



Agilent N2X
**Next-Generation
Ethernet Interfaces**

10/100/1000BASE-T and 1000BASE-X (SFP)
XP-2, XR-2 and XS-2 Test Cards
N5550A/B, N5551A/B, N5552A/B, N5553A/B, N5630A/B
Technical Data Sheet



Next generation Ethernet test cards designed to increase scalability and reduce test cost with its high port density and new CPU per port architecture that enables multiple users to share ports on a card.

Key Features

- **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 Ethernet Test Cards are available with 10/100/1000 BASE T and 1000 BASE-X interfaces including dual mode RJ-45/SFP. In conjunction with N2X Packets & Protocols Application they provide multi-port traffic generation, scalable protocol emulation and unprecedented performance analysis of today's Ethernet 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.

These next generation Ethernet test cards are designed to increase test coverage and reduce test cost. Each port has a dedicated CPU and RAM – no sharing of CPUs and no compromise in performance. Next generation Ethernet Test Cards support an individual user per port. Multiple users can concurrently utilize their own test port maximizing the use of test equipment and return on year investment.

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 through 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 Ethernet 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.

Flexible Hardware options to meet your test needs

Along with flexibility in interface types, N2X next generation Ethernet test cards are available in three key performance variants designed to match your specific test needs:

- **XP-2** – offered as a four port only card, this cost effective packet generation and analysis test card provides users with full access to N2X’s easy to use Packets application. It’s unique PDU builder and flexible packet generator lets you manipulate and define the contents of all protocol fields quickly and easily. Large numbers of streams and the industries most comprehensive test payload enables users to simulate realistic traffic mixes and accurately verify the forwarding performance and QoS capabilities of your system under test.
- **XR-2** – offered in both 2 and four port variants, 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** – offered as a 2 port only variant, this test card provides the protocol scalability and performance needed to test the highest performing Internet routers and switches. 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.

| | 2 Port | 4 Port |
|-------------|---|---|
| XP-2 | N/A | N5553A/B -10/100/1000 BASE-T, 1000 BASE-X (SFP) |
| XR-2 | N5552A/B -10/100/1000 BASE-T, 1000 BASE-X (SFP) | N5550A/B -10/100 BASE-T N5551A /B -10/100/1000 BASE-T, 1000 BASE-X (SFP) |
| XS-2 | N5630A/B -10/100/1000 BASE-T, 1000 BASE-X (SFP) | N/A |

Figure 1 : Next generation Ethernet available hardware combinations

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 that 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 RAM per port 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 Ethernet test card is the only card that 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 N5630A/B is significantly more economical than buying multiple test cards. Taking the cost of test interfaces and router ports into account, the N5630A/B 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.

Configuration and Ordering Details

Ethernet test card variants

- N5550A/B : 4-port 10/100 BASE-T XR-2 Test Card.
- N5551A/B : 4-port 10/100/1000 BASE-T 1000BASE-X (SFP) Ethernet XR-2 Test Card.
- N5552A/B : 2-port 10/100/1000 BASE-T 1000BASE-X (SFP) Ethernet XR-2 Test Card.
- N5553A/B : 4-port 10/100/1000 BASE-T 1000BASE-X (SFP) Ethernet XP-2 Test Card.
- N5630A/B : 2-port 10/100/1000 BASE-T 1000BASE-X (SFP) Ethernet XS-2 Test Card.

Pluggable SFP optics options

- Option 001: Include one - 1000Base SX SFP (850nm)
- Option 002: Include one - 1000Base LX SFP (1310nm)
- Option 003: Include one - 1000Base ZX SFP (1550nm)
- Not applicable for N5550A/B.

Software Compatibility

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

The N5550B, N5551B, N5552B, N5553B and N5630B test cards require version N2X Packets and Protocols Release 6.8 or later.

Technical Specifications

Physical layer specifications

Connectivity

| | |
|--------------------------------|---|
| Port Density & connection type | <ul style="list-style-type: none"> N5550A/B: 4 - 10/100 RJ-45 electrical Ethernet ports N5551A/B: 4 - 10/100/1000 RJ-45 electrical and SFP Ethernet ports N5552A/B: 2 - 10/100/1000 RJ-45 electrical and SFP Ethernet ports N5553A/B: 4 - 10/100/1000 RJ-45 electrical and SFP Ethernet ports N5630A/B 2 – 10/100/1000 RJ-45 electrical and SFP Ethernet ports |
| Connection Type | <ul style="list-style-type: none"> Supports SFP (SFF-8074i v1.0) RJ-45 (tri-rate) Auto-detect of MDI/MDI-X and auto-configure |

Interface Operation Modes

| | |
|--------------------|---|
| Terminal | <ul style="list-style-type: none"> Normal operation – transmit and receive interfaces operate independently |
| Transmit loop-back | <ul style="list-style-type: none"> Transmitted data is electrically looped back to the receive interface. The optical receive interface is disabled in this mode. (SFP interface only) |
| Monitor | <ul style="list-style-type: none"> 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 (SFP interface only) |

Transmit Clock Sources

| | |
|--------------|--|
| Clock source | <ul style="list-style-type: none"> Internally generated based on chassis system reference |
|--------------|--|

Front Panel Indicators

| | |
|---|---|
| Ethernet Indicators (for each optical and electrical interface) | <ul style="list-style-type: none"> Link: Green - Ethernet framing is detected on the receive interface and link has been established with a link partner. Activity: Green - Data is transmitted or received |
|---|---|

Alarms and Errors

| | |
|---------------------------|--|
| Real-Time Alarm Detection | <ul style="list-style-type: none"> Current module status is indicated on the user interface 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) |
|---------------------------|--|

| | |
|------------------|--|
| Error monitoring | <ul style="list-style-type: none"> For the selected Ethernet statistics the following parameters are recorded: <ul style="list-style-type: none"> Number of individual occurrences of the event Number of seconds during which at least one event occurred Statistics are User selectable, dependant on the application. These may include, but are not limited to, the following: Frames transmitted, Valid frames received, Octets transmitted, Octets received, Runts, Short events, Jumbo frames, Jabbers, FCS errored frames, ARP frames, Flow control frames, VLAN tagged frames. |
|------------------|--|

Link layer specifications

Auto-negotiation

The Test Card supports auto-negotiation. This may be disabled independently on each port.

PAUSE Frames

The Test Card can generate, count and respond to PAUSE frames.

Measurement System

Measurements are synchronized across all cards within the test system.

| | |
|--------------|---|
| Result types | <ul style="list-style-type: none"> Cumulative: <ul style="list-style-type: none"> Measurements are reported from the start of the measurement interval Sampled: <ul style="list-style-type: none"> Measurements are reported from the most recently completed sampling interval Measurement Interval <ul style="list-style-type: none"> 1 second to 7 days Sampling Interval <ul style="list-style-type: none"> 1 second to 1 hour Measurement clock: <ul style="list-style-type: none"> 20 ns resolution +/-0.5 ppm/year clock drift 3 ppm max. difference between systems |
|--------------|---|

Real-time Statistics

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

Glossary

| | |
|--|--|
| Short event | <ul style="list-style-type: none"> A sequence of bytes of insufficient length to form a valid Ethernet frame (<18 bytes) |
| Runt | <ul style="list-style-type: none"> A frame with less than 64 bytes (excluding preamble) and a valid FCS. |
| Long frame | <ul style="list-style-type: none"> A frame longer than 1522 bytes (or 9022 for jumbo frames) with a valid FCS. |
| Jumbo frame | <ul style="list-style-type: none"> A frame between 1519 and 9022 bytes with a valid FCS and an Ethertype of 0x8870. |
| Jabber frame | <ul style="list-style-type: none"> A frame longer than 1522 bytes (or 9022 for jumbo frames) with an invalid FCS. |
| Pattern Match | <ul style="list-style-type: none"> Count of frames matching specified fields in the header |
| PPIC (Packet Payload Integrity Check). | <ul style="list-style-type: none"> 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 Stats | <ul style="list-style-type: none"> Tx and Rx % line use Misdirected packets Error rate |
| Per Stream Stats. | <ul style="list-style-type: none"> Rx and Tx stream packets and octets Misordered packets |
| Per Stream & Port Stats. | <ul style="list-style-type: none"> Tx and Rx test packets and octets Expected Rx packets Throughput Packets not received Average latency Minimum/maximum latency PPIC violations (ie. Count on payload error) |
| Ethernet | <ul style="list-style-type: none"> Tx and Rx frame and Octet counts Tx and Rx Throughput 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 | <ul style="list-style-type: none"> Tagged Tx and Rx frame and Octet counts |
| MPLS | <ul style="list-style-type: none"> Tx and Rx packets |
| IPv4 | <ul style="list-style-type: none"> Tx and Rx packet and octet counts Header checksum errors Fragmented packet count Throughput |

IPv6

- Tx and Rx packet and octet counts
- Throughput counts

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

All measurements are per physical interface port.

| | | | |
|---|--|----------|--------|
| Capture RAM | All models: 27MB | | |
| CPU RAM | N5550A/B, N553A/B: 128MB N5551A/B, N5552A/B: 256MB N5630A: 1GB | | |
| | All XS-2 and XR-2 | All XP-2 | |
| Maximum number of stream groups | 8192 | 1023 | |
| Maximum number of traffic streams | 32,768 | 32,768 | |
| Maximum number of field inserters | 24,576 | 128 | |
| Minimum transmit layer 2 frame length (bytes) | 5 | 5 | |
| Maximum transmit layer 2 frame length (bytes) | 65,703 | 65,703 | |
| Maximum receive layer 2 frame length | 1000 BASE-X | 65,535 | 65,535 |
| | 1000 BASE-T | 65,535 | 65,535 |
| | 100 BASE-T | 16,000 | 16,000 |
| | 10 BASE-T | 13,000 | 13,000 |

Applicable Standards

| | |
|-----------------------------|--|
| PCS/MAC | <ul style="list-style-type: none"> IEEE 802.3 |
| Address Resolution Protocol | <ul style="list-style-type: none"> IETF RFC 826 An Ethernet Address Resolution Protocol |
| IP IEEE 802 Networks | <ul style="list-style-type: none"> IETF RFC 1042 |

Mechanical Specifications

| | |
|------------|---|
| Physical | <ul style="list-style-type: none"> • Width 206 mm • Depth 313 mm • Height 31.0 mm • Weight 1.5 kg |
| Electrical | <ul style="list-style-type: none"> • Power consumption 50W |

Environmental

| | |
|---------------------------|---|
| Operating temperature | • 5 °C to 40 °C |
| Storage temperature | • -40 °C to 70 °C |
| Maximum Relative Humidity | • Maximum relative humidity 80% for temperatures up to 31 °C, decreasing lineally to 50% relative humidity at 40 °C (non-condensing). |

Regulatory Compliance

| | |
|---|--|
| Electrical (Electromagnetic Compliance - EMC) | <ul style="list-style-type: none"> • As per IEC 61326-1:1997 + A1:1998 / EN 61326-1:1997 + A1:1998 <p>Electrical equipment for measurement, control and laboratory use (Class A)</p> <ul style="list-style-type: none"> • EMC Directive 89/336/EEC (including 93/68/EEC) • For complete compliance information refer to Declaration of Conformity E7900-91300 (Tested for regulatory compliance with Agilent Technologies SFPs) |
| Electrical (Safety) | <ul style="list-style-type: none"> • Safety requirements for electrical equipment for measurement, control, and laboratory use • Low voltage directive 73/23/EEC |
| Optical (Safety) | <ul style="list-style-type: none"> • Complies with IEC 60825 Class 1, and CDRH 21 CFR 1040 - Class I Laser Products when equipped with Agilent supplied SFP optical transceivers |

Application Programming Interface

An Application Programming Interface (API) is provided through the Tool command Language (Tcl). The API is intended to automate configuration tasks, create repeatable test sequences, or to integrate the test system into a larger test system. The scripting language is Tcl/Tk. Tcl/Tk comes bundled with the E7880A Traffic Generation and Analysis software.

An API client may run directly on the N2X System Controller, or may run on any other PC or UNIX workstation connected to the System Controller via a TCP/IP connection. API clients communicate with the System Controller via an included package of Tcl commands. All functions available through the GUI are available via the API. Any changes made through the API are automatically reflected on the GUI.

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

United States:

Agilent Technologies
Test and Measurement Call Center
P.O. Box 4026
Englewood, CO 80155-4026
1-800-452-4844

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