



Agilent N2X  
**Next Generation  
Ethernet Interfaces**



N5605A 10-port Ethernet SFP XR-2 &  
N5606A 10-port Ethernet 10/100/1000 BASE-T XR-2  
Test Card  
Technical Data Sheet

**The most flexible high-density Ethernet test cards for line-rate traffic and protocol performance verification, optimized to occupy the least rack space for high port-count testing.**



**Agilent Technologies**

## Key Features

- **20 Ethernet ports per rack-unit (U)**
- **High-powered CPU resources that can be concentrated behind a single port**
- **High-density, high-scale support for service-aware testing**
- **Line-rate traffic generation and analysis**
- **Dual media support enabled by electrical and optical SFP plug-ins**
- **Comprehensive API & open library of automated QuickTest 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.

N2X 10-port Ethernet test cards provide flexible SFP or RJ45 interfaces with support for gigabit optical and tri-rate (10/100/1000 Mbps) electrical interfaces. In conjunction with the N2X Packets & Protocols Application, they provide multi-port traffic generation, scalable protocol emulation and service-centric analysis of today's Ethernet devices and networks. From wire-speed traffic generation and analysis to full emulation of Internet-scale routing topologies and services 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 and 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 features a multi-profile traffic scheduler, thousands of streams, programmable field modifiers and Agilent's patented test payload. This provides unparalleled test realism and flexibility to ensure you can generate the traffic to meet any test scenario.

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

N2X's traffic generator and receiver capabilities are tightly coupled with powerful protocol emulation hardware on all XR-2 test cards. This integration will ensure your devices are tested under the most realistic environment possible and save you time by removing 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. There is comprehensive support for resiliency mechanisms including Graceful Restart, MPLS FRR and BFD. Carrier Ethernet testing can be completed with a range of protocols including E-OAM, BFD xSTP and LACP. Multicast technologies can be verified easily with our IGMP, MLD and PIM-SM protocol emulations. Access networks and devices can be tested with PPPoX, DHCP and ANCP protocols.

All N2X 10-port Ethernet test cards provide independent per-port data capture memory to enable detailed inspection and analysis of received data. 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.

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

### 20 Ethernet ports per rack-unit (U)

N2X 10-port Ethernet test cards provide the highest-density test solution in deployments up to 120 ports, minimizing the lab space required for high port-count 10/100/1000 Mbps Ethernet testing. This significantly reduces operational expense for test labs that undertake high port-count testing.

### High-powered CPU resources that can be concentrated behind a single port

N2X 10-port Ethernet test cards offer the flexibility to distribute the resources (RAM, I/O and processing cycles) of multiple high-powered CPUs across a set of ports. This provides you with a single cost-effective test card to test either at high port counts/densities or at high performance across fewer ports.

### Line rate traffic generation and analysis

Each port of the high-density test card supports full wire-speed packet generation and real-time analysis on up to 32,000 user-defined streams. The packet engine is implemented in dedicated hardware with no reliance on the CPU for fast-path activities, giving predictable, repeatable and guaranteed performance.

### High-density, high-scale support for service-aware testing

Full Packets & Protocols application support, including SIP/VoIP, will be available with release 6.11. IPTV support is planned for a subsequent release.

### Dual media support enabled by electrical and optical SFP plug-ins.

N2X 10-port Ethernet SFP test card supports dual media optical/electrical operation. Each port of the N5605A can accept either an electrical or optical SFP transceiver. Use of the Agilent supplied electrical SFP enables 1000BASE-T operation.

### Comprehensive API & open library of automated QuickTest 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

<b>Port Density &amp; connection type</b>	N5605A: 10 x SFP Ethernet ports (SFF-8074i v1.0) N5606A: 10 x 10/100/1000 Mb/s RJ45 Electrical Ethernet ports  Auto-detect of MDI/MDI-X and auto-configure
<b>Interface Operation Modes</b>	Terminal Normal operation – transmit and receive interfaces operate independently.  Transmit loop-back Transmitted data is electrically looped back to the receive interface. The physical SFP transmit & receive interfaces are disabled in this mode.
<b>Clock source</b>	Internally generated based on chassis system reference.
<b>Ethernet Indicators (for each optical and electrical interface)</b>	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.
<b>Real-Time Alarm Detection</b>	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).
<b>Error monitoring</b>	For the selected Ethernet statistics the following parameters are recorded:  <ul style="list-style-type: none"> <li>• Number of individual occurrences of the event;</li> <li>• Number of seconds during which at least one event occurred.</li> </ul> Statistics are user-selectable, dependent 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

<b>Auto-negotiation</b>	The Test Card supports auto-negotiation. This may be disabled independently on each port.
<b>PAUSE Frames</b>	The Test Card can generate, capture, count and respond to PAUSE frames.

### Measurement System

#### General

<b>Synchronization</b>	Measurements are synchronized across all cards within the test system.
<b>Result types</b>	Cumulative Measurements are reported from the start of the measurement interval.  Sampled Measurements are reported from the most recently completed sampling interval.
<b>Measurement Interval</b>	1 second to 7 days.
<b>Sampling Interval</b>	1 second to 1 hour.
<b>Measurement clock</b>	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.

<b>Short event</b>	A sequence of bytes of insufficient length to form a valid Ethernet frame (<18 bytes).
<b>Runt</b>	A frame with less than 64 bytes (excluding preamble) and a valid FCS.
<b>Long frame</b>	A frame longer than 1522 bytes (or 9022 for jumbo frames) with a valid FCS.
<b>Jumbo frame</b>	A frame longer than 1522 bytes (or 9022 for jumbo frames) with a valid FCS.
<b>Jabber frame</b>	A frame longer than 1522 bytes (or 9022 for jumbo frames) with an invalid FCS.
<b>Pattern Match</b>	Count of frames matching specified fields in the header.
<b>PPIC (Packet Payload Integrity Check)</b>	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

<b>Per Port Stats</b>	<ul style="list-style-type: none"> <li>• Tx and Rx % line use</li> <li>• Misdirected packets</li> <li>• Error rate</li> </ul>
<b>Per Stream Stats</b>	<ul style="list-style-type: none"> <li>• Rx and Tx stream packets and octets,</li> <li>• Misordered packets</li> </ul>
<b>Per Stream &amp; Port Stats</b>	<ul style="list-style-type: none"> <li>• Tx and Rx test packets and octets</li> <li>• Expected Rx packets</li> <li>• Throughput</li> <li>• Packets not received</li> <li>• Average latency</li> <li>• Minimum/maximum latency</li> <li>• PPIC violations (i.e. Count on payload error)</li> </ul>

<b>Ethernet</b>	<ul style="list-style-type: none"> <li>• Tx and Rx frame and Octet counts</li> <li>• Tx and Rx Throughput</li> <li>• Tx and Rx MAC control frames</li> <li>• Short events received</li> <li>• Runt frames received</li> <li>• Tx &amp; Rx long frames</li> <li>• Jabber frames received</li> <li>• Tx &amp; Rx invalid FCS frames</li> </ul>
<b>VLAN</b>	Tagged Tx and Rx frame and octet counts.
<b>MPLS</b>	Tx and Rx packets.
<b>IPv4</b>	<ul style="list-style-type: none"> <li>• Tx and Rx packet and octet counts</li> <li>• Header checksum errors</li> <li>• Fragmented packet count</li> <li>• Throughput</li> </ul>
<b>IPv6</b>	<ul style="list-style-type: none"> <li>• Tx and Rx packet and octet counts</li> <li>• Throughput counts</li> </ul>
<b>User Defined Statistics</b>	Powerful features allow statistics collection on a per stream, per-MPLS tag, per-VLAN tag or other user-defined-index basis.

### Card Specific Specifications

<b>CPU</b>	<ul style="list-style-type: none"> <li>• 2 CPUs per card</li> <li>• 5 ports per CPU</li> <li>• 1GHz 32-bit RISC architecture</li> <li>• 1GB RAM per CPU</li> </ul>	
<b>Capture RAM</b>	• 27MB per port	
<b>Maximum transmit profiles</b>	• 15 per port	
<b>Maximum stream groups</b>	• 8,192 per port	
<b>Maximum traffic streams</b>	• 32,768 per port	
	<b>N5605A</b>	<b>N5606A</b>
<b>Minimum transmit L2 frame length (bytes)</b>	• 5	• 5
<b>Maximum transmit L2 frame length (bytes)</b>	• 65,534	• 65,534 (Master) • 10,000 (Slave)
<b>Minimum receive L2 Frame Length (bytes)</b>	• 5	• 5
<b>Maximum receive L2 frame length (bytes)</b>	• 65,535	• 18,000

### Applicable Standards

<b>PCS/MAC</b>	• IEEE 802.3
<b>Address Resolution Protocol</b>	• IETF RFC 826 An Ethernet Address Resolution Protocol
<b>IP IEEE 802 Networks</b>	• IETF RFC 1042

### Mechanical Specifications

<b>Physical</b>	<ul style="list-style-type: none"> <li>• Width 206 mm</li> <li>• Depth 313 mm</li> <li>• Height 31.0 mm</li> <li>• Weight 1.5 kg</li> </ul>
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<b>Electrical Power consumption</b>	• Power consumption 95W
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### Environmental

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

### Regulatory Compliance

(For complete compliance information refer to the product Declaration of Conformity available on request)

<b>Electrical (Electromagnetic Compatibility - EMC)</b>	Complies with requirements for electrical equipment for measurement, control and laboratory use (Class A) as per EMC Directive 2004/108/EC (Tested for regulatory compliance with Agilent Technologies SFP optical transceivers).
<b>Electrical (Safety)</b>	Complies with safety requirements for electrical equipment for measurement, control, and laboratory use as per Low Voltage Directive 2006/95/EC when incorporated into N2X Chassis.
<b>Optical (Safety)</b>	Complies with IEC 60825 Class 1, and CDRH 21 CFR 1040 - Class I Laser Products when equipped with Agilent supplied SFP optical transceivers, as per CDRH Laser Notice No. 42.

### 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.

## Configuration and Ordering Details

### Ethernet test card variants

- N5605A: N2X 10-port Ethernet SFP XR-2 test card
- N5606A: N2X 10-port 10/100/1000BASE-T XR-2 test card

### Pluggable SFP optics options (N5605A only)

- Option 001: Include one –1000Base-SX SFP (850nm)
- Option 002: Include one –1000Base-LX SFP (1310nm)
- Option 003: Include one –1000Base-ZX SFP (1550nm)
- Option 004: Include one –1000Base-T SFP (Electrical)

## Software Compatibility

The N5605A and N5606A XR-2 test card support both the E7880B Packets Application and the E7881B Packets and Protocols Application, release 6.11 SR1 or later. The E7880B provides traffic generation and analysis, while the E7881B adds a scalable N2X multi-protocol emulation environment and integrated traffic & protocol features. Additional licenses are required for specific protocol emulations. Please contact your Agilent sales representative for further information.

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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.

## Software and Support Agreement

To protect your investment in the Agilent N2X, every new system includes an initial 12-month comprehensive system-based warranty and Software and Support Agreement (SSA).

Renewing Agilent support services ensures uninterrupted technical support and software upgrades, giving you confidence in N2X throughout the life of your system.

The N2X technical support portion of your SSA includes assistance with product operation and measurements, and verification that the N2X equipment is in correct working order.

## 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.

## Ordering Information

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

## Sales, Service and Support

N2X must be serviced by an approved Agilent Technologies service centre, please contact us for more information.

### United States:

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

1-800-829-4444

### Canada:

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