

Xcellon-Multis[®] QSFP28 Enhanced 100/50/25GbE Load Module



Introducing the Evolution of Xcellon HSE Testing

Evolve Your Higher Speed Ethernet Testing

Bandwidth requirements for enterprises, service providers, and global data centers are growing rapidly, out-pacing 10GbE and 40GbE technologies. Cloud service providers, carriers, and hyperscale data centers are looking at high-density 100GbE, 50GbE, and 25GbE networking infrastructure solutions to meet growing bandwidth demands. Equipment manufacturers are rapidly increasing 100GbE port densities and delivering multi-rate switch ports to remain competitive. With Ixia's support of native QSFP28 interface technology, equipment manufacturers can use Ixia's high-density 100/50/25GbE load module to assist the move to higher density 100GbE, with four 100GbE ports per blade and up to 16x25GbE speed links. For data centers, native QSFP28 100GbE, 50GbE, and 4x25GbE speed support provides a more efficient use of network bandwidth, and new multi-rate test requirements have emerged for testing 100GbE, 50GbE, and 25GbE on the same port.

Xcellon-Multis is Ixia's next-generation architecture and test solution that provides the world's first 100/50/25GbE multi-rate test system to satisfy equipment maker test needs ranging from basic interoperability and functional test, to high-port count performance tests. As organizations implement this same high-density networking and network computing equipment in their own networks, they need this same test solution to verify performance and functionality prior to deployment.

Key Benefits

- Do more with less: more ports, speeds, bandwidth, flexibility, capability, and horsepower in a single high density test load module
- Cost effective: Allows testing of 100GbE, 50GbE, and 25GbE on the same test load module
- Support for: 1x50GbE, 4x25GbE, and 2x25GbE speed capability per port over 100GbE passive, copper and fiber point-to-point and fan-out cable media
- Excellent test platform: for the new 100GBASE-SR4, 100GBASE-CR4, Auto-Negotiation, FEC, and Link Training interoperability, functional and performance testing
- Usability: a broad feature set common to the other Xcellon-Multis 100GbE products, such as CFP4 and CXP



The world's first multi-rate 100/50/25GbE test module: Xcellon-Multis native QSFP28 4x100GbE, 1-slot load module

Key Features

Xcellon-Multis QSFP28 XM100GE4QSFP28+ENH is an enhanced high-density, native QSFP28 4-port load module for 1x100GbE, 1x50GbE, 2x25GbE, and 4x25GbE per port operation, enabling testing of leading-edge data center switches that support 100GbE, 50GbE, and 25GbE. Key features include:

- Support for 1x50GbE speed per port (a total of 4 ports of 50GbE across a single load module) over 100GbE passive copper cable media up to 3 meters in length
- Support for 2x25GbE and 4x25GbE fan-out per port (total of 16x25GbE speed links per single load module) over 100GbE passive copper cable media and fiber fan-out cable media up to 3 meters in length
- Traffic and protocol scale and performance stress tests to ensure error-free network data transmission with long-term stability and high reliability
- 100Gb/s, 50Gb/s, and 4x25Gb/s line-rate packet capture and decode tools to detect and de-bug data transmission errors
- An excellent test platform for full line-rate 100Gb/s to evaluate the new 100GbE ASIC designs, FPGAs, and hardware switch fabrics that use the new 4x25Gb/s electrical interface
- Mid-range-to-high-scale protocol emulation performance and scale testing of ultra-high-density 100GbE, 50GbE, and 25GbE network equipment using industry-standard RFC benchmark tests in small and large test-beds
- A broad range of application support including: IxExplorer, IxNetwork, IxLoad, and related Tcl APIs
- The highest ROI of any single, high density test and measurement load module
 - 4-ports of 100GbE in a single slot with native QSFP28 physical interfaces
 - 4-ports of 50GbE in a single slot with native QSFP28 physical interfaces
 - 16-ports of 25GbE using 4x25GbE and 2x25GbE speed support over 100GbE passive copper and fiber point-to-point and fan-out cable media
 - A balanced feature-set for functional, performance, and scale testing
 - Greater test case coverage due to broad range of available L2/3 protocols
 - Enhanced hardware capability for using advanced features on 100GbE: Ethernet Forward Error Correction (Clause 91, RS-FEC), Auto-Negotiation, and Link Training

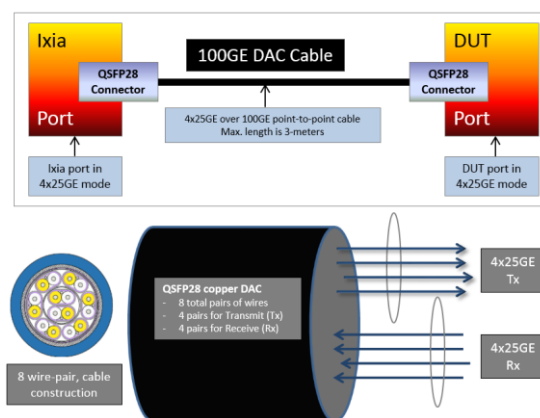


Figure 1 - Ixia 4x25GbE and 2x25GbE point-to-point cable implementation

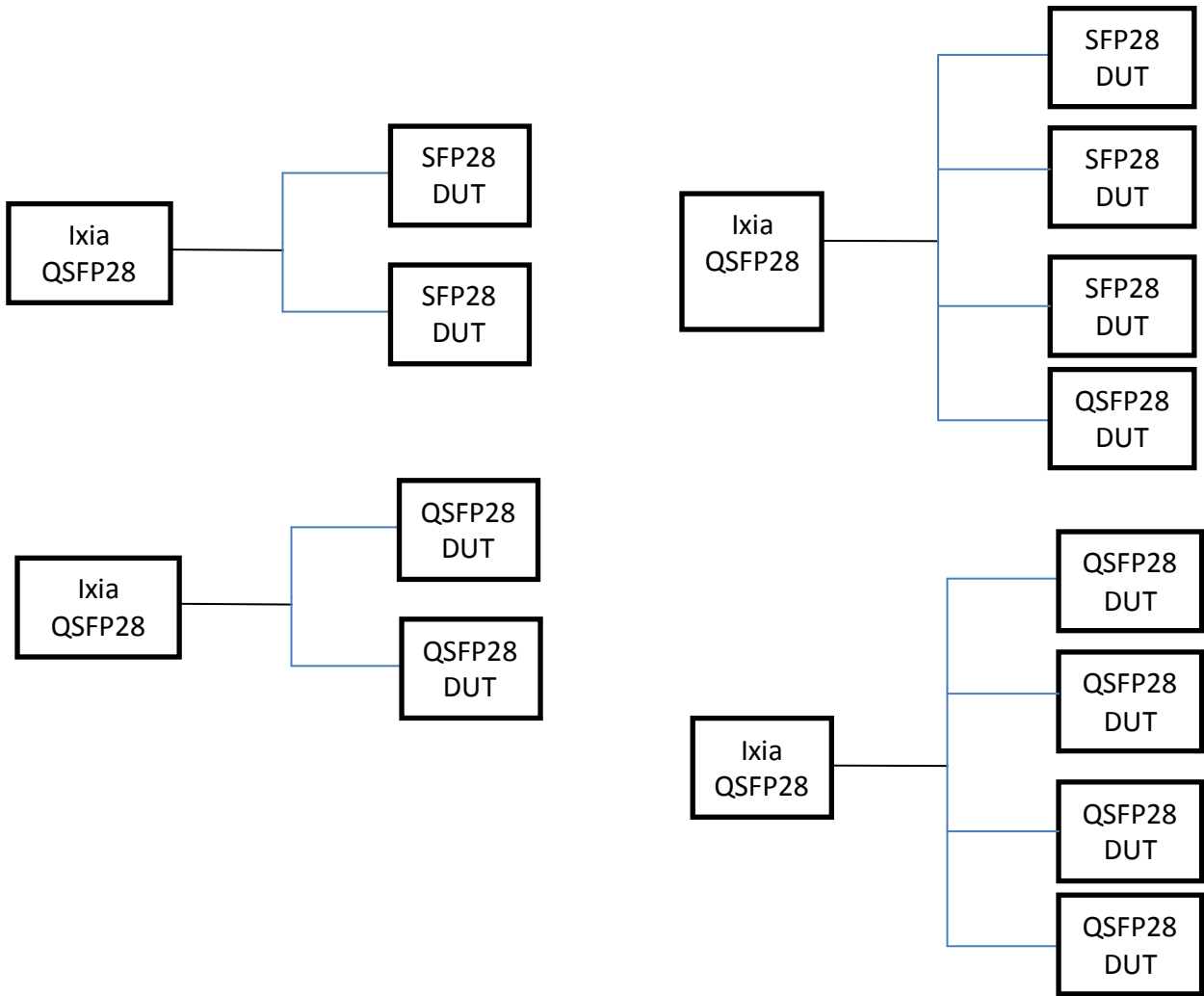


Figure 2 - Ixia 4x25GbE and 2x25GbE fan-out cable implementation

Xcellon-Multis QSFP28 Enhanced Load Module Specification Table

Model Name	XM100GE4QSFP28+ENH
Part Number	944-1117
Hardware Load Module Specifications	
Slot / Number of Ports	1-slot / 4x100GbE QSFP28 native ports, 4x50GbE ports, or 16x25GbE speed links
Physical Interfaces	Native QSFP28 (with 4x25Gb/s host electrical interface)
Supported port speeds:	<ul style="list-style-type: none"> • 100GbE/port • 50GbE/port • 4x25GbE/port over 100GbE point-to-point, passive, copper cable media • 2x25GbE/port over 100GbE point-to-point, passive, copper cable media • 4x25GbE/port fan-out links over passive copper and fiber fan-out cable media • 2x25GbE/port fan-out links over passive copper and fiber fan-out cable media
CPU and Memory	Multicore processors with 4GB of memory per processor
Interface Protocols ⁱ	<ul style="list-style-type: none"> • IEEE 802.3 100GBASE-R • 25G & 50G Consortium specification for 25 and 50GBASE-R • IEEE P802.3by 25GBASE-R • IEEE 802.3bj • IEEE P802.3bm
Advanced Layer 1 support	<ul style="list-style-type: none"> • 100GbE: <ul style="list-style-type: none"> ○ Auto-negotiation (AN, Clause 73 copper cable assembly) ○ Ethernet Forward Error Correction (FEC , Clause 91) ○ FEC statistics: RS-FEC Corrected and Uncorrected Codeword Counts ○ Link Training (for 100GbE copper cable media) ○ Ability to independently turn ON or OFF AN, FEC and Link Training, or to allow IEEE defaults to manage the interoperability
Transceiver Support	<ul style="list-style-type: none"> • 100GBASE-LR4 QSFP28 for single mode fiber <ul style="list-style-type: none"> ○ Pluggable transceiver • 100GBASE-SR4 QSFP28 for multimode fiber <ul style="list-style-type: none"> ○ Pluggable transceiver

Model Name	XM100GE4QSFP28+ENH
Cable Media	<ul style="list-style-type: none"> • 100GBASE-SR4 multimode fiber Active Optical Cable (AOC) for QSFP28 • 100GBASE-CR4, passive, copper Direct Attached Cable (DAC) up to 5 meters in length; note: requires RS-FEC to be enabled • 50GBASE-CR1, passive, copper Direct Attached Cable (DAC) up to 3 meters in length • 25GBASE-CR1, passive, copper Direct Attached Cable (DAC) up to 3 meters in length
Load Module Dimensions	<ul style="list-style-type: none"> • 16.1" (L) x 1.3" (W) x 12.0" (H) • 409mm (L) x 33mm (W) x 305mm (H)
Load Module Weights	<ul style="list-style-type: none"> • Module only: 13.15 lbs. (5.96 kg) • Shipping: 16.95 lbs. (7.69 kg)
Chassis Capacity: Maximum Number of Cards and Ports per Chassis Model	
XGS12-SD Chassis ⁱⁱ (940-0011)	10 cards: <ul style="list-style-type: none"> • 40-ports of 100GbE • 40-ports of 50GbE • 160-links of 25GbE (i.e. 4x100GbE ports with 4x25GbE per physical 100GbE port) • 80-links of 25GbE (i.e. 4x100GbE ports with 2x25GbE per physical 100GbE port)
XGS12-HS Chassis ⁱⁱ (940-0006)	10 cards: <ul style="list-style-type: none"> • 40-ports of 100GbE • 40-ports of 50GbE • 160-links of 25GbE (i.e. 4x100GbE ports with 4x25GbE per physical 100GbE port) • 80-links of 25GbE (i.e. 4x100GbE ports with 2x25GbE per physical 100GbE port)
XG12 Chassis ⁱⁱ (940-0005)	10 cards: <ul style="list-style-type: none"> • 40-ports of 100GbE • 40-ports of 50GbE • 160-links of 25GbE (i.e. 4x100GbE ports with 4x25GbE per physical 100GbE port) • 80-links of 25GbE (i.e. 4x100GbE ports with 2x25GbE per physical 100GbE port)

Model Name	XM100GE4QSFP28+ENH
XGS2-SD Chassis (940-0010)	2 cards: <ul style="list-style-type: none"> • 8-ports of 100GbE • 8-ports of 50GbE • 32-links of 25GbE (i.e. 4x100GbE ports with 4x25GbE fan-out per physical 100GbE port) • 16-links of 25GbE (i.e. 4x100GbE ports with 2x25GbE fan-out per physical 100GbE port)
XGS2-HS Chassis (940-0012)	2 cards: <ul style="list-style-type: none"> • 8-ports of 100GbE • 8-ports of 50GbE • 32-links of 25GbE (i.e. 4x100GbE ports with 4x25GbE fan-out per physical 100GbE port) • 16-links of 25GbE (i.e. 4x100GbE ports with 2x25GbE fan-out per physical 100GbE port)
XM2 Chassis ⁱⁱⁱ (941-0023)	1 card: <ul style="list-style-type: none"> • 4-ports of 100GbE • 4-ports of 50GbE • 16-links of 25GbE (i.e. 4x100GbE ports with 4x25GbE per physical 100GbE port) • 8-links of 25GbE (i.e. 4x100GbE ports with 2x25GbE fan-out per physical 100GbE port)
Transmit Feature Specifications	
Transmit Engine	Wire-speed packet generation with timestamps, sequence numbers, data integrity signature, and packet group signatures
Max. Streams per Port	100GbE and 50GbE: 128 25GbE: 16
Max. Streams per Port in Data Center Ethernet	100GbE and 50GbE: 128 25GbE: 16
Stream Controls	Rate and frame size change on the fly, sequential and advanced stream scheduler
Minimum Frame Size	100GbE, 50GbE, and 25GbE: <ul style="list-style-type: none"> • 60 bytes and greater at full line rate • 49 bytes at less than full line rate
Maximum Frame Size	14,000 bytes

Model Name	XM100GE4QSFP28+ENH
Maximum Frame Size in Data Center Ethernet	9,216 bytes
Priority Flow Control	<ul style="list-style-type: none"> 8 line-rate-capable queues with each supporting up to 2,500 byte frame lengths 1 queue supporting up to 9,216 byte frame lengths
Frame Length Controls	Fixed, increment by user-defined step, weighted pairs, 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 ten, 32-bit wide UDFs are available.
<ul style="list-style-type: none"> Value Lists (Max.) 	100GbE and 50GbE: 4 million / UDF 25GbE: 1 million / UDF
<ul style="list-style-type: none"> Sequence (Max.) 	100GbE and 50GbE: 256K / UDF 25GbE: 64K / UDF
Error Generation	Generate good CRC or force bad CRC, undersize and oversize standard Ethernet frame lengths, and bad checksum
Hardware Checksum Generation	Checksum generation and verification for IPv4, IP over IP, IGMP/GRE/TCP/UDP, L2TP, GTP
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, plus the ability to select the option to have the transmit port ignore link faults from a remote link partner.
Latency Measurement Resolution	100GbE, 50GbE, 2x25GbE, and 4x25GbE: 2.5 nanoseconds
Intrinsic Latency Compensation	Removes inherent latency error from the 100GbE port electronics
Transmit Line Clock Adjustment	Ability to adjust the parts per million line frequency over a range of -100 ppm to +100 ppm per port or resource group
Receive Feature Specifications	
Receive Engine	Wire-speed packet filtering, capturing, real-time latency and inter-arrival time for each packet group, with data integrity, sequence and advanced sequence checking capability
Trackable Receive Flows per Port	100GbE and 50GbE: 512K 25GbE: 128K

Model Name	XM100GE4QSFP28+ENH
Minimum Frame Size	100GbE, 50GbE, and 25GbE: <ul style="list-style-type: none"> • 60 bytes and greater at full line rate • 49 bytes at less than full line rate
Filters (User-Defined Statistics, UDS)	2 SA/DA pattern matchers, 2x16-byte user-definable patterns with offsets capability for start of: frame, IP, or protocol. Up to 6 UDS counters are available
Hardware Capture Buffer per Port or Resource Group	100GbE and 50GbE: 2GB 25GbE: 2GB per 1, user-selected link of the 4x25GbE resource group
Statistics and Rates	Link state, line speed, frames sent, valid frames received, bytes sent/received, fragments, undersize, oversize, CRC errors, VLAN tagged frames, 6 user-defined stats, capture trigger (UDS 3), capture filter (UDS 4), 8 QoS counters, data integrity frames, data integrity errors, sequence and advanced sequence checking frames, sequence checking errors, ARP, and PING requests and replies, FEC statistics: RS-FEC Corrected and Uncorrected Codeword Counts
PCS Lanes Port Statistics	PCS Sync Errors, Illegal Codes, Remote Faults, Local Faults, Illegal Ordered Set, Illegal Idle, Illegal SOF, Out Of Order SOF, Out Of Order EOF, Out Of Order Data, Out Of Order Ordered Set
Latency / Jitter Measurements	Cut-through, store & forward, forwarding delay, up to 16 time bins latency/jitter, MEF jitter, and inter-arrival time
Layer 2-7 Protocol Support	
IxNetwork: L2/3 Routing, Bridging, and Timing	<p>Routing / Switching: BGP4/BGP4+, OSPFv2/OSPFv3, ISISv4/v6, RIP/RIPng, EIGRP/EIGRPv6, PIM-SM/SSM, BFD, STP/RSTP/MSTP, PVST+/RPVST+, LACP, PoLACP, LISP</p> <p>MPLS: RSVP-TE/P2MP, LDP/MLDP, LDP6, L3 MPLS VPN/6VPE, LDP L2VPN (PWE/VPLS), BGP VPLS, Multicast VPN Rosen Draft, NG Multicast VPN, EVPN / PBB-EVPN, MPLS OAM, MPLS-TP</p> <p>Carrier Ethernet: Link OAM, CFM/Y.1731, PBB/PBB_TE, E-LMI, 1588v2 (PTP), ESMC, TWAMP</p>
IxNetwork: Data Center Ethernet / SDN	Priority Class-Based Flow Control (IEEE802.1Qbb), FCoE/FIP, LLDP/DCBX, VNTAG/VNIC, VEPA, FabricPath, TRILL, SPBM, OpenFlow, VXLAN, Segment Routing ISIS
IxNetwork: Broadband Access	<p>Broadband: DHCPv4/v6, PPPoX / L2TP, ANCP, IPv6 Autoconfiguration, DHCPv4/v6 over EoGRE, IGMP/MLD, IPTV One-time (IGMP / MLD Join / Leave latency), AMT</p> <p>Authentication: 802.1x, WebAuth, EAPoUDP, Cisco NAC</p>

Model Name	XM100GE4QSFP28+ENH
IxLoad: Layer 4-7 Application Traffic Testing Support	Data protocol support for: HTTP, SSL, FTP/TFTP, email (SMTP, POP3, IMAP), IPv4, IPv6, VLAN, ER The IxLoad application only supports the 100GE speed ^{iv}

Application Support

Xcellon-Multis QSFP28+ENH Load Modules

- **IxExplorer:** Layer 2-3 wire-speed traffic generation and analysis and Layer 1 BERT and IEEE 802.3ba HSE PCS Lanes testing.
- **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.
- **IxLoad:** A scalable solution for testing converged multiplay services, application delivery platforms, and security devices and systems. IxLoad emulates data, voice, and video subscribers and associated protocols to ensure quality of experience (QoE).^{iv}
- **Tcl API:** Custom user script development for layer 1-7 testing.

Ordering Information

Load module

944-1117

Xcellon-Multis XM100GE4QSFP28+ENH 100-Gigabit Ethernet, enhanced load module, 1-slot with 4-ports of the native QSFP28 physical interface with L2-7 support, and enhanced for support of Ethernet Forward Error Correction (RS-FEC). The load module is compatible with the XGS12-SD 12-slot, standard performance rack mount chassis bundle (940-0011), XGS12-HS 12-slot, high-speed performance rackmount chassis bundle (940-0006), XG12 12-slot, rackmount chassis (940-0005), XGS2-SD 2-slot, 3RU standard performance chassis bundle (940-0010), XGS2-HS 2-slot, 3RU high-speed performance chassis bundle (940-0012) and the XM2 desktop chassis (941-0003). Optional: QSFP28 passive, copper, Direct Attach Cable (DAC), 3-meter length (942-0088) and/or QSFP28 Active Optical Cable (AOC), multimode fiber, 850nm, 3-meter length (942-0092).



Speed Options

1x50GE load module speed options

905-1009

XM-1x50GE, this is the 1x50GE FACTORY INSTALLED option for the Xcellon-Multis QSFP28 XM100GE4QSFP28+ENH 100GE load module (944-1117). This enables 1x50GE capability on all four 100GE QSFP28 ports on the module. The 50GE capability is ONLY supported on the XM100GE4QSFP28+ENH load module (944-1117). Note1: This option is REQUIRED FOR NEW PURCHASES of the 1x50GE capability for the Xcellon-Multis XM100GE4QSFP28+ENH load module with native QSFP28 4x100GE physical interfaces. Note2: The 1x50GE capability is per 100GE physical port. It is supported over QSFP28 100GE point-to-point, passive copper and fiber cables where each channel of the cable is rated for 25Gb/s per channel operation.

905-1010

UPG-XM-1x50GE Option. This is the 1x50GE FIELD UPGRADE option for the Xcellon-Multis QSFP28 XM100GE4QSFP28+ENH 100GE load module (944-1117). This enables 1x50GE capability on all four 100GE QSFP28 ports on the module. The 50GE capability is ONLY supported on the XM100GE4QSFP28+ENH load module (944-1117). Note1: This option is REQUIRED FOR FIELD UPGRADE PURCHASES of the 1x50GE capability for the Xcellon-Multis XM100GE4QSFP28+ENH load module with native QSFP28 4x100GE physical interfaces. Note2: The 1x50GE capability is per 100GE physical port. It is supported over QSFP28 100GE point-to-point, passive copper and fiber cables where each channel of the cable is rated for 25Gb/s per channel operation. Note3: For the 50GE upgrade purchase please provide the serial number of the desired load module to install the option on at the time of order placement.

4x25GE load module speed options

905-1004

XM-4x25GE, this is the 4x25GE FACTORY INSTALLED option for the Xcellon-Multis QSFP28 XM100GE4QSFP28+ENH 100GE load module (944-1117). This enables 4x25GE and 2x25GE capability on all four 100GE QSFP28 ports on the module. The 25GE capability is ONLY supported on the XM100GE4QSFP28+ENH load module (944-1117). Note1: This option is REQUIRED FOR NEW PURCHASES of the 4x25GE and 2x25GE capability for the Xcellon-Multis XM100GE4QSFP28+ENH load module with native QSFP28 4x100GE physical interfaces. Note2: The 4x25GE and 2x25GE fan-out capabilities are per 100GE physical port. They are supported over QSFP28 100GE point-to-point and fan-out passive copper and fiber cables where each channel of the cable is rated for 25Gb/s per channel operation.

905-1005

UPG-XM-4x25GE, this is the 4x25GE FIELD UPGRADE option for the Xcellon-Multis QSFP28 XM100GE4QSFP28+ENH 100GE load module (944-1117). This enables 4x25GE and 2x25GE capability on all four 100GE QSFP28 ports on the module. The 25GE capability is ONLY supported on the XM100GE4QSFP28+ENH load module (944-1117). Note1: This option is REQUIRED FOR FIELD UPGRADE PURCHASES of the 4x25GE and 2x25GE capability for the Xcellon-Multis XM100GE4QSFP28+ENH load module with native QSFP28 4x100GE physical interfaces. Note2: The 4x25GE and 2x25GE fan-out capabilities are per 100GE physical port. They are supported over QSFP28 100GE point-to-point and fan-out passive copper and fiber cables where each channel of the cable is rated for 25Gb/s per channel operation. Note3: For the 25GE upgrade purchase please provide the serial number of the desired load module to install the option on at the time of order placement.

QSFP28 cable media options

942-0088

QSFP28 passive, copper, Direct Attach Cable (DAC), 3-meter length for Xcellon-Multis XM100GE4QSFP28, 100GE only speed load module (944-1116), and the XM100GE4QSFP28+ENH 100GE speed and 4x25GE speed option enhanced load module (944-1117).

942-0092

QSFP28 Active Optical Cable (AOC), multimode fiber, 850nm, 3-meter length. Compatible with the Xcellon-Lava CFP-to-QSFP28 interface adapter (948-0029), Xcellon-Multis XM100GE4QSFP28+ENH 100-Gigabit Ethernet, Enhanced load module (944-1117) and the NOVUS100GE8Q28+FAN, 8-port, QSFP28 100GE load module (944-1140).

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- ⁱ The 1x50GbE, 4x25GbE, and 2x25GbE speed options do not support Auto-Negotiation, Ethernet Forward Error Correction (Clause 91, RS-FEC), and Link Training. In the 50GbE and 25GbE speed modes, the maximum length of a passive, copper direct attached cable (DAC) supported is 3-meters for both point-to-point and fan-out cables as applicable.
 - ⁱⁱ The Xcellon-Multis load modules may not be placed into slots 1 and 12 of the XGS12-HS, XGS12-SD, and XG12 chassis. Please consult your factory sales representative for further information.
 - ⁱⁱⁱ Slot 1 (the lower slot) of the XM2 chassis provides optimal cooling for an Xcellon-Multis load module. Only one Xcellon-Multis load module may be installed in the XM2 chassis. No other load module may be installed while an Xcellon-Multis load module is installed.
 - ^{iv} The IxLoad application only supports the 100GbE speed on a per port basis. The application does not support the 50GbE nor the 25GbE speeds and their respective fan-out configurations. The application only supports the L4-7 protocols specifically listed in the Specification Table of this datasheet.