 400GE speed only)

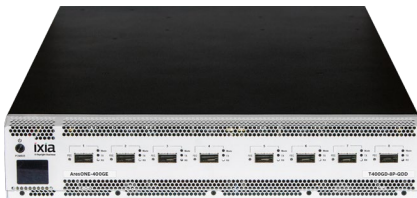
IxExplorer Tcl API: Custom user script development for Layer 1-3 testing

Ordering Information

Fixed Chassis Systems

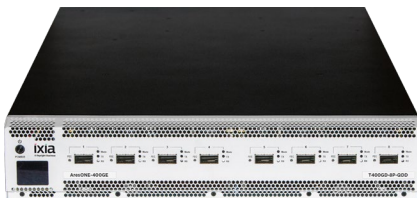
944-1170

Ixia, AresONE T400GD-8P-QDD, High Density, 8-port, full performance fixed chassis model with native QSFP-DD 400GE physical interfaces and L1-3 support (944-1170). Includes installation of the latest production released version of the IxOS software. Includes 3 each 100-125 VAC power cords for North American operation. NOTE: For 200-240 VAC operation, please order, at no charge, the AresONE 200-240 VAC Power Cord Option Kit for AresONE QSFP-DD fixed chassis models (942-0110).



944-1171

Ixia, AresONE T400GDR-8P-QDD, High Density, 8-port, reduced performance fixed chassis model with native QSFP-DD 400GE physical interfaces and L1-3 support (944-1171). Includes installation of the latest production released version of the IxOS software. Includes 3 each 100-125 VAC power cords for North American operation. NOTE: For 200-240 VAC operation, please order, at no charge, the AresONE 200-240 VAC Power Cord Option Kit for AresONE QSFP-DD fixed chassis models (942-0110).



944-1172

Ixia, AresONE T400GD-4P-QDD, High Density, 4-port, full performance fixed chassis model with native QSFP-DD 400GE physical interfaces and L1-3 support (944-1172). Includes installation of the latest production released version of the IxOS software. Includes 3 each 100-125VAC power cords for North American operation. NOTE: For 200-240 VAC operation, please order, at no charge, the AresONE 200-240 VAC Power Cord Option Kit for AresONE QSFP-DD fixed chassis models (942-0110).

944-1173

Ixia, AresONE T400GDR-4P-QDD, High Density, 4-port, reduced performance fixed chassis model with native QSFP-DD 400GE physical interfaces and L1-3 support (944-1173). Includes installation of the latest production released version of the IxOS software. Includes 3 each 100-125VAC power cords for North American operation. NOTE: For 200-240 VAC operation, please order, at no charge, the AresONE 200-240 VAC Power Cord Option Kit for AresONE QSFP-DD fixed chassis models (942-0110).

200-240 VAC Power Cord Option

942-0110

Ixia, AresONE 200-240VAC Power Cord Option Kit includes 2 each C13 to 6-20P, 8 feet in length, and 2 each C13 to L6-20P, 10 feet in length. Two cord types are provided that accommodate the most common 200-240VAC power receptacle types. Two of either cord types are required to power the AresONE fixed chassis. These power cords are compatible with all AresONE fixed chassis systems. The kit is optional and is sold at no charge. It is REQUIRED only when a AresONE fixed chassis must be connected to 200-240VAC single phase power sources. Note: Requires (2) power sources when running single phase 200-240VAC drawing 7 Amps for each power supply.

Fan-Out Options

905-1044

Ixia, AresONE T400GD/T400GDR Fan-out option: 2x200GE, 4x100GE, 8x50GE FAN-OUT FACTORY INSTALLED option for the QSFP-DD T400GD/T400GDR 8-port and 4-port, full and reduced, fixed chassis systems. One option is required for each fixed chassis system for all 8x400GE physical ports. Note: This option is REQUIRED ON NEW PURCHASES to enable the 2x200GE, 4x100GE, 8x50GE fan-out speeds per port.

905-1045

Ixia, AresONE T400GD/T400GDR Fan-out option: 2x200GE, 4x100GE, 8x50GE FAN-OUT FIELD UPGRADE Option for the QSFP-DD T400GD/T400GDR 8-port and 4-port, full and reduced, fixed chassis systems. One option is required for each fixed chassis system for all 8x400GE physical ports. Note1: This option is REQUIRED ON FIELD UPGRADE PURCHASES to enable the 2x200GE, 4x100GE, 8x50GE fan-out speeds. Note2: For the 2x200GE, 4x100GE, 8x50GE fan-out speed option upgrade purchase, please provide the serial number of the desired fixed chassis to install the option on at the time of order placement.

Sequential Scheduler Option

905-1047

Sequential Traffic Scheduler option, FACTORY INSTALLED ONLY. For all AresONE 400GE, AresONE-S 400GE and AresONE 800GE fixed chassis models. The minimum software for this support on AresONE 400GE chassis is IxOS 8.52 EA. This option applies to all ports on the fixed chassis. In the event this option is required to be added to an existing unit in the field, the unit must be returned to the factory to be installed.

905-1069

Sequential Traffic Scheduler option, FIELD UPGRADE. For all AresONE 400GE, AresONE-S 400GE and AresONE 800GE fixed chassis models. The minimum software for this support on AresONE 400GE chassis is IxOS 9.39 EA. This option applies to all ports on the fixed chassis.

Advanced Histogram Analysis Option

905-1067

Advanced Rx Eye Histogram Analysis Option, FACTORY installed for AresONE QSFP-DD and OSFP models. This option is supported on these AresONE fixed chassis: AresONE QSFP-DD models; T400GD-8P-QDD (944-1170), T400GDR-8P-QDD (944-1171), T400GD-4P-QDD (944-1172), T400GDR-4P-QDD (944-1173) and T400GP-4P-QDD (944-1178).

905-1068

Advanced Rx Eye Histogram Analysis Option, FIELD UPGRADE for AresONE QSFP-DD and OSFP models. This option is supported on these AresONE fixed chassis: AresONE QSFP-DD models; T400GD-8P-QDD (944-1170), T400GDR-8P-QDD (944-1171), T400GD-4P-QDD (944-1172), T400GDR-4P-QDD (944-1173) and T400GP-4P-QDD (944-1178).

IxNetwork AresONE Only — Software Bundle Options

930-2200

IxNetwork, All Inclusive package for AresONE. Supports all IxNetwork software features with exclusion; Excludes: 930-3461 IxNetwork AppLibrary Slot Bundle, Layer 4-7 Performance Test Application; 930-2207 IxNetwork Encryption test package for AresONE. Any optional script package or IxSuiteStore optional test suite is not considered as part of IxNetwork software features.

Note: AresONE does not support traditional IxNetwork a la carte license, bundle license and tier licenses.

930-2201

IxNetwork Basic package for AresONE; INCLUDES: IxNetwork Base, RFC2544/2889 QuickTest.

930-2202

IxNetwork Routing, Switching and Carrier Ethernet package for AresONE; Includes BGP4/BGP4+, OSPFv2/v3, ISISv4/v6, RIP/RIPng, EIGRP, BFD, IGMP/MLD/PIM-SM/SSM, LACP/Protocol over LACP, STP/RSTP/MSTP/PVST, GRE and Protocol over GRE, CFM/Y.1731, Link-OAM, PBB-TE, ELMI, 1588v2/SyncE ESMC, Y.1564QT, TWAMP, NTP, LISP; REQUIRES: 930-2201 IxNetwork Basic package for AresONE.

930-2203

IxNetwork MPLS and VPN package for AresONE; INCLUDES: BGP4/BGP4+, OSPFv2/v3, ISISv4/v6, RIP/RIPng, BFD, RSVP-TE/P2MP, LDP/mLDP/LDPv6, L3VPN/6VPE, NGmVPN, PIM-SM/SSM/mVPN, MPLS-TP, MPLS OAM, GRE and Protocol over GRE, LACP/Protocol over LACP; REQUIRES: 930-2201 IxNetwork Basic package for AresONE.

930-2204

IxNetwork SDN package for AresONE; INCLUDES: BGP4/BGP4+, OSPFv2/v3, ISISv4/v6, RIP/RIPng, BFD; EVPN, VXLAN, GENEVE, Segment Routing, BGP-LS, PCEP, BGP SR-TE Policy, BGP FlowSpec, OVSDb, Netconf, BIER, OpenFlow; GRE and Protocol over GRE, LACP/Protocol over LACP; REQUIRES: 930-2201 IxNetwork Basic package for AresONE.

930-2205

IxNetwork Data Center package for AresONE; INCLUDES: BGP4/BGP4+, OSPFv2/v3, ISISv4/v6, RIP/RIPng, BFD; EVPN, VXLAN, GENEVE, OVSDb, DCBX, FCoE, Fabric Path, SPBM, VEPA, TRILL, FCoE QT, IxCloudPerf QT, RFC7747 BGP Convergence QT, LACP/Protocol over LACP; REQUIRES: 930-2201 IxNetwork Basic package for AresONE.

930-2206

IxNetwork Broadband Access and Authentication package for AresONE; INCLUDES: PPPoX/L2TP, DHCPv4/v6, ANCP, IGMP/MLD/IPTV, 802.1x, GRE/Protocol over GRE, LACP/Protocol over LACP, Session Aware Traffic, Service over MPLS, Broadband Control Plane QT, Asymmetric Data Performance QT; REQUIRES: 930-2201 IxNetwork Basic package for AresONE.

930-2207

IxNetwork, Encryption Test package for AresONE (930-2207); INCLUDES: MACsec Emulation; REQUIRES: 930-2201 IxNetwork Basic package for AresONE; Recommend with: 930-3461 IxNetwork AppLibrary Slot Bundle, Optional Software, Layer 4-7 Performance Test Application for additional encryption/decryption capability in Static MACsec emulation.

Fixed Chassis System Upgrade Options

905-1031

Ixia, AresONE UPG-T400GDR-to-T400GD is a FIELD UPGRADE that upgrades the reduced performance T400GDR-8P-QDD model (944-1171) fixed chassis to the higher L23 IxNetwork protocol emulation of the T400GD-8P-QDD full performance model (944-1170) fixed chassis. Note: At the time of order placement of the purchase of the upgrade, please provide the serial number of the desired T400GDR-8P-QDD reduced model to install the upgrade.

905-1035

Ixia, AresONE UPG-T400GD-4P-to-T400GD-8P FIELD UPGRADE for the 4-port full performance T400GD-4P-QDD (944-1172) fixed chassis to the full performance 8-port T400GD-8P-QDD (944-1170), (905-1035) fixed chassis. Note: At the time of order placement of the purchase of the upgrade, please provide the serial number of the desired T400GD-4P-QDD full performance model to install the upgrade.

905-1036

Ixia, AresONE UPG-T400GDR-4P-to-T400GDR-8P FIELD UPGRADE for the 4-port reduced performance T400GDR-4P-QDD (944-1173) fixed chassis to the reduced performance 8-port T400GD-8P-QDD (944-1171) fixed chassis. Note: At the time of order placement of the purchase of the upgrade, please provide the serial number of the desired T400GDR-4P-QDD reduced model to install the upgrade.

905-1039

Ixia, AresONE UPG-T400GDR-to-T400GD is a FIELD UPGRADE that upgrades the reduced performance T400GDR-4P-QDD model (944-1173) fixed chassis to the higher L23 IxNetwork protocol emulation of the T400GD-4P-QDD full performance model (944-1172) fixed chassis. Note: At the time of order placement of the purchase of the upgrade, please provide the serial number of the desired T400GDR-4P-QDD reduced model to install the upgrade.

IxSuiteStore Software Option

930-6001

IXIA IxSuiteStore optional test suite for functional validation of PCS lanes BER, KP4 FEC Bit-error distribution with error insertion and Link stability based on IEEE 802.3bs specification (at 400GE speed only). This software is compatible with the following hardware platforms with the native QSFP-DD 400GE interfaces: K400 QSFP-DD-400GE (944-1152), K400 QSFP-DD-R400GE (944-1153); and all AresONE QSFP-DD and OSFP models: T400GD-8P-QDD (944-1170), T400GDR-8P-QDD (944-1171), T400GD-4P-QDD (944-1172), T400GDR-4P-QDD (944-1173), T400GD-8P-OSFP (944-1174), T400GDR-8P-OSFP (944-1175), T400GD-4P-OSFP (944-1176), T400GDR-4P-OSFP (944-1177).

Passive Copper Point-to-Point Cables

QSFP-DD-1M-CBL

Ixia, QSFP-DD-1M-CBL 400GE 400GBASE-R passive copper, Direct Attach Cable (DAC), point-to-point cable, 1-meter length (942-0106). This copper DAC is compatible with all K400 QSFP-DD load modules, AresONE QSFP-DD, and AresONE High Performance QSFP-DD, and all AresONE-S QSFP-QDD fixed chassis models. Note: This fanout cable supports PAM4 and NRZ signaling. Consult the 400GE Optics and Cables Guide for the specific Ethernet speed support with the PAM4 or NRZ signaling.

QSFP-DD-2M-CBL

Ixia, QSFP-DD-2M-CBL 400GE 400GBASE-R passive copper, Direct Attach Cable (DAC), point-to-point cable, 2-meter length (942-0109). This copper DAC is compatible with all AresONE QSFP-DD fixed chassis models. This fanout cable supports PAM4 and NRZ signaling. Consult the 400GE Optics and Cables Guide for the specific Ethernet speed support with the PAM4 or NRZ signaling.

QSFP-DD-2-5M-CBL

Ixia, QSFP-DD-2-5M-CBL 400GE 400GBASE-R passive copper, Direct Attach Cable (DAC), point-to-point cable, 2.5-meter length (942-0108). This copper DAC is compatible with all AresONE QSFP-DD fixed chassis models. This fanout cable supports PAM4 and NRZ signaling. Consult the 400GE Optics and Cables Guide for the specific Ethernet speed support with the PAM4 or NRZ signaling.

Passive Copper Fan-Out Cables

QSFPDD4XQ56-1-5M-CBL

Ixia, QSFPDD4XQ56-1-5M-CBL QSFP-DD-to-4xQSFP56 400GBASE-R Direct Attached Copper cable (DAC) fan-out cable, 1.5-meter length (942-0140). This copper, fan-out DAC is compatible with all AresONE QSFP-DD fixed chassis models. This fanout cable supports PAM4 and NRZ signaling. Consult the 400GE Optics and Cables Guide for the specific Ethernet speed support with the PAM4 or NRZ signaling.

QSFPDD2XQ56-2-5M-CBL

Ixia, QSFPDD2XQ56-2-5M-CBL QSFP-DD-to-2xQSFP-DD 400GBASE-R Direct Attached Copper (DAC) fan-out cable, 2.5-meter length (942-0141). This copper, fan-out DAC is compatible with all AresONE QSFP-DD fixed chassis models. This fanout cable supports PAM4 and NRZ signaling. Consult the 400GE Optics and Cables Guide for the specific Ethernet speed support with the PAM4 or NRZ signaling.

QSFPDD8XQ56-1-5M-CBL

Ixia, QSFPDD8XQ56-1-5M-CBL QSFP-DD-to-8xSFP56 400GBASE-R Direct Attached Cable (DAC) fan-out cable, 1.5-meter length (942-0142). This copper, fan-out DAC is compatible with all AresONE QSFP-DD fixed chassis models. This fanout cable supports PAM4 and NRZ signaling. Consult the 400GE Optics and Cables Guide for the specific Ethernet speed support with the PAM4 or NRZ signaling.

Active Electrical Fan-Out Cable

QSFPDD-4XQ28-AEC-CBL

Ixia, QSFP-DD-to-4xQSFP28 400GBASE-R Active Electrical Fan-out Cable (AEC), for 400GE to 4x100GE fan-out, 3-meter length (942-0139). This Active Electrical Copper (AEC) cable is compatible with all AresONE QSFP-DD models. This cable converts 400GE PAM4 signaling to 100GE NRZ signaling.

Optical Transceivers

QSFP-DD-DR4-XCVR

Ixia, QSFP-DD-DR4-XCVR QSFP-DD 400GE 400GBASE-DR4 pluggable optical transceiver, SMF (singlemode), 1310 nm, 500-meter reach (948-0050). This optical transceiver is compatible with all AresONE QSFP-DD fixed chassis models. This optical transceiver supports PAM4 signaling output.

QSFP28-DR1-XCVR

Ixia, QSFP28-DR1-XCVR QSFP28 100GE 100GBASE-DR1 pluggable optical transceiver, SMF (singlemode), 1310 nm, 500-meter reach (948-0055). This optical transceiver is compatible with all. This QSFP28 transceiver converts PAM4 optical signaling to NRZ electrical signaling. It is used with the QSFP-DD-DR4-XCVR optical transceiver (948-0050) and the QSFP-DD-DR4-CBL MT-to-4x100GE LC fan-out, fiber cable (942-0138) for 4x100GE fan-out applications for the AresONE QSFP-DD 400GE ports for Nx100GE connections to NRZ-based QSFP28 network devices.

QSFP-DD-FR4-XCVR

Ixia, QSFP-DD-FR4-XCVR QSFP-DD 400GE 400GBASE-FR4 pluggable optical transceiver, SMF (singlemode), 1310 nm, 2-kilometer reach (948-0052). This optical transceiver is compatible with all AresONE QSFP-DD fixed chassis models. This optical transceiver supports PAM4 signaling output.

QSFP-DD-LR4-XCVR

Ixia, QSFP-DD-LR4-XCVR QSFP-DD 400GE 400GBASE-LR4 pluggable optical transceiver, SMF (singlemode), 1310 nm, 10-kilometer reach (948-0054). This optical transceiver is compatible with all AresONE QSFP-DD fixed chassis models. This optical transceiver supports PAM4 signaling output.

QSFP-DD-SR8-XCVR

Ixia, QSFP-DD-SR8-XCVR 400GE 400GBASE-SR8 pluggable optical transceiver, MMF (multimode), 850 nm, 100-meter reach (948-0051). This optical transceiver is compatible with all AresONE QSFP-DD fixed chassis models. This optical transceiver supports PAM4 signaling output.

Optical Transceiver Point-to-Point Cables

QSFP-DD-MPO16-CBL

Ixia, QSFP-DD-MPO16-CBL MT-to-MT, MPO16, OM4, MMF, APC, 2-meter fiber point-to-point cable (942-0124) for the 400GE QSFP-DD-SR8-XCVR. REQUIRES QSFP-DD-SR8-XCVR pluggable optical transceiver, 850 nm, MMF (Multimode Fiber), 100-meter reach (948-0051). This cable supports 1x400GE, 2x200GE, 4x100GE and 8x50GE logical fan-out speed modes from a QSFP-DD physical port with the QSFP-DD-SR8-XCVR optical transceiver.

Optical Transceiver Fan-Out Cables

QSFP-DD-DR4-CBL

Ixia, QSFP-DD-DR4-CBL MT-to-4x100GE LC fan-out, SMF, 3-meter fiber cable for 4x100GE fan-out (942-0138). REQUIRES QSFP-DD-DR4-XCVR pluggable optical transceiver, 1310 nm, SMF (Single Mode Fiber), 500-meter reach (948-0050).

QSFP-DD-SR8-CBL

Ixia, QSFP-DD-SR8-CBL MT-to-8x50GE LC fan-out, OM4 MMF, MPO16, APC, 2-meter fan-out cable (942-0125) for 8x50GE fan-out speed mode. REQUIRES QSFP-DD-SR8-XCVR pluggable optical transceiver, 850 nm, MMF (Multimode Fiber), 100-meter reach (948-0051). This cable supports 8x50GE physical fan-out from a QSFP-DD physical port with the QSFP-DD-SR8-XCVR optical transceiver.

i There is a hardware capture buffer per a fan-out resource group that may be assigned to one port of the fanout resource group.

ii This is a minimum specification; consult factory for more information.

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