Agilent RouterTester 900

10/100 Ethernet 4-port Routing Test Card

E7922A

Technical Datasheet

Seamless interoperation with RouterTester GbE and 10GbE test modules. Generates and analyzes IP packets and Ethernet frames. Enables realistic testing of switches/routers with 10/100 interfaces.

Agilent Technologies

Key Features

- **10BASE-T/100BASE-TX Wire Speed Transmission & Analysis**
- **Synchronized Multi-port Measurements in Real-time**
- **Routing Emulation Software**
- **Powerful IP and Ethernet Data Capture**
- **Protocol Conformance and Automation Test Suites**
- **IEEE 802.1Q VLAN Support**
- **Simultaneous IPv6 and IPv4 generation and analysis capabilities to test dual stack routers**
- **MAC Addressing Support**

Product Overview

By benchmarking a network or router with realistic tests, carriers and equipment manufacturers can be assured that the router will function and perform reliably when deployed in the real world. By using RouterTester to characterize the tight interaction that exists between a router control-plane and data-plane, performance limits can be uncovered.

RouterTester's ability to emulate multiple E-BGP, I-BGP, OSPF, IS-IS and MPLS-TE sessions at line rate creates a realistic 'network cloud' around the System Under Test (SUT), providing unprecedented realism to testing.

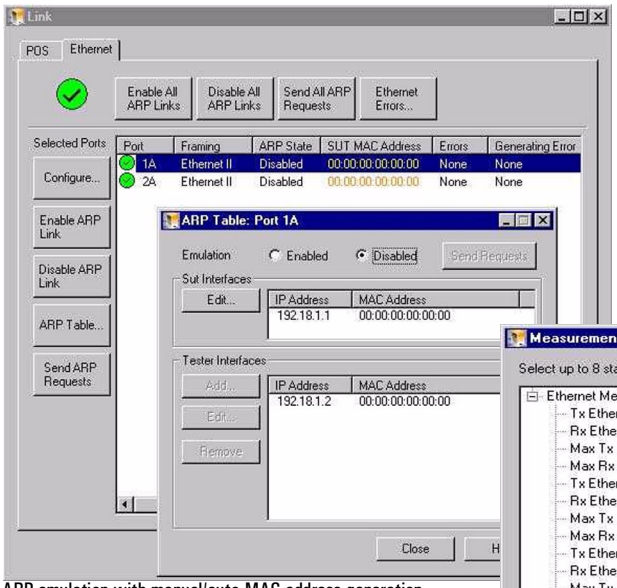
A large number of routes with a flexible range of attributes can be advertised into the router or network under test, building immense and complex forwarding tables within these devices, which will stress the data forwarding abilities of the router under test.

Working in conjunction with the RouterTester 'IP Performance' application, the data forwarding performance of a router can be measured at full line rate while simultaneously advertising and withdrawing routes. The time taken for a router to converge on new routes can be precisely measured, along with the amount of data lost during this 'route flap' process.

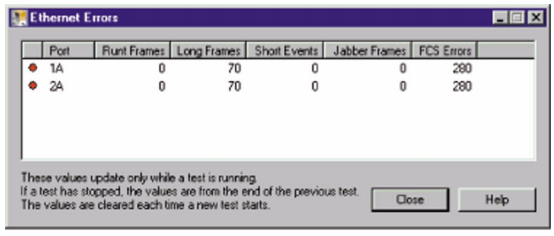
Comprehensive transmit and receive statistics at the IP layer, Link layer and Physical layer are available in real-time, tabular and graphical formats.

The powerful 'IP-Analysis' application enables off-line data-capture, analysis, graphing and decodes, such that erratic or transient behavior can be diagnosed.

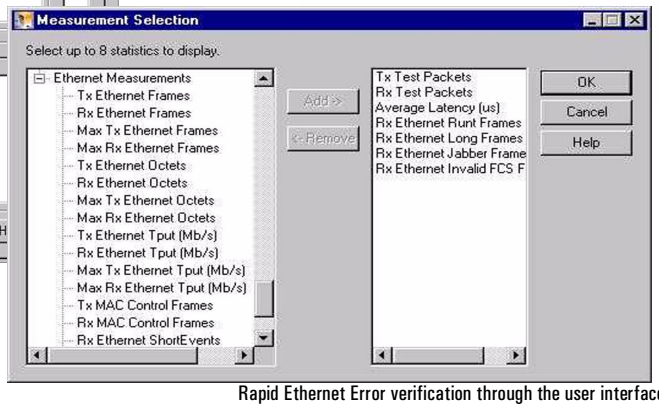
The E7922A RouterTester 10/100 test module has four full-duplex ports. Each port can generate suitably encapsulated IP packets. Many modules can be utilized in a single system, providing an unparalleled 'Internet-scale' test solution.



ARP emulation with manual/auto MAC address generation



Extensive choice of Ethernet statistics



Rapid Ethernet Error verification through the user interface

Product Features

Wire Speed Transmission & Analysis

All frames can be transmitted and received at up to wire speed.

Synchronized Multi-port Measurements in Real-time

All transmitted packets can be instrumented with a sequence number and transmit timestamp, allowing accurate packet loss and latency measurements. All modules are synchronized via a common distributed clock signal. Comprehensive transmit, receive and error statistics at the IP layer, link layer and physical layer are thus available in real time across all test ports.

Routing Emulation Software

RouterTester emulates all the 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 advertised and withdrawn.

Comprehensive and tightly integrated MPLS-TE capability operating at full line rate is also supported. This includes the three essential requirements to properly test MPLS-TE:

(a) Automatic IGP protocol emulation (OSPF or IS-IS, with traffic engineering extensions) to advertise a simulated network topology

(b) Signaling protocol emulation (RSVP-TE) to dynamically establish Label Switched Paths (LSPs)

(c) Ability to send labeled packets on dynamically established paths

IP & Ethernet Data Capture

Each 10/100 module contains 256MB of line-rate capture RAM. Capture can be started and stopped manually or triggered automatically, based on specific events, pattern matches, thresholds or error conditions. This allows the RouterTester's off-line analysis tools to investigate the packets of interest, as well as graphically display the results. The IP Analysis application includes an extensive suite of protocol decodes (including BGP-4, OSPF, IS-IS).

Full capture and decode of Ethernet frames

Flexible Capture Memory Assignment

256MB capture memory can be used across all 4 ports or a specific subset (ie a single port may have up to 256MB of capture)

Protocol Conformance and Automation Test Suites

Conformance test suites are available to ensure compliance with the relevant IETF RFCs and Internet-drafts. Automation test suites such as RFC2544 are also available.

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, and customised test scripts are easily developed.

IEEE 802.1Q VLAN Support

The 10/100 module also includes support for 802.1Q VLAN tagging.

On the transmit side, support is provided for up to 4095 VLAN IDs and up to 8 priority levels per port. Tags may be inserted explicitly by the user, or automatically by the traffic generator. Mixed tagged and untagged traffic may also be transmitted. Testing of routing protocols is also supported over a VLAN.

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.

Mac Addressing

In addition to the powerful routing layer features, the E7922 supports MAC layer

addressing as well. This enables switch functionality to be verified generating traffic to and from specified ranges of MAC addresses. Parameters such as packet loss, throughput and latency can then be measured.

Multi-Port, Wire-Speed IPv6 Traffic Generation

Multi-Port, Wire-Speed IPv6 Traffic Generation

RouterTester's multi-port platform offers simultaneous, wire-speed IPv4 and IPv6 traffic generation and analysis capabilities. RouterTester's automated test tools and easy-to-use GUI make it simple to configure both IPv4 and IPv6 traffic streams from a test port, and perform real-time measurements on the System Under Test (SUT). Each traffic stream can be configured with a different IPv6 Traffic Class (equivalent to IPv4 Type of Service field or DiffServ field) value allowing comparative QoS measurements such as throughput, latency, and loss between IPv6 streams in real time.

Technical Specifications

System Specifications

E7922A Physical Interface

Number of ports	4
Connector	RJ45

Measurement System

Result types	Cumulative: measurements are reported from the start of the measurement interval Sampled: measurements are reported from the most recently completed sampling interval
Measurement interval	Range: 1 second to 7 days
Sampling interval	Range: 1 second to 1 hour
Measurement clock	10 ns resolution +/- 0.5 ppm/year clock drift 3 ppm max. difference between systems
Module Synchronization	All measurements are synchronized across all modules within the test system
Negative Test Frames (Transmit)	FCS errored Runt (Ethernet Frame Size < 64 bytes) Long (Ethernet Frame Size > 1518 bytes, with up to 9018 bytes)

10BASE-T/100BASE-TX MAC/PCS

Standards	Fully compliant with IEEE 802.3
PCS Encapsulation	4b/5b (100Mb/s)
MAC Encapsulation	Ethernet II (DIX) IEEE 802.3 LLC SNAP IEEE 802.3 LLC SAP
FCS	32 bit FCS length
Flow Control	Generation of PAUSE frames Response to PAUSE frames Counting of PAUSE frames
Mode	Half Duplex Full Duplex
Autonegotiation	Supported
ARP	Full Emulation Supported

Measurement Statistics and Indicators

Scalability	Up to 65536 source destination address pairs per port Up to 2000Transmit streams per port Up to 2000 statistics flows

Ethernet Real-Time Transmit Statistics

Tx Ethernet Frames	Frames successfully transmitted, including broadcast frames and multicast frames. Not including long frames or FCS errored frames.
Tx Ethernet Octets	A count of data and padding transmitted in "Tx Ethernet Frames".
Tx Ethernet Throughput (Mb/s)	Rate at which Ethernet payload was sent in a sampling interval
VLAN Frames	Count of VLAN Frames transmitted
VLAN Octets	Count of VLAN Octets transmitted

Ethernet Real-Time Receive Statistics

Rx Ethernet Frames	All frames received,
Rx Ethernet Octets	A count of all bytes received in "Rx Ethernet Frames" Not including preamble.
Rx Ethernet Oversize Frames	A count of well-formed frames received that exceed 1518 octets (excluding preamble, but including FCS octets)
Rx Ethernet Runt Frames	A count of frames which have an Octets count less than 64 and valid FCS.
Rx Ethernet Invalid FCS Frames	A count of received frames that do not pass the FCS check. (Excludes long and short frames)
Rx MAC Control Frames	A count of MAC Control frames received
Rx Ethernet Tput (Mb/s)	Rate at which Ethernet data was received in a sampling interval
Rx Jabber Frames	Received frames more than 1518 octets in length with a FCS error
VLAN Frames	Count of VLAN Frames received
VLAN Octets	Count of VLAN Octets received

General Specifications

Front Panel LED Indicators

Power	Green when module has power
Module	Numerical module identifier
Activity	Data is transmitted or received
Link	Physical link is sound

Environmental Operating Conditions

Operating temp	0^{o} C to 45^{o} C
Storage temperature	-40^{o} C to 70^{o} C
Maximum Relative Humidity	80% for temperatures up to 31degrees C decreasing linearly to 50% relative humidity at 40 degrees C – non condensing
Operating Voltage	100 to 120Vac and 200 to 240Vac
Maximum power consumption	630W (E7900A product only)

Regulatory Compliance

Electromagnetic Compatibility

IEC 61326-1:1997 + A1:1998 / EN 61326-1:1997 + A1:1998 Class A, Annex B

This equipment is designed to operate in a controlled electromagnetic environment, ie where RF transmitters such as mobile telephones may not be used in close proximity

EMC Directive 89/336/EEC (including 93/68/EEC)

Electrical Safety

CAN/CSA C22.2 No. 1010.1 (1993)

UL 3101, 3111 (First Editions)

This equipment has also been evaluated to IEC 61010 Edition 1 including amendments 1 + 2 (Safety requirements for electrical equipment for measurement, control and laboratory use) by CSA international

Low voltage Directive 72/23/EEC

Optical Safety (when fitted with optical interfaces/blades)

IEC 60825-1 : Edition 1.2 : 2001

CFR title 21 part 1040.10 and 1040.11

Applicable Standards

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

This page intentionally left blank.

This page intentionally left blank.

Agilent's RouterTester system

Agilent's RouterTester system offers a powerful and versatile test platform to address the evolving test needs of metro/edge platforms, core routers and optical switches. RouterTester provides Network Equipment Manufacturers and Service Providers with the industry's leading tools for wire speed, multiport traffic generation and performance analysis of today's networking devices.

Warranty and Support

Hardware Warranty

All RouterTester and QA Robot hardware is warranted against defects in materials and workmanship for a period of 3 years from the date of shipment.

Software Warranty

All RouterTester and QA Robot 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 Enhancement Service (SES) 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.

United States:

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

Canada:

Agilent Technologies Canada Inc.
5150 Spectrum Way
Mississauga, Ontario
L4W 5G1
1-877-894-4414

Europe:

Agilent Technologies
European Marketing Organisation
P.O. Box 999
1180 AZ Amstelveen
The Netherlands
(31 20) 547-2323

United Kingdom
07004 666666

Japan:

Agilent Technologies Japan Ltd.
Measurement Assistance Center
9-1, Takakura-Cho, Hachioji-Shi,
Tokyo 192-8510, Japan
Tel: (81) 426-56-7832
Fax: (81) 426-56-7840

Latin America:

Agilent Technologies
Latin American Region Headquarters
5200 Blue Lagoon Drive, Suite #950
Miami, Florida 33126
U.S.A.
Tel: (305) 269-7500
Fax: (305) 267-4286

Asia Pacific:

Agilent Technologies
19/F, Cityplaza One, 1111 King's Road,
Taikoo Shing, Hong Kong, SAR
Tel: (852) 3197-7777
Fax: (852) 2506-9233

Australia/New Zealand:

Agilent Technologies Australia Pty Ltd
347 Burwood Highway
Forest Hill, Victoria 3131
Tel: 1-800-629-485 (Australia)
Fax: (61-3) 9272-0749
Tel: 0-800-738-378 (New Zealand)
Fax: (64-4) 802-6881

www.agilent.com/comms/RouterTester

May 20, 2002.
5988-4192EN, Rev C

Agilent Technologies