

Novus-NP 10/1/100 Ethernet Load Modules

Extend and Simplify Your Multi-Rate Ethernet and Application Delivery Testing

High-Density 10G/1G/100M Multi-Rate Ethernet Test in One Load Module!

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

Novus-NP combines the innovative Novus load module architecture with the Keysight's unique NP (network processor) technology to create a high-density, scalable, and high-performance application traffic generation platform.

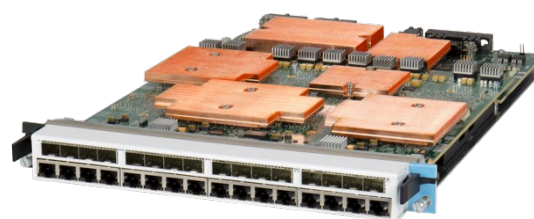
Capable of emulating up to 40G of application traffic and generating and analyzing wire-speed Layer 2-3 traffic on its 16 dual-PHY ports (SFP+ and 10GBase-T RJ45), Novus-NP is the efficient platform for creating ultra-high-density test environments for 10GE/1GE/100M Ethernet over copper and fiber. A single 12-slot Keysight chassis supports up to 192 10GE/1GE/100M test ports and can generate up to 480Gpbs of stateful traffic.

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

- **NOVUS-NP 10/1GE16DP:** A full-featured 16-port, Dual-PHY (RJ45 and SFP+) 10GE/1GE/100M load module designed for high-density testing.

Highlights

- Unified network infrastructure and application test platform, with Layer 2-7 test capabilities
- Broader coverage of L4-7 protocols including video, voice, storage, and access
- Industry's highest-density Dual-PHY SFP+/10GBASE-T RJ45 solution
- High-performance multiplay traffic with real subscriber behavior emulation
- Line-rate Layer 2-3 data plane testing
- Purpose-built to test high-performance, low-latency devices
- Tri-speed 10GE/1GE/100M ports provide low total cost of ownership and high ROI



NOVUS-NP 10/1GE16DP

16-port DUAL-PHY tri-speed load module

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

Key Features

- High-performance Layer 4-7 testing by using Keysight's IxLoad application—up to 40G bidirectional application throughput per load module
- 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 by using Keysight's IxNetwork application
- Full line-rate traffic generation to evaluate ASIC designs, FPGAs, and hardware switch fabrics
- Support for testing SFP+ and 10GBASE-T RJ-45 copper ports at different speeds simultaneously on the same load module
- Industry-standard RFC tests and protocol emulation in large test bed with hundreds of 10G, 1G, and/or 100M ports in a single test—to benchmark data plane and performance and scale of ultra-high-density network equipment
- 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
- Support for a broad range of IxLoad L4-7 application layer testing 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-NP 10GE/1GE/100M brings a new level of performance with a broad range of coverage of all the most popular features of IxNetwork and IxLoad applications.

Specifications

Product Description	NOVUS-NP 10/1GE16DP 10G/1G/100M	NOVUS-NP 10/1GE8DP 10G/1G/100M ¹
Part Number	944-1162	944-1163
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
Physical Interfaces	16-ports of Dual-PHY SFP+/10GBASE-T RJ-45	8-ports of Dual-PHY SFP+/10GBASE-T RJ-45
Supported Port Speeds	• 10G/port and 1G/port: 10G and 1G-capable fiber and copper cable media • 100M/port: 100M capable fiber and copper media	

Product Description	NOVUS-NP 10/1GE16DP 10G/1G/100M	NOVUS-NP 10/1GE8DP 10G/1G/100M ⁱ
CPU and Memory	Multicore processor with 2GB memory per port	
Cable Media	• CAT5e • CAT6 • CAT6A	
Load Module Dimensions	• 17.3" (L) x 1.3" (W) x 12.0" (H) • 440mm (L) x 33mm (W) x 305mm (H)	
Load Module Weights	• Module only: 12.9 lbs (5.85 kg) • Shipping: 19.7 lbs (8.94 kg)	
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	
Chassis Capacity: Maximum Number of Cards and Ports per Chassis Model		
XGS12-SD Rackmount Chassis (940-0011) ⁱⁱ	12 load modules: • 192-ports of 10GbE • 192-ports of 1GbE • 192-ports of 100MbE	12 load modules: • 96-ports of 10GbE • 96-ports of 1GbE • 96-ports of 100MbE
XGS12-HSL Rackmount Chassis (940-0016) ⁱⁱ	12 load modules: • 192-ports of 10GbE • 192-ports of 1GbE • 192-ports of 100MbE	12 load modules: • 96-ports of 10GbE • 96-ports of 1GbE • 96-ports of 100MbE
XGS2-SD Rackmount Chassis (940-0010)	2 load modules: • 32-ports of 10GbE • 32-ports of 1GbE • 32-ports of 100MbE	2 load modules: • 16-ports of 10GbE • 16-ports of 1GbE • 16-ports of 100MbE
XGS2-HSL Rackmount Chassis (940-0014)	2 load modules: • 32-ports of 10GbE • 32-ports of 1GbE • 32-ports of 100MbE	2 load modules: • 16-ports of 10GbE • 16-ports of 1GbE • 16-ports of 100MbE
Transmit Feature Specifications		
Transmit Engine	Wire-speed packet generation with timestamps, sequence numbers, data integrity signature, and packet group signatures	

Product Description	NOVUS-NP 10/1GE16DP 10G/1G/100M	NOVUS-NP 10/1GE8DP 10G/1G/100M ⁱ
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	
Minimum Frame Size	10GbE: • 49 bytes at full line rate without UDF • 60 bytes at full line rate with UDF 1GbE and 100MbE: • 49 bytes at full line rate	
Maximum Frame Size	16,384 bytes	
Maximum Fame Size in Data Center Ethernet	9,216 bytes	
Priority Flow Control	• 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	
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.	

Product Description	NOVUS-NP 10/1GE16DP 10G/1G/100M	NOVUS-NP 10/1GE8DP 10G/1G/100M ⁱ
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	• 1M without Tx/Rx Sync and sequence checking • 512k with Tx/Rx Sync and sequence checking	
Minimum Frame Size	• 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 and 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	
Software Defined Network	OpenFlow, Segment Routing, BGP Link State (BGP-LS), PCEP, VXLAN, EVPN VXLAN, OVSB, 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	

Product Description	NOVUS-NP 10/1GE16DP 10G/1G/100M	NOVUS-NP 10/1GE8DP 10G/1G/100M ⁱ
Layer 4-7 Application Traffic Testing Support		
Data	HTTP, HTTPS, TCP Session, FTP, DNS, Mail (SMTP, POP3, and IMAP), TFTP, AppReplay (TCP and UDP), 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 and RTP, Audio and Video Codecs, VoLTE, MSRP, Telepresence, SMS; 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, and IPsec	

Application Support

NOVUS-NP 10/1GE16DP, NOVUS-NP 10/1GE8DP
• 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.

Novus-NP, IxLoad performanceⁱⁱⁱ

Performance Metric	NOVUS-NP 10/1GE16DP 10G/1G/100M	NOVUS-NP 10/1GE8DP 10G/1G/100M
HTTP TPUT (Gbps)	20	10
HTTP Bidirectional TPUT (Gbps)	40	20
HTTP CPS	750,000	375,000
HTTP CC	7,500,000	3,750,000
SIP endpoints signaling only	480,000	240,000
SIP endpoints with media	40,000	20,000

Performance Metric	NOVUS-NP 10/1GE16DP 10G/1G/100M	NOVUS-NP 10/1GE8DP 10G/1G/100M
Video simulated users	100,000	50,000
Video TPUT (Gbps)	20	10

Novus-NP, IxNetwork performanceⁱⁱⁱ

Protocol	NOVUS-NP 10/1GE16DP 10G/1G/100M	NOVUS-NP 10/1GE8DP 10G/1G/100M
IPv4 sessions	1,024,000	512,000
IPv6 sessions	800,000	400,000
OSPFv2 sessions	450,000	225,000
BGP sessions	280,000	140,000
DHCP sessions	512,000	256,000
PPPoE sessions	512,000	256,000
IGMP sessions	840,000	420,000

Ordering Information

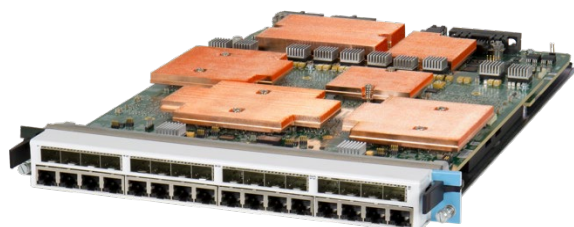
Load modules

944-1162

NOVUS-NP10/1GE16DP, 16-port, SFP+/10GBASE-T Dual-PHY 10GE/1GE/100M Application Network Processor 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 (940-0011) and XGS12-HSL (940-0016) 12-slot rack mountable chassis, and XGS2-SD (940-0010) and XGS2-HSL (940-0014) 2-slot chassis.

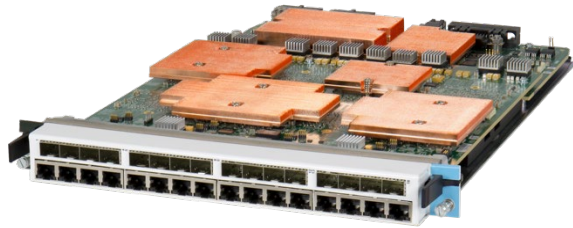
944-4012-T (TAA version of 944-1162)

IXIA TAA Compliant NOVUS-NP10/1GE16DP, 16-port, SFP+/10GBASE-T Dual-PHY 10GE/1GE/100M load module



944-1163

NOVUS-NP10/1GE8DP, 8-port enablement on the 16-port SFP+/10GBASE-T Dual-PHY 10GE/1GE/100M Application Network Processor load module (944-1162). Compatible with the XGS12-SD (940-0011) and XGS12-HSL (940-0016) 12-slot rack mountable chassis, and XGS2-SD (940-0010) and XGS2-HSL (940-0014) 2-slot chassis.



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 and 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 10GbE 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, Xdenisty 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 pluggable optical transceiver, MMF (multimode), 1310nm, 2km reach

TAA Transceivers

SFP-PLUS-LR-XCVR-T

Ixia, TAA compliant, SFP+ 10GBASE LR pluggable optical transceiver, 1310nm, SMF (single mode fiber), 10km reach, LC (948-0057). COMPATIBLE NETWORK TEST PRODUCTS: Novus 10/1 3 Speed (944-1141, 944-1142, 944-1143, 944-1146), Novus 10/1 5 Speed (944-1148, 944-1149, 944-1154, 944-1155) and Novus ONE PLUS (941-0063, 941-0064, 941-0065, 941-0066, 941-0067, 941-0068).

SFP-LX-I-XCVR-T

Ixia, TAA Compliant, Industrial temperature rate 1G LX transceiver (995-0060). COMPATIBLE NETWORK TEST PRODUCTS: Novus 10/1 3 Speed (944-1141, 944-1142, 944-1143, 944-1146), Novus 10/1 5 Speed (944-1148, 944-1149, 944-1154, 944-1155) and Novus ONE PLUS (941-0063, 941-0064, 941-0065, 941-0066, 941-0067, 941-0068).

SFP-SX-I-XCVR-T

Ixia, TAA Compliant, Industrial temperature rate 1G SX transceiver (995-0061). COMPATIBLE NETWORK TEST PRODUCTS: Novus 10/1 3 Speed (944-1141, 944-1142, 944-1143, 944-1146), Novus 10/1 5 Speed (944-1148, 944-1149, 944-1154, 944-1155) and Novus ONE PLUS (941-0063, 941-0064, 941-0065, 941-0066, 941-0067, 941-0068).

SFP-PLUS-LR-XCVR-D-T

Ixia, TAA compliant, SFP+ 10/1GBASE Dual Rate LR pluggable optical transceiver, 1310nm, MMF (single mode fiber), 10km reach, LC (948-0070). COMPATIBLE NETWORK TEST PRODUCTS: Novus 10/1 3 Speed (944-1141, 944-1142, 944-1143, 944-1146), Novus 10/1 5 Speed (944-1148, 944-1149, 944-1154, 944-1155) and Novus ONE PLUS (941-0063, 941-0064, 941-0065, 941-0066, 941-0067, 941-0068).

SFP-PLUS-SR-XCVR-D-T

Ixia, TAA compliant, SFP+ 10/1GBASE Dual Rate LR pluggable optical transceiver, 1310nm, MMF (single mode fiber), 10km reach, LC (948-0070). COMPATIBLE NETWORK TEST PRODUCTS: Novus 10/1 3 Speed (944-1141, 944-1142, 944-1143, 944-1146), Novus 10/1 5 Speed (944-1148, 944-1149, 944-1154, 944-1155) and Novus ONE PLUS (941-0063, 941-0064, 941-0065, 941-0066, 941-0067, 941-0068).

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

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

ⁱⁱⁱ Numbers in the table represent the performance of a single Novus-NP module, with ports connected back to back.

Learn more at: www.keysight.com

For more information on Keysight Technologies' products, applications or services, please contact your local Keysight office. The complete list is available at: www.keysight.com/find/contactus

