Agilent N2X

Next Generation 10Gb/s Test Cards

10 Gb/s Ethernet and POS (XFP)
XR-2 and XS-2 Test Cards
N5602A, N5603A, N5632A
Technical Data Sheet

Wire-speed traffic generation, routing protocol emulation and analysis for the development and deployment of routers and switches with 10 Gb/s Ethernet or Packet over SONET/SDH interfaces.

Agilent Technologies

Key Features

- **XFP pluggable optics**
- **Flexible hardware to match your test needs**
- **Industry's highest protocol performance**
- **Industry's highest protocol scalability**
- **Full control over all traffic generation parameters**
- **Comprehensive API & Open-Library of Automated Test Scripts**

Product Overview

The Agilent N2X is the industry's most comprehensive test solution for testing the development and deployment of network services for converging network infrastructures. Service providers, network equipment manufacturers (NEMs), and component manufacturers can verify service attributes of entire networks end-to-end, while also isolating problems down to individual networking devices and subsystems. Agilent N2X delivers unparalleled test realism to verify the ultimate performance, scalability and resilience of carrier grade services and infrastructure.

The Agilent N2X Next Generation 10Gb/s Ethernet & POS Test Cards are available with XFP pluggable optics. In conjunction with the N2X Packets & Protocols Application, they provide multi-port traffic generation, scalable protocol emulation and unparalleled performance analysis of today's networks and devices. From wire-speed traffic generation and analysis to full emulation of Internet-scale routing topologies using the latest protocols and technologies, Agilent provides the most flexible, comprehensive and easy to use system available today.

The foundation of all N2X test cards is a powerful yet flexible traffic generation engine capable of verifying everything from L2 Ethernet Switches through to multi-chassis carrier-class routing nodes and networks. The real-time traffic generator with multi-profile traffic scheduler and thousands of streams, programmable field modifiers and industry-leading test payload provides unparalleled test realism and flexibility to ensure you can generate the traffic to meet any test scenario.

Combined with comprehensive, real-time layer-1 to 4 transmit and receive statistics and graphs including packet loss, latency and misordering, N2X is able to verify the data-plane functionality, performance and scalability of your device or network.

Agilent N2X's traffic generator and receiver capabilities are tightly coupled with powerful protocol emulation hardware on all XR-2 and XS-2 test cards. This integration will ensure your devices are tested under the most realistic environment possible and remove the need to manually configure traffic addresses when completing performance measurements. N2X provides emulation of the most popular routing protocols, including BGP, OSPF, ISIS and RIP and the latest MPLS protocols, including RSVP-TE, LDP/CR-LDP, L2oMPLS (Martini), and VPLS. Multicast protocols can be verified easily with our IGMP and PIM-SM protocol emulations. Access networks and devices can be tested with PPPoX and DHCP protocols.

All N2X next generation 10Gb/s test cards provide the data capture memory required to enable detailed analysis from a single test session. N2X allows users to set a range of triggers including a specific event threshold as a 'trigger' to initiate or halt capture. Combined with powerful capture analysis software, users can quickly isolate, analyze and debug performance issues.

Agilent N2X test cards offer superior test flexibility and investment protection. Built upon powerful programmable logic technology, test functionality can be continually adapted to ever-changing standards and evolving technologies.

Product Features

Flexible Hardware options to meet your test needs

Along with flexibility in interface types, N2X next-generation 10Gb test cards are available in three variants designed to match your specific test needs

- **XR-2** – Available in UniPHY POS/ Ethernet LAN/WAN and LAN/ WAN-only Ethernet versions. This card offers seamless integration of traffic and protocol testing for realistic testing of Internet routers and switches. Combined with the N2X Packets and Protocols application, these cards validate leading-edge services such as Multicast VPNs and IPTV on network devices. It can emulate multiple protocols simultaneously, creating sophisticated network topologies required to verify that the device can concurrently manage numerous protocol engines and routing tables while continuously forwarding traffic.

- **XS-2** – This test card provides the industry's leading protocol scalability and performance needed to test the highest performing Internet routers and switches. This card is available in 10Gb Packet over SONET/SDH and Ethernet LAN/WAN variants. It sets a new benchmark for protocol scalability and performance testing with the ability to emulate the largest multi-protocol topologies of any test equipment on the market.

Industry's Highest Protocol Performance

A high-performance CPU with on-board cache enables the industry's fastest protocol engine.

When testing high-performance routers, a key measurement is to determine the convergence time. A router has "converged" when it has learned all routes from its peers.

The XS-2 next-generation Ethernet test card is the only card available today that can determine the convergence time of routers by advertising routes faster than any other test equipment

Industry's Highest Protocol Scalability

1 GB of CPU RAM per port on the XS-2 test card enables the industry's highest protocol scalability.

A key measurement is to determine the number of routing peers that a router can support. For example, Layer-3 VPNs require each core and edge router to support a BGP-4 session. Any router must support thousands of BGP-4 peering sessions.

The XS-2 next generation 10Gb test card is the only card available today that can practically measure the absolute scalability of routers. Multiple XS-2 test cards can be added into a single test system, to increase the scalability of the entire system – the possibilities for scalability testing are nearly endless.

For scalability testing, the N5632A is much more economical than buying multiple test cards. Taking the cost of test interfaces and router ports into account, the N5632A halves the cost of test by concentrating more processing power on a single card.

Full Control over ALL Traffic Generation Parameters

Agilent N2X's innovative "flexible PDU builder" technology delivers the most advanced solution for traffic generation and analysis available. Any type of data-plane frame or packet can be generated, including custom formats. Users can manipulate and define the contents of all protocol fields quickly and easily. You no longer have to wait for industry standards, or write unique test scripts to test new and proprietary protocol encapsulations.

Comprehensive API & Open Library of Automated Test Scripts

N2X's automated QuickTests, based on Agilent's Journal of Internet Test Methodologies, make it easy to perform even the most complex tests. N2X's powerful API makes it easy to customize scripts to match your specific test needs.

In addition, proprietary scripts can be created using the Tcl/Tk scripting environment. With only a few lines of code, powerful test scenarios can be executed with precision.

Technical Specifications

Physical Layer Specifications

N5602A, N5603A, N5632A Test Cards

Port Density	1 duplex test port per card
Connection Type	Tx & Rx LC female
Wavelengths	Selected by XFP type

Interface Operation Modes

Terminal	Normal operation -Transmit and receive interfaces operate independently.
Transmit loop-back	Transmitted data is electrically looped back to the receive interface. The optical receive interface is disabled in this mode.
Monitor	Received data is looped back to the transmit interface. Received data is also copied into the test port where all real time Rx measurements are made. Capture and subsequent analysis are also fully functional in this mode.

Transmit Clock Sources

Three clock sources are possible	• Internally generated
	• Recovered from the received signal
	• External transmit reference clock:
	  • 19.44MHz (±50ppm SONET / ±100ppm Ethernet), 50±5% duty cycle
	  • Input signal 0dBm nominal / 7dBm max terminated in 50 ohm to ground i/p.

Clock Offset	Using the API or GUI, the transmit clock can be varied by ± 100ppm in 4ppm steps from the internally generated clock (SONET modes only).

Front Panel Indicators

Common Indicators	• **Laser**: Green when output laser is on • **Tx**: Green when a HDLC frame or Ethernet frame is transmitted. Does not indicate integrity of the transmitted SONET SPE • **Rx**: Green when a HDLC frame or Ethernet frame is received. Indicates integrity of the SONET SPE and HDLC framing
SONET/SDH Indicators	• **Signal**: Green - A valid optical receive signal is detected (opposite of LOS condition) • **LOF/LOP**: Yellow - Loss of Frame or Loss of Pointer condition exists at the receiver • **AIS**: Yellow - Line/MS AIS, Line/MS RDI, Path AIS or Path RDI condition exists at the receiver
Ethernet Indicators	• **Link: Green** - Ethernet framing is detected on receive interface. • **LF/RF**: Yellow - Local Fault signal detected from receive signal. Flashing yellow - Remote Fault signal detected from receive signal. • **LOL**: Yellow - Loss of Block Lock (64B/66B receive synchronization is lost)

Alarms and Errors

At the SONET/SDH interface, access is provided to generate alarms, to manipulate the automatic protection switching bytes (K1/K2), section and path trace messages (J0/J1), and synchronization byte (S1).

Real-Time Alarm Detection	• Current alarm status is indicated on the user interface (GUI and/or API) and front panel LEDs • Alarm events are reported in a trace log during the measurement interval • Number of errored seconds is reported per alarm type (count of 1s intervals in which the alarm is detected at least once)

Alarm Generation	Alarm conditions can be invoked, one at a time
	• SONET Alarms
	  • LOS
	  • LOF
	  • LOP
	  • AIS-L
	  • RDI-L
	  • AIS-P
	  • RDI-P
	• SDH Alarms
	  • LOS
	  • LOF
	  • MS-AIS
	  • MS-RDI
	  • AU-AIS
	  • AU-RDI

Error Monitoring (SONET/SDH)	'Number of occurrences reported', 'number of errored seconds reported' and 'error rate' are recorded for each of the following Section (RSOH) / Line (MSOH) and Path errors:
	  • SONET: Section BIP-8 (B1)
	  • SDH: RSOH (B1) errors
	  • SONET: Line REI (M1) errors
	  • SDH: MSOH (M1) errors
	  • SONET: Line BIP-8 (B2) errors
	  • SDH: MSOH (B2) errors
	  • SONET/SDH Path BIP-8 (B3) errors
	  • SONET/SDH Path REI (G1) errors

Error Monitoring (Ethernet)	• Block error • 64B/66B high bit error

Optical Interface

Connector	850nm SR/SW, 1310nm SR-1 & 1550nm IR-2 XFP • 1 Duplex LC Connector
Average Output Power	850nm SR/SW XFP • Typical = -1.5 dbM 1310nm SR-1 XFP • Typical = -3 dBm 1550nm IR-2 XFP • Typical = 0.5 dBm
Transmit Wavelength	850nm SR/SW XFP • Minimum = 840nm • Typical = 850nm • Maximum = 860nm 1310nm SR-1 XFP • Minimum = 1290 nm • Typical = 1310 nm • Maximum = 1330 nm 1550nm IR-2 XFP • Minimum = 1530 nm • Typical = 1550 nm • Maximum = 1580 nm
Receiver Type	850nm SR/SW, 1330nm SR-1 & 1550nm IR-2 XFP • PIN Based
Wavelength Range	850nm SR/SW XFP • Minimum = 840nm • Maximum = 860nm 1330nm SR-1 & 1550nm IR-2 XFP • Minimum = 1250 nm • Maximum = 16100 nm
Input Sensitivity	850nm SR/SW XFP • Maximum = -11.1 dBm 1330nm SR-1 & 1550nm IR-2 XFP • Maximum = -17 dBm
Input Power	850nm SR/SW XFP • Maximum = +0.65 dBm 1330nm SR-1 • Maximum = -1.0 dBm 1550nm IR-2 XFP • Maximum = -1.0 dBm

Link Layer Specifications

PAUSE Frames

In Ethernet mode, the Test Module can both generate and respond to PAUSE frames.

Measurement System

Measurements are synchronized across all cards within the test system with a 3 PPM max. difference between systems.

Result types
- Cumulative: measurements are reported from the start of the measurement interval
- Instantaneous: measurements are reported from the most recently completed sampling interval
- Measurement interval: 1 second to 7 days
- Sampling interval: 1 second to 1 hour
- Measurement clock: 10 ns resolution +/- 0.5 ppm/year clock drift

Real-time Statistics

Unless otherwise specified all statistics are on a per port basis.

Glossary

Short event	A sequence of bytes of insufficient length to form a valid Ethernet frame (<18 bytes).
Runt	A frame with less than 64 bytes (excluding preamble) and a valid FCS.
Long frame	A frame longer than 1522 bytes (or 9022 for jumbo frames) with a valid FCS.
Jumbo frame	A frame between 1519 and 9022 bytes with a valid FCS and an Ethertype of 0x8870.
Jabber frame	A frame longer than 1522 bytes (or 9022 for jumbo frames) with an invalid FCS.
Pattern Match	Count of frames matching specified fields in the header.
PPIC	Packet Payload Integrity Check. The PPIC field contains a 16-bit CRC calculated over the "protected payload. The "protected payload" refers to any of the following: • IP packet payload (default) • MPLS frame payload • L2 frame payload • User-defined

General Statistics

Per-Port Statistics.	• Tx and Rx % line use • Misdirected packets • Error rate
Per-Stream Statistics	• Tx and Rx stream packets and octets • Misordered packets
Per-Stream & Port Statistics	• Tx and Rx test packets and octets • Expected Rx packets • Throughput • Packets not received • Average latency • Minimum/maximum latency • PPIC violations (i.e. count on payload error)
IPv4	• Tx and Rx octet counts • Header checksum errors • Fragmented packet count • Throughput
IPv6	• Tx and Rx packet and octet counts • Throughput
MPLS	• Tx and Rx packets
Ethernet	• Tx and Rx frame and octet counts • Tx and Rx throughput (Mb/s) • Tx and Rx MAC control frames • Short events received • Runt frames received • Tx & Rx long frames • Jabber frames received • Tx & Rx invalid FCS frames
VLAN	• Tagged Tx and Rx frame and Octet counts
HDLC	• Tx/Rx frame and octet counts • Tx/Rx throughput (Mb/s pre and post stuffing) • Tx efficiency • Rx FCS errors • Rx aborted frames
SONET/SDH	• B1, B2 and B3 error counts • B1, B2 and B3 errors (seconds)
User Defined Statistics	Powerful features allow statistics collection on a per-stream, per-MPLS tag, per-VLAN tag or other user-defined-index basis.

Card Specific Specifications

Capture RAM	• N5602A, N5603A, N5632A: 256 MB
CPU RAM (for protocol scalability and performance testing)	• N5602A, N5603A: 512 MB • N5632A: 1GB

All measurements are per physical interface port.

Maximum number of stream groups	• 4095
Maximum number of traffic streams	• 32,768
Maximum number of field inserters	• 1024
Minimum transmit layer-2 frame length (bytes)	• Ethernet: 9 • POS: 3
Maximum transmit layer-2 frame length (bytes)	• 65,703
Minimum receive layer-2 frame length (bytes)	• Ethernet: 9 • POS: 8
Maximum receive layer-2 frame length (bytes)	• 65,703

Applicable Standards

Optical Transmitter And Receiver	• Telcordia Technologies GR-1377-CORE (Issue 5, Rev. 2, Dec. 98 - SR short reach /LR long reach OC-192 interface specification) • SDH STM-64c as per ITU-T Rec. G.691 (March, 1999) • IEEE 802.3ae
SONET/SDH	• SONET STS-192c as per Telcordia Technologies GR-1377-CORE (Issue 5, Rev. 2, Dec. 98 - SR short reach / LR long reach OC-192 interface specification) • SDH STM-64c as per ITU-T Rec. G.707 (March, 1996)
Packet Over SONET/SDH	• IETF RFC 2615, PPP over SONET/SDH
PPP/HDLC	• IETF RFC 1662, PPP in HDLC-like Framing
Link Control Protocol	• IETF RFC 1661, The Point-to-Point Protocol (PPP)
IP Control Protocol	• IETF RFC 1332, The PPP Internet Protocol Control Protocol (IPCP)
Address Resolution Protocol	• IETF RFC 826 An Ethernet Address Resolution Protocol
PCS/RS/MAC Protocol	• IEEE 802.3ae
IP IEEE 802 Networks	• IETF RFC 1042

Mechanical Specifications

Physical	• Width: 206 mm • Depth: 313 mm • Height: 31.0 mm • Weight: 2kg
Electrical Power consumption	• 100W max

Environmental

Operating temperature	• 05 °C to 40 °C
Storage temperature	• -40 °C to 70 °C
Maximum Relative Humidity	• Humidity 80% for temperatures up to 31 °C decreasing linearly to 50% relative humidity at 40 °C – non condensing

Regulatory Compliance

Electrical (Electromagnetic Compliance - EMC)

- As per IEC 61326-1:1997 + A1:1998 / EN 61326-1:1997 + A1:1998 / EN 61326-1:1997 + A2:2000+A3:2003.
- Electrical equipment for measurement, control and laboratory use.(Class A)
- EMC Directive 89/336/EEC (including 93/68/EEC)
- For complete compliance information refer to Declaration of Conformity E7900-91300

Electrical (Safety)

- IEC 61010-1:1990 + A1:1992 + A2:1995
- Safety requirements for electrical equipment for measurement, control, and laboratory use
- Low voltage directive 73/23/EEC

Optical (Safety)

Complies with IEC 60825/CDRH Class 1, and 21 CFR 1040 - Class 1 Laser Products.

Online Help

An extensive online help system provides complete descriptions and detailed usage instructions for every component of N2X. Dialog-level, context-sensitive help provides rapid access to the relevant sections of the online help.

Configuration and Ordering Details

10 Gb/s test card variants

- N5602A: 1-port 10Gb XR-2 Test Card (POS & Ethernet LAN/WAN XFP)
- N5603A: 1-port 10Gb XR-2 Test Card (Ethernet LAN/WAN XFP)
- N5632A: 1-port 10Gb XS-2 Test Card (POS & Ethernet LAN/WAN XFP)

Pluggable XFP optics options

- Option 001: Include one – 1310nm SR-1 XFP
- Option 002: Include one – 1550nm IR-2 XFP
- Option 003: Include one – 850nm SR/SW XFP

The 1310nm and 1550nm XFP transceivers are multi-rate compliant and will support Ethernet LAN, Ethernat WAN and POS framing on relevant test cards. 850nm XFP transceiver will only support Ethernet LAN framing.

Agilent strongly recommends purchase of Agilent specified XFP transceivers with the unit to ensure reliable testing. Agilent cannot guarantee that XFPs purchased from other sources have been verified to successfully interoperate with the test card.

Your local Agilent field engineer can provide more details on how to order and configure a test system.

Software Compatibility

The E7880B Packets Application software enables the traffic generation and analysis features on the XR-2 & XS-2 test cards. Furthermore, these cards can take advantage of the multi-protocol emulation environment plus integrated traffic & routing features available in the E7881B Packets & Protocols Application software.

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Agilent N2X

Agilent's N2X multi-service tester combines leading-edge services with carrier grade infrastructure testing and emulation. The N2X solution set allows network equipment manufacturers and service providers to more comprehensively test new services end-to-end, resulting in higher quality of service and lower network operating costs.

Warranty and Support

Hardware Warranty

All N2X hardware is warranted against defects in materials and workmanship for a period of 1 year from the date of shipment.

Software Warranty

All N2X software is warranted for a period of 90 days. The applications are warranted to execute and install properly from the media provided.
This warranty only covers physical defects in the media, whereby the media is replaced at no charge during the warranty period.

Software Updates

With the purchase of any new system controller, Agilent will provide 1 year of complimentary software updates. At the end of the first year, you can enroll into the Software and Support Agreement (SSA) contract for continuing software product enhancements.

Support

Technical support is available throughout the support life of the product. Support is available to verify that the equipment works properly, to help with product operation, and to provide basic measurement assistance for the use of the specified capabilities, at no extra cost, upon request.

Ordering Information

To order and configure the test system consult your local Agilent field engineer.

Sales, Service and Support

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