

**Agilent RouterTester**  
Powered by QA Robot Technology

**GbE/4 (SX/LX)  
Test Module**  
**E7904/7914A**  
Technical Datasheet



- **Four 1 Gb Ethernet interfaces per test module**
- **Generates and analyzes IP and MPLS packets at up to wire speed**
- **Multi-access networks are emulated using RouterTester's emulation software (BGP-4, OSPF, IS-IS, RIP, RSVP-TE, LDP, CR-LDP)**
- **Realistic Internet-scale routing simulation of BGP-4, OSPF and IS-IS for the comprehensive verification and stressing of routers and networks**
- **IEEE 802.1 p and Q VLAN tag capability**
- **Multi-user remote access**
- **Comprehensive layer 2 and layer 3 capture and analysis/decode tools**



**Agilent Technologies**

## Product Overview

The RouterTester’s ability to emulate multiple E-BGP, I-BGP, OSPF and IS-IS sessions creates a realistic network cloud around the System under Test (SUT), providing unprecedented realism to router testing.

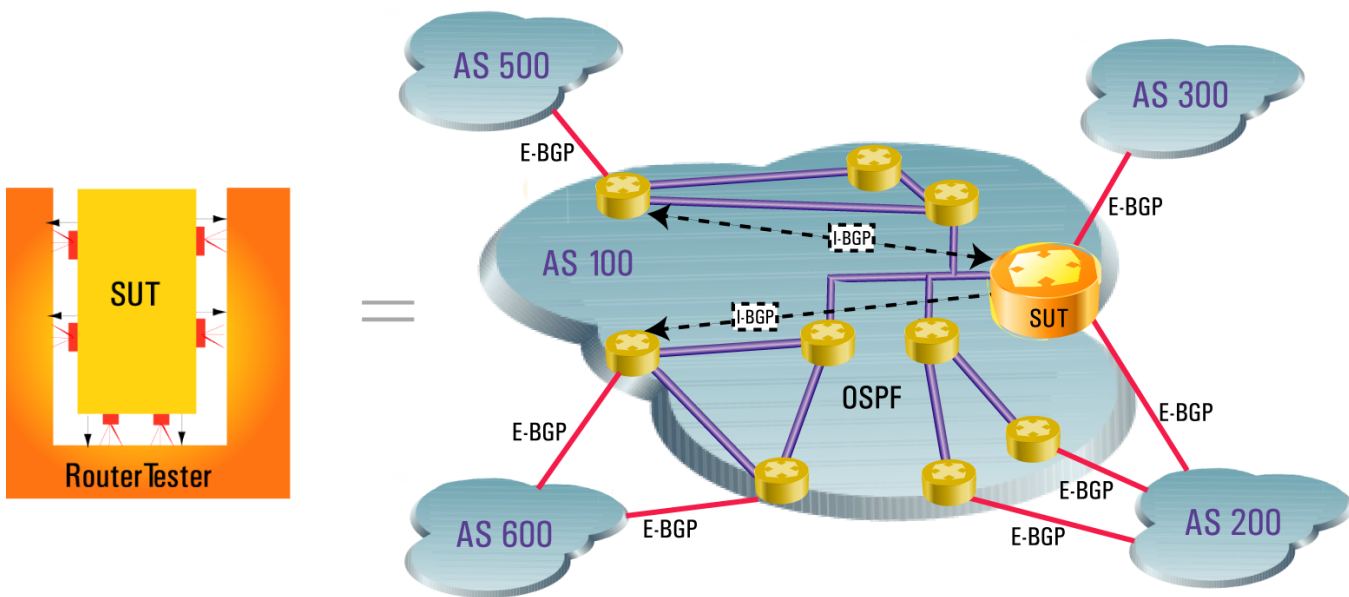
Any number of routes with a flexible range of attributes can be advertised into the router (or network) under test, building immense and complex forwarding tables within these devices, which will stress the data forwarding abilities of the router under test.

Working in conjunction with the IP performance application, the data forwarding performance of a router can be measured while simultaneously advertising and withdrawing routes. The ability of a router to withstand route flap “storms” as well as the time it takes for a router to converge on new routes can be precisely measured. Questions such as “How much user data is lost when a route changes?” can be answered. By benchmarking a network or router with realistic tests, a router will function and

perform reliably when deployed in the real world.

When using the Gigabit Ethernet module on RouterTester, multi-access networks can be simulated, allowing the creation of multiple peer sessions, making it possible for the data forwarding ability of the Router under test to be measured on an Ethernet segment.

The RouterTester GbE/4 Test module has four 1Gb 1000-base-SX/LX optical interfaces. Each full-duplex port can generate IP packets encapsulated within an Ethernet frame and analyzes received frames in real-time at up to wire speed. Up to 32 modules can be utilized in a single system, providing an unparalleled Internet-scale test solution.



**RouterTester can simulate a realistic autonomous system around a router under test**

## Product Features

### Routing Emulation software

RouterTester emulates the entire core routing protocols that are currently used in networks, enabling a realistic network cloud to be created around the router under test. Working in conjunction with the IP performance software, data forwarding performance is measured while routes are added and removed.

### Provides rapid configuration of network addresses

Network addresses are easily defined through the graphical user interface. The user can assign a specific route/routes over a single prefix or automatically assign a number of routes evenly over a range of prefixes. The BGP-4, OSPF and IS-IS Attributes can be easily manipulated to generate 'preferred' and 'alternative' routes.

### IP Analysis Software

Each Gigabit Ethernet Port comes with 64 MB of line rate capture. Capture can be started and stopped manually or automatically based on specific events, pattern matches, thresholds or error conditions, allowing the RouterTester's off-line analysis tools to investigate the packets of interest. IP Analysis comes with an extensive suite of protocol decodes (including BGP-4, OSPF, IS-IS).

### Statistics

While network instabilities or a route advertisements/withdrawals are simulated, IP packet measurements are monitored using RouterTester's comprehensive and real-time L2 and L3 statistics. Jumbo frames up to 8096 bytes are supported.

### IEEE 802.1p and Q VLAN Support

The 1 GbE module also includes support for 802.1p and Q VLAN tagging. With the VLAN enhancements, up to 4095 channels can be emulated on a RouterTester 1 GbE. More than simply inserting a 32-bit VLAN tag between a frame's header and payload, the testing of

peering protocols such as E-BGP is also supported over a VLAN channel.

On the transmit side, support is provided for up to 4095 VLAN IDs and up to 8 priority levels. Tags may be inserted explicitly by the user, or automatically by the traffic generator. Mixed tagged and untagged traffic may also be transmitted.

VLAN specific statistics are available in real-time on port, stream, and VLAN-ID bases. Statistics are provided for both transmitted and received VLAN traffic.

### Flexible, Powerful Scripting

Automated scripts are quickly created using RouterTester's Tcl/Tk scripting environment. With only a few lines of code, thousands of networks are easily advertised from simulated peers on any or all of RouterTester's ports.

### QBOL Support

QBOL Scripts previously developed for the Agilent Technologies QARobot are fully portable to RouterTester.

### Protocol Conformance Suites

Conformance test suites are available to ensure compliance to the relevant IETF RFCs and Internet-drafts.

### Multi User Remote Access

RouterTester can be controlled via the local system controller, or multiple sessions can be controlled remotely from any PC attached to a corporate LAN.

### Online Help

An extensive online help system provides complete descriptions and detailed usage instructions. Dialog-level context-sensitive help provides rapid access to the relevant sections of the online help. A technology reference section provides a complete library of background information pertaining to gigabit and terabit router performance testing.

## Technical Specifications

### System Specifications

#### Physical Interface

Connector	<ul style="list-style-type: none"> <li>4 duplex SC connectors</li> </ul>
Optical Interface	<ul style="list-style-type: none"> <li>SX Multi-mode                             <ul style="list-style-type: none"> <li>850 nm receiver</li> <li>850 nm Class 1 laser</li> <li>compliant with specifications for IEEE 802.3z Gigabit Ethernet</li> </ul> </li> <li>LX Single-Mode                             <ul style="list-style-type: none"> <li>1310 nm receiver</li> <li>1310 nm class 1 laser</li> <li>compliant with specifications for IEEE 802.3z Gigabit Ethernet</li> </ul> </li> </ul>

Input Sensitivity	<ul style="list-style-type: none"> <li>-18.5 dBm (min)</li> </ul>
Average Output Power	<ul style="list-style-type: none"> <li>-9.5 dBm (min)</li> </ul>

#### Interface operation modes

Terminal	<ul style="list-style-type: none"> <li>Transmit and receive interfaces operate independently. Allows line "monitor" mode via optical splitter</li> </ul>
Transmit loop-back	<ul style="list-style-type: none"> <li>Transmitted data is electrically looped back to the receive interface. The optical receive interface is disabled in this mode</li> </ul>
Autonegotiation	<ul style="list-style-type: none"> <li>Not supported</li> </ul>

#### Measurement System

Result Types	<ul style="list-style-type: none"> <li>Cumulative: measurements are reported from the start of the measurement interval</li> <li>Sampled: measurements are reported from the most recently completed sampling interval</li> </ul>
Measurement Interval	<ul style="list-style-type: none"> <li>Range: 1 second to 7 days</li> </ul>
Sampling Interval	<ul style="list-style-type: none"> <li>Range: 1 second to 1 hour</li> </ul>
Measurement Clock	<ul style="list-style-type: none"> <li>10 ns resolution</li> <li>+/- 0.5 ppm/year clock drift</li> <li>3 ppm max. difference between systems</li> </ul>
Module Synchronization	<ul style="list-style-type: none"> <li>All measurements are synchronized across all modules within the test system</li> </ul>

### Negative Testing Frames Transmit (Single shot only)

Runt (Ethernet Frame size)	<ul style="list-style-type: none"> <li>9 to 63 bytes</li> </ul>
Jumbo (Ethernet Frame Size)	<ul style="list-style-type: none"> <li>Up to 65,535 bytes</li> </ul>

### Real-time Statistics

#### Real-time Ethernet receive statistics

Frames received	<ul style="list-style-type: none"> <li>Count of all frames received, including FCS errors, aborted and invalid frames</li> </ul>
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Pattern Match	<ul style="list-style-type: none"> <li>Count of frames matching specified fields in Ethernet header</li> </ul>
Octets received	<ul style="list-style-type: none"> <li>Counts of all octets received</li> </ul>
Oversize frame	<ul style="list-style-type: none"> <li>Count of all frames &gt; 1,528 bytes that were received</li> </ul>
MAC control frames	<ul style="list-style-type: none"> <li>Count of all MAC control frames received</li> </ul>
FCS errors	<ul style="list-style-type: none"> <li>Count of all frames received with an invalid FCS</li> </ul>
Short frames	<ul style="list-style-type: none"> <li>Count of all frames &lt; 64 bytes that were received</li> </ul>
Jumbo frames	<ul style="list-style-type: none"> <li>Count of all frames received with length between 1528 and 8096 bytes</li> </ul>
VLAN frames (octets)	<ul style="list-style-type: none"> <li>Count of all VLAN frames (octets) received</li> </ul>

#### Real-time Ethernet transmit statistics

Frames transmitted	<ul style="list-style-type: none"> <li>Count of all frames transmitted</li> </ul>
VLAN frames (octets)	<ul style="list-style-type: none"> <li>Count of all VLAN frames (octets) transmitted</li> </ul>

#### Layer 2 capture/decode

Capture Control	<ul style="list-style-type: none"> <li>Trigger, precapture and postcapture against L2 header fields</li> </ul>
Encapsulations	<ul style="list-style-type: none"> <li>MAC, SAP, SNAP with and without VLAN Tag</li> </ul>
Decodes	<ul style="list-style-type: none"> <li>VLAN tag, GMRP, GVRP</li> </ul>

### Mechanical Specifications

Size	<ul style="list-style-type: none"> <li>441 mm (width) x 390 mm (depth) x 44 mm (height)</li> </ul>
Weight	<ul style="list-style-type: none"> <li>4.8 kg</li> </ul>
Supply voltage	<ul style="list-style-type: none"> <li>100 - 240 Volts AC</li> </ul>
Supply frequency	<ul style="list-style-type: none"> <li>50- 60 Hz</li> </ul>
Power consumption	<ul style="list-style-type: none"> <li>100 watts maximum</li> </ul>
Input current	<ul style="list-style-type: none"> <li>&lt; 3.0 amps RMS, measured at 85 VAC</li> </ul>
Input protection	<ul style="list-style-type: none"> <li>Non-user serviceable, internally located 5 amp, anti-surge AC input line fuse</li> </ul>
Inrush current	<ul style="list-style-type: none"> <li>35 amps peak (Vin = 230 VAC, one cycle, 25° C)</li> <li>current internally limited by thermistor</li> </ul>
Power factor	<ul style="list-style-type: none"> <li>0.95 W/VA (per EN61000-3-2)</li> </ul>
Rear connectors	<ul style="list-style-type: none"> <li>Ethernet:                             <ul style="list-style-type: none"> <li>RJ-45 clock line connectors (input/output)</li> <li>SMA event lines (input/output)</li> <li>Twin BNC external trigger (input/external trigger)</li> </ul> </li> <li>Output                             <ul style="list-style-type: none"> <li>BNC</li> </ul> </li> </ul>

**Front panel LED indicators**

Power	• Green when module has power
Status	• Yellow to indicate module start-up • Green to indicate that a test application is running • Red to indicate a module error
Module	• Numerical module identifier

**Port LED indicators**

Link	• Green when a valid optical receive signal is detected
Tx	• Green when an Ethernet Frame is transmitted
Rx	• Green when an Ethernet Frame is received

**Environmental Operating Conditions**

Operating temperature	• 0° C - 55° C
Storage temperature	• -40° C - 70° C
Humidity	• 50% to 95% relative humidity from 25° C - 40° C

**Regulatory Compliance****Electrical (Electromagnetic Compliance -EMC)**

- As per EN 61326-1:1997: Electrical equipment for measurement control and laboratory use.

**Emission standards**

- CISPR 11:1992 + A2: 1996 (electrical disturbance): Limits and methods of measurements of electromagnetic disturbance characteristics of industrial, scientific and medical radio frequency equipment. This equipment meets Group 1, Class A limits.
- EN 61000-3-2:1995 / IEC 1000-3-2:1995, Section 2: Limits for harmonic current emissions.
- EN 61000-3-3: 1994 / IEC 1000-3-3:1994, Section 3: Limitation of voltage fluctuations and flicker.

**Immunity standards**

- EN 61000-4-2:1997 / IEC 1000-4-2:1995, Section 2: Electrostatic discharge test.
- EN 61000-4-3:1995 / IEC 1000-4-3:1995, Section 3: Radiated electromagnetic field test.
- EN 61000-4-4:1995 / IEC 1000-4-4:1995, Section 4: Electrical fast transient/burst test.
- EN 61000-4-5:1995 / IEC 1000-4-5:1995, Section 5: Surge immunity test.
- EN 61000-4-6:1996 / IEC 1000-4-6:1996, Section 6: Radiated electromagnetic field test.
- EN 61000-4-8:1993 / IEC 1000-4-8:1993, Section 8: Power frequency magnetic field immunity test.
- Electrical (safety)
- CSA22.2 No. 1010.1, NRTL/C, EN 61010-1:1993 + A2: 1995/IEC 1010-1:1990 + A1: 1992 + A2: 1995 Safety requirements for electrical equipment for measurement, control and laboratory use.
- Optical (Safety)
- Complies with IEC 825/CDRH Class 1, and 21 CFR 1040 - Class 1 Laser Products

**Applicable Standards**

Optical Transmitter and Receiver • IEEE-802z Gigabit Ethernet

**IP over Ethernet/MAC Layer Specification**

Address Resolution Protocol • IETF RFC 826 An Ethernet Address Resolution Protocol (ARP)