

NOVUS™ 10/1 3-SPEED ETHERNET LOAD MODULES

DATA SHEET

EVOLVE YOUR MULTI-RATE ETHERNET TESTING

HIGH-DENSITY 10G/1G/100M MULTI-RATE ETHERNET IN ONE LOAD MODULE!

Ixia's Novus 10/1 family of load modules offers complete Layer 2-7 (L2-7) network and application testing in a single system.

Support for Dual-PHY (SFP+ and 10GBase-T RJ45) allows for up to line-rate L2/3 traffic generation and analysis, high-performance routing/bridging protocol emulation, and true L4-7 application traffic generation and subscriber emulation all with one load module. With up to 16 Dual-PHY ports per module, you can create ultra-high-density test environments for 10GE/1GE/100M Ethernet over copper and fiber. Up to 192 10GE/1GE/100M Ethernet test ports are supported in a single 12-slot Ixia chassis.

Novus 10GE/1GE/100M load modules are available in three different models to match your requirements and budget:

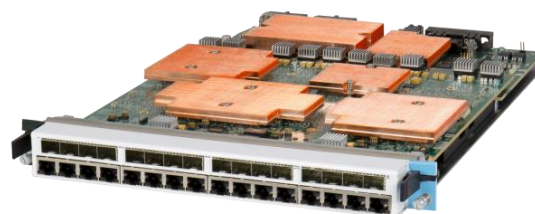
- **NOVUS10/1GE16DP:** A full-featured 16-port, Dual-PHY (RJ45 and SFP+) 10GE/1GE/100M load module designed for high-density requirements.
- **NOVUS10/1GE8DP:** A full-featured 8-port, Dual-PHY (RJ45 and SFP+) 10GE and 1GE load module designed for high-density switch testing. To support evolving test needs, users can perform a software field-upgrade to a full 16-port NOVUS10/1G16DP load module.
- **NOVUS1GE16DP:** A full-featured 16-port, Dual-PHY (RJ45 and SFP+) 1GE and 100M load module designed for high-density requirements.

KEY FEATURES

- Full line-rate traffic generation to evaluate ASIC designs, FPGAs, and hardware switch fabrics
- Ultra-high scale and performance for emulating L2/3 protocols to validate performance and scalability of L2/3 routing/switching and data center test cases using the Ixia's IxNetwork application

HIGHLIGHTS

- Industry's only and highest-density 10/1/100M Dual-PHY SFP+/10GBASE-T RJ45 solution
- 3-speed 10GE/1GE/100M ports provide low total cost of ownership and high ROI
- Feature, scale, and performance parity with existing Ixia 10GE and 1GE load modules
- Broader coverage of L4-7 protocols including video, voice, storage, and access
- Purpose built to test high-performance, low-latency devices



**NOVUS10/1GE16DP 16-port DUAL-PHY
tri-speed load module**

- Support for testing SFP+ and 10GBase-T RJ-45 copper ports at different speeds simultaneously on the same load module
- Perform industry-standard RFC benchmark tests and protocol emulation in large test bed with hundreds of 3-speed ports in a single test
- 10G, 1G, and 100M line-rate hardware packet capture and decode tools to detect and debug data transmission errors
- Application support for IxExplorer, IxNetwork, IxLoad, and the related Tcl and automation APIs
- Novus adds IxLoad L4-7 including voice, video, and access protocols
- Flexible 4:1 CPU and memory aggregation, for high-scale protocol emulation and performance
- Flexible custom packet generation
- Real-time latency with latency resolution of up to 2.5ns
- Extensive port and traffic flow statistics
- Advanced sequence checking with duplicate packet detection

Novus 3-speed brings new level of performance with broad range of coverage of all the most popular features of IxNetwork and IxLoad applications.

SPECIFICATIONS

PRODUCT DESCRIPTION	NOVUS10/1GE16DP 10G/1G/100M	NOVUS10/1GE8DP 10G/1G/100M ⁱ	NOVUS1GE16DP 1G/100M
Part Number	944-1142	944-1143	944-1146
Hardware Load Module Specifications			
Slot / Number of Ports	1-slot with 16x10/1G Dual-PHY SFP+/10GBASE-T ports	1-slot with 8x10/1G Dual-PHY SFP+/10GBASE-T ports	1-slot with 16x10/1G Dual-PHY SFP+/1000BASE-T ports
Physical Interfaces	16-ports of Dual-PHY SFP+/10GBASE-T RJ-45	8-ports of Dual-PHY SFP+/10GBASE-T RJ-45	16-ports of SFP+/1000BASE-T RJ-45

PRODUCT DESCRIPTION	NOVUS10/1GE16DP 10G/1G/100M	NOVUS10/1GE8DP 10G/1G/100M ⁱ	NOVUS1GE16DP 1G/100M
Supported Port Speeds	<ul style="list-style-type: none"> 10GE/port and 1GE/port: 10GE and 1GE-capable fiber and copper cable media 100M/port: 100M capable fiber and copper media 		<ul style="list-style-type: none"> 1GE/port: 1GE-capable fiber and copper cable media 100M/port: 100M capable fiber and copper media
Number of users	16-port model: <ul style="list-style-type: none"> Normal mode: Up to 16-users per load module (i.e. non-aggregation mode) Aggregation mode: Up to 4 users per load module 8-port model: <ul style="list-style-type: none"> Normal mode: Up to 8-users per load module (i.e. non-aggregation mode) Aggregation mode: Up to 2 users per load module 		
CPU and Memory	Multicore processor with 2GB of CPU memory per port pair		
Port Aggregation	<ul style="list-style-type: none"> Aggregation mode is set across the entire load module Ixia aggregation mode allows the CPU and memory resources of 4 ports to be assigned to 1 port. This provides ultra-high scalability for L2/3 protocol emulation and up to 16Gbps of L4-7 stateful traffic. 		
Cable Media	<ul style="list-style-type: none"> CAT5e CAT6 CAT6A 		
Load Module Dimensions	<ul style="list-style-type: none"> 17.3" (L) x 1.3" (W) x 12.0" (H) 440mm (L) x 33mm (W) x 305mm (H) 		
Load Module Weights	<ul style="list-style-type: none"> Module only: 12.9 lbs (5.85 kg) Shipping: 19.7 lbs (8.94 kg) 		
Temperature	<ul style="list-style-type: none"> Operating: 41°F to 104°F (5°C to 40°C) Storage: 41°F to 122°F (5°C to 50°C) 		
Humidity	<ul style="list-style-type: none"> Operating: 0% to 85%, non-condensing Storage: 0% to 85%, non-condensing 		

PRODUCT DESCRIPTION	NOVUS10/1GE16DP 10G/1G/100M	NOVUS10/1GE8DP 10G/1G/100M ⁱ	NOVUS1GE16DP 1G/100M
Chassis Capacity: Maximum Number of Cards and Ports per Chassis Model			
XGS12-SD Rackmount Chassis (940-0011)ⁱⁱ	12 load modules: <ul style="list-style-type: none"> • 192-ports of 10GE • 192-ports of 1GE • 192-ports of 100M 	12 load modules: <ul style="list-style-type: none"> • 96-ports of 10GE • 96-ports of 1GE • 96-ports of 100M 	12 load modules: <ul style="list-style-type: none"> • 192-ports of 1GE • 192-ports of 100M
XGS12-HSL Rackmount Chassis (940-0016)ⁱⁱ	12 load modules: <ul style="list-style-type: none"> • 192-ports of 10GE • 192-ports of 1GE • 192-ports of 100M 	12 load modules: <ul style="list-style-type: none"> • 96-ports of 10GE • 96-ports of 1GE • 96-ports of 100M 	12 load modules: <ul style="list-style-type: none"> • 192-ports of 1GE • 192-ports of 100M
XGS2-SD Rackmount Chassis (940-0010)	2 load modules: <ul style="list-style-type: none"> • 32-ports of 10GE • 32-ports of 1GE • 32-ports of 100M 	2 load modules: <ul style="list-style-type: none"> • 16-ports of 10GE • 16-ports of 1GE • 16-ports of 100M 	2 load modules: <ul style="list-style-type: none"> • 32-ports of 1GE • 32-ports of 100M
XGS2-HSL Rackmount Chassis (940-0014)	2 load modules: <ul style="list-style-type: none"> • 32-ports of 10GE • 32-ports of 1GE • 32-ports of 100M 	2 load modules: <ul style="list-style-type: none"> • 16-ports of 10GE • 16-ports of 1GE • 16-ports of 100M 	2 load modules: <ul style="list-style-type: none"> • 32-ports of 1GE • 32-ports of 100M
Transmit Feature Specifications			
Transmit Engine	Wire-speed packet generation with timestamps, sequence numbers, data integrity signature, and packet group signatures		
Max. Streams per Port	512		
Max. Streams per Port in Data Center Ethernet	256		
Stream Controls	Rate and frame size change on the fly, sequential and advanced stream scheduler		

PRODUCT DESCRIPTION	NOVUS10/1GE16DP 10G/1G/100M	NOVUS10/1GE8DP 10G/1G/100M ⁱ	NOVUS1GE16DP 1G/100M
Minimum Frame Size	10GE: <ul style="list-style-type: none"> • 49 bytes at full line rate without UDF • 60 bytes at full line rate with UDF 1GE and 100M: <ul style="list-style-type: none"> • 49 bytes at full line rate 		
Maximum Frame Size	16,384 bytes		
Maximum Frame Size in Data Center Ethernet	9,216 bytes		
Priority Flow Control	<ul style="list-style-type: none"> • 8 line-rate-capable queues, 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 five, 32-bit-wide UDFs are available		
Value Lists (Max.)	2M across 5 User Defined Fields		
Sequence (Max.)	512		
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, ICMP/GRE/TCP/UDP, L2TP, GTP		
Link Fault Signaling	10GE: Reports, no fault, remote fault, and local fault port statistics; ability to select the option to have the transmit port ignore link faults from a remote link partner		Not Applicable

PRODUCT DESCRIPTION	NOVUS10/1GE16DP 10G/1G/100M	NOVUS10/1GE8DP 10G/1G/100M ⁱ	NOVUS1GE16DP 1G/100M
Latency Measurement Resolution	2.5 nanoseconds		
Transmit Line Clock Adjustment	Ability to adjust the parts-per-million line frequency over a range of -100 ppm to +100 ppm across all ports on the load module.		
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	<ul style="list-style-type: none"> • 512k with Tx/Rx Sync and sequence checking 		
Minimum Frame Size	<ul style="list-style-type: none"> • 64 bytes at full line rate into the capture buffer • 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	512MB per port		
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		
Latency/Jitter Measurements	Cut-through, store & forward, forwarding delay, up to 16 time bins latency/jitter, MEF jitter, and inter-arrival time		
Layer 2-3 Protocol Support			
Routing and Switching	BGP4/BGP4+, OSPFv2/v3, ISISv4/v6, EIGRP/EIGRPv6, RIP/RIPng, BFD, IGMP/MLD, PIM-SM/SSM, STP/RSTP/MSTP, PVST+/RPVST+, Link Aggregation (LACP), LISP		

PRODUCT DESCRIPTION	NOVUS10/1GE16DP 10G/1G/100M	NOVUS10/1GE8DP 10G/1G/100M ⁱ	NOVUS1GE16DP 1G/100M
Software Defined Network	OpenFlow, Segment Routing, BGP Link State (BGP-LS), PCEP, VXLAN, EVPN, VXLAN, OVSD, GENEVE		
MPLS	RSVP-TE P2P/P2MP, LDP/LDPv6/mLDP, LDP L2VPN (PWE/VPLS), BGP VPLS, L3VPN/6VPE, 6PE, BGP RFC3107, MPLS-TP, MPLS OAM, EVPN/PBB-EVPN, Multicast VPN Rosen Draft, NG Multicast VPN		
Broadband and Authentication	PPPoX/L2TPv2, DHCPv4/DHCPv6, ANCP, IPv6 Autoconfiguration (SLAAC), IGMP/MLD, IPTV, 802.1x, WebAuth, EAPoUDP, Cisco NAC		
Industrial Ethernet	Link OAM (IEEE 802.3ah), CFM/Y.1731, PBB/PBB-TE, ELMI, TWAMP, Sync-E ESMC, IEEE 1588v2 (PTP), gPTP (IEEE 802.1AS), MSRP (IEEE 802.1 Qat), IEEE 1722		
Data Center Ethernet	DCBX/LLDP, FCoE/FIP, PFC (IEEE 802.1Qbb), TRILL, Cisco FabricPath, SPBM, VEPA		
Layer 4-7 Application Traffic Testing Support			
Data	HTTP, HTTPS, TCP Session, FTP, DNS, Mail (SMTP, POP3, and IMAP), TFTP, AppReplay, AppLibrary		
Video	RTSP, IPTV, VoD, Adobe Flash Client, Apple HLS Client, Microsoft Silverlight Client, Adobe HDS Client, DASH Client; includes Video Quality VQMON and TCP Video Quality		
Voice	Advanced VoIP SIP & RTP, Audio & Video Codecs, VoLTE, MSRP, Telepresence, SMS, T.38; includes: Voice Quality and Video Quality for conversational video traffic		
Storage	iSCSI, CIFSv1, CIFSv2 (SMB2), SMB3, NFSv3 Client, NFSv4 Client, NFS4.1 Client, Cloud Storage Client		
Access	IPv4, IPv6, VLAN, Emulated Routers, DNS, DHCP		

APPLICATION SUPPORT

NOVUS10/1GE16DP, NOVUS10/1GE8DP, NOVUS1GE16DP

- **IxExplorer:** A full-featured layer 2-3 wire-speed Ethernet traffic generation and analysis test application.
- **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 L4-7 solution for testing converged multiplay services, application delivery platforms, and security devices and systems. IxLoad emulates data, access, storage, voice, and video subscribers and associated protocols to ensure quality of experience (QoE).
- **Tcl API:** Custom user script development for layer 2-7 testing.

ORDERING INFORMATION

LOAD MODULES

944-1142

NOVUS10/1GE16DP, 16-port, SFP+/10GBASE-T Dual-PHY 10GE/1GE/100M load module, 1-slot Dual-PHY with 16-ports each of the SFP+ and 10GBASE-T RJ45 physical interfaces, L2-7 support. Compatible with the XGS12-SD rack mount chassis (940-0011), XGS12-HSL rack mount chassis (940-0016), and XGS2-SD 2-slot standard performance chassis (940-0010), and 2-slot high performance chassis XGS2-HSL chassis (940-0014).



944-1143

NOVUS10/1GE8DP, 8-port enablement on the 16-port SFP+/10GBASE-T Dual-PHY 10GE/1GE/100M load module (944-1142), 1-slot Dual-PHY with 8-ports each of the SFP+ and 10GBASE-T RJ45 physical interfaces, L2-7 support. Compatible with the XGS12-SD rack mount chassis (940-0011), XGS12-HSL rack mount chassis (940-0016), and XGS2-SD 2-slot standard performance chassis (940-0010), and 2-slot high performance chassis XGS2-HSL chassis (940-0014).



944-1146

NOVUS1GE16DP, 16-port 1GE/100M SFP+/1000BASE-T Dual-PHY load module. 1-slot Dual-PHY with 16-ports each of the SFP+ and 1000BASE-T RJ45 physical interfaces, L2-7 support. Compatible with the XGS12-SD rack mount chassis (940-0011), XGS12-HSL rack mount chassis (940-0016), XGS2-SD 2-slot standard performance chassis (940-0010), and 2-slot high performance XGS2-HSL Chassis (940-0014). Note. This is the NOVUS10/1GE16DP, 16-port load module (944-1142) enabled for ONLY 1GE/100Mbps operation on all 16-ports.



PORT UPGRADE OPTION

905-1006

NOVUS10/1GE/100M-UPGRADE, additional 8-port enablement for FIELD UPGRADE for NOVUS10/1GE16DP, 8-port enabled load module (944-1143) and 8-port enabled Novus One appliance (941-0061). Note1. This creates a total of 16-ports enabled on the load module or appliance. Note2: For the additional 8-port upgrade purchase please provide the serial number of the desired load module or appliance to install the option on at the time of order placement.

CABLES & TRANSCEIVERS

988-0011

SFP+10GBASE-SR/SW and 1000BASE-SX Dual-Rate pluggable optical transceiver for 10/1 Gigabit Ethernet LAN/WAN load modules with pluggable SFP+ interface, 850nm. Compatible with all 10/1 Gigabit Ethernet Novus, PerfectStorm and Firestorm load modules and appliances. Note: Multi-mode fiber LC-LC, 3 meter cable included.

988-0012

SFP+10GBASE-LR/LW and 1000BASE-LX Dual-Rate pluggable optical transceiver for 10/1 Gigabit Ethernet LAN/WAN load modules with pluggable SFP+ interface, 1310nm, 10km reach. Compatible with all 10/1 Gigabit Ethernet Novus, PerfectStorm and Firestorm load modules and appliances. Note: Single-mode fiber LC-LC, 10 ft cable included.

948-0013

SFP+10GBASE-SR/SW, Accessory, SFP+ Transceiver for 10 Gigabit Ethernet LAN/WAN load modules with pluggable SFP+ interface, 850nm; Operates with 944-0050 (LSM10GXM4S-01), 944-0051 (LSM10GXM8S-01), 944-0052 (LSM10GXMR4S-01), 944-0053 (LSM10GXMR8S-01), 944-0054 (LSM10GXM2S-01), 944-0055 (LSM10GXMR2S-01); and 944-0022 (LSM10G1-01) with 948-0012 (SFP+ADAP-01); or 944-0024 (LSM10GL1-01) with 948-0012 (SFP+ADAP-01).

948-0014

SFP+10GBASE-LR/LW, Accessory, SFP+ Transceiver for 10 Gigabit Ethernet LAN/WAN load modules with pluggable SFP+ interface, 1310nm; Operates with 944-0050 (LSM10GXM4S-01), 944-0051 (LSM10GXM8S-01), 944-0052 (LSM10GXMR4S-01), 944-0053 (LSM10GXMR8S-01), 944-0054 (LSM10GXM2S-01), 944-0055 (LSM10GXMR2S-01); and 944-0022 (LSM10G1-01) with 948-0012 (SFP+ADAP-01); or 944-0024 (LSM10GL1-01) with 948-0012 (SFP+ADAP-01).

948-0015

SFP+10GBASE-LRM, Accessory, SFP+ Transceiver for 10 Gigabit Ethernet LAN/WAN load modules with pluggable SFP+ interface, For multimode fiber, 1310nm; Operates with 944-0050 (LSM10GXM4S-01), 944-0051 (LSM10GXM8S-01), 944-0052 (LSM10GXMR4S-01), 944-0053 (LSM10GXMR8S-01), 944-0054 (LSM10GXM2S-01), 944-0055 (LSM10GXMR2S-01); and 944-0022 (LSM10G1-01) with 948-0012 (SFP+ADAP-01); or 944-0024 (LSM10GL1-01) with 948-0012 (SFP+ADAP-01); NOTE: SFP+10GBASE-LRM does not support the 10GE WAN mode in any of the load modules listed above.

948-0016

SFP+10GSFP+Cu, Accessory, passive, copper Direct Attach Cable Assembly for 10 Gigabit Ethernet LAN/WAN load modules with pluggable SFP+ interface, 3 meter length; NGY 10GE SFP+ modules, Xdensity modules, and Xcellon-Flex 10GE SFP+ FE and AP modules.

SFP-LX

SFP 1 Gigabit Ethernet Transceiver - 1310nm LX

SFP-SX

SFP 1 Gigabit Transceiver - 850nm SX

SFP-FX-100M-XCVR

SFP 100BASE-FX 100M SGMII pluggable optical transceiver, MMF (multimode), 1310nm, 2km reach. Compatible with NOVUS10/1GE32S (944-1141), NOVUS10/1GE16DP (944-1142), NOVUS10/1GE8DP (944-1143), NOVUS1GE16DP (944-1146), NOVUS-NP10/1GE16DP (944-1162), NOVUS-NP10/1GE8DP (944-1163) load modules, NOVUS ONE 10/1GE/100M 16-port (941-0060) and NOVUS ONE 10/1GE/100M 8-port (941-0061) appliances. Note: This transceiver supports only the 100M speed mode.

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ⁱ 8-port Novus10/1GE8DP can be upgraded to full 16-port version NOVUS10/1GE16DP via 905-1006 additional 8-port enablement option.

ⁱⁱ Ixia recommends the use of XGS12-SD and XGS12-HSL chassis for large-port-count test applications.